USDA
United States Department of Agriculture

Rocky Mountain Research Station
Science You Can Use Bulletin

March / April 2018 | Issue 29

Keeping it Wild: Asking the Right Questions to Guide Wilderness Management

CHERISHING OUR WILDERNESS TO DEATH

Wilderness management can be tricky. The conservationist Aldo Leopold, who is considered by many to be the father of wildlife ecology and the U.S. wilderness system, was probably thinking about this when he said, "All conservation of wildness is self-defeating, for to cherish we must see and fondle, and when enough have seen and fondled, there is no wilderness left to cherish."

Aldo Leopold and other conservationists such as Howard Zahniser, Bob Marshall, and Olaus Murie helped guide U.S. preservation philosophies that led to the Wilderness Act of 1964. This law established a National Wilderness Preservation System to designate U.S. lands and preserve their wilderness character. Today, that system is made up of 762 administrative units across more than 100 million acres of public

Wilderness managers in North Cascades National Park opted for chemical treatments to remove invasive fish species (Photo by National Park Service staff).

SUMMARY

The Wilderness Act of 1964 mandates that designated wilderness areas should be managed with the "imprint of man's work substantially unnoticeable." However, human-related environmental stressors such as climate change and non-native species invasions often call for environmental remediation or other management actions. In recent years, some of these stressors have had a significant and growing impact on wilderness areas, leading to conflicts and confusion over whether specific wilderness management actions are appropriate or permissible.

To help wilderness managers ask the right questions, ecologists at the Aldo Leopold Wilderness Research Institute in Missoula have helped to develop a set of wilderness management resources called the Ecological Intervention and Site Restoration Toolbox. Found at www.wilderness.net/restoration, the Toolbox includes a recently created wilderness evaluation framework questionnaire. The wilderness evaluation framework can help wilderness managers evaluate wilderness restoration needs in light of the management restraint mandated by the Wilderness Act. It also can help facilitate communication and collaboration between State and Federal agencies and wilderness area stakeholders.

land and managed by four Federal agencies: the Forest Service, the Bureau of Land Management, the National Park Service and the Fish and Wildlife Service.

MANAGING WITH RESTRAINT

The Wilderness Act states that a wilderness area is to be managed so that it is "untrammeled by man" and "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable." But every year, Federal wilderness management agencies receive hundreds of proposals for ecological restoration actions in U.S. wilderness areas.

Beth Hahn, an ecologist at the Aldo Leopold Wilderness Research Institute (commonly known as the Leopold Institute), says restoration needs are driven by a host of landscape stressors, including recreational use, invasive species and climate change. However, Hahn says, existing laws and policies seldom provide clear support for decisionmaking, and wilderness managers often must consider varying and sometimes conflicting beliefs about wilderness value.

Scientists at the Aldo Leopold Wilderness Research Institute are helping wilderness managers navigate complex intervention decisions in designated U.S. wilderness areas. (Photo: U.S. Forest Service.)

According to ecologist Peter Landres, who recently retired after more than 25 years at the Leopold Institute, "This is one of the most contentious, most difficult issues to deal with in managing wilderness. Wilderness managers want to preserve untrammeled wilderness as per the Wilderness Act but there's confusion about what 'untrammeled' means. It's about managerial restraint and humility — and about considering the option of not doing anything."

In response to requests to help navigate the complexity of wilderness management, Landres and Hahn worked with Leopold Institute staff, university faculty and wilderness agency staff to develop a questionnaire that they call a wilderness evaluation framework. The wilderness evaluation framework can be found on www.wilderness.net/restoration as part of the Ecological Intervention and Site Restoration Toolbox, which also includes management strategies and guidelines, case law examples, agency wildlife policies and case studies. The wilderness evaluation framework, which was finalized in December and has the full name of "Supplement to Minimum Requirements Analysis/Decision Guide: Evaluating Proposals for Ecological Intervention in Wilderness," can improve communication and collaboration between multiple agencies and stakeholders while helping wilderness managers create a "minimum requirements analysis," which is legally required whenever a proposed management action involves a prohibited use, as defined by Wilderness Act section 4(c).

