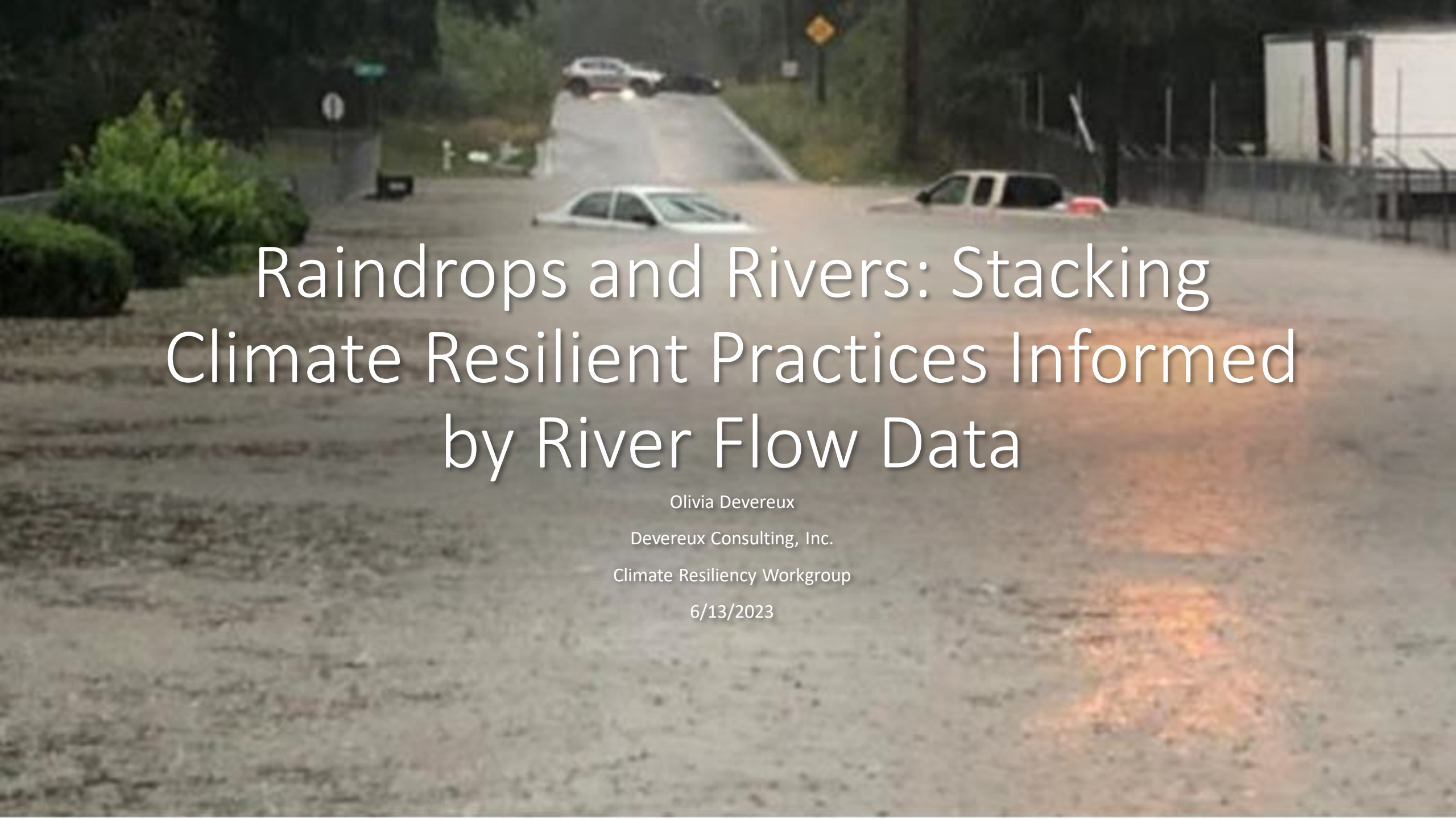


Raindrops and Rivers: Stacking Climate Resilient Practices Informed by River Flow Data

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

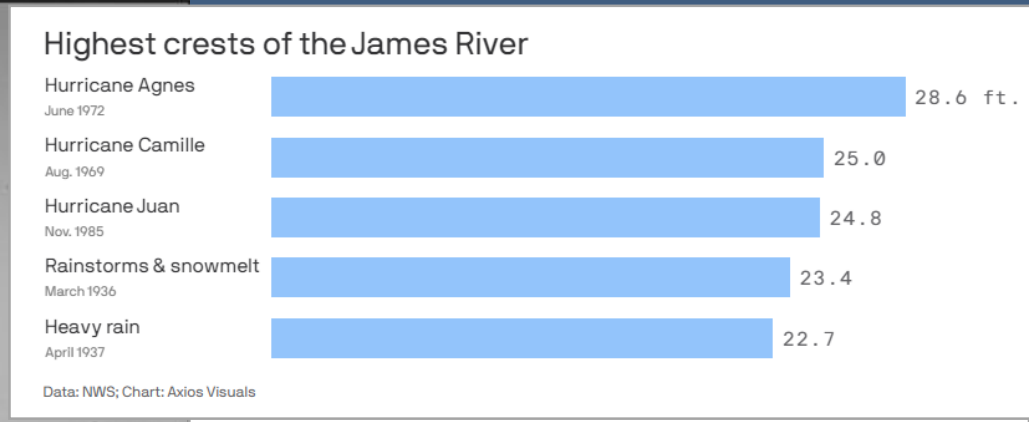
- Find and interpret river flow data to identify trends
- Illustrate changes in short and long-term river flow trends
- Identify management practices that address changing flows
- Identify the multiple benefits of management practices
- Create community engagement necessary to prioritize climate resilient 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

