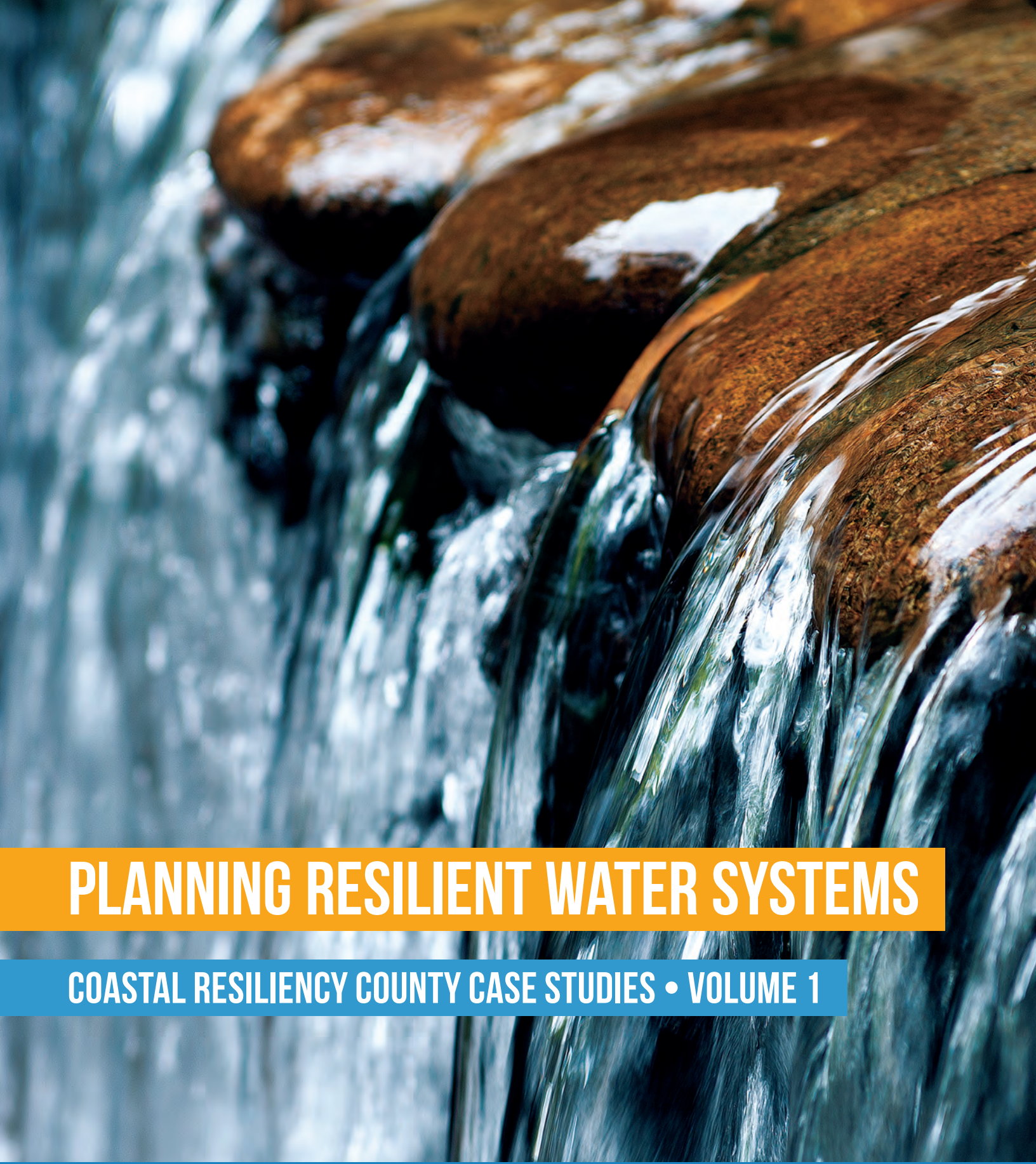

PLANNING RESILIENT WATER SYSTEMS

COASTAL RESILIENCY COUNTY CASE STUDIES • VOLUME 1

July 2014

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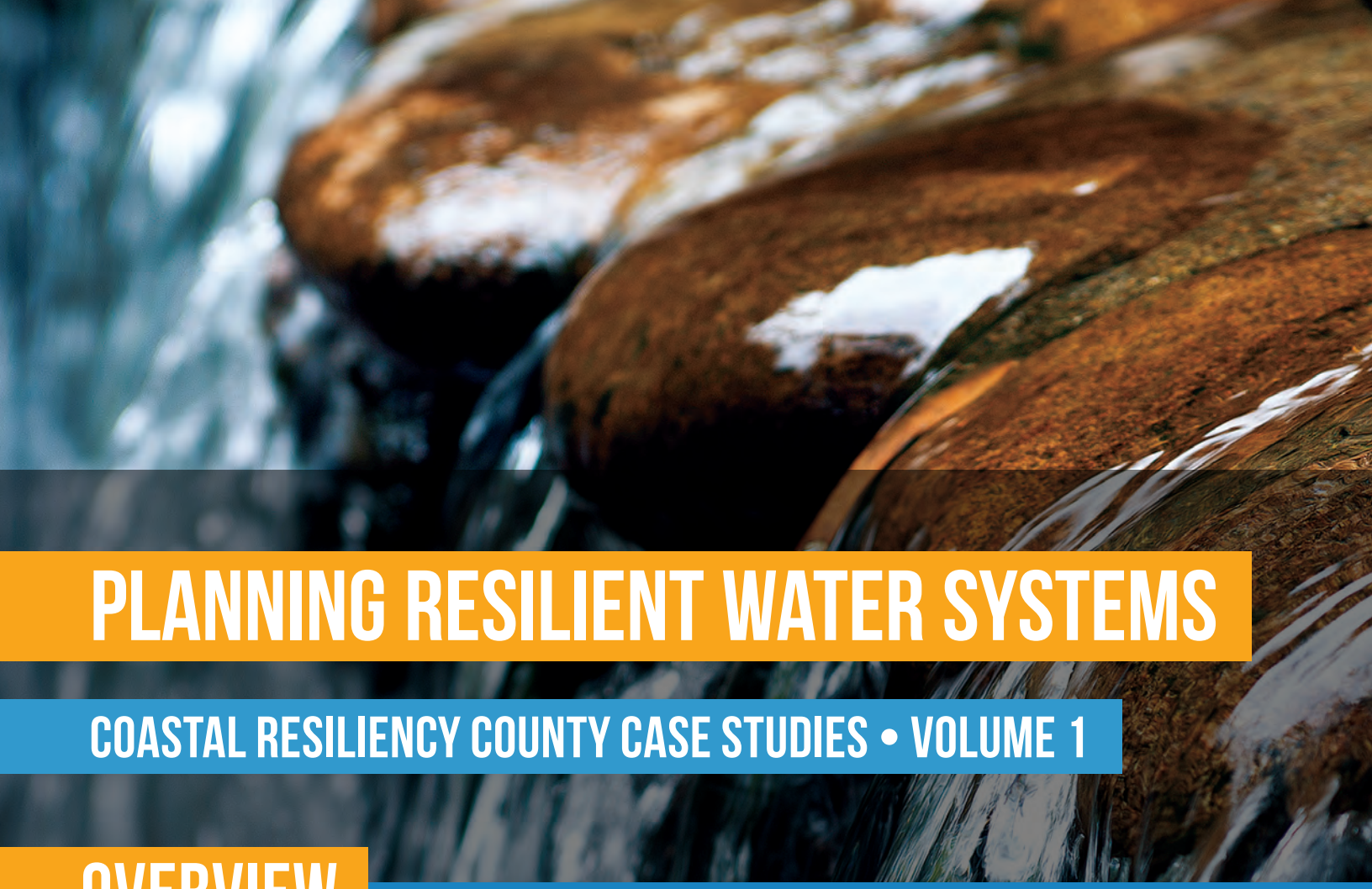

PLANNING RESILIENT WATER SYSTEMS

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OVERVIEW

Water quality standards measure three important features: how safe the water is for human contact, how safe it is for drinking and the health of an ecosystem. A critical component of community resilience is responsible stewardship of our water bodies, which are vital resources for human, economic and ecological health.

The following case studies showcase counties that have experienced negative effects of poor water quality, and are now striving to reverse this course. Both Bucks County, Pa. and Suffolk County, N.Y. have created detailed plans to guide future water quality improvements through sediment reduction and wastewater management, respectively. In each case, the counties have found that partnerships have been key components for achieving success.

