



# Raindrops and Rivers: Stacking Climate Resilient Practices Informed by River Flow Data

Olivia Devereux

Devereux Consulting, Inc.

Climate Resiliency Workgroup

6/13/2023

# Objectives

Discover	Discover where to access river flow data that can illustrate trends leading to nuisance flooding
Learn	Learn an approach for identifying and quantifying multiple benefits of climate resilient management practices
Resources	Amass resources for and examples of community engagement successes that improve climate resiliency

# Outline

- Find and interpret river flow data to identify trends
- Illustrate changes in short and long-term river flow trends
- Identify management practices that address changing flows
- Identify the multiple benefits of management practices
- Create community engagement necessary to prioritize climate resilient management practices
- Couple with community success stories
- Improve and protect communities from nuisance flooding

# 'What about us': Residents on Richmond's Southside ask for solution after widespread flooding

by: [Rachel Keller](#)

Posted: Jun 10, 2021 / 07:26 PM EDT

Updated: Jun 11, 2021 / 08:20 AM EDT



**STORMTRACKER 8**

**FLASH FLOODING IN THE SOUTHSIDE**  
RESIDENTS DEMANDING THE CITY TAKE ACTION

<https://www.wric.com/news/local-news/richmond/what-about-us-residents-on-richmonds-southside-ask-for-solution-after-widespread-flooding/>





### Highest crests of the James River



Data: NWS; Chart: Axios Visuals

<https://www.axios.com/local/richmond/2022/06/22/hurricane-agnes-flooding-richmond-50th-anniversary>

- Richmond's South Side
- Industrial and areas historically considered by lenders as less desirable homes

[https://www.flickr.com/photos/library\\_of\\_virginia/7797533454/in/photostream/](https://www.flickr.com/photos/library_of_virginia/7797533454/in/photostream/)

# River Flow Data

**Chesapeake Assessment Scenario Tool**

HOME NEWS PUBLIC REPORTS LEARNING ABOUT CONTACT US

Search Cast...

**New to CAST?**

Register to create and edit scenarios for reducing nitrogen, phosphorus, and sediment with varying best management practices to streamline environmental planning. Registration also includes access to additional data, tools and resources including CAST's monthly newsletter.

**DEVELOP A PLAN**

Get answers to your questions about how to use CAST to develop a plan.

**Develop A Plan**

**SOURCE DATA**

Download data tables including load sources and agencies, BMP geographic references and deli

**View Source Data**

**MAPPING TOOLS**

View geographical information and shapefiles.

**Learn More**

**COSTS**

Download BMP costs data and vie for each state and Chesapeake B

**Learn More**

**Monitoring**

**USGS Tidal and Nontidal Monitoring Stations**

The [USGS website](#) provides information on the water quality loads and trends at the nontidal monitoring stations in the Chesapeake Bay Watershed. Methods, data, results, and interpretations are available for nutrient and sediment loads and yields (per-acre loads), and trends in nutrient and sediment loads.

This [USGS Data Release](#) summarizes the loads and trends measured at the Chesapeake Bay River Input Monitoring stations for the water years 1985-2020. Nitrogen, phosphorus, and suspended-sediment loads, and changes in loads, in major rivers across the Chesapeake Bay watershed have been calculated using monitoring data from the Chesapeake Bay River Input Monitoring (RIM) Network stations.

The [Chesapeake Bay Nontidal Monitoring Loads and Trends](#) page provides the short-term water year nutrient and suspended-sediment load and trend results and background information for the Chesapeake Bay Program's nontidal network (NTN). It provides primary findings for nitrogen, phosphorus, and sediment trends and examines results for individual sites.

**Chesapeake Bay Watershed Data**

The Chesapeake Bay has an [Open Data Portal](#) with spatial information about monitoring and much, much more. Find some datasets for direct download at the bottom of this page.

The [Watershed Data Dashboard](#) is a visualization tool to consolidate and provide accessibility to Chesapeake Bay watershed monitoring, modeling, trends, projections and explanations for use in watershed management planning and implementation. Much of these data came from CAST and are presented in a way that helps people understand the need for watershed improvement.

The Chesapeake Progress website has a page on [Water Quality Standards Attainment and Monitoring](#), which provides text and visuals to share the results of nutrient and sediment monitoring progress toward the Bay TMDL. Here you will find interactive graphs and maps representing the watershed data over the years, as well as downloadable excel files and PDFs.

