2010 Toyota TAPESTRY Large Grant Awardees

Environmental Science Education

Utica's Brownfields: Past, Present and Future
Pamela Allen
Staff: **Kimberly VanDuren**
Senator James H. Donovan Middle School
1701 Noyes Street
Utica, New York 13502
315-368-6541
pallen@uticaschools.org; kvanduren@uticaschools.org

This project proposes to increase our students' understanding of scientific inquiry by creating authentic learning experiences in environmental science in which students will become researchers and problem solvers while studying a real-life community problem. This study of local brownfields will incorporate all areas of STEM learning as students will study the history of these sites and incorporate science, technology, engineering and mathematics into their research and findings. In this school-wide project, over 400 students in grades 6-8 will be involved in researching and analyzing the effects of Utica's historical textile mills on various sites throughout the city. Students will determine the extent of the environmental impact on the Utica community.

Mississippi Investigates Caterpillars
John R. Banks
Velma Jackson High School
2000 Loring Road
Camden, Mississippi 39045
662-468-2508
jbanks@madison-schools.com; jbks@mac.com

In their own way all caterpillars are cute and all butterflies beautiful. Why not study them both to stimulate scientific curiosity and inquiry and to add to long-standing research on caterpillars and global warming? The Project Director's rural students will lead a network of public school students across a mostly urban school district in this ongoing research. Twenty-four teams of three students and one adult mentor will gather for a training event, be given collection supplies, and be sent forth to gather and rear out caterpillars on four different days throughout the school year. Throughout the project the students and mentors will journal with words, pictures and videos on the project wikipage (micproject.wikispaces.com). At the conclusion of the first year there will be a celebration banquet to give awards, to highlight project successes and to plan for the next year of the project.

Removal of the Invasive Species Imperata cylindrica
Angela Chapman
Staff: **Janet Gano, Chris Euverard, Linda Upchurch**
Lake Region High School
1995 Thunder Road, Eagle Lake, Florida 33839
702-799-5650
Angela.chapman@polk-fl.net; achapman@livebreathescience.com

Cogongrass (Imperata cylindrica) is an invasive and non-native weed throughout subtropical regions of the world. In central Florida, Cogongrass has invaded many regions including forests, reclaimed mined areas, roadsides, and natural ecosystems. Because of its tenuous and invasive nature, cogongrass has impeded the restoration of phosphate-mined land. A primary objective of this project is for students to
develop a plan for removal of cogon grass from Tenoroc Wildlife Management Area, a reclaimed phosphate-mind land. Students groups will work on different parts of the project toward this end. One student group will be responsible for the field work at Tenoroc: determining population density, vegetation analysis, collection of plants for laboratory experiments, and (later) treatment of cogongrass with potential allelopathic chemicals. This will require several trips through the school year. A second student group will use biochemical techniques (chromatography, electrophoresis) to identify candidates from whole plant extracts. A third students group will use computer based protein modeling and alignment programs to investigate properties and related proteins. A fourth student group will use
biotechnology to extract DNA, create a cDNA library and amplify potential allelopathic genes. Students will communicate their results through writing a scientific manuscript (in collaboration with their scientist mentor), a school based website, and science fair presentations.

Hydrogelling in the Desert
Maria Cieslak
Staff: **Francine Gollmer, Karen Johnson**
Gene Ward Elementary
1555 E. Hacienda Avenue
Las Vegas, Nevada 89119
702-799-5650
Mcjc123@aol.com; mcieslak@embarqmail.com

Sustainability, accountability, and stewardship are important concepts that must be taught to the future generations that live in the Mojave Desert. Through a series of action research conservation projects at our one and a half acre school garden, our students will develop some long term comparison studies of biodegradable super absorbent potassium based polymers. The hydrogels would act like a sponge, absorbing and retaining water and nutrients to be used by plants when they need it. Our hydrogel project offers our "at risk" students a unique opportunity to take a leadership role that has the potential to benefit desert communities.

