June 2004
Vol. 6, No. 4

The Quivira Coalition
Working to Achieve Harmony Between Humans and Nature

Watershed Management in Nature's Image: About Commitment to and Kinship with a Place

by Jan-Willem Jansens

When I came to New Mexico eleven years ago, I silently treasured the goal of becoming part of a community and adopting a piece of land that I could call home. Over time, I realized that both personally and professionally this meant that I had to commit to a place and develop an intimate relation with it for a significant period of time.

I also realized that many landscape degradation problems originate in the rapid growth of the world population and the related increase in people's mobility. Who is still rooted in their place of birth? Who knows intimately the climate, soils, and plants and all the quirks of weather, water, or wildlife dynamics in his or her home region? Many people have become too distant from the land, dependent on knowledge from books, pictures, and anecdotes. Many of us hardly ever know it from the experience of living on and working with the land; from listening to it, talking with it, feeling it, and having observed it for a lifetime or more. We are no longer part of the natural community of the place we live in. That makes us as individuals and as institutions distant and sometimes ignorant toward the land. Fancy this, that in a recent meeting of fifty community leaders and public land managers who are all stakeholders of the Galisteo watershed, nobody was born and raised in the area! If we happen to be charged with or even committed to land management, we risk being inadequately educated by the land and often forced to make decisions that are bold and shortsighted. Aldo Leopold had it right, we often do not think like a mountain. . . .

Brought Up Amidst Land and Water

Born in The Netherlands to a family of geographers, I was introduced to the mysteries of landscapes at an early age. There are still photos of me as a 3- or 4-year old playing amid the cobbles of a small stream of the Ardennes, the low mountain range in the border region of Belgium, Luxemburg, and Germany. My play was to trick the water into following new paths by moving twigs and

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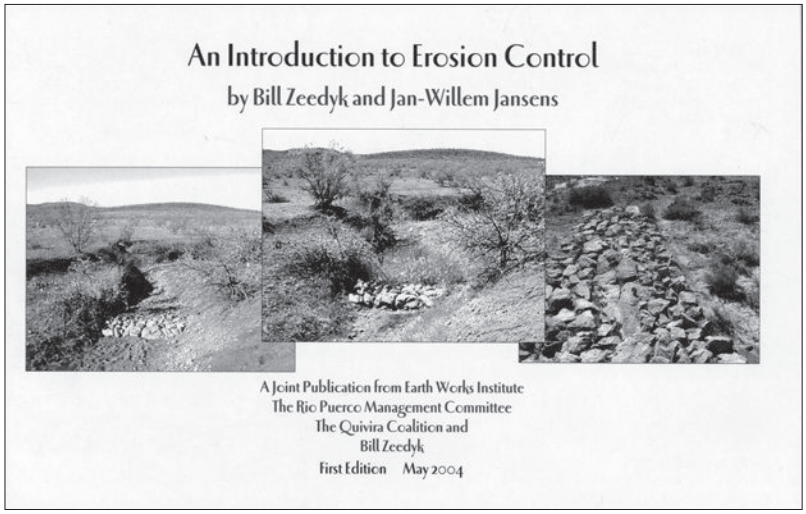
Editor's Note

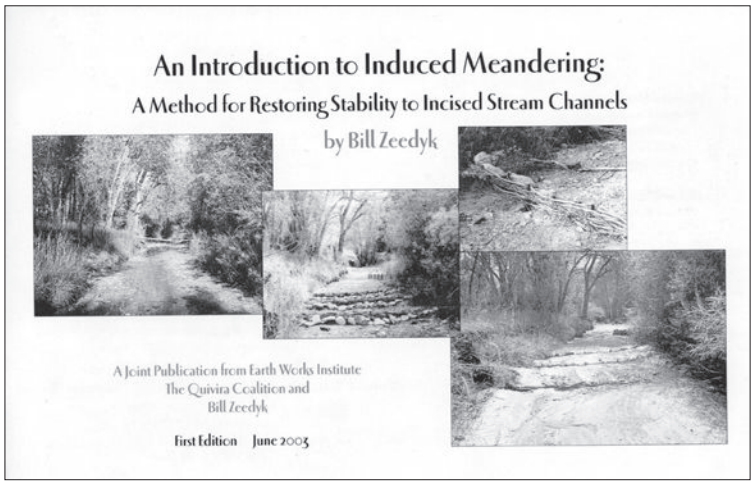
This is the last in our series of newsletters on *working in nature's model.* This issue is about watershed management and restoration. We think you will find it both informative and provocative.

There has been much talk lately in the agencies and within funding organizations about working on a "landscape" or "watershed scale." Thus far, there has been little actual work on the ground within such a framework. The articles in this newsletter emphasize the importance of such work and why we need to start doing it soon.

New! Erosion Control Field Guide Available



The new *Introduction to Erosion Control* by Bill Zeedyk and Jan-Willem Jansens has arrived from the printer. These useful guides are companions to the *Introduction to Induced Meandering* and *Rangeland Health and Planned Grazing Field Guide* published last year. All three are FREE and available from The Quivira Coalition. Publication of these guides was made possible by support from Earth Works Institute, Bill Zeedyk, The Quivira Coalition, the Rio Puerco Management Committee, the EPA, and the New Mexico Environment Department, Surface Water Quality Bureau.



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From the Founders

Jim Winder
Courtney White
Barbara Johnson

It's hard to believe it has been seven years already since we started.

We were reminded of the passage of time recently when we returned to the Unitarian Church in Santa Fe to give a talk on The Quivira Coalition and the New Ranch. It was the first time we had been back since the (nearly) fateful day in mid-June 1997, when we put on our first workshop. We arrived late that day, with Dan Dagget in tow, only to realize that we had the wrong key to the door. Panic stricken, we called around desperately, finally locating the right key just in time. If we had not, The Quivira Coalition might have fallen on its face right out of the chute.

We didn't, however. Fifty people showed up for that first workshop, including a healthy contingent of ranchers. Speakers included Dan, Jim Winder, Kris Havstad, Frank Hayes, and Ray Powell (we have a video copy someplace around here). Our only product was our first newsletter, which was distributed to every chair. We'd be lying if we said we knew what we were doing. Hope was our only asset.

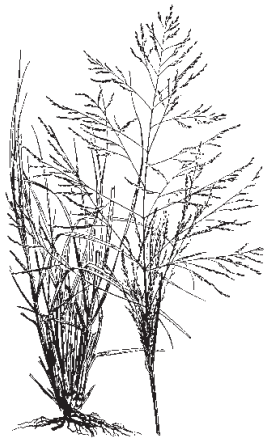
Seven years later, we can't help but be struck by how much has changed, and how far we've come. For one thing, the slide show now takes well over an hour to get through—and that's just on our work! In the early days we scrambled to fill up a slide tray, often raiding the shows of our friends. Today, we run the risk of going on too long. Fortunately, the crowd at the Unitarian Church enjoyed the show.

We're proud of our growth and our accomplishments. We retired the Dan/Jim/Kris show in the summer of 1999, as it became clear to us that the idea of ranchers, environmentalists, and scientists getting along was no longer news. And we couldn't take much credit either—common ground was being discovered all over the West. Since then, we've tried to roll with the times, commencing lots of restoration work, starting an Annual Conference, and helping to launch the Radical Center, among other activities.

More recently, we are proud of our modest role in helping launch the Southwest Grassfed Livestock Alliance (SWGLA), which holds a great deal of promise for ranchers and consumers alike, we feel.

And there's more to come. New, larger challenges and opportunities loom on the horizon, including the possibility of managing a grassbank. We're both thrilled and awed by what may lie ahead. But most of all we're very happy to have the support of so many diverse people and organizations around the region.

Hopefully, the best is yet to come.



And If a River Runs Through It

by Bill Zeedyk

Elk resting in the riparian area during spring runoff at Yellowstone National Park. (All photos with this article are courtesy of the author, unless otherwise indicated.)

Editor's Note: *This article was taken from a talk Bill gave at our 2003 Annual Conference. Any errors are those of the editor, not the author.*

You may wonder about my sanity and my ability to reason. Here I am, somebody who likes to work with water in that state in the union that has the least surface water per capita! The only thing we've got going for us in New Mexico is that some other states are growing faster than we are, so they'll probably shift the scale. They won't have any more water, but they'll have less per capita than we have.

I have been involved in the natural resource field all my life. I built my first dam to try to help restore a wetland when I was fourteen. But I had an ulterior motive. I was saving money to go to college to be a biologist, and I trapped furs to make money. (That's heresy in this day and age, but nevertheless I did.) I trapped enough furs to pay for my first year through college. Those furs were muskrats, and by restoring an old marsh, I had more muskrats than I would have had otherwise. Today, we have other uses for marshes and streamside areas.

My subject is "And If a River Runs Through It." We all saw the movie, about a beautiful, rushing, white water stream with steelhead trout. We don't have any steelheads. We don't have very many rushing white water streams in New Mexico, especially this year. But every ranch has a river running through it. Water running downhill is a river.

Obligations and Opportunities

There are obligations and opportunities that go with having a river running through the ranch. There are benefits and values for the rancher, in economic terms, for the ecosystem in ecological terms, and for society, because we all use and enjoy those values or products produced by that river, whether it's a perennial river or an ephemeral river. In a sense, the river "belongs" to all of us.

But to the cattleman, the streamside areas next to a river of any size are especially valuable, because those streamside soils are deep alluvial soils with high levels of organic material and fine-grained silts and clays. They develop into loams that can hold the fertility and wick moisture through the soil. Our sub-irrigated streamside wetlands have far more capacity to produce vegetation than the adjacent uplands. That production may vary from 4,000 to 6,000 pounds per acre per year, as compared to many of our uplands, which have been invaded by piñon-juniper trees, with maybe 100 to 200 pounds per acre per year, if we're lucky. So one acre of riparian area or wetland equals 25 acres of upland in terms of forage production alone. But if you add on the reliability of that forage yield and the diversity of species found there, it's far more valuable than just the tons of forage produced.

In addition to livestock using riparian and streamside areas, most of our wildlife species in New Mexico prefer streamside areas. Of course, elk is a hot-button issue in the ranching community. It's both an income producer, if you have the opportunity to sell hunting rights, and it's a competitor with your livestock. Elk tend to be attracted to streamside areas too, and sometimes they can frustrate any program for

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livestock management that calls for resting riparian zones, because the elk don't respect the fencing and they don't respect the goal! But, on the other hand, this is a part of the habitat that they need. The elk wouldn't be there, except that there's a lack of forage on other parts of the ranch. So the impact of the elk in the riparian zone is worse in the years of drought and much less in the good years.

