Beaver Brook Process-Based Restoration Project

Boquet River Association, Ruffed Grouse Society, Essex County Soil & Water Conservation District

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Executive Summary

The Beaver Brook Restoration Project is a low-cost, volunteer-based approach to planting riparian buffers and adding temporary erosion control structures that will reduce sedimentation and improve stream geomorphology to create a healthier, biologically complex riverscape that will support multiple critical wildlife populations.

Beaver Brook is a 6.3 square mile sub-watershed of the Boquet River in the towns of Essex and Westport, NY. The Boquet and its tributaries are an important spawning habitat for Atlantic Salmon, Brook Trout and other NY Species of Greatest Conservation Need including American Eel, Wood Turtle and freshwater mussels. Beaver Brook itself suffers from impaired road crossings that inhibit aquatic organism passage and very high rates of erosion and sedimentation. A coalition of partners (USFWS, TNC, LCBP) have targeted the Brook as a key restoration priority within Lake Champlain watershed.

The 2025 project scope includes multiple volunteer days organized by the principle project partners: BRASS, the Ruffed Grouse Society (RGS) and Essex County Soil & Water Conservation District (ESWCD) and is sponsored by regional for profit and nonprofit organizations.

The first phase of the project (May 2025) will be a tree-planting day. Fifty all-age volunteers will plant 650 trees during the all-day planting exercise. The planting palette includes Elderberry, Oak, Plum, Sycamore, Poplar, Maple, Willow Cottonwood and Alder, sourced from ecotypic nursery stock only.

The second phase of the 2025 project will be the construction of two complexes of erosion control structures along two reaches of the brook outlined in the attached maps. This will occur over several days in Summer of 2025. In addition, honeysuckle, buckthorn and oriental bittersweet will be removed with mechanical pulling.

Introduction

This project seeks to show the value of Low Tech Process Based Restoration in the Beaver Brook subwatershed of the Boquet River in Essex County, NY. The demonstration will mix native tree planting with conservation practices* such as Post-Assisted Log Structures (PALS) and Strategic Wood Addition** to reduce erosion and improve habitat and the geomorphic complexity of the brook.

The purpose of this report is to provide landowners, partners, volunteers and permitting agencies with data to make informed decisions regarding the project. Additionally, it provides a framework for understanding possible outcomes, adaptive management and long term monitoring strategies. This report is *not* a prescriptive document, but a framework and outline for making science-based decisions subject to in-the-field reinterpretation and adaptive management by the project managers in consultation with the landowners.

* USDA NRCS Conservation Practice Code 643 (Restoration of Rare or Declining Natural Communities)
** Kratzer, J.F. (2020), Vermont Strategic Wood Addition Handbook, Vermont Department of Fish & Wildlife.

Project Background

Beaver Brook is a NY State Class C stream located in the towns of Essex and Westport in northeastern New York (see map below.) It is a headwater of the 47-mile Boquet River which drains approximately 280 square miles off the eastern slopes of the Adirondack mountains into Lake Champlain. The Boquet is an important spawning habitat for Atlantic Salmon, Brook Trout and other NY Species of Greatest Conservation Need including American Eel, Wood Turtle and freshwater mussels. Beaver Brook is a 6.3 square mile sub-watershed that suffers from impaired road crossings and very high rates of erosion and sedimentation. As a Class C stream without T or TS (Trout, Trout Spawning) classification it

does not require a NYSDEC Protection of Waters permit for the restoration work described here.

Problem(s)

These proposed projects impact several reaches of Beaver Brook that exhibit deeply incised channels (10’ to 3’ depending on the hillslope), high rates of bank erosion and “structural starvation” from the lack of in-stream wood and cobbles (see Figures 1 & 2). Due to incision, the brook has poor connection to its flood plain with a tendency for flashy discharges that carry high sediment loads from the woodlands and agricultural fields directly into the main stem of the Boquet. Finally, the brook’s floodplain in these reaches has relatively sparse woody vegetation that limits the amount of natural wood accumulation in the stream.