KEY FINDINGS

- Ecological interventions, including ecological restoration actions, are increasingly used to mitigate the impacts of direct and indirect human activities while meeting conservation goals in protected areas.
- Although the Wilderness Act of 1964 emphasizes management restraint as a statutory goal, intervention actions have been widely implemented across the National Wilderness Preservation System.
- A wilderness evaluation framework questionnaire, recently developed by a team led by Leopold Institute ecologists, can help wilderness managers to evaluate restoration needs in light of the management restraint mandated by the Wilderness Act of 1964.
- This framework, which is part of the Ecological Intervention and Site Restoration Toolbox, can be found on the Wilderness Connect website at www.wilderness.net/restoration.
- Wilderness managers who use the wilderness evaluation framework may be better equipped to communicate and collaborate with other State and Federal agencies as well as with wilderness stakeholders.

"Ghost forests" of dead whitebark pine trees reflect management challenges in the Bob Marshall Wilderness of Montana (Photo by Wes Swaffar, National Forest Foundation).

For example, one question asked in the wilderness evaluation framework is "How does the proposed intervention affect wilderness character?" Follow-up questions address whether the proposed intervention can occur in wilderness areas or in adjacent non-wilderness lands or waters; whether or not there's an urgent need for intervention to preserve wilderness areas, and whether or not legal obligations to preserve wilderness have been considered. These questions, which are based on several decades of scientific research and management experience around the country, can help ensure that wilderness-specific criteria, including stakeholder values, are considered in proposed interventions.

A CATCH-22 IN "THE BOB"

One place where the Toolbox and the wilderness evaluation framework could be useful is the Bob Marshall Wilderness in Montana. Formally designated in 1964, "The Bob" includes more than a million acres of waterfalls, lakes, dense forests, and a whole lot of Grizzly bears. In a recent study, researchers found that mortality of mature whitebark pine trees in the Bob Marshall Wilderness had more than doubled (from 35 percent to 80 percent) in the last two decades, with white pine blister rust, an invasive fungal disease originally from Asia, accounting for more than 60 percent of these deaths. If left alone by humans, this keystone species and the biodiversity it supports may be lost from high mountain landscapes.

According to Anna Schoettle, a research plant ecophysiologist for the Rocky Mountain Research Station, the solution is to plant more whitebark pine trees, especially those with genetic

"Wilderness managers want to preserve untrammeled wilderness as per the Wilderness Act but there's confusion about what 'untrammeled' means."

MANAGEMENT IMPLICATIONS

- Altered disturbance regimes and changing ecosystem dynamics in wilderness areas have increased the importance of having an evaluation framework to support transparent decisionmaking for ecological restoration actions.
- A recently created wilderness evaluation framework questionnaire provides standardized criteria to evaluate the benefits and tradeoffs of ecological restoration actions in wilderness.
- Wilderness managers can use this wilderness evaluation framework, which is part of the part of the Ecological Intervention and Site Restoration Toolbox, to prioritize goals and improve communication between land management agencies and wilderness stakeholders.
- The wilderness evaluation framework provides support for completing a minimum requirements analysis, which is legally required whenever land managers are considering a use prohibited by Section 4(c) of the Wilderness Act of 1964.

resistance to white pine blister rust. Schoettle says, "You've got a situation where human-influenced stressors such as disease, beetles, past fire exclusion and climate change are harming these trees to the point that the species is imperiled."

Schoettle admits that both sides have a valid argument, and insists that she's no fan of human interference in wilderness areas. This is why she's excited about the wilderness evaluation framework. She explains, "You need to make sure that you have the best available science to achieve the most positive outcome with the least possible likelihood of impacting wilderness character. The wilderness evaluation framework will make a huge difference in balancing wilderness management priorities."

CHASING RAINBOWS IN MONTANA

Elsewhere in Montana, non-native rainbow trout in the North Fork of Montana's Blackfoot River have displaced native, endangered bull trout and possibly westslope cutthroat trout, a species which has lost habitat throughout the region due to factors such as livestock grazing, climate change and waterway obstacles such as roads, dams, and diversions. A 50-mile stretch of this world-renowned flyfishing river, located in the Scapegoat Wilderness in northwestern Montana, may be a perfect habitat for this beleaguered species.