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

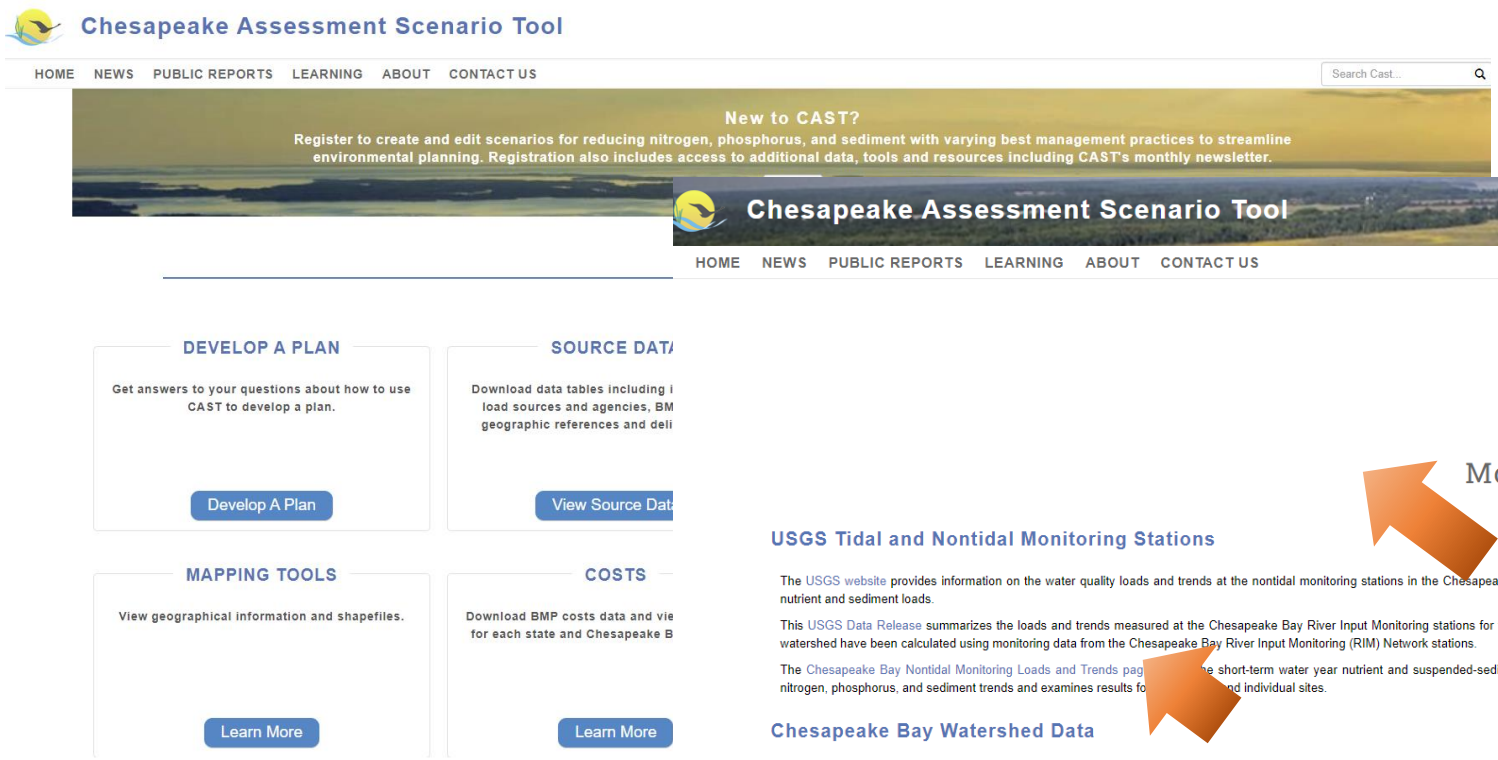
https://www.flickr.com/photos/library_of_virginia/7797533454/in/photostream/

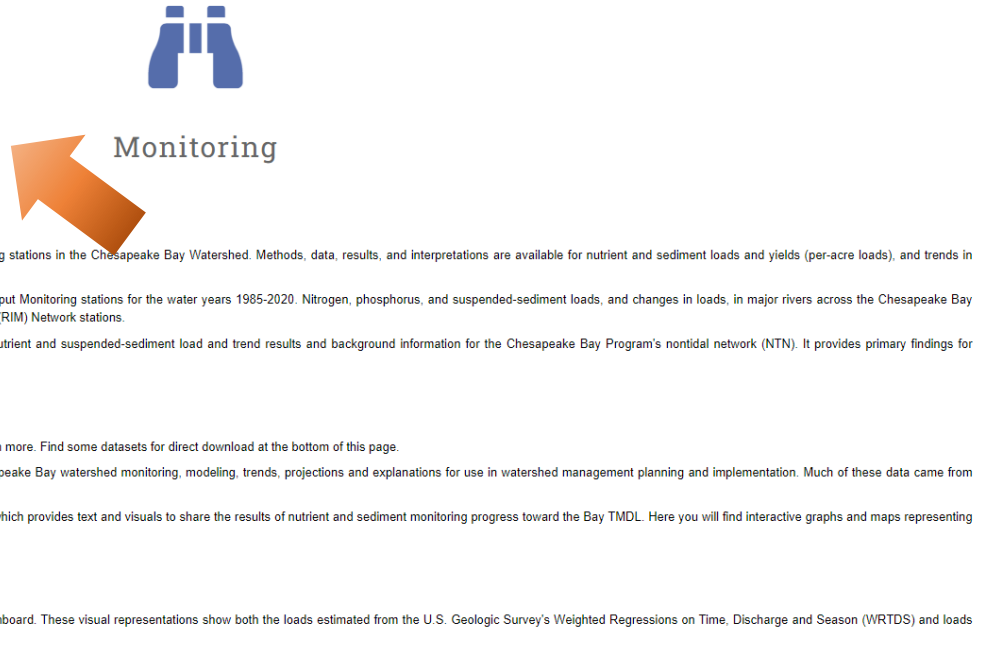


https://www.axios.com/local/richmond/2022/06/22/hurricane-agnes-flooding-richmond-50th-anniversary

