

**RESEARCH PROJECT TITLE:** ED-STEEP: Education Solutions to Environmental and Economic Problems

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**INTERIM OR FINAL REPORT:** Interim

**PROJECT OBJECTIVES:**

**Objective 1.** To create a standards-based series of lessons and learning activities, based on the accomplishments and issues addressed by the STEEP Program, that can be incorporated into secondary school science classrooms. These classrooms include biology, life sciences, environmental sciences, chemistry, and physics, as well as agriculture education.

**Objective 2.** To create education material and learning activities, based on the accomplishments and issues addressed by the STEEP Program, that can be incorporated into post-secondary courses at 2- and 4-year higher education institutions. We will target numerous biology, agriculture, and environmental science courses being offered in the regions colleges and universities.

**KEY WORDS:** Education Website, Curriculum Development, Science Education, Environmental Education

**STATEMENT OF PROBLEM:** A focus of the STEEP Program has been on the education of researchers and producers in ways to minimize soil erosion and other environmental problems, and maximize soil quality, water quality, and agricultural sustainability. The benefits of the STEEP Program are significant and known to many within the agricultural community. However, the research and benefits of the program are not widely known to another important part of the community – students. Yet, it is these students that will lead the drive for more innovative and newer solutions to the environmental and economic problems in the Inland Northwest. The specific problem that we wish to address is the lack of connection between the information being generated through the STEEP Program and students in secondary and post-secondary school classrooms.

**ZONE OF INTEREST:** All

**ABSTRACT OF RESEARCH FINDINGS:** Since the beginning of the project in October 2004, we have identified science curriculum standards that need to be addressed by the ED-STEEP project, have identified specific environmental issues being addressed through the STEEP program, have begun developing specific lessons and activities for secondary school classrooms and post-secondary science classes that relate to the STEEP Program, have begun developing a network of teacher consultants for the project, and have begun the physical development of the ED-STEEP website. The secondary education component of ED-STEEP must focus on standards-based curriculum to adhere to state and national science education guidelines. Many of the significant environmental issues addressed by STEEP researchers have

been addressed and are being incorporated into another website, “Sustainable Commodity-Based Agriculture in the Pacific Northwest.” These include information on environmental impacts, species diversity and conservation, nutrient management and soil quality, pest management, carbon sequestration and global warming, and biotechnology. Specific lesson plans and activities are currently being developed and tested in science classrooms. For example, Quinn recently taught a two-week unit on “Soil Ecology” to a secondary school biology class, that focused on STEEP-related issues such as soil quality and soil biodiversity. In the process of teaching in the Palouse Region and at WSU, Quinn and Perillo are developing a network of teacher consultants to help define curriculum goals and lesson objectives.

**RESULTS AND INTERPRETATION:** Because the project began in October 2004, results and interpretations are still pending. Preliminary results are as follows.

Many of the specific state and national science education standards for Idaho and Washington have been identified. The secondary education component of ED-STEER must focus on standards-based curriculum to adhere to state and national science education guidelines. This is particularly important because states are likely to implement, in the near future, standardized testing in sciences, similar to current standardized testing in math, writing, and English. As an example, the Soil Quality Unit that we are developing meets the following Idaho State Standards:

- 648.01-.03 (Unifying Concepts of Science)
- 649 (Concepts of Scientific Inquiry)
- 650.02-.03 (Concepts of Physical Science)
- 652.02 (Interdependence of Organisms and Biological Change)
- 653.01 (Matter, Energy, and Organization in Living Systems)
- 654.02 (Earth and Space Systems)
- 655.01 (Technology)
- 656.01-.04 (Personal and Social Perspectives)
- 658.01-.02 (Interdisciplinary Concepts)

In addition, the Soil Quality Unit will adhere to all relevant State of Washington Essential Academic Learning Requirements (EARLs) for Physical Systems, Living Systems, Investigating Systems, and Nature of Science; and AAAS Benchmark standards for Diversity of Life, Interdependence of Life, Flow of Matter and Energy, Scientific Inquiry, and The Scientific Enterprise.

