

## Featured Investigator - Keirith Snyder

Keirith Snyder is a Research Scientist in plant ecophysiology with the USDA-ARS Jornada Experimental Range. Keirith joined the Jornada two years ago and is also adjunct faculty in Biology at NMSU. She received her undergraduate degree from the University of California at Berkeley, her MS in watershed management, and her PhD in renewable natural resources from the University of Arizona in Tucson. Since joining the Jornada, she has established a new plant physiological ecology lab emphasizing the use of stable isotope techniques to address ecological questions. Her research program focuses on interactions between plants and the water cycle (ecohydrology) and potential

impacts of climate change. She has worked in a variety of ecosystems including riparian systems, oak woodlands, semi-arid grass-shrub systems, and cold desert shrublands. Currently she is employing new techniques to determine which sources of water plants use and the sources of ecosystem carbon and water flux. She has established a large scale precipitation experiment at the mesquite-black grama ecotone to address how potential changes in the frequency and magnitude of summer precipitation, predicted by global climate models, may affect plant performance, community composition, soil respiration, biological crust photosynthesis, and ecosystem car-

bon and water cycling. Keirith hopes to improve estimates of the water budget in semi-arid regions by partitioning evapotranspiration into its components fluxes, evaporation and transpiration. Keirith also enjoys working with students on incorporating ecophysiology into their research projects, and hopes the collaboration with the LTER will increase these interactions.



## Sabbatical Visitors



Leigh Murray, Experimental Statistics, New Mexico State University

Two university faculty are spending the fall academic semester on sabbatical with Jornada scientists in Las Cruces, New Mexico. Leigh Murray, a Professor in Experimental Statistics at New Mexico State University, is focusing on time series analysis of Jornada data. Leigh has been a co-author on numerous manuscripts involving long term data sets from the Jornada. Dr. Karen Launchbaugh and her husband Karl from the University of Idaho are spending time with Jornada scientists working on revision of ecological site descriptions, methods for assessment and monitoring of rangelands, and unique outreach organizations such as the Quivira Coalition. Karen is Professor and Head of the Department of Rangeland Ecology and Management at the University of Idaho.



Karen and Karl Launchbaugh, Department of Rangeland Ecology and Management, University of Idaho

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# JORNADA TRAILS



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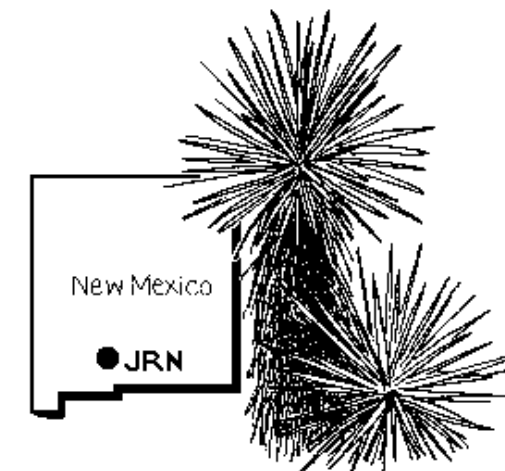
## Desert Hydrology by Tony Parsons

The one thing most people know about deserts is that they are dry. What is often surprising is that when it does rain, the results are often quite dramatic and far more so than in humid landscapes. There are a couple of good reasons for this. First, many deserts, and the Chihuahuan Desert is one of them, experience very intense rainfall. About half the rainfall in the Jornada Basin comes



Figure 1. This stock pond is one of several within the Jornada Experimental Range that have been instrumented to measure rates of runoff from different vegetation types. During one storm, an empty stock pond in an area of mesquite dunes filled in 20 minutes. Photo by David Thatcher.

from short and often intense summer thunderstorms. Rainfall intensities can be on average 30 mm/hour and peak at more than 200 mm/hr for periods of one to two minutes. In any environment the effects of such an intense rainstorm would be dramatic, but it is more so in deserts because of the second important factor: the condition of the ground surface. In humid landscapes the ground is typically covered with a more-or-less continuous vegetation cover that protects the soil from the impact of the rain and allows infiltration. In contrast, desert vegetation is sparse and typically more than half the ground surface is bare. Pounding of this surface by rainfall makes it compact so that it less readily absorbs the rain. Physical and biotic crusts on the surface of these bare soils also make the surface more impermeable. The result is that more of the water remains on the surface where it flows into small rivulets and then into channels leading to flash floods. To some extent these flash floods can be used



