



Earth and Environmental Systems Institute Center for Environmental Informatics

Douglas A. Miller, Director
Brian W. Bills, Assistant Director

Center Renewal Proposal

April 15, 2011

PARTICIPANTS

Collaborating Penn State Faculty

- Dr. Paul Adler, USDA-ARS, Pasture Systems Research Lab
- Dr. Todd Bacastow, Dutton e-Education Institute
- Dr. Susan Brantley, EESI
- Dr. Kathy Brazier, Agricultural Economics and Rural Sociology
- Dr. Margaret Brittingham, School of Forest Resources
- Dr. Robert Brooks, Riparia
- Dr. Jeffery Brownson, Energy Institute
- Dr. Patrick Drohan, Crop and Soil Science
- Dr. Christopher Duffy, Civil and Environmental Engineering
- Dr. Barry Evans, Penn State Institutes for Energy and the Environment
- Dr. Jill Findeis, Agricultural Economics and Rural Sociology
- Dr. Shelby Fleischer, Entomology
- Dr. Larry Gorenflo, Landscape Architecture
- Dr. Russ Graham, EMS Museum Director
- Dr. Marvin Hall, Crop and Soil Science
- Dr. Jason Kay, Crop and Soil Science
- Dr. Armen Kemanian, Crop and Soil Science
- Dr. Peter Kleinman, USDA-ARS, Pasture Systems Research Lab
- Mr. Paul Knight, Meteorology
- Dr. Henry Lin, Crop and Soil Science
- Dr. Jonathan Lynch, Horticulture
- Dr. David Mortensen, Crop and Soil Science

- Dr. Timothy Murtha, Landscape Architecture
- Dr. Wayne Myers, School of Forest Resources
- Dr. Michael Paul, ARL
- Dr. Erica Smithwick, Geography
- Dr. John Tooker, Entomology
- Dr. Thorsten Wegener, Civil and Environmental Engineering

External Collaborators

- Dr. Erick DeWolf, Kansas State University
- Dr. Todd Fearer, US Fish & Wildlife Service
- Dr. Mark Gleason, Iowa State University
- Dr. Eric Grimm, Illinois Natural History Survey
- Dr. Bill Hutchison, University of Minnesota
- Dr. Steve Kelling, Cornell University
- Dr. Edward Laurent, American Bird Conservancy
- Casey Lott, American Bird Conservancy
- Dr. Michael Meit, University of Chicago, NORC
- Dr. Andy Michael, The Ohio State University
- Terry Rich, US Fish & Wildlife Service, Partners-in-Flight
- Dr. Brian Smith, American Bird Conservancy
- Sharon Waltman, USDA-NRCS, National Geospatial Development Center
- Dr. Jake Weltzin, USGS, US National Phenology Network

Center Personnel

- Doug Miller, Director
- Brian Bills, Assistant Director
- Susie Anderson, Research Assistant
- Martin T. Auer, Wage Payroll
- Stephen Crawford, Research Assistant
- Blake Ketchum, Research Associate
- Jim Sloan, Research Assistant
- Patryk Soika, IT Staff
- Michael Stryker, Wage Payroll
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Center-Affiliated Personnel (funded through CEI projects, but not appointed at EESI)

- Dr. Joseph Bishop, Research Associate, Cooperative Wetlands Center
- Scott Dane, Research Assistant PSIEE

RATIONALE

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 11 years of its existence as an interdisciplinary center within the Institute, the Center for Environmental Informatics (CEI) 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 21st 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, to 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

FUNDING SOURCES AND 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 11 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.

Several current and developing projects are leading us to decision support at the landscape scale. We are collaborating with the American Bird Conservancy to develop an ecosystem management tool for the Interior Least Tern, a threatened and endangered species on Southern Great Plains Rivers. This work links our expertise in web map-based decision support technologies with an agent-based model of tern behavior in the riverine ecosystem. The success of this work is leading to the potential for work with Piping Plovers, another threatened species in similar environments. Our contribution to the development of the USGS Climate Science Center proposal aligns with collaborations that we are developing with the Appalachian LCC, the South Atlantic LCC, and the Gulf Coast and Ozarks LCC (where we are currently negotiating a project to provide land use/land cover and habitat management tools) and enhances the potential for connecting regional-scale climate model simulations and observations to “on-the-ground” land conservation management activities.

