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The Quivira Coalition

Sharing Common-Sense Solutions to the Rangeland Conflict

Holy Cow! Biodiversity on Ranches, Developments, and Protected Areas in the "New West"

by Jeremy D. Maestas, Richard L. Knight, and Wendell C. Gilgert, Department of Fishery & Wildlife Biology, Colorado State University

Conservationists have an admirable history of documenting the impacts of human land uses on biodiversity to better inform resource management decisions, but our current knowledge about land-use changes in the Mountain West is less than satisfactory. We work to diminish extractive and commodity-based industries such as water development, logging, mining, and livestock grazing in this region, but have largely failed to recognize the ecological consequences of our own actions, especially when those actions involve where we choose to live and play. We continue to devote much of our attention to the traditional consumptive land uses that characterized the "Old West," while other threats to biodiversity become more pervasive each year with the emergence of a "New West." For example, urban sprawl and outdoor recreation are the number two and number four leading causes, respectively, for the decline of federally listed threatened and endangered species (Czech, Krausman, and Devers 2000).

The character of the New West is being shaped by a flood of immigrants seeking to enjoy the natural amenities and recreational opportunities of a region rich in public lands (Power 1996; Masnick 2001). Importantly, however, the West is only half public lands; the most productive lands in this region are in private ownership (Scott and others 2001). This fact becomes critical since the most profound land use change in the New West is the conversion of private lands presently in ranching and farming to rural residential developments (i.e., exurban development) (Knight 2002). Unfortunately, conservationists have given scant attention to studying the ecological implications of this land-use conversion.

Here, we address some of the ecological issues associated with land-use change in the Mountain West.

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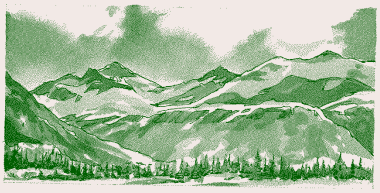
Editor's Note

In this newsletter, we discuss the complex issue of Biodiversity,



highlighting some current research into an often misunderstood subject which is at the heart of tensions over grazing in the West.

First Annual Clarence Burch Award To Honor Southwestern Willow Flycatcher Research Project

The Quivira Coalition is pleased to announce that its First Annual Clarence Burch Award is being given


Clarence Burch.

to the Southwestern Willow Flycatcher Research Project, located on the U Bar Ranch, near Silver City, NM.

This award honors a partnership between scientists, ranchers, private land owners, and public land managers in a project whose goal has been to gain a better understanding of the complex ecological issues involving the critically endangered Southwestern Willow Flycatcher.

The U Bar Ranch, home to the largest population of Southwestern Willow Flycatchers in the United States, has important lessons to teach about the positive relationship between scientific research, habitat restoration, progressive ranch and farm management, and private and public land owner support. In many ways, it is a model of cooperation in service to the recovery of an endangered species.

The honorees have demonstrated an eagerness to share the lessons they have learned from their work on the U Bar. For this eagerness, and for their integrity, dedication, and unfailing good humor, sometimes in the face of adversity, The Quivira Coalition wishes to honor the following individuals:

***Ty Bays**, Phelps Dodge Corp.;*

***Paul Boucher**, Gila National Forest;*

***Deborah Finch**, USFS Rocky Mountain Research Station;*

***David Ogilvie**, U Bar Ranch;*

***Ralph Pope**, Gila National Forest;*

***Roland Shook**, Western New Mexico University; and*

***Scott Stoleson**, USFS Rocky Mountain Research Station.*

A stipulation of the Burch Award, named in honor of a pioneering rancher and conservationist from Oklahoma, is that the $15,000 cash award be invested back into the project, either in the form of continued research or another on-the-ground activity.

The Award will be presented at our First Annual Banquet, to be held at La Posada de Albuquerque, Saturday, January 19, 2002. For more information, please see our web site.

And congratulations to the winners!

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From the Founders

Jim Winder
Courtney White
Barbara Johnson

We're happily enduring growth pains.

On October 1, we moved into our first official office. It's a lovely little building at 1411 Second St., in Santa Fe (1-1/2 blocks east of Cerrillos Blvd., on the north side of Second St.). It has four offices, a conference room, and a large communal area where Tamara works. We will be sharing space with our friend Craig Conley, who owns Bionomics Southwest.

The move has been a chore, as we expected, but we have finally gotten everything out of boxes and in place, more or less. It has already made a big difference to us to have the extra elbow room, especially as visitors begin to drop by. Come and visit us!

We would like thank all the people who made a special contribution to help us with the moving costs. We raised over $10,000!! Thank You!

Next, at our November Board meeting, we welcomed three new Board members. They are: Roger Bowe, a rancher from San Jon, NM; Sterling Grogan, biologist with the Middle Rio Grande Conservancy District; and Ed Singleton, Albuquerque Field Office Manager for the BLM. This raises the number of Board members to twelve, and maintains the (intentional) even division between ranchers, environmentalists, and state or federal employees.

We are very pleased the new members agreed to serve on the Board and look forward to their contribution to our energetic, and philosophical, Board meetings.

We are also pleased to announce that we are advertising for a new staff member (see the ad on Page 11). A new office means that we have space for more assistance, which we desperately need. The upside to all the work we have taken on recently is that we have the means to hire someone. The downside is, now we have to DO all that work!

There is also plenty of elbow room for VOLUNTEERS. If you are willing to commit five to ten hours a week (or more!) to us, then we have a job for you! Just give Tamara a call.

Finally, our First Annual Conference is shaping up to be a real event. Attendance is looking great, and we hope to make a splash in the media. We pulled together some amazing speakers, and we sincerely pray their message is heard.

That so many innovative and hard-working people have agreed to take time out of their busy lives to speak and attend our two-day conference is a very hopeful sign, we believe.

All four developments mark genuine milestones for The Quivira Coalition. While it is a credit to the staff that we have been able to come so far so fast, our success is mostly due to the people who support us financially, emotionally, and physically. We wish we could say it has been part of a carefully orchestrated plan, but it has not.

It has been a bit bewildering, to be honest.

Perhaps that's why our Board has decided to embark on its first official retreat this winter, to help map out the next few years.

We hope to see you at the Conference.

The New Ranch Handbook: A Guide to Restoring Western Rangelands is available from The Quivira Coalition at a reduced price. Send $10 plus $3.50 for shipping and handling to:

The New Ranch Handbook
The Quivira Coalition
551 Cordova Rd. #423
Santa Fe, NM 87505

A New Environmentalism (Part 2)

by Courtney White

Slopes at the beginning of reclamation of an overburden pile at a mine site near Cuba, New Mexico. (Photo courtesy of Courtney White.)

Environmentalists have asked ranchers and others to make significant changes in the way they think and act, without making similar demands of themselves. In Part 1 of this article, which appeared in our October 2001 issue, Courtney stressed the need for the environmental movement to start over at the level of soil, grass, and water.

Restoration

The principal chore ahead of us is restoration, which I define as achieving full ecological functionality at the level of soil, grass, and water. Our job as activists, in other words, is transforming "red" to "green" on maps like that of the Altar Valley. (See part 1.)

One does not need to be an expert in the minutiae of rangeland health to understand that we have a tremendous amount of unhealthy land out there. The catalogue is all too familiar by now—choking forests, eroding land, endangered species. Add to this list what I consider to be the most alarming trend in recent years: accelerated habitat fragmentation due to off-road vehicle damage, new road construction, and exurban development.

In light of the "functionality crisis" confronting us, renewed calls for an expansion of the national wilderness system, as well as the creation of other "protected" areas, seem anachronistic in a new century. Shielding bits of land from the threat of mechanized human activity without simultaneously confronting the source of that threat—the way we live as a society and a people—is, to paraphrase Aldo Leopold, like "improving the pump, rather than the well."

Additionally, the whole concept of "preserving" some places while "releasing" others creates a stratification of land quality and land use that is harmful to land health. For example, what about all the "Plain Jane" lands across the West not deemed worthy of "protection?" Very often these lands are in need of ecological assistance as well. And what about the ecologically artificial distinction between public and private land (a problem exposed by the term "public lands environmentalism")? If the plants and animals do not recognize these boundaries, why should we?

A rangeland health paradigm, by contrast, treats all areas equally and, as a result, gives us a snapshot of functionality—a snapshot that enables land owners and managers to prioritize their restoration work, if restoration work is required. And by working at the level of soil, grass, and water it reduces our dependence on land discrimination.

The key, I am convinced, is more stewardship, not less. By that I mean stewardship that is defined, and measured, by its effects on soil, grass, and water. Stewardship, also, that is humble.

Good stewardship also means having a full toolbox at one's disposal. This includes cattle. In fact, a whole host of new tools involving cattle have popped up recently, including grassbanks, holistic management, dormant season grazing, poop-and-stomps on mine tailings, and herding (an ancient idea that is being rediscov-

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ered).

Unfortunately, we are often precluded from using certain tools, tying our own hands, sometimes by regulation, but most often by our attitude. In his classic book, ***Game Management***, Aldo Leopold wrote that wildlife "can be restored with the same tools that had hithertofore destroyed it—fire, ax, cow, gun, and plow." The difference, of course, is not the tool itself, but how we use it; and our willingness to use it in the first place.

Attitude, in other words, is as important as knowledge.

Work

Recently, I had the privilege of riding a horse into the West Elks Wilderness, near Paonia, Colorado. I went because I wanted to see an award-winning cattle herding operation in action and learn more about the compatibility between well-managed ranching and wilderness values. I also wanted to see some pretty country.

I took two local environmental activists along, one of whom had recently backpacked the very trail we were riding. Initially, we were shocked by what we saw. The thousand-head herd had traveled the same path only a few days prior, leaving cow plops and broken vegetation everywhere. The trail had been trampled into a muddy mess. Our Forest Service guide said this was a *good* thing—he believed that land can tolerate, and sometimes benefit from, disturbance caused by animal impact.

I asked the backpacker, who was also the director of an active environmental organization, what she thought. "People call me all the time and complain," she said. "They're hikers. They don't think there should be cows in the wilderness."

"What do you tell them?" I asked.

