Shenandoah River Algae

Field Monitoring Methods, Data Summary and Current Status

April 10, 2019

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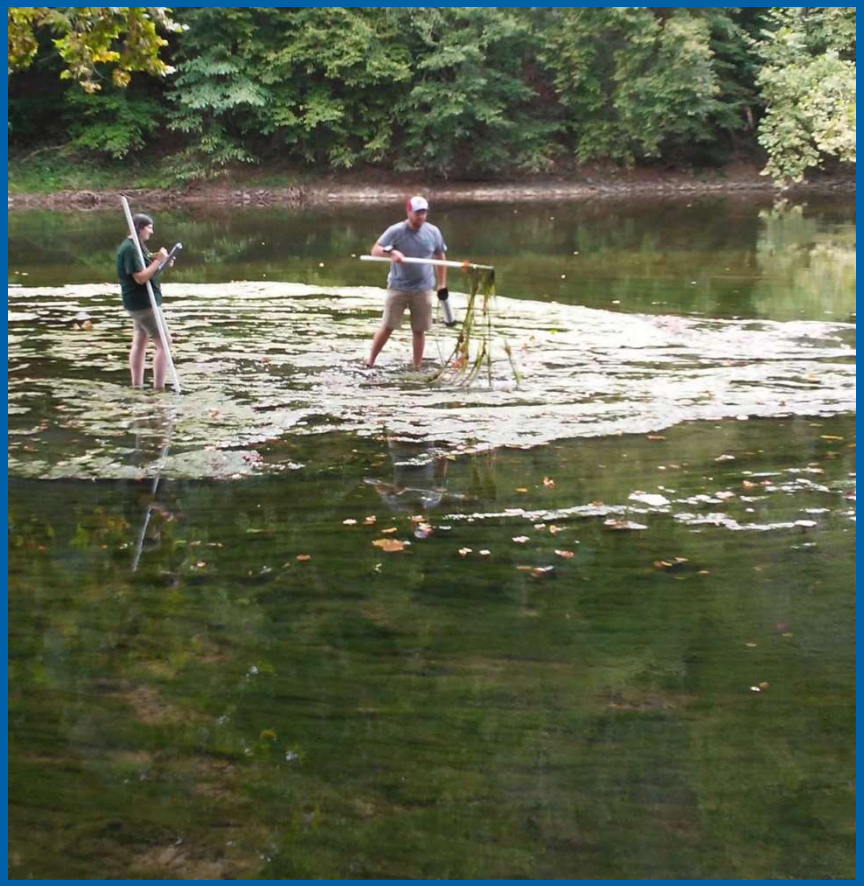
VDEQ - Valley Regional Office




Quick Overview

- Background
- Review algae monitoring methods development
- Discuss 2017 & 2018 Results
- Lessons Learned and Next Steps



