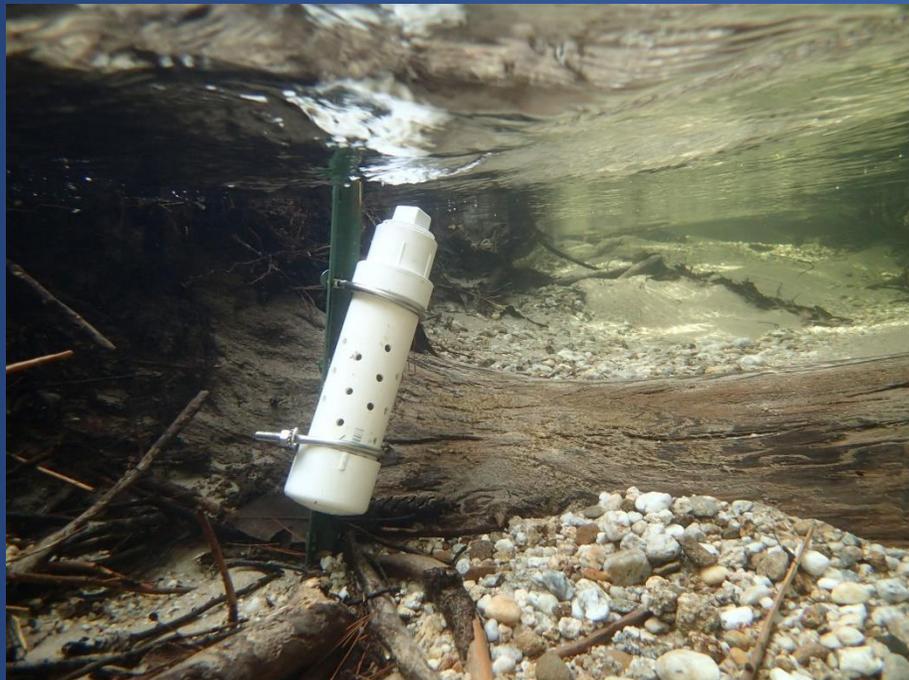


Big Creek Restoration: AMD & Beyond

(collaboration among DRN, SCD, SH, PADEP/BAMR, and others)

