

Global Learning and Observations to Benefit the Environment

by Dr. Elena Sparrow, Affiliate Associate Professor of Soil Microbiology and Science Education

THE GLOBE PROGRAM[®]



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In 1994, the first U.S. Global Change Education conference brought together scientists and educators from all over the United States to discuss education regarding global change and to share expertise in launching global change curricula across the country. Kindergarten through junior college students and the general public were identified as highest priority audiences. An Alaska team consisting of science teachers (Sandra Pahlke and Steve Hackett), a University of Alaska Fairbanks (UAF) Agricultural and Forestry Experiment Station (AFES) scientist (Elena Sparrow), an educator from the Alaska State Department of Education (Terri Campbell), and a community science educator (Janet Blalock) attended the conference. Later, Jennifer Coggins, Peggy Cowan, Marjorie Menzie and Nanci Spear also joined the Alaska Global Change Education team.

Funding for a global change education planning grant was obtained, surveys were conducted and education materials were researched as to availability and suitability for use in Alaska. Among the materials and programs reviewed and chosen, was the GLOBE (Global Learning and Observations to Benefit the Environment) Program.

The GLOBE Program is an international hands-on environmental science and education program that connects K-12 students, teachers and scientists around the world for research collaboration and cross-cultural enrichment. Alaska teachers

and students are participating in the GLOBE Program which involves more than 7,000 schools in more than 80 countries. Alaska students are contributing to a "global" picture of the health of the earth as they monitor their local environment.

Understanding global changes in the atmosphere, hydrosphere, lithosphere and biosphere are vital in predicting causes, impacts, and potential responses to these occurrences. Most global change environmental issues relevant throughout the world, such as climate change, ozone depletion, increased ultraviolet radiation, and decreased biodiversity are also of local importance in our resource-rich state.

Global warming is expected to be of greater magnitude in high latitude areas such as Alaska. Data sets for Alaska and the Arctic indicate a warming trend of 2-4° C over the last 50-100 years. A warmer climate could cause the melting of permafrost, sea ice, snow, and glaciers, all prominent features of the Alaska environment. Permafrost underlies most of the state. Extensive sea ice occurs along Alaska's western and northern coasts. Snow covers the ground in Interior Alaska for six to seven



Globe students Jackie M., Devona C., Leianna H. and Rosie L. work as a team checking their plot every day during spring and fall.

Photo by Nancy Johnson and Michelle Boyden

months out of the year. Climate warming is believed to be the main cause of rising sea level. The melting of mountain glaciers along the Gulf of Alaska has apparently been a major contributor to the observed global sea level rise. These conditions could impact the environment, including the habitats of plants, fish, and animals. Climate changes could impact not only ecosystems, but also the subsistence life-style of Alaska's indigenous people.

Alaskans need to be well educated on these high priority global change environmental issues in order to make well-informed choices, prepare for consequences of global environmental alterations, and take mitigating steps. Alaskans, as well as people from other places, need to realize that we are affected by what happens worldwide, and that what happens locally and regionally, in turn, has global implications.

The Alaska Global Change Education Team, with Elena Sparrow as the principal investigator and

instructor of the course, successfully obtained a grant from the US Environmental Protection Agency to teach a course titled Earth System/Global Environmental Changes for K-12 Educators. The course was distance-delivered to three sites in Alaska: Anchorage, Fairbanks, and Juneau. Teachers learned about earth system changes such as climate change, enhanced greenhouse effect, sea level rise, and ecosystem response. AFES faculty members Glenn Juday and Dave Valentine were also scientist presenters for the course.

The Alaska GLOBE Franchise initiated by Elena Sparrow was established through the Center for Global Change and Arctic System Research. The GLOBE Franchise is an agreement between the GLOBE Program and UAF which will work cooperatively within the University of Alaska State-wide System to undertake responsibility for recruiting GLOBE Schools, training GLOBE teachers, and mentoring GLOBE students throughout Alaska.