These projects are in addition to our growing set of agricultural management tools being developed to meet specific cropping system management objectives at the landscape/field level. Recent funding successes in this area include a project to develop forecast tools for management of cucurbit crops, a tool for meeting the challenge of fruit crop pathogens—sootyblotch and flyspeck (where we leverage our work with the expertise in the State Climatologist’s office), and a recently completed project to revive the USDA-NRCS soil moisture and climate regime tool known as the Newhall Simulation Model—which we have just released as a desktop Java-based application. Additionally, we are in the early stages of developing a collaborative project with Dave Mortensen in Crop and Soil Science related to landscape fragmentation and the floral provisioning for native pollinators.

CENTER NEEDS

The Center for Environmental Informatics is located on the 3rd floor of the Earth-Engineering Sciences Building. We have been blessed with office and laboratory space since the Institute 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.

CEI has received \$5,000/year in general operating funds for its use since 2009. These funds have supported CEI staff personnel HR training within the University as well as off-site commercial vendor training and travel to promote CEI capabilities to acquire extramural funding. With this renewal proposal, CEI requests continued support at the annual level of \$5,000.00, for staff training and enrichment activities, travel for project promotion and development, and minor equipment purchases (for example—this year we’re replacing a 7 year old digital projector that has failed!).

MANAGEMENT STRUCTURE

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 and Assistant Director. Dr. Miller and Mr. Bills are 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

CEI highlights from the past 5 years:

- NSF Geoinformatics: Collaborative Research: Neotoma Paleoecology Database, Pliocene-Quaternary grant. 9/1/2010 - 8/31/2015. \$1,606,051.
- Completion of the PAMAP Program resulting in high-resolution orthoimagery and digital elevation model for the entire Commonwealth of Pennsylvania—the most extensive state-based mapping program in the US in the past 25 years: June 2011. \$23,994,328.
- PestWatch—our daily monitoring tool for corn pests in the Northeast United States expands to the entire Corn Belt of the United States: May 2007; Now one of the longest continuous pest monitoring programs in the world.
- PestWatch success leads to funding in the Caribbean and Serbia to transfer our Open Source-based technology to these countries: 2007 and 2008 MIT Technology Review recognizes CEI for the development of the only daily forecast in the world for wheat fusarium headblight—the major wheat plant pathogen: May 2006

The following list is a non-exhaustive tabulation of the funding successes that CEI has had since approximately 2004 in working with colleagues within Penn State as well as our external collaborators.

A Partial List of Funded Projects since 2004:

Project: PA Map Implementation Plan

Source of Support: PA Department of Conservation and Natural Resources

Total Award Amount : \$23,994,328.00

Total Award Period Covered: 7/01/04 – 6/30/11

Project: Neotoma Information Architecture

Source of Support: NSF

Total Award Amount : \$1,707,051

Total Award Period Covered: 1/01/07 – 8/31/15

Collaborators: Eric Grimm, IL State Museum and Russ Graham, Penn State

Project: Enhanced Tools for the Deployment of Fusarium Head Blight Prediction Models
Source of Support: USDA/Michigan State University
Total Award Amount: \$ 28,543
Total Award Period Covered: 5/01/07 – 5/31/2011
Collaborators: Erick DeWolf, Kansas State and Paul Knight, Penn State

Project: A Web-based Planning Tool for Emergency Response Managers in Buffalo, NY
Source of Support: Western NY Public Health Alliance
Total Award Amount: \$ 122,400
Total Award Period Covered: 9/02/06 – 5/31/08
Collaborator: Michael Meit, University of Chicago, NORC

Project: Transitions to Prosperity and Sustainability: Enhancing Small and Medium-Sized Farms in the Rural Exurban-Urban Transitional Zone
Source of Support: USDA – National Research Initiative
Total Award Amount: \$ 491,081
Total Award Period Covered: 9/2007 – 8/2012
Collaborators: Jill Findeis and Others, Penn State

Project: Development of the PA Historic Aerial Imagery Library (PennPilot)
Source of Support: PA Topographic and Geologic Survey, DCNR
Total Award Amount: \$ 438,170
Total Award Period Covered: 7/1/04 – 4/30/08

Project: Development of a North American Soils Database for Terrestrial Carbon Modeling
Source of Support: DOE
Total Award Amount : \$ 50,723
Total Award Period Covered: 10/1/06 – 9/30/08
Collaborator: Wilfred Post, Oak Ridge National Lab

Project: Regolith & the Critical Zone in the Susquehanna River Basin: The Shale Experiment
Source of Support: NSF
Total Award Amount: \$ 4,250,000
Total Award Period Covered: 7/1/07 – 6/30/12
Collaborators: Chris Duffy and Others, Penn State

