



**Inland Fisheries Division
Habitat Conservation and Enhancement Program**

Large Woody Debris Fact Sheet

I. Introduction

Trees that grow along a streamside can often fall into a watercourse due to floods, erosion, windthrow, disease, beaver activity or natural mortality. These materials, often referred to as Large Woody Debris (LWD) can include whole trees with a rootwad and limbs attached or portions of trees with or without rootwads or limbs. LWD is typically defined by biologists as logs with a minimum diameter of 4 inches and a minimum length of 6 feet that protrude or lay within a stream channel. Environmental and recreational groups have often removed LWD as part of river cleanup or river improvement projects. Although these groups have good intentions, LWD removal can be “very detrimental” to stream health and well being. In fact, during the last decade, the Inland Fisheries Division has been actively adding LWD to river systems as a component of individual stream restoration projects, particularly in streams that are LWD deficient. This fact sheet describes the vital importance of LWD to river ecosystems and provides guidance for its beneficial management.



Example of various types of large woody debris in the Moosup River, Plainfield.

II. Ecological Benefits of Large Woody Debris

Research studies have shown that LWD is a vital and naturally occurring component of healthy stream ecosystems. Ecological benefits of LWD are described below.

➤ *Fish Habitat*

LWD that falls completely across a stream causes water to be slightly impounded resulting in the formation of an upstream pool and a downstream plunge pool as water flows under and over the wood. Pools are deeper water habitats that provide critical hiding and resting areas for fish and are especially important fish habitats during periods of low streamflow. Water flowing over and under LWD during high flow events can result in localized scour pockets or holes, providing excellent cover habitats for fish. LWD can also create velocity shelters for fish, especially behind large rootwads. Fish often rest within these velocity shelters, where water velocities are slower. In large streams and rivers, LWD can trap and accumulate smaller wood, branches, leaves and other organic materials that add to the complexity and diversity of instream fish habitats.

➤ *Stream Channel and Streambank Stability*

LWD in low gradient, meandering and sandy streambed systems such as the Scantic River in north central Connecticut serve a critical function in controlling the grade of the stream channel by holding back or stabilizing the movement of these fine streambed materials. Conversely, LWD can also facilitate the transport of fine sediments where wood accumulation narrows a stream channel thereby increasing water velocities. In these situations, LWD assists with flood management by ensuring that the streambed elevation does not increase. In addition, LWD that has accumulated along streambanks can often absorb and redirect the highly erosive forces of large streamflow events protecting streambanks from erosion. Research has documented many examples where LWD was removed from entire river sections, resulting in major erosion of the stream channel, streambanks and ultimately degradation of instream fish habitats.

➤ *Biological Diversity*

Microscopic algae, called periphyton can attach to LWD and provide food for aquatic insects and other invertebrates, which also colonize and attach themselves to woody debris. In addition, LWD tends to trap and collect other organic materials such as leaves, providing a food source for many aquatic insects, which shred and consume leaf materials. These same aquatic insects comprise a major component within fish diets. In a very real sense, LWD effectively creates a “mini-ecosystem” which significantly adds to a stream’s biological diversity and health.

III. Large Woody Debris Management

Considering the multiple environmental benefits provided by large woody debris, it is understandable why biologists are extremely concerned about river cleanup projects that involve extensive LWD removal. Therefore, it is the intent of this fact sheet to provide common sense guidelines for large woody debris management that will address the concerns of property owners and river users while retaining the natural ecological benefits of LWD in Connecticut streams.

➤ **General Guidelines**

LWD removal should only be considered when there is compelling evidence that it is causing flooding of private/public infrastructure, significant streambank erosion, or is a navigational hazard. When cutting streamside trees and LWD, first determine property ownership in the specific area where the work is to be done. You must always obtain permission from the property owner to legally gain access and perform the work. Property boundaries in Connecticut often run through the centerline of the stream channel so you may have to contact property owners on both sides of a stream channel for permission. Secondly, **always contact your municipal Inland Wetland Agency** to determine if the proposed work will require any local regulatory permits. Lastly, although any large-scale riverwide LWD removal projects would be discouraged, such projects may require permits from the Connecticut Department of Environmental Protection. Please contact the DEP Inland Water Resources Division for regulatory guidance and permit determination prior to initiating any projects. Fisheries Biologists from the DEP Inland Fisheries Division, Habitat Conservation and Enhancement Program can also be contacted for specific onsite guidance regarding LWD removal. DEP Watershed Management and Coordination staff may be contacted for further assistance regarding watershed management issues.



Example of large woody debris cut and removed from the Hockanum River, Manchester. While some wood was left in place, some of the cut wood could have been repositioned and anchored to the streambank to help retain LWD ecological benefits.

Where LWD absolutely has to be cut, wood can be floated, repositioned and anchored to the shoreline, so its ecological benefits are not lost. For example, LWD that lies perpendicular to streamflow can be repositioned so it is aligned in a downstream orientation at an angle ranging from **20 to 40 degrees** to the streambank (see diagram).