Background

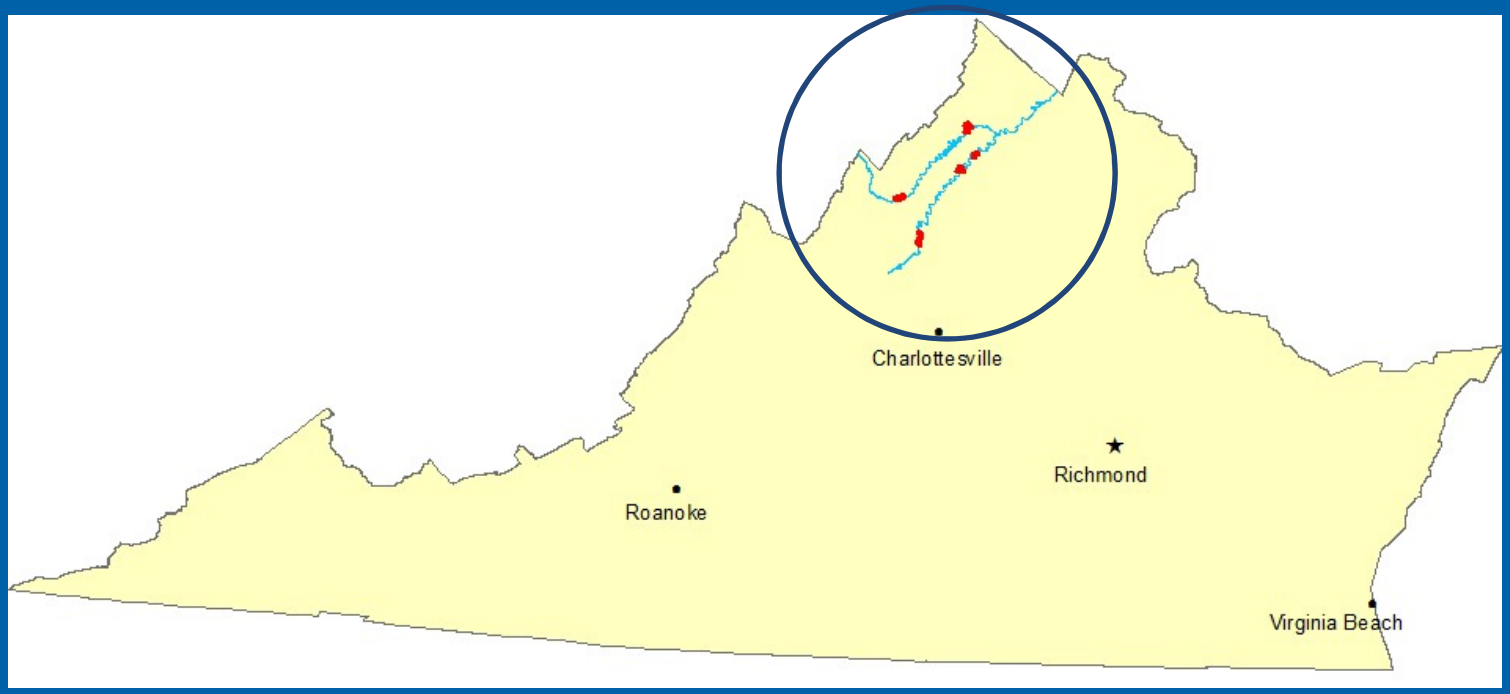
www.deq.virginia.gov

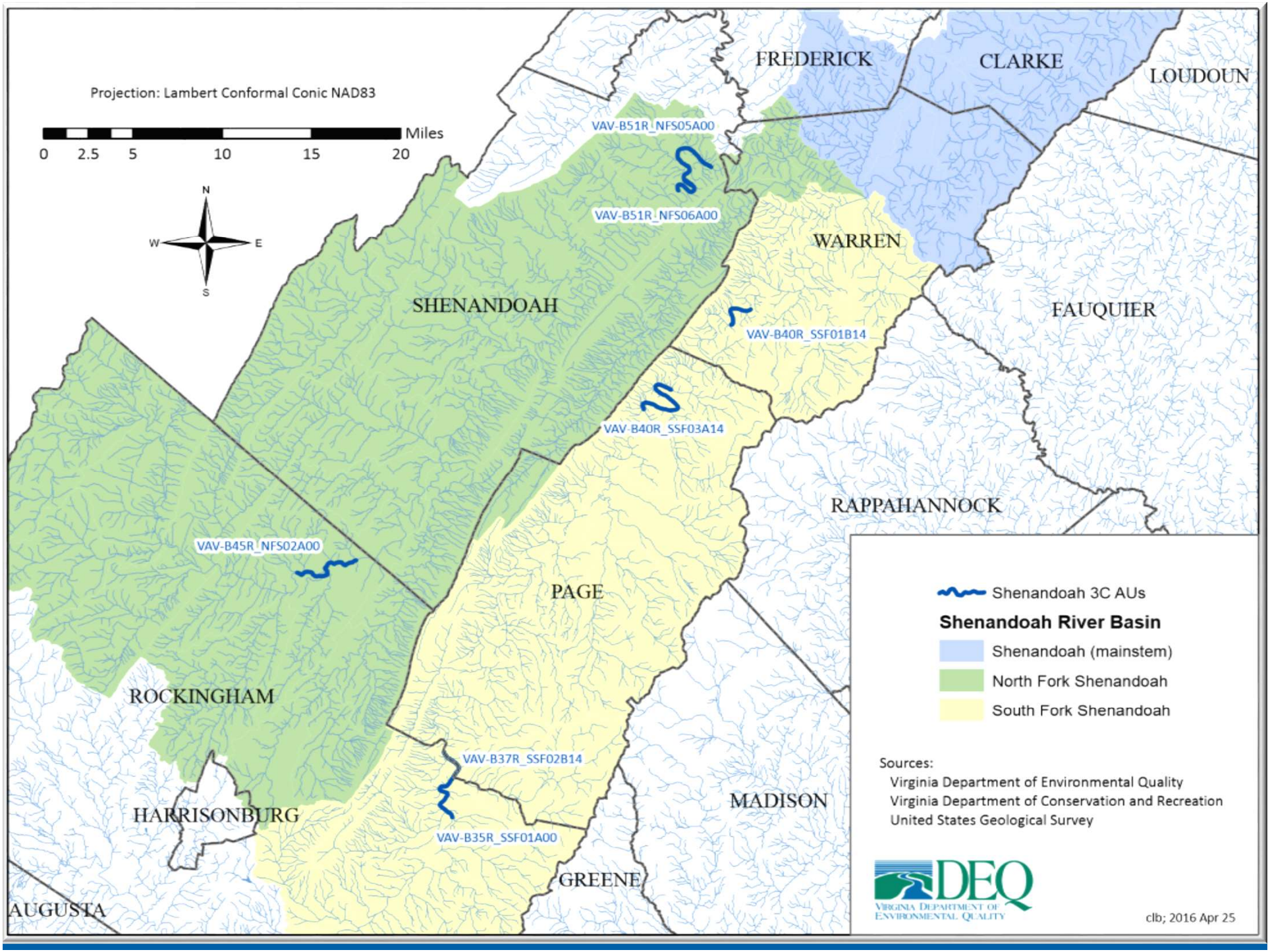
- Every even year, Virginia submits to EPA the **Integrated Water Quality Assessment Report,** or **IR** which describes the quality of Virginia's waters.

- EPA Approval for the 2014 IR was delayed due to citizen concerns about **algae growth** in the Shenandoah River and its impact to **recreation**.

