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The Quivira Coalition
Working to Achieve Harmony Between Humans and Nature

Restoring Natural Systems Through Natural Processes

by Dr. Melissa Savage, The Four Corners Institute

Restoration is a roadmap for repairing natural ecosystems that have been damaged by human activities. In the Southwest, grasslands, bosques, and forests have changed dramatically over the past century by intensive land uses. Natural structures and processes have been altered by historical overgrazing, water diversion, fire suppression, logging, exotic species introductions, predator control, and many other influences, some of which are mainly activities of the past. But history matters in natural ecosystems. Even if damaging activities stop, ecosystems may not be able to return to their historical conditions by themselves, or perhaps not in the foreseeable future.

Responsibility

A general consensus has emerged that humans bear a responsibility for restoring damaged ecosystems. It is also clearly in our best interests to do so. Southwestern ponderosa pine forests, for example, now densely packed with trees as a result of decades of "Smokey the Bear" policies, threaten our towns and villages with conflagrations. Historically, these pine forests burned often and with low-intensity fires whose flames usually reached only a few feet in height. These surface fires burned lightly through the forests, thinning young trees but preserving the old, fire-resistant pines. Open groves of trees with grassy understories resulted, and this forest structure supported unthreatening fires. The fires created the forest structure which, in turn, supported these kinds of fires.

How, then, can we return ecosystems in the Southwest to more healthy, sustainable conditions? One approach is to alter the current structure of ecosystems to mimic natural structures. Exotic tree species, such as Russian olive and tamarisk, can be cleared from riparian communities. Small trees can be thinned from the pine forests. But if we do so, what will

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Editor's Note

This is the second in our series of newsletters on "Nature's Model." Here we explore issues surrounding restoration of our forest ecosystems and how that can be accomplished in such a way as to "kickstart" natural processes which have been interrupted by years of overlogging, overgrazing, and fire suppression.

Thanks, Jim. A Reflection

by Courtney White

*[**Editor's Note:** On May 9, 2003, Jim Winder resigned as Chair and member of the Board of Directors of The Quivira Coalition.]*

There would not have been a Quivira Coalition without Jim Winder.

Jim has always been a trailblazer; and as he moves on to new ground, leaving us to reap what we sowed together over the years, I can't help but recall the pioneering spirit that created The Quivira Coalition in the first place.

It began with a put-down. I don't know if Jim remembers, but the very first time I met him was at a statewide Sierra Club meeting at the Black Range Lodge, in Kingston. At the time, Jim sat on the Executive Committee of the Club's Rio Grande Chapter—a fact that surprised and discomfited me. I distinctly remember thinking "what in the world is a *rancher* doing in a leadership position in an environmental organization?"

It was 1995 and I was a cub activist, having been self-propelled into action the previous Fall by my concern over the Newt Gringrich-led coup in Washington, D.C. In true neophyte fashion, I marched into the Chapter meeting with a typewritten letter of outrage in my hand, directed at the poor behavior of rural people, as I recall. When I was done reading it aloud, Jim broke the silence by saying, "Well, that was dumb. Let's move on."

It was dumb. And we did move on.

In January 1996, my wife Gen and I joined a tour of Jim's ranch. My curiosity had been piqued by Jim's boasts about the ecological benefits of his management. As archaeologists, Gen and I were well aware of the ill effects of poor cattle management in dry landscapes, though our knowledge didn't extend much farther than our feet. Jim's claims seemed to us, well, fantastic.

We were joined on the tour that day by Tony Merton, a newly transplanted anti-grazing activist (who would commit suicide a few months later). The lively repartee between rancher and activist was fascinating and illuminating. Jim parried every one of Tony's barbs with an inspiring display of facts, analysis, and aplomb, including an endearingly rude sense of humor. Tony wasn't mollified by Jim's answers, of course, but we were. In fact, we were downright impressed.

We also liked the look of Jim's ranch. Even in the dead of winter it had a vibrancy that was unfamiliar to us. Upon returning home, I picked up Dan Dagget's newly published book, *Beyond the Rangeland Conflict*, learning that Jim wasn't the only crazy rancher in the West. There were others, and this fact lodged in my brain like an revelation.

I didn't know it, but The Quivira Coalition had been conceived.

Jim and I began to talk. He thought a new, and different, organi-

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From the Founders

Jim Winder
Courtney White
Barbara Johnson

If, as they say, the only constant in life is change, then we've been doing a lot of living recently.

First, the sad news. In May, rancher and co-founder Jim Winder resigned from the Board of The Quivira Coalition. Actually, ours was one of a number of Boards Jim retired from at the same time. Jim has started his own nonprofit organization, called the Heritage Ranch Institute, which is focused on conducting research and education on Jim's five ranches around the state. Jim felt he needed more time so he could give his fledgling organization the energy and attention it deserves.

We can certainly understand. And although the parting is a cause for sadness, we share Jim's sentiments, expressed in his resignation letter, that "it has been the greatest honor of my life just to sit among you and to be considered as your peer."

We wish Jim luck in his new endeavors.

On a more upbeat note, we asked Sid Goodloe, last year's Clarence Burch Award winner, to fill Jim's seat on the Board and he has agreed. Thanks, Sid, and welcome!

Continuing the good news, in early July we moved into a permanent home, called the Fortaleza Coyote Compound (right next door to our old office). You can't miss it—it's the only three-story building in Santa Fe with a metal dragon on the roof!

We were able to make the move due to the great good graces of Eugene and Clare Thaw, and the wonderful staff at their foundation, especially Executive Director Sherry Thompson. The Foundation purchased the large building with the intention of creating a conservation center in town dedicated to collaboration, innovation, education, and with a focus on watersheds and restoration.

Other tenants include the Conservation Fund's Valle Grande Grass Bank, the Santa Fe Watershed Association, Earth Works, and the Four Corners Institute—all friends, and all working from the same conservation script.

You can see the building in person at our "Housewarming" on October 17th. See page 28 for details. (All photos courtesy of Courtney White, unless otherwise noted.)

It is our hope, as well as the goal of the Thaw Charitable Trust, that the Compound will become a model for other conservation efforts around the region. If nothing else, the synergy created by so many good people working and visiting in the building will make it an exciting place to be.

Come by for a visit!

From all of us here at The Quivira Coalition, we want to thank the Thaw Foundation for their vision. We would not be half the organization we are today without their financial and moral support.

Finally, we are pleased to announce that Sheryl Russell has

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Mike Reardon: Seeing the Trees *and* the Forest (I)

"When I get done, I want it to look like I was never here."

Mike Reardon is not your typical weekend warrior. On most Fridays he hangs up his tools as a custom home builder in Albuquerque, jumps into his truck, picks up his good friend Allen Darrow and drives three hours to his family's ranch a few miles east of Wagon Mound, where they work furiously for the weekend before driving home again.

Then they do it all over again the following weekend.

The object of so much time and energy? Trees. Lots of trees. "There are too many on the ranch," says Mike. "They grow like weeds." His solution? Burn them, push them, pull them, lop them, and never stop. "We are trying to reverse what's happened in the last 100 to 150 years and they have a big head start."

Mike readily admits that his learning curve has been short and steep. "Six years ago I didn't even know I had a tree problem," he says. "Like most folks, I assumed all those trees were normal." All that changed one day in 1997 when Mike gave a tour of the ranch to Danny Branch, the local agent for the Natural Resources Conservation Service. Mike was seeking advice on what he could do with the government program to improve the ranch. Danny suggested water distribution and possibly working on the infestation of piñon and juniper. Not knowing he had a piñon/juniper problem, Mike asked Danny how bad he thought it was on the ranch. Danny said it was moderate to severe.

The 7,000 acre Cañon Bonita Ranch was at one time the southernmost extension of the massive Red River Ranch. Mike fondly recalls summers cowboying over the miles of open country. As with many big ranches, however, the Red River was split up and Cañon Bonita stayed in the Reardon family.

Mike took over managing Cañon Bonita shortly before the Red River Ranch was split up. In the spring of 1998, Mike decided to begin big with a controlled burn of the entire ranch. His neighbor Greg Moore, a fan of rancher and fire guru Sid Goodloe, gave Mike the idea to burn. At that time, Greg had already been burning portions of his ranch for three or four years. With the help of Greg, his sons, Mike's friend Allen, and a handful of others, they burned the whole ranch over a ten-day period. For the most part, the fire was a success, killing a lot of small trees and setting others back. If anything, it bought Mike some time to try other methods of tree control while waiting five to seven years to burn again. Though the fire killed thousands of trees, there were still tens of thousands to go.

After the burn was completed, Mike and Allen set about methodically slaughtering trees by hand. They tried many techniques: chain saws, loppers, spin trimmers, axes, Pulaskis, and others. After a couple of years of hand removal, they decided that they wouldn't live long enough to complete what they wanted to do. In 1999, they made a trip to Sid Goodloe's ranch to see what methods were working for Sid. Sid told them that he used a bulldozer to push the trees, then piled them up and burned them.

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Seeing the Trees *and* the Forest (I)

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Mike couldn't afford a bulldozer, but his friend Larry Gribble was in the excavation business and found a 1974 Cat 930 front-end loader in good shape for a good price. Mike bought the loader in 2000, ordered a brush rake for it and went to work. Allen pushed out the big trees with the loader while Mike continued to lop the small trees.

