

Delaware River Basin Commission

Using Data for Water Resource Management at the Delaware River Basin Commission

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2021 AWRA Mid Atlantic Conference



Delaware River Basin Commission



Compact signed 1961

Five Equal Members:

- Delaware
- New Jersey
- Pennsylvania
- New York
- Federal Government

Broad Responsibilities / Authorities

- Water Supply
- Drought Management
- Flood Loss Reduction
- Water Quality
- Watershed Planning
- Regulatory Review (Permitting)
- Outreach/Education
- Recreation

Continuous Real-Time Data at DRBC

- DRBC mostly doesn't generate continuous real-time data
- Rely heavily on data from others (some funded by DRBC)
 - USGS via NWIS
 - NOAA via PORTS
- Turn measurements into knowledge about the system
- Will Demo some of the ways we use this data
 - Dashboards
 - Models (including model calibration)
 - Assessments
 - Episodic Events
- Talk about why and how

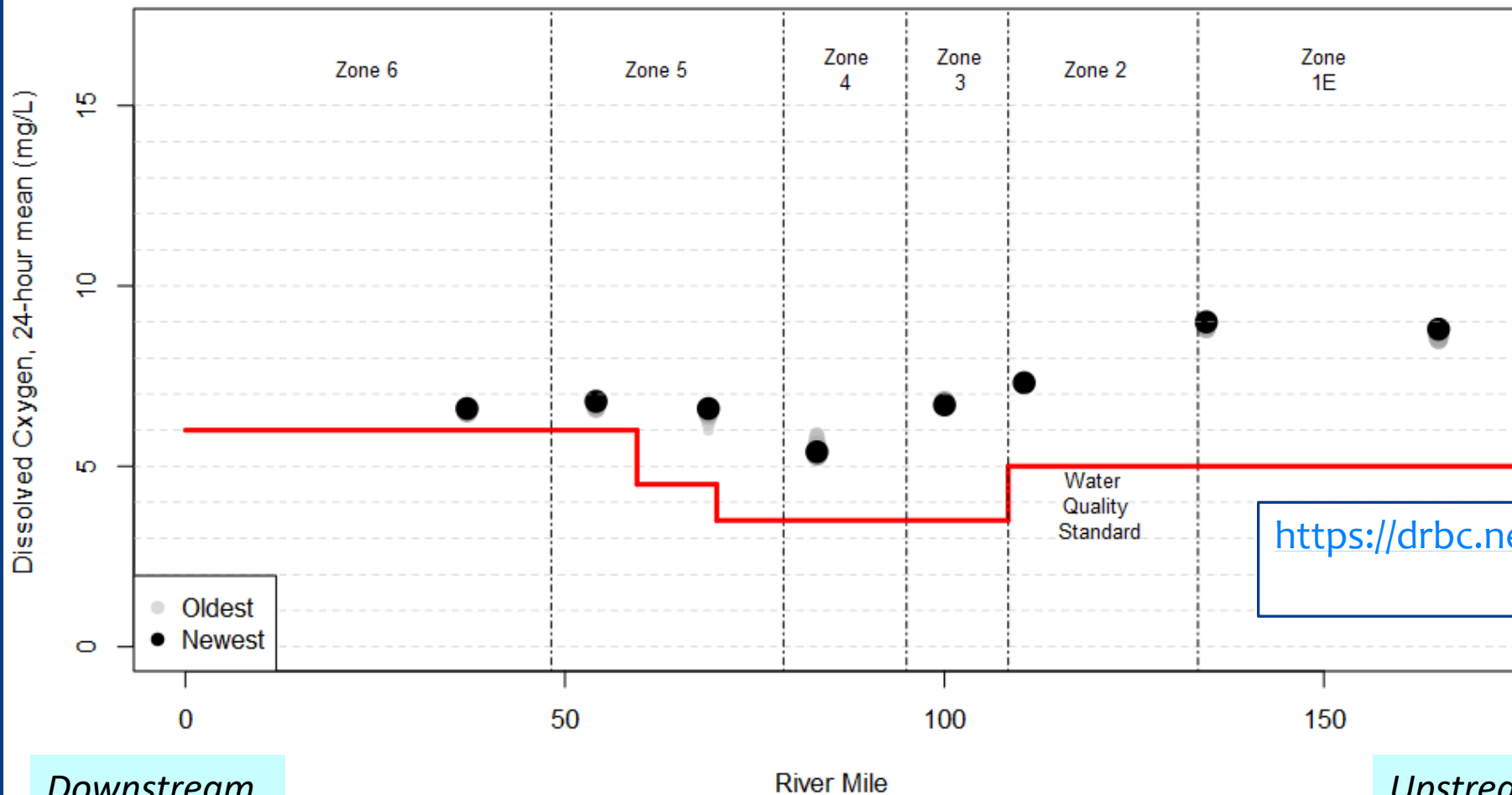
DRBC Dashboards

- Written reports tell you what conditions *used to be*
- Would like to know conditions closer to *right now*

Dashboard	Link
Water Quality	https://drbc.net/Sky/waterq.htm
Flow	https://drbc.net/Sky/flows.htm
Hydrosnap	https://www.arcgis.com/apps/dashboards/690464a9958b49e5b49550964641ffd7
Upper Delaware Temperature	https://www.drbc.net/Sky/uptemp.htm
Ground water surface elevation trends	https://www.drbc.net/Sky/nj2.htm https://www.drbc.net/Sky/sepagwpa.htm

DRBC Water Quality Dashboard

Delaware River Dissolved Oxygen Concentrations
09/15/2021 to 09/20/2021 and Standards