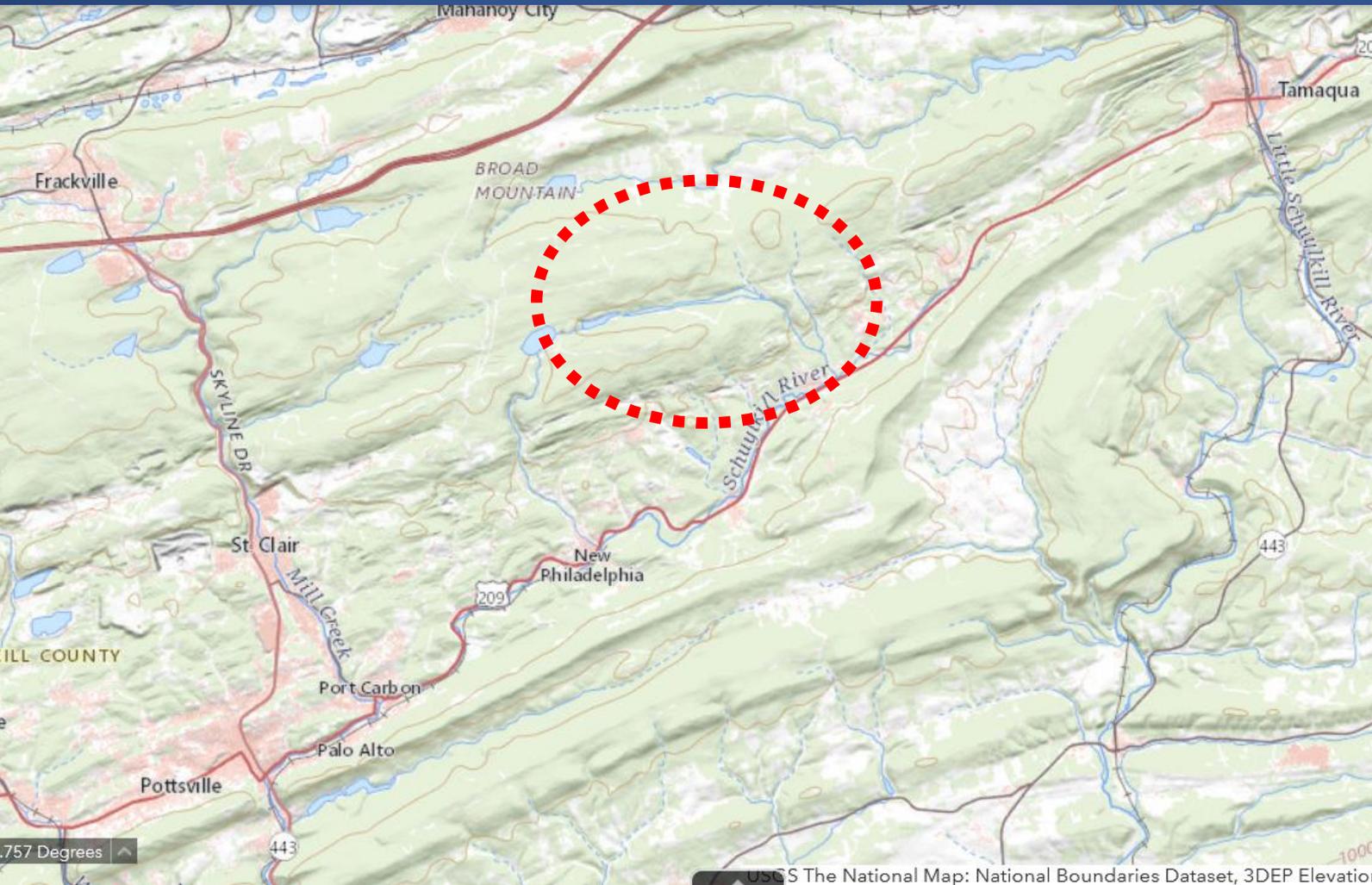


July 12, 2022

presented by
Erik L. Silldorff, PhD

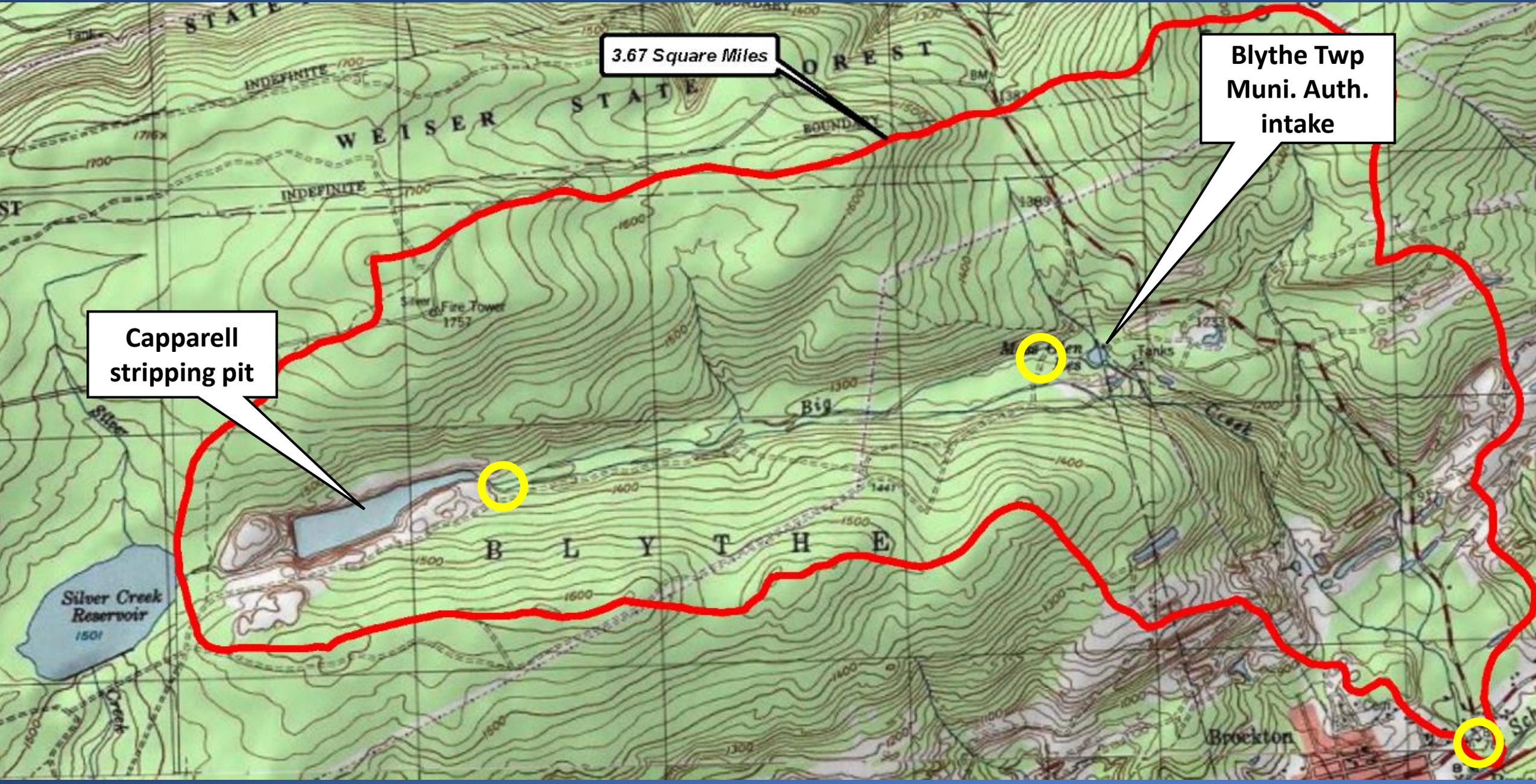


Big Creek Watershed

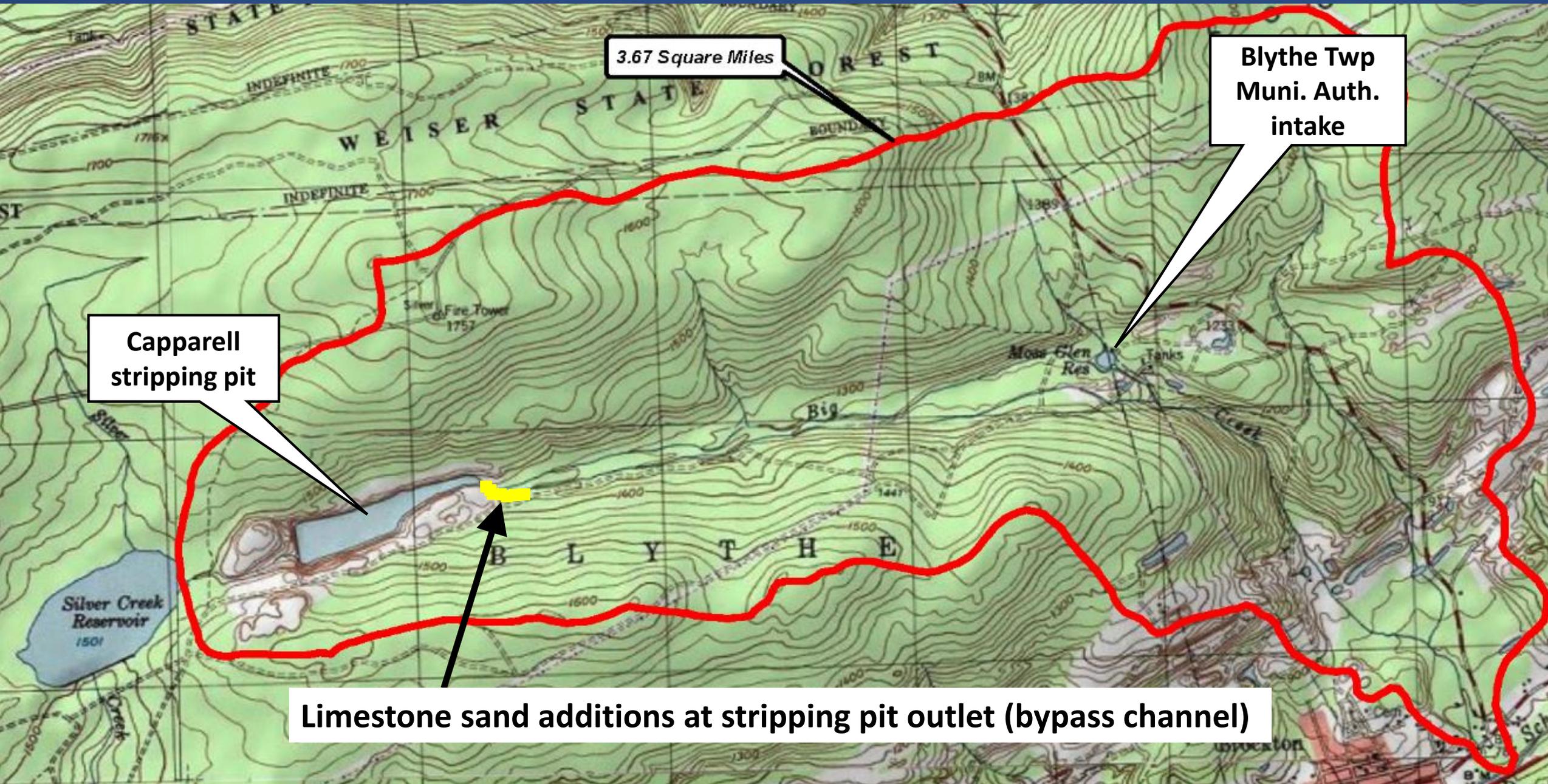


- 3.7 mi² drainage area, nearly 100% forested
- Blythe Twp Mun Auth source water (one of three)
- 19 acre flooded strip mine in the headwaters (Capparell stripping pit)
- TMDL & WIP identify Big Creek as among the largest untreated sources of acidity & aluminum loading
- Biological community highly altered, including lack of fish life and severely altered stream insect community

