Notes from the Field

THE WATERSHED FORESTRY PARTNERSHIP & RIPARIAN BUFFER WORKING GROUP NEWSLETTER

FALL 2021

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MORE THAN REFORESTATION: ADDING WOODY DEBRIS TO A MISSISQUOI RIVER HEADWATER STREAM

Allaire Diamond, Ecologist, Vermont Land Trust &
Shayne Jaquith, Watershed Restoration Manager, TNC VT —

Vermont Land Trust, The Nature Conservancy, and Habitat Restoration Solutions, Inc. are piloting how small hand-constructed wood structures can slow flows and reverse channel incision while increasing instream habitat complexity.

We recently ran a trial project on a first-order stream with direct connection to the Missisquoi River. In this article we describe this case study, and outline the technical process we followed to design, permit, construct, and monitor this stream restoration project.

Read more about this project on pages 2-4!

WATERSHED FORESTRY PARTNERSHIP LAUNCHES NEW PODCAST ABOUT RIPARIAN FOREST RESTORATION

Liz Woodhull, Podcast Development Assistant, Watershed Forestry Partnership

The Watershed Forestry Partnership has a podcast! "Restoration Roundup" aims to support the work of practitioners, farmers, organizations, and individuals interested in riparian forests and the efforts to restore them across Vermont. Topics include the impacts of invasive species; the native tree stock shortage and why it matters; the role of riparian forests in supporting pollinator populations; incentive programs (current, new, and imagined) for supporting riparian forest restoration; and more!

This podcast will provide information for professionals working on riparian restoration in Vermont in an easy-to-consume way. You can listen to at home, in the car, or even while planting trees in the field.

The first monthly episode, released in late September, features a conversation with Patrick Engelken, a US Forest Service entomologist, about the effects of emerald ash borer on riparian forests. Episodes can be streamed at the WFP's podcast website (where you can also find links to more information about the content discussed in each episode), or on Spotify, Apple Podcasts, Google Podcasts, or wherever you find your podcasts. ◆

USFWS PARTNERS FOR FISH & WILDLIFE PROGRAM WELCOMES DAVID ROJEK

Katie Kain, U.S. Fish & Wildlife Service Partners for Fish and Wildlife Program

In May of 2021 the U.S. Fish & Wildlife Service welcomed a new member to the Partners for Fish and Wildlife Team! David Rojek joins us as a Biological Science Technician for the PFW program; prior to moving to Vermont he worked for the USFWS at the Nathaniel P. Reed Hobe Sound National Wildlife Refuge.

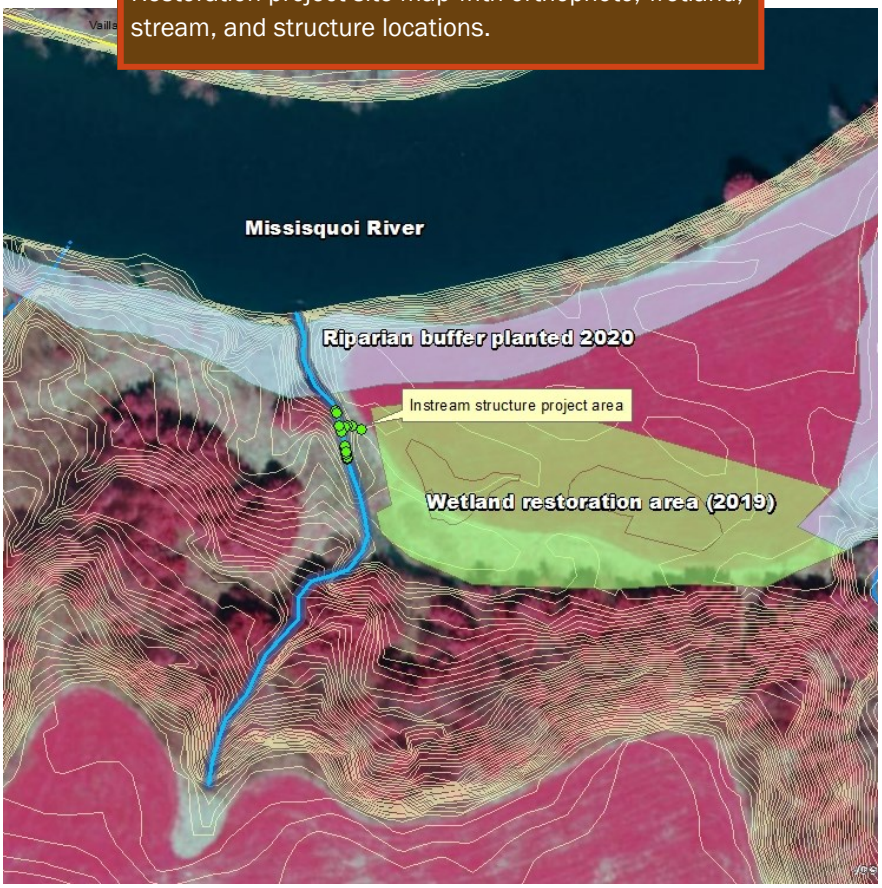
David spent his first Vermont summer helping to implement and support stewardship activities for many of our riparian and wetland restoration projects. You may have seen him hard at work in restoration areas, often wielding a string trimmer to keep reed canary grass and bindweed away from our planted trees. David was able to visit 20 sites to steward 40 acres of plantings in the summer of 2021. For some sites David was able to work alongside the Intervale Conservation Nursery's stewardship crew, expanding our collective ability to reach more projects that needed follow-up stewardship this summer. We're looking forward to another successful planting and stewardship season in 2022! ◆

