

# Science

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issue two hundred twenty-nine / july 2020

*“Science affects the way we think together.”*

Lewis Thomas

## Ranchers, Beavers, and Stream Restoration on Western Rangelands



Nick Weber

A beaver dam in Bridge Creek, Oregon, built atop a human-made beaver dam analog constructed to help restore habitat for threatened steelhead. When beavers take over beaver dam analogs, they can further contribute to stream restoration efforts.

### IN SUMMARY

Beavers have become a source of inspiration for public and private land managers over the past decade. Beaver dams can help control flooding, raise groundwater levels, and improve surface water flows. Some land managers are now designing stream restoration projects that mimic the way beaver dams shape river ecosystems. Beaver-related restoration may even help the recovery of endangered species that depend on healthy aquatic and riparian areas.

The approach also holds promise for ranchers who graze livestock on rangelands in the Western United States where drier conditions are expected in the coming years. Those already experimenting with beaver-related restoration are discovering that it can increase water and forage availability for their livestock.

Until recently, the social factors that influence the success or failure of these projects on rangelands were not well understood. To assess the social and regulatory environment associated with this new approach, Susan Charnley, a research social scientist with the USDA Forest Service, Pacific Northwest Research Station, and her colleagues conducted five case studies in California, Idaho, Nevada, and Oregon. Interviews with more than 100 ranchers, nongovernmental organizations, and regulatory agencies shed light on their attitudes and motivations, as well as the regulatory landscape that influences successful implementation. The findings are important for successfully implementing beaver-related restoration projects in other areas.

*“The more our world functions like the natural world, the more likely we are to endure on this home that is ours, but not ours alone.”*

—Janine Benyus, biologist and author

Streams flowing across rangelands in the Western United States are the life blood for fish and wildlife as well as ranchers and livestock. In the West, where conditions are becoming drier, incised stream channels are a growing concern, especially where threatened and endangered fish species are at risk. This type of erosion can deepen

a channel to the point where water no longer spreads out on to the surrounding floodplain and groundwater levels drop. A stream that has become disconnected from its floodplain can spell trouble for livestock as well as a myriad of other species that depend on vegetation supported by a moist floodplain.

Love them or hate them, North American beavers (*Castor canadensis*) could be an important part of the solution. These furry engineers are legendary for their ability to reshape their environment by chewing down trees and building dams. On one hand, beavers can be a big nuisance. Beaver dams in the wrong place can

block irrigation infrastructure and road culverts, and cause flooding along roadways or in farm fields. On the other hand, beaver dams can slow water, raise groundwater levels, and improve surface water flows.

Scientists who study how beaver activity naturally shapes river ecosystems have begun to design stream restoration projects that are inspired by these industrious animals. Some projects involve translocating beavers from places where they are unwanted to places where they are, and hoping they will stay and build dams. Other projects aim to restore vegetation in riparian areas—naturally or through plantings—improving beaver habitat and enabling them to colonize naturally and build dams. In the absence of beavers or suitable habitat, a third type of project entails installing artificial beaver dams in streams. One popular type of artificial beaver dam that has had positive results is beaver dam analogs, typically made of wooden posts woven with vegetation and sediment. Once a beaver dam analog has been constructed, beavers have been known to move in and take over the job of maintaining the human-made structures. They may even settle in to build new dams.

Beaver-related restoration has grown rapidly in the past 10 years along with research on the biological and physical aspects of beavers and their dams. But are people willing to accept animals that are also a known nuisance as potential allies for stream restoration?