(Figures 1 & 2 – Stream Incision on the project site)

Description of Restoration Project

This project seeks to use low-cost, volunteer-based methods to increase native riparian vegetation and replicate natural wood jams to reduce overall sedimentation and improve stream geomorphology including decreasing incision, increasing aggradation to boost floodplain reconnection and increasing the channel to valley bottom ratio. River managers anticipate these changes will create a healthier, biologically rich riverscape. As the first of its kind in the eastern Adirondacks, the project will serve as a demonstration for some of these techniques that have been more widely applied in the American west & New England.

Broad Management Goals

The project's broad management goals are to:

- Arrest channel incision (downcutting) and erosion.
- Increase the presence and diversity of native woody vegetation.
- Increase the complexity of the geomorphic structure of Beaver Brook to increase varied residence times for water, sediment and vegetation and to improve habitat.

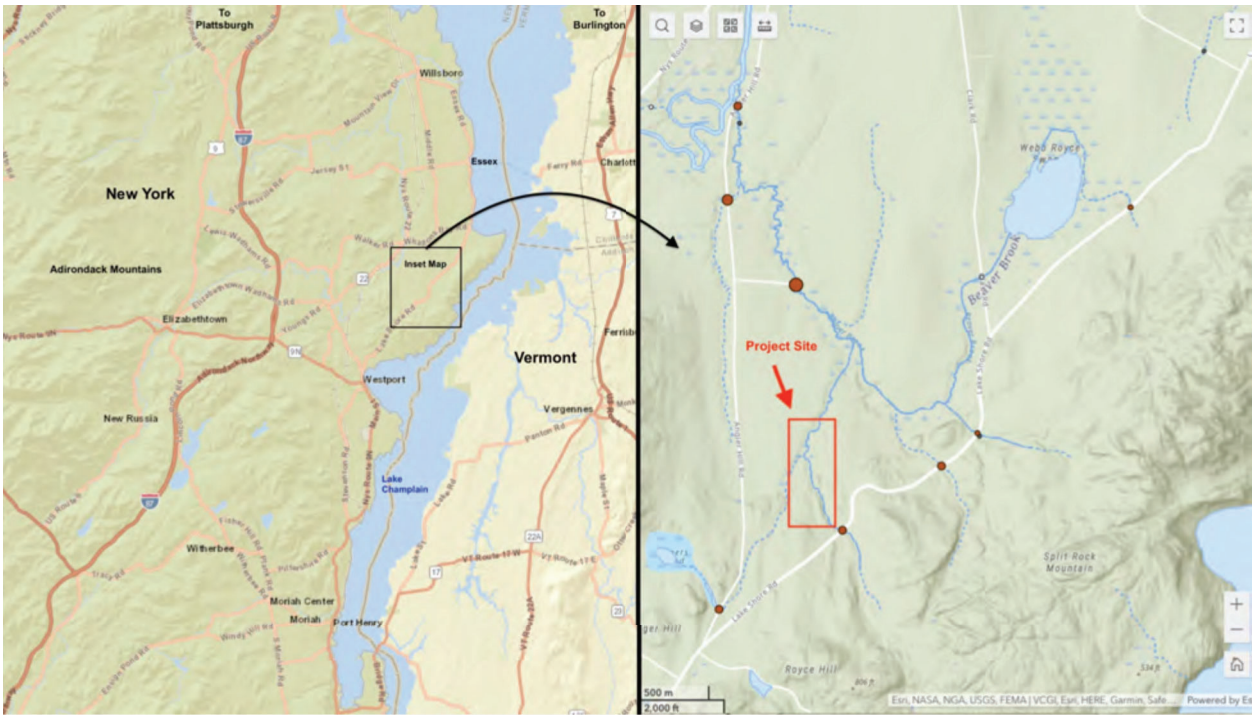
- Allow the brook to "do the work" of increasing complexity.
- Move toward a self-sustaining system of complexity.
- All of the above should reduce flashy discharges along with high sedimentation rates at the river confluence.

Specific Project Goals

- Perform pre-project geomorphic and biological assessment to establish baseline conditions.
- Plant 650 trees and shrubs in the valley bottom and adjacent uplands to increase the abundance of woody vegetation.
- Build complexes of temporary structures such as Post Assisted Log Structures (PALs) to arrest erosion and increase geomorphic complexity (in accordance with NRCS conservation practice activity guidelines.)
- Perform post-project assessments, continue adaptive management and consider or perform additional treatment phases over multiple years to provide better likelihoods of success.
- Document the project for resource managers regional partners and inform future adaptive management activities.