Bioinspiration-Looking to nature to Meet Our Energy Needs
Troy Dassler
Aldo Leopold Elementary
2602 Post Road, Madison, Wisconsin 53713
608-204-2471; tdassler@madison.k12.wi.us; troydassler@yahoo.com

The goal of Microexplorers is to offer elementary-aged children the opportunity to explore how nature designs structures to inspire them to solve two of society's greatest challenges: energy production and efficiency. Explorers will examine the surface structures through images taken from digital optical microscopes and a Scanning Electron Microscope from the University of Wisconsin. Explorers will examine how nature creates color, cleans the surface of leaves and animals alike, and moves the tiny fly to the great whale. Explorers will use what they have learned from nature to create eco-friendly efficient alternative energy power generators. A windmill's design may be inspired by the fluke of a whale. Surfaces of solar panels can be coated with a super hydrophobic coating like that found on the surface of a lotus leaf. The ideas are only limited by the diversity of nature and the imagination and creativity of the explorers.

Classroom to Classroom Collaboration
Robin Dirksen
Staff: **Thomas Loughran, Jokondino Okema, Steve Silliman**
Lead-Deadwood High School
320 S. Main Street, Lead, South Dakota 57754
605-717-3899; robin.dirksen@k12.sd.us

This collaborative project incorporates the analysis of water quality data collected in the field by students in two countries- Uganda and the US. The data will be shared, mapped, and analyzed, using Web 2.0 technologies by students in both countries. The objective of the project is to develop science activities using collected data that can not only be used in the classroom to teach lab techniques, methods of data collection, and computational analysis; but may also be of potential use to the entities that monitor water quality, in our local community and in Gulu Province, Uganda. A principal motivation for the project arises from my personal experience as an educator that when the content of a course is made relevant to the learner, the level of engagement in the content increases. And hopefully, as a result of the immersion in real-world problems, and participation in the development of solutions to those problems, more US secondary students will choose to become science and technology majors in college, and choose related careers.

Jigsaw
Angie Dowling
Staff: **Dr. Terence Ahern**
Suncrest Middle School
360 Baldwin Street, Morgantown, West Virginia 26505
304-291-9335; adowling@access.k12.wv.us; adowlingsms@gmail.com

Jigsaw is a hands-on inquiry-based program that has students investigate real-world problems using appropriate skills from mathematics, science, engineering and computer programming. Students will develop a model of the dynamics of a local stream near their middle school. In order to accomplish this, the students will learn field-based collection techniques and how to use various probes to collect the data. Once they have collected the baseline data, the students will learn how to program a simulation of their model by incorporating the data into programming a computer-based model of the stream.

Changing Trends: Using Solar and Wind Energy to Increase Biodiversity
Jason Ersing
Staff: **Robert Sells**
Frontier Central Schools
2751 Amsdell Road
Hamburg, New York 14075
716-646-2207 x3229
jersing@frontier.wnyric.org

Our goal as educated environmentally concerned members of the global community is to recognize potentially harmful problems to the environment and then create innovative solutions to these problems. The continuation of decline in biodiversity along with the continued increase in activities that lead to global climate change has put strain on our ecosystems for years. Our students will utilize solar and wind energy in their efforts to operate a sustained fish hatchery. Our intensions are to decrease greenhouse gases such as carbon dioxide along with increasing fish populations. The students will then use biotelemetry equipment in order to tag and track the fish they have raised. Our students will be using GPS equipment to document fish substrate selections for later habitat restoration projects in those given areas. We will also be attending the Great Lakes Summit held this year at the University of Buffalo in order to discuss the logistics of our project with other students, teachers and environmental professionals.