Data:
USGS Continuous
Water Quality via
NWIS

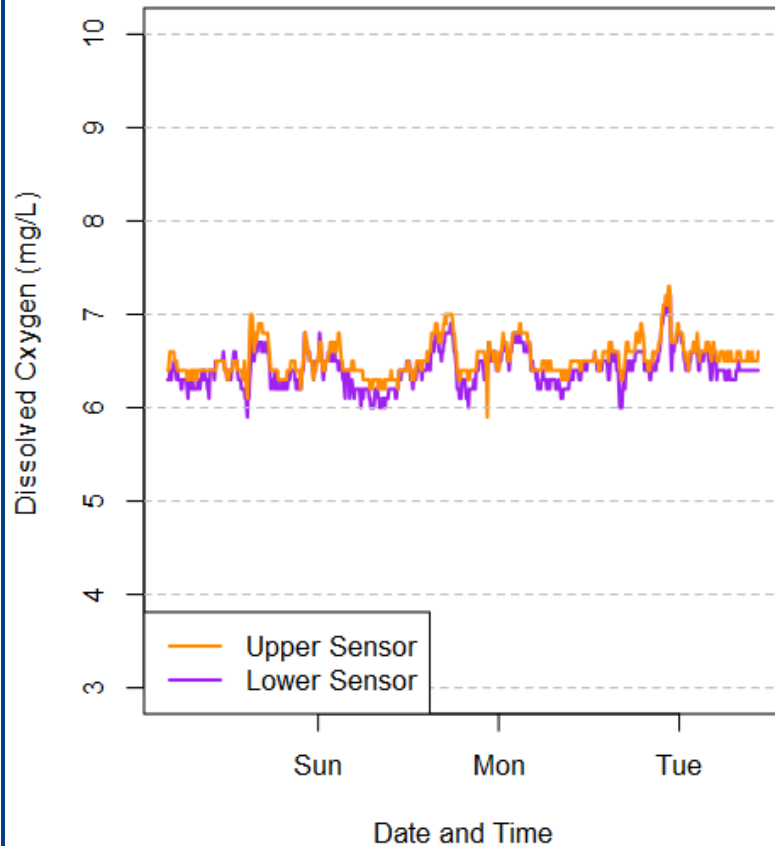
<https://drbc.net/Sky/waterq.htm>

Downstream

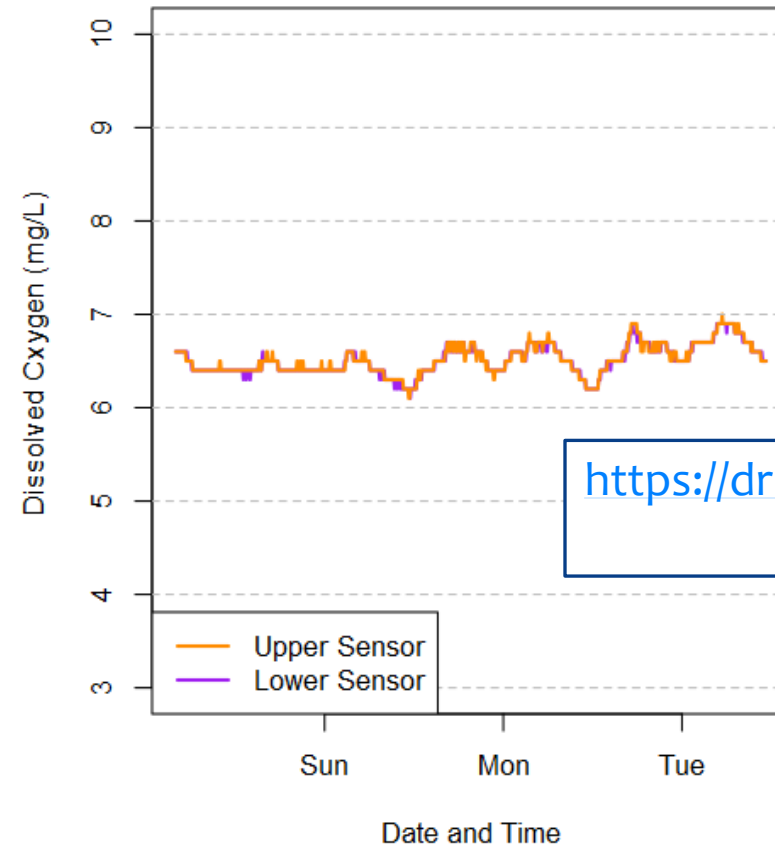
Upstream

DRBC Water Quality Dashboard

**Ship John Shoal Lighthouse
at RM 37.1 Ending 2021-09-21**



**Delaware Memorial Bridge
at RM 68.9 Ending 2021-09-21**

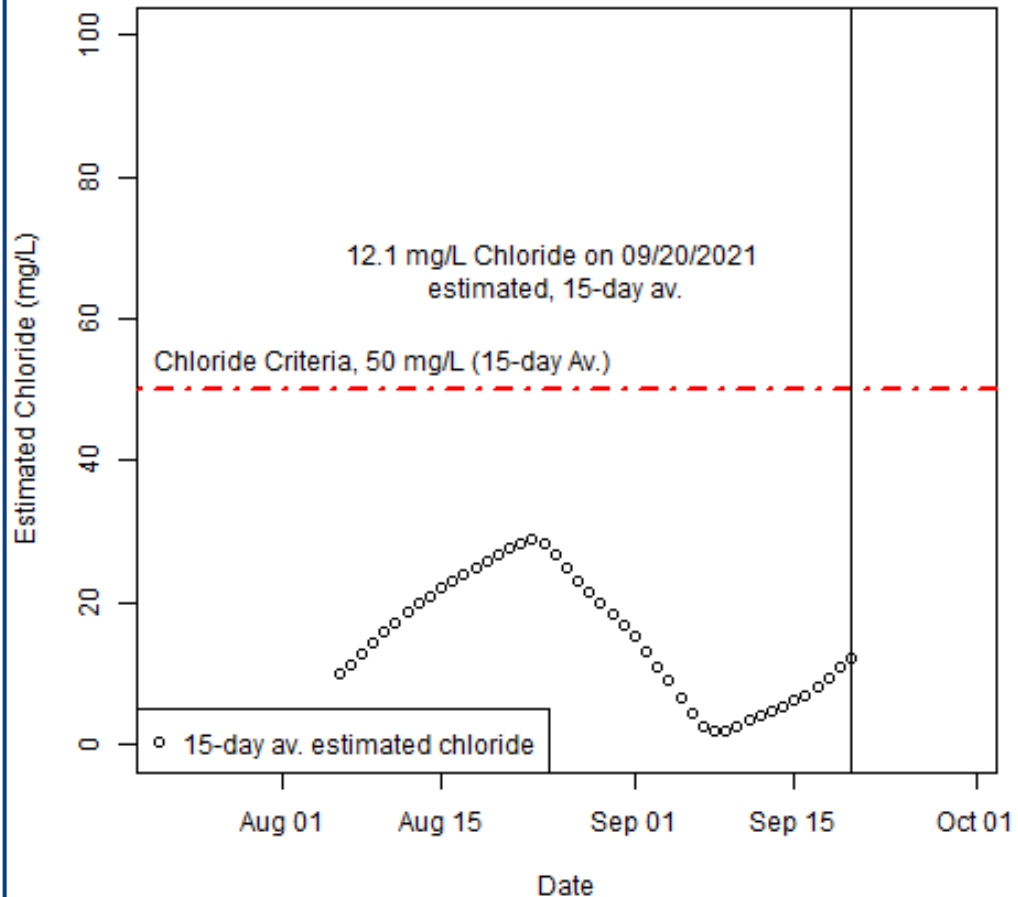


Data:
USGS Continuous
Water Quality via
NWIS

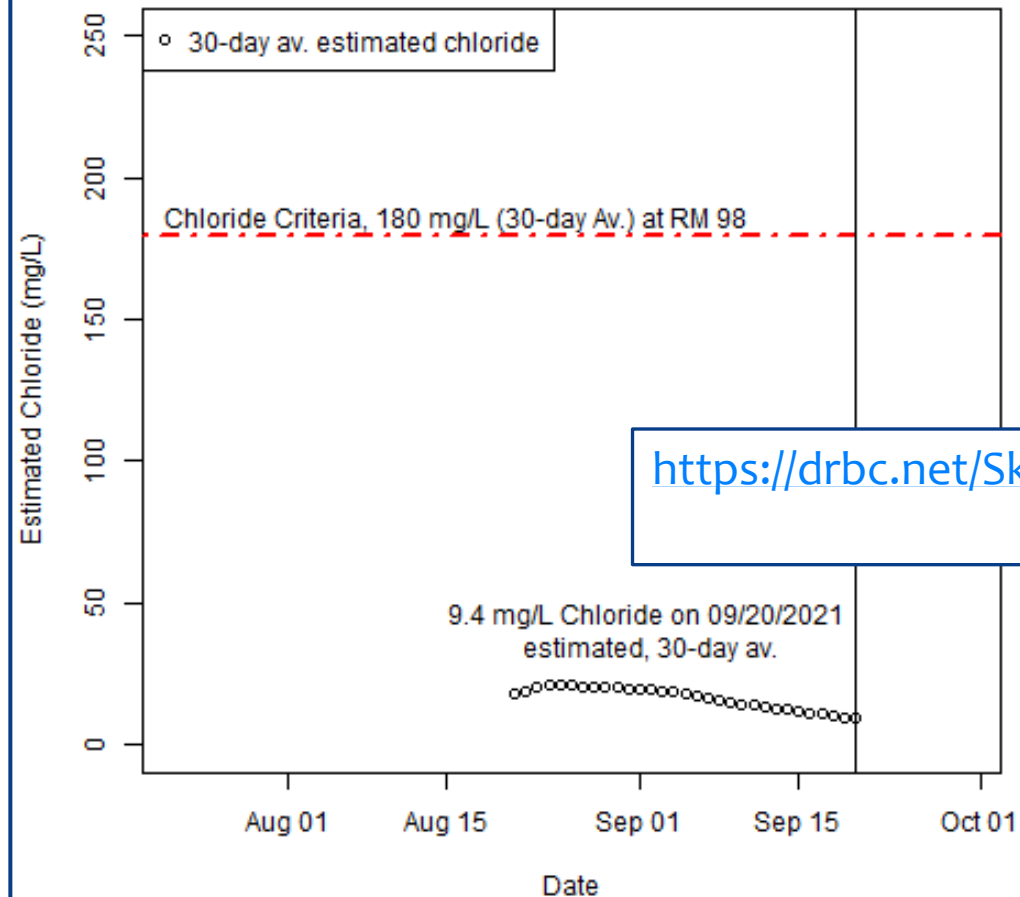
<https://drbc.net/Sky/waterq.htm>

DRBC Water Quality Dashboard

Comparison of Estimated Chloride to Criteria,
Delaware River Zone 2, as of 09/20/2021



Comparison of Estimated Chloride to Criteria,
Delaware River Zone 3, as of 09/20/2021



