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Water Management Impacts on Groundwater-River Water Exchanges

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Human activity along river corridors disturbs many critical river processes, including surface- groundwater exchanges. In many rivers, these exchanges provide important exchanges of energy, biota, and solutes between the surface and subsurface environments, and support fisheries and removal of some pollutants from rivers. This project aims to determine if water management activities within and beyond the river corridor impact groundwater exchanges. To determine this, we are studying the Hanford Reach of the Columbia River, in Southeast Washington. Since there are many challenges to using applied tracers in a large river system, this project aims to use natural tracers to determine locations of groundwater inflows, by taking water quality and GPS measurements along the streambed during boat surveys throughout the year. These measurements indicate the presence of groundwater inflows at the riverbed at several locations. We compare these inflows against locations of irrigation return flow and lateral contributing area to the exchange to identify the influence of each on river-groundwater exchange.

Several of these inflows show higher than main-channel levels of nitrate, suggesting impact from nearby shoreline irrigation. These insights will improve calibration models of hydrologic exchange developed by the River Corridor SFA at the reach scale of the Columbia River, as well as advance knowledge about the connection of landscape management to large river systems.