

Jornada Basin LTER 2007 SUPPLEMENT

The Jornada Basin LTER Program investigates the environmental causes and consequences of desertification in semi-arid Chihuahuan Desert ecosystems. Our current research efforts focus on expanding our understanding of the processes that redistribute soil resources in desertifying systems (such as erosion by wind or water, and animal activities) across spatial scales. Our work is aimed at providing a sound basis for management and remediation efforts, and at improving societal understanding of the nature and dynamics of arid and semi-arid systems. This proposal outlines work in several distinct areas that would advance our capabilities significantly as well as improve network-level synthesis. These activities fall into three categories with a separate budget for each, and a summary budget.

- I. Research Experience for Undergraduates program (\$18,000)
- II. Schoolyard activities (\$29,400)
- III. Other categories (\$24,750)

Total = \$72,150

I. REU Request (\$18,000)

1. We request funding for three undergraduate students to be added to our LTER program. One student will be supported to work with Dr. Curtis Monger (New Mexico State University). The student is compiling weather data for the Chihuahuan Desert in the US and Mexico. She presented a poster on this topic at the LTER All Scientists Meeting. We request continued support for her to compile the data in a form that can be used by other investigators. The student identified for this project, Sarah Ricketts, is an undergraduate at NMSU.
2. We request support for a second undergraduate to work with Dr. Osvaldo Sala (Brown University), a Co-PI on the Jornada. The student would assist in data collection for an ongoing project examining biotic and biogeochemical constraints on primary productivity. The student will work closely with a Ph.D. student, collecting data on plant community composition, coverage, and function on experimental plots, as well as conducting laboratory analysis on soil and plant material samples. Additionally, the student will be responsible for conducting his/her own independent research involving plant-water interactions on experimental plots. We will recruit a student for this position from Brown University.
3. We request support for a third undergraduate to work with Dr. Heather Throop, a new Co-PI on the Jornada. This student would work on a project exploring spatial and temporal patterns of soil organic carbon and root carbon relative to shrub size and landscape position. This student would participate in field work selecting shrubs and obtaining soil cores. Lab portions of the project would include soil processing (sieving, density fractioning), and elemental analysis of the different density fractions. The student would also participate, as feasible, in data analysis and manuscript preparation. We will recruit an NMSU student for this position, and will recruit from members of underrepresented groups.

Budget and justification (total = \$18,000)

The majority of the REU funds would be used directly for student stipends (\$14,400), supporting 3 students for 40 hours per week during the summer 2007 and 10-15 hours per week during the following fall. NMSU will collect 25% administrative costs on the student stipends (\$3600). Additional materials, supplies, and travel for these students will come from other sources.

REU stipend (3 students * \$4800/student)	\$ 14,400
Administrative costs (25%* \$14400)	\$ 3,600
Total REU request	\$ 18,000

II. Schoolyard LTER (\$29,400)

Background

The Jornada Basin sLTER is run through a unique collaboration that links the Jornada Basin LTER, the USDA-ARS Jornada Experimental Range, and the nonprofit Chihuahuan Desert Nature Park. The program was called "...simply outstanding" and "a model of what LTER education programs can be" by an NSF review panel in October 2003. Since then, it has actually become a model program used by regional school districts (El Paso Independent School District), other NSF-funded programs (e.g., GK12 program at the University of Texas El Paso), and statewide science initiatives (New Mexico's NSF EPSCoR). The program's success and widespread appeal highlight the tremendous need for inquiry-based science education opportunities for underrepresented students in this border region where approximately 70% of the students are Hispanic.