**Non-Tidal Water Quality Dashboard**

Comparisons between the modeled and monitored data can be found on the non-tidal water quality dashboard. These visual representations show both the loads estimated from the U.S. Geologic Survey's Weighted Regressions on Time, Discharge and Season (WRTDS) and loads estimated from the time-variable Phase 6 Watershed Model. [Non-Tidal Water Quality Dashboard](#)

# Chesapeake Bay Nontidal Monitoring Network Loads and Trends

Short-term nutrient and sediment loads and trends, results through water year 2020

Virginia and West Virginia Water Science Center, U.S. Geological Survey



## River Flow Data

- <https://cast.chesapeakebay.net/Home/Monitoring>
- <https://va.water.usgs.gov/geonarratives/ntn/>



# Changes in River Trends

An official website of the United States government [Here's how you know](#)



<https://va.water.usgs.gov/geonarratives/ntn/>

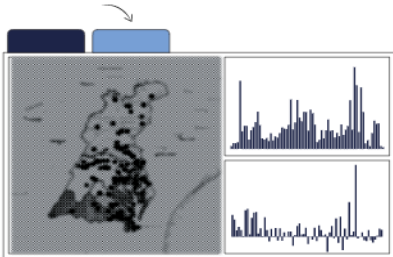
[About](#) [Monitoring Network](#) [Trends Summary](#) [Total Nitrogen](#) [Total Phosphorus](#) [Suspended Sediment](#) [Loads to Tidal Waters](#) [Definitions](#) [Methods](#) [Factors: Loads and Trends](#) [Resources](#)

Graph tool

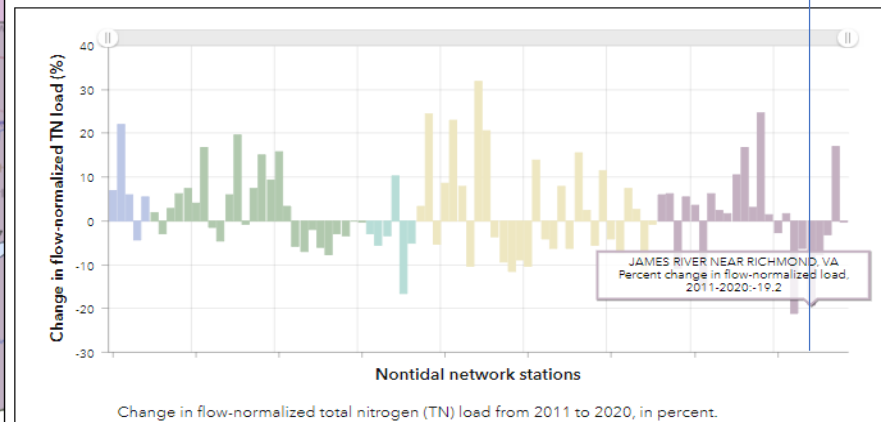
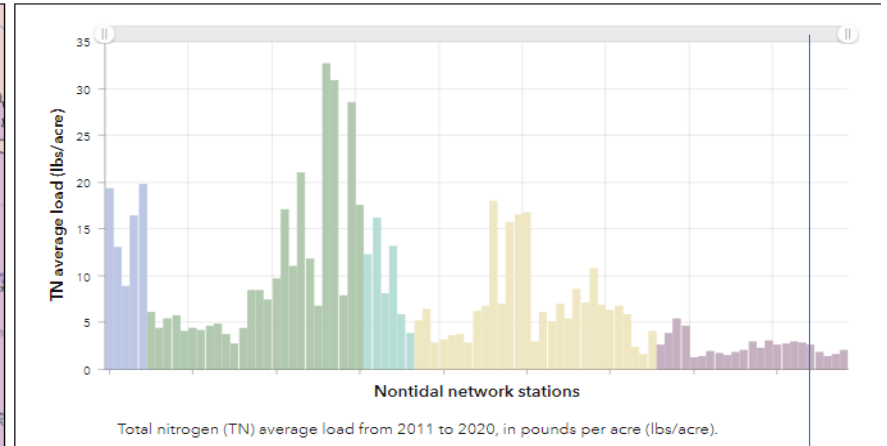
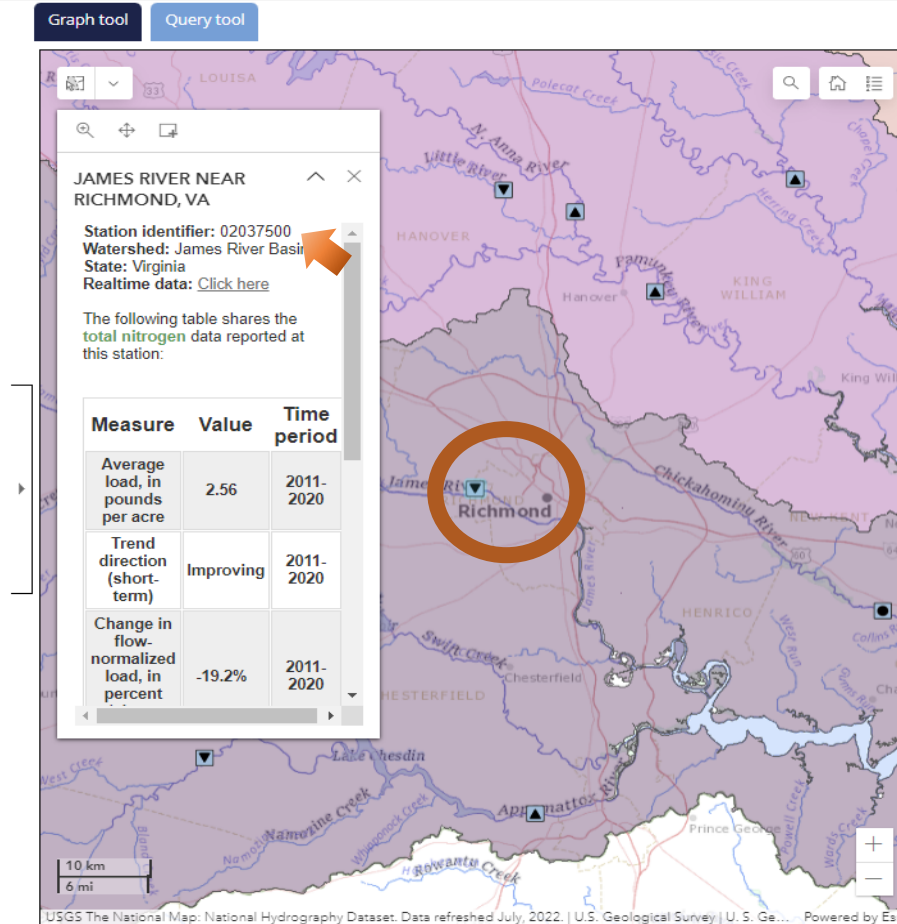
Query tool

