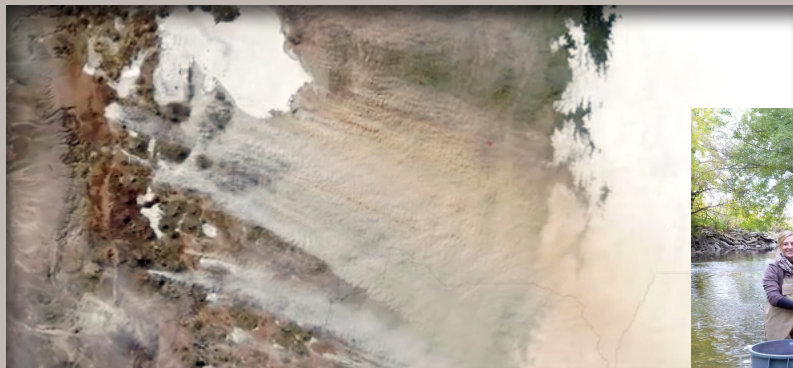


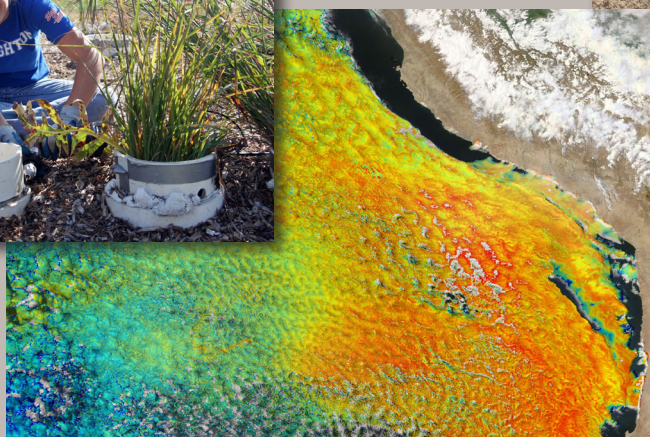


C G R E R

THE CENTER FOR GLOBAL & REGIONAL
ENVIRONMENTAL RESEARCH

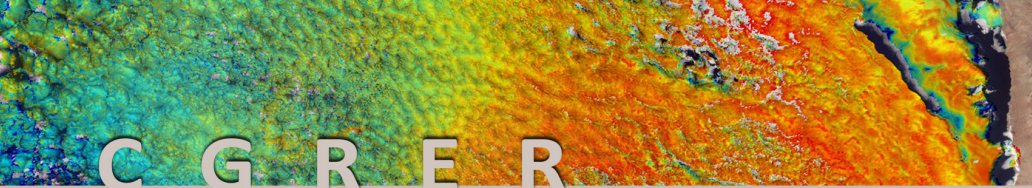


2012 ANNUAL REPORT



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THE CENTER FOR GLOBAL & REGIONAL ENVIRONMENTAL RESEARCH

The names of CGRER members and those affiliated with CGRER are highlighted in boldface throughout this report.

Photo at right: UI graduate student Ted Marks traveled to western Namibia for his CGRER-funded research on how early humans adapted to life in a harsh desert environment. (photo by Paul Grigg)



THE CENTER FOR GLOBAL & REGIONAL ENVIRONMENTAL RESEARCH

The Center for Global and Regional Environmental Research (CGRER) was established in 1990 with the intent of promoting interdisciplinary efforts that focus on global environmental change. Housed on the University of Iowa (UI) campus in the Iowa Advanced Technology Laboratories (IATL), CGRER is supported by revenues generated from public utilities, as mandated by the State of Iowa's Energy Efficiency Act. Funds are used to support research and provide services to faculty members and students across the state who are interested in environmental change. CGRER currently is composed of 96 members from 31 departments at seven institutions.

While environmental change is constant and natural, CGRER focuses on the human-induced acceleration of such change caused by modern technologies, lifestyles and population growth. Concerns about global change encompass multiple issues including its effects on natural ecosystems, environments and resources, and on human health, culture and social systems. Because global change promises to touch virtually every aspect of life and requires the reinterpretation of many fields of science and engineering, the humanities, medicine and law, an understanding of global change requires collaborative efforts among the many disciplines involved. CGRER's mission is to foster such collaborative

interdisciplinary actions in three ways: by promoting dialogue among specialists and agencies, by educating students and the general public, and by fostering and supporting relevant research projects.

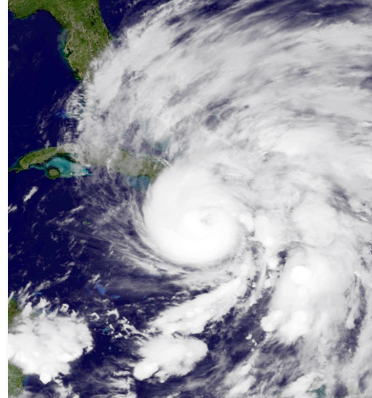
This annual report summarizes CGRER's activities in each of these three areas. Because CGRER's output is commensurate with that of its many members, a summary of which would require a small book, this annual report includes only a sampling of significant projects and efforts. Yet this sampling provides a vision of CGRER's multiple efforts to achieve its ultimate goal: assisting Iowa's agencies, industries and citizens in assessing and preparing for global change and its effects.



PROMOTE DIALOGUE AMONG SPECIALISTS AND AGENCIES

EDUCATE STUDENTS AND THE GENERAL PUBLIC

FOSTER AND SUPPORT RELEVANT RESEARCH PROJECTS



EXECUTIVE SUMMARY



As you will learn as you read this annual report, 2012 has been another productive year for CGRER and its members. Our work was given added significance by the severe Midwestern drought and the destruction wreaked by Superstorm Sandy on the East Coast. There is no doubt that anthropogenic changes to the Earth's systems are widespread and profound and that we are particularly vulnerable to shifts in weather and climate. We need to better understand our role in these changes in order to develop more effective mitigation and adaptation strategies.



Doug Schnoebelen teaches visiting Chinese high school students at the Lucille A. Carver Mississippi River-side Environmental Research Station (LACMRERS) near Muscatine.

CGRER members continue to conduct first-class research aimed at improving our understanding of environmental change and in developing practices that reduce the impacts associated with these changes. For example, through our research activities and collaborations with local, state and regional organizations we are enhancing our understanding of the causes of elevated levels of air pollutants during the winter and identifying strategies to reduce these levels. We are

CGRER members continue to conduct first-class research aimed at improving our understanding of environmental change and in developing practices that reduce the impacts associated with these changes.

also working with state and national agencies to develop measures that will help restore and enhance Iowa's agricultural landscape so it can be more resilient to future floods. You will find additional examples of our research work in our annual report.

The translation of our research findings into practice requires effective communication with the larger world. The scientific community must learn to better communicate its work to policy makers, key stakeholders and the general public. This will enhance everyone's understanding of science and its impact on society and will ultimately lead



UI graduate student Simone Williams takes stream water level and GPS coordinates at a water quality sampling site in Jamaica. (photo by Damian Martin)

to greater progress in finding solutions. To this end, CGRER continues to expand its outreach activities, which during the year included hosting a legislative reception at the Iowa Statehouse and the continuation of our radio project, which distributes

weekly segments highlighting sustainability efforts to stations throughout Iowa. Our members traveled to the Iowa State Fair with an interactive display from the Iowa Flood Center that demonstrated projects that are helping communities prepare for future floods. We also launched the Telling Your Research Story Video Project, which advises graduate students on how they can better communicate the significance of their work to the general public.

It is also important that we continue our efforts to educate students on the Earth's systems and processes and how we can

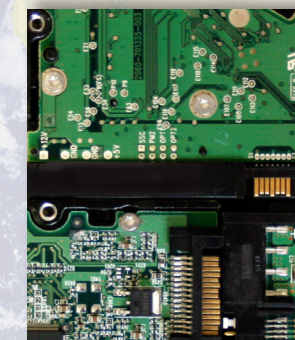


impact them. We have a new initiative to improve elementary school science instruction by introducing hydrologic cycle modeling concepts. We are also working with middle and high school teachers to explore ways in which environmental learning can be broadly incorporated across the curriculum from science to art and music. These and other educational activities are described in the following pages.

We hope you enjoy reading our 2012 annual report. We welcome your comments and invite opportunities to further engage with our stakeholders in addressing environmental change issues.

**GREGORY R. CARMICHAEL,
CGRER CO-DIRECTOR WITH
JERALD L. SCHNOOR**

Nitrogen monitoring and automated water samplers were installed on this Iowa creek to monitor the hydrological and nutrient responses of storm events after the 2012 drought. (photo by Adam Ward)



Jerry Schnoor is helping to find ways to better deal with the problem of e-waste from electronic products.



Pablo Saide has developed a system to predict periods of high air pollution in Santiago, Chile.



