2015 ESPP RESEARCH SYMPOSIUM
International Research Collaborations:
Addressing Environmental Challenges
OCTOBER 23, 2015

SPARTANS WILL:
RESEARCH ACROSS THE GLOBE

STUDENT NEWS
Meet our newest ESPP Fellows for 2015-16

Samuel Smidt, ESPP student, discusses his research

ESPP student awards and accolades

FACULTY NEWS
Water Science Network takes off, launches WaterCube

VISTAS grant leads to invasive species conference

ESPP director, associate director reappointed for new terms

New Faculty Advisory Council members named

Letter from the Director

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ESPP Research Colloquia 15-16: Oil spills, biochar, antibiotic resistance and more

Fate of the Earth 2016: Climate-Food-Energy-Water Nexus

Research Symposium: International Research Collaborations
Five years ago, I accepted the position as Director of the Environmental Science and Policy Program. Since then, I have had the privilege of overseeing the growth and expansion of this innovative interdisciplinary program. I received tremendous support from the broad MSU community, especially from ESPP’s faculty and students, the four ESPP colleges, the Graduate School, AgBioResearch, OVPRGS, and the university administration in general. It is their dedication to interdisciplinary environmental scholarship that has made ESPP a reality and a success.

ESPP has been successful in bringing the campus community together to advance interdisciplinary environmental research and graduate education. The number of faculty with partial appointments in ESPP has grown from 5 to 14, and now ESPP has more than 230 affiliated faculty representing over 50 departments and 12 colleges. Our portfolio of graduate programs has expanded to include two new graduate certificates, and has attracted more students to engage with ESPP. We have supported a large number of faculty workgroups to collaborate in strategically important areas and to develop grant proposals. We have been successful in integrating graduate education with research, offering several signature programs such as the annual ESPP Research Symposium and the Fate of the Earth Symposium.

Our growth has not stopped there. Most recently, we have coordinated the Water Science Network to connect more than 100 faculty members working in diverse areas of water research. With the network came the unique funding program, WaterCube.

As I enter my second term as Director, I hope to continue expanding the program while ensuring that current activities remain relevant and productive. We are exploring ways to further connect key faculty members in strategic areas through closer affiliations with ESPP. We are taking a close look at our portfolio of graduate programs including expanding to a Dual Major program and revitalizing a Masters Specialization. I am confident that more progress will be made with the collective efforts of those concerned about the environment and believing in interdisciplinary approaches. Stay tuned for more news on both these fronts.

All the best,
Jinhua Zhao

Zhao, Tarabara reappointed for three more years

Dr. Jinhua Zhao, director of the Environmental Science and Policy Program since 2010, has been re-appointed for a second term. Dr. Zhao is Professor of Economics and holds appointments in the Department of Economics and the Department of Agricultural, Food and Resource Economics. His research areas include natural resource and environmental economics, applied micro theory, global climate change, energy economics, trade and environment, real option theory, technology adoption, and dynamic decision making.

Dr. Zhao has been reappointed for three more years following a formal renewal process by a committee of members from all ESPP colleges – Social Science, Natural Science, Agriculture and Natural Resources, and Engineering. In addition, ESPP faculty, staff and students were surveyed about Dr. Zhao’s performance. Based on the survey and Dr. Zhao’s statement of accomplishment, the committee recommended to the deans that both directors be renewed. The four deans approved the reappointment.

Dr. Vlad Tarabara, associate director of ESPP since 2012, has also been reappointed for another 3-year term. Dr. Tarabara, Associate Professor of Environmental Engineering, has research interests in water quality and treatment with an emphasis on membrane separation processes. Current projects are on virus removal and detection, separation of emulsions and membrane reactors.
Editor’s note: In the winter of 2015, ESPP provided funding through the VISTAS program for Drs. Michael Wagner and John Hume to host a panel discussion on invasive species control in the Great Lakes. Specifically the pair of Fisheries & Wildlife researchers are interested in exploring the conflicts between controlling invasive species such as sea lampreys and allowing native species to thrive, while enabling services such as hydro-electric dams to exist.

