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U.S. DEPARTMENT OF AGRICULTURE



Rocky Mountain Research Station Science You Can Use *(in 5 minutes)*

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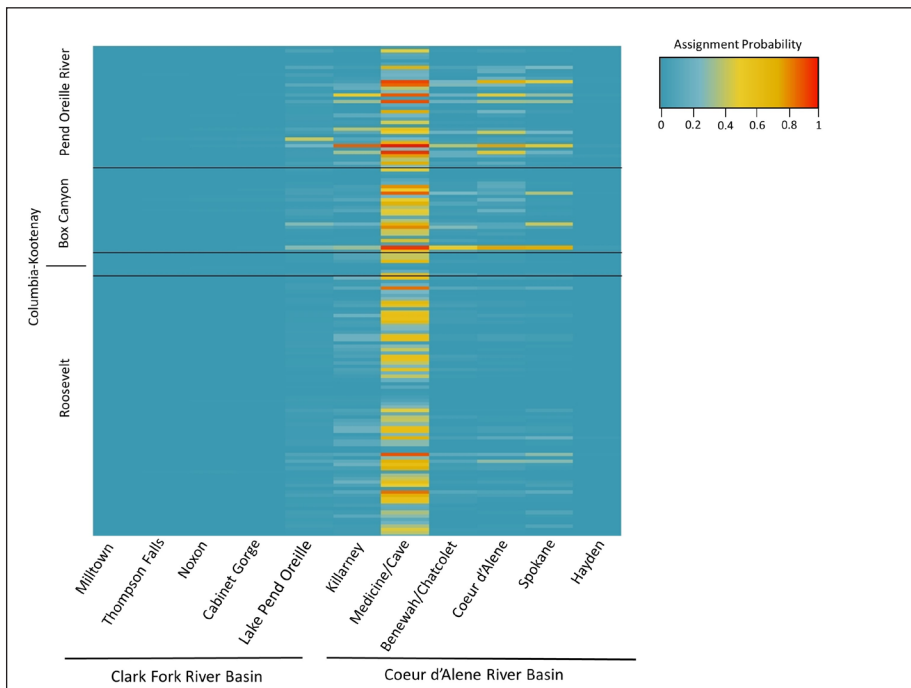
Tracing the Source: How Did Invasive Northern Pike Arrive in the Columbia River Basin?

Northern pike are among the most exciting freshwater fishes to land because they tend to put up quite a fight. This species is broadly distributed outside its native range due to human transport and subsequent expansion. Where pike have been introduced, native fish like bull trout, which are listed as Threatened under the Endangered Species Act (ESA), are suffering dire consequences as this long-lived, generalist top predator is using native fish as a food source. A recent publication, “Mechanism of northern pike invasion in the Columbia River basin,”

describes how a team of Tribal, State, and Federal biologists, led by Rocky Mountain Research Station Research Ecologist Dr. Kellie Carim, analyzed genetic information to explore the pathways that northern pike are taking to invade the upper Columbia River basin. The publication also discusses how the team is using this research to support pike control efforts.

Prior to this important study, northern pike were believed to be spreading in a downstream pattern, entering the Columbia River in eastern Washington

from upstream sources in Idaho and Montana. Carim and colleagues set out to verify the pattern of the northern pike invasion to provide fisheries managers with information that could improve control efforts. They began with creating a genetic database of clipped fins from northern pike populations across Montana, Idaho, and eastern Washington State. Biologists from around the region sent these tissue samples to the [National Genomic Center for Wildlife and Fish Conservation](#). Here, the genetic makeup of these fish was compared to understand which populations were most closely related. It's like a 23andme or Ancestry.com genetic test for the natural world, and it revealed some surprising results!



Heat map showing probability of assignment for 145 northern pike sampled from recently invaded areas to potential source populations in the Clark Fork and Coeur d'Alene River basins. Recently invaded areas (y-axis) are listed in an upstream (top) to downstream (bottom) order. Source populations within each basin (x-axis) are listed in an upstream (left) to downstream (right) order.



Surprising Results!

