



USDA-ARS Land Management Research Unit  
Jornada Experimental Range,  
Las Cruces, NM



Southwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

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## The Jornada

### Science-based Knowledge for Sustainability of Rangelands

Our mission is to conduct long-term, collaborative research to sustain agriculture and other land uses in rangelands. Our research group is collaboration of the USDA Agricultural Research Service, New Mexico State University, and USDA Natural Resources Conservation Service in Las Cruces, New Mexico. We link site-based research on ecosystem change, innovative livestock production systems, and ecological restoration with national and global research on land health monitoring and decision support tools. We are a part of the USDA Long-Term Agroecosystem Research and Long-Term Ecological Research Networks. We host the USDA Southwest Climate Hub and collaborate with the Asombro Institute for Science Education. [See Jornada website](#)



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## Editorial

### Precision Information Everywhere. PIE in the sky or eventual reality?

by Brandon Bestelmeyer

The Jornada is unique among research laboratories in hosting a USDA Climate Hub and participating in four major national science networks: the USDA Long-Term Agroecosystem Research Network and the National Science Foundation's Long-Term Ecological Research, Critical Zone Observatory, and National Ecological Observatory Networks. There are several themes that unite these networks at the Jornada, and one of them I call PIE—Precision Information Everywhere. PIE is a vision in which we integrate spatial data and remote sensing, models, sensor networks, web and mobile tools, and structure planning processes to enable land managers to be proactive, tailor decisions to local contexts, base decisions on a variety of information sources, and develop a shared understanding of what to do where to be “sustainable”, “resilient”, and “climate smart”.

PIE is being developed in different ways through different research programs. **The Long-Term Ecological Research program's goal is to develop predictive models of how arid rangeland ecosystems of the Southwest will change in the future.** LTER is asking how and where we can intervene to prevent and reverse land degradation and how management and restoration will impact carbon sequestration, wildlife, and rangeland production in the future.

Our program in Land Health Knowledge Systems has made great strides in providing precision information to guide rangeland management decisions. Based on our years of work evaluating land health at the Range, we developed land monitoring techniques and databases that have been adopted at the national scale via collaborations with government agencies, and at a global scale via support from USAID and international collaborators. This has resulted in tens of thousands of standardized monitoring sites throughout the world. We have also helped the US and other governments develop models and maps for interpreting monitoring data according to land potential and possible ecosystem transitions. Monitoring data have also been combined with remote sensing data in machine learning models to estimate vegetation cover and production across rangelands of the entire US, going back to 1986, via the Rangeland Analysis Platform. **Our goal is to see land health knowledge used to improve the outcomes of land management decisions**

**across rangeland of the US and the**

PIE is also being advanced by our work with the USDA Long-Term Agroecosystem Research Network, which has a goal of conducting

coordinated research across 18 sites to create, organize, and report on agricultural innovations. Nationally, one of LTAR's goals is to produce a national database to measure the costs and benefits of climate smart practices and match practice options to particular land areas. **At the Jornada, we aim to use precision ranching technologies alongside heritage cattle types as a solution to regenerative grazing tailored to more arid landscapes.** Virtual fencing concepts, pioneered at the Jornada by emeritus scientist Dean Anderson and now operational with modern technologies, allow ranchers to adjust grazing dynamically with respect to spatial and temporal variability in forage resources (and degradation risks) and that does not require massive increases in fence infrastructure to further fragment rangeland and reduces rather than increases labor costs. Finally, the USDA Southwest Climate Hub is producing forecasts of climate change effects on agriculture at increasingly fine scales, organizing tools to be accessible to users, and convening local groups to develop climate adaptation strategies tailored to specific agricultural systems and landscapes. **A Climate Hub goal is to enable local landowners, land managers, and communities to make the best use scientific resources in their efforts to make climate smart decisions.** The Hubs aims to connect science to *all* users, including those that have been chronically underserved by science organizations. **The integration of Jornada's programs position us to make the PIE vision a reality in rangelands:** an understanding of how land will change, matching tools to specific land types that can be used to direct or adapt to change, innovating new solutions to manage change, and a means to connect these tools to all interested users.



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## Research Results

Four recently published papers are highlighted below. We constantly update our papers and abstracts--over 3,300 of them. To view papers go to [Jornada Bibliography](#).

### **Genetic and productive background of Criollo cattle in Argentina, Mexico, Uruguay and the United States**

Criollo cattle from Argentina and Uruguay showed clear divergence due to genetic isolation but clustered together, representing the southernmost expansion of cattle in the Americas. See the paper [here](#).

