JRN-LTER VII: Annual Report (Year 3)

Award Number: 2025166
Project Title: LTER: Long - Term Research at the Jornada Basin (LTER VII)

Project/Grant Period: 12/1/2020 - 11/30/2024

Reporting Period: 12/1/2022 - 11/30/2023

ACCOMPLISHMENTS

What are the major goals of the project?

We will explore how landscape-level spatial heterogeneity evolves in response to the effects of disturbance triggers, connectivity-mediated feedbacks, and their interactions with the soil-geomorphic template. We will integrate long-term observations and recent theoretical developments to improve a conceptual and predictive framework for drylands. We propose to expand our landscape linkages framework to fill this critical need, and to contribute to emerging ecological theory on: (a) alternative states and transient dynamics, (b) ecosystem sensitivity under global change, and (c) cross-scale interactions.

Obj. 1. quantify effects of interactions among triggers, connectivity-mediated feedbacks, and soil-geomorphic heterogeneity on the rate and nature of state transitions.

Obj. 2. explain and predict multi-scale spatial heterogeneity in alternative states.

Obj. 3. apply new analytical concepts and tools to broader extents (regional to global) and examine consequences for ecosystem services.

What was accomplished under these goals?

Major activities

Obj. 1: quantify effects of interactions among triggers, connectivity-mediated feedbacks and soil-geomorphic heterogeneity on rate and nature of state transitions

A. Grassland to shrubland transitions

A1: ThreshEx: ThreshEx2 examines processes & controls on tipping points in grass recovery following variable intensity grazing disturbances interacting with varying degrees of drought. A postdoc was recruited and the experiment was initiated this past year, including the first year of data collection. In addition, vegetation data were gathered for ThreshEx1, yielding a 27 year observation record.

A2: NEAT2: The Garcia-Pichel Microbial Nursery is now functional in support of NEAT2 and other projects involving microbial ecology. NEAT2 plots were inoculated Summer 2022. First monitoring was carried out this Fall.

A3: The Ecotone Study: Long-term sampling of rodents, lagomorphs, and mammalian predators continues to examine trophic cascades during grass-shrub state transitions. We expanded to include herbivory feedbacks from native, invasive, and domesticated mammals.

B. Shrubland to grassland transitions

B1: The Threshold Responses in Grass Growth, Establishment and Recovery Experiment: In TRIGGER we manipulate rainfall and connectivity in a factorial design in a mesquite-invaded site, with PPT levels representing 100-yr and 10-yr wet/dry sequences (+/-80%, +/-50%) and ambient conditions. Replicate plots include three levels (low, medium, high) of initial grass cover, with/without presence of connectivity modifiers. We monitor ANPP, cover, plant and litter density, and recruitment by species.

B2: The Grass Recovery on Wind Eroded Soils Experiment: GROWES is examining alternative succession pathways in the presence or absence of shrubs following major disturbance. Measurements of vegetation structure, soil moisture and dust transport continue.

B3: Cross-Scale Interaction Study: CSIS examines how grass recovery is impacted by aeolian connectivity and competition with shrubs, replicated on sandy soils with mesquite and black grama across a gradient in shrub cover. Replicated plots manipulate connectivity using 'conmods' and competition from shrubs. This long-term experiment has been running for >10 years, with major results recently submitted for publication and data published to EDI.

B4: Long-Term NPP and Grass Recovery Trends: We continue monitoring NPP at 15 locations across JRN and the legacy effects of wet and dry periods, spatial-temporal variability in vegetation responses of grasses and forbs, shrubs, and biocrusts in different geomorphic/soil contexts. A baseline of biocrust cover and composition of functional types was assessed for these 15 locations. This dataset was brought up to date in 2023 and will provide ground-truthed information for future drone-based monitoring. The role of bacterial predators on biocrust primary productivity losses was established (Bethany et al 2022).

C. Shrubland to shrubland transitions

C1: Long-Term Shrub Monitoring: Four long-term shrub monitoring plots were installed this year in grassland, mesquite dunes, creosotebush and tarbush communities, with UAV and field-based inventory of all shrubs for establishment, growth and mortality. These data will provide baseline data on shrub demographics under natural conditions, complementing shrub demographic experiments and linking JRN Jornada shrub population processes to long-term forest plots across the LTER network and globally.

C2: Shrub Demographic Experiment: We extended a recent analysis of shrub distributions across the Jornada that inferred competition among shrubs as related to canopy density, size and cover, and estimated root overlap. A subsequent study added data on canopy heights from airborne lidar to estimate shrub volumes that provide a superior index of competition among shrubs and competitive constraints on shrub encroachment.

QuadCam Development: We conducted greenhouse QuadCam experiments to assess optimal camera, light, and timing configurations to identify germination, growth and mortality events, and provide image data to train deep learning algorithms for image segmentation.

Plant-Soil Feedbacks: We continue studies of rhizosphere microbiomes for abundant Jornada shrub species (tarbush, mesquite, creosote, mariola) and grass species (black grama, lovegrass). DNA amplicon metabarcoding was used to characterize bacterial and fungal communities and shrub-specific microbiomes. The data is currently being analyzed.

C3: Bajada Watershed Studies: Infiltrometer studies quantified soil saturated hydraulic conductivity as a function of vegetation cover and terrain for five sampling periods during the

year. Comparisons of cosmic-ray neutron sensing of soil water content with the environmental sensor network are underway. Hillslope runoff plots have helped explain historical runoff generation at multiple scales. A radio network now telemeters watershed data in real-time.

Carbon and Water Flux Studies: We updated datasets on AmeriFlux and installed a temporary EC tower at an ephemeral playa with long-term water level, soil moisture, evapotranspiration, carbon fluxes, and meteorological data. A comparison of open- and closed-path infrared gas analyzers is underway at one site as part of the standardization effort across the network. JRN-LTER and partner projects now operate a network of 10 flux towers, providing an unprecedented opportunity to monitor carbon, water, and energy exchange at Basin scale.

D. Transition to novel ecosystems

D1: How do Rainfall Variability, Grazing, and Competition with Native Grasses Interact to Trigger Non-Native Grass Invasion?

Plant-Soil Feedbacks and Lovegrass Invasion: Seed germination and early establishment study contrasting biocrust presence and absence showed rangeland grass species responded strongly to seed position (on top, within, or below biocrust) and secondly to biocrust types. A new plant soil feedback study was initiated investigating plant soil feedbacks between lovegrass and black grama when exposed to drought, fertilizer addition, and competition treatments.

E. Transitions under climate change

E1: Rainfall Manipulation Experiment: Our long-term experiments (> 15 y) in mixed black grama-mesquite manipulate (1) PPT amount (+/-80% & ambient) in a factorial design with/without N fertilization, and (2) PPT inter-annual variability (altering the sequence of wet/dry years under constant PPT. A new experiment in which we reduced and enhanced annual precipitation is examining root dynamics in the different treatments using soil cores, root in-growth methods, and minirhizotrons. Over a decade of data on plant cover, biomass, soil water, and related variables from these experiments were made available or updated at the EDI repository this year.

Obj. 2: explain and predict multi-scale spatial heterogeneity in alternative states

Jornada Long-Term Quadrats: The analysis of relationships between vegetation cover in Jornada quadrats over 101 years and climate variables with different time scales, including annual rainfall/temperature and ENSO and PDO climate oscillations was published as a Report in the journal Ecology.

Ecohydrological Modeling: We sampled soil hydrological parameters for bare and vegetated patches in the watershed. We conducted a calibration activity at two COSMOS sites (bajada watershed and playa) to enhance the observation network with respect to soil water content. We delineated catchments draining to 18 instrumented playas based on a 1-m digital elevation model from LiDAR. Flow and inundation dynamics of channels and playas have been detected using a small-sat data from Planet. Six years of playa water level data have been published to the EDI data repository in 2023.

Biocrust distributions: We are continuing our study exploring how biocrust abundance and diversity is shaped by ecological site and state conditions. We examined 63 plots located on sandy, loamy, and clayey ecological sites. We collected data on vegetation plant community composition, canopy cover and height, canopy gap, soil aggregate stability and relationships to

biocrust cover and composition. Multivariate statistics will be used to identify ecological patterns. A lab based biocrust phenology experiment was conducted to link biocrust carbon exchange to microbial activity (in collaboration with Mauritz-Tozer, Tweedie, Darrouzet-Nardi). The role of symbioses between cyanobacteria and heterotrophic bacteria in the establishment of biocrusts was firmly established, and major microbial players and mechanisms identified (Nelson et al 2021, Nelson et al, in the press). The role of allelopathic interactions among microbes as determinant of biocrust species distributions was established (Nelson et al. 2022)

Obj. 3 apply new analytical concepts and tools to broader extents (regional to global) and examine consequences for ecosystem services

Expanding Arid Land Ecological Theory: We are adapting the ecosystem model Multi Element Limitation (MEL) to the Chihuahuan desert to attempt to reproduce our long-term manipulative experiments. Mismatch of MEL runs with our results would generate hypotheses to be tested in the field. We have also made significant contributions to the Pulse Reserve Paradigm of arid lands, by making it extensive to microbes and plants in a novel explicit model (Garcia-Pichel and Sala, 2022), and by seeking experimental validation to some of the model predictions among soil microbes (Kut and Garcia-Pichel, in press).

Restore New Mexico: A publication based on vegetation and soil data collection to date is in review after revision. Analyses from a regional study were completed on how vertebrates respond to landscape mosaics created by shrub removal. A paper will be submitted in 2024 on results from a regional study on how vertebrates respond to landscape mosaics created by shrub removal.

Malpai Borderlands Collaborative Research: A new study of livestock activity using GPS collars in relation to vegetation states was initiated in 2023.

Vegetation dynamics and state-change in the southwestern USA: We applied a new method to diagnose changes in vegetation structure based on long-term satellite data (2001-2022) which enables us to estimate changes in woody vegetation separate from changes in herbaceous vegetation cover. This analysis will provide a regional assessment of recent changes in vegetation associated with losses and gains in herbaceous vegetation, and losses and gains in woody plant (shrub) cover.

Competition for resources in global woody plant communities: We used data from the SapFluxNet database to explore competition in woody plants at global scales, linking emergent landscape scale limits to shrub and tree density to underlying competition for water resources, particularly in water-limited ecosystems.

Specific Objectives

See major goals (above)

Significant results

Obj. 1: quantify effects of interactions among triggers, connectivity-mediated feedbacks, and soil-geomorphic heterogeneity on the rate and nature of state transitions.

A. Grassland to shrubland transitions

A1: ThreshEx: The 2023 record of ThreshEx1 indicates that shrub encroachment into the experiment is now constraining grass recovery after decades of grass increase. Furthermore, grazing history has had no effect on shrub encroachment when shrubs were undisturbed, but protection from grazing seems to have slowed shrub encroachment.

A2: The NEAT Experiment: Studies in Jornada biocrusts were central to major advances in the biology, spatial organization, and trophic interactions in soil crusts carried out by Jornada-supported students (Bethany et al., 2022; Nelson et al., 2022; Nelson et al, in press Figure 1).

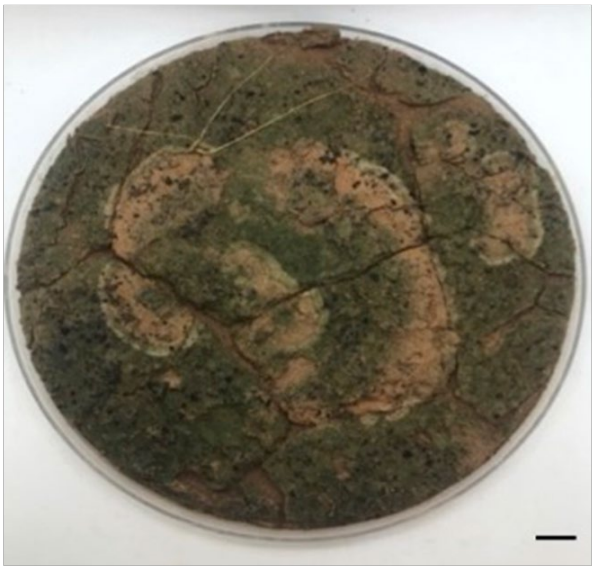

Figure 1. Macroscopic symptomology of a *Cyanoraptor togatus* epidemic on soil biocrusts as cm-sized clearings on biocrust cover that reduce crust NPP by ~10% at landscape scale. Nelson, et el (in press).

