FINAL REPORT

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RESTORING FOREST FOR IMPROVED HABITAT AND WATER QUALITY – FINAL REPORT

CONTACT INFORMATION

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EXECUTIVE SUMMARY

Vermont forests suffer from fragmentation pressure as new houses and roads are built in once-forested areas, resulting in habitat loss and increasing stormwater runoff to wetlands and streams. In the spring of 2023 Friends of the Winooski River planted 3 acres of woody vegetation to restore forest habitat on three residential sites where forested land had been cleared for lawn or haying. This involved working with the landowners to develop a mutually acceptable planting plan, procuring native trees and shrubs appropriate for each site, and recruiting, training, and educating community volunteers to do the planting.

Volunteers included employees from SunCommon, Trout Unlimited members, a visiting school group from Myanmar, and individuals from the community. At the beginning of each planting we discussed the purpose of the planting with the volunteers and taught them how to plant trees correctly. We also talked about ways individuals can help protect water quality and improve habitat at their own homes.

A total of 1200 native trees and shrubs were planted on 3 sites in East Montpelier, Montpelier, and Cabot, VT to create or improve wetland buffers, improve connection between forest blocks, and reduce overland stormwater flow. Two sites were planted by volunteers (East Montpelier and Montpelier) and the third (Cabot) was planted by a hired planting crew from the Intervale Conservation Nursery.

Outputs include the restored areas, final planting plans, landowner agreements, before and after photos of the planting sites, planting summaries, and quarterly and final reports.

CONTENTS

1. PROJECT SYNOPSIS

When land in Vermont is developed for residential housing, forested landscapes are often converted to lawns, hayfields, rooftops, roads, and driveways. This conversion fragments forests, in turn degrading the habitat of many species, especially those that require interior forests or large forest blocks to maintain viable populations. Removing the forest canopy also reduces the amount of rainfall and snowmelt an area can intercept and absorb. The resulting stormwater runoff carries pollutants such as fertilizers, sediment, herbicides, and pesticides to waterways and wetlands, adversely impacting wetland and aquatic habitat. An increase in stormwater volume leads to erosion, “flashy” streams, and downstream flooding.

The effects of converting forests to open areas is usually incremental and property owners are often unaware of the repercussions of their land use decisions. While the removal of trees on an individual parcel could be considered negligible, the cumulative effects of many small deforested parcels can become quite large. Conversely, reversing this trend will necessarily involve small restoration projects on private properties.

The primary impact forests have on water quality and aquatic habitat is the prevention of water pollution and stabilization of flow regimes by reducing runoff volume. Trees and other woody vegetation capture and store rainfall by intercepting rainfall, promoting infiltration, and improving the soil’s water storage capacity. Evapotranspiration from leaves creates a constant pump of water from the soil to the atmosphere while roots and leaf litter slow runoff and create conditions that allow water to soak into the soil. An increase in forest cover therefore protects streams, lakes, and wetlands and the quality of habitat these ecosystems provide. Adding more trees on the landscape can also increase the sizes of remaining forest blocks, connect patches of forest, and restore wildlife corridors.

Restoring forests is a straight-forward solution to declining habitat, biodiversity, and water quality. Even when landowners are interested in undertaking restoration projects on their properties, however, many will not take action on their own. Often they lack the finances, time, or expertise to choose species and execute a planting, are physically unable to do the work, or are intimidated by the scope of the project. Other landowners simply stop mowing an area only to find it becomes overrun by invasive plants.

The Friends of the Winooski River (FWR) is often contacted by the landowners for help with ecological restoration projects on their properties. The three sites that were planted under this project were selected due to their topography and proximity to wetlands and other forest blocks. The landowners of all three sites heard about our organization via our “Lawns to Forest” program, a LCBP-funded project in which we helped landowners reduce the extent of their lawns and plant native woody vegetation in its place. One of the landowners was a volunteer at one of our Lawns to Forest plantings in the spring of 2022. In all cases the landowners had acquired their properties fairly recently. Whereas the previous landowners of all three properties had maintained cleared areas of open land for various reasons including haying, lawn for sports, possible subdivision, and views, the new landowners were interested in managing their land for forest and wildlife habitat.

