

# **Earth and Environmental Systems Institute**

## **Center for Environmental Informatics**

Douglas A. Miller, Director

### **Center Renewal Proposal**

April 17, 2017

#### **PARTICIPANTS**

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##### **Collaborating Penn State Faculty**

- Dr. Paul Adler, USDA-ARS, Pasture Systems Research Lab  
Dr. Margaret Brittingham, School of Forest Resources
- Dr. Robert Brooks, Department of Geography and Riparia
- Dr. Anthony Buda, USDA-ARS, Pasture Systems Research Lab
- Dr. Andy Cole, Landscape Architecture
- Dr. William Curran, Plant Science
- Dr. Patrick Drohan, Ecosystem Science and Management
- Dr. Shelby Fleischer, Entomology
- Dr. Larry Gorenflo, Landscape Architecture
- Dr. Russ Graham, Geosciences/EMS Museum
- Dr. Christina Grozinger, Entomology
- Dr. Sarah Goslee, USDA-ARS, Pasture Systems Research Lab
- Dr. Marvin Hall, Plant Science
- Dr. Margot Kaye, Ecosystem Science and Management
- Dr. Armen Kemanian, Plant Science

- Dr. Peter Kleinman, USDA-ARS, Pasture Systems Research Lab
- Dr. Laura Leites, Ecosystem Science and Management
- Dr. Marc McDill, Ecosystem Science and Management
- Mr. Kyle Imhof, Meteorology
- Dr. Timothy Murtha, Landscape Architecture
- Dr. Harland Patch, Entomology
- Dr. Bronwen Powell, Geography
- Dr. James Shortle, Agricultural Economics
- Dr. Erica Smithwick, Geography
- Dr. John Tooker, Entomology
- Dr. Eric Zenner, Ecosystem Science and Management

#### **External Collaborators**

- Dr. Erick DeWolf, Kansas State University
- Dr. Todd Fearer, American Bird Conservancy
- Dr. Eric Grimm, Illinois Natural History Survey (retired)
- Dr. Edward Laurent, Consultant
- Dr. David Wiedenfeld, American Bird Conservancy

### **Center Personnel**

- Doug Miller, Director
- Dr. Barry Evans, Sr. Research Associate
- Stephen Crawford, Research Assistant
- Michael Stryker, Research Assistant
- Nooreen Meghani, Research Assistant

### **Center-Affiliated Personnel** (funded through CEI projects, but not appointed at EESI)

- Scott Dane, Research Assistant PSIEE

## **RATIONALE**

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The Center for Environmental Informatics (CEI) in the Earth and Environmental Systems Institute was originally formed in 2000 as the Outreach Center of the former Environment Institute within the College of Earth and Mineral Sciences. CEI focuses on the development of new and innovative approaches to the creation and dissemination of environmental information resources. In the 17 years of its existence as an interdisciplinary center within the Institute, the Center for Environmental Informatics has developed a unique niche that contributes to the tripartite mission of the University. We have achieved national and international recognition for our unique and inventive approaches to combining advanced web-based technology with domain-based scientific expertise to provide information resources for decision makers.

There may be no higher call to the science community than that made by society itself to address fundamental challenges related to the human predicament. As we move rapidly through the 21<sup>st</sup> Century this need will grow as we continue to stress our planetary system with a growing population demanding food, energy, and a clean environment. It is simply not enough for scientists to observe, measure, model, and assemble scientific knowledge as an academic exercise. We are increasingly called to show the relevance of our work—society's investment—to the pressing problems of the time. This call lies at the very core of the mission and focus of CEI.

We believe that our contribution to the overall mission of the University is now needed more than ever. Increasingly decision makers are looking to the academic community for relevant contributions to society. In this spirit, CEI looks to continue to work with colleagues in a wide range of domain sciences to provide solutions to pressing earth system problems.

The Mission and Focus statements on our web site succinctly describe our Center:

**Mission**

Produce high quality environmental information resources, in usable forms and formats, that serve the needs of individuals, communities, and organizations at all levels of society.