EXECUTIVE COMMITTEE

David Bennett
Geography,
University of Iowa

Dennis Dahms
Geography,
University of Northern Iowa

Kajsa Dalrymple
Journalism and Mass
Communication,
University of Iowa

Vicki Grassian
Chemistry,
University of Iowa

Sarah Larsen
Chemistry,
University of Iowa

Lou Licht
Ecolotree, Inc.

Thanos Papanicolaou
Civil and Environmental
Engineering,
University of Iowa

Charlie Stanier
Chemical and Biochemical
Engineering
University of Iowa

Above: Charlie Stanier, Scott Spak and Elizabeth Stone helped local and state officials monitor the plume rising from a fire at the Iowa City Landfill.

MESSAGE FROM THE CGRER ADVISORY BOARD

As an Advisory Board member since 2007, I believe CGRER's programs in the areas of research, education and outreach represent, without question, one of the most important services a university can offer the state, nation and world at this time in human history. Jerry Schnoor and

While much of the knowledge, technologies and sustainable pilot communities are already in existence to begin tackling this challenge, by and large the world is still bogged down with institutions, technologies, policies and behaviors of mind established during

CGRER is an exemplar of how institutions of higher learning can facilitate a generational transition to a 21st-century Sustainability Revolution.

Greg Carmichael have provided distinguished leadership in elevating the center to this high standard.

The challenge is how to live well in the 21st century on an increasingly interconnected, over-crowded, resource-depleted planet buffeted by an unstable and ever-changing climate.

the unsustainable Industrial Revolution.

CGRER is an exemplar of how institutions of higher learning can facilitate a generational transition to a 21st-century Sustainability Revolution. CGRER's stellar research program supports projects too numerous to be listed in their entirety here. As

this annual report describes, these projects range from evaluating the health effects of environmental contaminants on rural and agricultural populations to research on the climatic impact of black carbon in the Arctic and the development of ways satellites can "see" through clouds to better monitor surface pollutants.

Another urgent need is to enhance the public's awareness of the momentous changes that are occurring in order to attain a critical mass of support for promoting effective and enduring global sustainability initiatives. CGRER is doing its part through its Iowa Environmental Focus daily blog, radio show and website. In addition, Greg and Jerry helped initiate and write a nationally distributed statement, signed by more than 125 Iowa scientists, on connections

between the 2012 drought and climate change.

Finally, education of students is particularly important because they are the primary stakeholders in the future of this planet. Universities worldwide must equip their students with skills in leadership, civic engagement, and innovative technologies to ensure that they will make wise decisions concerning the sustainability of the planet. Again, CGRER is taking a lead in this endeavor through a variety of initiatives, including providing support for graduate students doing field research on environmental change, sponsoring institutes and workshops designed to improve science education, and finding creative ways for student researchers to share the significance of their work with the larger world.

It has been an honor to serve on CGRER's Advisory Board for the past six years. I am thankful for its numerous contributions toward building a sustainable future.

William M. Stigliani
Center for Energy &
Environmental Education,
University of Northern Iowa



ADVISORY BOARD MEMBERS

Joe Bannon
MidAmerican Energy

Robert Dvorsky
Senator, Iowa State Legislature

Darrell Hanson
Iowa Utilities Board

Doug Kopp
Alliant Energy

Mark Kresowik
Beyond Coal Campaign,
Sierra Club

Hiram "Chip" Levy
Geophysical Fluid
Dynamics Laboratory, NOAA

David Osterberg
Occupational and Environmental
Health, University of Iowa

William Stigliani
Center for Energy &
Environmental Education,
University of Northern Iowa

Sharon Tahtinen
Iowa Department of
Natural Resources



Left: Cheryl Smith, Joe Cullin and Mary Weber inject tracer solution into Fourmile Creek in Ankeny, Iowa. (photo by Adam Ward)
Below: CGRER and the Iowa Flood Center co-hosted a Legislative Breakfast Reception at the Iowa State Capitol in March.



Left: Craig Just and Columbus Community Technical Coordinator Todd Heck meet at the Columbus Junction High School to discuss ways to increase the school's energy efficiency.



UI professors Jerry Schnoor and Greg Carmichael are co-founders of the Center for Global and Regional Environmental Research (CGRER).

Right: UI graduate student Simone Williams is studying how bauxite mining affects stream quality in the Rio Cobre Watershed in Jamaica. (photo by Simone Williams)



OUTREACH

CGRER members shared their expertise with the larger world through a variety of initiatives during 2012. Outreach efforts included spearheading a nationally distributed statement on Climate Change and the 2012 Drought, assisting civic leaders and public health officials during a major landfill fire in Iowa City, and the publication of an advisory report on future challenges faced by the Environmental Protection Agency.

CLIMATE CHANGE AND THE 2012 DROUGHT



Dave Courard-Hauri from Drake University, Jerry Schnoor from the UI and Chris Anderson from ISU speak at a press conference.

A statement outlining the connection between the severe drought of 2012 and climate change was released in November to considerable state, regional and national attention. **Jerry Schnoor**, **Greg Carmichael** and **Gene Takle** helped draft the *Iowa Climate Statement: The Drought of 2012*. It was signed by 138 science faculty and research staff at 27 Iowa colleges and universities, including many CGRER members. The statement says that while science cannot say for certain that the drought of 2012 was directly caused by human activities, the disaster is consistent with a growing

body of research indicating that rising levels of greenhouse gases are likely to bring more extreme weather events. In a warmer climate, wet years are expected to get wetter and dry years dryer. The statement urges Iowans to act now to reduce the economic costs associated with droughts and floods by reducing their greenhouse gas emissions, increasing energy efficiency and use of renewable fuels, and implementing mitigation strategies. The statement was reported upon in a wide variety of media outlets, including *USA Today*, *CBS News*, *Newsday* and *The Huffington Post*.

COLUMBUS JUNCTION CONNECTIONS

Craig Just is working to decrease energy consumption in the Columbus Community School District and promote energy efficiency awareness in the town of Columbus Junction. His efforts are funded through the energy utilization platform of the Iowa NSF EPSCoR grant. The project's goal is to make the schools more energy efficient, in the process lowering the district's costs while also educating students about

energy conservation. The EPSCoR grant will fund \$135,000 in improvements to local schools, providing data that will be used to educate students about energy efficiency and giving them a model for how similar changes can be made in homes. Additional learning modules will teach the design principles of energy efficient buildings and about career opportunities in environmental fields.

Research associate Melissa Ward and Craig Just use thermal imaging cameras at Columbus Community High School.



ADVISING THE EPA

Jerry Schnoor served as chair of a national committee of 21 scientists asked to advise the U.S. Environmental Protection Agency (EPA) on how it can best meet future environmental challenges. Their report, *Science for Environmental Protection: The Road Ahead*, urges the EPA to develop new tools, technologies and a systems approach to interdisciplinary science. It says the agency will need to be younger, smarter and more engaged in society if it is to continue to serve the public and protect the environment.

The report, which was published by the National Research Council, predicted that new fields such as nanotechnologies will

raise difficult regulatory questions and will require teams of scientists from a variety of disciplines to understand their risks. At the same time, improving the environment and human health does not always require legislation or regulation. Sometimes social and behavioral scientists can determine better solutions by designing programs to change behavior through economic incentives or by community action at the local scale. This also supports the EPA's goal of obtaining better outcomes at lower cost. The report concludes that the EPA will need to innovate and take a long-term systems viewpoint in order to collaboratively solve emerging environmental problems.

