

A photograph of a bridge spanning a rocky stream. The bridge is made of dark concrete and has a metal railing. A small, rectangular monitoring station is attached to the railing, featuring a solar panel on top. The stream below is rocky and shallow, with green grass and trees lining the banks. The sky is overcast.

Real-time sediment and nutrient monitoring in York County, PA

York County Monitoring Program

- York is 6 of 23 USGS-operated supergauge sites in Pennsylvania (and growing!)
- Multi-level cooperators (local County, State, and Federal)

Sites (in order going south through York):

Fishing Ck at Goldsboro,
17.5 mi²

**W. Conewago Ck nr
Manchester, 510 mi²**

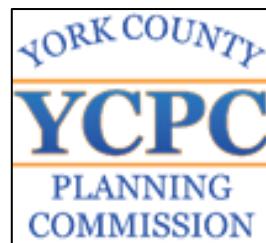
**Codorus Ck. nr. Saginaw,
277 mi²**

Kreutz Ck at Strickler, 32.3
mi²

Fishing Ck at Craley, 15.8
mi²

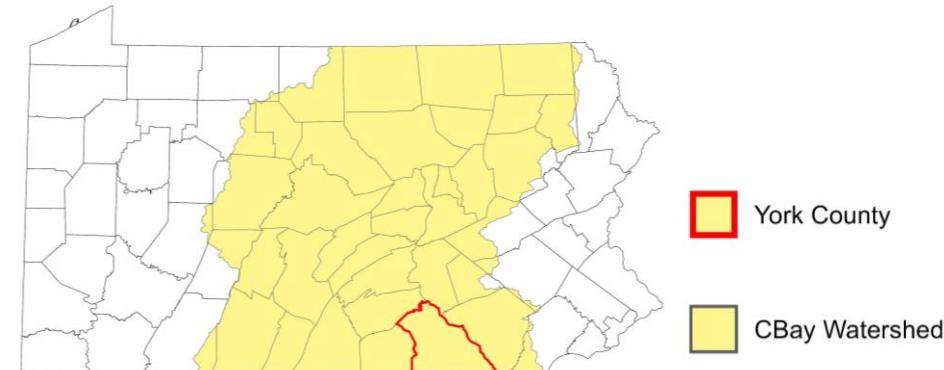
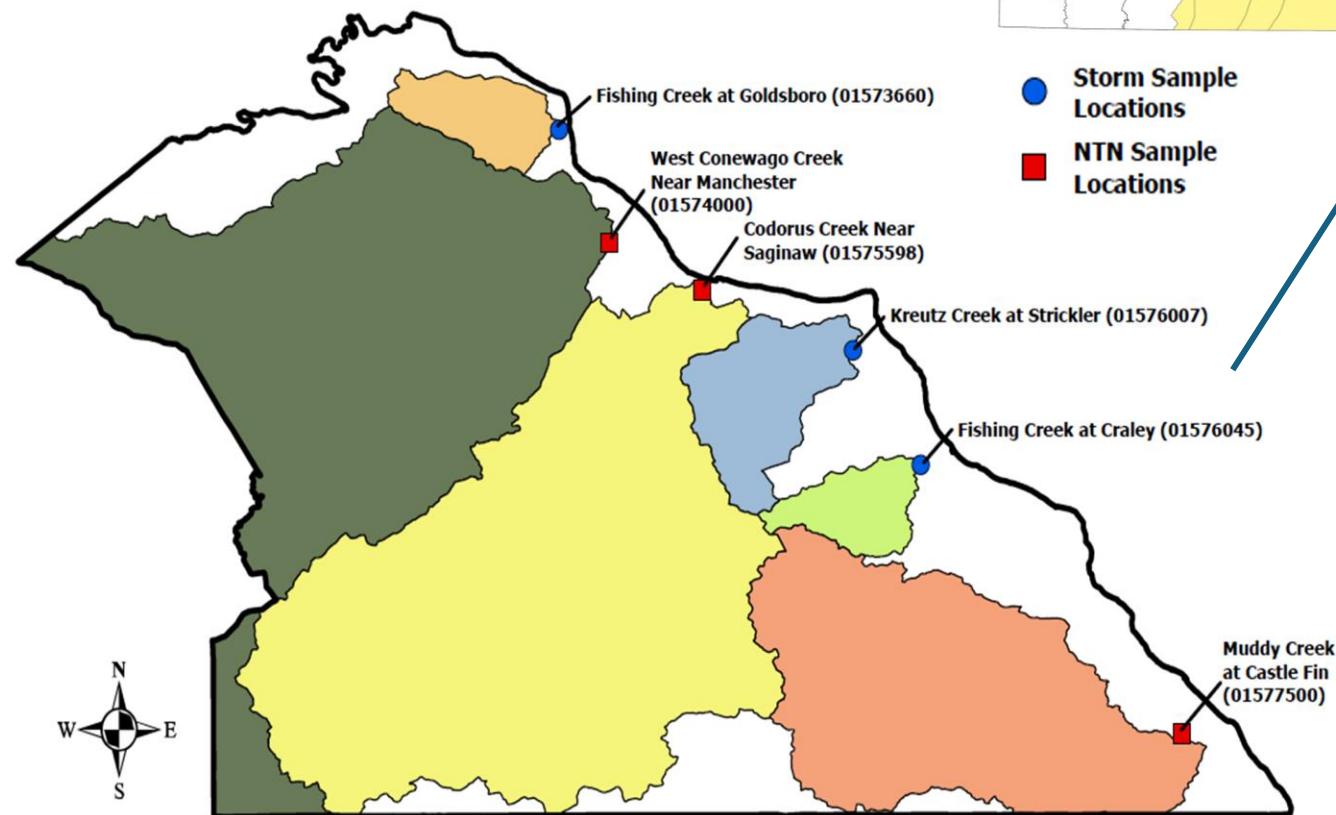
**Muddy Ck at Castle Fin,
133 mi²**

