

Institute for Environmental Science and Policy

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IESP Staff

Director:
Thomas Theis, PhD, PE

Outreach Activities
Coordinator: Susan Kaplan, JD

Assistant to the Director:
Maggie Jameson, MA

Contact Information:

Institute for Environmental
Science and Policy
School of Public Health West
Room 529
2121 West Taylor Street
(M/C 673)
Chicago, IL 60612-7260

Ph: 312-996-1081
Fax: 312-355-0760

iesp@uic.edu
www.iesp.uic.edu

INTRODUCING SUSAN KAPLAN, OUTREACH ACTIVITIES COORDINATOR

We are pleased to announce that Susan B. Kaplan has joined IESP as our new Outreach Activities Coordinator. Susan will have responsibility for developing external programs and new research opportunities, coordinating activities with our external partners, and producing IESP publications. Over the next few weeks she will be making the rounds to meet most of you, and of course she will be at the External Advisory Board meeting in September.

Susan is a lawyer by training who has worked primarily in environmental and health policy. Most recently, she managed the brownfields program at the Rhode Island Economic



Susan Kaplan, Outreach Activities Coordinator

Development Corporation, which involved applying for and administering assessment and cleanup grants from EPA, making loans and grants to developers, and developing policies to promote brownfields redevelopment, green building and other sustainable practices.

Prior to that, she was assistant director of an electricity policy group at the Kennedy School of

Government and a health standards lawyer at OSHA.

Susan is also a freelance writer of articles, opinion pieces and personal essays. She lives in Evanston with her husband and son.

We hope you will all join us in welcoming her to UIC and to the Institute.

Mission Statement

The mission of The Institute for Environmental Science and Policy (IESP) at the University of Illinois at Chicago is to advance multidisciplinary research and scholarship within the environmental and health sciences, engineering, economics, urban planning and the social sciences among UIC's faculty and students, to prepare the next generation of environmental scientists and decision makers, and to transmit workable solutions for environmental problems to the public sector.

FROM THE DIRECTOR

Suddenly, the environment is all over the news. It's great to see that climate change is starting to be taken seriously by citizens, and that municipalities, insti-



Thomas L. Theis, Director, IESP

“Improving the health of the Earth will continue to require action on many levels – from researching complex environmental issues, to crafting new policies, to educating tomorrow’s scientists, teachers and policymakers about the environment.”

- Thomas Theis

tutions and individuals are “going green” in a variety of ways. Still, improving the health of the Earth will continue to require action on many levels – from researching complex environmental issues, to crafting new policies, to educating tomorrow’s scientists, teachers and policymakers about the environment.

Since its founding in 2001, the Institute for Environmental Science and Policy (IESP), one of five cross-campus, interdisciplinary research institutes at UIC, has increased its activities and broadened its efforts to address today’s critical environmental issues – with the city of Chicago providing an ideal laboratory for this

work. IESP has grown to include a three-person staff, six joint faculty members, faculty scholars, graduate fellows, and affiliated faculty from colleges and departments spanning the university.

We are pleased to describe some of our recent activities in the realms of teaching, research and outreach. “LEAP Program Takes Off”

looks at Landscape Ecological & Anthropogenic Processes, a new, multidisciplinary Integrative Graduate Education and Research Traineeship (IGERT) doctoral program at UIC that focuses on understanding ecological processes in landscapes that have been altered by humans. With its first cohort of students having completed their first year, and the second entering this fall, this innovative program is preparing students from a range of disciplines for careers centered on protecting the environment.

What do spiders have to do with global warming? “Climate Change and Biodiversity – Q & A with Professor David Wise” sheds light on this and other important connec-

tions with insights from the Professor of Biological Sciences and IESP joint faculty member.

We also get to know Moira Zellner, who joined UIC in 2006 as Assistant Professor of Urban Planning and Policy and IESP joint faculty member. She is currently developing and implementing a computer modeling program that tests the effects of a variety of public policy and individual decisions on land-use change and environmental quality. By illustrating the effects of these decisions on natural systems – in essence, making the invisible visible – the program enables policymakers and citizens to develop new land-use paradigms.



We look forward to a continuation of these and new exciting efforts, and welcome your comments and feedback.

**Thomas L. Theis,
Director**

LEAP Program Takes Off

How can humans and our activities co-exist with animals, plants, natural landscapes and delicate ecosystems? Answering that broad and timely question requires the participation and cooperation of researchers from a variety of scientific disciplines, as well as economics, urban planning, and the social sciences. That kind of innovative, interdisciplinary atmosphere, which IESP aims to foster among faculty and students, is embodied by LEAP (Landscape Ecological & Anthropogenic Processes), a new, multidisciplinary doctoral program at UIC that focuses on understanding ecological processes in landscapes that have been altered by humans.