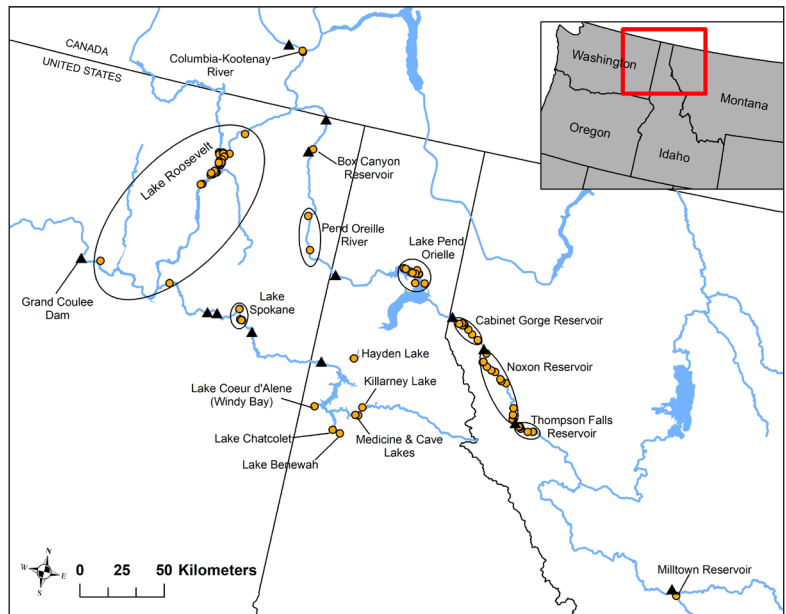
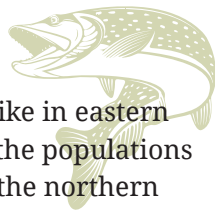
Carim found that the northern pike in eastern Washington were not related to the populations immediately upstream. Instead, the northern pike at the edge of the invasion in Washington State was most closely related to disconnected populations in the Coeur d'Alene River basin in Idaho. Here was evidence indicating that the illegal transport of fish is to blame for the introduction of the northern pike into the Columbia River. Carim says, "In this case, the simplest answer to the question 'Where are these fish coming from?' was not actually the correct answer. It highlights the importance of double-checking assumptions that underpin large-scale management actions, especially when the actions require coordinated, multiagency efforts."

Results from this study have shown the importance of public outreach and education in managing the spread of invasive species. Moving any fish between water bodies is illegal, and the introduction of nonnative species can have negative effects on native species. The database created as a part of this study is already being used to identify sources of other northern pike invasions elsewhere in Washington. Not only will this work help inform management of existing invasions, it has the potential to keep new invasions from occurring.

FURTHER READING

Carim, Kellie J.; Eby, Lisa A.; Miller, Loren M.; McLellan, Holly; Dupuis, Virgil; Schwartz, Michael K. 2022. [Mechanism of northern pike invasion in the Columbia River basin. *Management of Biological Invasions*. 13\(1\): 168–190.](#)

Carim, Kellie; Caleb Dysthe, Joseph; McLellan, Holly; Young, Michael K.; McKelvey, Kevin S.; Schwartz, Michael K. 2019. [Using environmental DNA sampling to monitor the invasion of nonnative *Esox lucius* \(northern pike\) in the Columbia River basin, USA. *Environmental DNA*. 1\(3\): 215–226.](#)



Sampling locations for northern pike in this study. Gray triangles represent hydroelectric dams that prevent the upstream movement of fish. Yellow dots represent northern pike sampling locations.

FEATURED SCIENTIST

KELLIE CARIM works for the Rocky Mountain Research Station [Aldo Leopold Wilderness Research Institute](#) in Missoula, MT as a Research Ecologist. Her research program draws upon her expertise in aquatic ecology and genetic applications to inform wilderness stewardship and understand the benefits of wilderness to populations, ecosystems, and landscapes. Carim enjoys working with diverse partners to provide a more comprehensive perspective on the management and conservation of aquatic systems in the wilderness.

KEY MANAGEMENT CONSIDERATIONS

- Understanding the source and pathways of northern pike invasions is key to understanding how the populations are related across the Columbia River Basin. Ongoing pike control efforts will be more efficient, effective, and longer lasting if managers can eliminate pike from the source and focus on "pinch points" where pike may be entering.
- Emerging monitoring tools, such as environmental DNA and genetic databases, will allow managers to efficiently monitor for new invasions of northern pike and many other aquatic invasive species and implement a more targeted response in the water and during transport.
- Identifying locations where illegal fish transport may be occurring can help to focus public outreach efforts about the negative consequences of moving species from one waterway to another.

The Rocky Mountain Research Station is one of seven units within USDA Forest Service Research & Development. RMRS maintains 14 field laboratories throughout a 12-state geography encompassing parts of the Great Basin, Southwest, Rocky Mountains, and the Great Plains. While anchored in the geography of the West, our research is global in scale. RMRS also administers and conducts research on 14 experimental forests, ranges and watersheds and maintains long-term research databases for these areas. Our science improves lives and landscapes. More information about Forest Service research in the Rocky Mountain Region can be found here: <https://www.fs.usda.gov/rmrs/>.

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