Bold = NTN stations



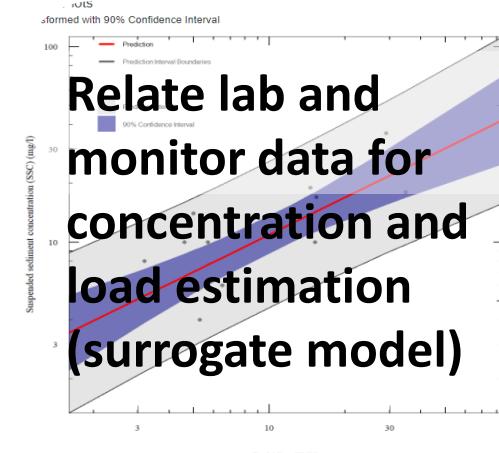
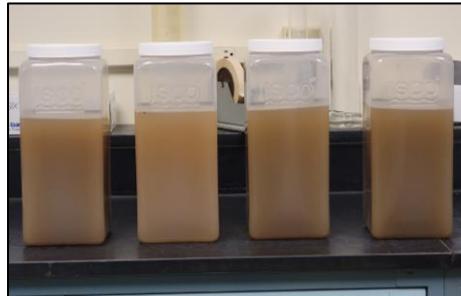
YORK COUNTY
YCP
PLANNING
COMMISSION

YORK COUNTY
CONSERVATION DISTRICT



- Storm Sample Locations
- NTN Sample Locations

This monitoring network covers ~80% of York county!



Model Archive Summary for Suspended Sediment Concentration at Station 01 West Conewago Creek near Manchess [2022 Version]

log10 transformation, turbidity predictor

This model archive summary describes the regression model developed to estimate continuous instantaneous suspended sediment concentrations with data starting since 2019-10-01. This is the first model developed to continuously estimate suspended sediment concentrations at this station, and the model uses all available calibration data.

Site and Monitoring Information

U.S. Geological Survey Water-Quality Monitoring Station 01

Station name: West Conewago Creek near Manchess

Data regression model was created: 2022-07-27

Start of data pulled for model: 2019-10-01

Period of data for model calibration: 2019-10-16 - 2022-06-15

All Available Data

Model Statistics, Data, and Plots

Model

$\log SSC = 0.575 * \log TURB + 0.498$

Variable Summary Statistics

Calibration data and model archive summaries for suspended-sediment, total nitrogen, and total phosphorus concentration surrogate models in York County, Pennsylvania, 2019-2023, ver. 2.0, May 2024

Dates

Publication Date: 2024-05-22
Start Date: 2019-10-01
End Date: 2023-07-29
Revision: 2024-05-21

Citation

Schmer, N.K., Dars, J.W., Gypes, M.C., Carper, L.G., Cortes, V., Dozier, H.J., and Vining, M.R., 2024, Calibration data and model archive summaries for suspended-sediment, total nitrogen, and total phosphorus concentration surrogate models in York County, Pennsylvania, 2019-2023 (ver. 2.0, May 2024): U.S. Geological Survey data release, <https://doi.org/10.5066/P983XZ>.

Summary

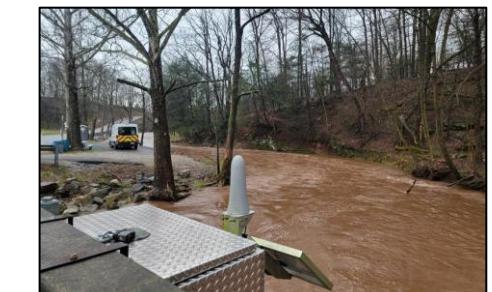
The U.S. Geological Survey (USGS), in cooperation with the York County Planning Commission and York County Conservation District, has collected discrete stream samples for analysis of suspended sediment, total nitrogen, and total phosphorus concentrations at six real-time streamflow and water-quality monitoring turbidity, nitrate, and specific conductance stations located in York County, Pennsylvania. Data were collected from 2019-2023 at these stations for the application of predicting suspended-sediment, total nitrogen, and total phosphorus concentrations using real-time continuous turbidity, nitrate, specific conductance, and streamflow. Regression equations were developed by relating discrete-sample suspended sediment and continuous turbidity, discrete sample total nitrogen and continuous nitrate

