

Ashokan Watershed Stream Management Program

STREAM GUIDE

A HOMEOWNER'S GUIDE TO MANAGING WOOD IN STREAMS

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This Stream Guide provides information on the role of wood in stream ecosystems, common hazards created by wood in streams, landowner responsibilities, and best management practices for managing wood in streams.

Wood has been a common and natural feature in stream channels for as long as streams and forests have existed. The Ashokan Reservoir watershed features over 450 miles of streams and is 95% forested, so it is expected that wood will frequently enter stream channels. Wood tends to accumulate in predictable areas, including upstream of split channels and at stream corridor constrictions (like bridges and culverts). Other areas of repeat accumulation include where a valley widens and the stream has a low slope. High stream flows can mobilize wood and the likelihood of mobilization is dependent on piece size, channel shape, and flood magnitude.[1]

Wood in streams can range in size from a single branch to a channel-spanning log jam. Wood can accumulate near the banks, in the center of the channel, or piled on bridge piers. Limbs and branches can trap smaller pieces of wood and leaves, leading to an accumulation of material that spans an entire channel, referred to as a wood jam, log jam, or wood accumulation.



A large wood accumulation on the Warner Creek.

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Biological role of wood in streams

Wood in streams provides ecological benefits for many fish species, including New York's only native trout species, the Brook Trout (*Salvelinus fontinalis*). The orientation of how wood is deposited in a stream will create different types of pools and habitat. Deep scour pools can be created as water is forced to flow under or over wood in the stream channel. Scour pools are excellent habitat for fish and hold cold water that fish need as a refuge during hot summer months. Shallow pools often form upstream of channel-spanning wood jams. The slow-moving water in these pools causes accumulation and deposition of organic matter, including leaves. Organic matter fuels the aquatic food web and sustains the insects that Brook Trout rely on for food.

In northeastern Vermont, a study found more Brook Trout in streams with large amounts of wood. The authors conclude that streams with large amounts of wood are likely to create pools and complex habitats that benefit Brook Trout.[2] The Vermont Fish and Wildlife Department has strategically added wood to sections of stream that have been previously logged. Adding wood to the streams increased both the population and size of the Brook Trout.

Physical role of wood in streams

A stable stream is in balance with its valley setting and upstream sediment supply and doesn't accumulate sediment or rapidly erode into its bed or banks. Stream features such as pools, riffles, meanders, and steps dissipate the energy of water.

Streams with stable channels in their valley setting don't erode quickly into the banks or bed. Stable streams do not cause common landowner concerns such as accumulation of sediment or sudden channel shifts and erosion into stream banks at typical flows. Large wood adds complexity to stream channels and plays an important role in maintaining channel stability.

Wood provides roughness, which disperses and reduces the velocity of water. Large wood positioned on the outside of channel meander bends can deflect water from the stream banks and lower erosion rates by reducing water velocities near the banks. Some stream restoration projects use engineered wood structures known as rootwad revetments to prevent bank erosion. Additionally, the diversity of flows created by large wood can slow down



Wood in streams can provide physical and ecological benefits. However, wood can also present hazards and risks. The decision to remove or retain large wood should consider the benefits as well as hazards at the site and downstream.

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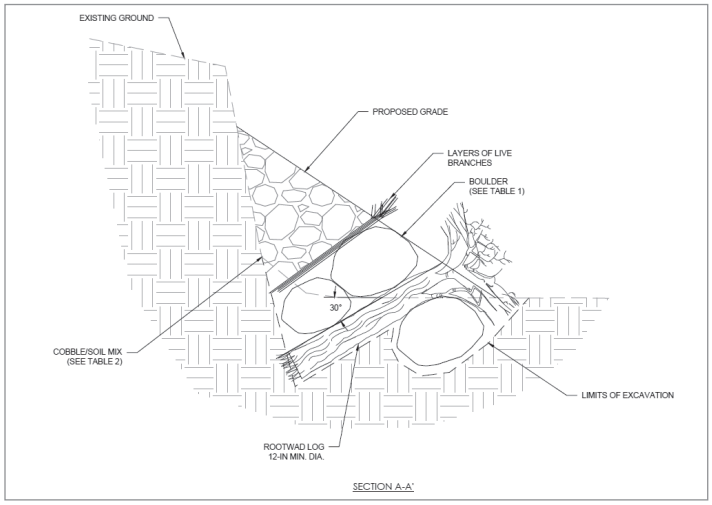