July 2014

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BUCKS COUNTY, PENNSYLVANIA

Neshaminy Creek Watershed Sediment Reduction Plan for Municipal Implementation

Located in southeastern Pennsylvania, Bucks County is home to approximately 625,000 citizens.[1] Although several riverfront communities exist, it is an otherwise landlocked county which makes up part of the Delaware Bay watershed. The county seat is Doylestown, and the populous southern third of Bucks County lies between Trenton, N.J. and Philadelphia. This flat, industrial area lays within the Atlantic Coastal Plain, at about sea level. The southern part of the county has a long history of large industrial mills and factories including steel, vulcanized rubber and plastics, chemical plants and landfills that receive much out-of-state waste. The central portion of Bucks County is at the urban/rural interface where suburban development abuts farmland and forested area. The northern portion of Bucks County is much more rural, boasting bucolic settings that attract tourism. Point sources of pollution, such as industrial and wastewater treatment plant discharges, have historically been the focus of water quality improvements in Bucks County. While these pollution sources are being addressed through mitigation strategies, nonpoint sources of pollution still present a challenge for this area.

POINT SOURCE refers to a single, identifiable source of pollution, often a pipe or drain.

NONPOINT SOURCE refers to a diffuse source of pollution, often associated with large areas and certain types of land use.

THE CHALLENGE

The Neshaminy Creek is a tributary of the Delaware River, which flows to Delaware Bay. The land cover of the 232-square mile Neshaminy Creek watershed includes 24 percent developed land, 38 percent agriculture, 36 percent wooded and 2 percent other.[2] Over 418 miles of streams exist in the watershed, almost half of which have been included in Pennsylvania's list for aquatic life impairments, as per the Clean Water Act (CWA). This means that even after implementing the required technology-based CWA effluent limitations to point and nonpoint sources of pollution, these streams require further attention to water quality in the form of setting total maximum daily loads (TMDLs) to assure future compliance with water quality standards (see an explanation of TMDLs on the following page). TMDL analysis showed that **more than 75 percent of sediment loading was attributable to erosion** along stream banks, while the remainder was attributable to upland erosion and storm runoff, a trend which has increased due in part to the 20 percent increase in developed land in the past decade.[3] Problems associated with sediment pollution include:

1 "U.S. Census 2010". U.S. Census Bureau. 2010. www.census.gov/2010census/

2 See *Neshaminy Creek Watershed Sediment Reduction Plan for Municipal Implementation* under Resources

3 Ibid

Neshaminy Creek Watershed

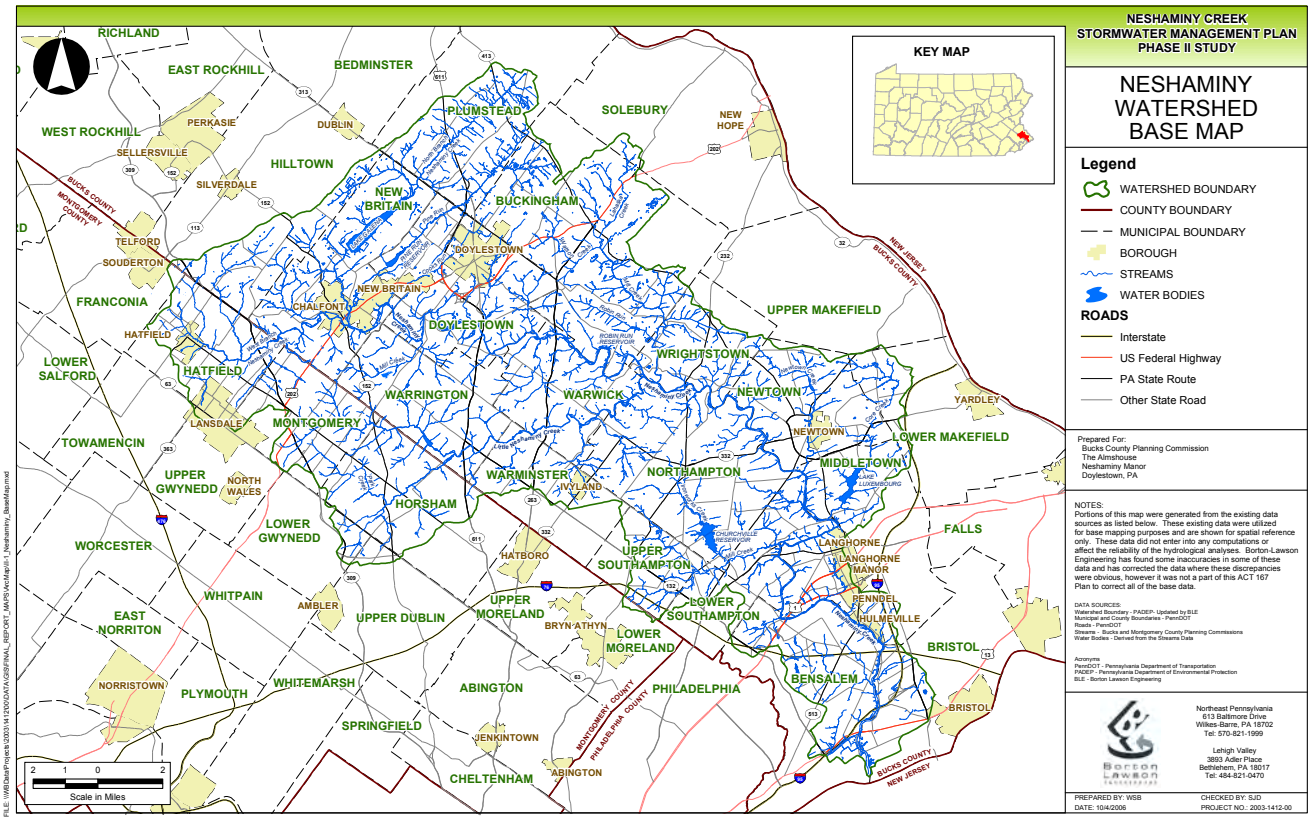

Image Credit: Borton Lawson Engineering

INTRO TO TMDLs

Total Maximum Daily Loads (TMDLs) are water quality criteria that act as goals or targets for watershed restoration plans. A TMDL calculates the pollution cap for a given water body, and the term TMDL has come to imply both the cap itself as well as the restoration or management plan needed to meet this goal. Meeting TMDL goals prevents or reduces pollution in an "impaired" water body, sufficient to meet water quality criteria and support uses. Under the Clean Water Act, "Each state shall identify those waters within its boundaries for which the effluent limitations [for industrial and municipal wastewater] are not stringent enough to implement any water quality standard applicable to such waters." Read more in the Clean Water Act Owner's Manual, listed at the end of this publication.

Source: Clean Water Act, Section 303 (d)

BEST MANAGEMENT PRACTICES
FOR WATERSHED SEDIMENT REDUCTION INCLUDE:

RIPARIAN BUFFERS. Establishing stable, vegetated streambanks with a width of 100 feet can decrease total suspended solids (TSS) by as much as 65 percent.

MULTI-CHAMBERED BAFFLE BOXES. Structural manufactured treatment devices like this sediment filter are effective in urban or suburban areas where land is not available for other BMPs. They can be retrofitted into existing infrastructure and can decrease TSS by 70 percent.

VEGETATED SWALE. Swales are ditches designed to hold water instead of move water away from an area. They can decrease TSS by 50 percent.

RAIN GARDENS FOR BIORETENTION. On small one- to two-acre plots, a special soil blend to maximize infiltration and planted with vegetation to treat runoff can decrease TSS by 85 percent.

RETROFIT OF EXISTING DRY DETENTION BASINS. Simply allowing vegetation to grow in these basins and only cutting them at the end of the growing season can decrease TSS by 30 percent. Additional structural modifications can increase this removal rate up to 60 percent.

CONSTRUCTING WETLANDS. On 10-100 acre plots, these act similarly to rain gardens and also decrease TSS by 85 percent.

Sources: US EPA. 2001. Stormwater Technology Fact Sheet: Baffle Boxes. EPA 832-F-01-004. Washington, D.C.; PA DEP. 2006. Pennsylvania Stormwater Best Management Practices Manual. Technical Guidance Document 36-0300-002.

clogged storm drains and catch basins, increased risk of flooding; cloudy water preventing vegetation from growing or animals from being able to see food; increased cost in treating drinking water; decreased fish health; and altered flow of waterways, making navigation or recreation difficult.[4]

THE PROJECT

The *Neshaminy Creek Watershed Sediment Reduction Plan for Municipal Implementation* (SR Plan) was created by the Bucks County Planning Commission and Princeton Hydro, an ecological and engineering consulting firm, as the first step toward restoring Neshaminy Creek. This plan is a guidance document that assists municipalities by providing a clear path forward in restoration work. Though the plan itself is voluntary, many of the recommendations within it are mandatory.