The Jornada Basin LTER Program is an NSF funded project.

to good effect. For example, ranchers often build stock ponds to collect this runoff water to supply their cattle through the long dry periods (Fig 1). Flash flooding is just one of the characteristics of desert hydrology. Other important consequences are the effects of surface runoff in redistributing sediment and plant nutrients. This redistribution varies with vegetation type. At the Jornada, we have documented (Continued on page 2)

## Ganado Criollo de Sierra Tarahumara by Ed Fredrickson

Beef cattle have grazed the Chihuahuan Desert since 1527 or shortly thereafter. These cattle arrived in the new world from Andalusia, Spain and the Canary Islands with Columbus's second voyage in 1493. They have both transformed the Chihuahuan Desert and been transformed by it. By all accounts, these animals are quite different than breeds now common to the desert southwest. In order to know how cattle interacted with other agents of change that eventually shaped the Chihuahuan Desert, we must understand the behaviors and underlying physiology of both current and historic breeds. To achieve this goal and to better understand what it

means to be adapted to desert conditions, we searched through Mexico for old cattle types with direct lineage to the animals introduced by Columbus. Two remaining populations were of interest to us: the Chinampo cattle of Baja California Sur and the cattle of the Tarahumara Indians and Mestizos in isolated areas of the Sierra Tarahumara or Copper Canyon region of western Chihuahua. In these areas, there is little, if any, genetic influence of recently introduced breeds. Furthermore, the arid climate and extensive management provides a significant selective pressure for arid land adaptation. The Jornada has acquired 30 animals

from the canyons of the Sierra Tarahumara that will be used in behavior studies to learn how cattle interact with arid landscapes and to develop flexible production systems required for desert systems.



## Jornada Helps BLM Answer Land Management Questions

A unique collaboration between researchers from the Jornada Basin LTER, the USDA-ARS Jornada Experimental Range, the USDA Natural Resources Conservation Service, and management staff with Bureau of Land Management (BLM) in tackling ecological problems in the western United States is attracting the attention of policy makers. In June 2004, the BLM director, Dr. Kathleen Clarke, invited Jornada researchers and collaborating BLM staff to the Bureau's Washington, D.C. headquarters to brief BLM staff, who were developing new national assessment strategies, on their collaborative activities. These activities are all linked to a basic technology required for management of rangelands - the ecological site description.

BLM oversees about 105 million hectares of land in twelve western states of the USA. Increasingly, these states are interested in carrying out comprehensive assessments of the health of the nation's public deserts, grasslands, shrublands, and woodlands. Questions relevant to management of these lands include how standards for public lands health can be identified, how deviations from this standard can be measured and interpreted, and how millions of hectares of land can be examined efficiently.

BLM sought scientific guidance to translate the policies resulting from this renewed interest in ecological questions into practice. This collaboration based in New Mexico has resulted in several direct applications of Jornada LTER scientific findings, such as improved ecological site descriptions based on state-and-transition models describing vegetation dynamics

(described in Bestelmeyer et al. 2003; 2004; and viewable at [www.nm.nrcs.usda.gov/technical/fotg/section-2/esd.html](http://www.nm.nrcs.usda.gov/technical/fotg/section-2/esd.html)), process-based indicators that allow managers to infer the nature of vegetation change based on snapshot or short-duration monitoring (Pyke et al. 2002), and remote-sensing approaches that link state-and-transition models and indicators as well as simulation models to broad-scale patterns (Peters and Herrick 2001).

For more information, please contact Jornada researchers Brandon Bestelmeyer ([bbestelm@nmsu.edu](mailto:bbestelm@nmsu.edu)), Kris Havstad ([khavstad@nmsu.edu](mailto:khavstad@nmsu.edu)), or Jeff Herrick ([jherrick@nmsu.edu](mailto:jherrick@nmsu.edu)).

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## Jornada Research in the Proceedings of the National Academy of Sciences Researchers Improve Science of Predicting Catastrophes

Extracted from a press release by Donald Comis, USDA-ARS Information Staff.