"It gets complicated," according to Jimmy Gaudry, Wilderness and Rivers Program Manager for the Forest Service's Northern Region. "Different State and Federal agencies have different responsibilities when it comes to rivers and their flora and fauna. In this case, we're considering removal of the non-native rainbow trout and putting in what we think might have been a native fish species. From a wildlife perspective, we're questioning whether we should do this and how best to do it. At the same time, there's definitely interest in finding suitable habitat for westslope cutthroat trout since it has lost so much habitat elsewhere."

Gaudry, who helped advise the team that created the wilderness evaluation framework a few years ago, is now looking forward to using it. "I think it will help us engage with other agencies and stakeholders as we consider the management path going forward," he says.

Wilderness managers in Montana are considering introducing westslope cutthroat trout to the North Fort of the Blackfoot River (Photo by Chris Schnepf, University of Idaho, Bugwood.org).

CONSIDERING BISON IN THE KENAI

Up in south-central Alaska, Kenai National Wildlife Refuge biologists are pondering how to manage massive vegetation shifts brought on by climate change. Dr. John Morton, a supervisory biologist with the U.S. Fish and Wildlife Service, explains, "Alaska's climate is changing at twice the rate of what's occurring in the lower 48. The really big change we're seeing here on the Kenai is deforestation: Some large forested areas are turning into grasslands, partly due to spruce bark beetle outbreaks, which tend to occur after a few years of above-average temperatures."

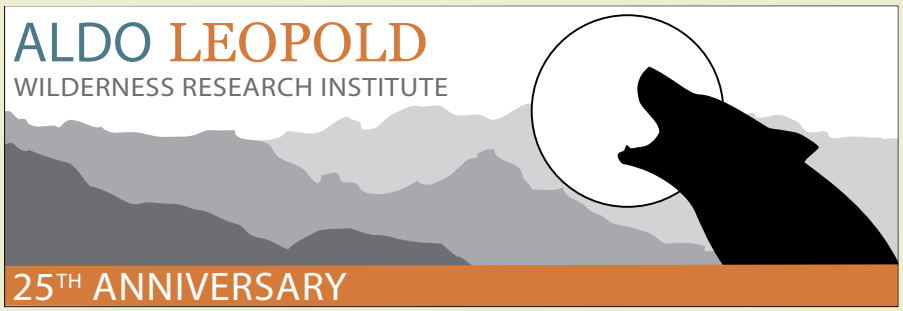
Spruce beetle outbreaks are contributing to widespread, rapid environmental change in the Kenai National Wildlife Refuge, causing pressure to manage wildlife differently than in the past (Photo by William M. Ciesla, Forest Health Management International, Bugwood.org).

RMRS Research Spotlight

Promoting Wilderness Stewardship for 25 years: Aldo Leopold Wilderness Research Institute

Located on the University of Montana campus in Missoula, the Leopold Institute is a place where scientists from different disciplines address wilderness research needs of land management agencies and organizations. Now in its 25th year, the Leopold Institute is a collaboration between the Bureau of Land Management, the U.S. Fish and Wildlife Service, the U.S. Forest Service, the National Park Service, and the U.S. Geological Survey. It's the only Federal research group dedicated to the development and dissemination of knowledge about wilderness preservation management, and it helps to extend a legacy that began in 1964 when the United States became the first country in the world to define and designate wilderness areas through law. As Leopold Institute ecologist Beth Hahn observes, "Our country's protected area network is an absolute jewel for the public. I think these places are essential to the nation, whether they're a city park or a wilderness area in Alaska."

More information on the Leopold Institute can be found at http://leopold.wilderness.net and at wilderness.net, a public wilderness information website with resources from the Leopold Institute, the Arthur Carhart National Wilderness Training Center, and the College of Forestry and Conservation's Wilderness Institute at the University of Montana.



These newly established grasslands lack an appropriate variety of species. Complicating the issue is that the six-million-acre Kenai Peninsula has a land connection to the mainland that's a mere 10 miles wide. Morton explains, "With an isthmus that narrow, you can't wait for native species to migrate there naturally. If you do, what you get are exotic plants and animals that don't belong here, typically brought in unintentionally. There are about 130 exotic species here already and we're finding new stuff all the time."

"We could just let it unfold," Morton says, "but it would be a real mess, with species that don't belong. We could also plant trees and push it back toward being a forest. Or we could help it to become a healthy grassland — but to do that you need fire and species diversity, including a keystone species such as bison, which were here about 40,000 years ago." As a keystone grazing species, bison prevent the build-up of a litter layer that can enable encroachment by invasive species.

