FALL 2010

NATURAL RESOURCES AND ENVIRONMENT
UNIVERSITY OF MICHIGAN

Stewards

A magazine for alumni and friends of the School of Natural Resources and Environment

CLIMATESMART

SNRE researchers work to solve the climate-adaptation puzzle

WATER WORK

Research teams receive $9M to study health, future of the Great Lakes

UNIVERSITY OF MICHIGAN

CORPS CONNECTION

50 years after Kennedy's inspiring speech, the Peace Corps spirit lives on at SNRE

Stewards

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CLIMATE SMART

features

ANGELA MICHALEK, PEACE CORPS FELLOW

COPING WITH CLIMATE CHANGE

SPANNING THE WORLD: DEAN BIERBAUM IN THE GALAPAGOS ISLANDS (LEFT) AND AT MCMURDO, ANTARCTICA.

We are living in a moment of tremendous opportunity, uncertainty and risk. Societies are already feeling the impacts of climate change through changes in droughts, floods, wildfires and extreme storms. Suddenly the word "adaptation" has become mainstream and the nascent field of adaptation research is front and center. The National Climate Adaptation Summit was just held in Washington, D.C., and I was honored to co-chair it. The United States is building the National Climate Service to help communities respond to climate change, beginning the next Congressionally mandated National Climate Assessment, and designing the next 10-year global change research plan. A new generation of environmental leaders is stepping up in businesses and governments across the globe to confront climate change. Those are some of the *opportunities*.

The chief *uncertainty* is whether we have the political and popular will to stem greenhouse gas emissions in time to prevent "dangerous anthropogenic interference with the climate system", as called for under the United Nations Framework Convention on Climate Change. The *risk* is that mitigation efforts and adaptation planning will be insufficient, haphazard, or fragmented.

SNRE is in the vanguard of responders to climate change and we recognize it must be tackled in concert with the other environmental stresses occurring concomitantly—such as habitat fragmentation, invasive species, air and water pollution and loss of biodiversity. Our prescient SNRE mission statement will continue to serve us well: We are "devoted to generating knowledge and developing policies, techniques and skills to help practitioners manage and conserve natural and environmental resources to meet the full range of human needs on a sustainable basis."

In order to cope with climate change, we need to ask "So what? What does a changing climate mean to me, in my place?" If Michigan summers will feel like Arkansas summers by the end of the century, as has been projected, our farms, forests and lifestyles will be fundamentally different.

Those "so what" questions are at the heart of climate adaptation and are at the center of the scholarly and applied work of faculty and students at SNRE. No one lives in the "global average climate," and we must understand climate impacts in the context of a particular place. How can our knowledge help people—in Detroit, Port-au-Prince or a village in Nepal—survive rates of change that are faster than observed for the last 10,000 years? And not only survive, but prevail with minimal damage to public health, education, culture and improved standards of living?

This issue of *Stewards* tells the story of how the SNRE academic community is creating and applying adaptation knowledge. Can we prevent today's adaptation strategy from becoming tomorrow's ecological disaster, political boondoggle or financial black hole? Can we lift developing countries out of poverty and achieve the United Nations Millennium Development Goals? Can we work together to adapt adaptively by strategically altering our technologies, management practices and institutions to respond to a changing climate?

Managing species or building cities for the climate of the last century will be inefficient and ineffective. Infrastructure must be built to withstand new extremes. Land and water must be managed in ways that cope with changing temperature and precipitation regimes. We need national and international climate services to guide decisions made by farmers and mayors and businesses every day. We need increased emergency response plans, early-warning systems and stronger social safety nets. We must elucidate how poverty, race, gender and social capital affect vulnerability and determine a reliable way to measure the costs of adaptation against the costs of not adapting. We must anticipate opportunities presented by climate change, such as conditions that support new crops or create demand for new energy technologies.

The myriad needs are complex and daunting, but the faculty and students of SNRE, working with the greater university community, have begun to tackle these interdisciplinary problems and advance the knowledge and expertise needed to meet the challenges of this century

Adaptation to climate change requires participation from everybody: scientists, economists, entrepreneurs, community leaders, educators, communicators, policy makers, engineers, lawyers and landscape architects. It requires you. We must learn by doing. We need to share best practices and work from the local to the global scale so actions can be coherent. A decision not to act is as much a decision as one to act. If I had to Tweet what we need to do, I think I could say it in three words: "communicate, coordinate, act." It's a simple edict for a complex global challenge, but our community has the flexibility, creativity and passion to embrace the uncertainty, mitigate the risks, create new opportunities and lead the way into this crucial new era in climate change research.

Rosina M. Bierbaum

Dean, School of Natural Resources and Environment

THE GLOVES GO ON

INCOMING STUDENTS RETREAT TO THE BIOSTATION

The School of Natural Resources and Environment welcomed members of its incoming class in late August, when more than 170 master's and doctoral students caravaned in busses to the University of Michigan Biological Station in the northern Lower Peninsula for the annual new student orientation activities. Dean Rosina M. Bierbaum provided the opening-day welcome and Associate Deans Arun Agrawal and Bill Currie provided additional details and insight into academic life at SNRE.

Students explored the region on foot and by raft, and capped each evening with a campfire. They battled steady morning rains while learning fish collection and identification techniques during the fish-shock exercise in the Sturgeon River near the town of Wolverine.

The three-day orientation is a decades-long SNRE tradition. The Biostation consists of more than 10,000 acres on the shores of Douglas Lake, about four hours from Ann Arbor. This year, film crews from the Big Ten Network filmed the SNRE orientation as part of a documentary about research work at the University of Michigan facility.

SNAPSHOT OF SNRE STUDENTS

474	Entire current SNRE student body *(61 Ph.D., 413 M.S. and M.L.A.)*
171	New students
120	Undergraduate majors represented in entire SNRE student body* *(including accounting, advertising, agricultural science, criminology, dance, earth science, history, horticulture, mechanical engineering, music, urban design, wildlife management and zoology)*
60	Undergraduate majors represented in incoming class* *(most common undergraduate majors: environmental studies, biology, business administration)*
33	Number of states represented *(plus Puerto Rico and Washington, D.C.)*
29	Average age
26	Percent of entire student body from the state of Michigan
17	Number of countries represented
11	Percent from outside the United States

** Numbers are approximate*

KRISTIN BAJA , A MASTER'S STUDENT PURSUING DEGREES AT SNRE AND THE TAUBMAN COLLEGE OF ARCHITECTURE AND URBAN PLANNING, PREPARES FOR THE FISH ELECTROSHOCKING EXPERIENCE.

SOMETHING IN THE WATER

U-M receives $9 million for Great Lakes research

SNRE researchers are prominently involved in two major Great Lakes climate-related projects that received funding this fall. The **Great Lakes Regional Integrated Sciences and Assessments Center (GLISA)** was funded by the National Oceanic and Atmospheric Administration for $4.2 million over five years. U-M and Michigan State University will jointly lead an interdisciplinary effort to help Great Lakes-region residents anticipate and adapt to climate change. Work at GLISA will focus initially on the watersheds of lakes Erie and Huron and three critical topics: agriculture, watershed management and natural resources-based recreation and tourism. SNRE Professor and Director of the Graham Environmental Sustainability Institute Don Scavia is a co-leader of the project and Associate Professor Maria Carmen Lemos is on the team. Meanwhile, a team of 27 researchers from across U-M and collaborators at other institutions received $5 million from the National Science Foundation for a project called "**Extreme Events Impacts on Water Quality in the Great Lakes: Prediction and Management of Nutrient Loading in a Changing Climate**." Professors Lemos, Scavia, Dan Brown and Michael Moore, along with Research Scientists Dima Beletsky and Eric Anderson and postdoctoral fellow Mary Anne Evans, are on the interdisciplinary team, which is lead by U-M Engineering Professor Anna Michalak.

SUNRISE ON THE SHORE OF LAKE SUPERIOR IN NORTHERN MINNESOTA

IN BRIEF

Twenty Years of Justice

In 1990, a U-M conference on race and environmental hazards marked the birth of environmental justice as an academic discipline. A book compiling the research of the 12 scholars who presented at the conference, called "Race and the Incidence of Environmental Hazards," was published in 1992. Many scholars point to the event as influential in the environmental justice movement.

Twenty years later, a volume based on a 2007 conference organized by the Multicultural Environmental Leadership Development Initiative has been published by Emerald Group Publishing Ltd. as a special issue of the journal *Research in Social Problems and Public Policy*. The book, *Environment and Social Justice: An International Perspective*, is a compilation of articles by leading environmental justice researchers. The book covers issues related to food, water, urban planning, energy and communication and perceptions.

SNRE Associate Professor Dorceta E. Taylor edited the volume. In August, she also received the Allan Schainberg 2010 Outstanding Publication Award from the American Sociological Association for *The Environment and the People in American Cities, 1600s-1900s: Disorder, Inequality, and Social Change*, published by Duke University Press in 2009. In the book, she identifies deep historic connections between racism and environmental conditions in a provocative portrait of urban inequality.

All the President's Scientists

Assistant Professor Shelie Miller, who joined the SNRE faculty this fall, is one of 100 winners of the 2010 Presidential Early Career Award for Scientists and Engineers. The award is the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers. Her work focuses on reducing the environmental impacts of emerging systems, like the biofuel industry, in order to avoid unintended consequences and improve system design.

Provost Forming Dean Search Committee

University of Michigan Provost Phil Hanlon is creating a search advisory committee this fall to help him identify the next dean of the School of Natural Resources and Environment. The new dean will replace Rosina M. Bierbaum, now in her 10th year of leadership.

"As a national and international leader in environmental science, Dean Bierbaum has been strategic and effective in bringing new ideas, resources, people and connections to build on existing strengths in SNRE," said Provost Hanlon, who also serves as the University of Michigan's Executive Vice President for Academic Affairs. "She has guided growth in important areas of study such as environmental sustainability, global change and land-use change, thus enhancing the school's strength, visibility and reputation at all levels."

The search advisory committee will include representatives of SNRE's faculty, one of whom will serve as chair. It also will include a faculty representative from another discipline; an SNRE staff member; an SNRE alumnus; a sitting dean from another U-M college or school; and one or two students. The committee will be asked to search broadly and submit to President Mary Sue Coleman and Provost Hanlon a slate of unranked recommended candidates.