Spatial Services

ScienceBase WMS: <https://www.sciencebase.gov/catalog>

Communities

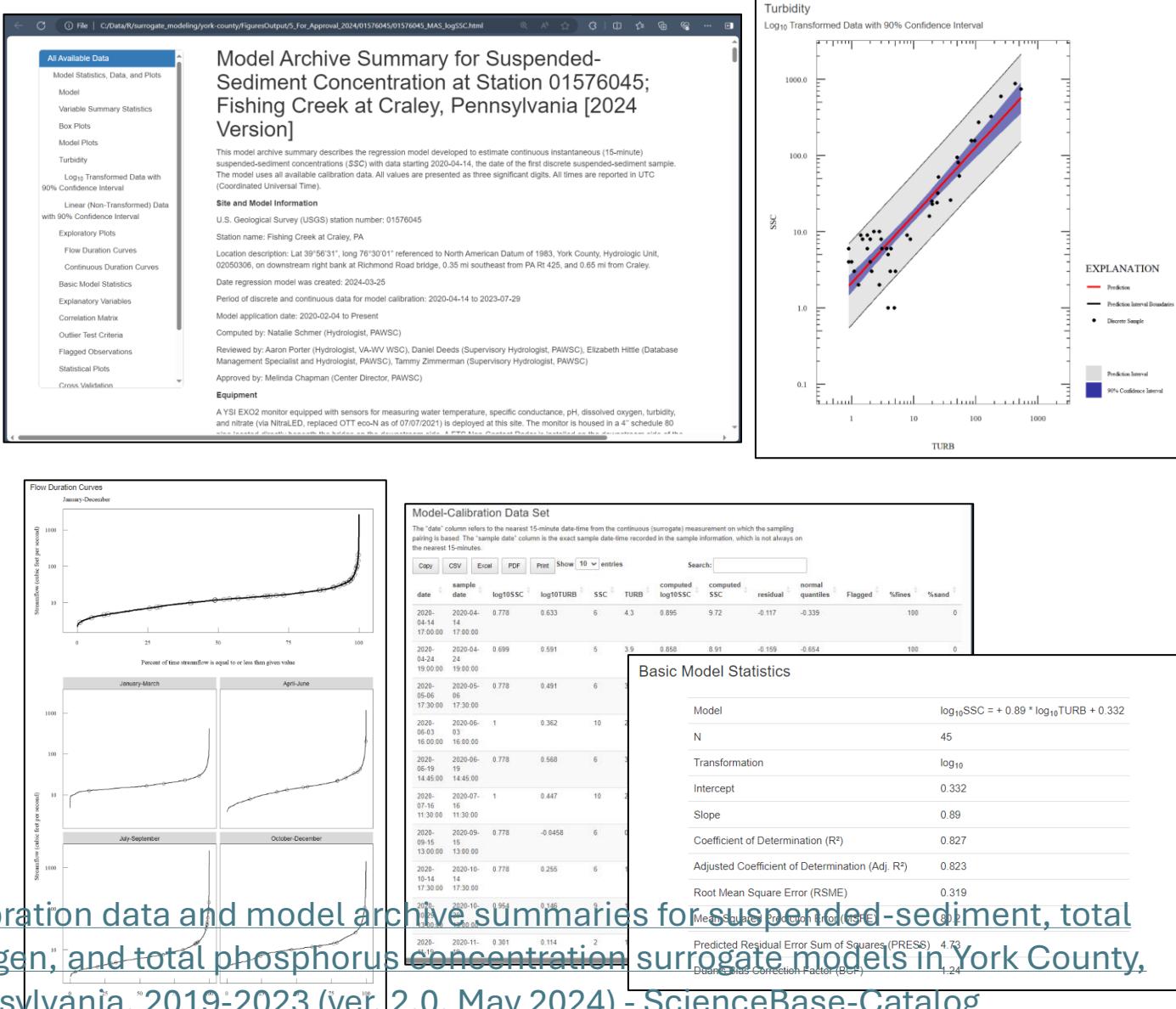
• USGS Data Release Products



Products: Surrogate Model Archive Summary

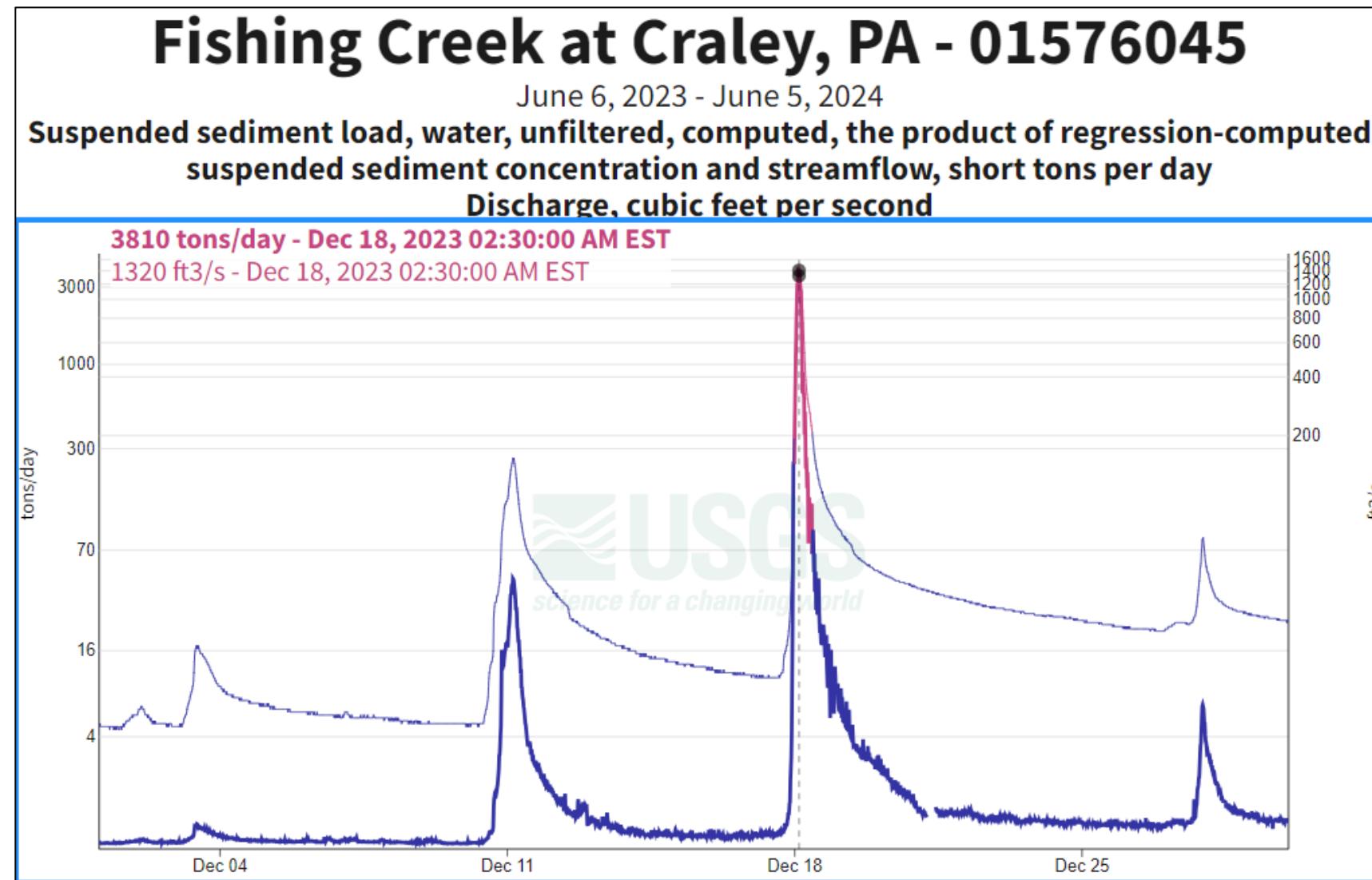
- Published in a publicly accessible USGS database (ScienceBase)
- Done in R Markdown
 - Consistent, reproducible across all projects and sites
 - Can control formatting, produces HTML file that can be opened in a browser for easy document navigation

- Includes
 - Formula for the relation of sensor and sample, with statistics and plots that describe the relation**
 - Relation calibration data (how does sensor relate to sample)**
 - Once published, applied to data on the web