MORE THAN REFORESTATION: ADDING WOODY DEBRIS TO A MISSISQUOI RIVER HEADWATER STREAM

Allaire Diamond, Ecologist, Vermont Land Trust

Shayne Jaquith, Watershed Restoration Manager, The Nature Conservancy

The vast majority – 70-80% -- of a watershed's river network is comprised of first and second order "headwater" streams which cumulatively and significantly shape the system's habitat quality, water quality and flood resiliency. Resilient forested streams that are connected to their floodplains and riparian wetlands, and loaded with coarse wood (pre-settlement streams in our region are thought to have had approximately one piece of large wood every 30 feet), can attenuate high flow volumes and the sediments they contain, while providing diverse habitat and connectivity functions. In contrast, headwater streams in cleared settings, or those recovering from historic deforestation and adjacent land clearing, often have anthropogenically deepened, steepened and armored channels, completely lacking in wood structure. These streams efficiently drain headwater areas, but the increased volume and velocity of the flow they transport carves the channels even deeper, further disconnecting them from the floodplain and wetland features that were once fed by high flows and simultaneously mitigated the impact of those flows downstream.



Restoration project site map with orthophoto, wetland, stream, and structure locations.

Vermont Land Trust, The Nature Conservancy, and Habitat Restoration Solutions, Inc. are partnering to develop simple, repeatable techniques to stop and eventually reverse this damaging cycle. Conserved farms are excellent locations to implement headwater stream restoration on the parcel level in coordination with farmers. We are piloting how small hand-constructed wood structures can slow flows and reverse channel incision while increasing instream habitat complexity. Here we present a case study of one trial project on a first-order stream with direct connection to the Missisquoi River and outline the technical process we followed to design, permit, construct, and monitor this stream restoration project.

Site

The project site is on a large farm along the Missisquoi River in Sheldon. The farm was conserved with Vermont Land Trust in 2000 and a river corridor easement was placed on the Missisquoi active river area in 2019. As part of the river corridor project, part of a small wet hayfield was retired and Vermont Land Trust coordinated wetland restoration there, reshaping a ditch and excavating wetland depressions. This restored wetland retains water that would previously have flowed quickly off the property and into an adjacent first-order stream, the subject of this wood addition project. This stream receives water from higher farm fields, forest patches, the remnants of the ditch, and occasional outflow from the restored wetland. It descends steeply over its short length (~575') and is deeply incised (6' or more) and actively eroding in its final 245' from the valley wall to meeting the Missisquoi.

(cont.)

(cont. from pg. 2)

Goals

The project goal was to use a low-cost solution that could be constructed quickly by volunteers using materials gathered on-site to arrest and reverse the channel incision process in order to increase the integrity and function of the adjacent wetland restoration project. The selected approach involved increasing the amount of instream wood structure to create instream roughness that will slow flow velocities and trap sediments delivered from upstream.

Design

Our design approach is deeply informed by Low-Tech Process-Based Restoration techniques developed and used in the western United States, and the project serves as a test of how effectively these techniques can be implemented in Vermont. In the field, we closely observed the stream channel and noted features such as inset floodplains, change in channel slope, existing wood accumulations, local valley width, existing woody vegetation or other notable features. A key design principle is to base our design on this close reading and use existing features as places to build from. For example, a log already embedded in the bank that is trapping sediment might be a feature to enhance by adding posts and raising the height. A steeper section might be a place to build a set of small structures to control the bed elevation, while a narrow valley constriction at the end of a longer flatter section could be a place to build a post-assisted log structure to retain water.

