JOSEPH W. JONES
ECOLOGICAL RESEARCH CENTER
at Ichauway

Publication Brief

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Nutrient Retention by Nuisance Vegetation in a Shallow Subtropical Impoundment

Modern rivers are human-modified and their flows controlled. In the past 100 years, almost 50% of the length of the world's rivers have been altered by impoundments. Extensive alteration, combined with new combinations of native and invasive species, has led to communities of plants and animals without historical analogues. These novel ecosystems may foreshadow rivers of the future assuming ongoing increases in human population, land use, water extraction, and continuing climate change. Our view of modern rivers must accept some of this change as inevitable and we need to develop strategies that sustain diverse ecological benefits.

We studied how nuisance submerged aquatic vegetation (SAV, native and invasive) affected nutrient processing in a shallow reservoir. We compared growing and dormant seasons along with wet and dry years. Our study site, Lake Seminole is a shallow 50-year-old impoundment at the confluence of the Flint and Chattahoochee Rivers in southwestern Georgia, USA. The impoundment is noted for nuisance levels of *Hydrilla verticillata*, in combination with other native and invasive SAV species.

We found that SAV coverage determines the amount of nutrient retention and transformation, particularly during the growing season. It does so through direct nutrient update, sediment filtering, and facilitating removal of nitrogen by microbes. Nutrient retention during the growing season was greater than the dormant season. Greatest retention was observed during drought years when SAV coverage was at the greatest extent. Nutrient and suspended sediment concentrations were significantly lower than in open water, further suggesting SAV uptake.

KEY POINTS

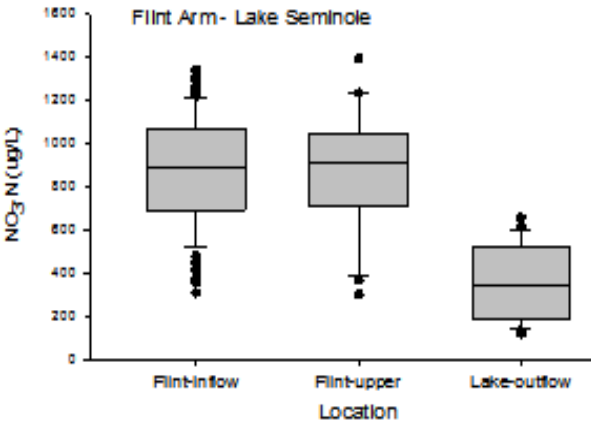
Most modern rivers are modified by impoundments

Impoundments are often dominated by novel combinations of native and invasive species

While irreversible, changes to rivers must be understood and managed to sustain ecological benefits

SAV in impoundments acts as a focal point for material processing, reducing effects of upstream human activity

Growing season flood pulses may limit SAV coverage to tolerable levels while maintaining water quality improvement



An example of nutrient reduction, NO_3-N concentration, with passage through the impoundment

Our results indicated that Lake Seminole acts as a regional hotspot of material processing in the larger river. SAV beds absorb runoff from upstream human activities caused by urban and rural land uses. The effect is an improvement in water quality. Often, SAV is viewed as a nuisance and aggressive management efforts are attempted to limit its spread. Management is expensive and permanent reduction is difficult following SAV establishment. A better approach might be to reduce SAV coverage through growing season flood pulses. This would limit SAV coverage while maintaining important benefits, like water quality improvement.

CITATION

Shivers, S. D., S. W. Golladay, M. N. Waters, S. B. Wilde, and A. P. Covich. 2018. Rivers to reservoirs: hydrological drivers control reservoir function by affecting the abundance of submerged and floating macrophytes. Hydrobiologia 815:21-35. https://doi.org/10.1007/s10750-018-3532-0.

CONTACT

Stephen W. Golladay, steve.golladay@jonectr.org