What Rivers Do

There is a little branch to Bluewater Creek over in the Zuni Mountains, south of Grants. It's an intermittent stream—it has water flowing in it more than six months of the year, but it doesn't have water every year. During snowmelt season, it runs at nearly bankfull. There's an awful lot of things happening in that river. And those things are: It's carrying water down to Bluewater Reservoir so somebody can irrigate their alfalfa field with it. It's carrying water to Bluewater Creek to support trout. It's carrying water to Bluewater Creek to produce willows for the beavers that live along the creek. But most importantly, *it's carrying sediment.* And that sediment is in two forms. It's suspended sediment that makes the water turbid. And there's sediment bouncing along the bottom of the creek that we call *bed load.* And that sediment is made up of silts and sands and gravel and cobble, and boulders, depending on the size of the flood. When it's at bankfull, the water spills out onto the land, on what is called a *point bar*, and that's where the sediments are deposited. The sediments bump along through a "riffle" area and pick up speed as they come around the bend. (See Figure 1.) The water's running fast going into the curve and slow coming out of it, so sediments drop out on the inside of the curve, but they erode the bank and pick up silt on the outside of the curve. And the riffled area determines the gradient or the steepness of the creek. The stream tends to drop the same amount in elevation from one riffle to the next, so the grade between riffles tends to be constant.

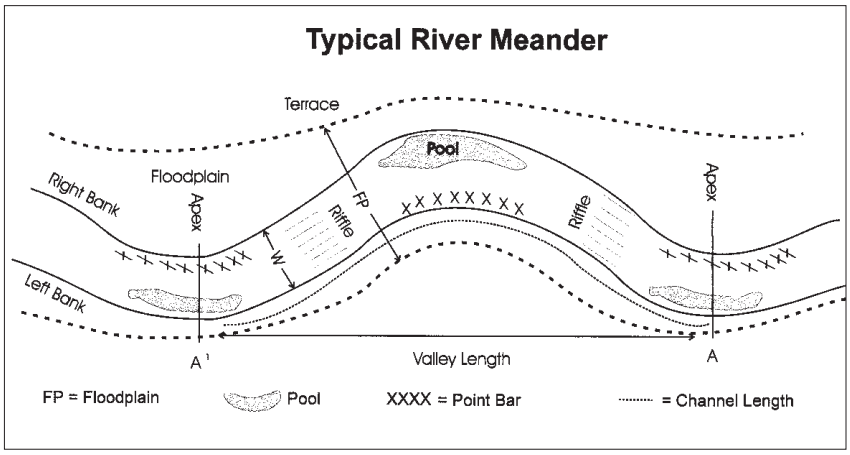

Figure 1. (Graphics courtesy of Tamara E. Gadzia.)

Wetlands

And you say, well, what's that got to do with running a ranch? It's got everything to do with running a ranch. Because how fast that river is flowing and whether or not

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If a River Runs Through It

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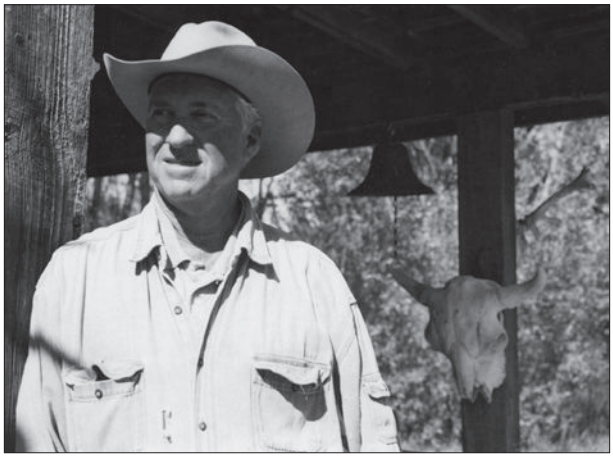
Making Conservation Pay

Jim Crosswhite and the EC Bar Ranch, Nutrioso, AZ

"What we are trying to do here is demonstrate how the integration of conservation and sustainable agricultural practices can improve ranching economics, water quality, and wildlife habitat while meeting public policy objectives."—Jim Crosswhite, quoted in the *White Mountain Independent*, September 5, 2000



Jim on his porch. (Photo courtesy of Courtney White.)

It is not a coincidence that for ten years Jim Crosswhite ran circles around the Himalaya Mountains—literally. To say he enjoys a challenge, usually doing what others choose not to do is like saying a fish enjoys water, or a cow enjoys grass. Following successful careers as a trader on the Chicago Board of Trade, adventure travel operator, and organizer of high-altitude endurance trials, it is little wonder that after "retiring" to a mountain meadow near Springerville, Arizona, Jim would try to cut the Gordian knot of ranch economics in the American West.

He may very well have succeeded.

When Jim purchased the 300-acre EC Bar Ranch in 1996 he knew it was in trouble. Rabbitbrush and sumac infested the uplands; blue gramma, the predominant native grass, yielded only three hundred pounds of production per acre; the riparian area was rated "non-functional" due to raw, exposed streambanks; there were no cross fences or livestock drinkers, elk were a problem, and the ranch's infrastructure was in disrepair. Moreover, Jim soon learned that Nutrioso Creek is native habitat for a federally designated threatened fish species—the Little Colorado River spinedace (*Lepidomeda vittata*).

Things became even more "challenging" in 2000 when the Arizona Department of Environmental Quality (ADEQ) completed the *Nutrioso Creek TMDL for Turbidity*. This report identified seven out of 27 miles of Nutrioso Creek, including Jim's three-mile stretch, as exceeding Total Daily Maximum Load standards for clean water due to exposed streambanks aggravated by historical activity by livestock and elk. Under the federal Clean Water Act, the Environmental Protection Agency (EPA) coordinates with state agencies in an effort to reduce non-point source pollution, such as excessive levels of water-borne sediment, or turbidity, which reduces water quality to the detriment of wildlife and human populations. Jim's ranch was high on the list for action.

In other words, there was no shortage of challenges confronting Jim on the EC Bar Ranch because, without a change in ranch management practices to improve water quality and aquatic habitat, Jim felt there was a risk of losing water and property rights.

Making It Work

This is where the story, however, takes an unusual turn. Rather than get mad, get even, or give up, Jim decided to cooperate with the agencies. "When a Game and Fish guy came to our valley," said Jim, by way of an example, "one of my neighbors pulled out his gun and ran him off. But after realizing the benefits of partnering with agencies to improve my property, I invited him to talk."

To his surprise, Jim liked what he heard. So, rather than struggle against the regulations, Jim took a long look at the list of recommendations in the species recovery plan and TMDL report. Some were already being imple-

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Making Conservation Pay

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mented through a comprehensive Conservation Plan prepared by the Natural Resources Conservation Service (NRCS) in 1997. He decided to give the rest of them a try, plus a few extra. "I didn't feel like I was giving in," said Jim. "They had good workable ideas. And they wanted to help. In fact, I haven't met a government employee that I couldn't work with. Agencies have different priorities, ADEQ focuses on water quality improvements, Game & Fish Department focuses on wildlife improvements, while I focus on ranching economics. All three approaches are not only compatible, but essential to success in today's environment."

Jim swung into action with the energy and determination of a long-distance runner. Here is a short list of the most successful Best Management Practices (BMPs) that Jim has implemented on the EC Bar so far:

Pasture improvements. Jim built elk-proof fence, and riparian and buffer strip fencing to create 15 separate pastures for rotational grazing. He limits grazing in riparian and buffer pastures to the dormant season only, with careful monitoring. Rabbitbrush has been controlled and eradicated by mowing, fire, and root plowing, followed by overseeding with native cool-season grasses. Erosion has been reduced, habitat improved, and annual livestock forage production has increased from 300 lbs/acre in 1996 to 4,000 lbs/acre in riparian pastures and 2,000 lbs/acre in irrigated upland pastures.

Riparian restoration. After hearing Bill Zeedyk speak at a Quivira meeting about the benefits of induced meandering and stream stabilization structures, Jim hired Bill to develop a riparian restoration plan. Over 20 riffle weirs, 10 post vanes, and 80,000 willows have been used to address TMDL and habitat concerns. The objective is to slow water down so sediment will naturally filter out to improve turbidity, protect streambanks from erosion, increase aquatic and wildlife habitat, while raising the water table. This process has resulted in more forage production with less irrigation.

Improved irrigation. Jim installed off-channel water wells with drinkers for daily waterings by livestock and wildlife. The wells are also used to supplement surface water used for irrigation. A 250,000 gallon water storage tank, 2,000 gpm diesel powered water pump, 20,000 feet of above-ground pipe, and 100 "big gun" sprinklers have replaced an earth ditch system wasting 100 million gallons of water annually due to seepage and evaporation. About half the sprinklers are located along two miles of riparian corridor to help establish and maintain riparian vegetation as surface flows dry up during drought conditions.

[Top] Riparian fencing to keep livestock out of the riparian zone. It has an electric top-wire to discourage elk from jumping in. The gates allow the livestock to use the area in the dormant season. [Bottom] Willow planting in April 2003. Three thousand willows were planted to stabilize the streambanks. (All photos with this article are courtesy of Jim Crosswhite, unless otherwise indicated.)

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Making Conservation Pay

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Judging from the numerous tours, lectures, and articles he has posted on his web site, Jim has enjoyed significant success with his restoration work. In June 2002, for instance, he hosted Arizona Governor Jane Hull and other dignitaries in a celebration of the 30th anniversary of the passage of the Clean Water Act. The Director of ADEQ was quoted in a press release as saying the "EC Bar's achievements serve as an excellent example of the power of environmental stewardship on private land."

Post vanes designed by Bill Zeedyk were placed on Nutrioso Creek to divert water from eroding banks earlier this year.

To Jim, however, the best indicator of his success didn't involve a press release. It happened in late 2003, when the ADEQ decided to relocate the "reference reach" for 27 miles of Nutrioso Creek from a site 10 miles downstream, to "Reach 3" on the EC Bar Ranch. This is significant because, in 1996, "Reach 3" was officially rated as "nonfunctional" by hydrologists. "Now it's a beautiful, properly functioning E-type channel, producing over 4,000 lbs/acre," said Jim, referring to the Rosgen system of stream classification. (See page 26.)

"While I didn't say anything to them at the time, I consider this to be about the highest award I may ever receive for riparian restoration, and it means a great deal to me. From a practical perspective, after travelling to more than 70 countries and around the world for 30 years, walking down the creek on a summer's evening with my wife and old dog is as good as it gets."

Making It Pay

The other unusual element to the EC Bar story is how Jim paid for all this restoration work: he learned to cooperate with public agencies to meet public policy objectives while improving his own ranching economics. "My philosophy is a simple one," said Jim. "When a government agency produces a report that identifies a problem affecting my property and recommends solutions, then I want to participate in any grant program they may offer, including matching with my own funds. As a private landowner, I can learn about issues, cooperate with agencies, and help resolve water quality and habitat concerns, while improving ranching economics. I also like to share information with other farmers and ranchers through my website, films, and group tours of projects." So far, Jim has written over 20 grant proposals, with about a 90% approval rate. About $1.3 million in projects have been completed on the EC Bar Ranch, with Jim matching 50% of public funds. Recently, Jim was awarded an ADEQ grant to plant 50,000 willows on the Apache Sitgreaves

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Making Conservation Pay

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National Forest downstream to improve water quality to help meet turbidity standards.

Whatever answers eventually develop, Jim likes to emphasize one central point: "conservation improves profits. I've more than doubled the number of animal units per acre by improving water quality through best management practices," said Jim, matter-of-factly. "More importantly, all the water quality and habitat improvement projects I've done have increased my property values, no question about it." It's all about incentives, Jim believes. "These days, society would rather pay me to grow grass, protect fish, and raise willows rather than just cows," he said. "If that's the market, then I'll deliver conservation practices and cows." Over the long run, Jim believes that protecting the improvements with a conservation easement that restricts future property development on part of the EC Bar Ranch is the best approach in his situation.