LEAP is the second grant received by IESP faculty through the Integrative Graduate Education and Research Traineeship (IGERT) program funded by the National Science Foundation. The IGERT program aims to catalyze a cultural change in graduate education for students, faculty and universities overall by establishing new teaching models and facilitating collaborative research and team-based problem-solving.

With the first cohort of four students now in their second semester of the program, and the second group of five slated to start this fall, LEAP is in full swing. Students spend their first two years completing coursework, including four classes that have been developed specifically for the program in order to provide students with an understanding of how scientists, engineers, policymakers and managers approach and solve problems (and which are open to non-LEAP students as well). Courses are taught by faculty drawn from a range of departments, including Biological

Sciences, Earth and Environmental Sciences, Civil and Materials Engineering, and Urban Planning and Public Affairs.

In line with its emphasis on providing students with applied as well as theoretical knowledge, one of the specially-designed courses, "Field Experience in Landscape, Ecological and Anthropogenic Processes," involves lectures from practitioners, followed by all-day field trips to their sites. Sites of field trips have included the Indiana Harbor Canal (led by staff of the U.S. Army Corps of Engineers) and the Midewin Tallgrass Prairie, site of the most ambitious prairie restoration project in the world. Another course exposes students to research methods from a variety of disciplines. The final class is a capstone project in which students choose a "real world" research project to work on as a team, with a faculty member serving as advisor.

In addition to coursework, a key element of LEAP is the internship that students undertake at a Chicago-area organization or agency. In addition, they are required to carry out an outreach or education project, such as training volunteers to do restoration work or designing an educational display. They then begin work on their doctoral dissertations. The grant provides students with a stipend and tuition for two years, and research and travel funds for four years.

What makes the program unique? According to Mary Ashley, Professor of Biological Sciences – and the prime mover behind development of the program, along with Kayri Havens, a botanist at the Chicago Botanic Garden – it

can be distinguished from other academic programs in a number of ways. Its setting in Chicago, she says, where there is a lot of restoration ecology and many activities around biodiversity, provides a singular advantage. Also, Ashley says, LEAP is unique in its focus on integrated landscapes – that is, relatively small spaces in which humans and animals coexist. "Other programs in urban ecology focus on humans only, or on how a big city impacts nature," Ashley notes. "We're saying nature is in the city. In Chicago, there is more protected land in the metropolitan area than outside of it."

Ashley also points out that attempting to understand processes that are occurring because humans are changing the landscape is not something that ecologists – who normally focus on how organisms interact with each other in pristine, undisturbed habitats—usually study. Finally, the many partner organizations where students can participate in internships distinguishes the program. These organizations include the [Chicago Division of the Army Corp of Engineers](#), the [Midewin National Tallgrass Prairie](#), Chicago Botanic Garden, [Illinois Natural History Survey](#), [The Morton Arboretum](#), the [USDA Forest Service](#), and [Chicago Wilderness](#).

The response of faculty members who are participating has been very positive, says Ashley. "One of the big benefits is getting faculty from different departments working together and talking," she notes. "I think there will be benefits from this program beyond the education of students – there will likely be more collaboration among faculty as they discover shared interests."

Students also express great enthusiasm about their experience with LEAP. Jennifer Ison, who received her

undergraduate degree in biology and worked at the Chicago Botanic Garden on a long-term prairie fragmentation study and on an online herbarium of plants in the Chicago region prior to starting the program, was attracted to its interdisciplinary focus. "That approach is very unique for a PhD program," she says. "Most tend to be narrowly focused. LEAP is based on the realization that many PhDs don't go into academia, and for many positions, you need to have more of a background in areas outside of your own field." Ison learned this herself in both her work with the Botanic Garden and, in particular, during a summer she spent working for a municipal government. "I saw urban planning and other areas in practice – completely different things than what I was trained to do as a biologist."

Ison also views as extremely positive LEAP's integration of students from different academic backgrounds. She notes that in an environmental planning course that the cohort took at the College of Urban Planning and Public Affairs in fall 2006, "there were students from urban planning, earth and environmental sciences, and other fields, and it was really interesting to hear the perspectives of other students from different departments." Ashley says that LEAP's incoming group of students will be even more diverse in terms of background – including an architect and someone in public administration – further increasing cross-disciplinary dialogue.