Dr. Wagner and Dr. Hume brought in Dr. Martyn Lucas from Durham University and Dr. Robert McLaughlin from the University of Guelph for a week-long visit, and to take part in the discussion. The following is an excerpt from the press coverage of the conference:

Researchers know that lamprey are attracted by sex pheromones and repulsed by chemicals released by other lamprey that are dead or dying. So last summer, in an experiment near Mackinac City, they tried to repel the fish from one half of a stream with the chemical released by dead lamprey, and attract them with the pheromone to a trap in the other half.

“The use of a repellant and attractant is a novel combination for use in a sea lamprey control program, something not typically used to control fish species,” said Dr. Hume. The result: The repellant pushed lamprey across the river faster, but the partial sex pheromone’s effect on capture wasn’t measureable.

“We didn’t see any additive effect,” Hume said. “It could be the result of stream conditions that year. It’s not the silver bullet control boards get excited about, and that’s part of the problem with field experiments.”

Future research will focus on teasing out these relationships, determining their natural function and working with new barriers and traps.

Meanwhile, researchers are continuing the fight against lamprey on a variety of fronts.

“We’re working toward an all tactics combined approach for the sea lamprey control program,” Hume said. “We have a barrier that blocks and redistributes them, we have the potential for many new improved traps, and we know push and pull cues have shown success in the lab.”

Nearly 1,000 barriers, including dams, in the Great Lakes basin control the invasion of sea lamprey that threaten local ecosystems and important commercial and recreational fisheries valued at $7 billion or more. But barriers also block native fish, including non-invasive native lamprey whose numbers have dropped worldwide.

Ironically, elsewhere where the lamprey are native to the ecosystem, other researchers are trying to help them surmount such barriers. And the problems they have passing the fish, may help the researchers in the Great Lakes region learn to stop them.

“In the Pacific Northwest and across Europe researchers are finding ways to get native lamprey past barriers, and their failures inform us,” said Mike Wagner, coauthor of the push-pull experiment and aquatic behavioral ecologist at Michigan State. Barriers and dams obstruct sea lamprey from moving upstream for spawning but also restrict movement of native lamprey that can safely coexist with other species.

“We’re facing competing priorities,” Wagner said. “We want to restrict the distribution and population sizes of invasive species but also open up our river networks to be used again.”

Native lamprey support local ecosystems, and their young are thought to be an important food source for other native fish, like salmon. They’re also an important cultural resource to Native Americans in the Northwest, said Mary Moser, a research fishery biologist with the National Oceanic and Atmospheric Administration.

“Lamprey are valued as a food source, as well as for medicinal or ceremonial practices,” she said at a recent MSU conference on lamprey passage.

Chemical cues are also being investigated to help direct safe passage of native fish, but most fishways are designed for salmon and are hard for the native lamprey to navigate, Moser said.

Researchers hope to redesign the salmon-specific passes to support the movement of other native fish without removing the barriers that have successfully trapped sea lamprey from moving upstream.

Modified fishways can enable native fish to pass barriers by swimming, leaping, climbing or sucking their way up a series of low steps – a fishladder. The incline of steps and size of slots allow some species to pass through and others not.
The MSU Water Science Network is an effort to link the many water-related research and programs across campus. The Network’s goal is to build rapid synergies and working relationships among faculty, facilitate joint research grants, and promote MSU as a center of excellence in water. The Water Science Network offers networking opportunities and innovative funding programs to build these relationships and promote interdisciplinary collaboration across campus. Supported by funds from the Office of the Vice President for Research and Graduate Studies and six colleges, ESPP administers the Water Science Network with guidance provided by a university-wide water faculty advisory committee.

