Earth and Environmental Systems Institute
Center for Environmental Informatics

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

Center Renewal Proposal

April 21, 2008

PARTICIPANTS

Collaborating Penn State Faculty (partial list)

- Dr. Paul Adler, USDA-ARS, Pasture Systems Research Lab
- Dr. Todd Bacastow, Dutton e-Education Institute
- Dr. Susan Brantley, EESI
- 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. David Hill, Civil and Environmental Engineering
- Mr. Paul Knight, Meteorology
- Dr. Henry Lin, Crop and Soil Science
- Dr. Jonathan Lynch, Horticulture
- Dr. Timothy Murtha, Landscape Architecture
- Dr. Wayne Myers, School of Forest Resources
- Dr. Patrick Reed, Civil and Environmental Engineering
- Dr. Kai Shaft, College of Education, Center for Rural Education and Communities
- Dr. Erica Smithwick, Geography
- Dr. Thorsten Wegener, Civil and Environmental Engineering

External Collaborators

- Dr. Erick DeWolf, Kansas State University
- Dr. Eric Grimm, Illinois Natural History Survey
- Dr. Bill Hutchison, University of Minnesota
- Dr. Steve Kelling, Cornell University
- Dr. Michael Meit, University of Chicago, NORC
- Dr. Wilfred M. Post, Oak Ridge National Laboratory
- Sharon Waltman, USDA-NRCS, National Geospatial Development Center
- Terry Rich, US Fish & Wildlife Service, Partners-in-Flight
- Dr. Daniel Richter, Duke University

Center Personnel

- Susie Anderson, Research Assistant
- Stephen Crawford, Research Assistant
- Christopher Hilferty, Research Assistant

- Blake Ketchum, Research Associate
- Jim Sloan, Research Assistant
- Patryck Soika, IT Staff
- Jon Voortman, Research Assistant

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

- Dr. Joseph Bishop, Research Associate, Cooperative Wetlands Center
- George Baumer, Sr. Research Assistant PSIEE-ORSSIR
- Ryan Baxter, Sr. Research Assistant PSIEE
- Ken Corradini, Research Assistant PSIEE
- Scott Dane, Research Assistant PSIEE
- James Spayd, Research Assistant PSIEE
- Dr. Eric Warner, Sr. Research Associate, Applied Research Lab

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. CEI focuses on the development of new and innovative approaches to the creation and dissemination of environmental information resources. In the 8 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 plunge rapidly into the 21st Century this call will grow as we move toward a predicted 9 – 12 billion people on our planet. 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 CEI's mission and focus.

We believe that our contribution to the overall mission of the University is today needed more than ever as society works to come to grip with fundamental issues of food security, environmental degradation, energy, and the basic human condition around the globe. Increasingly, decision makers are looking to the academic community for potential solutions and it is in this spirit that CEI seeks to provide solutions into the future. The Mission and Focus statements on our web site succinctly describe our Center:

> **Mission**
>
> Produce innovative environmental information resources, in highly usable forms and formats, that serve the needs of individuals, communities, and organizations at all levels of society.

Focus

- Development of decision support tools and environments
- Integration of geospatial technologies with environmental observation networks
- Deployment of mission-critical environmental applications

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, NOAA, NASA, DOE, EPA, and USFWS. Over the past 8 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.

Various USDA agencies including the Natural Resources Conservation Service (NRCS), the Foreign Agriculture Service (FAS), and the Risk Assessment and Mitigation (RAMP) program have agency mandates that could benefit from CEI services. We have established strong relationships with several of these organizations and have every confidence that we will continue to receive interest (and funding) from them in the future. Of particular note with the USDA agencies is our long-term and ongoing relationship with NRCS to develop soil information resources for inter-agency as well as public use. We are just completing 4 consecutive years of funding from the NRCS National Geospatial Development Center—with a fifth year of funding now in process. We have every reason to believe that our relationship with NRCS will continue indefinitely.

