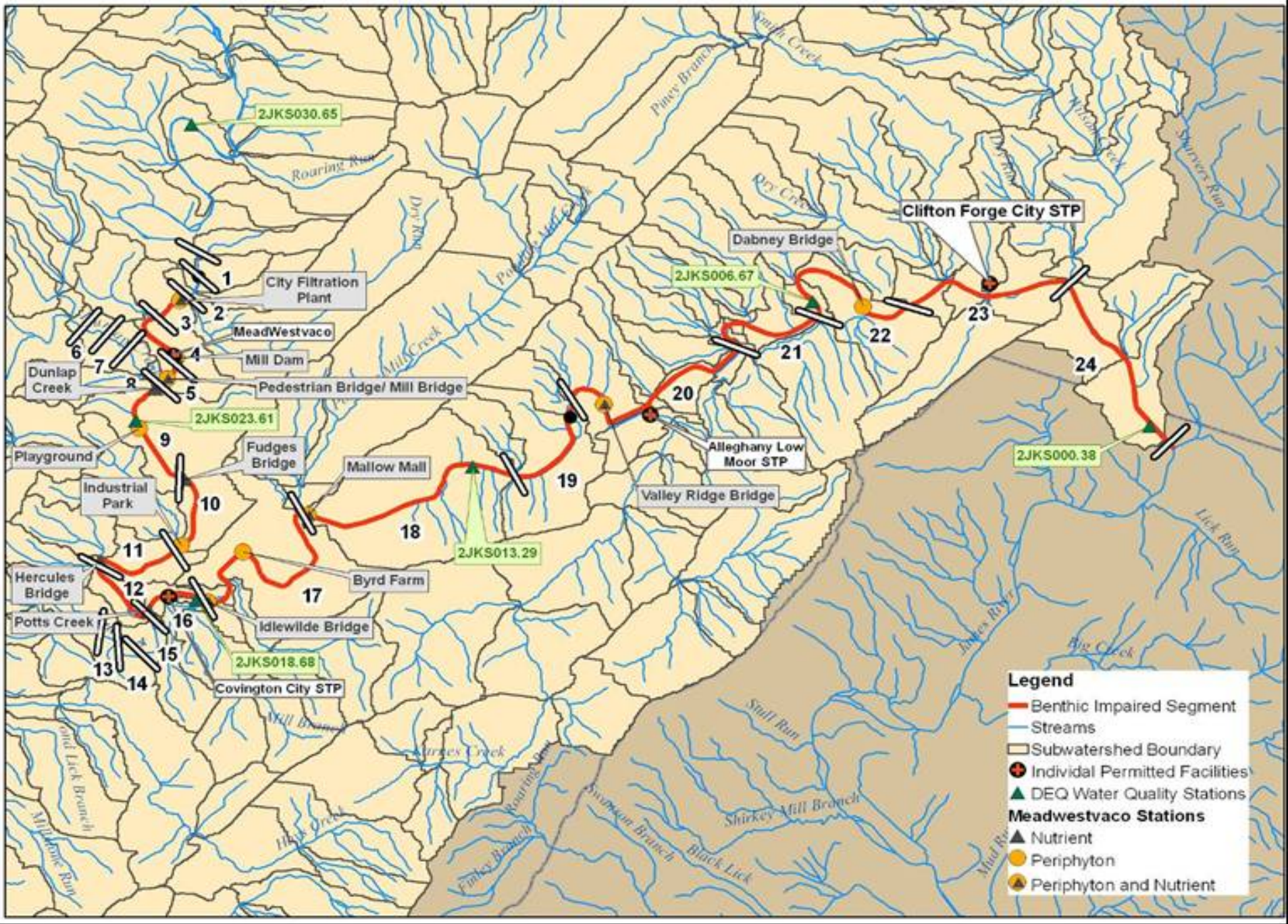
Jackson River Pulse Study Data – 2018 Update