Bierbaum Receives ESA Award

The Ecological Society of America (ESA) recognized Dean Rosina M. Bierbaum for her long and distinguished service to the scientific community and her ecological work in the public interest. She received the Distinguished Service Citation at ESA's 95th annual meeting in August in Pittsburgh. The ESA selected her for her work developing a new kind of cross-cutting education focused on today's environmental challenges. "She has been an effective advocate for the application of sound ecological science to a wide range of problems, from acid rain and energy development to climate change impacts and adaptive strategies, and been such an advocate in the halls of power where the critical decisions are made that influence us all," said Deborah Goldberg, the Elzada U. Clover Collegiate Professor and Chair of the U-M Department of Ecology and Evolutionary Biology, in her introduction of Dean Bierbaum.

SNRE to the IPCC

Three SNRE researchers have been selected to contribute climate-change adaptation research and analysis to the fifth climate assessment report of the Intergovernmental Panel on Climate Change (IPCC).

Dean Rosina M. Bierbaum will serve as a review editor for a chapter on global climate adaptation decision-making. Professor and Associate Dean for Research Arun Agrawal has been appointed a lead author of a chapter on climate effects on livelihoods and poverty, and Associate Professor Maria Carmen Lemos will be a lead author on a climate-change resilience and sustainable development chapter.

The IPCC's comprehensive and influential assessments examine climate change in terms of physical science, adaptation and mitigation of impacts, and provide governments with sound scientific knowledge of climate change. The report will be published as the Fifth Assessment Report (AR5) by 2014.

The IPCC was established by the United Nations Environmental Programme and the World Meteorological Organization in 1989. The IPCC's fourth assessment report was published in 2007 and was nearly 3,000 pages long; the IPCC was awarded the Nobel Peace Prize that same year.

Top Honors for Allan and Perfecto

Professors Dave Allan and Ivette Perfecto have received some of the university's top faculty honors. Professor Allan received the 2010 Distinguished Faculty Achievement Award. It honors senior faculty who have consistently demonstrated outstanding achievements scholarly research and/or creative endeavors; teaching and mentoring of students and junior faculty; service; and other activities that have brought distinction to themselves and the university. Professor Perfecto received the 2010 Faculty Recognition Award. It recognizes faculty in early phases of their careers who have made substantive contributions to U-M through achievements in scholarly research and/or creative endeavors; excellence as a teacher, advisor and mentor; and distinguished participation in service activities.

In Memory:
Chuck Cares

SNRE lost one of its longest-term friends when Landscape Architecture Professor Emeritus Charles W. "Chuck" Cares died Sept. 22, just a few weeks short of his 92nd birthday. Chuck joined the Landscape Architecture faculty at the university in 1959 and taught in areas of landscape history, planting design and landscape design. During his long career, Chuck mentored hundreds of students, served as chair of the landscape architecture program and directed Nichols Arboretum.

He and his wife, Marian, frequently welcomed students into their home, and Chuck kept in touch with many as alumni, taking great pride in their accomplishments and careers. When I joined the faculty in 1986, he became a good friend and mentor, sharing his sense of history and passion for thoughtful design.

Chuck was also active in a wide variety of community organizations and created landscape designs for dozens of private residences, commercial properties and parks in and around Ann Arbor.

—Bob Grese, Professor of Landscape Architecture

DEAN BIERBAUM PRESENTS AN AWARD TO CHUCK CARES IN 2008 FOR HIS LEADERSHIP, SERVICE AND COMMITMENT TO LANDSCAPE ARCHITECTURE AT SNRE. INSET: CARES IN 1965.

PITE STUDENT BUCK CASTILLO, CENTER, AND GRADUATE STUDENTS IN A FIELD BIOLOGY CLASS

A SUSTAINABLE SURGE

SNRE, PitE fuel U-M environmental degree growth

The School of Natural Resources and Environment isn't the only environmental program at the University of Michigan with growing enrollments. As graduate applications to SNRE doubled in the past five years, the undergraduate Program in the Environment (PitE) has enjoyed an enrollment surge as well; the number of students choosing PitE as a minor or concentrator (major) has grown from 35 in the 2003 to 511 in 2010.

And it is the job of PitE's new director, Professor Paul Webb, a fish biologist who joined SNRE in 1972, to sustain that growth and create new ways to enrich the student experience. PitE is jointly administered by SNRE and the College of Literature, Science, and the Arts (LSA).

"I am totally dedicated to developing environmental education across campus," he said. "I do not see the Program in the Environment as an LSA program or an SNRE program. I see it as a program that draws students and faculty from across the entire campus." Among the challenges in the coming years are to prepare for the program's five-year review, expand internship opportunities, create a sustainability minor across campus and encourage faculty to design new courses for PiTE students—all while preparing for the program's 10th anniversary next year.

"We want to develop connections with any unit that is involved in environmental problems," Professor Webb said. "So far, we've barely scratched that surface."

PitE evolved out of the undergraduate program at SNRE, which was combined with other smaller programs in LSA. The University of Michigan Board of Regents created PitE in November 2001; the program became effective the following fall. Students receive a single combined diploma from LSA and SNRE and attend SNRE's graduation ceremonies in the spring. The growing student interest at both undergraduate and graduate levels mirrors a dramatic national increase in programs and students pursuing environmental-related degrees.

Like SNRE, PitE's approach to environmental education is inherently interdisciplinary, but PitE especially seeks to integrate humanities with natural and social sciences.

"One of the things we recognize is the critical role of culture and humanities in addressing environmental issues," he said. "Storytelling, music and art have been tremendous vehicles to take the most difficult problems and 'domesticate' them, to humanize them, so we can then build them into our value set."

Professor Webb is no stranger to PitE. He has been the program's associate director since its establishment in 2002. He also has a dual appointment with LSA's Department of Ecology and Evolutionary Biology and served as SNRE's interim dean from 1995-96.

BLOG ROLL

Know Your Farmer

Shannon J. Brines, **SNRE lecturer and manager of the Environmental Spatial Analysis Lab**

Shannon Brines works as a systems analyst and researcher in the GIS lab of SNRE Professor Dan Brown, but he and his family also have a small organic farm in Dexter, Mich. Brines blogs about crops, the food media, urban farming and other agriculture issues at Know Your Farmer (**brines.blogspot.com**.)

"A blog was just one natural way that I could communicate to folks so they could learn about things going on at the farm, farm offerings, as well as my interests and motivations as their farmer," Brines said. The blog also relates to Brines' work as a geographic information systems research specialist and lecturer. "Some of the projects I work on with public health and urban planning colleagues are related to obesity and access to food in the built environment," he said. "I like to share general media reports, journal publications and maps pertaining to such matters on my blog."

The Small Infinity Project

Rachel Chadderdon **(M.S. '10)** *and Emily Plews* **(M.S. '10)**

Rachel Chadderdon and Emily Plews believe so strongly in the potential for change through stories that they have both vowed to get tattoos if enough people participate in their blog, the Small Infinity Project (**smallinfinityproject.com**). The pair of 2010 graduates started the Small Infinity Project to share stories about change that happens as a result of individual actions.

They began soliciting stories about small acts, like one about a woman whose backyard beekeeping lead to legalizing apiaries in her community. "Words and stories are an important, amplifying and empowering part of the ripple effect of individual actions, and we want as many people reading and contributing as possible," Chadderdon said. Plews added: "Once you start looking for Small Infinity stories, you see them everywhere."

Plews now works for the Center for Positive Organizational Scholarship at the Ross School of Business; Chadderdon is the Double Up Food Bucks Program Manager for the Fair Food Network.

Saginaw Forest: Caretakers' blog

Shaw Lacy **(Ph.D. '12)**

SNRE's Saginaw Forest has had a caretaker for decades, and the caretaker has usually kept a log. Shaw Nozaki Lacy, an aquatics Ph.D. student who took over as caretaker in January 2009, is the first to keep the log online. After starting the blog (**saginawforest.blogspot.com**), he began to add previous caretakers' log entries, backdating them to when the entries were written and creating a historical record of the forest.

"I do it out of a sense of duty to the forest: to note some of the minutiae of the day-to-day, as well as note the changes—recurring seasonal ones, continuous non-seasonal ones and abrupt ones, too—that take place," Lacy said. "Some entries are in a sense of wonder, while some are 'merely' recounting the passage of the day, and others record the interesting encounters with public users."

CITED a sample of recent faculty publications

MORE FACULTY JOURNAL ARTICLES:
snre.umich.edu/citations

In the balance

A 10-year study of an organic coffee farm in Mexico suggested that the complex relationships between several ant species and a handful of coffee pests—as well as predators, parasites and diseases—help to ensure the sustainability of the farm without the use of chemicals. SNRE Professor Ivette Perfecto, Professor John Vandermeer of U-M's Ecology and Evolutionary Biology department, and Stacy Philpott of the University of Toledo uncovered the web of intricate interactions that buffers the farm against outbreaks of pests and diseases. Their research was published in the July/August issue of *BioScience*.

How is climate change like cigarettes?

We're used to thinking of climate change in terms of science, technology and economics, but Andy Hoffman, SNRE professor and associate director of the Erb Institute for Global Sustainable Enterprise, argues that environmental problems and solutions are cultural and behavioral issues. In a forthcoming article in the journal *Organizational Dynamics*, Professor Hoffman draws strong parallels between climate change and the examples of cigarette smoking and slavery abolition to suggest that addressing climate change requires a shift in perception of climate change as a "scientific fact" to a "social fact."

Contributing to America's Climate Choices

Dean Rosina M. Bierbaum, Professors Andy Hoffman and Ted Parson, and Associate Professor Maria Carmen Lemos contributed to *America's Climate Choices*, a series of four national reports on climate change that was produced by the National Research Council of the National Academies of Science at the request of Congress and published over the summer. Dean Bierbaum was on the panel that wrote "Informing an Effective Response to Climate Change." Professor Parson and Associate Professor Lemos contributed to "Advancing the Science of Climate Change," and Professor Hoffman was on the panel for "Limiting the Magnitude of Future Climate Change."

IN October of 1960, U.S. Sen. John F. Kennedy sparked the passion of hundreds of students by delivering a speech at the Michigan Union challenging them to work for global peace and justice by volunteering in developing nations. The momentum grew into the Peace Corps, which was established in 1961. This fall, university-wide activities mark the 50-year anniversary of then-Senator Kennedy's speech.

CORPS CONNECTION

Nearly 20 current SNRE students have served in the Peace Corps. The school's commitment to the federal program can be seen through its participation in the Peace Corps Fellows program and, starting this year, the Peace Corps Master's International program.

SNRE started its Fellows program in 2006 and awards up to four students a year a one-time scholarship. U-M is one of eight universities that offer an environmental program for Fellows; within U-M, SNRE and the Ford School of Public Policy are the only schools that host Fellows. The Master's International program allows students to start school, then leave to fulfill their Peace Corps commitment, and then return to SNRE to complete their degree.