Eighty-six percent of the Neshaminy Creek watershed lies within Bucks County, with the remainder lying in neighboring Montgomery County. Forty-one municipalities exist within the watershed. As the county with more area of the watershed within its boundaries, Bucks County served as a convening entity of local stakeholders, and conducted field work that the municipalities would not have been able to do on their own, with Montgomery County acting as a primary partner in these activities. In particular, Bucks County was responsible for stream assessments in key subwatershed areas in order to provide feedback for plan development and establish the location of challenged areas. Bucks County maintains responsibility for sharing data collected during the creation of this watershed-wide water quality improvement plan.

The SR Plan stipulates that funding for sediment reduction be shared across political and property boundaries within the watershed, which will help two counties and 41 municipalities that lie within the watershed implement the SR Plan over a 20 to 30 year period.[5] The SR Plan provides specific recommendations for Best Management Practices (BMP) as well as measuring the impacts through ongoing monitoring efforts. Some of the recommended BMPs include use of riparian buffers, multi-chambered baffle boxes, vegetated swale and rain gardens for bioretention, retrofit of existing dry detention basins and constructing wetlands. The plan also recommends four methods for monitoring and measuring TMDL achievement including stormwater sampling, pollutant modeling and photographic documentation. Finally, the SR Plan identifies several priority areas to begin projects to improve water quality within the Neshaminy watershed. Moving forward, Bucks County will likely continue to function as steward of the SR Plan.

4 "What is Sediment Pollution?" Mid-America Regional Council. http://cfpub.epa.gov/npstbx/files/ksmo_sediment.pdf

5 There are 41 municipalities that lie within the Neshaminy Creek Watershed, but only 34 of these have impaired streams.

Eroded banks with fallen tree in the left image and lack of riparian buffer seen in the right image.

Photo Credit: Bucks County

THE OUTCOMES

By examining effects on the entire watershed, the SR Plan makes meeting water quality requirements more effective and efficient than individual municipalities developing their own plans. For many municipalities, developing their own TMDL implementation plan would have involved tremendous effort and cost. Instead, Bucks County was able to act as a regional convener for this effort, in coordination with Montgomery County. The SR Plan provides 34 municipalities with access to an easy-to-understand, working document that offers guidance, recommendations and prioritization of areas for implementation. Another benefit is that pursuing additional funding for implementation of the plan is now easier because specific recommendations and the associated sediment reduction percentages can be calculated from the SR Plan.

THE LESSONS LEARNED

Municipalities appreciated the watershed-wide approach, as they had an opportunity to provide feedback, learn about the work of other communities and share strategies to meet the necessary sediment load reductions. “We hope this process encourages multi-municipal planning efforts moving forward, especially with regard to large-scale projects, and sharing resources for educational materials and outreach efforts” says Rea Monaghan, Bucks County Planning Commission Environmental Planner. She continues, “It may be helpful to reach out to the stakeholders, municipal Environmental Advisory Councils and watershed groups, as these groups are typically aware of restoration and retrofit projects that have been implemented, or are proposed by municipalities. These groups are also often involved with public outreach efforts and implementation of on-the-ground projects.” Stakeholders that were included in the process were Bucks and Montgomery Counties planning commissions, conservation districts, engineers, departments of public information, police departments, municipal managers and personnel, as well as Princeton Hydro and Pennsylvania Department of Environmental Protection.

