Dr. Anne Jefferson, Assistant Professor in the Department of Geology at the Kent State University progressed in completing an Ohio Water Resources Center project via USGS 104(b) subaward. The overall objective of her project titled **“Characterizing stream restoration’s water quality improvement potential through hyporheic exchange enhancement”** is to evaluate how stream restoration affects hyporheic exchange, and therefore water chemistry. Such understanding is crucial for deciding where stream restoration is appropriate to meet management objectives, designing restoration projects to meet those objectives, and evaluating whether restorations are successful.

Figure 1 *Dr. Jefferson's student collecting samples*

Overall this study has discovered a dynamic environment in the hyporheic zone of restored streams, with changing hydraulic conductivity and strong chemical gradients. In the stream where sediment inputs were restricted by an upstream dam, hydraulic conductivity did not change at the reach scale over a 5 month period, as opposed to a stream with unresticted sediment input where hydraulics conductivity declined over 15 months following restoration. Despite these dynamics, neither restored reach effected a change in surface water chemistry, as measured by baseflow grab samples analyzed for nitrate and other anions. Pore water collected from piezometers (Figure 1) revealed one important trend. Manganese concentrations were greatest in the head or upstream end of riffle 2 and 3, and in the middle of riffle 1, in each case as much as ten times higher than the surface water (Figure 2). These results suggest that redox chemistry is active within the constructed riffles in the restoration and is likely caused by dissolved oxygen gradients along flowpaths through these structures.

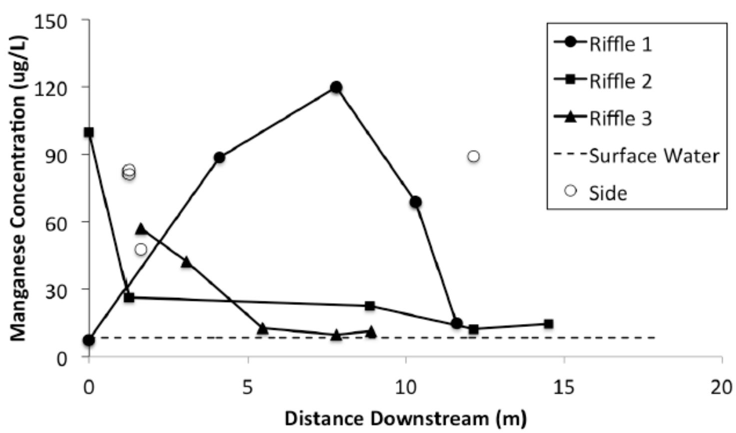

Figure 2 *Manganese concentrations from pore water 15---30 cm below the streambed surface at Kelsey Creek.*

In summary, hyporheic exchange was not significant enough to modify the water quality signal resulting from upstream land use and geology. This could be either be the result of insufficient hydraulic conductivity; the observed weak upwelling and downwelling; or short restored reach length. While the study was limited to two sites and approximately one year of data, the results suggest that stream restoration practices may not induce sufficient hyporheic exchange to improve downstream water quality.

<u>Researcher Profile:</u> Dr. Anne Jefferson’s lab works on watershed hydrology, groundwater-surface water interactions, and landscape evolution in human-altered landscapes. Current projects focus on green infrastructure, stormwater management, and stream restoration. Much of her research is field-based, but her group also makes use of stable isotope analyses, geographic information systems (GIS), and hydrologic modeling.