3.11 Supplemental Practices

Depending on your project, the following practices may enhance or augment the functions and values provided by your primary restoration treatments.

WOODY MATERIAL ADDITION

Decaying woody material is an important component of healthy ecosystems. In wetlands, logs, stumps, and smaller branches provide habitat and shelter for animals, store sediment, increase water storage and infiltration, reduce erosion, and provide a carbon source for the microbial food web.

Woody Material Specification

Source	Look for logs, stumps, and/or branches onsite in upland locations.
Size	Select a range of sizes and stages of decay.
Staging	Utilize staging and access locations identified for the primary restoration practices.
Distribution	Scatter material throughout the restoration area to provide a variety of ecosystem functions.

Woody addition in restored wetland

Do not scavenge woody material from surrounding wetlands.

Do not transport ash wood outside of the Emerald Ash Borer Infested Area in Vermont.

Do not use woodchips or mulch for this supplementary practice.

EROSION CONTROL PRACTICES

Sediment washing into streams is one of the largest water quality problems in Vermont. Excess sediment can kill fish and other aquatic organisms and damage aquatic habitat. Sloped sites have a higher risk of erosion than flat sites, though gullying can occur on flat sites if water flows are concentrated. Basic approaches can control erosion and prevent the discharge of sediment.

Causes of Erosion
Vegetation removal
Topsoil and organic matter removal
Changes to drainage
Failure to cover bare soil

Avoidance Measures
Avoid work in the rain
Avoid work in high flows
Avoid work in winter conditions: October 15 to April 15

Seeding and Mulch

Seeding and mulch is the best and cheapest erosion control tool for use with wetland restoration practices that involve earth disturbance and stockpiling of soils. Temporary seeding is used to quickly establish vegetation on disturbed soil to reduce erosion during construction and/or late in the growing season. For best results, seed and mulch disturbed areas as quickly as possible after completion of grading and work activities. Apply seed first. Straw (not hay, which can contain NNIS seeds) can be hand scattered or blown to a depth of 1 inch. Track mulch in as needed to prevent removal by wind. In winter, apply mulch to a depth of 3 inches. Seed and mulch soil stockpiles if storage is for more than a week or if heavy rain is predicted. Reapply mulch as needed to ensure bare soil is 80-90% covered.

Except for temporary erosion control, use native seed mixes from Vermont or New England.

Timing and Application Rates for Typical Temporary Seeding Species

Complete all erosion control seeding by September 15 to ensure adequate growth and cover.

May 1 - Sept 15	Annual Rye at 20 lbs./acre
Sept 15 – May 1	Winter Rye at 120 lbs./acre

Mulch Timing and Application Rates

Mulch is used to stabilize soil and prevent erosion prior to vegetative growth. Mulch also holds seed in place and allows it to become established. Use weed free straw mulch to avoid the introduction of nuisance plant species to the restoration site.

April 15 - Sept 15	1-2 inches deep
Sept 15 – April 15	3 inches deep

Erosion Control Blankets

Erosion control blankets are a temporary practice used on steeper slopes (3:1 or steeper) and level drainage ditches (less than 20:1 slopes). They are designed to hold soil in place until vegetation can grow through them and they biodegrade. For wetland restoration projects, erosion control blankets must be netless and comprised of natural fiber to avoid wildlife mortality. Anchoring devices are used to secure the blankets in place during heavy rain or wind. Anchors are often made of metal, but live stakes from native plants could serve a dual purpose.

Eroson control blankets on slope above wetland restoration

Erosion Control Blanket Specification

Preparation	Seed area first.
Short Slopes	For slopes less than 8 feet, install blankets across the slope (horizontal).
Long Slopes	For slopes greater than 8 feet, install blankets up and down the hill (vertical). Unroll mats from top of the hill.
Key In	Trench matting in 8 inches at top of hills.
Anchor	Unroll mats and staple/anchor as unrolled. Use plenty of staples to keep blankets flat.
Coverage	Overlap blankets 6 to 8 inches on sides, tops, and bottoms. Staple through both blankets at areas of overlap.

Wetland Matting

Wetland matting ("swamp mats") provides temporary access for large equipment within the restoration area by giving machines traction and preventing equipment from becoming stuck. Mats are placed directly on top of existing vegetation (vegetation removal may require a permit), and then removed within one growing season. To avoid the need for permitting, use of swamp mats must meet the US Army Corps of Engineers General Permit conditions (see Chapter 5).