Big Creek Watershed



Big Creek: Limestone Sand Additions



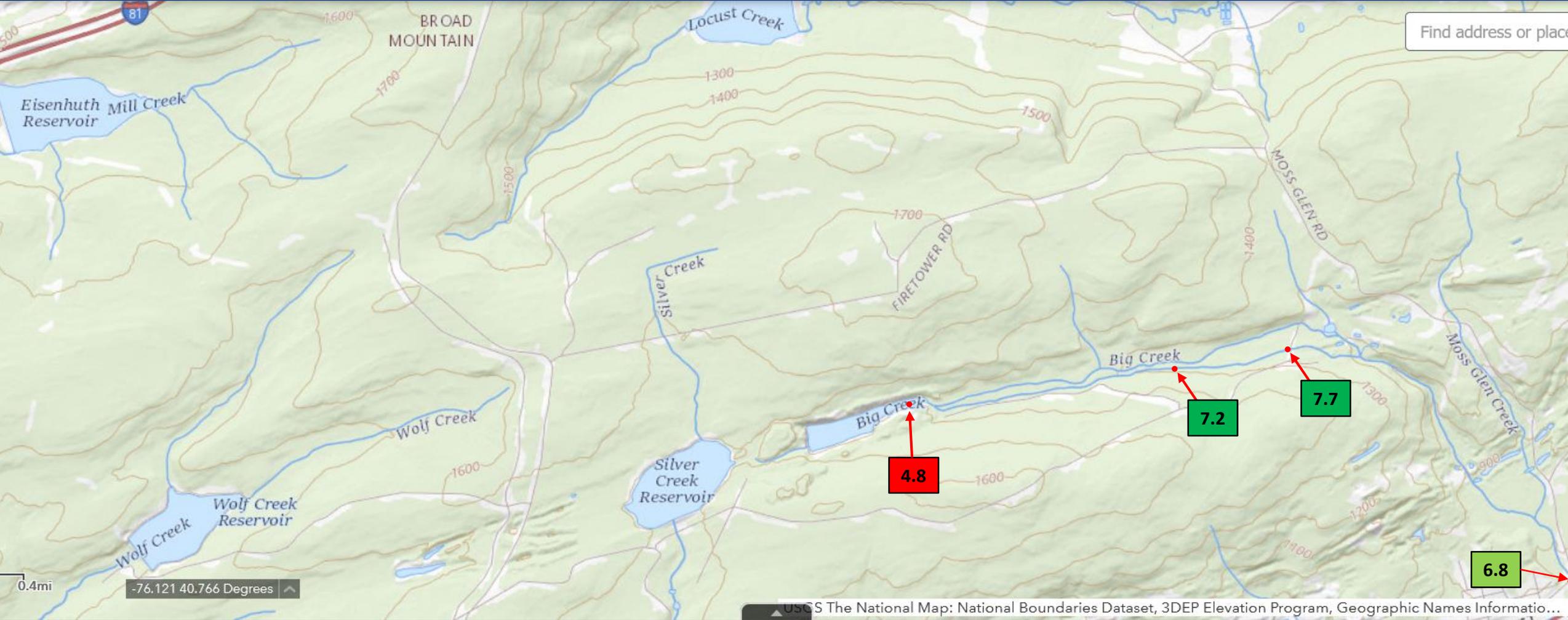
2020-2023 Grants

- Support additional limestone sand additions (9 to 12 month intervals)
- Spatially & temporally intensive monitoring to understand anomalies
 - pH snapshots
 - HOBO pH loggers (uncertainty at conductivities as low as 10 $\mu\text{S}/\text{cm}$)
 - continued SCD-BAMR field & lab water chemistry
- Baseline & “restored” macroinvertebrate surveys
- If possible, reintroduce brook trout into headwaters of Big Creek

History Limestone Sand Additions

- **SCD & SHA began limestone additions in 2016**
 - **330 ton in October 2016**
 - **300 ton in December 2017**
- **Resumed limestone additions in February 2020**
 - **270 ton in February 2020**
 - **260 ton in December 2020**
 - **180 ton in December 2021**
 - **200 ton planned for Fall 2022**
 - **200 ton planned for Fall 2023**

