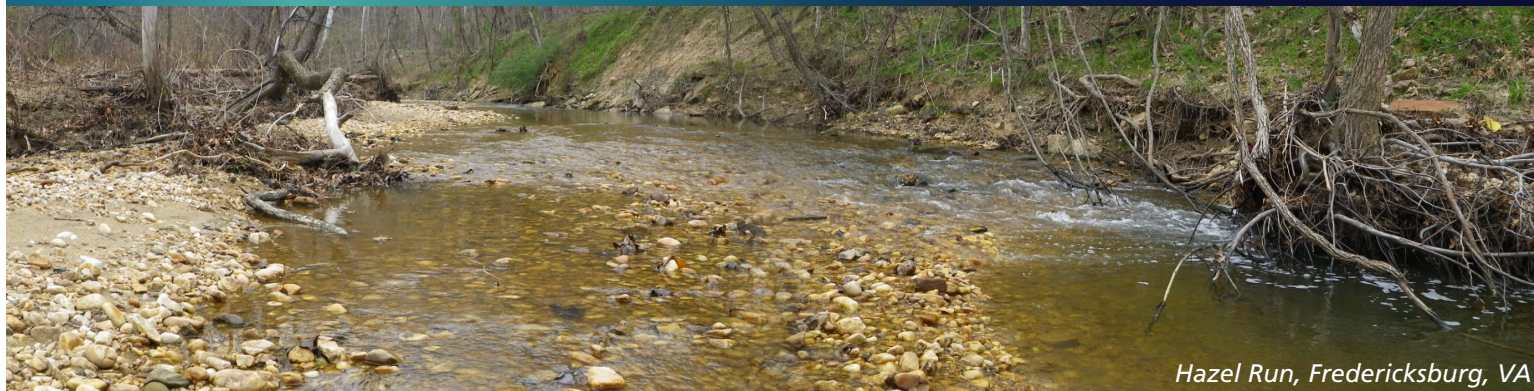




Mid-Atlantic Network

Water Quality Resource Brief



Hazel Run, Fredericksburg, VA

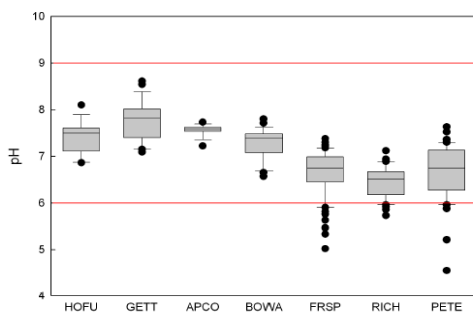
2010 Status & Trends

During the summer of 2010, pilot testing for water quality monitoring was initiated across the entire Mid-Atlantic Network. We are now sampling water quality at over 50 sites in more than 40 rivers and streams. From June through December, approximately 300 site visits were recorded and more than 125 water samples were collected and delivered to the University of Virginia for analysis. This analysis will increase our understanding of how stressors, such as acid deposition (e.g. acid rain) and the input of excess nutrients, affect Mid-Atlantic streams.

Given the number of sites and the frequency that samples are collected, this program would not succeed without the help of resource managers throughout the network, the U.S. Geological Survey, and the outstanding volunteer teams at Booker T. Washington NM and

Hopewell Furnace NHS. The Mid-Atlantic Network provides equipment, training, supplies, and support to each park; the parks collect data and water samples which are shipped to the laboratory. This partnership between network staff and park resource managers has been critical to the implementation of the program.

As we approach the first year of sam-



Stream acidity (pH) varies across network parks, with 50% of the values falling within the gray box and 80% between the two bars. Red lines indicate state (PA and VA) minimum and maximum standards for pH.

Objectives

1. Document the status and trends in water quality and flow.
2. Determine the natural range of variability in water chemistry.
3. Detect water quality measures that exceed threshold values and determine their compliance with state and federal water quality standards.
4. Document changes in stream channel characteristics at sampling sites.

pling, a clear picture of the status of water quality in streams throughout the network is emerging. Using exploratory data analysis tools, information concerning water quality in the Mid-Atlantic streams can be revealed. This information will help guide the development of a final protocol for long-term monitoring.



Appomattox River,
Appomattox, VA

Importance

Streams in the Mid-Atlantic region are located in a highly fragmented landscape where watersheds and national parks are intersected by agricultural, forested, and urbanized lands. Land-use and watershed attributes, like soil chemistry, have a direct effect on water quality. Watershed soils can act to buffer against stream acidification by providing ion exchange sites. Urbanized and agricultural watersheds can lead to increased erosion rates and excess nutrient loading to surface waters.