Data:
USGS Continuous
Water Quality via
NWIS

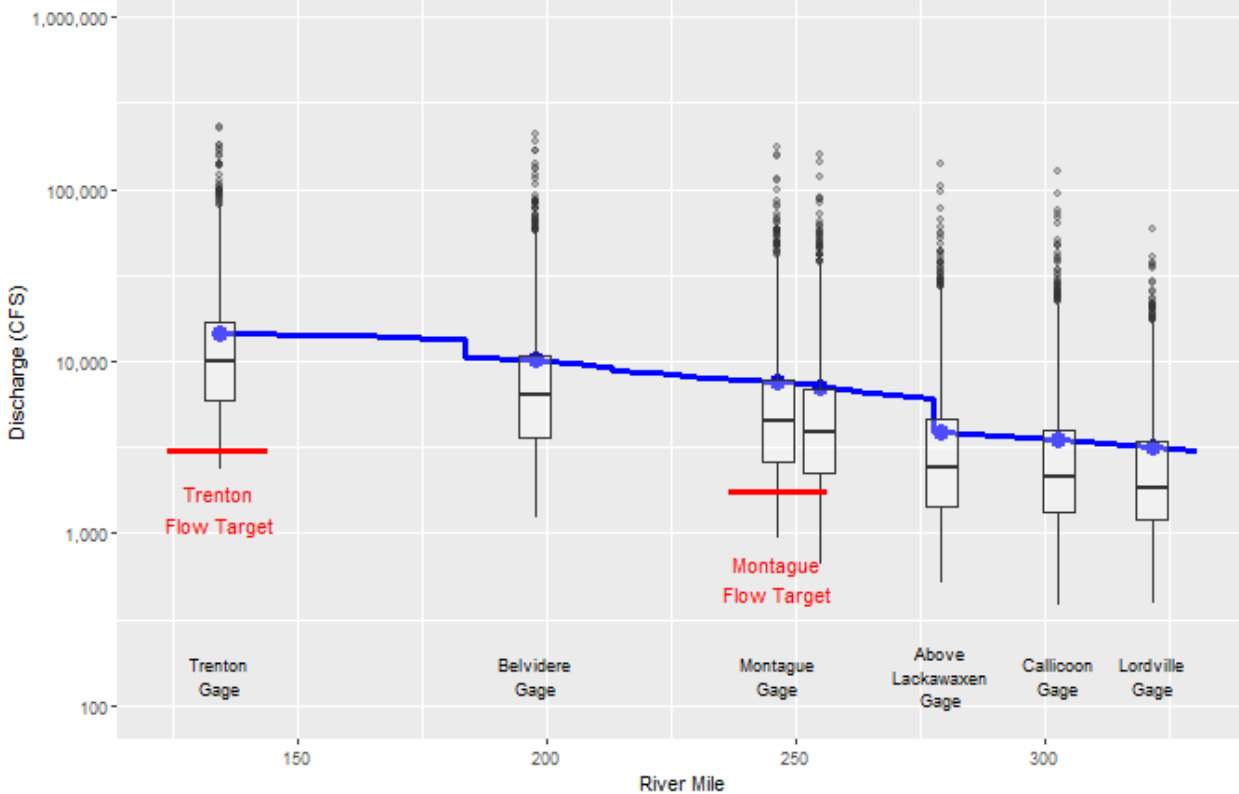
<https://drbc.net/Sky/waterq.htm>

DRBC Flow Dashboard

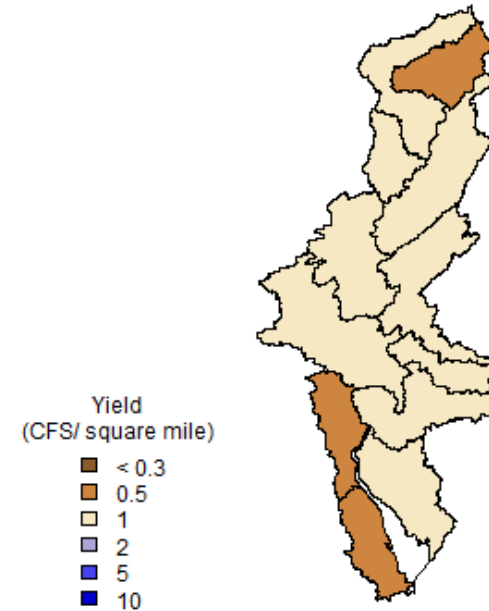
Downstream

Mainstem Delaware River Discharge Profile on 09/20/2021
Compared to 20-year Boxplots at USGS Gage Sites

Upstream



Delaware Basin daily water Yield
(CFS/square mile) on 08/15/2021



Data:
USGS Flow via
NWIS

<https://drbc.net/Sky/flows.htm>

DRBC Groundwater Surface Elevation Dashboard

Data:
USGS
Groundwater via
NWIS

USGS Observation Well: 395524074502501

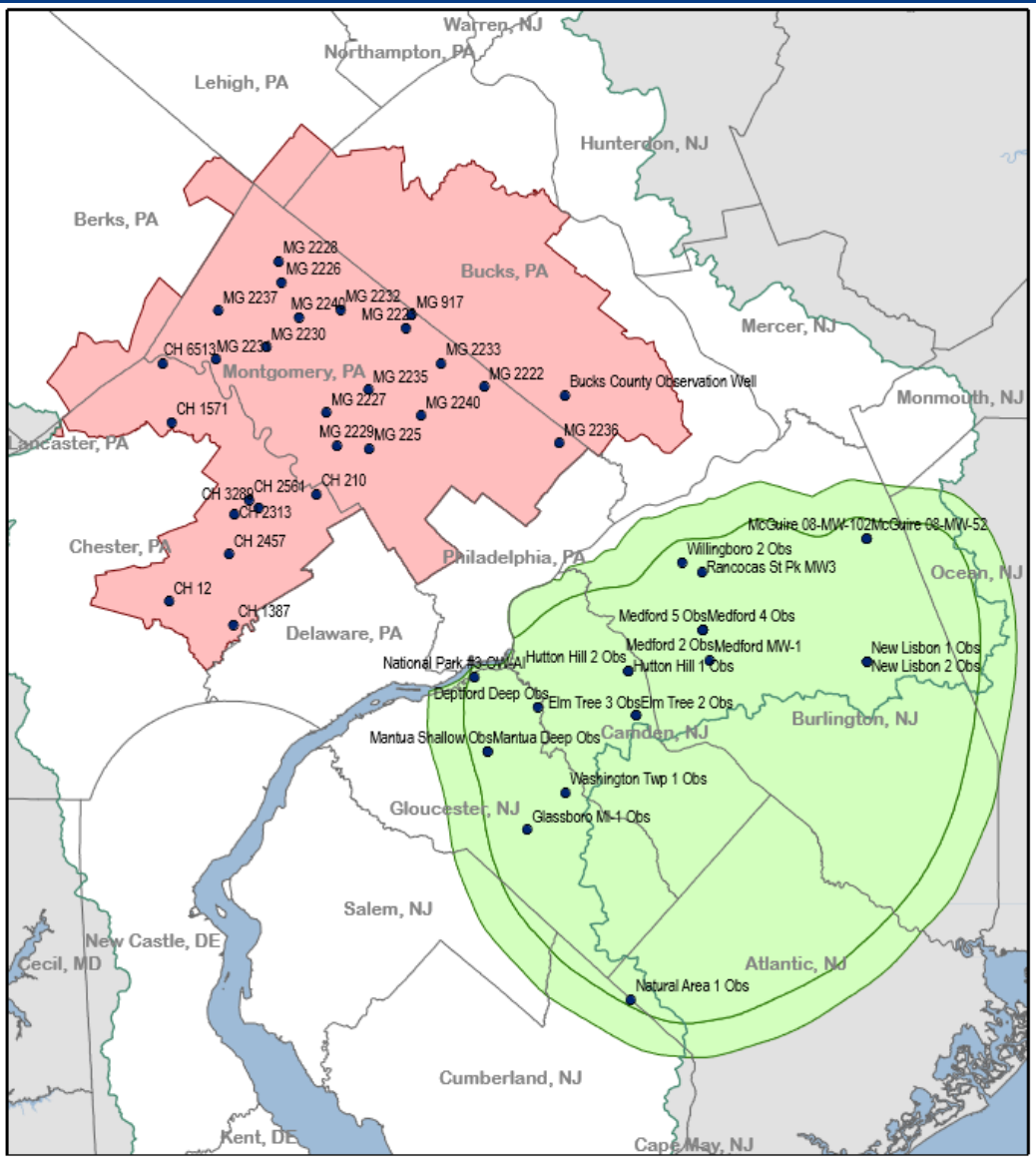
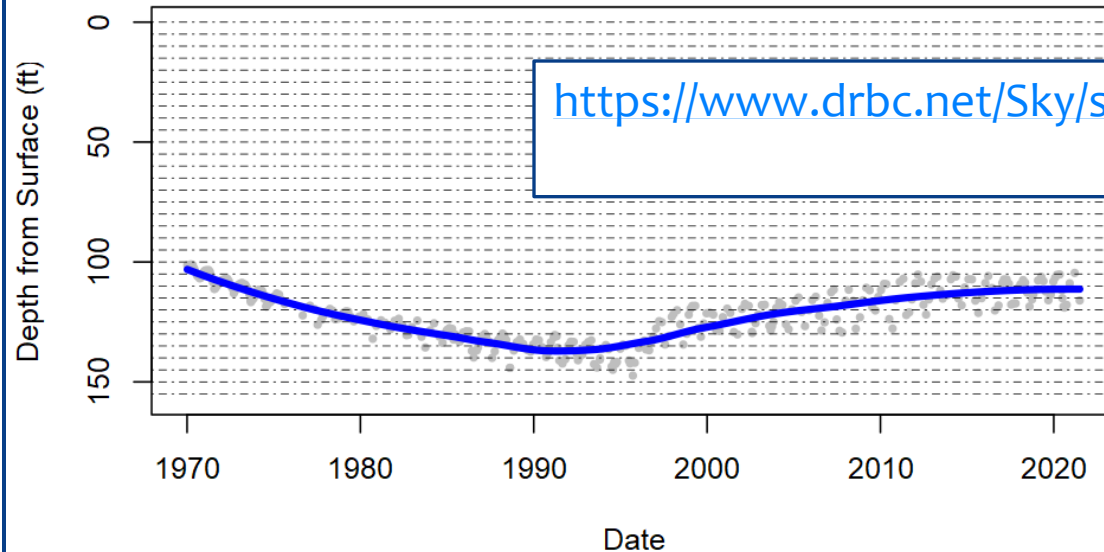
Burlington County, NJ Well: Medford 1 Obs

