

2006-2009

LTERR Education Committee Report

At the 2006 ASM, Ali Whitmer (SBC) and Carol Landis (MCM) volunteered to co-chair the Education Committee, agreeing that Ali would attend the network-level meetings and Carol would serve as the primary communicator to the EduReps group.

Since the 2006 ASM, the Education Committee has promoted:

- 1) Successful proposals for cross-site research,
- 2) Continued success and involvement with the Children's Book Series,
- 3) A report process for LTER Education Reps to the Committee, and
- 4) Participation at the 2009 ASM, with guidance toward suggestions made to the LTER Executive Board in 2008.

1) Cross-site research efforts are underway at a minimum of 9 sites. Three projects serve as examples of the sorts of activities with which educators and scientists are engaged in cross-site efforts (lead site is indicated by bold, participating sites listed alphabetically):

- i. **CAP** has been successful in obtaining funds from NSF's EdEn program, TPC program, and ITEST program. TPC funding was obtained for a grant entitled: Teaching Ecosystem Complexity through Field Research involves a collaboration of CAP LTER with AND, JOR, LUQ, and SGS
- ii. The BES, FCE, and **SBC** sites are partnering with Science Approach on an NSF ITEST grant, *CoastLines*, to provide high quality teacher professional development that focuses on using LTER GIS data in the classroom.
- iii. **SGS** serves as the lead institution along with BES, KBS, and SBC, in an NSF-funded Math-Science Partnership (MSP) entitled: Culturally Relevant Ecology, Learning Progressions and Environmental Literacy. This project follows up on work that was done in conjunction with the development of the ISSE and is the first specific effort to address the suggestions made in that report.

2) The LTER Children's Book Series has continued to review proposals and work with site representatives in the development of their ideas. Members of the Committee for the Book Series include: Diane McKnight (MCM), Monica Elser (CAP), Claudia Mills (Univ of Colorado), Peter Groffman (BES), Whendee Silver (LUQ), and Carol Landis, with additional assistance provided by Amy H. Rinehart (Moonlight Publishing). The most recent book in the series, "Sea Secrets", is featured on the LTER homepage: <http://www.lternet.edu/news/Article219.html>

Two other book proposals are in the development stage. *Kupe and the Reef* is the working title of a book proposal (in Stage 2) that was submitted by Jacqueline Padilla-Gamino, from the Moorea LTER.

3) In March 2008, Landis requested input from the EduReps about their active engagement in education and outreach. Responses were obtained from 13 sites, providing an update about strategies and successes employed across the LTER Network. The summaries are attached and updates received as of May 11, 2009 have been included. *Site names with submissions for 2009*

are shown in italics.

2009 updates were received from:

AND
BES
HFR
HBR
JRN
KBS
KNZ
PAL
PIE
SBC

4) Communications were initiated in March, 2009, to encourage participation of all EduReps in the pre-ASM meeting slated to occur on Sunday, Sept. 13. Planning is underway and Landis has fielded questions and suggestions from several of the EduReps who plan to participate.

EPO reports from LTER sites, for Science Council Meeting, May 7-9, 2008 (except where the site name is italicized, indicating an update for 2009):

Andrews Experimental Forest (AND), submitted by Kari O'Connell, 5/11/09:

Canopy Connections is a partnership between the H.J. Andrews Experimental Forest, the Environmental Leadership Program at the University of Oregon, and the Pacific Tree Climbing Institute. The program brings students into the canopy of the old-growth forest. Under the guidance of professional tree climbers, students ascend several stories into an old-growth canopy using specialized climbing gear and rope. While settled in “treeboats” high up in the canopy, students engage in creative writing, art, science inquiry projects, and quiet observation time. 125 Oregon middle school students are scheduled to participate in the experience during the spring of 2009.

The Andrews LTER site continues to be a destination for field trips, field courses, and tours for more than 15 colleges and universities and many other organizations. Important interdisciplinary endeavors, the NSF-sponsored Ecosystem Informatics (EI) IGERT (for 30 PhD students) and the EI Summer Institute for undergraduates (14 students from 12 universities in 2008, its second of 4 years), have brought together students from math, computer science, engineering, and the biophysical sciences. Much of these EI endeavors are based on the Andrews Forest place and are allied with its program.

About 95 guests joined us in celebration of the ***60th Anniversary of the HJA Experimental Forest and the Experimental Forests and Ranges Centennial***. Highlights included letters of congratulations from Senator Wyden (OR-D) and Congressman DeFazio (OR-D). The program provided opportunities for guests to learn about the science, management, education, and outreach programs.

2) Schoolyard LTER efforts:

The Andrews Forest LTER Program partners with the Oregon Natural Resources Education Program (ONREP) for the Teachers as Researchers project. In 2008, thirteen high school teachers from around Oregon participated in the project, which began with a two-day workshop at the Andrews LTER. The overall goal of the project was to increase teachers' understanding of authentic environmental science research and to expand their capacity to design relevant field-based science inquiry projects for their students. ONREP will receive funding from the Oregon Watershed Enhancement Board to help support the Teachers as Researchers project with a watershed focus for 2009-10.

3) Cross-site work:

Teaching Ecological Complexity helps train high school science teachers to conduct field ecology research at five LTER sites – AND, CAP, SGS, LUQ, and JRN. The project uses qualitative modeling to broaden teachers' understanding of complexity, diversity, and ecology as a science. Teachers are supported throughout the year as they conduct field studies with their

classes and instructional materials are provided online.

4) Publications or media representation:

OSU Professor and Andrews Forest scientist, John Selker, was featured on Oregon Public Broadcasting's program "Oregon Field Guide" on February 5, 2008. The program shows how Selker's combination of research and cutting-edge technology is helping scientists learn about water movement at the Andrews Forest. The program is available online at <http://www.opb.org/programs/ofg/videos/view/254-Stream-Temps>.

Mark Harmon, an OSU Professor and Andrews LTER Scientist, was one of the authors on a paper in *Science* (Jan 2009), that concludes that regional warming and drought stress are the “dominant contributors” to a rapid increase of tree mortality in old growth forests across the West during the past 50 years, with the Pacific Northwest the hardest hit of all areas studied. The areas studied in this report were forest stands 200 or more years old, with trees of all ages and sizes. The Andrews Forest was one of the sites, including other sites in Oregon, Washington, California, Arizona, Colorado, New Mexico and southwestern British Columbia.

Andrews Forest research was prominently featured in the new book, *Old Growth in a New World: A Pacific Northwest Icon Revisited* (Island Press 2009), edited by Tom Spies and Sally Duncan. The 27 authors—ecologists, social scientists, environmentalists, forest industry professionals, and a philosopher—look forward to what might be the role of old growth forests in coming decades.