"I tell them it's a working wilderness," she replied.

And it is a wilderness that is working well by every ecological and economic indicator that I have seen. In fact, both the local Forest Service office and the pool of ranchers received national awards recently for their innovative collaboration. And they have the monitoring data to back up their claims.

But what about work? If a new environmentalism is going to do restoration, or support ecologically sensitive ranch management, it must first confront the question of human labor on the land. This is an important issue because environmentalists often deride work on public lands, equating it almost universally with destruction.

This is a problem, says historian Richard White in a provocative essay,[11] because, by segregating work from nature, environmentalists "create a set of dualisms where work can only mean the absence of nature and nature can only mean human leisure, [thus making] both humans and nonhumans. . .ultimately. . .the poorer. . . . Work once bore the burden of connecting us with nature. In shifting much of this burden onto the various forms of play that take us back to nature, Americans have shifted the burden to leisure. And play cannot bear the weight."

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A New Environmentalism (Part 2)

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Biodiversity: More Than a Numbers Game

by Laura F. Huenneke
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Conservationists, scientists, and land managers all focus on maintaining biodiversity in ecological communities. Plant diversity is surveyed as part of most assessments of rangeland health. But what is this thing called biodiversity? The "variety of life" is a deceptively simple concept, lending itself to quantification and comparisons; but there are many layers of complexity.

Number of Species. At its simplest, "biodiversity" is the richness or number of species (kinds of organisms) in a community. Many people are surprised to learn which groups are most diverse, worldwide or in a given site. Insects, of course, and other arthropods are most diverse; but fungi (molds and mushrooms—important as decomposers, disease organisms, and soil builders), bacteria, and myriad invertebrates such as worms and clams are extremely diverse as well. The familiar vertebrates (birds, mammals, reptiles) that are so charismatic and so often the objects of conservation efforts, and the vascular plants, the structural components of most terrestrial communities, are actually not all that diverse! Assessing the diversity of a site may thus mean much more intensive, careful sampling than simply counting the most conspicuous organisms.

"Evenness." Biological diversity, though, is not just numbers or a species list: the relative abundance or importance of component species also influences our perception of variability. A forest with ten tree species, equally abundant (like some eastern U.S. deciduous forests), is perceived by the observer as more diverse than one with the same ten species where one species makes up 99% of the total. Ecologists call the relative abundance of the species in a community "evenness." They've derived a number of diversity "indices" to measure and compare community diversity; these give different weight or importance to richness and to evenness, or different emphasis to the presence of rare species in a community, say. Thus it's not necessarily straightforward to compare two communities—particularly if you don't have time for repeated or thorough sampling—and to say with confidence which is more diverse.

Genetic Diversity. So, diversity at the species level is what we usually emphasize. But biologists also use "biodiversity" to refer to life's variability at other levels of organization beyond (or within) the species. An important example is genetic diversity: significant variation in inherited characteristics among individuals or local populations within a species. This is why a single population of a rare species is not considered sufficient as a conservation target. There may be substantial genetic differences between groups of a species, and those variations are considered essential to long-term viability in an unpredictable future. For example, the Douglas fir of Pacific Northwest forests differs greatly from that of the Rocky Mountains—and still further from that of the Mexican highlands. The trees clearly belong to the same species, but differ in growth

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Biodiversity: More Than a Numbers Game

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responses and tolerance of environmental conditions, and even slightly in appearance. Foresters or others interested in potentially useful genes for breeding improved varieties, would argue that no one local population contains all the valuable diversity of that widespread species.

Ecosystem Type. Another component of biodiversity occurs at a scale larger than that of species: the diversity of communities or ecosystem types within a landscape. This is the patchwork quilt that is so obvious when we look down from the air or at a satellite image. In a midwestern agricultural landscape, the mosaic contains forest fragments, cleared fields, small unplowed wetlands, and streamside gallery forests. In the semi-arid west, the "patches" are larger and may represent the different vegetation of different soil units, or the recent history of fire or forest harvest. Human activities exert strong control over landscape diversity. Our land uses tend to sharpen and straighten boundaries between patches, make patches larger and more homogeneous, and rearrange patterns in space.

Ecologists and conservation biologists have worked out various sampling schemes for assessing the diversity of species in a community or along a gradient of communities. Such sampling distinguishes richness or diversity at a specific site from the gradual addition of species as one moves within a community type (from south to north in the Chihuahuan desert, for example), from the addition of whole assemblages of species encountered as one moves into a new ecosystem type. Given that one cannot really characterize diversity of even a single spot without multiple visits to observe species active at different times, careful description and comparison of diversity presents some stiff challenges.

Species Extinction. Conservation biologists worry about the loss of diversity from natural ecosystems around the planet. One obvious concern is overall erosion of species richness caused by extinction. In the past century there have been numerous extinctions of vertebrates (fish, birds, even some mammals), and there are fears (though few hard data) that hundreds of tropical invertebrates, fungi, and plant species are disappearing before even being described or named. It appears, too, that genetic diversity is eroding rapidly within many species, as numbers are reduced and smaller populations disappear altogether.

Species Invasion. Another factor acting to reduce diversity is the increasing rate and impact of species invasions. Humans are extremely effective at moving organisms around, both deliberately (crops, game species, pet and aquarium fish trade) and accidentally. Some of these introduced species "escape" and become so dominant in their new homes as to displace the native biota. Cheatgrass, spotted knapweed, and yellow star-thistle are among the plant invaders that have altered western rangelands, but non-na-

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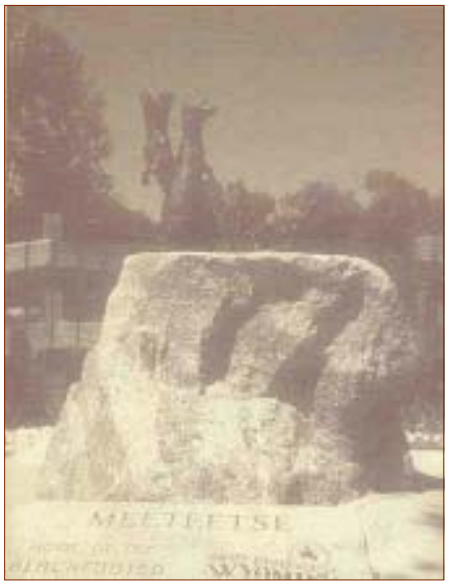

Black-footed Ferret monument in Meeteetse, Wyoming. A colony was found on a working ranch there. (Photo courtesy of Dan Dagget.)

Profile of Good Stewardship: The Gray Ranch: A Biodiversity Success Story

There is good news to report from the bootheel of New Mexico: the endangered Black-tailed Prairie Dog and cattle are getting along fine.

This is news because, according to conventional wisdom, prairie dogs and cattle are supposed to be mutually exclusive. From the ranching perspective, the clichés are well-known: prairie dogs steal forage from cows, their burrows are hazardous to the limbs of livestock and humans alike, and they are notorious vectors for disease, such as the plague.

Prairie dog. (Photo courtesy of Don McCarter, New Mexico Game & Fish Department.)

On the flip side, according to the conventional environmental wisdom, prairie dogs are the keystone species in desert grassland ecosystems, their presence guarantees greater biodiversity, and they cannot tolerate grazing by livestock.

However, according to the early findings of an ongoing research project at the Gray Ranch involving three reintroduced Black-tailed Prairie Dog populations in areas that are actively grazed by cattle, the conventional wisdom on both sides of this issue may be wrong.

In a recent technical report on the reintroduction effort (dated October 5, 2001), lead researcher Charles Curtin, of the Arid Lands Project, writes, "The short-term results of an experimental prairie dog reintroduction [on the Gray Ranch] indicate that the traditional beliefs that prairie dogs are good for conservation by increasing species diversity, but bad for ranching by reducing vegetation cover, are not supported."

He goes on to say, "There is also potentially a positive interaction between prairie dogs and ranching."

What's going on here? And what is the lesson for the acrimonious debate about the relationship between biodiversity and livestock production?

History of the Ranch

Let's pause for a second and talk a little bit about history. In 1990, The Nature Conservancy purchased the 322,000-acre Gray Ranch, located in the extreme southwestern corner of New Mexico, in order to protect its abundance of biological diversity. For a decade or more, the U.S. Fish and Wildlife Service had coveted the Gray Ranch as a wildlife refuge, so when TNC acquired the ranch and offered it to the federal government, it looked like a dream come true.

But something funny happened on the way to Congress.

According to Ben Brown, manager of the Gray Ranch, who worked for TNC at the time as its chief scientist in the western region, the scope of such a large private-to-public land transfer

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worried some TNC officials, who thought it would further erode the organization's public image as an entity engaged in enlarging the government's fiefdom at the expense of private landowners. In the West, where water is for drinking and private property rights are for fighting, this was no small cause for concern.

In the end, TNC decided to take the radical step of selling the Gray Ranch back to a rancher, Drum Hadley in this case. In 1994, the Gray was transferred to Drum's Animas Foundation and Ben Brown was hired to figure out how to ranch the property while preserving its diverse biological, cultural, and historical assets.

For Ben, who had extensive experience working as a biologist in ranching landscapes around the West, his mandate was not a contradiction in terms. The key was good stewardship. "There is no incompatibility between livestock production and native biodiversity," says Ben. "Well-managed ranches are strongholds of biological diversity."

"In fact, the Gray Ranch has better biodiversity than some national parks I know of," he says.

The Gray has the added benefit of being able to produce revenue to support its biological programs. "To me, a piece of well-managed rangeland is worth more than an unmanaged landscape," says Ben. "That's because the costs of preservation are high. Stewardship can help pay for the costs of maintaining biodiversity."

Ecological Stewardship

To back up these claims, the Animas Foundation embarked on a rigorous and ambitious program of ecological stewardship, including the reintroduction of extensive prescribed fires. It also created a grassbank in conjunction with the Malpai Borderlands Group, an organization dedicated to the preservation of a large working landscape. "The more intact an ecosystem is, the better the biodiversity," says Ben. "Whole, well-managed ranches can do that."

To test this point, the Gray Ranch also began an aggressive program of scientific research and monitoring—which is where Charles Curtin and the prairie dogs come in.