Management Area: NJ Critical Area 2

Most Recent Observation: 2021-07-01

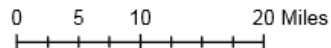
Formation: Magothy-Raritan-Potomac Aquifer System, Upper Aquifer

<https://www.drbc.net/Sky/sepagwpa.htm>



Legend

- NWIS Wells
- PA GWPA
- NJ Crit Area 2



Models

Delaware Estuary 1D Hydrodynamic Model

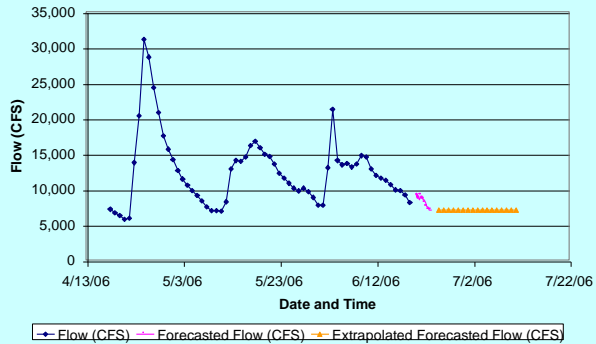


- Motivation – Athos 1 oil spill
- If you wait for the spill to begin modeling, you're too late
- Model of the Delaware Estuary from Atlantic Ocean to Head of Tide at Trenton
- Pre-run the hydrodynamic part

Photo courtesy of the US Coast Guard

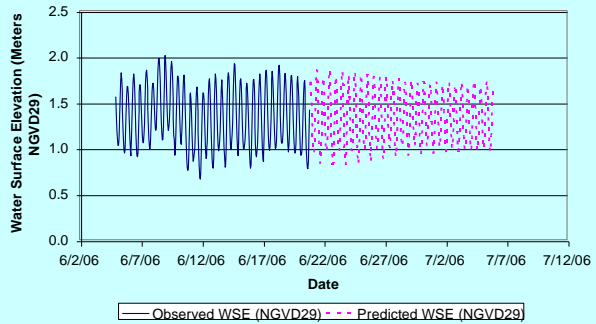
Automated Daily Processes No User Input Required

Measured, Forecasted, and Extrapolated Forecasted Flows at the Delaware River at Trenton (USGS Station 01463500)



**Freshwater
Boundary
Discharge Data
and Predictions**

Observed and Predicted Water Surface Elevation, C&D Canal at Chesapeake City, MD NOAA Station 8573927



**Tidal Boundary
Water Surface
Data and
Predictions**

**Pre-Processor
develops model
input file**

DYNHYD5

WASP

**Spill
Data**

**Predicted Location,
Duration, and
Concentration of
Impacted Water Intakes**

**Prescriptive Measures to
Mitigate Impact**

Data:

1. USGS Flow via NWIS
2. NOAA water surface elevation via PORTS
3. NOAA predicted flow via AHPS

DRBC Basin-Wide Rapid Dilution Model

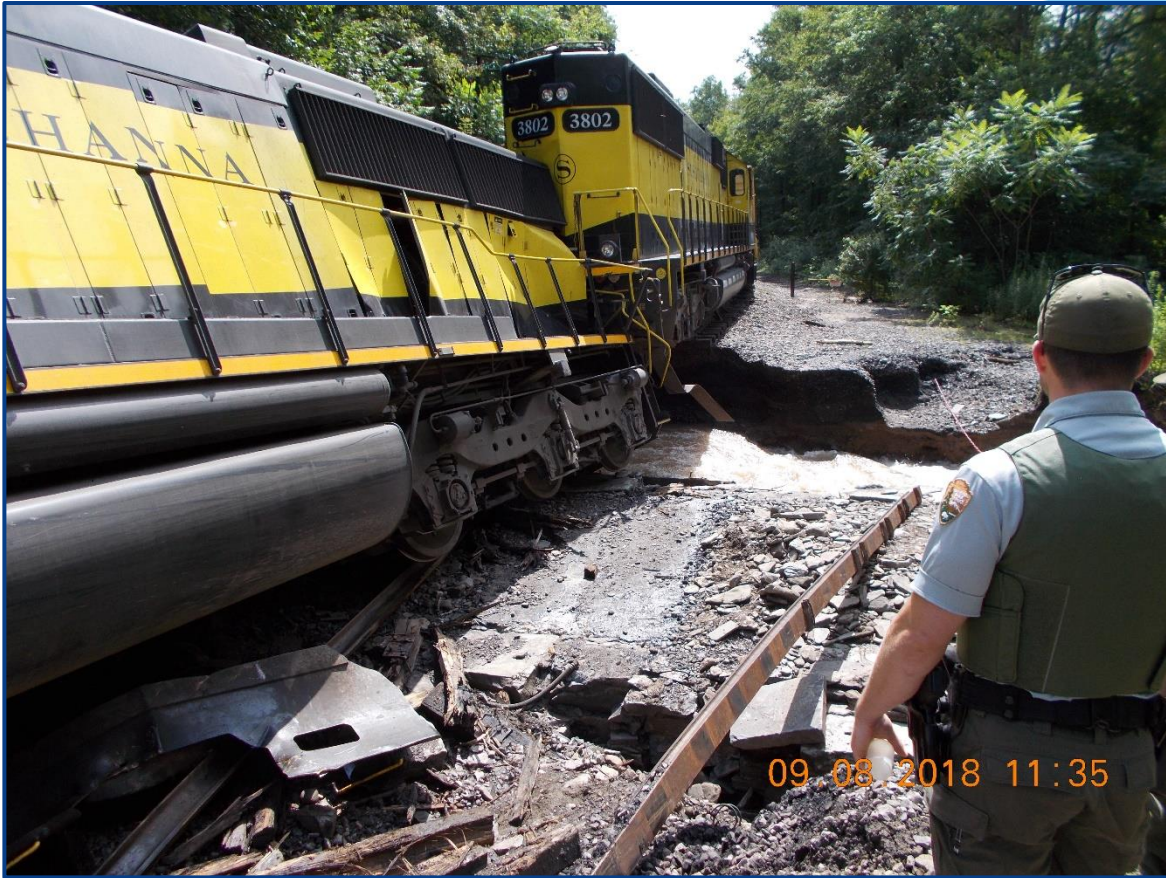


Photo courtesy of National Park Service, Upper Delaware Scenic & Recreational River

- Motivation – Hancock, NY train derailment in 2018, multiple cyanobacterial blooms in 2019
- Need a rapid way to estimate downstream dilution under current conditions anywhere in the basin

