

HEADWATERS

PUBLICATION OF MARYLAND SEA GRANT EXTENSION WATERSHED EDUCATORS

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DEAR READERS:

We are enthusiastic to share with you our third volume of Headwaters. Our ongoing dedication to delivering unbiased and science-driven information through Headwaters has improved partnerships and generated success stories across the Chesapeake Watershed. In the coming year, we hope you will use Headwaters to stay informed on the latest stormwater science and programs involving the Extension Watershed Team.

In this issue, you will find articles that exemplify the breadth of our reporting. We delve into the science of **salt, soils, and social norms** and then **introduce Sarah Wilkins**, who is a critical new collaborator for climate science as the Chesapeake Bay’s Sentinel Site Coordinator.

For more information on how we support Chesapeake Bay restoration, please visit our website, www.extension.umd.edu/watershed.

Sincerely,

The Maryland Sea Grant Extension Watershed Educators Team



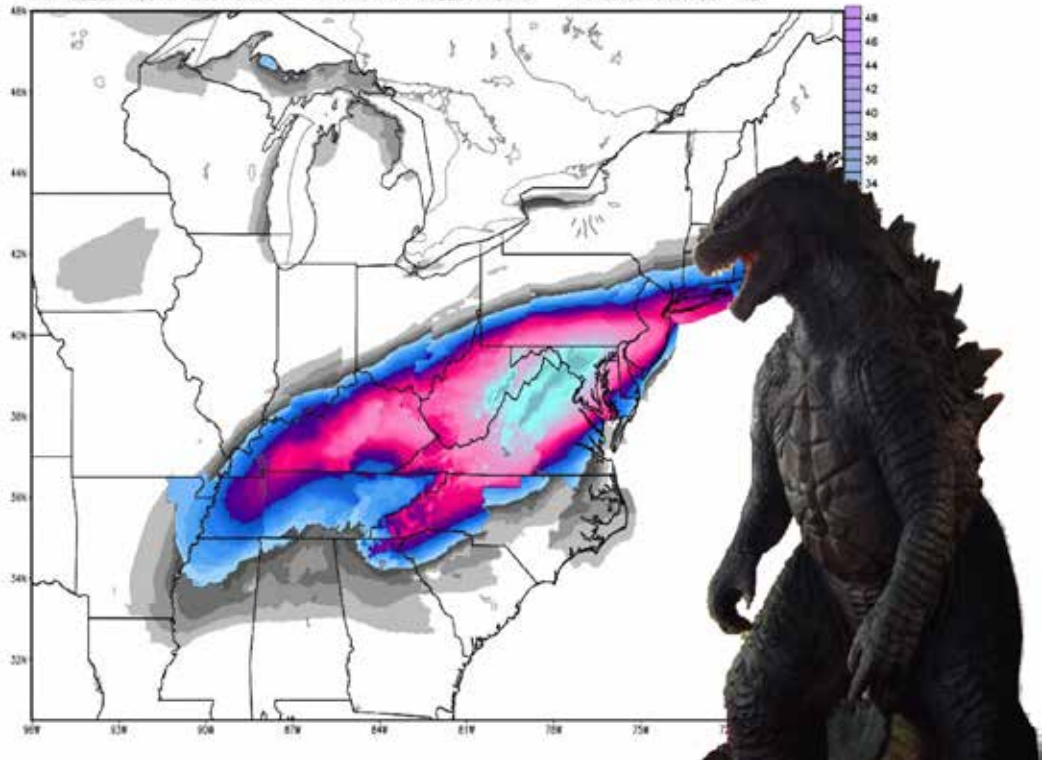


SNOWZILLA VS. CLEAN WATER

+ KRISZTIAN VARSA

+ SALT ATTACKS OUR WATERWAYS

NCEP NDFD Snowfall Accumulation [inches] between 15Z22JAN2016-00Z25JAN2016 Max 38.0 inch
Init: 15Z22JAN2016 Accumulation --> thru Mon 00Z25JAN2016 Forecast issuance: 15Z