## Total nitrogen

From 2011-2020, total nitrogen trends improved at 38% of stations and degraded at 42%. Of the long-term sites (sites monitored since approximately 1985), 55% are improving.



View patterns across the watershed and use the tabs to access tools for comparing stations. Click on an individual station to view site-specific load and trend information.

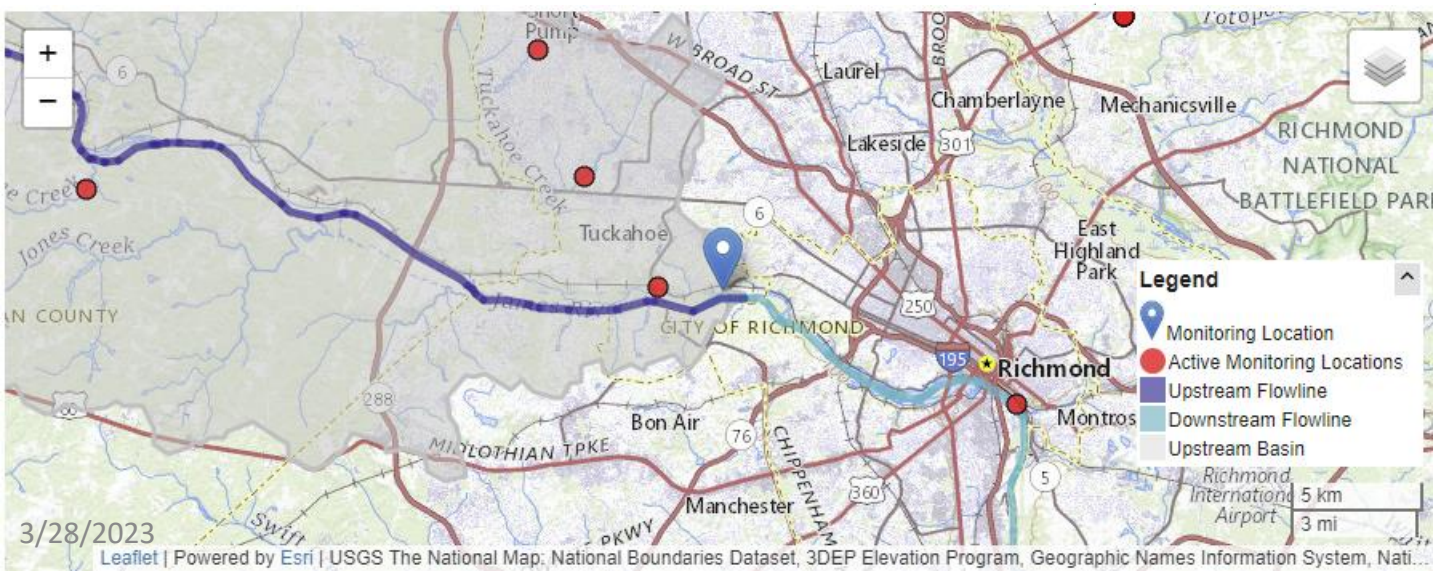
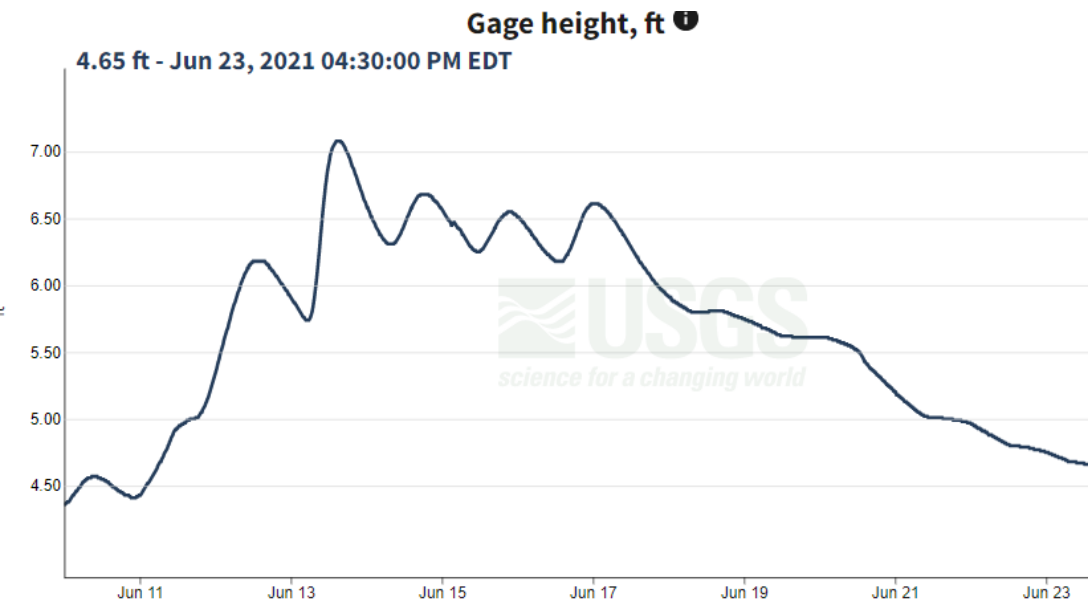




# JAMES RIVER NEAR RICHMOND, VA

IMPORTANT [Legacy real-time page](#) ⓘ


Monitoring location 02037500 is associated with a STREAM in HENRICO COUNTY, VIRGINIA. Current conditions of DISCHARGE and GAGE HEIGHT are available. Water data back to 1934 are available online.



## Changes in River Trends

- Find the gage height and flows
  - Search for station ID and NWIS
- <https://waterdata.usgs.gov/nwis>
- Hydrograph shows the storm that was in the news story.
- Longer term data also available
- Tip: Can select to have text alerts on gage height sent to you