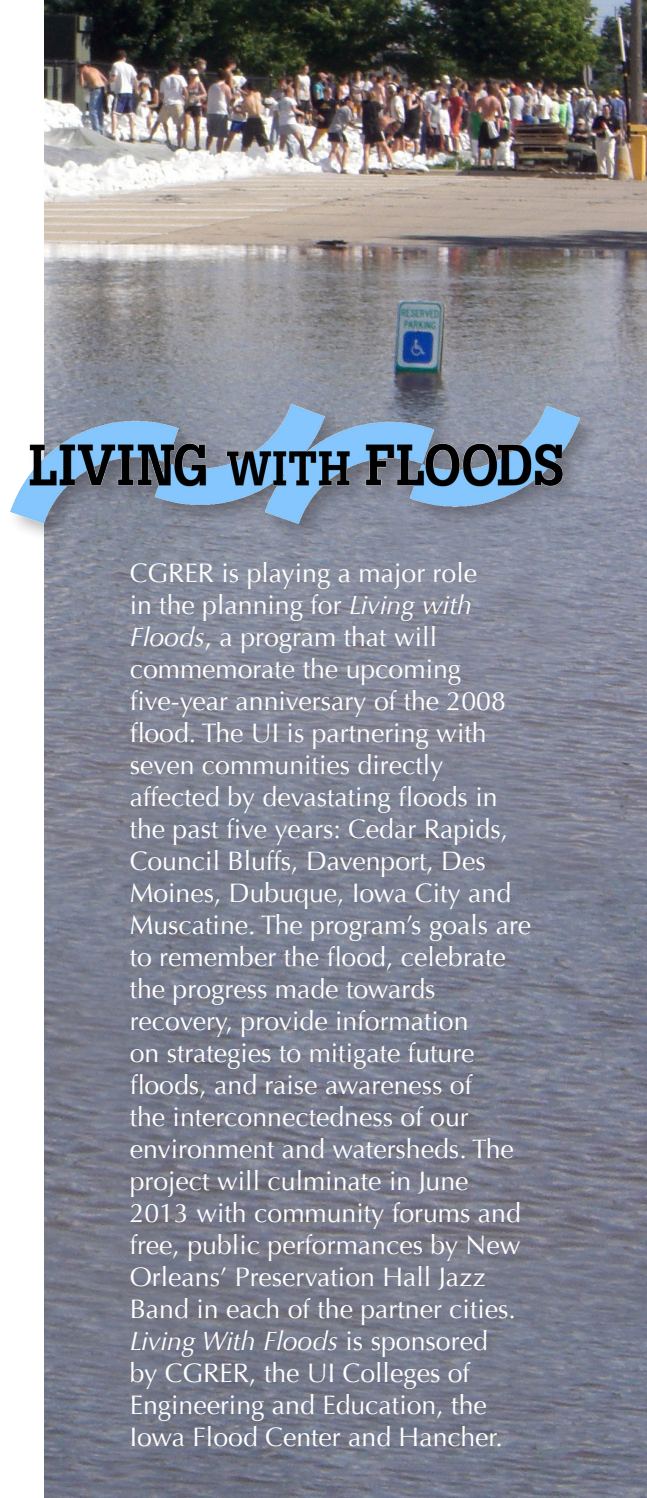


Above and right: Information about the Iowa Flood Center's work was presented at the Iowa State Fair. (photo by IFC)

STATE FAIR OUTREACH

Faculty, staff and students from the Iowa Flood Center (IFC) hosted an interactive display during the Iowa State Fair in August. Fair-goers had the chance to learn about the Iowa Flood Information System, an online application that provides real-time information on stream levels, rainfall and additional flood-related resources for individuals and communities in Iowa. The booth also gave

information on IFC research and its efforts to support Iowans in better monitoring and preparing for future flooding. CGRER members associated with the flood center include **Witold Krajewski** (IFC director), **Allen Bradley**, **Joe Bolkcom** (IFC outreach and community education director), **William Eichinger** and **Larry Weber** (director of IIHR – Hydrosience & Engineering).



LIVING WITH FLOODS

CGRER is playing a major role in the planning for *Living with Floods*, a program that will commemorate the upcoming five-year anniversary of the 2008 flood. The UI is partnering with seven communities directly affected by devastating floods in the past five years: Cedar Rapids, Council Bluffs, Davenport, Des Moines, Dubuque, Iowa City and Muscatine. The program's goals are to remember the flood, celebrate the progress made towards recovery, provide information on strategies to mitigate future floods, and raise awareness of the interconnectedness of our environment and watersheds. The project will culminate in June 2013 with community forums and free, public performances by New Orleans' Preservation Hall Jazz Band in each of the partner cities. *Living With Floods* is sponsored by CGRER, the UI Colleges of Engineering and Education, the Iowa Flood Center and Hancher.



ALTERNATIVE WASTEWATER TREATMENTS



Lou Licht is working on a large-scale wastewater treatment project in Port of Morrow, Oregon. Licht's company, Ecolotree, specializes in phytoremediation, which uses plants to remove pollutants from the soil. In Port of Morrow, a food processing complex along the Columbia River puts out five million gallons of wastewater a day. Ecolotree is developing a plan to remove nitrogen and waste products from the water by using it for year-round irrigation of a forest of poplar trees. The

project would eliminate the need for an expensive new wastewater treatment plant and the pulp wood from the trees could be sold for commercial uses. **Craig Just** is assisting Ecolotree with a research project designed to support the Port of Morrow's application for regulatory changes needed to fully implement the plan. Ecolotree is currently working in 15 states on 22 projects in sites that include landfills, industrial facilities and fertilizer spill areas.

LEGISLATIVE RECEPTION

CGRER and the Iowa Flood Center co-hosted a Legislative Breakfast Reception at the Iowa State Capitol in March. Thirty-five legislators as well as a number of state government officials and representatives from non-governmental agencies attended. **Witold Krajewski**, director of the Iowa Flood Center, and **Larry Weber**, director of IHR—Hydroscience & Engineering, provided an update on the work of the Iowa Flood Center and its web-based

tools and new technologies and projects designed to help Iowa communities better prepare for future flooding.

CGRER members **Steve Hendrix**, **Lou Licht**, **Scott Spak** and **Elizabeth Stone** shared their work in several areas of environmental research. CGRER Advisory Board members **Senator Bob Dvorsky**, **Darrell Hanson** and **Sharon Tahtinen** also attended.



Tibebe Ayalew, a UI graduate student in civil & environmental engineering, discusses river flow modeling at the Legislative Reception.

IOWA CITY LANDFILL FIRE



Above: Elizabeth Stone works with a particulate matter sampler on the UI campus. Below: The plume from the Iowa City Landfill Fire was visible for miles. (photos by Elizabeth Stone)

A major fire at the Iowa City Landfill in early summer raised many concerns about air quality and health risks. **Charlie Stanier**, **Scott Spak** and **Elizabeth Stone** helped local and state officials monitor and forecast the plume using their mobile air quality sampling units, which tested for sulfur dioxide, carbon monoxide, carbon dioxide, and particle size and composition of more than 40 organic compounds. This information was combined with CGRER's weather forecast model and an EPA dispersion model to predict hourly

pollution concentrations for every neighborhood in Johnson County each day until the fire was out.

The research team's observations and forecasts provided officials with a more complete picture of the fire's impacts, assisting them as they responded to the fire and issued safety advisories to local residents. The team is making the knowledge gained during the Iowa City fire available on a national basis, providing valuable information for other communities facing this sort of disaster.

CGRER COMMUNICATIONS

Michael Gallagher works as a half-time intern while pursuing his MA in journalism. Much of his time during the year was spent on the Student Research Video Project (see page 12), developing scripts and filming videos. He also began work on a second video project involving Water Sustainability Initiative faculty and on the development of the new CGRER webpage. He continues to be involved with recording and distributing CGRER's radio segments and keeps the Iowa Environmental Focus blog updated with articles, photographs and links.

Josh Quinnett, an undergraduate student in journalism/mass communication, has been a quarter-time CGRER intern since December, 2011. Along with Michael Gallagher, he has worked on the Iowa Environmental Focus blog and the two video projects. He has also assisted with the design and development of the new CGRER webpage and worked with the Iowa Flood Center to develop a series of video tutorials for the Iowa Flood Information System (IFIS).



Josh Quinnett and Michael Gallagher



Jerry Schnoor, Michael Gallagher and Josh Quinnett create a radio segment for Iowa Environmental Focus.

IOWA ENVIRONMENTAL FOCUS

CGRER's blog and radio project continued to grow in popularity and visibility during the year. Launched in 2010, Iowa Environmental Focus features daily blog posts and weekly radio segments on environmental news and events. In 2012, 51 one-to-two minute segments were produced and distributed

to 90 stations, 30 of which run them weekly while the rest use the content on a more occasional basis. The radio segments highlight the work of CGRER members as well as current Iowa environmental issues and efforts toward greater sustainability. For more information, see iowaenvironmentalfocus.org.



A SAMPLING OF AWARDS, ACHIEVEMENTS & APPOINTMENTS



Pedro Alvarez (above) was honored with the Athalie Richardson Irvine Clarke Prize, which is given by the National Water Research Institute to recognize exceptional contributions to the field of water research. Alvarez was selected because of his global leadership and contributions to enhancing water resource sustainability through water pollution control.

Jonathan Carlson (right) and **Burns Weston**, along with co-author Sir Geoffrey W.R. Palmer, published the third edition of *International Environmental Law and World Order: A Problem-Oriented Coursebook* (West Publishing Company).



Richard Cruse delivered a keynote address on Climate Change and Agriculture at the International Soil and Tillage Research Organization meeting in Montevideo, Uruguay.

Dennis Dahms was elected a Fellow of the Geological Society of America, an honor given for distinguished contributions to the geosciences. Dahms was recognized for his work on the glacial geologic history of the Wind River Range of Wyoming.

Diane Debinski (below) was honored as a Distinguished Visiting Researcher by the University of Ottawa in Canada during the fall of 2012. She collaborated with University of Ottawa scientists to develop a research partnership using butterflies as bioindicators of climate change in North America.



