Maryland Water Resources Research Center
Civil and Environmental Engineering

Annual Technical Report
2019

Maryland Water Resources Research Center

Products

Refereed Journal Articles Appearing During the Reporting Period (June 18, 2019 through December 31, 2020)

Title: Kinetic Isotope Effects in Electrophilic Aromatic Halogenation of Dimethenamid in Chlor(am)inated Water Demonstrate Unique Aspects of Iodination

Author(s): Rose, MR (Rose, Michael R.); Reber, KP (Reber, Keith P.)

Source: ENVIRONMENTAL SCIENCE & TECHNOLOGY LETTERS Volume: 7 Issue: 10 Pages: 721-726 DOI: 10.1021/acs.estlett.0c00557 Published: OCT 13 2020

Title: The role of organic amendments in wetland restorations

Author(s): Scott, B (Scott, Brian); Baldwin, AH (Baldwin, Andrew H.); Ballantine, K (Ballantine, Kate); Palmer, M (Palmer, Margaret); Yarwood, S (Yarwood, Stephanie)

Source: RESTORATION ECOLOGY Volume: 28 Issue: 4 Pages: 776-784 DOI: 10.1111/rec.13179 Early Access Date: JUN 2020 Published: JUL 2020

Title: High-Frequency Data Reveal Deicing Salts Drive Elevated Specific Conductance and Chloride along with Pervasive and Frequent Exceedances of the US Environmental Protection Agency Aquatic Life Criteria for Chloride in Urban Streams

Author(s): Moore, J (Moore, Joel); Fanelli, RM (Fanelli, Rosemary M.); Sekellic, AJ (Sekellic, Andrew J.)

Source: ENVIRONMENTAL SCIENCE & TECHNOLOGY Volume: 54 Issue: 2 Pages: 778-789 DOI: 10.1021/acs.est.9b04316 Published: JAN 21 2020

Title: Urban legacies: Aquatic stressors and low aquatic biodiversity persist despite implementation of regenerative stormwater conveyance systems

Author(s): Fanelli, RM (Fanelli, Rosemary M.); Prestegaard, KL (Prestegaard, Karen L.); Palmer, MA (Palmer, Margaret A.)

Source: FRESHWATER SCIENCE Volume: 38 Issue: 4 Pages: 818-833 DOI: 10.1086/706072 Published: DEC 1 2019

Title: Iodination of Dimethenamid in Chloraminated Water: Active Iodinating Agents and Distinctions between Chlorination, Bromination, and Iodination

Author(s): Rose, MR (Rose, Michael R.); Roberts, AL (Roberts, A. Lynn)

Source: ENVIRONMENTAL SCIENCE & TECHNOLOGY Volume: 53 Issue: 20 Pages: 11764-11773 DOI: 10.1021/acs.est.9b03645 Published: OCT 15 2019

Title: Effect of pH and Subgrade Type on Trace-Metal Leaching from Steel-Slag Embankments into Groundwater

Author(s): Dayioglu, AY (Dayioglu, Asli Y.); Aydilek, AH (Aydilek, Ahmet H.)

Source: JOURNAL OF MATERIALS IN CIVIL ENGINEERING Volume: 31 Issue: 8 Article Number: 04019149 DOI: 10.1061/(ASCE)MT.1943-5533.0002777 Published: AUG 1 2019

Abstracts/Conference Proceedings

Cosans, C.L., Moore, J., Gomes, M.L., Harman, C.J. (2019) Finding the culprit of elevated sulfate in (sub)urban streams: Source identification and transport dynamics using sulfur isotopes and intensive sampling. Gordon 2019 Catchment Science: Interactions of Hydrology, Biology and Geochemistry., Andover NH, June 23, 2019 - June 28, 2019.

Marsh M., Moore J. (Dec. 2019) Using high-frequency data and concentration-discharge relationships to describe solute mobilization and transport in suburban and urban watersheds. American Geophysical Union Fall Meeting, San Francisco, CA.

Talbot-Wendlandt, H. and Prestegaard, K. (2019) Examination of Suspended Sediment-Discharge Relationships to identify changes in sediment sources in an Urbanized Watershed: American Geophysical Union 2019 annual meeting.

Information Transfer Program

Nothing to report

Student Support

Graduate	3
Undergraduate	3 research (+10 in upper-level field classes)

Notable Achievements and Awards

Haley Talbot-Wendlandt (2019MD128B) was awarded the 2019-20 Green Fellowship in Global Climate Change at the University of Maryland

Investigating Precipitation Patterns In Maryland: Implications For Infrastructure Design And Planning

Project Type: Annual Base Grant
Project ID: 2019MD126B

Project Impact:

The PI/MWRRC Director has participated in meetings with communities on Maryland's Eastern Shore (Delmarva Peninsula), where there is considerable interest in predicting future rainfall. Currently, infrastructure design in Maryland requires consideration of future land use. Our preliminary results show that potential precipitation changes can alter watershed runoff much more than land use change. Much work needs to be done in communicating this finding to communities and decision makers. It is also important to analyze uncertainty in the results, and communicate that as well.

