

# Tracking Complex Transport and Reaction Processes in The Groundwater-Surface Water Interaction Zone

## Challenge

- Highly dynamic hydrologic processes in river corridor systems have complicated understanding and models of surface water-groundwater interaction and its affect on surface water quality and biogenic gas releases to the atmosphere.

## Approach and Results

- High-resolution monitoring of tracer uranium and other solutes in the groundwater-surface water interaction zone was performed for 3 years combined with hydrologic and reactive transport modeling.
- Seasonal surface water intrusion into the aquifer caused complex, but eventually predictable solute distribution and concentration patterns that varied with the annual hydrograph and dynamic groundwater flow vectors.

## Significance and Impact

- Subsurface geologic structures and physical heterogeneities cause complex and temporally variable flow pathways that control source water mixing, residence times, and reactions.
- Stage variations mediate groundwater discharge to surface water, and ESM must consider this critical interaction.



**Columbia River at low stage.** Spring increases in river stage to and above the riparian zone drive extended periods of river water intrusion into groundwater that stimulates biogeochemical processes

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**Reference:** Zachara, J.M., X. Chen, C. Murray, and G.E. Hammond. 2016. “River stage influences on uranium transport in a hydrologically dynamic groundwater-surface water transition zone.” *Water Resources Research*, In Press. DOI: 10.1002/2015WR018009