Freshwater Potomac Cyanobacteria Investigation

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

- Survey focused on the 60 km of the river between the Shenandoah confluence and the confluence of Seneca Creek.

- Bank to bank transects (N=3) were identified that have shallow profiles most likely to foster algae growth and give the greatest chance to make visual observations of the river substrate across the width of the river.

Potomac River Algae Survey Locations

Brunswick

Point of Rocks

White's Ferry

Whites Ferry

Combined Morphology/Genetic approach to obtain ID

- -Magnification ID using morphometric characteristics outlined by Suda et al. (2002) and Komárek and Anagnostidis (2005)

- -DNA extracted from pelleted cells – Plasmid DNA sent to UMES IMET for Sanger sequencing – unique sequence = *Planktothrix* cf. *isothrix*

Results

- Temporal differences were consistent throughout the study – blooms were more dominant during June-July

- Spatial differences occur during years when observations of nuisance cyanobacteria exist

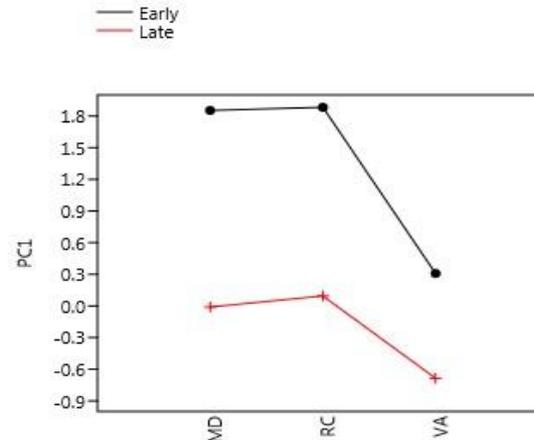- Both temperature and flow correlated with bloom biomass

2013
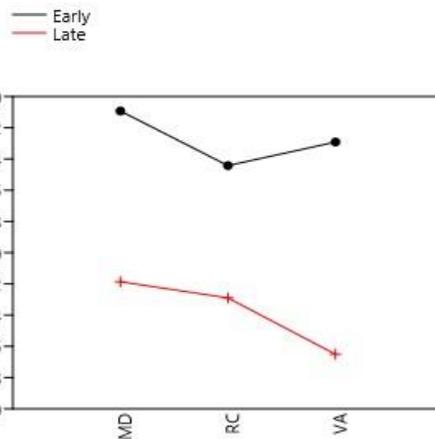
2-Way ANOVA Results

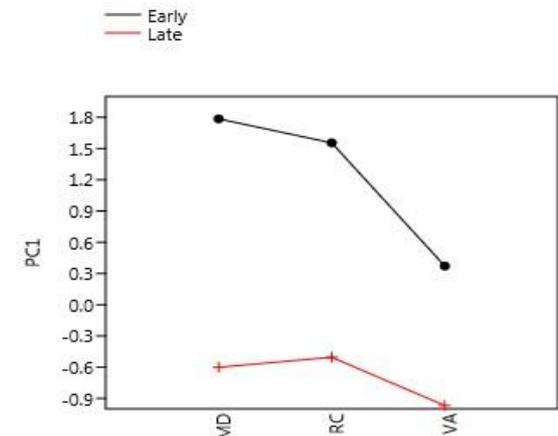Spatial: F = 1.2; P = 0.3

Temporal: F = 38.3; P = <0.0001

2014

2-Way ANOVA Results

Spatial = F = 16.2, P = <0.0001

Temporal = F = 60.8, P = <0.0001

2015

2-Way ANOVA Results

Spatial = F = 5.9, P =0.005

Temporal = F = 56.8, P = <0.0001

Impacts to Aquatic Life (Macroinvertebrates)

- 2013 & 2014: Once per month benthic macro invertebrate samples were collected just downstream of each plot location using 3-30 second D-net kicks. Samples were identified and metrics calculated for individual plots to account for differences that may result from tributary influence, habitat differences, and/or potential effects of cyanobacteria to aquatic biota

2013: Control (no algae)

Temporal (Early/Late): F=10.2; P=0.004

Spatial (MD,RC,VA): F=0.9; P=0.4
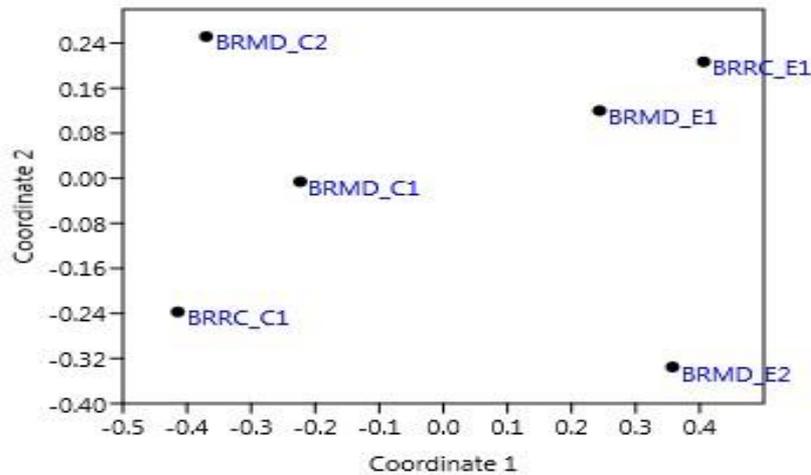
2014: Effect (algal mats)