A host of NGO organizations in natural resources and conservation offer the potential to provide funding for CEI. As one example, we have recently set our sights on the efforts of various NGOs working to promote land conservation for migratory birds. We have been working diligently to develop a relationship with Partners-in-Flight, an NGO underwritten in part by the US Fish and Wildlife Service (USFWS). Partners-in-Flight (PIF) promotes the conservation of habitats on either end of the migratory pathways for neo-tropical species in the Western Hemisphere. Early prototyping work with PIF led to interest in our work from the Laboratory for Ornithology at Cornell and, ultimately, a two-year $1,000,000 proposal to NSF. Although subsequently declined, the interaction with Cornell will lead to future funding opportunities.

Our work with PIF and Cornell has, in turn, led to the opportunity to develop a relationship with the American Bird Conservancy. In May 2008 we will participate in the planning stages for the Appalachian Mountains Joint Venture—a private/public partnership to develop a coordinated approach to habitat protection in the Appalachians. The potential role for CEI in this venture is the development of advanced web map services and collaborative tools for participating agencies and private organizations to prioritize land conservation efforts.

In conjunction with our interest and objectives in land conservation in the United States, we are currently developing a white paper describing how our informatics approaches could be applied to the rehabilitation of the Gorongosa National Park in Mozambique. We have demonstrated our capabilities to a representative of the Carr Foundation which has currently committed $40 million to this ecological restoration. We will be working with Dr. Erica Smithwick in Geography to pursue this funding.

CENTER NEEDS

The Center for Environmental Informatics is located on the 3rd floor of the Earth-Engineering Sciences Building. We appreciate the office and laboratory space provided by the Institute since moving to the building in 2001. All of our full-time and some of our part-time staff are located in this work area. EESI has recently purchased office furniture for one of the multi-person lab spaces occupied by CEI. This furniture, which will maximize our use of that particular space, is due to arrive in late April. With this renewal request, we seek the continued support of the Institute for office and laboratory space for our employees.

CEI has received no sustained general operating funds from EESI since 2003. Discretionary general funds would provide the flexibility to promote CEI's unique capabilities in order to create new funding opportunities. In addition, these funds would allow us to invest in the continued professional development of our staff of 8 full-time employees and 7 part-time employees who represent in excess of 150 years of service to Penn State. CEI's critical position on the cutting-edge of web-based geospatial technologies can only be maintained if our employees stay current with rapidly changing information technologies. Although Miller and Bills have taken advantage of the newly established Director's Fund this year, we are challenged to meet the balance of our staff's needs for off-site commercial training, Penn State HRDC development, and supplemental professional materials such as technical books and multimedia training subscriptions.

With this renewal proposal, CEI requests a designated annual amount, not to exceed $5,000.00, specifically to support the development of both new funding opportunities, and our professional staff. We believe that our success as a center is due, in no small part, to our accumulated experience and expertise.

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:

- 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
- 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

- PestWatch success leads to funding in the Caribbean and Serbia to transfer our Open Source-based technology to these countries: 2007 and 2008

- PAMAP - CEI provides the technical expertise and program management in the most extensive statewide mapping program in the nation. Project funding exceeds $20 million.

- Penn Pilot - CEI designed and developed the largest online historic archive of aerial imagery in the United States. The archive presently contains more than 100,000 (6 TB) images and receives extensive positive feedback from users.

The following list is a non-exhaustive tabulation of the funding successes that CEI has had with our partners and collaborators since approximately 2002:

Project: PA Map Implementation Plan
Source of Support: PA Department of Conservation and Natural Resources
Total Award Amount: $20,870,000
Total Award Period Covered: 7/01/04 – 6/30/08
Collaborator: Dr. Todd Bacastow

Project: Support DMVA at Fort Indiantown GAP: GIS Support Services
Source of Support: PA Dept. of Military and Veterans Affairs
Total Award Amount: $ 3,393,655
Total Award Period Covered: 2/01/02 – 6/30/08
Collaborator: Dr. Todd Bacastow

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: Dr. Susan Brantley and Dr. Daniel Richter

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 – 4/30/08
Collaborators: Dr. Erick DeWolf and Mr. Paul Knight

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: Dr. Michael Meit

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 – 8/2011
Collaborators: Dr. Jill Findeis et al.

