

home:
subscribe
today's page 1
contact us
search

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column
analysis
post a comment
readers respond
backgrounders
archives

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A West that works

Think like a creek



Bill Zeedyk teaching a riparian restoration workshop in New Mexico.

Photo courtesy of Courtney White

A retired Forest Service biologist uses the natural meanderings of waterways to help restore the ecological health of the land

By Courtney White
for Headwaters News
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Question: You know cattle are walking up and down a trail in a deep, sandy bottom in desert country, cutting a deeper and deeper incision in the soft soil with each journey. You also know that left unchecked, the trail may soon capture the creek and start downcutting, dropping the water table and causing the whole system to unravel over time.

What do you do?

If you are an environmentalist, the traditional answer has been to kick the cows out and damn the social and economic consequences to the local community. If you are a rancher, the traditional response is to ignore the damage the cattle are doing and pray for more rain. If you belong to an agency, a typical answer might be to get a government grant to fix the damage and then orchestrate a symphony of backhoes, riprap, cement and paperwork.



Courtney White writes a monthly column for Headwaters News that focuses on people who embrace a sustainable approach to western resources.

White is executive director of the Quivira Coalition, a Santa Fe-based group devoted to collaboration as the approach to an ecologically healthy region.

Much of Quivira's emphasis is on ranching, but its principles of education, cooperation and innovation apply to many of the region's biggest issues.

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If you are Bill Zeedyk, who tried all of the above through a long career as a biologist with the U.S. Forest Service, you try something else. You get community members to construct short fences and place them squarely across the trail, at carefully measured intervals, so that the cattle are forced to meander in an S-pattern as they walk – precisely where you think the water would meander naturally.

Then you stand back and watch the water table come up, vegetation grow back, steep banks slough off, and water appear in the bottom of the arroyo – as Bill did in a pilot project he directed some years back. In other words, you let nature do the work – though in this case, only for a while.

"It worked until someone stole the fences," said Bill, with his warm, wry smile.

Bill's experience reminds us that environmental problems are, at heart, "people problems" – our society, culture, economics, and politics – which means that most ecological "fixes" require equivalent social solutions as well. Or, to paraphrase Aldo Leopold, fixing the "pump" without fixing the "well" is only doing half of the job.

However, at age 71, Bill would rather leave the "people problem" to somebody else. "I'm done arguing," he said, "I'd rather focus my energy on fixing creeks and roads."

And how. Over the span of two decades, Bill has become one the most inspiring teachers in the region. He has also developed a significant new toolbox for the restoration of damaged landscapes using techniques that "heal nature with nature," as he puts it.

This is important news. In this age of restoration we need all sorts of practitioners, including economists, entrepreneurs, ranchers, specialists, lobbyists, and myriad volunteers. But everyone needs new tools, as well as new teachers, in order to make progress where it counts most – on the ground.

Fixing the Pump

An inventory of the restoration toolbox that Bill has created demonstrates how his low-cost, low-tech solutions allow "nature to do the work." Each solution works to reduce erosion and sedimentation, return riparian areas to a healthier functioning condition, and restore wet meadows and other wetlands, all at a minimal cost compared to other techniques, and often with longer lasting success.

Those solutions include:

- one-rock dams
- picket baffles and deflectors
- wicker weirs
- rock berms
- vanes
- head cut control structures
- worm ditches
- "Zuni" rock bowls

Many of these structures are placed directly in a stream. Vanes and baffles, for instance, often constructed of wooden pickets (harvested locally), are used to deflect streamflow toward the opposite bank. Weirs are used to control streambed grade and pool depth. One-rock dams are used to stabilize bed elevation, modify slope gradient, retain moisture and nurture vegetation.

The goal of these structures is to stop down-cutting, often by "inducing" an incised stream to return to a "dynamically stable" channel type through the power of small flood events. They do this by restoring channel dimensions, increasing sinuosity, reestablishing appropriate meander patterns and pool/riffle ratios, restoring stream access to its floodplain, and raising the alluvial water table which enables riparian vegetation to grow.

"My aim is to armor eroded stream banks the old-fashioned way," said Bill, "with green, growing plants, not with cement and rock gabions."

To accomplish this goal, Bill uses to his advantage a simple fact: creeks want to meander. Even an incised system will create a sinuous streambed in a new floodplain over time. The trick to restoration is to speed the process up – a process he calls "Induced Meandering."

"As a species, we humans want immediate results. But nature often has the last word. It took 150 years to get the land into this condition; it's going to take at least as long to get it repaired."

– Bill Zeedyk

"The Induced Meandering Method," writes Zeedyk in a field guide, "uses artificial instream structures, manipulation of stream bank vegetation, and the power of running water to expedite channel evolution and floodplain development."