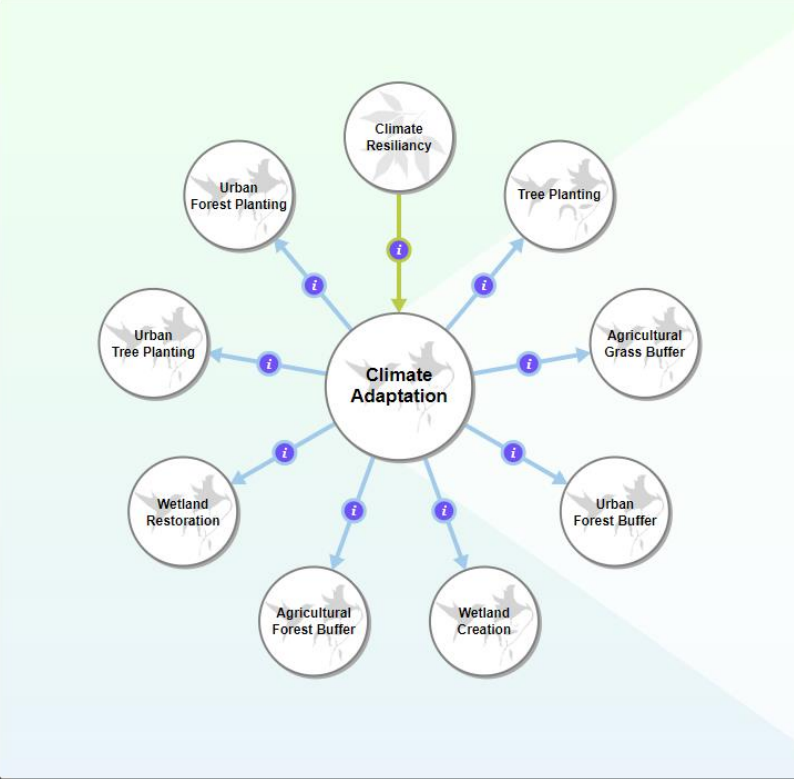
# Identify Management Practices

 **Chesapeake Assessment Scenario Tool** LOG IN

HOME NEWS PUBLIC REPORTS LEARNING ABOUT CONTACT US

## Eco-Health Relationship Browser

Click on the topic bubbles to explore. Click on the linkages (i) to view the relationship between elements.



**Climate Adaptation**

Continually pursue, design and construct restoration and protection projects to enhance the resiliency of the Bay and aquatic ecosystems from the impacts of coastal erosion, coastal flooding, more intense and more frequent storms and sea level rise.

**Goals**

- Toxic Contaminants
- Stewardship
- Land Conservation
- Environmental Literacy
- Public Access
- Sustainable Fisheries
- Water Quality
- Healthy Watersheds

**Outcomes**

- Fish Passage
- Climate Adaptation**
- Toxic Contaminants Research
- Local Leadership
- Protected Lands
- Diversity
- Forest Buffer
- Toxic Contaminants Policy and Prevention

**CoBenefit Bmps**

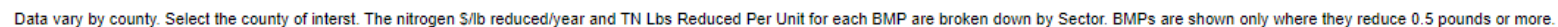
- Tree Planting
- Impervious Surface Reduction
- Agricultural Grass Buffer
- Urban Forest Buffer
- Wetland Creation
- Agricultural Forest Buffer
- Wetland Restoration
- Urban Tree Planting

Chesapeake Bay Program Office Phase 6 - 7 & 8

- Shows the relationship between
  - BMPs
  - Goals
  - Outcomes
- Tool is evolving to include more Ecosystem Benefits