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: Dr. Wilfred Post

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: Dr. Chris Duffy et al.

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 Site-Specific Field Corn IPM Program That Incorporates Transgenic Technology
Source of Support: USDA Risk Avoidance and Mitigation Program (RAMP)
Total Award Amount: $1,850,000
Total Award Period Covered: 9/01/02 – 8/31/06
Collaborators: Dr. Dennis Calvin; Dr. Jeff Hyde

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: Consortium for Atlantic Regional Assessment (CARA): Proposed Assessment in the Mid- and Upper-Atlantic Region (MUAR).
Source of Support: EPA
Total Award Amount: $2,249,930
Total Award Period Covered: 9/1/02 – 8/31/06
Collaborators: Dr. Ann Fisher et al.

SUPPORT LETTERS

Patrick Drohan, Crop and Soil Science

From: Patrick Drohan <pjd7@psu.edu>
Date: Thu, 17 Apr 2008 14:19:12 -0400
To: Doug Miller <miller@eesi.psu.edu>
To the evaluation panel:

I am writing in support of the Center for Environmental Informatics.

Before I arrived at Penn State in August of 2007, I interacted with the Center on research I was conducting in Nevada that modeled soil factors important in pygmy rabbit habitat. The Center was instrumental in a publication that came of this research appearing in the Journal of Arid Environments.

Since arriving at Penn State, I have collaborated with the Center on numerous projects of international and national relevance. Currently, I am collaborating with the Center on three research projects examining facets of biofuels production on marginal soils in Pennsylvania. This research has spun off numerous Center, campus and ARS collaborations.

I am also aiding the center in an advisory role on the North American Carbon Map project. The NOAM map will be an essential piece of climate change data helping scientists across the globe estimate the effects of climate change.

The WWW interface tools the center has produced have provided land managers across the United States with soils information that has greatly aided in making high quality decisions. In addition, the tools are very useful for teaching purposes and have enhanced the educational experience of my students.

I look forward to working with the Center on current and future research topics and in using their tools.

Sincerely, Dr. Patrick Drohan

Jill Findeis, Agricultural Economics and Rural Sociology

From: Jill Findeis <fa2@psu.edu>
Date: Fri, 18 Apr 2008 13:14:28 -0400
To: Doug Miller <miller@eesi.psu.edu>
Conversation: Letter of Support for Center for Environmental Informatics
Subject: Letter of Support for Center for Environmental Informatics

To: EESI Center Evaluation Panel
Date: April 17, 2008

I am writing to express strong support for the Environmental Informatics effort through the College of Earth and Mineral Sciences. Environmental Informatics provides critical geospatial support to the Transitional Zone Ecosystem Initiative (T-Zone Initiative), a collaborative research effort between scientists and social scientists at Penn State. EI is central to the T-Zone Initiative,

providing access to LULC (land use/land cover) data series, enabling innovative temporal constructions of spatial data for project analyses, and facilitating site selection for research on human-environment interactions in the Susquehanna Basin.

The EI also serves to stimulate collaboration among different research teams at Penn State, allowing for efficiencies to be captured. I strongly support EI without hesitation.

Jill L. Findeis
University Distinguished Professor

Shelby Fleischer, Entomology

April 17, 2008,

Dear EESI Center Evaluation Panel

My interactions with the Center for Environmental Informatics are *absolutely critical* for research and Extension (outreach) programs in entomology that focuses on information technologies for Integrated Pest Management.