In 2015, the Water Science Network launched an innovated program, designed to stimulate new multidisciplinary collaborations and novel water research ideas with minimal investment of college funds and faculty time spent on developing internal grant proposals. The program creates tokens, each worth $20,000 in research spending over two years, and awards them to individual faculty members. Faculty members then form teams of at least three token holders, one of whom must be new to the team, to create a WaterCube. Each WaterCube is thus provided with at least $60,000 to be spent over two years to pursue promising research ideas. Written proposals are not required – if members of a WaterCube agree on a worthy water project, then the project is a go. WaterCubes are expected to produce external grant proposals and peer-reviewed publications, and document evidence of progress through annual WaterCube meetings with peers.

WaterCube Quick Facts

- 6 colleges issued a total of 52 tokens
- 13 WaterCube teams involving 45 tokens will be funded
- All teams are multidisciplinary and include:
  - 3 to 4 tokenholders
  - 2 to 3 different colleges
  - at least 1 new collaborator
- $900,000 will be invested in the 13 teams over the next 2 years
- WaterCube funding will support 25 Assistant Professors, including 12 Global Water Initiative hires
- Nearly half (46%) of the WaterCubes will develop and/or apply new technologies

water.msu.edu is the homebase for all water related research at MSU. Here you will find links to water-related websites, facts about water research, water-related funding opportunities, water-related degree programs and profiles of MSU researchers.
Dr. Ben Gramig completed his doctorate in Agricultural Economics in January 2008, having completed most of his ESPP coursework during his Ph.D. studies. He started as an Assistant Professor at Purdue University the following month.

Professor Gramig’s research program is inherently interdisciplinary and examines human-environmental relationships using econometrics, bio-economic modeling and survey-based experiments. The applied focus of this research is predominantly at the interface of agricultural production and the environment. His current research is funded by the US Department of Energy and the US Department of Agriculture. The work for DoE examines economic and environmental tradeoffs in the production of cellulosic feedstocks for biofuels, and involves life-cycle assessment and interactions between water quality, greenhouse gas emissions and the candidate feedstocks corn stover, switchgrass and Miscanthus. His current USDA sponsored work contributes to the integrated research-extension project called Useful-to-Usable that is researching climate variability and change in maize-based cropping systems across the Corn Belt.

Dr. Gramig is leading the development of economic case studies that examine adaptations to climate change and generate potential environmental benefits through reduced Nitrogen fertilizer loss and conservation tillage. The U2U project has developed a number of Decision Support Tools for farmers and farm advisers that are freely accessible online. Dr. Gramig is currently leading the development of a new irrigation investment calculator based on a tool originally developed by Roger Betz, an extension educator at Michigan State University.

Dr. Gramig attributes his motivation to pursue an interdisciplinary research program to his experiences in ESPP. He developed an appreciation for the traditional dichotomy between a narrow disciplinary research career that was a product of how the academy trains doctoral students and the need for truly integrated research that spans multiple disciplines to solve environmental challenges and communicate effectively with policymakers. He notes that this increases the transaction costs of doing research and can create challenges for those on the tenure-track, but it has proven to be rewarding and reinforces Dr. Gramig’s reasons for pursuing a PhD in the first place.

**Basso, Liao, Libarkin and Lopez join the Faculty Advisory Council**

Affiliated faculty members of ESPP selected four new members of the Faculty Advisory Council this summer. The Council advises ESPP’s director on all matters related to the strategic directions and operations of the program. The newly elected members are:

- **Bruno Basso**
  Geological Sciences

- **Wei Liao**
  Biosystems and Agricultural Engineering

- **Julie Libarkin**
  Geological Sciences

- **Maria Claudia Lopez**
  Community Sustainability
This year’s theme focuses on collaborations between scholars across disciplines and across geographies working together to identify and address pressing environmental challenges. We propose this conference as a means to connect ideas and researchers from a myriad of backgrounds and regions. A holistic approach toward sustainability requires multiple perspectives, and this program intends to foster this interdisciplinary sharing. The symposium will explore opportunities and angles to better unite present and future academics in addressing the state of the environment.

