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Understanding changing natural and human-altered watersheds in the Inland Pacific Northwest through hydrological and sedimentological connectivity

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Many watersheds undergo a variety of natural and human induced disturbances that impact hydro-geomorphic connectivity. Conservation or green infrastructure strategies are needed to safeguard water supplies and ecosystem health. In the inland Pacific Northwest (PNW) of the USA, sediment and tracers are being used to identify dominant flow paths and spatio-temporal moments in water and sediment transport in an urban-agroecological system. The objective of this study is to investigate the changing nature of hydro-geomorphic connectivity during and after a shift in landscape management (no-till agriculture, bank stabilization, stream restoration projects). Through assessment of agro-ecological hydrology and urban stormwater, the study analyzes (i) the spatiotemporal variation of discharge and sediment concentrations at two stations in Paradise Creek above Pullman, WA and (ii) the potential of critical areas (impervious features) and conservation practices (reduced tillage, streambanks) to alter discharge and sediment transport in aquatic systems. A long-term data set from 2002- 2013 was evaluated using sediment hysteresis index (HImid) patterns and comparison with electrical conductivity. Result show that after a period of dis-connectivity in sediment transport, sediment connectivity was re-established in the catchment. A $1.8 million investment showed a reduction in sediment transport from 2002 to 2005 (from 1,550 t to 130 t), but load rose again in the years after, peaking at 1,500 t in 2012. This coincided with a rise in annual precipitation and extreme wetness events from 2005 to 2012. Management practices may have shifted hydrological connectivity through the landscape on managed agricultural lands, however increased wetness could play a role in re-activating altered sediment transport pathways. In the context of a shift to warming climates with less snow and more rain, expected moisture increases could increase sedimentological connectivity in transport-limited environments.