



Applying knowledge to improve water quality

# Pacific Northwest

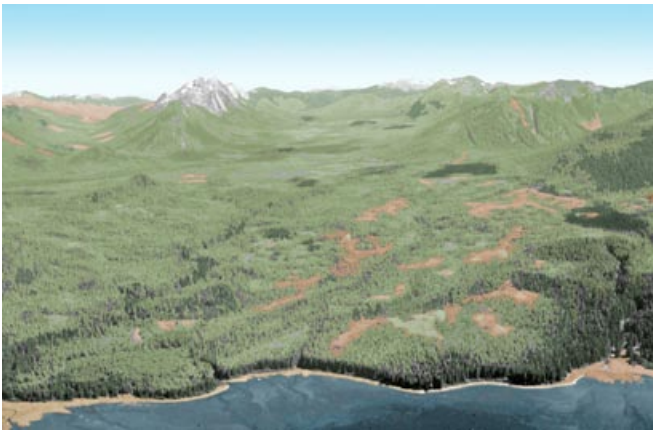
## Regional Water Program

A Partnership of USDA CSREES  
& Land Grant Colleges and Universities

Spring 2006  
PNWWATER 083

### Watershed Research:

## Salmon and Wetland Influences on Nutrient Cycling in Forested Watersheds



*The temperate rainforest in southeastern Alaska is a mosaic of coniferous uplands, forested wetlands and emergent wetlands, and areas of alpine tundra .*

The National Research Initiative (NRI) of USDA recently awarded a grant to a team led by Eran Hood of the University of Alaska to study salmon and wetland influences on carbon and nutrient cycling in forested watersheds. This is one of only 14 national awards from NRI's 2005 Watershed Processes and Water Resources Program.

Currently there is little information about the role of wetlands and salmon carcasses in supporting watershed productivity in temperate forest ecosystems in Alaska and the Pacific Northwest. This three-year research project will develop an understanding of how wetlands and salmon carcasses influence stream water chemistry and nutrient dynamics in forested watersheds. This information will allow managers to assess how natural and human-induced changes may be influencing productivity in these ecosystems.

The productivity of aquatic ecosystems in forested watersheds is dependent on the availability of dissolved organic matter (DOM) and inorganic nutrients such as nitrogen and phosphorus. These nutrients influence primary and secondary production in rivers and streams and therefore play a significant role in supporting aquatic food webs. In coastal watersheds in southeastern Alaska, stream water concentrations of DOM and inorganic nutrients are strongly influenced by the presence of wetlands and anadromous salmon.

Wetlands are an important component of the landscape in southeastern Alaska, comprising more than 29 percent of the Tongass National Forest. These wetlands are thought to provide abundant dissolved organic matter to streams, however the wetland-stream interactions that control the amount and quality of dissolved organic matter inputs to streams are not well understood. The Tongass also contains over 4,000 salmon streams. These streams serve as conduits through which nutrients derived from marine ecosystems are returned to the land. When salmon return to their natal streams to spawn, their carcasses provide substantial inputs of carbon, nitrogen, and phosphorus to terrestrial and aquatic ecosystems within coastal watersheds. These



## Pacific Northwest Regional Water Quality Coordination Project Partners

### Land Grant Universities

#### Alaska

Cooperative Extension Service  
Contact Fred Sorensen:  
907-786-6311

<http://www.uaf.edu/ces/water/>

University Publications:

<http://www.alaska.edu/uaf/ces/publications/>

#### Idaho

University of Idaho  
Cooperative Extension System  
Contact Bob Mahler: 208-885-7025

<http://www.uidaho.edu/wq/wqhome.html>

University Publications:

<http://info.ag.uidaho.edu/Catalog/catalog.html>

#### Oregon

Oregon State University  
Extension Service  
Contact Mike Gamroth: 541-737-3316

<http://extension.oregonstate.edu/>

University Publications:

<http://extension.oregonstate.edu/catalog/>

#### Washington

Washington State University  
WSU Extension  
Contact Bob Simmons:  
360-427-9670 ext. 690

<http://wawater.wsu.edu/>

University Publications:

<http://pubs.wsu.edu/>

Northwest Indian College

Contact Dan Burns:  
360-392-4328

[dburns@nwic.edu](mailto:dburns@nwic.edu) or

<http://www.nwic.edu/>

### Water Resource Research Institutes

Water and Environmental Research  
Center (Alaska)

<http://www.uaf.edu/water/>

Idaho Water Resources  
Research Institute

<http://www.boise.uidaho.edu/>

Institute for Water and  
Watersheds (Oregon)

<http://water.oregonstate.edu/>

State of Washington

Water Research Center

<http://www.swwrc.wsu.edu/>

### Environmental Protection Agency

EPA, Region 10

The Pacific Northwest

<http://www.epa.gov/r10earth/>

Office of Research and Development,  
Corvallis Laboratory

<http://www.epa.gov/wed/>

For more information contact  
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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 Cooperative State Research, Education, and Extension System (CSREES).

### 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, individual 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.

salmon-derived nutrients can have dramatic effects on the productivity of streams and streamside riparian areas, however the relative importance of salmon nutrients in the overall nutrient budgets of coastal watersheds has not been thoroughly examined. The purpose of this study is to develop a fundamental understanding of how wetland soils and carcasses from spawning salmon influence watershed nutrient dynamics in the Tongass National Forest, the nation's largest national forest.

This project will provide vital information to land managers about the present health of watersheds in a large and historically understudied region. In addition, information about the role of wetlands and salmon carcasses in supporting watershed productivity in temperate forests will allow for more accurate predictions about how watershed health may be influenced by forestry practices and climate change. This research will also establish a template for understanding dissolved organic matter and nutrient dynamics across a large and geomorphically diverse landscape that can be applied to other watershed types in the Pacific Northwest and Alaska. Finally, the knowledge derived from this project will aid in the development of more appropriate restoration goals for previously impacted watersheds in coastal temperate forests.

The project is a collaboration between the University of Alaska Southeast, Environmental Science Program, and the Aquatic and Land Interactions Program at Pacific Northwest Research Station in Juneau, AK. Further information may be obtained from Eran Hood, Assistant Professor of Environmental Science, University of Alaska Southeast, 11120 Glacier Hwy., Juneau, AK 99801; 907-796-6244 (voice); 907-796-6406 (fax); email: [eran.hood@uas.alaska.edu](mailto:eran.hood@uas.alaska.edu).

### 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 Cooperative State Research, Education, and Extension System.

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

*CSREES is the Cooperative States Research, Education, and Extension Service, a sub-agency of the United States Department of Agriculture, and is the federal partner in this water quality program.*