Provo River Watershed Bat Project
Kelly Gallo
Soldier Hollow Charter School
2002 South Olympic Drive
Midway, Utah 84049
435-654-1347
TeachingGreen@yahoo.com; TeachingGreenGallo@gmail.com

The Utah Bat Conservation Plan outlined by the Utah Division of Wildlife Resources (DWR) states that “the biology and life history of most of the bat species in Utah are poorly and incompletely known, and this lack of knowledge impedes effective efforts to manage and to conserve their populations.” As bats are widely considered a bio indicator of ecosystem health, it is the goal of the Provo River Watershed Bat Project to fill some of the gaps in the current knowledge about bat populations and species in Utah through inquiry. Students in grades 4-8 will use real-world field survey techniques to investigate the following questions: "Where are bats roosting within the Provo River Watershed Bat Project?" "What species exist in the Project?" "What food sources exist for insectivorous bats in the Project?

Orange County Ocean White Seabass Restoration and Field Studies Project
Gregory Gardiner
Staff: **Nancy Caruso, Mark Drawbridge, Erica S. Gardiner**
Huntington Beach High School
1905 Main Street
Huntington Beach, California 92648
714-536-2514
ggardiner@hboilers.com; esgardiner@sbcglobal.net

The Orange County Ocean White Seabass Restoration Project (OCOWSRP) is a ground-breaking project that proposes to be the first of its kind to directly involve Huntington Beach High School students in sustainably raising white sea bass in the classroom for return to local waters. White seabass has a history as a popular commercial and recreational foodfish from the coastal waters of Orange County, California to Baja California, Mexico. White seabass population numbers are low and without human intervention, this keystone species could be lost. The goals of OCOWSRP are prevention of species loss, demonstration of the sustainability of a natural resource through the practices of environmental science, raised awareness of water quality as a factor in animal, plant, and human health, and the creation of real-life student scientists from the foundation of one hundred eighty student scientists who will go on to teach and inspire other students, teachers, and community members at a Student Environmental Science Symposium.

Stewards of the Chesapeake
Kevin Garner
Staff: **Kathy Hayes**
Severn River Middle School
241 Peninsula Farm Road
Arnold, Maryland 21012
410-544-0922
ksgarner@aacps.org; ksgarner1@verizon.net

Restoration of the Chesapeake Bay will require a concerted effort to control pollution, to protect and restore habitat, and to improve the management of natural resources in order to improve water quality and the health of the ecosystem. To this end, the students will survey, monitor, and participate in grade appropriate projects on streams adjacent to school property which run into the Chesapeake Bay. The student projects will raise community awareness regarding the health of this small ecosystem and how it affects the health of the Bay and will aid in the education of the surrounding community. Each project will be an extension of the current science curriculum and will function in cooperation with the departments of art, math and language arts. The art department will assist in making brochures and materials for presentations to the community. The math department will assist with the calculations necessary for the physical limnology of the streams. The language arts department will have supplemental reading materials and writing assignments targeted to the project. Incorporating student projects into the current science curriculum will not only further community awareness but will also function as a tool to teach students ways to improve the health of the ecosystem.

Assessment of Larval Recruitment and Habitat Disruption in a Salt Marsh Ecosystem
Rebecca Grella
Staff: **Lisa Cantadella, Laurie Perino, Dianna Padilla**
Brentwood High School
1st and 6th Avenue
Brentwood, New York 11717
631-434-2204
rebeccagrella@gmail.com; rgrella@bufsd.org

This project encourages students to explore aquatic ecosystems and get involved in activities that promote environmental learning, climate change awareness, experimental design, and stewardship by assessing recruitment of the Atlantic Ribbed Mussel (*Geukensia demissa*) in Flax Pond Preserve located on Long Island Sound. Recruitment studies will allow us the ability to assess the resilience of this ecosystem, and the potential for maintenance of essential ecosystem services provided by this and other marshes, including shoreline protection from erosion and effects of hurricanes, water runoff filtration, and protection of nursery areas for important near shore fisheries. Using GIS, students will be capable of constructing various graphs with their data to include, but not limited to: 1. GIS maps illustrating relationships between recruitment and location in the marsh (e.g., proximity to walking trail, edge, channel or creek),
2. Relationship between marsh plant density and recruitment, 3. Relationship between elevation or other physical parameters and recruitment.