DRBC Basin-Wide Rapid Dilution Model

- Tell it where the spill occurred, how much
- Retrieves the prior day's daily flow from all USGS gages in the basin >300 gages
- Computes the average water yield by HUC8
- Computes the downstream path from the 'release' to the terminus of the non-tidal
- Defines the contributing upstream watershed at each node of the downstream path
- Computes dilution at each node
- Creates a list of intakes at each node in the path
- Optionally include a background concentration if your expectation is that the background concentration is non-zero

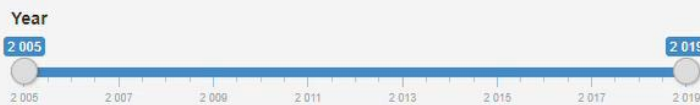
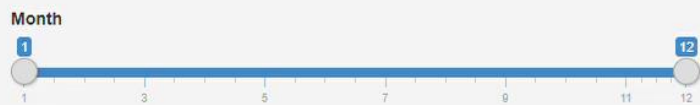
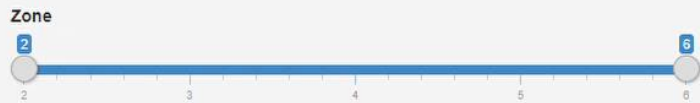
Data:
USGS Flow via
NWIS

Delaware River Basin



<https://giphy.com/gifs/NVzbf8ralooccBMDkB>

Input Variables



Parameter 1 (red):

Nitrate



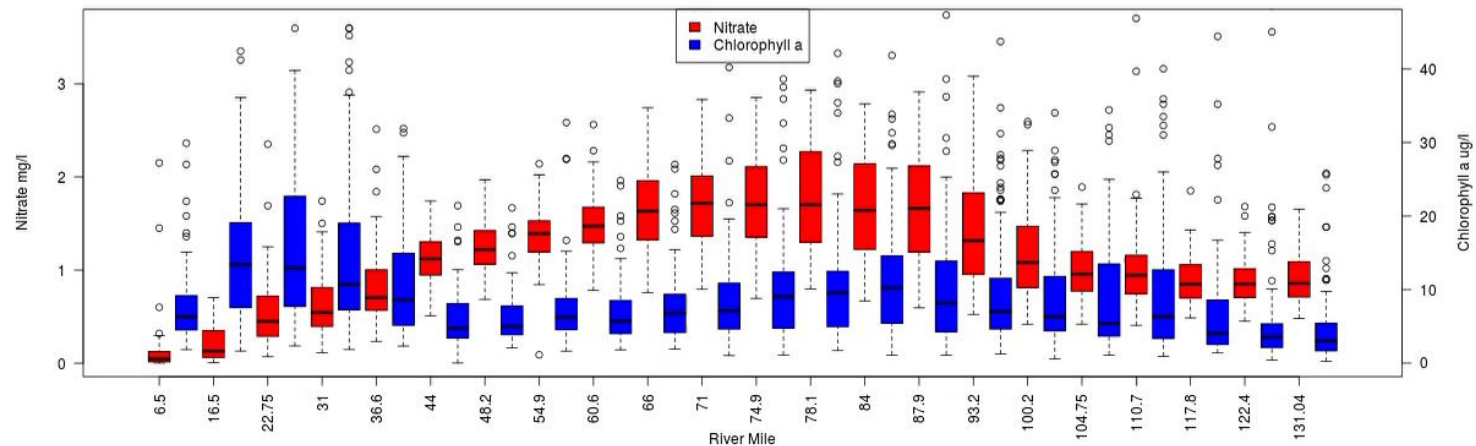
Parameter 2 (blue):

Chlorophyll a



DRBC Delaware Estuary Water Quality Data Overplots

An app for comparing paired observations by River Mile from DRBC's Delaware Estuary Water Quality Data set.

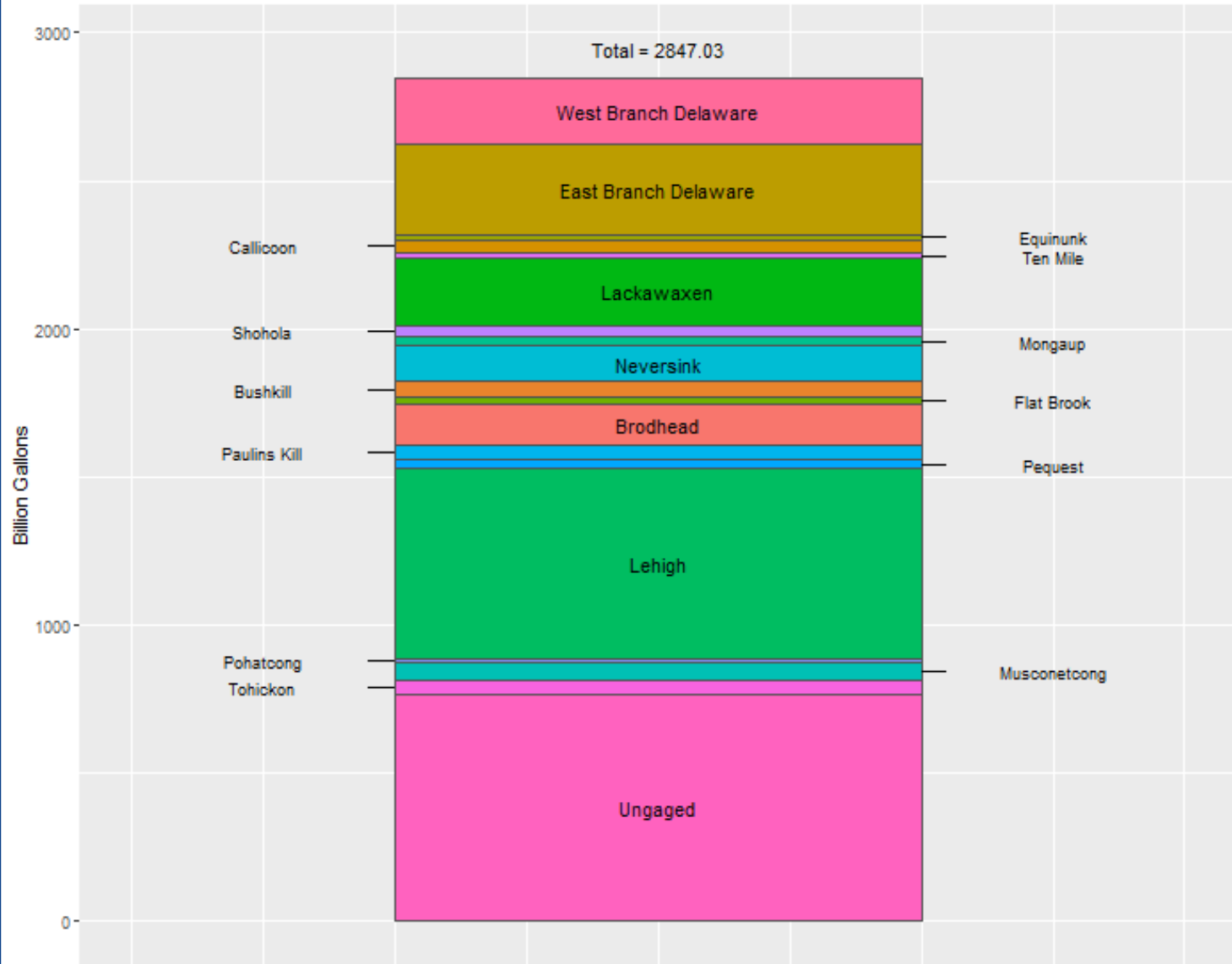


Programmed by John Yagetic, P.E. (John.Yagetic@drbc.nj.gov or JYagetic@gmail.com), June 2017
 Learn more about DRBC's Estuary Water Quality Monitoring Program



