USDA United States Department of Agriculture

Natural Resources Conservation Service

Guidelines for Strategic Wood Additions (SWA) to Streams In Northern New England (ME, NH, and VT)

Introduction

Above: A section of stream which lacks woody material and as a result the stream lacks pools, riffles, and cascades.

A lack of woody biomass in Northeast streams is due primarily to the lack of old trees in riparian areas which die and fall into streams naturally. Trees and other debris have historically been removed from streams in the Northeast due to past practices and perceived need. Additionally, culverts and other infrastructure collect wood and are cleaned-out seasonally further reducing the amount of wood in streams and on floodplains. Woody biomass in streams creates several key ecological feedbacks, which are important for the larger watershed. This guide presents an overview of the environmental benefits of Strategic Wood Addition (SWA) from adding woody biomass to lower (e.g. first, second, third) order streams, baselines for evaluating stream condition, site selection, permitting, risk assessment, and tips for successful installation.

Environmental Benefits

Water Quality

During high flow events sediments (sand, gravel, silts) and organic matter (twigs, logs, and leaves) are mobilized and moved out of low order streams. Without woody material to reduce velocities and retain inorganic and organic materials in these stream segments, they are deposited into larger water bodies and wetland systems much lower in the watershed. This deposition known as siltation changes the depth of water bodies, buries sub-aquatic vegetation, and increases nutrient loading. Upstream the converse happens, stream channels become incised from the constant loss of material and streams lose contact with their floodplains which results in increased velocities which result in damage to downstream infrastructure and the system itself. The lack of retention of wood, organic material, and sediment translates to a reduction in biomass of insects, invertebrates, and fish.

Fish Habitat

Wood in streams increases fish populations by providing deeper pools and a greater diversity of habitats which help fish persist during hot summer months and long winters. Cascades and riffles are formed

Above: Gravel and sand accumulate behind wood in a stream. Note the complexity of the stream bed.

from the stream flowing over logs which increases oxygen content. Wood also provides escape cover, increases gravel bars for spawning, and collects organic matter which increases populations of insects and invertebrates. During drought conditions, first order streams become fragmented and fish are forced to wait for the cooler fall rains often in a single pool. Increasing the number of pools in a stream segment greatly increases low-flow holding areas as well as allowing fish to overwinter and survive drought conditions. Research by the Vermont Fish and Wildlife Department in northeastern Vermont found that the total population biomass of brook trout tripled on average in streams where large woody material was added!

Reduced Flood Intensities

Incised streams are created when scour in the stream bed deepens the channel and as a result the stream loses contact with the floodplain. Log-jams in these streams are valuable as they collect sediment on the upstream side and reduce flow velocities. As sediments accrete behind log-jams, there is reduced hydrologic capacity at that location allowing flood waters and sediment during high flows to access the floodplain. Intact forested floodplains offer flood water storage and reduce peak discharges thereby further collecting sediments and organic matter.

Best Management Practices for Strategic Wood Addition to Streams

Because adding wood to streams can have unexpected effects to stream geomorphology, such as increased bank erosion, damage to culverts, change of flood regimes and – deposition of cut wood onto neighboring properties, great care must be taken in selecting proper sites. The list below identifies some important considerations when planning to add woody material to streams.

- ✓ See State Specific Guidelines on Page 8.
- ✓ Only trained contractors with proper experience can install this conservation practice.
- ✓ At least 1,000 feet of stream for treatment.
- ✓ Work with landowners who own both sides of the stream or with cooperating neighbors on each side of stream.
- ✓ Low order streams are ideal; typically less than 20 feet (bankfull width) wide. It is safest to work in areas where average tree height is greater than 2X bankfull widths.

- ✓ Low stream slopes are ideal but up to 10% may work. Consult with experienced practitioners for the site. Generally higher slopes can work with narrower streams and lower slopes for wider.

- ✓ Rural landscapes which lack downstream infrastructure (culverts, roads, houses, etc.) generally within 1,000 feet of the project area.

- ✓ Ideally targeted stream sections will have downstream beaver flowages, low gradient sections, meander bends or wetlands to collect wood moving downstream. These are ideal features above infrastructure.

- ✓ Where ample canopy cover exists and cutting trees to add to the stream will not greatly reduce shading. Generally don't exceed 30% opening in canopy cover.

- ✓ Don't cut trees on the stream bank, they will eventually fall in on their own and offer erosion protection. Also, undercut banks held with tree roots are a favorite for trout and other fish.

- ✓ Leave felled logs on floodplains to increase roughness, reduce flood intensities, capture sediment, improve wildlife habitat and timber quality (if part of forest stand improvement).

- ✓ Suitable areas for "strainers" on site where a few large diameter trees can be felled across the stream and lodged in place behind immobile features (e.g. live standing trees) on the downstream end of the treatment to collect any wood which may dislodge during high flows.