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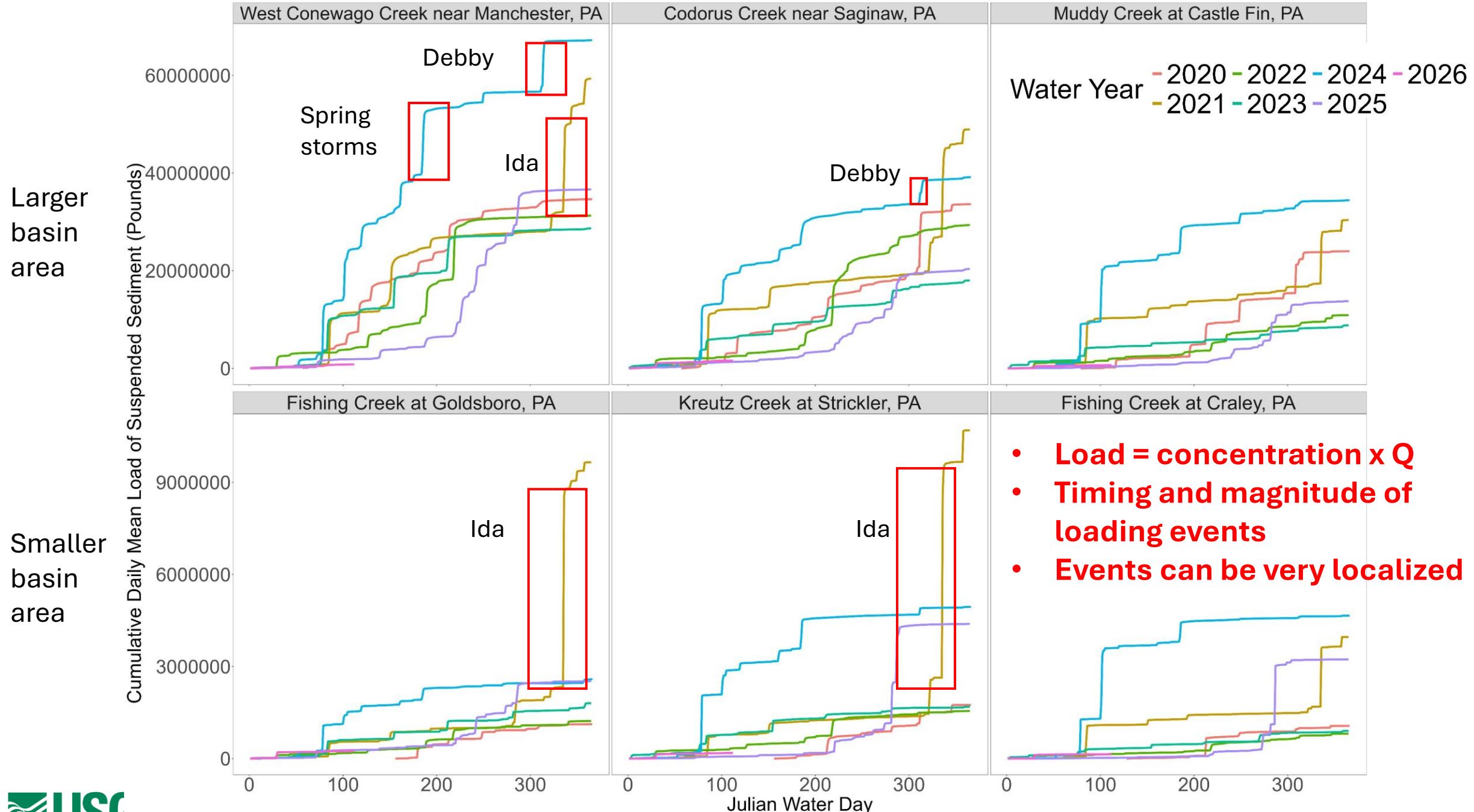


[Fishing Creek at Craley, PA - USGS Water Data for the Nation](#)

