

Climate change, invasive species found to drive native trout declines

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Westslope cutthroat trout and a bull trout swim in the Flathead River system of Montana. Credit: Jonny Armstrong, USGS

In a new study published in *Science Advances*, University of Montana researchers found that climate change drives native trout declines by

reducing stream habitat and facilitating the expansion of invasive trout species.

"This study had three main questions: How have the distributions of native and invasive trout shifted in Montana over the last 30 years, how will they change in the future, and what factors are causing those changes?" said Donovan Bell, the study's lead author and a doctoral candidate in UM's Wildlife Biology Program.

To answer those questions, scientists from UM, the U.S. Geological Survey and Montana Fish, Wildlife & Parks quantified the impacts of [climate change](#) on the distributions of five [trout species](#) (native westslope cutthroat trout and bull trout and invasive brook trout, brown trout and [rainbow trout](#)) in the northern Rocky Mountains. They used an expansive long-term dataset collected and maintained by Montana FWP, analyzing close to 22,000 [data points](#) from electrofishing surveys in Montana's streams and rivers over the past 30 years.

The researchers found native bull trout and westslope cutthroat trout occupancy—defined as the amount of stream where a species is present—declined by 18% and 6%, respectively, between 1993 and 2018 and are predicted to decrease by an additional 39% and 16% by 2080. Although invasive brook trout also were expected to decline, invasive brown and rainbow trout have expanded their range due to rising [water temperatures](#) and appear poised to prosper during future climate change.

The culprit for declines of both native trout species is likely climate change, researchers found, but the specific mechanisms of the declines varied by species.

Bull trout, a threatened species under the Endangered Species Act, require cold streams with adequate flow. But warmer water temperatures and lower summer water levels—both driven by climate change—have

degraded stream habitat and likely caused declines of bull trout. Meanwhile, westslope cutthroat trout were strongly limited by the presence of invasive trout species, including brook trout that can outcompete native trout, and rainbow trout that readily hybridize with westslope cutthroat trout. The threat from invasive rainbow trout is particularly concerning as their range is expanding due to climatic warming.

"Our two native trout species in Montana will decline in the future unless appropriate conservation action is taken," Bell said. "Our results suggest that tailoring conservation strategies to specific species and specific climate-change threats is important for native fish conservation."

For example, the conservation of bull trout in streams and rivers may be better aimed at protecting, reconnecting and restoring critical cold-water habitat. On the other hand, suppression of invasive trout species likely is more effective for the conservation of westslope cutthroat trout.

"Globally, climate-induced changes to aquatic habitats are predicted to threaten at least one-third of freshwater fishes, and some invasive species could take advantage of such changes," said Clint Muhlfeld, a USGS scientist and study co-author. "These scenarios seem to be playing out in our backyard with native and invasive [trout](#)."

The study also highlights the importance of using and maintaining long-term datasets covering large regions to shed light on the complex ways climate and invasive species work in concert to affect native species.

"It's exciting to have the opportunity to use data meticulously collected over decades in Montana to convincingly answer complex questions like these," said David Schmetterling, fisheries research coordinator for Montana FWP.

Andrew Whiteley, a study co-author and UM associate professor, said Montana already has lost populations of cold-adapted native fish species, and this likely will continue as climate change progresses over this century.

"This is particularly troubling in a state where cold-water fisheries now contribute nearly \$650 million a year to our economy," said Whiteley, who studies fisheries and conservation genetics. "But all is not lost for these economically, ecologically and culturally important [species](#) as long as appropriate conservation action is taken."

More information: Donovan A. Bell et al, Climate change and expanding invasive species drive widespread declines of native trout in the northern Rocky Mountains, USA, *Science Advances* (2021). [DOI: 10.1126/sciadv.abj5471](#)

Provided by University of Montana

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