In 1998, fresh from a stint as a post-doctoral fellow at UNM, where he studied wildlife and climate interactions at the community level, Charles jumped at an opportunity to work on the Gray where he could study biodiversity at a landscape scale.

Prairie Dogs

At the same time, the Board of the Animas Foundation was intrigued by new research in Texas and other locations that suggested that healthy prairie dog populations could help reduce shrubs, mesquite in particular. The Board was further intrigued by the potentially positive role prairie dogs might have on the ecosystem of the ranch as a whole.

So, they decided to act.

In 1999, 102 Black-tailed Prairie Dogs, a federally designated "threatened" species, were released into the McKinney Flats area of

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"There is no incompatibility between livestock production and native biodiversity," says Ben [Brown]. "Well-managed ranches are strongholds of biological diversity."

Good Stewardship:
The Gray Ranch

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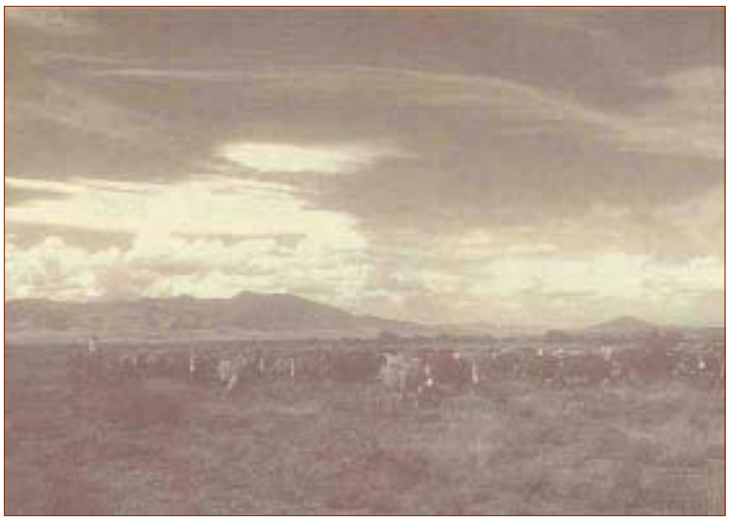
the privately owned Gray. Charles designed a scientifically valid experiment in which each pasture contained four treatment areas of fire/grazing, fire/no-grazing, no-fire/grazing, and no-fire/no-grazing. Then, artifical burrows were built, which is less expensive, and more successful, than the old technology of quarantining dog towns with electric fencing and employing aggressive predator control. The animals quickly made themselves comfortable in their new homes.



Herd of cattle roaming across the Gray Ranch. (Photo courtesy of Courtney White.)

To everyone's surprise, shortly after the prairie dogs were released, "the cows made a bee line for the towns," says Charles.

Under the designed strategy, two hundred and fifty cows grazed the pastures in a four pasture rest-rotation system This management was chosen "instead of something more intensive," according to Ben, "because we deemed it to be more representative of what a moderately progressive ranch manager in this part of the world would use, and we wanted to measure the effects of a representative type of grazing management."

Everything worked out great. The cows kept the grass clipped low, which dramatically reduced the predator threat to the prairie dogs. They did not break a leg in the holes, or catch a disease.

"It's misleading to think of prairie dogs as vectors of plague," says Charles. "They are very sensitive to disease and are easily susceptible, which is different. If the towns are healthy, then plague is not present."

As the cows grazed, plant and animal densities were sampled in each pasture. The clipped grass around the towns was found to be high in biomass. Charles noted that cattle and prairie dogs had different diets, they consumed different types of grass, and the dogs had a wider diet in general. So, the cliché about competition appeared to be unsubstantiated.

Symbiosis

A symbiosis, in fact, between cattle and prairie dogs, seemed to be taking place on the Gray.

Charles offered the following analysis in his report:

"It is too simplistic to state that prairie dogs have a blanket positive impact on biodiversity, rather, there are winners and losers. While the prairie dogs did not significantly alter vegetation composition, they did increase vegetation biomass, but decreased diversity (species number). Small mammals show a negative or neutral response to prairie dog reintroduction, while lizards had a positive response.

"The increased vegetation biomass documented here, and higher nutrient content docu-

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mented in numerous studies…suggests that prairie dog reintroductions can actually have positive benefits for ranchers, and that these patterns are in many ways more tangible than the benefits to conservation. This information, coupled with disproportionate use of the prairie dog towns by cattle on the pastures, suggests there can be a positive feedback loop between cows and prairie dogs.

"Because the cows focus their foraging activities in an area about 40% larger than the actual prairie dog town, they in turn are expanding the area of potential prairie dog colonization, which in turn can lead to increased amounts of rich forage for the cattle. In addition, the hoof action and intense foraging of the cattle appears to have an effect of increased micro-topography and habitat diversity on the landscape that is comparable to the effects of the prairie dogs.

"These observations suggest that much of the system diversity ascribed to prairie dog towns is a reflection of not just the work of prairie dogs, but an interaction between prairie dogs and large ungulate species, including not just native species such as antelope, bison, and deer, but also domestic species, such as cattle."

More research, of course, is needed, but one practical effect should be clear: the conventional wisdom needs an update.

Good Stewardship: The Gray Ranch

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For more information contact Ben Brown at benbrown@vtc.net or (505) 548-2225, or Charles Curtin at the Arid Lands Project, at ccurtin@earthlink.net

Come Work for The Quivira Coalition!

The Quivira Coalition is looking for an administrative assistant to work in its Santa Fe office. Duties include: general office support, organization of files and maintenance of databases, assistance in organizing conferences and field work, project support, support in preparing and conducting public involvement meetings and hearings, and providing graphics and editing support in the preparation of reports. This position will be shared with Bionomics Southwest, an environmental consulting firm located in the same office. Applicants should have strong computer skills, be organized, self-directed, and like working with people. The position is full-time and the starting salary is $30,000 per year.

Ranching for Biodiversity

by Tony Malmberg

My grandfather used to say that cattle did better on a mixture of grass.

This awareness of different grass species prepared me for the broader concept of biodiversity. As I began thinking about biodiversity, my awareness moved beyond a "mixture of grass" to recognize mammals, birds, predators, and many species beyond grass as part of an interlinked system. That wasn't always the case. I used to consciously remove species, whether Canada thistle, coyote, or beaver.

Our ranch sits in the foothills of the Southern Wind River Mountains. My father, uncle, and I bought this ranch in 1978. Twin Creek, a small mountain stream, flows onto our ranch in an incised canyon for 4 miles before it comes to a narrow alluvial meadow at our headquarters. Here it turns north through juniper breaks for 8 miles before leaving the ranch. Elevation ranges from 5,800-8,000 feet. Today, we use the tool of grazing to develop willows for beaver habitat—but that wasn't always the case. An excerpt from my book, ***Overgrazed***, recalls this scene when my brother-in-law and I blew a beaver dam.

Jim and I crawled through the meadow grass under his pickup giggling. We were about 100 feet from Twin Creek, one-half mile west of the house. Jim pulled the wires in behind him, leading to the charge of dynamite.

"This will show that little bastard," I said, wiping the drool from my chin. Jim touched the two wires to the battery. WOOMPH! The concussion preceded the explosion. Sticks and mud came raining down on the pickup. As soon as it stopped hailing willows and mud, we scrambled out from under our shield.

"Yeah!" I hollered as we ran down to the creek bank, "I think we got it all." Water gushed through the gutted beaver dam, and we could see the level dropping quickly. The next morning I rode my wrangle horse across the restored crossing. The beaver dam had gotten so deep; I couldn't bring the horses across. But that was taken care of now. I loped around the horses and galloped down the creek to the resurrected crossing. The water ran muddy and I couldn't help but notice creek banks caving into the stream. I wondered.

Consequences

As I came to realize the consequences of erosion—a lowered water table and reduced riparian area production—resulting from blowing up the beaver dam, I developed an entirely different mindset. I shifted my thought process to live with the beaver and their dams. With this commitment, I viewed the creek as a fence rather than something I could cross. This attitude gave me an extra pasture, a higher water table, less erosion, and more grass on the riparian area. I learned that the hardest part of change was my mindset. The tough is only mental. The positive results energized me, and I began to curiously watch in a new way.

As beaver inhabited larger segments of Twin Creek, I began noticing more biodiversity. We had an occasional moose in the winter but now we have a resident population of moose. The University of Wyoming and Wyoming Game and

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Ranching for Biodiversity

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Fish Department conducted a study on our ranch to see how beaver habitat affected bird population. They found the bird populations increased by 50% and a species jump of 70%. I view the addition of these species as key indicators of changing habitat. Blowing the beaver dam was my first realization that, by killing a form of life, I could damage stability and my profitability.

A course with Kirk Gadzia in 1987 introduced me to the Holistic Management decision model. With this aide, I started concentrating cattle numbers and stopped my traditional practice of season-long grazing. In the beginning, I started with a simple deferred rotation plan. With developed water storage to enable larger herds and fencing, I ran a herd of 1,200 yearlings and 600 pairs on our 33,000 acre ranch. In 1999 we sold a BLM allotment and leased an adjacent ranch. We now run two herds of 1,000 pairs and 1,200 yearlings on 50,000 acres. We utilize temporary electric fence to increase livestock density and reduce grazing periods to less than 21 days per year on any given area. My goal is to reduce that time to less than 14 days. During fast growth, we attempt to move the cows every 5 or 6 days.

Costs Decreased

When I first started running larger herds and moving cattle more often, I was concerned about labor. We started a ranch recreation business so paying guests could offset additional labor costs. I have learned that it takes cattle new to our operations about 3 years to adjust to increased concentration and moving. Now we can easily move 1,200 yearlings or 1,000 pairs to adjacent pastures with 2 or 3 riders and I have done it alone on many occasions. Longer moves take more help, depending on the terrain. Our operating expenses, particularly labor and fuel have decreased, even though we have nearly doubled this number of cattle.

The tool of intensity (concentrating cattle numbers) at work on Roger Bowe's ranch near San Jon. (Photo courtesy of Roger Bowe.)