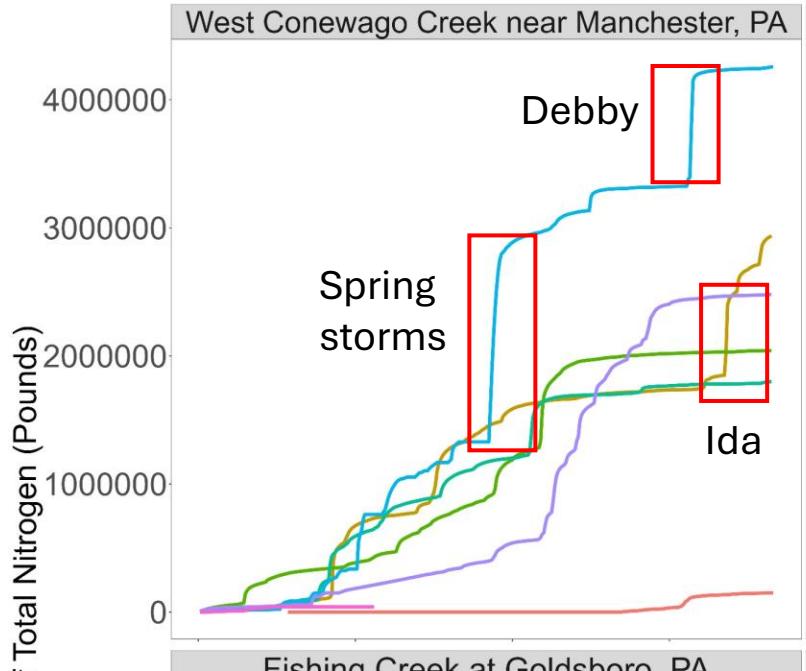
Loads and Yields Data

Loads

Suspended Sediment, Total Nitrogen, Total Phosphorus



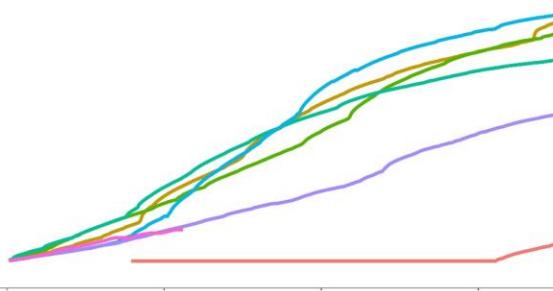
Larger basin area



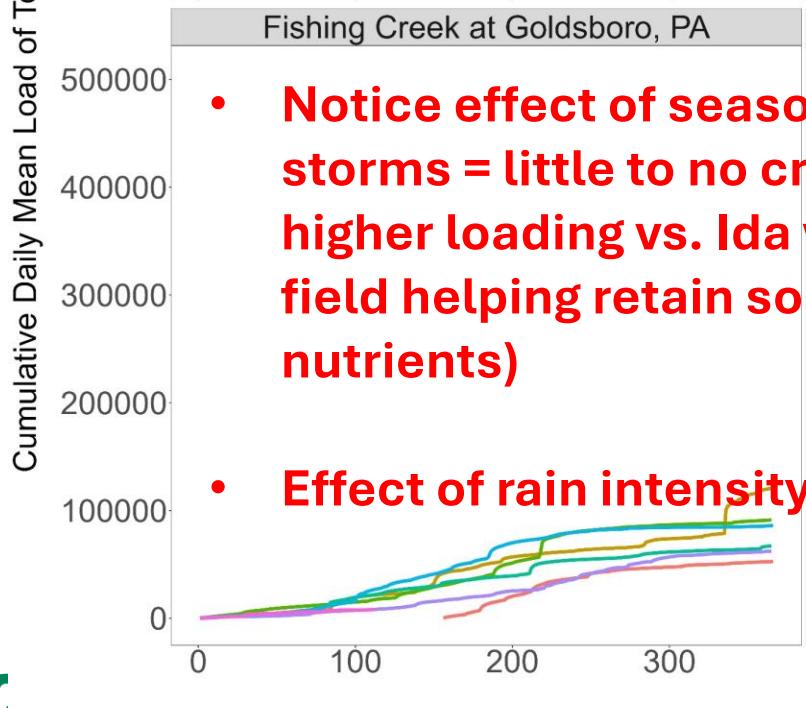
Codorus Creek near Saginaw, PA

- Look at line shape as compared to sediment- indicates baseflow vs runoff transport
- Important to consider for NO_3 transport

