

Research sheds new light on wolves' impact on Yellowstone ecosystems

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A wolf in Yellowstone National Park. Photo courtesy of Yellowstone National Park

(Phys.org)—New research by Colorado State University finds that the removal of wolves from Yellowstone National Park caused complex changes in ecological processes that cannot be simply reversed by wolf reintroduction alone. The research findings are presented in a new paper, "Stream hydrology limits recovery of riparian ecosystems after wolf reintroduction," which is published in *Proceedings of the Royal Society B: Biological Sciences* and concludes that the effects of apex predator removal are unpredictable and are not symmetrical with the effects of predator reintroduction.

"The reintroduction of the wolf in Yellowstone has contributed to positive improvements in the Park's ecosystems, but it isn't a simple on

and off light-switch effect," says Kristin Marshall, lead author and recent CSU alumna. "Our research shows that the complexity of the [ecological damage](#) caused by the eradication of a key predator species requires careful consideration of dynamic variables for restoration, and so additional caution must be emphasized to avoid predator removal in the first place."

Observational studies by other researchers have suggested that the reintroduction of wolves to Yellowstone initiated dramatic restoration of riparian ecosystems. However, Marshall's research shows that changes in the hydrology of streams caused by the loss of beaver from the ecosystem prevents rapid restoration of willows even when they are totally protected from browsing by elk. The plants required both removing browsing and restoring the beaver-modified stream conditions that occurred prior to wolf removal in order to thrive.

Marshall conducted her research while she was a doctoral student at CSU's Warner College of Natural Resources in the Graduate Degree Program in Ecology. Her research was part of a larger, 10-year experiment conducted by a team of researchers from CSU's Warner College of Natural Resources that examined the effects of beaver dams and removal of browsing on restoration of willows in Yellowstone. The paper is co-authored by Marshall's research co-advisors at CSU: David Cooper, senior research scientist in the Department of Forestry and Rangeland Stewardship, and Thompson Hobbs, senior research scientist with the Natural Resource Ecology Lab and professor in the Department of Ecosystem Science and Sustainability.

Hobbs and Cooper have worked together on the research project for the past decade and emphasize the importance of beavers to the process. "The loss of wolves caused the loss of beaver and willows from small streams," said Hobbs. "Our experiment shows that you can't get beavers back without willows and you can't get willows back without beavers."

The study was funded by the National Science Foundation and will provide new insights to help solve the ongoing debate on the role of wolf-driven trophic cascades in the greater Yellowstone ecosystem.

"The research illustrates the value of long-term ecological experiments to understanding how species interactions cascade through food webs to determine ecosystem resilience," says Alan Tessier, program director in the National Science Foundation's Division of Environmental Biology, which funded the research. "The results have immediate practical applications in restoring and protecting ecosystems such as that of Yellowstone."

More information: The full paper can be found at [rspb.royalsocietypublishing.org1098/rspb.2012.2977](https://royalsocietypublishing.org/doi/10.1098/rspb.2012.2977)

Provided by Colorado State University

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