From these observations we planned to build 8-12 channel-spanning post-assisted wood accumulations, each about 8" high and anchored in the bed and banks, out of woody material obtained onsite. These included simple grade control structures embedded in the channel bed and banks, either a single log spanning the channel or two logs forming a V facing upstream; and some of these were built up into post-assisted log structures, with vertical posts downstream of the logs that were woven with fine branches to catch sediment and organic material like leaves and small wood. *(cont.)*

Below: Adding the posts that will accumulate wood at the restoration site.

(cont. from pg. 3)

Permitting

This type of stream restoration requires an approved Vermont General Permit #10 from the Army Corps of Engineers. We planned 6-8 weeks for our application to go through the approval process and scheduled construction accordingly. Our application included a map with LiDAR and LiDAR-derived 1' contours showing the stream reach with the ordinary high-water width, obtained through field measurements, and also indicated a representative cross section. We also included simple figures showing the representative cross section shape and the longitudinal profile of the stream reach with wood structures indicated. These figures were created remotely in Excel using the 1' contours derived from LiDAR.

Apples piling up behind the wood structures

Depending on the stream and design characteristics, Vermont's Stream Alteration Program may require an application but wood addition work is typically considered a nonreporting activity under the permit. Our wood addition projects so far have not required a permit application, but we inform the Stream Alteration Engineer of our project as due diligence.

Construction

We completed construction of 13 structures in one day with five people, one chainsaw, handsaws, trenching shovels, and hammers to pound posts in place. We started the day cutting several small (4-6") pin cherry and gray birch trees from a nearby 'old field' area identified by the landowner and outside the 50' stream buffer. These trees were then cut into logs, posts, and fine branches. Though we knew the general types of structures we wanted to build, we made all final design decisions onsite that day and processed the material accordingly. Logs were cut to extend 6-10" inches into the adjacent banks and were trenched in with shovels so they could lay horizontally with continuous bed contact. Posts are 3-4' long and were pounded into the bed about 1', just downstream from and along the logs, to leave room for weaving fine branches both on construction day and in future years. The fine birch and cherry branches were fresh and pliable and worked well to weave between the posts, where they will hopefully catch leaves and other plant matter as well as sediment washing from upstream. Willow stems are another excellent material for this purpose and have the potential to re-root if they extend into banks or the bed.

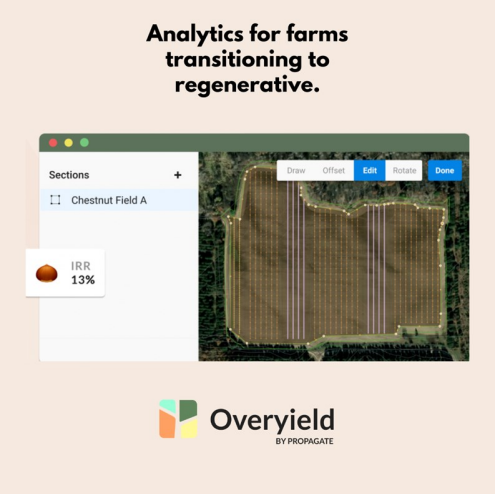
As-built Monitoring

Our as-built monitoring includes photos and GPS points for each structure, a description of each structure and its intended purpose and function, and a longitudinal survey of the channel bed with the top and base of each structure included. We will then follow that up with photos and survey after year 1, and future survey work at an interval to be determined. ◆

OVERYIELD: WORKING FOR FARMERS TO MAKE REGENERATIVE AGRICULTURE MORE ACCESSIBLE

Mandy St. Hilaire, Project Resource Manager, Propagate Ventures

How do we bridge working lands and income opportunities with riparian habitat and improving water quality? The term "regenerative agriculture" is one that many have likely heard at this point, so how does it fit with conservation? The potential for planting perennials, generating income, and increasing riparian habitat is here: the barriers to entry for farmers, landowners, and farm networks for increasing riparian acreage are starting to come down.