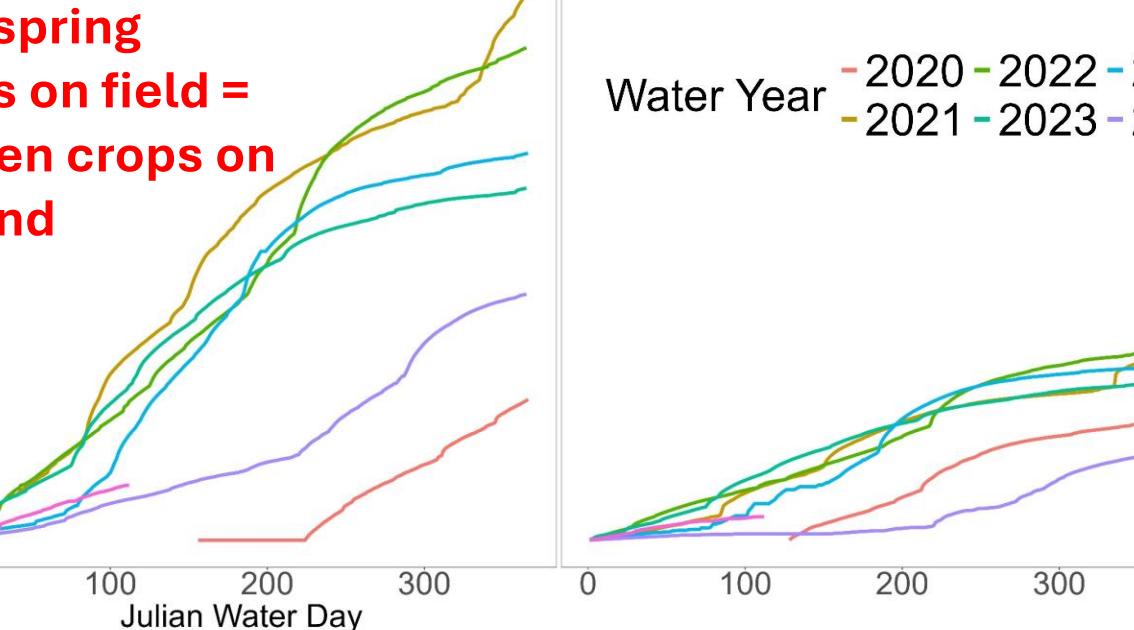
Muddy Creek at Castle Fin, PA



Smaller basin area

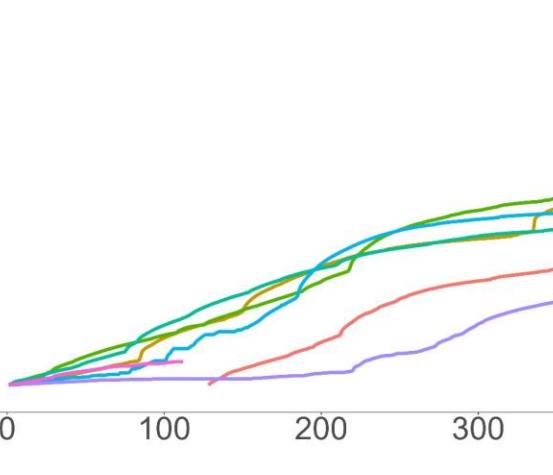


Kreutz Creek at Strickler, PA



Water Year

- 2020
- 2021
- 2022
- 2023
- 2024
- 2025
- 2026

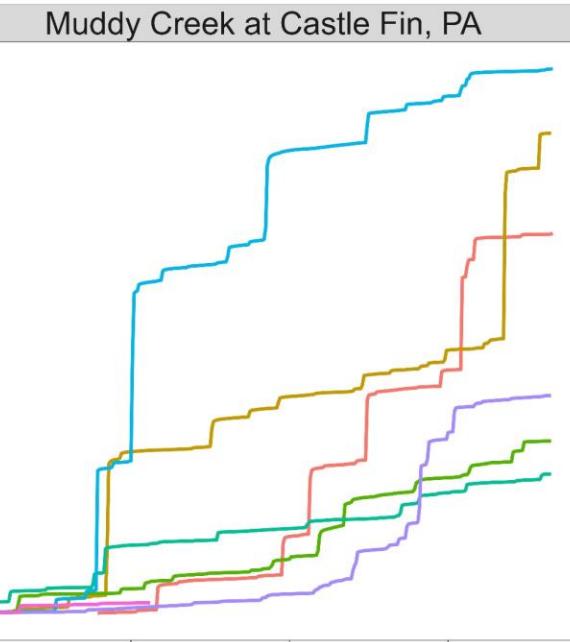
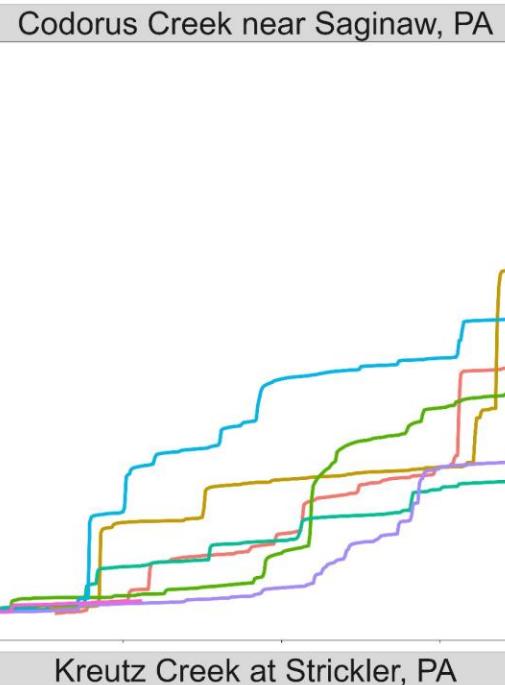
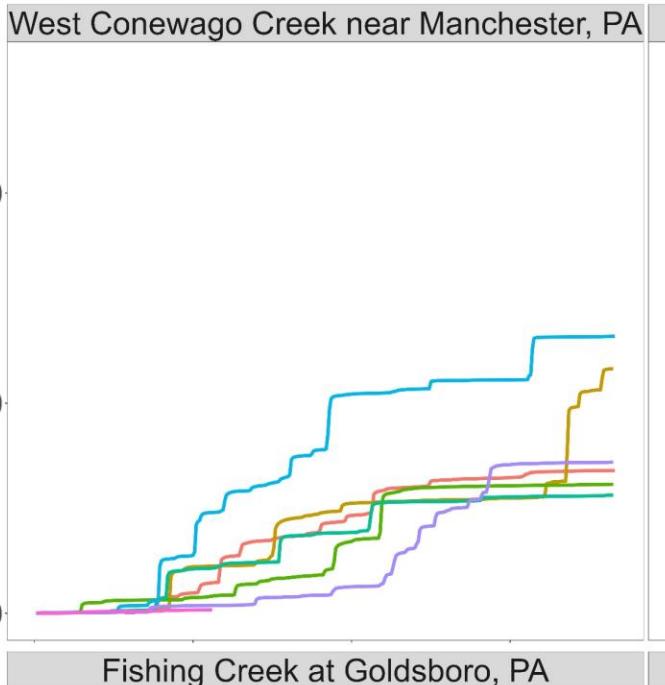


Julian Water Day

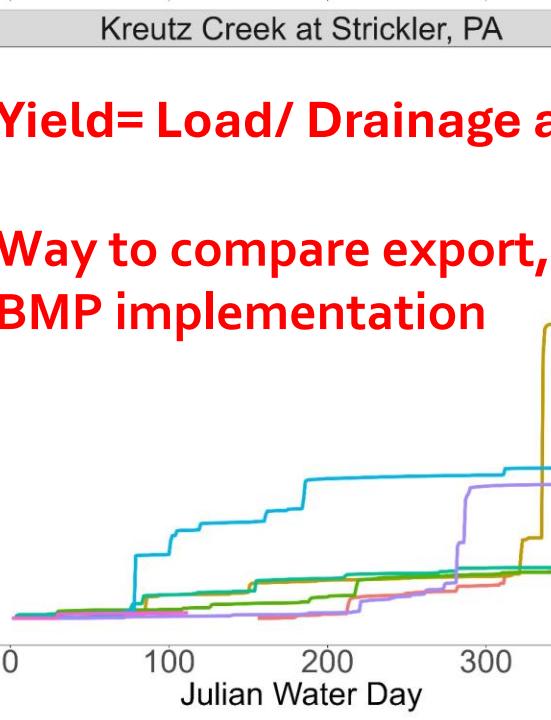
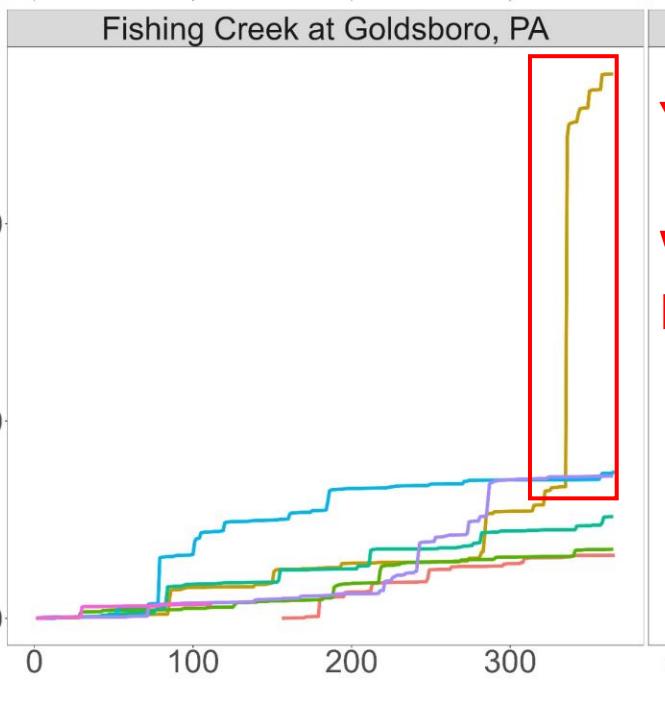
Yields

Suspended Sediment, Total Nitrogen, Total Phosphorus

Larger
basin
area



Smaller
basin
area



Yield= Load/ Drainage area

Way to compare export, normalized by area, can help target BMP implementation

Next Steps: Products

- First was publishing Model Archive Summaries in 2024 (presented earlier in this talk)
- Stakeholders needed additional tools and data presentation options besides data releases and reports...
- Specifically, wanted data presented in a way that facilitates their decision-making and offers additional ways of **interaction**. They also want products that are **accessible and easy to understand** for wider audiences....