5) New initiatives:

The new Pollination Biology Research Experience for Undergraduates program will integrate the disciplines of entomology, botany and ecology, as each student will compare native bee pollinator diversity and dynamic mutualistic interactions with local flora at three ecologically diverse habitats - a forest ecosystem at the foothills of the Cascade Mountains (Andrews Forest LTER site), a dryland prairie in northeast Oregon, and agricultural landscapes in western Oregon.

Baltimore (BES), submitted by Bess Caplan, 5/13/09:

1) Education & Outreach efforts:

- We will be holding an 8 day summer Institute in July 2009 which will explore the big ideas in environmental science in the urban ecosystems of Baltimore, and will include learning about carbon cycling, water flow and quality, and biodiversity through inquiry-based projects in the field and classroom
- We will be supporting 4 Research Experience for Teachers Fellows beginning in June 2009 and extending through the 2009-2010 school year.
- We will be hiring a post-doc whose work will focus on educational research
- The BES education team is continuously improving our curriculum for KidsGrow, a Baltimore City Elementary School after school ecology program; we will be bringing on a summer employee beginning in June to help complete the curriculum and develop assessments for each module.
- BES has participated in several local school environmental conferences by presenting materials on BES research and conducting short interactive lessons with groups of middle and high schoolers; BES also hosted an informational booth at the 92nd annual Baltimore Flower Mart.

2) Cross-site work

- We are currently part of an NSF sponsored Math Science Partnership project with three other LTER sites: Short Grass Steppe, Colorado State; Kellogg Biological Research Station, Michigan State; and Santa Barbara Coastal, University of Santa Barbara

3) New initiatives

- “Communicating Climate Change” (C3), a partnership with the Maryland Science Center (MSC)

BES was asked by the MSC to act as their scientific partner for this project which will use citizen science collected data to track climate change in the Baltimore region. The C3 project includes 12 science centers around the country all working on climate change issues. In the fall of 2008, BES began a partnership with the Maryland Science Center and 11 other science centers around the country. This collaborative partnership, entitled, “Communicating Climate Change” (C3) uses current research and citizen participation to illustrate local signs of climate change. The C3 project in the Baltimore region will use citizen scientists to gather local temperature data and observe and record the timing of important plant life cycle events such as the bloom times of Black Eyed Susans. BES scientists are currently developing protocols for the collection of this data and we hope to start collecting measurements this summer. You may visit the project website at <http://marylandsciencecenter.org/exhibits/C3.html>.

- Math Science Partnership with three other LTER sites

This exciting research project brings together Universities, research centers, and school districts across the nation to: a) define essential pathways for achieving environmental science literacy, and b) to develop and test teacher professional development programs that help accomplish this ambitious goal through innovative instruction in the sciences in middle and high schools.

Central Arizona-Phoenix (CAP), submitted by Monica Elser, 4/8/08:

Ecology Explorers is the K-12 education program of Arizona State University's Central Arizona—Phoenix Long-Term Ecological Research (CAP LTER) project. The aims of the Ecology Explorers program are to: help schools develop and implement a schoolyard ecology program where students collect data similar to CAP LTER data, enter results into our database, share data with other schools, and develop hypotheses and experiments to explain their findings; improve science literacy by exposing students and teachers to research conducted by university-level scientists; enhance teachers' capabilities to design lessons and activities that use scientific inquiry and encourage interest in science; provide access to and promote the use of CAP LTER materials and information; encourage collaboration between CAP LTER researchers and the K-12 community; and provide students an opportunity to share their research with other children, adults and researchers.

We accomplish these goals through a variety of programs. We offer professional development opportunities for teachers that include paid workshops and summer internships. These programs work with teachers to build skills in conducting ecological research with their students. We organize after-school science clubs targeting schools with high minority populations. One of our after-school programs connects the children with a local habitat restoration project. Another after-school program teaches children about interactions between the natural and built environment focusing specifically on the urban heat island. Finally we link with local environmental education providers to develop workshops relating to urban ecosystem and urban sustainability. Our primary funding has been through CAP LTER, but we have also been successful in receiving funding from NSF's EdEn program, TPC program, and ITEST program. In particular, the TPC funding for a grant entitled: Teaching Ecosystem Complexity through Field Research involves a collaboration of CAP LTER with SGS, JOR, AND & LUQ.

California Current (CCE), submitted by Beth Simmons, 4/20/08:

The California Current Ecosystem LTER's Education and Outreach program has benefited greatly from their involvement in the Children's book project, not only resulting in the creation of *Sea Secrets* but also in the construction of new relationships with scientific experts and education specialists from a variety of places. For example, the Point Reyes Bird Observatory, NOAA's National Marine Fisheries, Scripps Institution of Oceanography, Cascadia Research, and Polar Ocean Research Group are to name a few but we are not excluding those new relationships with other professionals such as educators, artists, illustrators, publishers and editors. All of these people helped us to gather and create materials for the book, align photographs with text, generate supporting publications and collect various other materials that we hope will help us extend these relationships and broaden the book's appeal upon its publication in September, 2008.

The book project also allowed us to benefit from the Schoolyard's First Book Fund. This past April we were the recipients of an award which is allowing us to be able to donate more books to schools, tap into informal educational facilities like aquariums, libraries and research related book stores, as well as educational programs like those at Ocean Institute, one of CCE's main outreach partners. The funding has definitely afforded us the ability to broaden the impact that outreach was trying to generate.

CCE Education and Outreach program also launched its outreach website this past February <http://cce.lternet.edu/outreach/> increasing their exposure and building a platform for their outreach program to grow. This website is allowing us to generate interest in the Research Experience for Undergraduates (REU). As the program grows the outreach website will feature each undergraduate's work and continue to expose the opportunities available. Currently we are interviewing candidates for three new positions in the summer of 2008 <http://cce.lternet.edu/outreach/opportunities/reu.php>. Additionally, we will be building our Research Experience for Teachers (RET) program through the participation from a local teacher who will be working on an elaborating our Chlorophyll Temperature Time Series Project http://cce.lternet.edu/outreach/projects/chlorophyll_project/. We started this partnership between Ocean Institute (OI) and the California Current ecosystem LTER back in January of 2006. Presently, OI has logged more than 129 distinct events during numerous two-hour cruises. As a result nearly 1200 students have been active participants in ongoing, large-scaled scientific investigations at sea.