Improved production, better land health, recovered riparian areas, and increased biodiversity have all resulted from the core management practices of:

1. Concentrating cattle numbers (intensity).
2. Reducing the length of time in one place (frequency).
3. Varying the time of year I return to a specific piece of ground (timing).

Increased Biodiversity

Riparian areas, which comprise 3% of the surface area of our ranch, particularly responded to this increased level of management. That 3% contributes 35% of our production. The more we slow water down and the higher we raise the water table, the more

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Ranching for Biodiversity

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"If I spray and kill a weed, I am moving succession backwards to bare ground. This happens when I focus on the problem of weeds rather than on the goal of a diverse and complex plant community."

production we have. Increased biodiversity of willows, beaver, moose, and songbirds reflect increased production and profitability.

Once I realized the benefits from beaver, I became more aware of diversity of all sorts. In 1989 we were moving cattle and passed through a prairie dog town and I noticed a coyote lying quietly beside a prairie dog hole. After moving the cattle, we retraced our steps past the prairie dog town. The coyote was patiently waiting in the same spot, hunting prairie dogs. As a result of that observation 12 years ago, I have not shot a coyote or allowed anyone to hunt coyotes.

With planned grazing and a predator-friendly policy, prairie dog colonies stay small. The smaller colonies of 20-40 prairie dogs seem to move around from place to place, particularly when I place a salt block in an active town. When the prairie dogs relocate, the western wheat grass explodes around their holes. Applying the tools of animal impact and grazing with prairie dogs increases grass production.

Weed Management

The same awareness of diversity holds true with weed management. I have learned that whatever grows should be there. If I spray and kill a weed, I am moving succession backwards to bare ground. This happens when I focus on the problem of weeds rather than on the goal of a diverse and complex plant community. Once we have moved succession backwards to bare ground, we must again populate that ground with annuals and weeds until the soil and plant complexity can support perennial plants. With proper frequency and timing of the tools of animal impact and grazing, the succession process will move toward a perennial grass plant community.

Canada thistle is an easy example. Canada thistle cannot stand hot season grazing. By planning to graze riparian areas in the hot season every three to five years, I keep Canada thistle under control. I would rather have cheat grass, Canada thistle, knapweed, or leafy spurge than bare ground. With these weeds I have plant material to place on the soil surface creating mulch and incubation sites for perennial grass plants.

Change: Becoming Comfortable with Being Uncomfortable

The level of complexity and diversity defines succession on the land as well as in community dynamics. As a person, I experience succession processes also. This is a fancy way of saying I change and evolve. Change is uncomfortable. I learned that, in order to keep up with changes around me, I had to become comfortable with being uncomfortable. As I learned to seek change, I increased my learning opportunities.

Most of my rancher neighbors remain guardedly skeptical but some have adopted the fence and livestock water practices we use. The local environmentalists are more open to grazing as a

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viable tool because of what they see on our riparian areas and in our bird populations. I have had the same BLM range conservationist for 23 years and he has been very supportive. When I first asked him what he thought about implementing planned grazing, he said he thought some management was better than none at all. It is easy for me to stop by the BLM office and visit casually with the personnel because of an increased trust. With more than half of our ranch being public land, I am concerned about environmentalist and agency perceptions and concerns. By pursuing dialogue with these people in my community, I have gained valuable resources in knowledge and experience, which help me better manage our ranch.

Guiding Principles

As an individual, my level of succession can be defined by the diversity and complexity of my knowledge and experience. My ability to interact and manage the land is directly proportional to my level of succession. My guiding principles in land management change as my level of knowledge and experience evolve. At this point in my development I have two guiding principles:

First, I avoid actively killing anything and notice what is here. Whether a weed or an animal, it would not be here if its habitat were not. I plan the timing, intensity, and frequency of tools (grazing, rest, fire, animal impact, technology and living organisms) to move community dynamics to a level of higher diversity and complexity.

Second, I ask myself what is missing. Problems are not due to the presence of a species but rather the absence of a species. The absence of moose meant willows were missing, which meant beaver were missing and the chain continues. Some think the weak link in Sage Grouse survival lies in the early brood rearing stage, which requires a high protein diet. This consists of forbs and insects. Are these missing? If so, why?

My goal is to manage for diversity and complexity of life on the ranch. Biodiversity. Each plant species has different growing seasons, different root zones, and different leaf capacity. Each provides a different pathway for conversion of solar energy to life. By maximizing the pathways of solar energy conversion, I maximize production. I have learned that biodiversity extends beyond a mixture of grass. Each animal, fish, and insect species expresses something about the niches provided. Indicator species of moose, migratory songbirds, and black bear tell me something about the habitat. If I honor my rule of not suppressing life, I will see beyond symptoms to address problems. If I continue asking, "What is missing?" I will continue to see beyond simple systems and realize the whole. When I increase biodiversity I improve land health, I improve community relations, and I improve our ranch profitability.

Ranching for Biodiversity

(con't from page 14)

"If I honor my rule of not suppressing life, I will see beyond symptoms to address problems. If I continue asking, 'What is missing?' I will continue to see beyond simple systems and realize the whole. When I increase biodiversity I improve land health, I improve community relations, and I improve our ranch profitability."

Monitoring Progress on Comanche Creek

Mike Boring viewing a vegetation line transect at the headwaters of Vidal Creek. (Photo courtesy of Kirk Gadzia.)

Conducting an assessment of the Upper Comanche Creek watershed. (Photo courtesy of Courtney White.)

Kirk Gadzia and George Long (of the U.S. Forest Service) talk about what they've seen. (Photo courtesy of Courtney White.)

This fall, The Quivira Coalition was awarded a three-year grant from the EPA and the New Mexico Environment Department for an on-the-ground project in the 80,000-acre Comanche Creek watershed, in the Valle Vidal unit of the Carson National Forest.

Our role is to coordinate a collaborative effort involving the Forest Service, the livestock permittees, the state Game & Fish and Surface Water Quality Departments, Trout Unlimited, New Mexico Trout, various researchers, and other organizations with the ultimate goal of assisting the Rio Grande Cutthroat Trout, a species struggling for survival, by enhancing water quality in the stream.

Comanche Creek is an ideal location for the Cutthroat, and if we are successful, we hope this effort could be a role model for future collaborations involving grazing, clean water, and threatened or endangered species.

Another role for The Quivira Coalition is to provide assessment and monitoring on the upland conditions within the watershed. This was begun this fall through our Cibola Services program.

First, we took a horseback tour through the upper watershed, which we evaluated to be in surprisingly good condition given the historic heavy (ab)use of the Valle Vidal prior to its acquisition by the federal government in the mid-1980s. Today, the Valle Vidal Grazing Association, which was formed after the acquisition, employs a herder to move its cattle

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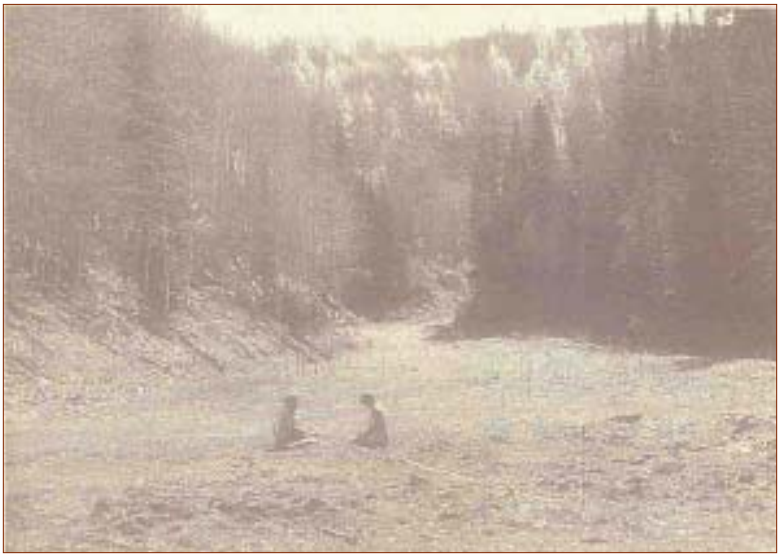
Gordon Tooley, Terry Hicks, Kirk Gadzia. (Photo courtesy of Tamara Sherburn.)

[Above] Kirk, "riding the range" at the Valle Vidal. (Photo courtesy of Courtney White.)
[Below] Tamara Sherburn and Rachel Jankowitz at the River Run ski run at Ski Rio, Cordova Creek. (Photo courtesy of Kirk Gadzia.)



Monitoring Progress on Comanche Creek

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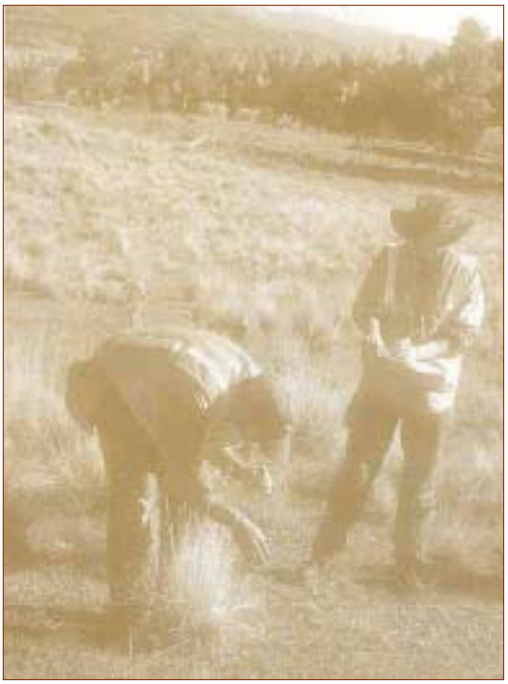

Gordon Tooley and Pat Boring at the headwaters of Springwagon Creek. (Photo courtesy of Kirk Gadzia.)

around—and the ecological benefits of this method were clear for all to see.

Later, our qualitative assessment continued on mountain bikes. Once this was completed, eleven long-term monitoring sites were selected, plus other photo points, and quantitative baseline data was collected following protocols developed by the USDA's Jornada Experimental Range.

