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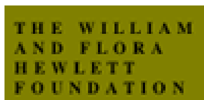

A West that works

Riding the flux of nature

Dr. Kris Havstad (left) explains new rangeland monitoring processes at a workshop sponsored by the Quivira Coalition, on a ranch near Quemado, N.M.

–Courtney White photo

Scientists use adaptive management practices to restore rangeland at New Mexico's Jornada Experimental range.

By Courtney White
for Headwaters News

Editor's Note: *This is the first of a two-part series on the work done at the U.S. Department of Agriclture's Jornada Experimental Range in Las Cruces, N.M.*

The first time I heard Dr. Kris Havstad give a presentation on desert ecology he began his talk in the back of the room – literally.

His point was figurative as well as literal – that for too long scientists were most comfortable in the back of the room, listening attentively, but politely disengaged from the controversies surrounding natural resource management in the West.

The reasons for this detachment, he noted, included a concern about incomplete knowledge, a fear of getting dragged into politics, an aversion to conflict, and even a certain shyness.

As Havstad said these things he walked slowly to the front of the room.

This was also meant to illustrate a point – that it was time for science to be out front, to be engaged, to be useful. In Havstad's opinion the main role of scientists, especially government scientists, such as those who work under his supervision at the U.S. Department of Agriculture's Jornada Experimental Range (JER) in Las Cruces, N.M., is to deliver their knowledge in ways that have impact in the real world.

"If we're not relevant," Havstad said recently, "then the public should bag us."

It is a typical statement from a man who has gained a well-earned reputation

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

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

comment on this column

as an articulate spokesperson both for the role of science in society and for explaining how arid ecosystems work. An opportunity to combine the two was one of the reasons Havstad left a professorship at Montana State University and took the job as the boss of the JER in 1994.

"If we're not relevant then the public should bag us."
– Dr. Kris Havstad, Supervisor
USDA Jornada Experimental Range

Eight years ago, when Havstad began walking the talk, which included becoming a founding board member of The Quivira Coalition, the idea of relevant science was somewhat radical, especially the holistic (meaning 'whole systems') approach exercised by the JER scientists.

Moreover, the tenor of the times was not exactly ripe for thoughtful analysis. The political climate was confrontational, the struggle between ranchers and environmentalists had reached a crescendo, and anti-federalist feelings in rural counties ran high.

It's no wonder scientists felt safe in the back of the room.

It took some courage, therefore, for the JER researchers not only to step forward but also to find creative ways to break down old stereotypes. Fortunately, Havstad had help, including Dr. Jeff Herrick, a soil scientist who led the effort to rethink monitoring protocols, and Dr. Ed Frederickson, an animal scientist who has taken the JER's traditional focus on cattle in new directions.

Perhaps the best way to explain this new approach is to repeat a phrase I heard Havstad use often, with acknowledged irony, when opening a meeting with ranchers and other private citizens at the time:

"We're from the government and we're here to help."

Old School

It is almost a cliché to say that summarizing the complexity of rangeland science at the start of the 21st century is as difficult as summarizing the desert itself.

The more we learn, it seems, the more we realize how little we know. And if the goal of achieving ecological understanding isn't enough, add to it the job of communicating this knowledge to growing and diversifying lay audiences and you have a recipe for a tall order.

Adding to the difficulty is the changing nature of rangeland research itself. Until recently, useful science at the JER meant research that supported agricultural aims, specifically the goal of raising cattle in an arid environment.

In fact, the principal reason the 190,000-acre Jornada Ranch, located north of Las Cruces, became government property in 1911 was so scientists could study the damage done by overgrazing in the desert and consider mitigation strategies.

There was a lot to consider. The Boom Years (1880-1920) of the livestock industry, characterized by large numbers of animals and few controls, had decimated the range across the Southwest. Throw in periodic drought, and you had a serious problem.