Agricultural Research Service scientists in New Mexico and cooperators have joined forces to improve the science of predicting catastrophes, ranging from forest fires to desertification and global warming.

By pooling their research, the scientists have constructed a theoretical mathematical framework supported by data as a first step toward developing the tools—including computer models—and designing the experiments needed to forecast and avert catastrophes that can begin with a single

tree or shrub, person or event. A paper on the research appears in the current issue of the Proceedings of the National Academy of Sciences.

ARS scientists Debra Peters, Brandon Bestelmeyer and Kris Havstad cooperated on the research with Roger Pielke, Sr., a Colorado State University atmospheric scientist; Craig Allan, a U.S. Geological Survey fire ecologist; and Stuart Munson-McGee, a New Mexico State University chemical engineer.

Peters began the inquiry by wondering about similar dynamics between desertifi-

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Newsletter by Valerie K. LaPlante and Kris M. Havstad

### Desert Hydrology (Continued)

that creosotebush dominated shrublands typically produce two to three times more runoff than black grama grasslands. Although concentrations of dissolved nitrogen in the runoff water from creosotebush shrublands are lower, the total nitrogen losses are greater than from black grama dominated grasslands. We are using this information about patterns in water redistribution to provide insight into variation in desertification and remediation dynamics across a range of spatial and temporal scales. For more information, contact Tony Parsons ([ajp16@leicester.ac.uk](mailto:ajp16@leicester.ac.uk)) or John Wainwright ([j.wainwright@kcl.ac.uk](mailto:j.wainwright@kcl.ac.uk)).

cation and wildfires. She, Bestelmeyer, Havstad, and cooperators now theorize that there are common elements between catastrophes that involve propagating events—like disease epidemics. Such events occur in four stages, with thresholds between each one. At each stage, both the pace of events and the dominating processes or forces change. When events cross the threshold after the third stage, they can become irreversible.

For complete press release, see <http://www.ars.usda.gov/news/docs.htm?docid=1261>.

## Schoolyard LTER

The Jornada Basin Schoolyard LTER program (locally called “Schoolyard Desert Discovery”) includes field trips, schoolyard science investigations, and in-class programs. During the summer when most students are out of school, we focus on training teachers. In July and early August, we conducted a workshop for middle school teachers and science graduate students who are participants in the NSF-funded GK12 program. Now that the school year has begun, teachers and graduate students are implementing Schoolyard Desert Discovery activities in every middle school in Hatch, Las Cruces, and Gadsden districts. In early October we presented another workshop for El Paso teachers, again expanding the

reach of this successful science education program.

The Schoolyard Desert Discovery Program is in even more demand this school year following the implementation of new state science standards. These new standards concentrate heavily on the scientific process; this has been a major focus of the Schoolyard Desert Discovery Program since its inception. We look forward to another school year full of field trips to the Chihuahuan Desert Nature Park and exciting ecological science studies taking place in schools throughout our region.

Please visit our web site ([www.cdn.org](http://www.cdn.org)) or contact [cdnp@zianet.com](mailto:cdnp@zianet.com) for additional information.



Teacher workshop participants Kevin Coleman, Rachel Couch, and Shawn Collier collect data for a study of microclimates. Photo by Nancy McMillan.

## Jornada Researchers Attend the Chihuahuan Desert Symposium

The Sixth Symposium on the Natural Resources of the Chihuahuan Desert Region held at Sul Ross State University in Alpine, Texas (October 14-17, 2004) provided a venue for research conducted by a number of Jornada scientists. A synthesis of ARS and LTER research was presented in the special session entitled

"Landscape linkages and cross-scale interactions in the Chihuahuan Desert". Papers were presented by Debra Peters, Curtis Monger, Al Rango, Keirith Snyder, Ed Fredrickson, Mary Lucero, and Brandon Bestelmeyer. Manuscripts based on these talks will be submitted to a journal as a special issue. In addition, Jeff

Herrick presented a paper on inventory, assessment, and monitoring, and conducted a workshop with Arlene Tugel on interpreting indicators of rangeland health. Isabella Mariotto and Dean Anderson presented posters on their Jornada research.

## Selected Recent Publications from the Jornada

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