Wetland Matting Specification

Position	Run mats across wet areas until they reach solid ground.
	Place mats parallel to the direction of travel to distribute weight.
	No gaps should exist between mats.
Installation	Use machinery (such as track excavators) to place mats.
	More than one layer of mats may be necessary in areas that are inundated or have deep organic wetland soils.
	Use lifting bolts to install. Timber mats have two lifting bolts on each end, making it easy to lift and place them with machinery.
Removal	Matting is removed by backing out of the site while removing mats one at a time. Any rutting or significant indentations should be regraded, taking care not to compact soils.

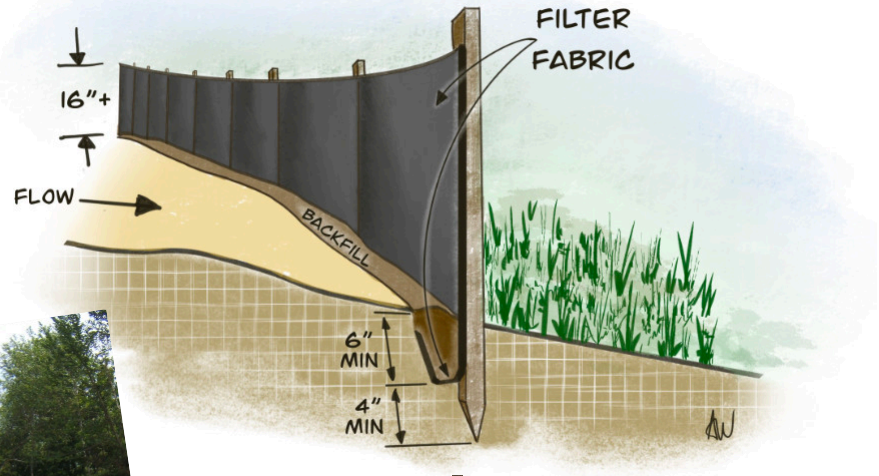
Layered wetland matting providing temporary wetland crossing

Silt Fence

Silt fencing is a type of sediment barrier recommended for use in large areas of soil disturbance (>0.5 acres) on slopes or near surface waters. The fence works by trapping sediment as water flows through it. Silt fences are made of geotextile fabric and supported by wooden stakes or metal posts.

Silt Fence Specification

Location	On sloped site, locate the fence downhill of the soil disturbance activity.
	On a site adjacent to surface waters, install the fence between the disturbed soil and the waterway.
Installation	Dig a trench 6" deep across (not up and down) the slope.
	Ensure stakes are on the downhill side of the fence.
	Join fencing by rolling the end stakes together.
	Drive stakes in against downhill side of trench.
	Push fabric into the trench, spreading it along the bottom.
	Fill trench with soil and pack down.
Maintenance	Remove accumulated sediment before it rises halfway up the fence.
	Ensure that the silt fence is trenched in the ground and that there are no gaps.
	Remove fence when restoration site is stabilized with vegetation.



