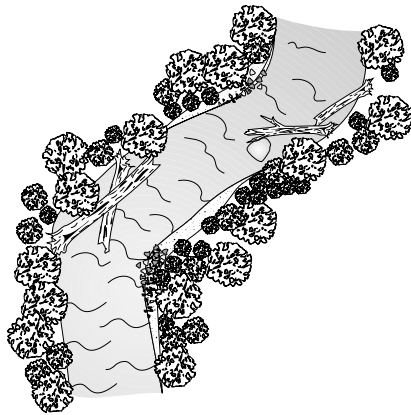


OHIO STREAM MANAGEMENT GUIDE

Large Woody Debris in Streams

Guide No. 21

Large Woody Debris (LWD) is a general term referring to all wood naturally occurring or artificially placed in streams including branches, stumps, logs and logjams. Almost all LWD in streams is derived from trees located in the riparian corridor. Streams affected by urbanization, agriculture, development, or clear cuts often lack a sufficient quantity of the LWD necessary to maintain an ecologically healthy and stable ecosystem. Streams with adequate LWD tend to have greater habitat diversity, a natural meandering shape and greater resistance against high water events. Therefore, LWD is an essential component of a healthy stream's ecology and is beneficial.



LWD is an important component of high quality streams that helps increase the diversity of biological communities and physical habitats. Certain species of fish depend on the wood in the streams to survive. However, many riparian owners and land managers traditionally treat woody material in streams as a nuisance and remove the LWD in the streams and along the banks with uncertain consequences. This is often unnecessary and perhaps harmful to high quality streams. Stream cleaning practices reduce the amount of organic materials necessary to support the aquatic food web, remove the vital in-

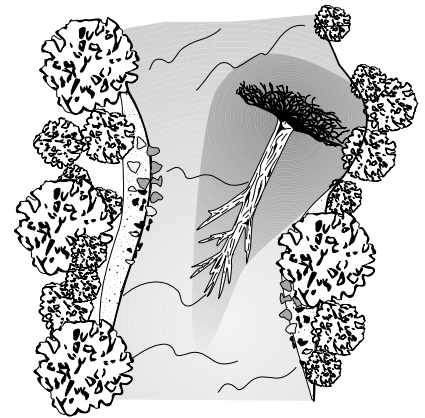
stream habitats that fish utilize for shelter and spawning, and reduce the level of erosion resistance provided against high flows. In addition, LWD improves the stream structure by enhancing the substrate and diverting the stream current in such ways that pools and riffles are likely to develop. A stream with a heterogeneous substrate and pools and riffles is ideal for benthic (bottom dwelling) organisms as well as for spawning of desirable fish species like trout and bass.

BIOLOGICAL HABITAT DIVERSITY

In order for a stream to maintain a healthy ecosystem with a wide variety of plant and animals species, there must be structure, a variety of habitats, and a large influx of nutrients and materials. LWD is essential to macroinvertebrates for food and shelter, who break organic materials down into small particles known as detritus. Detritus is necessary for a complex food web to maintain a healthy balance. Detritus also provides habitat for bacteria and insects, which in turn are prey for fish, birds, amphibians, and riparian mammals. The leaf litter and vegetation that falls into streams are primary food sources for caddisflies, stoneflies, and mayflies. Trees that have fallen in or near the stream provide shelter and habitat for insects, birds, and small animals while certain fish utilize the shade for protection and camouflage for hunting.

TRUNKS AND ROOTWADS

"Rootwad" is a term given for the trunk of a tree with the roots still attached and exposed either from an undercut bank or a tree that has fallen. A "rootmat" is similar to a rootwad but with a smaller root diameter and root mass area. Both provide several benefits to an aquatic ecosystem such as erosion control, substrate for invertebrates, feeding areas, and refuge for young fish. They are also



a key structural component that deflect flows in ways that induce meanders and help scour deep pools, both beneficial for fish habitats. Rootwads may act as streambank anchors against high flows and floods, holding the soil into the bank, thus reducing sedimentation downstream. Therefore, they provide a necessary resource function and should not be disturbed.