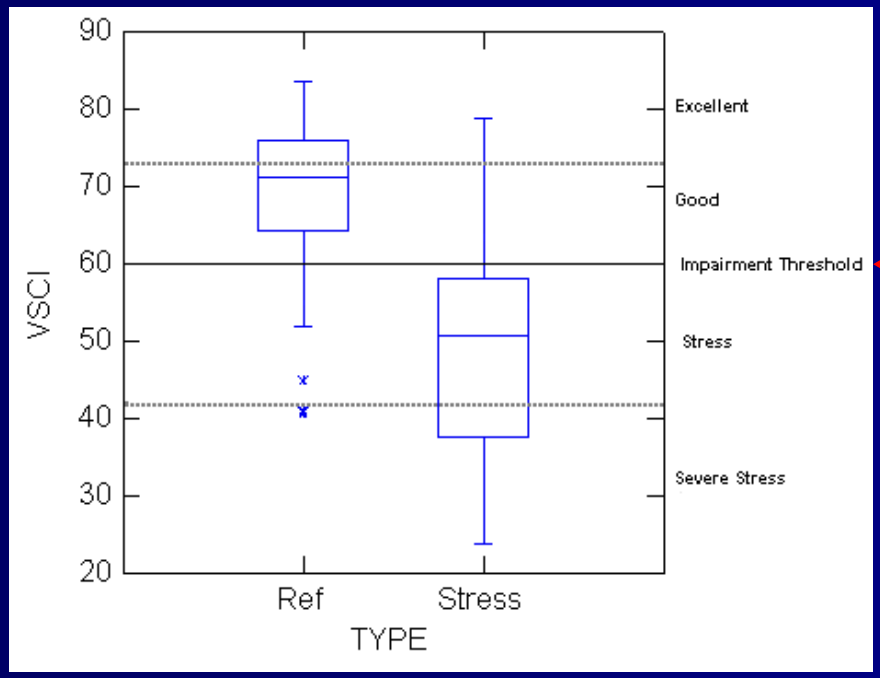
2JKS030.65
Rouring Run
Dry Run
Piney Branch
Smith Creek
Dry Creek
Clifton Forge City STP
Dabney Bridge
2JKS006.67
City Filtration Plant
MeadWestvaco
Mill Dam
Dunlap Creek
Pedestrian Bridge/ Mill Bridge
2JKS023.61
Playground
Fudges Bridge
Mallow Mall
Industrial Park
Alleghany Low Moor STP
Valley Ridge Bridge
2JKS000.38
2JKS013.29
Byrd Farm
Hercules Bridge
Potts Creek
Idlewilde Bridge
2JKS018.68
Covington City STP
Mill Branch
Mill Creek
Lick Run
James River
Big Creek
Stull Run
Shirkey Mill Branch
Swanson Branch
Black Lick
Finley Branch
Mud Run
Legend
Benthic Impaired Segment
Streams
Subwatershed Boundary
Individal Permitted Facilities
DEQ Water Quality Stations
Meadwestvaco Stations
Nutrient
Periphyton
Periphyton and Nutrient

Biological Assessment

The General Water Quality Standard: "All state waters shall be free from substances [...] which are harmful to human, animal, plant or aquatic life." (9 VAC 25-260-20).

- Virginia Stream Condition Index (VSCI) used in non-coastal ecoregions to assess ecological health
- Coast Plain Macroinvertebrate Index (CPMI) used in coastal ecoregions to assess ecological health

