Applying knowledge to improve water quality
Pacific Northwest
Regional Water Program
A Partnership of USDA NIFA
& Land Grant Colleges and Universities

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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 0.9º 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

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http://water.oregonstate.edu/

State of Washington Water Research Center
http://www.swwrc.wsu.edu/

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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 National Institute of Food and Agriculture.

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

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