Maybe this philosophy has some merit because on Thanksgiving Day, 2003, Jim suffered a sudden massive blood clot in his right leg that moved to his lungs, stopping his heart. "I prayed to finish my riparian restoration projects, be with my dog when he eventually dies, and see my wife again, in that order," Jim said. "As the first person in history to ever pray to finish riparian restoration, I guess it must have been important because after a few months, I am back to normal." The only medical explanation offered by Jim's doctors is that a "miracle" occurred that restarted his heart, prevented damage, and allowed an exceptionally rapid recovery. Jim says, "I am grateful for a second chance. I work faster and on more projects now."

Making The Steps

Jim has some suggestions for participating with state and federal agencies, especially for those private landowners with TMDL or species recovery plans available.

"*First*, ask the local NRCS Conservationist to help develop a comprehensive conservation plan on your farm or ranch. If Environmental Quality Incentive Program (EQIP) funds are insufficient to meet the objectives, use the Plan as a guide to apply to other agency grant programs.

Jim's work at the EC Bar was included in a 45 minute film entitled *Keeping our Waters Clean,* which aired on CNBC December 8, 2001.

"*Second*, focus on the highest and best assets on your property. Since we are in a long term drought, perhaps 40 years or longer, the 'old ways' experienced over the last 30 years may not work very well. If you own a riparian zone, concentrate on restoring and protecting it as your most valuable asset. The most public funding is available for riparian restoration.

"*Third*, learn what public programs are available to improve your assets. Even when a match is involved, it can be to your advantage to use grant funding rather than borrow money at the bank. There are favorable tax treatments for conservation projects leading to expectations of improved ranching profits.

"*Fourth*, spend bad weather days inside writing grants, which is

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Like Water in the Bank: the Promise of Alluvial Storage

A concept paper by Bill Zeedyk, Courtney White, and Jan-Willem Jansens

If, as Mark Twain famously observed, whiskey is for drinkin' and water is for fightin', then the West should brace itself for a major rumble. In New Mexico, for instance, stubborn drought, steady urban growth, declining rural economies, rising environmental concerns, and a widening competition for scarce resources all point in one direction: a high-stakes conflict between urban and rural populations over water.

To avoid, or at least lessen, the effects of this rumble, a number of intriguing ideas have been brought forward recently. One that merits further consideration is the idea of a "Strategic River Reserve," proposed recently by the nonprofit organization Think New Mexico in a report entitled *Rio Vivo!* It is an idea based on the example of a Strategic Petroleum Reserve, which "banks" petroleum in order to buffer the United States against a disruption in the oil supply. In New Mexico, under this concept, a board would be established to "bank" water for emergencies by a number of innovative mechanisms, including the purchase of water rights, monitoring, and other means.

We offer a complementary idea: **let's "store" water in the banks of creeks and streams all across the state**. Currently, water "storage" generally means New Mexico's system of lakes and reservoirs, which due to the high rate of evaporation, especially on large bodies of water such as Elephant Butte Reservoir, waste precious resources. The "savings" accrued by our lakes and reservoirs are not as high as they might be if water were safely stored in the creeks where they originated.

We think water can be better protected in the banks of New Mexico's streams. We also think landowners should be compensated financially for land management practices that create a healthy hydrological cycle, resulting in increased storage to alluvial systems. We think urban growth can be redesigned so as to protect natural recharge zones, according to geomorphological conditions, so that storm water becomes a resource to the community rather than a nuisance. We think if the downstream user paid the upstream owner to put water in a "savings bank," that could generate interest over time.

According to Wayne Elmore, a retired hydrologist with the BLM in Oregon, a simple change in livestock management on Bear Creek—to dormant season use—resulted in a ***two million gallon increase*** in water storage in the banks of the creek. As the riparian vegetation rebounded from decades of overgrazing, water slowed and began to be absorbed again into the alluvial soils and sedimentary strata of the valley floor. When the stream is at flood stage, water is temporarily stored in its banks, only to be released again during low-flow periods. The hydrological cycle on Bear Creek was thus restored to a healthy condition.

What happened on Bear Creek can happen in New Mexico's creeks and rivers—and already is

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Like Water in the Bank

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in some places. Restoring stream channels to the point that bank storage could function at potential might require not only changes in livestock grazing practices but also changes in some road crossings, culvert elevations, road alignments, and related land uses.

But, the "benefits" that such a savings program would create include:

• A reduction in soil erosion, including the amount of siltation in reservoirs.

• An increase in grass and riparian vegetation which would have big benefits for wildlife and livestock alike.

• Healthier and more attractive greenbelts in urban developments.

• Local recharge of groundwater supplies.

• Improved fish and bird habitat.

• Increased bank storage and increased or extended low-flow discharge.

• Job creation, "fixing" creeks as well as road modifications and upgrades.

• Compensation to rural landowners for storing water, possibly in the form of "water credits" that could be sold, traded, or leased for cash.

• Reduced conflict between urban and rural populations.

• Encouragement for the "anti-commodification" of water.

• Improvement in recreational opportunities as land improves and is maintained.

The elements of an alluvial bank storage program would include:

1. Creating hydrological maps of suitable valley areas and potential recharge zones so that areas with high potential for bank storage could be selected for treatment.

2. Using best management practices in new real estate developments to protect the best soils, maintain capacity, and recharge the alluvial strata.

3. Creating compensation strategies for landowners who would create or protect bank storage sites.

4. Developing guidelines for classifying areas—to identify the highest potential areas.

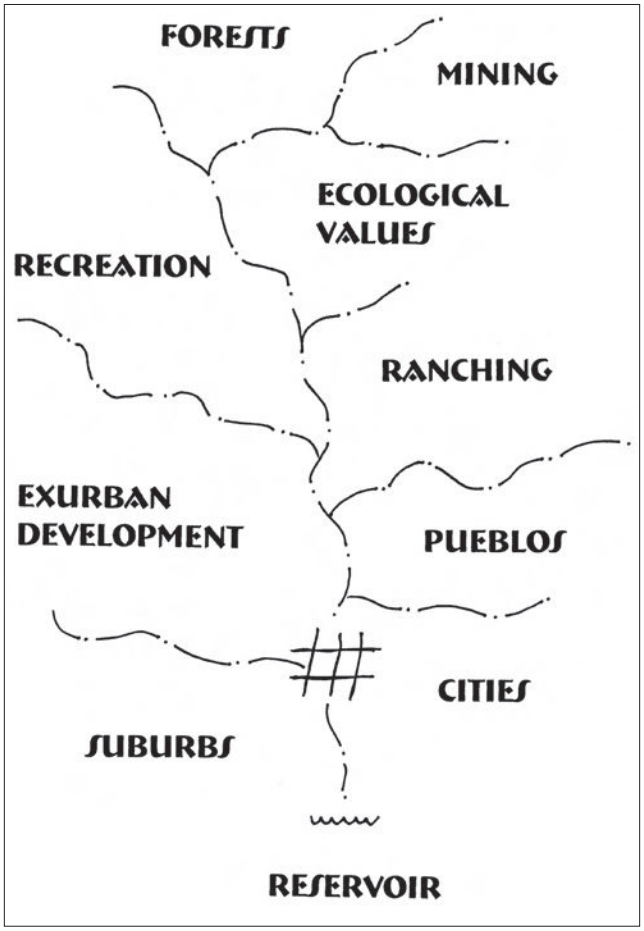
5. Developing and encouraging the use of Best Management Practices that help to store water.

6. Developing a capability to measure and monitor channel response. The critical factor will be the ability to quantify the amount of water storage.

7. Developing guidelines for better decision making—where is the most valuable land? Should we build houses, for example, on the best recharge zones?

8. Encouraging cooperative oversight.

9. Working at watershed scales.



A model watershed. (Concept by Bill Zeedyk, map by Courtney White.)

The Far Horizon

by Courtney White

"Conservation is a positive exercise of skill and insight, not merely a negative exercise of abstinence or caution."
—Aldo Leopold

On the eve of the fortieth anniversary of the landmark Wilderness Act, I am compelled to ask a heretical question: should wilderness protection continue to be a top priority of conservation activists?

It is a maxim of any social movement that old ideas, and the motivations that inspired them, unless reinvigorated by fresh meaning become, well, old. Like any enterprise, to maintain "profitability" movements must evolve in response to changing knowledge, technology, and values or else run the risk of becoming anachronistic.

This is exactly where the wilderness concept finds itself today—struggling for relevance in a modern world gripped by global climate change, rampant consumerism, political gridlock, and social lethargy. Even in the American West, where I live, wilderness protection is increasingly like, to paraphrase Aldo Leopold, "fixing the pump without fixing the well." Shielding bits of land from the destructive behavior of human beings without effectively influencing the forces that threaten them in the first place means they are not really protected in the long run.

That's because the essence of the crisis confronting us today, as it was a century ago, is social and cultural, not ecological. The Wilderness Act is a social document, not an ecological prescription. It was a legal, and thus cultural, response to the nation's "frontier hangover" which was destroying the primitive nature of our landscapes at a rapid clip. Leopold and others made ecological arguments for wilderness protection, but the potency of the concept primarily lay in its social **value**—what it said about ourselves, our behavior, our strengths, and our weaknesses.

Does the wilderness idea retain that potency today? I think it does not. "Protection" does not mean what it did forty or eighty years ago. The threat from motorized vehicles, for example, no longer compares to the effects of global climate change or noxious weed infestation, which ignore lines drawn on maps. The recent vigorous arguments for the expansion of protected areas on ecological grounds, which, while meritorious, do little to solve the underlying issue: how we alter the coalescing social forces that are threatening the ecological integrity of the planet. Reinvigorating the wilderness idea can't "fix the well" anymore. Instead, I think we need a new strategy altogether.

Vision

What worries me most about the current state of affairs is the steady disengagement of people and society from the natural world. This concern might seem ironic given the dramatic rise over the past two decades of recreational use of our public lands, but I'll argue that the overall trend in society is one of increased isolationism, especially from nature. We are spending more time in front of our computers and less time outdoors (and probably less time with our families). The trend of work continues to flow toward cities and indoors—just ask

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The Far Horizon

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the sons and daughters of farmers and ranchers about their future plans and dreams. What flow there is toward the rural tends to be in the form of recreation or subdivisions, both of which create more problems than they solve.

Meanwhile, the science community has determined that much of the land under our care is in need of ecological restoration. New protocols for the qualitative and quantitative assessment and monitoring of land health have been developed, allowing us to gauge the relative "health" of landscapes. And the emerging picture isn't pretty. At the same time, an entrepreneurial spirit has spread across the West focused on "fixing" degraded land by employing methods modeled on nature's principles. As a result, a shift is underway in the region away from acts of "shielding" and towards acts of "healing."