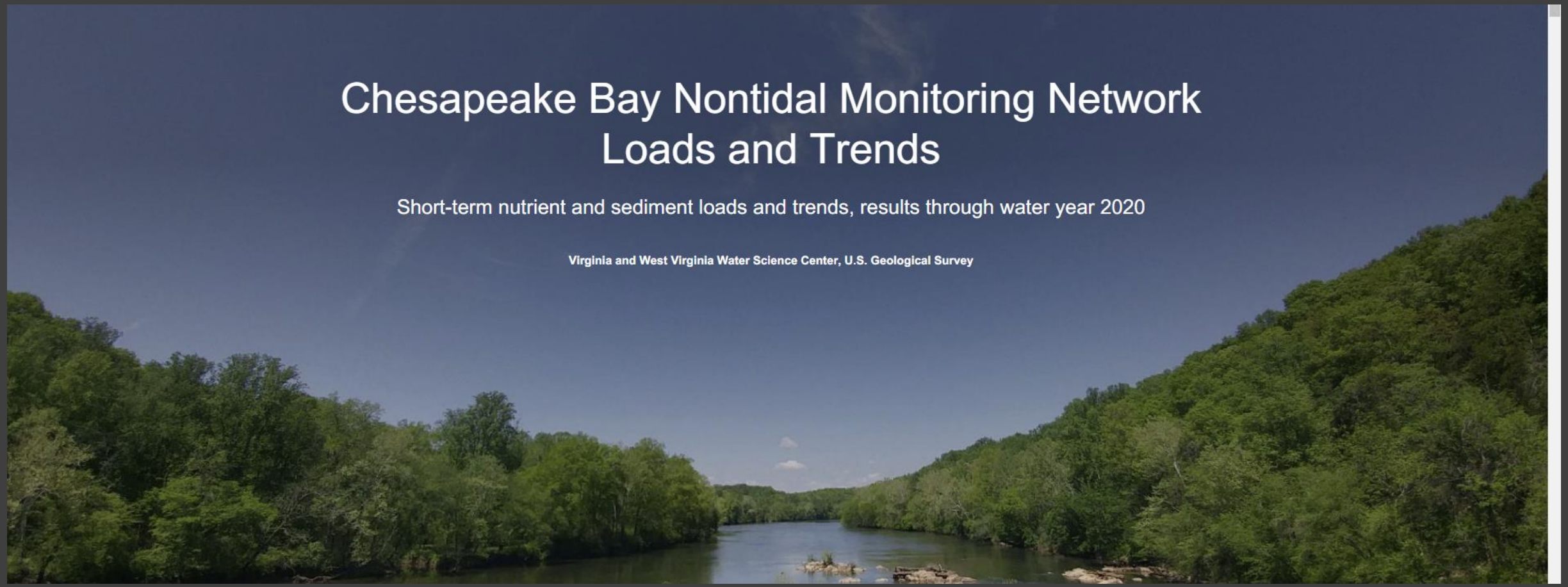
- Richmond's South Side
- Industrial and areas historically considered by lenders as less desirable homes

