USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Northern Research Station

Rooted in Research

ISSUE 18 | SEPTEMBER 2023

Honeysuckle Management Shows Promise for Improving Forest Health Along Waterways

Across the United States, rivers and streams connect people with recreation opportunities, drinking water, and complex and critical ecosystems. Riparian forests perform important ecosystem services, including filtering nutrients, preventing soil erosion, filtering sediment from runoff, and offering shade and wildlife habitat. Without these crucial forest buffers, the likelihood of croplands and downstream communities flooding, pollution contaminating rivers and streams, and ecosystems breaking down increases.

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According to Charles Flower, a research ecologist at the U.S. Department of Agriculture Forest Service, Northern Research Station (NRS), "Riparian forests are under threat from a variety of factors, including climate change; human-derived pollution and development; and nonnative pests, pathogens, and plants." He says the general lack of consistent riparian forest management coupled with the frequent use of nonnative and invasive plants in nearby landscaping have altered riparian forest structures and functions in many places. Amur honeysuckle (*Lonicera maackii* [Rupr.]) is one such plant.

KEY MANAGEMENT CONSIDERATIONS

- Portable canopy LiDAR may be a valuable tool for rapidly assessing areas that could benefit most from removing honeysuckle and for monitoring the forest structural changes after honeysuckle has been removed.
- Removing honeysuckle from urban riparian forests helps promote native tree growth for up to 10 years in areas where honeysuckle abundance is high and native tree density is low.
- Honeysuckle removal, followed by treating honeysuckle stumps with herbicides, is key for establishing a healthy restored riparian forest.
- Planting a diverse suite of native species to fill different ecological niches helps create more resilient forest systems.

Riparian forests along the Ohio River. Licensed photo by Adobe Stock.

The Amur honeysuckle is a problematic invasive shrub dominating forest understories in the eastern and central United States. It spreads rapidly due to its competitive growth strategy, allelopathy (a biochemical produced by one plant that influences the germination, growth, and survival of other plants), and ability to resprout after cutting. The presence of honeysuckle negatively affects native plant communities by suppressing plant recruitment, homogenizing forest communities, and altering ecosystem processes. It also shapes the canopy structure by affecting the growth and composition of overstory trees, as well as the amount of leaf material. Understanding the impact of honeysuckle on canopy structural traits is important because canopy structure influences ecosystem processes, such as carbon storage, resource acquisition, and light distribution, which in turn affect forest productivity and wildlife habitat.

Amur honeysuckle is among the most widespread and problematic invasive plants in urban forests of the eastern and midwestern United States. Yet, no research studies have analyzed the impacts of honeysuckle removal on riparian forests over the course of a decade of restoration—that is, until now.

A team of researchers led by Flower and Leila Pinchot, a research ecologist at NRS, tracked and characterized the immediate, short-term, and long-term impacts of honeysuckle removal on forest canopy structural traits in five heavily invaded riparian forests in central Ohio. Additionally, the study aimed to assess the utility of

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portable canopy laser imaging, detection, and ranging (LiDAR) as a rapid assessment tool for identifying priority areas for invasive species management. The study was one of the first to utilize LiDAR to investigate the forest structural complexity of riparian forests invaded by honeysuckle. Working in partnership with Columbus Metro Parks and Ohio State University, the team published their findings in Forest Ecology and Management in May 2022.

Laser Imaging Enlightens

This study was part of a larger restoration effort to improve the resilience and function of disturbed riparian forests. "We utilized ground-based LiDAR scans to better understand the role of honeysuckle in these systems and to provide mitigation options to enhance their resilience," Flower says.

The team used a portable hand-held LiDAR system that emits short laser bursts to gather, process, and log data. Flower says this system is quick to deploy and more precise and data-rich than other options. It also offers high resolution and rapid recording of many useful plant measurements that reflect important ecosystem processes, such as carbon cycling and productivity. The researchers paired the data from a current restoration experiment (pre-honeysuckle removal and post-removal) with existing data from nearby restoration locations. They found that honeysuckle had a stronger influence on tree species diversity than on the size or number of trees. Within 2 years of honeysuckle removal, the sites showed characteristics of resilient forests, including a 40 percent reduction in canopy leaf volume (i.e., leaves), a greater average height for the tallest trees, and increased leaf area around trees. In areas with high honeysuckle abundance and low native tree density, honeysuckle removal also prompted long-term increases in the tree canopy's structural complexity.

These results suggest that removing honeysuckle from heavily invaded stands can promote complex canopy structure over the long term. However, the scientists say that the outcome might depend on initial forest conditions.

After removing the honeysuckle, the researchers planted a variety of woody plants, including understory shrubs and mid-canopy and full-canopy tree species. "This approach is designed to fill the understory gap associated with honeysuckle removal," Flower says, "and use species that will persist at different heights in the tree canopy to create wildlife and carbon storage benefits."

Amur honeysuckle (*Lonicera maackii*), also known as bush honeysuckle, most often occurs in disturbed habitats, including forest edges, floodplains, pastures, and roadsides. Licensed photo by Adobe Stock.

The scientists chose to conduct this study around the Columbus, OH, metropolitan area. "These forests are in urban natural areas that are representative of forest patches across Midwestern cities," says Flower. So, generally speaking, the methods from this study are widely applicable as a resilience-based restoration approach.

"Urban riparian forests have historically been overlooked, abused, and underappreciated," Flower says, "but restoring them has the potential to create habitat for a plethora of wildlife, improve water quality, increase [ecological] diversity, and more—thereby enhancing human communities."

Project Leads

Charles Flower is a research ecologist with the Communities and Landscapes of the Urban Northeast research unit at the Northern Research Station. Learn more about his work at https://www.fs.usda.gov/research/about/people/charlesflower.

Leila Pinchot is a research ecologist in Genetics, Biological Control, and Management of Invasive Species at the Northern Research Station. Learn more about her work at https://www.fs.usda.gov/research/about/people/corneliapinchot.

FURTHER READING

Fotis, Alexander; Flower, Charles E.; Atkins, Jeff W.; Pinchot, Cornelia C.; Rodewald, Amanda D.; Matthews, Stephen. 2022. The short-term and long-term effects of honeysuckle removal on canopy structure and implications for urban forest management. Forest Ecology and Management. 517(6): 120251. 10 p. https://doi.org/10.1016/j.foreco.2022.120251.

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