Why Is Sulfate Elevated In (sub)urban Watersheds? Fingerprinting Sources Of Sulfate In Forested, Suburban, And Urban Streams

Project Type: Annual Base Grant
Project ID: 2019MD127B

Project Impact:

(Joint project with 2019MD129B)

Atmospheric deposition of sulfate was considered a major source of acidity to streams in the eastern US before the Clean Air Act limited sulfur dioxide emissions. In unglaciated regions like Maryland, the decrease in sulfate concentrations in streams is less than would be expected due to decreased atmospheric deposition. Additionally, in Maryland, (sub)urban streams with high sulfate are not substantially more acidic than streams with lower sulfate concentrations, implying that atmospheric deposition is not a major source.

Sampling and analysis were hindered by COVID-19 restrictions on activities. Based on partially completed analysis: Concentration-discharge relationships for sulfate in the low-density suburban watershed (Baisman Run) and urban watershed (Herring Run) indicate differing transport patterns during storm events and likely point to differing sulfur sources. At the suburban Baisman Run, the near-surface soil sulfate may be transported to the stream via interflow of soil water that arrives at the stream during the falling limb. The overall patterns at Herring Run suggest a system dominated by flushing and dilution, almost certainly because of fast inputs of water directly from impervious surfaces. The addition of isotope data for sulfate from a storm event will help elucidate and clarify patterns suggested by concentration-discharge data.

Understanding the sources of sulfate in (sub)urban streams will yield valuable insights on biogeochemical cycling and how cycling is altered by urbanization. Also, given the potential connections between sulfate and nitrogen cycling, our results may be useful in efforts to reduce nitrogen fluxes to the Chesapeake Bay.

Evaluating Seasonal Variations In Where Trees Get Their Water

Project Type: Annual Base Grant
Project ID: 2019MD128B

Project Impact:

(Summer Graduate Fellowship)

Plant transpiration is directly related to biomass productivity, and it represents (as the main component of evapotranspiration, ET) the primary outflow component of the water balance in temperate environments. Therefore, it is important to understand where trees draw water for transpiration and how this varies with topography and climate. A seasonal variation in groundwater level was observed. During the summer months (July and August), the groundwater table reaches a minimum. This supports the hypothesis that the trees are influencing groundwater by drawing water out for transpiration during warmer months. The groundwater level also displays a diurnal pattern, which is observable on short time scales, with the levels dropping more steeply during the day and leveling off overnight. This is consistent with trees removing water from groundwater storage or capillary storage during daylight, with little response at night. The lack of groundwater recovery at night indicates that there is little groundwater flow into the site from adjacent hillslopes. Future comparison of water table response decline rates in the spring-summer with recovery rates in the fall-winter will be used to evaluate whether groundwater levels decline due to a) withdrawal of infiltrating water so that it doesn't recharge the water table, or b) roots pulling water from below the water table.

Why Is Sulfate Elevated In (sub)urban Watersheds? Fingerprinting Sources Of Sulfate In Forested, Suburban, And Urban Streams

Project Type: Annual Base Grant
Project ID: 2019MD129B

Project Impact:

(Joint project with 2019MD127B)

See Project Impact statement for 2019MD127B

Dynamic Measurements Of Flow And Sediment Transport Through Urban Stream Confluences

Project Type: Annual Base Grant
Project ID: 2019MD130B

Project Impact:

The project was designed to evaluate hydraulics and sediment transport in urban tributary junctions. Urbanization and channelization shorten the time between rainfall and hydrograph peaks. We hypothesized that flashy urban streams would generate almost synchronous flood peaks, enhancing tributary scour and downstream sediment transport. We instrumented one tributary junction in detail (water level recorders and scour monitors) and evaluated sediment deposition after flow events. We also used USGS gauge data and field monitoring of sediment deposition at 2 other tributary junctions. Storm intensity, which influences urban storm peaks, can vary over short distances, resulting in variations in peak discharge and a variety of hydraulic differences between the tributary pairs at all 3 tributary junctions. Suspended sediment load contributions from each tributary also varied among storm events. We found that storage of fine sediment in upstream alluvial reaches of river generated high variability of suspended sediment inputs to the tributary junctions.

Due to Covid-19 restrictions, we focused less on one tributary junction and evaluated responses at 3 tributary junctions. We could not work in the field in large groups; therefore, the PI worked individually with 3 undergraduate senior thesis students, each on a different project. One graduate student also worked on the project and gave a presentation at the Fall 2019 AGU meeting. Planned presentations at 2020 meetings were canceled. The graduate student partially supported by the project defended her M.S. thesis in Summer 2020. Senior thesis students and the PI are currently writing up results for publication.