"Students with Peace Corps experience bring exceptional leadership qualities to our graduate programs," said Rosina M. Bierbaum, dean of SNRE. "By participating in the Master's International program, we anticipate similar recruiting results: attracting scholars interested in sharing experiences and bringing diverse perspectives and passion to a cause."

MORE ABOUT SNRE PEACE CORPS:
snre.umich.edu/prospective_students/peace_corps

THE EIGHT CURRENT SNRE FELLOWS (LEFT TO RIGHT) ARE TAYLOR J. SAMUELSEN, ANGELA MICHALEK, NATE SPRINGER, NICK DEYO, ABIGAIL HYDUKE, ERIC ROBERTS, LAUREN COTTER AND ELIZABETH SENECAL

"The large contingent of Returned Peace Corps Volunteers at SNRE and the University of Michigan reminds me that my work in Senegal was part of a larger movement to engage in global community development and service."

~ Elizabeth Senecal, Class of 2011

NICK DEYO

Class of 2011

Field of study: Landscape Architecture

Peace Corps service: 2003 to 2005, Western Samoa

I worked for a marine protected area to help raise awareness about the importance of marine conservation in rural communities by teaching high school classes and leading programs at elementary schools. Occasionally, I was able to conduct field research including sea turtle nesting patrols, coral reef surveys and invasive species monitoring.

WHY SNRE? Peace Corps changed the course of my life in many ways, both personally and professionally. In particular, I learned the importance of involving community in conservation projects. Also, I enjoyed working across disciplines on difficult environmental issues. Both of these experiences pointed me in the direction of SNRE. SNRE has a strong community of students who served in the Peace Corps, and it's great to meet and talk with other returned volunteers—you always have rich shared experience.

ERIC ROBERTS

Class of 2012

Field of study: Environmental Policy and Planning

Peace Corps service: 2005 to 2008, Paraguay

As an agroforestry extensionist volunteer, I connected the community to outside resources, instructed farmers on establishing tree nurseries, helped develop an ecotourism project, instructed high school students and teachers on HIV/AIDS prevention education, collaborated with a youth group on a weekly radio program, and shared rounds of tereré with Paraguayans while sitting in the shade of a mango tree on a sweltering day.

Why SNRE? While collaborating with Paraguayans to address environmental issues, I realized the importance of collaborative processes in establishing community-based resource-management policies, and several SNRE faculty members were investigating collaborative decision-making and ecosystem management.

ANGELA MICHALEK

Class of 2010

Fields of study: Environmental Policy and Planning, Aquatic Sciences

Peace Corps service: 2005 to 2007, Senegal

I promoted agroforestry technologies like intercropping, fruit tree grafting and live fencing to farmers. Pulling water and carrying it on my head back to my mud hut made me miss the tap, but peering down 50-foot wells in the Sahel also helped me appreciate having access to water—even if it wasn't that clean.

Why SNRE? Subsistence farmers are transitioning to a more modern lifestyle, gaining access to health care and education while accumulating trash and public health hazards. Their communities are skipping the landlines and going straight to cell phones, and solar energy production is slowly expanding to flashlight-lit villages. It feels like development, but remittances, aid and resource extraction fuel a large portion of this economy. I came to SNRE to explore interdisciplinary topics in economics, environmental policy and water resources.

NATE SPRINGER

Class of 2011

Field of study: Environmental Policy and Planning

Peace Corps service: 2000 to 2002, Paraguay

I split my time between working with teachers in the schools to integrate environmental education into the curriculum, and working with farmers on soil conservation projects to improve crop yields and reduce workloads.

Why SNRE? I have always worked in an environmental field, so it made sense to get a master's. I wanted a program with a strong identity, expert faculty and great legacy, and SNRE is one of the top programs. Peace Corps helped me learn about the world, but SNRE has refined my understanding of both the natural world and the social systems that impact it.

ABIGAIL HYDUKE

Class of 2010

Field of study: Conservation Biology

Peace Corps service: 2007 to 2009, Cameroon

As an agroforestry volunteer, my projects were varied but ranged from improving pig diets, designing environmental education curriculum, facilitating medicinal plant workshops, raising cane rats and planting leguminous trees in farms with a hoe and a machete.

Why SNRE? I always knew I wanted to pursue a career in conservation and was inspired by working alongside subsistence farmers in Cameroon. SNRE's approach to conservation as a social and scientific endeavor made it an easy choice in my home state. After working in a developing country where many people seek educational and employment opportunities abroad, I wanted to return to Michigan in order to use the lessons I learned in Cameroon to contribute to the solutions of our own conservation issues.

LAUREN COTTER

Class of 2012

Fields of study: Environmental Justice, Environmental Policy and Planning

Peace Corps service: 2006 to 2008, Paraguay

I worked with professors and students to incorporate environmental education into curriculums.

Why SNRE? As a Peace Corps volunteer, I was exposed to a number of environmental problems that plague the developing world, and the affect these problems had on the people of my community prompted me to apply to graduate school. Witnessing environmental injustices first-hand served as the catalyst for me. I believe that the development and implementation of policy can help to create a more environmentally just world.

ELIZABETH SENECAL

Class of 2011

Fields of study: Sustainable Systems, Conservation Biology

Peace Corps service: 2006 to 2008, Senegal

I taught farmers techniques to improve crop yields and increase village food security, and taught students how to make and sell mosquito repellent lotion, created a school pen-pal program with a class in the U.S., implemented a baby-weighing program, taught a group how to plant onions and terrace garden plots, and created a women-owned business to provide mosquito bed-nets. And I danced every day with the village women.

Why SNRE? My experience in Senegal gave me a more global perspective of subsistence agriculture in the face of desertification, soil degradation and natural resource depletion. SNRE has breadth and depth in environmental issues, policy and decision-making and fosters communication and creative problem-solving to face today's environmental challenges.

TAYLOR J. SAMUELSEN

Class of 2012

Field of study: Environmental Justice

Peace Corps service: 2006 to 2008, Paraguay

In rural Paraguay, I worked extensively on agroforestry, environmental education and community health projects.

Why SNRE? I chose SNRE for two reasons: the multi-disciplinary resources available to its students and the invaluable wealth of knowledge held by the student body within the program. While here, I hope to acquire a broad understanding of geopolitical and environmental disciplines to more effectively understand and create adaptive drivers towards global economic and environmental solidarity, especially in regards to food sovereignty.


Endangered Species '03


Collaborative Planning '06


Ecosystem Ecological Analysis '05


Institutional Capacity and Market Accessibility '09


Evaluation of Environmentally Responsible Behavior '04


Sustainable Energy for Rural India '08

A look back at SNRE
MASTER'S PROJECTS from 2000-2010

The last 10 years have been especially fertile for complex, globally oriented and cross-disciplinary projects.

MORE ABOUT THE MASTER'S PROJECTS:
snre.umich.edu/current_students/masters_projects

READ PAST MASTER'S PROJECTS:
deepblue.lib.umich.edu

DESIGN
Communities Speak for Themselves: An Innovative Approach to Neighborhood Design
'00

Location: Ypsilanti, Mich.

Client: East Middle School

Students: Theresa Buckwalter, Andrea Bullock, Rebecca Henry Shawn Severence

Faculty adviser: Peter Pollock

This project focused on working with students from East Middle School in Ypsilanti, Mich., to re-envision their neighborhood. The group based its approach on work by landscape architect and urban planner Anne Whiston Spirn, whose work in a West Philadelphia neighborhood linked landscape design, community development and urban stormwater management.

GREAT LAKES
Assessing the Freshwater Conservation Potential of Terrestrial Protected Areas
'10

Location: Great Lakes

Client: Nature Conservancy

Students: Drew Casey, Peter Gamberg, Sarah Neville, Colin Hume, David Sena, Amy Samples

Faculty adviser: Allen Burton

Physical alteration, habitat loss, water withdrawal, pollution, land-use change, overexploitation and the introduction of nonnative species harm freshwater ecosystems, and protected areas are an emerging tool for the protection of natural resources. This group's goal was to investigate the conservation potential of terrestrial protected areas by evaluating the effect of undeveloped land on downstream freshwater. Results suggested that terrestrial protected areas likely contribute to freshwater conservation by protecting land from development and through certain management activities, but that watershed protections are not synonymous with freshwater conservation.


Assessment of the Stonyfield Farm

SUSTAINABLE BUSINESS
Life Cycle Assessment of the Stonyfield Farm Product Delivery System
'01

Location: New Hampshire

Client: Stonyfield Farm

Students: Dov Brachfeld, Terence Dritz, Shinsuke Kodama, Alan Phipp, Elyse Steiner

Faculty adviser: Greg Keoleian

Stonyfield Farm wanted to reduce the environmental burden of its business. This project—part of ongoing work of different master's projects groups with Stonyfield—identified stages in yogurt production and delivery that presented opportunities for environmental impact reduction. The group recommended switching to thermoformed cup manufacturing, opening a second production facility, optimizing the ratio of primary packaging to corrugated board and further investigating renewable packaging.

SUSTAINABLE ENERGY – URBAN
DTE Energy and Sustainability Project
'02

Location: Detroit, Michigan

Client: DTE

Students: Jessica Brinkman, James Lloyd Michael Sadowski, Jake Swenson, Elizabeth Fastiggi

Faculty adviser: Tom Gladwin

DTE Energy is one of the largest utility companies in the United States and has served as a client for a number of SNRE master's projects. This group focused on a plan for sustainability for the company.

ENDANGERED SPECIES
Assessing the Landscape: Toward a Viable Gray Wolf Population in Michigan and Wisconsin
'03

Location: Michigan, Wisconsin

Client: National Wildlife Federation

Students: Damon Hearne, Karen Lewis, Marisa Martin, Elizabeth Mitton, Carly Rocklen

Faculty advisers: Bobbi Low, Steve Yaffee

This study examined the sufficiency of range in Michigan and Wisconsin to support a viable wolf population after the expected delisting of the gray wolf from the federal Endangered Species Act. (As of press time, petitions were pending to delist the gray wolf.) The group created a spatial model that suggested sufficient wolf range will be available, and that the range is capable of supporting wolf population numbers well above the minimum viable threshold.

BEHAVIOR
An Evaluation of Environmentally Responsible Behavior in the Lake Baikal Region of Russia
'04

Location: Russia

Client: Baikal Environmental Wave

Students: Nicole Rom, Jonah Smith

Faculty adviser: Ray De Young

Siberia's Lake Baikal is the oldest and deepest lake—the most voluminous body of freshwater—in the world. A spectacularly biodiverse and beautiful region, Baikal is also the center of controversy regarding nearby industry and pollution. This group worked with a small community NGO to examine environmentally responsible behavior in the area.