In the spring of 2002, Mike bought a Bobcat that he uses to pull the small trees (from the size of a beer can to five to six feet tall) out by their roots. The bobcat pulls between 150 to 300 trees an hour, depending on the density. It's a lot easier than lopping, and when you pull the trees out by their roots, they're gone for good.

Following the advice of Sid Goodloe, Mike and Allen push the trees into piles of two to twenty trees. They let the trees dry for a year and then burn them after the rainy season when the grass is still green. The next spring the burned piles are graded and reseeded.

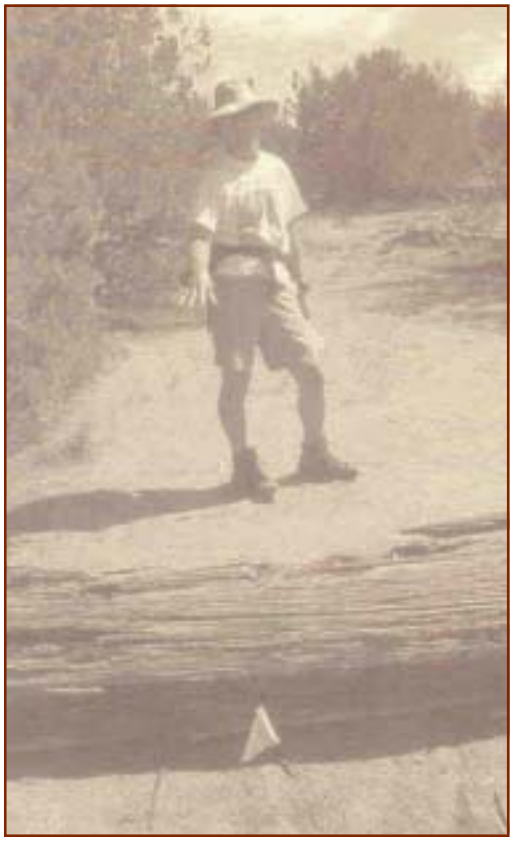
In 2002, Mike invited Kirk Gadzia to come to Cañon Bonita to evaluate the range conditions. Kirk said that Cañon Bonita was short on cool season grasses. From 1965 until 1995, the ranch was used as wintering country for the Red River Ranch. The cattle were brought in after shipping in October and left after branding in June. Kirk suggested that Mike replant the burned piles with cool season grasses to re-establish them on the ranch. In addition, Mike and Kirk decided to try only dormant season grazing when Mike brings cattle back onto the ranch after the next burn. Mike is planning to do another controlled burn in the spring of 2005.

There is still a great deal of work to do and more curve climbing. All of which begs the question: Why? Why give up the weekend to slaughter trees on a ranch two hundred miles from home? "There are lots of reasons," Mike answers. "For one thing, it's an investment we can't afford not to do. I feel like I'm making the land better." Mike is doing it for the wildlife too. And he is clearly doing it for himself as well. "I like the sense of accomplishment I get, like when I finish a home for somebody," he says. Mike is also patient. "Although I'm fifty, I'm not in a rush. I want to do the job right."

"When I get done, I want it to look like I was never here."

The Board of Directors

Craig Allen: Seeing the Trees *and* the Forest (II)



Ecologist Craig Allen, explaining the effects of the last major drought in the area, which killed this ponderosa.

Craig Allen is trying hard to make ecology relevant.

This effort is not only evident in the many articles he has written for scientific journals, in the many lectures he has given on forests and fire to a wide variety of audiences, and in the elegant experiments in ecological restoration he is conducting, but also in the energy he puts into a conversation about forests while just *hiking* to a project site.

Clearly, Craig loves what he does.

And what Craig does is to try to understand fundamental ecological processes in the woodlands and forests of the Jemez Mountains, west of Santa Fe, New Mexico. Employed by the U.S. Geological Survey and stationed at Bandelier National Monument, Craig has devoted nearly twenty years of his professional life to gaining a comprehensive understanding of forest health, forest sickness, and what constitutes appropriate cures.

Need to Restore

But it is not merely an academic interest. Craig believes humans have a responsibility to "repair" damaged land and has become a vocal advocate for science-based "adaptive management"—carefully monitored experimentation—in our forests. And he is keenly aware of the **need** to restore our forests to health. That's why he tries to make his work relevant to non-scientists.

"This is a harsh environment," Craig says during a hike to a restoration study site on a mesa in Bandelier's wilderness. "There's pounding rain in the summer, when it rains, lots of freeze-thaw action in the soil in the winter, when it snows, and desiccating winds in the spring, when it blows." These conditions have wreaked havoc on Bandelier's delicate, and shallow, soils—soils which are not atypical of many around the state. And much of Bandelier suffered a similar human history: decades of rough treatment by settlers and others following the arrival of the railroad to northern New Mexico in 1880. The litany is familiar by now: overlogging, overgrazing, fire suppression—all contributing to massive erosion, a legacy that endures to this day.

Natural Range of Variability

So what is a modern land manager to do in the face of this persistent "erosion crisis?" Craig and other ecologists have an idea: restore the natural range of variability to the land. (See graphic on page 22.) In other words, get natural processes, especially fire, up and running again.

He explains at the restoration site. "In 1997, crews came in here and cut the trees, lopped the branches and spread everything out over the land," he says. "The idea was to get a more natural water cycle going by allowing more infiltration by rain so grass would grow. We wanted to do this by improving micro-environments in the bare interspaces between grass

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Seeing the Trees *and* the Forest (II)

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clumps and trees, and we did that with the slash.

"There was an immediate response," says Craig. "Remnant grass bunches started growing again, a weedy successional cycle started, and new plants grew." The slash did this, according to Craig, for three reasons: 1) the branches and needles increased "surface roughness" by creating a "zillion" little checkdams that held back water; 2) the foliage provided a pulse of nutrients to plants and seeds; and 3) shading by the branches reduced evaporation.

"By reducing the harshness of the micro-environment," he says, "we increased the amount of Plant Available Water, which is essential to slowing and stopping sheet erosion." If rain runs off too quickly then plants can't grow, and if plants can't grow, they can't become fuel for a fire, and if a fire can't run its course, then too many trees grow, which reduces the amount of Plant Available Water, which encourages additional erosion—round and round it goes, as it has for nearly a century.

When Craig and other scientists compared the restoration site to an adjacent "control" watershed that did not receive treatment, they were pleasantly surprised by the results. "Overall biomass went up six to eightfold," Craig says, "and sediment yield dropped one hundred-fold. Biodiversity and abundance went up too. We even started to see butterflies again because the plants were flowering.

"It was very encouraging," he continues. "It showed us that you can kick-start natural processes again without too much work or money. We didn't plant any seeds. All we really needed were chainsaws."

New Approach

All of this represents a new approach to restoration. First and foremost, it's humble. "We can't erase history," Craig notes, "but what we can do is allow ecological processes to function again as naturally as possible. And be ready to admit mistakes." Craig is the first to acknowledge that they don't know when they will reach the endpoint of this experiment exactly, but he does know they can't be managing it forever. "We don't want to be endlessly deciding who lives and who dies out here," he says. That's why their approach has the goal of letting nature take over as soon as possible.

Their approach is also practical. Craig thinks this "mulching"

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An archaeological site in the midst of the restoration project at Bandelier.

Seeing the Trees and the Forest (II)

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"'Some might argue that we should sit back and let nature take its course, but I'm not one of them.' Once ecosystems have crossed a threshold, as they have in Bandelier and many other places, protecting it does not help much, [Allen] says. Action is required."

method will appeal to land owners because of its simplicity. On a larger scale, with larger trees, he recommends the employment of a "splatterer"—a machine on rubber tires that "eats" trees from the top down using a fast-spinning rotary head and a rotating cab. Debris from this process is "splattered" for two hundred yards in a random manner that Craig considers to be natural enough. "Chipping," he advises, "doesn't do it."

"Popping trees out of the ground may not be enough either," he warns. "You're just reducing tree competition, not addressing the problem of poor water cycling." Removing a piñon or juniper does not necessarily mean the grass will return, he notes. Often additional work is required, such as mulching. And don't lose sight of the ultimate goal, he reminds us—which is to get fire back into the system.

Action Needed

Craig candidly admits that their approach may not be ideal for everyone—but some sort of approach is urgently needed. "We've got 100,000-year-old soils in Bandelier that will be gone in two centuries if we don't do something," he says. "Some might argue that we should sit back and let nature take its course, but I'm not one of them." Once ecosystems have crossed a threshold, as they have in Bandelier and many other places, protecting it does not help much, he says. Action is required. "Aldo Leopold observed years ago that many Southwestern ecosystems were in trouble," says Craig. "They're still in trouble. We know now they've fallen out of their natural range of variability. The difference is today we now know enough to make progress in repairing the damage."

That is in large part due to scientists like Craig Allen.

"We don't know it all," says Craig, "but we know enough to get started."

From the Founders

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become a real-life employee of The Quivira Coalition. Many of you know Sheryl through her volunteer work with us in the office and at workshops and conferences, and know her to be tirelessly cheerful, efficient, and helpful. We think she's simply fabulous! (But she won't let us take a photograph of her).