<https://johnyagetic.shinyapps.io/Overplots/>

2020 Cumulative Discharge, Delaware River at Trenton by tributary
January 1, 2020 through December 31, 2020

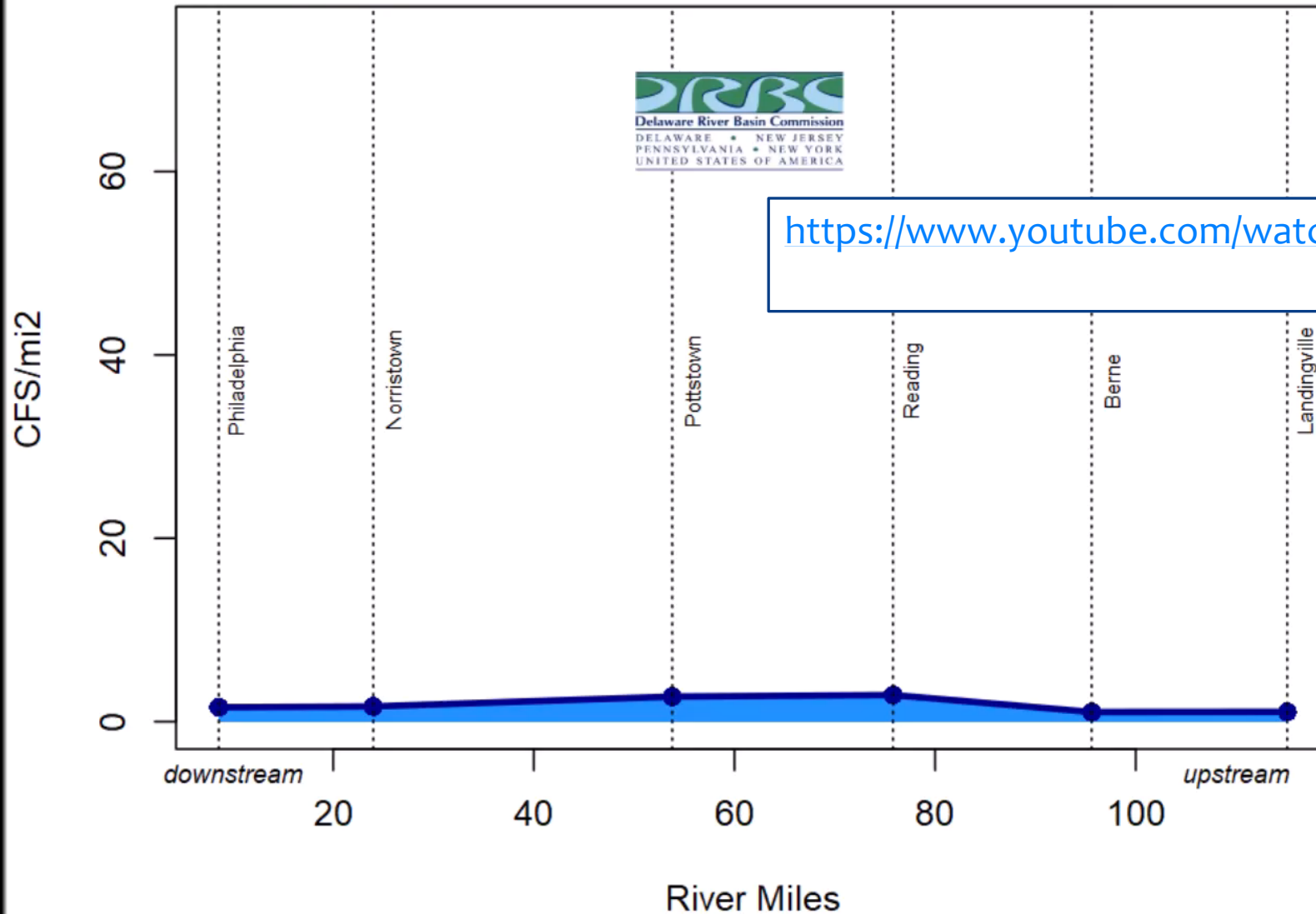


Assessments

- End of year assessments
- Episodic events
- Understanding the system better

Data:
USGS Flow via
NWIS

Schuylkill River Discharge per Drainage Area 2021-09-01 00:00:00



<https://www.youtube.com/watch?v=pmfdTdDqV9M>

Data:
USGS Continuous
Water Quality via
NWIS

Blue Marsh Reservoir during Ida

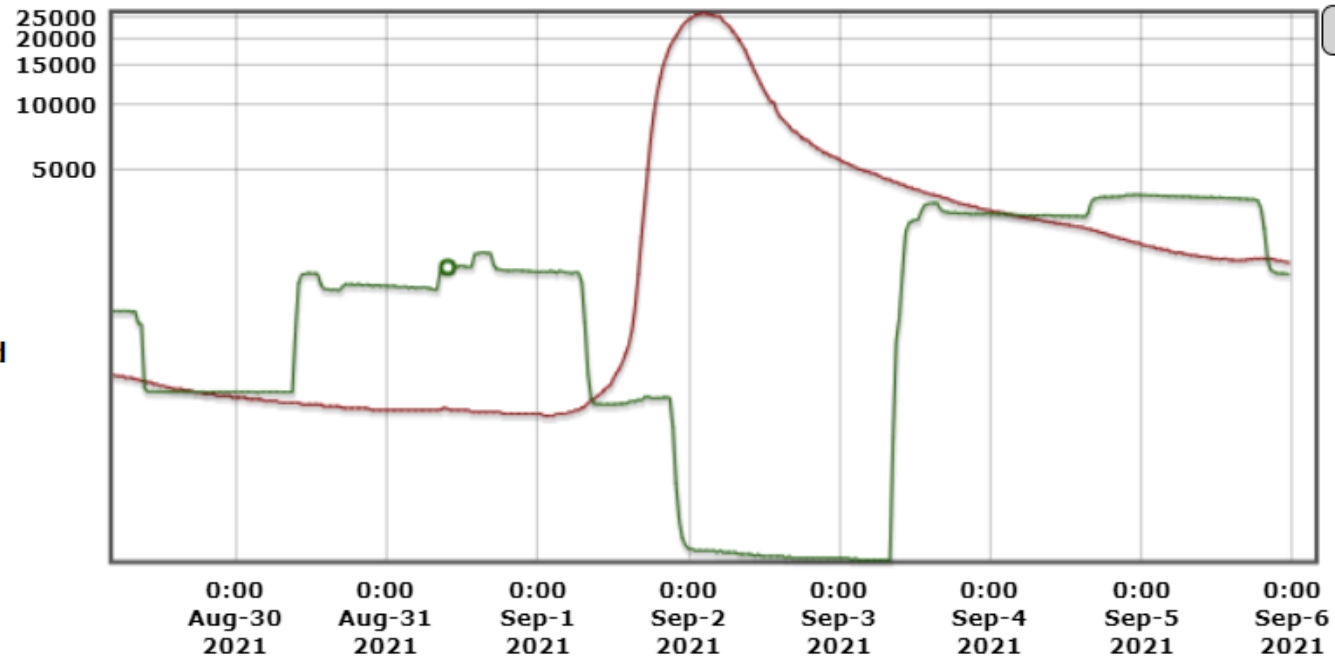
DA Berne 355
DA Tulephocken 175

USGS 01470500 Schuylkill River at Berne, PA
USGS 01470960 Tulpehocken Cr at Blue Marsh Damsite near Reading