Project Location, Description & Scope

Beaver Brook is a 6.3 square mile sub-watershed that drains west from the protected 3700-acre Split Rock Mountain Wild Forest, and south from the 305-acre Webb-Royce Swamp Preserve. The Brook travels from forested uplands through a broad agricultural valley bottom and joins the main stem of the Boquet near Angier Hill Road in Essex. This project focuses on two reaches of the Brook on private land at the forest-agriculture margin that have been heavily impacted by historic farm and woodland use.



The 2025 project scope includes multiple volunteer days organized by the principal project partners: Boquet River Association (BRASS), the Ruffed Grouse Society (RGS) and Essex County Soil & Water Conservation District (ESWCD).

The first phase of the project (May 2025) will be a tree-planting day. (See below for the planting palette.)

The second phase of the 2025 project will be the construction of several complexes of Post-Assisted Log Structures (PALS) and/or Strategic Wood Addition along the two reaches of the brook outlined in the attached maps. This will occur over several days in Summer of 2025 with a smaller crew of trained volunteers. Preparation for this will include brush collection, and stake harvesting in upland areas.

Assessment of Structural Starvation and Appropriateness of Low-Tech

- The larger project site is a mix of open agricultural lands, successional scrub forest and mature forest. Despite forest regeneration, incision and rilling remains and overland flow exacerbates natural and artificial farm drainages. Historic wood

harvesting, and channelization of streams throughout the region have starved the brook of structural wood and allowed deep incision and headcuts to move eastward toward Lakeshore Rd. Low Tech restoration is appropriate due to the ready availability of onsite materials, intermittent and low flow levels of the two channels of Beaver Brook, and the proximity of beaver populations who may take over the work with the right incentives.

Inventory of Resources

The valley bottoms contain non-native species such as buckthorn and honeysuckle that will be harvested for use in the conservation structures.

Planting Palette

The native plants are sourced hyper-locally including five species of cultivars from Barred Owl Brook Farm's (project site) own native nursery. Six additional species are sourced from AuSable Freshwater Center's native nursery that specializes in stock sourced in the Eastern Adirondack watersheds.

Source	Species	Size (tube stock)	Planting Zone	Quantity	Tube?
Barred Owl Brook Farm	Elderberry (Sambucus canadensis)	2 yr bare root rooted cutting	mesic / hydric	90	not required
Barred Owl Brook Farm	Oak, White (Quercus alba x bicolor)	4 yr bare root seedling	hydr / Mes/ Upl	15	yes, required
Barred Owl Brook Farm	Plum (Prunus americana) - American	2 yr bare root seedling	mesic / upland	60	yes, required
Barred Owl Brook Farm	Sycamore (Platanus occidentalis)	2 yr bare root seedling	mesic / hydric	20	not required
	Willow (Salix spp.)	2 yr rooted cutting	mesic / hydric	30	
	Total Barred Owl Brook Farm sourced plants			**215**	
AuSable Freshwater Center	Balsam Poplar	4-10'	hydric/ mesic	75	yes, required
AuSable Freshwater Center	Bebb's Willow	4-10'	hydric	75	yes, required
AuSable Freshwater Center	Eastern Cottonwood	4-10'	hydric	75	yes, required
AuSable Freshwater Center	Red Maple	4-10'	hydric	75	yes, required
AuSable Freshwater Center	Shrub Willow	12-18"	hydric	75	not required
AuSable Freshwater Center	Speckled Alder	4-10'	hydric	75	yes, required
	Total AuSable Freshwater Center sourced plants:			**450**	
	Total			**665**	

Planning & Design Methods

This project follows the standard of practice for Low Tech Process Based Restoration as detailed in the LTPBR Design Manual (Bennet, et al, 2019), Chapters 3 and 5. These practices have also been codified as the USDA NRCS Conservation Practice Code 643 (Restoration of Rare or Declining Natural Communities) There is concurring guidance from the Vermont Department of Fish & Wildlife that identifies this work as Strategic Wood Addition (SWA) (Kratzer, 2020). Vermont DEC has crediting guidance for SWA projects to quantify phosphorus reduction based on improvements to floodplain storage and stream stability. Furthermore, studies of this approach in Vermont indicate dramatic habitat improvements including trout biomass approximately tripling in two years post-treatment (Kratzer, 2018).