Sheryl comes to us from a diverse business background. Recently she has been working as a professional tour director (Courtney and Sheryl met years ago when they worked together on a Tony Hillerman tour). We are very happy to have Sheryl as a member of our small family.

Our friend Dan Dagget likes to talk about turning obstacles into opportunities. We know what he means. As times change, and the world becomes increasingly more challenging, especially on the financial front, we have been fortunate to roll with the punches, and even make a little progress.

Thanks to our friends.

Thanks, Jim.

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zation was needed to wade into the fractious terrain of the cattle debate. At the time an ugly, and all too familiar, conflict between ranchers, environmental extremists, and inscrutable federal land managers in the Gila wilderness, called the Diamond Bar fight, was in full flower. Additionally, there was bad news coming out of Washington, D.C., contributing to rising tempers at home. Things looked bleak; something needed to be done.

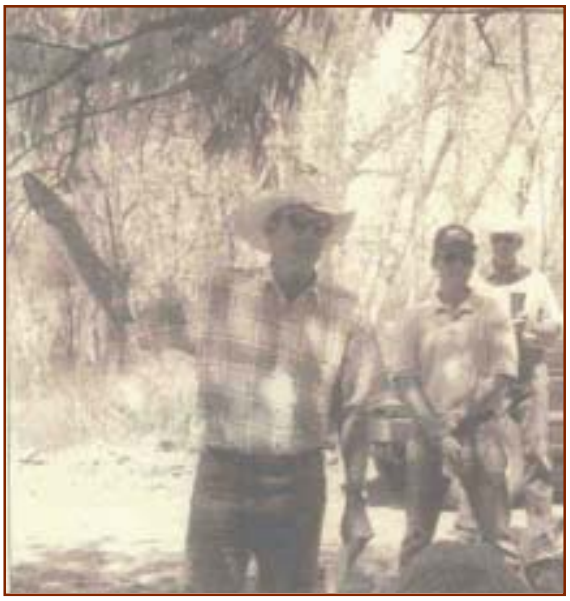
Jim's idea was to create a neutral place, or "third position" as he later called it, outside the usual continuum of argument where ranchers and environmentalists could meet, talk, and make progress. I liked the idea, but we didn't do anything about it until Jim suddenly announced, that following June, that he was retiring from his leadership position in the Sierra Club. He wanted to move on, he said. In a bit of a panic, I proposed to him that we actually start the blasted nonprofit that he advocated.

"Fine with me," he said.

Barbara joined us shortly thereafter, and as a triumverate we put the pieces of a new organization together. It took a year and some memorable meetings, including one in a mountain pass above Kingston, and one in a Santa Fe restaurant where Jim was forced to share a goat cheese pizza, but we got the deal done. I came up with the name, Jim ponied up the first cash ($1000), and Barbara assembled the benedictory newsletter. We incorporated in June 1997, and a few days later hosted a workshop in a church in Santa Fe. We had sent out flyers to everyone we knew, and crossed our fingers. To our delight, fifty people showed up.

The Quivira Coalition was off and running.

Through all this, and well into the first tumultuous year of work, Jim remained the firm hand and guiding light. In the tours of his ranch, and the early workshops, Jim continued to impress the friendly and the skeptical alike. I know he inspired *us*, as Barbara and I struggled to construct The Quivira Coalition into a sea-worthy vessel. Jim wasn't the captain of our little boat, but he did help us navigate unfamiliar waters, often employing a carefully targeted wisecrack or two.



Jim leading a tour of his ranch in 1997. Quivira Board member Bob Jenks is behind him.

And if an idea was a dumb one, Jim didn't hesitate to say so.

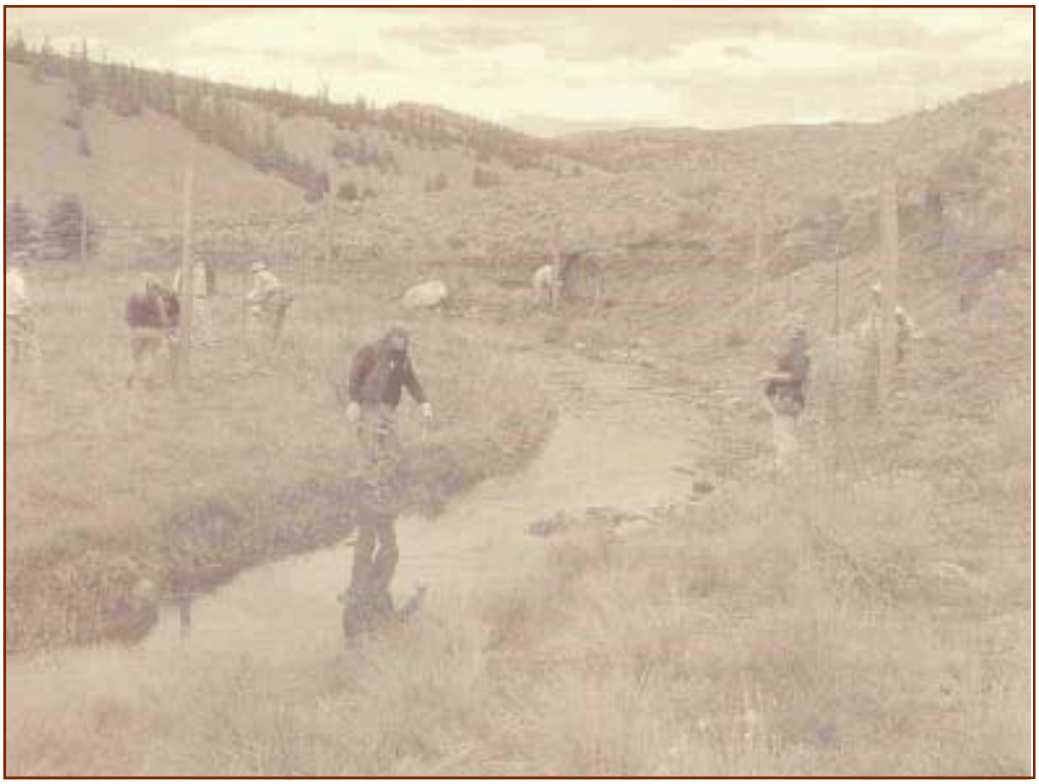
Meanwhile, he continued to move on, which is what pioneers do. In his business life, Jim began to tackle a whole new set of challenges, including the purchase of additional ranches. We weren't surprised by his evolution; in fact, he had warned us. From the start, Jim envisioned a "sunset" clause for The Quivira Coalition. "Let's try it maybe for five years, max," he said one night in 1996 as we sat outside his home, "then let's get out."

In the end, Barbara and I had other ideas. We didn't get out. But we've moved on too, just in a different direction. And as we part ways, I just want to say, "Thanks, Jim." Thanks for the inspiration, the energy, and the ideas. Thanks too for the sarcasm and the rude jokes. You made us laugh at exactly the right moments. Thanks for everything.

We couldn't have done it without you.

(Tree graphics in this issue are courtesy of Marty Peale.)

Making Waves on Comanche Creek



[Top] Bill Zeedyk, right, explaining how water moves across roads during a tour in July 2002; [Right] September 14, 2002 Workday with New Mexico Trout. (All photos on pages 10 and 11 courtesy of Tamara Gadzia.)

It began with a phone call about a fish.

Three years ago, Dick Neuman, then the president of New Mexico Trout, a fishing conservation organization, called The Quivira Coalition. His organization had invested many volunteer hours in an attempt to restore Comanche Creek, located in the western half of the Valle Vidal unit of the Carson National Forest, north of Questa, to a condition where it could support a healthy population of native Rio Grande Cutthroat Trout.

Dick felt progress wasn't going fast enough for the fish, and wondered if we could help.

As it turned out, the EPA and the state Environment Department were also interested in Comanche Creek, though for different reasons. The Forest Service

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Comanche Creek

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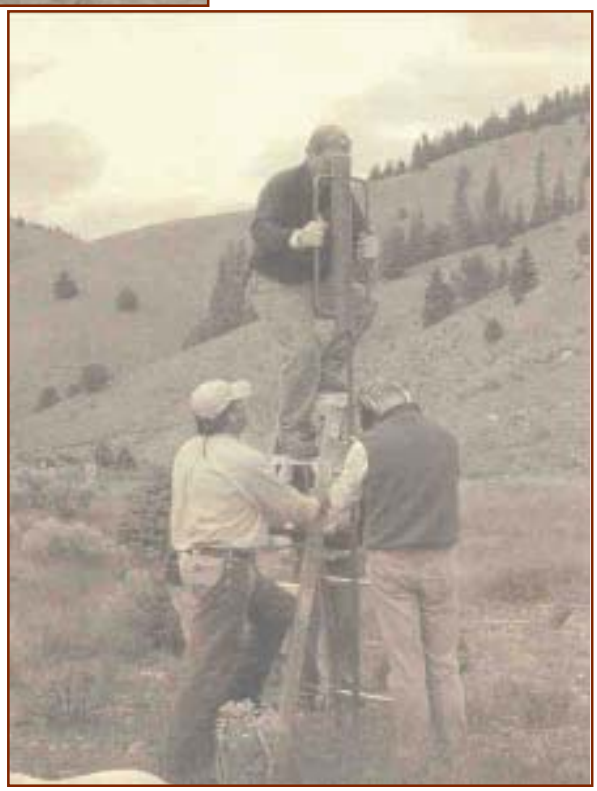
[Left and below] September 14, 2002 Workday sponsored by New Mexico Trout, building elk exclosures on Comanche Creek.



also had a keen interest in the Creek and the trout, as did the New Mexico Game & Fish Department. The Valle Vidal Grazing Association wanted to help too. So began a team effort.

