

**Environment and Natural Resources Trust Fund  
2010 Request for Proposals (RFP)**

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**LCCMR ID: 211-F**

**Project Title:**

An Environmental Education Computer Modeling/Simulation Laboratory

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**LCCMR 2010 Funding Priority:**

F. Environmental Education

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**Total Project Budget: \$** \$153,323

**Proposed Project Time Period for the Funding Requested:** 1 year, 2010 - 2011

**Other Non-State Funds: \$** \$0

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**Summary:**

The purpose of this project is to provide an environmental education computer modeling/simulation laboratory to support K-12 and adult instruction and provide environmental consulting/research/computing services to greater Minnesota.

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**Sponsoring Organization:** St. Cloud State University

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**Location:**

**Region:** NW, NE, Central

**County Name:** a, Wright

**City / Township:** St. Cloud

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_____ Knowledge Base	_____ Broad App.	_____ Innovation
_____ Leverage	_____ Outcomes	
_____ Partnerships	_____ Urgency	_____ TOTAL

# MAIN PROPOSAL

**PROJECT TITLE:** An Environmental Education Computer Modeling/Simulation Laboratory

## I. PROJECT STATEMENT

There are a plethora of problems facing every Minnesotan's goal of living in a clean and sustainable environment. Unfortunately, many of these problems are extremely complex and their solution is not trivial. Further, their solution lies in the application of sound scientific principles. Too often solutions are attempted that rely on a trial and error methodology. While this methodology at times produces viable solutions the time and cost to reach these solution is often high. In most areas of the sciences computer modeling and simulation have proven quite effective in providing an alternate, scientifically sound and effective solution to the trial and error process. For example, if one wanted to design a hydrogen fuel cell using nano-tube technology. instead of building a separate fuel cell for each possible design variation in regard to the size, shape and material related to those nano-tubes, simulation could be employed. All the pertinent scientific principles would be programmed into the simulation and all combinations of variable could be tried and then perhaps the five best combinations of variables could serve as candidates and actual fuel cells for only those five combinations would actually be built and tested. While the benefits of modeling/simulation are well identified the degree to which it is available and utilized in the general population specifically in regard to environmental problems is a concern. While there is a need to introduce and educate the adult population in modeling/simulation so that they might apply it to pressing complex environmental related projects, perhaps there is a more pressing need to introduce the K-12 population to modeling/simulation so that they can appreciate its value in solving complex problems and ultimately remain competitive in a global job market.

The purpose of this project is to provide an environmental education computer modeling/simulation laboratory to support K-12 and adult instruction, provide consulting services to greater Minnesota and provide a research facility to central and northern Minnesota. This will be accomplished by leveraging existing computing resources to provide outreach to students and adults. While this existing infrastructure has been successful in modeling endeavors access has been limited to only SCSU student/faculty. The goal of this project is to conduct two model research projects in the area of environmental sustainability (such as hydrogen fuel cell design and turbine optimization) that would serve to illustrate the process of applying computer modeling/simulation to solve environmental related problems. In addition, we purpose to provide free consulting services to stimulate Minnesotans wishing to use simulation to aid in the design of environmental related commercial products. Using the results of the two model research projects, we plan to introduce K-12 and adult students to computer/modeling simulation within environmental topics and provide these learners with training and hands-on experiences to will make them aware of its value and peak their interest for further study in the area. By providing remote computer access to both of these groups, they would then be able to access the same shareware software from their home computer and experiment/learn on their own at their own pace. Although the intent would be to make the technology available indefinitely, the current computer laboratory relies on outside funding for support and accessibility would be a function of success in the endeavor.