River Flow Data





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



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

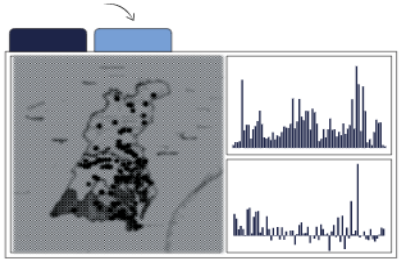
USGS science for a changing world

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

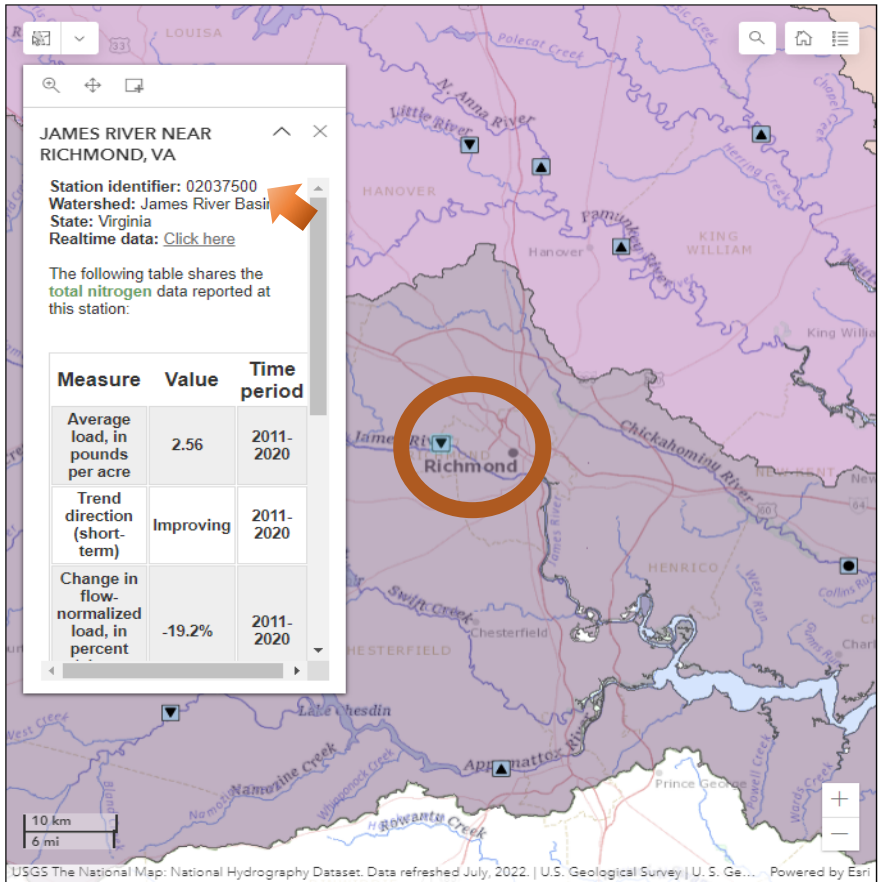
Total nitrogen

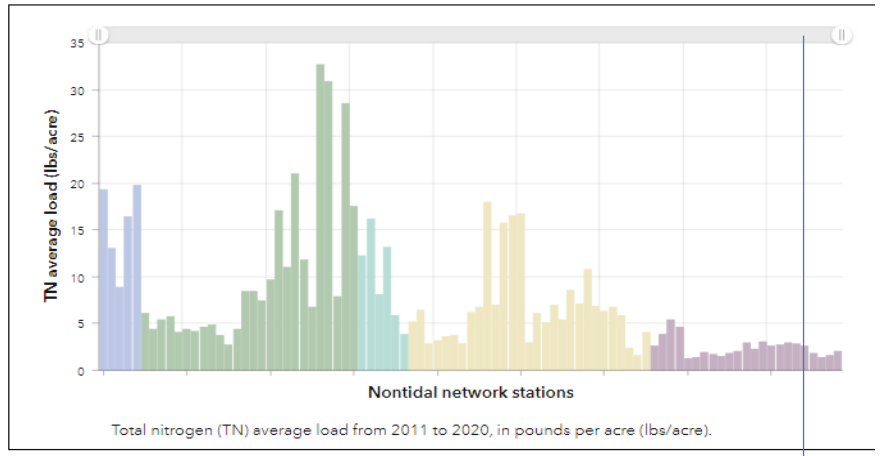
From 2011-2020, total nitrogen trends improved at 38% of stations and degraded at 42%. Of the long-term sites (sites monitored since approximately 1985), 55% are improving.



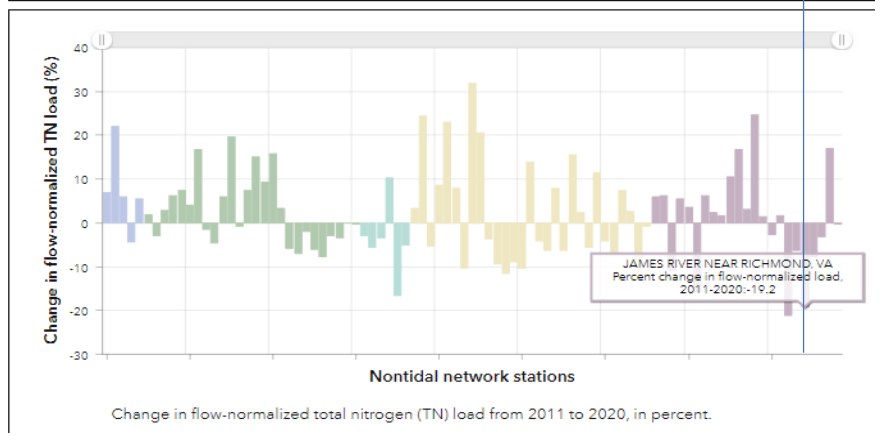
View patterns across the watershed and use the tabs to access tools for comparing stations. Click on an individual station to view site-specific load and trend information.

Graph tool | Query tool





Total nitrogen (TN) average load from 2011 to 2020, in pounds per acre (lbs/acre).



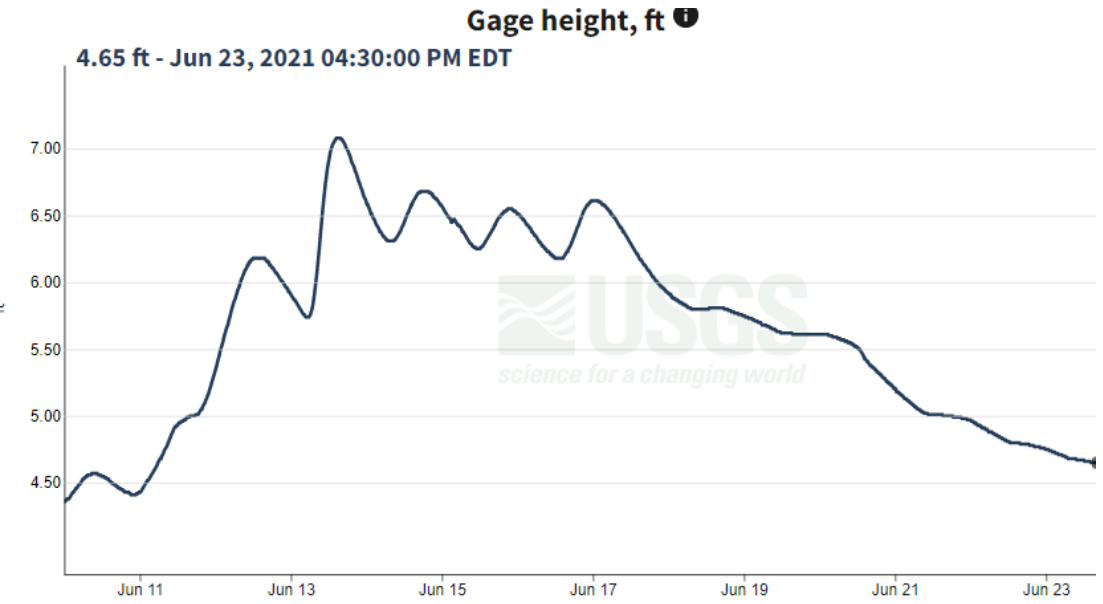
Change in flow-normalized total nitrogen (TN) load from 2011 to 2020, in percent.