Another current LEAP student, Paul Gulezian, was a graduate student in biology at UIC when he decided to apply for the LEAP program. He was attracted both to its interdisciplinary emphasis and to its focus on areas that are heavily impacted by human activities. *Continued on page 5*

FACULTY FOCUS: MOIRA ZELLNER

Having arrived at UIC in January 2006, Moira Zellner, Assistant Professor of Urban Planning and Policy and an IESP joint faculty member, is one of the newer faces around. And she is already adding fresh insights and perspectives on planning and the environment as part of her research on the complexity of human-environment interactions and their effects on the sustainability of natural resources. That work is both cutting-edge and very applicable to the way that planners and citizens make land-use decisions affecting ecological processes.

Zellner frames the core question that informs her work as: What alternative models of development can we create that do not require output growth? "The Smart Growth movement has provided very useful principles for urban development, but growth is not an appropriate paradigm for sustainability because there are biophysical limitations that we cannot ignore," she says. "We need a new paradigm, where development is something other than growth."

Originally from Buenos Aires, Argentina, Zellner came to Chicago from the University of Michigan, where she completed her Masters and PhD in urban planning, as well as a certificate in complex systems. She has worked on projects that include domestic and hazardous waste management, river remediation, industrial pollution control, environmental impact assessments, urban air pollution, greenway development and transportation surveys.

Zellner's current work focuses on using agent-based models to test the effects of public policy and individual decision-making on land-use change

and consequently on environmental quality and integrity. Agent-based modeling allows one to integrate different forms of knowledge (e.g. quantitative and qualitative, scientific and pragmatic, biophysical and social) to explain an environmental problem and inform its solution. An example is Zellner's doctoral dissertation, which resulted from a concern in Monroe County, Michigan about the county's groundwater depletion. A study by a federal agency had already found that changes in land-use patterns were the cause - but the specific connections with groundwater levels were not clear.

Zellner developed an agent-based model to measure the impact of a multitude of variables related to development in the county, such as stone quarry operations, agricultural activity, residential location, and infrastructure and land-use policy, on groundwater levels. After integrating in the model all of the development information with the hydrology of the groundwater system, she was able to measure the impacts of natural, social and policy factors on groundwater supply.

One of her findings was that zoning, by shaping land-use patterns, can significantly affect groundwater availability and exposure to drought. Interestingly, both low-density sprawl and high residential densities around city centers can be beneficial in preventing drought. It is the spread of middle-density development that most affects the availability of groundwater. Relaxing zoning restrictions in ar-

reas providing municipal water from Lake Erie can contain development in those areas and reduce the reliance on groundwater systems, which take longer to be replenished than surface water systems.



Moira Zellner, Assistant Professor

This is the kind of information that planners could use in developing municipal land-use plans. Currently, however, planners tend to consider fewer factors and therefore may miss critical connections between policies and their effects on the environment. Zellner says that while a lot of research has been done examining land use, not as much has been carried out evaluating land-use policy. This type of modeling, says Zellner, can help develop new land-use paradigms by illustrating to policymakers what the effects of their decisions are on natural systems - in essence, making the invisible visible. In a similar vein, she is also working on a project to measure the impact of different land-use patterns on energy usage and pollution generation.

"We don't see the groundwater or the air pollution," Zellner points out. "These models make things visible, so that we can have more of a collective discussion about the choices we make, such as

driving 30 or 40 miles to work every day and sitting in traffic, and about the policies we implement and their consequences - which is not happening, in part because we don't have the tools. The idea is to integrate all of these factors and have a public discussion so that a broader audience can understand and frame the problem, then participate in building and adopting a solution."

Since Zellner sees her work as having an important policy benefit, she has been meeting with several Chicago-area environmental and land-use organizations in order to explain her models and how they could be applied. A possible next step is to expand the use of these models in policy contexts, as demonstration projects carried out in conjunction with a Chicago-area city or town.

What is behind Zellner's zeal for a cleaner environment? "I always loved nature," she says. "Argentina is beautiful, with a lot of undeveloped areas, and my family traveled a lot." At age 16, she made a decision to study ecology rather than agronomy, in order to work towards environmental diversity and quality on a larger scale. Urban planning as a discipline doesn't exist in Argentina, says Zellner, so her advisor encouraged her to study abroad. A six-month stint at Cornell University confirmed for her the correctness of this decision, and she returned to the U.S. for graduate study.

Zellner is cautiously optimistic about the environmental prospects for Earth's denizens. "If we can understand what we're doing," she says, "we may still have a chance to avoid a major collapse." Her research aims to increase our understanding and therefore the actions we can and should take.