ECOTOURISM
Sustainable Ecotourism Design for the Mountain Pine Ridge Forest Reserve in Belize
'05

Location: Belize

Client: Ministry of Natural Resources

Students: Dorothy Buckley, Curtis Davidson, Kathryn Herweyer Kiyoko Julyk, Eric Letourneaux, Lori Tuchman

Faculty adviser: Elizabeth Brabec

This group wrote ecotourism management guidelines for protected areas of the Mountain Pine Ridge Forest Reserve. Much like the rest of Belize, the reserve is an area of great natural beauty that needs to conserve biological diversity and yet meet the economic needs of local communities and indigenous people. The site management guidelines were designed to promote the sustainable use of biodiversity by generating income through increased tourist routes through the area.

PLANNING
Collaborative Planning on State Trust Lands
'06

Location: Western U.S.

Client: Sonoran Institute

Students: Stephanie Bertaina, Alden Boetsch, Emily Kelly, Eirin Krane, Jessica Mitchell, Elizabeth Spalding, Matthew Stout, John Vankat

Faculty adviser: Steve Yaffee

State trust lands comprise approximately 46 million acres in the contiguous U.S. Most state trust lands are managed to generate revenue for designated beneficiaries like public schools. Rapid growth calls for new approaches to generating revenue; at the same time, many communities increasingly view state trust lands as public assets valued for open space, fish and wildlife protection and recreation, resulting in conflict over land management decisions in some cases. The group examined the use of collaborative planning in managing the land.

GREENHOUSE GASES
Corporate Strategies for Addressing Climate Change
'07

Location: Washington, D.C.

Client: Pew Center on Global Climate Change

Students: Douglas Glancy, Michael Horn, Scott Pryor, Mark Shahinian, Gregory Shopoff

Faculty adviser: Andy Hoffman

The academic and business literature has explored *why* companies are addressing climate change, but this group looked at *how* companies are addressing climate change. By exploring the risks, rewards, opportunities and barriers surrounding corporate action on climate change, the group gleaned insights into the climate-related strategies that aim to reduce greenhouse gas emissions, or that significantly reduce emissions emissions as a co-benefit.

SUSTAINABLE ENERGY – RURAL
Sustainable Energy for Rural India: Bhudapada Village, a Case Study
'08

Location: India

Client: Joyasree Mahanti; Bharat Integrated Social Welfare Agency

Students: Angela Flood, Rupal Shroff, Devon Treece, Marc Weatherill

Faculty adviser: Tom Lyon

In Bhudapada Village near Sambalpur, Orissa, in rural India, most residents earn their living as agricultural laborers, surviving on an average per capita income of $1 per day. Access to light is a serious development issue in communities like Bhudapada Village, and this group developed a scalable, financially sustainable business model that a microfinance institution could implement to allow households to obtain light, as well as create a new, viable business in the form of a micro-utility. Availability of light would enable business owners to extend their hours and villagers to increase participation in cottage industries, as well as improve education and safety.

CLIMATE CHANGE / ADAPTATION
Institutional Capacity and Market Accessibility as Determinants of the Effectiveness of Climate Change Adaptation Strategies - The Case of Three Middle Hill Communities in Nepal
'09

Location: Nepal

Client: International Forestry Resources and Institutions

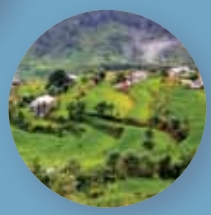
Students: Dietrich Bouma, Eric Chu, Charlotte Mack, Parvais Parry

Faculty advisers: Arun Agrawal, Rosina M. Bierbaum

Climate change has the potential to devastate the livelihoods of vulnerable populations, and since limited resources are available to those populations, there is a need to identify particular factors that facilitate institutional restructuring, rather than funding short-term projects. Through three case studies of communities in the Middle Hills of Nepal, this group concluded with recommendations directed at the local level, for facilitating community and organization, and at the regional/national level, for assessing environmental vulnerability and to bring attention to the need for increasing national resilience for Nepal.

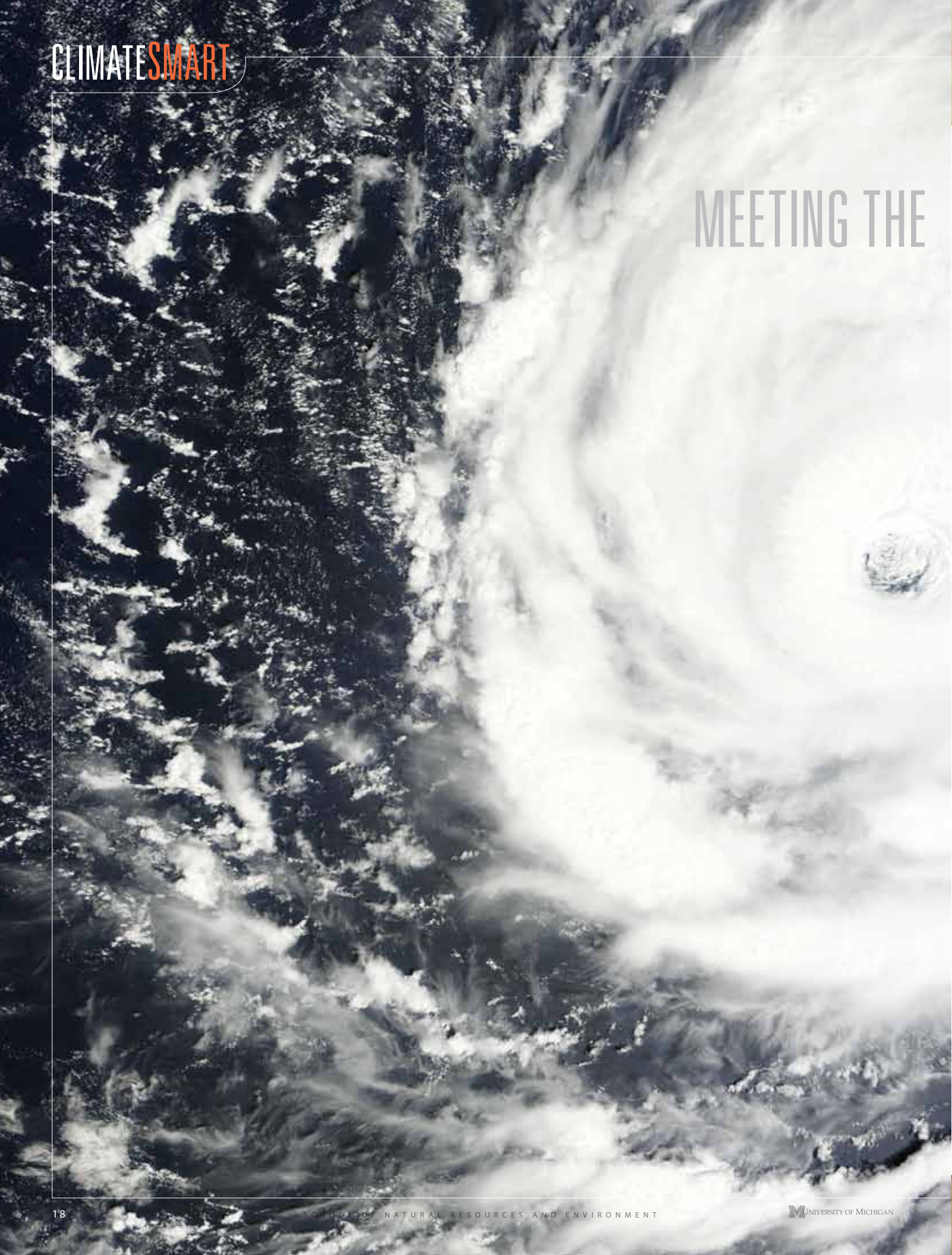
Since the master's project was added to the curriculum in the mid-1980s, about 160 interdisciplinary projects have been completed. Students work in teams to solve real-world environmental problems with clients from government, nonprofit, business and education sectors.

WORLDLY thinking



Students receive academic credit for the project and most choose to participate in one; those who don't are required to complete alternative, equally challenging assignments such as a thesis or practicum. The typical project takes 12 to 18 months to complete. Many require travel to project sites. Budgets range from $6,000 to $100,000 (for a multi-year project.) Groups present the projects at the Master's Project Symposium, held in December and May; projects are archived in U-M's Deep Blue database.

This map provides a snapshot of the projects' breadth and depth since 2000.



MEETING THE

FORCES OF CHANGE

BY LAURA J. WILLIAMS

With major research beginning this year, faculty and students at SNRE are addressing the issue of climate-change adaptation in the interdisciplinary spirit of the school

Scientists have been warning of rising greenhouse gases and an increase in the rate of climate change since the mid-20th century. But while "climate skeptics" are questioning the very existence of "global warming," the academic community is working to bridge the gap between science and society by making sophisticated tools like climate modeling available to the people who must respond to a changing climate.

The urgency of addressing the impacts of climate change has increased as the rate of temperature fluctuation, precipitation shifts and the rising and falling of water levels—as well as the likelihood of severe storms—has accelerated. At the School of Natural Resources and Environment, wide-ranging initiatives and faculty from divergent fields have independently pursued research related to climate change. But in the last five years, a convergence of support, funding, passion and collaboration has produced a constellation of climate-adaptation-related projects. (See timeline, page 20-21.)

For example, among the projects launching this fall involving SNRE faculty are the establishment of a National Oceanic and Atmospheric Administration (NOAA) center for research and assessment related to climate change; the kick-off of an initiative to prepare Great Lakes cities to adapt; the initiation of a five-year study of the Great Lakes ecosystem funded by the National Science Foundation (NSF); and at least three student master's projects exploring issues related to cities and adaptations. The growth in climate-change research at SNRE dovetails with the university-wide emphasis on sustainability, which President Mary Sue Coleman announced in October 2009.

"Climate change is the major issue of our times," said SNRE Dean Rosina M. Bierbaum. "With a solid foundation in the natural sciences and a record of engagement in the national and international climate conversation, SNRE is in a strong position for working on climate change-adaptation planning."