In the fall of 2001, The Quivira Coalition was awarded a three-year restoration and education grant from the EPA, through the New Mexico Environment Department, under its section 319 program. This money comes from the Clean Water Act and specifically targets "non-point" sources of pollution (as opposed to a factory smokestack or a sewer pipe) for mitigation. In the case of Comanche Creek, the problems included high water temperatures and too much sediment depositing itself in the Creek.

The Creek is still trying to recover from a triple whammy of overgrazing (6,000 head of cattle!), logging, and mining, including all the associated road building, all of which took place before the Valle Vidal became public land in the early 1980s.

Our team has been meeting at least quarterly to plan work on the Creek. Quivira has held several workshops on the Creek and New Mexico Trout has contributed many volunteer workdays constructing elk exclosures.

This summer, we decided to "ramp up" our efforts and we made substantial progress. In June, Bill Zeedyk, with assistance from Steve Carson, surveyed the roads system and identified spots where too much sedimentation was flowing into the creek.

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Comanche Creek

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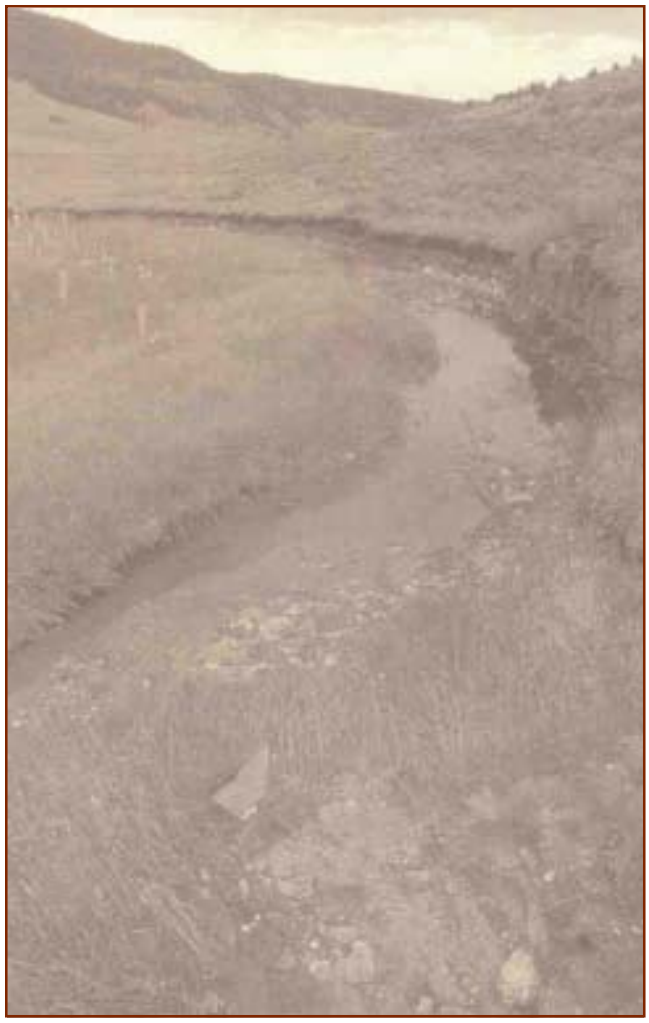

[Left] View south and [top] view north from the same point, showing erosion into the creek from a poorly designed road culvert.

Not surprisingly, the principal culprit was the main road, whose culverts were poorly designed. With the help of the Forest Service, the roads will be corrected, and sediment loads reduced.

Second, with the energetic assistance of the Taos-based Rocky Mountain Youth Corps and the Albuquerque-based New Mexico Trout, more mini-exclosures are being built around existing willow plants along the Creek's edge, according to a "map" plotted by Bill Zeedyk. The idea here is to protect naturally occurring native woody vegetation from browsing by elk and cattle. The plants will shade the stream as well as stabilize the banks. Twenty have been finished so far and ten more are in the works. They augment the exclosures that New Mexico Trout has been constructing for the last couple of years.

And the structures are working!

All of it, in fact, is working. "Our watershed restoration efforts are targeting sources of pollution instead of the symptoms," says Mary Ann McGraw, the project officer for the Environment Department. "At the end of the day, the Comanche Creek project will result in the delisting of the stream."

Which is good news for the fish!

The Far Horizon

by Courtney White

"*The only thing I ever wanted to be was home.*" – from **James Galvin**'s novel ***The Meadow***

"*There is only one way to have grizzlies in these mountains, and that is on the grizzlies' own terms….This is roughly how the West itself must now be understood. Whatever the feelings nonwesterners have about the region—whatever affections, whatever myths—the only way to take care of the West now is to give it the room it needs to take care of itself.*"

So starts Dan Kemmis' controversial and provocative book *This Sovereign Land*. In it, Kemmis lays out a compelling case not only for western self-governance but also for its inevitability. That's because the history of the American West is the history of colonization by empire, both foreign and domestic, and the lesson learned is the same one from around the world—eventually all empires fall. Self-governance in the West is as inevitable as the Boston Tea Party.

Strong, imperial forces, Kemmis argues, have controlled the West from the get go. They started fast with the national land grab called Manifest Destiny. After the Civil War they gained industrial strength during the phase of buccaneering capitalism called the "frontier." Then, in reaction to the tide of environmental destruction that resulted, a new set of imperialistic forces coalesced under the paternalistic leadership of Progressive Era federal technocrats. After waning a bit, these bureaucratic forces gained new life as part of the New Deal. After mid-century, both sets of forces were reinvigorated by simultaneous, and linked, trends—a booming national economy, which encouraged another round of exploitation of the West's natural resources, and the rise of an urban-based environmental movement, which demanded greater bureaucratic command-and-control.

The West, in other words, has never been free from the grip of empire.

As an illustration, Kemmis focuses on the West's public lands, which, he argues, remain important for two reasons: They allow equal access for all Americans, and they include all Americans in the decision-making process that determines how the lands will be managed.

However, many rural westerners now view the public lands system as anti-democratic. They feel ignored by a decision-making process that is supposed to include them, causing them to vent their frustration and anger at employees of public land management agencies, politicians, and environmentalists. This anger, and the resulting emotion it provokes among its targets, has created a paralysis that now characterizes the region. This paralysis must be overcome. "The future of the West," Kemmis writes, "must involve a radical and permanent transcendence of the region's embedded struggle between imperial-type environmentalism and Sagebrush Rebellion-type resistance."

However, this transcendence will require significant political reform that cannot take place until we settle the question of liberation. "No viable, democratic, ecologically sustainable institution for governing western landscapes

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The Far Horizon

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"Despite its apparent disunity, there is a key commonality that wends its way through many collaborative efforts. It is the goal, whether outwardly expressed or not, of 'returning to nature's model of land health.'"

can be successfully devised," he writes, "without in some fundamental and innovative way addressing the question of sovereignty. In the end, this is the question of who rules—of who will be in charge of the West."

Collaborations

Out of the ashes of gridlock, frustration, and anger, has come a resurgent movement based on the radical (and very "frontier") ideas of collaboration, cooperation, and progress. And it is in this movement that Kemmis sees signs of revolution.

Many of the collaborations he highlights are familiar to us by now. But Kemmis takes us an important step further—he links the rise of the collaborative movement to the question of sovereignty. He writes, "The steadily expanding collaboration movement is an indigenous, democratic phenomenon through which westerners have begun to translate their land-rootedness into direct and effective control over their home ground."

However, Kemmis does **not** argue for the privatization of public lands, as some of his critics have assumed. Instead, he argues **for** what he calls "watershed democracy"—collaborations of individuals and organizations working toward on-the-ground solutions to common problems. It does not mean the abdication of federal control of public land, but it does mean a reinvention of federalism as well as the revitalization of democracy in general.

He concludes: "Americans cannot nurture democratic practice worldwide if they do not trust their own people to govern their own landscapes. If there was a time when national control of most of the West was the most democratic and the most ecologically sound approach, there is also a time when that approach must give way to a more vital, more human-scale, more grounded form of democracy. The time has come when westerners must be allowed to be in charge of the West."

I wholeheartedly agree. But Kemmis' book leaves an important question unanswered: How is the West supposed to achieve its emancipation exactly? I agree that conservation collaboratives hold the key to self-governance, but many of the collaborations he describes are notable more for their dissimilarities than for their unities.

There are as many permutations of "watershed democracy" as there are watersheds. Collaborations run the gamut from inclusive to exclusive—Dan Dagget tells the story about a nonprofit director who once told him, "I like collaboration. I like it when I tell you what to do, and then you do it."

