Fiber Optic Distributed Temperature Sensing: An Emerging Groundwater Monitoring Technology

Kristen B. McSwain

Affiliation: Hydrologist, U.S. Geological Survey South Atlantic Water Science Center, Norcross Georgia 30093

Reference: McDowell RJ, CA Pruitt, RA Bahn (eds.), *Proceedings of the 2015 Georgia Water Resources Conference*, April 28-29, 2015, University of Georgia, Athens.

Abstract. The exchange of water through the groundwater/surface water interface of waterbodies has been the subject of much research over the past twenty years. Despite intense study, adequately describing the temporal dynamics and spatial patterns of groundwater/surface water interactions continues to be a challenge. Groundwater discharge areas are not often readily discernable and may require a tracer to differentiate between groundwater and surface water. Temperature has been shown to be an excellent passive environmental tracer to infer areas of groundwater movement as it interacts with surface water. The relatively recent addition of fiber optic distributed temperature sensing (FO-DTS) networks into the hydrologist's data collection tool box has increased the spatial and temporal scale of temperature observations to extensions of 5 kilometers or more with resolution of less than 1 meter and temperature precision of 0.1 degree Celsius. In a March 2013 application of this technology, a 725 meter FO-DTS survey was conducted in an unnamed tributary to Hawe Creek at the Barite Hill/Nevada Goldfields Superfund Site near McCormick, South Carolina. The goal was to determine if groundwater discharge affected by acid mine drainage could be located in the tributary that bounds the abandoned mine. Four areas of groundwater discharge were identified on the basis of thermal differences. Synoptic measurements of pH and specific conductance in the surface water above and below the identified groundwater discharge sites suggest the groundwater has been adversely affected by acid mine drainage originating from the Main Pit Lake.