<https://cast.chesapeakebay.net/EcoHealth/Benefits>

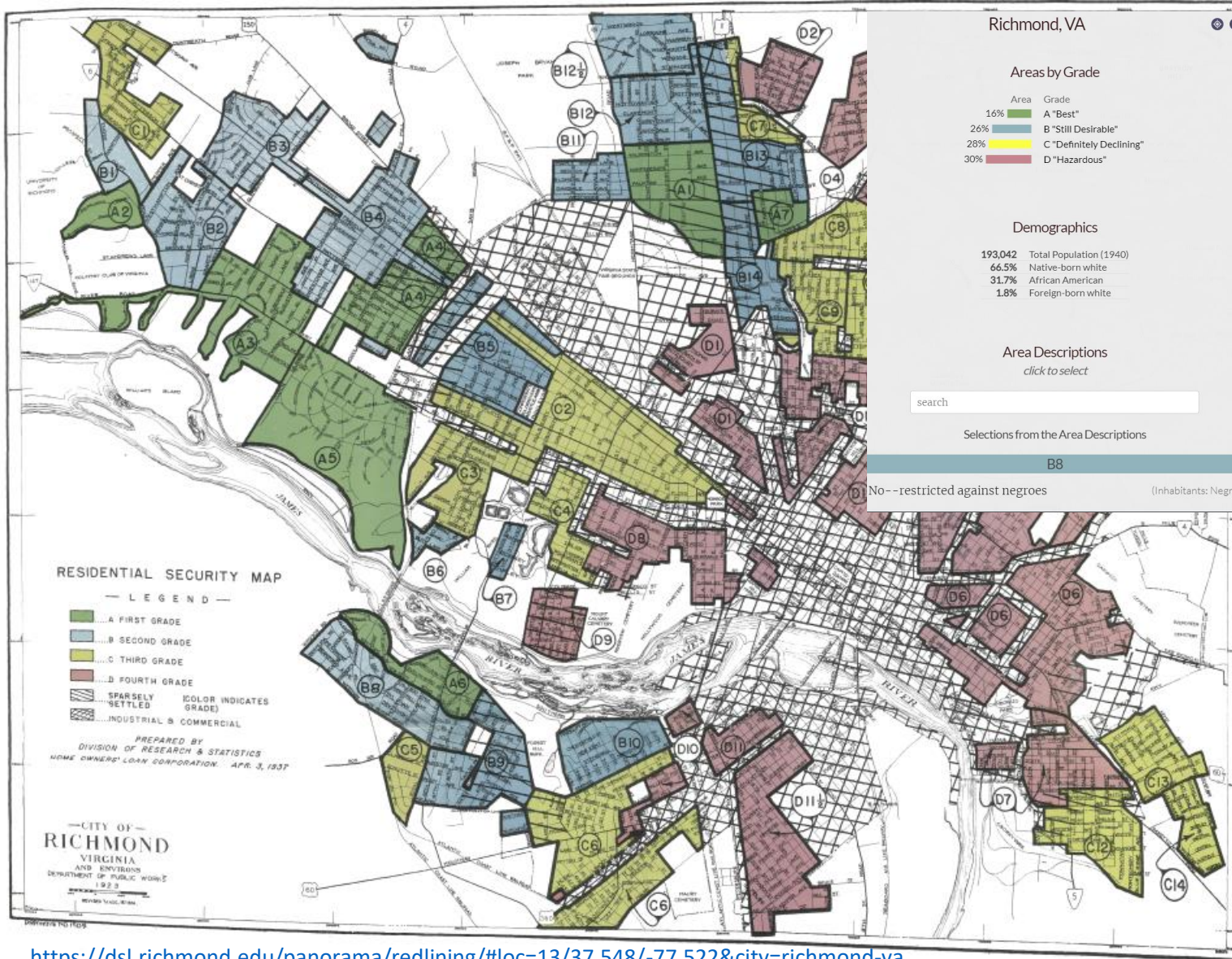
## Richmond City, VA (CBWS Porti... ▼



11



# Community Engagement



- Solicit community involvement as part of implementation planning and project development, *not* as a public meeting after the fact
- Need to be aware of the history in these areas so that the flooding can be addressed in a way that is sensitive to residential needs
- Example
  - This color-coded “red lining” map from the 1930s ranks the loan worthiness of neighborhoods, initially used by the federal government, and then by private lenders
  - Those neighborhoods given the lowest ratings (“red lined”) remain underdeveloped and environmentally vulnerable
  - The discriminatory practices of 80 years ago are still impacting communities today and these rain events with flooding are an important aspect of that impact

# Community Success Stories

## Chesapeake Bay Program Beyond Environmental Benefits Database and Search Tool

Cleaning up the Chesapeake Bay is about more than science. It's also about the people who are improving their communities by reducing pollution and protecting public health, fragile habitats, and the Bay's multibillion-dollar fishery, seafood, and recreation industries. These case studies show how local governments, citizens, and private companies are installing water quality best management practices (BMPs) to keep waterways healthy, beautiful, and economically viable. The stories below highlight some of the region's best projects, showcasing how communities can solve big problems like polluted runoff while also generating other benefits.

[Click here for more details about the search columns and definitions.](#)