SUFFOLK COUNTY, NEW YORK

Comprehensive Water Resources Management Plan

Suffolk County occupies the central and eastern portion of Long Island, N.Y., and is home to approximately 1.5 million citizens.[6] Despite Suffolk County's proximity to New York City, it is the state's highest grossing county in terms of crop production[7], and thus supports both suburban and agricultural areas. Public water suppliers serve more than 90 percent of the county's residents. Protecting Suffolk County's groundwater is critical; it is a federally designated Sole Source Aquifer, which means that if the aquifer were to be compromised in some way, finding an alternative means of providing safe water would be physically, legally and economically infeasible. Water is vital to the health and quality of life of Long Island's citizens and it underpins a tourism industry that yields over a billion dollars annually.[8]

THE CHALLENGE

Water is the single most significant resource for which Suffolk County bears responsibility. **Due primarily to nitrogen pollution, Suffolk County's water quality has significantly declined** since the early 1980s.[9] In January 2014, Suffolk County released the Suffolk County Comprehensive Water Resources Management Plan (WRM Plan) that highlights the pollution of this precious resource. Surface waters are significantly impaired and drinking water quality has been diminished.[10] Moreover, the source of these impairments has demonstrably degraded the wetlands and seagrass that used to serve as Suffolk County's last line of natural defense against storm surge, increasing vulnerability to future storms.

Sixty-nine percent of total nitrogen pollution in Suffolk County's Great South Bay[11] comes from inadequate septic tanks and cesspools which are located in flood zones, in areas with high water tables and/or in close proximity to surface waters. Thus, the bulk of Suffolk County's plan focuses on reducing or eliminating these particular nitrogen sources. While agricultural fertilizer is typically a significant contributor to nitrogen pollution levels nationwide,

6 "U.S. Census 2010". U.S. Census Bureau. 2010. www.census.gov/2010census/

7 Measured by total receipts ($255 million in 2007). National Agricultural Statistics Service. www.nass.usda.gov/Statistics_by_State/New_York/Publications/Current_News_Release/Cash_Receipts/2008/Cash%20Receipts%20by%20County0808.htm

8 68.5% of Suffolk County's annual GDP comes from tourism and recreation, equaling $1.1 billion as of 2011. Economics: National Ocean Watch (ENOW) Explorer. www.csc.noaa.gov/enow/explorer/

9 See *Suffolk County Comprehensive Water Resources Management Plan* under Resources

10 Larry Swanson, Assc. Dean, School of Marine & Atmospheric Sciences (New York Times, 2/28/08) says of Suffolk County's Forge River, "It's the worst case of anoxia [absence of oxygen] I have seen." See *Suffolk County Comprehensive Water Resources Management Plan* under Resources

11 Kinney E. L. and I. Valiela "Nitrogen Loading to Great South Bay: Land Use, Sources, Retention, and Transport from Land to Bay". Journal of Coastal Research: Volume 27, Issue 4: pp. 672 – 686, 2011.

in Suffolk County, fertilizer is not the major source of nitrogen pollution. In fact, despite being a major agricultural county in New York, 80 percent of fertilizer purchased in Suffolk County is for residential uses. Suffolk County's plan includes educational outreach to citizens about how to use fertilizer responsibly.

A grave effect of the nitrogen pollution in the Great South Bay[12] is the collapse of a seafood industry due in part to harmful algae blooms that occur as a result of high nitrogen concentrations. This area once provided over 6,000 jobs and produced more than half the clams eaten in the United States.[13] Clam populations have declined over 93 percent in the past 25 years[14] due largely to overharvesting, and have been unable to recover because of algae blooms that use most of the oxygen in the water. Bay scallops were also decimated due to suffocation from the algal blooms, and commercial harvests are only 1-2 percent of what they were prior to these blooms.[15]

THE PROJECT

In an effort to mitigate nitrogen pollution, improve water quality and rebuild natural defenses to future storms, Suffolk County has created the *Suffolk County Comprehensive Water Resources Management Plan* (WRM Plan) which suggests making strategic investments in a number of critical areas. Suffolk County has begun implementation of the WRM Plan by addressing wastewater treatment in four ways (in order of priority):

1. Fortifying existing wastewater infrastructure against future storm events,
2. Installing sewers in targeted areas that currently suffer from inadequate septic tanks and cesspools,
3. Piloting alternative or innovative neighborhood wastewater treatment systems, and
4. Developing and deploying onsite technology such as updated septic systems.

Nationwide, 20 percent of households rely on septic systems.[16] In stark contrast, 74 percent of Suffolk County households are on septic systems. The majority of these households in Suffolk County (approximately 200,000 homes) are in need of wastewater upgrades. Because just 18,500 of the 200,000 homes are responsible for 25

12 The Great South Bay is a lagoon located on the southern side of Long Island, protected from the ocean by Fire Island, a barrier island.