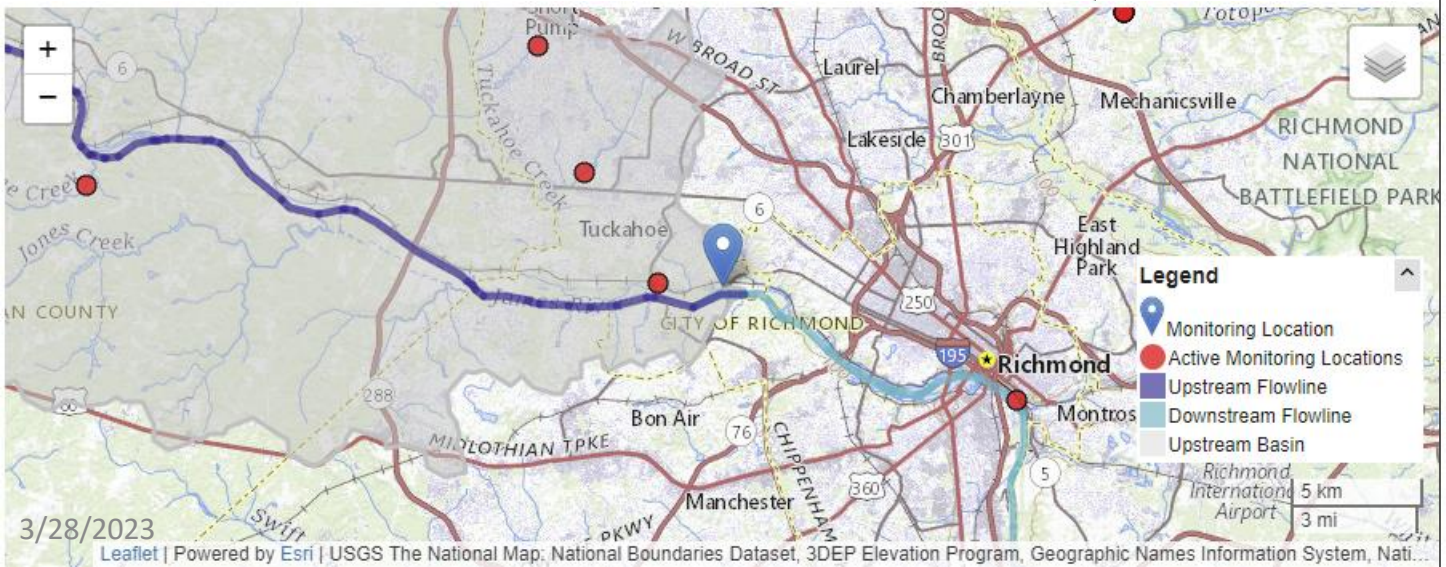
03 / 06

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.