Dean Bierbaum has been an international leader in bridging the gap between climate-change adaptation research and policy. She co-authored and co-directed the *World Development Report 2010*, which focused on climate change; initiated the first national summit on climate-change adaptation at U-M in 2007; and co-chaired the 2010 National Climate Adaptation Summit. She is a member of President Obama's Council of Advisors on Science and Technology (PCAST) and was Director for Environment of the Office of Science and Technology Policy (OSTP) during the Clinton Administration. She is currently an editor on the fifth Intergovernmental Panel on Climate Change (IPCC) assessment report.

LEFT: HURRICANE IGOR, THE CATEGORY 4 STORM THAT HIT THE ATLANTIC IN SEPTEMBER. NASA IMAGE COURTESY OF MODIS RAPID RESPONSE TEAM

Grounding of the SNRE curriculum in a variety of disciplines has helped fuel the growth of collaborative projects and research.

"A lot of what we do is indirectly related to climate change," said Bill Currie, associate professor and associate dean. "Climate change affects everything and it's all interconnected, but the work adds up to new ways of thinking about how to manage ecosystems and use natural resources."

Not only science but culture, politics and economics are part of the interdisciplinary approach to addressing climate-change adaptation.

SNRE Professor and Associate Director of the Erb Institute for Global Sustainable Enterprise Andy Hoffman said that while policy must be a part of any adaptation plan, the business community will be the driving force behind successful adaptation. As businesses respond to a changing climate as a market shift—as supplies cost more, as insurance rates change, as prices fluctuate—the public will see climate change as real.

"Any policy must include business—investors, insurers, consumers, suppliers and buyers," he said. But government can't force a cultural acceptance of a changing climate.

"Climate change is a scientific fact, not a cultural fact, but changing the culture means a fundamental shift in the way we see the world," Professor Hoffman said. "When will people see that mowing my lawn in Ann Arbor affects the people of Pakistan? Going even further, just as we see slavery as immoral today, when will we see the emission of C02 as a sin?"

The Great Lakes advantage

SNRE's interdisciplinary strength is complemented by University of Michigan's geographical location. With its proximity to the Great Lakes and partnerships with other leading institutions, U-M's capability for collecting and synthesizing crucial data to inform adaptation has been recognized by the NSF and NOAA; both national organizations have supported major research projects on which SNRE faculty participate.

"The funding for adaptation has increased, and U-M was in a position to take advantage of that increase," said Don Scavia, an SNRE professor and director of the Graham Environmental Sustainability Institute, an institute under the U-M provost that works in partnership with schools, colleges and units across the university.

Professor Scavia and the Graham Institute are leading a team of researchers from U-M, Michigan State University and Ohio State University in establishing a NOAA-funded Great Lakes climate assessment center. NOAA recently awarded $4.2 million to the team, which includes SNRE Professor Maria Carmen Lemos, U-M Engineering Professor Richard Rood, and researchers and extension specialists from MSU and OSU, to establish a Regional Integrated Scientific Assessment center, or RISA, on the Ann Arbor campus.

The center, called the Great Lakes Regional Integrated Sciences and Assessments Center, or GLISA, has adaptation at its core, with an initial focus on water, tourism and recreation, and agriculture, Professor Scavia said. NOAA and the White House are also looking at how RISAs will be part of the next national climate assessment. The center "puts us on the map," Professor Scavia said.

NOAA started the RISA program in the mid-1990s to improve the link between climate scientists and policy makers and address society's needs and concerns through university-based centers that provide information to farmers, ranchers and fishermen.

"The GLISA proposal embraced the program objectives in a robust way. In particular, GLISA proposed a research approach that integrated the requirements of decision-makers to adapt to climate variability and change," said Adam Parris, NOAA program manager for RISAs. "The GLISA team has experience and expertise in many disciplines, including climate and physical science, ecosystems science and social science. GLISA also embraced NOAA's broader goal of supporting resilient ecosystems, communities and economies." Including the newly funded GLISA, the number of RISAs is now 11.

"It gives us a platform to build on," Professor Scavia said. A related project already underway is a Graham Institute-funded integrated assessment for helping Great Lakes cities adapt to a changing climate. Lead by SNRE Professor Arun

Climate Adaptation: An SNRE Timeline

Research activity and support related to climate-change adaptation has increased at SNRE, especially in recent years. Below are selected adaptation events, publication and awards.

2004

- Dean Rosina M. Bierbaum and Professor Bunyan Bryant organize the Environmental Justice and Climate Change conference.

2007

- SNRE hosts the National Summit on Coping with Climate Change (pictured above), the first-ever conference focused on helping the United States prepare for the impact of climate change and the ongoing alterations in temperature, precipitation, sea-level rise and species range. Experts identified adaptation needs in four critical areas—public health, energy industry, water quality and fisheries—then developed options for actions to be taken by cities, counties and states as well as business and industry. Those ideas were published in the book *Coping with Climate Change*.

- Professor Arun Agrawal is the principal investigator for a grant titled "Environmental Governance, Forests and Logging Concessions: The Effects of Institutional Complexity of Forest Systems, Cover and Change in Central Africa." The research receives a $1,027,364 grant from the National Science Foundation. Co-investigators are Professors Dan Brown, Rebecca Hardin and Thomas Lyon.

2008

- Professor Brown receives a $90,000, three-year grant from NASA for a project called "From Vulnerability to Sustainability: Vulnerability and Sustainability Development in the Context of Climatic and Institutional Changes in Rural China."

2009

- ICARUS (Initiative on Climate Adaptation Research and Understanding through the Social Sciences) is founded by Associate Professor Maria Carmen Lemos, Professor Agrawal and faculty from the University of Illinois and Columbia University.
- NASA awards $900,000 in July to a team led by Professor Brown and co-investigators Professor Agrawal and Associate Research Scientist Kathleen Bergen for the project "Grassland Ecosystems and Societal Adaptations under Changing Grazing Intensity and Climate on the Mongolian Plateau."
- *The World Development Report 2010: Development and Climate Change*, co-directed by Dean Bierbaum, is published by the World Bank in November.

2010

- *America's Climate Choices,* a series produced by the National Academies of Science, is published in July. Dean Bierbaum and Professors Andy Hoffman and Ted Parson, and Associate Professor Lemos, contributed.
- Dean Bierbaum, Professor Agrawal and Associate Professor Lemos are selected in July to contribute to the fifth climate assessment report of the Intergovernmental Panel on Climate Change.
- A team led by U-M engineering faculty that includes SNRE Professors Brown, Michael Moore and Don Scavia and Associate Professor Lemos, is awarded a $5 million NSF grant in September to research the impact of extreme events on Great Lakes water quality.
- NOAA funds the Great Lakes Regional Integrated Sciences and Assessments Center (GLISA) with a $4.2 million grant. Associate Professor Lemos and Professor Scavia are leading the project with a scientist from Michigan State University.
- Dean Bierbaum and fellow scientists present a report to the White House based on the proceedings of the May 2010 National Climate Adaptation Summit, of which she was co-chair. (For info on the summit and a copy of the report, visit www.joss.ucar.edu/events/2010/ncas/index.html.) The report identifies priorities for a national response to climate change.

MORE ON CLIMATE CHANGE:
snre.umich.edu/climate_change

Agrawal, the program will begin with an October meeting of mayors and other stakeholders from cities around the region. The Graham Institute will support the plan with up to $600,000 in funding over the next two years.

Another large Great Lakes-related project at U-M was recently funded by the NSF. SNRE Professors Scavia, Michael Moore and Dan Brown, Associate Professor Maria Carmen Lemos, Research Scientists Dima Beletsky and Eric Anderson and postdoctoral fellow Mary Anne Evans, are on an interdisciplinary team led by U-M Engineering Professor Anna Michalak that received $5 million to study the effects of climate-induced extreme weather in the Great Lakes.

Professor Moore will be looking at how climate variability has historically influenced decisions related to human populations and agriculture in the area. "Climate change may induce major changes in human settlement patterns and agricultural land use," he said. "Our team will examine how these potential land-use changes link to changes in Great Lakes water quality."

The complex context

Associate Professor Lemos' research often focuses on the intersection of science and society. Climate-change adaptation, she said, is "very contextual. That makes science complicated." Associate Professor Lemos has published extensively on climate change, adaptation and social factors, particularly as they affect communities in her native Brazil. Now she is applying this knowledge to the Great Lakes region; she is a co-investigator both on the GLISA and the NSF project.

Her work, she says, requires her to travel between the pure pursuit of scientific goals and being more practically useful for decision-makers. Often those decision-makers change or their needs shift. And while a political leader may have one set of priorities, a household may be focused on another priority; even among households, the impact of climate change varies significantly. "Their vulnerability is different," Professor Lemos said. "Even in wealthy Florida, if there's a hurricane, rich people are, in general, better off than the people in trailer parks."

Measuring the vulnerabilities of different stakeholders can mean looking to history. Past extreme weather events have provided foundations for future adaptation plans. "A lot of what we know comes from disasters," Associate Professor Lemos said. "And I have good confidence in the science to say that disasters will become more frequent."

SNRE has a long tradition of environmental justice work, and an extreme event like a hurricane or drought exacerbates existing inequities. Poor people are more likely to be devastated by climate change, but "Is poverty the same thing as vulnerability?" Associate Professor Lemos asked. "That's not settled. One could argue that these problems—economy, poverty—have always existed, but there's a new problem: climate change."

"Adaptation planning is complicated by ethical questions and by population and wealth distribution," Associate Professor Lemos added. "Populations who have nothing to mitigate because of their very low contribution to the carbon budget are going to need to adapt. Can high-consuming carbon countries be 'blamed'? When a hurricane hits Florida, nobody or very few people die, but it's very expensive; when a hurricane hits Honduras, many people die."

Other frontiers

Professor Brown is leading a study of human adaptation to climate change on the Mongolian Plateau; Professor Agrawal and Associate Research Scientist Kathleen Bergen are also working on the project. Funded by NASA through a $900,000 grant in 2009, the team is evaluating interactions between grassland ecosystems and herder communities at multiple scales, and the role of climate variability in determining changes in grassland productivity and human adaptations.

"If you look at any given place where people depend on land-based productivity, their whole livelihood is an adaptation to their environment," Professor Brown said. "As environmental change occurs, adaptation can sometimes make situations worse. In China, because of the huge social changes occurring, it's hard to separate out adaptations to environmental and social change. It's hard, but it's necessary in planning for the future."

EARLY ADAPTOR

SNRE Professor and Dean of Research Arun Agrawal is at the forefront of adaptation research at SNRE—and around the world. In addition to his extensive work in development, forest management and international issues around governance and natural resource management, in the past year he helped coordinate a comparative study of adaptation in six Latin American and West African countries for the World Bank, and wrote a similar examination of rural institutions, governance and livelihoods in Ethiopia, India, Vietnam and Yemen. He is currently developing the largest database on behavioral adaptations to climate variability, and working on a book tentatively titled *Adaptive Development*. He has also advised graduate students on projects related to climate change adaptation and cities, climate-change adaptation strategies in Nepal and development and climate change.