**Focus**

- Develop web-based decision support tools and enabling information technology systems
- Integrate geospatial technologies with environmental observation networks
- Deploy mission-critical environmental information applications

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**FUNDING OPPORTUNITIES**

Funding opportunities to sustain CEI contributions exist at all levels of government and numerous private and NGO organizations. We see strong continued support for our work from Federal agencies such as the USDA, USGS, USFWS, NSF, NASA, and EPA. Over the past 17 years much of our work has been focused at the national and regional scales. While continuing to work at these scales with agencies that have traditionally funded us, we are now interested in moving “down-scale” where we see great promise for the application of our advanced web-based geospatial technology for decision makers working at the landscape scale.

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**CENTER NEEDS**

The Center for Environmental Informatics is located on the 3<sup>rd</sup> floor of the Earth-Engineering Sciences Building. We greatly appreciate the office and laboratory space provided by the Institute since we moved to the building in 2001. All of our full-time and some of our part-time staff are located in this work area. With this renewal request, we seek the continued support of the Institute for office and laboratory space for our employees.

With this renewal proposal, CEI requests a designated annual amount, not to exceed \$7,500.00, for project development, hardware and software procurement and staff training and enrichment activities—including travel to present our work at suitable national venues. Our staff of 5 full-time employees represents nearly 75 years of service to Penn State. We believe that our success as a center is due, in no small part, to this accumulated experience and expertise.

## MANAGEMENT STRUCTURE

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CEI maintains a flat organizational structure designed to empower staff members to work effectively with our internal and external collaborators to meet specific project requirements. Overall administration of the Center resides with the Center Director who is responsible for the day-to-day operations where they identify potential collaborators, write proposals, administer funded projects, assign project tasks, and coordinate CEI staff to accomplish project objectives. CEI staff members are actively involved in project decision making with collaborators and are empowered to move projects forward under minimal direct supervision.

## PREVIOUS SUCCESSES

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CEI highlights from the past 3 years:

- USDA Wheat Fusarium HeadBlight. This fusarium is the major wheat plant pathogen on Earth. We provide the only daily forecast for this pathogen in North America and have been doing this continuously since 2002.
- Geoinformatics: Collaborative Research: Neotoma Paleoecology Database, Pliocene-Quaternary grant. 9/1/2010 - 8/31/2015. \$1,606,051. This long-term effort leverages CEI capabilities in data modeling and management, as well as interface design, to advance collaborative work in paleoecology.
- The initiation of a new cross-campus group devoted to environmental sensing with small, unmanned autonomous systems (sUAS). While still in early infancy, the collaborative efforts initiated in this area promise potential for substantive, long-term research successes.

The following list is a non-exhaustive tabulation of the funding successes that CEI has had since approximately 2011 in working with colleagues within Penn State as well as our external collaborators.

### *Partial List of Projects Funding CEI (2011-present):*

**Project:** "Enhancements to Web-Based MS4 Periodic Reporting Application"

Sponsor: COP: Department of Environmental Protection

Period of Performance: 11/1/2016-6/30/2017

Total Budget Requested: \$98,500

**Project:** "Kansas Wheat Dashboard: Information about Emerging Stripe Rust Epidemics and Other Threats to Wheat Production"

Sponsor: Kansas State University

Period of Performance: 7/1/2016-6/30/2017  
Total Budget Requested: \$10,000

**Project:** "Continued Deployment of Prediction Models for Fusarium Head Blight"  
Sponsor: USDA Agricultural Research Service  
Period of Performance: 6/7/2016-6/6/2018  
Total Budget Requested: \$31,417

**Project:** "Web-based Tool for Estimating Climate Change Impacts on CONUS Cropping Patterns Using the National Commodity Crop Productivity Index (NCCPI)"  
Sponsor: USDA Natural Resources Conservation Service  
Period of Performance: 9/16/2015-9/30/2017  
Total Budget Requested: \$74,986