Harvard Forest, (HFR), submitted by Pam Snow, 5/11/09:

Overview

With funding from NSF's sLTER program and a private local Foundation, we were able to involve over 60 classrooms in 35 Massachusetts' public schools and 7 private schools in hands-on schoolyard based field research. sLTER support at the 24 K level in 2009-10 will allow HF both to continue to reach out to over 1,500 students in existing K-12 partner school and our existing collaborators, while increasing our capacity to process and post data for this growing program

Highlights 2008-09

Schoolyard/RET Teacher Awarded by New England Env. Ed. Assoc.: Katherine Bennett was awarded the Formal Educator award from the New England Env. Education Association (NEEEA).

See LTER Spring Newsletter for recent article:

<http://www.lternet.edu/news/Article225.html>

and New England Env. Ed. Assoc. website at :

<http://www.neeea.org/awardwin.html>

Teacher Training and workshops

Harvard Forest's Schoolyard Ecology program added an additional teacher workshop and published an online Graphing Manual for teachers this year.

Link to HF Graphing Manual

<http://harvardforest.fas.harvard.edu/museum/data/k12/data-analysis.html>

Site scientists, Drs. Colburn, Orwig, O'Keefe, and Boose provided significant support to sLTER program including participation in 4 teacher training workshops, program planning, and review of program materials.

See a slide show of last year's HF schoolyard program at:

<http://harvardforest.fas.harvard.edu/museum/data/k12/Harvard%20LTER%20Schoolyard%202007-2008.pdf>

We are planning a summer Inst. on Aug. 10, 2009-see our flyers at:

<http://harvardforest.fas.harvard.edu/education/k-12.html>

REU program

We have an active and extensive REU program that runs every summer as a residential program here at HF. For more info on that program see:

<http://harvardforest.fas.harvard.edu/education/reu/reu.html>

RET program

Teacher Kate Bennett(award winner noted above) works with Ecologist Aaron Ellison for field research related to ants/pitcher plants/bog community.

Bennett, K. T., and A. M. Ellison. 2009. Nectar, not colour, may lure insects to their death. *Biology Letters* (in press). DOI: 10.1098/rsbl.2009.0161.

Hubbard Brook, (HBR), submitted by Jackie Wilson, 5/4/09:

Education and Outreach

Education and outreach efforts at Hubbard Brook come from both on-site USFS employees and the Hubbard Brook Research Foundation (HBRF). HBRF launched its Environmental Literacy Program (ELP) to bring the lessons of Hubbard Brook research to teachers, students and the public. Workshops for teachers were held at schools and conferences around the region. HBRF and its partners at Plymouth State University (PSU) and the Smithsonian Migratory Bird Program piloted a new project that pairs classrooms in NH and Nicaragua so that students better understand the habitats and cultures of the lands the birds visit during their annual travels. Building on this work, new interactive teaching guides on acid rain and migratory birds are being developed and tested for broad distribution. Another ELP event in 2008 convened an Environmental Literacy Summit at Hubbard Brook to discuss how strong partnerships could be forged among Forest Service and other scientists, NGOs specializing in environmental education, and local schools. The summit's keynote address was given by Michael Rains, Director of the Forest Service's Northern Research Station.

In addition, HB will host its second Research Experience for Undergraduates (REU) program this summer, in coordination with its partners: PSU, USFS and HB scientists who serve as mentors to the students. The program emphasizes the societal relevance of ecology and ecosystem science through field studies and outreach projects.

Exploring Acid Rain

In an effort to extend the reach of its successful Science Links products, HBRF produced a curriculum based on its acid rain project. *Exploring Acid Rain* is a guide to acid rain science for secondary school teachers, supported by training sessions and outreach activities. HBRF unveiled the guide in the fall of 2007 at a workshop at the North Country Professional Development Day (sponsored by North Country Education Services) in Whitefield, NH. Workshops for secondary teachers were also held at Plymouth State University, the Maine Environmental Education Association Conference and the Wellborn Ecology Conference. Pre- and post-workshop surveys administered to workshop participants demonstrated a significant increase in acid rain science comprehension after the workshops. The *Exploring Acid Rain* teachers' guide is in press.

New initiatives

Migratory Bird Teaching Guide, in progress

Jornada Basin (JRN), submitted by Stephanie Bestelmeyer, 5/11/09:

1) In the summer of 2008, Jornada Basin LTER education staff ran a two-week, advanced ecology workshop for 11 teachers from southern New Mexico. The workshop was coordinated with teacher workshops taking place the same summer at the H.J. Andrews LTER, the Shortgrass Steppe LTER, and the Luquillo LTER, and it was funded primarily from an NSF EHR grant to Marion Dresner. During the workshop, teachers worked with LTER scientists and formed qualitative conceptual models to help them see direct and indirect interactions between components in the transition between grassland and shrubland. Teachers also completed their own full research projects, culminating in a poster session on the last day of the workshop. Teachers at the Jornada Basin LTER and at one other site showed remarkable increases in their understanding of ecological concepts. A paper on these results has been submitted to the Journal of Research in Science Teaching.

2) From January through May 2008, ten teachers and more than 1,000 students participated in the Real World - Real Science Project, run by Jornada Basin LTER staff. The project was funded with Schoolyard LTER supplement funds and through a grant to the Asombro Institute for Science Education (a Jornada Basin Schoolyard LTER collaborator) from the EPA's Environmental Education grant program. The Real World - Real Science Project helps middle school students learn about environmental science concepts and the scientific process through hands-on experience with real science. The project includes: (1) a one-day workshop to introduce teachers to the project, (2) pre-field trip activities to prepare students, (3) a full-day field trip for all students, and (4) post-field trip classroom programs run by Asombro Institute staff members that allow students to continue their data collection and analysis in their schoolyard. This was the second year of the program. A key addition this year was the creation of a model on global climate change. We installed rainout shelters modelled after shelters being used by LTER scientists and had students collect data on soil moisture, vegetation cover, and vegetation growth under the shelters and on control plots.

3) In late summer and early fall 2009, Jornada Basin LTER staff members will be running a one-day teacher workshop for elementary school teachers to learn about the 35 hands-on inquiry based activities that are part of our Schoolyard Desert Discovery Project. We will also host a public education event in October 2009 for community members in southern New Mexico and western Texas.

Kellogg Biological Station (KBS), submitted by Robin Tinghitella, 5/12/09:

1) Education & Outreach efforts for your site

- a. At KBS, we have an ongoing, highly successful K-12 Partnership. Our program serves >80 teachers from 11 rural school districts in SW Michigan. We are supported by a schoolyard LTER supplement, an NSF funded GK-12 grant, and more recently a Math and Science Partnership grant (described below). Over the last year we have hosted four school year professional development workshops and a week-long Summer Science Institute. Each was attended by >45 area K-12 teachers. Topics included ‘Evolution in Action’, ‘Human Impacts on Wildlife’, ‘Winter Ecology’, and ‘KBS Science for Your Classroom’.
- b. We have worked to pass our project findings on to broad audiences via talks and posters at meetings. These are summarized in the table below.