Associate Dean Arun Agrawal on the urgency and optimism of planning for climate-change adaptation

WHY DOES CLIMATE CHANGE ADAPTATION MATTER, RIGHT HERE, RIGHT NOW?

Climate change is already affecting life on the planet—from plants and animals, to individual humans and households, to whole societies and countries. Some life forms, some individuals, some societies are responding to experienced and anticipated changes better than others. Others are either oblivious to these changes, or do not have the resources to respond. Because the rate of climate change is so slow at present, and because it is easy to miss change because of natural variability in climatic phenomena, it is easy to brush aside the need to begin adapting as soon as possible. There are other more urgent issues to attend to, more pressing problems to address.

But adaptation does not occur immediately. Indeed, human societies are notoriously resistant to change. But the longer we delay adaptation, the more change will cost. The need to adapt is inevitable, and the longer we wait the faster we will have to adapt—and the risk increases of failing to adapt successfully. So we need to adapt now so as to respond effectively to ongoing climate change, and also to prepare for future climate change.

HOW DOES THE GLOBAL RELATE TO THE LOCAL, AND VICE VERSA, IN THE DISCUSSION OF CLIMATE-CHANGE ADAPTATION?

Because the impacts of climate change are going to be felt locally and are likely to vary from one locale to another owing to differences in the characteristics of different places, contemporary and future adaptation must take into account the particularities of a given location. But the local capacity to adapt is often limited by a lack of information about how climate change will affect a given place, lack of resources to adapt and lack of models that can provide guidance as to how climate change impacts will interact with ongoing demographic, socioeconomic, ecological and health changes, among others. Stakeholders at both the global and local levels must work together to promote effective adaptation.

WHAT DOES "CLIMATE-CHANGE ADAPTATION" MEAN TO DIFFERENT POPULATIONS?

Although climate change is going to affect the entire planet, the place-specific nature of climate impacts and different capacities to adapt among wealthy vs. poor, urban vs. rural, and fast-changing vs. more stable human populations mean that different population groups will confront different challenges. Thus, fast-growing urban populations on the coasts will need to adapt to rising sea levels, potentially stronger storms and coastal flooding. But equally fast-growing inland cities, particularly those in semi-arid areas, may face more erratic and concentrated rainfall, requiring entirely different adaptation strategies. In rural areas, again depending on access to private or public resources, behavioral adaptations such as migration or occupational diversification might prove far more effective adaptation strategies than the development of large and expensive infrastructure projects that climate change may rapidly render obsolete. The unstudied, enormous diversity of what will make for effective adaptation is mind-boggling—it is, therefore, simultaneously daunting and exciting.

IN YOUR RESEARCH, WHAT ARE SOME EXAMPLES YOU HAVE SEEN OF SUCCESSFUL ADAPTATION BY COMMUNITIES, HOUSEHOLDS OR INDIVIDUALS?

Because it is difficult to distinguish climate change from climate variability in the short run, it would be fair to say that human societies have been adapting to climatic phenomena for most of their existence in ways that remain relevant for future climate change. As climate change presents new and more extreme challenges, past experiences and adaptations will become less relevant. But in the short to medium run, one can identify many examples of effective and successful adaptation based on historical examples. These would include, for example, migration by pastoralists and agricultural smallholders in response to droughts; occupational as well as asset diversification by rural as well as urban populations to reduce risks; social safety nets created and used by both communities and governments to support the sick, the disabled and the infirm; and finally, promotion of green spaces and green design in urban areas to address heat island effects.

WHAT IS THE RELATIONSHIP BETWEEN SCIENTIFIC RESEARCH AND POLICY DEVELOPMENT IN THE CONTEXT OF ADAPTATION?

Governments, for the most part, do not have well-thought out adaptation policies as of now. In some isolated instances, and in some places, governments are beginning to think seriously about climate change and what it will mean for their populations—for example, Bangladesh and the Netherlands. But there is enormous ground to be covered before there are adaptation policies and programs at international, national and local levels. That said, there are many incipient efforts afoot to think how governments, especially the international community, should address the need for adaptation.

The vacuum of official policies and positions puts scientific work on adaptation in a privileged place. This is because it is far easier to shape policies before they have been set and become conventional wisdom than to change them once they have been created.

Quite apart from the common-sense connection between the need for evidence-based policies and good research, the politics of adaptation policies helps make the policy–science

connection stronger. In a number of countries in the developing world—Vietnam and Senegal, for example—there are efforts to use existing adaptation knowledge to develop adaptation policies. Funding agencies and donors are interested in supporting the best bets for successful adaptive planning to leverage their support into longer-term policy adoption by governments.

WHAT DO YOU THINK THE FIELD OF ADAPTATION WILL LOOK LIKE IN FIVE YEARS? TEN YEARS? TWENTY? FIFTY?

With the passage of time, I anticipate three major changes in the state of knowledge and policy making around adaptation. The first is that we will see a far better understanding of adaptation in the short to medium run. A substantial body of research already exists, but this will become both deeper and more extensive. As we witness more climate-related changes, there will be a clearer recognition that despite our best efforts—which frankly have not been made until now—climate change will generate wrenching impacts and require transformational responses. These will prompt a new generation of scholars to look at climate adaptation far more carefully and systematically.

I also anticipate that the relatively modest current support for adaptation—both in terms of on-the-ground initiatives and in terms of research—will grow as institutional, financial and cultural bodies recognize the need for cutting-edge work on adaptation.

Finally, I anticipate that those interested in climate change will produce far better models, based on qualitative and quantitative research, to integrate costs and benefits of different forms of adaptation into existing analyses of climate change, impacts and costs.

WHEN THINKING ABOUT ADAPTING TO CLIMATE CHANGE, HOW DO YOU INCORPORATE THE UNCERTAINTY OF PREDICTIONS?

We have to struggle far more against the social inertia that deems adaptation cost-ineffective or politically infeasible than against simple uncertainty. While some future climate impacts are uncertain, others are quite certain. With increasing temperatures, sea levels are going to rise for the entire planet, threatening coastal urban locations in ways that are predictable, even if distant in the future. Higher temperatures in semi-arid areas, coupled with more concentrated and more erratic rainfall, means that many of our current water harvesting, storage and distribution technologies will need to be considerably revised.

But there are also other climate-change impacts that are highly uncertain. In such situations, much of what makes for good adaptation is also good development—and socially and economically desirable even if politically costly. We have to address uncertainty in governance and politics at least as much as in models of climate change.

WHAT ARE SOME OF THE BARRIERS YOU HAVE ENCOUNTERED TO DISCUSSIONS ABOUT CLIMATE-CHANGE ADAPTATION?

There are at least three widespread important barriers to climate-change adaptation and in discussions that highlight the importance of adaptation. The first, and it is particularly widespread in the United States, has to do with the misperception that talking about adaptation means we have lost the fight to limit the adverse impacts of climate change—and instead we should continue to work towards reducing emissions or towards mitigation. As a society, we do not have a choice between adaptation and mitigation. We have to act on both fronts now. The greenhouse gases we have already emitted, and which we will unavoidably emit over the next few decades, make it certain that future climate impacts will be worse than what we are witnessing today. Without action on adaptation, the costs of coping with climate impacts will be far higher, particularly for poorer, more marginal, less powerful people.

A second major impediment to action has to do with misunderstandings about what "adaptation" means. Many people believe that the best way to adapt is simply to keep pursuing higher levels of development: more economic growth, higher incomes and more resources will allow people to adapt to climate impacts without any need for coordinated collective action. There is probably some truth in this view, but even the very rich with beachfront bungalows on the Gulf Coast are likely to suffer climate impacts against which their riches will not offer much protection.

Adaptation to climate change requires a way of thinking about and seeing the world that tries to assess changing risks and identify strategies of socioeconomic development that ameliorate risks. As we have become more developed, we have sought to address risks by developing more sophisticated and comprehensive insurance products, but insurance is fundamentally about pooling uncorrelated risks. When there is an across-the-board rise in risks, insurance is not a good strategy.

Finally, adaptation costs and uncertainty about their magnitude are a third barrier. There is substantial disagreement, or at least divergence, across different estimates of costs of future adaptation—ranging from a few billion dollars per year to more than hundreds of billions of dollars a year by 2100. Despite such uncertainty about the range of costs of adaptation, we need to keep in mind that costs of action on mitigation are going to be even higher, and that for many countries and peoples, investments in adaptation are going to provide local, country and community-specific returns.

Bottom line? The costs of adaptation are far smaller than those of inaction or of mitigation, and adaptation provides direct benefits to those who are adapting (in contrast to mitigation whose benefits will be distributed across the entire planet).

WHAT ARE SOME OF THE MOST INTERESTING NEW INSIGHTS TO EMERGE FROM WORK ON CLIMATE-CHANGE ADAPTATION?

Although there are many different exciting areas of work on adaptation, let me mention two. The first has to do with the fact that adaptation can be undertaken in many different ways, and that successful adaptation will require exploration of all these different avenues. We can identify infrastructure-related, technological and institutional means of adaptation in different parts of the world. The limits on adaptation are defined only by limits on human ingenuity.

Second, we can learn a lot from historical experiences of climatic adversity and responses. Adaptation to climate change is not a new beast—it is a set of related problems to which we have found solutions in the past , whether these solutions have to do with collective action by communities, actions by governments or strategies chosen by households. This means we don't have to wait until we experience the impacts of climate change to figure out how to adapt. We can begin to work on adaptive strategies today—as soon as there is a commitment and a willingness to act.

adaptation in ACTION

BY LAURA J. WILLIAMS

TOP: FAMILY FARM IN THE W RESERVE BUFFER ZONE

SECOND FROM TOP: MILLER WITH SERO KORA OF NIKKI, KING OF THE BARIBA PEOPLE

MIDDLE: W RESERVE PISTEUR

BOTTOM: FAMILY FARMERS IN BUFFER ZONE

Dan Miller was riding a motorcycle with a *pisteur* in the 'W' Transboundary Biosphere Reserve in West Africa in the wet season of 2008. The pisteur (the term is French for ranger) wore a military uniform. The bike slid in the muddy roads.

A Ph.D. student of Professor Arun Agrawal, Miller traveled to the area—named for a large W-shaped bend in the Niger River and encompassing parts of Benin, Burkina Faso and Niger—to untangle threads of socioeconomic, political and biophysical factors that shape the ability of local communities to adapt to climate change.