Many of the significant environmental issues being addressed through the STEER program have been identified and include: soil quality, soil erosion, air and water quality, biodiversity, pesticide usage, genetic engineering, and global warming. We have also begun identifying specific research outcomes from STEER projects that can be incorporated into secondary and post-secondary science curriculum. This information has been compiled for the dryland, cereal based crop production region of the Inland Northwest and is currently being incorporated into the WSU “Sustainable Commodity-based Agriculture in the Pacific Northwest website” (tentative URL: <http://www.css.wsu.edu/commodity>). Table 1 shows the type of information in the database for this system, which focuses on several topics, including: 1) environmental impacts,

2) species diversity and conservation, 3) nutrient management and soil quality, 4) pest management, 5) production factors, 6) biotechnology, and 7) markets, economics, and consumer issues. Within the Environmental Impacts section, information is listed for such STEEP-related issues as air and water quality, soil erosion, carbon sequestration, nitrogen and pesticide runoff, pesticides, and soil quality.

Table 1. Outline of research and information for the dryland, cereal based cropping system component of the Partnership 2020 Project, “Sustainability of Commodity-Based Agriculture in the Pacific Northwest: A Web-Based Resource for Issues, Information and Research.”

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#### Introduction

- Sustainable Agriculture Information – Websites
  - University
  - State Government
  - United State Department of Agriculture
  - Other Organizations
- Sustainable Agriculture Research Programs

#### Commodity-Based Agricultural Systems

- Tree Fruit Production System
- Potato-based Irrigated Cropping System
- Dryland Cereal-based Cropping System

#### Information and Research Topic for the Dryland Cereal-based Cropping System

- Environmental Research
  - Air Quality
  - Water Quality
  - Soil Erosion
  - Pesticides and Fertilizers
  - Conservation and Biodiversity
  - Carbon Sequestration
- Crop Production Methods Research
  - Direct-Seeding Systems – Research Programs
  - Direct-Seeding Systems – Research
  - Direct-Seeding Systems – Case Studies
  - Direct-Seeding Systems – Grower’s Experiences
  - Precision Farming Research
  - Alternate Crops Research
  - Plant Breeding and Genetic Improvement Research
  - Organic Systems Research and Websites
  - Grass Seed Production Research
- Soil Quality Research
  - Soil Quality – General Information
  - Soil Quality and Direct-Seed Systems
  - Managing Soil Nutrients
  - Green Manures, Cover Crops, and Legumes
  - Residue Management
- Pest Management Research
  - Pest Management Guides
  - Weed Management Guides and Research
  - Pathogen Management Guides and Research

- Insect Management Guides and Research
  - Biotechnology Research
    - Biotechnology Research Programs
    - Genetic Engineering – General Information
    - Genetic Engineering – Herbicide Resistance Research
    - Genetic Engineering – Pathogen Resistance Research
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The ED-STEER website will contain specific lesson plans and activities for secondary school and post-secondary school science teachers. For example, we are developing a specific lesson on “Soil Organic Matter and Biodiversity” which we have also evaluated in a secondary school biology class taught by Quinn.

Quinn has recently taught classes in biology, life sciences, chemistry, physical science, and earth sciences in three different school districts in Idaho and Washington. The experience has allowed him develop a partial list of teacher consultants. Perillo is a current instructor in the Department of Crop and Soil Sciences and is developing a network of teacher consultants within the university community. These consultants will be used to identify specific curriculum goals and objectives.

**INTERACTIONS (COOPERATION) WITH OTHER SCIENTISTS CONDUCTING RELATED ACTIVITY:** We will be consulting with numerous STEER researchers to identify specific research outcomes that can be incorporated into secondary and post-secondary science curriculum. This will be done after the specific secondary and post-secondary goals and objectives are identified.

**PUBLICATIONS AND PRESENTATIONS:** None yet.