Meeting	Title	Authors
Ecological Society of America	Ecological Literacy in the K-12 Classrooms of Rural Michigan	Wilke, B., and Smith, S.
Ecological Society of America	The Missing Link between Structure and Function in Biodiversity Education	Wilke, B., Anderson, C.W., and Hartley, L.
Ecological Society of America	Why do students have so much trouble tracing matter through ecological processes and systems?	Hartley, L., Anderson, C.W., and Wilke, B.
NSF GK-12 National Meeting	Bringing Fellows’ Research to K-12 Classrooms through the Summer Institute and School-year Workshops	Tinghitella, R., Getty, T., Syswerda, S., and Erwin, S.
KBS ASM	Pathways to Ecological Literacy: A Math Science Partnership at W.K. Kellogg Biological Station	Tinghitella, R.M., Wilke, B., Schramm, J., and Anderson, C.W.

2) Schoolyard LTER efforts

a. Greenhouse and Garden Plots at Martin Public Schools

The GK-12 fellow-teacher team at Martin Public Schools is building an approximately 40 foot long hoop greenhouse in the school courtyard. Their plans also include clearing school land for garden beds and planting the beds this summer. The schoolyard garden will include plots for perennial grain crops allowing students to participate in ongoing field testing of alternative crops in collaboration with MSU for years to come. Parents of Martin students and community members have been invited to participate in growing vegetables on garden beds, which will raise community awareness of sustainable agriculture practices and help foster community involvement in the school.

b. Schoolyard Ecology Plot at Gull Lake Community Schools

The GK-12 fellow-teacher team working at Gull Lake Community Schools has created a 2 acre outdoor ecology study area on their school grounds. The district received a grant from the Gull Lake Association to support the outdoor classroom. One acre of the space is being planted

as a native prairie garden and GK-12 fellow Anne Royer and district teachers are collaborating to develop curriculum for each grade level that is tied to the outdoor classroom to ensure the space will be used for years to come.

c. **Schoolyard Ecology Plot at Olivet Community Schools**

The GK-12 fellow-teacher team working at Olivet Community Schools is creating a series of areas of outdoor ecology study areas on their school grounds. The partner teachers received a \$2500 Captain Planet grant to install this outdoor classroom. Each grade level will have two plots to conduct ecological research. Areas include pollinator gardens, rain gardens, and native prairie.

3) Cross Site Collaborations

KBS is one of four LTER sites participating in a recently funded Math and Science Partnership grant titled “Culturally relevant ecology, learning progressions and environmental literacy”. Research efforts include developing assessments of environmental literacy in three areas: carbon, water, and biodiversity. At KBS, the MSP brings together Michigan State University faculty, post-docs, graduate students, and local K-12 teachers to develop learning progressions that bridge the divide between students’ informal worldviews and principle-based scientific thinking and to integrate this research into ongoing professional development activities for K-12 teachers.

4) Publications or media representation

a. **News Articles**

The Kalamazoo Hometown Gazette published two news articles highlighting the work of GK-12 fellow Jean Johnson in Plainwell Community Schools. Johnson coordinated a Science Night in Plainwell Schools that attracted more than 500 visitors (area students, parents, and community members) and featured demonstrations, talks, and booths on such topics as alternative energy, solar cars, volcano eruptions, live animals from a local zoo, and local organic farms. Students from all grade levels in the Plainwell district proudly displayed their science research.

b. **Science Night and Community Involvement in K-12 Activities**

The GK-12 fellow-teacher team at Plainwell Community Schools planned and executed a highly successful district-wide Science Night, for the second year in a row, to emphasize science happening locally and encourage the community to engage in that science. The event included displays and talks by visitors from local universities, farms, zoos, and community organizations, as well as science projects conducted by K-12 students at all grade levels. Over 500 community members attended the event - double the number attending in 2008. Plans are already in place to continue Science Night in 2010 and several other districts participating in our GK-12 program have expressed an interest in planning similar events.

c. **Presentations to the School Board**

GK-12 Fellow Sara Syswerda and Partner Teacher Sandy Erwin presented their work in the Harper Creek Community Schools to members of the Harper Creek School Board on 3/23/2009. They highlighted recent success with a long-term experiment in the high school on phytoremediation that uses "Living Machines" to mimic a wetland habitat. Students plan to present their findings to local media and the EPA.

Konza Prairie (KNZ), submitted by Valerie Wright, 5/12/09:

The Konza Prairie Schoolyard LTER (SLTER) program begins its eleventh year as an ecological science education program built around the Konza Prairie LTER and targeting K-12 teachers and their students. This program is directed by the Konza Environmental Education Program Director (Dr. Valerie Wright) with input from Konza LTER PIs and Kansas K-12 educators. The Konza Prairie SLTER program educates students about ecology and global change, with emphasis on regional grasslands, by engaging students and teachers in realistic and relevant science-based activities focused on long-term data collection at our LTER site. These activities were designed to give students an understanding of ecology and to provide them the opportunity to collect and interpret their own data, which can be integrated with our long-term student-collected SLTER databases via the Internet (see <http://keep.konza.ksu.edu>).

In addition to site-based activities, the Konza Prairie SLTER program has grown to include students and teachers from schools across Kansas. As SLTER activities at Konza Prairie approached maximum capacity for the site, we sought funding (EdEn 2004 & 2005) to expand our SLTER program to school districts beyond our local area with an SLTER program called Prairies Across Kansas (PAK). The teachers are trained at Konza Prairie in a workshop similar to those offered to local teachers, and their students participate in data collection at native prairie sites near their home schools. As non-local teachers are recruited for the workshop, we also help them locate appropriate native prairie sites near their schools. This allows direct comparison of ecological processes, and change over time, in different regional prairie types (tall-, mixed- and short-grass prairies) through our SLTER databases, because all teachers in the program follow the same protocols. Targeted school districts, especially in the mixed and shortgrass regions of Kansas receive printed information and an invitation for teachers to join the project. The website materials are promoted among all Kansas teachers through announcements and presentations at conferences and state-wide meetings each year.

