

Restoring California's Wild Watersheds

Why more water for wildlife means more water for people.



Jane Braxton Little posted May 27, 2010

Jim Wilcox is sitting on a rock near a quarter-acre pond watching a pair of willow flycatchers flit in and out of the brush across the water. The 15-inch rainbow trout he spied a week ago does not flash on this summer morning, but Wilcox knows it's down there somewhere beneath the surface.

He allows himself a small smile. Three years ago his pond-side perch was in the middle of a sagebrush field high in the headwaters of California's Feather River, 170 miles northeast of Sacramento. Red Clover Creek trickled through in a braided network of rutted gullies.

A century of logging, road-building, and intensive overgrazing had reduced this and other meadows throughout the Sierra Nevada to baked and barren flats. Today the stream meanders through a meadow lush with native grasses and small ponds.

Wilcox, a former logger, is part of a 25-year effort to restore all of the meadows within the upper Feather River basin, an area larger than Delaware. As program manager for the Feather River Coordinated Resource Management group, he works with ranchers, timber owners, anglers, and federal and state agency officials—anyone who shares an interest in improving the land and the water that cascades down to the Sacramento Valley and the delta that empties into San Francisco Bay. At a time when climate change is putting unprecedented pressure on water supplies, these mountain meadows may be a first step in preserving both the environment and the economy. Restoring them helps revitalize the watershed and wildlife, and it also helps sustain the downstream farms, ranches, towns, and cities that depend on the alpine water.



Jim Wilcox is among those who have worked for 25 years to improve the land and water that runs through the Feather River watershed.

Photo by Jane Braxton Little

Water, after all, delivers most of the effects of global warming: melting icebergs, rising sea levels, lower stream flows, reduced snowpacks, and increased tropical storms. Throughout the American West, communities, cities, and entire state economies have relied on mountain snowpacks, which replenish the streams that feed water supplies. Now, as climate change is altering historic snowfall patterns, land managers are turning to meadows to help reduce the effects of a warming planet.

Nature's Reservoirs

Mountain meadows store water, acting as natural reservoirs that hold back floodwaters. By slowing the heavy spring flows and releasing them gradually over the dry summer months, healthy watersheds can increase the quantity of water available downstream.

In California, where agriculture is the economic mainstay, the impacts of climate change could be devastating. The Sierra Nevada snowpack supplies two-thirds of the state's water needs. The Sierra's 22 major river systems nourish farms and orchards in California's Central Valley, which produces

8 percent of the nation's crops. Over the last century, however, late spring runoff has declined 25 percent. Scientists predict even more dramatic reductions over the next 90 years, as global warming restricts snowfall to the highest elevations. The timing of peak snowmelt throughout the range is already earlier and could occur a full two weeks sooner by the end of the century, according to climate scientists.



The restored Red Clover Creek.

Photo by Jane Braxton Little

Scientists and land managers are launching innovative plans to maximize the storage capacity of meadows throughout the Sierras, which stretch 400 miles along the state border with Nevada. The most ambitious project involves nearly 300,000 acres of floodplains, an area about 20 times the size of Manhattan. The National Fish and Wildlife Foundation, a Washington, D.C.-based nonprofit created by Congress, is providing \$15 million and coordination for work in as many as 20 Sierra Nevada watersheds over the next 10 years. Along with restoring fish and wildlife habitat, their goal is to continue

delivering fresh water to the rest of the state.

“Everyone agrees that California will have less snow and more rain in coming decades. There is no doubt that water is the crisis here and now,” says Timothy Male, the foundation’s director of wildlife and habitat conservation.

The diminishing snowpack is likely to provoke more skirmishes in the statewide water wars that pit the north against the south, farmers against environmentalists, and rural interests against urban. The underlying problem is a demand for water that has outgrown today’s supplies, U.S. Interior Secretary Ken Salazar told *The Los Angeles Times*. California, he said, is “sitting on a ticking time bomb, and you better get your act together, because otherwise the bomb’s going to go off.”

Making Up for Lost Snowpack

The Feather River watershed lies at the northern end of the Sierra range among its lower peaks. The impacts of diminishing snowpacks will take their toll here first, says Wilcox, who has lived in these mountains since the 1970s. The effects on the quantity and timing of the downstream flow will be dramatic, he says. That puts even more pressure on restoring meadows in the watershed that provides more than 5 percent of California’s freshwater supply.