Some include all stakeholders in a watershed, from loggers to bird-watchers, and some consist solely of a coalition of disparate environmental groups. Some focus on resolving a specific dispute in a specific place, while some work at a regional scale.

Some file lawsuits, and some have vowed not to. Some exist to influence the political pro-

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cess, and some stick to the "grass" and the "roots."

While diversity is a strength of the movement, it is also a weakness. How, for example, do we get from this relative state of chaos to orderly self-governance of the American West? How do we achieve emancipation without subsequently dissolving into feudalism? Without unity, how do we fulfill the inevitability of change and progress without letting the empire strike back? And perhaps most importantly, how do we make self-governance last?

Nature's Model

An answer can be found, I believe, with a deeper look into the movement. Despite its apparent disunity, there is a key commonality that wends its way through many collaborative efforts. It is the goal, whether outwardly expressed or not, of "returning to nature's model of land health."

Nearly all collaborations have an ecological restoration element to their work. For many, it is a significant part of what they do. For example, one of the unifying objectives that brought the Malpai Borderlands Group together in the early 1990s was the desire to reintroduce prescribed fire into the landscape. The Applegate Partnership, in southern Oregon, came together to address the problem of unhealthy forests in their watershed. South of Santa Fe, Earth Works has initiated a cooperative project in the Galisteo Basin with a major focus on slowing and reversing erosion in a watershed that is being steadily subdivided.

The list goes on and on.

Much of this work expresses new knowledge about nature's basic principles. When Aldo Leopold bought a worn-out piece of farm land on the banks of the Wisconsin River and set about

methodically restoring the land to health, he was mostly guessing at what to do. Seventy years later, ecological science has developed to the point where we can make sound decisions about what to cut, where to burn, when to graze, and how to measure the effects—all with the goal of restoring the "natural range of ecological variability."

The significance of "returning to nature's model" to the collaborative movement, and ultimately to the question of sovereignty in the West, is this: It creates an unambiguous baseline from which we can commence our work together. This is how revolution starts—not just with the requisite handshake and declaration of good

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"It is noteworthy that the vocabulary of land health developed over the last twenty years can be applied to evaluating political health as well. Words and terms such as self-renewal, diversity, stability, resilience to perturbation, vigor, adaptability, and functioning properly at the grassroots level suggest that the health of a watershed democracy can be maintained and monitored in much the manner a watershed itself can."

intentions, but with common, and measurable, goals of human and land health.

It is noteworthy that the vocabulary of land health developed over the last twenty years can be applied to evaluating political health as well. Words and terms such as self-renewal, diversity, stability, resilience to perturbation, vigor, adaptability, and functioning properly at the grassroots level suggest that the health of a watershed democracy can be maintained and monitored in much the manner a watershed itself can.

Perhaps we need to develop a "seventeen-point checklist" of indicators of political health in the West to go along with ecological evaluations.

In any case, the tyranny we wish to throw off is not just the last vestige of empire, but the legacy of history itself. Creating a society to match the West's scenery doesn't just mean "getting along with each other" but actually drawing to a close both the environmentally destructive exploitation of our natural resources and the socially destructive exploitation of our anger and frustration.

It will be hard work, but I know it can be done. That's because it has already begun. I don't know if we need a Missoula Tea Party or not, but liberation is coming. Only through unity, however, can we hope to control what happens next.

Fuelwooding for Forest Restoration

The lands of northern New Mexico—the valleys, grasslands, and forests—have sustained human communities for centuries. But the ponderosa pine forests of the region have changed greatly in the last century by becoming full of dense stands of young, small trees. The suppression of naturally occurring fires, past overgrazing, and favorable climate conditions have all contributed to an overabundance of young trees that choke the forests and invade meadows. These forests are now at risk of supporting destructive crown fires that can cause widespread forest mortality, soil erosion, and destructive flooding. The previously rich grass cover beneath the trees has been reduced so that livestock or wildlife grazing is concentrated on increasingly smaller areas.

A restoration project to thin small trees and reintroduce light surface fire has been undertaken by The Four Corners Institute, The Quivira Coalition, Forest Trust, and the USDA Forest Service/Pecos/Las Vegas Ranger District.

The restoration project would thin the trees with the help of fuelwooders, who have used the area for decades to collect firewood and other small diameter wood. Thinning the forest by collection of fuelwood will help restore ecological well-being to a 300 acre stand of ponderosa pine forest.

The project is taking place on the Forest Service allotment of the Valle Grande Grass Bank, run by The Conservation Fund. The Valle Grande Grass Bank is a regional grass bank for use by stockmen from local villages to rest and restore their home ranges.

For more information on this project, see the insert to this newslettter.

Grass, Brush, Timber, and Fire in Southern Arizona

by Aldo Leopold

[***Editor's note:*** *According to Craig Allen, this article by Aldo Leopold, published in the October 1924 edition of the* ***Journal of Forestry****, "hits the target mostly dead-on." We reprint a condensed version here to illustrate how much, and how little, has changed.*]

One of the first things which a forester hears when he begins to travel among the cow-camps of the southern Arizona foothills is the story of how brush has "taken the country." At first he is inclined to classify this with the legend, prevalent among the old timers of some of the northern states, about the hard winters that occurred years ago. The belief in the encroachment of brush, however, is often remarkably circumstantial. A cow-man will tell about how in the 1880s on a certain mesa he could see his cattle several miles, whereas now on the same mesa he can not even find them in a day's hunt. The legend of brush encroachment must be taken seriously.

Along with it goes an almost universal story about the great number of cattle which the southern Arizona foothills carried in the old days. The old timers say that there is not one cow now where there used to be 10, 20, 30 and so on. This again might be dismissed but for the figures cited as to the brandings of the old cattle outfits, of which the location and area of range are readily determinable. This story likewise must be taken seriously.

In some quarters the forester will find a naïve belief that the two stories represent cause and effect, that by putting more cattle on the range the old days of prosperity for the range industry might somehow be restored.

The country in which the forester finds these prevalent beliefs consists of rough foothills corresponding in elevation to the woodland type. Above lie the forests of western yellow pine. Below lie the semi-desert ranges characteristic of the southern Arizona plains.…

Five facts are so conspicuous in this foothill region as to immediately arrest the attention of the forester.

1) Widespread abnormal erosion. This is universal along watercourses with sheet erosion in certain formations, especially granite.

2) Universal fire scars on all the junipers, oaks, or other trees old enough to bear them.

3) Old juniper stumps, often levelled to the ground, evidently by fire.

4) Much juniper reproduction merging to pine reproduction in the upper limits of the type.

5) Great thrift and size in the junipers or other woodland species which have survived fire.

A closer examination reveals the following additional facts:

First, the reproduction is remarkably even aged. A few ring counts immediately establish the significant fact that none of it is over 40 years old. It is therefore contemporaneous with settlement; this region having been settled and completely stocked with cattle in the 1880s.

Second, the reproduction is encroaching on the parks. These parks, in spite of the heavy grazing, still contain some grass. It would appear, therefore, that this reproduction has something to do with grass.

Third, one frequently sees manzanita, young juniper or young pines growing within a foot or two of badly fire-scarred juniper trees. These growths being very susceptible to fire damage, they could obviously not have survived the fires which produced the scars. Ring counts show that these growths are less than 40 years old. One is forced to the conclusion that there have been no widespread fires during the last 40 years.

Fourth, a close examination of the erosion indicates that it, too, dates back about 40 years and is therefore contemporaneous with settlement, removal of grass, and cessation

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". . .at least in this region grass is a much more effective conserver of watersheds than foresters were at first willing to admit, . . ."

of fires.

These observations coordinate themselves in the following theory of what has happened: Previous to the settlement of the country, fires started by lightning and Indians kept the brush thin, kept the juniper and other woodland species decimated, and gave the grass the upper hand with respect to possession of the soil. In spite of the periodic fires, this grass prevented erosion. Then came the settlers with their great herds of livestock. These ranges had never been grazed and they grazed them to death, thus removing the grass and automatically checking the possibility of widespread fires. The removal of the grass relieved the brush species of root competition and of fire damage and thereby caused them to spread and "take the country."…

Assuming that all the foregoing theory is correct, let us now consider what it teaches us about erosion. Why has erosion been enormously augmented during the last 40 years? Why has not the encroachment of brush checked the erosion which was induced by the removal of grass? Why did not the fires of pre-settlement days cause as much erosion as the grazing of post-settlement days?

It is obvious at the start that these questions can not be answered without rejecting some of our traditional theories of erosion. The substance of these traditional theories and the extent to which they must be amended before they can be applied to the Southwest, I have discussed elsewhere.[1] It will be well to repeat, however, that the acceptance of my theory as to the ecology of these brushfields carries with it the acceptance of the fact that at least in this region grass is a much more effective conserver of watersheds than foresters were at first willing to admit, and that grazing is the prime factor in destroying watershed values.…

Let us now consider the bearing of this theory on Forest administration. We have learned that during the pre-settlement period of no grazing and severe fires, erosion was not abnormally active. We have learned that during the post-settlement period of no fires and severe grazing, erosion became exceedingly active. Has our administrative policy applied these facts?