To date, we have trained 64 local teachers, 37 who currently participate annually by bringing classes to Konza Prairie. Another 34 are teaching students at regionally-distributed "satellite" native prairie sites where long-term data is also being collected. Some of these teachers participate with their classes several years in a row and others return as their curriculum allows. Twelve of these teachers are from a nearby school district, which has 55% economically disadvantaged students. The administrators of this district have been enthusiastic supporters of our program. Other teachers are from rural Kansas districts with limited science resources and high immigrant populations. In 2008, 1160 students from 20 schools experienced 45 hands-on activities at Konza Prairie. The Prairies Across Kansas program impacted an additional 430 students across the state for a total of 1590 students. These hands-on activities were designed with input from researchers and local elementary, middle and high school teachers. Individual class data can be accessed along with the long-term databases through the Internet and manipulated in the classroom in ways that give students a better understanding of the process of science. To date we have reached > 8000 students from third grade through high school with SLTER activities at Konza Prairie and another 1750 across the state through PAK. In 2009, we anticipate involving ~1000 additional students in activities at Konza, with a similar number from around the state participating in PAK activities, substantially increasing the impact of our site-based SLTER program in Kansas. One of our high school teachers and her students carried out a special floristic survey of Wabaunsee County looking at changes in diversity since the early work by Maus in 1927.

In 2008 we again updated and enhanced our web site and improved navigation. The Docent's Notebook, a special section for our volunteers working with SLTER, now contains training materials, quizzes, resources and calendars. See the KEEP web site at <http://keep.konza.ksu.edu> (note the new url).

KEEP, the associated SLTER program, and the recent addition of Prairies Across Kansas educate local and statewide teachers and their students about the unique attributes of prairie ecosystems and important

global changes which impact the central US grasslands. By sharing knowledge generated through long-term data collection at the Konza Prairie LTER site and adding information from student data collections, we give teachers tools for connecting children to these ecosystems.

LUQUILLO LTER ANNUAL REPORT 2006-2007

Submitted by Steven McGee, April 3, 2008

To cover period September 2006 - August 2007 (first year of Luquillo LTER 4)

Schoolyard Institute

From November 17-20, 2006, LUQ Schoolyard program hosted a Luquillo Schoolyard Institute for 30 high school students and 4 high school teachers from three Schoolyard schools. The institute took place at the El Verde field station. The students were trained on two protocols – tree census and limnology. Researchers from Luquillo worked with the students to identify tree species and determine dbh for all the trees in a set plot. For the limnology protocol, students examined a number of hydrological and water quality characteristics of a cross section of a stream near the El Verde station. Students also did identification of macroinvertebrates found in the stream. Student teams developed presentations of their results for researchers at Luquillo. In addition to the hands on activities, the students heard lectures from renowned scientists such as Dr. Ariel Lugo and Dr. Frank Wadsworth.

Schoolyard GPS Activity

As part of the Schoolyard Institute, the students participated in a multimedia GPS activity. Each student was lent a handheld GPS device and a digital camera. They received training on the devices and were given opportunities to practice using the devices. The students took the devices with them to their school and took pictures around their school and around their neighborhood. For each picture they recorded the GPS location. The Learning Partnership is currently processing the images and GPS locations on to a GIS map. This will serve as baseline data for ongoing schoolyard protocol to examine land use changes using GIS software.

Computer Learning Center GPS Activity

On March 27 2007 teams of students set out on a learning experience rich in knowledge, community service, technology and fun in Culebra, Puerto Rico. This initiative resulted from students' concern about their beaches. The students of the Antonio R. Barceló High School, wanted to do a "cleanup project" on Flamenco Beach. Fifty nine students participated in what was a cultural and environmental awareness encounter. These twenty one boys and twenty seven girls were involved in activities using technology devices which helped them get information that could be used for their classroom assignments in the areas of Science, Math and Social Studies. We were also assisted by thirteen college students who volunteered their time in the cleanup.

The Global Positioning System (GPS) was one of the devices used by the students in the cleanup activity. GPS has become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, and scientific uses. GPS also provides a precise time reference used in many applications including scientific study of earthquakes, and synchronization of telecommunications. This valuable information acquired and used at the beach cleanup activity enabled students to expand their knowledge and become familiar with the use of new technologies. Students took pictures of the sites for which

they were measuring with the GPS devices. These pictures were uploaded to a web mapping site called Panoramio. Finally, the students participated in a treasure hunt activity using the GPS units.

RET Program

Through an application process, Zamaria Rocio, a middle school teacher from San Diego, was accepted into the Luquillo RET program as a representative of the Journey to El Yunque project. From July 29 to Aug 27, she is participating in a variety of research activities. She is gaining exposure to a wide variety of Luquillo research. Elliot Lopez has also been accepted as an RET teacher from the Schoolyard LTER program. He and Zamaria will be collaborating on a pitfall trap protocol to be completed in Florida, PR and San Diego.

McMurdo Dry Valleys (MCM), submitted by Carol Landis, 5/3/08:

The Education and Public Outreach efforts of the McMurdo Dry Valleys LTER have been primarily focused on REU and graduate experiences, the development and enhancement of ancillary materials to accompany *The Lost Seal* book and the field experiences of the research teams via the website and associated blogs.

The Lost Seal is highlighted on the official IPY website:
http://www.ipy.org/index.php?/ipy/detail/the_lost_seal1/

A companion CD was developed for the second printing of the book, which is part of the LTER Children's Book Series. The companion CD incorporates some of the information and graphics designed for the 2007 CD-set about research in the McMurdo Dry Valleys.

In January, 2008, the NSF Site Review team recognized the excellence of the MCM website. Its search features offer direct interaction with the people, pictures, and data associated with study site. Blogs were an important means of expanding our outreach, since that is the only quick form of communication from Antarctica. Chris Gardner (information manager) and Kathy Welch (lead geochemist) offered their insights and experiences via the blog-osphere. Another popular blog by Chris Kannen, an artist with the NSF Artists and Writers program, enriched the MCM website this field season as well. Some of the blogs were associated with specific teachers and classrooms back in the U.S.A.

The SLTER river study information was also organized and made searchable in the past year. The SLTER link now features a zoom-able Google Earth map with information about each of the sampling sites for the Olentangy River project.

This year the Lakes Team stayed in the field through the end of March, observing the Taylor Valley (Antarctica) ecosystem under diminishing light and colder temperatures as autumn slipped into the polar night of winter. This brought additional attention from the International Polar Year research community, including a March 12th web seminar, featuring a "live broadcast" with Dr. John Prisco (speaking from McMurdo Station) and Dr. Jill Mikucki and Dr. Jeb Barrett and also with Mike Lizotte and the students living and working at the Lake Bonney field camp. The web seminar was part of the *Live from IPY* event, sponsored by the Arctic Research Consortium of the United States (ARCUS) and is archived at:
<http://www.polartrec.com/live-from-ipy/archive>

Palmer Station (PAL), submitted by Beth Simmons, 5/10/09:



Palmer Station, LTER Education and Outreach (E/O) program continues to leverage the innate fascination people have with the southern ocean with ways to encourage the general public to connect with its science (Simmons and Conners, 2008 <http://databits.lternet.edu/node/36>). During the most recent cruise

scientists actively participated in posting content surrounding their collaborative studies to a new blog site (<http://pal.lternet.edu/outreach/blogs/cruise/>). Here they answered questions from participants in classrooms and helped us make polar ocean connections to explore how the research in Antarctica affects our lives. Building on this concept, this year's 2009/2010 Palmer cruise will bring along the Education and Outreach coordinator and elaborate on the interconnectedness between our lives and the pelagic ocean. Short audio and video short stories are being coordinated around inquiry-based questions underscoring the science aboard the research vessel and also at Palmer Station. Upon return in February 2010, these short series of investigations will focus on recent discoveries and scientific issues facing the Earth's ecosystem today. They are being framed for submission for the [Ocean Today Kiosks](#) at the new Sant Ocean Hall in the Natural History Museum in Washington D.C.