The conservation movement needs to catch up with this shift. In fact, I think the primary challenge confronting the conservation movement is to develop a paradigm that reengages people with the land that emphasizes **work**, and not simply weekend recreation. Play and aesthetic appreciation are fine as far as they go, but if our goal is to join the movement to restore and maintain ecological integrity of land for the long run, then our engagement with nature needs to be deeper than a quick trip to a national park.

And it is only through the meaningful engagement called "work" that we will influence the social forces that threaten our planet and existence.

I have a vision of a new conservation movement that sends volunteers into riparian areas to plant willows and construct structures that heal creeks collaboratively with landowners; I see ranchers being paid by city folk to repair historically damaged arroyos so grass can grow and water can be stored in the banks for downstream use; I see conservationists learning from scientists how to restore a landscape properly and sustainably; I see birders and ranchers looking for ferruginous hawks together; I see open space protected not by fences, but by work—people restoring, managing, healing, and earning a paycheck from labor within nature's model.

Herding cows in the West Elk Wilderness near Paonia, Colorado. (Photo courtesy of West Elk Grazing Association.)

I see a new conservation movement that cascades **upward** from the real grassroots (grass and roots), toward social and political centers of power, changing our behavior in ways that, to paraphrase Wendell Berry, no longer deplete soil or people. By a profitable and regenerative reengagement with

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nature based on work and restoration, we can begin to influence those social and economic forces that imperil the very heart of what we love and know to be essential to our existence—a healthy relationship with the natural world.

Six Steps

A new conservation movement will come into existence, however, only with difficulty. Old ideas and prejudices will take time to tear down or replace. I propose, therefore, that individuals and organizations consider six steps, or transitions, as key:

San Pedro Parks Wilderness, northern New Mexico. (Photo courtesy of the author.)

1. Give Up the Myth of Pristineness.

Whether a "pristine" environment ever existed before or not, it doesn't exist now. Anywhere. Pollution, climate change, CO_2 buildup, soil erosion, and a myriad of other global anthropogenic changes are here to stay for a very long time. Additionally, ecologists are telling us that the myth of the "balance of nature" was just that —a myth. Instead, they argue that nature exists in a "state of flux" —always changing, always adapting to perturbations, and a little bit chaotic. So, rather than try to "conserve" the natural world, I think activists should encourage a dynamic relationship with nature that acknowledges the "impure" world that we now inhabit.

2. Soil First!

Our land needs more, and better, stewardship, not less. Much of the American West, for instance, exists in various degraded conditions, the result of historical damage, poor mitigation strategies, and, now, global changes. At the same time, ecologists have developed a much clearer picture of what constitutes land health at the level of soil, grass, and water—what they call "functionality." Consequently, restoring, maintaining, or improving this "land mechanism," as Aldo Leopold called it, should be a top priority for conservationists, including restoring health to wilderness areas and national parks. Preservation alone is no longer an option, because without healthy land at a baseline level, much of what we value will be jeopardized over time.

3. Be More Balanced.

The old movement's habit of stratifying land by degree of "pristineness"—with national parks and wilderness areas at the top and working landscapes at the bottom—created a hierarchy of land quality that was elitist and had the effect of encouraging disengagement. Wilderness can still be a "gold standard" for a new movement, but it should also acknowledge that working landscapes matter. This means a new movement needs to be more democratic than in the past—ques-

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tions of ecological function, wildlife protection, cultural diversity, economic prosperity, justice, and egalitarian access for all citizens need to be balanced together. This is crucial because as America continues to urbanize, the need to reconnect its citizens with its natural heritage at many scales and many locales becomes increasingly important.

4. Talk About Boundaries.

A new conservation dialogue needs to expand from simply doing "what is right for the caribou" to questions about curbs to society's appetites and behaviors. Scientists talk about negative environmental consequences when systems cross ecological thresholds, but social and political thresholds exist too. And all three are often connected. The Dust Bowl of the 1930s, for example, was as much about an unsustainable social activity as it was about breaking natural boundaries. Conservationists should talk about both—not only what constitutes "nature's model" but how we might learn to adapt to it.

5. Profit Is Not a Dirty Word.

If it isn't about economics, and profit, at some level then long-term environmental and social health will not be achieved. Lectures by conservationists about ethical behavior without pragmatic solutions that help people make changes in order to reach a more sustainable future will always be just that—lectures. Fortunately, new models of sustainable work have emerged in the last twenty years. The new entrepreneurial spirit on the land aims at creating a "healing economy"—as opposed to the traditional one that exploits natural resources for short-term gain—and doing so with the aim of making it pay. Restoration, for example, should, and can be, profitable. Conservationists should help by supporting this type of new business activity.

Bill Zeedyk [left] and participants during a riparian restoration workshop on Largo Creek near Quemado. (Photo courtesy of the author.)

6. Join the Radical Center.

A new movement should eschew the extremes. It needs to focus on pragmatic solutions that solve real problems—and that means mobilizing the middle. This means engaging ranchers, scientists, public land managers, poets, farmers, dayhikers—anyone dedicated to restoring ecological and economic health to this country, and doing so collaboratively, and with meaningful measurements of our success. It is in the middle—the Radical Center—where the work can begin.

Reengagement means asking not what the land can do for you, but what you can do for the land.

Watershed Management in Nature's Image

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Jan-Willem Jansens. (Photo courtesy of Gene Peach.)

cobblestones around.

It was not until I was 17 years old, again on a vacation in the Ardennes, that I knew that I wanted to study landscape architecture. I realized at that time that even the most scenic and natural-looking landscapes were strongly influenced by the decisions of people. Yet, some decisions were in harmony with nature's image and others clearly were not.

As a student, my goal was to develop the skills of a landscape professional who knows how to work with the *genius loci*: the spirit of place and nature's "secret" forces. Rather than designing gardens, I wanted to plan entire rural landscapes: forest areas, watersheds, and communities. I wanted them to be productive, the home of people, and as close as possible to how Mother Nature would have designed them herself.

In 1984, this way of looking at the land led me on an unusual path in my studies. I traveled to Kenya to study how people live close to the land and craft their landscapes in ways that allow them to eke out a living in a desert environment. I researched how to integrate land suitability and erosion hazard evaluations with sociological analyses in an attempt to apply agro-forestry techniques as tools in watershed restoration and the rehabilitation of eroded grazing lands.

Landscape Planning

I discovered through trial and error what a great challenge it is to work in a holistic manner, integrating all environmental—including human—processes and conditions in a "pattern language" that accommodates people's economic and cultural choreography. I realized that planning is indeed a learning process. In fact, planning often is done together with colleagues and residents, which makes it a collaborative learning process. Therefore, I define landscape planning as *the process of seeking to establish the best possible mutual relationship between communities and land resources in order to satisfy people's needs and strengthen the integrity of the landscape.* Practically speaking, it is the search to reconcile and balance the landscape's changing carrying capacity and the changing needs and behavioral patterns of people. In a philosophical and spiritual sense, it is our process toward atonement with nature after the damage we've done to it in the past and the pressure we put on it by our changing and increasing needs.

I have come to realize that the crux of this holistic way of planning is the focus on people's relationship to the land. If we know ourselves and know the genius of the place we live in, we will arrive at a state of living in harmony with the environment, because we realize that we depend on each other and that we stem from each other: that we are related.

Many indigenous, place-based people prefer the concept of "kinship" over that of "stewardship" toward nature to explain their relation to the environment. For them, nature is a relative, an animate being that is to be respected as your brother. You take care of nature as it takes care of you. Yet, in our mobile, urban society most people have gradually detached themselves from the land and a particular place. Fleeting as we are, the landscape is just there to serve us, as the backdrop of our experiences, or the set of our dance of life—to be changed upon our design or whim. Even if we try to see and hear our environment and promote ourselves to be the stewards of the land, we are still too much removed from it to understand it as our next of kin.

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Now, I find myself in New Mexico, working more intensely than ever on bringing people closer to the place they live. We all need to (re)learn how we should relate to the land in order to restore or maintain the integrity of our ecosystems, the genius of the place, and to satisfy the needs of our descendants.

Earth Works' Watershed Works

In 1998, I joined the Earth Works Institute (EWI) to study the Galisteo watershed south of Santa Fe, New Mexico. In the six years since, I have been enjoying the gradual collaborative search for locally appropriate, replicable, and affordable ways to heal the hydrology, soil, and vegetation of this area. This search has grown from one that builds community between people and the land to one that also focuses on the restoration of the soil as the "sponge" of the landscape.

EWI began the Galisteo Watershed Restoration Project (GWRP) in response to problems of severe flooding, streambank erosion, and decline of the water table at the EWI demonstration ranch and surrounding properties. We conducted a series of community meetings and field tours with various government agencies that manage water resources, forest and range lands, and highways in the watershed. We soon discovered that the political and social make up of the area would not allow us to follow the rational, textbook approach of watershed management, which teaches to begin improving conditions at the headwaters and then work your way down. Instead, we decided to work where we were invited to work, to follow an opportunistic approach, in brief, "to go with the flow." In addition, we realized that it was impossible to restore this 730-square mile watershed, even if we possessed millions of dollars. The watershed is too big, we cannot bring back the past, and we need people to support any rehabilitation work. Moreover, we can only rehabilitate natural processes and functions in order to grow the ecological building blocks of the landscape (the soil, plants, and animals), and to provide insight to people about the capabilities of the land. We decided that we needed a strategy to entice and mobilize people to do their part based on inspiring, practical examples.

Monotoring on the Galisteo. (All photos courtesy of the author unless otherwise indicated.)

We established three demonstration sites in three different neighborhoods in the watershed. This allowed us to address different soil and water conservation problems, demonstrate various site-specific techniques, and reach people in three different communities. We selected the sites based on landowner interest, easy access, and demonstration value. Within each site we identified a sub-watershed and discrete problems that would focus and justify our work. The problems all had a strong utilitarian component: they concerned the protection of a neighborhood road and the protection of homes that were threatened by gully erosion and the collapse of streambanks due to scouring floods.