pH Snapshots: May



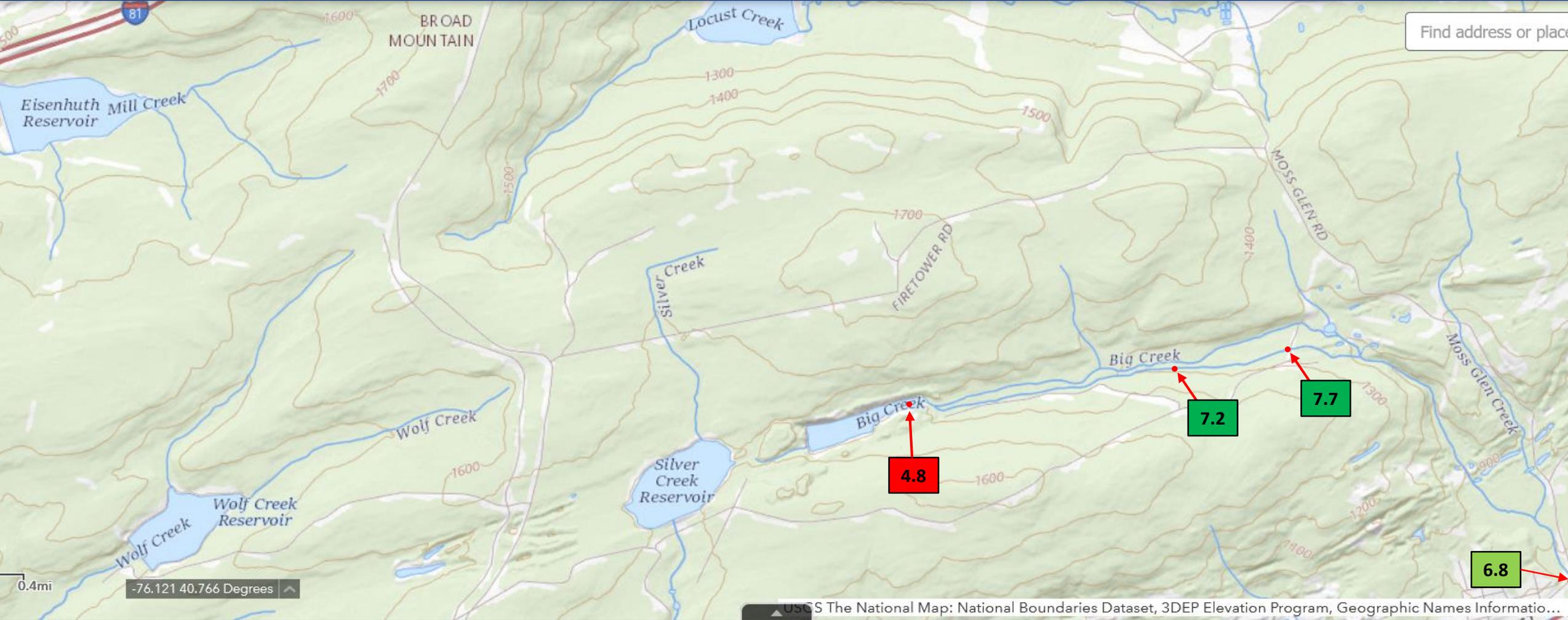
pH Snapshots: December



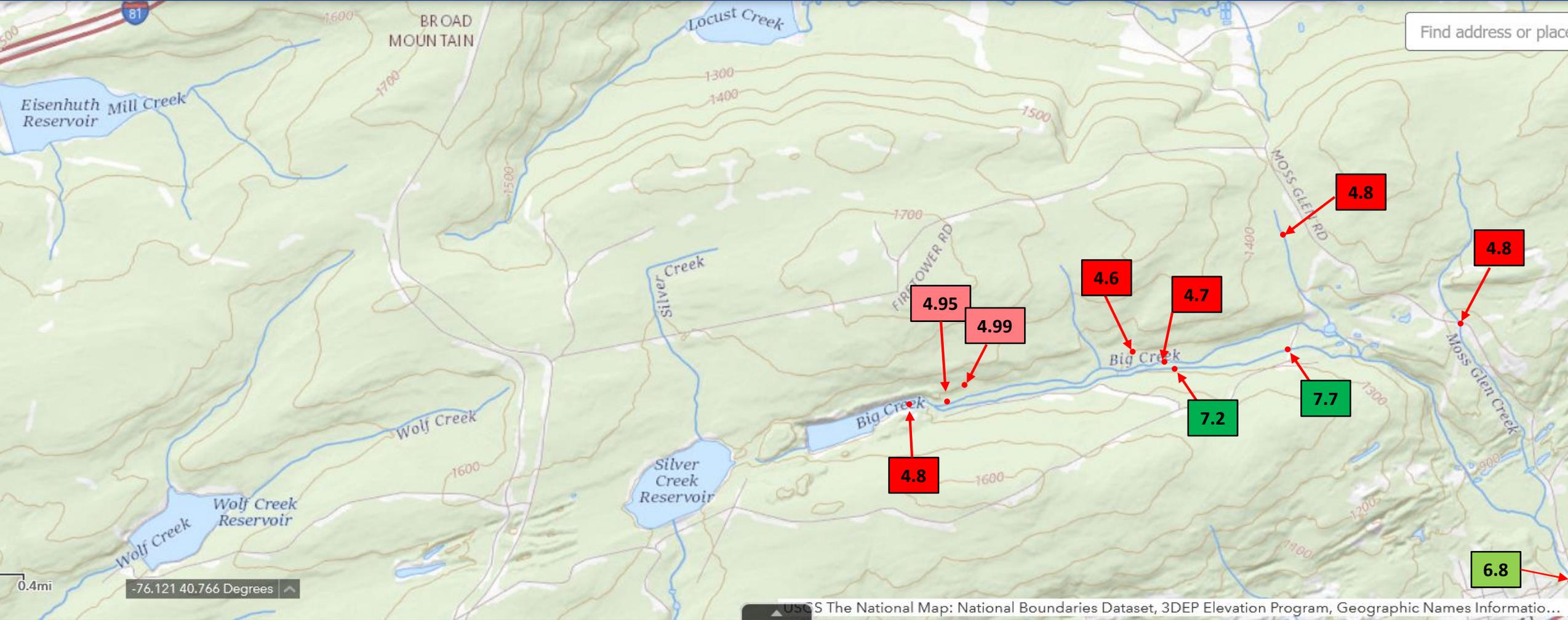
Unavoidable Complexity!