A3: The Ecotone Study: Trophic interactions among canid predators and their lagomorph prey are driven by bottom-up pulses that are mediated by ecological state. Lagomorphs respond strongly to years of high summer precipitation, but only on sites with high shrub cover. A complementary long-term (25 years) herbivore exclosure experiment revealed perennial grass cover increased with removal of native small mammals (Figure 2), but mesquite expansion was unrelated to treatment. Long term trends on biocrust cover and community composition were also detected, surprisingly implicating small mammals as suppressors of biocrust cover.

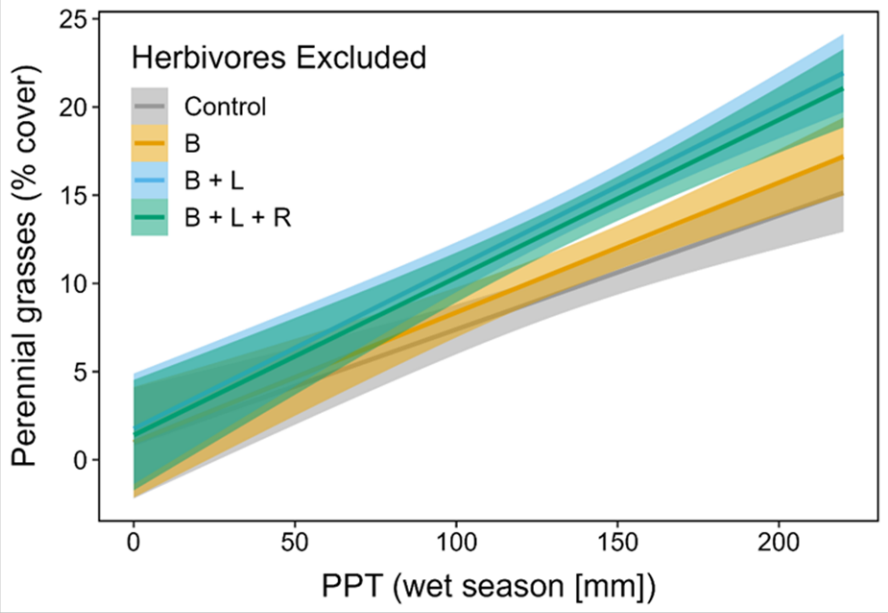

Figure 2. Perennial grass cover response to rainfall (PPT) from a 25-year herbivore exclosure experiment. Treatments included exclusion of bovids (B), bovids and lagomorphs (B + L), and bovids, lagomorphs and rodents (B + L + R). Perennial grasses respond to PPT more strongly in plots excluding lagomorphs.

B. Shrubland to grassland transitions

B1: The Threshold Responses in Grass Growth, Establishment and Recovery Experiment (TRIGGER): Three years of field data collection have been completed and preliminary data analysis has been conducted. Our results indicate significant impacts of initial cover, precipitation treatment, and connectivity on live perennial grass cover and litter accumulation. Three years of high-resolution orthophotos are being analyzed to understand detailed patterns of vegetation and litter accumulation in the treatments.

B2: The Grass Recovery on Wind Eroded Soils Experiment: Nothing to report yet.

B3: Cross-Scale Interaction Study (CSIS): Combined treatments that reduced shrub competition and aeolian connectivity across a landscape-scale gradient of increasing shrub cover, provide the first compelling evidence for a pathway to grass recovery in southwestern drylands. Individual treatments (killing shrubs, or adding connectivity modifiers) had only small impacts on perennial grass populations. However, when shrub competition and aeolian connectivity are decreased together, their interactive effects produce a much larger synergistic response (Figure 3). These results have been submitted for publication (Peters et al., 2023) and five new datasets from the project have been published in the EDI data repository.

Figure 3. Impact of cross-scale experiment treatments on perennial grass cover. The experiment was replicated at 15 locations in sandy locations of the Jornada valley floor with variable levels of mesquite encroachment (Peters et al., in review).

B4: Long-Term NPP and Grass Recovery Trends: A major retrospective and reanalysis of the long-term NPP plot datasets was published in 2023 (Peters et al., 2023, Eco Monograph reference), showing how temporal lags interact with landscape context and soil types to control woody and herbaceous production.

C. Shrubland to shrubland transitions

C1: Long-Term Shrub Monitoring: Baseline data have been collected at four sites.

C2: Shrub Demographic Experiment (ShrubDemo): Three submitted articles explore how competition emerges among woody plants as density increases (Figure 4). The first (Wojcikiewicz et al, in review) uses a simulation modeling approach to infer root competition intensity across the Jornada Basin-wide using shrub density and cover datasets, establishing that shrub population growth rates tend to zero (or negative) when local population density increases canopy cover above ~25% (Figure 4A). The second (Roberts et al., in review, A) explores how competitive interactions and limits to the shrub encroachment process depend more closely on a 3-dimensional estimate of shrub community structure (i.e., shrub volume), than on the 2-dimensional metric of shrub cover (Figure 4B). When combined with an independent study that shows competition increasing with stem density in global sap-flow data (Roberts et al., in review, B) this suggests that shrub volumes may be a better index of competitive interactions because volume is better correlated with leaf area index than canopy cover, and LAI is closely correlated with the ability of a plant to transport water. Shrub volume estimates are in the process of being published at the EDI data repository.

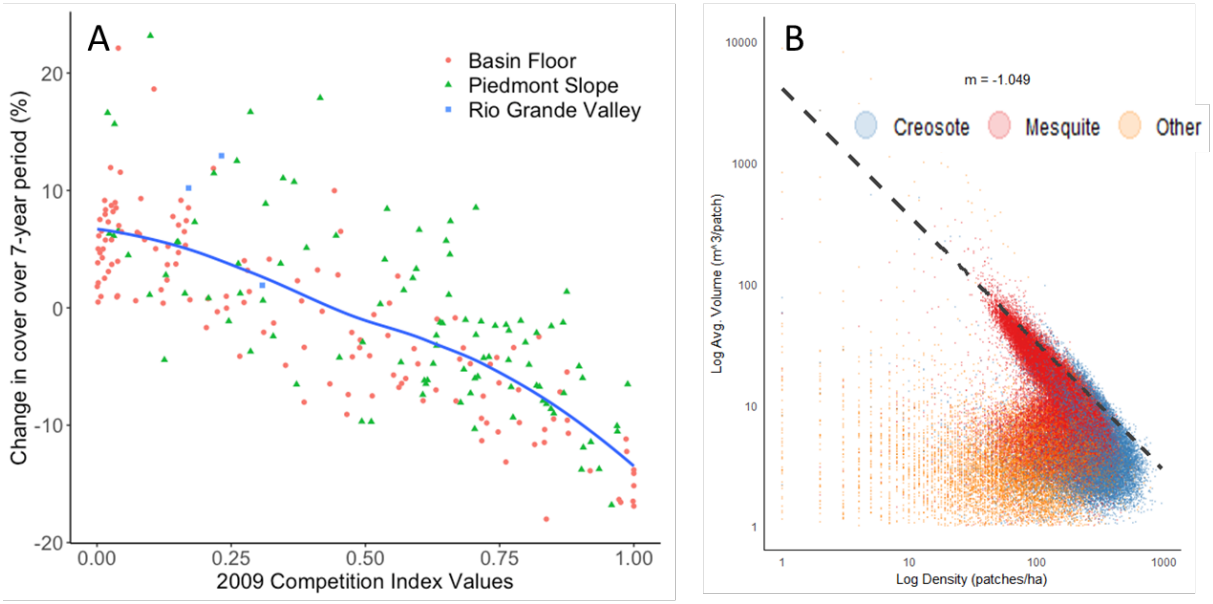

Figure 4. Evidence for shrub-shrub competition limiting JRN-LTER shrub populations. (A) Relationship between 2009 competition index (CI) values, computed using a root overlap model, and changes in cover observed over a seven-year period (Wojcikiewicz et al., in review). Points with CI<0.5 tend to increase in shrub cover, while sites with CI>0.65 show decreases in shrub cover. (B) Self-thinning lines emerge in plots of average shrub volume against shrub density (on log-log scales; Roberts et al., in review). Shrub volume (shown here) provides a thinning exponent (m=-1.049) closer to the theoretical expectation (m=-1) than a similar analysis using shrub canopy area.

C3: Bajada Watershed Studies: We confirmed that soil saturated hydraulic conductivity (surface infiltration) varies significantly between bare and vegetated patches. More interestingly, we found that surface infiltration was significantly reduced after the first rains. This effect was attributed to rain drop effects on soils with sufficient clay content that lead to surface sealing. We also examined the relationship between small plot-scale runoff generation and watershed-scale, with most rainfall events not leading to watershed discharge and an exponential relationship between plot-scale and watershed runoff (Figure 5; Keller et al., 2023). Further work is needed to explore the implications of this vegetation- mediated soil process on runoff production.

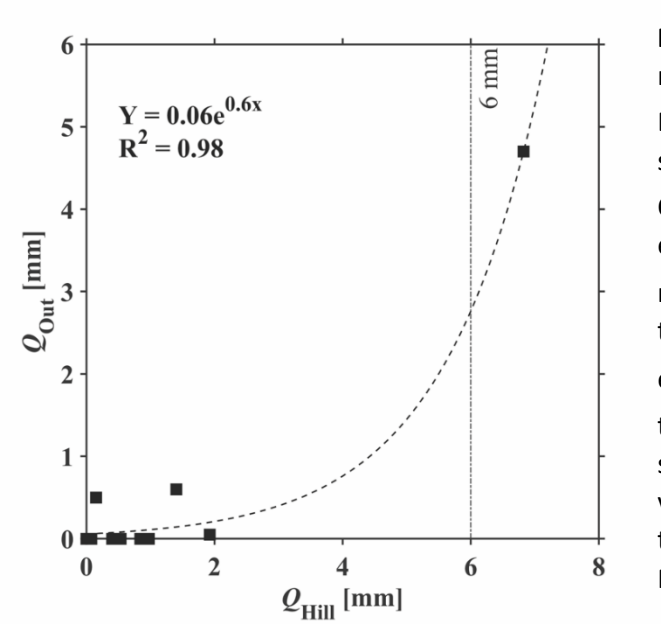

Figure 5. Relation between local-scale hillslope runoff (Q_{Hill}) averaged across four plots at the Bajada watershed and the emall-watershed-scale outlet discharge (Q_{Out}) for all events from October 1, 2019 to September 15, 2021 (Keller et al., 2023). Runoff volumes have been normalized by their respective areas (8 m^2 for the runoff plots and 4.67 ha for the outlet). An exponential regression of the form $Y = ae^{bx}$ with the coefficient of determination (R^2) value is shown by the dashed line as a visual aid. The vertical line is the model-derived hillslope runoff threshold for outlet discharge (Schreiner-McGraw and Vivoni, 2018).

D. Transition to novel ecosystems

D1: How do Rainfall Variability, Grazing, and Competition with Native Grasses Interact to Trigger Non-Native Grass Invasion?

Nothing new to report.

E. Transitions under climate change

E1: Rainfall Manipulation Experiment: As precipitation is expected to shift under climate change, we asked how changes in water availability elicit acclimation of the N cycle and how long does this acclimation take. We found that site-averaged foliar $\delta^{15}N$ decreases with mean annual precipitation across continents. However, within a desert grassland, interannual foliar and soil $\delta^{15}N$ increased with precipitation amount. Using precipitation manipulation field experiments, we then assessed trends in foliar and soil $\delta^{15}N$ as duration of the precipitation manipulation increased, from 4 to 14 years. When parsed temporally, the $\delta^{15}N$-precipitation slope showed initially increasing trends that decreased after 14 years of precipitation manipulation. When compared to the global explanatory model of $\delta^{15}N$ vs. mean annual precipitation, we estimated rates of acclimation at one site to range from 10 to 27 years. Stable isotopes are a reasonable proxy to assess ecosystem N availability, which we conclude is changing with precipitation amount and duration of the altered precipitation regime. We hypothesize that response lags to changes in precipitation between plants and microorganisms control acclimation. Ignoring acclimation by predicting future N availability using spatial models alone would have inaccurately estimated the directionality and N availability under climate change**.**

Key outcomes or other achievements

Obj. 2: explain and predict multi-scale spatial heterogeneity in alternative states.