> *"Our country's protected area network is an absolute jewel for the public. I think these places are essential to the nation, whether they're a city park or a wilderness area in Alaska."*

This raises important questions about the appropriate role of Federal land management agencies in managing congressionally designated wilderness areas—questions that Morton has pondered for years. He explains, "If the system was just changing on its own without human interference, I wouldn't do anything about it—that's the concept of wilderness protection as it was originally conceived. But from a practical perspective, the system is changing so quickly and so dramatically that it's unlike anything we've dealt with before. Today, we have the ability and I'd say we have the responsibility to step in and right the boat."

STRONG MEDICINE IN THE NORTH CASCADES

North Cascades National Park in northern Washington State is another example of a place where wilderness management has gotten complicated. Covering more than half a million acres, North Cascades National Park has jagged peaks, gray wolves, glaciers and hundreds of high-elevation lakes, dozens of which are home to cutthroat, rainbow and eastern brook trout.

Unfortunately, all of these fish are relative newcomers, descendants of fish that were brought in by bucket to these previously fishless lakes starting about 100 years ago. In the years since then, these non-native species have nearly wiped out some of the previous residents, including long-toed salamander, Western toad, and several frog species.

Dozens of lakes in North Cascades National Park wilderness area contain invasive fish species (Photo: U.S. Forest Service).

According to Jack Oelfke, the National Park's Chief of Resources, this led to a conflict in management directives. He explains, "With the Wilderness Act we're trying to respect qualities of wilderness character. At the same time, we're trying to follow the Organic Act of 1916, which was the law that developed the National Park Service. In the language of the day, the Organic Act mandated managing designated National Park resources 'in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.' More recent management policies are more specific about restoring native species where they've been extirpated or removed due to human intervention of some kind."

Oelfke says that the National Park Service weighed the options and found an approach that restores natural ecosystems with minimal interference to wilderness character. "We've been addressing this issue for a little over 10 years," Oelfke says, adding, "it's intensive and it's manipulative, but we can remove fish from a given lake in as little as a week. When funding is available for a given lake, we use helicopters, chemical fish-killing compounds or gill-netting to get rid of the fish. At these lakes, we've seen the amphibian populations rebound."

But reaching this management decision took years of research and evaluation, to say nothing of stakeholder discussion. "The anglers eventually came to understand where we're coming from," Oelfke says, adding that not all the lakes are slated for eventual trout removal. The wilderness evaluation framework, if it had been available years ago, could have helped in this process of evaluation and discussion.

HIGHER ASPIRATIONS

As part of their work in developing the Toolbox and the wilderness evaluation framework, the Leopold Institute team have not only collected resources to help with tough decisions in wilderness management, they've helped to raise awareness of wilderness management as a worthy goal, even when there doesn't seem to be a good solution. As Aldo Leopold once observed, "We shall never achieve harmony with land, any more than we shall achieve absolute justice or liberty for people. In these higher aspirations the important thing is not to achieve, but to strive."

FURTHER READING

Hahn, B.A; Landres, P.B.; Biber, E.; Spencer, D.T. [In review[.. Asking the right questions: Integrating science, law, and ethics to support decisions about ecological intervention in wilderness. BioScience.

Lieberman, L. 2017. The Balancing Act: Ecological interventions and decision tradeoffs to preserve wilderness character. Master's Thesis. Missoula, MT: University of Montana. https://scholarworks.umt.edu/etd/10993.

Lieberman, L.; Hahn, B.; Landres, P.B. 2018. Manipulating the wild: A survey of restoration and management interventions in U.S. wilderness. Restoration Ecology. doi: 10.1111/rec.12670. http://onlinelibrary.wiley.com/doi/10.1111/rec.12670/full.

Retzlaff, Molly L.; Leirfallom, Signe B.; Keane, Robert E. 2016. A 20-year reassessment of the health and status of whitebark pine forests in the Bob Marshall Wilderness Complex, Montana. Res. Note RMRS-RN-73. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 10 p. www.fs.usda.gov/treesearch/pubs/52317.