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Watershed Management in Nature's Image

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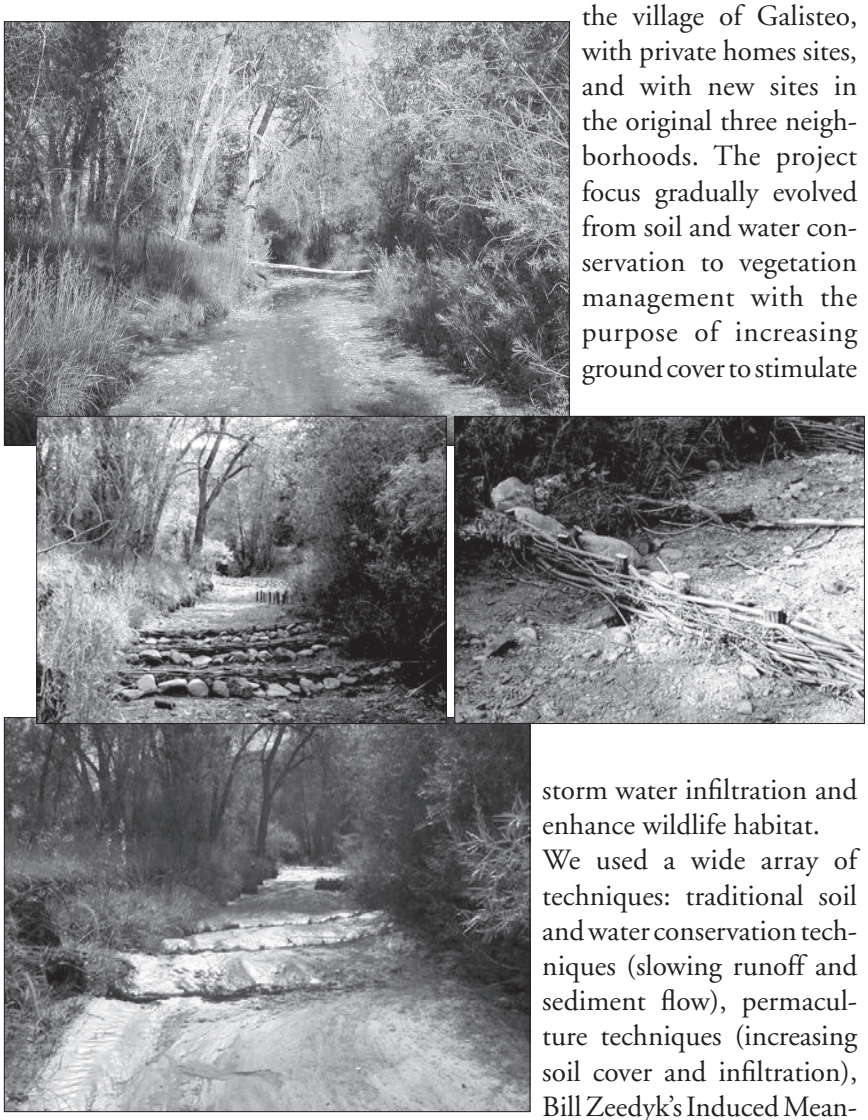

Working in the Galisteo. [Top] Galisteo Creek before. [Middle left] Wicker weirs installed. [Middle right] Weir close-up. [Bottom] After the first flood event.

Over time, we were able to expand these sites with forest management and wildfire prevention activities in the forested headwaters of the watershed, with streamside forest management in the bosque of the village of Galisteo, with private homes sites, and with new sites in the original three neighborhoods. The project focus gradually evolved from soil and water conservation to vegetation management with the purpose of increasing ground cover to stimulate storm water infiltration and enhance wildlife habitat.

We used a wide array of techniques: traditional soil and water conservation techniques (slowing runoff and sediment flow), permaculture techniques (increasing soil cover and infiltration), Bill Zeedyk's Induced Meandering for stream and riparian area rehabilitation, bio-technical streambank rehabilitation techniques, Dave Rosgen's methods for stream straightening and sediment transportation, and short duration-high intensity grazing prescriptions and grazing planning (including prescribed rest periods). Selection of techniques was based on the maximum use of local and natural materials, the use of natural processes, and the appropriateness of the techniques for their use by local residents, students, and volunteers. These qualifiers guaranteed that the techniques were low-cost, replicable, and ecologically sound. Simultaneously, public outreach and education remained our central underlying theme in order to seek replication of our demonstration projects, and to reconnect people to the land. The ultimate goal was to increase land stewardship actions in a working landscape in the Galisteo watershed.

Results

Rigorous monitoring of public involvement and management objectives on the land has allowed us to gauge whether we achieved what we set out to do. Monitoring results have indicated that we have been moderately successful in reaching and mobilizing people. In 2000, we began our work with six landowners, a list of about 20 interested volunteers and about $125,000. The combined land area included about 20 acres and 2,000 feet of the Galisteo Creek. At present, after about $500,000 of private and public investments and an equal amount in in-kind and volunteer contributions, we have implemented work on nearly 20 properties, comprising nearly 1,000 acres and nearly 2 miles of stream. In addition, we completed community-based fire prevention plans for 20,000 acres of forest lands and grazing plans for about 1,600 acres of grasslands. Our mailing list includes more than 1,000 people. More than 60 landowners and government organizations benefited from our technical assistance services, which may have impacted as many as 10,000 acres throughout the watershed.

EWI has been a natural leader in the GWRP, because as a landowner it has a stake in the health of the landscape and is committed to contributing to the increased health

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of the land. As an educational and adaptive research institution, EWI is also committed to collaborative learning and to helping its staff and students deepen their relation to the land. These are vital conditions that enable EWI to develop effective watershed management strategies and learn while doing.

We want collaborative learning to continue and we want to broaden the local leadership of this process. To that end, we have begun a long-term strategic planning and community organizing process. Since early 2003, EWI has facilitated monthly meetings of watershed residents and stakeholders to explore the possibilities of establishing a watershed association. Through this process, we organized educational events and established committees that provided guidance in specific fields, such as the development of a long-term strategy (Watershed Restoration Action Strategy—WRAS), a short-term meeting agenda, and bylaws and procedures for establishing the watershed association. Simultaneously, we began a dialogue with the Santa Fe County Land Use Department and the Santa Fe Conservation Trust about urban planning and open space issues in the watershed. This has led to a visioning and planning initiative with community leaders and government agencies that play a role in the watershed. We anticipate that in the near future the watershed association and the multiparty stakeholder visioning initiative will merge into one movement that will help coordinate the many piecemeal planning, development, and land rehabilitation projects in the watershed.

Thinking like a Watershed: Lessons for the Future

In the past ten years, we have learned some interesting lessons about watersheds, and in particular about how we should think about water and soils as the main ecological components. For us, a watershed, or better a watershed area, is a technical term for a *surface water management land unit*. This area is technically defined by the ridges or landscape heights that separate (or "shed") precipitation that gathers within the unit from that which flows outside the unit. In American English, such a surface water management unit is also known as a *drainage basin*, while in British English, it is called a *water catchment area*. The latter is in fact a much more precise and more desirable term, as it focuses on gathering the water rather than shedding it.

Monitoring channel response on the Galisteo. (Photo courtesy of Bill Zeedyk.)

In the early stages of our work in the water-deprived Galisteo watershed, it became obvious that collecting or "harvesting" water should be our focus in watershed management. This is not only a linguistic and philosophical play with words. It is all related to what our objectives are. How to design stable conduits to rid ourselves of large volumes of potentially harmful stormwater has long been a central water management query for physical and hydraulic engineers. In this management paradigm, water is merely a

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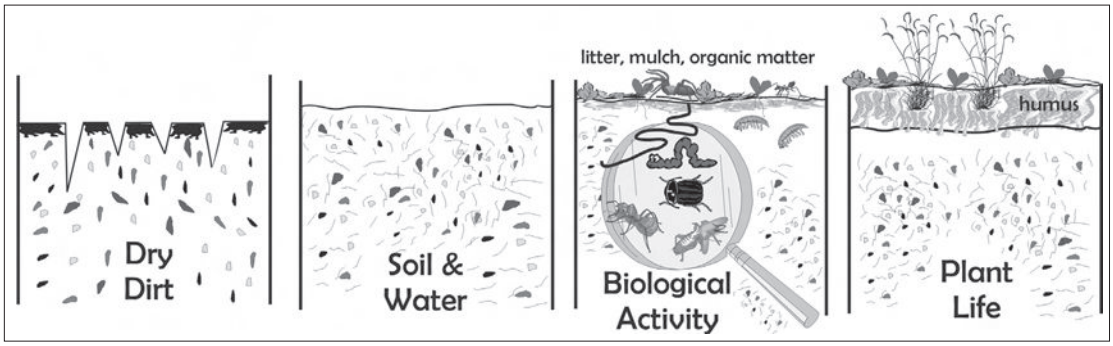

[Top] Erosion cloth on the Lippard property in the Galisteo watershed. [Bottom] Figure 1. Restoring the soil's "sponge" capacity restores the watershed.

substance that needs to be distributed from places of abundance and hazard to places of need and security. How to do this effectively and efficiently is an engineering design problem. Yet, how to design effective uses for water at or near the places where we collect it has long been the principal water management query for farmers, manufacturers, and public decision makers. With the advance of global climate change, which may make rainfall in our region even more erratic and runoff more concentrated, proponents of both paradigms of water management will emphasize the importance of their points of view. Rapid runoff over desert soils (and urbanized areas) will lead to a greater need for excess water drainage, while a general trend toward lower levels of annual precipitation will lead to the need for more economical and smarter uses of the limited water supply available to us.

The ever-growing disparity between trends and needs relating to water in the American West will put increasing pressure on our search for wisdom in managing watersheds. The changes in our environment, the landscape's dwindling water availability, and the changes in human needs also lead us to realize that watershed management is not only about fixing problems created in the past, such as water pollution, lack of soil cover, soil erosion, and poor water adjudication decisions. It will largely have to address what's going to happen in the future, which means that watershed management includes a large component of planning, of finding innovative solutions, and of educating people about these new ways of dealing with water in the landscape.

Many in the American West realize that conventional engineering solutions are often inadequate for solving these complex land use problems. Many engineering solutions are too expensive to be applied landscape-wide, and in their use and application of materials they take too great a toll on the environment, both geophysically and biologically. Only in urbanized and industrial areas, where productivity values per acre are high and space for ecological functions is limited, investments in intensive engineering solutions may be cost effective. In rural and wilderness areas in the West, we need to look for a new water management paradigm.

Planning and designing with nature, although not new, has received more attention in the last few decades as a cost-effective approach that integrates the many values that exist in rural and wilderness areas in the West. This approach calls into action a set of techniques that are similar to gardening and ranching. Ranching in particular is a land use and resource management practice that can cover large areas, and is therefore specifically useful in the large-scale rural and wilderness landscapes of the West. Other practices and techniques that originate in the ranching, farming, and forestry domain are the use of micro-organisms, plants, water, and fire to meet management objectives for soil, water, and vegetation (i.e., wildlife habitat). There might also be

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a promise in these techniques for our increasing need to manage open space areas that we create in the growing urban web in the American West.

One of the most important of these techniques is the practice of building soil as the "sponge" of the landscape: the storage medium for water and the fundamental growing capital for plant and animal life. (See Figure 1.) Large areas in the West have largely lost their water storage capacity and their potential to reproduce plant life. The soils are bare, crusted, eroded, devoid of seeds and micro-organisms, and sometimes even of the basic minerals that induce plant regeneration. Bringing back life to these soils requires that we invest in them; that we see our land use strategies primarily as soil building strategies and our biomass, animal, and other products merely as by-products of this approach. Basic investments in the soil include techniques such as applying a mulch cover, breaking the crust, and re-establishing vegetation. We will need to invest in (bio-)technical solutions that slow down stormwater runoff and reduce erosion. Many of these investments can actually be accomplished with biological techniques, such as managed grazing or browse (by goats), inoculating soils with microorganisms (*mycelium* and bacteria) and trace minerals (manganese, magnesium, aluminum, zinc, and iron), applying organic matter (compost, green mulch, or manure) and seed, and prescribed fire, supported by strategic investments in hydrologic patterns through Induced Meandering in streams and small water harvesting and erosion control structures on slopes and in gullies.