Temporal (Early, 21July, Late): F=7.3; P=0.003
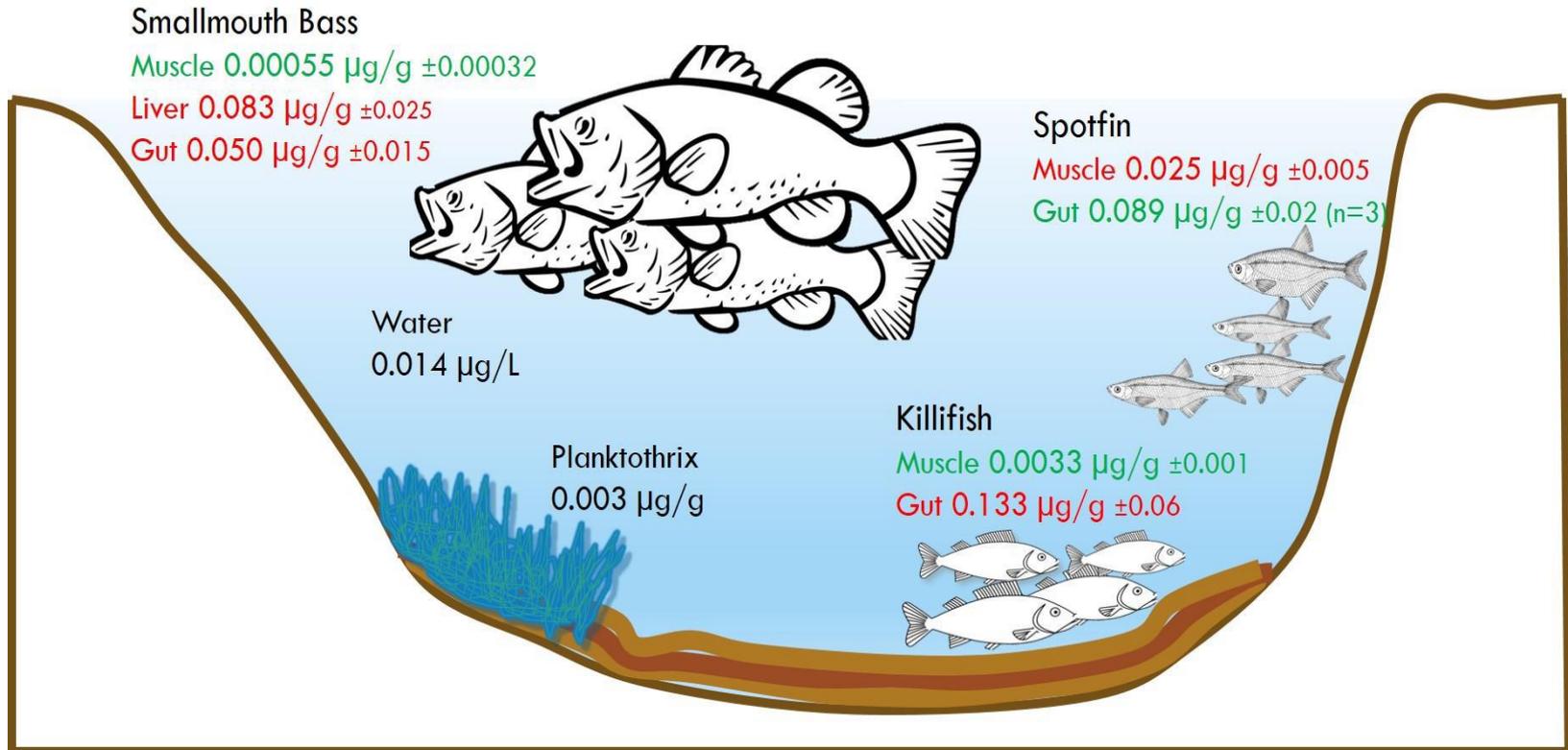
Spatial (MD,RC / VA): F=3.6; P=0.04

2015 Inverts

- A total of 6 samples were conducted on 06August. 3 samples collected in predefined areas of highest algal growth (effect) and 3 samples taken in areas devoid of algae (control). All other habitat conditions (substrate) were identical.

Sample	Diversity	E	Rich.	N	EPT%	HBI
BR-C1	1.18	0.46	13	178	**88%**	**3.54**
BR-C2	1.79	0.72	12	152	**84%**	**3.86**
BR-C1	1.99	0.72	16	98	**85%**	**3.65**
BR-E1	1.68	0.64	14	180	**43%**	**5.26**
BR-E2	2.02	0.7	18	425	**55%**	**4.82**
BR-E1	1.94	0.7	16	163	**36%**	**5.4**

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- 2015 – trace amounts of microcystin detected (ELISA) (0.81 µg L^{-1}, expressed per 5 g wet weight)

- 2017 – microcystin detected in macroinvertebrate, minnow, and gamefish:

Smallmouth Bass
Muscle 0.00055 µg/g ±0.00032
Liver 0.083 µg/g ±0.025
Gut 0.050 µg/g ±0.015

Spotfin
Muscle 0.025 µg/g ±0.005
Gut 0.089 µg/g ±0.02 (n=3)

Water
0.014 µg/L

Planktothrix
0.003 µg/g

Killifish
Muscle 0.0033 µg/g ±0.001
Gut 0.133 µg/g ±0.06

- 2019 – anatoxin a - ≤5ppb; microcystin - ≤5ppb