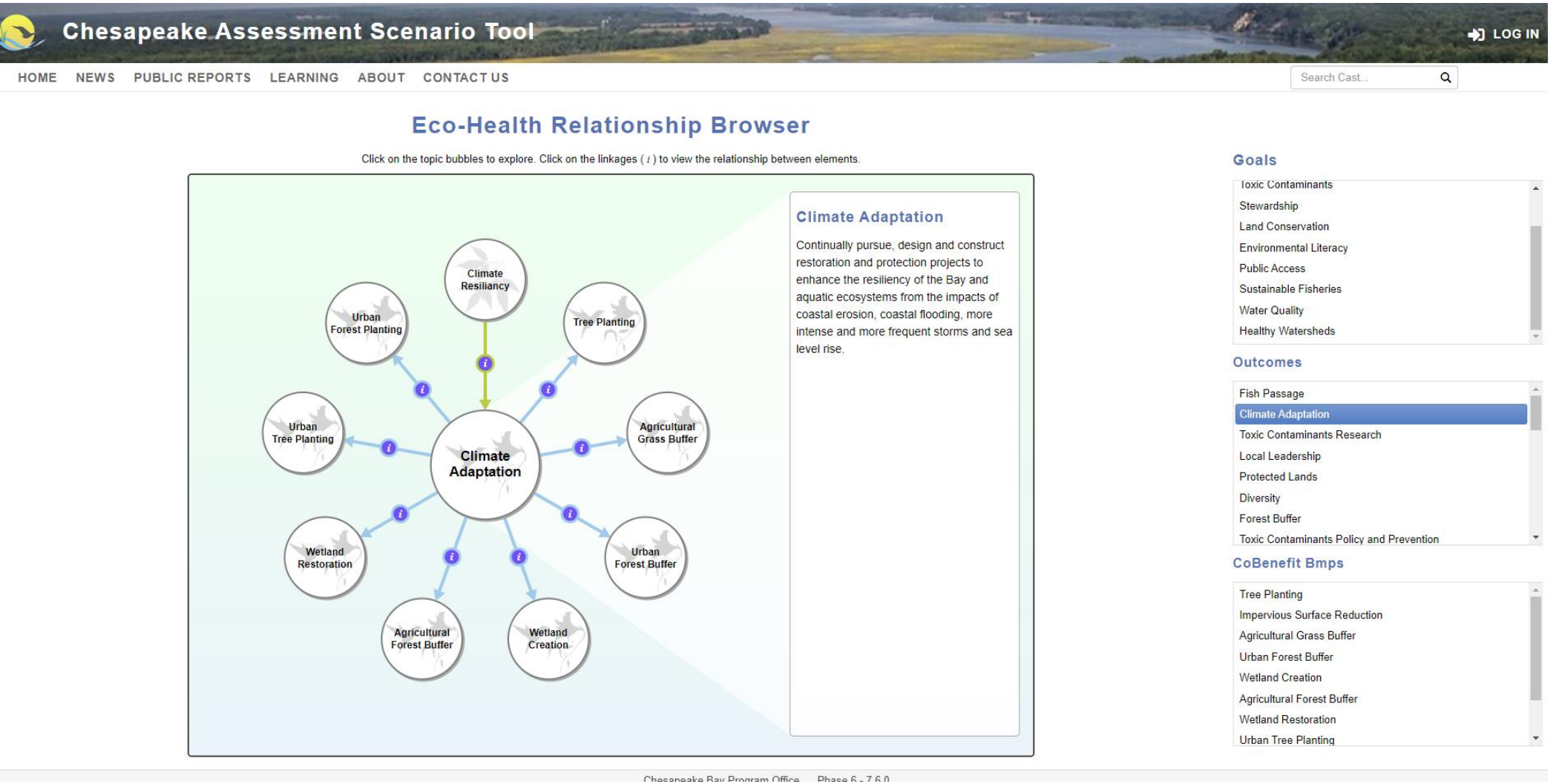
Changes in River Trends

- 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



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

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

BMP POUNDS REDUCED AND COSTS BY COUNTY

Description | Nitrogen | Phosphorus

Nitrogen

Geography: Richmond City, VA (CBWS Porti...

Sector	BMP	Nitrogen $/lb reduced/year	TN Lbs Reduced Per Unit
Agriculture	Wetland Restoration - Floodplain	7	21.9
	Forest Buffer	6	24.2
Developed	Conservation Landscaping Practices	-178	1.7
	Forest Planting	14	3.1
	Forest Buffer	16	4.5
	Dry Extended Detention Ponds	530	0.9
	Infiltration Practices w/o Sand, Veg. - A/B soils, no underdrain	902	3.5
	Bioswale	920	3.1
	Wet Ponds and Wetlands	1,636	0.9
	Filtering Practices	1,865	1.8
	Stormwater Performance Standard-Stormwater Treatment	2,725	0.9
	Stormwater Performance Standard-Runoff Reduction	3,445	1.5
	Vegetated Open Channels - A/B soils, no underdrain	3,538	2.0
	Filter Strip Runoff Reduction	4,191	0.9
	Bioretention/raingardens - C/D soils, underdrain	6,014	1.1
	Impervious Surface Reduction	31,499	1.8
	Impervious Disconnection to amended soils	72,615	0.5
Natural	Forest Harvesting Practices	20	3.0
	Oyster reef restoration – enhanced denitrification	20	57.0
	Oyster reef restoration – nutrient assimilation	49	24.0
	Algal Flow-way Tidal	124	545.0
	Algal Flow-way Non-Tidal	189	357.4
Septic	Septic Connection	378	3.3
	Septic Denitrification - Conventional	2,399	1.8

Nitrogen $/lb reduced/year: -10K, 0K, 10K, 20K, 30K, 40K, 50K, 60K, 70K, 80K

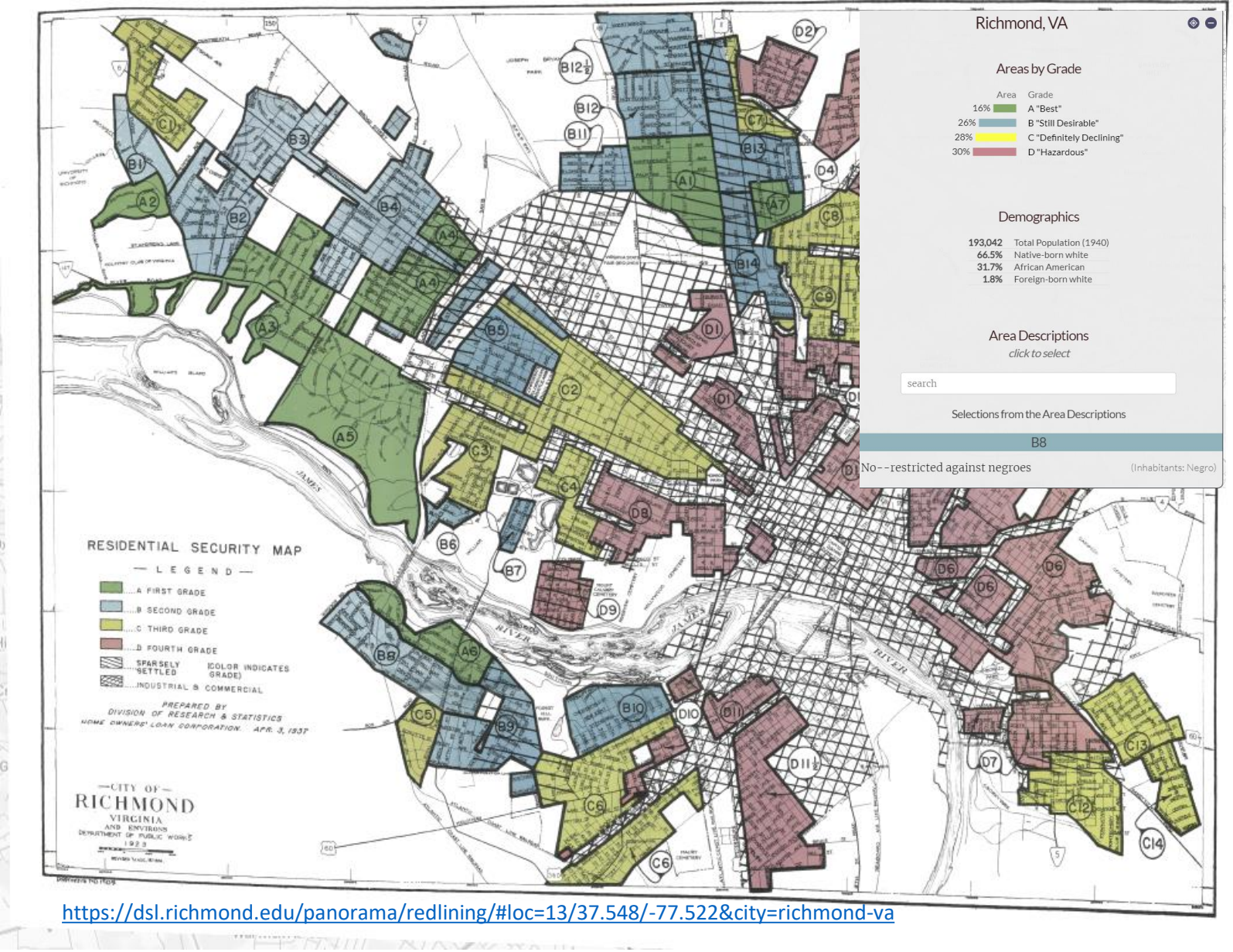
TN Lbs Reduced Per Unit: 0, 100, 200, 300, 400, 500, 600