So, we're off to a good start. Stay tuned for more information about the Comanche Creek project. There will be opportunities for volunteers to do restoration work in the watershed in the coming year.

A New Environmentalism (Part 2)

(con't from page 5)

We need to examine work, he says, or "we will condemn ourselves to spending most of our lives outside of nature, for there can be no permanent place for us inside. Having demonized those whose very lives recognize the tangled complexity of a planet in which we kill, destroy and alter as a condition of living and working, we can claim an innocence that in the end is merely irresponsibility. . .

Volunteers laboring to restore a portion of Largo Creek on private property near Quemado, New Mexico.
(Photo courtesy of Courtney White.)

"If, on the other hand," he concludes, "environmentalism could focus on our work rather than on leisure, then a whole series of fruitful new angles on the world might be possible. It links us to each other, and it links us to nature. It unites issues as diverse as workplace safety and grazing on public lands; it unites toxic sites and wilderness areas. In taking responsibility for our own lives and work, in unmasking the connections of our labor and nature's labor, in giving up our hopeless fixation on purity, we may ultimately find a way to break the borders that imprison nature as much as ourselves. Work, then, is where we should begin."

I've quoted Dr. White at length because I think his point stabs at the heart of the question about the future of the environmental movement. As I witnessed in the West Elks, and on many other ranches, work, when done responsibly and with humility, and measured by its effect on soil, grass and water, is compatible with ecological and wilderness values. There is simply no question about it.

Wendell Berry once wrote, "The conservationist's picture of the world as either a deserted landscape or desertified landscape is too simple; it misrepresents both the world and humanity. If we are to have an accurate picture of the world, even in its present diseased condition, we must interpose between the unused landscape and the misused landscape a landscape that humans have used well."[12]

However, to measure this "well-used landscape," we need to employ a new equation—one that examines the interplay between work, play, and ecology in a much more sophisticated manner than we have used in the past. One of the goals of the new environmentalism is to create a formula that allows for a more complete understanding of the sustainable aspects of the work/ play/ecology dynamic.

But to accomplish this goal, we need to stop pitting one value against another.

Good versus Evil

A new environmentalism must avoid, at all costs, the yoke of dualisms. Good Guy vs. Bad, Work vs. Recreation, Urban vs. Rural, Wilderness vs. Wise Use, Sacred

(con't on page 19)

vs. Profane, Us vs. Them. In the bad ol' days of rampant clearcutting and dam-building, these dualisms served an important purpose—to call the public to arms. They remain useful today because unsustainable exploitation of our natural world still yields immense profits for a select few. But they have become a crutch, often blinding us and tying our hands.

This brings us back to the question of wilderness again. Historian William Cronon has written, "The critique of modernity that is one of environmentalism's most important contributions to the moral and political discourse of our time more often than not appeals, explicitly or implicitly, to wilderness as the standard against which to measure the failings of our human world."[13]

This creates a paradox in which the human exists outside the natural. "If we allow ourselves to believe that nature, to be true, must also be wild," continues Cronon, "then our very presence in nature represents its fall. The place where we are is where nature is not. If this is so—if by definition wilderness leaves no place for human beings, save perhaps as contemplative sojourners enjoying their leisurely reverie in God's natural cathedral—then also by definition it can offer no solution to the environmental and other problems that confront us."

By indulging in a dualism that sets nature and humanity at opposite poles, we "leave ourselves little hope of discovering what an ethical, sustainable, *honorable* human place in nature might actually look like." It can also lead to environmentally irresponsible behavior.

"Our challenge is to stop thinking of such things according to a set of bipolar moral scales in which the human and the nonhuman, the natural and the unnatural, the fallen and the unfallen, serve as our conceptual map for understanding and valuing the world. Instead, we need to embrace the full continuum of a natural landscape that is also cultural, in which the city, suburb, the pastoral, and the wild each has its proper place, which we permit ourselves to celebrate without needlessly denigrating the others."

He concludes "The wilderness dualism. . .denies us the middle ground in which responsible use and non-use might attain some kind of balanced, sustainable relationship." And according to Cronon, the "middle ground is where we actually live."

I have quoted him at length because his point too is critical to the success of a new environmentalism—that we must find a way to occupy and work in the "middle ground," or what some have called the Radical Center. In my experience, work, play, soil, predators, wilderness, and agriculture can be balanced with one another—if we drop the dualisms and start shaking hands instead.

Only by working in the Radical Center will we make actual progress on the back forty.

The Big Picture

I am not suggesting that we forgo designation of new wil-

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A New Environmentalism (Part 2)

(con't from page 18)

"The only progress that counts is that on the actual landscape of the back forty."—***Aldo Leopold***

A New Environmentalism (Part 2)

(con't from page 19)

derness areas or drop the tactics of confrontationalism entirely. They both serve important purposes in certain situations, though I think lawsuits are like antibiotics—great in a crisis but increasingly ineffective over time, especially as resistance builds. And a great deal of resistance has been building over the last two decades.

Furthermore, the environmental movement was forged in confrontation and adversity and will necessarily be called on again and again to fight. The trouble today, however, with a continued dependence on this form of crisis management is that it has transformed the movement into a green version of The Little Dutch Boy. Activists race around plugging holes in an increasingly leaky dike called "the environment" without significantly addressing the sources of the threat to the dike in the first place—principally, the way we live as a people.

Wendell Berry, as usual, put it best when he asked, "Can we adapt our work and our pleasure to our places so as to live in them without destroying them? Can we limit our work and our economies to a scale appropriate to our places, to our place in the order of things, and to our intelligence? Can we control ourselves?"

Or, right to the point, "Can we get beyond the assumption that it is possible to live inhumanely and yet 'save the planet' by a series of last-minute preservations of things perceived at the last minute to be endangered and, only because endangered, precious?"

A new environmentalism must address the bigger picture.

It is not enough anymore to "save" nature. We, as environmentalists, need to ask harder questions about how to work together to conserve and restore self-sustaining social and natural landscapes. We can start by addressing the causes of our unhealthy and unhappy world, rather than simply concentrating on the symptoms.

There is a parallel with the rangeland health paradigm here. By examining a watershed holistically, for instance, at the level of soil, grass, and water, we can get a good sense for causes of degradation, rather than spend our money and energy on quick technological fixes.

"There is a parallel with the rangeland health paradigm here. By examining a watershed holistically, for instance, at the level of soil, grass, and water, we can get a good sense for causes of degradation, rather than spend our money and energy on quick technological fixes."

For example, at a public meeting I attended in Catron County a few years ago, a rancher complained about the infestation of small trees on his land by saying that "he was hardly making a dent in the forest with his backhoe." Kirk Gadzia responded by asking, not so rhetorically, "Is the problem that we don't have enough backhoes?"

Are we working on symptoms when we should be working on causes? Granted, some problems, such as global warming, may be beyond the reach of us individually, but many can be fixed at home, if we know where to look, what tools to use, and whom to turn to for assistance. All of which will require some fundamental shifts in our culture and society.

Environmentalists can help lead the way, if we want.

Cultural critic Stephanie Mills put it well when she said, "It's

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A New Environmentalism (Part 2)

(con't from page 20)

time to ditch the home entertainment center and break the consumer trance, time to roll up our sleeves and learn the plants. . . . We may even rescue the wildness within us from the extinction threatened by credit cards, muscle wagons, and trips to the mall. By working to restore our life places from the soil on up, we can renew our membership in the biotic community."[14]

How It Works

I believe that the goals of a new environmentalism can be advanced by a few core strategies:

Work at the Grassroots: Literally at the level of grass and roots. This means seeking out projects that restore watersheds one acre at a time, if need be, or reclaim mine tailings, or assist riparian areas to recover, and to do so principally by using nature's original toolbox. The objective is to grow grass, reduce bare soil, restore conditions for fire, and a million other acts of healing.

Work Collaboratively: Strength lies in numbers. When we argue our interests instead of our positions we often uncover acres of common ground. Practical solutions to seemingly intractable natural resource conflicts exist, but only if we are willing to work toward common goals. A rangeland health paradigm encourages collaboration by steering the discussion back to the ground, where it belongs.

Encourage Better Stewardship: That means teaching, listening, and learning. Education is a two-way street, not a cul-de-sac with a "Do Not Enter" sign out front. Knowledge marches on, new technologies are invented, and values change. Incorporating these changes constructively means employing an open hand, not a closed fist, when dealing with ranchers and other land managers, especially those who work for the federal government.

This is an important point, given the long history of environmentalists demanding "compliance" from the federal government. I feel the need to quote Wendell Berry here again: "You can not get good care in the use of the land by demanding it from public officials. That you have the legal right to demand it does not at all improve the case. . . . The idea that a displaced people might take appropriate care of places is absurd; there is no sense in it and no hope."

Lend a Hand: The time has come to help people. The federal government can no longer carry the load of assuring proper stewardship of our public lands because it has neither the financial, manpower, or spiritual resources to do the work alone anymore, especially as the workload expands on an almost daily basis. It is therefore incumbent on all of us to assist them somehow—bring

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On Date Creek in Arizona, Phil Knight has restored this cottonwood-willow forest by limiting grazing to the dormant season. (Photo courtesy of Dan Dagget.)

A New Environmentalism (Part 2)

(con't from page 21)

In a new environmentalism, culture and history matter. (Photo on the Valle Grande Grassbank, courtesy of Courtney White.)

money to the table, or monitoring services, or organize a workshop.

Work Toward Results: Measure success by progress on the back forty. Demand, and help achieve, quantifiable, real-world results. Learn how ecosystems actually operate, embrace ideas that achieve ecological and economic sustainability simultaneously, then insist that the results are monitored. Better yet, help with the monitoring **yourself!**

As I said earlier, these strategies are not theoretical; they are being implemented daily and across a wide region. What they need, however, is more support.

Review

In summation, I believe a new environmentalism does the following:

- Employs a rangeland health paradigm.
- Acknowledges that the old "protection" paradigm is not terribly useful anymore.
- Considers its principal job to be ecological and economic restoration.
- Encourages good stewardship and values sustainable work on the land.
- Dumps destructive dualisms.
- Takes seriously the complex work/play/ecology equation.
- Learns, teaches, listens, and lends a hand.
- Achieves and monitors on-the-ground results.
- Keeps an eye on the prize: guiding fundamental human behavior toward restraint and self-sustainability.