- Low pH & sources of acidity
- Hydrology & human alterations

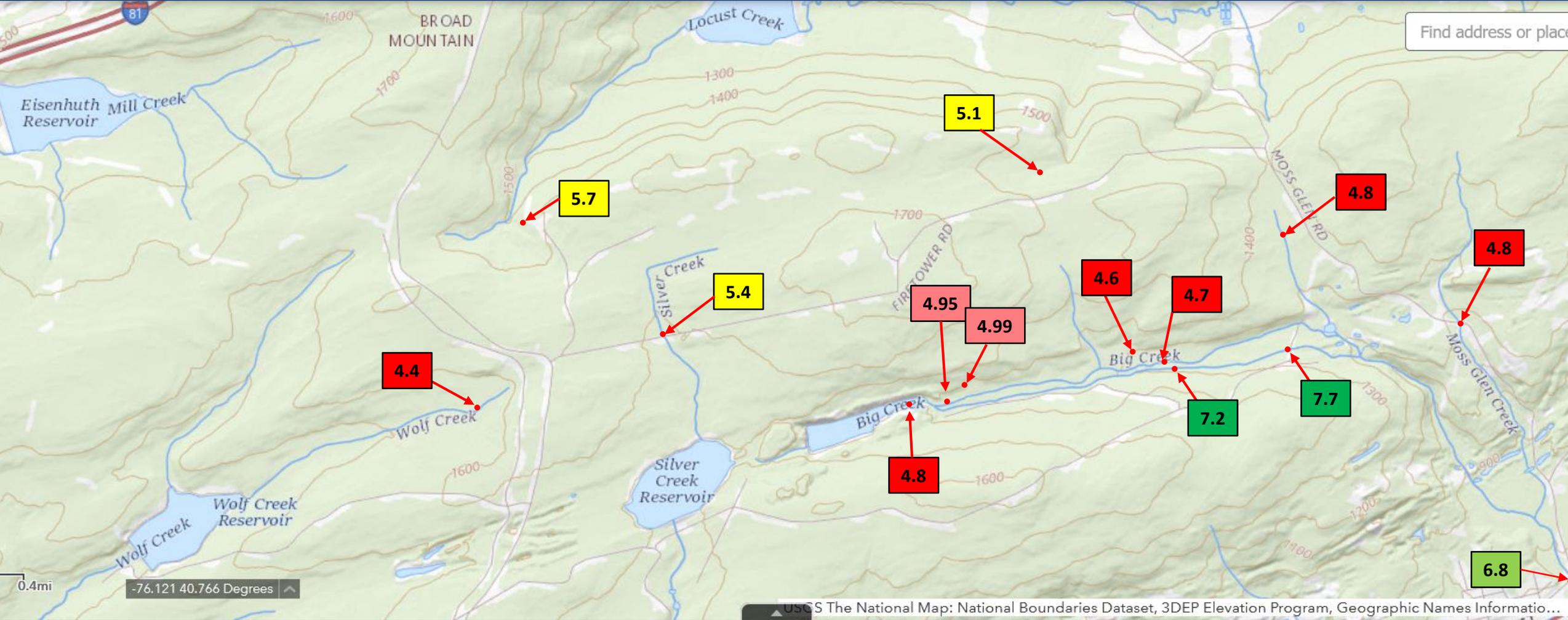
pH Snapshots: May



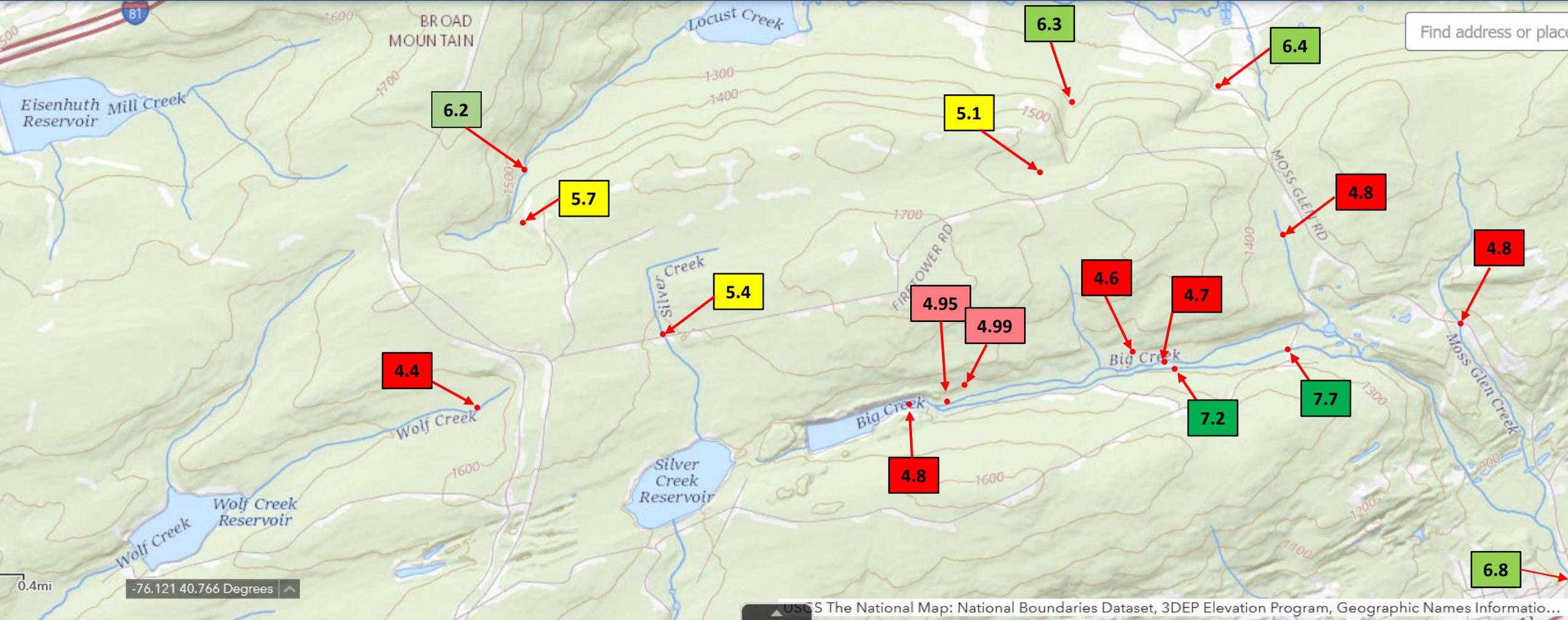
pH Snapshots: May



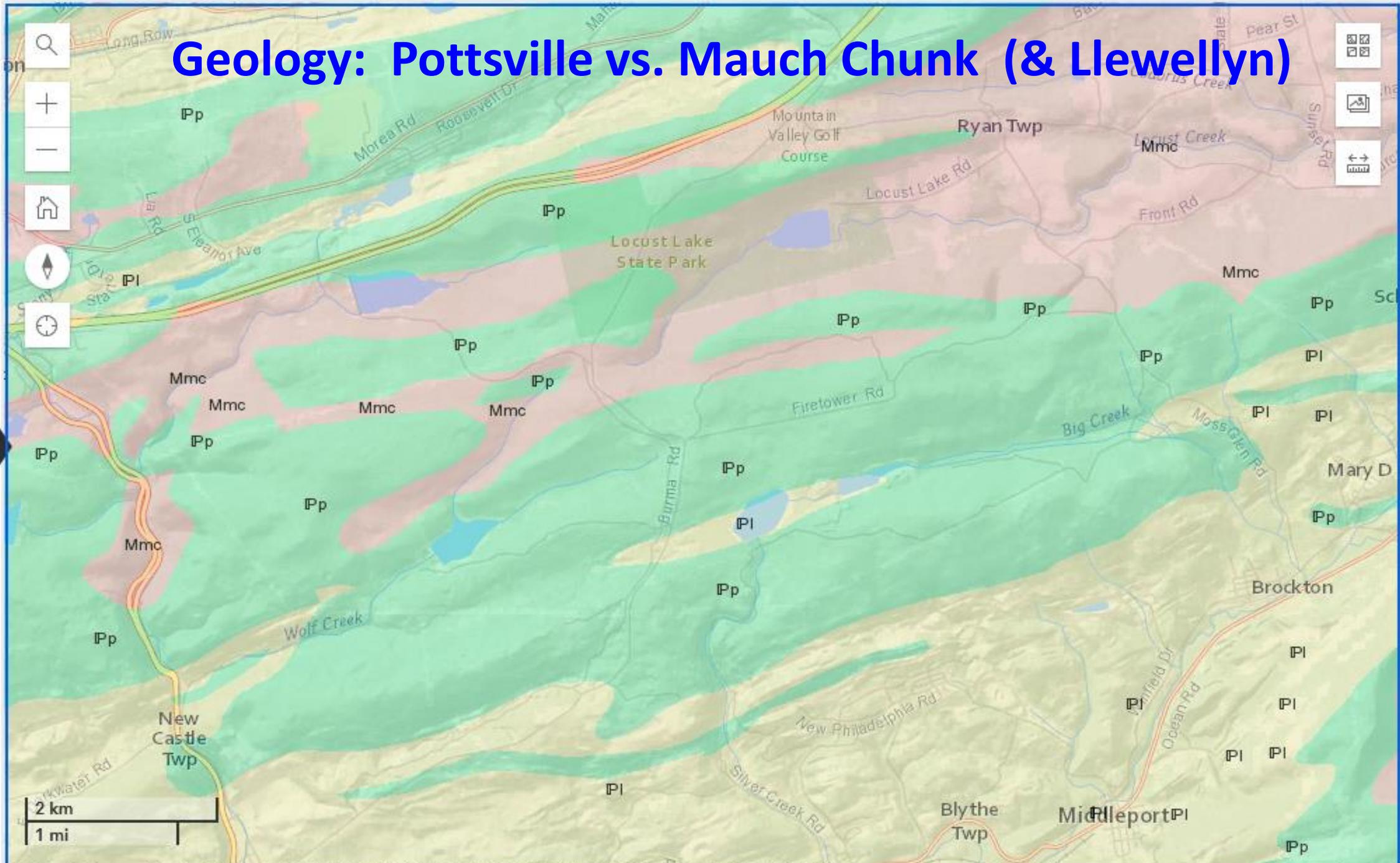
pH Snapshots: May



pH Snapshots: May



Geology: Pottsville vs. Mauch Chunk (& Llewellyn)