It has not. Until very recently we have administered the southern Arizona forests on the assumption that while overgrazing was bad for erosion, fire was worse, and that therefore we must keep the brush hazard grazed down to the extent necessary to prevent serious fires.

In making this assumption we have accepted the traditional theory as to the place of fire and forests in erosion, and rejected the plain story written on the face of Nature. He who runs may read that it was not until fires ceased and grazing began that abnormal erosion occurred. We have likewise rejected the story written in our own fire statistics, which shows that on the Tonto Forest only about one-third of 1% of the hazard area burns over each year, and that it would therefore take 300 years for fire to cover the forest once. Even if the more conservative grazing policy which now prevails should largely enhance the present brush hazard by restoring a little grass, neither the potential danger of fire damage nor the potential cost of fire control could compare with the existing watershed damage. Moreover, the reduction of the brush hazard by grazing is to a large degree impossible. This brush that has "taken the country" consists of many species, varying greatly in palatability. Heavy grazing of the palatable species would simply result in

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the unpalatable species closing in, and our hazard would still be there.…

In discussing administrative policy, I have tried to make three points clear: First, fifteen years of Forest administration were based on an incorrect interpretation of ecological facts and were, therefore, in part misdirected. Second, this error of interpretation has now been recognized and administrative policy corrected accordingly. Third, while there can be no doubt about the enormous value of European traditions to American forestry, this error illustrates that there can also be no doubt about the great danger of European traditions to American forestry.

The present situation in the southern Arizona brushfields may be summed up administratively as follows:

1) There has been great damage to the watershed resources.

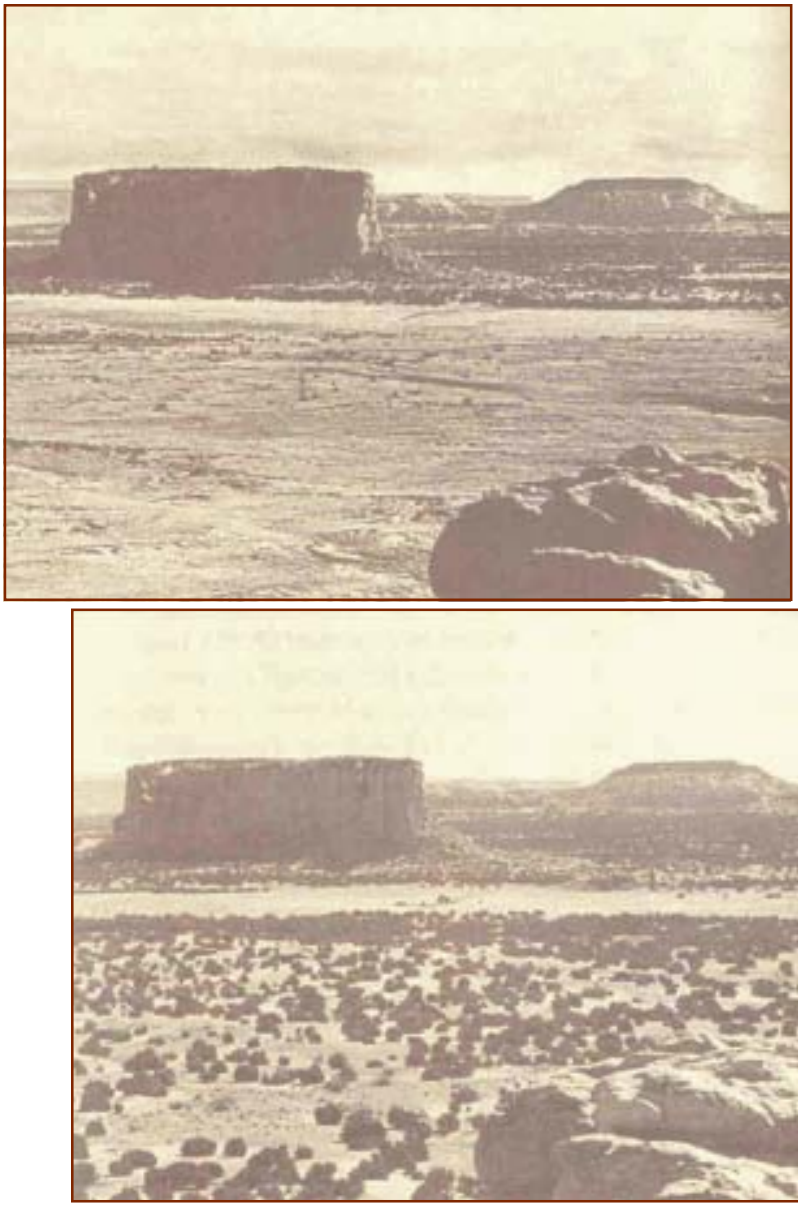
2) There has been great benefit to the timber resources.

3) There has been great damage to the range resources.

Whether the benefit to timber could have been obtained with lesser damage to watersheds and ranges is an academic question dealing with bygones and need not be discussed. Our present job is to conserve the benefit to timber and minimize the damage to watershed and range in so far as technical skill and good administration can do it. Wholesale exclusion of grazing is neither skill nor administration, and should be used only as a last resort.

The problem which faces us constitutes a challenge to our technical competency as foresters—a challenge we have hardly as yet answered, much less actually attempted to meet. We are dealing right now with a fraction of a cycle involving centuries. We can not obstruct or reverse the cycle, but we can bend it; in what degree remains to be shown.

[1]"Pioneers and Gullies," by Aldo Leopold, *Sunset Magazine*, May 1924.



Mesa Encantada, western New Mexico, 1899 [top] and 1977 [bottom]. The formerly open grassy valley has been invaded by juniper trees—a phenomenon that has been documented throughout the Southwest. Aldo Leopold was the first to write about this process, correctly linking the change to the structure of the vegetation with overgrazing, watershed erosion, and fire suppression. (Top photo by William Henry Jackson, courtesy of Colorado Historical Society; bottom photo courtesy of Harold E. Malde, USGS.) From *Aldo Leopold's Southwest*, edited by David E. Brown and Neil B. Carmony, University of New Mexico Press, 1990.

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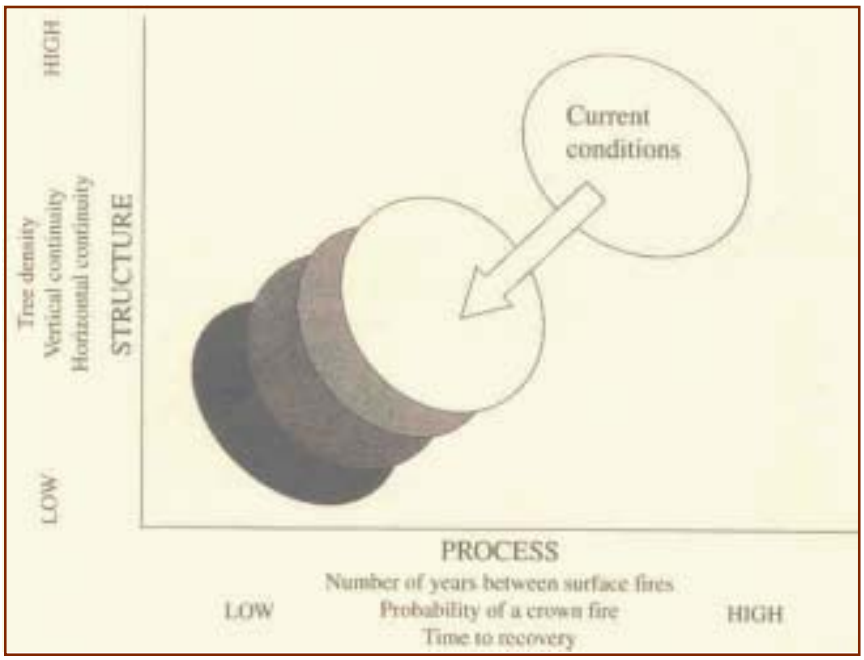
prevent exotic tree species from regrowing and new thickets of pines from establishing?

Structure and Process

In nature, structure and process are two sides of the same coin. Riparian communities evolved with flooding, and ponderosa pine forests evolved with low-intensity surface fires. Restoring natural **structures** alone will not be enough to recreate ecosystem integrity. For communities to be able to sustain natural structures, they will need to experience the same kinds of **processes** with which they evolved. In riparian communities, flooding scoured away debris and created the conditions that cottonwood trees require to establish. In ponderosa pine forests, frequent fires prevented the germination of thickets of young trees and the accumulation of abundant surface fuels.

But to restore historical structures and processes, we need to understand what they were like when ecosystems were intact, before significant human influences altered them. When restoration ecologists reconstruct historical conditions in ecosystems, sometimes a time-consuming task, these are called *reference conditions*. Historical photographs, tree ring records, fire-scar evidence in trees, historical documents, and diaries all can help to reconstruct reference conditions for restoration.

Still, we know that natural systems are highly dynamic. The reconstruction of the precise structure of a forest of 100 or 150 years ago only gives us the state of the forest at one moment in time. A century and a half ago, for example, the Southwest was coming out of a long climate period known as the "Little Ice Age." Climate conditions at present are different, and continually changing as well. It may not be appropriate to try to restore forests to the structure present during a precise moment in time. This is especially true for ponderosa pine trees, which are highly sensitive to climatic conditions for germination, and appear to regenerate only episodically, at intervals of decades or more.