Low-tech restoration to reverse structural starvation of riverscapes frequently takes more than one treatment (and design). This project's conservation planning process follows an adaptive management framework that anticipates multiple phases over a number of years to achieve the long-term restoration goal of a self-sustaining riverscape.

The implementation of a design involves an iteration between carrying out treatments of structural additions and evaluation. Ultimately, it is assumed project goals will be met if the processes of wood accumulation and/or beaver activity make the transition from being mimicked and promoted by treatments to occurring on their own in a self-sustaining fashion.

Planning

Design – Phase 1

The first phase of the project is a tree planting exercise placing 650 trees (species and quantities described in the planting palette above) to enhance the health, diversity and scale of riparian tree species. BRASS has a forty-year history of planting riparian buffers in the Boquet watershed with a cumulative total of over 250,000 trees. Volunteer days such as

the 2024 event illustrated on the first page of this report build public awareness, involvement and celebrate our rich watershed.

Design - Phase 2

The second phase of the project (Summer 2025) is the reproduction of natural wood accumulation and logjams similar to ones found elsewhere on Beaver Brook (see Figure 2) with temporary constructed structures. Project managers will supervise volunteer teams in the construction of several complexes of Post-Assisted Log Structures (PALS) or Strategic Wood Addition (SWA) along the two reaches of the brook outlined in the Site Plan. The complexes may be from 3 to 5 structures each, with placement and adjustment decisions made on site during construction. The structures will be sited and designed to aggrade the incised channel, increase pool depth and aeration, create cool water refuge and be porous to aquatic organism passage. Follow up monitoring and documentation will inform the scale and scope of further treatments in 2026 and later.

(Figure 3 – photo courtesy BRASS)

Naturally occurring wood accumulation on the project site equivalent to proposed conservation practices:

Typical Structure Types

(Figures 4 & 5 – courtesy of LTPBR Manual)
(Figure 6 – courtesy of Vermont Strategic Wood Addition Handbook)

POST-ASSISTED LOG STRUCTURES

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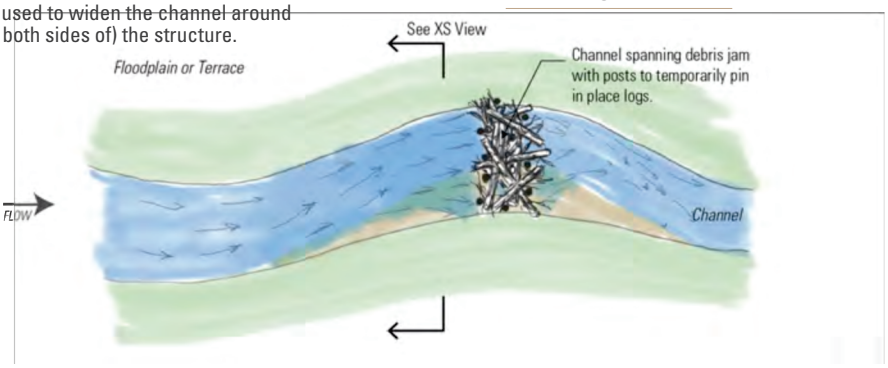
CHANNEL-SPANNING PALS

- Bank-attached on both sides, such that even at low-flow there is some hydraulic purchase across most of the channel, acting to back-water flow behind it. Unlike a beaver dam (with a uniform crest elevation), channel-spanning PALS can have a variable crest elevation and rougher finish, and are generally built with much greater porosity.
- Over time, increased water depth and decreased velocity upstream of PALS encourages more wood accumulation, organic accumulation and sediment deposition, all of which can act to stabilize the structure.
- If crest elevations are higher than adjacent floodplain(s), it can increase frequency of floodplain inundation, force new diffluences, and/or promote avulsions.
- Can be used to widen the channel around (one or both sides of) the structure.