Strengthened environmental decision making requires researchers who can critically integrate diverse perspectives and methodologies when conceptualizing, investigating, and addressing environmental challenges. Students from all departments are invited to present work at any stage in its development through oral presentations, poster presentations, and discussion groups. Proposals may consider research collaborations in any environmental context, including but not limited to:

- Climate mitigation, adaptation, and geoengineering
- Water policy and management
- Resource use and extraction
- Agricultural cultivation, distribution, and consumption
- Human and physical dimensions of wildlife policy and management
- Social, political, psychological, and economic factors in risk perception and assessment
- Challenges in the conceptualization and communication of environmental problems

Accepted proposals will be organized by shared themes but will strive to bring together unique perspectives on each phase in the development of a comprehensive research project. Abstracts can be submitted for consideration at www.espp.msu.edu/events/research_symposium/abstract.php.

Dr. SenGupta’s research interests include preparation, characterization and innovative use of novel adsorbents; ion exchangers; reactive polymers; specialty membranes in environmental separation and development of sustainable environmental processes. He is a leader in environmental technology research and education, and has guided dozens of graduate students to successful careers in engineering practice and research. Dr. SenGupta’s award-winning research has expanded the field of ion exchange science and technology in solving critical environmental problems, and has led to the development of new classes of hybrid ion exchangers that have been incorporated into water and wastewater treatment processes globally. He heads an international, interdisciplinary effort to develop and promote a sustainable treatment system that provides drinking water free of arsenic to thousands of people all over the world. He developed and helped to commercialize the first polymer-based absorbent for arsenic in the U.S., a product that provides arsenic-safe water to well over one million people in both the developing and the developed world. SenGupta currently has seven US patents.
ESPP is excited to announce a wide-ranging and diverse slate of esteemed distinguished speakers for our 3rd Annual Fate of the Earth Symposium. Coming next spring to the Kellogg Center will be:

**KEYNOTE LECTURE:**
**Lynn Scarlett,** The Nature Conservancy. Former Deputy Secretary and Chief Operating Officer of the U.S. Department of the Interior, Lynn Scarlett is worldwide Managing Director for Public Policy at The Nature Conservancy.

**Tasso Azevedo,** Rainforest Alliance. Tasso Azevedo is a forest and climate change consultant and social entrepreneur. He was the founder and director of the Brazilian NGO Imaflora.

**Kate Brauman,** University of Minnesota. Dr. Brauman is the Lead Scientist for the Global Water Initiative at the University of Minnesota’s Institute on the Environment.

**Ed McCormick,** Water Environment Federation. An expert in recovering valuable resources from wastewater, Ed McCormick is the 2014-2015 President of the Board of Trustees of the Water Environmental Federation, an international organization of water quality professionals.

**Nadine Unger,** Yale University. An assistant professor of Climate Science at Yale School of Forestry & Environmental Studies, Dr. Unger works in numerical modeling of the interactions between atmospheric chemistry and the climate.

The Environmental Science and Policy Program launched a symposium series to explore the challenges and opportunities we face in enhancing human well-being while protecting the environment. This symposium will bring distinguished thinkers from around the world to explore what we know, what we need to know and what we must do as we move into a century of unprecedented environmental change, technological advancement and scale of human activity.

*This symposium is made possible through the generous endowment of Barbara Sawyer-Koch and Donald Koch.*
ESPP selected five incoming doctoral students as recipients for the 2015-2016 ESPP Doctoral Recruiting Fellowship. These fellowships are designed to attract the best possible cohort of students to pursue a doctoral education focused on the environment.

**Lin Liu** is joining the Department of Geological Sciences under the guidance of Dr. Bruno Basso. She will be studying Hydroecology. Previously she has studied at Sichuan University and State University of New York. She is receiving her masters degree in environmental geosciences from MSU this spring.