Microbial diversity and distribution: Our understanding of spatial and temporal drivers of Chihuahuan Desert microbial communities is limited. We explored the composition and structure of top soil microbiomes at the long-term NPP plots. Specifically, we related community patterns to abiotic and biotic landscape characteristics and investigated the effects of trampling disturbance. The findings were published in Hansen et al. (2023). In brief, disturbed samples did not differ from undisturbed samples with respect to alpha and beta diversity indices, possibly due to a lack of frequent or impactful disturbance at the NPP exclosures and access to propagule "bank" for recolonization. Vegetation type and landform showed differences in richness of bacteria, archaea, and cyanobacteria but not in fungi. Landscape features including parent material, vegetation zone, landform type, and ecological sites and states exhibited strong influence on microbial community structure. Soil texture, pH, salinity, biocrust lichen cover, and perennial plant biomass correlated strongly with microbial community gradients. Mechanistic studies clearly identified microbial chemical interactions as major drivers of microbila distributions in biocrusts ((Nelson et al, 2022 and Nelson et al, in the press). A new genus a of predatory bacteria (*Cyanoraptor togatus*) , was identified, described, and its ecological impact studies (Bethany et al, 2022)

Biocrust microbiome state transitions: We continued analysis of previous research investigating how the presence of biocrust and addition of nutrients in the form of carbon (glucose) and a nitrogen/phosphorus mixture impacts microbial community structure and their associated metabolomes in surface and subsurface soils in a greenhouse experiment. Exometabolites were extracted from the surface and subsurface soil samples with cold-methanol, and gas chromatography/mass spectrometry was used to analyze the presence of volatile compounds in a subset of each treatment group. MS-dial software was used to process the data and identify extracted compounds present in the samples. Global Natural Product Social Molecular Networking (GNPS) software and correlation analysis will identify how exometabolite presence in the samples differs under each treatment, and how it relates back to microbial community structure.

Biocrust Carbon Cycling: Replicates of five different biocrust types (light cyanobacterial, dark cyanobacterial, cyanolichen *Peltula sp.*, chlorolichen *Clavascidium sp.* and moss dominated crusts) were collected in the field at three consecutive seasonal time points, rehydrated in the lab, and examined for carbon exchange rates. Photosynthesis and respiration rates differed by biocrust type, incubation time since wetting, and sampling date. All crust types were able to recover from desiccation quickly after rehydration. Lichens and mosses had higher carbon fixation rates than both cyanobacterial crusts. Sampling date effects on gas exchange rates suggest potential influence of environmental conditions such as length and heat load of drought preceding biocrust collection. This study was published in Hoellrich et al., (2023).

Jornada Long-Term Quadrats: Analysis of >100 years of quadrat measurements showed that the single best predictor for perennial grass cover in the early part of the data set (1916-1979) was the pacific decadal oscillation index (PDO), suggesting that long timescale oscillations were more influential to perennial grasses than short-term climate fluctuations. The collapse of grasses on the JER in the fabled 1950s drought was entirely explained by the PDO. However, the relationship did not hold for later years of data collection (1995-2016). Warm phase PDO did not result in expected increases in grass cover in recent decades, which we attribute to measured increases in shrub cover and increased temperatures (Christensen et al., 2023).

Obj. 3: apply new analytical concepts and tools to broader extents (regional to global) and examine consequences for ecosystem services.

Shrub encroachment in the southwestern USA: Management agencies are attempting to remove encroaching shrubs throughout southwestern New Mexico. We investigated how bird and lizard communities and a keystone rodent respond to these efforts within 7 x 7 km landscape mosaic blocks representing a treatment gradient. Abundances of most species of conservation concern were related positively to habitat heterogeneity, which was maximized at intermediate treatment levels. These results can inform landscape management—more shrub removal is not necessarily better for biodiversity and ecosystem services. Data is currently undergoing analysis.

Vegetation dynamics and state-change in the southwestern USA: We used long-term satellite data (2001-2022) to diagnose changes in woody vegetation separate from changes in herbaceous vegetation cover in the southwestern USA (Figure 6), showing regions where shrub encroachment continues, and areas with increasing herbaceous vegetation, which might be associated with recovery of native grasses, or increase in invasive grass species. We are completing this analysis for publication in the coming year (Anchang et al. in prep).

Density Dependence in Global Woody Plant Communities: Analysis of the global sap flow database indicates increases in sap flow (normalized per unit sapwood area) with radiation but decreases when neighborhood competition is more intense (Roberts et al. in prep). The relationships are stronger for dryland regions, providing direct evidence that reduced growth and increased mortality (associated with thinning relationships observed at JRN and in other drylands), could be associated with below-ground competition for water and reduced sap flow (Figure 6).

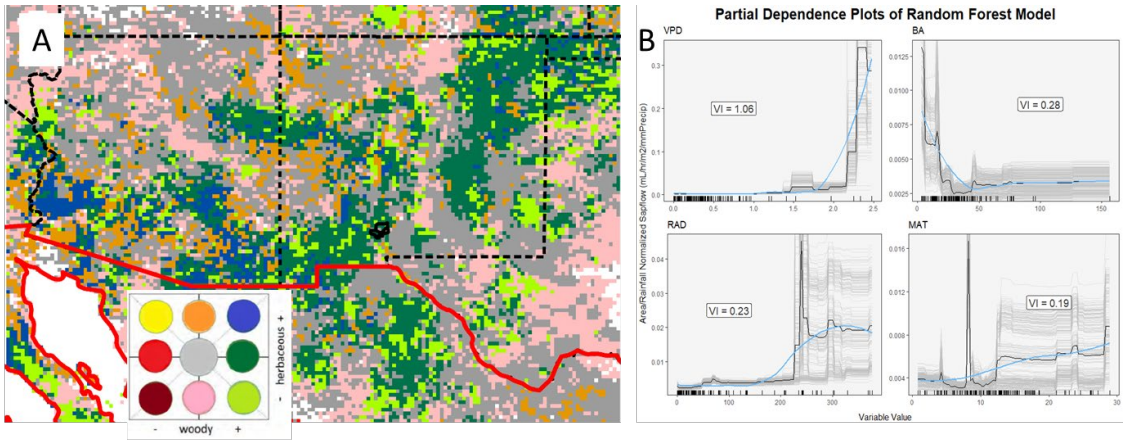

Figure 6. Regional and global-scale analyses of shrub dynamics and competitive interactions. (A) Change in woody and herbaceous components in southwestern drylands inferred from long-term (2001-2022) satellite data, with separate estimates of increase/decrease in woody plants relative to increase/decrease in herbaceous plants (Anchang et al., in prep); (B) response of saplow (normalized by sap-wood area and mean annual rainfall, derived from the global SapFluxNet database) to environmental variables, showing expected impacts of vapor pressure deficit (VPD), mean radiation load (RAD), and mean annual temperature (MAT), with a significant additional impact of neighborhood basal area (BA), showing the impact of shrub-shrub competition on resource acquisition (Roberts et al, in prep.).

What opportunities for training and professional development has the project provided?

K-12 Education and Outreach Accomplishments: The Jornada Basin LTER collaborates with the nonprofit Asombro Institute for Science Education to run Jornada's K-12 education program. The program's goals are to increase students' ecological literacy, decrease student stereotypes about scientists and science, and encourage them to consider STEM careers. These goals are especially important in southern New Mexico, where the majority of our participants are from groups underrepresented in science: 75% of our K-12 participants are economically disadvantaged, and 77% are Hispanic.

Since the K-12 program began in 1998, our team has created a suite of programs, detailed below. This year, we brought back public programs and added a "schoolyard field trip" program, which has already become very popular. **Between December 2022 and October 2023, these programs collectively reached 21,508 K-12 students and 1,337 teachers**. Accomplishments for each component are listed below.

1. Classroom and Schoolyard Science Lessons: 17,655 K-12th grade students participated in 818 one-hour classroom and schoolyard activities delivered by Asombro educators. Grade-specific lessons for kindergarten through high school students cover a variety of topics related to Jornada research. All lessons are hands-on, aligned with Next Generation Science Standards, and are designed using our 15-step development process, which includes screening for diversity, equity, and inclusion criteria.

2. Field Trips: Our team provided 26 field trips for 1,433 students between December 2022 and October 2023. Field trips feature hands-on activities, data collection, and interpretation around a central theme: desert plant and animal habitats (kindergarten and 1st grade), wind and water erosion (2nd and 3rd grade), using science to protect natural resources (4th and 5th grade), and desertification and restoration (6th-8th grade).

3. NEW: Schoolyard Field Trips: When teachers told us that they were having trouble with the logistics of off-campus field trips (e.g., bus costs and scheduling, finding chaperones), we developed two-hour schoolyard field trips to give students the benefits of outdoor learning while bypassing the logistical challenges. We developed a 2nd/3rd grade field trip and a 4th/5th grade field trip and delivered 15 of them for 815 students this year. In each schoolyard field trip, students investigate a central question through hands-on activity stations led by Asombro staff and classroom teachers. Each station incorporates science, reading, writing, and math.

4. Desert Data Jam: The 10-year-old Desert Data Jam engages students in interpreting real data and then communicating data trends in creative ways (e.g., games, videos, physical models). In spring 2023, Asombro educators worked with 339 middle school students through four classroom lessons. The top 54 projects were entered into the final competition and judged at least four times. The three top prize winners and ten honorable mention projects can be viewed on the Desert Data Jam website (https://asombro.org/desert-data-jam/).

5. Teacher Workshops: We hosted 17 in-person and virtual workshops for 204 teachers from December 2022 through October 2023.

6. LTER Children's Book *One Day in the Desert* and Associated Lessons: Jornada published our contribution to the LTER children's book series (One Day in the Desert) in 2017 and added a

three-video series associated with the book in 2020. We continued to promote this series to educators throughout New Mexico and showcased it for Education and Outreach Coordinators at other LTER sites last month.

7. Public Programs: Following a hold on public programs during the pandemic, we brought this popular type of program back this year, hosting or participating in others' programs throughout southern New Mexico and far west Texas. We reached 1,605 K-12 students and 950 adults through 19 public programs.

8. Undergraduate Internship in Science Education: In the spring 2023 semester, we hosted two undergraduate interns from New Mexico State University. The paid internship exposed undergraduates to science education and outreach as they (a) accompanied staff into local classrooms to assist with lessons, (b) assisted with field trips, and (c) worked on office projects to help prepare for upcoming lessons, workshops, and public events.

9. Graduate Student Integration in K-12 Education: Graduate students who receive fellowships from the LTER participate in 2-10 hours of K-12 education activities. They choose from a menu of options that can be done in-person or from afar (e.g., assisting with education programs or providing science reviews for new science education lessons). Between December 2022 and October 2023, 9 graduate students contributed more than 50 hours to the K-12 program.

Education and Outreach in Higher Education and Other Contexts: In 2023, the JRN LTER program increased outreach and education activities with Jornada undergraduate and graduate students, our own researchers and staff, and neighboring institutions and communities. These activities are focused on developing research and technical skills, building relationships with regional scientists, managers, and the public. Selected accomplishments are highlighted below.

1. Data Carpentry Workshops: The JRN IM team organized one Data Carpentry workshop in 2023, which was focused on introductory R programming for ecologists and included the Jornada REU students, graduate students, and an instructor from the MCM LTER. Lead IM Maurer co-organized and instructed in two other workshops not specifically tied to JRN that involved NMSU undergraduate students and tribal resource management professionals. Logistical and financial support for these workshops is provided by NM EPSCoR.

2. LTER-VII Graduate Fellow Report: The JRN-LTER Graduate Student Research Fellowships Program provided direct support for 9 graduate students in 2023. Student training, mentoring, and research opportunities in dryland ecology this year extended to an additional 18 graduate students. We continued our graduate networking and professional development forum (the "Desert Discourse" Series) to enhance opportunities for research and career advancement for graduate students, PIs, postdocs, and staff for networking, team building and professional development, and as a mechanism for retention and the promotion of a diverse next generation of ecological and STEM researchers.