Scientists around the world use GLOBE data in environmental research. Teachers receive special training and educational materials for

Photo by Michelle Boyden and Nancy Johnson



Globe students Amanda D. and Allison P. making ground observations to help validate remote sensed images.



Photo by Nancy Johnson and Michelle Boyden

Color charts to track the color changes in the leaves in their GLOBE study plots are used by students.

implementing the GLOBE program. Students under the guidance of GLOBE-trained teachers make a core set of environmental measurements at or near their schools, send their data via the Internet to a GLOBE data processing center, receive and use global images created from GLOBE data and other science sources, and study environmental topics in their classrooms. GLOBE students are able to communicate and collaborate with other students in the U.S. or the world, who like them are generating new knowledge about our planet Earth. The GLOBE website is <http://www.globe.gov>.

Seasons: The Global Plant Waves

Two AFES faculty members, Dave Verbyla and Elena Sparrow, and Leslie Gordon, an education specialist from the Fairbanks North Star Borough School District are co-principal investigators of the *Seasons: The Global Plant Waves* project which started in May 1998. Check out our home page at <http://www.lter.uaf.edu/~dverbyla/globe>.

Every year there are important waves occurring that you can see from a global perspective—the wave of green-up as conditions for photosynthesis improve and the wave of green-down or senescence as plants become dormant. These waves are important because they are directly related to global carbon fixation. With global warming and changes such as El Niño, these waves are expected to change significantly. These global changes have already been detected! For example, the spring green-up has advanced by eight plus/minus three days since the early 1980s at high latitudes.

The greenness index measures reflectance related to photosynthesis and plant cellular struc-

ture. The index is derived from satellite data. Each satellite sensor is calibrated for spectral reflectance before being launched, however this calibration drifts as the satellite sensor ages and therefore estimates become less accurate. Also since the sun angle changes with the seasons and the viewing angle of the sensor changes with image location, estimates can have low precision. Thus, on-the-ground observations of spring green-up and fall senescence are needed to validate estimates of growing season that are possible using satellite data. The GLOBE program is probably the best opportunity scientists using remote sensing of the globe have at obtaining on-the-ground observations of plant leaf phenology.

The goal of the project is to improve math, science, and technology in K-12 classrooms by providing an opportunity for scientists and students to collaborate on a research project of real significance to scientists who are tracking plant phenological changes as an indicator of global change. Both students and scientists will benefit from participation in this project. Students will take part in an authentic science project where they have the opportunity to apply what they are learning to create new knowledge.

Students are involved in school site observations and recording of plant green-up and senescence at their GLOBE study sites. Students will also study the climatic variables affecting plant growth in their location. Four Fairbanks schools piloted the green-up protocols in the spring of 1998 and fourteen K-12 schools from Alaska piloted the senescence protocols in the fall of 1998.

To learn more about this program contact Elena Sparrow, e-mail ffebs@uaf.edu. GLOBE teacher training workshops are held yearly.

Bonanza Creek Schoolyard LTER



by John Irons, LTER/School District Liaison

The Bonanza Creek Schoolyard LTER is part of the Bonanza Creek/Caribou-Poker Creeks Long Term Ecological Research (LTER) program, funded by the National Science Foundation. A co-operative program to provide interaction between LTER scientists and the Fairbanks North Star Borough School District (FNSBSD) teachers and students is being explored to determine the feasibility and desirability of integrating LTER sites with local schools and the GLOBE program.

We want to provide unique learning experiences both inside and outside the classroom for K-12 students, training and support for FNSBSD science teachers at all grade levels, and collect datasets useful to the LTER that might otherwise be impossible to get.

The AFES faculty involved in this project include Dr. Elena Sparrow (Alaska Global Change Education Co-coordinator and Affiliate Associate Professor of Soil Microbiology and Science Education), Dr. Glenn Juday (Associate Professor of Plant Ecology), and Dr. Dave Verbyla (Associate Professor of Forest Sciences).

Visit our website at http://www.lter.alaska.edu/~jirons/schoolyard_lter/schoolyard.htm for more information on this project.