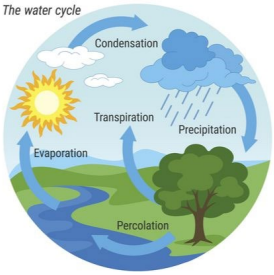
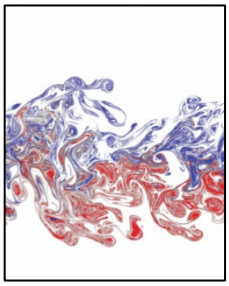
Boase Seminar Series in Hydrology and Water Resources Engineering

Department of Civil, Environmental and Architectural Engineering





Go with the flow (hyporheic that is): Processes Controlling Thermal Regimes in Secondary Channel Features on the Willamette River

Ms. Carolyn Gombert

Hydraulic Engineer

Sedimentation & River Hydraulics Group

USBR, Denver

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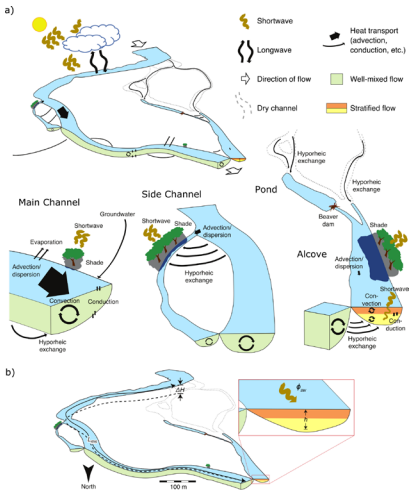
Zoom: https://cuboulder.zoom.us/j/98861379124

(passcode: water)

Abstract:

In the Willamette River, Oregon, main channel temperatures can be too warm for cold water fishes, causing fish to concentrate in secondary channel features that provide thermal refugia. Increasingly, these patterns in surface water temperatures hold true for many rivers across the Pacific Northwest. The study on which I will present seeks to improve our understanding of physical processes controlling thermal regimes in side channels, alcoves, and ponds on gravel bed rivers. Water temperature data collected for this work show that temperatures vary among and within features on the upper Willamette. In addition to collecting field data, we used dimensional analysis to develop a novel dimensionless number, the Hyporheic Insolation (HIN) index. As formulated, the HIN index can predict and thereby classify thermal refugia based on minimal field data. We took continuous water temperature measurements at one side channel, eight alcoves, and six beaver ponds to provide data to ground truth HIN index predictions. HIN index calculations require stratification in the water column, which we calculated using the dimensionless Richardson number. At our 13 stratified sites, calculation of the novel HIN index characterized the ratio of cooling flux from hyporheic discharge to heat flux from incoming solar radiation. As the HIN index increased, measured temperatures at sites decreased, showing a bin-averaged logarithmic fit (R2=0.91). Calculation of the Richardson number and the HIN index indicate that secondary channel features characterized by stratification and cool hyporheic discharge can provide thermal refugia. The new HIN index provides a tool to practitioners that is fast, simple, and accessible, and guides restoration in a more quantifiable direction.



Speaker Bio: Ms. Gombert is currently a hydraulic engineer in the Sedimentation and River Hydraulics group at the Bureau of Reclamation. Prior to joining the Reclamation team in Denver, she also worked in Sacramento, CA for the Army Corps of Engineers and for Northwest Hydraulic Consultants. Ms. Gombert completed her Master's in Water Resources Engineering at Oregon State, where her research focused on water temperature in gravel bed rivers. In her current role at Reclamation, she is involved in numerical modeling, paleoflood studies, and river restoration. The Willamette River remains her favorite river, with the American River in California coming in at a close second.