LOGS

The term "log" is commonly associated with lumber but simply means a fallen tree. Logs that fall in or along a stream are generally viewed as obstacles by land managers, but can be very beneficial to the ecosystem. Depending on its orientation, a log can protect banks from scour at high flows, enhance deposition of fine sediment, and

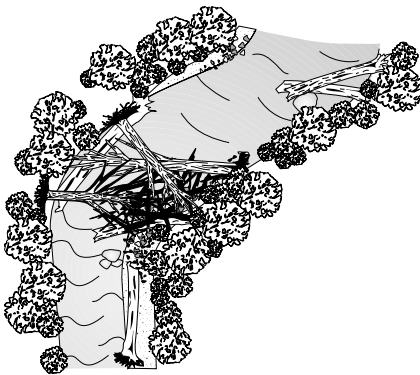


deposit substrate for invertebrates. Logs also provide refuge from predators and feeding areas for smaller fish and insects. A fallen tree also provides roughness to the stream channel by altering

the flow pattern, which increases channel diversity (pools, riffles, meanders and undercut banks) and decreases the channel slope. A sweeper is the name for a log that has fallen perpendicular to the streambank where water flows both over and underneath it. The current flowing over the sweeper often scours a deeper hole on the downstream side of the log called a plunge pool. Plunge pools provide critical habitat for aquatic life seeking slower current and cover for fish to rest.

LOGJAMS

Logjams are obstructions occurring in streams from the accumulation of woody vegetation, with or without debris. They obstruct a stream channel, and create a backwater condition. Logjams may be positive or negative depending on the perspective and the specific site characteristics. Determining a logjam's value requires an understanding of watershed dynamics as well as the social and biological impacts in the watershed.



Not all logjams need to be removed. Leaving in LWD should be considered in high quality streams as long as water is not impounded behind the logjam. For the purposes of this Stream Management Guide, only the benefits are discussed. For information regarding the negative aspects of logjams, The Ohio Department of Natural Resources recommends Guide 06, *Stream Debris and Obstruction Removal*, in addition to seeking consultation from the county engineer and local floodplain coordinator before working in streams and riparian corridors.

Contrary to the negative perceptions commonly associated with logjams, they provide many benefits to fish and wildlife. Logjams in smaller streams can redirect the stream flow into multiple channels, often where it has previously been dry, creating more habitat for fish and aquatic organisms. These shifts within the floodplain are a frequent occurrence in forested streams; unfortunately, development has often limited the area in which a stream may naturally meander. In addition to the biological assets of logjams, they are often a catalyst initiating the run-riffle-pool sequence that enhances the substrate and reduces high-water forces. A balance of the advantages of logjams (biological integrity and an enhanced substrate), versus the disadvantages (floods and erosion), should be considered before any action is taken.

SUMMARY

The intent of this guide is not to suggest adding LWD or other materials into a stream channel, but rather reconsidering its removal in stream management. In some cases, adding LWD to streams may be desired for stream channel restoration to achieve bank and channel erosion protection. Other circumstances where valuable property is subject to flooding and public safety is threatened, removal may be necessary. LWD is most important in streams with a low gradient and less critical in headwater streams. The effects of LWD on a stream channel is a function of the size of both the debris and the stream as well as the land use of the adjacent watershed.

REFERENCES:

U.S. Geological Survey and Missouri Department of Conservation, 1998. *Riparian-Vegetation Controls on the Spatial Pattern of Stream-Channel Instability*, Little Piney Creek, Missouri

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This Guide is one of a series of Ohio Stream Management Guides covering a variety of watershed and stream management issues and methods of addressing stream related problems. The first several guides in the series are overview guides intended to give the reader an understanding of the functions and values of streams. For more information about stream management programs, issues and methodologies, see *Guide 05 Index of Titles* or call the ODNR Division of Water at 614/265-6739. All Guides are available from the Ohio Department of Natural Resources. Single copies are available free of charge and may be reproduced. Please contact:

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