

## Benefits of Large Woody Debris in Streams

Large wood provides multiple benefits in stream systems such as stabilized streambanks, improved floodplain connectivity, and more diverse aquatic habitat.

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Large woody debris is seen here helping to stabilize a streambank. Photo: Danielle Rhea, Penn State

Large woody debris, also referred to as large wood, is typically described as fallen trees, logs, and branches that are at least four inches wide and six feet long. Traditionally, large wood is removed from streams in an effort to clean up stream channels and to prevent localized flooding. Studies have shown that public perception of large wood in waterways is typically negative, often

associating flooding, bank erosion, and infrastructure damage with the presence of large wood. Many people consider streams having wood laying in or around the channel to be less attractive, more hazardous, and needing more improvement than those without wood; however, large wood has many physical and biological benefits to stream systems.

The presence of trees and other woody material that have fallen from the riparian area helps connect the stream channel to its floodplain. During rainstorms and snow melts, large wood can act as an obstacle to flowing water, forcing high flows into the nearby floodplain along with any sediment and nutrients it may be carrying. The

floodplain acts as a giant sponge, storing water, sediment, and nutrients while reducing the volume of water carried by the stream channel itself. Allowing water to access the floodplain reduces flooding impacts downstream where it may be more difficult to address high flows. Large wood present within the stream channel also slows the flow of water as it is forced to flow over and around logs. As the velocity of water is reduced, its ability to erode and carry sediment is decreased as well.

Large woody material helps create more diverse aquatic habitat. Exposed logs are also used as basking and perching sites for reptiles and birds. Fallen trees create cover and hiding places for fish and other aquatic organisms. As water flows over and around large wood, localized scouring of the bed and banks creates pools and undercut banks that provide additional shelter and act as resting areas for fish, such as trout. Finer substrate, such as small gravel, is typically deposited upstream of large wood as flows are slowed, which is an important spawning habitat for some fish species. Large wood helps feed the aquatic food chain from the bottom up. Wood provides a surface for algae to grow on and often traps smaller sticks, leaves, and other organic material, all of which are food sources for a variety of aquatic macroinvertebrates. Aquatic macroinvertebrates are an important element of fish diets, and by improving the habitat for aquatic macroinvertebrates, streams can support more diverse fish populations.

Because of the benefits of large wood to aquatic ecosystems, it is often a component of stream restoration projects. In 2016, the U.S. Army Corps of Engineers and U.S. Department of the Interior Bureau of Reclamation published a National Large Wood Manual to assist with assessing, planning, designing and maintaining large wood in streams and rivers. Restoration with large wood can be as simple as strategically cutting and placing trees in a stream and as complex as engineered structures that are constructed from logs and secured within the stream channel. While the benefits of leaving or placing large wood in streams have been confirmed by many studies, it is always important to assess any threats downstream to public safety, property, or infrastructure that could be caused by large wood.

## References

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