Biological Assessment



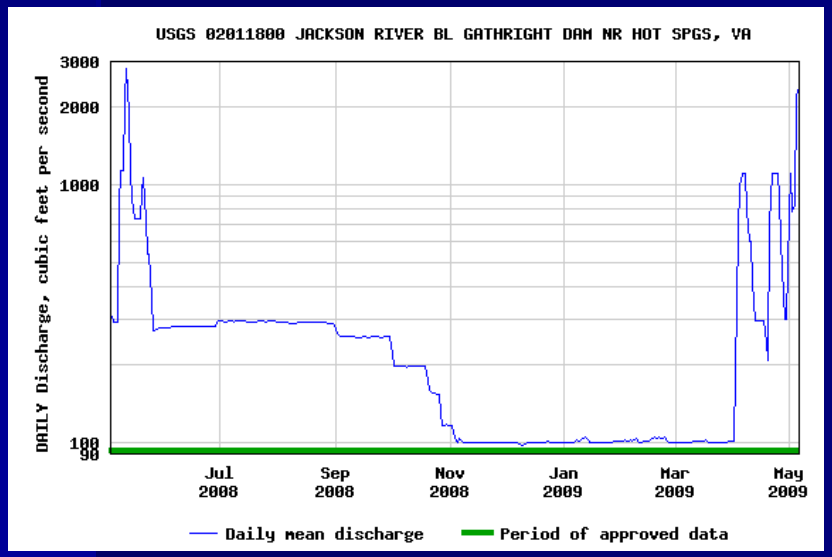
TMDL required ☹

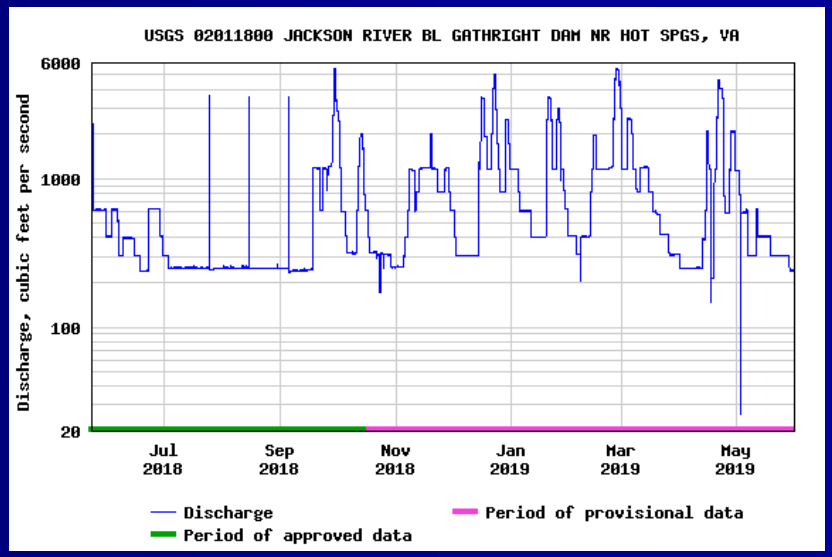
Virginia biological assessment tools are an ecoregional calibrated set metrics that detect and integrate a gradient of anthropogenic stressors