By examining water quality, we can reveal stressors that are affecting aquatic communities within park boundaries and beyond. For example, stream acidification can have an immediate effect on the health of streams within park lands. While other stressors, like excess nutrients, may not have an appreciable effect until they reach receiving waters (e.g. Chesapeake Bay) where hypoxia (low dissolved oxygen) events can lead to biological "dead" zones and fish kills.

Management Applications

- Identify threats to maintaining stream flow and determine where restoration efforts are needed.
- Identify and improve water quality of impaired waters.
- Maintain high water quality where it exists.



Long-term Monitoring

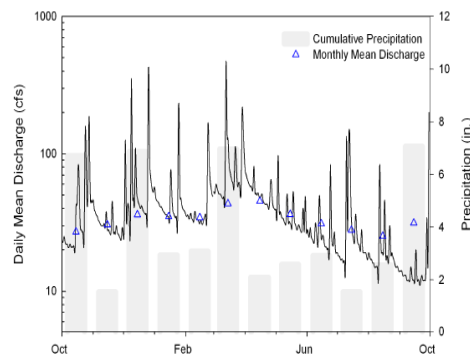
A pilot testing phase has been initiated to assess water quality within Mid-Atlantic parks. This assessment consists of two major components: in-situ (in stream) characterization and chemical analysis. At each water quality sampling site, in-situ variables (temperature, specific conductance, pH, dissolved oxygen) are measured using a portable multi-parameter sonde. Additionally, qualitative observations on stream condition are recorded regarding weather, discharge stage, and turbidity. For chemical analysis, water samples are collected at a subset of the sites and delivered to an analytical laboratory at the University of Virginia. These samples are processed to obtain data regarding chemical attributes of the stream water including major an-

ions (Cl , NO_3 , NH_4 , PO_4 , SO_4) and cations (Ca , Mg , K , Na), acid neutralizing capacity (ANC), dissolved organic carbon (DOC), inorganic monomeric aluminum, and silica.

A total of 51 water quality sites has been established within Mid-Atlantic parks. On a monthly basis, 39 of these sites are sampled for in-situ characterization and at 14 of these sites, water samples are collected. Quarterly (Feb., May, Aug., Nov.), 12 additional sites are included in the in-situ characterization and water samples are obtained at 29 of the 51 sites. The pilot testing phase will help us understand the conditions at each stream, determine the number of sites to be monitored long-term, and the frequency they should be sampled.

Status & Trends...

In Valley Forge NHP, an alternate approach to assessing water quality has been taken by the network. In response to the unique concerns of the park management, the network has joined with the Chester County Water Resources Authority and the USGS to support continuous monitoring of discharge and turbidity data in Valley Creek. Network staff will generate reports regarding water quality based on the data collected and processed by the USGS to address these concerns. The network is current-



Daily mean discharge (ft^3/s) of Valley Creek for water year 2010 (Oct. 2009 - Sept. 2010) with monthly cumulative precipitation values, which help to explain patterns in stream discharge.

ly working with natural resource staff to refine this reporting so that the information generated can be integrated into park management decision making and that metrics identified in the resource stewardship strategy are reported.

As the water quality monitoring program gets off the ground, resource managers will be engaged by network staff to ensure a high-quality protocol is developed that is relevant to park management throughout the network.

Design by Heather Dammeyer, photos by Appomattox Court House NHP and Nathan Dammeyer.

Acknowledgements

We would like to thank all of our partners in monitoring water quality in the Mid-Atlantic Network. Especially the outstanding volunteer teams at Booker T. Washington NM (Guy Buford, Jean and Lee Borgman, Marshall Daniels, De English, Connie Hylton, Don Kelso) and Hopewell Furnace NHS (Martey Costello, John Hoekstra, Jim Thorne). We would also like to thank the Natural Resource Managers for their continued support of water quality monitoring in the Mid-Atlantic Network including Kristen Allen, Steve Ambrose, Tim Blumenshine, Brian Eick, Kristina Heister, Gregg Kneipp, Sara Koenig, and Timbo Sims. Additionally, we would like to recognize our collaborators, Rick Webb, Suzanne Maben, and Frank Deviney from the University of Virginia and the USGS staff in Exton, PA.



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Parks monitored: Appomattox Court House NHP • Booker T. Washington NM • Eisenhower NHS • Fredericksburg & Spotsylvania NMP • Gettysburg NMP • Hopewell Furnace NHS Petersburg NB • Richmond NBP • Valley Forge NHP