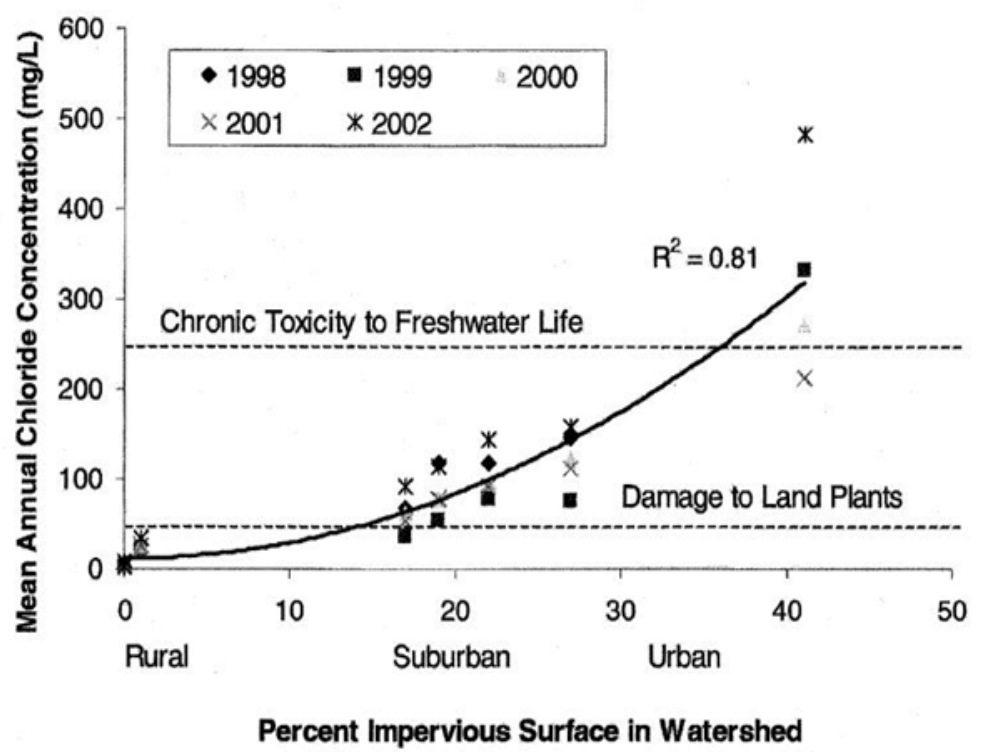
Appropriately nicknamed “Snowzilla,” the recent storm that crippled Maryland for more than a week delivered eye-popping snowfall across the state. Nearly thirty inches fell in Baltimore and elevated western areas received nearly 40 inches of snow. The extreme storm led jurisdictions and residents to

apply deicers in the form of salt and brine to reduce the snow’s impacts before, during, and after the storm. Prior to the storm, the Maryland State Highway Administration (SHA) alone prepared **365,000 tons**, or 730 million pounds, of salt which is the equivalent weight of 1,700 adult blue whales or 30,000 school





“Snowzilla could have caused over 400 million pounds of salt to enter Maryland’s waterways.”



busesⁱ. Another name for snow might be “delayed stormwater,” and like stormwater, it will melt and deliver whatever material is on hard surfaces to local waterways. According to the [Baltimore Ecosystem Study](#) approximately 55% of the deicing material used in Maryland is carried away in

surface runoffⁱⁱ. Therefore, using a very rough estimate based on the SHA salt preparation, Snowzilla could have caused more than 400 million pounds of salt to enter Maryland’s waterways. The chloride compounds and deicers result in unnatural and potentially toxic levels





“The easiest and best way to reduce deicer application is by shoveling snow instead.”

of chloride in local streams and the sensitive Bay estuary, causing changes to the plant and animal life in the waterways. Further, high chloride levels increase the corrosiveness of water, and high corrosiveness can leach lead from the drinking water pipes, as evidenced by the recent emergency in Flint, Michigan.

Alternative, more ecologically-friendly deicers are being considered across the country and some of these include cheese brine, beet molasses, and calcium magnesium acetate. However, chemicals are not the only solution, and everyone can help reduce the chloride entering their local stream using these ideas:

- The easiest and best way to reduce deicer application is by

shoveling snow instead. Help your neighbor or ask for help- this is a great way to spend time outdoors in the winter with your community!

