



Applying knowledge to improve water quality

# Pacific Northwest

## Regional Water Program

A Partnership of USDA CSREES  
& Land Grant Colleges and Universities

Summer 2006  
PNWWATER 089

### Graduate Students Partner with OSU Extension to Answer Groundwater Management Questions

The OSU Extension Service Well Water program recently partnered with three Oregon State University graduate students to answer some critical questions in the Southern Willamette Valley Groundwater Management Area. These students weren't from academic departments with traditional Extension ties: two were in Geosciences and one in Anthropology. Here is the story of how these students integrated Extension outreach into their research and how their research helped in the development of groundwater protection policy.

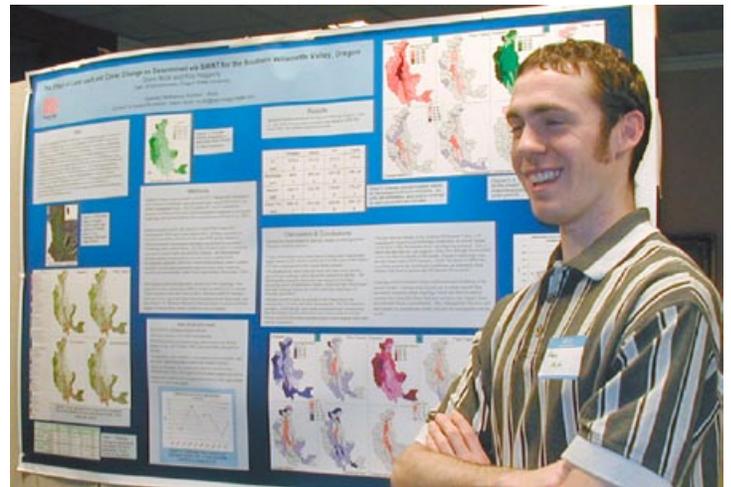
Elevated groundwater nitrate concentrations in the Southern Willamette Valley led the Oregon Department of Environmental Quality (ODEQ) to declare a Groundwater Management Area (GWMA) in Spring 2004. The OSU Extension Service Well Water Program partnered with ODEQ and other agencies to support the GMWA Stakeholders' Committee in the development of the GWMA action plan.

Early in the process questions arose that were beyond the scope of the GWMA project team. The basic questions were: (1) What would it take to motivate residents to adopt recommended changes to reduce nitrate entering groundwater; and (2) When and where should nitrate be measured to show whether the situation is improving. Because the Extension Well Water Program is based on the OSU campus, the fortuitous serendipity of graduate students looking for projects and research questions needing answers occurred—three times!

Irene Rolston, a master's student in Applied Anthropology, interviewed agricultural producers exploring their perceptions about using water quality protection practices. Concerns about economic viability tend to drive the decisions of agricultural producers in this area and appear to amplify the perception of risks associated with management changes. Based on this information, the GWMA team is incorporating economics as well as water quality protection when making "best management practice" recommendations.

Two Geology master's students, Jeremy Craner and Glenn Mutti (Mutti also double majored in Water Resources Science), worked on the complex issues associated with long-term monitoring of nitrate in the Southern Willamette Valley. Both students developed numerical models that can eventually be linked to show the movement of groundwater nitrate under different land-use and management scenarios. With this information researchers can predict where and when they would expect to see changes resulting from actions taken.

Mutti's nitrate loading model indicates that implementing agricultural groundwater protection management practices is a more effective agent for reduced nitrate leaching than land-use change alone. Together, land-use change and the



Graduate student, Glenn Mutti, answers questions on his project's poster presentation.



## 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/index.html>

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: Michael Cochrane:  
360-392-4299

[mcocrane@nwic.edu](mailto:mcocrane@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  
Jan Seago at 206-553-0038 or  
[seago.jan@epa.gov](mailto:seago.jan@epa.gov)

adoption of groundwater protection practices were found to decrease nitrate leaching values by up to 46 percent of their present-day rates.

Another aspect of Mutti's research was to monitor wells for 15 months to determine if there is seasonal variation in nitrate levels within individual wells. He found that there is significant seasonal variation in some wells, but the seasonality wasn't consistent across the sites. Mutti concluded that effects of seasonality would be dampened when pooling data from multiple wells to look at regional trends from long-term monitoring. Outreach implications are that we can tell household drinking water well owners that their nitrate levels vary, but we can't tell them exactly what time of year they are the highest, so testing more than once a year may be necessary in some cases.

Craner's model sought to understand direction of groundwater flow, groundwater age, and nitrate transport. This study suggests it may take tens of years to see measurable declines of groundwater nitrate in some locations. In addition to assisting researchers in understanding long-term monitoring data, Craner's model is being used as an outreach tool. Output from the model helps illustrate to residents the complexity of measuring nitrate reduction resulting from changes in practices, shows how groundwater contamination moves, and drives home that fact that groundwater contamination and clean-up operates on a long time scale.

Then both Mutti and Craner collected field data from household wells and shared groundwater protection recommendations with the well owners. This type of outreach in conjunction with research has proven to be an effective method of reaching residents within the groundwater management area. Many residents know about the regional groundwater issues because of their participation in research projects.

All three graduate students participated regularly in the GWMA Committee meetings and delivered formal presentations of their research to the committee. Their research continues to contribute to decisions that are being made about which practices to recommend and how to measure impacts from those changes.

Irene Rolston was advised by Dr. Deanna Kingston, OSU Anthropology Department. Jeremy Craner and Glenn Mutti were both advised by Dr. Roy Haggerty, OSU Geosciences Department. Rolston and Mutti were partially funded by an EPA Clean Water Act 319 Grant from Oregon DEQ awarded to the OSU Well Water Program. Mutti was also funded by the USGS Small Grants Program through OSU CWEST. Craner was funded by an EPA Region 10 Regional Geographic Initiative Grant.

Copies of all the theses, PowerPoint presentations, a web profile of Craner's model, and contact information are available on the Southern Willamette Groundwater Management Area web site at:

<http://groundwater.oregonstate.edu/willamette/research.htm>.

## 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.*