Greg Carmichael (above) received the American Institute of Chemical Engineers' highest environmental award. The Lawrence K. Cecil Award in Environmental Chemical Engineering recognizes Carmichael's outstanding contributions to the field of chemical engineering and his distinguished service in environmental protection.

Allen Bradley (above) was awarded the 2012 President and Provost Award for Teaching Excellence at the UI. The award is a university-wide recognition for faculty members who have demonstrated a sustained, high level of teaching excellence.



Witold Krajewski speaks with Representative Clel Baudler at a Legislative Reception at the Iowa State Capitol hosted by CGRER and the Iowa Flood Center.



Bill Field (above) was honored with the Michael J. Brody Award for Faculty Excellence, which recognizes those who have made exceptional service contributions to the UI and the community. Field has played a national role in radon research and public education on the risks of radon exposure. He was also appointed to the EPA's Science Advisory Board (SAB) and continues to serve on the EPA's SAB Radiation Advisory Committee.

David Barrett Gough, a UI graduate student in American Studies, received a Ballard Seashore Dissertation Fellowship. A CGRER travel stipend enabled him to do research for his fellowship application. His project is an ecocritical history of Robinson Forest, an ecological research site and writers' retreat owned by the University of Kentucky. **Barbara Eckstein** is Gough's dissertation advisor.

Witold Krajewski (above) received the 2012 UI Graduate College Outstanding Faculty Mentor Award in mathematical and physical sciences and engineering. Krajewski was nominated for the award by his colleagues and students. Several of his students have received prestigious national and international awards and fellowships.

Christian Mavris, a UNI post-doctoral student working with **Dennis Dahms**, was awarded a fellowship from the Swiss National Science Foundation for a study of global warming-induced vegetation changes and their effects on mineral weathering in the Wind River Range of Wyoming.

Maija Sipola, a UI PhD student working with **Art Bettis**, was awarded an NSF East Asia and Pacific Fellowship to spend three months at Macquarie University in Sydney, Australia, learning a new luminescence dating technique used in sediments dominated by volcanic quartz.



Vicki Grassian receives her award from the American Chemical Society. (photo by ACS Cutts Photography)

VICKI GRASSIAN RECEIVES NATIONAL AWARD

Vicki Grassian received an award for Creative Advances in Environmental Science and Technology from the American Chemical Society (ACS). Grassian was recognized for her original and creative contributions in understanding mineral dust aerosol and its impact on atmospheric chemistry and climate. In addition, she was named an ACS Fellow in August. The ACS has more than 163,000 members and is the world's largest scientific society.

Adam Ward delivered a talk on geophysical imaging and solute transport dynamics at the European Geophysical Union 2012 meeting in Vienna, Austria.

Left: Maija Sipola sampling sand in Java to be used for luminescence dating. (photo by Art Bettis)



EDUCATION

CGRER helps educate the next generation of researchers and scientists who will address the complex issues and problems associated with environmental change. Educational efforts during the year included a video project highlighting graduate student research, an environmental education workshop for elementary school teachers in areas affected by flooding, and a program to raise awareness of the ecological importance of perennial native plants.

TELLING YOUR RESEARCH STORY VIDEO PROJECT

Recognizing that there is a growing need for scientists to better communicate the significance of their work to the public, CGRER sponsored two projects designed to help graduate students present their research in accessible and interesting ways. The first was a workshop in which participants learned how to concisely describe their work, why it is important and how their research will benefit society. The workshop prepared attendees to participate in CGRER's Telling Your Research Story Video Project, which helped 12 graduate students create 2-3 minute videos describing their work. The videos can be found at www.youtube.com/user/CGRERResearchFocus. The video series offers a personal introduction to the valuable research being done at the UI and highlights the ways in which science can help solve problems from the local to global levels.



PRAIRIE ROOTS PROJECT



The Prairie Roots Project, begun at the University of Northern Iowa in 2009 under the direction of **Laura Jackson**, is drawing increasing attention to the importance of perennial native plants to ecosystem health. Canadian filmmaker Jeremy Nelson traveled to Cedar Falls this year to film the project for an upcoming documentary *The Watershed Project*, to be released in 2014 by Stornoway Productions.

The Prairie Roots Project involves the growing of prairie plants in long tubes. When the plants are harvested, their roots are preserved in a glycerin-based solution so that they can be displayed in museums, nature centers, schools and other educational settings. The intricate root systems provide a vivid illustration of how prairie plants capture nutrients, slow run-off, prevent erosion, store carbon and re-build topsoil. The project also includes the development of educational materials to accompany the root displays. The overall goal is to increase public understanding of a complex and important part of the natural world that is normally hidden below ground. The Prairie Roots Project is funded by the Iowa Department of Transportation's Living Roadway Trust Fund and is sponsored by the UNI Biology Department, with additional technical assistance from The Land Institute of Salina, Kansas.

Above left: UNI graduate student Carmen Pellish inspects plants being grown in deep pots so that their root systems can later be harvested.
Below left: Ryan Knight from Stornoway Productions prepares to shoot close-up images of a root system.



Craig Just speaks at a Sustainability Rally at Kinnick Stadium. (photo by George McCrory)

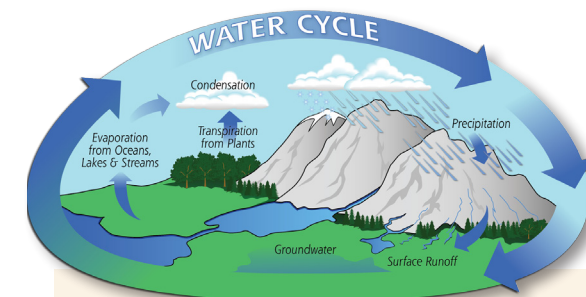
PROMOTING SUSTAINABILITY

Craig Just taught an Honors First-Year Seminar on Explorations in Sustainable Campus Living. Just's course focused on facilities, projects, programs and student-led activities that impact sustainability on the UI campus, including the Energy Control Center, Drinking Water Treatment Plant and Student Garden. The seminar included a Sustainability Rally at the Kinnick Stadium Press Box during which participants met sustainability leaders on campus and in the community with the intention of creating lasting service-learning relationships. The rally also introduced the UI's participation in the nationwide Sustainable Citizen Program, which seeks to support and educate a network of citizens so they can think systematically and dialogue democratically about environmental issues and solutions.

FLOOD INSTITUTE FOR TEACHERS

CGRER helped sponsor a three-day institute designed to assist teachers in areas affected by the floods of 2008 and 2011 incorporate environmental learning into their classes. Thirty-five middle and high school teachers from seven communities participated in the UI College of Education's Interdisciplinary Flood Institute for Teachers, which is part of a larger *Living With Floods* project (see page 7). The institute explored how environmental learning can be incorporated into all content areas ranging from science and social studies to reading, writing, art and music. The goal is to help Iowa educators develop curricula that are focused on understanding the causes of flooding and how communities can develop resilience in the face of disaster. The institute was taught by UI College of Education faculty. Partners in the effort included CGRER, the Iowa Flood Center, the UI College of Engineering and Hancher.

The Interdisciplinary Flood Institute for Teachers included ways to incorporate environmental learning into music education.



IMPROVING SCIENCE EDUCATION

Cory Forbes has been awarded a \$447,000 NSF grant designed to improve elementary school science instruction in modeling, an increasingly valuable tool in scientific research. The project, called Modeling Hydrologic Systems in Elementary Science (MoHSES), grew out of a CGRER seed grant and will involve three years of research investigating third-grade students' model-based reasoning about geospheric components of the hydrologic cycle (pictured above) and how elementary teachers can support this type of reasoning. The research will be done in six elementary classrooms in the Iowa City, Clear Creek Amana and Cedar Rapids school districts and will use classroom observations, in-depth interviews with students and teachers, and student work to produce empirical findings on how modeling can best be incorporated into elementary science curricula. Partners in the MoHSES project are CGRER, Michigan State University science education programs, the Iowa Van Allen Science Teaching Center and the Grant Wood Area Education Agency.

LIVING WITH FLOODS

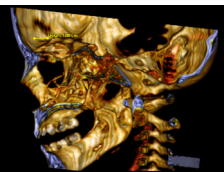
FIELD RESEARCH TRAVEL GRANTS FOR GRADUATE STUDENTS



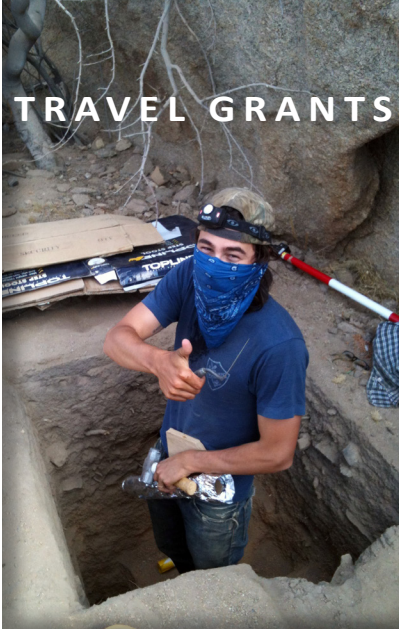
Cheryl Smith, undergraduate assistant to Joseph Cullin, stirs a tracer solution in Ankeny, Iowa. (photo by Adam Ward)



Alejandro Muzzio studied the Garifuna culture on the north coast of the Honduras. (photo by Alejandro Muzzio)



Christina Nicholas uses facial CT scans in her research.



