



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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PNWWATER 065

Maintaining Agricultural Waterways in King County

The King County Department of Natural Resources and Parks is funding a five-year collaborative study between Washington State University and the University of Washington to determine the effects of maintaining farm drainage ditches on plants, erosion, fish habitat, and water quality. Maintaining drainages is an important practice for the protection of valuable farm land in the county. As illustrated in the figure, waterways can quickly become choked with reed canarygrass (RCG) and sediment making adjacent agricultural lands more prone to flooding and impacting the yields or use of the land after seasonal flooding events. The goal of the project is to investigate ways to avoid or minimize agricultural maintenance related impacts on salmonid habitat by: 1) evaluating both reach-specific and upstream factors that determine the function of lowland agricultural watercourse habitat for salmonid fishes; 2) assessing the effects of agricultural drainage maintenance activities on these factors; and 3) identify drainage maintenance activities that can be undertaken to effectively avoid and minimize habitat impacts. This summary covers research conducted to date. We will finish analyzing the data and writing the final report by the end of 2006.



What we've learned so far

Numerous fish utilize the agricultural drainage ditches. In fact, about 3,500 fish, representing 19 different species, were captured near or in farm ditches during our 2004 quarterly monitoring. Salmonids represented 18 percent of the fish collected, included coho salmon, Chinook salmon, chum salmon, and cutthroat trout. Juvenile coho were widespread in the ditches. Juvenile Chinook were found in Snoqualmie and Green River watershed ditches, showing that these ditches can be important habitat for salmonids in some years and in some watersheds.

Studies on short reaches of farm ditches showed that willows, Himalayan blackberry, and reed canarygrass all provided lots of shade. Data indicate that steepening the streambanks increases the effectiveness of plants in providing shade to the ditches. Shade cast by vegetation and the banks themselves can decrease maximum seven day average water temperatures by 0.9° Fahrenheit. The data suggest that air temperature may more strongly influence temperature in wide ditches with gently sloping banks, while shade vegetation may be more important in affecting the temperature of narrower, steeper-sided ditches. It's important to note that steeper-banked channels are more likely to erode and cannot convey as much water during floods.

Small insects like mayflies, stoneflies, and dragonflies (and other invertebrates) serve as indicators of the overall health of watersheds. Mayflies, stoneflies, and caddisflies are sensitive species indicating good water



**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:

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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>

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

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

University Publications:

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Washington State University
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360-427-9670 ext. 690

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

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Northwest Indian College
Contact Dan Burns:
360-392-4328

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
Jan Seago at 206-553-0038 or
seago.jan@epa.gov

quality, while blackflies, aquatic worms, and midge larvae are tolerant species indicating poor water quality. Salmonid survival depends in part on a healthy and diverse collection of these small critters. Early findings in this study suggest that a combination of trees, shrubs, and grasses along ditches is correlated with greater diversity and more sensitive macroinvertebrate population than other habitat types. Although some of the ditches currently do not have salmonids in them, they appear to have the potential to provide an important source of food for young salmon.

Reed canarygrass is a tenacious competitor that can crowd out native plants along creek or ditch banks and impede flow in ditches. The study is testing whether burlap/compost "pillows" (layers of burlap, compost, and more burlap) laid on top of mowed reed canarygrass can suppress its growth and how long the RCG must be covered to control re-growth from its rhizomes (underground stem structures that store nutrients). Ideally the pillows will allow native plants to get established along banks and provide shade and multiple layers of vegetation. Additionally, researchers are investigating the use of red cedar hogfuel as a way to inhibit reed canarygrass growth. Initial results are suggesting the red cedar hogfuel reduces nitrogen availability to reed canarygrass, therefore slowing its growth.

We are just starting our research on how to control erosion and siltation into ditches and how, and if, large woody debris (LWD) impacts hydraulic diversity in these low gradient channels. Erosion research will investigate ways to minimize both the sediment movement that happens with the "first flush" of a storm or other increase in water volume and cumulative siltation over time. The project will evaluate the effectiveness of peat moss, coir mat (coconut fiber) fabric, sodding, wood chips, soil binders, hydroseeding, and hand seeding in controlling erosion. LWD research will investigate if woody debris creates hydraulic diversity (e.g., changes in pool depth, velocity, and substrate) in agricultural waterways.

Outreach is an important part of this project as it is essential that the regulators, farmers, and general public are aware of these findings. University and Extension faculty are part of the multi-disciplinary research team involved in this project. Through their combined efforts, this research project will be better able to help shape policy decisions that benefit both farmers and fish.



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.