Palmer's Education and Outreach program continues to also strengthen its cross-site partnership with the other pelagic research site CCE LTER surrounding the release of the children's book, *SeaSecrets: Tiny Clues to a Big Mystery*. This IPY project is now in second phase of its proposal and developing an instructional guide accompany the book. This collection of materials will elaborate on the relevant topics covered in the book and expand its usefulness. The children's book is a part of the Polar Books Club <http://www.unep.org/publications/polarbooks/> an international project contributing to ocean literacy and polar science.



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Plum Island Ecosystem, submitted by Liz Duff, 5/5/09:

LTER Schoolyard: This program has been highly successful as a result of collaboration with Mass Audubon and the Governor's Academy, and additional NSF funds (EdEn and Expanded Schoolyard supplements.) Teachers at the Governor's Academy, especially Susan Olezsko, implement science modules for high school students using student monitoring of ribbed mussels and intertidal marsh plant distribution. The approach and methods were developed in conjunction with LTER scientists and the data are included in the PIE database and website. (<http://ecosystems.mbl.edu/pie/data/student/schlyard.thm>). Mass Audubon has implemented, with partial support from the LTER, a 5th–12th grade science education program "The Salt Marsh Science Project" (<http://www.massaudubon.org/saltmarsh>). This program focuses on the invasion of *Phragmites australis* in salt marshes. Under the guidance of Mass Audubon, students monitor transects to analyze vegetation changes, and measure porewater salinities in relationship to the vegetation. Students monitor the spread of invasive species including the common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*) and study fish communities. Students' research has paralleled that of LTER and collaborating scientists. SMS serves an average of 1000+ students per year and 40 teachers from 11 schools per year.

Mass Audubon's Education Coordinator and LTER education Representative, Elizabeth Duff, trains local teachers in the field protocols, classroom lessons, and data entry and analysis procedures. Duff works in partnership with these teachers, implementing the SMS program. On field trips, students collect real data of interest to scientists. Scientists assist with data analysis, interpretation and feedback. An annual conference, allows participants to share their findings, and to learn from each other. Student data is shared via the SMS web site.

Reaching a Broader Community: In addition to maintaining this highly successful Schoolyard program, Duff has helped forge links between teachers and PIE-LTER research and local school curriculum. Since 2004, 20 teachers have attended the PIE-LTER All Scientists Meeting (ASM). At ASM workshops teachers have connected with PIE researchers - brainstorming ways research connects to the Massachusetts Science Frameworks, and discussing ways that LTER scientists can help support teaching goals. To help teachers better understand the scientific presentations and to help researchers better communicate with a lay audience (i.e., drop the jargon), we developed a glossary of scientific terms, and developed and presented a PowerPoint slideshow with suggestions for scientists presenting to non-scientists. From the brainstorming sessions, we identified several PIE-LTER research areas best suited for connecting to schoolyard and local educational programs. We developed and delivered 3 courses on climate change and coastal communities, with 4 PIE scientists presenting LTER research to a total of 60 teachers. Five LTER scientists (including students) shared their research on striped bass in an "Ocean Science Education Institute" for 50 youth and adults. These scientists also assisted a team of educators in developing and piloting curriculum based on LTER bass research. The Ocean Science Institute is a component of the Gulf of Maine Institute, which receives additional support from the Massachusetts Environmental Trust, NSF via the Center for Ocean Science Educational Excellence (COSEE), Mass Audubon and GE via the Corporate Wetlands Restoration Partnership. Duff has worked to develop a partnership with the Harvard Forest LTER by enrolling teachers from the PIE region in the HFR Schoolyard study of "Bud's Leaves and Global Warming." To help the greater community learn more about LTER science we have

written and published articles about LTER research in Mass Audubon's "Connections" magazine.

It is particularly challenging to maintain a strong Schoolyard Program given the vagaries and fluctuations in funding. During years of "extra" support the SMS program was able to serve a greater proportion of urban students, including those from the lower income Dorchester and East Boston neighborhoods. While during baseline funding, the SMS "reach" drops from about 1500 students to about 1000.

Undergraduates and REU's: Each summer the LTER and associated projects support 2 or more students in the NSF Research Experience for Undergraduates program. Each student works closely with a principal investigator and either post-doc or research assistant. Students typically help out with the various field activities that are occurring at Plum Island (thereby gaining a broad research experience), plus they conduct their own independent research projects. Each student is required to prepare a poster and short manuscript describing their research project. Students typically participate in the Marine Biological Laboratory Annual Scientific Meeting and present their research reports or they present their reports at the Audubon facility at Joppa Flats in Newburyport. See Appendix I for list of students and project titles.

MBL offers an undergraduate Semester in Ecosystems Science (full 15 credits) annually. Over the past 4 years, PIE investigators have supervised numerous students with independent projects that are related to our aquatic research at PIE (see Appendix I).

Over the past several years, 81 undergraduates have been affiliated with the PIE LTER

Graduate Students, Post-docs and Research Interns: Perhaps our most effective means of education is through graduate student training, post-doctoral fellowships and research assistant internships. Over the past 3 years PIE has supported 35 graduate students, 27 of whom were directly affiliated with PIE. We have supported 8 Post-docs at the Marine Biological Laboratory and collaborated with 8 others from MIT. We typically offer 2 research assistant fellowships (RAF) to recent college graduates prior to beginning graduate school. In the past several years we have supported 8 RAFs, most of whom have gone on to graduate school in ECOSYSTEM science (see appendix I).

Science Writers: Each summer the Marine Biological Laboratory supports a course for professional science writers (TV, newspaper, journal, etc). These people play a critical role in our society, as they try to inform the public of the excitement and concepts that scientists work on. An informed public is the cornerstone of a democratic society. Public support for science depends on effective channels of communication between science and the general public. Over the past several years, many of these writers have been exposed to ecosystem research looking at N loading from land to coastal systems. This past summer a writer initiated a story on the "low water" situation in the Ipswich River.