DEQ Action

- Listed 5 river segments in the 2014 IR (~25 river miles) as having an **observed effect**.
- Committed to follow-up monitoring to develop field methods for estimating probable nuisance conditions by filamentous algae

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PAGE
ROCKINGHAM
VAV-B37R_SSF02B14
MADISON
HARRISONBURG
VAV-B35R_SSF01A00
GREENE
AUGUSTA
Shenandoah 3C AUs
Shenandoah River Basin
Shenandoah (mainstem)
North Fork Shenandoah
South Fork Shenandoah
Sources:
Virginia Department of Environmental Quality
Virginia Department of Conservation and Recreation
United States Geological Survey
DEQ
Virginia Department of Environmental Quality
clb; 2016 Apr 25

Field Methods – Three Stages

- **Stage 1:** Visual observation for early indications of algae growth from bank
- **Stage 2:** Lateral transect (Quadrat method) to visually estimate algal percent coverage
- **Stage 3:** Numeric algae densities generated via algae samples: measure Biomass in field and lab analyzed chlorophyll-a/Ash-free dry mass (AFDM)

2017 Monitoring Summary

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- Weekly monitoring, June – October, at each site (conditions permitting)
- Monitoring focused on:
  - **Lateral transects:** (% cover)
  - **Wet Biomass (g):** wrung wet-weight as initial estimate of nuisance potential and volumetric fill
  - **Chlorophyll a (mg/m^2):** commonly used indicator of potential impacts due to algae. Captures filamentous algae & blue/green algae
  - **Chlorophyll b** (mg/m^2): used to corroborate the CHL-a results. Captures filamentous algae but not blue-green algae and diatoms.
  - **Ash Free Dry Mass** (g/m^2): also used to corroborate the CHL-a results

Stage 1- Bank Estimate

www.deq.virginia.gov

Stage 2- Lateral Transect

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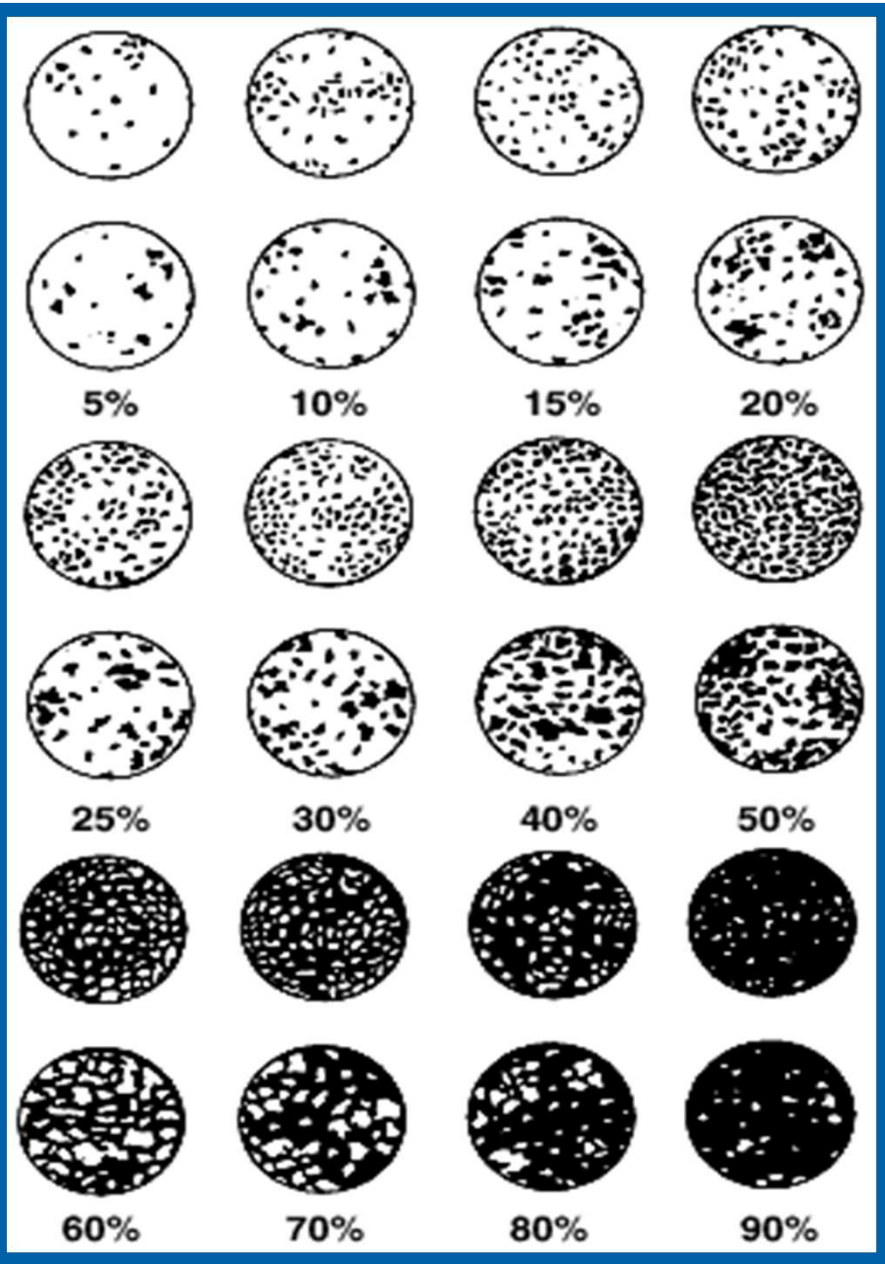
Stage 2- Lateral Transect