**Project:** "Comprehensive Data Management and Modeling for The USDA-ARS Pasture Systems and Watershed Management Research Unit"  
Sponsor: USDA Agricultural Research Service  
Period of Performance: 8/28/2014-5/31/2017  
Total Budget Requested: \$41,500

**Project:** "Center for Multi-Scale Nutrient Pollution Solutions"  
Sponsor: Environmental Protection Agency  
Period of Performance: 9/1/2013-8/31/2017  
Total Budget Requested: \$2,220,649

**Project:** "Developing a Web-based Forecasting Tool for Nutrient Management"  
Sponsor: USDA National Institute of Food and Agriculture  
Period of Performance: 3/1/2012-2/28/2018  
Total Budget Requested: \$484,000

**Project:** "Center for Multi-Scale Nutrient Pollution Solutions"  
Sponsor: Environmental Protection Agency  
Period of Performance: 9/1/2013 - 8/31/2016  
Total Budget Requested: \$2,220,649

**Project:** "Geoinformatics: Collaborative Research: Neotoma Paleoecology Database, Pliocene-Quaternary (Revised Budget)"  
Sponsor: National Science Foundation  
Period of Performance: 9/1/2010-8/31/2017  
Total Budget Requested: \$1,486,857

**Project:** "WE38 Land Use Database Research Asset Development"  
Sponsor: USDA Agricultural Research Service  
Period of Performance: 3/1/2012 - 9/30/2014  
Total Budget Requested: \$29,000

**Project:** "Map-based Web Application for Assessing Seabird By-catch Risks in Fisheries"  
Sponsor: American Bird Conservancy

Period of Performance: 2/1/2014 - 3/31/2015

Total Budget Requested: \$50,000

**Project:** "Development of a Real-Time Mexican Rice Borer Population Monitoring Program and Refinement of Management Recommendations as the Pest Invades Rice and Sugarcane"

Sponsor: Louisiana State University

Period of Performance: 8/1/2012 - 7/31/2014

Total Budget Requested: \$8,000

**Project:** "National Wetland Program Development: Supplemental Project - "Enhancing the Design and Functionality of the Floristic Quality Assessment Database and Calculator"

Sponsor: Environmental Protection Agency

Period of Performance: 1/1/2011 - 9/30/2014

Budget: \$15,000

**Project:** "Developing an IPM program for Western Bean Cutworm, a New Corn and Dry Bean Pest in the Northeast Region" (Extension)

Sponsor: USDA National Institute of Food and Agriculture

Period of Performance: 8/15/2012 - 8/14/2014

Budget: \$35,692

**Project:** "Developing an IPM program for Western Bean Cutworm, a New Corn and Dry Bean Pest in the Northeast Region" (Research)

Sponsor: USDA National Institute of Food and Agriculture

Period of Performance: 8/15/2012 - 8/14/2014

Budget: \$111,985

**Project:** "Continued Deployment of Prediction Models for Fusarium Head Blight"

Sponsor: USDA Agricultural Research Service

Period of Performance: 6/25/2012 - 6/24/2014

Budget: \$62,120

**Project:** "Developing a Web-based Forecasting Tool for Nutrient Management"

Sponsor: USDA National Institute of Food and Agriculture

Period of Performance: 3/1/2012 - 2/28/2017

Budget: \$484,000

**Project:** "PAMAP Data Curation Services"

Sponsor: COP: Department of Conservation and Natural Resources

Period of Performance: 10/1/2011 - 6/30/2016

Budget: \$281,900

**Project:** "Regional Distribution and Abundance of Biofuel and Forage Species"

Sponsor: USDA Agricultural Research Service

Period of Performance: 9/15/2011 - 9/30/2014

Budget: \$75,000

**Project:** "Full-Scale Development Project: Marcellus Matters: Engaging Adults in Science and Energy (EASE)"

Sponsor: National Science Foundation

Period of Performance: 10/1/2011 - 9/30/2014

Budget: \$2,541,418

**Project:** "Effects of Natural Gas Extraction within the Marcellus Shale on Forest Ecosystems:  
Assessment, Monitoring and Remediation"