Many of the pisteurs were former poachers in the W park, before the European Union-sponsored project Ecosystèmes Protégés en Afrique Soudano-Sahélienn (ECOPAS) led to the creation of the W reserve in 2002. ECOPAS managers attempted to convert poachers into rangers and tour guides because they knew the park better than anyone else. In their new official roles and uniforms, the pisteurs had the power to arrest or fine—or extract bribes—from people living in communities around the border of W.

"When you approach a community near the park and you're with a pisteur, the people are scared and reticent," Miller said. However, for a researcher like Miller, fluent in French, an official language of the area, but not in Bariba, one of more than 50 languages spoken in Benin, the pisteurs were invaluable guides.

Miller and the guide visited a family farm in the buffer zone around W, an area where it is now illegal to live, but where many people resided and farmed before the reserve was created. The family raised chickens and grew millet and yams for their own subsistence as well as cotton for export. The farmer's wife explained, in Bariba translated by the ranger, the danger of elephants coming onto their farm from the park to look for food or water. The family gave Miller 20 guinea hen eggs, and when he returned to his quarters, he made an omelet.

"Those eggs were typical of the hospitality in the region," Miller explained. "Living there is hard. And that hospitality is an adaptation."

In his research, Miller focuses on the strategies and resources families have to cope with climate change—what researchers call "adaptive capacity"—in communities also affected by conservation projects. He realized that existing scholarship focused on the economic and livelihood effects of national parks and other protected areas in Africa, but has not considered social impacts as related to climate variability and change.

Before coming to SNRE, Miller worked for the MacArthur Foundation coordinating grants relating to the social context of conservation and climate-change adaptation. During his time there, he made his first visit to the W region. He began to wonder what actually happened to the money given to NGOs, and so sought a graduate program with faculty strong in the social aspects of development, biodiversity conservation, environmental justice and climate change.

Working with Professor Agrawal as well as Professor Rebecca Hardin and Associate Professor Maria Carmen Lemos, Miller decided to find out just how ECOPAS affected the adaptive capacity of people living around W. "There aren't a lot of studies of what actually happens when communities adapt to climate change," Miller said. He began seeking examples of climate-change adaptation by people whose "legal status is threatened and access denied," like the farmers he visited in Benin.

For his dissertation, Miller left in September to spend a year conducting surveys in several representative communities in each of the three countries responsible for the W reserve. His goal is to assess the ability of households to adapt before and after ECOPAS created the W reserve; he expects to find that the adaptive capacity of the communities increased if ECOPAS supported decentralized power and resources and if the project helped clarify land tenure and access to natural resources, but resilience would decrease if ECOPAS' role led to an increase in central government enforcement that limited the communities' use of resources.

"If ECOPAS empowered people, that would increase adaptive capacity, but often responsibility is given to local communities without the resources or power to meet the responsibility," he said. "I suspect that entrenched interests have retained power."

Class Notes

Welcome back, Brian and Jumana

SNRE recently welcomed two alumni to its Visiting Committee. The volunteer group meets twice a year and provides advice to Dean Rosina M. Bierbaum and other school leaders. "We welcome their ideas and are thankful for their commitments to our students and faculty," said Dean Bierbaum.

Brian Swett (M.S. '08/MBA '08) is a project manager for the Boston region's development group for Boston Properties. He advises and oversees LEED and sustainability-related initiatives throughout the Boston region and across the company. Prior to joining Boston Properties, he worked for an environmental justice nonprofit organization, two socially responsible investment firms, U.S. Sen. Barbara Boxer (D-Calif.) and several offices in the U.S. Environmental Protection Agency. A LEED AP, he is active in educating graduate students about sustainable design.

Jumana Vasi (M.S. '08) is an associate program officer in the C. S. Mott Foundation's Environment Program. Her grantmaking responsibilities are focused primarily on the Great Lakes basin and aim to build the organizational capacity of nonprofit organizations engaged in the conservation of freshwater resources; influence selected public policy issues; and promote site-based conservation activities. She previously was director of development at Enlace Chicago, a community-based Latino organization. She speaks several languages, including French, Gujarati, Urdu and Wolof.

MORE ABOUT THE COMMITTEE:
snre.umich.edu/visiting_committee

HAVE TO HAND IT TO HER: When Elaine Kagan was sworn in Aug. 7 as the newest Associate Justice of the U.S. Supreme Court, Jeffrey Minear (M.S. '82/J.D. '82) had a hand in the ceremony. Actually, two hands. Incoming justices have the option of asking either a family member or court officer to hold the Bible during the taking of the judicial oath. Associate Justice Kagan opted for a court officer. Normally, the officer would be the Clerk of the Court, but the clerk was not available that day. Jeff is the counselor to the U.S. Supreme Court Chief Justice John Roberts, and so the duty fell to him. The picture and accompanying video featuring Jeff, Associate Justice Kagan and Chief Justice Roberts appeared on websites and newspapers around the world.

On the road

DOZENS OF SNRE ALUMNI AND FRIENDS CAME TOGETHER SEPT. 24 AS THE SCHOOL HOSTED ITS ANNUAL FALL RECEPTION IN WASHINGTON, D.C. THE EVENT WAS CO-HOSTED BY DEAN ROSINA M. BIERBAUM AND LISA DELPLACE (M.L.A. '88). AMONG THE OTHER ALUMNI IN ATTENDANCE WERE (FROM LEFT) KERRY DUGGAN (M.S. '06), RUSSELL MARTIN (M.S. '10) AND KRISTEN JOHNSON (M.S. '09)

AMONG THE ALUMNI ATTENDING THE AUG. 13 RECEPTION IN ATLANTA WERE JUNE GIN (PH.D. '07, LEFT) AND KISHI ANIMASHAUN DUCRE (PH.D. '05). THEY WERE IN THE CITY TO ATTEND THE ANNUAL AMERICAN SOCIOLOGICAL ASSOCIATION CONFERENCE AND TO HONOR RECEPTION HOST DORCETA TAYLOR. ASSOCIATE PROFESSOR TAYLOR RECEIVED THE ALLAN SCHAINBERG OUTSTANDING PUBLICATION AWARD BY THE ENVIRONMENT AND TECHNOLOGY SECTION OF THE ASA.

Lauran (Vincent) Hawken (M.S. '83) is the new principal at John Muir Elementary in the Martinez Unified School District, northeast of Oakland, Calif. "I studied with William Stapp, who was professor emeritus of resource planning and conservation in the School of Natural Resources and Environment, who was amazing," Lauran told the *Martinez News-Gazette.*

Monica Tomosy (M.S. '89) returned to the Dana Building Sept. 30 to participate in a Careers Q&A and lunch with current students. The event was organized by the Office of Academic Programs. Monica is with the U.S. Forest Service's Research and Development program in Washington, D.C., in a new position managing climate change and wildlife research collaboration with the U.S. Geological Survey (USGS). All of her 22 years with the federal government have been focused on natural resource conservation. During that time, she has worked for three bureaus: U.S. Forest Service, USGS and U.S. Fish and Wildlife Service.

Jennifer Layke (M.S. '97/MBA '97), former deputy director of the climate and energy program at the World Resources Institute (WRI), joined Johnson Controls in Washington, D.C., as director of its new Institute for Building Efficiency. The Institute provides information and analysis of technologies, policies and practices for efficient, high-performance buildings and smart-energy systems around the world. As director, she brings two decades of global experience focused on energy and sustainability issues, including her recent work at WRI.

Stephen Thorn (M.S. '05/J.D. '05) has founded his own environmental law firm, Thorn & Associates LLC. The Chicago-based firm works with clients throughout the Midwest. "While most law firms wait until clients have problems, I take a more proactive approach and work with companies to avoid problems through compliance counseling and environmental audit," said Stephen, who graduated with a dual degree. "I prefer this approach because the end result is greater protection for the environment and my clients appreciate it because it helps protect not only the environment, but also their reputations and bottom lines." Learn more about his firm at thornenvironmentallaw.com.

Eric Hesse (M.S. '06) was named a Top 40 Under 40 by *Mass Transit* magazine. Eric is a strategic planning analyst in the Office of the General Manager for TriMet, which provides bus, light rail and commuter rail services in the Portland (Oreg.) metro area.

Joshua Kweller (M.S. '07/J.D. '07) joined the Colorado Springs office of Hogan Lovells in the Litigation, Arbitration, and Employment practice. He focuses on general litigation matters, with an emphasis on the environment and natural resources

Aviva Glaser (M.S. '10/M.S.W '10) was lead author of *The Price of Pollution: Cost Estimates of Environment-Related Childhood Disease in Michigan*, a major report released this summer. A coalition of health and environmental groups released the report, which examines direct and indirect costs for four childhood diseases linked in part or whole to environmental toxicants. Aviva is the agricultural program coordinator for the National Wildlife Federation.

Fires and Forests

Nick Reo (B.S. '97, M.S. '02) has returned to SNRE as a postdoc to conduct research into how two nations can cooperate on forest management issues. And he will do it without leaving the Upper Peninsula.

After earning his Ph.D. from Michigan State University in May, Nick and co-investigators and SNRE Professors Steve Yaffee and Bob Grese are examining how the U.S. Forest Service and the Sault Ste. Marie tribe of the Chippewa Indians can adopt mutually beneficial fire-management processes. The work, occurring on the 900,000-acre Hiawatha National Forest in Michigan's U.P., will attempt to integrate the restoration of tribal traditional knowledge about fire management with the restoration of historic fire regimes in ecosystems where periodic burning is an important ecological process.

The project isn't new ground for Nick; his dissertation examined many of the same issues. And as a tribal citizen who has professional experience building partnerships between tribal and non-tribal entities, he will be able to move easily between groups. "Ideally when this project is complete, I will have fashioned a process worthy of replication in other national forests that integrates tribal priorities into the Forest Service's work," he said.

The two-year research project is funded through the federal McIntire-Stennis Research Program and the U-M provost office. Nick is one of 17 post-doctoral researchers at SNRE this fall. Post-docs usually have recently completed a dissertation and are working on one of their first major grant- or fellowship-funded projects.

Read more about Nick Reo at snre.umich.edu/~reon/.

