THE JONES CENTER AT ICHAUWAY

Publication Brief

24 Aug 2023

Management of longleaf pine as open woodlands leads to water savings

Seasonal water scarcity is a global problem. In the southeastern U.S., changing climate and intensifying land use are adding to issues around water scarcity. Unmanaged forests typically have the greatest annual water use after irrigated agriculture, due to high leaf area and deep roots. However, longleaf pine ecosystems have lower tree density and native understory grasses that use less water than more dense forests. Previous modeling research suggested that low density longleaf pine restoration increased annual streamflow, particularly during droughts. To determine whether modeled outcomes would hold true in real-world landscapes, we quantified how existing longleaf pine woodlands affect hydrology across the southeastern U.S.

Photo by Richard T. Bryant

We used USGS streamflow records from 1989 to 2021 to quantify the long-term water yield of 21 watersheds in the southeastern U.S. that had longleaf pine land cover varying from 0 to 72%. We used a suite of publicly available datasets including landcover and leaf area coverage to quantify the factors affecting hydrology, particularly water yield, in the watersheds.

We found that watersheds with greater longleaf pine forest cover averaged 17% higher annual water yield than watersheds with little or no longleaf pine cover. More importantly, streamflow was 92% higher during droughts in watersheds with longleaf pine. This indicates that longleaf pine can protect aquatic resources when water is scarce. One exception to this pattern is that hydrological benefits were not realized if the longleaf pine cover was managed at high densities. In order to realize the hydrological benefits of longleaf pine woodlands, they must be managed as open woodlands. Management strategies such as frequent prescribed fire, periodic thinning, and hardwood removal are needed to maintain open forest structure and appropriate stocking and composition. Longleaf pine restoration and management can play an important part in broader strategies to conserve water resources in the southeastern U.S.

MORE INFORMATION

Younger, S.E., J.B. Cannon, S.T. Brantley. 2023. Impacts of longleaf pine (*Pinus palustris* Mill.) on long-term hydrology at the watershed scale. *Science of the Total Environment*. doi.org/10.1016/j.scitotenv.2023.165999

Funding: U.S. Department of Agriculture, Natural Resources Conservation Service, Conservation Effects Assessment Project-Grazing Lands (NR193A750007C002)

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KEY POINTS

Watersheds with greater acreage of longleaf pine woodlands have higher annual water yield than watersheds dominated by dense unmanaged forests.

Watersheds with greater amounts of longleaf pine woodlands had much higher streamflow during droughts, supporting vulnerable aquatic habitat for fish and wildlife.

Ecological restoration of longleaf pine woodlands contributes to water conservation and aquatic habitat preservation along with the terrestrial ecosystem services they provide.