LEAP (CONTINUED FROM PAGE 3)

"The usual paradigm is to study pristine areas," he says. "But there are very few of those left. Unfortunately, I think humans are going to continue to have a greater and greater impact on the environment, so the paradigm needs to shift."

Like Ison, he may pursue a non-academic career, possibly with a non-profit organization, so he appreciates the program's emphasis on preparing students for jobs in the policy and other non-

academic realms. The internship component, he notes, helps with that, "giving the program a practical impact and transcending the walls of academia," he says. "It doesn't just stop with journals."

The long-term impact of LEAP is likely to be significant. "It will help bring UIC recognition as an intellectual center for urban ecology research," says Professor Ashley. "We've always had a lot of students interested in environmental science and in non-academic



Jobs like policy and management. As a result of this program, we will be producing some real leaders in those areas."

Climate Change and Biodiversity – Q & A with Professor David Wise

David Wise, Professor of Biological Sciences and joint faculty with IESP, joined UIC in November 2006 after many years at the University of Kentucky, the University of Maryland and elsewhere. Prof. Wise's research investigates the causes and implications of food-web complexity and explores how human impacts, such as global climate change and habitat modification, will affect the functioning of terrestrial food webs. He also teaches in the Landscape, Ecological and Anthropogenic Processes program.

Is our climate changing?

That's certainly a hot topic these days. Our climate has



David Wise, Professor

always changed. We know this from historical records and from scientific research. In school we all learned about the ice ages, so at one level

we're all aware that long-term changes in climate are normal. However, several things today are new. First, scientists are convinced that the pace of climate change in the next century will be more rapid than any change experienced by our species since we became *Homo sapiens*. Second, we don't know what all the consequences will be, but most predictions are discouraging to say the least. Third, this rapid change is due to human activities. And most important, we know that we can do something about climate change — we are probably the first conscious geological force in the history of the Earth.

What can we do about climate change?

The first thing we could do is watch Al Gore's *An Inconvenient Truth* if we haven't already seen it, and start taking the actions suggested at the end of the movie. As an ecologist, I am not only keenly interested in what we can do to slow the rate of climate change, but also, how can we as a society adapt to climate change. In particular, I want to understand how a rapidly changing climate will affect species interactions in eco-

logical communities, because many of these changes will have consequences for humans.

How does this relate to the issue of "biodiversity"?

Excellent question. By the term "biodiversity" ecologists mean many things: total number of species in a landscape, the relative number of rare and common species, the genetic diversity of populations, and the intricate web of ecological interactions. My research focuses on the latter aspect of biodiversity — discovering how chains of species interactions in very complex, species-rich communities affect what we call ecosystem processes, such as plant growth or the rates at which dead plants decompose.

That sounds all rather abstract. How does all this connect to your interest in spiders? You and your students have published many scientific papers about spiders — why do you find them so fascinating?

Ah, the spiderman question! I'm sure a psychoanalyst could come up with a theory, but in my view the answer is

simple: spiders occur in all terrestrial ecosystems, they are abundant, there are lots of species, and they have the potential to have big impacts on insect populations. And because they are small, my students and I can set up replicated field experiments, in which we intentionally alter spider numbers to see how the ecosystem responds.

But do spiders really make a difference?

Yes, they do. Here are two examples from research my students and I conducted at the University of Kentucky. Wolf spiders immigrate into vegetable gardens from surrounding habitats. We found that they either kill or scare away enough cucumber beetles to substantially improve cucumber production in spring gardens. Thus farmers could increase cucumber yield by improving the environment for wolf spiders, for example, by adding straw mulch, and thereby reducing the need to rely on heavy applications of chemical insecticides. Yet in the same gardens in summertime, the same wolf spiders caused a big drop in squash production if beetle predators were rare, probably because the spiders preyed on a major predator of squash bugs. These vegetable gardens have relatively simple food webs, yet the species interactions can be really quite complicated.

Are there other ways in which they have an impact?

Well, consider the complexity of interactions in our second study system, one that a British ecologist has dubbed "the poor man's rainforest" — that is, the dirt and dead leaves that we rarely think about on our nature walks in the woods. The thin layer of leaves in a forest can house 40-50 species of spiders, plus numerous other arthropods. We've found that wolf spiders can have a big impact on the rate of leaf-litter

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Faculty Awards and Appointments

Hormoz BasiriRad was one of five nationwide recipients of the Bullard Fellowship award from Harvard University for Sept. 2006 to Sept. 2007.

Nurtan Esmen was elected a Fellow of the American Industrial Hygiene Association and is a member of the Semiconductor Industry Association Worker Health Study Science Advisory Board.