A Vision for the Future: A Naturalist Paradigm

Watershed management that follows an approach of planning and designing with nature is a paradigm shift from the one that is based exclusively on functional and technical engineering solutions. I would call such a paradigm the *Naturalist Paradigm*. Under the Naturalist Paradigm human land management is based on direct experience of the environment and people's active participation in or kinship with our natural environment. In this paradigm, we recognize that Nature has many unknowns for us, and that the uncertainty and complexity caused by dynamic systems is such that we cannot always be in control of Nature. We recognize that schematic models of natural processes may not always work for us to make management decisions. This may open opportunities to take time and wonder about Nature again and discover values in our environment that are difficult to express in dollar amounts and are in a sense beyond that.

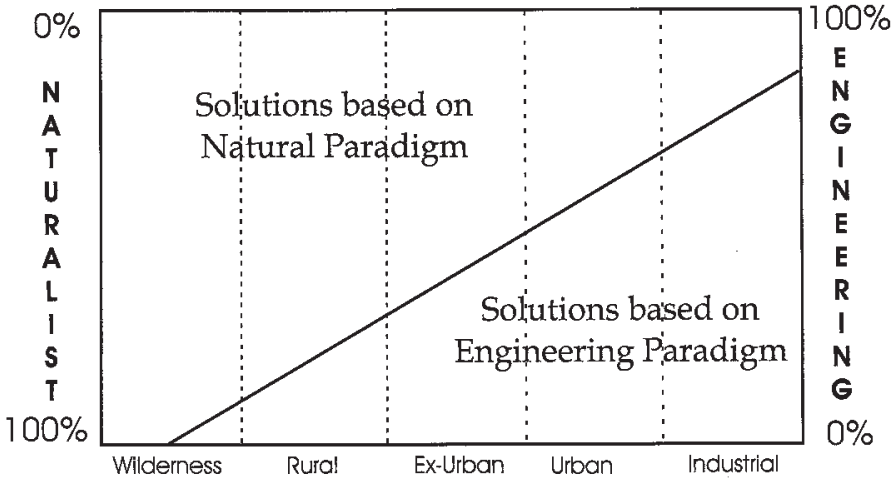

Figure 2.

The engineering approach and the Naturalist approach to water and watershed management are in many ways complementary to each other, and should as much as possible be combined in bio-engineering solutions. The extent to which one or the other approach dominates management prescriptions depends on the environmental context or location

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Jan-Willem is the Executive Director of Earth Works Institute and the founder and director of the Galisteo Watershed Restoration Project. Earth Works Institute is a 501(c)(3) non-profit organization dedicated to protecting the integrity of the natural environment by developing and promoting models of natural systems for sustainable, self-sufficient communities.

of a particular resource management problem and on legal and financial limitations. We could visualize their complementarity in a graph as indicated in Figure 2. In rural and wilderness areas, where water and watershed management costs per acre must be kept low, where there is an abundance of natural resources and processes to use for management purposes, where ownership and regulatory restrictions or financial stakes are lower and urgency of problems relatively lower in the context of land use requirements, the Naturalist approach should be emphasized, whereas in an urban setting, where investments per acre can be higher, where natural processes are more reined in, where space is limited, time is of the essence, and financial and liability stakes are high, engineering solutions are typically more appropriate.

The cost of water and watershed management in large rural and wilderness areas has short duration aspects and long duration aspects. The short ones relate to implementation of restoration and management prescriptions. The long-term ones relate to ongoing maintenance. Because changes in objectives in rural and wilderness land management are at a much slower pace than in urban areas, maintenance time schedules can also be longer. In urbanized areas, sites conditions, values, and objectives change constantly and liability stakes are much higher, which justifies large upfront investments and relatively lower budgets for maintenance.

Under the current trends of climate change, globalization of the economy, population growth, and suburbanization of the West, we should ask ourselves what the place is of the engineering and the Naturalist paradigm in watershed management. To what extent do these trends justify us continuing to apply Naturalist or engineering solutions for water and watershed management? While thinking ahead about future maintenance costs, and the fact that large proportions of our western landscape are taken out of production for residential, entertainment, recreation, open space, and other non-productive amenities, we will be faced with budget gaps in water and watershed maintenance, especially if we follow the conventional logic and use engineering solutions, which are typically more costly. Already, land conversion to urban areas is double the rate of population growth compared with 25 years ago. More and more land is needed per person, while it is taken out of productive use. In addition, with the increase of built-up and paved areas, we are losing the productive and water-storing capacity of the landscape, in particular the soil in our watersheds. The soil has already been destroyed to the extent that we had to build dams and reservoirs to store our precious water resources in the middle of the 20th century.

We are clearly faced with a conundrum, in which we will feel a need for more engineering solutions, while we cannot pay for them. The only solution is to explore the best options from the Naturalist approach in ways that it pays for itself by providing jobs and supporting the local economy. In addition, by building and conserving soils we should be able to reduce our need for expensive engineering solutions, while enabling the landscape, both in cities and rural areas, to be healthier and serve more economic functions, such as water purification, local climate control, erosion control, flood control, and high-quality outdoor recreation areas.

Finally, in order to become more effective in finding Naturalist solutions to the pressures on the landscapes of the western U.S., it is essential that we all be committed to

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a certain place in this vast landscape of the West and get to know it in all its details and love it for what it is. Working together with others and empowered by this attitude, there is a good chance that we will each be able to find sustainable and affordable ways to maintain a home and livelihood in this landscape despite the many rapid changes that shape the land at this moment. Maintaining and rehabilitating the soil and water functions of watersheds will be the ecological foundation, and commitment and kinship to the land will be the human foundation of achieving a productive and resilient living environment for generations to come.

Literature that formed an inspiration for my thinking:

Alexander, Christopher. 1979. *The Timeless Way of Building.* Oxford University Press.

---. 1980. *A Pattern Language.* Oxford University Press.

Bradshaw. 1996. "Underlying Principles of Restoration." *Canadian Journal of Fisheries and Aquatic Science 53*(Suppl. 1):3-9 (1996). NRC Canada.

Le Corbusier. Quoted in Foque, R. 1975. *Ontwerpsystemen; een inleiding tot de ontwerptheorie. (Design systems; an introduction to design theory.)* Utrecht.

Leopold, Aldo. 1966. *A Sand County Almanac.* Oxford University Press.

Pope, Alexander. (early 1700s). *Moral Essays.* Epistle IV.

EWI's work in the Galisteo watershed has been described in:

Jansens, Jan-Willem and Eliza A. Kretzmann. 2002. *Going with the Flow. A Workbook of Models, Methods, and Experiences of the Galisteo Watershed Restoration Project* (second edition July 2002). Earth Works Institute.

Zeedyk, Bill. 2003. *An Introduction to Induced Meandering: A Method for Restoring Stability to Incised Stream Channels* (first edition June 2003). Earth Works Institute and The Quivira Coalition.

Making Conservation Pay

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an excellent way to learn how practices work from both the perspective of an agency focus, like water quality improvements to reduce turbidity, and your own objectives to improve operational profits. Lead times to complete a grant application, receive an award, and implement practices can take years, so try to have as many different projects underway as possible so there is always something coming along. This is how any successful business operates.

"*Finally*, create a website where progress on various projects can be documented. Eventually, this outreach effort becomes an asset when writing grants, communicating with others, and developing new ideas. Keeping the website updated is like taking baby steps that can eventually leave a big footprint. I recently created a 20 minute film for use by the ADEQ at grant workshops all across Arizona that describes water quality improvement projects using information from my website."

For those interested in learning more about projects on the EC Bar Ranch, visit Jim's website at *http://www.ecbarranch.com.*

Watershed Management in Nature's Image

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If a River Runs Through It

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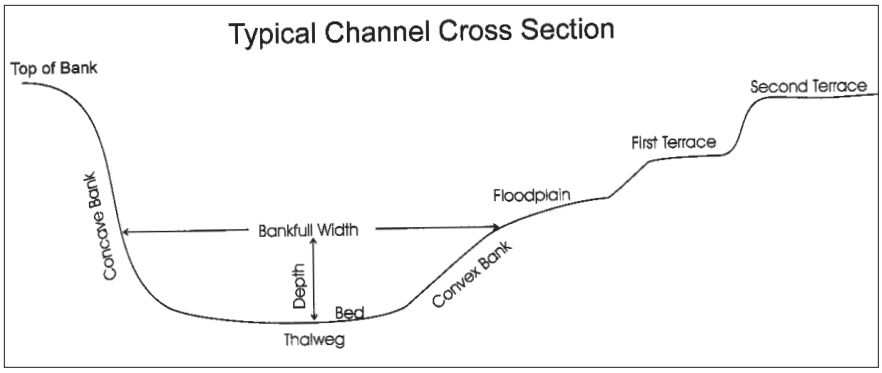

Figure 2.

sediments are being deposited and remobilized in an orderly fashion has to do with maintaining the productivity of those streamside wetland areas.

A riparian wetland, or riverine wetland, is maintained by the flow of a stream. In that riparian area, the river level is either rising or falling. It's hardly ever static. The stream is either gaining speed and moving more water, or it's losing speed and moving less water. So the wetlands on either side of a stream or river are either gaining moisture or losing moisture. All the vegetation that grows there has to be adapted to that hydro period, where it's either getting wetter or drier, and the duration of the wetness or dryness.

Managing streamside areas in wetlands is a matter of creating habitat for plants. We think that, with an eroding stream, we have to do something about the soil. We have to catch the soil. We have to stop soil erosion. That's not how we heal a damaged stream. **We heal a damaged stream by creating the right conditions for the kinds of plants that should grow along that stream.** And that depends on whether the water runs fast or slow or if the banks are high and graveled with cobble-sized material, or mainly silts and fine-grained materials. Different plants are adapted to grow in those different environments. So stream restoration is a matter of creating the right kind of habitat for the right kind of plants, the right velocity, depth, duration, and seasonality of flow and availability.

We've lost at least forty percent of the riparian areas historically present in New Mexico. That's according to the Fish & Wildlife Service national wetland inventory, which was conducted in the 1970s and early '80s. In actuality, I think we've lost a lot more. We probably have about one percent of New Mexico as wetlands or riparian areas.

Wetland soils are deep, fine-grained, and black. This kind of soil only forms in a wetland environment under anaerobic conditions, where there's no oxygen and the vegetation collects and it doesn't decompose. Carbon turns the soil black. If it were wet, it would have a sulfur-like smell to it. When we get into the best soil areas in New Mexico, we'll see this black soil on the surface, but it's no longer wet, it's no longer hydric. One of the issues then is, how can we restore formerly hydric soils to a more productive condition?

Runoff or discharge in New Mexico comes primarily from either melting snow in the spring of the year or summer storms during the monsoonal season. And those are pretty much equally distributed. In most years we get the same amount from snow as we get from summer storms, except as you go further south into the desert. There, more and more of it tends to come in the summer, less in the winter.

There are two big differences in the kind of runoff that occurs from these two different events. Snowmelt tends to take place over a

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period of a month to six weeks, and the river comes up to bankfull or close to bankfull every day and then subsides at night. Pulsing flows tend to scour the stream bottom and make the stream deeper. Summer storm discharge tends to come in shorter increments. The stream rises real fast, flows rapidly, and then drops quickly and leaves a lot of sediment behind.

