



Applying knowledge to improve water quality

Pacific Northwest

Regional Water Program

A Partnership of USDA CSREES
& Land Grant Colleges and Universities

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PNWATER 112

Studying Arid Watershed Management in the Pacific Northwest

Mays and Jensen are watersheds in the transition zone where central Oregon becomes basin-and-range country and the human population drops from sparse to almost nonexistent. It is an area that gets less than 13 inches of precipitation a year, forcing even drought-adapted plants to battle for moisture. Western juniper has spent the last century creeping down from these hilltops and expanding across the range where it is often victorious in the high-stakes competition for water.

Oregon State University and Bureau of Land Management scientists are comparing the two watersheds to see how much water the juniper trees are using. The scientists chose Mays and Jensen because the two watersheds have so much in common. Both are similar in topography and size—about 260 acres each. When the study began in the 1990s, both were covered with juniper, some spiky and scraggly and some towering and regal. Between the trees were patches of sagebrush and clumps of grasses, many of them dead or dying.

In 2005, after 12 years of study, the researchers removed 90 percent of the juniper growing in Mays while leaving Jensen untouched. The cut opened up the Mays landscape, exposing the hills and valleys; trees greater than 130 years old were left standing on the rocky ridge lines.

Soon after the trees came down, Tim Deboodt, an OSU Extension range management specialist, began measuring a change in the depth to groundwater in Mays. The spring in the Mays watershed began registering a significantly increased flow after the cut. Into the late summer, the Mays spring continued to flow at a higher rate compared to the spring in Jensen and compared to previous years' flow data before the cut. In April 2007, Deboodt measured the Mays spring's flow at about 40 gallons per minute; the Jensen spring, less than a half mile away in the uncut watershed, was running at about 14 gallons per minute.

Juniper inhibits the soil from retaining and holding water, so there is less groundwater available throughout the growing season. With its wide-reaching roots that can extend more than 40 feet from the tree, and a canopy that can stop more than half of all precipitation from reaching the ground, juniper dominates the landscape where it invades.

"It's not uncommon to see a landscape of nothing but trees with bare ground in between trunks," said Deboodt. "The situation leads to increased erosion from storm events and an inability of the land to soak up precipitation for later use."

"The new vegetation coming up in the Mays watershed is capturing precipitation and giving it time to infiltrate into the soil," said Deboodt. "If we can get water into the soil higher in the watershed, we decrease the chance that soil will wash away in the lower reach, and we save water that can be used by plants and animals later in the season when it's really needed."

Overgrazing, fire control, and favorable climatic conditions during the late 1800s and early 1900s are largely responsible for the rampant encroachment of western juniper, which increased ten-fold during the twentieth century, according to Deboodt.



Pacific Northwest Regional Water Quality Coordination Project Partners

Land Grant Universities

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University Publications:

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

Idaho

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

University Publications:

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

Oregon

Oregon State University
Extension Service
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University Publications:

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

Washington

Washington State University
WSU Extension
Contact Bob Simmons:
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University Publications:

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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,
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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.

“On its own, juniper isn’t a bad tree,” said John Buckhouse, an OSU scientist in the Department of Rangeland Ecology and Management. “But it is opportunistic, and fire suppression has created a situation that is not natural.”

The “paired” watershed experiment is an attempt to reestablish the landscape of the West’s presettlement era, when wildfire periodically burned the area and controlled the growth of small trees. Intermittent burns kept the juniper in check and helped ensure species diversity in the parched high desert.

“We have learned that management generally works best when we attempt to mimic nature,” said Michael Fisher, an OSU rangeland researcher at OSU’s Cascade Campus in Bend. “In this case we are using a chainsaw as a surrogate for fire; the tree harvest was planned and carried out to simulate a natural burn.”

“Removing the trees results in a more sustainable ecosystem,” said Buckhouse. “Where juniper has been removed, we are seeing the regeneration of sagebrush and grasses; and private landowners are telling us that springs are flowing where none were known before.”



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.