Ted Marks prepares to take samples for Optically Stimulated Luminescence (OSL) dating of sands at an archaeological site in Namibia. (photo by Alexander Woods)



Jill Scott uses a G2X MicroScribe Digitizer to record data points from human cranial material. (photo by Nicholas Roy)

Below: Simone Williams records field notes at a water quality sampling and stream gauge site in the Rio Cobre Watershed in Jamaica. (photo by Damian Martin)



In 2012, \$18,644 was awarded to graduate students advised by CGRER members who were traveling to sites to complete field research for their thesis or dissertation.

Joseph Cullin
Geoscience, UI
Can a Limited Suite of Tracers be used to Predict Fate and Transport of Emerging Contaminants?
Ankeny, IA

Ted Marks
Anthropology, UI
Site Formation Processes and Geochronology at ERB Tanks Rockshelter, Western Namibia
Namibia

Alejandro Muzzio
Anthropology, UI
Protected Areas and Tourism: Garifuna on the North Coast of Honduras
Honduras

Elizabeth Newbury
Anthropology, UI
Community Advisory Boards in Biobanking: Mediating Lay and Expert Knowledges in Post-genomic Science
Marshfield, WI

Christina Nicholas
Anthropology, UI
Ontogeny, Respiration and (Para)mastication: An Examination of the Relationship Between Dental and Nasal Traits in genus Homo
London and Paris

Jill Scott
Anthropology, UI
The Implications of Dietary Shifts Across Pleistocene and Holocene Homo for Understanding Environmental and Climatic Changes Throughout the Old World
Europe and Africa

Jill Sherwood
Ecology, Evolution and Organismal Biology, ISU
Examining the Impact of Reduced Snowpack and Passive Warming on Plant Phenology in a Montane Meadow System
Wyoming

Simone Williams
Geography, UI
Water Quality Processes, Patterns, and Equity in a Jamaican Watershed
Jamaica

CONFERENCE TRAVEL GRANTS FOR GRADUATE STUDENTS

In 2012, \$13,660 was awarded to graduate students advised by CGRER members who were traveling to professional conferences to make oral or poster presentations.

Benjamin Abban
Civil & Environmental Engineering, UI
American Geophysical Union Annual Meeting

Keelin Baine
Anthropology, UI
Society of American Archaeology Annual Meeting

Bo Chen
Civil & Environmental Engineering, UI
American Geophysical Union Annual Meeting

Deng Ding
Geography, UI
Phenology 2012 Conference

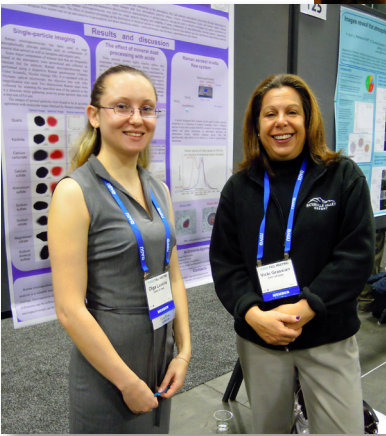
Susanna Donaldson
Anthropology, UI
Society for Applied Anthropology Annual Meeting



Mohamed El Saadani
Civil & Environmental Engineering, UI
American Geophysical Union Annual Meeting

Ali Reza Firoozfar
Civil & Environmental Engineering, UI
10th International Conference on Hydrosience & Engineering

Seyed M. Hajimirzaie
Civil & Environmental Engineering, UI
10th International Conference on Hydrosience & Engineering



Brittany Huhmann
Civil & Environmental Engineering, UI
Goldschmidt Geochemistry Conference

Brandi Janssen
Anthropology, UI
American Anthropological Association Annual Meeting

Foad Khoshouei
Civil & Environmental Engineering, UI
American Geophysical Union Annual Meeting

Olga Laskina
Chemistry, UI
American Geophysical Union Annual Meeting

Leanne Martin
Ecology, Evolution & Organismal Biology, ISU
Ecological Society of America Annual Meeting

Imali Ama Mudunkotuwa
Chemistry, UI
American Chemistry Society Annual Meeting

Charith Eranga Nanayakkara
Chemistry, UI
American Chemistry Society Annual Meeting

(continued on the next page)



Above: Mohamed El Saadani (right) and colleague at the American Geophysical Union Annual Meeting in San Francisco, CA. Left: Olga Laskina and Vicki Grassian also attended the meeting.



Above: Jennifer Trivedi presents her research at the Society for Applied Anthropology Annual Meeting in Baltimore, MD.

Left: Seyed M. Hajimirzaie and Ali Reza Firoozfar attended the 10th International Conference on Hydrosience & Engineering in Orlando, FL.



Above: Imali Ama Mudunkotuwa at the American Chemistry Society Annual Meeting in San Diego, CA.



Brandi Janssen presented a paper on connections between local farmers (including these school children growing food for their classroom) and food service providers at the American Anthropological Association Annual Meeting in San Francisco, CA.

CONFERENCE TRAVEL GRANTS (CONTINUED)

Nicholas Petrich
Civil & Environmental
Engineering
SETAC North America
33rd Annual Meeting

Jennifer Trivedi
Anthropology, UI
Society for Applied
Anthropology
Annal Meeting

Kevin Stunkel
Civil & Environmental
Engineering, UI
American Geophysical
Union Annual Meeting

Kimberly Van Meter
Civil & Environmental
Engineering
American Geophysical
Union Annual Meeting

Clare Tolmie
Anthropology, UI
Society for American
Archaeology
Annual Meeting

Kenneth Wacha
Civil & Environmental
Engineering, UI
American Geophysical
Union Annual Meeting

Sarah Trabert
Anthropology, UI
70th Annual Plains
Anthropological
Conference

Below: Deng Ding, second from left, with colleagues at the Phenology 2012 Conference in Milwaukee.



VISITING SCIENTISTS

Bin Zhang
Tsinghua University, China

Zhang visited CGRER to learn more about coupled chemistry and climate modeling. He plans to use these models in his PhD studies at Tsinghua University.

Dinesh Kumar Trivedi and Srinivas Reka
Indian Institute of Tropical Meteorology

Trivedi and Reka visited as part of a collaboration between CGRER and Indian Institute of Tropical Meteorology to launch a new operational air quality forecast system for the city of Pune, India.



Joon-Wun Kang visited the Grinnell Heritage Farm (pictured above) as part of his sustainability studies.

Joon-Wun Kang
Yonsei University, South Korea

Kang spent a year studying sustainability with **Jerry Schnoor** and **Craig Just**. He also participated in advanced oxidation process research in the groups of **Jerry Schnoor**, **Dave Cwiertny**, **Richard Valentine** and **Garry Buettner**.

Soon Woong Chang
Kyonggi University, South Korea

Chang will complete his year as a CGRER Visiting Scholar in June, 2013. He specializes in environmental engineering and the environmental impacts of water and wastewater infrastructure projects.



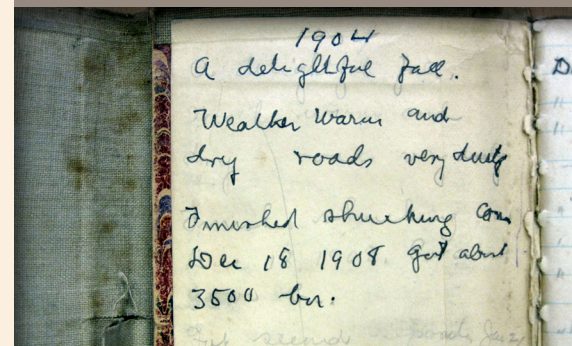
Kajsa Dalrymple, who was hired in the UI's School of Journalism/Mass Communication through the Water Sustainability Initiative, has created a new course on Risk Communication. The class (pictured above) helps students identify risks in

society and develop methods to communicate this information to the public. Such scientific knowledge is essential if people are going to make informed decisions about environmental, economic, health and other risks.



Barbara Eckstein, Marc NeuCollins and Jim Giglierano received a UI Digital Studio for Public Humanities grant to fund research assistants for the People's Weather Map project. Under their direction, students Erica Damman and Kristen DeGree are researching Iowa's weather history as recorded by people who lived through it.