PLANFORM VIEW



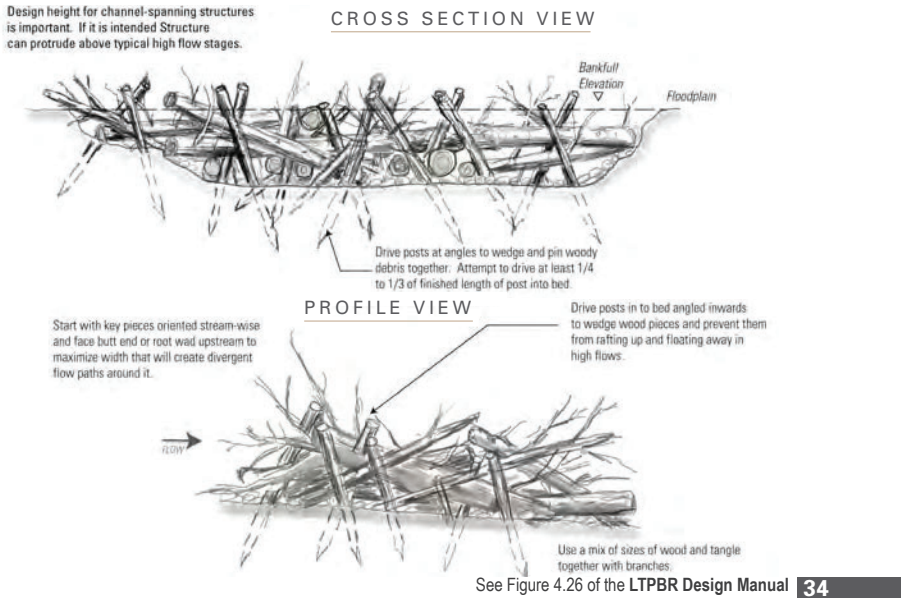


Figure 6

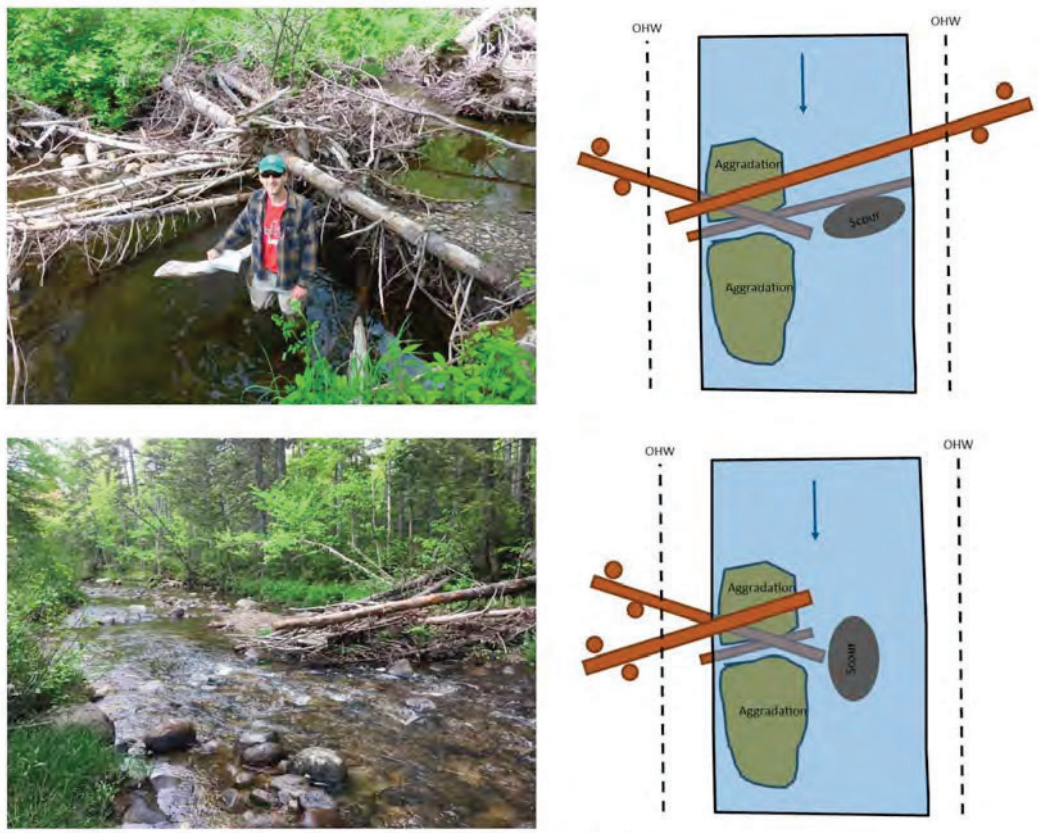


Figure 19. Examples of channel spanning and edge jam structures.