Outreach

Our goal is to communicate our findings to individuals, organizations (NGOs), and government agencies that will use our research results to better manage local and regional coastal resources. We support four types of activities: communicating what we do, advising NGOs and government agencies on issues of concern to them, collaborating with NGOs and government agencies on environmental research, and applying our scientific knowledge through public service. We have established communications and partnerships on four major issues: intertidal marshes, coastal

eutrophication, watershed resource management and fisheries (Table EO-1).

Our primary outreach effort is communicating with the public, NGOs, government agencies, and other scientists. We reach the public through a variety of mechanisms including talks (e.g., Deegan at the Newburyport and Ipswich Rotary Clubs), newsletters (e.g., *Earthkeepers* article on eutrophication), magazines (e.g., *MBL Catalyst* highlighted Hopkinson's involvement in promoting ecosystems services-based management), brochures (e.g., the PIE LTER brochure), and community-wide open houses (e.g., at our Marshview Field Station in Newbury, MA). In addition, we have developed 'Adopt-a-bass' and 'Adopt-a-herring' programs and web pages (<http://www.Ipswich-riverherring.com/index.html>) to engage the public in our research. To reach our scientific peers we communicate with journal publications (listed as an Appendix to this report) and presentations at national and international scientific society meetings.

We also seek opportunities to advise various NGO and government agencies on issues where we have developed knowledge resulting from LTER research. Wollheim and Hopkinson have attended numerous workshops sponsored by the Ipswich River Watershed Association dealing with low flow issues in the Ipswich River and we also serve on their Technical Advisory Council. Others of us have been involved in workshops with Mass CZM, Region 1 EPA, NMFS, and USFWS discussing issues such as marsh dieback, sea level rise, marsh invasives, and eutrophication. Jim Morris and Linda Deegan have advised US Senators and Representatives and their staffers (SC and Mass) on issues of sea level rise and coastal eutrophication. Morris has also discussed the ramifications of sea level rise on coastal systems through activities organized by the Heinz Center.

PIE LTER has established several research collaborations with several NGOs and government agencies. Mather has been working with several state and federal agencies as well as NGOs in studying striped bass and the recovery of river herring in the Plum Island system. Wollheim and Hopkinson have collaborated with the Ipswich River watershed association in monitoring river health. Several of us worked with a diverse group of NGO's and state and local agency people to develop a proposal to wisely manage growth in the Ipswich River watershed. Several of us have also helped Mass DEP and the PRNWR in restoring historically impounded salt marshes in the system. And several of us have also been working with NOAA and CZM in developing a digital elevation model and map of marsh plant species distribution through remote sensing (LIDAR and multispectral). Our annual 'All Scientists Meeting' has been an excellent way to get our information to our partner organizations and government agencies.

We use our scientific knowledge in providing several public services. Linda Deegan serves on the Falmouth Conservation Commission. Anne Giblin organized and spearheaded the construction of a "science-theme playground" in Falmouth. Jane Tucker serves on the Falmouth Coastal Resources Working Group. Several of us have advised students and served as judges for school science fairs (including Garritt, Tucker, Hopkinson, Giblin, Morris).

Finally, the PIE LTER has an extensive outreach arm through the activities of PI Robert Buchsbaum, who through the Audubon Society, interacts directly with the local and state management community. He is a member of the Great Marsh Salt Marsh Restoration Team, a committee organized by the Massachusetts Wetlands Restoration Program under the Massachusetts Office of Coastal Zone Management. Participants include staff from a variety of state and federal agencies: MA CZM, NOAA, USFWS (Parker River National Wildlife Refuge – PRNWR)), the EPA's Massachusetts Bays Program, Wells National Estuarine Research Reserve,

other nonprofits, and local governments. He provides updates to this committee about LTER activities and opportunities for collaboration. He is also an active member of the Gulf of Maine Council on the Marine Environment Habitat Monitoring Subcommittee. This committee has focused on monitoring salt marsh in the Gulf of Maine region. Buchsbaum has brought to the attention of this committee the work at the LTER, our network of SET tables, our marsh vegetation transect work, and our regular monitoring of water column. He has been on the organizing committee of two symposia examining the extent and cause of this phenomenon in New England. PIE has not experienced vegetation dieback to any unusual extent, but it is instructive to those in other parts of New England to relate our observations to theirs. He has also consulted with staff from the Massachusetts Wetlands Restoration Program about salt marsh haying, worked with the PRNWR and 8 Towns and the Bay Organization to develop a proposal to study the spread of *Phragmites australis* and discussed mercury contamination in salt marsh sparrows at the PRNWR and advised the Refuge on experimental design.

SANTA BARBARA COASTAL SLTER

SBC's Schoolyard LTER (SLTER) program is organized around a theme of watershed ecology. This approach allows for an integrated program that includes K-12 students, K-12 teachers, undergraduate and graduate students. In 2008 we are focusing on developing long-term connections with local middle schools in Santa Barbara County through a partnership with UCSB's Office of Academic Preparation and Education Outreach (APEO). The goal of APEO is to build college-going communities that improve student learning, increase college-going rates, and provide equal access to higher education for California's diverse students. In an effort to forge long-term connections with local schools, primarily those identified as underserved or low-achieving, the office has staff coordinators who work directly on the school campuses with teachers, administrators and students. With the infrastructural support of APEO, the SBC SLTER program aims to engage middle school students and teachers in local schools through the academic year and summers, and throughout their secondary school education.

Program Format: We are using the successes we had with our LACC summer program (2004-2007) to guide development of our Santa Barbara-based program. First, we continue to work with our undergraduate interns in a rigorous and pedagogically sound program of training in marine science and science pedagogy. These interns engage directly with middle school students as teachers and role models. Second, we continue to develop and adapt marine science lesson plans that engage students with learning about their local environment. These lesson plans incorporate ongoing SBC LTER research and include working with data generated by monitoring and experiments. The program is developed to build student's skills in scientific inquiry through a series of activities that move from structured or guided investigation to open-ended experimentation. Third, our program includes a combination of school-based activities, field trips, and an on-campus residential experience that immerses students in the environment of a college campus.

The SBC SLTER program is working with two Santa Barbara County middle schools: Santa Barbara Junior High School and Goleta Valley Junior High School. Both schools serve a diverse population of students with a large population of students on free or reduced lunch programs.