13 See *Suffolk County Comprehensive Water Resources Management Plan* under Resources

14 Ibid.

15 Tettelbach, S. T. and C. F. Smith. 2009. Bay scallop restoration in New York. *Ecological Restoration* 27(1):20-22. https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxzdGVwaGVudGV0dGVsYmFjaHxneDo2ODg2MDcyMGYxNTAxMjg2

16 "Septic Systems Fact Sheet." EPA. 2008. http://water.epa.gov/aboutow/owm/upload/2009_06_22_septics_septic_systems_factsheet.pdf

"Brown tide" or harmful algae bloom in Moriches Bay, Long Island, 2011.

Photo Credit: Google Earth

percent of Suffolk County's nitrogen load in the Great South Bay—as they are located in flood zones or areas with high water tables—these houses will be targeted for sewering[17]. Suffolk County's responsibilities include the review and approval of construction of sanitary systems, the implementation of planning steps, the review and management of new programs and technologies and the finalization of the WRM Plan.

To the extent funds are available, Suffolk County may annually appropriate up to $2 million for septic system upgrades for enhanced nitrogen removal. For the most part, the funds are derived from an apportionment of a quarter cent sales tax dedicated to the County's Drinking Water Protection Program. In addition, New York State will match up to $3 million of county funds to advance this issue. Suffolk County is working with IBM, as a recipient of the IBM Smarter Cities award, on implementing the WRM Plan. IBM's Smarter Cities award seeks to work with local governments worldwide where leaders drive economic growth through data-driven decisions and proactive coordination of resources to operate effectively.

THE OUTCOMES

So far, Suffolk County has held a successful teleconference hosted by County Executive Steve Bellone, for which 9,700 residents logged on to hear about water quality. Suffolk County has also completed a multi-state septic tour with federal, state, academic and non-profit partners, along with county employees, posting the summary of the tour online[18] and inviting citizens to submit requests if they express interest in "Advanced Onsite Wastewater Treatment System Technologies." In addition, the county has identified a few areas within the county in which sewering would decrease nitrogen load in the Great South Bay by 25 percent. IBM has recently chosen the county as a Smarter Cities award winner, and will be providing technical assistance to further the county's goals. Finally, the county has secured funding in the New York state budget for septic upgrades. By decreasing nitrogen pollution in the Great South Bay, Suffolk County hopes to encourage the recovery of storm-surge protecting sea grass, while simultaneously allowing shellfish population to recover and support a once-vibrant seafood industry.

17 Correspondence with Sarah Lansdale, Director of Planning, Suffolk County. April 4, 2014

18 "Reclaim Our Water Initiative". Suffolk County Government. 2014. www.suffolkcountyny.gov/Departments/Planning/ReclaimOurWaterInitiativeUpdate.aspx

Diminished clam and scallop landings over time, due in part to harmful algae blooms that occur as a result of high nitrogen concentrations.

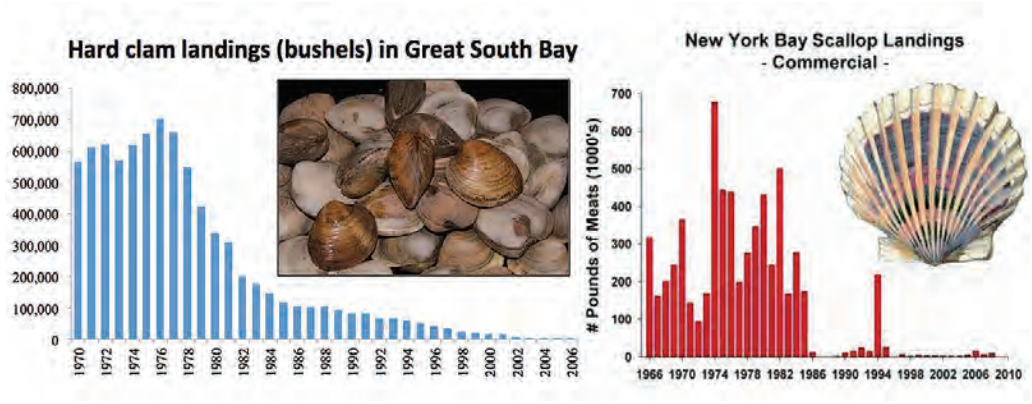

Image Credit: Suffolk County Comprehensive Water Resources Management Plan

Suffolk County watershed showing aquifer accessibility, and how land use can affect ground water and surface water quality.