One effort focuses on migratory lepidopterans, a large pest group that strongly influences insecticide use patterns across much of the U.S. Past work with the CEI ("Pestwatch", www.pestwatch.psu.edu), dating back to ~2000, at mapping this migratory process, in a manner useful for managing these pests, is now emerging as the monitoring component of a Lepidopteran Aerobiology Modeling system for migratory noctuids. In 2007, with extramural funding supplied by the North Central Regional IPM program, through the University of Minnesota, the geo-extents of the monitoring effort were expanded to a semi-continental scale, to include 545 locations: from TX to SD and MN, east to NH, and south to GA, with 43,000 data entries from July to Sept., 2007. New IT visualizations were developed to accommodate the range of temporal variation in trapping frequency and thresholds, and new databasing systems developed and implemented for quality control.

There was significant interest by those who use this information, for whom it influences insecticide use patterns. Examples include:

- The Grower (www.growermagazine.com) volume 40, July 2007
- Penn State Agriculture
- Minnesota Fruit and Vegetable News "New tools…Pestwatch Goes National" www.vegedge.umn.edu/MNFruit%26VegNews/Vol4/vol4n9.htm
- Vegetable Gazette (a newsletter that reaches ~3,000 vegetable growers within Pennsylvania

These interactive mapped visualizations, that capture spatial and temporal processes, produced through the CEI, are now used by meteorologists who are producing daily forecasts of CEW immigration based on synoptic meteorology and air flow trajectory models in for the Midwest, produced by Northern Illinois University in conjunction with DelMonte Foods. (see: http://agweather.niu.edu/IMRFForecast.html) This forecasting system began to rely upon daily views of PestWatch version 2.0 for defining source populations, critical for developing the forecasts, and to begin to develop validation studies.

Work with CEI was critical for a proposal to the USDA Pest Information Platform for Extension and Education (PIPE) supported by Extension from 30+ states. Over 20 Letters-of-Support were provided, and are available for your review. This proposal was ranked 2nd; unfortunately in this

year only one major proposal was funded. However, the collaborative group intends to keep the components of this effort in place and resubmit in 2008.

CEI was also a leader in a 2-day planning effort to envision a Lepidopteran Aerobiology Modeling System at a continental scale. The Insecticide Resistance Action Committee (IRAC, see http://www.irac-online.org/IRAC/Structure.asp) contributed funding. Participants spanned the public/private sectors, and came from 4 USDA labs, 4 Universities, 2 large ag-chem/seeds companies, and 2 information technology organizations. Outputs included a dependency network and we self-organized into a working group affiliated with NCR-148. We developed the relevant interactions that allowed us to begin operating at the appropriate scale to consider migration as a component of pest management in maize/vegetable agroecosystems. Minutes are posted at www.ncera148.psu.edu/LAMS/lams.htm.

This work has attracted International attention, projects, and funding. To support IPM in the Caribbean, participatory work among 13 Caribbean nations, funded through the IPM CRSP and IICA, defined fruit flies (Tephritidae), as a model system to develop an IPM surveillance and reporting program which is being currently built by CEI personnel, and funded through a US AID project. The model system considers a complex of Tephridid species indigenous in several island nations (West Indian fruit fly, *Anastrepha obliqua*, other *Anastrepha* spp.), and recent invasives to Latin America (Carambola fruit fly, *Bactrocera carambolae*) and the United States (Mediterrean fruit fly, *Ceratitis capitata*). Within Caribbean nations, this work relates to increasing emphasis on tree-fruit permaculture of mango (*Mangifera indica*), Jew plum (*Spondias dulcis*), guava (*Psidium guajava*), Otaheite apple (*Syzygium malaccensis*), cashew (*Anacardium occidentale*), and naseberry (*Manilkra zapota*). This project will assist in advancing regional IPM, quarantine programs, and export agriculture; additionally we believe it will help protect the United States from invasive species.