Widespread alarm at the time over soil erosion, loss of vegetative cover, and other grazing-related maladies prodded the federal government to take

remediative action, including the creation of the old Soil Conservation Service (now the National Resource Conservation Service) to assist private landowners. It also set researchers, such as those at the new Jornada station, to work on the problem of deducing a 'better way' to raise livestock in the desert.

They're still deducing.

What changed in the intervening years was the rise of ecology. However, in the beginning this young discipline was directed to maintain focus on livestock, especially on the issue of increasing forage production. But there was an unintended consequence – new knowledge began to rub against old thinking.

"We tried various silver bullets over the years to solve certain problems – herbicide, Lehman's lovegrass, prescribed burning," said Havstad, "but research revealed that if it isn't done right, it may be a waste of time."

"Rangelands involve thousands of variables and millions of interactions among those variables," said Havstad. "They don't 'behave' in predictable ways, they defy easy, quick, simplistic solutions or responses and they challenge specific blueprints for their management. That's the conundrum. We need years of scientific study, but the land manager is expected to provide quick, correct, and practical answers."

"That means today we should: one, understand the ecological processes in specific environments; two, know local conditions that modify those processes; three, monitor to evaluate responses; and four, adjust management."
– Dr. Kris Havstad

One significant change brought about by ecological understanding has been the broad shift within the science community from the idea of a 'balance of nature' – where natural forces are engaged in a constant effort to maintain equilibrium – to the idea of the 'flux of nature' – where the role of disturbance, or 'pulses of energy' such as fire, wind, and animal impact, is seen as key to the maintenance of land health.

This shift in thinking led the JER researchers to shift the definition of useful science.

"It's not about creating more forage for cattle anymore," said Havstad. "Our mission is to improve our knowledge of ecosystem processes as a basis for management and remediation of desert rangelands."

Teachable Moments

Believing that a basic understanding of ecological processes is a prerequisite for prudent decisions by land managers, the researchers at the JER started over, in a sense, at the level of soil, grass, and water.

"What we've learned since the 1950s," said Havstad, who like many scientists, tends to talk in lists, "is a better understanding of ecological principles, the mechanisms that drive ecological change, and the characteristics of ecological sites. That means today we should: one, understand the ecological processes in specific environments; two, know local conditions that modify those processes; three, monitor to evaluate responses; and four, adjust management."

In a nutshell: adaptive management.

The tools that the JER, in cooperation with many other researchers, has

helped to develop include:

- **(1) Ecological Site Descriptions** – which help communicate how ecological processes vary over time, climate, and soils in particular places;

- **(2) State-and-Transition models** – which summarize how particular processes combine to produce reversible and irreversible changes; and

- **(3) Rangeland Health Indicators** – a qualitative assessment protocol which enables land managers to evaluate actions, including approaching potential thresholds.

They also helped to develop a quantitative monitoring system that precisely measures watershed function over time.

By going back to basic ecological processes, these tools are designed to answer real-life questions – what is the land capable of supporting? What is the system lacking? What management strategy is appropriate?

And indirectly, but no less importantly: who will do the work?

"Repetitive behaviors on a landscape that are a function of soils, topography, aspect, climate, and organisms, create capacities and potentials," said Havstad. "Understanding those repetitive behaviors is the key to management."

So is communicating those behaviors. The trick, according to Havstad, is finding "teachable moments" – when and where you can actually have an impact.

One of the researchers on the front lines of finding these moments is Jeff Herrick, one of the principal authors of the new rangeland health monitoring and assessment protocols.

"It's all about better understanding the land and how our actions might affect it, and then communicating," said Herrick. "You can develop the best tools, but if you can't communicate them then you aren't helping."

Jeff does his part by leading a great deal of training, mostly on the assessment system these days, for government land managers, conservationists, ranchers, and other landowners.

"The point of the training, and really of all our work," said Herrick, "is the assumption that what we value from land, such as livestock use or recreation or hunting, depends on three attributes: soil and site stability, hydrologic function, and biotic integrity. Without that healthy foundation you'll never reach true sustainability."