Field Observations- Periphyton Growth

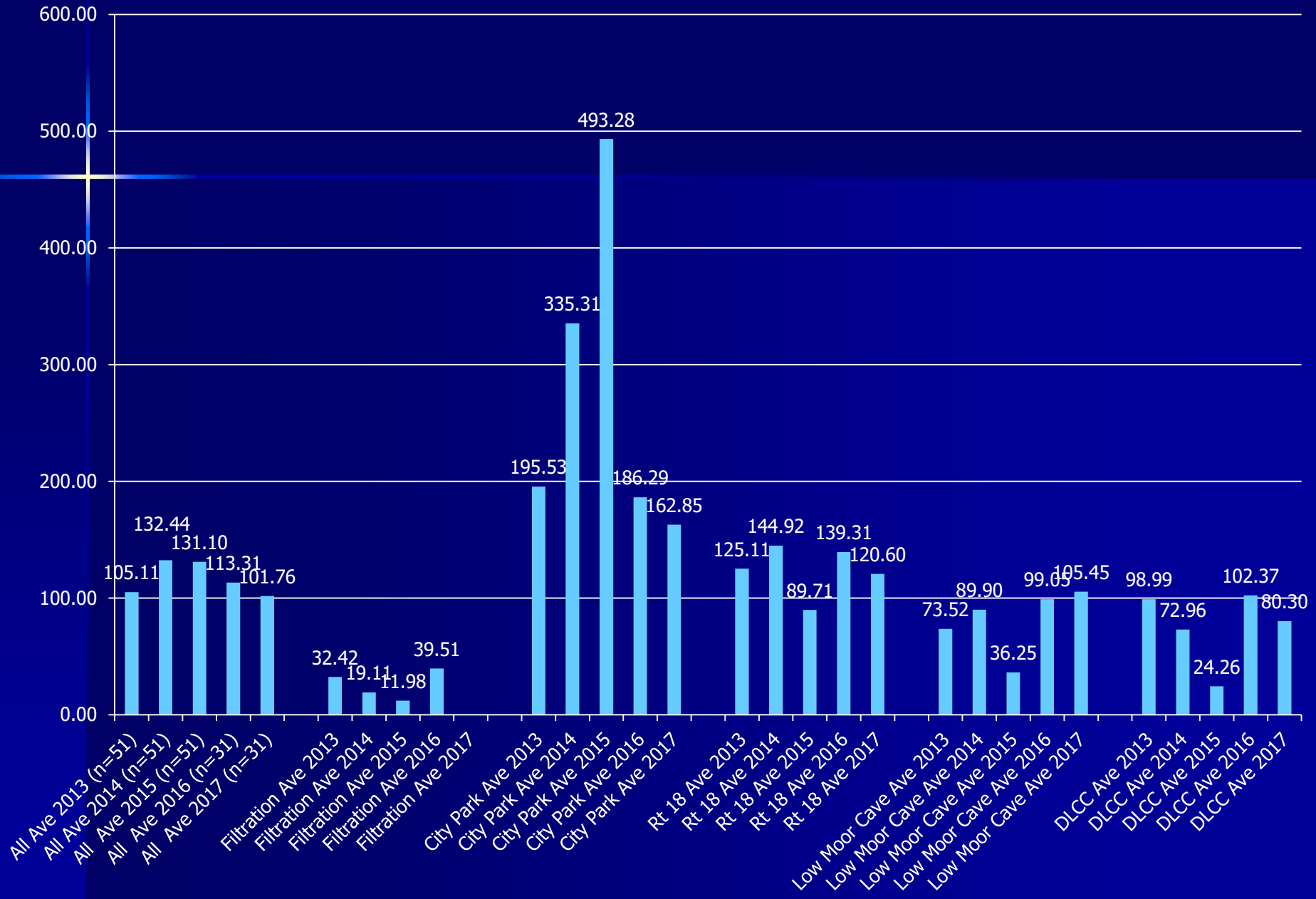
TMDL Implementation

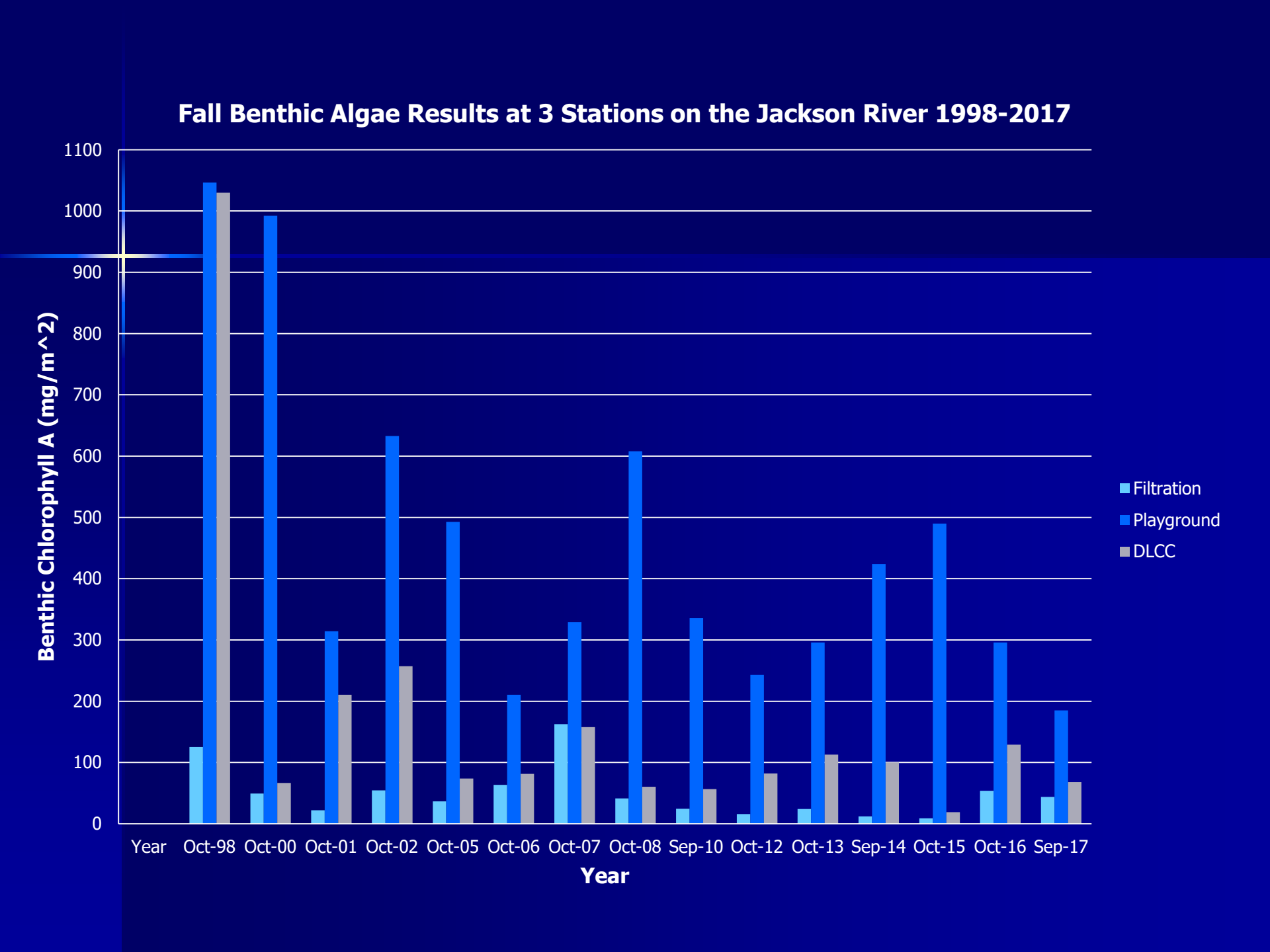
- Nutrient limits put into 1 major industrial facility, 2 major municipal facilities, and 1 minor municipal facility
- 89% Reduction in Phosphorus in impaired reach
- 20% Reduction in Nitrogen in impaired reach
- New Water Control Plan to change hydrology
- Goal is to have impaired reach less than 100 mg/m2 of Benthic Chlorophyll A