Zoom period plot

Wednesday Sep 8 2021 10:28

Discharge, cubic feet per second



Explanation

- 6390 — USGS 01470500
- 79.5 — USGS 01470960
- Measured discharge

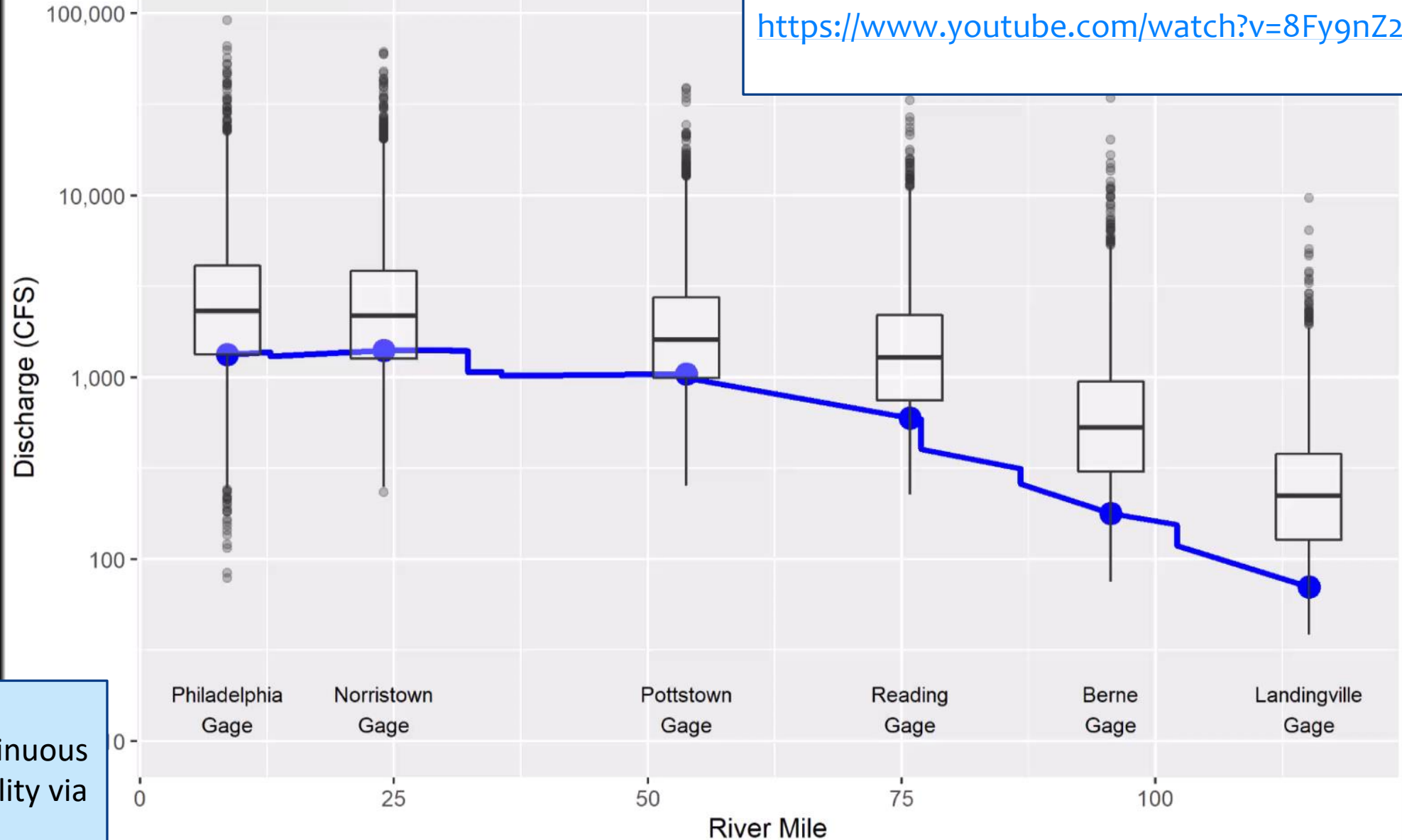
Data:
USGS Continuous
Water Quality via
NWIS

Mainstem Schuylkill River Discharge Profile on 08/12/2021 Compared to 20-year Boxplots at USGS Gage Sites

Downstream

Upstream

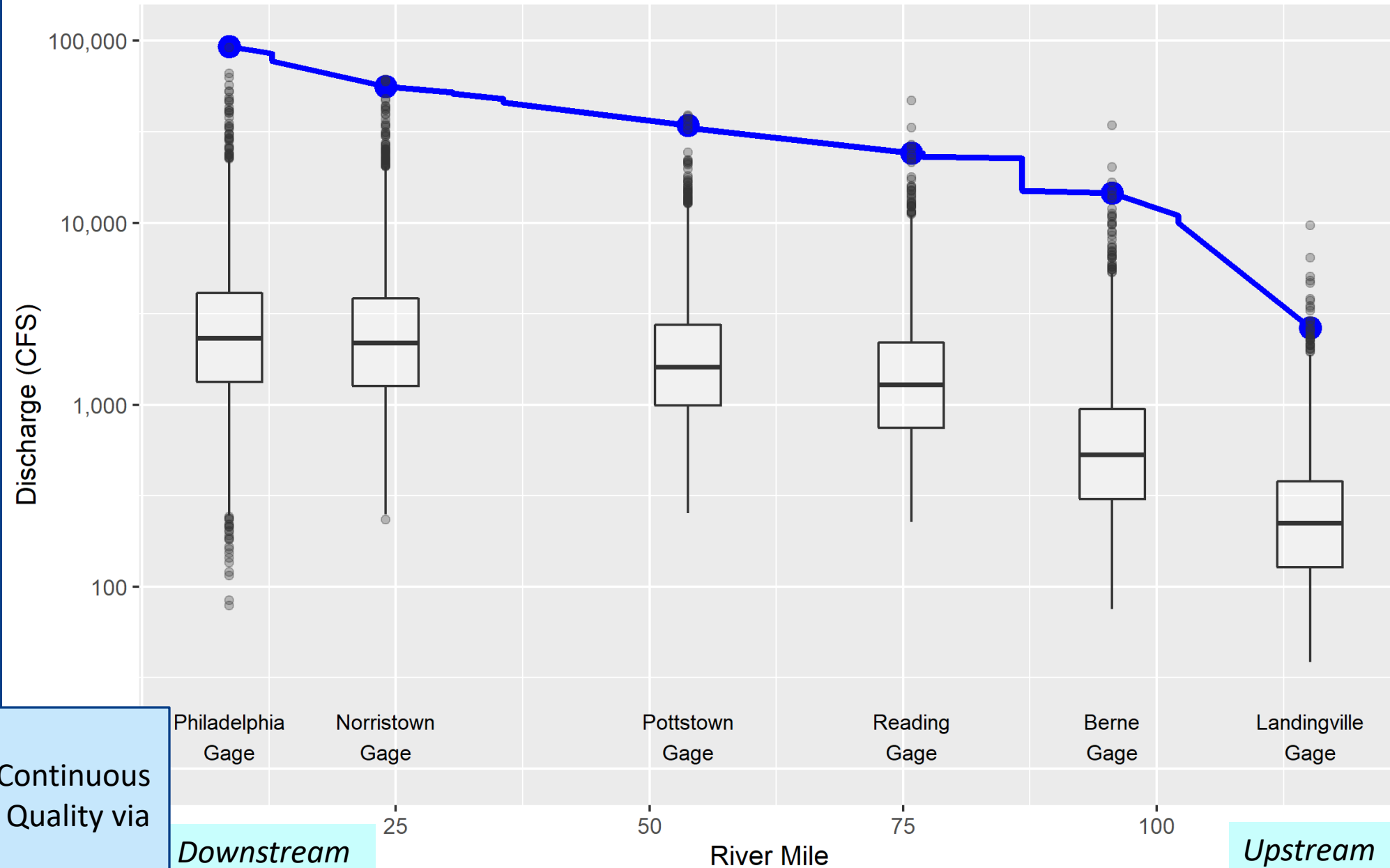
<https://www.youtube.com/watch?v=8FygnZ2RGYo>



Data:
USGS Continuous
Water Quality via
NWIS



Mainstem Schuylkill River Discharge Profile on 09/02/2021 Compared to 20-year Boxplots at USGS Gage Sites