www.deq.virginia.gov

Comparison Chart for Visual Percent Cover Estimation



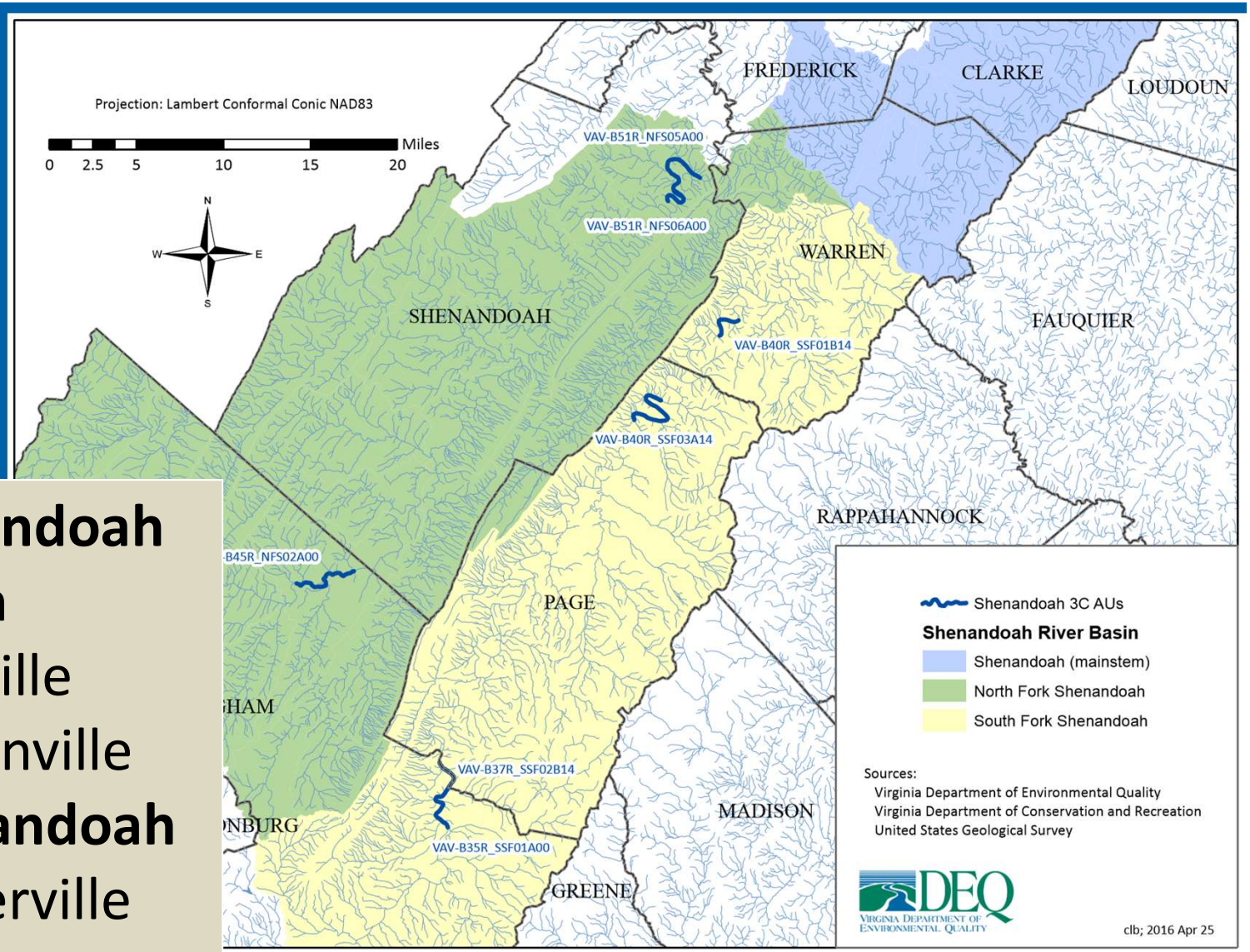
Stage 3- Biomass Collection

www.deq.virginia.gov

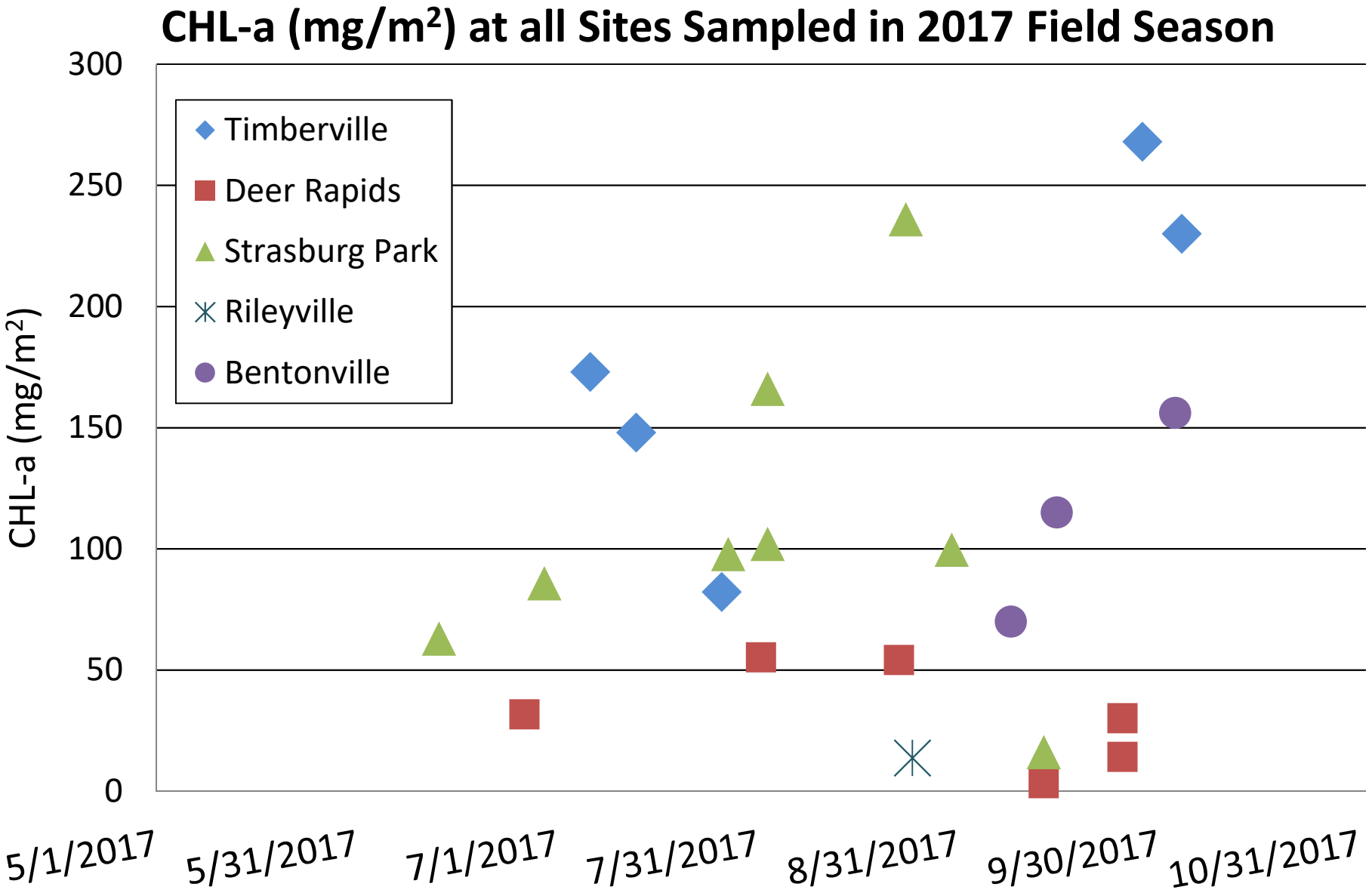