Students selected by APEO coordinators to participate in their education programs comprise the population of students eligible to participate in the SBC SLTER program. In order for students and their parents to become acquainted with the UCSB campus they are invited to an introductory day-long visit to the campus. An estimated 40 students and their parents or guardians are invited to a Saturday orientation to UC Santa Barbara during which they tour the campus, participate in a panel discussion lead by undergraduate students, and engage in a series of hands-on marine biology lessons. Then, beginning in the fall semester, SBC SLTER undergraduate interns conduct biweekly activities for students in an after school program format. As mentioned previously, these activities guide students through marine science activities aimed at improving science literacy and inquiry skills. School year activities also include a field trip to the UCSB aquarium, an SBC LTER research site, and on a Floating Lab trip into the Santa Barbara Channel. Finally, students are invited to participate in a weeklong residential program on the UCSB campus. These students are engaged in SBC LTER research-based learning activities, conduct field research, and explore the possibility of attending a 4-year college. Follow-up with students and their families includes college counseling and application advice as well as support of Spanish language classes for parents on post-secondary education in California, supported primarily through APEO.

An additional benefit expected in future years is the long-term connection we will maintain

with participating students both through APEO support (they work with these same students throughout their high school years) and through continued engagement with students as they move into high school. We envision a program that supports interested students with science fair projects, summer research opportunities, and mentoring opportunities with our middle school program.

Research Experience & Education Facility (REEF)

The Santa Barbara Coastal (SBC) LTER outreach, education and training programs benefit from a close association with the University of California at Santa Barbara's Research Experience & Education Facility, better known as the REEF, an interactive aquarium facility. The REEF is equipped with state-of-the-art, aquaria and touch tanks, ranging from 2 to 2,000 gallons. The REEF also utilizes a high-tech life support system for the Research Tank, which highlights current, on-going research at UCSB and the Marine Science Institute, including SBC-LTER research.

One of the joint goals of the SBC LTER and the REEF program is to provide UCSB undergraduates, majoring in Aquatic Biology, with a solid foundation in temperate marine ecology and research. The REEF training provides them with the basis for communicating this knowledge in an educational format. To that end, the REEF develops its curriculum around a number of research programs at UCSB. The SBC LTER is a significant contributor to this endeavor. Support from the SBC LTER schoolyard program has allowed the REEF to obtain teaching supplies and equipment for curriculum and teacher professional development, as well as provide stipends for teachers, undergraduate and graduate internships. The REEF also utilizes graduate students from the SBC LTER to train REEF undergraduate staff, which, in turn, enhances their training as laboratory and field assistants and research divers for SBC LTER research.

The REEF program has been busy during 2008, between outreach visits to schools, community events and on-campus programs, the REEF provided marine science and environmental education to over thousands of children and adults. This includes hosting educational visits from primary and secondary schools from King City in Monterey Co., to Sacramento and San Diego. The REEF also serves as a marine laboratory for many colleges including Cal Lutheran Thousand Oaks, CSU Channel Islands, and UCSB. At UCSB, the REEF serves as an interdisciplinary adjunct laboratory for undergraduate courses including: Geology 4 (Intro to Oceanography), EEMB 3 (Intro Biology), EEMB 106 (Biology of Fishes), Writing 2 and Writing 109 ST. This year the REEF had over 3,000 on-campus visitors. The REEF also serves UCSB outreach and summer programs, including the SBC-LTER Schoolyard Program.

OceansAlive!

SBC LTER students participate in the *OceansAlive!* program of the UCSB Marine Science Institute (MSI), a collaboration with a number of UCSB departments and research programs to provide 125 local junior high, middle school and high school students with UCSB undergraduate and graduate student mentors for science fair projects. These secondary school students then compete at the local level with the opportunity to progress to the state and national levels.

Other SBC Outreach Activities

Direct outreach to the public is an active area for many SBC investigators and students. Al Leydecker, a SBC post doc, assists and helps direct stream and river monitoring, education and sampling programs for several community environmental organizations including Santa Barbara

Channel Keeper, Isla Vista Surf Rider and Ventura Surf Rider and the Friends of the Santa Clara River. Jenny Dugan gave a K-12 teacher workshop on the ecology of sandy beaches in San Francisco in May 2008.

SBC investigators also participated in several public groups to provide education and a scientific perspective including the Santa Barbara Community Environmental Council, Friends of the Santa Clara River, Santa Barbara Creeks Council and the UCSB Shoreline Preservation Fund.

Virginia Coastal (VCR), submitted by Art Schwarzschild, 4/2/08:

The Virginia Coast Reserve Long Term Ecological Research program (VCR-LTER) is located on the rural Eastern Shore of Virginia at the southern end of the Delmarva Peninsula. The VCR includes a chain of barrier islands, coastal lagoons, tidal flats, salt marshes and coastal uplands and is one of the last and largest undeveloped areas along the east and gulf coasts of the United States. In recent years property values have increased as the area has been discovered as a destination for retirement and vacation homes. This rise in property values has resulted in a reduction in state support of public education, making the outreach and education resources made available through the School Yard LTER program even more valuable to the local community.

For the past 7 years the VCR SLTER program has sponsored an environmental science class at Northampton High School. In this class students learn about human and natural impacts on their local environments through routine sampling of water quality parameters at 26 sites throughout the VCR LTER. Two years ago VCR LTER staff assisted the Northampton High School science teachers in the development of a new Ecology course focused on local ecosystems and habitats. Last year we were able to significantly increase our outreach activities with three new programs by coupling SLTER supplemental grants with private donations and a grant from the Virginia Coastal Zone Management Program. First, we conducted a joint teacher training and curriculum development class for science teachers from both Northampton and Accomack counties. This class focused on environmental science issues in the VCR through lectures by several faculty members and guided field trips. The teachers who participated in this two-week summer course earned 3 graduate credits that could be applied to their recertification requirements. They also worked in groups, with support from VCR LTER staff to incorporate the information they were learning into new curriculum material for use in their classrooms. The second new program was the initiation of an internship program for high school students based on the successful NSF Research Experience for Undergraduates (REU program). This new program, Research Experience for High School Students (REHS), paired highly motivated high school students with graduate students and their advisors for 8 weeks during the summer. The REHS interns were expected to assist the graduate students in their research and to develop independent research projects of their own. At the end of the summer, the REHS interns presented their results to the group, and have also been given the opportunity to give their presentations to high school science classes, community groups, and at the VCR LTER All Scientist Meeting. The third new program was a monthly public seminar series focused on the wildlife, habitats, research and management issues of the VCR-LTER. To date, seminar topics have included: ongoing seagrass restoration efforts in the VCR LTER; factors influencing nesting success of local shorebird communities; ecology of sea turtles found in the VCR LTER; barrier island geomorphology and the impact of island migration on plant, animal and human populations; and current efforts to protect, manage and restore native vegetation to enhance habitat for migratory song birds. All three of these programs have increased public awareness of the research efforts being conducted at the VCR LTER while also helping to educate the local population on the impacts changing land use patterns, sea level rise and climate change can have on their local environment.