**Judith Namanya,** originally from Uganda, assisted Assistant Professor Amber Pearson in the MSU Department of Geography with her research in that country and now intends to study the crucial linkages between the environment and human health. Judith received her masters of science degree in public health from Leeds University.

**Rajiv Paudel** of Nepal will be studying human-natural food systems under Dr. Arika Ligmann-Zielinska in the Department of Geography. He has worked for environmental NGOs in Nepal for several years since receiving his masters degree in the United Kingdom in Ecology.

**Mark Suchyta** began his PhD studies at Pennsylvania State University in Environmental Sociology. At MSU, he will join the Department of Sociology where he will engage in research on public concerns and attitudes about animal welfare. He has undergraduate degrees from the University of Michigan and Wayne State University.

**Qiong Zhang** will also join the Department of Geography where she will investigate health geography issues, specifically maternal and child health and air pollution in her home country of China. She has dual master’s degrees from the University of Toledo in Geography and Planning and Public Administration.

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**KATERI SALK RECEIVES FIRST ROSE WATER FELLOWSHIP**

The Rose Water Fellowship has been awarded to Kateri Salk, Michigan State University doctoral student for the 2015 spring semester.

The award, endowed by Joan Rose, Homer Nowlin Chair in water research at MSU, is awarded to graduate level scientists seeking to advance the field of water science. Salk, who works under MSU professor Nathaniel Ostrom in the department of zoology, specializes in environmental science and policy research.

“The broader goal of the fellowship, rather than just funding a specific project, helped me to really think about my vision for a career in water science,” said Salk. “I believe research will help to address future water problems both locally and around the world.”

Salk plans to use the award to fund her current research project on algal blooms in Lake Erie. Last fall, bacteria living within these blooms turned toxic, causing water restrictions in the Toledo, Ohio.

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**ESPP’S ADAMS NAMED GRADUATE STUDENT OF THE YEAR**

Ellis Adams, an ESPP Specialization Student and a doctoral candidate in Geography, was named the Graduate Student of the Year for 2014-15.

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**Congratulations to ESPP’s Outstanding Service Award winners for 2015:**

**Carson Reeling** (Agriculture, Food and Resource Economics)

**Erin Haacker** (Geological Sciences)
The High Plains Aquifer in the western United States is one of the largest groundwater supplies in the world. Nearly one-third of all groundwater used for irrigation in U.S. agriculture is extracted from the massive supply. However, groundwater levels for most of the aquifer have steadily declined since measurements began in the early 1900s, and further decline is expected if current land use and management practices continue into the future. Declines have already become so extreme that for some regions aquifer depletion has become a reality.

Underlying an 8-state region from South Dakota down to Texas, the High Plains Aquifer is a key water source for crop production in an otherwise relatively dry, semi-arid climate. Crop production on the High Plains is one of the largest agricultural markets in the U.S. Any instability or depletion to the High Plains Aquifer will likely result in major economic and social implications at both the small and large scales.

Over the last year, I have had the opportunity to lead an interdisciplinary team, including four ESPP affiliates (PhD students Erin Haacker, Haoyang Li, myself, and Professor Dr. David Hyndman), toward a refocused approach to water management given the lessons learned from the water-energy-food nexus on the High Plains. Funded by the National Science Foundation, our team has focused on capturing important water use decision-making trends found in the coupled human and natural systems of the region.

The motivation for the study is that by analyzing the critical trends behind water use, the mitigation of groundwater decline can be better integrated as an objective in future management strategies. Results from the study can likely be applied as a conceptual framework in other intensive agricultural regions of the world.

Haoyang Li, member of the MSU Department of Economics and ESPP Specialization Student, said about the project, “Currently, most studies on the water-energy-food nexus in the High Plains Aquifer region look at this issue solely from a natural or socioeconomics perspective. We still want to know how those study results will change if we take them into the real complex system where natural and socioeconomic forces interact with each other. This study points out several interdisciplinary research areas where experts from various fields could cooperate together to better understand agricultural water systems”.