Data vary by county. Select the county of interst. The nitrogen $/lb reduced/year and TN Lbs Reduced Per Unit for each BMP are broken down by Sector. BMPs are shown only where they reduce 0.5 pounds or more.

https://cast.chesapeakebay.net/Documentation/CostProfiles

Good options for cost effectiveness and nitrogen reduction, in addition to flood controls

- Conservation Landscaping
- Trees and Infiltration



https://dsl.richmond.edu/panorama/redlining/#loc=13/37.548/-77.522&city=richmond-va

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

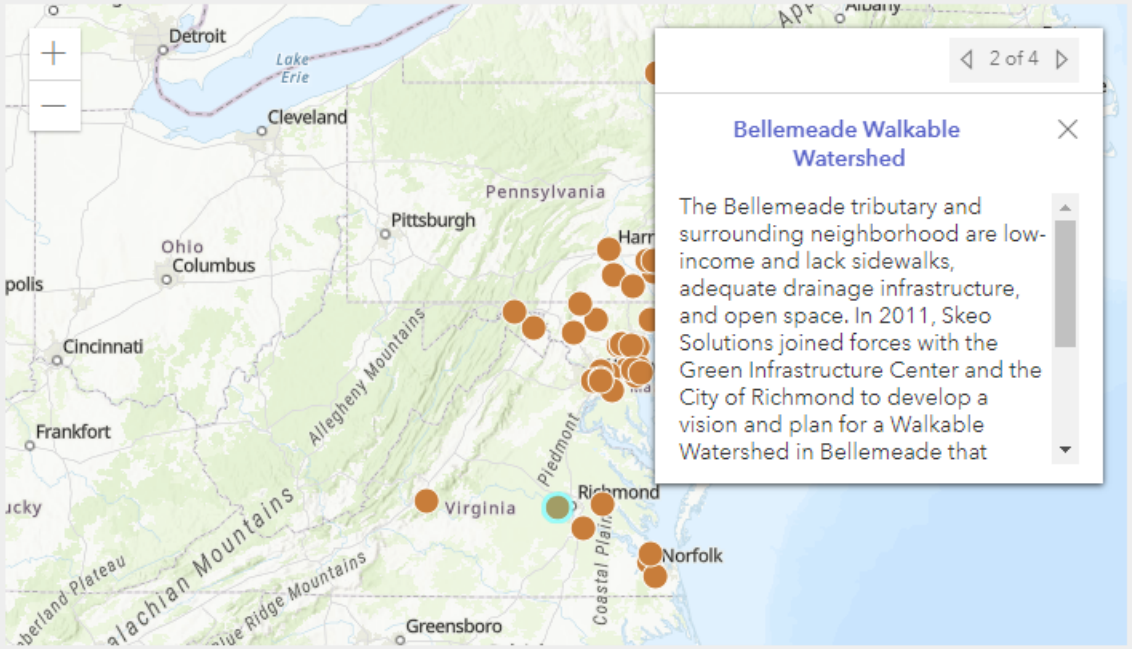
Cleaning up the Chesapeake Bay is about more than science. It's also about the people who are improving their communities by reducing pollution and protecting public health, fragile habitats, and the Bay's multibillion-dollar fishery, seafood, and recreation industries. These case studies show how local 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
- Clear all filter selections