## KEY FINDINGS



- Ranchers who participated in the studies perceived that the benefits of beaver-related restoration outweighed the drawbacks. The greatest benefits observed were increased water and forage availability for livestock.
- Ranchers were motivated to use beaver-related restoration by a desire to restore incised streams, riparian areas, and wet meadows; to raise groundwater levels and improve surface water flows; and to improve habitat for fish and wildlife, including threatened and endangered species.
- Ranchers used a variety of grazing management strategies that were compatible with beaver-related restoration. Some were adopted for the purpose of beaver-related restoration, and some were adopted to support other ecological restoration goals.
- The most relevant policies for beaver-related restoration are state regulations regarding beaver trapping and hunting; and federal and state regulations related to constructing instream structures and managing sensitive species.
- People who installed artificial beaver dams considered the regulatory process to be the biggest barrier to project implementation. Successful implementation involved collaboration among ranchers, scientists, practitioners, and regulatory agencies.

“You can design great restoration projects that might work really well, but you’re not going to be able to implement them unless you have a supportive social environment,” says Susan Charnley, a research social scientist with the USDA Forest Service, Pacific Northwest Research Station.

Charnley, in collaboration with scientists from Oregon State University and the University of

Oregon, studied several beaver-related restoration projects to understand the social factors that influence success. What they learned about people’s attitudes and the regulatory landscape are important for successfully establishing, maintaining, and adaptively managing beaver-related restoration projects.



Minette Layne/Flickr

North American beaver (*Castor canadensis*).

### Purpose of PNW Science Findings

To provide scientific information to people who make and influence decisions about managing land.

PNW Science Findings is published monthly by:

Pacific Northwest Research Station  
 USDA Forest Service  
 P.O. Box 3890  
 Portland, Oregon 97208

Send new subscription and change of address information to:

SM.FS.pnw\_pnwpubs@usda.gov

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## Nature-Based Restoration

Nature-based restoration leverages natural ecosystem processes. One example is beaver-related restoration to help rebuild incised stream channels.

“When beavers move in and build dams you get water spreading out on to the floodplain, you get more wet meadows, you get more riparian vegetation,” says Charnley.

Beaver activity can also raise groundwater levels, improve surface flows, and create habitat that supports and maintains biodiversity. Their handy work may even help with the recovery of endangered species that depend on healthy aquatic and riparian areas such as salmon (*Oncorhynchus* spp.) and Great Basin species such as the greater sage-grouse (*Centrocercus urophasianus*) and Columbia spotted frog (*Rana luteiventris*).

Ranchers in the Western United States who are motivated by these benefits have begun

to experiment with beaver-related restoration approaches on their land. They’re seeing firsthand that this type of restoration can increase water and forage availability for their livestock. The strategy could also prove important for adapting to a climate that is predicted to become drier.

Despite the potential, not everyone is enthralled with the idea of building structures that might attract beavers to their land. People’s attitudes about beavers are often influenced by how they make their living—for example, whether they are an agency manager, or a timber producer, a farmer, or a rancher.

“The biggest complaint about beavers that you hear from ranchers who grow hay to feed their livestock in winter is that their irrigation systems can get blocked,” Charnley says.

Farmers and ranchers have been known to break apart beaver dams with a backhoe as a control measure. However, Charnley found that the negative aspects of beavers reported

by study participants were often localized. For example, beavers may inhabit upland areas on a rancher’s property and not cause problems in their hay fields.

Still, their bad reputation is reflected in existing research about people’s attitudes toward beavers. The prevailing model goes like this: as human or beaver populations increase, human/beaver encounters increase as do negative impacts of beavers and their dams. As a result, tolerance by people decreases and demand for control measures goes up.

But when Charnley learned about a rancher in eastern Oregon who took it upon himself to install upwards of 600 artificial beaver dams in the form of low-rise rock dams along some 18 miles of stream that runs through his property, she began to suspect that not all ranchers considered beavers a nuisance. She began to investigate.

### *The Good, the Bad, and the Complicated*

Betsy Stapleton’s aha moment about beavers came during a drought in northern California. Stapleton, who is the board chair of the Scott River Watershed Council, noticed that where she saw naturally existing beaver complexes along one particularly dry section of the Scott River, there was also significant residual water and fish habitat.

“I went from ‘Oh, aren’t beavers cute?’ to ‘geez, maybe they could have a really beneficial effect, not only for ecosystems, but for the agricultural community,’” she says.

