Summary of the Precision Conservation Workshop

Susquehanna University, Selinsgrove, Pennsylvania - September 16, 2016

Background

On Friday, September 16, 2016, conservation and restoration professionals joined researchers and data analysts to learn about how the Chesapeake Conservancy is using data and technology to identify and prioritize restoration opportunities along impaired waterways in Pennsylvania. The meeting was held at the Freshwater Research Institute at Susquehanna University in Selinsgrove, Pennsylvania. The presenters included staff from the Chesapeake Conservancy, a non-profit environmental organization based in Annapolis, Maryland.

The motivation for this meeting was Pennsylvania's stated need to accelerate progress toward the Chesapeake Bay Total Maximum Daily Load (TMDL), established by the U.S. Environmental Protection Agency (EPA) in 2010. The TMDL is a historic and comprehensive "pollution diet" to restore clean water in the Chesapeake Bay and the region's streams, creeks, and rivers.

Amid increasing pressure from the EPA to increase progress in reducing nitrogen and sediment pollution, the Pennsylvania Departments of Environmental Protection (DEP), Agriculture (PDA), and Conservation and Natural Resources (DCNR) collaborated to develop "A DEP Strategy to Enhance Pennsylvania's Chesapeake Bay Restoration Effort," released in January 2016. The Conservancy's presentation addressed several recommendations outlined in the document, including:

- *"Accelerat[ing] the installation of forest riparian buffers"*
- *"Putting science-based, high-impact, low cost projects on the ground and working with partners in a focused manner"*
- *"Improving reporting, record keeping, and data systems"*

The Chesapeake Conservancy defined Precision Conservation as "getting the right practices in the right places, and at the right scale." A concept that has existed for decades, the Conservancy described how newly available high-resolution datasets created by the Conservancy are being newly applied to precision conservation. Significant advancements in the quality of datasets that describe the interactions between land and water have resulted in the creation of innovative GIS-based tools that can highlight the greatest opportunities for achieving water quality benefits at the parcel-scale. The results can then be scaled-up, helping to set goals and track progress across the entire Susquehanna River watershed.

The Conservancy described the new datasets and offered case studies where the organization is working with partners through its *Envision the Susquehanna*[1] initiative to set and meet conservation and restoration goals in Pennsylvania.

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1 *Envision the Susquehanna* is a collaborative effort of federal, state, local, academic, and non-profit organizations working throughout the Susquehanna watershed to improve the ecological and cultural integrity throughout the Susquehanna landscape and improve the quality of life for all citizens along the river.

The Datasets

High-resolution land cover classification[2]

The Chesapeake Conservancy and partners have recently completed a high-resolution land cover classification dataset across the Chesapeake Bay watershed. The new data replaces the commonly used 2006 National Land Cover Dataset that has a resolution of 30 meters by 30 meters with 2013 data at a resolution of 1 meter by 1 meter. It is freely available for download and covers 100,000+ square miles of the Chesapeake Bay Watershed. With 12 land cover classes, including new classes such as tree canopy over impervious surfaces, roads, and structures, the data enable users to carry out site-level analyses. The data will inform the Chesapeake Bay Program's Phase 6 Total Maximum Daily Load model, and will be available through the Chesapeake Bay Program and Chesapeake Conservancy's website in late 2016.

High resolution concentrated flow path mapping[3]

The Chesapeake Conservancy is also mapping where water tends to flow across the landscape before it reaches the stream channel, which can be described as "concentrated flow paths." This data also improves on the existing National Hydrography Dataset (NHD) by more accurately mapping the stream edge where the water meets the land. This concentrated flow path mapping methodology identifies 0 and 1st order streams, which research has shown can contribute substantial amounts of nutrient and sediment pollution into larger waterways. The Conservancy uses a combination of datasets and a Digital Elevation Model to identify how water moves across the landscape, an estimation of channel width based on the expected flow accumulation at a certain point, and the pixels identified as water in the land cover classification to map concentrated flow paths and stream channels. This mapping will be completed for the entire Susquehanna River Watershed and be available for download on the Chesapeake Conservancy's website in late 2016.

Applications

I. Riparian buffer analysis

The Conservancy demonstrated how a combination of the high resolution land cover and flow path datasets can identify, with high accuracy, the amount and locations of gaps in riparian forested buffer coverage. Within a buffer width of 35 ft. from the stream edge, the Conservancy identified gaps as any land cover type that did not include shrub-scrub, forest, or wetlands. Once a baseline buffer analysis is established, the data can be used to help prioritize restoration projects that may intercept the greatest amount of runoff, and can quantify the amount and classes of land area draining through a specific point. A riparian forest buffer gap analysis will be available on the Chesapeake Conservancy's website in late 2016.