During the spring of 2023 we planted a total of 1200 native trees and shrubs in the cleared areas of these properties. A total of 3 acres was planted at a density of 400 stems per acre - the

same density we use in our riparian restoration projects. Species appropriate for each site were selected with landowner input based on soil type and moisture, surrounding vegetation, and nursery availability. Community volunteers helped plant the Cobb and Borland sites and received training on proper planting techniques and info on how trees reduce runoff and flooding, protect water quality, and improve habitat. They were also encouraged to replace lawn with woody vegetation at their own homes.

In order to protect the plantings for the long term, we required landowners to sign an agreement stating they will maintain the planting as a natural forest for a minimum of 15 years, perform routine maintenance tasks like clearing competing vegetation and vine removal, otherwise refrain from mowing and fertilizing, and allow FWR to monitor the planting.

We expect this project will improve wetland, woodland, and aquatic habitat and provide flood resiliency. It therefore supports LCBP's Opportunities for Action Clean Water goals by "promoting clean water implementation programs that have co-benefits for adapting to climate change" (I.D.2.a), "protecting and restoring natural infrastructure systems… including wetlands… and headwater areas (I.D.2.b). It supports LCBP's Healthy Ecosystem goals by "protecting and restoring wetlands" (II.C.1.c), and "protecting amphibian habitat… terrestrial connectivity, and natural infrastructure" (II.C.1.e). In addition, the project will "deliver face-to-face, small group, and interactive interpretation with members of the public."

2. TASKS COMPLETED

Task 1: Procured bare-root plant material, with a preference for stock from local nurseries. All 1200 trees that were planted were species native to central Vermont and appropriate for the particular soil, moisture, and light conditions at each site. 732 of the plants were obtained from nurseries that carry woody species native to Vermont, but tree availability forced us to purchase an additional 478 from a nursery in Michigan.

Task 2: Completed Plantings. Native trees and shrubs were planted at each site according to the site's planting plan. Labor for planting was provided by volunteers and the Intervale Conservation Nursery planting crew. See below for more details about each site.

Planting Locations, Maps, Descriptions, and Photos

Borland Property, East Montpelier, VT, Washington County, Tributary to Upper Winooski (VT08-08) 44.25727, -72.53158: This property is located in a suburban neighborhood on a hillside above a class II wetlands (olive-colored areas, left). A large area of forest had been cleared by previous owners, and new landowners wanted to restore the forest in this and other cleared areas on their property. In order to expand the wetland buffer, reduce stormwater runoff to two swales that drain to the wetlands, and help reconnect the fragmented forest blocks in the neighborhood, we planted 400 trees in the 1-acre green area shaded green on the map on 5/13/2023 with volunteers from SunCommon, Trout Unlimited, and the local community.

Cobb Property, Montpelier, VT, Washington County, Tributary to Upper Winooski (VT08-08), 44.25733, -72.55284: A large section of this parcel, located in a suburban neighborhood, is comprised of wetland (ANR Atlas wetlands advisory layer, left). Previous owners brush-hogged the land to keep it open for future development, but the current owners would like to restore the wetland and create a forested wetland buffer. We planted 600 native trees and shrubs in the shaded green areas to create a wetland buffer, provide better wildlife habitat, expand and connect existing forest blocks, reduce flow to an eroding stream channel outlet from the wetland (not shown), and improve water quality. Completed by community volunteers and the Intervale crew on 5/25 and 5/26/2023.

Hofmeister property, Cabot, VT Washington County, Winooski River Headwaters (VT08-09), 44.43416, -72.27580: Most of this sloped suburban/rural parcel in the Winooski headwaters was cleared by previous owners. New owners wanted to restore the forest at the lower end of the hillside and manage the upper section as shrub habitat. While the parcel has some natural regeneration, the additional trees and shrubs will help accelerate forest recovery and keep invasives from establishing. It will also connect two forested areas on either side of the property, creating a wildlife corridor between two forest blocks, one of which is listed as a priority connectivity block. 200 trees were planted by FWR staff and the Intervale Conservation Nursery planting crew in the green shaded area on the map on 5/23/2023.