### **Diet selection of Raramuri Criollo and Angus x Hereford crossbred cattle in the Chihuahuan Desert**

This small-framed animal exhibits traveling behaviors that allow it to exploit vegetation at a greater distance from water, although it is unknown whether Raramuri Criollo have dietary preferences that differ from European breeds typically raised in the southwestern U.S.A. See the paper [here](#).

### **An inductive approach to developing ecological site concepts with existing monitoring data**

Eleven ecological site concepts and paired vegetation communities were identified using multivariate fuzzy clustering and classification tree analysis to determine the influence of abiotic variables on vegetation communities. See the paper [here](#).

### **Long term agroecosystem research experimental watershed network**

LTAR will expand the mission of the ARS Experimental Watersheds network to include intensification of agricultural production, without ecosystem degradation while working to enhance rural prosperity. See the paper [here](#).



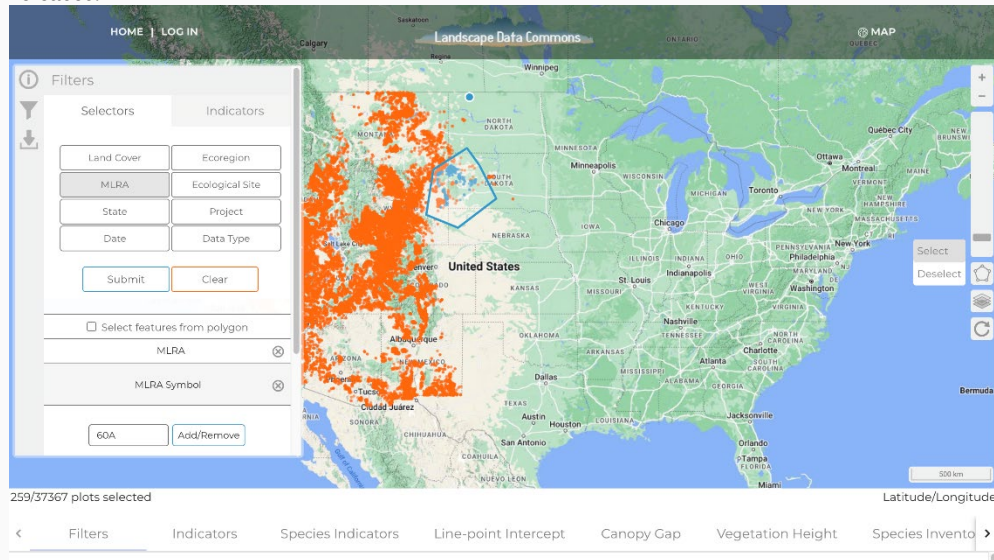
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## News

# Landscape Data Commons software

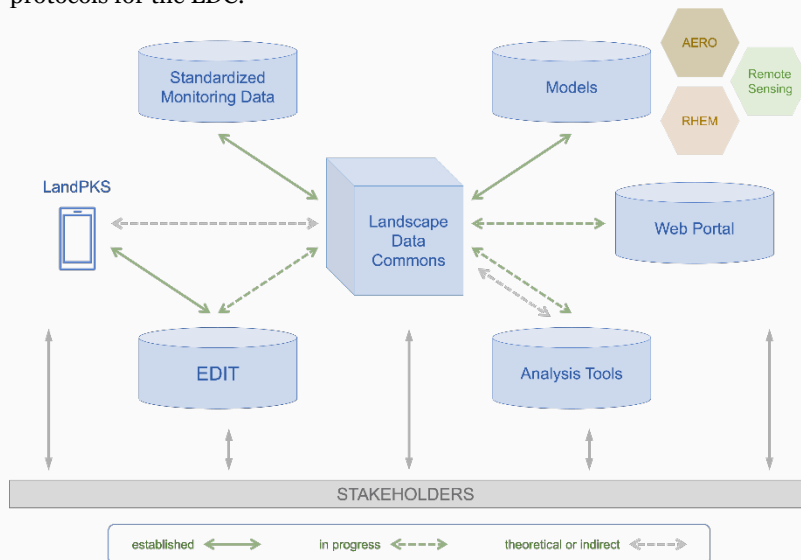
by Christopher Fraser

Christopher Fraser works with Sarah McCord and Nick Webb developing software for the [Landscape Data Commons](#) (LDC). Chris focuses primarily on the open-source LDC data portal, a website that provides access to the integrated, harmonized data that the LDC releases.