Project: Collaborative Research in Geoinformatics: Building a Cyberinfrastructure for the Critical Zone Exploration Network
Source of Support: NSF
Total Award Amount : \$ 250,000
Total Award Period Covered: 4/15/05 – 4/14/08
Collaborators: Susan Brantley, Penn State and Daniel Richter, Duke

Project: Land Cover Mapping for the Commonwealth of PA
Source of Support: PA Department of Conservation and Natural Resources
Total Award Amount: \$98,000
Total Award Period Covered: 1/1/2006 – 12/31/2006

Project: The Web-based National Soil Series Extent Mapping Tool
Source of Support: USDA
Total Award Amount: \$ 107,643
Total Award Period Covered: 10/1/05 – 12/31/07

Project: A Web-based National Land Resource Region (LRR) and Major Land Resource Region (MLRA) Interactive/Multi-media Tool to Complement the 2006 Agricultural Handbook 296 Publication.

Source of Support: USDA, National Geospatial Development Center

Total Award Amount: \$39,360

Total Award Period Covered: 4/1/2006 – 4/31/2007

Collaborator: Sharon Waltman

Project: National Effort to Implement Sustainable Management of SootyBlotch and Flyspeck on Apples.

Source of Support: USDA

Total Award Amount: \$30,000

Total Award Period Covered: 9/1/09 – 8/31/11

Collaborators: Mark Gleason, IA State University

Project: A Web Map-Based Management Interface for Least Tern Management in the Southern Great Plains"

Source of Support: American Bird Conservancy

Total Award Amount: \$44,113.00

Total Award Period Covered: 4/1/09 – 9/30/11

Collaborators: Casey Lott, American Bird Conservancy

Project: Newhall Simulation Model Services

Source of Support: USDA-NRCS

Total Award Amount: \$20,027

Total Award Period Covered: 4/1/10 – 3/31/11

Collaborators: Sharon Waltman, USDA-NRCS

SUPPORT LETTERS

See attached.



Susan Brantley, Professor of Geosciences
Director, Earth and Environmental Systems Institute
2217 Earth & Engineering Bldg.
Pennsylvania State University
University Park, PA 16802

14 April 2011

Re: Letter of support for the Center for Environmental Informatics (Doug Miller, Director)

Dear Sue:

I encourage you to continue support and funding for the Center for Environmental Informatics (CEI). I am truly impressed with the evolution of CEI's capabilities over the past several years. Under Doug's leadership, they continue to build upon past accomplishments, developing elegantly simple webportals and services that allow professional and amateur users to manage large, complex datasets, and communicate with colleagues, often in an asynchronous manner, using an array of innovative software and programming tools.

For example, Brian Bills, of CEI, is providing invaluable insight and assistance to Riparia, through a jointly-funded project, on reformulating Riparia's multiple databases, and constructing an effective website. When completed, it will have the capacity to provide instantaneous computations of Floristic Quality Assessment Index scores, and in the future, hydrogeomorphic functions of wetlands. In addition, partners from other states will be able to acquire design and performance data for mitigation projects; a great example of a value-added contribution.

Whether by leading the effort on securing high-resolution aerial photography and LIDAR for the entire Commonwealth, or by providing clients (e.g., federal agencies, professional organizations) with highly functional database management and/or webservice within specific knowledge domains, CEI has proved its value to EESI, across the University, and beyond.

CEI deserves to be an EESI center, and receive funding to continue their state-of-the-art work.

Sincerely,
Robert P. Brooks, Ph.D.
Professor of Geography and Ecology
and
Director, Riparia



13 April 2011

Subject: Need and Value of the Center of Environmental Informatics

Dear EESI Center Evaluation Panel:

I am writing in support of the Center for Environmental Informatics (CEI). In the past 18 months, I have initiated two projects with CEI, Doug Miller, and his staff, and am on the cusp of a third. As an extension specialist in the Department of Entomology, I feel fortunate to have such great collaborators on campus. Their expertise allows Penn State (and me!) a unique position when pursuing projects and funding. They are quite adept at generating useful, need driven projects that rely on technology to move basic observations into a useable format that provides great insight on area-wide dynamics.

I originally approached CEI because they had worked with colleagues in Entomology to develop the PestWatch system (www.pestwatch.psu.edu), which is used by growers and agricultural consultants to track populations of lepidopteran pests of sweet corn. I approached Dr. Miller to see if they could add to PestWatch an invasive species that recently arrived in Pennsylvania and they did so quickly and efficiently. Their work has really allowed us to understand how and where this pest species is spreading across Pennsylvania, and warn corn growers if the pest is a threat to their fields in different parts of the Commonwealth.