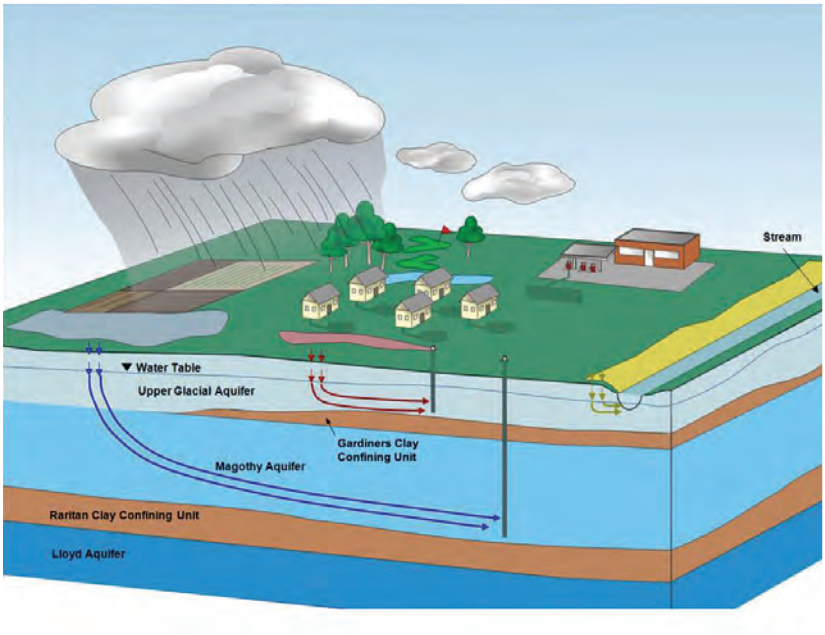

Image Credit: Suffolk County Comprehensive Water Resources Management Plan

THE LESSONS LEARNED

One of Suffolk County's strongly-held beliefs is that partnerships with all levels of government and local communities are necessary in order to achieve success. For this project alone, Suffolk County coordinated with local foundations, senators, the Governor, state representatives, federal and state agencies, private corporations, municipalities, building trades, state planning organizations, university researchers as well as regional businesses, environmental and civic groups.

CONCLUSION

Water quality issues affect counties in all types of geographies. Healthy water quality is important in every community for economic, public health, public safety and ecological reasons. Counties with point and nonpoint sources of pollution, a limited aquifer or decreased drinkable water availability will recognize the importance of taking measures to safeguard and improve water quality as Bucks County, Montgomery County and Suffolk County are doing. By partnering with public and private organizations, federal agencies and municipalities, counties are well-positioned to increase county resiliency through water quality improvement strategies.

RESOURCES

The following resources include both of the plans highlighted in these case studies, publications from the River Network to help you understand TMDLs and the Clean Water Act, as well as several tools from the Digital Coast, a resource developed by the National Oceanic and Atmospheric Administration to help communities address coastal issues.

Bucks County Neshaminy Creek Watershed Sediment Reduction Plan
www.buckscounty.org/docs/pc/ncfinalplanmarch2014.pdf?sfvrsn=2

C-Cap Land Cover Atlas
www.csc.noaa.gov/digitalcoast/tools/lca

The Clean Water Act Owner's Manual
http://content.yudu.com/Library/A1xrkp/CleanWaterAct/resources/index.htm?referrerUrl=http%3A%2F%2Fwww.rivernetwork.org%2Fresource-library%2Fonline-publications

ENOW Explorer
www.csc.noaa.gov/enow/explorer/

Impervious Surface Analysis Tool
www.csc.noaa.gov/digitalcoast/tools/isat/

Suffolk County Comprehensive Water Resources Management Plan
www.suffolkcountyny.gov/Departments/HealthServices/EnvironmentalQuality/WaterResources/ComprehensiveWaterResourcesManagementPlan.aspx

Suffolk County Septic Tour Summary
www.suffolkcountyny.gov/Portals/0/planning/general/Septic_Rd_Shw_FINAL4-28-14.pdf

Tracking TMDLs
http://content.yudu.com/Library/A1xs31/TrackingTMDLs/resources/index.htm?referrerUrl=http%3A%2F%2Fwww.rivernetwork.org%2Fresource-library%2Fonline-publications

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