Meet Overyield, our newest product to make regenerative agriculture work for farmers and landowners alike, and where we are designing "extreme riparian buffers" that couple traditional riparian acreage with income-generating perennial crops in upland zones. This tool enables farmers, landowners, and farm networks to consider profitable opportunities that also lead to an increase in ecosystem services. We'd love to connect with technical service providers who are interested in learning more about how to use this new tool for tree plantings in Vermont. Learn more at overyield.com. ◆

UPDATE FROM A CONSERVATION FELLOW: WHAT'S GOOD FOR BIRDS AND POLLINATORS IS GOOD FOR CLEAN WATER, HEALTHY SOILS, AND CLIMATE

Cassie Wolfanger, Conservation Fellow, Lake Champlain Sea Grant & Audubon VT (Bio)

Lake Champlain Sea Grant and Audubon Vermont share a common goal to work with landowners to enhance ecosystem services on their property to protect watershed health and support wildlife habitat through sustainable farm and forest practices. The past 6 months serving as a joint conservation fellow for both organizations have been a dream and I've had the pleasure to try my hand in several ongoing projects. Here's what I've been up to and where I'm looking ahead for my term during the next year and a half.

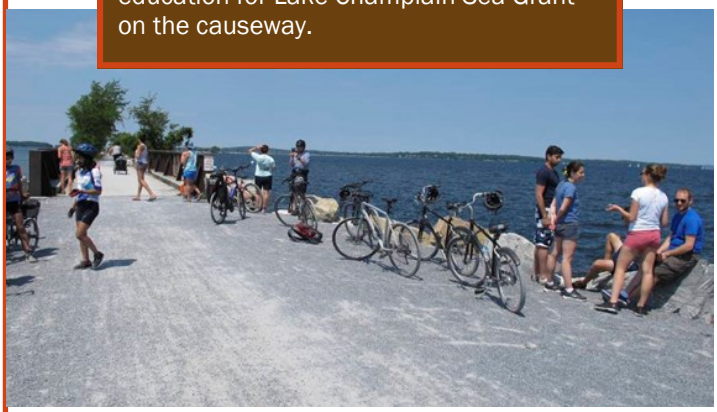
As the ground thawed and streams began to trickle again this past spring, neotropical migratory birds arrived in waves, bees emerged from their winter dormancy, and suddenly the field season was a full docket of surveys, riparian restoration plantings, meetings with landowners, and long-awaited in-person public education events. From May to August, I joined senior conservation biologists at Audubon Vermont on over 40 site visits for various projects. Some mornings were spent kayaking to monitor hard-to-reach waterfront Bald Eagle nests or counting Common Tern eggs on islands in northern Lake Champlain. *(cont.)*

(cont. from pg. 5)

Other mornings, I navigated Vermont's Class 4 roads and hiked into remote areas, lugging spotting scopes poking out of the top of my backpack, to sit and stare at rock cliffs to get a glimpse or hear a screech from a breeding pair of Peregrine Falcons. The absolute glee surveying grassland birds on farms enrolled in a cost-share program for delayed mowing is not yet lost on me, though I can't admit with conviction that I miss the 3:30am alarms or the soaked-to-the-bone feeling with morning dew from tall grasses. Few projects seem more characteristic of Vermont than Audubon's Bird-Friendly Maple—a fascinating intersection of bird conservation, economics, and sustainable forestry that I had a lot of fun inventorying forest blocks for. Further still, a particular satisfaction came from rolling up my sleeves, putting gloves on, and digging in the earth to plant trees for on-the-ground riparian restoration projects with the Vermont Land Trust, local conservation districts, and watershed non-profit groups like Friends of the Winooski. I also had my first attempt at public outreach and education for Sea Grant by teaching lake ecology, fish ID, and fishing techniques to counselors at Water Wanderings Summer Camp and giving Little Lake Lessons to bicyclists waiting for the ferry on the Lake Champlain causeway with emphasis that our actions on the terrestrial landscape are intimately linked to conditions in our aquatic environment.

However, the majority of my time has been spent assessing conditions at farms and talking to landowners about what adjustments they can make to their operations to reduce erosion and nutrient runoff, support wildlife habitat, control the invasion of exotic plants, and encourage native plant diversity. In addition to agricultural intensification, the last several decades have experienced alarming population declines in many bird species, especially aerial insectivores, and important native pollinators like bumblebees have declined, with many species reaching threatened status and several species already extirpated in Vermont. A response to these trends has been to incorporate conservation enhancements into agricultural practices to benefit wildlife, water, and soil. Audubon Vermont and the Gund Institute at the University of Vermont have partnered to develop a Bird and Bee Friendly Farming Initiative that promotes the creation and improvement of on-farm *(cont.)*

Planting bare-root trees and shrubs at the Bull Run riparian restoration area in Northfield with Friends of the Winooski.



