JORNADA BASIN LTER

LONG TERM ECOLOGICAL RESEARCH

Research Experience for Undergraduates (REU)

The NSF-supported Jornada Basin Long-Term Ecological Research (LTER) program has opportunities for undergraduate students to participate in research during the summer of 2023. Each participant will develop a personalized project under the guidance of a suitable mentor associated with the Jornada LTER and/or New Mexico State University.

Successful applicants will be awarded a stipend of $8,000 for the summer field season (approximately 5/15 – 8/14) to cover stipend, living, and travel expenses. Activities will include fieldwork at the Jornada research site northeast of Las Cruces, NM.

How to Apply

Applications will be evaluated upon submission, with priority given to those received before the deadline, and positions being filled as long as funding is available. Applications from underrepresented minorities are particularly encouraged. Based on their interests, applicants can select one or more of the research projects below, or work with a Jornada mentor to develop their own ideas. Complete applications should include:

- Completed Application Form
- Resume or Curriculum Vitae
- Unofficial Undergraduate Transcripts

About the Jornada LTER

The Jornada Basin Long-Term Ecological Research Program is focused on the ecology of drylands in the southwest USA, including the causes and consequences of alternative ecosystem states and expansion of woody plants into grasslands.

We are interested in spatial and temporal variation in ecosystem dynamics, and how historic legacies, geomorphology, wind, water, climate, and land use interact with vegetation, soils, microbes, and animals to determine past, present, and future ecosystem states across different scales. We use a large suite of long-term ecological and climatic data to understand and predict these dynamics.

More information on the LTER program is available at https://lter.jornada.nmsu.edu.

Applications Due: March 3rd, 2023

To apply, send all application materials compiled into a single file (e.g. PDF) to: Madeleine Soss (msoss@nmsu.edu)

NSF

NM STATE UNIVERSITY

JORNADA LTER RESEARCH EXPERIENCE FOR UNDERGRADUATES Due March 3, 2023 to Madeleine Soss

APPLICANT INFORMATION			
Last Name:	First:	M.I.	Date:
Street Address:	Apartment/Unit #:		
City:	State:	ZIP:	
Phone:	E-mail Address:		
Undergraduate Major/Minor:			
Expected Graduation Date:	University Name/Location:		
Project number(s) you are interested in:			

PLEASE ATTACH RESUME AND UNOFFICIAL UNDERGRADUATE TRANSCRIPTS

REFERENCES (can include your proposed JRN-REU mentor or other)	
1. Full Name:	Relationship:
Affiliation:	Email:
Address:	
2. Full Name:	Relationship:
Affiliation:	Email:
Address:	

Applicants are encouraged (not required) to contact the REU mentors to ask questions about summer research. Provide an outline of your interests and preferred research themes for your work with the Jornada LTER below.

DISCLAIMER AND SIGNATURE	
The information included in this application is true and is representative of my work and past experiences.	
Name	Date

2023 Jornada Potential LTER REU Projects

Please look over the project descriptions below and indicate the Project Number(s) (Ex: #1, #2, etc.) that you are most interested in on the attached application form.

1. CARBON SEQUESTRATION ON RANGELANDS VIA ENHANCED WEATHERING OF BASALT ROCK DUST—EFFECTS ON SOIL, VEGETATION, AND BIOLOGICAL SOIL CRUST

To help prevent warming of the Earth by 2 deg C, adding basalt rock dust to agricultural soils is an emerging negative-emissions technique for removing atmospheric carbon by "enhanced weathering." Studies in the United Kingdom, for example, claim that the UK could reach half of its 2050 carbon goals using this method. Other predictions indicate that the amount of carbon sequestered by basalt rock dust weathering is similar to the amount sequestered by soil organic carbon (about 2.5 Pg/y CO2 by 2100), but with inorganic C having a longer storage potential than organic C.

Rangelands will inevitably enter into the picture because of the vast area of arid and semiarid grazing lands worldwide. But what effect will rock dust have on dryland ecosystems? This project will involve establishing treatment and control plots at the Jornada Experimental Range, measuring soil physical properties in the field and lab, and characterizing the vegetation and biocrust in the plots. Once the rock dust is added, the soils, vegetation, and biocrusts will be monitored throughout the summer. Of particular interest will be the changes, if any, during the summer monsoon season.

Contact Information:

Curtis Monger
Professor Emeritus
Plant and Environmental Sciences Department
New Mexico State University
cmonger@nmsu.edu

2. The Sala Lab at Arizona State University is looking for a motivated undergraduate student to participate in research activities in grassland ecosystem ecology, for 10 weeks, during the summer of 2023. This student will work with peer students, faculty, graduate students, technicians, and postdocs to assist with ongoing rainfall manipulation experiments, vegetation and soil sampling, and other field surveys at the Jornada Experimental Range (~25 miles from Las Cruces, NM). Additionally, this student will have the opportunity to work with Sala Lab members and the PI to develop a personalized research project. Our hire can expect to conduct field work in summer weather conditions and live on-site at the Jornada Headquarters. This student will be awarded a stipend, which is to cover food, travel, and personal project costs.