3. LTER-VII REU Report: This year, student training and mentoring opportunities in dryland ecology included funding for 7 REU students and programming for more than 2 additional REU students supported through affiliate institutions. In 2022, we implemented a new REU selection process to recruit students from a wider range of institutions and backgrounds. Furthermore, we added field-trips, socials, data-management training, graduate-student mentoring, and workshops to our REU curriculum to enrich the student experience. This year, we had multiple opportunities for joint programming with SEV LTER REU students, which allowed for networking between sites.

4. Jornada Desert Ecology Short-Course: We hosted our Short-Course in-person this year at our field site. We hosted over 60 participants for three days of workshops, presentations, and field trips. This year we hosted the largest number of collaborators in recent memory, including those conducting research at JRN and visitors from neighboring institutions and LTER sites.

5. Jornada Basin LTER Safety Training: In 2022, JRN enacted new field safety protocols and training (https://lter.jornada.nmsu.edu/for-researchers), including our code of conduct, sections on physical safety (specific to the Chihuahuan desert and our facilities), harassment and Title-IX policies, mental well-being, other resources and reporting mechanisms. We feel this document will be a resource and help set a precedent for the entire LTER network. For 2023, the DEIJ committee had polled JRN personnel and students for opinions on how safety preparation can further be improved. For 2024, we plan to make more safety resources available on our website, increase training, and set stricter requirements for dispersing safety resources to our researchers.

How have the results been disseminated to communities of interest?

JRN-LTER results have been communicated through scientific meetings, and publications in high impact journals (see Products Report). In this reporting period there were 20 published journal articles, not including dissertations or theses. This year there were 26 JRN conference presentations, 8 of which were student-led.

Jornada LTER concepts and field methodologies have provided core field assessment methodologies adopted nationwide by NRCS and BLM, and globally (Mongolia, East Africa) using our Rangeland Analysis protocols and online apps including LandPKS. The Land-Potential Knowledge System (LandPKS; https://landpotential.org) is an increasingly powerful option for rangeland communities to collect data, providing them access to soil information at over 25,000 locations globally. LandPKS now includes direct links to the new "Ecosystem Dynamics Interpretive Tool" (EDIT) developed by the Jornada (https://edit.jornada.nmsu.edu/). We also share updated LTER results with US land management agencies and other natural resource managers through our co-leadership of the "Interpreting and Managing Indicators of Rangeland Health" (IIRH) course that is conducted three times/year in locations throughout the western US, and also in additional 4+ annual BLM "Assessment, Inventory and Monitoring" (AIM) trainings.

Outreach activities included a Malpai Borderlands Group Science Meeting (9/22/2023; 40 participants), and Restore New Mexico Coordination Meetings 9/12/2023 , with 25 participants).

JRN PI Mauritz and Pietrasiak provided a 3 day field and lab based Biocrust Classification Training to the 2023 JRN LTER REU undergraduate student cohort and hosted both LTER and Critical Zone (CZ) REU students for soil microbial research projects.

The Jornada Basin LTER in collaboration with New Mexico State University, the International Union of Soil Science, and the International Quaternary Association co-hosted the 14th International Symposium and Field Workshop on Paleopedology on October 7 to 15, 2023 (Figure 7).

FIGURE 7. Soils not only provide essential functions for modern ecosystems, they also record ecological changes of the past. (A) The Jornada Basin LTER in collaboration with New Mexico State University, the International Union of Soil Science, and the International Quaternary Association co-hosted the 14th International Symposium and Field Workshop on Paleopedology on October 7 to 15, 2023. (B) An exposure of an eolian paleosol overlying a lacustrine paleosol at the USDA Jornada Experimental Range. The black tape is 2 meters.

What do you plan to do during the next reporting period to accomplish the goals?

Obj. 1: quantify effects of interactions among triggers, connectivity-mediated feedbacks, and soil-geomorphic heterogeneity on the rate and nature of state transitions.

A. Grassland to shrubland transitions

We will continue long-term monitoring of vegetation structure changes across the Jornada Basin using combinations of field sites and long-term quadrats, airborne, and satellite measurements. We will advance the NEAT experiment to examine interactions between biocrust, rainfall, and erosion-based feedbacks in the shrub encroachment process. The Ecotone Study will continue long-term monitoring of mammalian consumers and predators, precipitation, plant cover, and net primary production. We will focus on estimating thermal landscapes and integrating these with spatiotemporal niches of predators and consumers. We will continue the ThreshEx 2 experiment for at least 10 years. As rainfall events in semi-arid grasslands become more variable, we need an empirical understanding of how grazing interactions with PPT may produce long-term effects on *B. eriopoda* production. Prior studies suggest that positive-feedbacks between patch size and productivity will stymie *B. eriopoda* recovery after grazing if plant cover is reduced to small areas . In addition, grass ANPP is known to exhibit lag responses to PPT legacies, with previous-year ANPP explaining more current-year productivity than previous-year PPT . Legacy impacts of PPT are mediated in part by grass tillers, which constrain growth following dry unproductive years and boost growth following wet productive ones . Because these legacy impacts are proportional to differences in interannual PPT , wet and dry years should cancel each other out and have no long-term impacts on *B. eriopoda* unless legacy impacts from grazing interact with PPT to constrain productivity following wet years. To measure *B. eriopoda* recovery post-

grazing, we will analyze foliar cover over a 23-year period. We will utilize measurements of *B. eriopoda* foliar cover from 2002, 2009, and 2016 in ThreshEx, which halted experimental grazing and shrub-removal treatments in 2000. We will repeat the measurements in October . We will analyze *B. eriopoda* foliar cover rates of change, as well as final values, against explanatory variables from 1996-2000 treatments, including initial percent foliar cover after perturbation. Following previous methods, *B. eriopoda* foliar cover will be analyzed using repeated-measures linear-mixed effects models. We can use grass cover in 1996 as a covariate to adjust for pre-manipulation differences among paddocks.

B. Shrubland to grassland transitions

We are continuing long-term experiments to examine rainfall and connectivity as triggers of grass recovery, evaluate the effects of shrub presence or absence on grass recovery, and monitor the cross-scale effects of shrub mortality, patch-scale redistribution of sediments and other resources, and cover of grasses or shrubs on grass recovery. We will continue to monitor ANPP on 15 locations for 5 ecosystem types at 3 sites each. These seasonal data have been collected since 1989 and remain a critical part of our long-term data. Baseline data on biocrust cover, activity, and gas exchange will be used to model biocrust carbon fluxes at the 15 ANPP sites. Monitoring changes to biocrust cover is planned using regular UAV based hyperspectral imaging.

C. Shrubland to shrubland transitions

Four additional long-term shrub monitoring sites (stem-maps) will be established to assess directional changes in density and species to complement earlier analysis of long-term shrub-shrub transitions. Shrub demographic (ShrubDemo) experiments will be analyzed and submitted for publication, and new experiments will be designed to fill gaps in our understanding of the demographic processes underlying long-term shifts in both density and species. To complement our new data on shrub demographic bottlenecks, we will continue greenhouse and field based QuadCam hardware and analysis systems for gradual deployment at the existing long-term NPP sites. These will add to our understanding of the role of rapid turnover in herbaceous and woody demographics. At our detailed ecohydrology research site, we will develop a more robust sampling plan for the soil surface saturated hydraulic conductivity and link this with a modeling exercise to understand the role of surface sealing on runoff production. We will analyze the long-term water, energy, and carbon flux measurements from the perspective of rainfall events (intensity, duration, distribution, and frequency) to understand triggers for vegetation productivity and the role of shrub phenology interacting with these precipitation characteristics.

D. Transition to novel ecosystems

We will continue experiments exploring invasion dynamics of the exotic Lehmann's lovegrass in response to varying climate, herbivory, and nutrients. We will continue to explore how the soil microbiomes of Lehmann's lovegrass and Black Grama may shift across a toposequence.

E. Transitions under climate change

For the rainfall manipulation experiment, we will continue monitoring the long-term experiments including those in which we manipulated precipitation amount, precipitation variability, nitrogen and herbivory.

Obj. 2: explain and predict multi-scale spatial heterogeneity in alternative states.

We have made excellent progress on a collaborative process-based modeling effort that will utilize specialist understanding of dryland ecology derived by the JRN-LTER team and others (i.e., the plant, soil, climate, herbivory and connectivity interactions and feedbacks underlying state-changes) to develop a synthetic model for dryland ecosystems applicable at the Jornada and in global drylands. We will expand basin scale remote sensing analysis to examine historical and on-going state change in southwestern drylands across the Chihuahuan, Sonoran, and Mojave desert regions. We will leverage new data-streams on vegetation structure from aerial and satellite imagery and lidar to diagnose vegetation states and state-change dynamics.

Obj. 3: apply new analytical concepts and tools to broader extents (regional to global) and examine consequences for ecosystem services.

In 2024 we will publish additional research on regional (Restore NM) monitoring of shrub control efforts and a study on the roles of climate vs. grazing on change in vegetation cover drylands of Mongolia. In addition, we will continue to gather monitoring data for the Restore NM program. We are also expanding partnerships in the drylands of East Africa for rangeland monitoring and prediction tools that build on JRN-LTER research for pastoral development and livestock insurance programs. This work partners JRN-LTER personnel with NGO and government partners in East Africa through funding from the NASA-USAID SERVIR program.

PRODUCTS

i. Book

n/a

ii. Book chapter

n/a

iii. Peer reviewed journal or conference proceeding (12/2022-11/2023)

Archer, Steven R. and Peters, Debra P. C. and Burruss, N. Dylan and Yao, Jin. (2022). Mechanisms and drivers of alternative shrubland states. *Ecosphere*. 13 (4). https://doi.org/10.1002/ecs2.3987

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iv. Thesis or Dissertation

Courtney McCann Currier. Long-Term Effects of Precipitation Extremes on Ecosystem Processes: From Plant Phenology to Nutrient Cycling. (2023). Arizona State University.

Charles Robert Kimsal. Hydrologic Dynamics of Dryland Playas and Their Catchments in the Chihuahuan Desert. (2023). Arizona State University.

Patrick Kut. The Effect of Hydration Pulse Duration on the Diversity and Composition of Soil Microbiomes. (2023). Arizona State University.

Stephanie Nicole Marquez. Quantifying The Contribution Of Atmospheric And Land Surface Characteristics To The Prediction Of Sub-Pixel Scale Surface Soil Moisture In The Jornada Experimental Range Through Interpretable Machine Learning. (2023). The University Of Texas At El Paso.

Jorge Andres Mayo-Rios. Using Machine Learning And Distributed Hydrologic Modeling To Predict Soil Texture, Surface Soil Moisture And Evapotranspiration In Jornada Experimental Range, Southwestern U.S.. (2023). The University Of Texas At El Paso.

Valeria Isabel Molina. Differentiating Biotic Vs. Abiotic Co2 In The Formation Of Pedogenic Carbonate In Agriculture And Natural Dryland Soils. (2023). University of Texas at El Paso.

Viridiana Orona. Characterizing Spatial Variability In Soil Co2 Fluxes In The Chihuahuan Desert Using Geostatistical Techniques. (2023). University of Texas at El Paso.

Trevor Roberts. Density-Dependent Competition In Desert Shrubland And Global Transpiration Data. (2023). New Mexico State University.

Kathleen Schaeffer. The Importance Of Soil Carbon In Large-Scale Shrub Removal Practices In The Chihuahuan Desert. (2023). University of Texas at El Paso.

Casey John Wagnon. Dryland State Transitions, Trophic Interactions, And The Restoration Of A Keystone Species. (2023). University Of Illinois Urbana-Champaign.

Jordan Yanowitz. Microbial Communities and Vegetation Change: An Unseen Driver?. (2023). University of California-Los Angeles.

v. Conference Presentation

Andreoni, K., and R. L. Schooley (2023). *Native small mammals and climate drive plant community dynamics in a Chihuahuan Desert grassland experiencing shrub encroachment*. The Wildlife Society Annual Conference. Louisville, KY.

Avolio M, Anderson M, Hayden M, Ohlert T, Smith M, Chen A, Chen A, Collins S, Dukes J, Holdrege M, Jentsch A, Limbu P, Lyon N, Munson S, Sala O.E., Slette I, Wilkins K, Yahdjian L, IDE (2023). *Multi-year drought increases species losses and changes plant community composition. Extreme drought consistently causes species loss and shifts in plant community composition*. Annual Meeting of the Ecological Society of America 2023. Portland, OR.