Communication Products: Dashboards

- Highly customizable
can include plots,
maps, text, links,
interactive maps
and plots
- Various programs to
make them already
exist (e.g R Shiny)
- Published March
2025


 science for a changing world

Search

York County Water Quality Dashboard | Overview | Dashboard Instructions | Continuous Data | Loads | Yields | Annual Summaries

Overview

Welcome to the York County Water Quality Dashboard! This dashboard has been created by the U.S. Geological Survey (USGS) Pennsylvania Water Science Center to display data collected from six active streamgage sites located in York County in south-central Pennsylvania. The USGS, in cooperation with the York County, the York County Planning Commission, and the York County Conservation District has collected sediment and nutrient (nitrogen and phosphorus) samples from these streamgages since 2019. The laboratory-analyzed samples, along with continuous streamflow and water quality (turbidity, nitrate, and specific conductance) measurements from the streamgages, have been used to estimate real time (15 minute interval) suspended-sediment and nutrient loads (mass of sediment or nutrients transported into a water body during a period of time) that are leaving each of the monitored watersheds.

Together, the six streamgages monitor six watersheds that cover 730 square miles, or about 80% of York County as well as parts of Adams and Cumberland counties in Pennsylvania and Carroll, Baltimore, and Harford counties in Maryland. To navigate the map and get more information about these locations, users can hover over the colored-in polygons on the map and the names of each watershed will appear. Click on the watersheds or the white circles and a popup with more information and a link the USGS webpage will appear for the streamgage that monitors that watershed. Users can also zoom in and out to see county names and boundaries, cities, roads, and other features, and pan around the map space.

More information about this monitoring effort can be found in the "About" tab in the popup when the page is opened or refreshed, or by clicking the "Informational Popup" button below.

Informational Popup

Recent County-Wide Load Totals

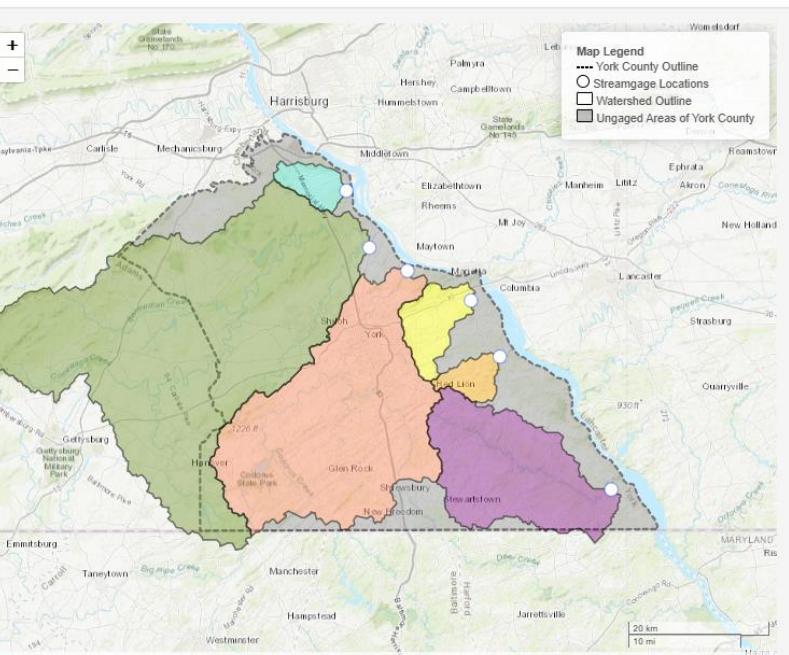
Year	Suspended Sediment, lbs	Total Nitrogen, lbs	Total Phosphorus, lbs
2022	90,140,432	7,507,964	314,161
2023	78,733,106	4,929,619	246,219
2024	115,683,479	8,732,763	397,813
2025	80,804,213	5,702,651	317,338
2026	230,613	88,744	1,945

To see data from all previous years, go to the

Annual Summaries Tab

Why is this Important?

The data presented on this dashboard is important for 1) understanding the timing and magnitude of downstream transport of sediment, nitrogen, and phosphorus out of the monitored watersheds, 2) understanding long term trends in sediment and nutrients, and 3) evaluating the effects of best management practices (BMP) within the monitored watersheds.



Map Legend

- York County Outline
- Streamgage Locations
- Watershed Outline
- Ungaged Areas of York County

Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

In cooperation with:









York County Water Quality Dashboard

<https://rconnect.usgs.gov/york-gw/>

Preliminary information- Subject to revision. Not for Citation or Distribution

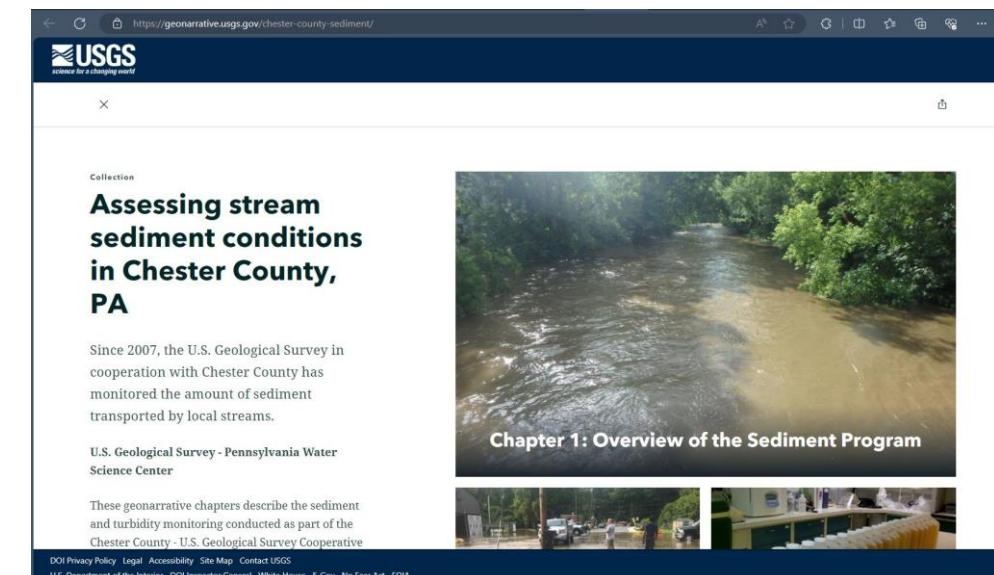
Communication Products: Geonarratives

- Highly customizable, can include plots, maps, text, links, interactive maps
- Various platforms (e.g. ArcGIS Online)
- Could be more appropriate for educational purposes and a more general audience



[Using Continuous Water Quality to Guide Conservation Efforts](https://geonarrative.usgs.gov/using-continuous-water-quality-to-guide-conservation-efforts/)