The employment of one-rock dams perhaps best typifies Bill's naturalistic approach. The typical response of landowners over the years to eroded, downcut streams and arroyos has been to build a tall check dam. The old idea was to trap sediment behind a dam, which would give vegetation a place to take root as moisture is captured and stored.

The trouble is check dams work against nature's long-term plans.

"All check dams, big or small, are doomed to fail," said Bill. "That's because nature has a lot more time than we do. As water does its work, especially during floods, the dam will be undercut and eventually collapse, sending all that sediment downstream and making things worse than if you did nothing at all."

"The trick is to think like a creek," he continued. "As someone once told me long ago, creeks don't like to be lakes, even tiny ones. Over time, they'll be creeks again."

One-rock dams, by contrast, don't collapse – because they are only one-rock tall. Instead, they slow water down, capture sediment, store a bit of moisture and give vegetation a place to take root. It just takes longer. One-rock dams can be enlarged slightly once secured by vegetation simply by adding another layer of rock.

"As a species, we humans want immediate results. But nature often has the last word," said Bill. "It took 150 years to get the land into this condition; it's going to take at least as long to get it repaired."

The key is to learn how to read the landscape – to become literate in the language of ecological health.

"All ecological change is a matter of process. I try to learn the process and let nature do the work," said Bill, "but you've got to understand the process, because if you don't, you can't fix the problem."

Trouble With Roads

Bill's second career as a restoration specialist, which began while he was still working for the Forest Service, had a simple genesis: bad roads.

During the 1980s, while serving as the agency's Regional Director of Wildlife and Fisheries, a position he held for fourteen years, Bill began to notice the deleterious effects of roads on wet meadows. Whenever a road crossed a wet meadow or a stream, he observed, almost invariably a culvert was installed too deeply, in order to make it lie well, often with profound and adverse effects on adjacent landforms.

"The culvert created a headcut that subsequently drained the meadow and often destroyed the resource," said Bill. "That's because the only goal of road construction at the time was cheap and safe roads with no regard for offsite effects."

While on a turkey hunt in the Zuni Mountains in 1985, Bill had a revelation. Disappointed that he wasn't finding any turkeys, Bill paused while hiking back to his truck, and suddenly took notice of a deep gully alongside the road. Following the gully, which started with the culvert under the road, he saw that it had drained a big meadow nearby.

"It was like a light went on," he recalled. "Maybe that's why there weren't any turkeys; the road had destroyed a key part of the habitat."

Bill went back to his boss, the regional forester, and got his concurrence to organize a team, which included the regional engineer, a hydrologist, members of the range staff, and others. They took a field trip to the drained meadow in the Zunis. Their reaction was positive, which led Bill to consider the power of collaborative thinking in problem-solving.

More immediately, it led to new designs in road crossings on forest lands. He also set about engaging the wildlife conservation community, of which he was an active member, in restoration projects around the region.

In the process, he scoped a lot of roads, which eventually led him to author a book on road repair and maintenance in 1995.

Bill is currently completing a new book on the subject entitled "A Good Road Lies Easy On The Land... Water Harvesting From Low Standard Rural Roads" and will be available from The Quivira Coalition this summer.

As an illustration of the impact roads can have on water, as well as the troubling consequences of our land illiteracy, Bill likes to tell the story of a rancher in the Estancia Basin, east of Albuquerque, who built a road across a wet meadow to his daughter's house. The road interrupted the natural flow of water across the meadow. When the meadow dried up, the rancher blamed the prairie dogs.

"But he did it himself," said Bill, "by starving the meadow of its water supply. What impressed me was that after some discussion, he recognized and acknowledged the problem.

The landowner was willing to try one of Bill's simple but unconventional remedies. Bill directed a backhoe operator to excavate 'rolling dips' every 300 feet or so in the road. This allowed the water to flow back across the meadow, instead of being captured in a ditch and hustled off the property as quickly as possible, as usual.

"I really respect him for getting at the real nature of the problem," said Bill.

The meadow came back to life.

"Too often we treat water as a nuisance, not a resource," said Bill, who calls his method of road repair "water harvesting."

Like many restorationists, Bill likes to think in terms of "opportunities" not "obstacles." And he thinks we're missing many of them.



Photo courtesy of Bill Zeedyk

"A huge part of our erosion problem in the Southwest is a result of bad roads," said Bill. "This is equal to overgrazing, in my mind. In fact, I like to say that $2 + 2 = 5$. Poor roads plus overgrazing by livestock is greater than the sum of the parts."

That's because less grass means more water coming off the hillslopes, which gets captured in a gully created by a culvert or a bad road ditch, which increases the erosive power of the water and causes even more erosion. In the meantime, the water is lost from the land it might otherwise nurture."