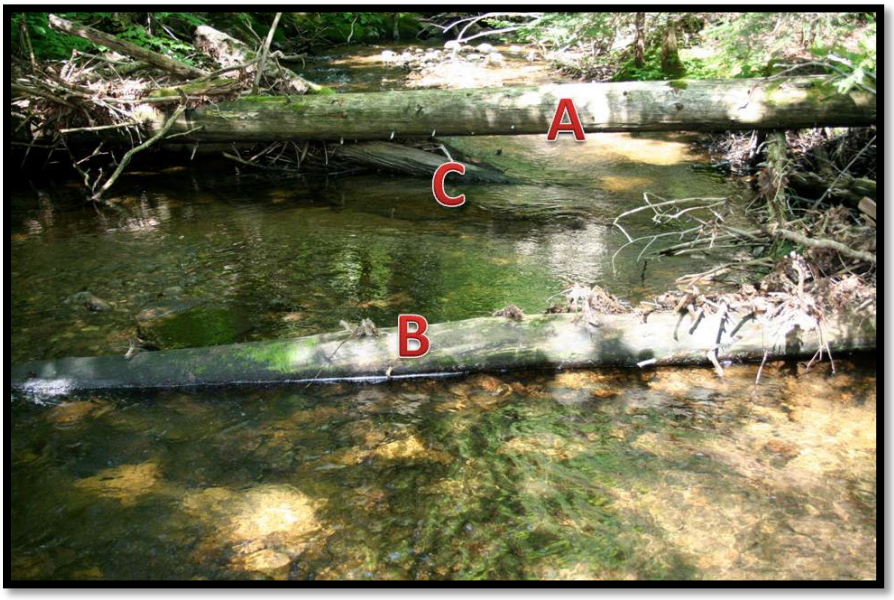
- ✓ When creating a strainer, the best situation is where these trees become "wedged" between other healthy trees and large immovable boulders etc.

- ✓ Consider creating strainers on bends in the stream, pinch points, and in areas where wood is already accumulating.

- ✓ Cut trees a few feet from the ground leaving a higher than normal stump on the downstream side when needed to help further secure recently cut trees.

Measuring Existing Wood – How Much Wood to Add

For each 100 foot section of stream, estimate the pieces of wood 4 inches or greater in diameter and 6 feet long or longer which are in contact with the water year-round (during low flows). A target minimal benchmark is 4 pieces of wood in-contact with the water at low flows for every 100 feet of stream. Streams with lower amounts than this benchmark are typically good candidates and will benefit greatly from additions. In old growth forests, there is usually so much wood it is hard to see the stream! Keep this in mind when selecting a desired outcome.



Above: A) shows a piece of wood which does not count in the survey as it is not in contact with the water. B) and C) shows pieces of wood larger than 4 inches in diameter in contact with the water and counts as part of the survey. For survey purposes, the above picture would have 2 pieces of wood in this stretch.

Above: The above picture shows created habitat for fish from wood additions. For each 100 foot section note pools, cascades, riffles and glides. The long term goal is to establish multiple features per 100 feet of stream through this work.

On floodplains, note the amount of downed wood and the overall roughness of the floodplain. Several logs can be left on the forest floor as part of forest stand improvement and will reduce flood velocities and collect sediment.

Above: A desirable area at the downstream end of the treatment area to collect any dislodged wood. Downstream, neighbors can become very upset and even file a lawsuit if cut wood ends up on their property so proper and thoughtful installation of wood is critical.

Above left: Cutting a tree higher than normal to help secure the tree at high flows.

Above right: A felled tree "wedged" between other trees to help secure it during high flows.