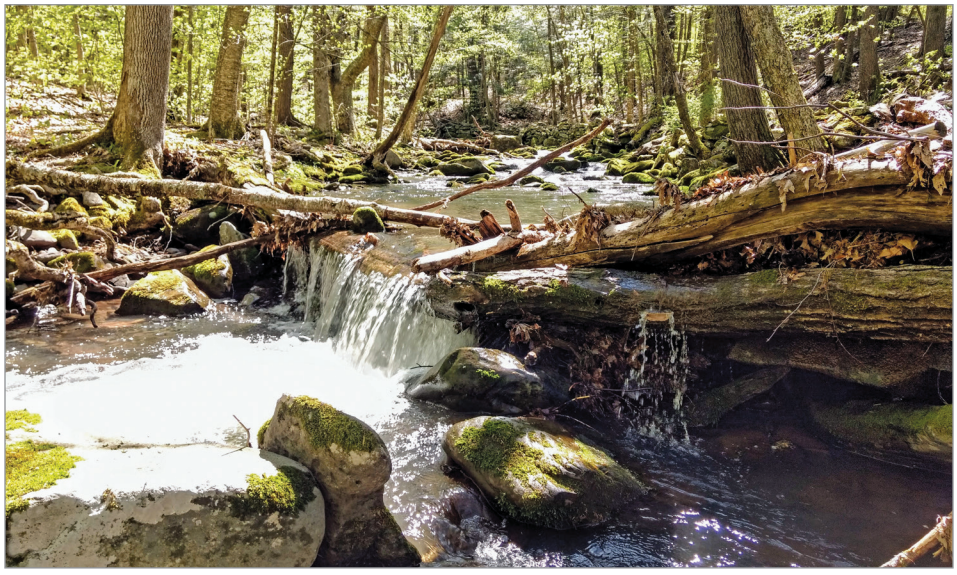


Left: Engineering schematic of a rootwad bank treatment. The log is buried into the bank with roots facing out. The protruding roots provide roughness, effectively slowing down the flow of water on the bank and creating resistance to erosion. This practice also creates habitat for aquatic organisms. Right: An engineered rootwad bank treatment to protect the bank from erosion at a stream restoration project on the Panther Kill in Woodland Valley.

water and result in fine sediment settling to the bottom, out of stream flows. This process maintains high water quality by reducing turbidity (the cloudiness) of water.

Water flowing in streams gradually moves sediment held in the stream banks and stream bed downstream. Smaller streams that are tributaries provide a large amount of gravel, cobble, and boulders to the mainstem creeks. An important physical attribute of wood is its role in retaining large sediment in tributaries and preventing that material from reaching mainstem creeks. This results in a more balanced sediment transport system in the tributaries and mainstem creeks.

Streams can erode downward into the stream bed through a process called incision. An incised channel no longer has access to a floodplain. Floodplains allow water to spill beyond the stream channel, dissipating energy rather than directing it into the stream banks or stream bed. Over time, the incised stream will become wider and create a new floodplain contained within the widened channel. However, this process of widening can undermine streamside forests and infrastructure such as homes or roads. In comparison, well-connected floodplains allow area for wood to naturally be deposited outside of the stream channel.



A log embedded perpendicular in the stream channel provides multiple benefits. The log holds the stream bed at its current elevation and prevents upstream erosion of the bed. It also creates a deep scour pool.

A headcut or knickpoint is a sharp point of incision that can travel upstream and cause stream instability for miles. Large wood embedded into a stream bed or embedded as "log steps" can prevent incision and keep the channel bed close to its current elevation. This stops bed erosion from advancing further upstream.

However, the physical impact of wood is site-specific. In some locations, wood in streams accelerates or causes bank and bed erosion. Wood in streams can deflect flows towards a stream bank and increase the rate of bank erosion. A

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Top: Wood transported downstream during Tropical Storm Irene in 2011 was unable to pass under the Bridge Street Bridge in Phoenicia. Bridges with center piers are especially vulnerable to wood accumulation. Bottom: The wood that piled on the Bridge Street Bridge resulted in damage to the bridge. The bridge deck slid approximately 18 inches as seen by the shifted yellow centerline.

channel-spanning jam can concentrate flow to the sides of the channel and undercut the banks on each side of the wood jam. A large jam can block the channel completely and cause the stream channel to change its course. The result may be stream channels running through forested floodplains or towards homes that were previously hundreds of feet away from the stream.

Large wood can pose threats to infrastructure and human life. Some bridges were damaged during Tropical Storm Irene when large wood accumulated on the bridge and resulted in extreme forces acting on the structure. Wood poses the greatest risk to human life in stream segments that have high recreation value, such as near popular swimming holes and reaches regularly used by tubers or kayakers.

How to determine if wood should be removed?