Task 3: Project Management, Grant Reporting & Administration

FWR worked with landowners to finalize the planting plans for each site and obtain signed landowner agreements. We also recruited and communicated with volunteers, managed the planting logistics, prepared plant material and equipment, trained and supervised volunteers, and documented the project. Quarterly reports were submitted in July and October 2023. This final report, and the project metric report will be submitted along with deliverables including planting plans, maps, and summaries; project metrics, and a press release.

3. METHODOLOGY

In order to select tree and shrub species appropriate for each site, we used the Vermont ANR Atlas (address) to determine the sites' soil types and hydrologic characteristics. Possible appropriate species for each site were determined based on the plant communities typically found on a site's soils as listed in "Soil Series of Vermont and their common Natural Communities" (Villars, 2003) and Wetland, Woodland, Wildland (Thompson and Sorenson, 2005). This list was then pared down based nursery availability and FWR staff's experience of which species have done well in our restoration projects. As much as possible we favored plant material from the Intervale since it is mostly sourced from Vermont (i.e. has a local genotype) and is grown from seed when practicable (to preserve genetic diversity). A final list of recommended species was given to the landowners for comments and approval. Once a mutually agreeable list was finalized, tree orders were submitted.

All plant material was bare-root and was stored at the Intervale until the planting date. The plants' roots were soaked in water in buckets for 30 minutes to 2 hours before being planted. Volunteers were trained in proper planting procedure and supervised during the planting. After the planting was completed, Friends of the Winooski River staff checked on all the stems to ensure they were planted properly, and replanted any that were not (i.e, if they were planted too deeply, had exposed roots, etc.). Landowners were instructed to water the newly planted stems during the first growing season if the weather was dry or hot.

In order to prevent the spread of invasive species (e.g. snake worms, wild chervil seeds, bishop's weed seeds, garlic mustard seems, etc) we cleaned the shovels used by the volunteers before and after each planting. While we did not observe wide-spread invasive plants or snake worms at any of the sites, we nevertheless talked to the volunteers about ways to avoid spreading seeds or soil from one site to another, such as cleaning soil off of boots and gloves before leaving the site. Using bare-root plant material also minimized the spread of seeds and eggs that might be present in container plants.

4. DELIVERABLES COMPLETED

Invoices for Tree Orders (completed Spring 2023)

Borland Invoice_ICN102896.pdf

Cobb Trees_ICN102919.pdf

Hofmeister Tree Invoice_ICN102918.pdf

Inv_184163_from_Cold_Stream_Farm_LLC_2392.pdf (includes plants for other projects; only $2809.85 of the total was applied toward this grant)

Cobb Crew Time Inv_ICN102915.pdf

HofmeisterDrinkwine_ICN Crew Time Invoice.pdf (includes ½ day crew time for a project not in this grant; only $800 of the total was applied toward this grant)

Before, During, and After Photos (completed Fall 2023, see Appendix for photo credits)

Borland planting:

Borland Before 1.jpg
Borland Before 2.jpg
Borland During 1.jpg
Borland During 2.jpg
Borland During 3.jpg
Borland After 1.jpg
Borland After 2.jpg
Borland Sign.jpg

Cobb planting:

Cobb Before 1.jpg
Cobb Before 2.jpg
Cobb During 1.jpg
Cobb During 2.jpg
Cobb After 1.jpg
Cobb After 2.jpg
Cobb After 3.jpg
Cobb Sign.jpg

Hofmeister planting:

Hofmeister Before 1.jpg
Hofmeister Before 2.jpg
Hofmeister During 1.jpg
Hofmeister During 2.jpg