Site Maps


To Plattsburgh
To Burlington
Willsboro
Essex
New York
Adirondack Mountains
Inset Map
Elizabethtown
Westport
Vermont
New Russia
Vergennes
Lake Champlain
Witherbee
Moriah Center
Moriah
Port Henry
Ferrisb
Charlott
Mountain View Dr
Essex Rd
Middle Rd
Jersey St
Stowersville Rd
Nys Route 22
Walker Rd
Whallons Bay Rd
Lewis Wadhams Rd
Elizabethtown Wadhams Rd
Youngs Rd
Lake Shore Rd
Nys Route 9N
Adirondack Northway
Lincoln Pond Rd
Main St
Stevenson Rd
Lake Rd
Panton Rd
Maple St
US Route 9
Fisher Hill Rd
Pilfershire Rd
Tracy Rd
Plank Rd
Witherbee Rd
Windy Hill Rd
S Moriah Rd
Ensign Pond Rd
Bridge Rd
VT Route 17 W
VT Route 17 E
VT Route 22A
Lake St
Ferry Rd
Ethan Allen Hwy
US Route 7
Stickney Bridge Rd
Pond Rd
US Route 9
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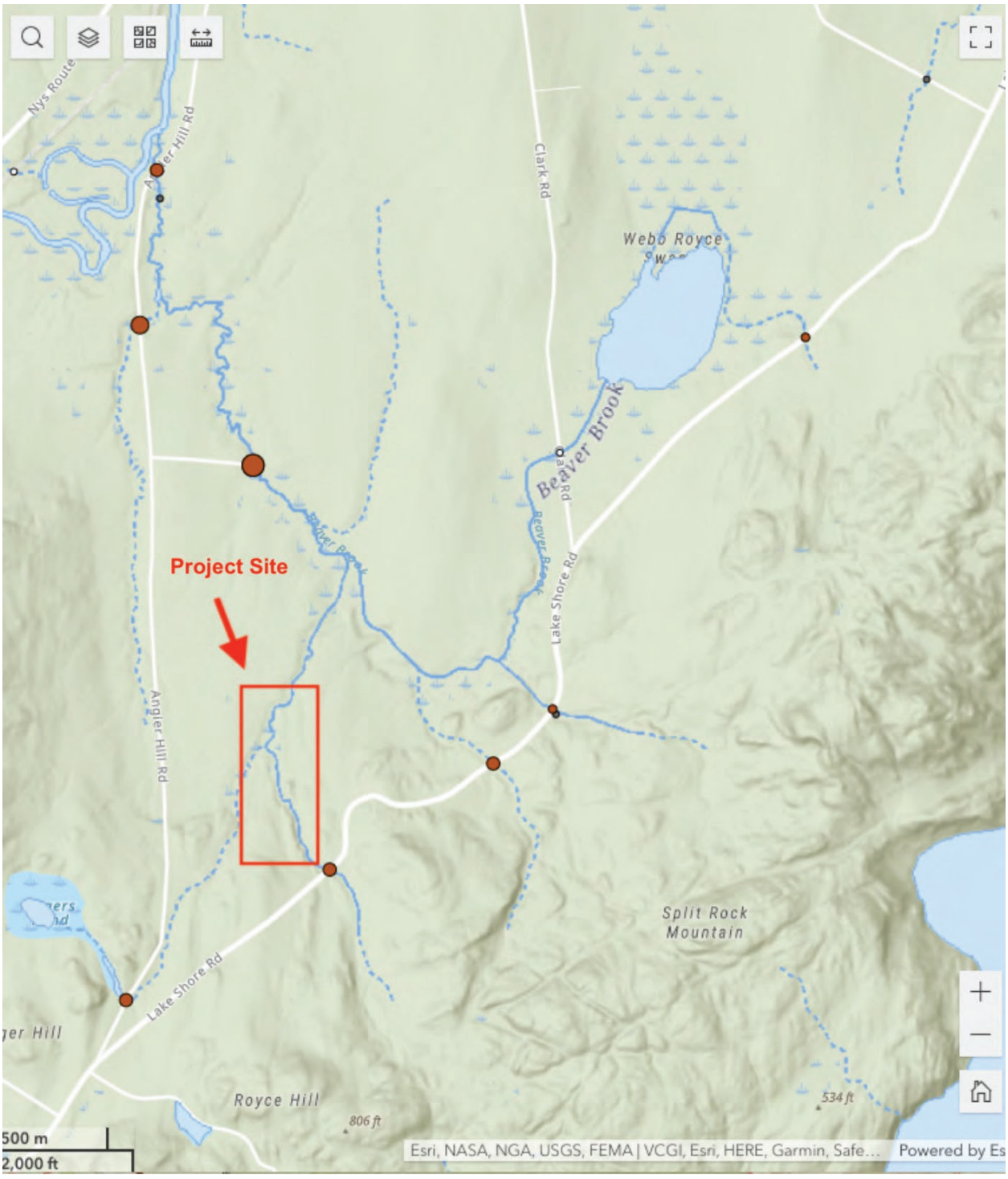
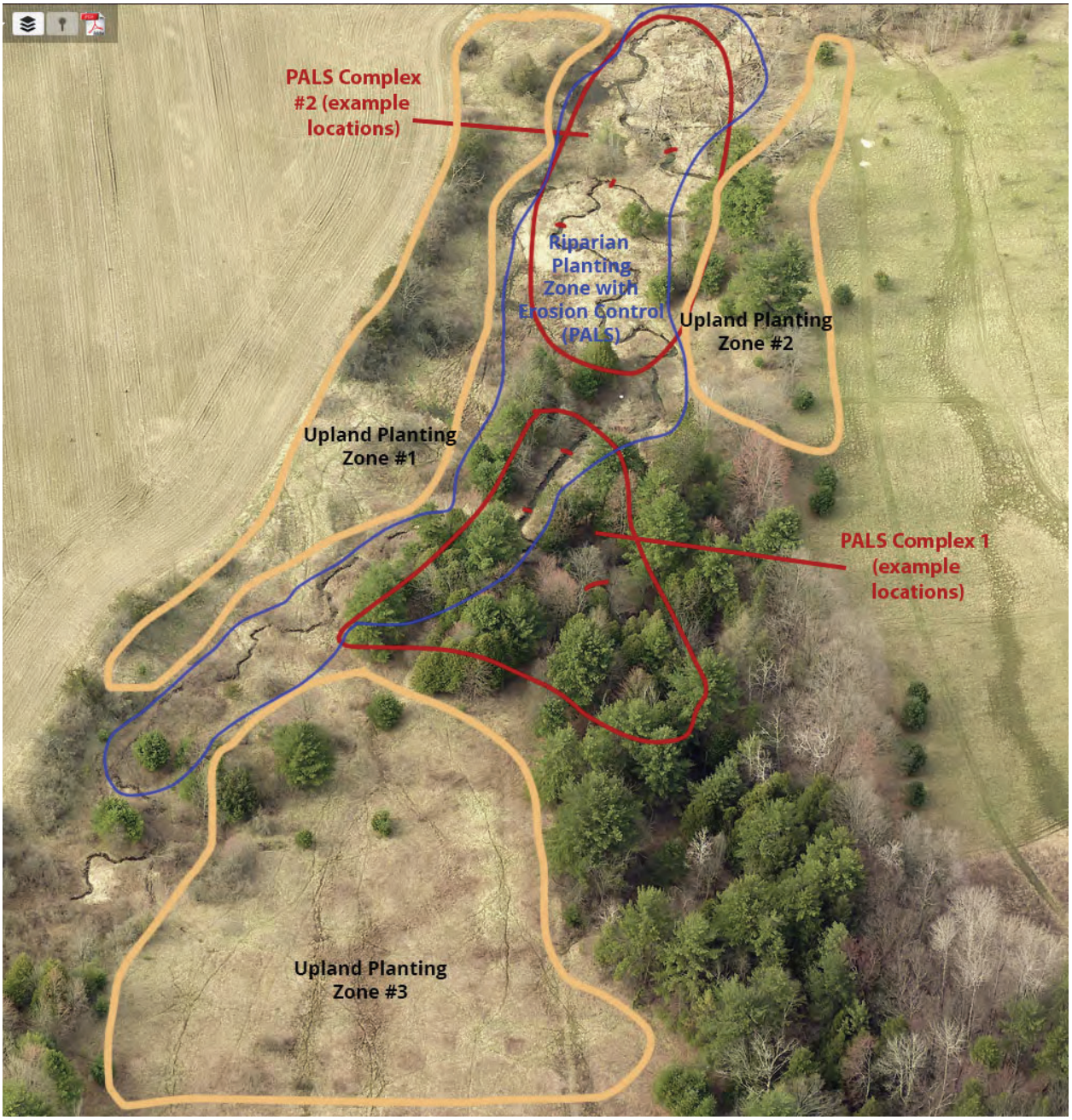