Little Lake Lesson public outreach and education for Lake Champlain Sea Grant on the causeway.

(cont. from pg. 6)

habitat for birds and pollinators. The program focuses on enhancing areas out of production (i.e., field edges, hedgerows, and fallow fields), grasslands, forest patches,

and riparian areas. Creating structurally heterogeneous hedgerows composed of native species, removing invasive plants, cultivating diverse crops, reducing tillage and pesticide use, and erecting wildlife structures can increase the abundance and diversity of pollinator and bird species that in turn provide important on-farm services, such as crop pollination and pest control. Vegetation established for wildlife habitat in riparian zones can also co-benefit water quality by intercepting nutrient pollution from agricultural runoff, stabilizing stream banks on field edges, and mitigating flooding while simultaneously sequestering carbon. A riparian planting and shrubland management project at Nordic Farms this spring with Audubon Vermont effectively demonstrates co-benefits of this work on bird habitat and clean water. At this initial stage in the program, we have recommended management plans for 15 Vermont farms, surveying for bird and pollinator species, suggesting native plant nurseries for stock purchase, and assisting with application for cost-sharing opportunities. Our work aims to support the long-term productivity of the land and financial sustainability of farm operations, and we plan to display our work on high-visibility demonstration sites and document the ecological and economic benefits of these practices.

Looking ahead, I've began targeting my focus for the next year and a half on bird and bee conservation planning at a couple of model farms at the Intervale Center in Burlington and Philo Ridge Farm in Charlotte who are interested in recommendations from the program. My goal is to sift through scientific literature and gather a consortium of resources for future farms to lean on and refer to. I also hope to hold some public workshops, present my findings at conferences, and publish reports to increase the level of impact these land management and conservation practices have. Energy and interest in Bird and Bee Friendly Farming has been gaining traction and that's what I'm most excited about—seeing the momentum this project can pick up. We will continue to work on-the-ground with farmers to better understand their motives, interests, and abilities to incorporate conservation practices on their farms that are healthier for wildlife, soil, water, and climate. ◆

VERMONT'S NRCDs PLANT 34.25 ACRES OF TREES AND SHRUBS TO RESTORE RIPARIAN HABITAT ACROSS THE LAKE CHAMPLAIN BASIN

Molly Varner, Communications Coordinator, Vermont Association of Conservation Districts

Beginning in 2020, Vermont's Natural Resources Conservation Districts planted 34.25 acres of native trees and shrubs across the Lake Champlain Basin through the Conservation District-led Trees for Streams Program. Funded in part by the Lake Champlain Basin Program (LCBP), the Trees for Stream Program supports the restoration of streamside habitat, or riparian buffers, to meet Vermont's clean water goals.

Funding awarded to the State Natural Resources Conservation Council (NRCC) was distributed to Conservation Districts within the basin to identify, develop, and implement streamside buffers. Through 13 projects on private and publicly owned lands, the Franklin County, Lamoille County, Orleans County, Otter Creek, Poultney Mettowee, and Winooski Conservation Districts planted 22% more acres than their original planting goal.

7.4 acres of trees and shrubs installed on a farm in Pawlet, Vermont by Poultney Mettowee Conservation District in Spring 2020.

According to the Lake Champlain Basin Program's 2021 State of the Lake report, 18% of phosphorus inputs to the basin come from streambank sources and erosion. Riparian buffers are a cost-effective method to filter nutrient and sediment runoff to surface waters, control erosion, improve fish and wildlife habitat, maintain water temperature, and give rivers and streams critically needed space to maintain their natural dynamic condition.

To protect natural communities and reduce the spread of invasive species, the plantings featured locally sourced, native species selected for their soil type, anticipated impact on water quality, state and partner input, and longevity. In addition, landowners agreed to maintain the plantings for 10 years, ensuring long-term success and resiliency.

Misty Koloski, a dairy farmer in Newport Center, worked with Orleans County Conservation District to revegetate 2.3 acres in Spring 2020. She said "Our experience with this project was certainly positive and the outcome great. Working with the Orleans County NRCD Director and the tree planting contractor's was seamless. I was very pleased with the professionalism and methodology including selecting the species for the project. We appreciate that there were elderberry trees included for the birds! With the assistance provided planting a riparian buffer and putting up a fence to get the heifers out of the stream our family organic dairy is positioned to improve the watershed and the small game habitat around our farm."