Michael Iversen was accepted into UIC's Urban Planning and Policy PhD Program for fall 2007, and was awarded a LEAP fellowship.

Martin Jaffe was appointed to the Environmental and Natural Resources Advisory Committee of the Chicago Metropolitan Agency for Planning (CMAP) and was elected to its Regional Water Supply Planning Group. He was also appointed to the Executive Board of the Illinois Water Resources Center at the UofI at Urbana-Champaign and to the Board of Directors of the Housing Opportunity Development Corporation, a non-profit low- and moderate-income housing developer serving the North Shore.

An Li holds an appointment as Adjunct Professor at the Chinese Academy of Sciences, Research Center for Eco-Environmental Sciences in Beijing.

Krishna Reddy received the Best Practice-Oriented Paper Award for the Practice Periodical of Hazardous, Toxic and Radioactive Waste Management from the American Society of Civil Engineers.

Rosemary Sokas received the American College of Occupational and Environmental Medicine's "Health Achievement in Occupational Medicine Award".

Thomas L. Theis, has been reappointed for a three-year term as a charter member to the U.S. Environmental Protection Agency's Science Advisory Board (SAB) by Stephen I. Johnson, USEPA Administrator.

Moira Zellner was appointed alternate member of the Environment and Natural Resource Committee at CMAP.

Environmental Manufacturing Management Program Alumni News

Aninda Chakraborty is Senior Lecturer in the Chemical Engineering Department of the University of Cape Town, South Africa.

Amy Landis has accepted a tenure-track faculty position at the University of Pittsburgh in the Dept. of Civil and Environmental Engineering. She will be working with several sustainability-focused programs at the university and within the city, including the University's Mascaro Sustainability Initiative, the new Center for Sustainable Transportation Infrastructure, and the Energy Institute.

Andres Malcolm is working in the process solutions office of Cargill as a research chemical engineer. His main responsibility is developing mathematical models of company plants in order to identify opportunities for energy savings and increase capacity.

Shelie Miller is an assistant professor in Environmental Engineering and Science at Clemson University. Her current research examines the environmental impacts of switchgrass-based ethanol and optimization of a bioenergy infrastructure in the Southeast.

Steffen Mueller is Senior Economist for the Energy Resources Center at the UIC and Adjunct Assistant Professor at UIC's College of Engineering. His recent work includes an article in "Ethanol Producers Magazine" on the impact of low-carbon fuel standards on the price of ethanol.

Brian Scott is a Visiting Assistant Professor of Finance, Economics and Quantitative Methods at the University of Alabama at Birmingham.

**External Advisory Board
Meeting : September 26**

UIC UNIVERSITY OF ILLINOIS
AT CHICAGO

Q & A WITH DAVID WISE (CONTINUED FROM PAGE 5)

decomposition, even though spiders are carnivores and certainly don't eat leaves. But they do eat a lot of springtails – primitive insects that consume dead organic material and the fungi that decompose the litter. We discovered that spiders can inhibit or accelerate decomposition, depending upon the moisture levels of the soil/litter system. It took five years of experimentation to uncover this phenomenon, including a three-year experiment in which we irrigated experimental forest plots at the extremes of low- and high-rainfall predicted by mathematical models of global climate change. Thus we found that wolf spiders can have a big impact even in systems with numerous other predators – and that climate change will alter the effects that spiders have.

How will effects like this one on the ways in which species interact as a result of climate

change matter for humans?

This particular interaction may have little direct impact on humans, although we don't know for sure, because we don't know enough about how the processes affecting leaf decomposition interact. The amount of dead leaves remaining on the ground could affect seedling survival, which might eventually alter the species composition of the forest. Most research to date has focused on direct impacts of climate change on plant species, or on direct effects upon a particular animal species, usually a charismatic vertebrate. Looking for how our changing climate will produce indirect effects due to altered species interactions is a new and virtually unexplored research area.

Here's an example involving wolves instead of wolf spiders. One prediction is that warmer winters will reduce snow cover, making wolves less effective

predators of moose, leading to an increase in moose populations with strong effects on the vegetation affected by moose browsing. Yet evidence suggests that hotter summers may be causing moose populations to decline because they feed less often and are weakened by an explosion of blood-sucking ticks – and fewer moose means that wolves go hungry, so their populations decline. This supposedly simple system is wondrously complex – no wonder ecologists are sometimes reluctant to make predictions. I will stick my neck out, though, and make a prediction. One way that climate change will affect humans through altering species interactions will be due to increased densities and expanded geographic ranges of arthropods that transmit disease. What's critical, of course, is predicting precisely how all this will play out.