The Jornada sLTER is a multifaceted K-12 education program that reaches more than 8,000 students and 300 teachers annually. The program includes:

- Schoolyard studies – The heart of the program is a 400-page teacher's handbook containing 35 inquiry-based activities that are done in the schoolyard and/or classroom. Activities are divided into seven categories that overlap with LTER research: weather, microclimates, soil, water, vegetation, arthropods, and vertebrates. Each activity includes teacher instructions, background information, sample tables and graphs, reproducible student pages in English and Spanish, and alignment with national and state (NM and TX) standards. Each topic area (e.g., weather, arthropods) has an associated Science Investigation Kit containing all of the equipment and consumable supplies needed to do the activities. Teachers borrow these kits for use in their classrooms.
- Teacher workshops – Teachers attend professional development workshops with program scientists to learn and practice the schoolyard activities. These workshops take place throughout New Mexico and in west Texas.
- Field trips – Students attend day-long field trips where they participate in hands-on activity stations to learn about LTER scientists' latest research. Using EdEn funding last year, we created an expanded field trip program where students participate in (1) pre-field trip activities, (2) a data-collection activity during the field trip, (3) post-field trip, schoolyard activities that build from the field trip study, and (4) and a post-field trip visit by sLTER staff to help students analyze their data and create conclusions.
- Classroom programs – Each month, program educators go to all 3rd grade classes at six of the most economically challenged schools in the region. Students participate in guided, hands-on programs using the schoolyard activities (modified for the elementary classroom).

- Programs for the general public – With EdEn support, we created the *Summer of Science Series* in 2006. Teacher workshop participants used their teaching expertise and their new content knowledge to host public programs. We will continue this program in 2007.

Need and Project Plan (total requested = \$23,520 direct + \$5880 IDC = \$29,400)

Under the current Jornada Basin sLTER, teachers first access the program and its many opportunities by attending a teacher professional development workshop, often during the summer. During these workshops, they learn background information about the Chihuahuan desert ecosystem and practice using the schoolyard activities that make up the heart of the program. Funding is needed to partially support the salary of the Project Coordinator to continue these activities. **Total = \$14,448 (\$11,200 salary+ \$3248 fringe).**

Unfortunately, not all teachers can take a one or two week summer workshop. New Mexico teachers' salaries are the 40th lowest in the country (NEA report, 2005), making it necessary for many teachers to work during the summer. Other teachers learn about the program during the school year, so they miss the opportunity to use the quality, inquiry-based activities until the following year, after they take a summer workshop. Furthermore, there are many teachers, especially at the elementary school level, who lack the interest in environmental science necessary to sign up for a voluntary, intense workshop. Nonetheless, these teachers are responsible for teaching science, so they are often left looking for good, locally relevant materials during the school year.

To help alleviate these problems and make the successful Jornada Basin sLTER program even more widely available, program staff will develop four introductory lessons (two for elementary school and two for middle school) that teachers can request without having first participated in an intense professional development workshop. Each topic will include:

- A one-hour classroom presentation run by Jornada Basin sLTER staff. Like all other program activities, this presentation will allow students to learn science by participating in locally relevant, hands-on data collection activities. We have budgeted for 20 school visits (approximately 80 one-hour programs) in the first year. Each school visit costs an average of \$120. **Total = \$2400 in travel.**
- Teacher materials given to teachers following the program. These materials will provide detailed instructions on how to follow up on the classroom program and allow students to continue the study even when sLTER staff are not present. We will model the teacher materials on the other 35 schoolyard activities that are already part of the Jornada Basin sLTER; they will include materials lists, tips for entire class participation, sample tables and graphs, and reproducible student pages in English and Spanish. **Total = \$752.**
- A kit of materials containing all of the equipment and consumable supplies teachers need to conduct the follow-up studies. These materials will be loaned to the teachers following the classroom program. We will create two copies of each kit (eight kits worth approximately \$740 each) to facilitate simultaneous use of the activities during the school year. **Total = \$5920 in supplies (8 kits * \$740/kit).**
- Evaluation tools to assess the students' gains in knowledge and attitudes about the process of science and environmental science.

We will also develop an email newsletter that will be sent to participating teachers quarterly. This newsletter will highlight upcoming science opportunities in the region, new programs available through the Jornada Basin sLTER program, and multiple ways to contact program staff

for further assistance. We have budgeted for 120 hours of sLTER staff members' time to develop each of these four topics.

As a result of this important addition to the Jornada Basin sLTER program, we expect the following outcomes:

- 1) Additional students who participate in sLTER programs since all teachers (not just teachers who have participated in workshops) can now request sLTER opportunities.
- 2) More teachers who have seen the benefits of engaging students in quality, inquiry-based science in the classroom and schoolyard.