Vanes are made of pickets or rock and installed at strategic locations in Comanche Creek to direct stream flow left or right, away from an eroding bank to reduce stream sediment.

But you can't just fix the roads," he warned, "you must also do proper grazing. And vice versa."

Careful Steward

How Bill came to his second career says as much about his generation, and how far it has come over the decades, as it does about him.

Born in New Jersey in 1935, in what was then a rural area, to schoolteacher-parents, he attended the University of New Hampshire where he majored in forestry, having decided at the tender age of fourteen that he wanted to be a forester.

He liked to hunt, fish, and trap – in fact, he paid for his first year at college by trapping muskrats. This led to his interest in habitat management – because he wanted to trap more muskrats, a subject pretty much taboo now.

"Trapping taught me how to observe wildlife and encouraged a sensitivity to habitat needs. It taught me how to read a landscape."

Despite his burgeoning respect for nature, however, Bill grew up in an era when humans assumed they knew best.

"We were always looking for a better tool to control nature," he recalled. "That changed with Earth Day, when we began to see that there are consequences to all that we do. Up until then we rarely took responsibility for our actions."

This included his employer. Bill joined the Forest Service right out of college and in 1962, he became the first biologist on the Daniel Boone (then Cumberland) National Forest. He believed firmly in the wisdom of multiple use on public lands (and still does) because of its inclusiveness.

"Everyone stood to gain something from the common management of our forests and this made the public lands system strong," he said. "Unfortunately, today the interests are splintered and the support for

public lands has eroded to the point where I believe their future may be in doubt. There is no longer the bond of common ownership that protected the integrity of the national forest system."

As he rose through the ranks, he remained focused on the needs of wildlife. While in Washington, D.C., in the early 1970s, he helped draft the first policies for the Forest Service in implementing the Endangered Species Act.

He was also on the front lines of the development of riparian management rules within the Forest Service. It didn't make him very popular.

"No one valued riparian health back in the 1970s," he recalled. "One forest supervisor told me to my face to get lost. He said there were no riparian areas on his forest. It was all about timber and cows."

The unofficial attitude toward wildlife wasn't much better. There were few biologists in the agency and the ones there got caught up in intense turf battles with state wildlife agencies and the U.S. Fish and Wildlife Service.

"The old thinking was: get the range right [i.e. grazing] then the wildlife will be OK," he said. "In the old days 'wildlife' meant deer and elk, not much else."

Things began to change, however, mostly as a result of intense pressure from an environmental movement that was flush with victory at the time. Standards rose, especially for riparian areas, but so did conflict and stress, along with the number of lawsuits.

By 1990, Bill was done arguing. He retired and tried to relax. But a personal tragedy and an innate desire to make things better pushed Bill into his new career. Upon completing a series of classes with hydrologist and restoration pioneer Dave Rosgen, who Bill credits with organizing his ideas, Bill was asked by Tom Morris of the Navajo Environmental Protection Agency to take a look at a serious erosion problem that threatened Hubbell Trading Post, near Ganado, Ariz.

It became the first project where Bill could try "Induced Meandering" on an ecosystem scale. It appeared to work, and soon he found himself working in the Zuni Mountains again where he studied a program the Zuni people had invented to stop headcuts in streams and meadows: shallow, rock-lined depressions that Bill came to call "Zuni bowls."

Bill fiddled with all these ideas for a few years, only giving them a proper working out while on a consulting job in Mexico in 1996, which he liked a lot because there was no paperwork.

Back in the states, the emergence of Bill's ideas was greeted with a mixture of skepticism and outright resistance. Induced Meandering in particular was a hard sell to regulating agencies because it operated on the principle that creating more erosion – temporarily while the creek created a new floodplain – was necessary to stop erosion. And Bill's emphasis on "sticks and rocks" as a way to fix creeks instead of backhoes, hard hats, diesel, cement, and gabions was a difficult novelty for some to accept.

Working in Bill's favor, however, was a general shift in society, away from the "humans know best" paradigm that had dominated natural resource management and on the one hand the "leave it alone" paradigm that dominated environmentalism. The talk now was all about restoration.

Today, nearly 16 years after his retirement from the Forest Service, Bill has never been busier. He is, in fact, booked. Of all the indicators that Bill

employs to monitor the success of his work, this may be the most telling.

So, the next time that you see a cattle trail beginning to dig into the soil along a fence in a way that should raise an alarm, consider one of Bill's ideas: place an obstacle in the trail, such as short jog in a fence, and make the cows meander around it.

Only, don't think of it as an "obstacle" - consider it an "opportunity."

A number of publications focused on Bill Zeedyk's work are available from [The Quivira Coalition](#). Details of a major restoration project involving Bill can also be viewed at www.comanchecreek.org

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