- If you do use deicer, it is important to use nontoxic deicing substances. Consider natural solutions to improve traction such as biodegradable cat litter, sand, or fireplace ash to keep your local stream clean. 💧

ⁱ <http://wtop.com/winter/2016/01/va-governor-declares-state-of-emergency-ahead-of-winter-storm/>

ⁱⁱ Baltimore Ecosystem Study Virtual Tour, Chloride. http://www.beslter.org/virtual_tour/Chloride.html





THE STORMWATER BACHELOR RETURNS

+ AMANDA ROCKLER
+ SOCIAL NORMS DRIVE
DECISION MAKING



Last week, two members of the watershed team were in Charleston, South Carolina for the Social Coast Conference, and amidst giving three presentations in two days, we squeezed in time to watch The Bachelor. Although “crazy Olivia” was sent home a few weeks ago, Bachelor nation continues to watch in rapture as the remaining four contestants vie for Bachelor Ben’s heart. This is an unusual argument, but I feel that The Bachelor highlights amazing things about human behavior and social norms.

As a reminder, social norms are the rules of behavior that are considered acceptable in society. Social norms help to establish a structure for human interactions and define the expectations of almost all social situations.

As I was contemplating how I could take lessons learned from The Bachelor and translate them into stormwater, Mary E. Allen from East Carolina University (ECU) presented her work on “norm power” and the link became a bit clearer.





“Consider recycling, which until recently had very little norm power.”

Mary shared that, “the power of social norms lies in the behavioral obligations imposed by a group, and in the informal sanctions enforced by others or felt by one’s self when conforming to or violating those obligations.” In other words, with a high-powered social norm, individuals have high obligation and high possibility of embarrassment. A low norm power is the inverse, where individuals feel low obligation and low embarrassment.

On *The Bachelor*, contestants have a high obligation to stay on the show and compete for a rose, and a high level of embarrassment when they do not receive a rose and are sent home. This creates a perfect combination for achieving norm power within *The Bachelor* community.

So how can we harness this norm power for stormwater improvement? If we want people to change their behavior (e.g. pick up pet waste, plant native plants,

install a rain barrel or rain garden), we need to make those behaviors high-powered social norms. Consider recycling, which until recently had very little norm power. People were influenced to use their recycling bin through social obligation and embarrassment for being the only house on the block not using their recycling bin. Recycling bins continue to be a high-powered social norm in neighborhoods that have recycling pick up.

Understanding the potential obligations of a target audience is critical for creating social norms. Armed with that information, we can develop communication and intervention strategies to target specific behaviors. You never know what you can learn about stormwater from the Bachelor, so let’s keep watching and learning as the remaining contestants continue to fight for Bachelor Ben’s rose/heart. 💧





SOILS – NATURE’S SECRET WEAPON TO ACHIEVE BETTER WATER QUALITY

+ ERIC BUEHL

+ UNEARTHING THE
COMPLEXITY OF SOIL

In Maryland, it was a time when the leading industry was manufacturing men’s clothing and nearly six million bushels of oysters were harvested from the Chesapeake Bay. It was also a time before jet airplanes and World War II. At least that is what I learned as I thumbed through my set of 1925 World Book encyclopedias. In these

pages, sandwiched between School Garden and the Trojan War, I found the entry for “Soil.” The entry read like an essay on geology and morphology, emphasizing soil’s formation and basic composition and making only limited references to its hidden complexities.

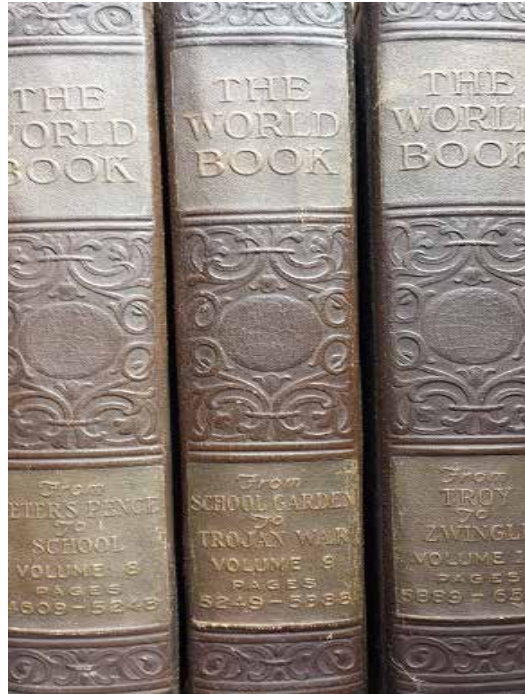


Natural Resources Conservation Service Soil Scientist James Brewer performing the ribbon test to check soil texture while out in the field.