Hobbs, Richard. J.; Cole, David N.; Yung, Laurie; [et al.]. 2010. Guiding concepts for Park and wilderness stewardship in an era of global environmental change. Frontiers of Ecology and the Environment (2010) 8(9): 483–490. www.fs.usda.gov/treesearch/pubs/38923.

Landres, P. 2010. Let it be: A hands-off approach to preserving wildness in protected areas. In: Cole, D.N.; Yung, L., eds. Beyond naturalness: Rethinking park and wilderness stewardship in an era of rapid change. Washington, DC: Island Press. https://www.fs.usda.gov/treesearch/pubs/37145.

Cole, David N.; Yung, Laurie; Zavaleta, Erika S.; [et al.]. 2008. Naturalness and beyond: Protected area stewardship in an era of global environmental change. The George Wright Forum. 25(1): 36–56. https://www.fs.usda.gov/treesearch/pubs/31765.

SCIENTIST PROFILES

The following scientists were instrumental in the creation of this Bulletin:

BETH HAHN is an ecologist with the Aldo Leopold Wilderness Research Institute in Missoula, Montana. Her research interests focus on ecological issues related to wilderness stewardship, with an emphasis on ecological restoration, wildlife, climate change, and disturbance ecology. Before working with the Leopold Institute, she worked as the regional wildlife ecologist for the Northern Region of the Forest Service and taught at the University of Michigan and the University of Montana. Beth received a bachelor's degree in physical geography from Boston University and a Ph.D. in ecology and evolutionary biology/resource ecology and management from the University of Michigan. To learn more about Beth's work, visit her profile page www.fs.fed.us/rmrs/people/bhahn

PETER LANDRES was a research ecologist with the Aldo Leopold Wilderness Research Institute from 1993 to 2017. His work was broadly aimed at developing the knowledge needed to protect and sustain ecological benefits and values in wilderness while developing strategies and tools for improving ecological-based wilderness management. Peter received a Ph.D. in ecology and biology from Utah State University and a bachelor's degree in natural science from Lewis and Clark College. He received the Forest Service's National Excellence in Wilderness Stewardship Award in 2015. Peter retired in 2017. To learn more about Peter's work, visit his profile page https://www.fs.fed.us/rmrs/people/plandres

WRITER'S PROFILE

BRIAN COOKE is a science writer for the Rocky Mountain Research Station in Fort Collins, Colorado. He received a bachelor's degree in journalism-science writing with a minor in geology from Lehigh University in Bethlehem, Pennsylvania. Brian's work has included articles for the National Park Service, website writing for various environmental services companies, and proposal writing and editing for a Bureau of Land Management contractor. Brian's science and environmental writing is frequently colored by his National Park Service interpretive training and experience as a volunteer docent for Alcatraz Island and San Francisco Maritime National Historical Park.

SYCU

SCIENCE YOU CAN USE BULLETIN

U.S. Department of Agriculture
Forest Service
Rocky Mountain Research Station
240 W. Prospect Rd.
Fort Collins, CO 80526

POSTAGE

The purpose of the Science You Can Use Bulletin: To provide scientific information to people who make and influence decisions about managing land.

The US Forest Service RMRS Science You Can Use Bulletin is published regularly by: Rocky Mountain Research Station (RMRS).

Nehalem Clark
Bulletin Editor / Science Delivery Specialist
ncclark@fs.fed.us

Jan Engert
Assistant Station Director
Science Application & Communication
jengert@fs.fed.us

To subscribe online to future Bulletins via email, use this link: tinyurl.com/RMRSsciencebulletin. Previously published Bulletins are posted on our website at: www.fs.fed.us/rmrs/science-you-can-use-bulletin.

Rocky Mountain Research Station (RMRS) researchers work at the forefront of science to improve the health and use of our Nation's forests and grasslands.

RMRS is one of 7 Forest Service Research and Development Stations located throughout the U.S. Within the 12 state intermountain west RMRS footprint, we maintain 12 research locations, conduct long-term ecological research on 14 experimental forests, ranges and watersheds and work in hundreds of research natural areas.

You may also be interested in regular science delivery bulletins similar to Science You Can Use, produced by Pacific Northwest and Southern Research Stations: PNW Science Findings and SRS Compass Live.

More information about the Rocky Mountain Research Station can be found here www.fs.fed.us/rmrs and you can learn more about Forest Service Research at www.fs.fed.us/research.

USDA