Evaluation

The Jornada Basin sLTER program is in the process of developing robust evaluation tools to document the use of program activities and changes in students' and teachers' knowledge based on these activities. We have budgeted for 80 hours to work with evaluation specialists to help create and test evaluation tools for these new classroom/schoolyard activities as well. We will be happy to share these tools with other sLTER programs.

PERSONNEL

Salaries, Project Coordinator	\$11,200
Fringe Benefits, Staff Salaries @ 29%	\$3,248
TOTAL SALARIES, WAGES, FRINGE	\$14,448

TRAVEL

Classroom visits, scientists	\$2,400
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OTHER DIRECT COSTS

Science kit supplies	\$5,920
Teacher handbooks	\$752

Total Other Direct Costs	\$6,672
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TOTAL DIRECT	\$23,520
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TOTAL F&A requested @ 25%	\$5,880
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TOTAL DIRECT & INDIRECT	\$29,400
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III. Other Categories (\$24,750)

We have two requests in this section. The first is to enhance our Information Management System (IMS) with personnel time. The second is for personnel time for opportunistic, one-time data acquisition that will lead to demonstrable plugging of critical knowledge gaps related to our most recently funded LTER proposal.

(1) Information Management (\$16,650)

We request support for a temporary 3/4 FTE student programmer position for one year (total = \$16,650 [\$13,320 (salary) + 3,330 (IDC@25%)]. There is a need for a temporary student programmer position to develop and enhance the administrative and user interfaces for the Jornada Basin Information Management System (JIMS) which provides access to ecological data

and associated metadata for all JRN data holdings. This position will develop and maintain applications for the Jornada Information Management System (JIMS) and support JRN and JER researchers and staff in the analysis, modeling, and visualization of research data stored within JIMS by developing tools for their use. This position will also develop databases and applications to support collaborative cross-site LTER and JER research opportunities. An important aspect of this position will be to align local programming efforts to LTER Network Information System (NIS) module development and to provide application development support for both site and cross-site synthesis activities. The salary is estimated as:

\$5400 = \$9/hour x 20 hours/week x 30 weeks (academic year)

\$7920 = \$9/hour x 40 hours/week x 22 weeks (summer, holidays)

\$13320 total salary

(2) Personnel time for opportunistic sampling to plug critical gaps (\$8100)

We request support for two field technicians to assist in the implementation of a new multi-scale experiment to be initiated at the Jornada this summer (2 students*\$6.75/hour*40 hours/week*12 weeks = \$6480 (salary) + \$1620 (IDC@25%) = \$8100. Our recently funded LTER proposal includes a new multi-scale experiment to be conducted at the Jornada that includes manipulations of drivers and resources at three spatial scales (plants, patches, landscape units). We will modify patterns in plants, patches, and landscape units to result in altered patterns in wind and/or water erosion of soil, nutrients, and seeds. We will conduct these manipulations in three geomorphic units with different dominant vegetation and drivers as defined in our proposal:

Geomorphic unit	Dominant vegetation	Dominant driver
Sand sheet	Mesquite/ black grama	wind
Transition zone	Tarbush, black grama, creosotebush	Wind and water
Bajada	Creosotebush, tarbush	water

Additional field technicians are needed in 2007 to collect a large amount of preliminary data on vegetation and soil patch structure across scales for each geomorphic unit, and to assist in the experimental manipulations. Because 2006 was an unusually wet year that resulted in large increased in plant recruitment, biomass, cover, and diversity, setting up this experiment in 2007 is both timely and opportunistic. We are starting 4 graduate students in fall (2007) that will conduct individual studies overlain on this experiment, and can assist in future maintenance of the plots.