“We discovered that soil is not simply an abiotic resource for humans to build upon or grow food in.”



1925 may have been a good year for F. Scott Fitzgerald and Nellie Tayloe Ross, but not for information about the diversity of life in soils.

In 1925, our understanding of the microscopic world was limited to what could be touched, separated, placed under a simple microscope, or subjected to basic chemical analyses. As technology advanced, so did our understanding of the complexity of life contained in the soil. We discovered that

soil is not simply an abiotic resource for humans to build upon or grow food in, but one that supports and sustains a diverse community of life. Our new definition of soil shows an appreciation for it as a living ecosystem, and includes words such as “living,” “biologically active,” and “symbiotic.” We’ve discovered that even a small amount of soil can be home to hundreds of thousands of living organisms including protozoa, fungi, bacteria, nematodes, arthropods, and earthworms. And only very recently have we begun to truly develop an understanding of the inter-relationships that exist between life in the soil and many of its physical and chemical properties.

Our improved understanding of soils’ ability to filter, immobilize, and degrade certain contaminants led to





“Stormwater engineers might recommend adding a layer of biosoil mixture in a bioretention facility.”

the evolution of stormwater runoff treatment. In the past, emphasis was placed on using large wet and dry stormwater ponds to “cleanse” runoff. Now we employ contaminant-reducing native soil in a rain garden to bind phosphorus from runoff. Or, stormwater engineers might recommend adding a layer of biosoil mixture in a bioretention facility to trap oil from a parking lot. These changes in our understanding of soils have led to changes

in practice, which truly acknowledge soils’ significance in improving water quality in the Chesapeake Bay.

To learn about soils in your area, check out SoilWeb at <http://casoilresource.lawr.ucdavis.edu/gmap/> or for information about soil health, visit the Natural Resources Conservation Service’s website <http://www.nrcs.usda.gov/wps/portal/nrcs/site/soils/home/>. 💧





A FOCUS ON SEA LEVEL RISE AND COASTAL INUNDATION

+ SARAH WILKINS

+ A NEW COORDINATOR
FOR THE CHESAPEAKE
BAY SENTINEL SITE
COOPERATIVE



National Oceanic and Atmospheric Administration (NOAA) tide gauges indicate that relative sea levels around the Chesapeake Bay are rising 3.4 millimeters per year, or twice the average global rate. In fact, during the last century, relative sea level has risen over 1 foot in the Chesapeake Bay. Rising water levels and land subsidence — or the sinking of land — combine to cause relative sea-level rise. And as relative sea level rise continues to increase, it

no longer takes a hurricane or Nor'easter to cause localized flooding.

According to the U.S. Geological Survey, or USGS, the southern portion of the Bay has subsided at a rate of 3 millimeters per year since 1940. This is due to a combination of glacial isostatic adjustment — the rise or fall of a land mass that was depressed by the weight of ice during the last glacial



“The combination of rapidly rising waters and sinking land means more land is at risk of going underwater at a faster rate.”

period — and water withdrawn from the ground to meet demand from urban centers. The combination of rapidly rising waters and sinking land means more land is at risk of going underwater at a faster rate. As you would expect, this is on the minds of many low-lying communities around the Bay. A recent publication in the journal *Nature* warns that rising sea levels could make the citizens of Tangier Island, Virginia, among the first climate-change refugees in the continental United States.

Cue the **Chesapeake Bay Sentinel Site Cooperative**, or CBSSC. Established by NOAA in 2012, the purpose of the CBSSC is to provide long term data, information, tools, and educational resources, derived from local observations collected at sentinel sites, to improve planning and management decisions regarding rising sea levels and inundation. Comprised of seven ecological sentinel sites, each site collects

long-term data, including marsh elevations, water levels, water quality, and vegetation type and distribution. The CBSSC extends from the mouth of the bay just north of Virginia Beach to the bay’s source, east of Havre de Grace, Maryland, where it meets the Susquehanna River.