## II. DESCRIPTION OF PROJECT RESULTS

**Result 1:** Training in environmental modeling to K-12 students (approx. 120) - **\$35,352**  
Design and deliver 4 training seminars for K-12 students: 2 to be held on campus and 2 at area high schools. In addition, 8 research assistantships at \$500 each will be awarded to students

<b>Deliverable</b>	<b>Completion Date</b>
Plan seminar structure and specifications both topics	7-1-10 to 8-31-10
Write and beta test presentation/code topics	9-1-10 to 10-31-10
2 on campus seminars on topic one and two	11-1-10 to 1-31-11
2 off campus seminars on topic one and two	2-1-11 to 4-30-11
<b>Result 2:</b> Introduction/training in environmental modeling/simulation to adult pop. - <b>\$36,854</b>	
Design and deliver 2 training seminars (30 attendees each) for adults to be held on campus.	
<b>Deliverable</b>	<b>Completion Date</b>
Plan seminar structure and specifications both topics	7-1-10 to 8-31-10
Write and beta test presentation/code topics	9-1-10 to 10-31-10
Offer on campus seminar on topic one and two	10-1-10 to 3-31-11
<b>Result 3:</b> Provide free remote access to software for both groups	<b>Budget: \$15,706</b>
Also, provide free help line and consulting service.	
<b>Deliverable</b>	<b>Completion Date</b>
Purchase, install, configure, and test software to be used	7-1-10 to 8-31-10
Devise, configure, and test a procedure for granting access to software	9-1-10 to 9-30-10
Devise an administrative procedure to maintain software/access	10-1-10 to 6-30-11
<b>Result 4:</b> Two model research projects	<b>Budget: \$45,206</b>
Design and conduct two model research projects in environmental topics.	
<b>Deliverable</b>	<b>Completion Date</b>
Identify and plan project one and two	7-1-10 to 9-30-10
Collect data/run experiments for project one and two	10-1-10 to 5-31-11
Write up and present results for project one and two	5-1-11 to 6-30-11
<b>Result 5:</b> Provide consulting for simulation modeling to actual projects	<b>Budget: \$20,206</b>
To include 180 hours of Ph.D. level consulting; 600 hours of graduate student level consulting.	
<b>Deliverable</b>	<b>Completion Date</b>
Implement advertising (website links and guest speaker at meetings)	7-1-10 to 12-31-10
Devise an administrative process to identify and manage clients	8-1-10 to 8-31-10
Offer consulting services to clients	9-1-10 to 6-30-11

### III. PROJECT STRATEGY

#### A. Project Team/Partners

Dr. Dennis Guster, Professor of Information Systems, St. Cloud State University (Direct the completion of results 1-5). Dr. Daniel Gregory, Professor of Chemistry, St. Cloud State University, (Coordinate the development and delivery of seminars for K-12 instruction (result 1)). Dr. Paul Safonov, Assoc. Professor of Info. Systems/Env. Economist, St. Cloud State University, (Coordinate the development and delivery of seminars for adult instruction (result 2)). Dr. Renat Sultanov, Research Scientist II and Nuclear Physicist, St. Cloud State University, (Coordinate simulation software, consultant on results 1, 2, 3 and 5, responsible for result 4). Dr. Avas Khugaev, Vice Director/Nuclear Physicist, Uzbek Inst. of Nuclear Physics, Tashkent, (Consultant on results 2, 3 and 5 and major responsibility for result 4).

#### B. Timeline Requirements

Project timeline is 7-1-10 to 6-30-11 as noted in deliverables above.

#### C. Long-Term Strategy

While the computing infrastructure has stable funding, continuation of the out-reach services requires ongoing searches for funding. It is expected that this pilot project will serve as a proof of concept that can be used to strengthen further funding requests and deliverables could be reused, thereby reducing cost.