Salary and fringe benefits	
student salary: programmer**	\$13,320
student salary: field technicians**	\$6,480
TOTAL SALARIES, WAGES, FRINGE	\$19,800
TOTAL DIRECT	\$19,800
TOTAL F&A requested @ 25%	\$4,950
TOTAL DIRECT & INDIRECT	\$24,750

Budget Summary

Salary and fringe benefits

sLTER Project Coordinator*	\$11,200
REU stipend (3 students @ \$4800 each)	\$14,400
student salary: programmer**	\$13,320
student salary: field technicians**	\$6,480

*Fringe Benefits, Staff Salaries @ 29%	\$3,248
TOTAL SALARIES, WAGES, FRINGE	\$48,648

TRAVEL

Classroom visits, scientists	\$2,400
Total Domestic Travel	\$2,400

OTHER DIRECT COSTS

Supplies	
Science kit supplies	\$5,920

Reproduction, Copier Costs	
Teacher handbooks	\$752

Total Other Direct Costs	\$6,672
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TOTAL DIRECT	\$57,720
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TOTAL F&A requested @ 25%	\$14,430
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TOTAL DIRECT & INDIRECT	\$72,150
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BUDGET AND JUSTIFICATION

I. REU Request (\$18,000)

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II. Schoolyard LTER (\$29,400)

We request funding to partially support the salary of the Project Coordinator (\$11,200 salary + \$3248 fringe). We also request travel support for a one-hour classroom presentation run by Jornada Basin sLTER staff. Like all other program activities, this presentation will allow students to learn science by participating in locally relevant, hands-on data collection activities. We have budgeted for 20 school visits (approximately 80 one-hour programs) in the first year. Each school visit costs an average of \$120. **Total = \$2400 in travel.**

- Teacher materials given to teachers following the program. These materials will provide detailed instructions on how to follow up on the classroom program and allow students to continue the study even when sLTER staff are not present. We will model the teacher materials on the other 35 schoolyard activities that are already part of the Jornada Basin sLTER; they will include materials lists, tips for entire class participation, sample tables and graphs, and reproducible student pages in English and Spanish. **Total = \$752.**
- A kit of materials containing all of the equipment and consumable supplies teachers need to conduct the follow-up studies. These materials will be loaned to the teachers following the classroom program. We will create two copies of each kit (eight kits worth approximately \$740 each) to facilitate simultaneous use of the activities during the school year. **Total = \$5920 in supplies (8 kits * \$740/kit).**
- Evaluation tools to assess the students' gains in knowledge and attitudes about the process of science and environmental science.

We will also develop an email newsletter that will be sent to participating teachers quarterly. This newsletter will highlight upcoming science opportunities in the region, new programs available through the Jornada Basin sLTER program, and multiple ways to contact program staff

III. Other Categories (\$24,750)

(1) Information Management (\$16,650)

We request support for a temporary $\frac{3}{4}$ FTE student programmer position for one year (total = \$16,650 [\$13,320 (salary) + 3330 (IDC@25%)]). There is a need for a temporary student programmer position to develop and enhance the administrative and user interfaces for the Jornada Basin Information Management System (JIMS) which provides access to ecological data and associated metadata for all JRN data holdings.

(2) Personnel time for opportunistic sampling to plug critical gaps (\$8100)

We request support for two field technicians to assist in the implementation of a new multi-scale experiment to be initiated at the Jornada this summer (2 students * \$6.75/hour * 40 hours/week * 12 weeks = \$6480 (salary) + \$1620 (IDC@25%) = \$8100). Our recently funded LTER proposal includes a new multi-scale experiment to be conducted at the Jornada that includes

manipulations of drivers and resources at three spatial scales (plants, patches, landscape units). Additional field technicians are needed in 2007 to collect a large amount of preliminary data on vegetation and soil patch structure across scales for each geomorphic unit, and to assist in the experimental manipulations. We are starting 4 graduate students in fall (2007) that will conduct individual studies overlain on this experiment, and can assist in future maintenance of the plots.