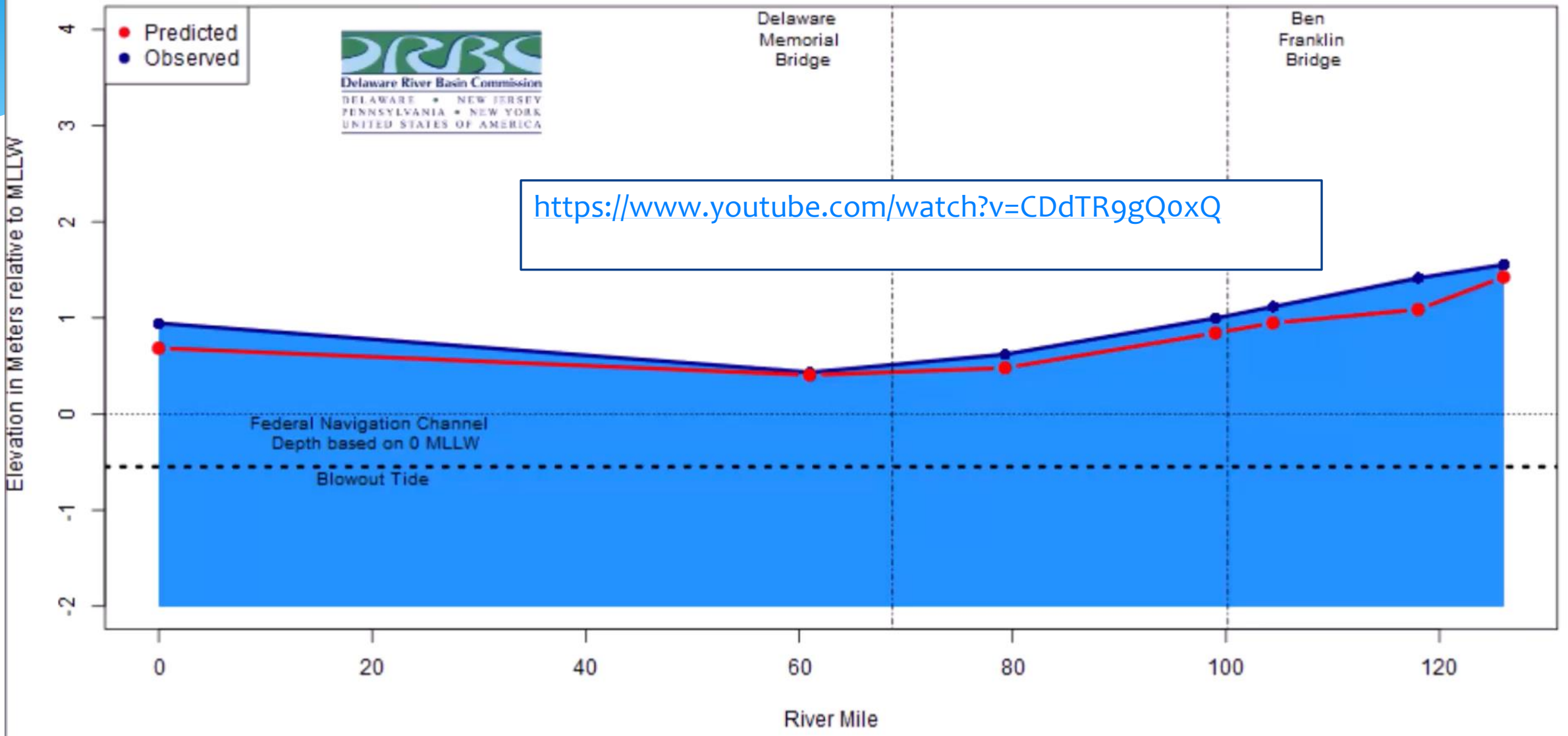


Data:
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Water Quality via
NWIS



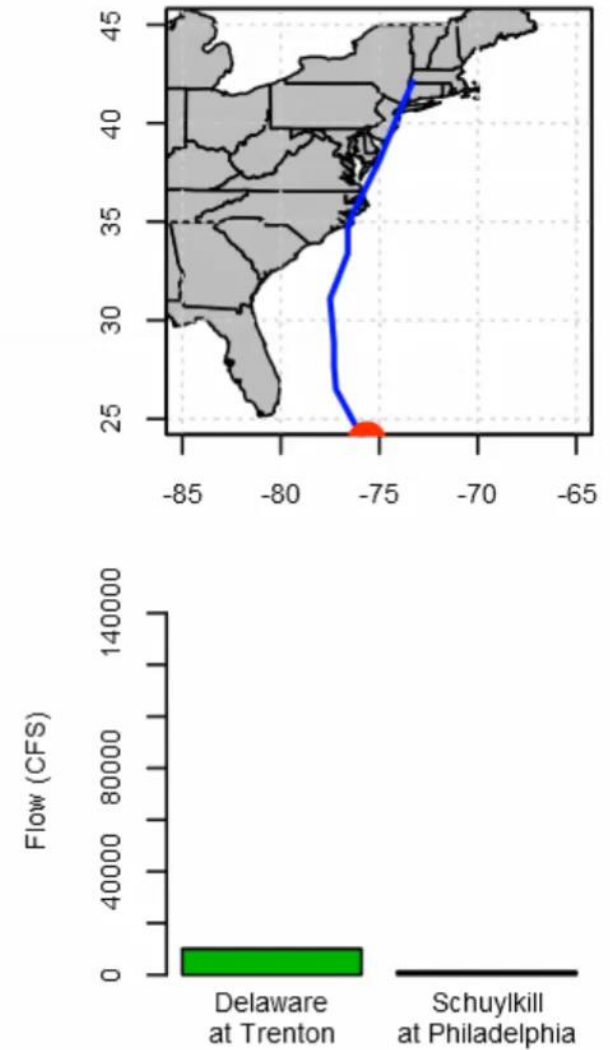
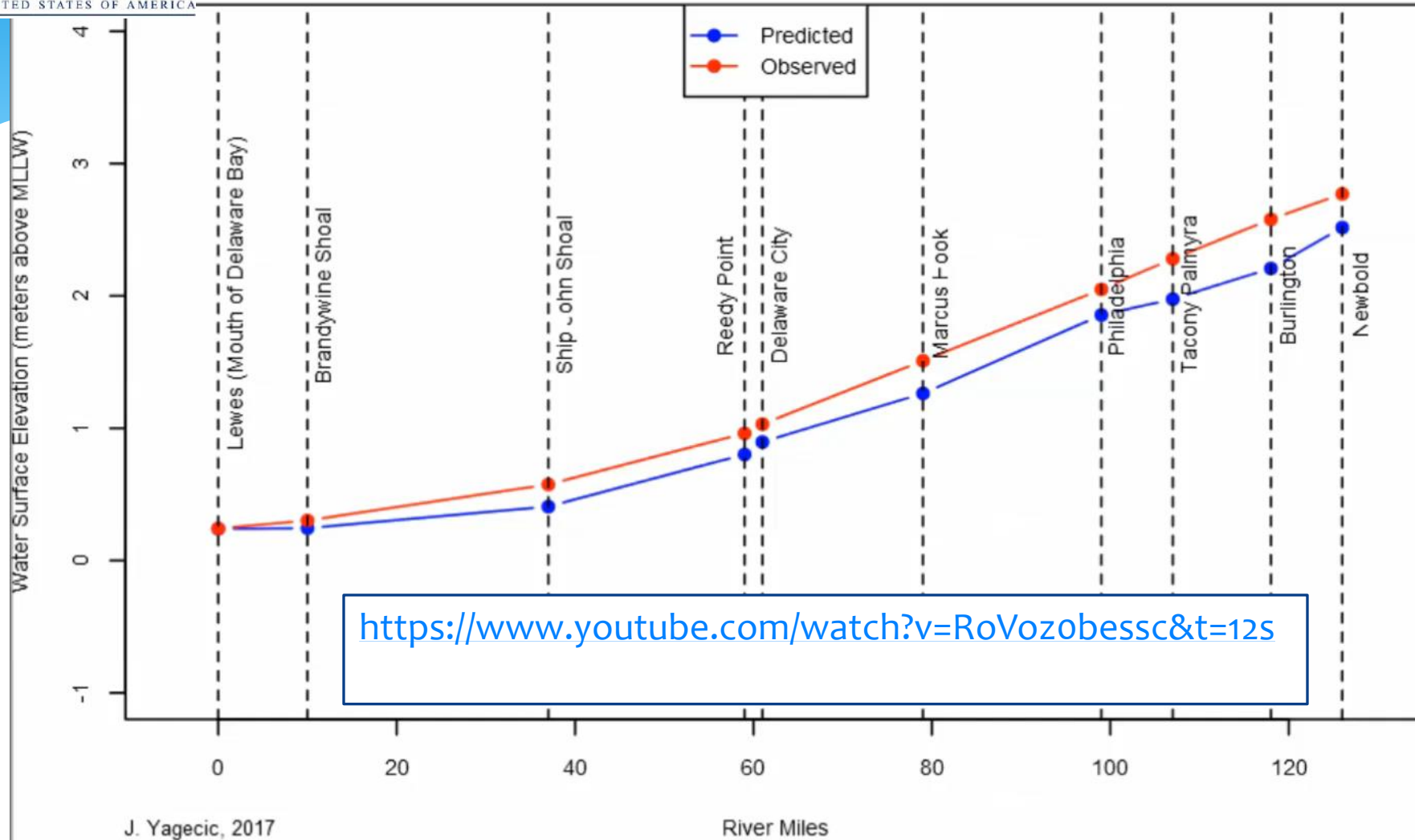
Data:
NOAA predicted and observed
water surface elevation via PORTS

Delaware Estuary Water Surface Elevation, 2021-08-31 00:54:00



<https://www.youtube.com/watch?v=CDdTR9gQoxQ>

Delaware Estuary Water Surface Elevations 2011-08-25



Power of Scripted Processing

- Data retrieval, processing, and plotting is all scripted
- R and python (work shown in this presentation is R)
- A little more work up front, but tremendous return on investment of effort

- Data lives in the database, script is the recipe

- **Always looking for collaborators!**

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www.drbc.gov

60 years
1961–2021



Delaware River Basin Commission

DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

*Managing, Protecting and Improving
Our Shared Water Resources
since 1961*