And one more goal:

- Attempts to achieve what Aldo Leopold longed for so many years ago—"a state of harmony between man and land."

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[11] "'Are You an Environmentalist or Do You Work for a Living?': Work and Nature," Richard White. In *Uncommon Ground: Rethinking the Human Place in Nature*. Edited by William Cronon. W.W. Norton, New York, 1996.

[12] All Berry quotes are from *Another Turn of the Crank: Essays*. Counterpoint Press, Washington D.C., 1995.

[13] "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," William Cronon. In *Uncommon Ground: Rethinking the Human Place in Nature*. Edited by William Cronon. W.W. Norton, New York, 1996.

[14] In *Consuming Desires: Consumption, Culture, and the Pursuit of Happiness*. Edited by Roger Rosenblatt. Island Press, Washington, D.C., 1999.

Exurbanization of the Mountain West

The Mountain West of the United States is experiencing a human population boom that rivals any in its history. Of the eight states that make up this region (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming), five are the fastest growing in the country (Figure 1). Metropolitan areas and their suburbs have accommodated much of this in-migration but rural areas are growing at a faster rate (Heimlich and Anderson 2001). Driven by a mixture of economic and quality-of-life features, people are increasingly drawn to the rural Mountain West (Power 1996). Unlike previous booms driven by resource extraction and commodity production, the present period of growth is fueled by the expansion of service, recreation, and information industries and is marked by the conversion in private land use from agriculture to exurban development (Riebsame, Gosnell, and Theobald 1996; Sullins and others 2002).

As a result, three of the principal land uses in the rural Mountain West today are protection, livestock ranching, and exurban development. Protected areas are lands where residential development is prohibited. Exurban development refers to low-density residential development that occurs beyond incorporated city limits (Nelson and Dueker 1990; Knight 1999). The main human use on protected areas is outdoor recreation and nature protection, on ranches it is livestock production, and on exurban development it is human residence. The amount of land in protection is relatively static with very little being acquired annually. The amount of land in ranching and exurban development, however, is in flux. Many ranches are being subdivided into exurban developments. For instance, between 1992 and 1997 in Colorado, the rate of agricultural land conversion to commercial and residential development was 270,000 acres per year (Oberman, Carlson, and Batchelder 2000).

The extent of land-use change due to population growth in rural areas of the Mountain West is greater than that in urban areas because of the dispersed nature of exurban development (Theobald 2000; Sullins and others 2002). Instead of focusing growth within incorporated city limits, exurban growth exists as pockets of residential development embedded in a matrix of agricultural and protected lands. Nearly 80% of the land used for houses constructed between 1994 and 1997 in the U.S. was in non-metropolitan areas (Heimlich and Anderson 2001). Sites adjacent to public lands are particularly attractive for development (Riebsame, Gosnell, and Theobald 1996; Swanson 2001). Also, exurban developments require more land than urban and suburban developments

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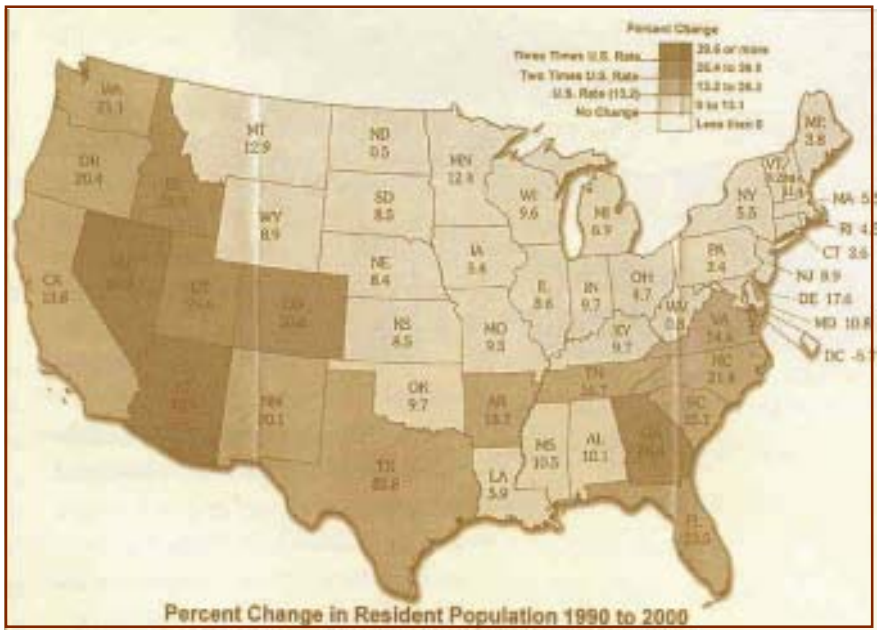

Percent Change in Resident Population 1990 to 2000

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Holy Cow!

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Subdivision in Wyoming. (Photo courtesy of Dan Dagget.)

because each house is situated on a large lot (typically 10-40 acres). Fifty-seven percent of the houses built between 1994 and 1997 were on lots •10 acres (Heimlich and Anderson 2001). In general, exurban developments increase the influences associated with human residences at two spatial scales: (1) the site scale by dispersed housing, and (2) the landscape scale by the placement of developments in rural areas (Duerksen and others 2000).

In contrast to urban and suburban development, the ecological consequences of exurban development are not well studied. Many researchers have documented changes in wildlife communities in and around metropolitan areas (e.g., Emlen 1974; Bessinger and Osborne 1982; Mills, Dunning, and Bates 1989; Engels and Sexton 1994; Blair 1996; Germaine and others 1998; Bock, Bock, and Bennett 1999; Crooks and Soulé 1999). Relatively few studies, however, have examined biodiversity associated with exurban developments (Vogel 1989; Harrison 1997, 1998; Odell and Knight 2001), and no studies have compared biodiversity on exurban developments with ranching and protected areas. Although little is known about the conversion of ranchland to exurban development, conservationists have assumed that it results in a simplification of biodiversity, favoring generalist species that thrive in association with humans over those that are more sensitive (Knight and Clark 1998; Knight 2002; Knight and others 2002).

We know that wildlife habitat is affected directly and indirectly by the conversion of Western ecosystems to exurban development (Knight and Clark 1998). Soil and vegetation are directly disturbed and lost in the construction of houses, roads, fences, and communication lines. Habitat quality is degraded because of the proliferation of non-native plants and the presence of humans, their automobiles, and their pets (Mills, Dunning, and Bates 1989; Knight and Clark 1998; Miller, Knight, and Miller 2001). These changes result in elevated mortality rates, as well as habitat loss and degradation.

Conservation Response

Concerns over the conversion of the Mountain West's natural heritage from a mixture of generalist and specialist species to one of increasingly human-adapted species have generated a new response to biodiversity protection among nongovernmental conservation organizations (NGOs). The traditional response to protecting biodiversity from anthropogenic degradation has been to purchase land and designate it as a protected area. The emerging response is to work with ranchers to protect biodiversity while keeping the land in private ownership and as a working ranch (Alexander and Propst 2002). Typically, development rights on the ranches are purchased through conservation easements while ranchers continue to raise livestock. This approach has become increasingly popular, especially among NGOs such as The Nature Conservancy and the Rocky Mountain Elk Foundation (Weeks 2002). In Colorado, about 86,000 acres of private land have been protected through conservation easements by The Nature Conser-

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vancy and 59,000 acres by the Rocky Mountain Elk Foundation (GCOFR 2000). This strategy has increased the number of land trusts that seek to protect private land in agriculture from development. By 2000, over 1,200 land trusts in the United States had protected roughly 2,600,000 acres through conservation easements, 46% of which was farm and ranchland (LTA 2001).

This emerging response to biodiversity protection however has some untested assumptions. It assumes that biodiversity on ranches is no different than that found on protected areas, or at least that biodiversity is better served on ranches than on exurban developments. NGOs are taking this mode of action to protect biodiversity with virtually no scientific evidence to support their approach. They continue with this strategy despite the fact that many environmentalists argue that livestock ranching is perhaps the most detrimental land use in the West (Fleischner 1994; Wuerthner 1994; Donahue 1999). We decided to test these assumptions of the emerging biodiversity protection strategy.

Study Area and Site Collection

We conducted our study from May through August during 2000 and 2001 in the foothills along the Front Range of the Rocky Mountains in northern Larimer County, Colorado. The study area is approximately 25 miles northwest of Fort Collins, the nearest metropolitan area. The land-use matrix of the region is a blend of private ranchland, public protected areas, and exurban developments. The vegetation is a mosaic of shrubsteppe and mixed-grass prairie with some trees occurring at the higher elevations and northern aspects. Dominant grasses include needle-and-thread, blue grama, western wheatgrass, and cheatgrass. Shrubs include mountain mahogany, skunkbrush sumac, and bitterbrush. Common forbs include fringed sage and hairy goldaster. Average annual precipitation ranges from 13-18 inches with 75% of it falling between April and September (U.S. Department of Agriculture 1980).

We restricted our study to sites with similar physical characteristics. We used sites in the same shrubsteppe plant community, with elevations between 5,700-7,200 feet, and similar soil types to reduce natural variability among sites. Study sites had to be greater than 2,500 acres in size to minimize the influence of surrounding land uses. We used 1:24,000 orthophoto-quadrangle maps and plat maps from the Larimer County Assessor's Office to determine potential sites. We had 33 out of 35 landowners grant us permission to conduct research on their property.

Study Design and Data Collection

We compared songbird, mammalian carnivore, and plant communities across three land uses: (1) public protected areas (Colorado Division of Wildlife's State Wildlife Areas) whose principal use was outdoor recreation and wildlife protection (no grazing, logging, mining, or water development), (2) private-land livestock ranches with cattle, and (3) exurban developments with 1 house per 35-50 acres. We randomly selected 93 points across the three land uses to survey songbirds and mammalian carnivores, and 69 points to sample the plant community. At each randomly selected point, we sampled communities using point counts for songbirds, scent stations for mammalian carnivores, and Daubenmire quadrats for plants.