2017 Data Review

www.deq.virginia.gov

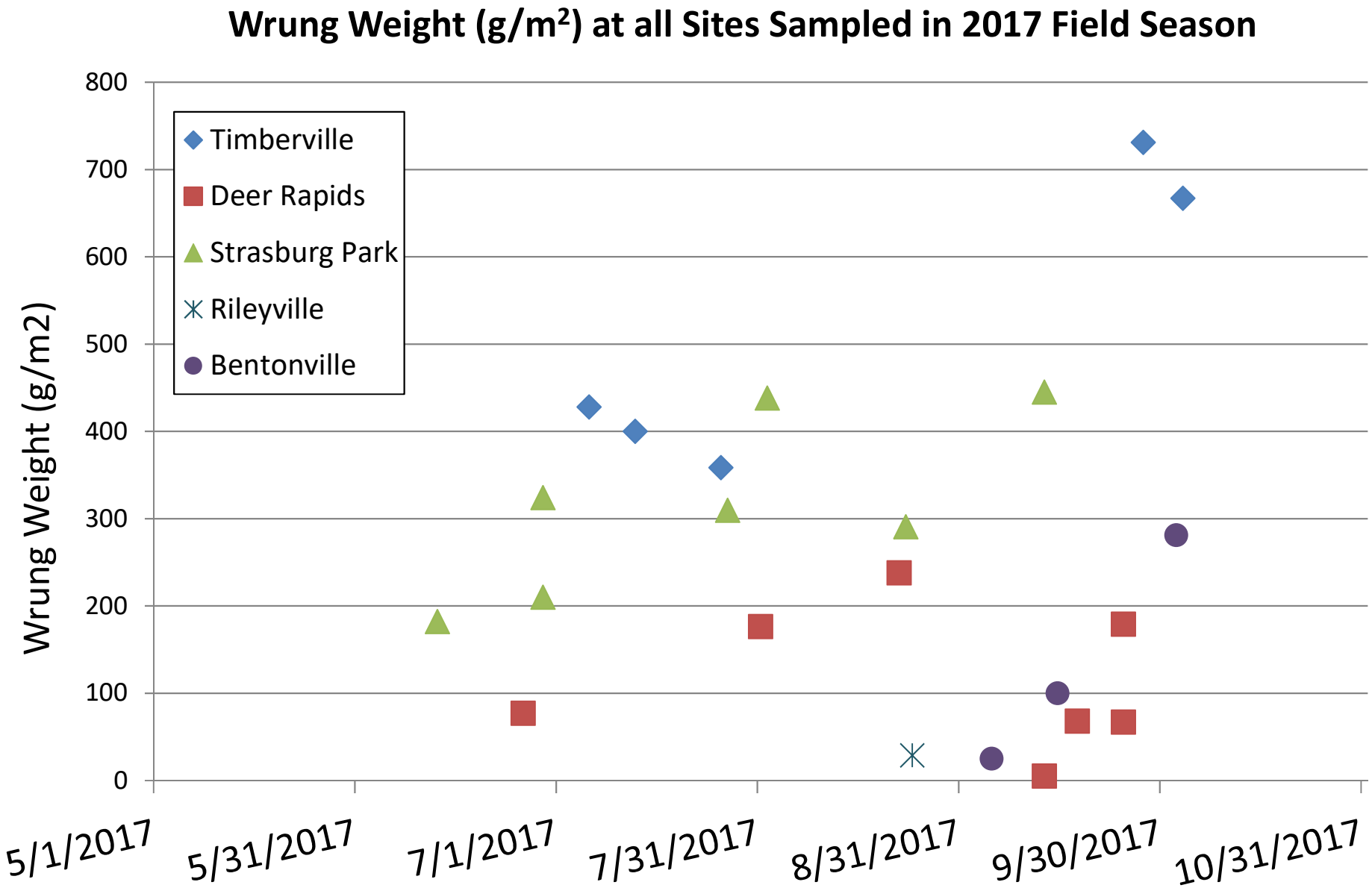
- **SF Shenandoah**
  - Elkton
  - Rileyville
  - Bentonville
- **NF Shenandoah**
  - Timberville
  - Strasburg