Jornada Basin LTER 2007 SUPPLEMENT: TRENDS

The goals of the Trends project are to create a platform for synthesis by making long-term data accessible, and to illustrate the utility of this platform in addressing within-site and network-level scientific questions. To do this, we are collecting long-term data sets from all 26 LTER sites, 9 USDA-FS sites, 8 USDA ARS sites, 1 DOE site, 1 USGS site, and 1 site operated by the University of Arizona. Four types of data are being collected for each site: (1) climate and physical variability, including disturbances, (2) human population and economy, (3) biogeochemistry, and (4) biotic structure, including biodiversity. We are generating two products: (1) a book to be published by Oxford University Press on trends in long-term data within and among sites, and examples that illustrate the value of long-term data in addressing important questions; (2) a web page containing derived data and metadata that are easily accessible for synthetic analyses. The synthesis products, in particular the book, will be a critical part of the LTER Strategic Plan.

The support provided by the 2006 LTER Supplement has been invaluable in allowing us to meet our goal of completing the book within a short time period. However, we have been overwhelmed by the positive response by LTER sites in providing data and figures to the Trends project, and a considerable amount of work remains before the web page development can proceed. The book will contain a small subset (< 20%) of the total number of data sets submitted by LTER sites alone (> 400). Two major activities need to be completed in the next year that relate to the development of the Trends web page: data manipulation and web page applications development. Both activities are required before the potential of Trends can be realized by the dynamic harvesting and updating of data.

In this supplement, we request support for the first activity. An accompanying supplement from the University of New Mexico will request support for the second activity.

Activity 1. Data manipulation

Currently, we have collected over 400 data sets, mostly from LTER sites. The diversity of datasets in their structure, format, and layout requires that individual attention be given to each dataset. Each dataset needs to be checked for errors, and converted to a standard format and standard units to make it usable in the book and accessible on the Trends web page. Many of the datasets have unique properties that require individual attention before standardization can occur. There will be a number of standard formats depending on the type of data that were collected. In addition, metadata need to be developed for the derived data that characterize Trends. We are writing R scripts to document the steps required to derive the data and to create the figures. These R scripts will be used to create graphs for the book, and to update the graphs on the web page as the data are updated and harvested through time.

Our major tasks are to:

1. check all submitted datasets for errors in units, formatting, etc.
2. format the data for graphing and analysis; the subset of datasets to be included in the book will have first priority

3. develop R scripts for formatting, graphing, and analysis
4. prepare graphs for the book, and data and metadata for the web page

Publication costs

In addition, we request support to offset the publishing costs of the book. The Trends Editorial Committee has agreed that color graphs and images will be important to the legibility of the data and the visibility of the book. A modest amount of support will allow color graphics to be included without making the book cost-prohibitive to a large audience.

Budget and justification (total=\$149,800)

We request salary and fringe benefits for Christine Laney, the Trends project coordinator, to develop the R scripts required for graphing the data in a common format for the book and to allow harvesting and automatic updates in the Trends web page. Christine will work with Mark Schildhauer and others at NCEAS when developing the R scripts. NCEAS has provided travel support for Christine to visit NCEAS in fall (2005), and has offered future travel support as well. To ensure the integration of the two described activities, Christine Laney will work in close, daily communication with Mark Servilla at the LTER Network Office. Mark will oversee the web applications development activity by directing the work of Duane Costa full-time Analyst Programmer II, and Inigo San Gil, Sr. Application Support Analyst supported by USGS NBII who will be contributing to the metadata development activities. She will also consult with James Brunt and Marshall White as necessary in developing data bases for the web page and designing the Trends web page. Christine regularly communicates with the information manager from each site when collecting and graphing the data. We also request salary and fringe benefits for a full-time software specialist and an undergraduate student assistant to work with Christine by checking all the datasets for errors, converting them to standard formats and units, and creating the initial graphs for viewing by the Trends Editorial Committee.

LTER 2007 Supplement: TRENDS

professional salary*	
Christine Laney	\$35,000
software specialist	\$30,000
student salary**	\$12,300
total salary	\$77,300

fringe	
*29%	\$22,417
**1%	\$123
total fringe	\$22,540

total salary and fringe	\$99,840
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publication costs	\$20,000
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TOTAL DIRECT	\$119,840
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IDC BASE	\$119,840
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IDC (25%)	\$29,960
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Total direct + indirect	\$149,800
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