Wilcox wasn’t thinking about climate change when he began working with the Feather River alliance 25 years ago. The group’s focus was on the erosion that was choking the river. Instead of conventional dredging of reservoirs and riverbeds, a handful of local entrepreneurs decided to try reducing the sediment buildup where it began: upstream in the tributary creeks and meadows.

In 1985, just before winter closed the roads, they built four small U-shaped rock and gravel dams in Red Clover Creek, 60 miles above a series of hydroelectric dams owned by Pacific Gas & Electric Company. The dams were designed to slow the water flow and trap in-stream

sediment. That winter tested the experiment. The 20 inches of rain that fell in five days washed out century-old bridges and roads. To nearly everyone's surprise, the dams not only survived; they also held back their share of sediment.

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Emboldened by that success, the small coalition of county officials and businessmen expanded to include ranchers, environmentalists, and state and federal officials. Although many of them had been at odds over land management issues, they realized they could only heal the watershed if they cooperated. Wilcox had been a firsthand witness to stream dredging and other practices harmful to ranchlands and forests. A man more at home in a pickup truck than an office, he was eager to be a part of reversing the damage. "I believe in watershed restoration. It has always been in my bones," he says. And that became the Feather River coalition's goal: restoring entire meadows along with the creeks flowing through them.

Now, as climate change is altering historic snowfall patterns, land managers are turning to meadows to help reduce the effects of a warming planet.

Among the methods they have pioneered is a low-tech procedure known as "pond and plug." Crews with heavy equipment dig several of the channels wider and deeper, creating small ponds. They use the excavated dirt to fill the remaining gullies back to the original ground level. Along Red Clover Creek, the groundwater began rising almost immediately after the crews finished plugging the channels. By the following spring the ponds were flush with the water that would otherwise have raced

downstream in late winter. Above and below the pond where Wilcox sits, the creek has found its way across the meadow in a natural, meandering channel.

The Feather River group has completed 66 restoration projects, which include 3,900 acres of meadow and

44 miles of stream. Since the work began, the data from a series of permanent monitoring stations show that the flow out of restored meadows is greater and lasts longer into the summer. Water temperatures have dropped despite an increase in average air temperatures, and stream turbidity, a measure of the amount of dirt and debris suspended in the water, has decreased to almost half pre-project levels. Groundwater, which never reached the surface before the restoration work, is now consistently at or above ground level for at least part of the year.

From Water to Wildlife

The Feather River projects have inspired the much larger Sierra-wide meadow restoration coordinated by the National Fish and Wildlife Foundation. Private landowners, universities, local and national resource organizations, and the U.S. Forest Service are working together to design strategies that will raise the water table and slow the flow out of mountain meadows. In an area from the Pit River in the north to the Kern River in the south, they are evaluating potential projects to determine which will yield the maximum benefits to fish and wildlife and the greatest quantities of water. Their goal is to restore at least 20,000 acres a year by 2014, says Male.

“Nationwide, we’re looking for tangible actions that address the realities of climate change. This is one of the best examples in America of a restoration initiative that can directly help people and wildlife adapt to our changing planet,” Male says.

Leave it to Beavers?



Nature's water engineers can restore river channels.

The plan, over the first five years, calls for restoring 60,000 acres of meadow. As the water table rises and meadows soak up more water from melting snows, native habitat lost for decades should return. Among the endangered species expected to benefit are the yellow warbler, Yosemite toad, Lahontan cutthroat and golden trout, Townsend’s big-eared bat, and the Sierra Nevada red fox.

But the effects of widespread meadow restoration will also flow downstream to farmers and other water users. The Forest Service manages about half of the Sierra’s degraded meadowlands. The agency is determining which of the 11,700 separate meadows in 10 national forests need to be restored. All are located on streams important for water supply, says Barry Hill, a regional hydrologist. Using foundation funds, the Forest Service hopes to determine the amount of additional water available for downstream use once the meadows return to health.

