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U.S. Geological Survey
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USGS Maryland-Delaware-District of Columbia Water Science Center

Seminar Series

Thursday, December 11, 2014 11:00 a.m.

Groundwater that looks like seawater: stormwater management basins and road salt loading into suburban watersheds

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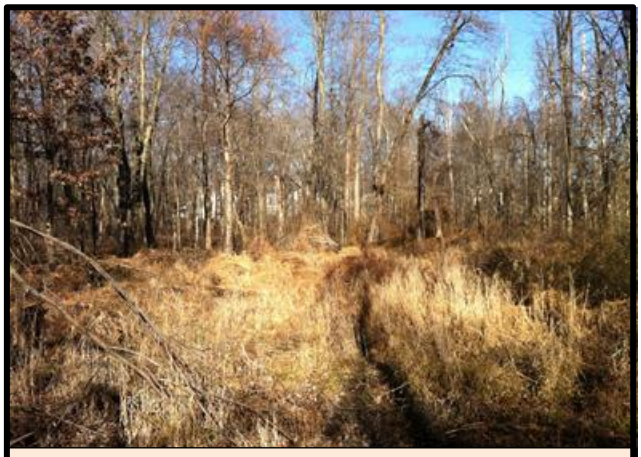
The research and environmental communities have become increasingly aware that road salt alters groundwater and stream chemistry on a year-round basis. Chloride and sodium concentrations in streams are now several times higher than pre-1960 concentrations in rural streams and orders of magnitude higher in urban and suburban streams. While road salt in streams has been studied in some detail, less is known about road salt loading to groundwater, in particular, the role that stormwater management basins (SMBs) play in directing road salt runoff into groundwater and streams.

Over several years, a suburban site in Owings Mills, MD with secondary and tertiary roads, relatively dense row/townhome development, and two SMBs has been studied to determine road salt effects on soil, groundwater, and stream chemistry. Water and soil/aquifer samples were collected from the SMBs, from a shallow aquifer downgradient of the SMBs, and from a second-order stream into which the groundwater flows. In the winter of 2013–14, chloride and sodium concentrations approached seawater concentrations in groundwater below the SMBs. In the shallow aquifer, average chloride and sodium concentrations were nearly 200 times higher than background concentrations for groundwater in a nearby watershed and above the EPA secondary limit for much the year. Flow of water high in chloride and sodium through the aquifer matrix raised the pH of the aquifer matrix and resulted in a cation exchange complex with 40% sodium as compared to background values of 0%. In the second-order stream, average chloride and sodium concentrations were ~125 times higher than background concentrations and exceeded the EPA secondary limit for most of the winter. Our observations demonstrate that SMBs result in significant loading of salt into groundwater, which produces year-round inputs of salt into streams.



'Dead' zone downgradient of stormwater management basin. This area had trees when the basin was installed ~14 years ago. High salt concentrations has resulted in tree kill.

Joel Moore is an assistant professor of Geosciences at Towson University. He received his Ph.D. in Geosciences from Penn State University and was a postdoctoral fellow at Northwestern University. His research interests are low temperature geochemistry and earth surface processes with research tools including isotopic tracers and geochemical modeling. Since starting at Towson in 2011, his research has focused on carbon capture and sequestration and on urban geochemistry, particularly road salt impacts on streams and groundwater.

This presentation will also be available remotely via Webex: https://usgs.webex.com/

For directions to the USGS MD-DE-DC WSC: http://md.water.usgs.gov/directions/baltimore.html.