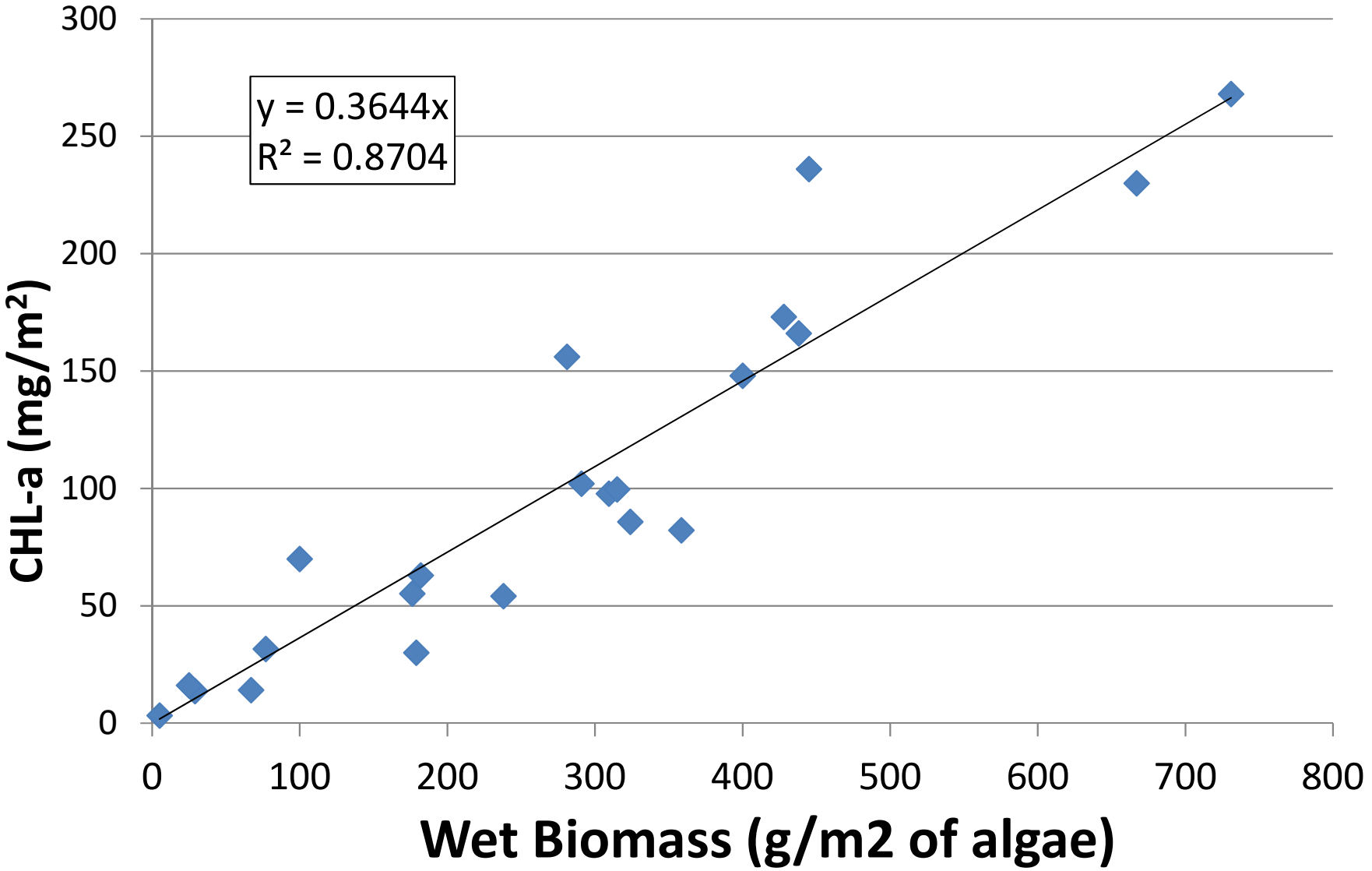
2017 Seasonal Summary – CHL-a



2017 Summary – Wet-wrung Biomass



Wet Biomass (g/m^2) vs CHL-a (mg/m^2)