Poorly installed silt fence-note lack of keying into soil at base

Silt fence failure

BEAVER DAM ANALOGS & POST-ASSISTED LOG STRUCTURES

Beaver Dam Analogs

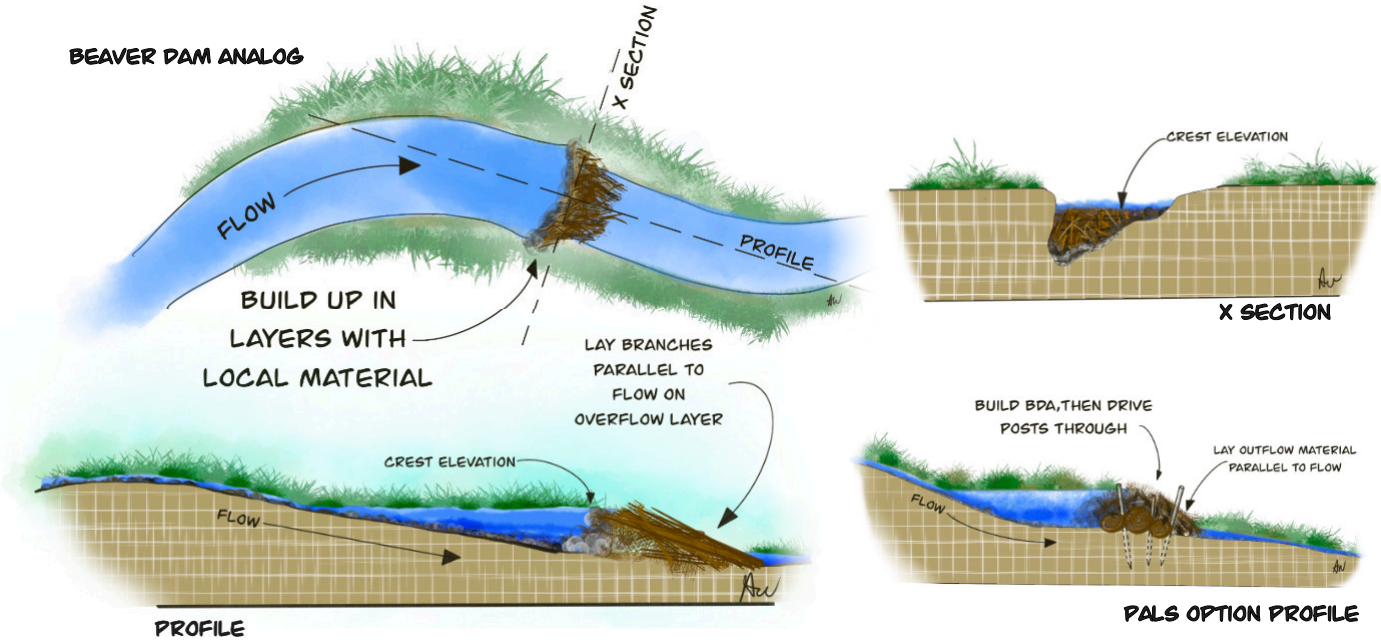
Beaver dam analogs (BDAs) and post-assisted log structures (PALS) are stream restoration practices that may complement a wetland restoration project that involves degraded streams lacking woody structure. These practices promote a self-sustaining riverscape with appropriate obstructions to flow, which create diverse habitats and reduce erosion. BDAs and PALS are non-engineered and hand-built with natural materials.

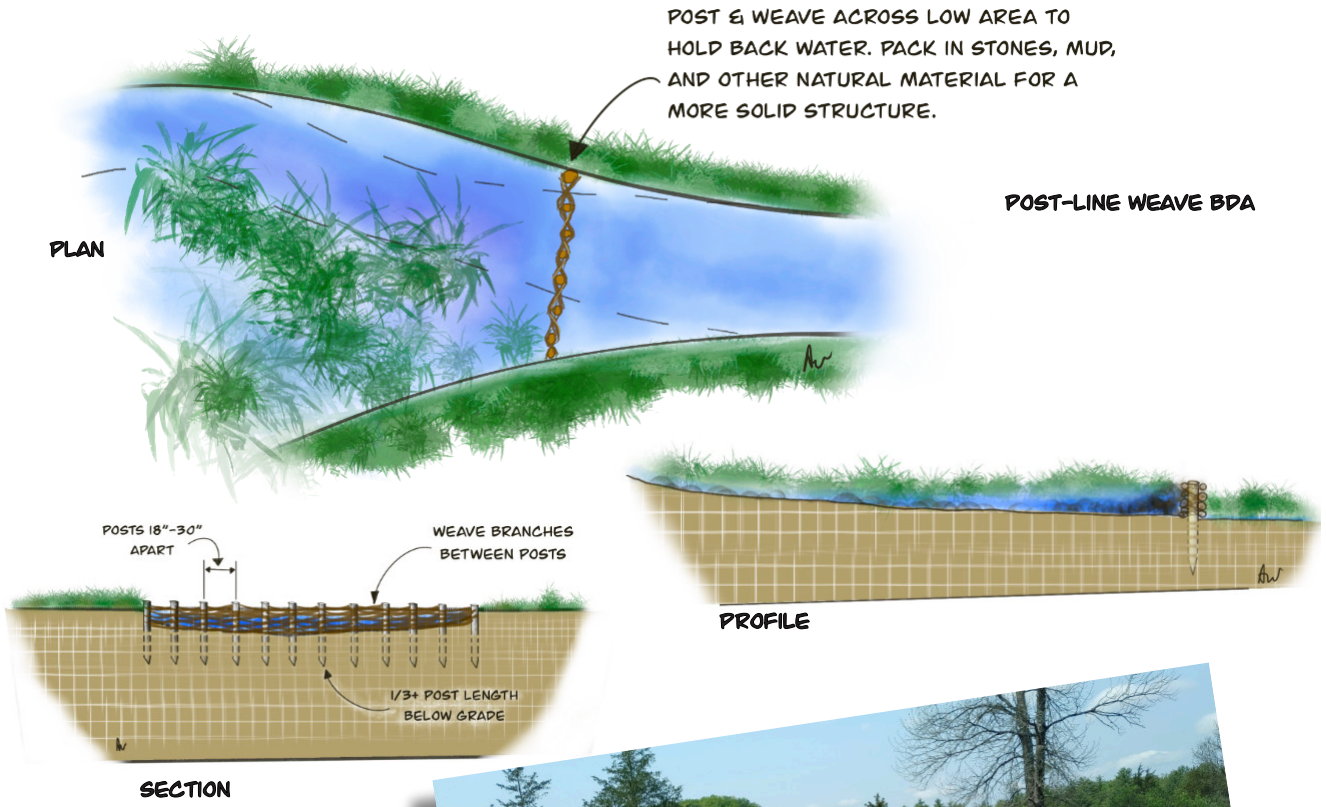
BDA: A permeable, channel-spanning structure with a constant crest elevation, constructed with a mixture of woody debris and fill materials to form a pond and mimic a natural beaver dam.