The Scott River Valley, which long ago was called Beaver Valley because it once supported so many beavers, is an important spawning area for the threatened southern Oregon/northern California coast population of coho salmon (*O. kisutch*). In 2014, it became the first place in California to implement beaver-related restoration using beaver dam analogs. Increasing beaver abundance in the region has become a priority action for recovery of the coho population.

Charnley included the Scott River Valley among five sites selected to be part of her case study research. To be included, the scientists decided that each restoration project had to involve willing participants; include riparian revegetation or construction of artificial beaver dams (they did not study translocation projects); be located on Western U.S. rangelands where ranching took place; and be far enough along (at least 2 years) to yield lessons learned. The projects selected were initiated by different proponents, including private landowners, scientists and federal agency staff, and a watershed council. The final selection included beaver restoration projects in Oregon (Grant and Wheeler Counties), Nevada (Elko County),

Carol Evans



Riparian vegetation with unrestricted summer grazing on Susie Creek, Nevada, in 1989 (above); and after timing and duration of riparian grazing changed and beavers colonized in 2017 (below).

Carol Evans





A rancher in Elko County, Nevada, shows a flow device he installed for nonlethal nuisance mitigation to prevent beaver from blocking a road culvert.

Idaho (Owyhee County) and California (Siskiyou County). Between 2016 and 2018, Charnley and her team interviewed 105 people about the projects: 53 ranchers (most kept cattle, but some also had sheep and goats), 44 federal agency staff, and 8 staff from nongovernmental organizations.

The ranchers' enthusiasm surprised Charnley as they shared observations about the positive impacts from beavers that moved onto their ranches or their federal grazing allotments.

"I mean, many were just in love with beavers," Charnley says. "It's like, 'bring them on, we're willing to put up with some of the drawbacks because we just really think they're great.'"

The ranchers reported both ecological and economic benefits due to the changes in water and riparian vegetation that beaver activity created. Increased availability of water and better forage improves livestock health, and that can translate into financial gains.

But ranchers also are well aware of problems beavers can cause. A few recalled regularly dynamiting beaver dams as kids because the animals were considered a nuisance. Now, those same ranchers are interested in encouraging beaver populations and are willing to put up with some inconvenience, although they would also like to find ways to mitigate their drawbacks. For example, some ranchers have had success using flow devices that help prevent clogging up culverts or irrigation canals, yet allow beaver dams to remain in place.

For beaver-related restoration to be successful, grazing practices need to be designed to reduce impacts on riparian areas that support

beavers. This can be accomplished through timing and intensity of use of riparian pastures, riparian fencing, or other means. For example, if establishing a project requires keeping livestock out of a stream, a rancher might need to invest in fencing materials or alter grazing management, in addition to installing a new water tank for an alternative source of water. The grazing management practices used by ranchers in all of the projects studied were compatible with beaver-related restoration. This was true on public and private land, whether the practices had been implemented specifically for beaver restoration, or to support other goals like restoring riparian vegetation for fish recovery.

Despite the drawbacks, the prevailing sentiment among more than 50 ranchers in the study was that the benefits were worth it.

"People have to really think that this is going to be good for them and help them out if they're going to participate in it," Charnley says.

Buy-in from ranchers is key because taking on a beaver-related restoration project means taking on risks—outcomes are not always certain. In addition, reducing the negative impacts of beavers and beaver dams and changing grazing management practices can be challenging and costly for ranchers. Agencies and nongovernmental organizations like the Scott River Watershed Council can help by providing education and technical assistance to landowners, as well as financial assistance to help defray the costs of things like nonlethal mitigation techniques, fencing, or new water tanks.

Once people are on board with beaver-related restoration, they tend to want to protect their

investment. Some study participants expressed concern that localized beaver trapping and hunting could undermine their efforts to promote beaver colonization. Beaver harvests have declined over the past few decades, according to reports from state licensing programs. However, hunting and trapping may need to be controlled or eliminated locally if it prevents beavers from becoming restoration partners.