Schematic representation of the restoration concept. If the natural range of variability is seen as a multidimensional "envelope" of ecological conditions, then the goal of restoration is to move an altered ecosystem back toward its pre-disruption envelope (the darkest region), and to allow natural processes over time to dynamically re-establish a range of natural structural conditions. (From *Ecological Restoration of Southwestern Ponderosa Pine Ecosystems: A Broad Perspective,* Allen et al, 2002.)

Range of Variation

Instead, restoration may work better if ecosystems are returned to within a "natural range of variation" (*Landres et al.* 1999). Ponderosa pine forests, for example, not only have a variability through time because of climate change, but also across the landscape. Forests across the region vary in the density of trees, the grass and forb species that occur in the understory, climatic conditions, and kinds of wildlife inhabiting the forest. We could not possibly reconstruct how each forest stand looked in the past.

Instead of determining precisely what the reconstruction should look like, we can rely on nature to

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accomplish most of the work. We can push the ecosystems back within an envelope of natural variability, and allow natural processes to restore the appropriate variability. If we can restore the natural processes, the natural structures should follow. The "natural range of variation" approach is imprecise, but it is flexible, less expensive, and bodes well for the creation of a self-sustaining ecosystem. The process model of restoration means working with the evolutionary context of ecosystems.

Restoration using natural process can also be accomplished incrementally, letting the natural system find its own dynamic equilibrium. Although restoration efforts are needed soon to reduce the vulnerability of many systems, we should be cautious in the implementation of treatments. Trying to accomplish restoration all in one blow may cause more harm than good. Instead, a careful, incremental approach can allow us to learn as we practice restoration.

The Society for Ecological Restoration defines restoration as "the processes of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context and sustainable cultural practices." A successful restoration will return **resilience** to ecosystems—communities will be able to withstand change without being damaged. Restoration should aim to set ecological trends in the right direction toward enhanced resilience (*Allen et al.* 2002).

The Case of Southwestern Ponderosa Pine Forests

Restoration has become an important forest management tool in southwestern ponderosa pine forests. Frequent, low-intensity fires have been replaced by high intensity, high mortality crown fires. From 2000-2002 alone, we saw Arizona's 469,000 acre Rodeo Chedeski, New Mexico's 48,000 acre Cerro Grande and Colorado's 137,000 acre Hayman fires. These fires are anomalous in both size and destruction. These are not the fires of our memory in this semi-arid region. We have recently come to anticipate and dread fast moving, intensely hot fires that reach into the canopy, leaving in their wake blackened hill slopes with widespread mortality, unstable slopes, and flooding. For decades, such fires have been unknown. Why have recent years brought such dramatic changes to the fire regime in the southwest? To answer this question, we must look at the intersection of both natural and human-caused factors.

Piñon-juniper encroachment in Apache Canyon. 1945 [top]; 1984 [bottom]. (Photos courtesy of New Mexico Museum of Natural History.)

Climate Matters

To a large extent, vegetation communities are pulled along by climate conditions. Precipitation and temperature determine the size and complexity of the plant ecosystems, and the kind of disturbance conditions the systems are subject to—fire, flooding, and violent storms. In the Southwest, a dry, temperate climate prevails. But through decades, centuries, and millennia, those conditions have cycled continuously. Early decades of the last century, for example, were so wet that an unusual cohort of pines established that captured much of the regional forest, and continues

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Typical overstocked forest in northern New Mexico.

to form the greater part of many pine stands.

A short-term fluctuation, the El Niño/La Niña cycle brings relatively wet conditions to the Southwest (El Niño), followed by relatively drier conditions brought by its twin (La Niña). This spring and summer in the Southwest, a mild El Niño episode is fading, bringing to an end the somewhat wet conditions of the past year. Next year, in 2004, when La Niña arrives, drier conditions will prevail throughout the regional forests.

Why does climate matter? Because climate patterns cause fire patterns. Regional patterns of moisture, temperature, lightning, and wind determine when and how intensely fire will burn in forests. The primary fuel for historic low-intensity fires was the lush grass cover that grew each summer in monsoon rains. The fires burned downed branches and dead needles, thinning seedlings and saplings. Larger trees, fire-adapted by their thick bark and lack of lower limbs, were not killed in these light fires. With precipitation too low to produce a large quantity of fuels, even in dry, warm conditions with an abundance of lightning, these light fires were able to burn on an average of every two to twenty years or so (*Swetnam and Betancourt* 1990). Early explorers described these forests as open colonnades of large trees, groves open enough for a horse to gallop through.

Different Places, Different Forests

Not every forest in the West grows under this kind of climate and fire regime. Farther to the north in the Rocky Mountains, cooler conditions mean moister forests in which fires burn less readily. Fires are postponed for longer periods of time, and fuels accumulate. When fires do ignite under temporarily drier conditions, far more severe burns occur, usually as crown fires that burn large areas. The Yellowstone Fire of 1988 was such a fire, destroying forest stands over a very large area, inspiring the fascinated attention of the public as a famous and beautiful National Park burned. The Yellowstone Fire, however, was probably a natural fire, burning on a natural interval of from 300 to 400 years. Such "crown fires," which cause mortality in the canopy over extensive areas, are characteristic of some forest ecosystems. Not so the open, semi-arid pine forests of the Southwest.

Why then, are we seeing half-million acre crown fires in the Southwest? Clearly, part of the explanation is that we appear to be entering a period of extremely dry climate in the Southwest region. The fluctuations in climate that we have seen over past centuries certainly includes multiple decades of deep drought. These episodes have been referred to as megadroughts, and it appears that the Southwest is poised to enter another megadrought. For example, the water year (October-September) of 2002 was among the driest in many Western states, as measured by the instru-

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mental record, and was surrounded by other very dry years (*Betancourt et al.* 2003). Such a drought would be well within the natural range of climate variability.

Not by Climate Alone

But climate has varied for hundreds and thousands of years in the Southwest, yet the size and severity of current stand-replacing fires in the Southwest is unprecedented. Forest ecologists and climate researchers, using tree-ring and fire-scar analysis, pollen and charcoal studies, repeat photography, and stand structure analysis, have yet to find evidence of large crown fires in southwestern pine forests. What explains this huge shift in fire behavior? The answer to this question lies with huge changes in the forest in the past century.

Prescribed fire on the Valle Grande Grass Bank on Rowe Mesa. (Photo courtesy of Bill de Buys.)

Although indigenous peoples lived in and used these forests for thousands of years, the entry of Euro-Americans into the Southwest caused extraordinary changes, particularly from around 1880, when social and demographic shifts changed the use of the forests. No one factor perhaps had more impact that the completion of railroads, which allowed the transport of cattle from Western ranges to Eastern markets.

There is a strong ecological marker for the entry of domestic livestock into southwestern forests. If grass is the primary fuel for low-intensity fires that burned on the forest floor, then grazing at the intensive levels of late 19th century stocking meant the virtual removal of that grassy layer. At no time since has the level of grazing in ponderosa pine forests reached the same level of intensity as the decades of the late 19th and early 20th centuries. When researchers look at the fire scar record contained in tree rings, they see a remarkable marker. At about the same time that livestock entered the regional forests, fire frequency dropped precipitously. The removal by grazing of the fine fuels that supported surface fires meant a virtual cessation of burning, in ponderosa pine forests at least.

Forests that had burned every few years or every few decades for thousands of years simply stopped burning. The last nail in the coffin was the increasingly effective fire suppression activities of the government. After World War II, the technologies developed during the war were put to use in suppressing fires throughout the West.

Fuels from falling branches and dead trees began to accumulate. We were constructing a bonfire on the forest floor, but preventing it from being ignited. Wetter periods simply meant more forest productivity and more material being added to the

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"The great fires of 1996, 2000, and 2002 were not accidental, but rather inevitable, given the scenario that had unfolded over the past century."

wood pile. Fire suppression mattered less in forests where the natural fire cycle is long—in lodgepole pine forests for example. In such forests, when fuel levels reach an adequate level, no amount of fire suppression effort would be able to quench the ferocity of the fire. But in southwestern forests, the length of time between natural fires meant that many decades of suppression would easily alter the natural balance.

So the woody fuels began to accumulate under ponderosa pine forests. The 1950s, with a severe but fairly natural level of drought, saw the first truly unnatural crown fires to burn in the region. Most fire sizes were in the several thousands of acres range, but one, the Carrizo Fire in Arizona, burned 90,000 acres. The management response—put the fires out harder.

After the 1950s drought, a relatively wet period ensued, especially from 1976 to 1995. The ponderosa pine forests thickened. Instead of open, grassy stands of trees, most stands were choked by down dead wood and thickets of young trees suppressed by competition. Understory grass and forb communities declined in abundance and diversity (*Covington and Moore* 1994). Thick mats of slowly decomposing pine needles on the forest floor prevented new pine regeneration. Old and large trees suffered from competition from the many small trees crowding the stands.