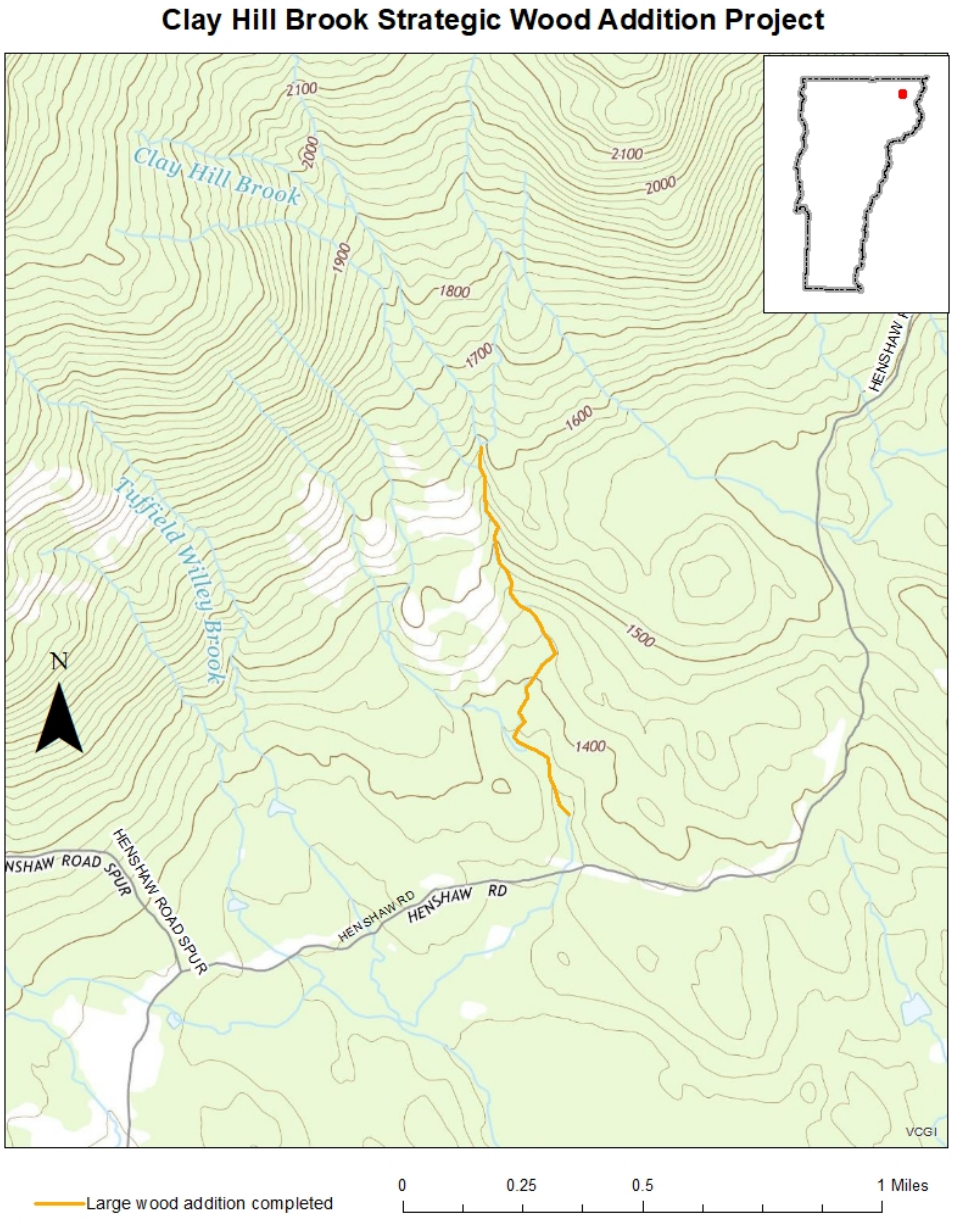
Above left: Segments of cut trees added to the stream. This technique is useful to try to get wood buried into the stream bed.

Above right: An example of wood which has been buried in the stream bed over time, and in contact with the water at low flows. Note the cascade and pool it creates.

Above left: several leaning trees on the stream bank which should not be cut as they are essential to stream shading and help secure the stream bank. They will fall in on their own eventually.

Above right: trees associated with an undercut bank which is great habitat, these trees should not be cut as they help secure the bank.

Both photos: Note the difference in sediment sizes in both streams; the left picture outlines a coarse-grained substrate typical of upland streams. The stream on the right is a lower valley which is silty in texture.



Above: A typical VT stream where wood has been added. When planning an installation, note the soils, hydrologic groups and slope of the watershed. In this case, upper portions of the stream are bedrock controlled and are steep but the overall watershed size is small which helps reduce risk. The flat area of the lower stream section helps to reduce flood intensities with larger floodplains, lower stream gradients and the installation of a strainer. To further minimize risk to infrastructure, the downstream limit of the project was over 1000 feet upstream of the road crossing.

State Specific Guidelines

Maine:

- Bring in possible permitting agency's (Army Corp. Land Use Planning Commission, Forest Service, Maine Department of Environmental Protection, Inland Fisheries and Wildlife, and Department of Maine Resources) early in the process. Depending on your large wood addition project type and project location different permits may be required.

New Hampshire:

- All projects require Department of Environmental Services (DES) permit.

Vermont:

- VT requires US Army Corps of Engineers (USACE) General Permit for wood additions to streams.
- Vermont DEC River Management Engineer must be contacted with proposed project details.
- Early coordination with the Vermont Fish and Wildlife Department's District Fisheries Biologist is important. Maps and locations will be shared with landowner permission. The District Fisheries Biologist will be notified/included in first site visit with landowner permission. Report back to the District Fisheries Biologist inventory information from the streams. District staff will be of assistance in identifying important areas for brook trout. There is potential that they will be available for limited shocking to determine species/populations in target streams.