Bestelmeyer, B. and J. Williamson (2023). *A tool for guided state and transition model development based on ecological theory*. Society for Range Management. Boise, ID.

Buhman M, Sala O.E., Collins S, Knapp A (2023). *Design of a Field Experiment to Disentangle Soil Moisture and Vapor Pressure Deficit as Determinants of Net Primary Productivity*. Annual Meeting of the Ecological Society of America 2023. Portland, OR.

De la Cruz-Amo L, Sala O.E., Pueyo Y, Anadón JD (2023). *Destocking trends of sheep extensive livestock in Spain*. Asociación Española de Ecología Terrestre National Congress XVI. Almería, Spain.

Akasha Faist, David Hooper, Andrew Dominguez, Brooke Osborne, Nicole Pietrasiak, Omar Holguin, Robin Reibold, Sasha Reed, Scott Ferrenberg (2023). *Biocrust and nutrient additions increase vascular plant biomass of perennial rangeland grass Arizona Cottontop (Digitaria californica)*. Society for Rangeland Management Annual Meeting. Boise, Idaho.

Fischella M., and G.S. Okin (2023). *A Spectroscopic Field Study Investigating the Mineral Composition of Soil-Derived Dust in Drylands*. American Geophysical Union Fall Meeting. San Francisco, CA.

Fischella., M., G.S. Okin, and O. Sala (2023). *Investigating the Role of Precipitation and Connectivity in Drylands on Grass Seedling Establishment and Re-Establishment*. American Geophysical Union Fall Meeting. San Francisco, CA.

Hurtado, R.Y., Vivoni, E.R., Franz, T.E., Gonzales, N.F., Hardgrove, C.J., Perez-Ruiz, E.R., Robles-Morua, A., Becerra, J.A., and Kimsal, C.R. (2023). *Investigating Field-Scale Soil Moisture at Upland Watershed and Ephemeral Lake Sites Using Stationary and Roving Cosmic Ray Neutron Sensing*. American Geophysical Union Fall Meeting. San Francisco, CA.

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Liu, Y., and G.S. Okin (2023). *Modelling Aeolian Particle Transport Using Parallel Computing*. American Geophysical Union Fall Meeting. San Francisco, CA.

Liu, Y., and G.S. Okin (2023). *The Model of Aeolian Particle Transport and Landform Evolution*. International Conference on Aeolian Research. Las Cruces, NM.

Nazir, A., Yu, Q., Prihodko, L., Roberts, T. H., Hanan, N. P. (2022). *Assessing the Accuracy of GEDI Cover in arid and semiarid regions of New Mexico, USA (Abstract #B45H-1809)*. American Geophysical Union Fall Meeting. Chicago, IL.

Ochoa, F., et al. (2023). *Field validation of fractional cover and mineral retrieval estimates from the EMIT L2 Spectral Unmixing Algorithms*. American Geophysical Union Fall Meeting. San Francisco, CA.

Ohlert T, Smith M, Anderson M, Avolio M, Chen A, Collins S, Dukes J, Felton A, Hayden M, Holdrege M, Jentsch A, Knapp A, Limbu, SP, Sala O.E, Slette I, Wilkins K, Yahdjian L, IDE (2023). *Multi-year drought impacts on terrestrial ecosystems: results from the International Drought Experiment (IDE)*. Annual Meeting of the Ecological Society of America 2023. Portland, OR.

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Perez-Ruiz, E.R., Vivoni, E.R., Robles-Morua, A., Kimsal, C.R., and Hurtado, R.Y. (2023). *Water and Carbon Dynamics of an Arid Playa of the Chihuahuan Desert*. American Geophysical Union Fall Meeting. AGU Fall Meeting.

Ravi, S., et al (2023). *Internal feedback mechanisms driving shrub-grass dominance: from shrub encroachment to exotic grass invasions in North American deserts*. American Geophysical Union Fall Meeting. San Francisco, CA.

Schaefer, A (2023). *Canopy Gap and Biocrusts*. Society for Rangeland Management Annual Meeting. Boise, Idaho.

Terry, T, Sala O.E., Reed S, Ferrenberg S, Osborne B, Jordan S, Lee S, Adler P (2023). *Severe disturbance increases sensitivity of production to precipitation in drylands*. Annual Meeting of the Ecological Society of America 2023. Portland, OR.

Vito C, Sala O.E. (2023). *Shrub-grass soil-water partitioning as modulated by individual size*. Annual Meeting of the Ecological Society of America. Portland, OR.

Brandi Wheeler, Nicholas Webb, Jason Williams, Brandon Edwards, Akasha Faist, Jeffrey Herrick, Emily Kachergis, Nika Lepak, Sarah McCord, Beth Newingham, Nicole Pietrasiak, David Toledo (2023). *Leveraging erosion models with established land health assessments to support management decisions*. Society for Rangeland Management Annual Meeting. Boise, Idaho.

Zhang, P., et al. (2023). *Surface shear velocity estimates in a sparsely vegetated rangeland landscape*. American Geophysical Union Fall Meeting. San Francisco, CA.

Zhou B., and G.S. Okin (2023). *Ecological Distance Matters More than Geographical Distance When Predicting Land Surface Indicators Using Machine Learning*. American Geophysical Union Fall Meeting. San Francisco, CA.

Zhou, B., and G.S. Okin (2023). *Implementing Wind Erosion Model in the Western US for the Last Two Decades using Google Earth Engine*. American Geophysical Union Fall Meeting. San Francisco, CA.

vi. Data Sets

(see attached at end of document)

IMPACT

What is the impact on the development of the principal discipline(s) of the project?

The Jornada Basin LTER project (JRN-LTER) continues to advance understanding and theory of dryland ecosystem functioning, relevant to applied range management and broader ecological theory. In particular, JRN-LTER advances the application of ecological understanding of state transitions and alternative stable states in drylands, the climate change impacts in drylands, and the development of ecological theory on state change and ecosystem dynamics in temporally and spatially complex environments.

What is the impact on other disciplines?

Jornada Basin LTER results are directly relevant to livestock, range management, and dryland ecosystems across the southwestern USA and other arid and semi-arid lands globally. JRN rangeland monitoring tools have been developed collaboratively with, and adopted for operational programs by, numerous Federal Agencies across the USA (e.g., BLM and NRCS) and globally (e.g. Mongolia and East Africa). JRN collaborations and outreach impact a variety of US and international, tropical, and temperate drylands.

What is the impact on the development of human resources?

Student training and mentoring opportunities in dryland ecology this year included direct support for 9 graduate students and 7 REU students, and participation of a larger number of students attending the Desert Ecology short-course and conducting research at the JRN with support from their JRN advisors, home universities, and independent research fellowships. We increased our REU program by 3 students and increased the flexibility in our program to accommodate more "non-traditional" undergraduate students. We continued our program for graduate networking and professional development (the "Desert Discourse" Series).

What is the impact on teaching and educational experiences?

K-12, undergraduate and graduate students from our host communities and neighboring institutions (K-12, Community and 4-year Colleges) benefit from field research opportunities and education/outreach activities.

What is the impact on physical resources that form infrastructure?

Nothing to report.

What is the impact on institutional resources that form infrastructure?

Nothing to report.

What is the impact on information resources that form infrastructure?

For the past four years, the JRN Information Management (IM) team has maintained a track record of providing up-to-date data annotated with consistent, high quality metadata, and has greatly improved discoverability and access to Jornada data. Since JRN's last annual report, data management activity resulted in 21 new datasets and updates to 240 unique existing datasets published in our primary data catalog at the EDI repository (Figure 8), metrics which are consistent with or improved upon our activity in 2022. In the past year, the JRN IM team has begun to direct its focus to two additional aspects of data management. First, we are attempting to reduce the handling time the IM team needs to update long-term datasets and to document and publish new datasets to EDI. We have built several efficient data management workflows (generally in MATLAB or R) and integrated them with Jornada research groups, including the JRN field crew, to assist with data QA/QC and data publication. We also train researchers and empower them to successfully manage data, collect metadata, and publish their own datasets in the JRN IM system (ezEML, Data Carpentry workshops). The second new focus is on data re-

use, and we are creating more ways for researchers, partners, and the public to interact with Jornada data. The JRN website data catalog has continued to improve, and this year we added a new spatial data catalog accompanied by an online portal for sharing maps and other interactive data features. In 2023 JRN began contributing data from two weather stations to an LTER demo in the Dendra platform for meteorology and hydrology sensor network data (https://dendra.science/orgs/lter). Development efforts for tools to harmonize Jornada data and create analysis ready data products (*jarmony* R package) are also ongoing. The JRN IM team also engages frequently with the LTER Network's Information Management Committee, the EDI repository, and other partners in the environmental science and data community to support and contribute to open science and sound data management initiatives.

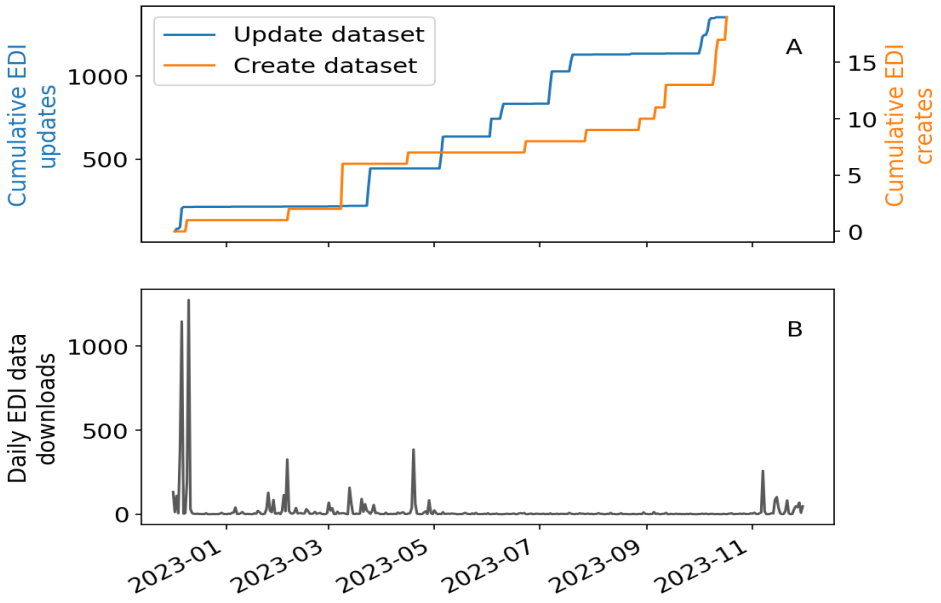

Figure 8. Publication and use of Jornada datasets during the 2023 annual report period. Panel A shows cumulative updates to existing datasets published at the EDI repository (blue line) and new datasets published (gold line, 21 total). Panel B shows daily data downloads from the EDI data portal, which have been filtered to remove robots and other automated events.

What is the impact on technology transfer?

Nothing to report.

What is the impact on society beyond science and technology?

Our K-12 outreach program reaches most children in the local school district and many additional children in other school districts across New Mexico. Field and classroom/schoolyard programs increase awareness and understanding in the general public with major long-term benefits for environmental and STEM literacy. The JRN-LTER has been working towards making its outreach programs more inclusive and accessible for marginalized communities. Participants in the K-12 programs for JRN include underrepresented and underserved groups. 75% of program participants are economically disadvantaged, and 77% are Hispanic, as defined and classified by the New Mexico Public Education Department. Jornada's K-12 outreach works with entire classes, schools, and sometimes districts. This helps promote equity by ensuring that all students are exposed to these enriching opportunities, not just those who have the resources to

sign up for voluntary science education opportunities. To formalize our consideration of DEI in education and outreach programming, Asombro created a DEI lesson screener in 2020. The screener includes nine criteria that are formally evaluated in the early stages of lesson development. For example, we ensure that each lesson contains stories of diverse people and careers in STEM, that it includes connections to Spanish and Native languages when possible, and that Spanish versions are available for all worksheets and video captions. We use this tool for every new lesson we develop, and we shared this tool with the LTER Network Education and Outreach Committee.

