Basin evolution of the Whitney Basin, NE Oregon, inferred from Baker terrane- and Clarno and John Day formation-derived gravel deposits.

Dale Lambert
Washington State University, School of Earth and Environmental Sciences
Pullman, WA
dplamber@wsu.edu

Gravel-rich, Cenozoic sedimentary deposits in the Whitney Basin, Blue Mountains Province (BMP), Oregon, provide information on the depositional history of local basins and are a potential analogue for non-traditional siliciclastic hydrocarbon prospects. Detailed geologic mapping and clast counts, augmented by major/trace element XRF analyses, are used to identify four geologic and structural elements in the Whitney Basin. The first element, analogue to a source rock, is the Triassic-Pennsylvanian Elkhorn Ridge Argillite (ERA), a siliceous argillite, which is part of the accreted Baker Terrane. The second element consists of local, northwest-trending, dextral-normal faults that mimic the Brother's Fault Zone, a larger regional fault system bordering the BMP ~200km to the southwest. Active since at least the Oligocene, these local faults produced >2km escarpments on the northern margin of the basin as evidenced by stratigraphic and spatial relationships between rocks of the ERA and younger depositional units. Tg, the third element, and potential reservoir, is a gravel-rich Oligocene-Miocene deposit, characterized by rounded pebble to boulder, quartz-rich metamorphic and igneous clasts, and a weakly consolidated, porous, sand-rich, matrix. The extent and generally planar stratification of Tg deposits suggest it accumulated in broad braided channels that unconformably overlie ERA bedrock. The fourth element, Tvs, is an Oligocene-Miocene volcaniclastic, gravel-rich deposit generated by a north-flowing alluvial fan and fluvial system, that is interstratified with basalt flows and reworked airfall deposits. Tvs filled the Whitney Basin, capped the fault escarpment to the north, overlies the ERA and Tg, and is an analogue to a stratigraphic trap.