Share your news

Send us updates and photos about your new job or personal achievements. Visit the SNRE website at **snre.umich.edu/alumni** and fill out our online update form. Or, send your information to Kevin Merrill, director of communications, via e-mail (merrillk@umich.edu) or regular mail. The address is School of Natural Resources and Environment, Office of Communications, University of Michigan, 440 Church St., Ann Arbor, MI, 48109-1041. We're looking forward to hearing from you and spreading your good news.

cleaning up

On the Front Lines in the Gulf of Mexico

BY LAURA J. WILLIAMS

When the Deepwater Horizon drilling rig exploded in the Gulf of Mexico in April, environmental scientists from around the country rushed to the site. One was Ian Hartwell, a marine biologist and toxicologist with a specialization in coastal ocean science and a long record of assessing water contamination.

Hartwell (M.S. '74) is chief scientist of bioeffects studies in the National Status and Trends program in the National Oceanic and Atmospheric Administration (NOAA). Bioeffects assessments establish how much harm was done to how much of the Gulf habitat by measuring sediment chemistry, toxicity and biological community health.

Sampling for the assessments requires extensive and careful coordination. "These are very complex operations," Hartwell said, and usually take more than a month to plan and equip.

With oil leaking into the Gulf at a rate estimated at 10,000 to 60,000 barrels a day, however, there was no time for careful planning as scientists rushed to assess the entire Gulf Coast in a matter of weeks. "We would never have attempted such an ambitious project under normal circumstances," Hartwell said. "It was all done on the fly and the pace was intense."

His team considered questions ranging from "Where are the nearest boat ramps?" and "What hotel will we sleep in tonight?" to "Where do we go if somebody gets hurt?" and "What are the priorities when things go bad or the weather blows us off the water?" The team worked intensely for 12 to 16 hours a day.

"I figured it would be a mess and I was right," he said.

Six months later, Hartwell is at sea sampling deepwater sediments as lead scientist on the R/V *Ocean Veritas*. He is one of a host of NOAA and academic scientists searching for submerged oil in the Gulf as part of the Subsurface Monitoring Program.

The subsurface monitoring program is a scientific collaboration among academic institutions, government agencies, BP and other entities to assess the distribution, concentration and degradation of oil remaining in the water column or sediments; evaluate the distribution of dispersants used in oil spill response activities and their break-down products; and identify additional response requirements to address remaining subsurface oil. The data collected by the subsurface monitoring program will form a valuable foundation for long-term restoration efforts in the Gulf of Mexico.

Hartwell credited SNRE for preparing him to become a professional fisheries biologist. "I developed an interest in aquatic toxicology in the basement fish labs in Dana," he said. "An appreciation of the realities of resource management and conflicting uses and benefits is still important."

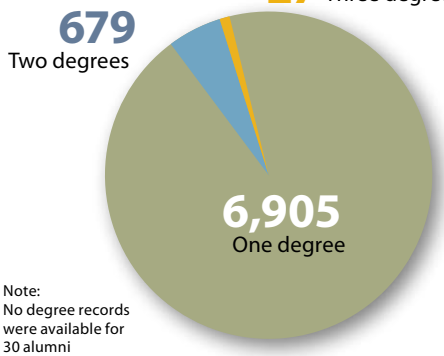
MORE INFORMATION ABOUT ONGOING RESEARCH IN THE GULF OF MEXICO:
restorethegulf.gov

data COLLECTION

From its roots as University of Michigan's School of Forestry, founded in 1927, to the establishment of the School of Natural Resources—the first of its kind in the world—in 1950, to its current identity as the School of Natural Resources and Environment, SNRE has adapted to changing priorities in environmental education and research while maintaining a reputation as a cutting-edge and forward-thinking interdisciplinary institution. The data below illustrates who you—the 7,500+ SNRE alumni dispersed around the world—are today.

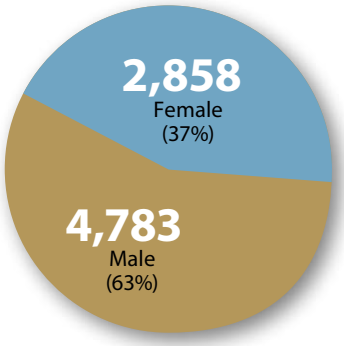
DEGREES OF LOYALTY 7,611 total

Alumni who earned one, two or three degrees from SNRE



Note:
No degree records were available for 30 alumni

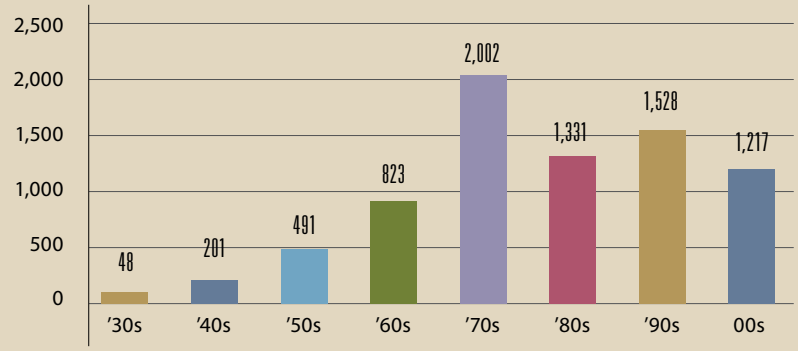
GENDER 7,641 total



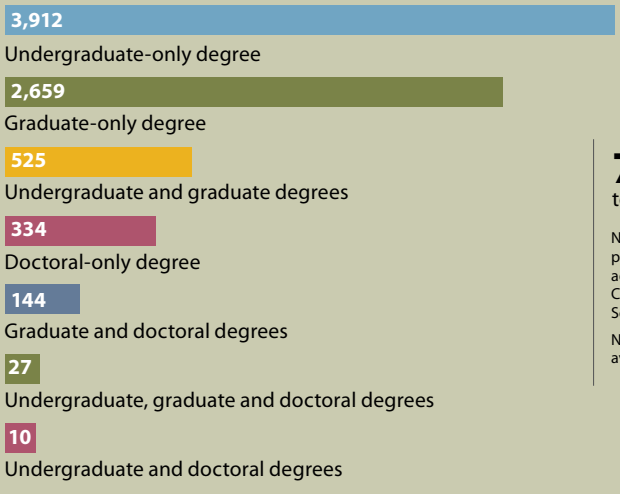
top 10 alumni...

CITIES		METRO AREAS	
Ann Arbor	423	Ann Arbor	657
Washington, D.C.	110	Detroit	497
Seattle	103	Washington, D.C.	387
Portland (Oregon)	86	Chicago	194
Chicago	85	Seattle	160
San Francisco	64	Denver	133
Grand Rapids	58	Boston	120
Ypsilanti	52	San Francisco	114
Denver	48	Portland (Oregon)	111
Traverse City	43	Oakland (Calif.)	95

GRADUATES BY DECADE



DEGREE CLASSIFICATION



7,641
total degrees

Note: SNRE's undergraduate program became jointly administered with the College of Literature, Science, and the Arts in 2002.

No degree records were available for 30 alumni

Videos

Among the videos recently added to the SNRE website is the 7th Annual Nancy Cantor Distinguished Lectureship on Intellectual Diversity, delivered April 13 by Dean Rosina M. Bierbaum. Lecture sponsors were the Office of the Senior Vice Provost for Academic Affairs in conjunction with the National Center for Institutional Diversity. The lecture was established in 2001 to commemorate former Provost Nancy Cantor's contributions to the social and intellectual well-being of the University of Michigan. Other videos available include five of the first nine Wege Lectures.

VISIT SNRE VIDEO SITES:
snre.umich.edu/videos
youtube.com/umsnre

Being Social

LinkedIn 490+ Members

Facebook 1,183 Fans

Twitter 1,259 Followers

RSS News and Events

JOIN THE NETWORK:
snre.umich.edu/social_networks

Events

October 2010

- Thursday, October 28
  4 - 5:30 p.m.
  Sustainable Systems ALIVE Conversation Series
  A fall series of informal, topical gatherings for graduate students, faculty and researchers interested in Sustainable Systems. (Also Nov. 11 and Dec. 9)

November 2010

- Tuesday, November 9
  4:30 - 6 p.m.
  JJR Landscape Architecture Lecture and Dean's Speaker Series
  M. Elen Deming, Professor and Head of the Department of Landscape Architecture at the University of Illinois, Urbana-Champaign, presents "The State of the Question: Research Strategies in Landscape Architecture." Reception to follow.

December 2010

- Friday, December 10
  9 a.m. - 3 p.m.
  Master's Project Symposium
  Master's students present the results of their work.

- Monday, December 13
  6:30 - 8 p.m.
  Alumni Reception at the Midwest Fish and Wildlife Conference in Minneapolis

January 2011

- Tuesday, January 11
  1 - 4 p.m.
  SNRE Career Fair

April 2011

- Friday, April 8
  9 a.m. - 6 p.m.
  Master's Project Symposium
  Master's students present the results of their work.

- Friday, April 15
  9 a.m. - 6 p.m.
  Master's Project Symposium

eRecruiter

TOOLS OF THE FIELD

As part of the SNRE community, SNRE alumni have access to eRecruiter, a large, active networking tool for job seekers and employers alike.

job seekers

On the market? eRecruiter provides an extensive network of employers in environmental fields to graduates of SNRE.

- 2,600+ employers, including corporations, government agencies and nonprofit organizations
- 4,000+ individual employer contacts
- More than 200 green job openings listed at any given time

To access eRecruiter as a job seeker, send an email request to snre.erecruiter@umich.edu with your name and U-M uniqname.

View SNRE's video tutorial to make sure you are making the most of eRecruiter's features: **snre.umich.edu/career_services/alumni**

potential employers

In the market? eRecruiter provides a valuable resource for employers, with a database of highly skilled people at all levels of experience. To post job or internship openings, sign up for an employer account at erecruiter.snre.umich.edu

"It all began with a summer internship I found on eRecruiter in 2007. I applied online and was hired by the USDA Forest Service. I love my job and I don't think I would have found this position otherwise."

—Judith Yi, GIS specialist,
USDA Forest Service (M.S. '09)

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UNIVERSITY OF MICHIGAN

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SEEING THE LIGHT

WITH A FLASHLIGHT AND A TIME-DELAYED CAMERA SHUTTER, THE ENERGY OF THE 2010 ORIENTATION CAMPFIRE WAS CAPTURED. WHEN NOT DEMONSTRATING THEIR ARTISTIC ABILITIES AND COORDINATION FOR THE CAMERA, THIS YEAR'S INCOMING STUDENTS RECEIVED AN INTENSIVE INTRODUCTION TO SNRE THROUGH SEMINARS, FIELD ASSIGNMENTS AND A GROUP SPLASH IN DOUGLAS LAKE. SEE PAGE 4 FOR DETAILS.