CBSSC sentinel sites include the Chesapeake National Estuarine Research Reserves in Maryland and Virginia, Assateague Island National Seashore, the Virginia Coast Long-term Ecological Research project, Smithsonian Environmental Research Center, Blackwater National Wildlife Refuge, and the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island. The CBSSC also connects to — and relies on — broader observing networks such as NOAA’s **Chesapeake Bay Interpretative Buoy System**, or CBIBS.





“The resilience and health of these sites could be a harbinger of what’s to come for much of the Chesapeake.”

The sentinel sites cover a diverse range of wetland types, including tidal freshwater marshes, back-barrier lagoons, estuarine brackish marshes, and managed wetlands. Seen as “sentinels” across the landscape, these sites serve as the proverbial “guards in a watchtower” or “canaries in a coal mine” across the Bay. The resilience and health of these sites could be a harbinger of what’s to come for much of the

Chesapeake. Stay tuned to hear more about these key sites and collaborative effort!

Sarah Wilkins joined Maryland Sea Grant Extension as the Coordinator of the Chesapeake Bay Sentinel Site Cooperative in August, 2015. 💧



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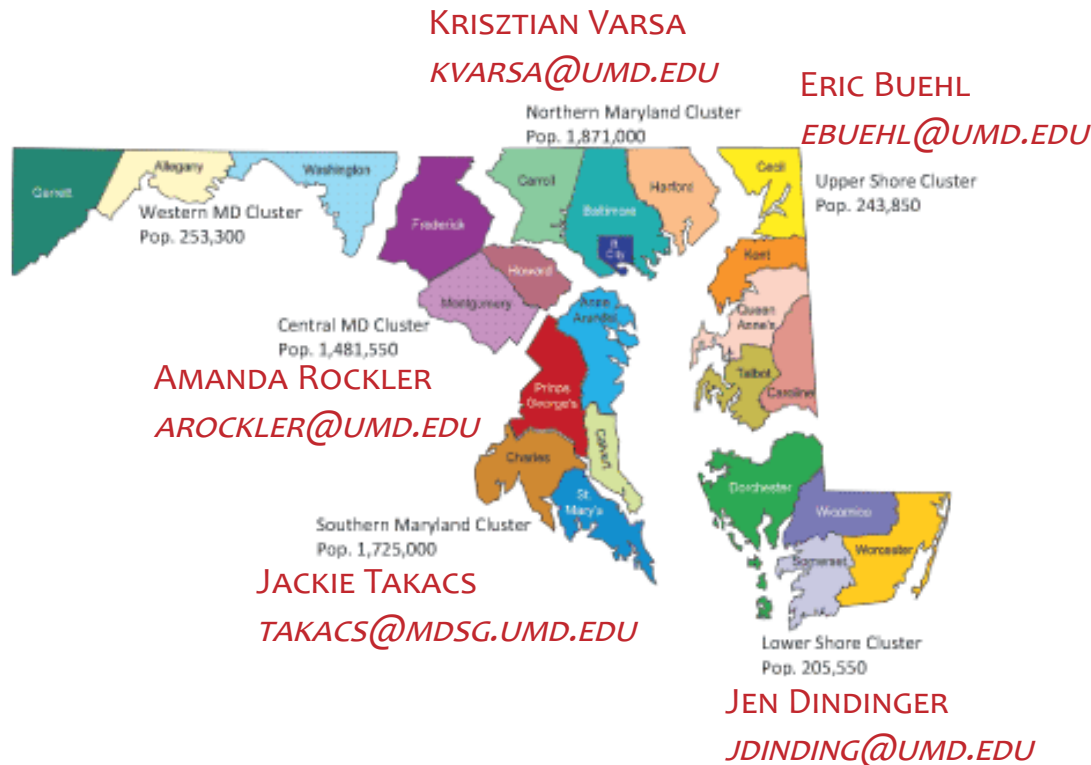
Headwaters is a publication providing information and resources for Extension and watershed protection professionals. It is a joint production of the University of Maryland Extension and Maryland Sea Grant Program. If you have any comments, questions, or ideas for Headwaters, please contact the Editor:

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WHO'S YOUR WATERSHED SPECIALIST?



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