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Holy Cow!

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"We know that wildlife habitat is affected directly and indirectly by the conversion of Western ecosystems to exurban development (Knight and Clark 1998). Soil and vegetation are directly disturbed and lost in the construction of houses, roads, fences, and communication lines. Habitat quality is degraded because of the proliferation of non-native plants and the presence of humans, their automobiles, and their pets. . ."

Holy Cow!

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Findings

Biodiversity differed across the three land-use categories. Wildlife species occurrence and densities were more similar between ranches and protected areas than on exurban developments. Plant communities on ranches, however, differed from those on protected areas and exurban developments.

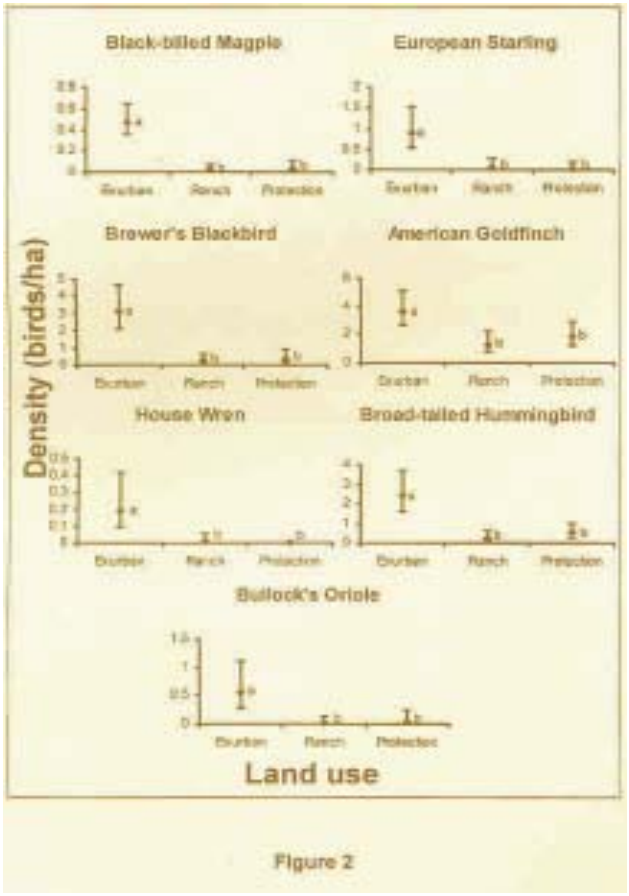

Figure 2

We observed a suite of species in the songbird and mammalian carnivore communities that benefit from factors that accompany elevated human densities found in exurban developments. We also found species of songbirds and carnivores that occurred in elevated densities on ranches and protected areas when compared to exurban developments. For the plant community, native species were more prevalent and non-native species were less prevalent on ranches than on either protected areas or exurban developments. Many of the species that thrived in exurban developments also fare well in suburban and urban settings.

Songbirds occurred in three categories that separated out based on densities and land use. Generalist or human-adapted species reached their greatest densities in exurban developments when compared to ranches and protected areas (Figure 2). Species with more narrow ecological niches attained their greatest densities on land devoted to ranching, protection, or both of those land uses when compared to exurban developments (Figure 3). Some songbird species, such as the brown-headed cowbird and rock wren, showed no statistically significant differences in densities across the three land uses.

We did not have large enough sample sizes to generate reliable density estimates for many of the species detected, but it is worth noting some compositional differences observed in these less abundant species. We observed the house finch, common raven, Say's phoebe, and red-winged blackbird only on exurban developments. The dusky flycatcher, savannah sparrow, and lark bunting were seen only on ranches and protected areas.

Few mammalian carnivores were detected over the course of our study. Domestic dogs and house cats were detected almost exclusively on exurban developments, whereas coyotes were seldom found at our scent stations on exurban developments (Figure 4). Bobcats showed no statistical difference at scent stations across the three land uses.

The number of species (i.e., species richness) and plant cover differed across the land uses. We recorded the most non-native species on exurban developments (Figure 5). Non-native species richness and cover per point was highest on the exurban developments and protected areas when compared to ranches. More species of native plants were found on ranches than the other two land uses, but the cover of native plant species did not differ statistically across land uses. The dominant non-native plant, cheatgrass, was more prevalent in terms of cover on the protected areas and exurban developments than on ranches.

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Conservation Implications

Our results support the emerging strategy for biodiversity protection being implemented by environmental NGOs. Ranches in our study supported a more desirable biodiversity than exurban developments. This is evident for three reasons. First, ranches were virtually the same as protected areas in terms of human-adapted wildlife species. Second, ranches had enhanced populations of native wildlife species of conservation concern compared to exurban developments. Third, plant communities on ranches had more native species, fewer non-native species, and less non-native plant cover than exurban developments.

A more ambiguous relationship exists between ranches and protected areas. The assumption that these two land uses support similar biodiversity is only partially borne out by our observations. Ranches and protected areas supported similarly low populations of human-adapted wildlife species but produced variable populations of other species. Also, protected areas had a higher prevalence of non-native plant species and fewer native plant species than ranches.

A generalization from our study is that there is an increase in human-adapted wildlife and non-native plant species with exurban development. Interactions among native, non-native, and human-adapted species could result in the simplification of the Mountain West's natural heritage favoring species whose evolutionary life histories allow them to exist with humans. This change has negative implications for the maintenance of biodiversity at both the site and landscape scales and its consequences are increased with increasing development (Knight 2002).

Songbirds. Elevated populations of human-adapted songbirds may be occurring to the detriment of other species (Marzluff, Gehlbach, and Manuwal 1998). For instance, nest predators such as the black-billed magpie may lower the reproductive success of other birds in an area. The blue jay, a similar nest predator, has been shown to increase with urbanization and play an important role in the decline of an endangered bird, the golden-cheeked warbler (Engels and Sexton 1994). The non-native European starling is an aggressive competitor with native birds for nesting cavities. In one area in Nevada, starlings were successful at excluding native birds from nest sites for five years (Weitzel 1988). Eric Odell and Richard Knight (2001) studied songbirds on exurban developments and undeveloped areas and found exurban developments supported the greatest densities of black-billed magpies and European starlings and the lowest densities of other songbirds, which may be attributed to interactions between these species.

Pets. House cats and domestic dogs are subsidized predators that have been shown to extend the realm of human influence and have substantial impacts on wildlife populations (Churcher and Lawton 1987; Miller, Knight, and Miller 2001). These free-ranging pets can occur at elevated densities, as seen in our study, because they are supplementally fed

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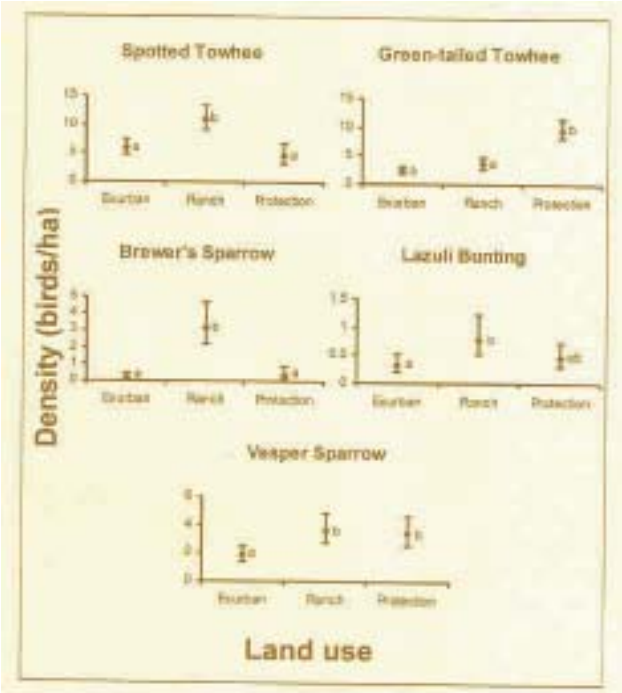

Figure 3

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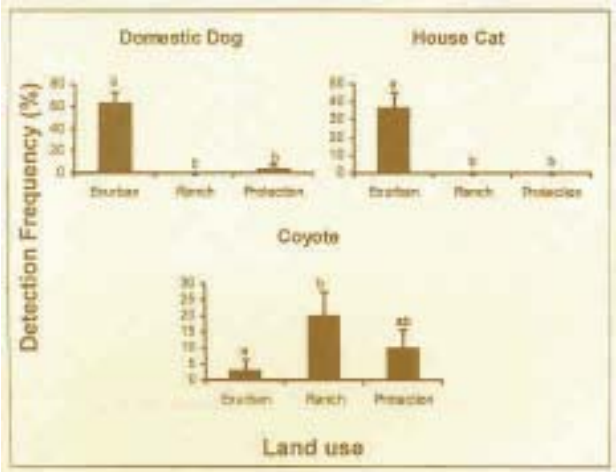

Figure 4

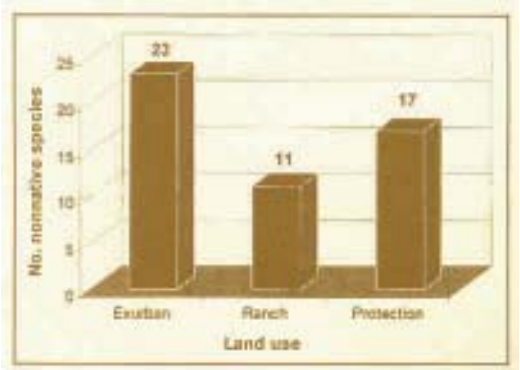

Figure 5

and are not dependent on densities of native prey species. House cats have been implicated in the decline and extinction of scrub-breeding songbirds in two studies in California (Hawkins 1998; Crooks and Soulé 1999). Furthermore, Kevin Crooks and Michael Soulé (1999) found that songbirds persisted in patches with coyotes because these native predators depressed house cat numbers. Coyotes were detected less frequently in exurban developments than in the other land uses in our study, which could result in unusually high songbird mortality from domestic cats. Domestic dogs are known to harass and kill wildlife, but their impacts are less well studied. Research has shown that they can extend the zone of human influence and contribute to the annual mortality of some species (Miller, Knight, and Miller 2001; Ballard and others 1999). Domestic dogs and house cats have been documented to be more prevalent in exurban developments, especially near houses, possibly at the expense of other native predators which were less abundant in exurban developments than undeveloped areas (Odell and Knight 2001).