Hofmeister After 1.jpg
Hofmeister After 2.jpg
Hofmeister Sign.jpg

Number of Volunteers Engaged

Borland planting: 31

Cobb planting: 13

Hofmeister planting: 2 (a 5-member crew from the Intervale planted most of this site since it is hard to get to)

Total volunteers engaged: 46

Planting plans for each site – these include the species planted and a map of the planting area (completed Spring 2023)

Borland Planting Plan.pdf
CobbPlantingPlan.pdf
Hofmeister Planting Plan.pdf

Signed landowner agreements (completed Spring 2023)

Borland Agreement_Final_signed.pdf
Cobb Agreement_Signed.pdf
Hofmeister Agreement _Final.pdf

Press Release (completed Fall 2023)

2023 Press Release Planting Projects.docx (describes all FWR 2023 plantings)

Quarterly Reports, Final Report, Project Metrics report

LS-2023-029 FWR_Restoring_Forest _Q1Report.doc (submitted July 2023)
LS-2023-029 FWR_Restoring_Forest_Q2 report.doc (submitted Oct 2023)
LS-2023-029 FWR_Restoring_Forest_Final.doc (this document, submitted Dec 2023)

5. PROJECT METRICS

Deliverable	Amount
Number of trees and shrubs planted	1200
Acres restored	3
Number of properties	3
Number of landowners engaged	6
Number of volunteers engaged	46
Total number of volunteer hours	99.5
Value of volunteer hours	$2671.58
Hours of FWR staff time funded	
Hours of Intervale Crew members funded	60
Value of locally produced nursery stock funded	$3905

6. CONCLUSIONS

Forest restoration projects were completed on three properties in the Winooski River watershed in Central Vermont. A total of 3 acres that were either hayfield or lawn were restored using 1200 woody species native to Vermont and appropriate for the conditions at each site. Volunteers were engaged to help plant and were given the opportunity to learn about how the projects would benefit both natural and human communities.

All three planting projects completed under this grant reconnected forest blocks, created or improved wetland buffers, or restored wetland species to the site. Since woody vegetation intercepts and absorbs more rainfall than herbaceous plants like grasses, the runoff from the project sites will be reduced. This, in turn, reduces stormwater runoff from the project parcels, allowing to be held further up in the watershed. Stormwater runoff often carries pollutants and sediment to streams and rivers. The restored vegetation, even if somewhat distant from a stream, will therefore help protect water quality and aquatic habitat. It will also help reduce the impact of flood events on downhill communities. Reconnected forest blocks provide larger areas for wildlife to access food and cover, and create protected corridors for their movement around the landscape.

The Friends of the Winooski River has been managing riparian restoration projects for over 15 years. Most of these projects have been located on large parcels adjacent to the Winooski River itself or its major tributaries. Riparian forest restoration projects directly on the major rivers and their tributaries are becoming harder to come by as we exhaust the “low-hanging fruit” – sites where landowners are willing and enthusiastic about planting, knotweed is minimal, and bank erosion is not too severe.

By developing projects further upstream - along smaller streams, wetlands, and places where forests have been removed or fragmented by development, we can continue to protect the stream and river network. It may seem counter-intuitive that we would shift some of our capacity to areas that are not directly on the major rivers and streams in the Winooski watershed. We have come to believe, however, that these upland areas, often at the top of a drainage, are crucial for reducing stormwater and protecting the water quality and aquatic habitat found further downhill. These more upland projects may be more effective since they influence the entire drainage. This opens up a huge opportunity for projects and allows us to work with a much larger fraction of the watershed community.

7. REFERENCES

Vermont ANR Atlas https://anrmaps.vermont.gov/websites/anra5/

NCRS_VT_Tree_Restoration_into.xlsx (available from Katherine Kain, US Fish & Wildlife Service, 11 Lincoln St #105, Essex Junction, VT 05452)

Villars, 2003, "Soil Series of Vermont and their common Natural Communities" (available from Katherine Kain, US Fish & Wildlife Service, 11 Lincoln St #105, Essex Junction, VT 05452)

Thompson and Sorenson, 2005, "Wetland, woodland, wildland : a guide to the natural communities of Vermont."