Erin Haacker, PhD candidate in the Department of Geological Sciences and ESPP Specialization student, is particularly excited about the intellectual growth this type of study has generated. “I think the biggest takeaway is the importance of a firm foundation for a large interdisciplinary project,” she said. “This study is not limited to a small aspect of the problem, so it is more holistic than most research that graduate students get to work on. The collaboration has really given us a common ground for the more complex problem solving that we want to do.”

When asked to reflect on how this study and ESPP are interconnected, Haacker replied, “This study involves students communicating across disciplines to solve problems. We are creating a peer network that could last us through our professional lives, both in this project and ESPP.”

Li expanded on the role of ESPP by adding, “ESPP has long been providing opportunities and platforms for scholars to conduct interdisciplinary research. In fact, most of the students on this study came to this project through the collaborative efforts of ESPP-affiliated faculty.”

We have found over the last year that the interdisciplinary lessons taught through ESPP can also be applied to complex water management on the High Plains Aquifer, and we believe the same approach can be further developed in future environmental studies. Li concluded by saying, “I believe the ESPP platform will continue to give rise to more interesting and collaborative research in upcoming environmental fields.”

*Samuel Smidt is a PhD student in the Department of Geological Sciences studying Environmental Geosciences. His interests include the supply and demand of the Earth’s water resources.*
STUDENT TRAVEL FUNDS NOW AVAILABLE THROUGHOUT YEAR
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<tr>
<th>Date</th>
<th>Time</th>
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<tbody>
<tr>
<td>Saturday Oct. 3</td>
<td>8 a.m.</td>
<td>ESPP Tailgate Open House</td>
<td>Shaw Lane and Farm Lane</td>
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<td>Thursday Oct. 8</td>
<td>3 p.m.</td>
<td>ESPP Colloquia Roundtable Discussion: Lessons Learned From Oil Spills</td>
<td>Kellogg Center</td>
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<td>Thursday Oct. 15</td>
<td>9:30 a.m.</td>
<td>ESPP Colloquia Distinguished Lecture: Dr. David Laird/biochar</td>
<td>Kellogg Center</td>
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<td>Friday Oct. 23</td>
<td>8 a.m.</td>
<td>ESPP Research Symposium</td>
<td>Kellogg Center</td>
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<td>Sunday-Tuesday Oct. 25-27</td>
<td>all day</td>
<td>United Nations International Year of Light</td>
<td>Henry Center</td>
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<td>Thursday Oct. 29</td>
<td>9:30 a.m.</td>
<td>ESPP Colloquia Distinguished Lecture and Roundtable Discussion: Dr. Edward Topp/ Antibiotic Resistance</td>
<td>Kellogg Center</td>
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<td>Thursday Nov. 12</td>
<td>3 p.m.</td>
<td>ESPP Colloquia Student Seminar: Melissa Rojas</td>
<td>273 Giltner Hall</td>
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<td>Thursday Jan. 21</td>
<td>3 p.m.</td>
<td>ESPP Colloquia Student Seminar: Stephan Vrla</td>
<td>273 Giltner Hall</td>
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<tr>
<td>Thursday Feb. 4</td>
<td>3 p.m.</td>
<td>ESPP Colloquia Student Seminar: Sam Smidt</td>
<td>273 Giltner Hall</td>
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<td>Thursday March 24</td>
<td>3 p.m.</td>
<td>ESPP Colloquia Student Seminar: Nicholas Skaff</td>
<td>273 Giltner Hall</td>
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<td>Wednesday April 6</td>
<td>all day</td>
<td>Fate of the Earth Symposium</td>
<td>Kellogg Center</td>
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**GO GREEN AT ESPP’S TAILGATE OPEN HOUSE!**
**OCT. 3 AT THE CORNER OF SHAW AND FARM LANE**