Non-Native Species. Non-native plants can change community dynamics by disrupting ecosystem processes and degrading the quality of wildlife habitat (Masters and Sheley 2001). For instance, cheatgrass proliferation in the Mountain West has altered historic fire regimes favoring non-native, annual grasslands over native, perennial species. This invasive plant has displaced native plants and altered the occurrence of shrub-obligate songbirds that utilize these ecosystems (Rotenberry 1998). In our study, eight of 23 non-native plant species were found only in exurban developments. Two of these species, spotted knapweed and leafy spurge, are noxious weeds that have been shown to lower the value of rangeland ecosystems for ungulates such as deer and elk (Trammell and Butler 1995; Thompson 1996).

The results of altered biotic communities in exurban developments could be influential at two spatial scales (Duerksen and others 2000). At the site scale, potential interactions among wildlife species suggest that exurban developments may be functioning as *ecological traps*: areas where species assess the land to be suitable habitat but then suffer reduced survival and reproduction when they live there (Pulliam 1996; Donovan and Thompson 2001). Also at this level, non-native plants displace native plants thereby altering interspecific dynamics and reducing habitat quality for wildlife that do best in native plant communities. At the landscape scale, exurban developments could be serving as sources that produce an excess of human-adapted wildlife species and non-native plants. Because exurban developments are embedded in rural areas, often adjacent to public lands, they may be providing individuals and propagules that spill over into surrounding lands. Therefore, the effects of exurban development are not just within its boundaries but well onto other areas (Buechner and Sauvajot 1996; Theobald, Miller, and Hobbs 1997;

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Knight and Clark 1998).

If exurban developments are sources of undesirable species, then the emerging strategy to protect biodiversity by working with ranchers is correct. Ranchers and farmers own much of the land being converted to exurban development in the Mountain West (Theobald 2000). Our study found that biodiversity was at least as well served on ranches as it was on protected areas. More support for the new conservation strategy is provided by a recent study that pointed out that most of our protected areas lie on the least productive soils and at the highest elevations, whereas most private lands occur on the most productive, low elevation sites (Scott and others 2001). Our results combined with this information suggest that we will not be able to sustain native biodiversity in the Mountain West by relying merely on protected areas. Future conservation efforts to protect this region's natural heritage will require closer attention being paid to the role of private lands (Knight 1999).

Considerations for Land-Use Decisionmakers

Inferences from our study should be viewed as speculative but if further studies support our findings, land-use planners need to be aware of the ecological effects of exurban developments across the Mountain West. The Ecological Society of America recently published a report that provided ecological principles and guidelines for land-use decisions (Dale and others 2000). Christopher Duerksen and others (2000) have written a useful handbook that gives suggestions for reducing human impacts associated with housing developments. Decisionmakers concerned about the sustainability of land uses and the maintenance of biodiversity should consult these documents and others and encourage more informed conversations about the implications of land-use decisions. We suggest three additional points, derived from an ecological perspective, to consider when making land-use decisions in the rural Mountain West:

(1) Development location is ecologically relevant. Low-elevation lands support a disproportionate amount of biodiversity and can be the most ecologically sensitive (Romme 1997). Additionally, the effects of development extend beyond its boundaries and can be expected to influence surrounding lands. Strategic placement of exurban developments within a rural landscape is critical (Knight and Clark1998).

(2) Low-density residential developments influence biotic communities. Even at densities of 1 house per 35-50 acres, the effects of human residences are seen. It cannot be assumed that because most of the land within exurban developments remains undeveloped that it is suitable for all species that would occur there if houses were not present. Exurban development patterns spread the influence associated with human developments further across the landscape than more concentrated development densities, such as urban and suburban. Laws that exclude certain development densities from the county review process should be reevaluated. For example, Colorado law allows subdivisions of 1 house per 35 acres or greater to avoid county review, therefore encouraging this density of development (Riebsame, Gosnell, and Theobald 1996; Romme 1997). Cluster developments are an alternative settlement pattern that involves concentrating houses and leaving the remainder of the purchased land undeveloped (Theobald, Miller, and Hobbs 1997; Odell and Knight 2001). However, little is known about the site-

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"Our results. . .suggest that we will not be able to sustain native biodiversity in the Mountain West by relying merely on protected areas."

Biodiversity: More Than a Numbers Game

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"Research, chiefly in grasslands, indicates that a diversity of plant types (growth form, nutrient and water use) results in more efficient use of resources, higher yield, and so on, in comparison to systems with fewer species or plant 'types.'"

tive fish, clams, and forest pests have been equally destructive. The combination of land use change and non-native species' impacts has altered the landscape so greatly that some biologists have dubbed our era the "Homogocene."

Species invasions remind us that biodiversity should consider more than simply species number. Introduced species may increase total richness, at least temporarily, for a local system—but we are usually much more interested in the diversity of natives than of exotic species.

Why be concerned about the loss of biodiversity? Pragmatic questions have stimulated scientific studies assessing the relationship between species diversity and ecosystem function and stability. Research, chiefly in grasslands, indicates that a diversity of plant types (growth form, nutrient and water use) results in more efficient use of resources, higher yield, and so on, in comparison to systems with fewer species or plant "types." It seems likely, too, that a system with more species is better able to survive and function under a wider range of environmental conditions (such as fluctuating climate); there are few data so far, though, testing this "insurance hypothesis." At the landscape scale, woodlots, riparian corridors, and other remnants of natural vegetation surrounding agricultural fields can influence strongly the runoff of soil, nutrients, and water. Ecologists are studying the effects of landscape diversity on ecosystem processes in other regions as well.

Beyond economic or management concerns, though, many people and societies value aspects of biodiversity as part of their cultural heritage. The distinctiveness of a place is largely shaped by the uniqueness of the native biota, whether the piñon forests of northern New Mexico or the black grama grasslands of the Chihuahuan Desert. A deeper understanding of the components of biodiversity can lead to a growing appreciation in those who live within a particular place on the landscape.

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and landscape-scale effects of cluster development, so caution should be used in promoting this approach.

(3) Ranches are important in biodiversity protection. Because private lands are often the most productive, lowest elevation sites, they play a disproportionate role in maintaining biodiversity that is not found on protected areas, which are mostly on the least productive, high elevation sites (Scott and others 2001). Ranches in our study area were as good or better as comparable protected areas at conserving biodiversity. Conversion of ranchland to exurban development should be monitored because it will likely result in a simplification of our natural heritage and an ever increasing number of species with declining populations.

Editor's Note: *Extensive references accompanied this article. However, they were too extensive to fit into this newsletter. They are currently available from the authors or from the editor (lunah3@aol.com). They will shortly be available on The Quivira Coalition website as well.*

with the Rio Puerco Management Committee

24, 25—Outdoor Classroom with Kirk Gadzia, at Sid Goodloe's Carrizo Valley Ranch

September
TBA—Work day at the Valle Grande Grassbank

14, 15—Outdoor Classroom with Kirk Gadzia, at the Williams' Ranch near Quemado

20, 21—Ranch Roads Workshop with the New Mexico Watershed Association and the Rio Puerco Management Committee, at Cuba

October
5, 6—Riparian Workshop with Bill Zeedyk, on the Dry Cimmaron

25, 26—Riparian Workshop with Bill Zeedyk, on the Rio Puerco

January 2003
19, 20—Second Annual Conference

Other Related

TOURS!
- Jim Winder's Ranch near Nutt
- Sam Montoya's operation at Sandia Pueblo
- Ghost Ranch
- Roger Bowe's award-winning ranch near San Jon

(These tours will be scheduled shortly and more information will be made available.)

Educational Opportunities:

March 25-30
November 4-9
Albuquerque

Holistic Management in Practice: Putting the New Ranch to Work!
with Kirk Gadzia

Learn how to:
- Manage for Profit
- Mange for People
- Manage for Land Health

Contact Resource Management Services
P.O. Box 1100
Bernalillo, NM 87004
for registration and more information

UPCOMING EVENTS

(con't from page 32)

Quivira Coalition Website

Our website contains information on current events as well as old issues of the newsletter. You can visit us online at www.quiviracoalition.org

UPCOMING EVENTS

The Quivira Coalition is planning another full year of educational events. What follows is a ***tentative*** list—some dates may change and in many cases the exact locations of the events have not yet been decided. Check the website for current information. More details will also be made available in this newsletter and through other mailings.

April
20—Drought Workshop with Kirk Gadzia

29, 30, May 1—Herding Clinic at Ghost Ranch

May
11, 12—Riparian Workshop with Bill Zeedyk

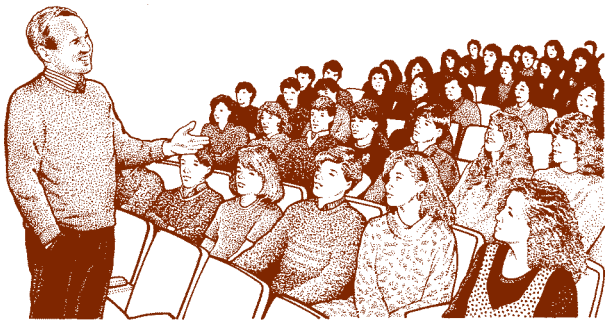
18—Rest Workshop with Kirk Gadzia, at Sevilleta Wildlife Refuge

22—Drought Workshop with Kirk Gadzia, at Ghost Ranch

June
1, 2—Riparian Workshop with Bill Zeedyk, on Largo Creek

8—Birding Tour of theU Bar

15—Herding Workshop, at Taos



29—Free Tour of the Valle Grande Grassbank with Bill de Buys

July
13, 14—Outdoor Classroom with Kirk Gadzia

August
3, 4—Riparian Workshop with Bill Zeedyk, at Comanche Creek
10—New Ranch Classroom,

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