Craig Just developed and taught an engineering course at the UI's Belin-Blank Center as part of its 2012 Summer on the Brain program. Seventeen high school students worked in small research teams (pictured above) to explore various hypothetical approaches for remediating a shipping canal containing sediments contaminated with toxic polychlorinated biphenyls (PCBs). Students learned about the complex issues faced by engineers as they address environmental, health and economic concerns.



Above: The People's Weather Map project makes use of sources such as a diary by Kate Dietrich, who recorded the weather every day from 1904 until the 1950s.

Cory Forbes, **Charlie Stanier** and colleagues have received a \$473,593 grant through the federal Mathematics and Science Partnership Program, which is part of the No Child Left Behind Act and is administered by the Iowa Department of Education. *Reflective Assessment for Elementary Science in Iowa* (RAES-Iowa) is a three-year

professional development program for elementary school teachers (pictured below) that will help them better engage students in scientific practices and promote their learning of science concepts. The program will involve 38 teachers in five school districts in eastern Iowa. Partners include CGRER, the UI Colleges of Education and

Engineering, Grant Wood Area Education Agency, Van Allen Science Teaching Center and the Lawrence Hall of Science at the University of California-Berkeley. The project aligns with nationwide efforts to encourage science, technology, engineering and mathematics (STEM) educational programs with a track record of success.



RESEARCH

CGRER fosters a wide variety of research projects that deepen our understanding of environmental change and help provide solutions to environmental problems from the local to global levels. During 2012 CGRER members worked on projects ranging from research on the Midwestern carbon cycle and the health effects of rural toxins to the development of a valuable new way of studying air pollution in the presence of cloud cover.

EFFECTS OF CLIMATE CHANGE ON AGRICULTURE

Gene Takle presented his research on the impact of climate change on U.S. agriculture at the United Nations Climate Change Conference in Doha, Qatar. Takle described how climate change is influencing Iowa farmers to adjust their operations. Because the growing season has lengthened, farmers are choosing

seed hybrids that take longer to mature but produce greater yields. Precipitation has also tended to be more plentiful in the first half of the growing season, and farmers are taking advantage of the resulting abundance of groundwater to plant seeds more densely than in the past. While some of these changes have been

beneficial for agriculture, Takle also warned that the Midwest is experiencing more extreme weather events such as drought and excessive rains, leading to accelerating erosion of valuable topsoil, property damage and increased economic risks.

SEEING THROUGH CLOUDS

Greg Carmichael, Scott Spak and Pablo Saide have developed an important new way of studying air pollution that allows researchers to “see” through cloud cover. Up until now, cloud cover has made it difficult to use satellite imagery to study air pollution. Their technique makes it possible to estimate the concentration of pollutants such as soot in and under clouds, and is finding

immediate applications across a wide range of scientific activities, including air quality forecasting, emissions estimation and health effects studies. The researchers combined regional weather and atmospheric chemistry modeling with NASA satellite cloud products to determine pollution concentrations, and verified the improvements using NSF aircraft measurements. The research was funded by NSF and NASA and was published in the *Proceedings of the National Academy of Sciences*.

Clouds off the coasts of Chile and Peru. (photo by Greg Carmichael)

RURAL HEALTH RESEARCH

Peter Thorne and colleagues have received a \$7.9 million grant to fund the work of the UI’s Environmental Health Sciences Research Center. The five-year grant from the National Institutes of Environmental Health Sciences will enable the center to continue investigating health effects arising from rural and agricultural environmental contaminant

exposures and will help the center expand its research into areas such as nanomaterials and antibiotic resistant organisms. The center’s research focuses on rural populations that face significant, unaddressed environmental health concerns including asthma, cancer, and neurodegenerative and inflammatory diseases. Members of the center have

conducted innovative research on the human health effects of industrialized livestock production, radon and natural disasters such as the Iowa flood of 2008. **Peter Thorne** is the Center Director. **Garry Buettner, Bill Field, Tori Forbes, Vicki Grassian, Joel Kline, Gerard Rushton and Charlie Stanier** are also members of the EHSRC.

MIDWESTERN CARBON CYCLE RESEARCH

Thanos Papanicolaou leads a research team investigating how carbon cycles through Midwestern landscapes. The group is also researching the impacts various farming practices have on the carbon cycle and the potential environmental effects these practices have on the Midwest and the world.

The fertile soils of the Midwest act like storage bins for carbon, which becomes a greenhouse gas when released into the atmosphere as CO₂. It is not fully known how different agricultural management practices influence the movement of carbon be-

tween the land and atmosphere. Papanicolaou’s team is conducting field studies of soil carbon sequestration under different land uses and crop rotations, using rainfall simulators to mimic precipitation. A collection system gathers the water and soil and measures the amount of organic carbon in the soil and how it is affected by erosion.

These small-scale experiments are yielding valuable information on the larger issue of how much carbon is stored in Midwestern soil and how much is emitted back into the atmosphere in the form of CO₂. The research team

hopes to show the benefits of carbon storage in the soil and to identify farming practices that increase this storage. The team is also providing data on carbon emissions due to erosion for use in NASA’s computer modeling efforts. Papanicolaou’s work is supported by a grant from NASA’s Experimental Program to Stimulate Competitive Research (EPSCoR). **Greg Carmichael** and **Charlie Stanier** are also involved in this research, along with colleagues from the UI, Iowa State University, University of Northern Iowa, U.S. Department of Agriculture and NASA.

ASSESSING AIR POLLUTION IN JOHNSON COUNTY

Scott Spak, Charlie Stanier, Elizabeth Stone and Greg Carmichael are the lead researchers for the Johnson County Air Quality Study, a project analyzing air pollution in Iowa City and eastern Iowa. The 18-month project represents Johnson County’s first air pollution assessment and attribution study, taking into account more than 50 trace gas and particle pollutants and

assessing the roles of power plants, motor vehicles, fireplaces and a range of other sources. Using the latest measurement techniques and modeling tools, the researchers are trying to find the best and most cost-effective emissions control strategies for improving air quality in the region under current and future regulatory standards. While the research will provide decision-makers

with the information needed to improve air quality and health in Johnson County, the study will also provide a national example of how state-of-the-science air quality modeling can improve the permitting process by contributing information that’s more complete, credible and useful to power plant operators, regulators and the public.

IOWA WATERSHEDS PROJECT

Working in conjunction with IIHR—Hydroscience & Engineering, the Iowa Flood Center has selected four watersheds for the initial phase of the Iowa Watersheds Project, an initiative funded by the U.S. Department of Housing and Urban Development (HUD). The effort seeks to restore and enhance Iowa’s agricultural landscape so that it can better

handle flood flows in coming years. The four watersheds are the Turkey River; Middle Raccoon River; Soap Creek and Chequest Creek; and Upper Cedar River. Researchers are working with local watershed management authorities, landowners and agency representatives to identify areas where flood mitigation projects are most likely to reduce

downstream flood damages. During the second phase, projects will be implemented in select locations. CGRER members associated with the flood center include its director, **Witold Krajewski**, and **Allen Bradley** and **William Eichinger**. **Larry Weber**, who leads the Iowa Watersheds Project, is director of IIHR—Hydroscience & Engineering.

SEED GRANTS

In 2012, CGRER awarded a total of \$159,819 in Seed Grants to six projects.

Evaluating the Hydrologic Performance of Bioretention Cells for Mitigating Urban Stormwater Runoff; **E. Arthur Bettis III**, UI Dept. of Geoscience; \$21,068

Working Toward a Sustainable Iowa: An Assessment of Public Attitudes Toward Water Sustainability; **Kajsa E. Dalrymple**, UI School of Journalism and Mass Communication; \$30,000

Modeling Hydrologic Systems in Elementary Science (MoHSES): A Pilot Study; **Cory T. Forbes**, UI Dept. of Teaching & Learning; \$29,971

Investigations of Uranium Complexation for Enhanced Transport Modeling and Environmental Remediation of Nuclear Materials; **Tori Z. Forbes**, UI Dept. of Chemistry; \$29,896

Climate Change, Spring Persistence and Conservation in the Kunene Region: Assessing the Sensitivity of Springs to Climate Change in Arid Western Namibia; **Peter J. Jacobson**, Grinnell College Dept. of Biology; with Keith E. Schilling of the Iowa Geological and Water Survey and UI Dept. of Geoscience; Werner Kilian of the Etosha Ecological Institute, Namibia; Jeff Muntifering of the Save the Rhino Trust, Namibia; and Mary Seely of the Desert Research Foundation of Namibia; \$24,800

Grass Lawn Ecosystem Sustainability in an Era of Climate Change: Insights from 38 Years of Warming; **James W. Raich**, ISU Dept. of Ecology, Evolution & Organismal Biology; \$24,084

A SAMPLING OF PUBLICATIONS BY CGRER MEMBERS

Abelkop, Adam D.K. and **Jonathan Carlson**. 2012. Reining in Phaëthon’s Chariot: Principles for the Governance of Geoengineering. *Transnational Law & Contemporary Problems*, SSRN: <http://ssrn.com/abstract=2165372>.