The Ministry of Agriculture in Jamaica is supplying human capacity, training, logistics and supervision for regional surveillance. This has resulted in 1,240 samples from 164 sites, over ~ 10 months, working through gaps due to Hurricane Dean. Metadata – defining local ecology and management practice - are captured on forms at the time of fortnightly sample collections. Methods (McPhail and Multilure traps baited with yeast hydrolysate) are designed to integrate with USDA/APHIS standards for monitoring invasive Tephritids. In the laboratory, identification guides were developed and to date, ~ 40% of the field samples have been processed by the Ministry of Agriculture & Lands: *Anastrepha oblique* is the dominant species, and *A. suspensa* is also common. We have supplemented this IT project by including specimens into a Ph.D. thesis that is defining haplotypes of *Anastrepha* for much of Latin America and the Caribbean, and developed contacts for future work with in-country molecular biologists.

The IT design – led by the CEI - developed a Functional Requirements document to capture needs expressed by 50 participants from multiple countries. The map extents incorporate all islands in the Caribbean Basin, all participants in CARDI and CIPMNet (to include Surname, and Belize), and the southern half of Florida. Database fields were defined, scripted, (www.caribbeanpestwatch.org/test1.html) and draft web pages developed. Prototyped mapped visualizations were initiated with mock data, with interactive visualizations to support multiple scaling and ease-of-view of temporal and spatial information (www.caribbeanpestwatch.org/tool.html). We use a web-services design, and develop entirely with freely-available open source software to enable technology transfer. We plan for this interactive cartography system to be operational with field collected data by the end of 2008, and to conduct technology transfer in 2009 – we are certainly counting on the continued presence of the CEI for completion of this effort.

Recently, we were contacted by USDA Foreign Ag Service to develop an analogous effort at information technologies for IPM in Serbia. We developed a plan of work, obtained funding, and the initial travel for this is scheduled for late May of 2008.

Publication output:

> Fleischer, S. Payne, G., Kuhar, T., Herbert, A. Jr., Malone, S., Whalen, J., Dively, G., Johnson, D., Hebberger, A., Ingerson-Mahar, J., Miller, D., and Isard, S.A., 2007. *H. zea* trends from the northeast: Suggestions towards collaborative mapping of migration and pyrethroid susceptibility. *In:* Hutchison & Weinzierl (Eds.), Proc. of the NCB-ESA Symposium, Bloomington, IL, March 2006. Plant Health Progress www.plantmanagementnetwork.org/sub/php/symposium/hzea/map/

Paul G. Knight, PA State Climatologist

From: Paul G Knight <pgk2@psu.edu>
Date: Thu, 17 Apr 2008 08:59:31 -0400
To: Doug Miller <miller@eesi.psu.edu>
Subject: EESI Center Evaluation Panel

Dear Doug,
This spring marks the 5th year of collaboration between the state climate office and EESI in producing one of the most comprehensive agro-meteorological decision tools available for U.S. Wheat and Barley Scab. The expertise offered by staff such as Jon Voortman and Stephen Crawford as well as the conference room facilities for meeting and teleconferencing with colleagues at Kansas State University are absolutely crucial to the on-going success of this project. In fact, this year we have fortified the data streams by adding redundancy and back-up using EESI computer facilities and networks. We look forward to continued success on this project and new opportunities with EESI.

Sincerely,
Paul Knight
PA State Climatologist

Russ Graham, Director EMS Museum

From: Russ Graham <rgraham@ems.psu.edu>
Date: Thu, 17 Apr 2008 10:40:58 -0400
To: Doug Miller <miller@eesi.psu.edu>
Cc: <bbills@eesi.psu.edu>
Subject: Re: EESI Center Evaluation Panel

EESI Center Evaluation Panel

I am writing in support of the Center for Environmental Informatics. Five colleagues and I have been working with the CEI in developing a NSF supported multidisciplinary and integrated database for paleobiological data. These data include pollen, plant macrofossils, beetles and vertebrates. It incorporates sites in North America for the last five million years of Earth History. Many of these databases have been in existence for at least fifteen years and others are completely new. To this end, all of us in the research group have worked with a lot of computer people in the past. However, all of us agree that the staff from CEI have been the most

professional and most knowledgeable of any that we have ever worked with. Also, trying to please a "host of masters" is more difficult than working with one researcher. Again, our interaction with the CEI staff has been exceptional. We know that the final product will be of the highest quality because of the knowledge and skills of the CEI staff. Also, it has been useful that there are various staff members with different skills rather than one person who may be good at some aspects of database design and implementation but marginal in other areas. It has also been ideal for me because they are located on the same campus rather than at another institution. If I can be of any further assistance in this process please do not hesitate to contact me.