Sponsor: The Heinz Endowments

Period of Performance: 1/1/2011 - 12/31/2014

Budget: \$412,141

**Project:** "Transitions to Prosperity and Sustainability: Enhancing Small and Medium-Sized Farms  
in the Rural Exurban-Urban Transitional Zone"

Sponsor: USDA – National Research Initiative

Period of Performance: 9/2007 – 8/2011

Budget: \$ 491,081

**SUPPORT LETTERS**

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Dr. Marc E. McDill  
Associate Professor of Forest Management  
School of Forest Resources

College of Agricultural Sciences  
The Pennsylvania State University  
310 Forest Resources Building  
University Park, PA 16802

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April 17, 2017

Susan Brantley  
Director, Earth-Environmental Systems Institute  
Distinguished Professor  
2217 EES Building  
University Park, PA 16802

Dear Dr. Brantley,

I am writing in support of the Center for Environmental Informatics and in support of their request for continued funding. The Center provides critical expertise and services for many projects involving a wide array of departments at PSU.

Doug Miller and I have been working together to build capacity to deploy a wide range of sensors on unmanned aerial systems (UAS). Doug first opened my eyes to the potential of these systems for remote sensing of natural resources a couple years ago, and we have worked through many of the legal and technical challenges that have stood in the way of achieving this potential. We now have several functional platforms and have completed several applications of these systems in agriculture and ecology. We are presently developing a UAS that will be able to deploy a small Velodyne LiDAR sensor. This research has been accomplished on shoestring budgets strung together mostly from small grants that Doug has been able to obtain. I am confident that this small initial investment will soon lead to large payoffs in terms of future research projects and applications of these systems.

The UAS project exemplifies the way that Doug is able to leverage small amounts of resources into larger projects and products. This is what the Center for Environmental Informatics does as well: leverage relatively small amounts of base funding into a significant service and research organization within the University.

Sincerely,

Marc McDill  
Associate Professor of Forest Management  
Department of Ecosystem Science and Management



April 19, 2017

Susan Brantley  
Director, Earth-Environmental Systems Institute  
Distinguished Professor  
2217 EES Building  
University Park, PA 16802

This is a letter of support for the Center for Environmental Informatics as it comes up for renewal. I strongly support Doug's efforts as he works widely across the university with a large variety of project.

Doug has been working with our nascent unit, the Center for Ecological Design and Restoration (CEDAR) since we first proposed it last fall. CEDAR and CEI are a natural fit as we both work to address environmental problems from different perspectives. Doug has been invaluable in helping us develop the proposal as well as brainstorm for our upcoming symposium focusing on ecological design.

I look forward to continuing our relationship with Doug and the CEI and I strongly endorse the renewal of the program.

Sincerely,

*Charles Andrew Cole*

Charles Andrew Cole, Ph.D.  
Associate Professor  
Department of Landscape Architecture



April 23, 2017

To Whom It May Concern:

I am delighted to write in support of the renewal of Penn State's Center for Environmental Informatics. I, and several other members of the Center for Pollinator Research, have worked with individuals in the CEI for the last 1.5 years. This is an incredibly synergistic interaction, since many of the questions we have about the factors driving global pollinator declines and how to mitigate those factors can be addressed by the expertise, tools, and resources in the CEI. We have submitted multiple grant proposals with Professor Doug Miller as a coPI representing the CEI, and are awaiting responses. Two training grants (supported by Penn State's College of Agricultural Strategic Networking Initiatives and the USDA National Needs Fellowship Program) have been funded and will support 6-7 graduate students over the next five years. We anticipate that several of these studies will be mentored by and collaborate with Professor Miller.

In short, the Center for Environmental Informatics places us at the forefront of research that can address global issues, including pollinator and biodiversity decline, and we are extremely fortunate to have such a skilled and collaborative organization at Penn State.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Christina M. Grozinger'.

Christina M. Grozinger  
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Director, Center for Pollinator Research  
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