Seasonal Plot Studies
Paul Grossi
Staff: **Lisa Hjelm**
The Girls Middle School
180 North Rengstoff Avenue, Mountain View, California 94043
650-968-8338; pgrossi@girlsms.org; pgrossi@aol.com

In this project, the entire 6th grade class from the Girls' Middle School in Mountain View, CA will conduct field studies in small groups at Stanford University's Jasper Ridge Biological Preserve, a biological and environmental science research center. The girls will visit Jasper Ridge four times over the course of the school year, using electronic data capture devices as part of tracking a number of different biotic parameters related to a specific plot within the preserve. Each group of 3-4 girls will develop a specific line of inquiry that they will pursue, and each group will work under the mentorship of a Stanford University graduate student who will help guide their individual lines of inquiry as well as their tracking of how their plot changes over the course of the seasons. The project will strive to support the ongoing development of the scientific skills and interests of the students involved by providing an opportunity to conduct authentic science under the mentorship of practicing scientists. Additionally, it will expand the integration of technology into an already technology-rich curriculum by adding the use of electronic data capture devices into the science curriculum.

Marine Biodiversity of the Robert E. Badham Marine Conservation Area
Dr. Todd Haney
Staff: **Drew Ishii, Amanda Bird**
Sage Hll School
20402 Newport Coast Drive
Newport Coast, California 92657
949-219-0100
haneyt@sagehillschool.org

High school students will engage in an authentic survey of the biodiversity of the intertidal zone within a local site known as Crystal Cove State Marine Conservation Area. The objectives of our project are two-fold: 1) we will examine the diversity and relative abundance of marine invertebrate organisms at two sites within the Marine Conservation Area, and 2) we will create a digital, interactive guide to the marine life of the rocky intertidal zone. Our biotic survey will help to reveal this cryptic diversity through an interdisciplinary approach by students of math and science. The baseline data that we produce will enable us to identify any patterns in the diversity of intertidal organisms that might relate to areas of high foot traffic, areas of substantial freshwater input (run-off) and protection of marine resources. All data will be disseminated via a website that will provide anyone with the ability to explore the life of the tide pools.

Organics in Local Water Quality
Coit Hendley
Eleanor Roosevelt High School
7601 Hanover Parkway, Greenbelt, Maryland 20770
301-513-5400; coit.hendley@pgcps.org; hendley4@verizon.net

Students are studying the water quality of local streams in Prince George's County Maryland. Students will use gas chromatographs (GC) to look for organic pollutants in local streams. They will use data in two streams obtained from pollutants found in clams as a baseline to standardize the GC measurements. They will use that standardized data to look for organic pollutants at sixteen sites in eight other streams. They will also use data collection probes to measure and compare the conductivity, pH and turbidity in local streams every two weeks to the levels during storm events.

Carbon Capturing Niches
Gloria Holzhausen
Staff: **Libby Hamilton**
Gadsden High School
6301 Hwy. 28, Anthony, New Mexico 88021
575-882-6300; gholzhausen@gisd.k12.nm.us; glow@zianet.com

The removal of native vegetation, disturbance of soils, and erosion are contributing to the growing problem of atmospheric carbon accumulation. As vegetated areas help capture carbon and reduce reflection, this project will establish more successful solutions for increasing the sustainability of carbon capturing vegetation in desert parks, school yards, and non landscaped easements. It will also serve to educate the community about ways to increase carbon capture with vegetation, and reduce erosion. This project will demonstrate ways to utilize marginal lands so as to increase their potential for capturing carbon while reducing erosion. Students from biology and landscaping classes will have a variety of applied learning tasks. Both student groups will examine microscopic fungal life forms, and learn how and why we will incorporate them in our testing.