Benthic Chlorophyll A(mg/m2)




Fall Benthic Algae Results at 3 Stations on the Jackson River 1998-2017
Benthic Chlorophyll A (mg/m^2)
1100
1000
900
800
700
600
500
400
300
200
100
0
Year
Oct-98
Oct-00
Oct-01
Oct-02
Oct-05
Oct-06
Oct-07
Oct-08
Sep-10
Oct-12
Oct-13
Sep-14
Oct-15
Oct-16
Sep-17
Year
Filtration
Playground
DLCC

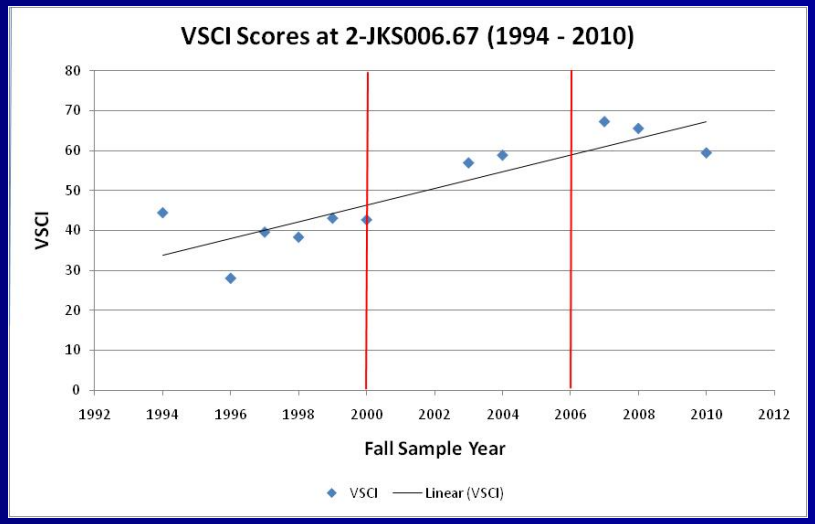
2018 Chlorophyll A Data Summary...one sample