   Contact Information:
   https://sala.lab.asu.edu
   https://jornada.nmsu.edu/lter
   bmsutter@asu.edu

3. Dr. Okin's lab at UCLA studies the interactions between plants, soils, and the atmosphere in deserts. At Jornada, he's been particularly interested in how process that transport matter (e.g., wind and water transport) interact with plant processes to affect the transition of grasslands to shrublands – a phenomenon that is occurring in deserts worldwide). This has led to the study of how landscape connectivity interacts with climate to maintain grasses or allow grass recovery, as well as studying how wind transport impacts soils and vegetation and acts as a trigger for shrub encroachment. This summer, we are continuing both manipulative and observational studies at the Jornada Experimental Range looking at these factors. This project will involve 6-8 weeks of field work at the Jornada, one of the world's premier sites for the study of dryland processes, in Las Cruces, New Mexico. There are opportunities for students to be involved in several field studies that use a variety of techniques such as: precipitation manipulation, UAV-based remote sensing, and traditional ecological methods.

   Contact Information:
   Gregory Okin — Institute of the Environment and Sustainability at UCLA
   okin@geog.ucla.edu

4. The Schooley lab at the Univ. of Illinois Urbana-Champaign examines how populations and communities of animal consumers respond to habitat change from shrub encroachment and potential feedbacks that could trigger or reinforce transitions to shrublands. Ongoing work at the Jornada Basin includes the dynamics of desert rodents and predator-prey interactions among canids and lagomorphs. Our project this summer will focus on how different groups of herbivorous mammals affect grass seedling survival and plant cover. The project will include 6-8 weeks of fieldwork in the Chihuahuan Desert in collaboration with an MS student.

Contact Information:
schooley@illinois.edu
kierana2@illinois.edu
| Natural Resources & Environmental Sciences | UIUC (illinois.edu)

5. The Mauritz lab at Univ. Texas El Paso focuses on capturing spatial and temporal drivers of ecosystem-level carbon, water, and energy exchange in the Chihuahuan Desert. We use a variety of instrument platforms to understand how vegetation and weather interact to control carbon, water, and energy exchange and ultimately to learn how vulnerable the system is to climate change. In the last decade, the scientific community has learned that dryland systems are far more important for global carbon storage than previously thought. Yet, most carbon models still rely on theories developed from research in cool, wet temperature ecosystems. More research is needed to improve representation of dryland systems, particularly responses to the extreme and highly variable rainfall patterns. Potential projects will incorporate long-term data sets and coding in R to explore some fundamental questions about how vegetation dynamics relate to ecosystem-level fluxes. Projects will be developed with interests and input from the student.

Research Topics: Ecosystem-level carbon, water, and energy exchange dynamics in the Chihuahuan Desert.

Contact Information:
Faculty — Systems Ecology Lab (squarespace.com)
memauritz@utep.edu

6. The Jornada Basin LTER's data science and information management group is responsible for the curation and publication of a wide range of research datasets generated by Jornada scientists. There are two potential projects that an REU student could get involved in in the summer of 2023.

a) We are developing more efficient methods to exchange data and metadata between community-standard repositories like the Environmental Data Initiative (EDI) and locally managed databases. We invite a student to contribute to creating standardized deployment methods for research metadata databases (PostgreSQL) and developing an R package for exchanging structured metadata (EML) between these databases and community repositories.

b) We are making data from the Jornada's extensive sensor network available to researchers in real-time, and then creating research-ready datasets from these data. We invite a student to assist with field collection and archiving of extensive metadata about sensor network nodes (weather stations, instrumented soil profiles, etc), and to develop code in the R language to standardize, harmonize, and publish thematic datasets with variables from these sensor networks.

Students will have the ability to shape project goals and will receive technical training as required. An anticipated outcome of both projects is the scaling of new tools across the LTER network, and students will interact with a collaborative team of data scientists at NMSU, the EDI repository, and other institutions.

Contact Information:

Greg Maurer
gmaurer@nmsu.edu

7. Characterizing biological soil crusts from the micro to landscape scale

Biological soil crusts are fascinating soil phenomena commonly found in dryland ecosystems. They are exclusively formed by soil microbial life and are integral to dryland ecosystem functioning and health. Mosses, lichens, fungi, algae, and cyanobacteria are the main organismal groups we find in these crusts. Recognizing their presence and activity is challenging due to their cryptic appearance and the fact that the crust organisms are dormant during the long dry periods of the year. However, characterizing biocrusts from the microscale to landscapes provide a promising framework to better quantify their presence and track their activity throughout time. We are inviting you to join an interdisciplinary research team to help build tools and develop methodologies to characterize biocrust structure and presence from micro to landscape scales of diverse Chihuahuan Desert biocrust types. You will work closely with Principal Investigators and graduate students at New Mexico State University, University of Texas, El Paso, and University of Nevada, Las Vegas, to collect data in the field during the dry and wet monsoon seasons. In addition to field collections, you will investigate spectral properties and 3D structure with advanced microscopy in a laboratory setting. You will be part of an interdisciplinary research team that is interested in understanding and quantifying the roles of biocrusts in dryland carbon cycling. You will be co-mentored by Dr. Nicole Pietrasiak (Soil Ecologist), Dr. Marguerite Mauritz-Tozer (Ecosystem Ecologist and Carbon Cycling Modeler), Dr. Liz La Rue (Landscape Ecologist) and Dr. Samy Belteton (Microscopist), with guidance by Dr. Sergio Vargas (Remote Sensing Ecologist) and Dr. Craig Tweedie (Ecosystem Ecologist).

Contact Information:

Dr. Nicole Pietrasiak
npietras@nmsu.edu
http://aces.nmsu.edu/academics/pes/soil-faculty.html
Twitter: @DrylandAlgae