PALS: Woody material of various sizes pinned together with untreated wooden posts driven into the substrate to mimic natural wood accumulations. Can be channel spanning, bank-attached, mid-channel, or on the floodplain.

Specification

Source	Collect locally sourced materials to construct BDAs. Non-treated natural wood commercial posts may be used in PALS.
Material	Use mud, stones, and a range of sizes and species of wood. Living stems, branches, and trunks from native willows can be used, which may root and form a living structure. Average diameter for weaving branches is 2".
Layering	Build up in 6" to 12" lifts, make sure each layer is holding back water and ponding. Start with wide base to support the desired height.
Overflow Mattress	Branches woven parallel to flow at downstream end of structure. Combination of branches, brush and cobble.
Posts	Optional. For higher flow conditions. Untreated wood, or robust native live stakes. Min 2" diameter for post and weave, 6" diameter for PALS. 18-30" gap between posts. Drive post through entire structure, with at least 1/3 the length of post into the underlying streambed.





Post weave BDA, Shayne Jaquith, The Nature Conservancy

Challenges and Solutions

- Can be too robust: BDAs and PALS that are too robust may be barriers to fish, hold back too much water, and flood neighboring properties. Build them only high enough to flood areas where inundation is appropriate. If fish passage is an issue, design strategic gaps in the structure.
- Can be too fragile: BDAs and PALS are temporary structures that will break down over time, and this should be planned for. Loose wood can block downstream culverts and flood roads if the structures are built too near upstream, and maintenance will be required if the structures break down before a self-sustaining riverscape becomes established. Thoughtful planning and regular monitoring can mitigate these challenges.

Installation of BDAs and PALS likely triggers other State and Federal approval or permitting. Consultation with ACOE and State River Engineer is encouraged early in the design process, and further design support from a consultant may be necessary. See State of Vermont Policies for more information on requirements (Vermont Rivers Program Policy on Wood and Structure Addition as a Restoration Strategy. 12/16/21).

CONSERVATION EASEMENTS

The restoration practices described in this guide are intended to enhance the functions and values of degraded wetlands across the landscape. These efforts are worthwhile because they help reduce flood damage, increase water quality, improve wildlife habitat, and more. Conservation easements are a unique practice in that they don't directly enhance wetland function, but instead ensure that restoration efforts aren't reversed as land ownership changes hands.

Conservation easements permanently protect a wetland restoration area through a legal agreement between the landowner and a land trust or government agency. Easements indicate the location and acreage of a Wetland Protection Zone (WPZ) and establish what uses and management activities are supported there. Management activities typically supported within a WPZ include the control of NNIS, management of beaver dams to the extent necessary to prevent or mitigate flooding outside the restoration area, and revegetation planting.

Resources

There are many organizations and agencies in Vermont that support conservation easements and deed restrictions. Examples include:

Department of Environmental Conservation, Vermont Agency of Natural Resources
Natural Resources Conservation Service, U.S. Department of Agriculture
The Vermont chapter of The Nature Conservancy
Vermont Land Trust
Other local land trusts