When snowmelt runoff crosses a wet meadow, the water spreads from hill slope to hill slope. The whole landform is subject to water entering the soil by gravity. It moves down into the soil column and thoroughly soaks the alluvium. And the stored water runs off as base flow on into the summertime.

What's happening to many wet meadows in New Mexico? We're losing them—the ponderosa pine are invading. How do we get rid of the ponderosa pine? Make the soil wet again, disperse that water back across the edges of the wetland.

Headcutting

The top picture on this page shows an area after the snowmelt is over. What if the water can't get out onto the surface of the wetland at all? Here's a former wetland. There's the black soil that says this used to be a wetland. There is the former stream channel high on the terrace. And there's the bottom of the gully now, and it's twenty-some feet deep, and it's getting deeper. The reason for this gully in this open meadow is because it was created by a wagon road about a hundred years ago and captured the surface flow down that valley and blew it down to all this steep, fine-grained soil that has no rock to impede the downward movement of the stream. Now when there's a flood, the water doesn't get out onto a floodplain any longer. All the pressure is on the bottom of the streambed, so the gully keeps getting deeper and deeper.

The bottom picture on this page shows the action of head cutting. That's how that gully was created. The water falls move upstream and at the point of the falls has more energy, so it digs a hole, and that hole undercuts the lip and that lip falls in and it moves gradually upstream, during each spring snowmelt or each summer storm. I have watched one headcut move a hundred and sixty yards in sixteen years—about ten yards a year. And that particular headcut was caused by a little road crossing, which cut across the meadow and created a trench that was about two feet below the historic land surface. Every time vehicles cross through there, they splash out the mud and they splash out the

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[Above] This gully, created by an old wagon road, drained this former wet meadow. [Below] Headcut on the Dry Cimarron. (Photo courtesy of Tamara E. Gadzia.)

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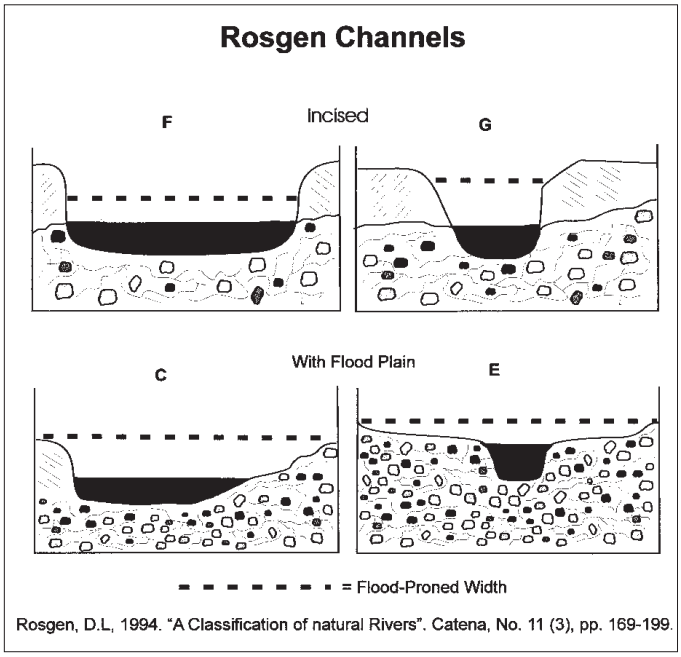
rocks and the next storm washes them away. Over time this streambed, or road surface, gets lower and lower and that change in the face elevation, the little water fall, works its way all the way up the stream course until it comes to something that won't erode.

[Above] Hubbell at bankfull. [Below] Figure 3.



That kind of headcutting can be caused by a ford on a ranch road or it can be caused by a culvert that's installed too deeply—and usually culverts are installed too deeply, because they have to have a firm base. So we dig a trench when we build a road, and we put the culvert in the bottom of the trench and, in so doing, we've lowered the streambed elevation and we've created that vertical drop at the upstream end of the culvert—a headcut. One way to prevent a headcut is to raise the inlet elevation of the culvert. Thatwas done on a creek in Arizona, just above Sierra Blanca Lake, near Alpine. It was a sixty inch culvert, and the road maintenance crew raised the elevation of the inlet by thirty inches, which was enough to stop the headcut and rewet twenty-five acres of historic wet meadow, and it cost just $700 to do.

There are lots of opportunities out there to restore the productivity of the land relatively cheaply, if you understand the hydrology and you understand the ecology. Because stream restoration is a melding of the sciences of hydrology and ecology, you're not going to be successful trying to go it alone with one or the other.

Now, in New Mexico we're used to a stream eroding its banks. But, is that good or bad? It depends. It's not bad. It's only a loss of soil. If the stream is eroding its banks in order to make room for itself to have a floodplain and nothing's being harmed, what difference does it make if we're losing soil off the right side and we're adding soil on the left side? It's only bad in the context of how it relates to infrastructure or property values.

There is a way you can heal an eroding bank. You can plant trees along the edge.

The best, most ecologically stable stream type is an E-channel. (See Figure 3.) It has a high sinuosity, and it's narrow and deep, with well-vegetated banks. It's deeper than it is wide, actually. And when there's a flood, it has a very wide floodplain—the water can spread from hill slope to hill slope and move very slowly across the valley and have little opportunity to erode.

If an E-channel downcuts, the stream no longer has the ability to reach its floodplain, and its channel can only get deeper at this point.

When a stream has gone about as deep as it can go, it starts to widen out. In the engineering world,

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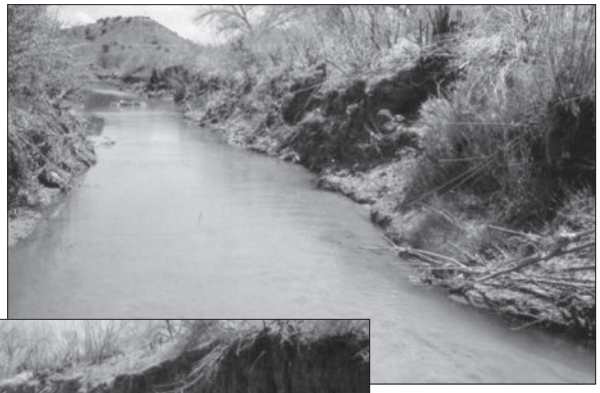
we fix that by making one bank hard. And all we do, when we do this, is to protect the infrastructure, such as a road. But we lock the stream into an unstable condition forever.

A stream that's cut down to as deep as it's going to go and is beginning to widen, and beginning to meander again, and beginning to have a floodplain again so it can dissipate its energy, is a Rosgen type F channel. When I look at a type F stream, I don't get alarmed by the fact that the streambank is eroding or collapsing—I look to see if the stream is developing a productive and functional floodplain. And that's how we ought to look at streams. We need to learn to recognize its evolutionary trend. Is it developing a floodplain, or losing one?

How You Restore a Stream



[Above] Hubbell before restoration. It was almost straight. [Left] These two photos show induced meandering work on Hubbell. The top left photo shows a baffle and the bottom one a weir. [Below] The results.

The pictures on this page show a stream in Arizona, at the Hubbell Trading Post. This stream was straightened by a backhoe for flood relief to protect the park headquarters. That left it twelve feet deep and twelve feet wide. It had no sinuosity—it was 1,046 feet long, with a sinuosity of 1.06, which means almost straight. I have been fooling with the idea that the way to make a stream healthy again is to make it meander. So this is the first place I tried what I later called *induced meandering* on a project scale.

With the concurrence of the park superintendent, Nancy Stone, who was very supportive, and Tom Morris from the Navajo Nation EPA, I embarked on trying to make a stream meander by making it erode its banks according to a predetermined pattern, so it has room for itself and can develop a floodplain again. I put in structures I call *baffles*. That was 1997.

A baffle causes the stream to deflect into the opposite bank and erode the opposite bank, and the water flows slowly across the

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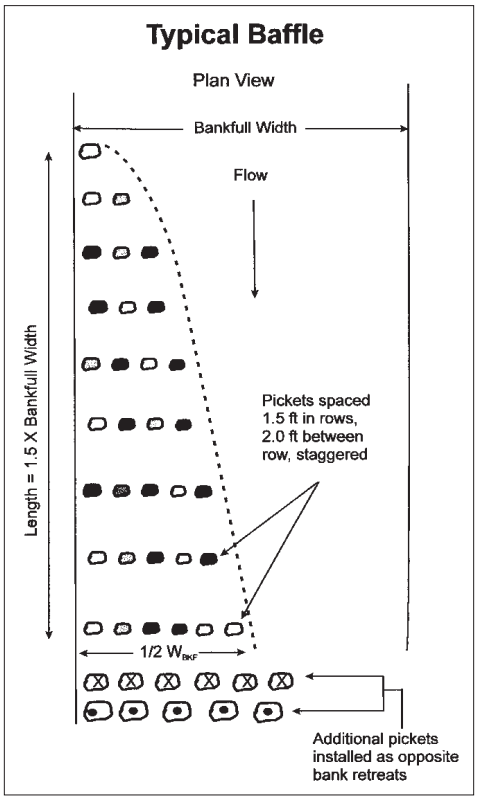

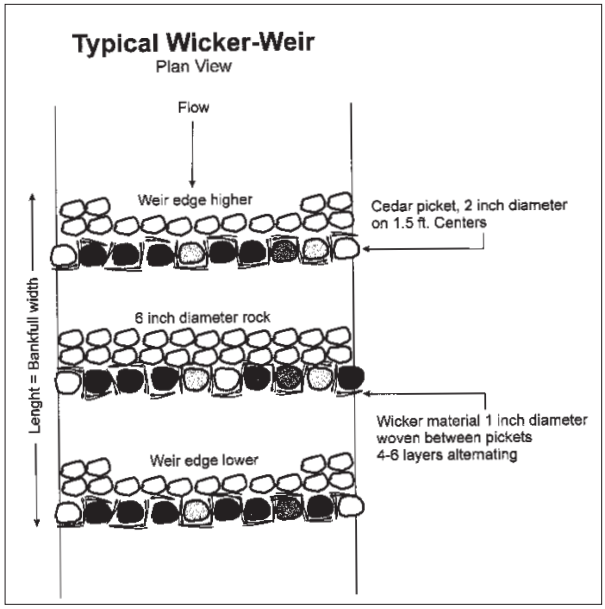

[Above] Figure 4. Picket Baffle. [Below] Rock baffle on Las Huertas. [Right] Figure 5.

baffle and deposits a point bar, a place where fine soils accumulate. It thus creates habitat for vegetation. Another structure I used I call a *weir*. (See Figure 5.) It controls the elevation and the slope gradient of the creek. The original weir at Hubbell was made out of rocks. It is an artificial riffle.

The bottom photo on page 27 is what the creek looked like in 2001, four years later. You can see the stream is now widening. It has room for itself. It's beginning to have a floodplain, and all these new soils are being occupied by a plant called "three square" or *scirpus* because soils are the ideal habitat for that plant to grow in. And that plant gets knocked down by floods and buried in sediment, and grows right back up through the sediment, because that's what it's adapted to do. Soon, it's ready for the next flood.

This stream went from twelve feet wide to twenty-four feet wide in six years. It became more sinuous, because it added four hundred feet of length to the stream channel. The change was caused by these little structures.