2023 JRN New and/or Updated Data Sets

EDI package ID	Title	Authors	Data start	Data end	DOI link
knb-lter-jrn.102.1	Carbon exchange responses of rehydrated and incubated biological soil crust samples from White Sands National Park in 2020-2022	Hoellrich, Mikaela;Pietrasiak, Nicole	2020-01-01	2022-12-31	DOI Link
knb-lter-jrn.200021001.5	Data to explore circular manureshed management in beef supply chains of the United States and western Canada	Spiegal, Sheri;Vendramini, João M.B.;Bittman, Shabtai;Silveira, Maria;Gifford, Craig;Rotz, Clarence Al;Ragosta, John P;Kleinman, Peter J.A.	2010-01-01	2019-12-31	DOI Link
knb-lter-jrn.200034001.1	Supplemental materials of the Castaño-Sánchez et. al. (2023) article (Agricultural Systems) containing the IFSM model input parameters not included in the main text, and the Criollo ranches survey form	Castaño-Sánchez, Jose P.;Rotz, C. Alan;McIntosh, Matt M;Tolle, Cindy;Duff, Glenn;Spiegal, Sheri	2020-07-01	2020-11-05	DOI Link
knb-lter-jrn.200043001.1	Jornada Experimental Range (USDA-ARS) monthly stocking data and pasture shape files from 1915 to 1952	Ragosta, John P;Havstad, Kris;Bestelmeyer, Brandon T;James, Darren	1915-06-01	1952-12-31	DOI Link
knb-lter-jrn.200047001.3	Map of ecological sites and ecological states for the USDA Jornada Experimental Range	Burkett, Laura M;Bestelmeyer, Brandon T	2014-01-01	2021-03-31	DOI Link
knb-lter-jrn.200048001.1	Map of ecological sites and ecological states for pastures 1, 4, 14, and 15 on the Chihuahuan Desert Rangeland Research Center, New Mexico	Burkett, Laura M;Bestelmeyer, Brandon T	2018-03-01	2018-06-30	DOI Link
knb-lter-jrn.210002001.129	Graduated rain gauge (GRG) precipitation observations from 21 sites at the Jornada Basin LTER site, 1989-ongoing	Abrahams, Athol;Whitford, Walter G;Huenneke, Laura F;Lightfoot, David C;Anderson, John;Parsons, Anthony;Wainwright, John	1989-01-03	2023-03-03	DOI Link
knb-lter-jrn.210009001.1	Occurrence of animals along five transects at the Jornada Basin LTER site from 1989-1994	Lightfoot, David C;Whitford, Walter G	1989-03-08	1994-12-02	DOI Link
knb-lter-jrn.210011001.4	Seasonal aboveground plant biomass estimates at 15 net primary production (NPP) study sites at Jornada Basin LTER from 1989-ongoing	Peters, Debra C;Huenneke, Laura F	1989-05-01	2022-10-31	DOI Link
knb-lter-jrn.210011002.109	Seasonal non-destructive vegetation measurements at 15 net primary production (NPP) study sites at Jornada Basin LTER, 1989-ongoing	Peters, Debra C;Huenneke, Laura F	1989-05-01	2022-10-31	DOI Link
knb-lter-jrn.210011003.106	Annual mean estimates of aboveground net primary production (NPP) at 15 sites at Jornada Basin LTER, 1989-ongoing	Peters, Debra C;Huenneke, Laura F	1990-01-01	2022-12-31	DOI Link
knb-lter-jrn.210011004.85	Seasonal reference harvest measurements of vegetation at 15 net primary production (NPP) study sites at Jornada Basin LTER, 1989-ongoing	Peters, Debra C;Huenneke, Laura F	1989-04-25	2023-05-15	DOI Link
knb-lter-jrn.210121001.50	Plant community responses to functional group and species removals along biodiversity experiment vegetation transects at the Jornada Basin LTER site, 1997-2002	Huenneke, Laura F;Buonopane, Michelle	1997-05-19	2004-05-17	DOI Link
knb-lter-jrn.210121003.1	Biomass removal at the initiation of a biodiversity experiment at the Jornada Basin LTER site in 1995	Huenneke, Laura F	1995-01-01	1995-12-31	DOI Link
knb-lter-jrn.210121004.1	Plant species-level responses to functional group and species removals in biodiversity experiment plots at the Jornada Basin LTER site, 1999	Huenneke, Laura F;Buonopane, Michelle	1999-07-13	1999-08-10	DOI Link
knb-lter-jrn.210126001.128	Jornada Basin LTER Weather Station Daily summary climate data	Anderson, John	1983-03-01	2023-10-10	DOI Link
knb-lter-jrn.210328001.5	Aboveground vegetation cover and biomass in plots with experimentally altered precipitation variability at the Jornada Basin LTER site, 2009-ongoing	Gherardi, Laureano;Sala, Osvaldo E	2009-01-01	2022-12-31	DOI Link
knb-lter-jrn.210328003.6	Soil water content measurements in plots with experimentally altered precipitation variability at the Jornada Basin LTER site, 2011-ongoing	Gherardi, Laureano;Sala, Osvaldo E	2011-07-12	2022-09-25	DOI Link
knb-lter-jrn.210328005.1	Perennial grass tiller and stolon counts in plots with experimentally altered precipitation variability at the Jornada Basin LTER site, 2012-2014	Gherardi, Laureano;Sala, Osvaldo E	2012-01-01	2014-12-31	DOI Link

knb-lter-jrn.210349001.1	Aboveground vegetation cover and biomass in plots with experimentally altered precipitation and nutrient inputs at the Jornada Basin LTER site, 2006-ongoing	Reichmann, Lara;Gherardi, Laureano;Sala, Osvaldo E	2006-01-01	2022-12-31	DOI Link
knb-lter-jrn.210349002.1	Soil water content measurements in plots with experimentally altered precipitation and nutrient inputs at the Jornada Basin LTER site, 2011-ongoing	Reichmann, Lara;Gherardi, Laureano;Sala, Osvaldo E	2011-07-12	2022-09-27	DOI Link
knb-lter-jrn.210349003.1	Perennial grass tiller and stolon density in plots with experimentally altered precipitation and nutrient inputs at the Jornada Basin LTER site, 2012-2014	Reichmann, Lara;Gherardi, Laureano;Sala, Osvaldo E	2012-01-01	2014-12-31	DOI Link
knb-lter-jrn.210380001.741	Monthly precipitation data from a network of standard gauges at the Jornada Experimental Range (Jornada Basin LTER) in southern New Mexico, January 1916 - ongoing	Thatcher, David;Bestelmeyer, Brandon T	1915-01-01	2021-10-01	DOI Link
knb-lter-jrn.210412001.59	Jornada Experimental Range (USDA-ARS) annual stocking rates for cattle, horses, and sheep, 1916-2001	Havstad, Kris;Bestelmeyer, Brandon T	1916-01-01	2001-12-31	DOI Link
knb-lter-jrn.210413001.2	Aeolian dust weights sampled by BSNE collectors quarterly from the CSIS study at Jornada Basin LTER, 2012-ongoing	Okin, Gregory S;Peters, Debra C	2012-03-09	2023-05-30	DOI Link
knb-lter-jrn.210413004.1	Repeat overhead photographs of microplots in a cross-scale interactions experiment (CSIS) at Jornada Basin LTER, 2013-ongoing	Peters, Debra C;Anderson, John	2013-02-13	2022-08-08	DOI Link
knb-lter-jrn.210413005.1	Plant and litter cover estimates derived from overhead microplot photos in the Cross-Scale Interactions Study (CSIS) at Jornada Basin LTER, 2013-ongoing	Peters, Debra C;Anderson, John	2013-02-13	2022-08-08	DOI Link
knb-lter-jrn.210413006.1	Repeat lateral photographs of microplots in a cross-scale interactions experiment (CSIS) at Jornada Basin LTER, 2013-2017	Peters, Debra C;Anderson, John	2013-02-21	2017-08-15	DOI Link
knb-lter-jrn.210413007.1	Litter and soil accumulation estimates derived from lateral microplot photos in the Cross-Scale Interactions Study (CSIS) at Jornada Basin LTER, 2013-2017	Peters, Debra C;Anderson, John	2013-02-21	2017-08-15	DOI Link
knb-lter-jrn.210425001.76	Gap-filled daily precipitation at the 15 long-term NPP sites at Jornada Basin LTER, 1980-ongoing	Yao, Jin;Savoy, Heather;Anderson, John;Peters, Debra C	1980-01-01	2020-06-30	DOI Link
knb-lter-jrn.210437001.38	Jornada Basin LTER: Wireless meteorological station at NPP C-CALI site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-11-05	2023-10-02	DOI Link
knb-lter-jrn.210437002.39	Jornada Basin LTER: Wireless meteorological station at NPP C-GRAV site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-09-16	2023-07-06	DOI Link
knb-lter-jrn.210437003.39	Jornada Basin LTER: Wireless meteorological station at NPP C-SAND site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-11-19	2023-10-02	DOI Link
knb-lter-jrn.210437004.39	Jornada Basin LTER: Wireless meteorological station at NPP G-BASN site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-07-25	2023-10-02	DOI Link
knb-lter-jrn.210437005.36	Jornada Basin LTER: Wireless meteorological station at NPP G-IBPE site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-08-06	2023-07-05	DOI Link
knb-lter-jrn.210437006.38	Jornada Basin LTER: Wireless meteorological station at NPP G-SUMM site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-07-24	2023-10-02	DOI Link
knb-lter-jrn.210437007.38	Jornada Basin LTER: Wireless meteorological station at NPP M-NORT site: 5-minute summary air temperature data: 2013 - ongoing	Anderson, John	2013-07-23	2023-10-02	DOI Link
knb-lter-jrn.210437008.37	Jornada Basin LTER: Wireless meteorological station at NPP M-RABB site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2015-08-30	2023-10-04	DOI Link
knb-lter-jrn.210437009.38	Jornada Basin LTER: Wireless meteorological station at NPP M-WELL site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-08-27	2023-10-02	DOI Link
knb-lter-jrn.210437010.38	Jornada Basin LTER: Wireless meteorological station at NPP P-COLL site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-08-21	2023-10-02	DOI Link

knb-lter-jrn.210437011.40	Jornada Basin LTER: Wireless meteorological station at NPP P-SMAL site: 5-minute summary wind and air temperature data: 2017 - ongoing	Anderson, John	2017-03-14	2023-10-02	DOI Link
knb-lter-jrn.210437012.38	Jornada Basin LTER: Wireless meteorological station at NPP P-TOBO site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2014-05-04	2023-10-02	DOI Link
knb-lter-jrn.210437013.38	Jornada Basin LTER: Wireless meteorological station at NPP T-EAST site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-07-29	2023-10-02	DOI Link
knb-lter-jrn.210437014.38	Jornada Basin LTER: Wireless meteorological station at NPP T-TAYL site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-08-07	2023-10-02	DOI Link
knb-lter-jrn.210437015.38	Jornada Basin LTER: Wireless meteorological station at NPP T-WEST site: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-07-30	2023-10-02	DOI Link
knb-lter-jrn.210437016.39	Jornada Basin LTER: Wireless meteorological station at NPP C-CALI site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-11-05	2023-10-04	DOI Link
knb-lter-jrn.210437017.39	Jornada Basin LTER: Wireless meteorological station at NPP C-GRAV site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-09-16	2023-10-02	DOI Link
knb-lter-jrn.210437018.38	Jornada Basin LTER: Wireless meteorological station at NPP C-SAND site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-11-19	2023-10-04	DOI Link
knb-lter-jrn.210437019.39	Jornada Basin LTER: Wireless meteorological station at NPP G-BASN site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-07-26	2023-10-02	DOI Link
knb-lter-jrn.210437020.37	Jornada Basin LTER: Wireless meteorological station at NPP G-IBPE site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-08-06	2023-10-02	DOI Link
knb-lter-jrn.210437021.38	Jornada Basin LTER: Wireless meteorological station at NPP G-SUMM site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-07-24	2023-10-02	DOI Link
knb-lter-jrn.210437022.38	Jornada Basin LTER: Wireless meteorological station at NPP M-NORT site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-07-23	2023-10-02	DOI Link
knb-lter-jrn.210437023.38	Jornada Basin LTER: Wireless meteorological station at NPP M-RABB site: 30-minute summary data: 2013 - ongoing	Anderson, John	2015-08-30	2023-10-02	DOI Link
knb-lter-jrn.210437024.38	Jornada Basin LTER: Wireless meteorological station at NPP M-WELL site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-08-27	2023-10-02	DOI Link
knb-lter-jrn.210437025.38	Jornada Basin LTER: Wireless meteorological station at NPP P-COLL site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-08-21	2023-10-02	DOI Link
knb-lter-jrn.210437026.38	Jornada Basin LTER: Wireless meteorological station at NPP P-SMAL site: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-03-14	2023-10-02	DOI Link
knb-lter-jrn.210437027.38	Jornada Basin LTER: Wireless meteorological station at NPP T-EAST site: 30-minute summary data: 2013 - ongoing	Anderson, John	2014-05-04	2023-10-02	DOI Link
knb-lter-jrn.210437028.37	Jornada Basin LTER: Wireless meteorological station at NPP T-EAST site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-07-29	2023-07-06	DOI Link
knb-lter-jrn.210437029.37	Jornada Basin LTER: Wireless meteorological station at NPP T-TAYL site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-08-07	2023-07-06	DOI Link
knb-lter-jrn.210437030.37	Jornada Basin LTER: Wireless meteorological station at NPP T-WEST site: 30-minute summary data: 2013 - ongoing	Anderson, John	2013-07-30	2023-10-02	DOI Link
knb-lter-jrn.210437031.38	Jornada Basin LTER: Wireless meteorological station at NPP C-CALI site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-11-05	2023-07-06	DOI Link
knb-lter-jrn.210437032.39	Jornada Basin LTER: Wireless meteorological station at NPP C-GRAV site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-09-16	2023-10-02	DOI Link
knb-lter-jrn.210437033.39	Jornada Basin LTER: Wireless meteorological station at NPP C-SAND site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-11-19	2023-10-04	DOI Link