More recently I have worked with CEI to develop an online tool for tracking another invasive species, brown marmorated stink bug. This pest species is causing economic damage to a wide range of agricultural crops, including fruit and vegetables, field crops, ornamental and landscape plants. It is also a nuisance pest in peoples' homes. The Pennsylvania Department of Agriculture approached me to see if I could help develop an online tool to track infestations of the stink bug and the damage that it causes. I of course turned to CEI and we developed in just a few months a great tool (<http://www.stinkbug-info.org/>) to track populations of the stink bug and quantify the damage it is causing. There has already been interest from other states that would like us to expand the range of the reporting device beyond Pennsylvania to allow them to take advantage of this great tool.

Certainly Penn State is in a great position to develop these tools because of the expertise of CEI and I feel as though we have an advantage because Penn State is a regional and national center of expertise in this area of online tool development relevant to basic and applied research. We have even included in pending grant proposals further work (and money) for CEI to improve the tool and its usefulness.

I fully support CEI, Doug Miller, and his staff. I look forward to continued collaborations.

Sincerely,

John F. Tooker, PhD
tooker@psu.edu



Illinois State Museum

Research and Collections Center
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Springfield, IL 62703, USA

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7 April 2011

EESI Center Evaluation Panel
Pennsylvania State University

To whom it may concern:

I am very pleased to write a letter in support of the Earth and Environmental Systems Institute at Penn State and, in particular, the Center for Environmental Informatics, with whom I collaborate. I am a co-lead PI with Russell Graham, Director of the Earth and Mineral Sciences Museum, of the Neotoma Paleocology Database funded by the NSF Geoinformatics Program. This database is the principal repository for fossil data from the Pliocene-Quaternary, and is an essential cyberinfrastructure for global-scale climate-change research. Hundreds of scientific papers have used data from the constituent databases.

A few years ago when we were first planning this project, Russ had discussions with personnel at CEI about them potentially hosting the database and providing the necessary IT support. This partnership has subsequently developed, and CEI is an essential cog in this database effort. Doug Miller is a co-PI on the 5-year renewal project, which began last fall. CEI provides excellent and essential support for this project.

Neotoma is an multi-disciplinary, international effort that is merging a number of disparate databases with the scientific objective of facilitating multi-disciplinary analyses and the practical objectives of developing common toolkits for various kinds of data and of lowering overall IT costs. Despite these laudible goals, considerable skepticism existed in the community about the technical feasibility of such a project and especially of the ability of various domain scientists to maintain quality control over their data. These concerns were especially pronounced for international participants. CEI personnel very capably and diplomatically explained how these issues could be addressed to the satisfaction of those involved.

Thus, CEI is critical to this international, multi-institutional, multi-disciplinary project, and the Institute has my full support.

Yours sincerely,

Eric C. Grimm
Curator and Chair of Botany



Environmental Archaeology Lab.
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4th April 2011

Letter of support for the Center for Environmental Informatics, EESI, Penn State.

To the EESI Center Evaluation Panel,

The Environmental Archaeology Lab at Umeå University, Sweden, has been engaged in a fruitful collaboration with the Center for Environmental Informatics since 2008, primarily relating to the development of international palaeoecology databases. These databases represent the cutting edge of multidisciplinary research infrastructure and will provide, at the very least, the backbone for future understanding of past environments and climates.

The sharing of ideas, design concepts and solutions with the center has greatly helped our work on the Strategic Environmental Archaeology Database project, and these benefits have naturally percolated into other projects. I have no doubt that our financiers looked favourably on this international cooperation when approving our latest funding bid, and that future infrastructure bids will benefit.

The open and community based development of IT systems for the storage and dissemination of environmental data, through collaboration such as this, is the only way forward. By working together to create widely applicable tools we are able to provide better support for an expanded potential user base. It also represents a globally more efficient use of funding, with the sharing of experience and solutions reducing the all too common re-inventing of the wheel.

The center provides the rare combination of a stable IT development resource and expert knowledge of environmental science, allowing them to more fully understand our requirements than most IT labs. We are repeatedly impressed by the professionalism and openness of the center's staff, and look forward to many years of working together.

Sincerely,

Philip Buckland

Assistant Director Environmental Archaeology Lab
The SEAD Project Director
Mobile: +46 738 321 131