<https://geonarrative.usgs.gov/using-continuous-water-quality-to-guide-conservation-efforts/>

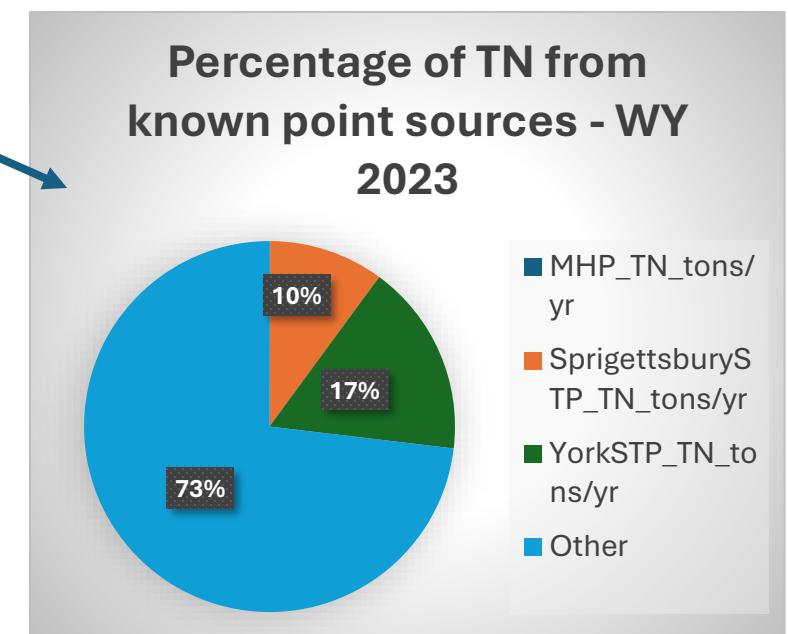
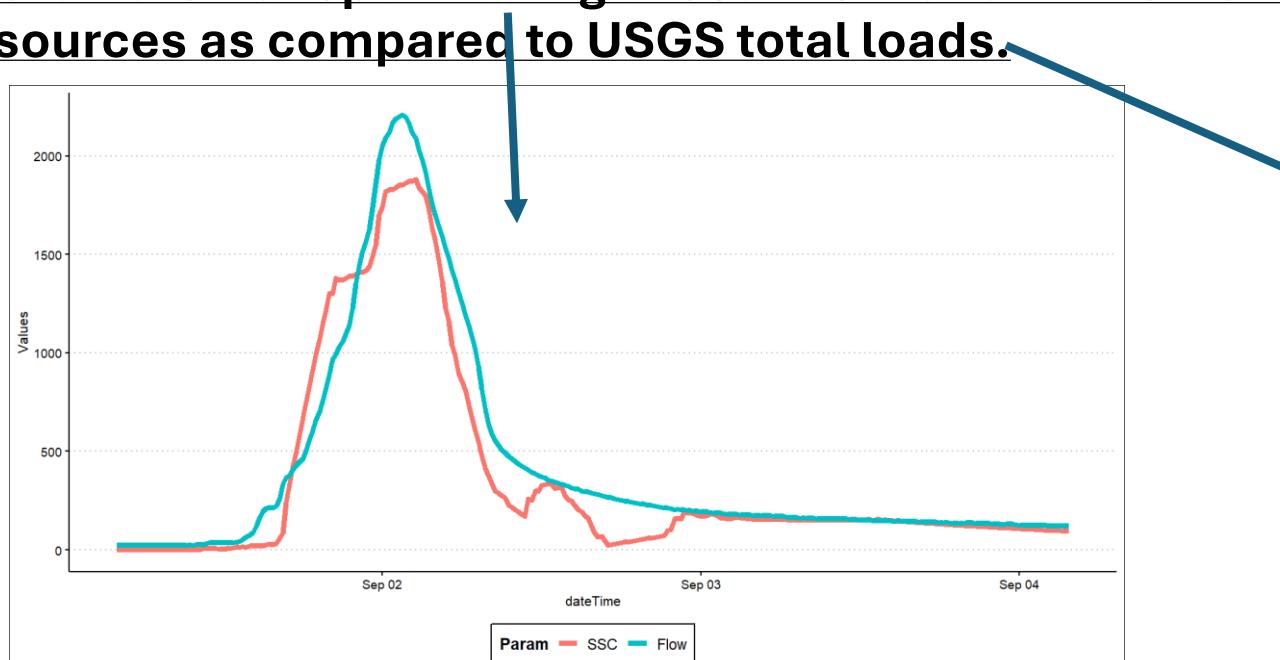


[Assessing stream sediment conditions in Chester County, PA](https://geonarrative.usgs.gov/chester-county-sediment/)

<https://geonarrative.usgs.gov/chester-county-sediment/>

Communication Products: USGS Interpretive Report

- Data will be represented across various products and integrated in a summary report in 2028. Planned topics include :
 - County loads summary (from USGS surrogate models)
 - Sediment and nutrient sources and transport timing
 - Methods and model result comparison of USGS surrogate vs USGS WRTDS vs Chesapeake Bay Program partnership's Watershed Model
- Potential additional data analysis includes analysis for: how much nutrient load is transported in groundwater, **evaluate transport timing of sediment and nutrients related to streamflow**, and **evaluating known point sources as compared to USGS total loads.**



Next Steps: Cross-Agency Collaboration

- York County could be used as a calibration or verification point for:
 - NTN Loads via WRTDS and WRTDS-K on the site level as site-specific calculations.
 - Chesapeake Bay Program partnership's Watershed Model on the county-scale (6 sites cover ~80% County drainage).
- Between NTN and CBP Watershed Model, could do direct comparisons of methods and calculated load estimations with York County loads.
- Data integration on this scale would provide a potential collaboration opportunity between USGS, York County, EPA, CBP, and DEP, and allow for potential data analysis expansion to integrate other supergages in the lower Susquehanna operated with EPA and USDA-NRCS.

Contact:

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Acknowledgements:

USGS field samplers and gage operators: Dylan Baumbach, James Colgin, Victor Cortes, Hilary Dozier, Heather Eggleston, Lee Eicholtz, Cameron Ensor, Cade Reed, Nicholas Santoro, Connor Soucek, Jake Wacker, Mitchell Weaver, Eli Whitehead-Zimmers

Cooperators: York County Planning Commission, York County Conservation District