If you are unsure if wood is beneficial or negatively affecting the stream, you should contact your local Stream Management Program. Stream Program staff can help you determine the value and risks of a wood jam, and if a permit is needed for its removal. Residents of the NYC Watershed have access to a local Stream Management Program that offers technical expertise. Those living outside of the NYC Watershed should contact the nearest Soil and Water Conservation District office.

The Ashokan Watershed Stream Management Program (AWSMP) inventories and maps the locations of wood in streams during stream assessments. The AWSMP monitors wood accumulations and helps with assessing whether wood may

cause risks to recreational users, property, and stream stability. The AWSMP piloted the use of trail cameras to monitor wood jams that may become mobilized in high flows.

Contact the Ashokan Watershed Stream Management Program at 845-688-3047 or info@ashokanstreams.org. Visit https://catskillstreams.org to find your local Stream Management Program.

Who is responsible for maintaining the stream on my property?

Streamside landowners are responsible for management of the stream bed and banks on their property. This includes managing wood, bank erosion, excessive sediment deposition, bridges, or flood hazards. However, because water and wildlife in stream channels are public resources, some stream management activities are regulated. Stream modifications undertaken in one location may affect stream stability and landowners both upstream and downstream of the site. When a person takes ownership of streamside property, they assume all risks and responsibilities associated with streamside living, including compliance with regulations.

There is generally no government agency or organization that is mandated with managing wood in streams. This is the case even if the wood originated from public lands. Specific exceptions include certain municipal districts or legally established flood control projects where state or municipal governments are required to follow specific maintenance requirements. Municipal highway departments are responsible for maintaining the proper functioning of their infrastructure. Under New York State Environmental Conservation Law landowners have no responsibility or obligation to remove wood from streams on their property.



A tricky situation for whether wood should be removed or retained. The AWSMP assessed this wood in 2018. The wood was not causing any erosion but directed some flow towards the road embankment (left of image). The stream program determined the wood was a slight threat to a downstream bridge, but the wood was unlikely to mobilize. The AWSMP recommended leaving the wood in place for its unique aquatic habitat benefits in this reach but also monitoring the site for any changes.

Best management practices for removing wood in streams

Often the best option is to leave wood in place. If you have determined the wood should be removed or altered follow the guidance below.

Reach out

Contact your local Stream Management Program, Soil and Water Conservation District, and/or New York State Department of Environmental Conservation regional office for technical assistance and advice.

Retain Rootwads

If a tree has fallen into the stream and its roots are still attached to the bank, only cut the trunk portion of the tree and retain the roots. The roots will continue to stabilize the stream bank after the trunk and branches have been cut. The removal of a rootwad will expose an unvegetated stream bank and make it susceptible to rapid bank erosion and retreat. Additionally, removal of roots from the bank is considered disturbance and will require a permit. Trees naturally grow toward the light above streams and leaning trees should be retained unless they create a hazard.

Remove

If you are going to remove large amounts of wood from the stream, cut wood into pieces less than four feet long and leave them in the stream channel. The four-foot sections will be carried downstream during the next high flow and cause little risk while still playing a functional role in the stream ecosystem. Discarded wood



The Ashokan Watershed Stream Management Program monitors large wood to assess its importance to stream function and habitat quality.

can be placed in the floodplain to create roughness. Refer to safety tips below. After consulting with stream managers and obtaining any necessary permits, contact a certified arborist or qualified professional if unable to safely remove the tree yourself.

Revegetate

Trees and shrubs are the best long-term strategy for protecting against bank erosion. For vegetation guidance and possible funding assistance, call your local Stream Management Program.



Planting willows and dogwoods along stream banks provides long-term protection against erosion. Contact your local Stream Management Program to learn more.

Safety tips for removing wood

Removing large wood from streams is difficult and dangerous. Do not advance with removal if you are not confident in your abilities.

- Wear personal protective equipment.
- Wet wood is on average 50% heavier than dry wood, making it deceptively challenging to remove in a safe manner. Additionally, the weight distribution of trees can be asymmetrical resulting in chopped pieces falling in unpredictable directions.
- If operating equipment on the stream banks, be aware of slope stability. The sediment that makes up stream banks is often unevenly distributed and can be severely undermined.
- If possible, conduct work during low flows for safety.

- Be aware of the forces acting on the wood jam. Ask yourself: If a piece of wood is removed, what is behind that piece and what is that piece holding together? Are you prepared to remove a pinned, buried, or tangled piece of wood that is under tension?

Wood that is partially buried or intertwined with other wood could be under tension. When cut, this wood could be released violently.

Do I need a permit?

The New York State Department of Environmental Conservation (NYSDEC) requires specific permits depending on the proposed activity:

Article 15 Stream Disturbance Permit: Required for any disturbance to the bed or banks of any stream of Class AA, A, B, or with a Class and Standard of C(t) or C(ts). Stream classifications can be viewed using the NYSDEC Environmental Resource Mapper (see link below).