Most stunning was the huge increase in the number of young trees. Densities of mature trees (> 12 inches) in diameter ranged between 8 to 51 trees per acre around 1900 in southwestern ponderosa pine ecosystems, (*Allen et al.* 2002), with probably relatively small numbers of seedlings and saplings. Currently, densities of trees of all sizes in these forests often exceed 1,000 trees per acre, and sometimes more than 2,000 (*Allen* 1998). Not only do these thickets of young trees provide a staggering amount of fuel, they also represent a "ladder" to the canopy of the forest, easily providing a path to crown fires. At the same time, the trees most resistant to fires, the mature pine trees, were largely removed from the forest by logging. By the end of the 20th century a human-made bonfire had been laid.

What has happened from the mid-1990s to the present in southwestern ponderosa pine forests, then, has been a collision of natural drought cycles with forest conditions massively altered by human policies. The great fires of 1996, 2000, and 2002 were not accidental, but rather inevitable, given the scenario that had unfolded over the past century. Given the size and continuity of the fuel load, it would have been truly astonishing, Betancourt et al. (2003) suggest, if the crown fires happening in recent years were not abnormal in size and severity.

What Will the Next Decade Bring?

Southwest regional climate can be understood to a large extent from the slow and large changes in sea surface temperatures. In 1995 the North Atlantic turned warm and in 1998 the Pacific went cold, the same pattern that occurred last in the 1950s (*Betancourt et al.* 2003). Many climate scientists now believe that we are facing another megadrought like the one that occurred in the 1950s. The difference between that period and the present is that there is another fifty years of fuel accumulation.

Unlike the situation in the 1950s, the problem is now widely recognized. Billions of dollars and many fire fighters lives have been

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spent recently trying to suppress these huge fires. Decades of moist conditions encouraged many people to build homes deep within the forests, made with rustic, i.e. woody, materials, often on narrow roads to protect privacy. Continued crown fires in the region will mean continued suffering and hardship for many small rural communities, and even larger towns.

The ecological effects of crown fires in the ponderosa pine forest are equally devastating. The long-term effects on forests that did not usually experience complete mortality over large areas on an evolutionary scale are unclear. How will these forests recover? How will seeds be carried long distances to regenerate the forest? Is it possible that other species, such as grasses or shrubs, may capture the burn sites and make it difficult or impossible for ponderosa pine to reestablish? If so, does this mean that large portions of southwestern forests may be converted, at least for some period of time, to other stable ecological communities (Savage, unpublished data)? The long-term fate of the ponderosa pine forest on these severe burns is not understood well.

There are multiple ecological effects that may occur because of forest change. Another is the potential for a severe decrease in biological diversity. Southwestern ponderosa pine forests provide habitat for at least 250 species of vertebrate animals (*Patton and Severson* 1989). Crown fires will have a large, but unknown, effect on these species, particularly threatened, endangered, and sensitive species. Some animals are highly dependent on certain forests structures, such as old and large trees, that will not be replaced for many decades. Large oak trees, commonly found in ponderosa pine forests, for example, are crucial for many wildlife species. Moreover, many burn sites are especially vulnerable to invasion by aggressive non-native plant species. These species are often difficult or impossible to remove once established (*Allen et al.* 2002).

Severe fires also greatly increase the chance for severe flooding and erosion. Since many crown fires burn in the dry foresummer—May and June—in the Southwest, the burn site may be particularly vulnerable to erosion and flooding during the monsoon rains that follow. Soils are left unprotected by leaf and litter cover from the force of the rain, and unstable without the mat of roots to prevent wholesale movement downslope. Without forests to absorb and hold downpours, flooding and rapid erosion have been the norm at severe burn sites.

What Is to be Done?

The prospect for changing the conditions on millions of acres of southwestern ponderosa pine is not a cheering one. Fierce crown fires, such as those that burn in extreme weather conditions of drought and high winds, are difficult and sometimes impossible to contain. The task that needs to be accomplished to stave off such unnatural fires seems to require too much money and effort. Having laid the bonfire, how can we unmake it in time?

The single best indicator that

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Forests in northern New Mexico.

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Effects of thinning and prescribed burning on an area near Truchas.

the risk of stand-destroying fire has been lowered would be the return of low-intensity, surface fire. Scientists and managers have been thinking in recent years about the most constructive ways to reduce the risk of crown fire and to improve the integrity of ponderosa pine forests. Allen et al. (2002) suggest 16 broad principles to foster implementation of a diverse range of ecologically justifiable restoration projects.

1. The most fundamental priority of restoration must be the rapid reduction of the widespread risk of crown fires across the landscape.

2. Given the scale of the task, restoration work must be strategically positioned in the landscape. Priority areas should include proximity to human communities and important watersheds, old-growth forest stands, habitats of sensitive species, and strategic locations that can effectively breakup the flow of fire across the landscape.

3. Wherever possible, local "reference conditions" should be developed, but in the face of incomplete knowledge the goal is to create ecological integrity and function.

4. Restoration should be thought of and implemented as a series of conservative interventions. Restoration accomplished all at once may be disruptive and nonproductive. More aggressive treatments may be appropriate near human communities.

5. Restoration should take advantage of any existing forest structure that may be useful. Clumps of trees and interlocking tree canopies, for example, should be preserved for wildlife that need them.

6. A more natural species composition should be encouraged. Restoration of natural fire regimes, in most cases, should be able to restore the balance of species without more intrusive mechanical thinning. The restoration of more natural fire regimes should also help restore a robust understory of grasses and forbs, essential to carrying low-intensity fire.

7. Large and old trees should receive special attention to protect them during the restoration process. These components form valuable wildlife habitat, and are increasingly rare in our southwestern forests.

8. Restoration projects should keep in mind that ponderosa pine is known to regenerate episodically. Because of this, it may be wise to retain patches of young trees to maximize options for future forest structure.

9. Restoration projects should pay attention to both structure and process in the forest. For example, thinning young trees to reduce the fuel load will not yield long-term results unless low-intensity surface fires are also reintroduced.

10. Care should be taken to minimize the potential for the invasion of non-native plant species. One pathway for non-native invasion is the practice of seeding with understory plant species. These seed mixes

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are usually contaminated with weed species, which thrive in the disturbed conditions of restoration treatments.

11. Restorations efforts should respect the high degree of regional heterogeneity due to topographic, hydrologic, and soil variability. No one restoration prescription will work across the landscape.

12. Some communities within the ponderosa pine forest need special care, those with higher than usual diversity, and streamside communities for example, and these should be assigned special protection.

13. Managers and restorationists should be mindful that small projects add up to large impacts across the landscape. The accumulative effects of restoration projects across the landscape need to be monitored over time.

14. Too dense tree canopies have meant the decline of understory grasses and forbs. Understories should recover quickly, but they need protection against livestock grazing while they are recovering.

15. Restoration is a new practice, and we have much to learn. It is essential that a monitoring program be put in place with every restoration project so that we can learn if the work is accomplishing what we hope it will.

16. Ecological restoration may take a century or two to be fully realized in southwestern forests and will take a long-term social and financial as well as scientific commitment.

Restoration Through Natural Process

There are no certainties in managing the natural world. Almost always, we find ourselves faced with unintended consequences, sometimes with stunning and unfortunate consequences. We are more likely to achieve our objectives if we are able to treat restoration as a work in progress rather than a technical certainty. Allowing natural processes to accomplish restoration seems to offer the most reliable and flexible way to return resilience and sustainability to natural ecosystems whose inner workings we barely understand.

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Upcoming Events

Mark your calendars for these events you don't want to miss!

❧ ***"Housewarming" Party*** at our new building, the Fortaleza Coyote Compound, 1413 Second Street, Santa Fe on **October 17** from 3-6 p.m. Help us celebrate our new digs!

❧ ***Road and Drainage Improvement Workshop*** with **Bill Zeedyk** at Earth Works Institute Ranch near Santa Fe on November 8. For information, call Earth Works at 982-9806.

❧ The ***Third Annual Quivira Coalition Conference*** will be held Thursday-Saturday, January 15-17, 2004, at the Hilton Hotel in Albuquerque. Entitled *Ranching In Nature's Image*, it will feature presentations by Linda Hasselstrom, Dana Jackson, Jo Robinson, Bill deBuys, Gregg Simonds, Wayne Elmore, Jim Howell, and many others.

Highlights include breakout sessions with Bill Zeedyk, Kirk Gadzia, Maria Sonett, Craig Conley, Jim Maynard, Sam Montoya, Jim Thorpe, and others, an annual meeting of the Southwest Grassfed Livestock Alliance, and music by South by Southwest.

As always, the Conference will conclude Saturday night with the Clarence Burch Awards Banquet. To join the party call The Quivira Coalition or check updates on our web site. Registration packets will be mailed in late October.

❧ ***Ranching in the Radical Center***—an all-day workshop on Wednesday, **January 28th**, 2004, in Elko, Nevada. This workshop is an official event of the **20th Annual National Cowboy Poetry Gathering**. It features presentations by Rick Knight, Sid Goodloe, Doc and Connie Hatfield, Courtney White, Agee Smith, and Steve and Robin Boies.

The goal of this workshop is to share information for creating and sustaining land health through the Radical Center. For more information contact the **Western Folklife Center** at **(775) 738-7508** or tbaer@westernfolklife.org.

For information on **all Upcoming Events**,
see our website, **www.quiviracoalition.org**

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