Case study: Riparian Buffer Restoration Prioritization in Partnership with Trout Unlimited[4]

Kettle Creek Watershed, Pennsylvania

Working with Trout Unlimited, the Chesapeake Conservancy has carried out a riparian buffer analysis of the Kettle Creek Watershed, within the West Branch Susquehanna River watershed. When compared to the NHD stream data, the Conservancy's stream data identified an additional 100 acres of restoration opportunities within this watershed. The Conservancy is now working with Trout Unlimited to set restoration goals within the watershed and develop a prioritization methodology for future projects.

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[2] Support provided by the Chesapeake Bay Program, through a cooperative agreement between the Chesapeake Conservancy and the National Park Service funded through an interagency agreement with the Environmental Protection Agency.

[3] Support provided by the Richard King Mellon Foundation and the Foundation for Pennsylvania Watersheds

[4] Support provided by the Richard King Mellon Foundation, the Foundation for Pennsylvania Watersheds, and a cooperative agreement from the U.S. Department of Interior, Fish and Wildlife Service; Wildlife Management Institute; and the North Atlantic Landscape Conservation Cooperative.

II. Urban Best Management Practice (BMP) Prioritization and Reporting

In the urban sector, municipalities with regulated Municipal Separate Storm Sewer Systems (MS4s) are required to report to the DEP progress toward meeting their Chesapeake Bay Pollution Reduction Plans (CBPRPs). The prioritization and reporting challenges to MS4s are two-fold. First, due to the nature of Pennsylvania's localized government, municipalities vary significantly in their technical capacity to identify high quality projects and produce the technical information required for reports. Second, disparate sources of data utilized by municipalities result in reports with varying confidence in the nutrient and sediment load reduction estimates, making it difficult for the county to compare and prioritize projects.

Case Study: York County Stormwater Consortium BMP Reporting Tool[5]

York County, Pennsylvania

To address the challenges described above, the Conservancy worked with the York County Stormwater Consortium to develop a customized, user-friendly, web-based tool that delivered the technical information needed to complete the CBPRP reports. Conservancy staff worked closely with focus groups and municipal and county staff to create a custom product and secure user buy-in, resulting in cost and time efficiencies for the Consortium, as well as an increased understanding of how individual stormwater projects interact with the landscape. In future years, the Conservancy plans to continue working with York County stakeholders to allow a user, regardless of GIS capacity, to use the tool to identify the most cost-efficient stormwater projects, and to develop a long-term plan to achieve the County's Chesapeake Bay goals.

III. Agricultural BMP Prioritization and Design

The datasets and tools created by the Conservancy have tremendous potential to help identify, prioritize, and design agricultural BMPs. In concert with other prioritization mechanisms, the Conservancy is exploring how flow path mapping and land cover data can help inform site-specific project design. For example, the Conservancy has identified 16 agricultural BMPs from the DEP's 2006 Stormwater BMP Manual where a greater understanding of land cover and concentrated flow paths could help inform project design and set priorities and goals at the watershed scale.

Case Study: Implementing Precision Conservation in the Susquehanna River Watershed[6]

Clinton and Centre Counties, Pennsylvania

The Conservancy is now working with the Chesapeake Bay Foundation, the DCNR, and Susquehanna and Bloomsburg Universities to engage agricultural restoration professionals in Clinton and Centre Counties and identify opportunities to integrate datasets into their workflow, and develop a mechanism to deliver this information to on-the-ground partners in a meaningful way. Through this three-year project, the Conservancy and its partners will hire a new Susquehanna Technical Coordinator, implement 5-8 agricultural restoration projects, carry out pre-and post-construction stream monitoring, develop a custom web-based tool for local partners, and export this process to other regions throughout the Susquehanna River watershed.

Conclusion

The Chesapeake Conservancy will continue to build "innovation hubs," like Kettle Creek Watershed, York County, and Clinton and Centre Counties, throughout the Susquehanna River Watershed to demonstrate real-world applications of newly created, high-resolution datasets. The Conservancy is dedicated to the meaningful delivery of these datasets to on-the-ground partners, and committed to working with partners at the local, state, and regional scale to identify the best opportunities to restore the Susquehanna River watershed, and in so doing, restore the Chesapeake Bay.

5 Support Provided by the York County Community Foundation and the Kinsley Foundation.

6 Support Provided by the National Fish and Wildlife Foundation, the Chesapeake Bay Program, and the Environmental Protection Agency.