Article 15 Excavation and Fill in Navigable Water Permit: Required for activities involving excavation or placement of fill below the mean high-water mark of any navigable waterbody, regardless of its class. For details visit the NYSDEC Protection of Waters Website.

Article 24 Freshwater Wetlands Permit: Required for any disturbance to soil or vegetation within regulated freshwater wetlands. To check if there are regulated wetlands in the proposed work zone, visit the NYSDEC Freshwater Wetlands Website.

List of the density of 12 foot lengths of various tree species found within riparian corridors and the weights (lbs) of various sized pieces.

Tree Species	Density (lb/ft^3)[a]	6-inch diameter	12-inch diameter	18-inch diameter	24-inch diameter
Black Walnut	57	134	537	1208	2148
Burr Oak	62	146	584	1314	2336
Cottonwood	58	137	546	1229	2185
Eastern Red Cedar	37	87	349	784	1394
Green Ash	53	125	499	1123	1997
Hackberry	51	120	480	1081	1922
Hickory	64	151	603	1356	2412
Sugar Maple	59	139	556	1251	2223
Sycamore	63	148	593	1335	2374
Willow	54	127	509	1145	2035
Average	55.8	131	526	1183	2103
Average-wet (50% increase)[b]	84	197	788	1774	3154

Note: Density of wood material will vary with moisture content and condition (live, seasoned, wet). This table should only be used as a guide for the weight of different sized pieces of large woody debris.

[a] Source: http://www.engineeringtoolbox.com/weigt-wood-d_821.html

[b] Estimated from data in Shields et al. 2004. Large Woody Debris Structures for Sand-Bed Channels. Journal of Hydraulic Engineering 130: 208–217.

Density and weight of riparian tree species in pounds. On average, wet wood is 50% heavier than dry wood. Source: A Primer on Large Woody Debris Management.

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A NYSDEC permit is required when:

- Equipment or heavy machinery will be operated within the stream or on its banks.
- Equipment or heavy machinery will be operated within a regulated wetland or its 100-foot adjacent area, resulting in soil disruption or destruction of vegetation.
- The project involves excavating sediment in addition to the removal of wood.
- The removal of wood is associated with a beaver lodge or dam. Refer to the NYSDEC Nuisance Beaver Website for more information.

A Permit is not needed if:

- Wood can be removed using hand tools such as chainsaws, axes, or handsaws.
- Wood can be removed using vehicles or equipment operated from beyond the top of the stream bank. By reaching into the stream to pull, cable, or winch the wood out.
- The removal can be accomplished within a state-regulated wetland without clearing vegetation, bringing in fill or mats to support equipment, or causing significant compaction or rutting.
- For additional information please refer to the NYSDEC Woody Debris and Removal from Rivers Website.

Permitting Contact Information:

If you have specific permitting questions, contact your regional NYSDEC office.

- NYSDEC Region 3 (Ulster and Sullivan Counties): dep.r3@dec.ny.gov or 845-256-3054.
- NYSDEC Region 4 (Greene, Schoharie, and Delaware Counties): r4dep@dec.ny.gov or 518-357-2068.

Further Reading:

1. Wohl, E., Uno, H., Dunn, S. B., Kemper, J. T., Marshall, A., Means-Brous, M., Scamardo, J. E., & Triantafillou, S. P. (2024). Why wood should move in rivers. River Research and Applications, 40(6), 976–987. https://doi.org/10.1002/rra.4114
2. Kratzer, J. F., & Warren, D. R. (2013). Factors Limiting Brook Trout Biomass in Northeastern Vermont Streams. North American Journal of Fisheries Management, 33(1), 130–139. https://doi.org/10.1080/02755947.2012.743934
3. Kratzer, J. F. (2018). Response of Brook Trout Biomass to Strategic Wood Additions in the East Branch Nulhegan River Watershed, Vermont.

Helpful Links:

NYS DEC Environmental Resource Mapper

https://dec.ny.gov/nature/animals-fish-plants/biodiversity-species-conservation/biodiversity-mapping/environmental-resource-mapper

NYS DEC Protection of Waters Program

https://dec.ny.gov/regulatory/permits-licenses/waterways-coastlines-wetlands/protection-of-waters-program

NYS DEC Freshwater Wetlands Program

https://dec.ny.gov/nature/waterbodies/wetlands/freshwater-wetlands-program

NYS DEC Nuisance Beaver Information

https://dec.ny.gov/nature/animals-fish-plants/nuisance-wildlife-species/beaver

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