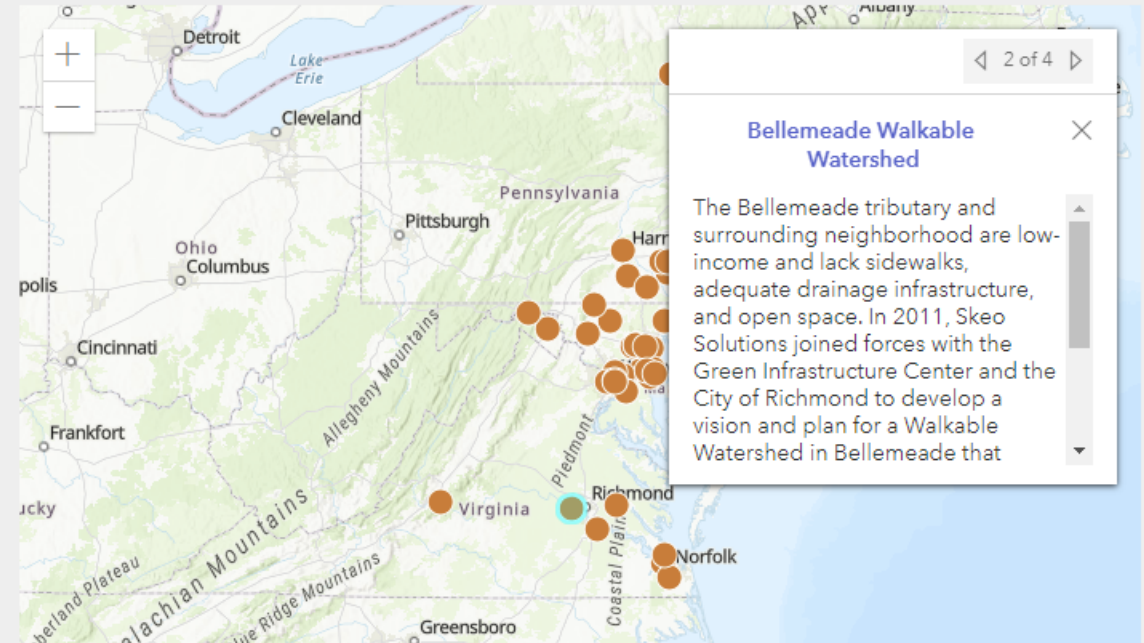
[Send Us Your Feedback](#)

To view the case studies, search by key word or filter the case studies using the filter options. Use the map to find case studies by location. Use the table below to view more details about each case study. Click on the title of each case study to view the case study PDF.

Search for: flood x Search Showing 76 case studies.

Filter by:

State
Locality
Community Type
Community and Economic Benefits
Environmental Benefits
BMPs Installed
Partners / Funders
<span style="color: red;">x</span> Clear all filter selections



<https://gis.chesapeakebay.net/wip/dashboard/>

3/28/2023



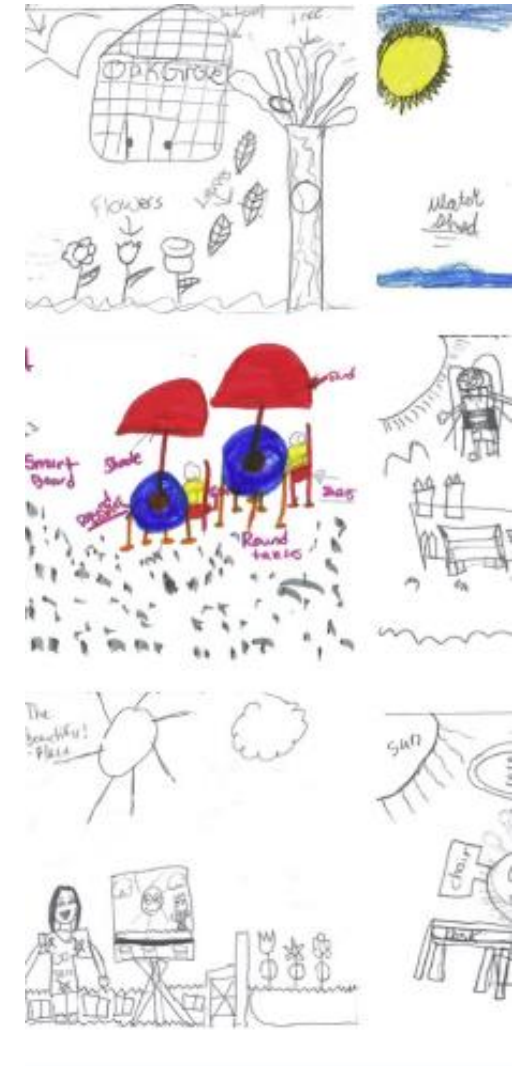
# Examples of Successes— Bellemeade

- Community meetings with schools and residents
- Walking and bike paths to schools through parks
- Playgrounds double with flood control infrastructure.
- Sidewalks built with drainage.
- Stream is the centerpiece of the community

In Richmond, Trees Will Battle Extreme Heat, Pollution, and Injustice in Greening Southside Initiative