Yusen, Z., E. Wang, **R.M. Cruse** and X. Chen. 2012. Characterization of seasonal freeze/thaw and potential impacts on soil erosion in northeast China. *Canadian Journal of Soil Science*, doi: 10.4141/cjss2010-045.

Dahms, D., F. Favilli, et al. 2012. Soil weathering and accumulation rates of oxalate-extractable phases derived from alpine chronosequences of up to 1Ma in age. *Geomorphology*, doi:10.1016/j.geomorph.2012.01.021.

Egli, M., F. Favilli, R. Krebs, B. Pichler, **D. Dahms**. 2012. Soil organic carbon and nitrogen accumulation rates in cold and alpine environments over 1 Ma. *Geoderma*, doi:10.1016/j.geoderma.2012.03.017.

Ibáñez, I., E. S. Gornish, L. Buckley, **D.M. Debinski**, et al. 2012. Moving forward in global-change ecology: capitalizing on natural variability. *Ecology and Evolution*, doi: 10.1002/ece3.433.

Eckstein, Barbara. 2012. Child’s Play: Nature-Deficit Disorder and Mark Twain’s Mississippi River Youth. *American Literary History, Special Issue: Sustainability in America*, doi: 10.1093/alh/ajr054.

Field, R.W. and B.L. Withers. 2012. Occupational and environmental causes of lung cancer. *Clinics in Chest Medicine*, doi:10.1016/j.ccm.2012.07.001.

Biggers, M. and **C.T. Forbes**. 2012. Balancing teacher and student roles in elementary classrooms: Preservice elementary teachers’ ideas about the inquiry continuum. *International Journal of Science Education*, doi:10.1080/09500693.2012.694146.

Zangori, L. and **C.T. Forbes**. 2012. This is inquiry...right? Strategies for effectively adapting elementary science lessons. *Science and Children*, 50(1), 48-53.

Laskina, O., M.A. Young, P.D. Kleiber, and **V.H. Grassian**. 2012. Infrared extinction spectra of mineral dust aerosol: single components and complex mixtures. *Journal of Geophysical Research: Atmospheres*, doi:10.1029/2012JD017756.

Ault, A.P.; T.M. Peters, E.J. Sawvel, G.S. Casuccio, R.D. Willis, G.A. Norris, and **V.H. Grassian**. 2012. Single particle SEM-EDX analysis of iron-containing coarse particulate matter in an urban environment: sources and distribution of iron within Cleveland, Ohio. *Environmental Science & Technology*, doi: 10.1021/es204006k.

Glisan, J., **W. J. Gutowski**, J. J. Cassano and M. E. Higgins. 2012. Effects of spectral nudging in WRF on Arctic temperature and precipitation simulations. *Journal of Climate*, doi: dx.doi.org/10.1175/JCLI-D-12-00318.1

Hornberger, G. M., E. Bernhardt, W. E. Dietrich, D. Entekhabi, G. E. Fogg, E. Foufoula-Georgiou, **W. J. Gutowski**, et al. 2012. *Challenges and Opportunities in the Hydrologic Sciences*. Water Science and Technology Board, National Academy of Sciences.

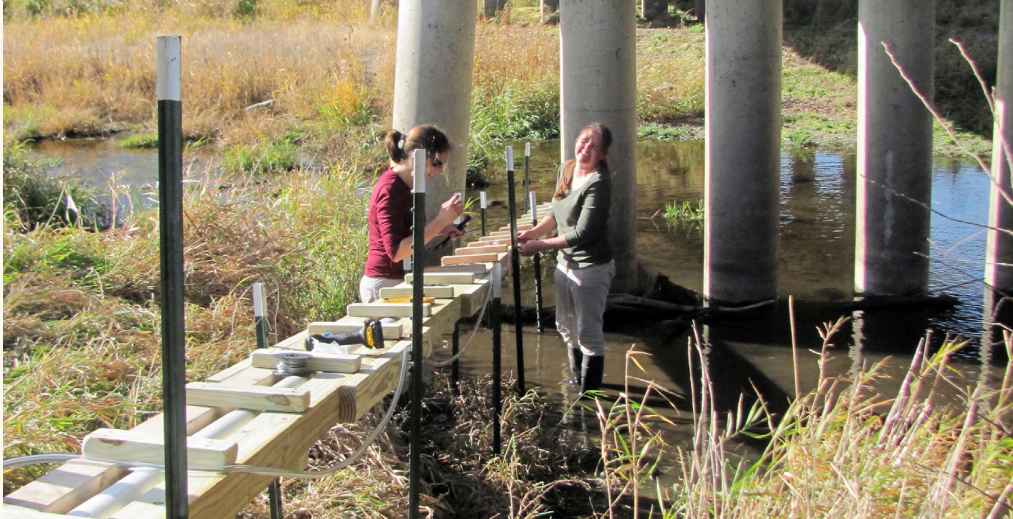
Mutel, C.F. 2012. Fiery Friend of the Forest. *Iowa Outdoors*, Sept-Oct issue, pp 28-35.

Saide, P.E., G.R. Carmichael, S.N. Spak, et al. 2012. Improving aerosol distributions below clouds by assimilating satellite-retrieved cloud droplet number. *Proceedings of the National Academy of Sciences*, doi: 10.1073/pnas.1205877109.

Mena-Carrasco, M.A., E. Oliva, **P.E. Saide, S.N. Spak**, et al. 2012. Estimating the health benefits from natural gas use in transport and heating in Santiago, Chile. *Science of the Total Environment*, doi:10.1016/j.scitotenv.2012.04.037.

Saide, P.E., S.N. Spak, G.R. Carmichael, et al. 2012. Evaluating WRF-Chem aerosol indirect effects in Southeast Pacific marine stratocumulus during VOCALS-Rex. *Atmospheric Chemistry and Physics*, doi:10.5194/acp-12-3045-2012.

Ward, A.S., M. Fitzgerald, M.N. Gooseff, et al. 2012. Hydrologic and geomorphic controls on hyporheic exchange during base flow recession in a headwater mountain stream. *Water Resources Research*, doi:10.1029/2011WR011461.



Monitoring nitrogen and discharge responses to storm events after the 2012 drought (photo: Adam Ward)

A SAMPLING OF GRANTS AWARDED TO CGRER MEMBERS

Art Bettis (co-PI) and colleagues from ISU, University of Kansas and Old Dominion University received a \$305,897 NSF grant for *Collaborative Research: Stabilized Organic Carbon and Paleoenvironmental Interpretation of Late Quaternary Paleosols* (2012-15).

Richard Cruse (PI) and colleagues received a \$620,898 grant from the U.S. Dept. of Agriculture for *An Integrated Approach To Precision Conservation Planning In The South Fork Watershed* (2012-2015).

Diane Debinski and Chris Anderson (PI) were awarded a \$120,227 grant from the North Central Climate Science Center for *Regional Extreme Climate Events: Gaining Understanding Through Past and Present Observations and Modeling* (2012-13).

Adam Ward (co-PI) and colleagues at the University of Nebraska-Lincoln and Coe College were awarded a \$197,568 NSF grant for *RAPID: Using a drought-enhanced nitrate pulse to understand stream N retention and processing* (2012-13).

CGRER AIDS TO RESEARCHERS

CGRER continues to provide high-performance computing and visualization resources to facilitate interdisciplinary research. During the year CGRER researchers significantly increased their use of the new Helium Cluster, which features specialized software and central processing units capable of handling large computer models and simulations. CGRER researchers logged over 76,000 CPU hours on Helium in

addition to their work on other computers.

During the year CGRER-owned storage capacity increased to nearly 350TB. CGRER also is one of four UI departments that supports and distributes geographical information system (GIS) software through a campus-wide site license with the Environmental Systems Research Institute, Inc.

INTERNATIONAL EFFORTS

CGRER's research and educational efforts span the globe. In 2012, members worked on projects ranging from studies of e-waste recycling in China and air quality modeling in Chile to research on the effects of black carbon in the Arctic.



E-waste is a growing problem for countries around the world. (photo by Jerry Schnoor)

E-WASTE RECYCLING IN CHINA

As electronic and electrical products such as computers and mobile phones have become ubiquitous, their recycling has become an increasingly important global issue. Such products often contain toxic materials such as heavy metals and PCBs as well as valuable elements such as copper and gold. The relatively high cost for e-waste disposal in developed countries has driven recycling operations to developing countries such as China, India and Pakistan. **Jerry Schnoor** and

two Chinese colleagues published an article on e-waste recycling in China in *Environmental Science & Technology*. The piece analyzes the economic, social and environmental implications of e-waste recycling in the developing world and makes recommendations on improving its management. As China is home to the world's largest e-waste recycling operation, lessons learned in China can be beneficial for other nations attempting to deal with this growing environmental issue.