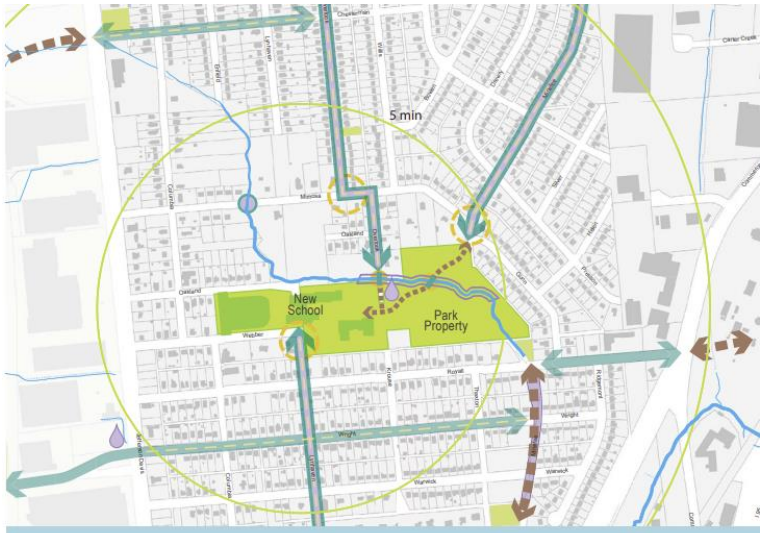


https://gis.chesapeakebay.net/wip/dashboard/

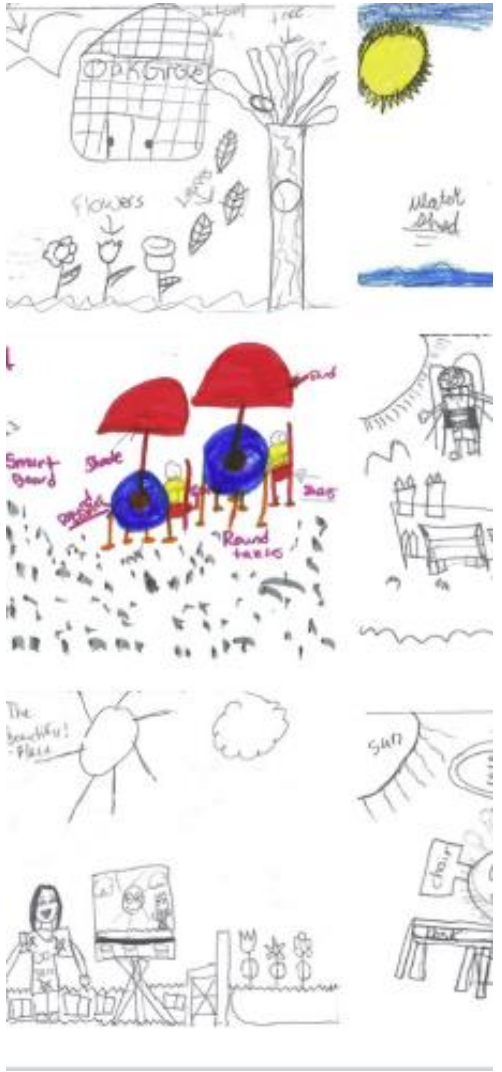
Examples of Successes—Bellemeade

- 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

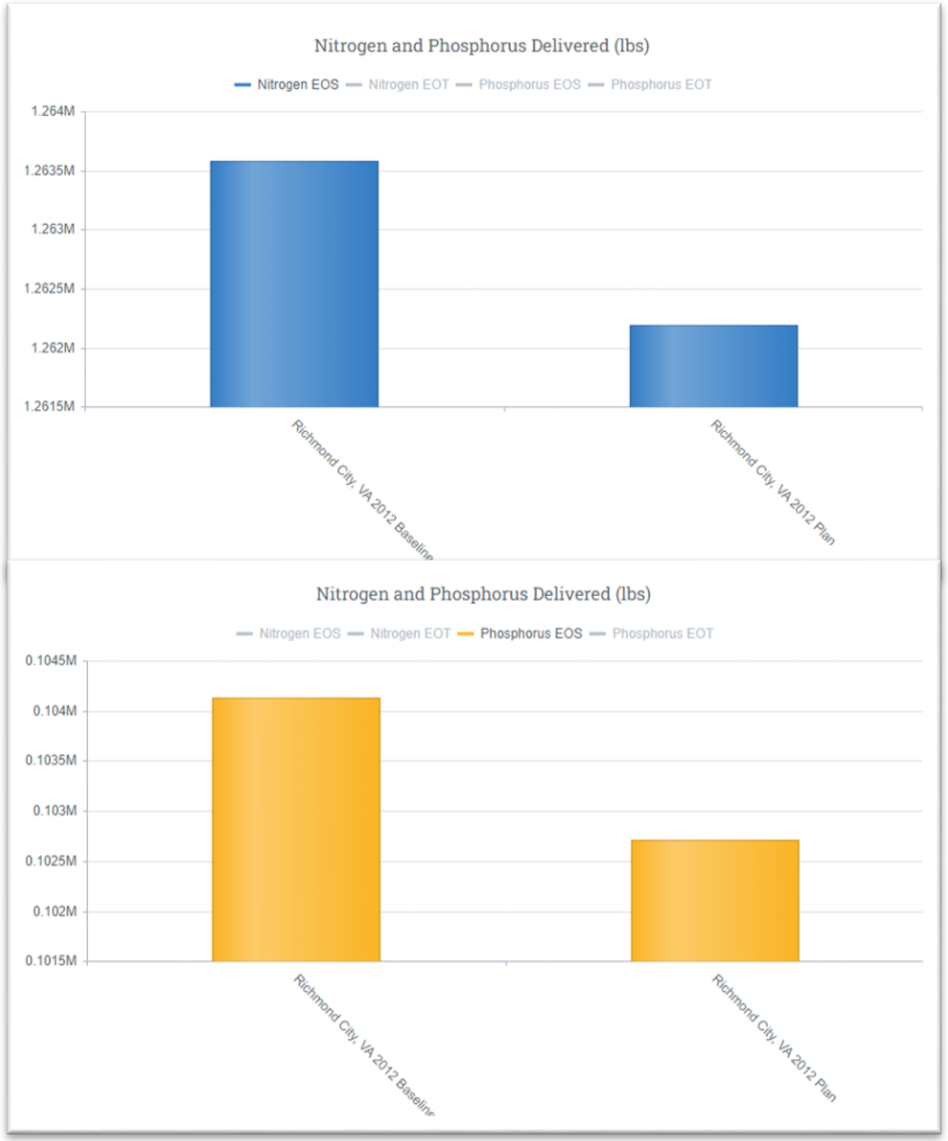


Building on student priorities, the watershed concept plan outlines three major green connections to the school and park.



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%

Raind*ropportunities*

- 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

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?