In other words, useful science-based land management, according to Herrick, Havstad and others, means:

- **(1)** defining the ecological potential of particular piece of land;

- **(2)** assessing the current status of that land relative to its potential; and

- **(3)** monitoring to document changes over time, especially in response to management activities.

It all starts with soil, grass, and water.

Value

One of the messages that Kris Havstad voiced when he walked from the back of the room to the front, years ago, was that from a scientific perspective the "debate" over livestock grazing in the Southwest was largely over.

In November 1999, Kris Havstad summarized this message in an issue of The Quivira Coalition's newsletter:

"We now know that many of our rangelands have been overgrazed, that some areas remain in degraded states despite adequate rainfall, and that some rangelands shouldn't be grazed by livestock. Yet, we also know fairly clearly that livestock grazing of rangelands can be a sustainable practice for many sites, for many seasons, and for many years.

Extensive experimentation has illustrated that grazing can be managed and the integrity of rangelands ecosystems, in terms of their ability to produce, capture and store nutrients and to conserve soil resources, can be maintained."

In other words, the ecological function of rangelands, if maintained, can support a societal value – livestock production. That was settled. The next step, he wrote, was to explore the ecological processes in more detail in order to provide the basis for their proper management.

According to Havstad, however, what could not be done was provide a 'silver bullet' for livestock management in arid environments. He compares it to the science of raising a child:

"There is no clear scientific basis supporting a specific 'blueprint' for a parent to follow in rearing a child…a single methodology derived from hypothesis-based scientific experimentation that services all possible combinations of parents, children, and environments does not exist."

"Like the science of children," he continued, "we have an impressive knowledge base for rangelands. Yet, like human nature, there does not exist a single science-based blueprint for how we interact with our environment."

This is important for two reasons: first, it demonstrates that rangeland management, like parenting, will always be more art than science.

In other words, science can inform, but not dictate, our decisions. Second, since these decisions will always be based primarily on societal values – culture, politics, economics – useful science means making as clear as possible the functions that supports these values – much the way medicine and psychology are used to raise healthy children.

For example, the JER recently began to focus on another societal value: sustainability. Achieving this value, which Havstad defines as "the maintenance of ecological integrity over time," is especially important not only if we intend to continue to use arid landscapes into the future, but also for wider issues involved in the human/nature relationship. Therefore, the goal of sustainable use in the desert is immediately relevant.

"Sustainable use can be defined as an appropriation of production, such as biomass used by grazing livestock, for instance," said Havstad, "that allows for natural processes to replace appropriated materials."

In other words, we must give back what we take, either by letting it happen naturally, through photosynthesis for example, or through restoration activities, if possible. In either case, it means that levels of use – all use – must be gauged by the natural limits of an ecosystem.

That's the theory – the practice is more complicated. Useful science along these lines is difficult to achieve because while ecosystems exist at tremendous scales, both in time and space, we tend to view them, for obvious reasons, at human-friendly scales. This means the tools available to land managers are limited to only a few components of a landscape.

Such as plants.

"There is much we can't control, but we can control plants," said Havstad, "and we know a great deal about plants. Water too, especially the water cycle in arid environments. We can base our management actions on how we impact properties of these landscapes that are related to these key processes."

And that's where livestock grazing comes in – as a tool for the maintenance of key ecological processes. It is, in fact, one of the few tools land managers have, along with fire, rest, and certain forms of technology, to ensure the maintenance of these processes over time. We could 'leave well enough alone' too – let nature take its course. But that's not an option in many places on the planet anymore.

For example, take desertification – a sustainability concern for one-third of the globe. It is characterized by the unnaturally rapid loss of soil's protective plant cover, resulting in erosion by wind and water, which threatens the very processes that sustain life.

If we are to reverse desertification – and many people think we need to – then we have to think about plants, as well as the proper use of land management tools that encourage their health, including well-managed livestock grazing.

In sum, function and value – ecological integrity and human use – are now inseparably intertwined, especially under the spreading threat of global climate change.

Coming next week: *How Jornada researchers are working to reduce the impact of livestock on the range by using a specific breed of cattle.*

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