AIR QUALITY MODELING IN SANTIAGO, CHILE



Santiago, Chile, has significant air pollution, particularly during the winter.

Pablo Saide has developed a system to predict periods of high pollution in Santiago, a Chilean city of six million that is especially prone to smog during the winter months. The new system has a longer lead time than previous forecasting models, giving the city several days to prepare for an upcoming surge in pollution through strategies such as limiting the use of private cars and shutting down factories. The prediction system is currently in use in a year-long pilot trial by the Chilean

Meteorological Office, which is sharing its results with Saide so that additional improvements can be made. A native of Chile, Saide is an environmental engineering PhD student advised by **Greg Carmichael** and **Scott Spak**. His collaborators on the forecasting project include UI alumnus **Marcelo Mena**, currently at Universidad Andrés Bello, and researchers from Universidad de Chile and U.S. National Oceanic and Atmospheric Administration (NOAA).



Photo: Wordpress.com/2012/05/1-img_9911.jpg

COLLABORATION WITH THE EUROPEAN UNION

Greg Carmichael is representing CGRER in a new European Union project funded by the Commission on Science and Technology (COST). The COST Action -- European framework for online integrated air quality and meteorology modeling

(EuMetChem) is a three-year initiative. Its goal is to develop a comprehensive strategy and specific action plan for the development of a new modeling framework to improve air quality, weather and climate prediction in Europe.



NASA Photo

BLACK CARBON AND THE ARCTIC

Greg Carmichael was part of a U.S. team that participated in a U.S.-Russian symposium on the Ecological, Economic and Medical Consequences of Emissions of Black Carbon into the Environment. The symposium was held in Moscow and was organized by the Russian Academy of Sciences and the U.S. National Academy of Sciences within the framework of the U.S.-Russian Bilateral Presidential Commission.

The meeting focused on the impacts of black carbon emissions resulting from gas flares, open mining operations and forest fires on the air quality and climate of the Arctic. These emissions accelerate warming in a part of the globe that is already experiencing faster climate change than other regions. There is a growing international recognition of the role black carbon plays in climate change and the importance of limiting it around the globe. Russian and American scientists are planning joint investigations to better understand the effects of black carbon and how they can be mitigated.

RIVERS AS BRIDGES PROGRAM



A group of China's top high school students visited the UI's Lucille A. Carver Mississippi Riverside Environmental Research Station (LACMRERS) on the Mississippi River in July. **Doug Schnoebelen**, LACMRERS

director, and **Larry Weber**, director of IIHR—Hydroscience & Engineering, welcomed the students. Schnoebelen discussed the significance of the Mississippi River and led the students in hands-on experiments relating to the work of the research station. The event was part of Rivers as Bridges, a program that celebrates the sister-river relationship of the Mississippi River and China's Yangtze River. LACMRERS is part of IIHR—Hydroscience & Engineering.



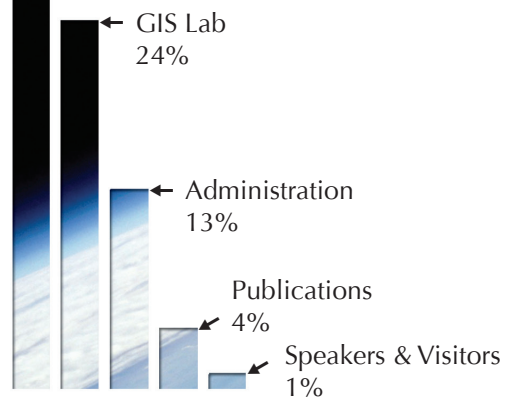
Above: Doug Schnoebelen discusses sediment deposition from cores collected in the Mississippi River with Chinese high school students. Right: Herky the Hawk joined the Chinese students for a field trip on the Mississippi.



← Research & Education
58%

BUDGET & FUNDING

In fiscal year 2012 (July 1, 2011-June 30, 2012), CGRER received \$685,984 in revenue from public utilities as mandated by the State of Iowa's Energy Efficiency Act. These funds helped CGRER assist its members in a wide variety of initiatives.



← \$6.2 million in new external funding

This funding was magnified many times in the research money awarded to CGRER members from other sources. In calendar year 2012, CGRER members brought in \$6.2 million in new external research funding.



← \$685,984 in revenue from rate payers through public utilities

ADMINISTRATION



Greg Carmichael and Jerry Schnoor

CGRER is directed by University of Iowa professors **Gregory Carmichael** (Dept. of Chemical and Biochemical Engineering) and **Jerald Schnoor** (Dept. of Civil and Environmental Engineering). Center activities are guided by an elected Executive Committee that consists of eight members (listed on page 3) plus the two co-directors. The Executive Committee meets monthly to plan initiatives and chart CGRER's course. An Advisory Board of nine members from outside the academic community (listed on page 5) meets annually to lend oversight to CGRER's activities.



Joe Bolkcom, Jane Frank and Jeremie Moen

Since 1992, CGRER has employed two full-time staff members. Administrative assistant **Jane Frank** oversees office operations. **Jeremie Moen** manages CGRER's computer facilities with the aid of services contracted from the Iowa Computer Aided Engineering Network. In addition, **Joe Bolkcom** serves as half-time Director of Outreach and Community Education. CGRER reports directly to the UI's Vice President for Research.

MEMBERS

UNIVERSITY OF IOWA

Anthropology

Margaret E. Beck
Michael S. Chibnik
Russell L. Ciochon
James G. Enloe
Matthew E. Hill, Jr.

Biology

Andrew A. Forbes
Stephen D. Hendrix
Diana G. Horton

Chemical and Biochemical Engineering

Gregory R. Carmichael
A. Umran Dogan
Charles O. Stanier

Chemistry

Tori Z. Forbes
Vicki H. Grassian
Sarah C. Larsen
Elizabeth Stone
Mark Young

Civil & Environmental Engineering

Nandita Basu
A. Allen Bradley
William E. Eichinger
Keri C. Hornbuckle
Craig L. Just
Witold F. Krajewski
Lou Licht
Timothy E. Mattes
Marian V. Muste
Wilfrid A. Nixon
A. Jacob Odgaard
A.N. Thanos Papanicolaou
Gene F. Parkin
Michelle Scherer
Jerald L. Schnoor
Richard L. Valentine
Larry Weber

Economics

Thomas F. Pogue
John L. Solow

Electron Spin Resonance Facility

Garry R. Buettner

English

Barbara Eckstein
Laura Rigal

Geography

Marc P. Armstrong
David Bennett
Margaret Carrel
Marc Linderman
George P. Malanson
Michael L. McNulty, Emeritus
R. Rajagopal
Heather Sander
Gerard Rushton
Eric Tate

Geoscience

Richard G. Baker, Emeritus
E. Arthur Bettis
Robert S. Carmichael
Jeffrey Dorale
Lon D. Drake, Emeritus
David W. Peate
Mark K. Reagan
Holmes A. Semken, Jr., Emeritus
Adam S. Ward
Frank H. Weirich
You-Kuan Zhang

History and Community & Behavioral Health

Paul R. Greenough

IIHR-Hydroscience & Engineering

Connie Mutel
Douglas Schnoebelen

Journalism and Mass Communication

Kajsa E. Dalrymple

Law

Jonathan Carlson
Burns H. Weston

Mechanical & Industrial Engineering

Geb Thomas

Molecular Physiology & Biophysics

G. Edgar Folk, Emeritus

Occupational & Environmental Health

William R. Field
Joel N. Kline
Peter S. Thorne

Physics & Astronomy

Donald A. Gurnett
Paul D. Kleiber
Steven R. Spangler

Science Education

Cory T. Forbes

Statistics & Actuarial Science

Kate Cowles
Dale L. Zimmerman

Urban & Regional Planning

Charles Connerly
Scott Spak
Aaron Strong

IOWA STATE UNIVERSITY

Agronomy

Raymond W. Arritt
Richard M. Cruse
Brian K. Hornbuckle

Ecology, Evolution, and Organismal Biology

Diane M. Debinski
John Nason
James W. Raich
Brian J. Wilsey

Geological & Atmospheric Sciences

William J. Gutowski
Eugene S. Takle

Natural Resource Ecology and Management

Jan Thompson

UNIVERSITY OF NORTHERN IOWA

Biology

Laura Jackson

Geography

Dennis E. Dahms
Ramanathan Sugumaran

CORNELL COLLEGE

Geology

Rhawn Denniston

HYDROLOGIC RESEARCH CENTER, SAN DIEGO, CA

Konstantine P. Georgakakos

RICE UNIVERSITY

Civil & Environmental Engineering

Pedro Alvarez

UNIVERSITY OF WYOMING

College of Engineering

Robert Ettema

CGRER

THE CENTER FOR GLOBAL AND REGIONAL ENVIRONMENTAL RESEARCH



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