## Project Budget

### IV. TOTAL PROJECT REQUEST BUDGET: one year

BUDGET ITEM	AMOUNT
<b>Personnel:</b>	\$ -
Project Coordinator D. Guster 1/3 reassigned time x 2 semesters (25% benefits)	\$41,029
K-12 Seminar Coord. D. Gregory 1/3 reassigned time x 1 semester (25% benefits)	\$ 14,146
Adult Seminar Coord. P. Safonov 1/3 reassigned time x 1 semester (25% benefits)	\$ 18,648
Model Project Coordinator Renat Sultanov \$25.51/hr + 50% fringe x 160 hours	\$ 6,500
Simulation consultant A. Kugarev 3 months part-time prof/technical (100% salary)	\$ 9,000
Student assistants 5 x \$6,000 each 1/2 time Academic YR 100% salary	\$ 30,000
High school interns 8 x \$500 each, 1/4 time one semester, 100% salary	\$ - \$4,000
<b>Contracts:</b>	\$ -
To support to model research projects: staff time, special equipment, digitizing components, milage short trips, research time, acquisition of research material. Research, configure, install new shareware software (in parallel) specific to the projects.	\$20,000
<b>Equipment/Tools/Supplies:</b>	
Write develop. Print and distribute manuals for the instructional component of the seminars. Configure, maintain and install shareware software in a parallel computing environment.	\$10,000
<b>TOTAL PROJECT BUDGET REQUEST TO LCCMR</b>	<b>\$ - \$153,323</b>

### V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
<b>In-kind Services During Project Period:</b> Access to 96 processor computer cluster, switching equipment, internet access and remote client support, depreciated at 1/7 retail value.	\$ 36,428	

## **Project Manager Qualifications and Organization Description:**

**PROJECT TITLE:** An Environmental Education Computer Modeling/Simulation Laboratory

**Organization Description:** St. Cloud State University's 17,000 students share a heritage of excellence and opportunity at our campus on the Mississippi River. In an environment that values whole-world education, civic engagement and critical thinking along with career preparation, St. Cloud State is a comprehensive university offering 175 undergraduate and graduate programs of study. Most, including all programs in the prestigious G. R. Herberger College of Business, have exceeded the criteria for national accreditation and professional acclaim. Classes are taught by professors who have a desire to mentor as well as instruct, to impart a lifelong love of learning as well as practical knowledge and job skills. Seventy-nine percent of our faculty have attained the highest academic level for their field, the highest percentage of any of the 32 institutions in the Minnesota State Colleges and Universities System. Living and learning at Minnesota's second largest university is an exhilarating, relevant and rewarding experience.

**Project Manager Qualifications:** Dr. Dennis Guster, Professor of Information Systems and Director of the Business Computing Research Laboratory (BCRL), St. Cloud State University will direct the completion of all Goals in the project. Dr. Guster has been directly involved in the adaptation of computer technology to improve problem solving in a wide variety of fields and has worked in the application of high performance computing to hydrogen collision problems. Further he is involved using computer simulation to aid in the design of hydrogen fuel cells. Dr. Guster has run research laboratories for many years and his current effort the BCRL contains 250+ server nodes and a hardware investment of about \$2 million. It has its own internet connection (bcrlscsu.net) and support staff that is accustomed to supporting instruction seminars and remote access. The BCRL has already undertaken many research projects related to computer modeling within environmental topics and as part of its mission wishes to extend its impact through outreach. In addition we have attempted to put together a top team of professional with ties to the BCRL and expertise in environmental modeling. A brief summary of the team follows. Two in particular (Dr. Sultanov and Dr. Khugaev) have strong international reputations in computer simulation relating to modeling the behavior of hydrogen.

### **Project Team Partners:**

Dr. Daniel Gregory, Professor of Chemistry and Chair Department of Chemistry, St. Cloud State University will coordinate the development and delivery of seminars for K-12 instruction (Result 1).

Dr. Paul Safonov, Associate Professor of Information Systems and Environmental Economist, St. Cloud State University will coordinate the development and delivery of seminars for adult instruction (Result 2).

Dr. Renat Sultanov, Research Scientist II and Nuclear Physicist, St. Cloud State University will coordinate the installation, configuration, testing and access methodology for modeling simulation software to be used in this project. He will serve as a consultant on Results 1, 2, 3 and 5 while retaining the primary responsibility for Result 4.

Dr. Avas Khugaev, Vice Director and Nuclear Physicist, Uzbek Institute of Nuclear Physics, Tashkent, will serve as a consultant on Results 2, 3 and 5 while retaining major responsibility for Result 4.