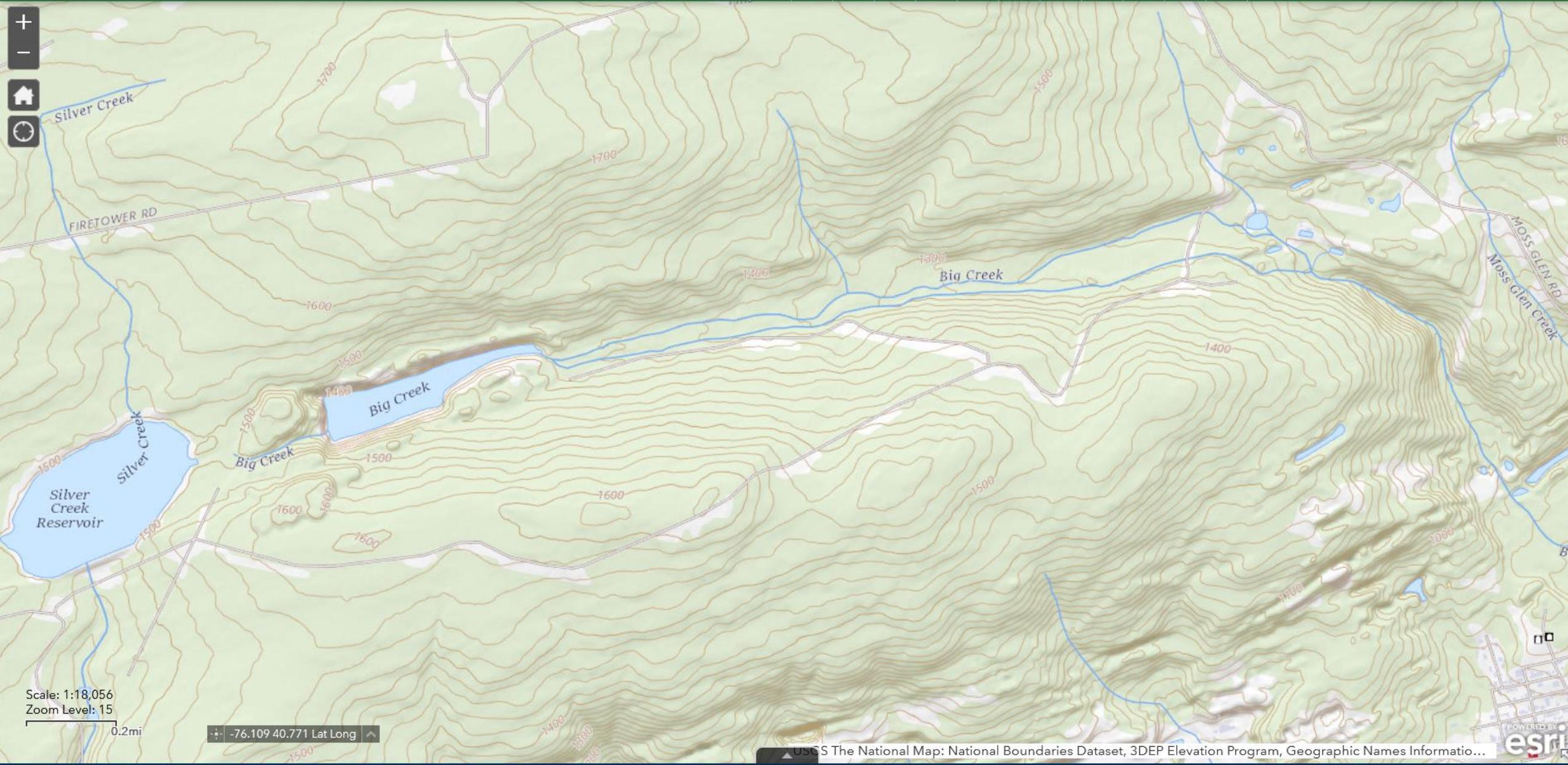
1. Legacy of Acid Deposition

- Pottsville Formation appears to provide no buffering, and may actually lead to further acidification
- Matt Shank (PADEP, WQ Assessment) is finding general pattern in multiple Formations in Pennsylvania (2022 or 2023 report expected)
- Dr. Pete Sharpe (NPS) working on similar watershed in Shenandoah Nat'l Park