8. APPENDICES

Appended Documents:

Press release

FOR IMMEDIATE RELEASE, October 2, 2023

For more information, contact: Shawn White, Friends of the Winooski River, shawn@winooskiriver.org , 802-371-8988.

Photo: Over 100 volunteers joined the Friends of the Winooski River to plant trees this year. Photo credit Friends of the Winooski River

Friends of the Winooski River Plants Trees for Flood Resilience, Clean Water and Wildlife Habitat - 5000 trees and shrubs planted in 2023

MONTPELIER, VT — This month, Friends of the Winooski River will be planting over 3000 trees and shrubs upstream of Montpelier to help reduce flooding, improve water quality, and restore steam and forest habitat.

Friends of the Winooski River, a non-profit that works to protect both the Winooski River and all its tributaries, will plant a young forest in place of a 7.5-acre open field on a private property in East Montpelier. Once the project is completed, the organization's volunteers and partners will have planted over 5,000 native trees and shrubs in Stowe, East Montpelier, Cabot, and Montpelier this year.

"The project has several goals" says Shawn White, Project Manager for Friends of the Winooski, "right now the July flood is still fresh on our minds, so we're focused on its flood resilience aspects. But it will also improve water quality and provide great wildlife habitat."

Returning land to forest

Planting woody vegetation along wetlands and small streams has an outsized impact on flood resilience and clean water. A fraction of the rainfall that lands on tree leaves never even reaches the ground, while roots draw water out of the soil making it ready to absorb more rainfall. Even dead leaves and wood on the ground can help absorb and retain water.

"The amount of runoff leaving a healthy undeveloped forest is something like 10-percent of total rainfall," says White, "but once those forests start getting cleared for driveways and buildings the amount of runoff increases rapidly, and for an urban area it's more like 90-percent." That extra runoff heads straight for the nearest stream or river, causing water levels to rise higher and more quickly than they did in pre-development times.

Like this fall's project, the other plantings completed this year are on private properties. While most are located on tributaries of the Winooski River, many are in upland areas not directly on a stream. The projects completed in the spring are located along Thatcher Brook in Waterbury, the Little River in Stowe, and on two hillsides in Cabot and East Montpelier. All are expected to reduce the flow of stormwater to the Winooski.

"We work with landowners and partners across the Winooski watershed to restore forests," said White. "Trees anywhere on the landscape can intercept and absorb much more rainfall than grass alone does. Restoring forest is key to reducing flooding, and even landowners without streams on their land can get involved. Replacing some of their lawn with woody plants is an easy way for property owners to help protect their communities from flooding."

Partners participating in this year's planting projects include Redstart Consulting, US Fish and Wildlife's Partners for Fish and Wildlife program, the Intervale Conservation Nursery, and over 100 volunteers from SunCommon, Trout Unlimited, Stowe Electric Department, Project Harmony students from Myanmar, as well as many individuals and families from local communities.

Planting trees has other benefits as well, including stabilizing streambanks and taking carbon dioxide out of the air. "This annual day of community service with Friends of the Winooski River is one of our favorites of the year as our team gets to work shoulder to shoulder supporting this

important conservation work, planting trees that will sequester carbon for decades to come", says Jake Elliot, Senior Manager of Impact and Advocacy at SunCommon.

One spring planting project attracted 31 volunteers to plant 400 trees on a barren hillside above a wetland, also in East Montpelier. The hill and a large area at the bottom of the hillside had been cleared of forest to create a space for a playing field that was never utilized. New landowners wanted to restore the forest to reconnect fragmented woodland, restore habitat, and protect the wetland.

"We believe trees are one of the best foundations of a healthy ecosystem in this area, and converting a large lawn to a diverse ecology is in everyone's long-term interest. Especially in a valley state, upriver water retention and resilience should be at the forefront of people's minds." Said Matt Borland, landowner.

Another landowner in Montpelier wanted to restore his yard to the forested wetland habitat the land had supported before it was developed. Other landowners in Stowe, Waterbury, and Cabot had similar reasons for partnering with the Friends of the Winooski to plant trees on their land.

