

OWEB Research Grant PROJECT SUMMARY
Linking cold-water refuges into a biologically effective network
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Summary

More than 11,000 miles of streams and rivers in Oregon have been listed as impaired based on temperatures that exceed the water quality standard. More than 35% of the streams in the Willamette River basin were in the poor category (DEQ 2004). Concerns over elevated water temperature have led to questions about cold water refuges for native biota through floodplain restoration, particularly where these habitats could provide multiple ecosystem and social benefits. Efforts are underway to establish ecosystem marketplace trading, using thermal trading credits in the Willamette River as a pilot study. Further, studies in the Pacific Northwest have demonstrated that salmonids gather in coldwater microhabitats and can use coldwater habitats as stepping stones to move through reaches that exceed their thermal tolerances. Our proposed research would 1) measure the importance of coldwater habitats as stepping stones, 2) link them to dynamic river processes, and 3) identify land owner benefits and concerns to design on-going conservation and restoration efforts in the Willamette River floodplain (e.g., Green Island, city of Eugene, NRCS).

We propose to map candidate locations for thermal refugia in the Willamette River between Eugene and Albany. We create a spatial framework for floodplain assessment by mapping one-km "slices" of the Willamette River floodplain. This spatial framework for the Willamette River floodplain will be the template for mapping the current thermal properties of the river channel and lateral floodplain habitats based on water temperature data we collected in 2005-2006.

We will identify the fish assemblages that use these cold water habitats. Based on our mapped coldwater and warmwater habitats, we will sample species diversity and abundance in different thermal habitats. These data will be used to project the consequences of floodplain restoration and recovery of thermal heterogeneity on fish assemblages.

We will estimate use and travel distances between coldwater habitats for a major coldwater species, cutthroat trout. Large cutthroat trout will be tracked using radio transmitters. Radio tags and small external temperature dataloggers will provide location and thermal data for each fish for 4-6 weeks during periods of high thermal stress. We will use fish movement data to determine maximum effective travel distances between coldwater refugia as a basis for spacing river restoration efforts in floodplain rivers.

We will then produce maps identifying places where the biophysical potential for refugia is likely to be higher and the socio-economic resistance to creating refugia is likely to be lower. We will map potential thermal refuges as well as critical land owner and land use factors (e.g. human population, road and building density/slice, area of private land/slice and land value/slice).

We will identify candidate locations for coldwater stepping stones that a) do not exceed effective travel distances, b) offer high biophysical potential for restoring coldwater refuges, and c) present low socio-economic obstacles to restoration. We will work with the Willamette Partnership and relevant local organizations (e.g. watershed councils, Cascade

Pacific RC&D, soil and water conservation districts, etc.) to identify opportunities and concerns for landowners in these areas. This land owner information and maps of floodplain and thermal restoration opportunities will be used to create a framework for developing a marketplace approach for investing in ecosystem services.

This study will be transferable to all Oregon streams and rivers where thermal environments create challenges for aquatic communities and restoration efforts of the Oregon Plan for Salmon and Watersheds. Additionally, it will demonstrate the value of observation networks and ecosystem marketplaces for restoring aquatic ecosystems. Such networks may serve as an investment strategy for communities and industries involved in Oregon's restoration and conservation efforts.