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Northern Research Station

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# Water

**May 2020**

About 18 percent of the nation's surface water supplies in the lower 48 states originate on National Forest System land, making the Forest Service the largest single source of water in the United States. From Midwest prairies to northern forest wetlands to New England trout streams, the Northern Research Station seeks to help managers and landowners understand and protect the water resources we all depend on. During May, we highlight a scientist, research, and a partnership that are helping ensure that clean, abundant water and healthy, resilient landscapes persist for future generations.

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## Featured Scientist

### Keith Nislow

Studying Atlantic salmon and brook trout while leading the Northern Research Station's Communities and Landscapes of the Urban Northeast research unit makes perfect sense to research fisheries biologist Keith Nislow. This New York City native has filled both roles since 2015.

Nislow grew up in Brooklyn and was introduced early to nature in and around the city. "I really got into fish and fishing and wildlife as a kid," he said. Drawn to the University of New Mexico as an undergraduate in biology, he ended up choosing aquatic insects over desert lizards for his master's degree, which steered him into aquatic ecology and fish biology.

While at Dartmouth College for his PhD, he connected with the Green Mountain National Forest to study the effects of their stream and watershed management program on Vermont fish and aquatic ecosystems as part of a region-wide Atlantic salmon restoration effort. Since he joined Forest Service Research and Development in 1999 at Amherst, Massachusetts, Nislow has continued and expanded his research on the links between management, migratory and freshwater fishes, and stream and river system ecosystem impacts across the globe. His work highlights the importance of ecological connectivity to healthy ecosystems and resilient fish populations.

These connections between water, land, and people carry over into his role as a principal investigator with the Northeast Climate Adaptation Science Center, a federal/academic partnership co-led by the U.S. Geological Survey and the University of Massachusetts. Here, Nislow is discovering how

management actions such as dam and barrier removal and forest and floodplain restoration can moderate the effects of climate-induced hydrologic extremes in a way that benefits humans and ecosystems.

Applying a similar Interdisciplinary research approach in an urban setting resonated with Nislow when he took on leadership of the NRS's urban field stations in New York, Baltimore, and Philadelphia. He focuses on applying social, biological, and physical science across the continuum of urban to rural landscapes.

Nislow's advice to other researchers -- focus on the importance of long-term relationships and partnerships. "Those relationships create the ability to link up the things you do and make a coherent picture that is responsive to management needs," he said.

More information about Keith Nislow >>

## Featured Research

### Adaptive Silviculture for Black Ash Swamps

It started with a query from the Chippewa National Forest. What will happen when emerald ash borer reaches Minnesota's black ash (*Fraxinus nigra*) wetlands? That was no small question as black ash is essentially the only tree species in 1.2 million acres of this forested wetland and controls the water cycle in this vast expanse of landscape.

Brian Palik, science leader in applied forest ecology for the Northern Research Station, and colleagues took on the question in 2012 and have been discovering some surprising results ever since. One of the first is that when black ash dies, the forest gets substantially wetter and stays wetter.

"When transpiration (a plant's release of water vapor into the atmosphere) by black ash is lost, the forest is wet all the time," Palik said. Those wet conditions create a difficult environment in which to establish new trees.

"The loss of trees has the potential of an environmental disaster in the making," Palik said. Changing water conditions affect soil conditions, aquatic food webs, amphibians, birds, and wildlife, each of which is a subject of on-going study. It even has a social impact as black ash is the only species used in Native American basket making in the northeastern United States.

If black ash were to disappear, natural regeneration of other tree species is sparse. So Palik and collaborators, including scientists from NRS, the University of Minnesota, and the University of Vermont, began looking at management techniques that would allow artificial establishment of new tree species that can grow in wet conditions. Researchers planted a suite of 12 different species looking for those with the highest survival and growth rates.

And again, the results were surprising. The species doing the best are swamp white oak and hackberry, trees that are currently found just south of the black ash's climate zone. "What it tells us is that the temperature profile in north central Minnesota has already changed to favor these species," Palik said.

Through these studies, researchers are learning the silvicultural techniques that will allow the wetlands to adapt to a changing climate and preserve the ecological functions that trees provide. National

Forests, state agencies, and tribes in Minnesota and Wisconsin are already applying the results.

More information on Adaptive Silviculture for Black Ash Swamps >>

## Featured Partnership

### Prairie Strips: Balancing Agricultural Productivity and Natural Resource Conservation

Prairie strips are a proven conservation practice that demonstrates how modest changes in land use can have profound positive effects on soil health, water quality, and biodiversity. Beginning in 2007 at the Neal Smith National Wildlife Refuge, the first experimental prairie strips were installed by researchers at Iowa State University, the U.S. Fish and Wildlife Service, and the USDA Forest Service, demonstrating that agricultural production, biodiversity conservation, and environmental quality goals can be blended together.

To achieve these positive outcomes, native prairie vegetation is strategically planted within farm fields. Uniquely adapted to the climate of the Midwest, prairie grasses and forbs grow dense and deep root systems, some species growing root structures upwards of 15 feet into the soil. Prairie plants form nearly impenetrable thickets, naturally limiting soil erosion, and absorbing water and nutrients. By sowing relatively narrow bands of prairie plants – as little as 30 feet wide – along landscape contours and at the base of slopes in corn and soybean fields, research has demonstrated that prairie strips can improve soil health, nutrient retention, and reduce phosphorous, nitrate concentrations, and sedimentation – all improving water quality.

Researchers have found that converting as little as 10 percent of a farm field to native prairie can reduce sedimentation by 95 percent, and phosphorus and nitrogen export by as much as 90 percent in surface runoff water. In addition, this simple conservation practice can yield big returns on plant, pollinator, and bird biodiversity.

Over the past 13 years, this experiment, known as the Science-based Trials of Row-crops Integrated with Prairie Strips (STRIPS) project, has grown from a single experiment in Iowa, to a nationally recognized conservation practice being implemented across farmlands in Iowa, Minnesota, Missouri, Michigan, Wisconsin, and Illinois. With its inclusion in the 2018 Farm Bill as a Conservation Reserve Program practice, farmers can now be subsidized to plant prairie strips which will likely lead to much more adoption.

“This research is changing the way we do agriculture in the Midwest,” said Randy Kolka, a research soil scientist and acting project leader with the USDA Forest Service’s Northern Research Station. “Prairie plants are very effective in keeping soil in place, which helps keep nitrogen and phosphorus from getting into waterways and ultimately to the Gulf of Mexico.”

In addition to improving water quality and benefiting wildlife, researchers have found that prairie strips have no negative impact on crop yields beyond the land areas converted to prairie strips, making it one of the most affordable and effective conservation practices available to farmers.

Learn more about the STRIPS project. >>

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