Applying knowledge to improve water quality
Pacific Northwest
Regional Water Program
A Partnership of USDA NIFA
& Land Grant Colleges and Universities

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PNWWATER 132

Idaho CEAP:
Monitoring and Erosion Modeling

In 2004, USDA-CSREES awarded the University of Idaho a three-year grant through the Conservation Effectiveness Assessment Program (CEAP) to study the effectiveness of conservation practices used to protect water quality in the Paradise Creek Watershed (PCW) of northern Idaho. For the last four years under the leadership of University of Idaho Water Scientist Jan Boll, this project has evaluated conservation practices by physical water quality monitoring and developing models to describe erosion on a field-by-field basis. CEAP is composed of two basic parts: a nationwide assessment of conservation benefits and more in-depth studies of these benefits as they directly impact the watershed selected for each study.

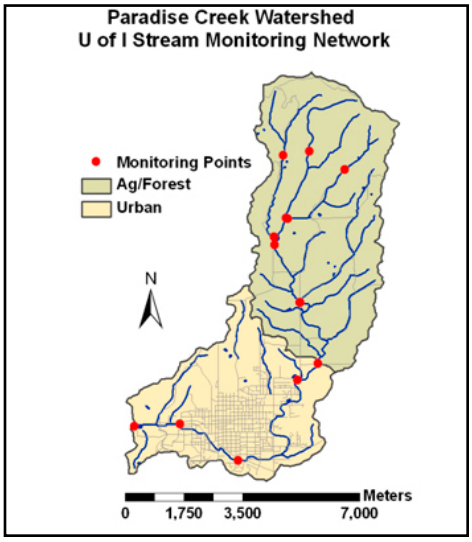

Figure 1. *Sampling locations in the Paradise Creek Watershed.*

Monitoring

Monitoring of effectiveness of agricultural practices in the PCW predominantly targets sediment. Data relevant to determination of sediment loading include continuous stage height and turbidity, event-based discharge and total suspended solids (TSS), weather data, stream cross-sections, and land use. Available data sources are USGS (discharge), MWWTP (TSS above and below discharge point), state agencies (bi-weekly monitoring at eight locations), and the University of Idaho (Dr. Boll's automated monitoring stations shown in Figure 1). Table 1 summarizes selected water monitoring data including source, period of collection, frequency, and location.

Table 1. Water monitoring data available in PCW[1].

Parameter (source)	Period of record	Sampling frequency	Location
Stream discharge (USGS)	1978 – present (1990 – present)	daily averages (15 min averages)	1 km upstream of MWWTP
Total Suspended Solids[2] (MWWTP)	1979 – 1980; 1988 – present	~3 days per week	Above and below MWWTP
Flow, turbidity, TSS (ISWCD[3], UI-CEAP)	3/23/99-6/18/02 2004-06	bi-weekly	eight points in PCW
Flow, turbidity, TSS[4] (University of Idaho, Boll)	2000-present	Continuous	1) below ag land use
	2001-present	Continuous	2) below forest land use 3) below urban land use
	2004-present	Continuous	4) within urban land use

[1] All locations also include temperature measurements.
[2] Outflow measurements also available.
[3] Pre-BMP by Idaho Soil and Water Conservation Districts for PCW Advisory Group.
[4] TSS is collected on a flow-proportional basis. A rating curve between turbidity and TSS exists.

Pacific Northwest Regional Water Quality Coordination Project Partners

Land Grant Universities

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The Project
Land Grant Universities, Water Research Institutes, and EPA Region 10 have formed a partnership to provide research and education to communities about protecting or restoring the quality of water resources. This partnership is being supported in part by the USDA's National Institute of Food and Agriculture (NIFA).

Our Goal and Approach
The goal of this Project is to provide leadership for water resources research, education, and outreach to help people, industry, and governments to prevent and solve current and emerging water quality and quantity problems. The approach to achieving this goal is for the Partners to develop a coordinated water quality effort based on, and strengthening, indivudual state programs.

Our Strengths
The Project promotes regional collaboration by acknowledging existing programs and successful efforts; assisting program gaps; identifying potential issues for cross-agency and private sector collaboration; and developing a clearinghouse of expertise and programs. In addition, the Project establishes or enhances partnerships with federal, state, and local environmental and water resource management agencies, such as by placing a University Liaison within the offices of EPA Region 10.

During the CEAP project, a bi-weekly sampling program was conducted for two years (2004-2006) at multiple locations in the watershed. At eight of these locations, continuous stage height and event-based TSS were measured during 2006 and 2007, along with discharge measurements for rating curves. During the CEAP project, weather data and stream cross-section data also were collected at multiple locations.

Modeling
Modeling is an important component of the Idaho CEAP project because it will enable researchers to determine the effectiveness of specific conservation practices employed in the PCW. It will also help to determine the optimum placement locations of each practice within the watershed.

Cumulative effects modeling was achieved by combined modeling with the Soil Moisture Routing (SMR) model, the Water Erosion Prediction Project (WEPP) model, and the Conservational Channel Evolution and Pollutant Transport System (CONCEPTS) model. Subsurface hydrology components from SMR were incorporated into the WEPP model, which divided the watershed into a large number of hillslopes. Each hillslope was characterized by topography (including lateral convergence), soils, management, and climate. Flow and sediment delivered to the stream as predicted by the WEPP model was put into the CONCEPTS model, which provided total sediment loading at the watershed outlet, as well as changes in cross-sections along the creek.

Model verification was performed using data from the Coweeta experiment and using monitoring data from 2001-2007 water years, mostly at station 20. Further simulations were ran for the period 1980 to 2007 to evaluate long-term effects of upland erosion and sediment delivery and stream bed and bank erosion. Preliminary results show that upland erosion and sediment delivery is minimized by the combined use of conservation tillage and selected gully plugs. A cyclical climatic sequence produced periods of large sediment input that are removed in a time scale on the order of decades rather than years.

National Water Quality Program Areas

The four land grant universities in the Pacific Northwest have aligned our water resource Extension and research efforts with eight themes of the USDA's National Institute of Food and Agriculture.

1. Animal Waste Management
2. Drinking Water and Human Health
3. Environmental Restoration
4. Nutrient and Pesticide Management
5. Pollution Assessment and Prevention
6. Watershed Management
7. Water Conservation and Management
8. Water Policy and Economics

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