Funding for the Trees for Streams program was supplemented by the efforts of volunteers, communities and towns, and the expertise of technical specialists. Additional support and collaboration came from the U.S. Fish & Wildlife Service, the Intervale Center, the USDA Natural Resource Conservation Service, the VT Agency of Agriculture, the VT Department of Environmental Conservation, and PUR Projet. *(cont.)*

(cont. from pg. 8)

Lake Champlain Basin Program's partnership with the NRCC and Conservation Districts has grown the statewide Trees for Stream program, which plays a vital role in protecting Lake Champlain's tributaries, engaging communities, improving water quality and flood resilience, and enhancing wildlife habitats. Individuals interested in learning more or working with their local Conservation District on tree plantings can find contact information here.

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Vermont's Natural Resources Conservation Districts were created by the Vermont Soil Conservation Act of 1939. Today, Vermont's 14 Conservation Districts work directly with landowners, communities, and partner organizations to conserve, protect, and use Vermont's natural resources. Conservation Districts promote water quality through education, agriculture, forestry, watershed protection, and urban conservation programs.

The State Natural Resources Conservation Council (NRCC) is a state Agency serving Vermont's 14 Natural Resources Conservation Districts. NRCC's mission is to advance conservation and water quality efforts in Vermont by providing strategic guidance and operational support to conservation districts, contributing a local perspective on state conservation policies, and facilitating the sharing of information among members and partners. ◆

JOHNSONS MILL DAM REMOVAL AND BOGUE BRANCH WILLOW STAKING

Lauren Weston, District Manager, Franklin County NRCD

In August 2021, the Johnsons Mill Dam was removed from the Bogue Branch in Bakersfield, VT. The project was managed from start to finish by the Franklin County Natural Resources Conservation District. This project was designed to restore natural stream flow and improve trout habitat by removing an aquatic organism passage barrier. The process of removing the dam started a few years ago with landowner outreach to various folks around Franklin County with dams on their property. During the Halloween storm of 2019, after initial engineering survey work had been completed, the dam unexpectedly breached and impounded sediment was sent flowing downstream without significant negative impacts. A post-breach survey was then completed and final designs for the structure removal and up-stream channel restoration began. Historical and cultural resources at the site were investigated and documented, and in early August, all of the pieces, and permits, were in place to get on site and remove the dam.

Above: Dam before removal (looking downstream). Breached portion in center of dam.

(cont.)

(cont. from pg. 9)

In seven quick days in mid-August, the contractor, Jeff Corey Excavating, completed the entire project. Their work included mobilizing to the site, stabilizing the streambanks by angling the once vertical and failing bank walls to a more stable 1:1 slope, transplanting native shrub willows from areas of bank disturbance, hammering away at the concrete and stone dam structure, seeding and mulching exposed slopes, and leaving the site with improved conditions. Sediment removed from the streambanks and some from the channel bed were sent to a neighboring farmer's hay fields to cover up exposed ledge in a mutually beneficial arrangement for the stream and the farmer.

Above: Area where dam was removed and Bogue Branch is now freely flowing (looking downstream)
Below: Bogue Branch channel and streambanks following channel restoration and bank stabilization work (looking upstream). Banks to be planted with live willow stakes in fall 2021.

Later this fall, once willows go dormant, the reshaped streambanks will be planted with live willow stakes. This site is home to hundreds of native willow shrubs across a floodplain that is suspected to have a high water table which is keeping these and other riparian plants thriving hundreds of feet away from the stream channel and wetland areas. The stakes will be harvested from the site, trimmed up, and installed across the toe of the new streambanks. Waiting until the fall to plant is necessary due to willow dormancy and it is also helpful in that it allows time for the banks to adjust following the disruption of excavation and dam removal; the channel has time to meander, form its new path, and stabilize before planting.

Learn more about the Johnsons Mill Dam Removal and watch a time lapse video of the work here.

This project was funded in part by grants from the Vermont Fish and Wildlife Department and Vermont Department of Environmental Conservation. This project has been funded by an agreement awarded by the Great Lakes Fishery Commission to the New England Interstate Water Pollution Control Commission in partnership with the Lake Champlain Basin Program. This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement (LC00A00605) to NEIWPCC in partnership with the Lake Champlain Basin Program. ◆

If you would like to submit a story for a future issue, or subscribe to or unsubscribe from the Watershed Forestry Partnership mailing list, contact Alison Adams at alison.adams@uvm.edu.

For more information about the Watershed Forestry Partnership, please visit our website!

Thanks to Watershed Forestry Partnership supporters: American Forests, Bruce Lisman, Lake Champlain Sea Grant, Pur Projet, and UVM Extension!