The Sierra projects are unique among large-scale water restoration efforts in the United States because of their potential to increase the amount of water available in a river system, says Male. Comprehensive efforts to restore the Chesapeake Bay, the nation’s largest estuary, focus on improving the quality of water flows throughout the 64,000-square-mile region. In the

Everglades, a wide-ranging plan to revive a dying ecosystem aims to improve the distribution of flows throughout 18,000 square miles in southern Florida. Along the lower Mississippi River and coastal Louisiana, the largest wetlands restoration effort is designed to reverse the pattern of land erosion by buffering against floods and hurricanes and, like all of the major projects, improving wildlife habitat.

Just how much more water healthy Sierra Nevada meadows can deliver is a matter of debate. Some scientists believe the boosts in stream flow may be absorbed by increases in vegetation in the new, restoration-created habitats. Others believe restoration could contribute up to 6.5 billion gallons of additional water storage throughout the California range. Over time, says Male, these restored meadows could hold 16 to 160 billion gallons of fresh water. That's equal to the size of one of the new dams state officials have proposed for construction to offset the state's declining snowpack.

Restoring mountain meadows will not solve California's water crisis. That will take a collective commitment from the agriculture industry, from municipalities, and from everyone who depends on the Sierra snowmelt for their livelihoods and their lives. It will also require more political will than elected officials have traditionally marshaled. Wilcox believes the public recognizes the value of healthy watersheds. He is optimistic that stream restoration will become routine as more people understand its importance upstream and downstream.

Meanwhile, the benefits to wildlife are unequivocal. In the wet meadow surrounding Red Clover Creek, the number of waterfowl species has doubled since Wilcox and his crews completed the pond-and-plug project. He has seen buffleheads, gadwalls, and two species of teal breeding in early spring. Sandhill cranes, willow flycatchers and 10 other species on state and federal watch lists have returned to the area. Walking through Red Clover Valley from the pond, Wilcox bends down to study a clump of dancing hairgrass, one of a handful of plant types that have regenerated from seeds dormant in the soil for decades. He has yet to see elk but he has found their tracks—the first in the area in decades.

Interested?

- , a conservation organization based in Washington, D.C., focuses on protecting rivers, wildlife, and water supply and quality. The organization's Web site also contains information about meadow restoration in California.
- The nonprofit provides grants to conservation projects across the United States.
- To find out more about the Feather River project, visit the .

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Jane Braxton Little wrote this article for Water Solutions, the Summer 2010 issue of YES! Magazine. Jane covers natural resource issues from California's northern Sierra Nevada. Her work has appeared in Scientific American, Nature Conservancy, and Audubon, where she is a contributing editor.

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Science to Solutions

Low-Tech Riparian and Meadow Restoration Keeps Rangelands Greener Longer



In Brief:

- Traditional approaches to riparian and wet meadow restoration are often intensive and expensive, limiting the extent to which they can be applied.
- Practitioners are increasingly turning to cost-effective, low-tech restoration options that restore soil moisture and improve vegetation, which can be more easily implemented at large scales.
- New research shows low-tech restoration methods effectively **increased vegetation productivity by 25%** and **kept plants greener longer** during the year.
- Restoration efforts also showed reduced sensitivity to precipitation over time, resulting in **greater resiliency** against the impacts of drought and climate variability.

On semiarid rangelands in the western U.S., water is life. Wet habitats—like riparian areas, streams, and meadows—comprise less than 2% of the landscape but are vitally important for wildlife and livestock. Unfortunately, nearly half of these scarce resources are considered degraded. Traditional approaches to restoring riparian areas and wet meadows are often intensive and expensive, limiting the extent to which they can be applied.

Increasingly, practitioners are using more cost-effective, low-tech restoration methods—like simple hand-built structures made of wood, mud, and rocks—that can be more readily applied to match the scope of degradation. These techniques are designed to kickstart natural recovery processes with the least amount of money, which allows landowners and managers to treat areas on a larger scale.

Goals of low-tech wet habitat restoration include enhancing floodplain connectivity, boosting soil moisture retention, and raising water tables, which produces more ‘green groceries’ that feed wildlife and livestock in the late summer and early fall.

New research shows that these low-tech restoration techniques are indeed making riparian and meadow areas more productive, and helping them stay greener longer. A [study](#) sponsored by the NRCS-led Sage Grouse Initiative and the Bureau of Land Management evaluates the outcomes of three different low-tech wet habitat restoration projects around the American West.