knb-lter-jrn.210437034.39	Jornada Basin LTER: Wireless meteorological station at NPP G-BASN site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-07-26	2023-10-02	DOI Link
knb-lter-jrn.210437035.37	Jornada Basin LTER: Wireless meteorological station at NPP G-IBPE site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-08-06	2023-10-04	DOI Link
knb-lter-jrn.210437036.38	Jornada Basin LTER: Wireless meteorological station at NPP G-SUMM site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-07-24	2023-10-02	DOI Link
knb-lter-jrn.210437037.38	Jornada Basin LTER: Wireless meteorological station at NPP M-NORT site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-07-23	2023-10-02	DOI Link
knb-lter-jrn.210437038.37	Jornada Basin LTER: Wireless meteorological station at NPP M-RABB site: 1-hour summary data: 2013 - ongoing	Anderson, John	2015-08-30	2023-07-06	DOI Link
knb-lter-jrn.210437039.36	Jornada Basin LTER: Wireless meteorological station at NPP M-WELL site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-08-27	2023-07-06	DOI Link
knb-lter-jrn.210437040.39	Jornada Basin LTER: Wireless meteorological station at NPP P-COLL site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-07-26	2023-10-02	DOI Link
knb-lter-jrn.210437041.38	Jornada Basin LTER: Wireless meteorological station at NPP P-SMAL site: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-03-14	2023-10-02	DOI Link
knb-lter-jrn.210437042.37	Jornada Basin LTER: Wireless meteorological station at NPP P-TOBO site: 1-hour summary data: 2013 - ongoing	Anderson, John	2014-05-04	2023-10-02	DOI Link
knb-lter-jrn.210437043.38	Jornada Basin LTER: Wireless meteorological station at NPP T-EAST site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-07-29	2023-10-02	DOI Link
knb-lter-jrn.210437044.38	Jornada Basin LTER: Wireless meteorological station at NPP T-TAYL site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-08-07	2023-10-02	DOI Link
knb-lter-jrn.210437045.37	Jornada Basin LTER: Wireless meteorological station at NPP T-WEST site: 1-hour summary data: 2013 - ongoing	Anderson, John	2013-07-30	2023-10-02	DOI Link
knb-lter-jrn.210437046.41	Jornada Basin LTER: Wireless meteorological station at NPP C-CALI site: Daily summary data: 2013 - ongoing	Anderson, John	2013-11-05	2023-10-01	DOI Link
knb-lter-jrn.210437047.39	Jornada Basin LTER: Wireless meteorological station at NPP C-GRAV site: Daily summary data: 2013 - ongoing	Anderson, John	2013-09-16	2023-10-01	DOI Link
knb-lter-jrn.210437048.39	Jornada Basin LTER: Wireless meteorological station at NPP C-SAND site: Daily summary data: 2013 - ongoing	Anderson, John	2013-11-20	2023-10-01	DOI Link
knb-lter-jrn.210437049.39	Jornada Basin LTER: Wireless meteorological station at NPP G-BASN site: Daily summary data: 2013 - ongoing	Anderson, John	2013-07-26	2023-10-01	DOI Link
knb-lter-jrn.210437050.37	Jornada Basin LTER: Wireless meteorological station at NPP G-IBPE site: Daily summary data: 2013 - ongoing	Anderson, John	2013-08-06	2023-10-01	DOI Link
knb-lter-jrn.210437051.36	Jornada Basin LTER: Wireless meteorological station at NPP G-SUMM site: Daily summary data: 2013 - ongoing	Anderson, John	2013-07-25	2023-10-01	DOI Link
knb-lter-jrn.210437052.38	Jornada Basin LTER: Wireless meteorological station at NPP M-NORT site: Daily summary data: 2013 - ongoing	Anderson, John	2013-07-23	2023-10-01	DOI Link
knb-lter-jrn.210437053.38	Jornada Basin LTER: Wireless meteorological station at NPP M-RABB site: Daily summary data: 2013 - ongoing	Anderson, John	2015-08-25	2023-10-03	DOI Link
knb-lter-jrn.210437054.38	Jornada Basin LTER: Wireless meteorological station at NPP M-WELL site: Daily summary data: 2013 - ongoing	Anderson, John	2013-08-27	2023-10-01	DOI Link
knb-lter-jrn.210437055.39	Jornada Basin LTER: Wireless meteorological station at NPP P-COLL site: Daily summary data: 2013 - ongoing	Anderson, John	2013-07-26	2023-10-01	DOI Link
knb-lter-jrn.210437056.38	Jornada Basin LTER: Wireless meteorological station at NPP P-SMAL site: Daily summary data: 2017 - ongoing	Anderson, John	2017-03-14	2023-10-01	DOI Link

knb-lter-jrn.210437057.38	Jornada Basin LTER: Wireless meteorological station at NPP P-TOBO site: Daily summary data: 2013 - ongoing	Anderson, John	2014-05-01	2023-10-01	DOI Link
knb-lter-jrn.210437058.38	Jornada Basin LTER: Wireless meteorological station at NPP T-EAST site: Daily summary data: 2013 - ongoing	Anderson, John	2013-07-30	2023-10-01	DOI Link
knb-lter-jrn.210437059.38	Jornada Basin LTER: Wireless meteorological station at NPP T-TAYL site: Daily summary data: 2013 - ongoing	Anderson, John	2013-08-07	2023-10-01	DOI Link
knb-lter-jrn.210437060.38	Jornada Basin LTER: Wireless meteorological station at NPP T-WEST site: Daily summary data: 2013 - ongoing	Anderson, John	2013-07-30	2023-10-01	DOI Link
knb-lter-jrn.210437061.34	Jornada Basin LTER: Wireless meteorological station at NPP C-CALI site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-07-24	2023-09-26	DOI Link
knb-lter-jrn.210437062.32	Jornada Basin LTER: Wireless meteorological station at NPP C-GRAV site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-08-02	2023-09-26	DOI Link
knb-lter-jrn.210437063.33	Jornada Basin LTER: Wireless meteorological station at NPP C-SAND site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-08-02	2023-09-30	DOI Link
knb-lter-jrn.210437064.35	Jornada Basin LTER: Wireless meteorological station at NPP G-BASN site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-07-26	2023-09-26	DOI Link
knb-lter-jrn.210437065.34	Jornada Basin LTER: Wireless meteorological station at NPP G-IBPE site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-08-06	2023-09-30	DOI Link
knb-lter-jrn.210437066.33	Jornada Basin LTER: Wireless meteorological station at NPP G-SUMM site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-07-24	2023-09-30	DOI Link
knb-lter-jrn.210437067.32	Jornada Basin LTER: Wireless meteorological station at NPP M-NORT site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-07-24	2023-09-29	DOI Link
knb-lter-jrn.210437068.33	Jornada Basin LTER: Wireless meteorological station at NPP M-RABB site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-08-19	2023-09-29	DOI Link
knb-lter-jrn.210437069.33	Jornada Basin LTER: Wireless meteorological station at NPP M-WELL site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-08-19	2023-09-29	DOI Link
knb-lter-jrn.210437070.32	Jornada Basin LTER: Wireless meteorological station at NPP P-COLL site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-07-26	2023-09-30	DOI Link
knb-lter-jrn.210437071.31	Jornada Basin LTER: Wireless meteorological station at NPP P-SMAL site: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-03-28	2023-09-21	DOI Link
knb-lter-jrn.210437072.32	Jornada Basin LTER: Wireless meteorological station at NPP P-TOBO site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-09-09	2023-09-29	DOI Link
knb-lter-jrn.210437073.33	Jornada Basin LTER: Wireless meteorological station at NPP T-EAST site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-07-30	2023-09-26	DOI Link
knb-lter-jrn.210437074.32	Jornada Basin LTER: Wireless meteorological station at NPP T-TAYL site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-08-10	2023-09-26	DOI Link
knb-lter-jrn.210437075.33	Jornada Basin LTER: Wireless meteorological station at NPP T-WEST site: 1-second summary precipitation data: 2013 - ongoing	Anderson, John	2013-07-30	2023-09-26	DOI Link
knb-lter-jrn.210437076.39	Jornada Basin LTER: Wireless meteorological station at NPP C-CALI site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-11-05	2023-10-02	DOI Link
knb-lter-jrn.210437077.39	Jornada Basin LTER: Wireless meteorological station at NPP C-GRAV site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-09-16	2023-10-04	DOI Link
knb-lter-jrn.210437078.39	Jornada Basin LTER: Wireless meteorological station at NPP C-SAND site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-11-19	2023-10-02	DOI Link
knb-lter-jrn.210437079.39	Jornada Basin LTER: Wireless meteorological station at NPP G-BASN site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-25	2023-10-02	DOI Link

knb-lter-jrn.210437080.38	Jornada Basin LTER: Wireless meteorological station at NPP G-IBPE site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-06	2023-10-02	DOI Link
knb-lter-jrn.210437081.37	Jornada Basin LTER: Wireless meteorological station at NPP G-SUMM site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-24	2023-10-02	DOI Link
knb-lter-jrn.210437082.38	Jornada Basin LTER: Wireless meteorological station at NPP M-NORT site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-23	2023-10-02	DOI Link
knb-lter-jrn.210437083.37	Jornada Basin LTER: Wireless meteorological station at NPP M-RABB site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-12	2023-10-02	DOI Link
knb-lter-jrn.210437084.38	Jornada Basin LTER: Wireless meteorological station at NPP M-WELL site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-13	2023-10-02	DOI Link
knb-lter-jrn.210437085.39	Jornada Basin LTER: Wireless meteorological station at NPP P-COLL site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-26	2023-10-02	DOI Link
knb-lter-jrn.210437086.38	Jornada Basin LTER: Wireless meteorological station at NPP P-SMAL site: 30-minute soil volumetric water content data: 2017 - ongoing	Duniway, Michael	2017-03-14	2023-10-02	DOI Link
knb-lter-jrn.210437087.37	Jornada Basin LTER: Wireless meteorological station at NPP P-TOBO site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2014-05-04	2023-07-07	DOI Link
knb-lter-jrn.210437088.38	Jornada Basin LTER: Wireless meteorological station at NPP T-EAST site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-29	2023-10-02	DOI Link
knb-lter-jrn.210437089.38	Jornada Basin LTER: Wireless meteorological station at NPP T-TAYL site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-07	2023-10-02	DOI Link
knb-lter-jrn.210437090.38	Jornada Basin LTER: Wireless meteorological station at NPP T-WEST site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-30	2023-10-02	DOI Link
knb-lter-jrn.210437091.39	Jornada Basin LTER: Wireless meteorological station at NPP C-CALI site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-11-05	2023-10-01	DOI Link
knb-lter-jrn.210437092.38	Jornada Basin LTER: Wireless meteorological station at NPP C-GRAV site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-09-16	2023-10-01	DOI Link
knb-lter-jrn.210437093.39	Jornada Basin LTER: Wireless meteorological station at NPP C-SAND site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-11-20	2023-10-01	DOI Link
knb-lter-jrn.210437094.38	Jornada Basin LTER: Wireless meteorological station at NPP G-BASN site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-26	2023-10-01	DOI Link
knb-lter-jrn.210437095.37	Jornada Basin LTER: Wireless meteorological station at NPP G-IBPE site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-06	2023-10-03	DOI Link
knb-lter-jrn.210437096.37	Jornada Basin LTER: Wireless meteorological station at NPP G-SUMM site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-24	2023-10-01	DOI Link
knb-lter-jrn.210437097.38	Jornada Basin LTER: Wireless meteorological station at NPP M-NORT site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2014-10-02	2023-10-01	DOI Link
knb-lter-jrn.210437098.38	Jornada Basin LTER: Wireless meteorological station at NPP M-RABB site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-12	2023-10-01	DOI Link
knb-lter-jrn.210437099.38	Jornada Basin LTER: Wireless meteorological station at NPP M-WELL site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-13	2023-10-03	DOI Link
knb-lter-jrn.210437100.39	Jornada Basin LTER: Wireless meteorological station at NPP P-COLL site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-27	2023-10-01	DOI Link
knb-lter-jrn.210437101.38	Jornada Basin LTER: Wireless meteorological station at NPP P-SMAL site: Daily average soil volumetric water content data: 2017 - ongoing	Duniway, Michael	2017-03-14	2023-10-01	DOI Link
knb-lter-jrn.210437102.37	Jornada Basin LTER: Wireless meteorological station at NPP P-TOBO site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2014-05-01	2023-10-01	DOI Link