The LDC data portal allows users to retrieve, examine, and download ecological monitoring data harmonized from a broad community of land managers and researchers. The portal includes an interactive map with search features that enable users to query vegetation and soils data by polygon, region (e.g., ecoregion, MLRA), and indicator values. Users can inspect data in tables on the data portal and download data for use in decision-making documents or research.

Chris is also exploring data-pipeline architectures, code-testing enhancements, documentation strategies, and general data-wrangling protocols for the LDC.

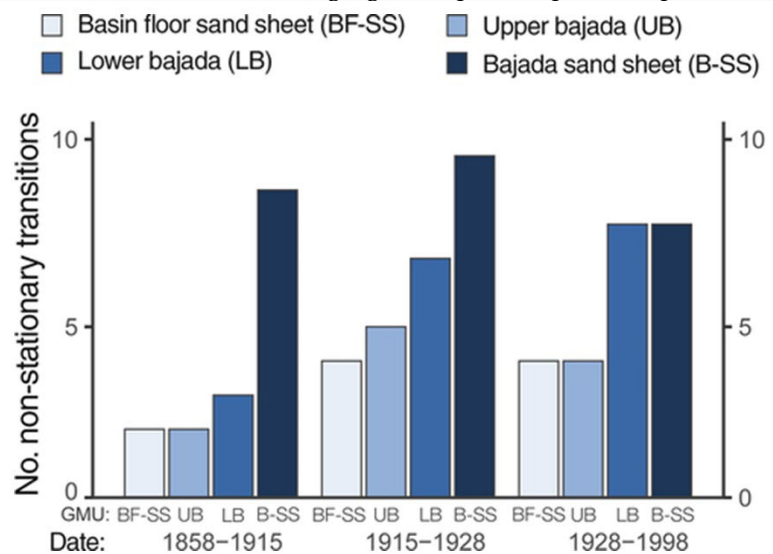


## Mechanisms and drivers of alternative shrubland states

by Dylan Burrus

We found that shrubland states developing on former grasslands were spatially and temporally more dynamic than has been generally assumed. Livestock overgrazing combined with periodic multiyear drought reduced perennial grass cover throughout our study area. Tarbush increased on bajadas, whereas mesquite increased on the sandy basin floor and bajada sand sheet landforms. However, while mesquite proliferation continued in the sandy landscape components over the past century, grazing-induced soil erosion on the upper bajada appears to have enabled creosote bush to displace tarbush and attain dominance. In the meantime, translocation of fine soil particles to lower bajada landscape elements reinforced tarbush dominance on those landscape elements. The shrubs invading the Chihuahuan Desert grasslands (mesquite, tarbush, and creosote bush) represent contrasting shrub functional types. Accordingly, characterizing observed changes as simply a “grassland-to-shrubland” state change ignores spatiotemporal complexities that have consequences for primary production, plant–soil feedbacks, nutrient cycling, biodiversity, and trophic interactions. See more [here](#).

Number of unique vegetation dominance transitions occurring on contrasting soil geomorphic units (basin floor sand sheet, lower and upper bajada, and bajada sand sheet) within the 104,166-ha Jornada Basin study site on three consecutive time periods (1858–1915, 1915–1928, and 1928–1998).



## Media

### 2022-2023 Sharing Management Practices

by Anna Weinberg from University of Arizona/ CCAST (Collaborative Conservation and Adaptation Strategy Toolbox)



## 2022-2023 Sharing Management Practices



### Leadership team

- Reanna Burnett – Communication Liaison
- Maude Dinan
- Noah Silber-Coats

### Goal(s)

- Facilitate peer to peer learning and knowledge exchange between on-the-ground managers
- Capture and provide documentation of drought adaptation, mitigation, and resilience strategies, including lessons learned, and share via written case studies, podcasts, videos
- Produce at least 4 case studies of topics that aligned with regional needs at annual meeting, one of which comes from Hawaii
- Continue brainstorming opportunities to gain feedback from Case Study users and understand how DLN members use Case Studies
- Continue improving communication between other teams and us; actively pursue case study needs from other groups
- Bring in and grow paid student writer capacity through partners

See video [here](#).

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**Niall Hanan, PhD**  
Lead Principal Investigator  
Jornada Basin LTER

## History, mission, and science of the Jornada LTER

Watch this video to learn about the history, mission, and science of the Jornada LTER as we celebrate our 40th anniversary in 2022.

See video [here](#).



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