2018 Data Review

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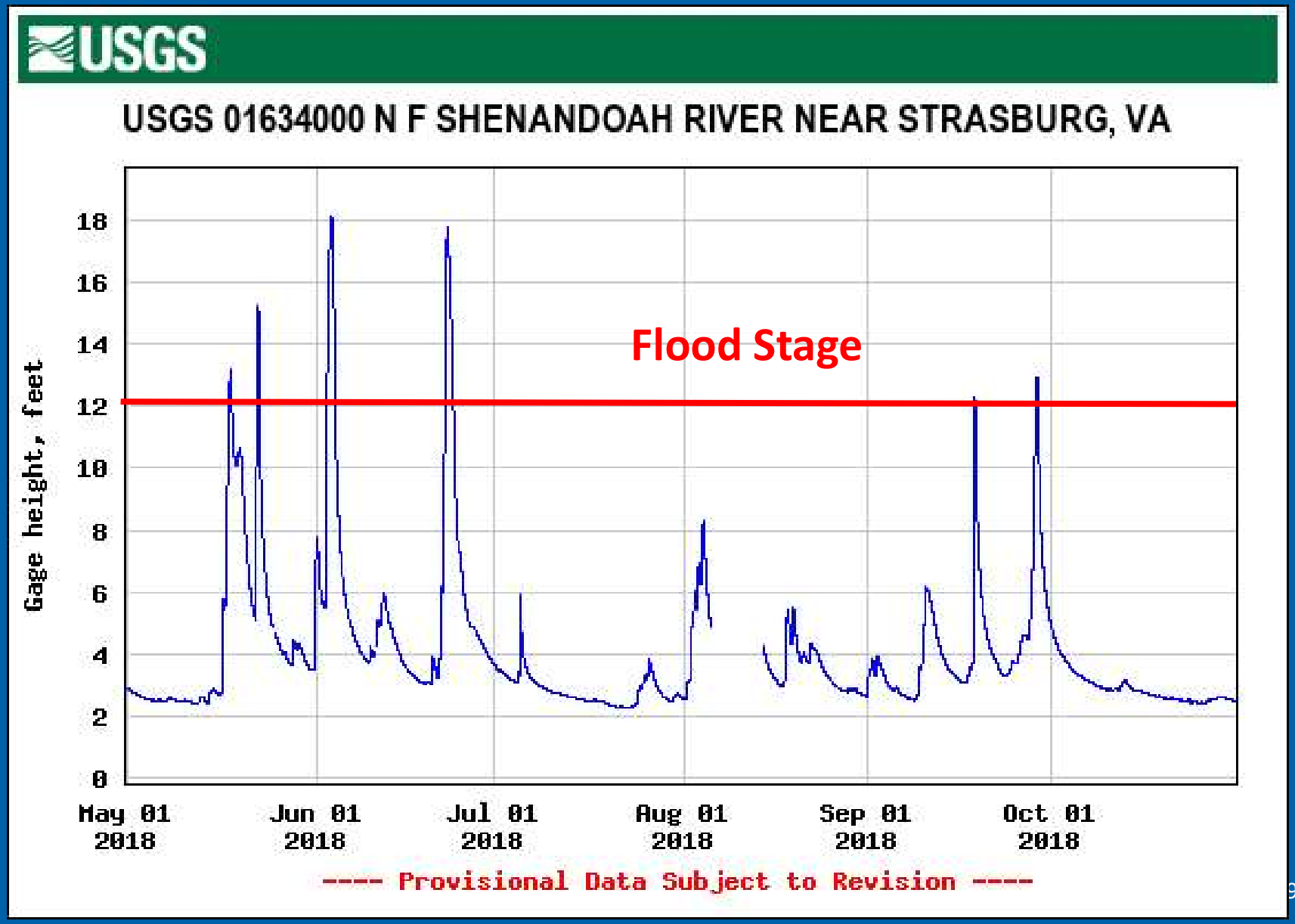

2018 By the numbers…

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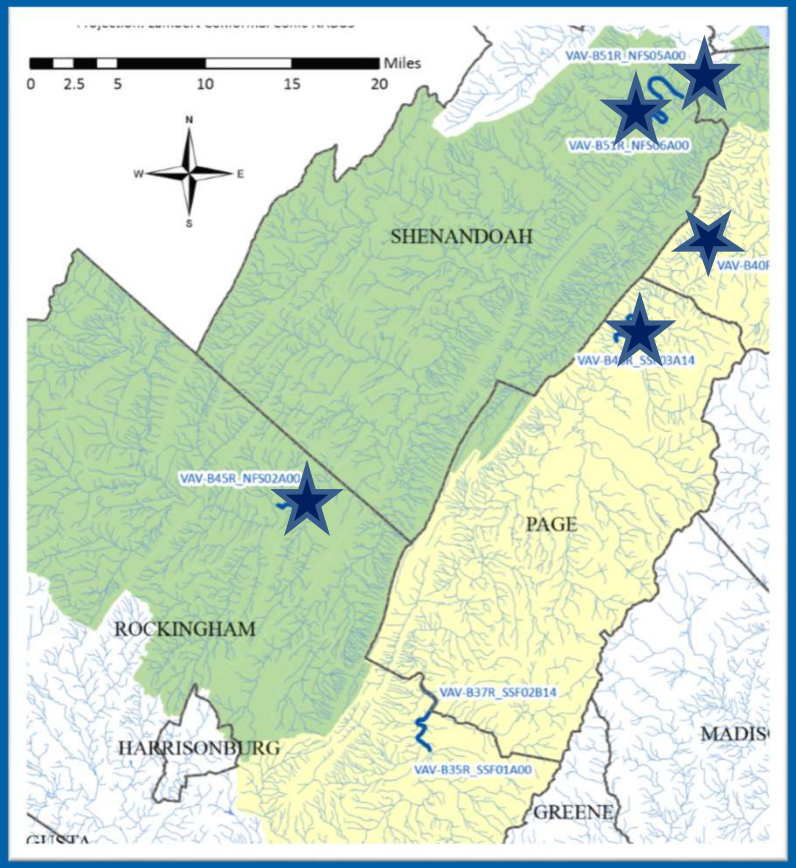
- **5** Sites on **4** segments
- **6** visual observations per site (monthly: May to October)
- **1** FILBEN sample collected & sent to DCLS
- **3** Complaints investigated
- **2** citizen monitoring organizations with **2** paid staffers collecting observations (but **0** citizen volunteers)