Just Another Day at the Beach
Ruth Lehmann Hutson
Blue Valley High School
P.O. Box 68, 2 Ram Way, Randolph, KS 66554
785-293-5255; rhutson@usd384.org; ruthhutson@bluevalley.net

Using a problem solving approach, students at Blue Valley High School in Randolph, Kansas will survey and document the stratigraphy and paleoecology of a cyclothem that is near the high school. They will compare the data they collect with data from Kansas Geological Survey, Riley County GIS, and Pottawatomie County GIS. They will develop models to better understand how climates change naturally over time. Students will survey rock outcrops at six sites in Pottawatomie and Riley counties. They will **i**dentify the macrofossils and microfossils found throughout cyclothem. Students will design and test models that could explain the formation of the distinct rock layers and the formation of the entire cyclothem. Students will develop literature to educate the public about our changing climates. They will provide community education via the district's website, a school open house, and presentations given to various civic groups.

Headstarting Blianding's Turtle and Other New England Native Turtle Species
Diane Kablik
Staff: **Carol Birdsall, Kristin Powderly, Jon Smith**
Ripley Building
120 Miriam Road
Concord, Massachusetts 01742
978-318-1500
dkablik@colonial.net; djkablik@verizon.net

Fourth grade students will be investigating ways that biologist, scientist, veterinarians, and other individuals have been able to increase the survival rate of adult Bliandings turtles in the area. Through out the school year students will be working with the lead ecologist as they participate in a unique wildlife rehabilitation and research program. Students in eleven classrooms will be led on several field investigations where they will check marked turtle nests for hatchlings and check turtle traps for juvenile and adult turtles. In the classroom students will set up and maintain a natural turtle habitat where the hatchlings will be raised for the school year. Students will observe, record, and monitor the growth of the turtles, the amount of food eaten/day, and the water temperature. Web 2.0 tools will be used to enter growth data on a shared database. In the spring the students will return to Great Meadows National Wildlife Refuge to fit selected turtles with a radio transmitter and release all turtles into their natural habitat.

Liberty Centennial Gila River Restoration Project
Patty Messer
Staff: **Janene Vvan Leeuwen, Terri Matteson**
Liberty Elementary School
19818 W. Highway 85
Buckeye, Arizona 85326
623-474-6654
pmesser@liberty.k12.az.us; spacenut@meant2teach.com

Throughout the Southwest it has been recognized by Environmental Scientists that the Salt Cedar tree is an environmental concern. This invasive species has no nutritious values to its habitat, it drives native species out of the riparian areas, causes increased fire safety concerns, and has been proven to consume two times the water as the native species of Cottonwoods and Desert Willows (Texas Tech) or up to 200 gallons of water a day. Based on this problem and ensuring a unique and purposeful learning experience for students, we propose to study Salt Cedars and how they affect our community as well as the Southwestern states. Students will brainstorm and research ways to possibly slow the evasion of this species and optimally how to remove Salt Cedars from the habitat. The Gila River, which runs through our district, is choked by Salt Cedars. This creates several issues for our community including: depletion of the water table, fire safety, air pollution, damage to the soil and reduction in native habitat. Since several of our schools are located near the river bed, this project will be valuable to the community and a meaningful learning experience.

Instillation of Remote Sensing Buoy on Dollar Lake at Conserve School
Andrew Milbauer
Staff: **Robert Eady**
Conserve School
5400 N. Black Oak Lake Road
Land O'Lakes, Wisconsin 54540
715-547-1355
Andrew.milbauer@conserveschool.org; andrewmilbauer@hotmail.com

The project is in collaboration with the Global Lakes Ecological Observatory Network (GLEON), The University of Wisconsin Center for Limnology and Robert Eady, a fellow teacher at Conserve School. With this grant our students will design, build and install lake observation buoy on Dollar Lake within our campus. This buoy will collect data on turbidity, dissolved oxygen, and temperature hourly and send them to a free international database. This allows our school the opportunity to share the resources of our campus with the global community through www.gleon.org. We will use this data to compare the water chemistry of this lake to lakes throughout the planet.

