

Healthy Waters



Healthy Waters Series #2: Linkages between Healthy Forests and Water Quality

The Leech Lake watershed has tens of thousands of acres of public and privately owned forestland. The Chippewa National Forest manages roughly 30% of the land base within it, and about 80% of that land base consists of forestland. Sustainable forest management across all ownerships (public and private) is critical to maintain a reliable supply of high-quality water, to support water-based recreation and to provide habitat for freshwater aquatic organisms throughout the watershed.

To understand the influence of forests on water quality, one must understand how water cycles through a forest ecosystem. There are five important functions of forests related to water quality: precipitation collection, water storage, water discharge, nutrient cycling, and aquatic habitat creation. The figure 2 shows some of the values forests provide to water quality.

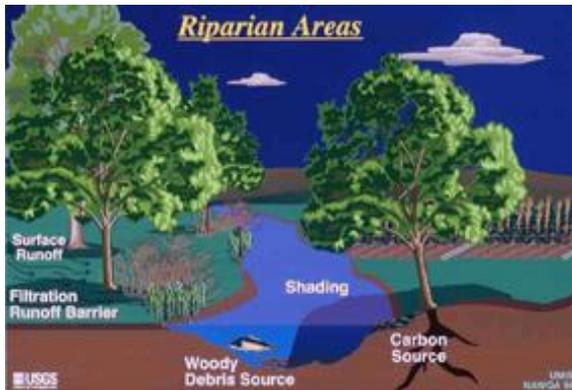


Figure 1. Examples of how forests influence water.
Source: USGS Minnesota Water Science Center

Forests capture a portion of rain or snow before it reaches the soil surface and groundwater. This water is stored temporarily on the plants or within their tissues and released back into the atmosphere through evapotranspiration. As a result, forests can moderate flooding by metering out how much water is released downstream in surface water runoff and groundwater discharge. High rates of timber harvest and deforestation in forested watersheds can increase surface water runoff and cause streams to become unstable. Unstable stream channels have higher rates of erosion and sediment deposition that can negatively impact water quality and aquatic habitat. Healthy, mature forests have diverse assemblages of plants with strong root systems that stabilize stream banks during flood flows and protect lakeshore from erosion due to wave-action and ice. Forest vegetation also functions as a filter, trapping sediment or harmful pollutants in surface water runoff from the surrounding landscape.

Forests are an important source of nutrients to water in the form of leaves, needles, branches, and whole trees. These woody materials are added to lakes and streams as direct or windblown litterfall from surrounding upslope vegetation or by erosion or stream water transport. As the wood decays, nutrients are released that serve as energy sources for the smallest of aquatic organisms. In turn, these microorganisms are food sources for larger organisms throughout the aquatic food web.

Forests along streams and lakes provide shade and regulate water temperature, which is particularly important for trout and other cold water, non-game fish species. In addition to being an energy source, large woody debris in streams and lakes can serve as habitat. Large wood in streams can slow down water velocity, creating resting areas and allowing sediment to accumulate into spawning beds for fish during migration. These spawning areas along streams are important for sustaining the health of native game fish populations in nearby lakes, particularly those that are not artificially stocked. Down trees along lakeshores are often popular places to fish because various species gather there for shade, cover from larger predators, or during spawning periods.

Key points:

- Healthy functioning forests are critical to maintaining water quality for consumption, water-based recreation, and aquatic habitat.
- Forests directly affect how water is captured, delivered downstream, and released back into the atmosphere within the hydrologic cycle.
- Adequate vegetative cover within forested watersheds moderates flooding and reduces the impact of erosion and sediment deposition in and adjacent to open water.
- Forests provide an energy source and habitat for aquatic organisms through litterfall. They supply the building blocks for aquatic food webs.
- The structure and composition of forest vegetation, particularly within riparian areas, directly affects both water quality and aquatic habitat.

This article was written by David Morley, hydrologist, Chippewa National Forest on behalf of the Civic Engagement Team of the Leech Lake Watershed Restoration and Protection Project. The next article in the Healthy Waters Series is “Healthy Waters for Fish, Wildlife, and Plants.”