So are eroding stream banks bad? Not necessarily.

Floods are what gets the work done. This stream at bankfull stage is shown on page 26. And it's churning right along down through there and opposite a structure it's eroding this bank, and opposite a structure here, it's eroding the other bank. In the meantime, we removed all the Russian olive and salt cedar that had protected the banks, and the banks became more erodable.

My little rock structures couldn't stand up to a large flood which occurred at Hubbell. It blew them away. So I gathered the rocks back up and put the structures back. I kept trying to erode and chase the receding bank. I finally caught onto the idea that if I drove sticks into the ground, they would have more resistance to shear stress than the rocks. After the next flood, the sticks were still there, but they had gathered all kinds of material. And that material created an ideal seedbed for the *scirpus*, and the bank was getting stronger and stronger all the time—more and more resistant to successive floods. And sediments were being pulled out of the water column and deposited on that

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landform as the floodplain widened. That floodplain is the ideal seedbed for these invading riparian plants.

Another important point—there's an abundant source of salt cedar seed. It comes in clouds in August, but there are no salt cedar growing on any of these point bars. Why? Because it can't compete with a healthy, herbaceous grasslike plant like *scirpus*. This area is not grazed, so the *scirpus* is vigorous. We could have vigorous *scirpus* in the presence of grazing, too, under the proper management regime. The point is that maybe there is a little hint in there as to why salt cedar has spread so widely across New Mexico, if our mudflats have no grass on them in August when the land is covered with salt cedar seeds.

I did the same kind of treatment on Las Huertas Creek. Only the difference is that Las Huertas Creek is ephemeral, so there is no water there to support wetland plants year round. The problem is how do we provide water? The disturbance in this watershed is exurbanization. We're losing the hydrology of the watershed. There are five hundred homes adjacent to the creek. Each home has a roof and a driveway and a hard-surfaced parking area, so we're getting more and more runoff from the same size storm in the summertime. The stream channel has to get bigger to accommodate the additional flows, especially the peak flows, but we don't have the sustained base flow to nurture the vegetation any more because channel incision has drained the shallow alluvial water table.

To harvest some water, I've been putting in these little structures I call *one-rock dams* at the crossover point where the stream goes from a right turn to a left turn and back. That's the natural place for a river to deposit cobbles and gravel. This dam is not a check dam. It's only a raised riffle. You won't see any pictures in my slides of check dams, gully plugs, or gabion baskets. I rely totally on native materials and bioengineering to stabilize a stream. A stream stabilizes itself with sticks and stones. Why can't we do the same? Why do we need concrete and steel and wire baskets? I don't think we do.

A one-rock dam is only one rock high. They're as wide as the gully bottom, and they're five rows of rocks wide, parallel to each other. (See Figure 6.) What happens is the fine grain material that's washing down the creek settles in between these rocks, and it gets trapped in there, and it produces the ideal seedbed for grass plants to grow. And the grass plants grow and bind the rocks together with their roots, holding them in place. It took a hundred years to downgrade some of our stream channels. We're not going to get them back up to the land surface in one year or after one treatment. But we start the process by stabilizing the riffle, raising it a few inches, and then coming back a year later and adding another layer and raising it another few inches. That creates a floodplain—habitat for vegetation. That rewets the streamside area and capillary action starts vegetation growing on the terraces.

The picture on this page is a bank of the same stream. You can see by the fact that these sediments are not very stratified that this is a very flashy stream system. And these rocks right here are the materials we can use to recreate a stable

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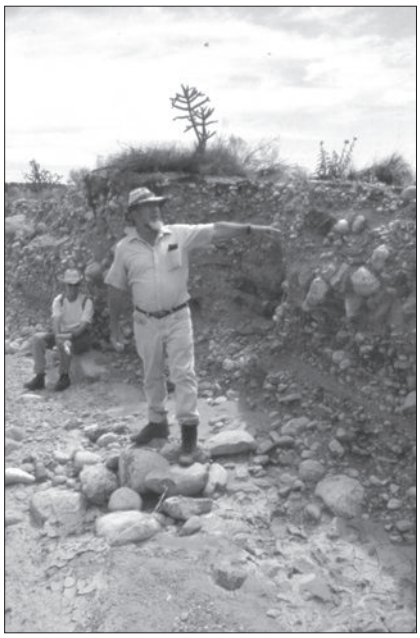
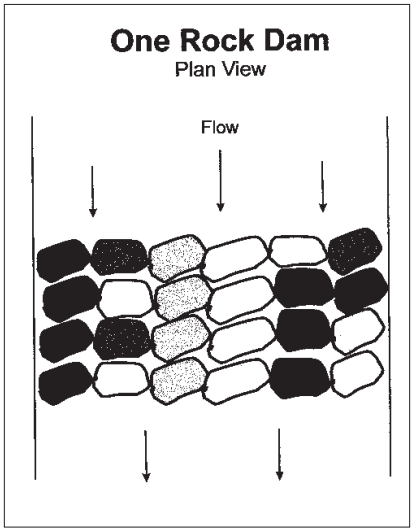


[Above] Bill showing the stratification on the Las Huertas bank. [Below] Figure 6.



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[Above] Bill on Largo Creek before work began. [Middle] Baffle and wicker weirs. [Bottom] The results in September 2001. (Photos courtesy of Courtney White.)

stream channel. We don't have to go anywhere for it. It's right there, waiting for us to use it correctly in the right kinds of structures.

So, we put in a rock baffle to deflect the water, add another bend in the stream, and protect this steep bank, and we'll have a stratified cobble layer in here that the water can seep into, run into it by gravity and get back under this land form and rewet the fine soils by wicking upward, and we'll get more vigorous vegetation on the slopes. And we're having cottonwoods and willows move in because now we're catching some fine-grained material and storing moisture. This project's been ongoing for four years and we're beginning to have some results, although we've had a lot of setbacks due to a huge storm recently.

We also use native materials like juniper posts for baffles. After all, there are lots of junipers on ranchlands in New Mexico. We drive them into the ground. We'll build a picket baffle that's going to deflect the water into one bank and cause the bank to erode, and we're going to build little brush weirs across the stream channel to raise the channel bed. The pictures on this page show a combination of a weir and a picket baffle after completion. That was March 2001. And that's what it looked like in September 2001. You can see how the picket baffle is catching material and deflecting water to that side. And the weir has raised the water elevation, so it's all getting wetter. Ranchers Jim and Joy Williams changed the grazing pattern on this pasture. The combination of raising the water table and changing the grazing resulted in vigorous response of the vegetation.

Here's a different situation. The pictures on the next page show a *picket vane*, and the water is presently eroding the bank. In this case we want to protect the bank. This is on the Dry Cimarron Creek on the Rainbow Ranch near Folsom, New Mexico. And this new structure will cause the water to be deflected away from the bank, thus protecting it. Then we can plant willows.

I'm doing the same kind of treatment on Jim Crosswhite's ranch near Springerville, Arizona, to restore capillary action. (See story on page 6.) This is a really important concept. We think in terms of water entering the soil by gravity. The water falls on the land surface and seeps into the soil, or runs off the adjacent hill slope, out across the land, and seeps into the soil by percolation. But just as important is the movement of water into the soil by capillary action. We can manage the stream to improve capillary action. Capillary lifting depends on particle size of the soils next to the standing water. The coarser the particle size, the less capillary lift, the finer the particle size, the higher the lift. If we can get fine materials reestablished next to the creek, we can wick water to the vegetation. And we can wick water laterally or we can wick it vertically. Up, down, or sidewise, capillary action works the same way. If we can reestablish

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capillary action, we can increase moisture availability for vegetation. Then the roots of all the vegetation can tap that capillary zone and restore the wetland. And restore the productivity of the land.

There are lots of ways to restore streams. The first thing we have to do is we have to have a grazing system, or a range management system, that lets us grow vigorous plants. Now I didn't say no grazing. I said a grazing system that lets us recover the vigor of those streamside plants. You can see that the plants are vigorous on the Hubbell site, and the stream doesn't have direct access to that steep bank any more. There's a shelf that protects the base of that bank from the annual floods, the small floods. Those are the ones we're concerned about. We need not worry about the 50 year return floods if we can stabilize the streambanks with vegetation that can withstand the more frequent, smaller floods.

Vegetation is what gets the work done, the sedges, or whatever the local plant adapted to that habitat might be. Because sedges can grow in a hydric environment, an anaerobic environment, and they can bond that soil in place, layer by layer they build the bank back up and stabilize the creek and create a floodplain where flood energies are dissipated.

The top picture on this page is Comanche Creek on the Valle Vidal. Twenty years ago the creek was wide and braided. The stream was much straighter. Now we have this broad point bar, and there is a floodplain, and the stream is slowly eroding that bank, but the overall system has narrowed, becoming more stable with each additional storm. So don't just look at the eroding bank, look at what's happening with the whole channel, and if it's moving toward stability, we're going in the right direction. Be patient, the river has much time. We're the ones that don't have much time.

All of us benefit from what can be done to restore stable streams on ranchlands, whether on public land or private land, and if we work together and use the principles of hydrology and ecology to restore a stable stream channel, we can do it in a very unobtrusive way without using rock and wire structures, concrete and steel, or old pick-up trucks.

Every ranch has a river running through it. Let's find it, keep it, and help it find itself.

[Top] Sedges along Comanche Creek. [Middle] Vegetation *(scirpus)* at Hubbell. [Above] Post vane under construction on the Dry Cimarron at Rainbow Ranch. [Left] Vegetation growing around post vane installed in October 2001 at Rainbow Ranch.

Announcing: Our Fourth Annual Conference

Mark your calendars! Our Fourth Annual Conference will be **January 13, 14, 15, 2005** at the Albuquerque Hilton.

This year we will start the activities on Thursday morning with a Riparian Mini-Conference and a Range School, co-sponsored by the Society for Range Management. There will also be the Annual Meeting of the Southwest Grassfed Livestock Alliance (SWGLA).

Our theme this year will be ***Half Public, Half Private, One West: Innovation and Opportunities Across Boundaries.*** As always, we will finish with the Clarence Burch Awards Banquet on Saturday evening.

Please consider joining us this year. More information and registration materials will be in the mail by October, but feel free to contact us with inquiries at any time.

Anyone interested in sponsoring the Conference, in placing an ad in our Conference Program, or in having a table at the event, please begin contacting us now.

Hope on the Range: New Ranch Tours
September 3-6, 2004 and October 1-4, 2004

The Quivira Coalition is pleased to announce 2 four-day tours of new ranches in New Mexico.

A small but growing progressive ranching movement is reinventing the profession. If you are interested in the future of land and people in the rural Southwest, come join us as we explore the various dimensions of the New Ranch and learn the ideas, methods, and results of this new style of ranching. This will also be a great opportunity to see deer, pronghorn, raptors, and some of the most beautifcul horizons in New Mexico.

Your host will be The Quivira Coalition's Executive Director, Courtney White.

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Cost: $895/per person, which includes all accommodations, meals, and travel. (A portion of this cost is tax deductible.) Please call us at 505-820-2544 to sign up.

For information on **all Upcoming Events,** see our website,
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