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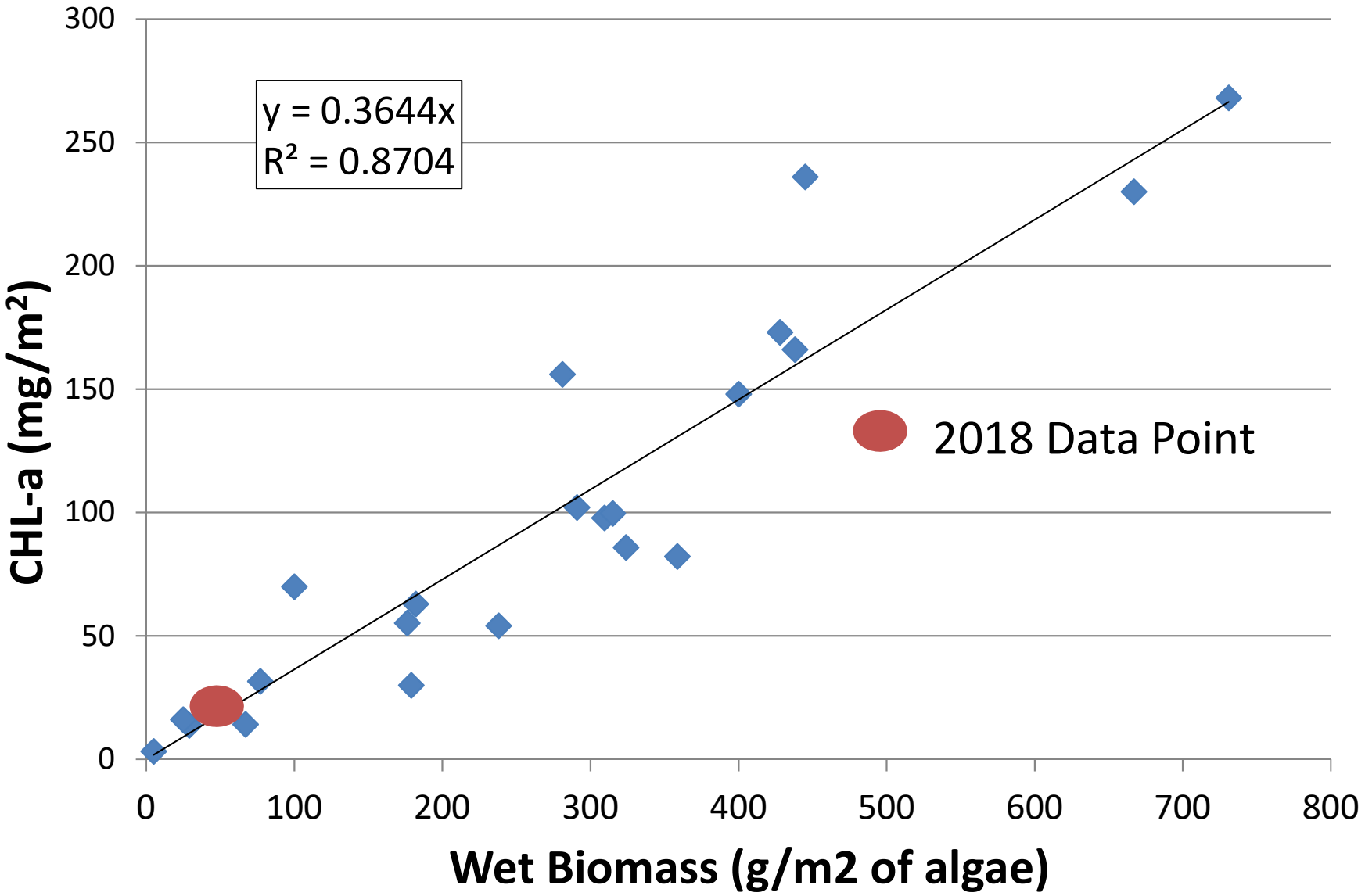

Lessons Learned

- Monitoring methods usable in wadable systems only
- Precipitation and high flow impacts filamentous algal growth and volumetric fill
- Filamentous algae has high seasonal/annual variability

http://www.xinhuanet.com

Next Steps

- 2019: Continue Monitoring Strategy & data collection on four priority segments. Respond to complaints as reported.
- Work with EPA Region III staff/Region 3 states to discuss findings and whether a meaningful nuisance threshold can be identified based on the work completed to date.

For more information:

www.deq.virginia.gov

http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/ShenandoahAlgae.aspx

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DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

REFERENCE SLIDES

For reference: Thresholds

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- WV impairment threshold for recreational impacts due to algae:
  - Lateral transect: 40% algal cover on any occasion, or 20% algal cover three times.
- Montana DEQ proposed chlorophyll a threshold to support recreation: >150 mg/m2 .
- The literature-based ranges for chlorophyll a thresholds for recreational nuisance designations are not extremely wide: 150 – 200 mg/m2 benthic chlorophyll a.