



Applying knowledge to improve water quality

Pacific Northwest

Regional Water Program

A Partnership of USDA CSREES
& Land Grant Colleges and Universities

Summer 2006
PNWWATER 088

Watershed Research:

Impact of Forest Management on the Water Cycle

A sound scientific basis for forest management decisions is necessary in order to foster and maintain healthy rural economies and sustainable forest environments in the Pacific Northwest. Within our forests both harvest methods and road construction may adversely impact water resources by altering the timing and volume of water flows from forested watersheds. Forests that are in transient snow zones, areas where the snow pack melts periodically during the winter, are believed to be particularly sensitive to hydrologic changes. Dr. Tim Link, a Forest Hydrologist at the University of Idaho, is studying how forest harvest, road patterns, and climate change will impact water flow in forested watersheds that span the transient snow zone.

Dr. Link's forest hydrology research effort is supported by the University of Idaho and a USDA-CSREES National Research Initiative (NRI) grant. The original grant was awarded in 2003; however, it was recently renewed and is scheduled to continue through 2008. His research is being conducted through a partnership with Potlatch Corporation at the Mica Creek Experimental Watershed in northern Idaho. The results from his study will not only help us understand the hydrology associated with forested watersheds in northern Idaho, but the understanding of how these processes can be used for sustainable management throughout the Pacific Northwest and the entire western portion of the USA.

Initial results show that 50 percent clear cut watersheds increase annual water flows by approximately 30 percent. Conversely, annual water flows are increased by 20 percent in 50 percent partial cut (thinned) watersheds. Increased water flows are attributed to a combination of increased snow accumulation and decreased evaporation and transpiration in harvested areas. Water flow increases during the snowmelt season are less in the thinned areas compared to clear cut areas because soil moisture in the thinned areas is not fully replenished until



the spring snow melt. Early results also suggest that although there is more snow accumulation in the clear cut and thinned areas relative to the intact forest, snowmelt rates are lower in the thinned areas due to reduced radiation and turbulent heat transfer. The combination of thinned and cleared areas provides a greater volume of runoff that is sustained into the summer dry season when flows are most needed for downstream users and maintenance of aquatic ecosystem health. Future research will focus on how water flows are expected to change under combined future harvest and climate scenarios, to guide future management decisions.

This project encompasses all three missions of a land grant institution. First, the research findings from this project will enable



Jason Hubbart, PhD student, installs solar and thermal radiometers at a treetop meteorological station.



Oregon State
UNIVERSITY



University of Idaho
A LEGACY OF LEADING



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

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<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/>

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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.

us to use both wood and water resources on a more sustainable basis. Second, the technology developed through this project will be transferred to end user groups through Extension. And finally, there is an important educational aspect of this project. Mica Creek is used as one of the main case studies in an upper division Watershed Science and Management course taught at the University of Idaho. This class is delivered both live and on-line. This study at Mica Creek is also featured in a number of graduate courses, continuing and adult education programs for natural resource professionals, and for outreach tours for community leaders, government officials, industry groups, and scientists.

Dr. Link's field measurements will be fed into computer models that will be used to predict how water flows are expected to change based upon future harvest regimes, climate, and combined harvest and climate scenarios. The results of this research will help increase the certainty of hydrologic impact predictions in managed forestlands by linking predicted climate changes to ideal management scenarios. The integrated, complementary research being conducted at the Mica Creek Experimental Watershed will couple interdisciplinary process-based scientific knowledge with management needs in working watersheds to sustain the ecosystem goods and services upon which societies rely.



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.