2. Unique Hydrology of Big Creek Watershed

Help Data Download Services

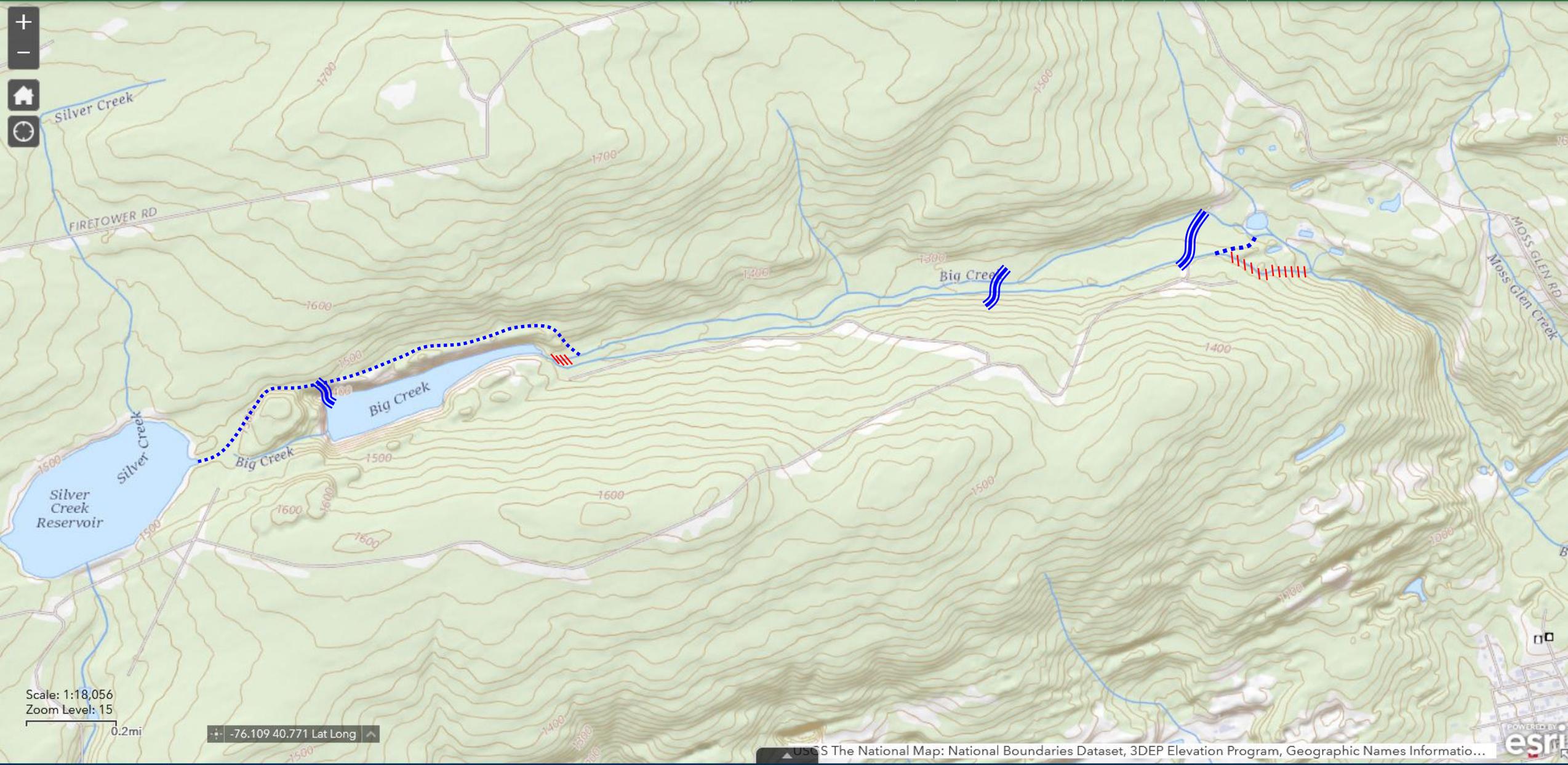
Find address or place



2. Unique Hydrology of Big Creek Watershed

Help Data Download Services

Find address or place



Scale: 1:18,056
Zoom Level: 15

-76.109 40.771 Lat Long

3. Continuous pH Sensors



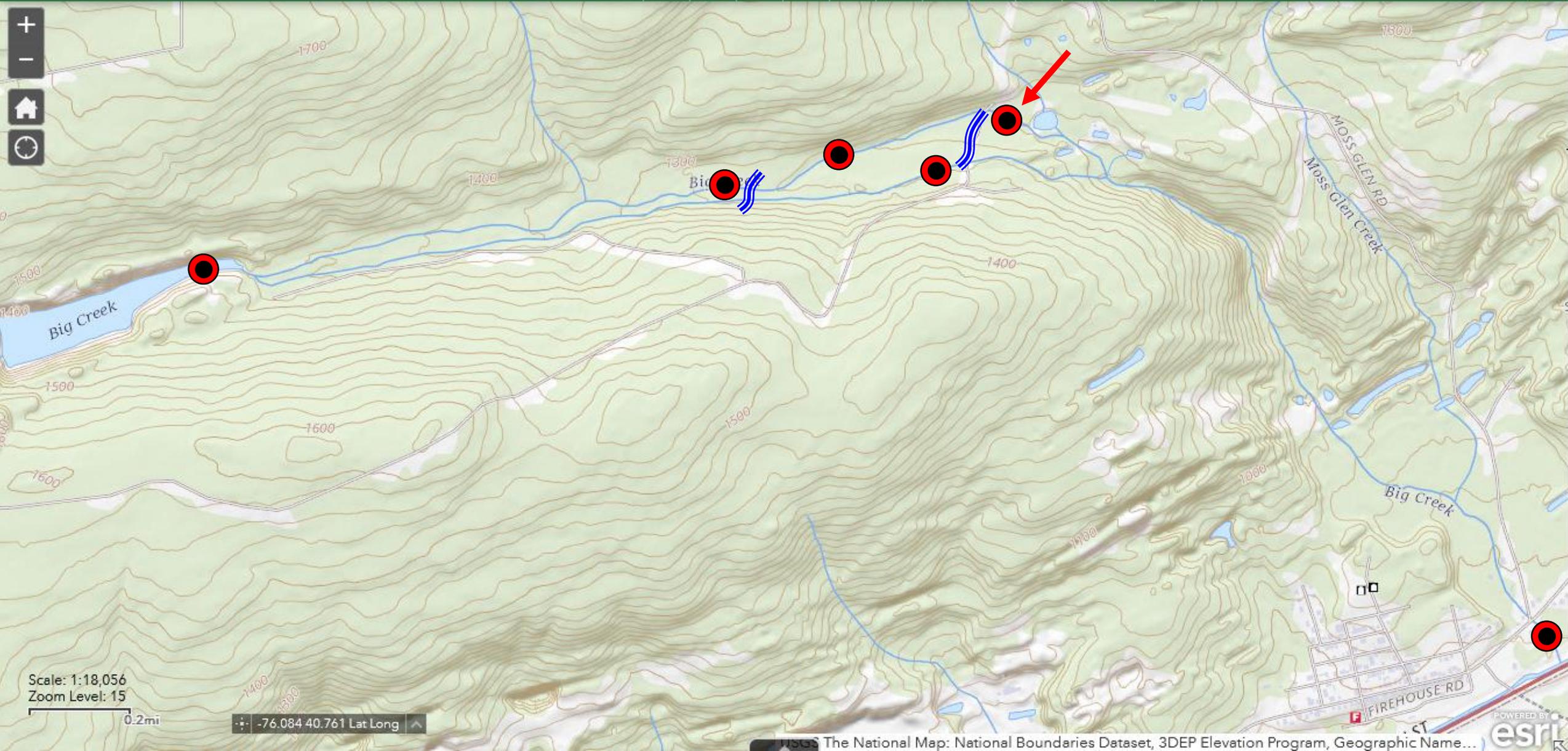
- Onset / HOBO MX2501
- Uncertain use in low-conductivity water
- 6 months replacement for sensor (\$120)
- calibrations at 2-4 weeks