Saving Our Shores and Sea (SOS2)
Megan O'Neill
Staff: **David Armstrong, Margaret Sedlecky, Angela Underwood, Ben Ricks**
Fairhope High School
1 Pirate Drive
Fairhope, Alabama 36532
251-928-8309
meganfoneill@hotmail.com; moneill@bcbe.org

Saving Our Shores and Sea (SOS2) provides Aquascience students of Fairhope High School with tools to raise and release native fish species and grow and establish native plant species for local habitat restoration. The fish species will be chosen, collected and released under the direction of biologists from Alabama State Fisheries. Students will be instructed on methods for inserting PIT tags to be able to track growth of the fish on a monthly basis. Water quality parameters will be monitored daily for optimum conditions. Plant selection and habitat restoration sites will be organized through cooperation with Weeks Bay National Estuarine Reserve Biologists.

Project Native Plant Restoration: An Interactive Hands-On Science Effort
Sheila Robbins
Staff: **Sarah Flinders, Sonia Bartholomew, Brian Johnson**
Sage Creek Elementary
1050 South 700 East
Springville, Utah 84663
801-489-2860
Sheila.robbins@nebo.edu; ssrobbins20@msn.com

When invasive noxious weeks start taking over areas, they disrupt our water shed by changing the ecosystem of that location. Fourth grade students at Sage Creek Elementary want to make a difference by helping Utah's native plants to reclaim these areas. We intend to grow and nurture native plants, both common and rare, in a native plant area that we create at our school. A knowledge and love for these native plants will be gained as students learn through research, and explore using scientific processes and inquiry, about their selected plant's adaptations. Their learning will be put to essential use as they harvest the seeds and replant them in the National Forest, thus actively doing their part to repopulate with native plants areas in the Uinta-Wasach-Cache National Forest that are being taken over with invasive species of plants. This real life application will make Science come to life for them. They will put this new gained knowledge to use as they share with others about the wonders of their own native plant and the many unique qualities that it possesses.

The Purple Martin Research Center
Michael Scully
Staff: **Elizabeth Adame, Calvin Buchholtz, Atlee Huchison, Daniel Eric Sweet**
John Jay Science and Engineering Academy
7611 Marbach Road
San Antonio, Texas 78227
210-397-2773
Mike.Scully@nisd.net; JJHSScully@aol.com

The John Jay Science and Engineering Academy (JJSEA) is a magnet high school located well within the city limits of San Antonio. Some years back, martin housing was put up on campus in order to attract a little of the natural world to our urban setting. We presently host forty pairs of nesting Purple Martins each year. Normal martin colony maintenance provides opportunities for students to actively participate, and we have installed a nest camera viewable by classrooms all over campus. The martin colony has also provided data for a number of student science projects. We will now build upon our success with the formation of a *Purple Martin Research Center*. One purpose of this research center will be to promote student-led, science-based investigations of purple martin behavior, population ecology and breeding biology. Our students will also be tasked with designing new and innovative forms of martin housing. Our other main purpose will be to promote the keeping of Purple Martins on other school campuses and in the surrounding community. Towards this end we shall organize a student-led Purple Martin outreach group that will maintain a web page, publish a newsletter, and give presentations to school and community groups.

Creating Environmental Stewards and Student Scientists

Daniel Williams
Shelter Island UFSD
33 North Ferry Road
Shelter Island, New York 11964
631-749-0302
willida@shelterisland.k12.ny.us; comatwins@optonline.net

This project is designed for an estuarine island community. Students will monitor abiotic environmental conditions such as salinity, dissolved oxygen content and nitrogen load creating a GIS database. With the database students will track abnormalities and changes over time. Students will also monitor select insect species diversity in the same locations potentially correlating abiotic factors with biological health. Individual species will also be examined to determine how genetically diverse their local populations are by examining 12s mtDNA indicating population health. Students will gain an appreciation for their environment and change from passive learners memorizing facts to active scientists learning through discovery.