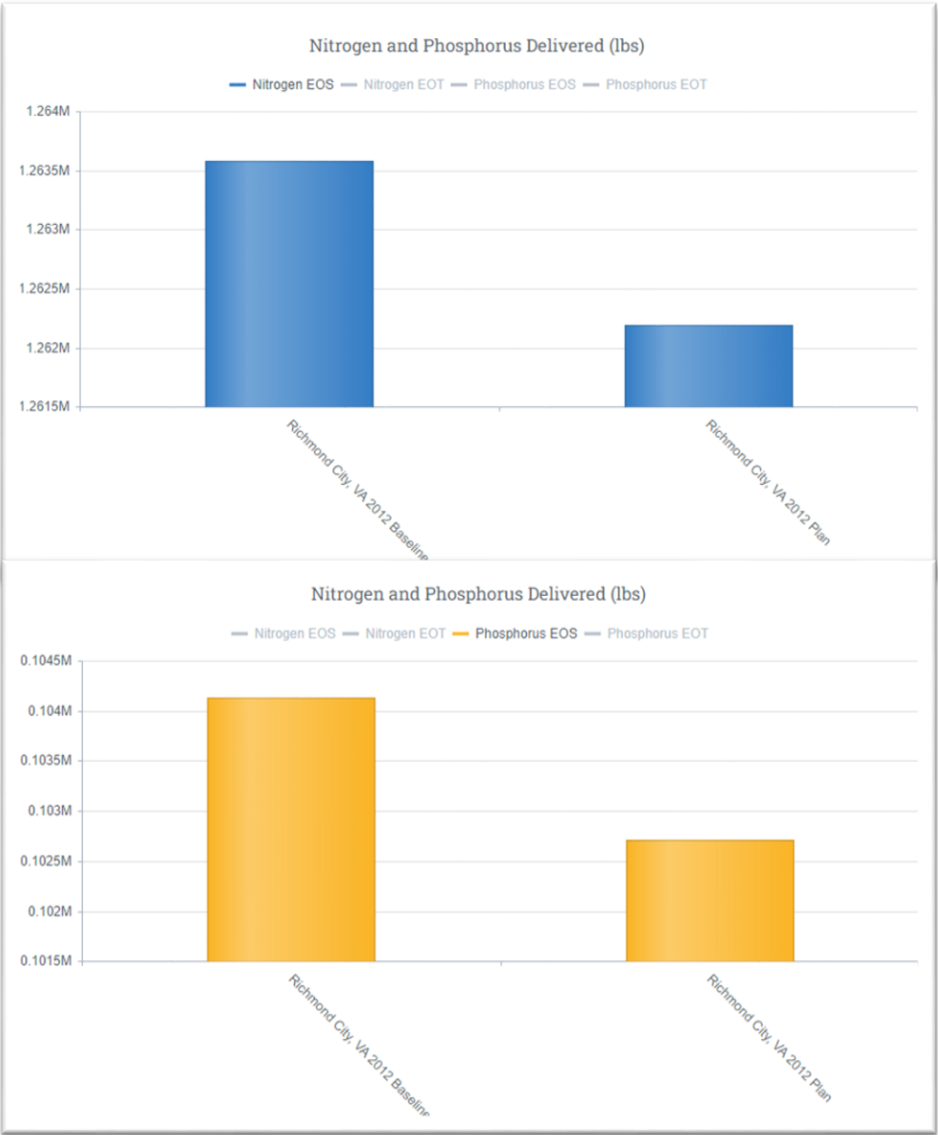
Building on student priorities, the watershed concept plan outlines three major green connections to the school and park.





# Quantifying Multiple Impacts

- Regulations require nitrogen, phosphorus, and sediment reductions, among other pollutants and contaminants in waterways
- Bellemeade BMPs
  - Stream restoration
  - Stormwater runoff reduction
  - Storm drain cleaning
  - Forest buffer planting



Pollutant	Initial (Lbs)	Estimated (Lbs)	Reduction (Lbs)	Percent Reduction
TN	1,263,579	1,262,194	1,385	0.11%
TP	104,134	102,707	1,427	1.37%

# Raindropportunities



River flow data and changes in trends

Cost effective management practices

Community engagement early and  
with understanding of historic impacts

Build on existing community  
partnerships and successes

Quantify all impacts, social as well as  
TN, TP, and TSS

# Contact Information

Olivia Devereux  
Sr. Watershed Strategist  
Devereux Consulting, Inc.

## References

<https://www.southsidereleaf.org/>

<https://www.walkablewatershed.com/>

<https://www.walkablewatershed.com/bellemeade/>

[http://www.gicinc.org/PDFs/Bellemeade\\_Report.pdf](http://www.gicinc.org/PDFs/Bellemeade_Report.pdf)



# Discussion

- How can this be shaped to better show that we can meet multiple needs, not just the TN, TP, and TSS reduction requirements?
- How could this information be packaged for planners? Community leaders? Others?