Project Site
Nys Route
Angler Hill Rd
Clark Rd
Webb Royce
Beaver Brook
Lake Shore Rd
Split Rock Mountain
Royce Hill
806 ft
534 ft
500 m
2,000 ft
Esri, NASA, NGA, USGS, FEMA | VCGI, Esri, HERE, Garmin, Safe...
Powered by Es

Project Site

This site plan is not a prescriptive document, but an outline for making site-specific, science-based decisions in the field that will be supported by adaptive management from the project partners.



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Restoration of Rare or Declining Natural Communities:

USDA United States Department of Agriculture
Natural Resources Conservation Service

Beaver Dam Analogues and Post-Assisted Log Structures for Low-Tech Stream Restoration

Conservation Practice 643 - Specification Sheet

Client:		**Date:**	
Location:		**County:**	
Contract #:		**Tract/Field:**	
Planner:		**Acres:**	

Practice Description

Post-Assisted Log Structures (PALS) are low-tech woody structures designed to facilitate process-based restoration of streams and riparian areas. PALS mimic and promote the processes of wood accumulation. Structures are low, semi-permeable, and hand-built using native materials (wood, sod, etc.) with untreated wooden posts added where necessary for extra stability. Structures are designed to be short-lived and used primarily as a temporary tool to promote natural process recovery. Typically, 'complexes' consisting of multiple structures are used within a stream reach to meet project objectives. The desired outcome is to initiate restoration of natural processes that self-sustain healthy valley bottoms and riparian habitats. For more details, reference: Low-Tech Process-Based Restoration of Riverscapes: Pocket Field Guide

Reach Conditions/Complex-Scale Objectives (complex = group of structures designed to work together)

Reach/ Complex Name	Length	Baseline Conditions	Goals & Objectives	Target Conditions
Beaver Brook	*500 ft*	*Channel incision (~3 feet) limits regular floodplain access. Excessive erosion is deepening channels and lowering water quality.*	*Improve floodplain connectivity, expand riparian vegetation to reduce incision and sedimentation and improve native fish and wildlife habitat*	*The desired outcome is to aggrade the active channel, promote regular floodplain connection, and increase riparian vegetation extent by 50% within 5 years.*

Treatment Specifications

Reach/ Complex Name	Structure No.	Structure Type	Approximate Dimensions (ft) (L x W x H)	Site-Specific Notes
Beaver Brook	*1*	*Channel-spanning PALS*	*7x2x2*	*Mimic natural wood accumulation to trap sediment and increase geomorphic complexity.*

Design drawings and maps	See Appendix A for standard structure drawings and installation instructions. Refer to conservation plan map for layout of structures.
Permits and consultations (List stipulations, timing restrictions, conservation measures, and notifications required by permitting/consultations.)	
Risk mitigation measures and additional notes (Complete risk considerations checklist and describe any measures needed to reduce risks)	