All of the projects use a combination of trees and shrub species that are native to Vermont. "We like to use a variety of species since we can't always predict which will do well at a particular site," continued White, "having a mix of trees and shrubs also creates diverse habitat for birds and other wildlife." Examples of the species planted are speckled alder, shrub willow, white pine, quaking aspen, black cherry, serviceberry, red osier dogwood, and balsam fir. Most of the plants used are grown locally at the Intervale Conservation Nursery in Burlington and Elmore Roots in Wolcott.

The group plants an average of 3000 trees per year in addition to completing dam removals, water quality monitoring, flood plain restoration, undersized culvert retrofits, stormwater management projects, and education and outreach. It also organized river cleanups to remove the massive amounts of garbage left along the Winooski River by the July flood.

The planting projects were funded in part by the United States Environmental Protection Agency (U.S. EPA) in partnership with the Lake Champlain Basin Program. Additional funding was provided by the Vermont Department of Environmental Conservation via a block grant to Watersheds United Vermont, the US Fish & Wildlife's Partners for Fish & Wildlife program, PUR Projet, and individual donations to the Friends of the Winooski River. Donations to Friends of the Winooski River can be made via winooskiriver.org

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About Friends of the Winooski River

Founded in 1998, Friends of the Winooski River is a non-profit organization dedicated to the restoration and protection of the Winooski River and its watershed. We hope to create a community of stewards working to improve watershed health by reducing pollution, improving habitat, and increasing river stability, while also encouraging sustainable enjoyment of the river.

Photos: Borland planting:

The "before" condition of the northern section of the Borland planting area, looking southwest. Photo credit: Friends of the Winooski River

The "before" condition of the western section of the Borland planting area, looking west. Photo credit: Friends of the Winooski River

SunCommon, Trout Unlimited, and individual volunteers at the May 13th planting at the Borland property. Photo credit: Friends of the Winooski River

SunCommon volunteers at the May 13th planting at the Borland property. Photo credit: Friends of the Winooski River

Volunteers watering the newly planted stems at the Borland planting. Photo credit: Friends of the Winooski River

The upper of the Borland hillside after planting and the summer growing season. Photo credit: Friends of the Winooski River

The lower hillside and field of the Borland property after planting and the summer growing season. Photo credit: Friends of the Winooski River

Sign displayed along Boulder Ridge Road at the Borland property. Photo credit: Friends of the Winooski River

Cobb planting:

The "before" condition of the eastern side of the Cobb planting area, looking south. Photo credit: Friends of the Winooski River

The "before" condition of the western side of the Cobb planting area, looking north. Photo credit: Friends of the Winooski River

Project Harmony volunteers celebrate after planting native trees and shrubs as part of a habitat restoration project at the Cobb property. Photo credit: Friends of the Winooski River.

Intervale Conservation Nursery crew finishing the Cobb planting. Photo credit: Friends of the Winooski River.

Southern part of the Cobb property, post-planting. Photo credit: Friends of the Winooski River.

Middle section of the planting area, post-planting. Photo credit: Friends of the Winooski River.

Sign displayed at the Cobb Property post-planting. Photo credit: Friends of the Winooski River.

Hofmeister planting:

The "before condition of one of the openings that was planting on the upper (eastern) end of the Hofmeister planting area, facing west. Photo credit: Friends of the Winooski River.

The "before condition of one of the openings that was planting on the upper (eastern) end of the Hofmeister planting area, facing west. Photo credit: Friends of the Winooski River.

Intervale and Friends of the Winooski staff plant at the Hofmeister property. Photo credit: Friends of the Winooski River.

Newly-planted trees in a opening on the Hofmeister property. Photo credit: Friends of the Winooski River.

A black cherry tree at the Hofmeister property doing well two months after the planting. Photo credit: Friends of the Winooski River.

Sign at the Hofmeister property installed after the planting was completed. Photo credit Friends of the Winooski River.