Russell W. Graham
Director
Earth and Mineral Sciences Museum
Associate Professor of Geosciences

Patrick Reed, Civil and Environmental Engineering

PENNSTATE

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University Park, PA 16802-1408

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Department of Civil and Environmental Engineering

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April 17, 2008

Subject: Need and Value of the Center for Environmental Informatics

Dear EESI Center Evaluation Panel:

The purpose of this letter is to advocate for your continued support of the Center of Environmental Informatics (CEI). CEI is both a regional and national resource that has dramatically enhanced Penn State's ability to contribute to the national water resource research dialogue specifically in the area of observatories, information management, and web-based decision support. Table (1) provides a brief sample of the emerging Penn State portfolio of federally funded projects where CEI has helped me personally.

Agency	Title	Funding
NSF	Integrated Modeling of Precipitation-Recharge-Runoff at the River Basin Scale: The Susquehanna	$410,000 2003-2007
NSF	Technician Support for Real-Time Hydrologic Sensor Systems within the Penn State Experimental Forest	$225,000 2004-2007
NSF/CUAHSI	Collaborative: CUAHSI/CLEANER Project for Demonstration and Development of a Test-bed Digital Observatory for the Susquehanna River Basin and Chesapeake Bay	$300,000 2007-2009
NSF/CUAHSI	A Synthesis of Community Data and Modeling for Advancing River Basin Science: The Evolving Susquehanna River Basin Experiment	$330,000 2007-2009

Table 1. Emerging research portfolio for Penn State's observatory research supported by CEI.

In the near term, CEI will help me build on these projects to create new data management and collaborative research frameworks for watershed experimentation (http://www.rthnet.psu.edu/) and for building basin-scale research via the Mid-Atlantic Watershed Atlas. The hardware and data resources available at CEI are unique and vital for Penn State.

Sincerely,

Patrick Reed

Sharon Waltman, USDA NRCS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
National Geospatial Development Center
157 Clark Hall Annex
West Virginia University
Morgantown, WV 26506-6301

April 21, 2008

Dr. Douglas A. Miller
Director, Center for Environmental Informatics
The Pennsylvania State University
Earth and Environmental Systems Institute
2217 Earth-Engineering Sciences Bldg.
University Park, PA 16802

Dear Dr. Miller:

I would like to express my support for the work we have done collaboratively for more than a decade regarding improving the accessibility of USDA-NRCS Soil Geographic Data to global change modelers (CONUS-SOIL), developing North American Soil Characteristics Databases (preliminary NOAM-SOIL), and the interactive Major Land Resource Area (MLRA) digital maps and associated narratives. More recently, your research group has made a very significant contribution in this regard through the cooperative development or the Soil Extent Mapping (SEM) Tool (http://www.cei.psu.edu/soiltool/semtool.html) and the MLRA Explorer Tool (http://www.cei.psu.edu/mlra/).

The expertise and insight that you and your staff have provided to these endeavors is invaluable to the federal community of soil survey. I sincerely hope that we will be able to continue our collaborations into the next decade. Much work remains to be done to further improve the understanding and accessibility of soil survey information to those who make environmental management decisions (locally, state-wide, and nationally).

Sincerely,

Sharon W. Waltman

SHARON W. WALTMAN
Soil Scientist-Spatial Data Analyst

Cc: Jon Hempel, Co-Director, National Geospatial Development Center, Morgantown, WV