Local habitat conditions can safeguard cutthroat trout against harvest, climate change

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Rock Creek, shown here, is part of Trask River Watershed in the north Coast Range of Oregon, USA. The creek is a coastal cutthroat trout stream that was simulated in a new Forest Service study. Credit: Brooke Penaluna, US Forest Service

Local habitat variability in northwest streams can help shield coastal cutthroat trout from the effects of forest harvest and climate change, a new U.S. Forest Service-led study has found.

The study—one of few to explore fish population response to both harvest activities and a changing climate— revealed that trout in four neighboring Oregon streams respond differently to these disturbances based on the features of the streams where trout live. The study is published in the journal *PLOS ONE*.

"We concluded that variability in stream habitat protects trout from both forest harvest and climate change," said Brooke Penaluna, a research fisheries biologist with the Forest Service's Pacific Northwest Research Station and lead author of the study.

"We were curious about how trout in different streams respond to the same forest harvest scenario and how those responses may change when climate change is also considered," Penaluna said. Climate change generally is projected to increase stream temperatures year-round and decrease stream flows in fall and winter. Both of these factors can negatively affect fish populations.

To study just how projected climate-induced changes in temperature and flow might affect coastal cutthroat trout—a fish found the farthest upstream in a stream network—Penaluna and her colleagues conducted computer simulations. They simulated temperature change and stream

flow associated with forest harvest and climate change using information from recent forest harvest and climate change studies in the region. Next, they assessed trout responses to these changes in simulated streams based largely on actual streams in northwestern Oregon's Trask Watershed over the course of nearly 65 years.

The simulations show that variability in habitat conditions among the streams—like stream depth and available habitat—mediated the effects of forest harvest and climate change on trout populations. Simulated climate change most strongly affected trout by triggering early emergence of trout fry, but also by reducing numbers of older trout and increasing numbers of younger trout. In contrast, simulated forest harvest changes in temperature and flow produced fewer and less consistent responses in the simulated populations and, even, in some cases, countered the effects of climate change through increased summer flow.

These four simulated streams are found in the Trask River, which is part of the Trask River Watershed Study, a multi-agency effort through the Watershed Research Cooperative at Oregon State University that includes many state, federal, and private industry partners. Authors on this study are affiliated with the Pacific Northwest Research Station, the U.S. Geological Survey Forest and Rangeland Ecosystem Science Center, Oregon State University, and Weyerhaeuser Company.

The Pacific Northwest Research Station—headquartered in Portland, Ore.—generates and communicates scientific knowledge that helps people make informed choices about natural resources and the environment. The station has 11 laboratories and centers located in Alaska, Washington, and Oregon and about 300 employees. Learn more online at http://www.fs.fed.us/pnw.

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