## Restoration and Regulations

The biggest and most complex challenge reported by study participants using artificial beaver dams was the regulatory process. They attributed this to several factors, including agency personnel's lack of experience with the new approach and vague or inappropriate regulations. Regulatory agencies also may be inclined to take a conservative approach toward any action that could threaten habitat for sensitive species. Beaver-related restoration requires adaptive management, yet environmental regulations weren't necessarily designed with this in mind.

"You have to take into account that it's a nature-based restoration process that's occurring in dynamic stream environments," Charnley says. "You can't always predict what the outcomes will be, so there has to be some flexibility on the part of regulatory agencies, implementing partners, and landowners."

Research and monitoring to assess both ecological and social impacts of a new approach like this also are important for allaying concerns and informing the regulatory process.

In her review of the regulatory landscape for beaver-related restoration in all four states, Charnley found that agencies have been adapting their approaches as they gain more experience. Federal regulations such as the Clean Water Act and the Rivers and Harbors Act apply across all four states, yet state requirements and compliance processes can vary. For example, while federal regulations have become more streamlined over time, in Oregon state requirements have become more stringent. In California, since the first installation of beaver dam analogs in the Scott River Valley, the state regulatory process has eased over time.

"Beaver dam analogs are now an accepted restoration technique in the state of California with acknowledged permitting pathways," Stapleton says.

She credits this success to clear communication, patience, persistence and multiple site visits by interested people. Bringing people out again and again to see changes that were taking place at the dam sites was an important learning experience for landowners as well as agency personnel.

“We were persistent. You know, it was one step forward, half a step back,” Stapleton says. “Dialogue and learning needed to happen all the way around.”

Successful implementation lies in the sweet spot where the regulatory environment for beaver-related restoration isn't so burdensome that people won't take it on, but not so lenient that resources are poorly managed or harmed. By working together, proponents and agencies are in a better position to figure out how to meet regulatory requirements and implement effective projects.

When Stapleton speaks to groups that are interested in working with beaver for restoration, she is often asked what landowners and ranchers think about it.

“We could answer that question based on our impressions, but Susan has provided unbiased documentation that landowners are often supportive and can evaluate the pros and cons in light of their own needs,” Stapleton says. “Her research has been invaluable in expanding the impact of our project beyond our local community to the rest of California.”

In western rangelands, beaver-related restoration holds promise for improving habitat for sensitive species and for sustaining ranching in the face of increasing drought. Serious consideration of the human dimensions of working with nature's ecosystem engineers will only strengthen this promise.



## LAND MANAGEMENT IMPLICATIONS



- Ranchers are more likely to participate in beaver-related restoration when they perceive that the benefits of beavers, beaver dams, and restoration outweigh the drawbacks.
- Ranchers may need to adapt grazing management practices to be compatible with beaver-related restoration.
- Education as well as technical and financial assistance for landowners to encourage adoption of nonlethal mitigation techniques can reduce the undesirable effects of beavers without compromising the restoration effort.
- Successful beaver-related restoration projects require proponents, landowners, grazing permittees, and partners who are willing to take risks, innovate, and stay committed. A regulatory environment that enables experimentation, flexibility, and adaptive management is also important.
- Effective beaver-related restoration projects can benefit threatened fish and wildlife and serve as a climate change adaptation strategy for ranchers.

“Whether you are talking about beaver-related restoration, or other kinds of restoration projects, it's always important to design projects in a way that take people's needs and interests into account,” Charnley says. “A good way to do that is to involve them as much as possible in the process.”

*“Look deep into nature, and then you will understand everything better.”*

—Albert Einstein

### Further Reading

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Susan Charnley



Betsy Stapleton, chair of the Scott River Watershed Council, leading a site visit to see beaver-related restoration in the Scott River Basin, California.

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### *Scientist Profiles*



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