3. Continuous pH Sensors

Help Data Download Services



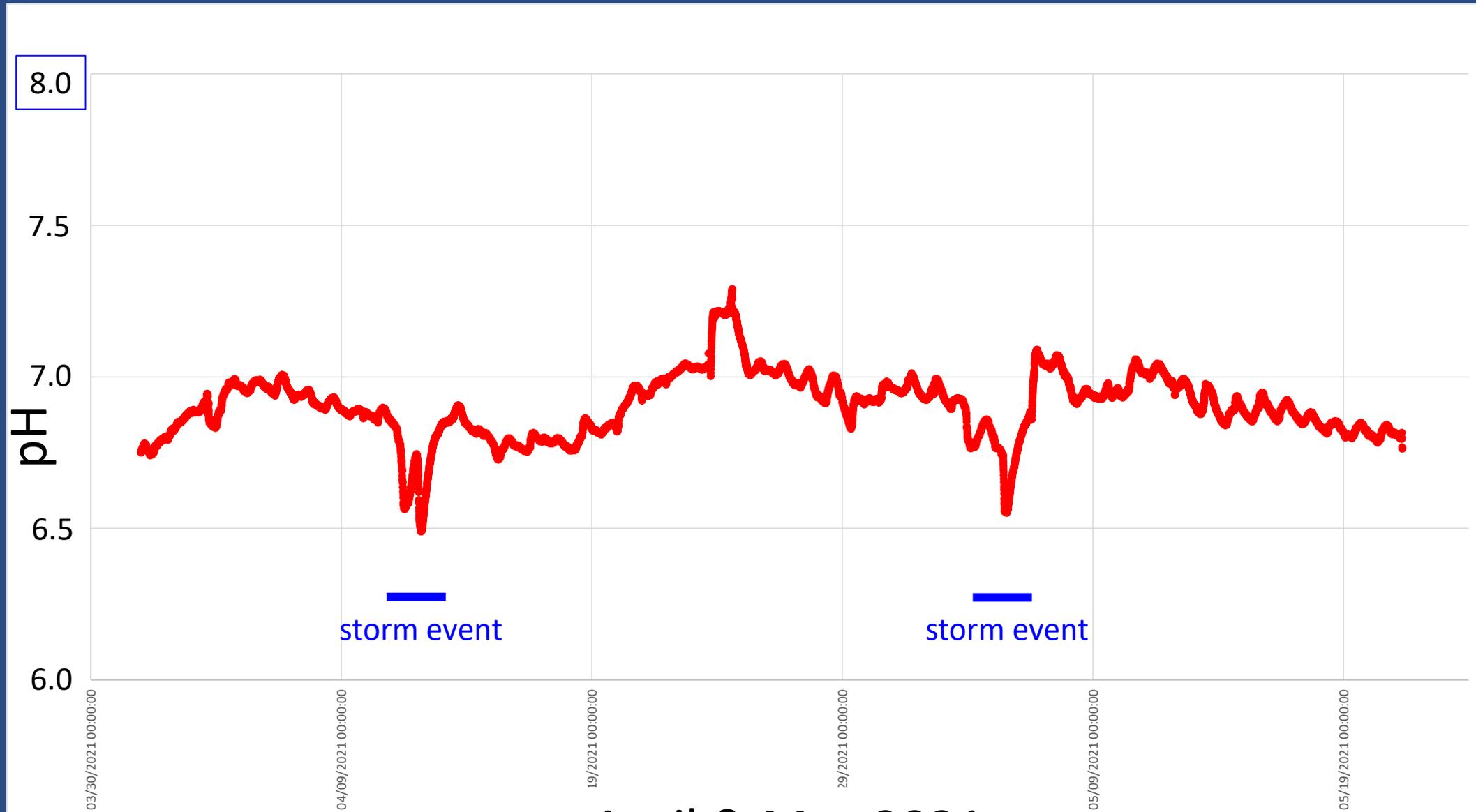
Find address or place



Scale: 1:18,056
Zoom Level: 15
0.2mi

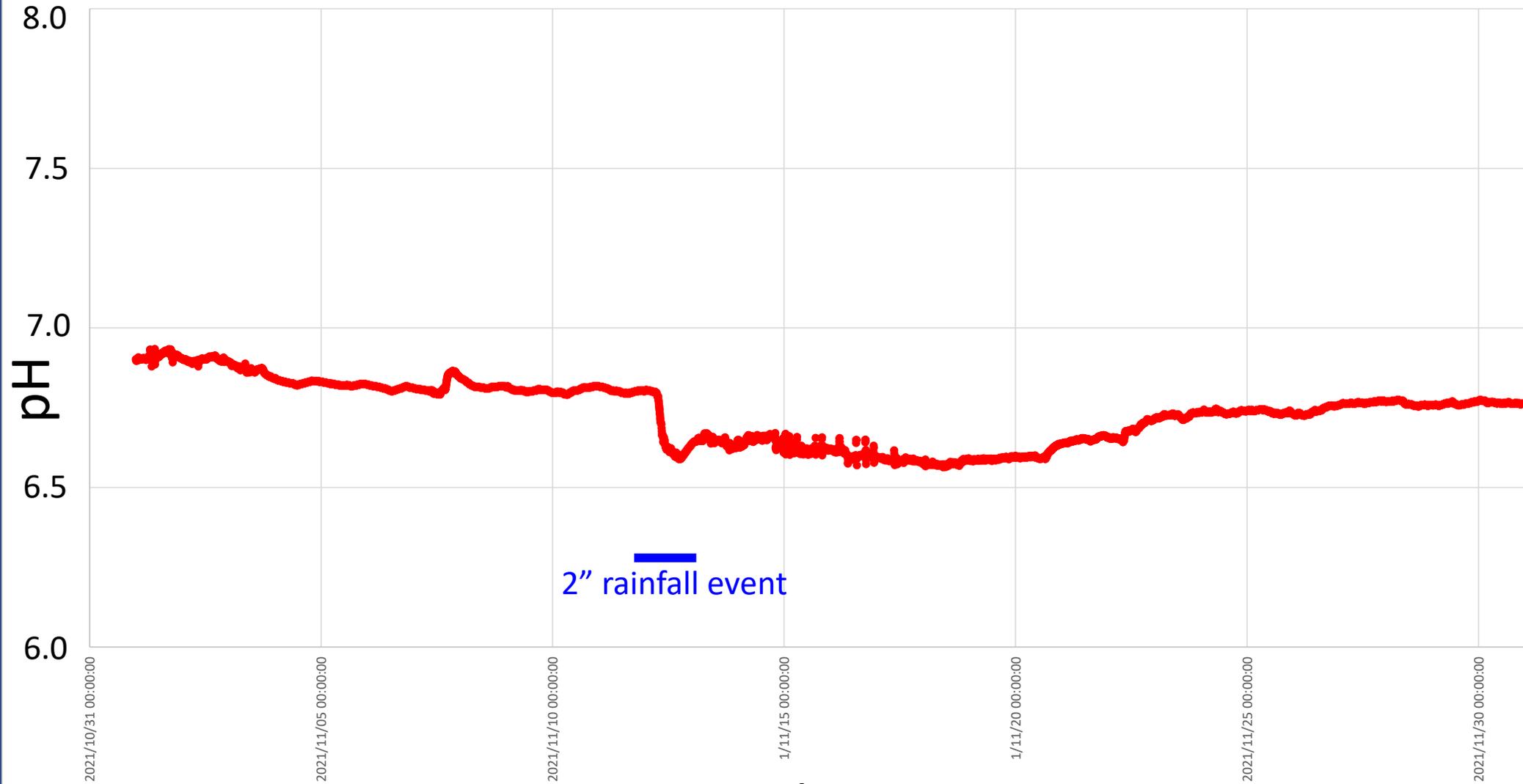
-76.084 40.761 Lat Long

Big Creek above Moss Glen Reservoir



April & May 2021

Big Creek above Moss Glen Reservoir



November 2021

Benthic Macroinvertebrates (and pH snapshot from May 2021)

(ref) Locust Creek

- outstanding diversity
- large populations of sensitive taxa

6.2

(ref) Silver Creek

- abundant Peltoperlidae
- sizable mayfly populations

5.4

"Reference" above connection

- no mayflies
- one Peltoperlidae

4.7

Big Cr @ MOSS

- Baetis*
- Maccaffertium*
- Leptophlebia*
- Siphonurus*

7.1

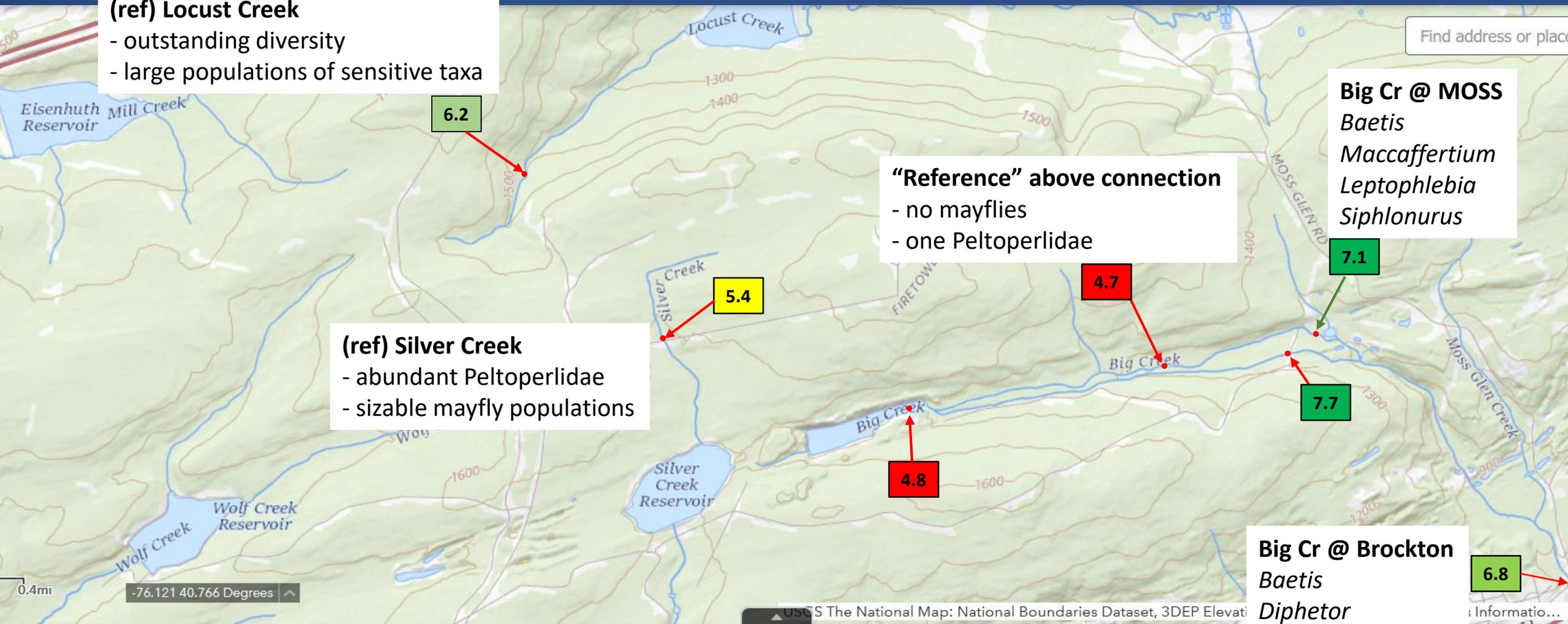
7.7

Big Cr @ Brockton

- Baetis*
- Dipheter*
- Eurylophella*
- Maccaffertium*
- Leptophlebiidae
- Siphonurus*

6.8

4.8



Restoration of Big Creek Watershed

- Limestone sand in “bypass” channel as BMP
- Brook trout reintroduction supported by continuous pH sensors & macroinvertebrate data
- Broaden application of limestone and/or dolomite, and broaden research collaborations
- Continued adaptive management with WQ and biological surveys

Big Creek Restoration: AMD & Beyond

(collaboration among DRN, SCD, SH, PADEP/BAMR, and others)





Questions?

Capparell stripping pit