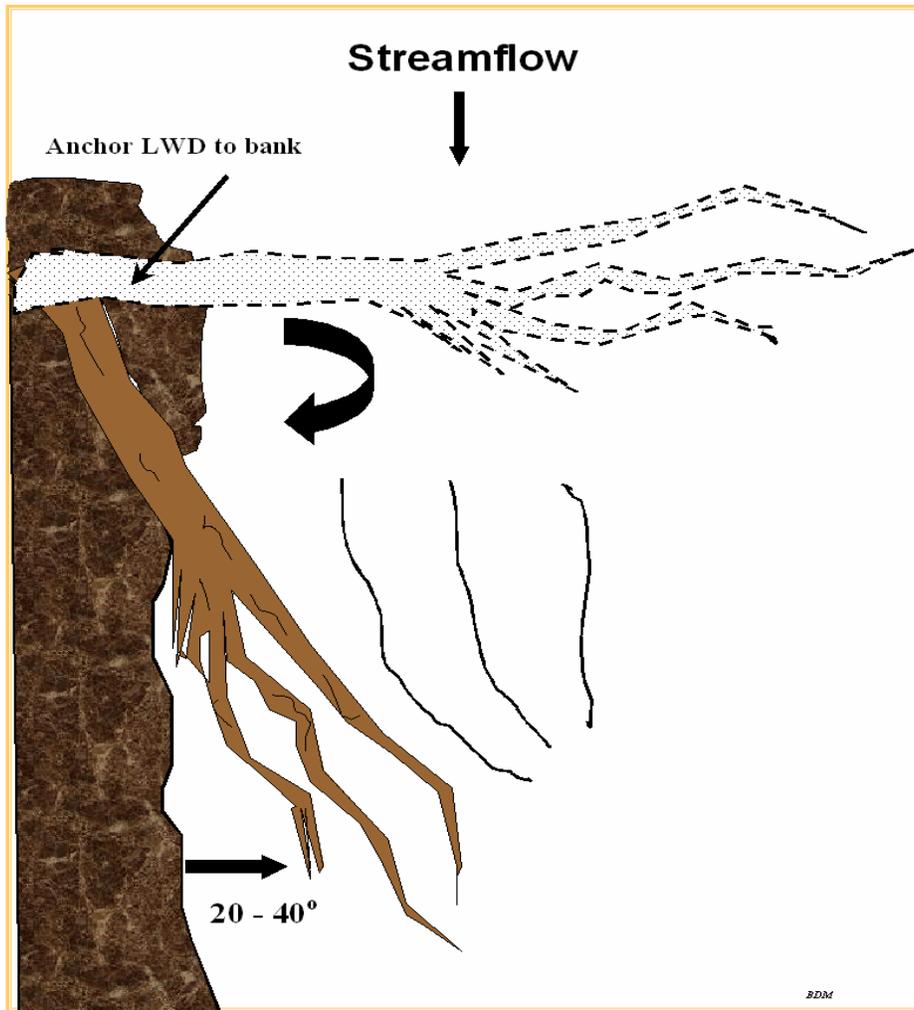


Diagram demonstrating LWD lying perpendicular to streamflow that was cut and realigned in a downstream orientation at the preferred angle ranging from 20 to 40 degrees to the streambank. LWD is secured to the streambank with an appropriate anchoring system.

This orientation will ensure that the repositioned LWD does not deflect river flows into the streambank and cause erosion. LWD can be anchored to the streambank with the use of wire cable and grapple fastening systems. Contact Inland Fisheries Division biologists for more specific information related to anchoring systems. Under no circumstances should LWD be cut and either allowed to float downstream or moved to streambanks and left within the floodplain where subsequent storm events can transport it back into the watercourse. The concern is that this wood could collect at a downstream bridge or culvert crossing and impair the conveyance of water through that roadway crossing infrastructure.

➤ **Navigation**

LWD has been removed from several streams in Connecticut to provide more favorable navigation conditions for canoes and kayaks during springtime canoe races. The removal of LWD for a one-day event can have long lasting impacts to a stream's ecosystem for decades to come. If LWD has to be removed to enhance navigation, it is recommended that partial removal be evaluated to allow for navigation through the area. Where feasible, only the minimum necessary amount of LWD should be removed to enhance passage and be replaced downstream where it will not pose a navigational hazard. Portage of canoes may be necessary in some areas to minimize LWD removal. As previously mentioned, when LWD absolutely has to be cut, wood can be floated, repositioned and anchored to the shoreline.

➤ **Logjams**

Logjams are natural accumulations of LWD that may span an entire width of stream channel and create a partial obstruction to streamflows. Logjams usually do not block upstream fish passage. In some circumstances where streams are completely blocked, logjams can create a backwater condition and flood riparian lands providing beneficial nutrient enrichment to riparian soils. Logjams provide many of the same benefits of LWD that have been described elsewhere in this fact sheet; however, another important function is that logjams may redirect streamflows resulting in the formation of a new stream channel or perhaps even redirect flow into an abandoned channel. These channel shifts are normal occurrences and function to effectively move water and sediment loads throughout a stream system.



Example of a newly formed logjam in the Fenton River, Mansfield.

LWD may have to be removed where logjams collect in front of roadway culverts and bridges if it has been determined that they impede water conveyance and create a flood hazard. However, it may be possible to remove the logjam and re-introduce portions of LWD downstream of the roadway crossing where it does not present any hazard. Logjams that do not present a flood hazard should not be removed. Often times, logjams are temporary and will break apart during subsequent flood events so they may not present an immediate cause for concern. Beaver may also build dams along logjams that can result in flooding. Please contact the DEP Wildlife Division for problems associated with beaver activity.

In summary, due to the important ecological functions and benefits of LWD in Connecticut streams, careful consideration should be given before it is removed from any river or stream. Prior to initiating LWD removal, one should refer to the guidance provided in this fact sheet and contact local and state agencies to obtain any necessary authorization.

Contact Information

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Wildlife Division

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Bureau of Water Protection and Land Reuse

Inland Water Resources Division

860-424-3019

Planning and Standards Division

Watershed Management and Coordination Program

860-424-3020

Suggested References

Gregory, S.V., K.L. Boyer and A.M. Gurnell, editors. 2003. The ecology and management of wood in world rivers. American Fisheries Society, Symposium 37, Bethesda, Maryland.

Rutherford, I., Marsh, N., Price, P. and S. Lovett. 2002. Managing woody debris in rivers, Fact Sheet 7, Land and Water, Australia, Canberra.