knb-lter-jrn.210437103.38	Jornada Basin LTER: Wireless meteorological station at NPP T-EAST site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-29	2023-10-01	DOI Link
knb-lter-jrn.210437104.38	Jornada Basin LTER: Wireless meteorological station at NPP T-TAYL site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-07	2023-10-01	DOI Link
knb-lter-jrn.210437105.38	Jornada Basin LTER: Wireless meteorological station at NPP T-WEST site: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-30	2023-10-01	DOI Link
knb-lter-jrn.210437106.36	Jornada Basin LTER: Wireless meteorological station at NPP G-IBPE site: 15-minute summary data: 2016 - ongoing	Anderson, John	2016-03-01	2023-10-02	DOI Link
knb-lter-jrn.210437107.26	Jornada Basin LTER: Wireless substation at NPP C-CALI site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-19	2023-10-01	DOI Link
knb-lter-jrn.210437108.26	Jornada Basin LTER: Wireless substation at NPP C-GRAV site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-12	2023-10-01	DOI Link
knb-lter-jrn.210437109.26	Jornada Basin LTER: Wireless substation at NPP C-SAND site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-12	2023-10-01	DOI Link
knb-lter-jrn.210437110.25	Jornada Basin LTER: Wireless substation at NPP G-BASN site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-08-12	2023-07-06	DOI Link
knb-lter-jrn.210437111.26	Jornada Basin LTER: Wireless substation at NPP G-IBPE site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-17	2023-10-01	DOI Link
knb-lter-jrn.210437112.26	Jornada Basin LTER: Wireless substation at NPP G-SUMM site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-06-18	2023-10-01	DOI Link
knb-lter-jrn.210437113.26	Jornada Basin LTER: Wireless substation at NPP M-NORT site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-06-18	2023-10-01	DOI Link
knb-lter-jrn.210437114.25	Jornada Basin LTER: Wireless substation at NPP M-RABB site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-06-18	2023-10-01	DOI Link
knb-lter-jrn.210437115.26	Jornada Basin LTER: Wireless substation at NPP M-WELL site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-06-18	2023-10-01	DOI Link
knb-lter-jrn.210437116.26	Jornada Basin LTER: Wireless substation at NPP P-SMAL site: 30-minute soil volumetric water content data: 2017 - ongoing	Duniway, Michael	2017-03-16	2023-10-01	DOI Link
knb-lter-jrn.210437117.26	Jornada Basin LTER: Wireless substation at NPP P-TOBO site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-10-02	2023-10-01	DOI Link
knb-lter-jrn.210437118.26	Jornada Basin LTER: Wireless substation at NPP T-EAST site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-15	2023-10-01	DOI Link
knb-lter-jrn.210437119.25	Jornada Basin LTER: Wireless substation at NPP T-TAYL site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-06-18	2023-10-01	DOI Link
knb-lter-jrn.210437120.25	Jornada Basin LTER: Wireless substation at NPP T-WEST site: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-07-15	2023-09-26	DOI Link
knb-lter-jrn.210527001.1	Ecophysiological variables of common shrub and grass species during the growing season following simulated sandblasting trials at the Jornada Experimental Range, New Mexico, USA, 2018 and 2019	Niu, Furong;Pierce, Nathan A;Archer, Steven;Okin, Gregory S;Fischella, Mike;Nadoum, Shereen	2018-01-01	2019-12-31	DOI Link
knb-lter-jrn.210548001.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 1 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-15	2023-10-06	DOI Link
knb-lter-jrn.210548002.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 2 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-15	2023-10-06	DOI Link

knb-lter-jrn.210548003.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 3 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-15	2023-10-06	DOI Link
knb-lter-jrn.210548004.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 4 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-06	2023-10-07	DOI Link
knb-lter-jrn.210548005.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 5 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548006.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 6 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-08	2023-10-07	DOI Link
knb-lter-jrn.210548007.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 7 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548008.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 8 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-07	2023-10-06	DOI Link
knb-lter-jrn.210548009.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 9 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-07	2023-10-06	DOI Link
knb-lter-jrn.210548010.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 10 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-07	2023-10-06	DOI Link
knb-lter-jrn.210548011.33	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 11 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548012.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 12 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-04-25	2023-10-06	DOI Link
knb-lter-jrn.210548013.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 13 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2014-05-23	2023-10-06	DOI Link
knb-lter-jrn.210548014.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 14 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-06-10	2023-10-06	DOI Link
knb-lter-jrn.210548015.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 15 meteorological station: 5-minute summary wind and air temperature data: 2013 - ongoing	Anderson, John	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548016.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 1 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548017.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 2 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548018.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 3 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548019.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 4 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-07	DOI Link

knb-lter-jrn.210548020.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 5 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548021.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 6 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548022.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 7 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548023.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 8 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548024.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 9 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548025.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 10 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548026.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 11 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548027.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 12 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548028.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 13 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548029.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 14 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548030.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 15 meteorological station: 30-minute summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-07	DOI Link
knb-lter-jrn.210548031.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 1 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548032.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 2 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548033.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 3 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548034.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 4 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-07	DOI Link
knb-lter-jrn.210548035.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 5 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548036.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 6 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548037.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 7 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548038.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 8 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548039.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 9 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548040.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 10 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548041.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 11 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548042.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 12 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link

knb-lter-jrn.210548043.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 13 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548044.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 14 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-07	DOI Link
knb-lter-jrn.210548045.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 15 meteorological station: 1-hour summary data: 2017 - ongoing	Anderson, John	2017-08-10	2023-10-06	DOI Link
knb-lter-jrn.210548046.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 1 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-15	2023-10-05	DOI Link
knb-lter-jrn.210548047.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 2 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-15	2023-10-05	DOI Link
knb-lter-jrn.210548048.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 3 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-15	2023-07-19	DOI Link
knb-lter-jrn.210548049.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 4 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-06	2023-10-05	DOI Link
knb-lter-jrn.210548050.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 5 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-08	2023-10-05	DOI Link
knb-lter-jrn.210548051.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 6 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-04-29	2023-10-05	DOI Link
knb-lter-jrn.210548052.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 7 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548053.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 8 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-07	2023-10-05	DOI Link
knb-lter-jrn.210548054.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 9 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-07	2023-10-05	DOI Link
knb-lter-jrn.210548055.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 10 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-07	2023-10-05	DOI Link
knb-lter-jrn.210548056.32	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 11 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-08	2023-07-07	DOI Link
knb-lter-jrn.210548057.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 12 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-07	2023-10-05	DOI Link
knb-lter-jrn.210548058.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 13 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2014-05-23	2023-10-05	DOI Link
knb-lter-jrn.210548059.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 14 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-06-11	2023-10-06	DOI Link
knb-lter-jrn.210548060.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 15 meteorological station: Daily summary data: 2013 - ongoing	Anderson, John	2013-05-08	2023-10-05	DOI Link
knb-lter-jrn.210548061.37	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 1 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-15	2023-10-06	DOI Link
knb-lter-jrn.210548062.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 2 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-15	2023-10-06	DOI Link
knb-lter-jrn.210548063.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 3 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-15	2023-10-06	DOI Link

knb-lter-jrn.210548064.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 4 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-06	2023-10-06	DOI Link
knb-lter-jrn.210548065.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 5 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548066.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 6 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548067.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 7 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548068.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 8 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-07	2023-10-06	DOI Link
knb-lter-jrn.210548069.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 9 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-07	2023-10-06	DOI Link
knb-lter-jrn.210548070.37	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 10 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-07	2023-10-06	DOI Link
knb-lter-jrn.210548071.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 11 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548072.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 12 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-04-25	2023-10-06	DOI Link
knb-lter-jrn.210548073.37	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 13 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2014-05-23	2023-10-06	DOI Link
knb-lter-jrn.210548074.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 14 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-06-11	2023-10-06	DOI Link
knb-lter-jrn.210548075.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 15 meteorological station: 30-minute soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-06	DOI Link
knb-lter-jrn.210548076.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 1 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-15	2023-10-06	DOI Link
knb-lter-jrn.210548077.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 2 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-15	2023-10-05	DOI Link
knb-lter-jrn.210548078.33	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 3 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-15	2023-10-05	DOI Link
knb-lter-jrn.210548079.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 4 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-06	2023-10-05	DOI Link

knb-lter-jrn.210548080.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 5 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-05	DOI Link
knb-lter-jrn.210548081.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 6 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-05	DOI Link
knb-lter-jrn.210548082.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 7 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-05	DOI Link
knb-lter-jrn.210548083.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 8 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-07	2023-10-05	DOI Link
knb-lter-jrn.210548084.34	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 9 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-07	2023-10-05	DOI Link
knb-lter-jrn.210548085.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 10 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-07	2023-10-05	DOI Link
knb-lter-jrn.210548086.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 11 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-05	DOI Link
knb-lter-jrn.210548087.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 12 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-07	2023-10-05	DOI Link
knb-lter-jrn.210548088.36	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 13 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2014-05-23	2023-10-05	DOI Link
knb-lter-jrn.210548089.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 14 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-06-11	2023-10-05	DOI Link
knb-lter-jrn.210548090.35	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 15 meteorological station: Daily average soil volumetric water content data: 2013 - ongoing	Duniway, Michael	2013-05-08	2023-10-05	DOI Link
knb-lter-jrn.210548091.26	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 2 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-10	2023-09-26	DOI Link
knb-lter-jrn.210548092.27	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 3 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-26	DOI Link
knb-lter-jrn.210548093.28	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 4 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548094.27	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 5 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548095.26	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 6 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2015-08-23	2023-09-21	DOI Link

knb-lter-jrn.210548096.27	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 7 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548097.28	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 8 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548098.28	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 9 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548099.28	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 10 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548100.29	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 11 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548101.28	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 13 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548102.27	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 14 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210548103.28	Jornada Basin LTER Cross-scale Interactions Study (CSIS) Block 15 meteorological station: 1-second summary precipitation data: 2017 - ongoing	Anderson, John	2017-08-11	2023-09-21	DOI Link
knb-lter-jrn.210586001.3	Soil and foliar carbon and nitrogen content and stable isotope ratios from rainfall manipulation experiments at the Jornada Basin LTER, 2011-2020	Currier, Courtney;Reichmann, Lara;Sala, Osvaldo E	2011-06-01	2020-09-30	DOI Link
knb-lter-jrn.210586002.3	Dataset and analyses for publication entitled: “Acclimation of the nitrogen cycle to changes in precipitation”	Currier, Courtney;Reichmann, Lara;Sala, Osvaldo E	1876-01-01	2021-12-31	DOI Link