Rivermile	River Location	Collection Date	Chlorophyll Average (mg/m^2)
2-JKS026.01	Filtration Plant (1)	7/24/18	8.76
2-JKS026.01	Filtration Plant (1)	7/26/18	10.51
2-JKS023.61	City Park	7/24/18	191.96
2-JKS023.61	City Park	7/26/18	125.81
2-JKS018.68	Rte 18 Bridge	7/24/18	117.91
2-JKS018.68	Rte 18 Bridge	7/26/18	89.21
2-JKS013.29	Low Moor Cave	7/24/18	51.79
2-JKS013.29	Low Moor Cave	7/26/18	45.17
2-JKS006.67	DLCC	7/24/18	30.76
2-JKS006.67	DLCC	7/26/18	83.82

Significant Improvement

Using reference site revisit data (over multiply years and season), we can calculate interannual variability due to natural conditions (using following equation):

$$x_a - x_b > Z_{(1-\alpha)} / s_{axx} \sqrt{\frac{1}{n_a} + \frac{1}{n_b}}$$

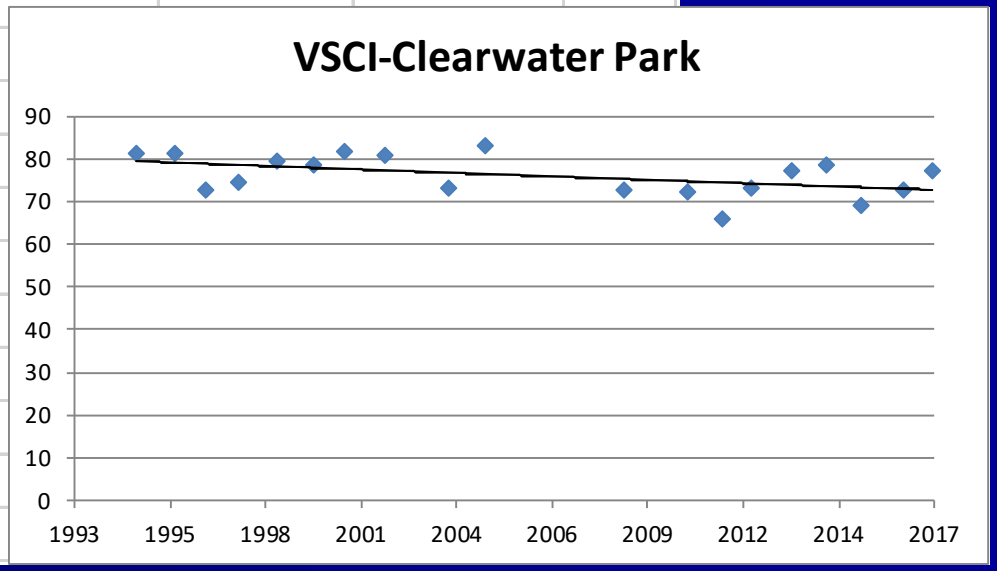


- VSCI increase in 9.7 points is considered significant improvement
- VSCI decrease in 9.7 points is considered significant degradation

VSCI Data Clearwater Park (Petticoat Junction) 1994-2017 (n=19)

StationID	CollDate	VSCI	Season	Year
2-JKS030.65	11/3/1994	81.28	Fall	1994
2-JKS030.65	12/4/1995	81.05	Fall	1995
2-JKS030.65	11/6/1996	72.52	Fall	1996
2-JKS030.65	10/7/1997	74.56	Fall	1997
2-JKS030.65	11/24/1998	79.6	Fall	1998
2-JKS030.65	11/30/1999	78.59	Fall	1999
2-JKS030.65	11/2/2000	81.65	Fall	2000
2-JKS030.65	12/18/2001	80.64	Fall	2001
2-JKS030.65	10/15/2003	73.09	Fall	2003
2-JKS030.65	11/1/2004	83.26	Fall	2004
2-JKS030.65	11/4/2008	72.64	Fall	2008
2-JKS030.65	8/24/2010	72.07	Fall	2010
2-JKS030.65	8/22/2011	65.88	Fall	2011
2-JKS030.65	6/18/2012	73.02	Fall	2012
2-JKS030.65	8/20/2013	77.32	Fall	2013
2-JKS030.65	8/25/2014	78.76	Fall	2014
2-JKS030.65	8/24/2015	68.89	Fall	2015
2-JKS030.65	11/2/2016	72.69	Fall	2016
2-JKS030.65	8/22/2017	77.32	Fall	2017

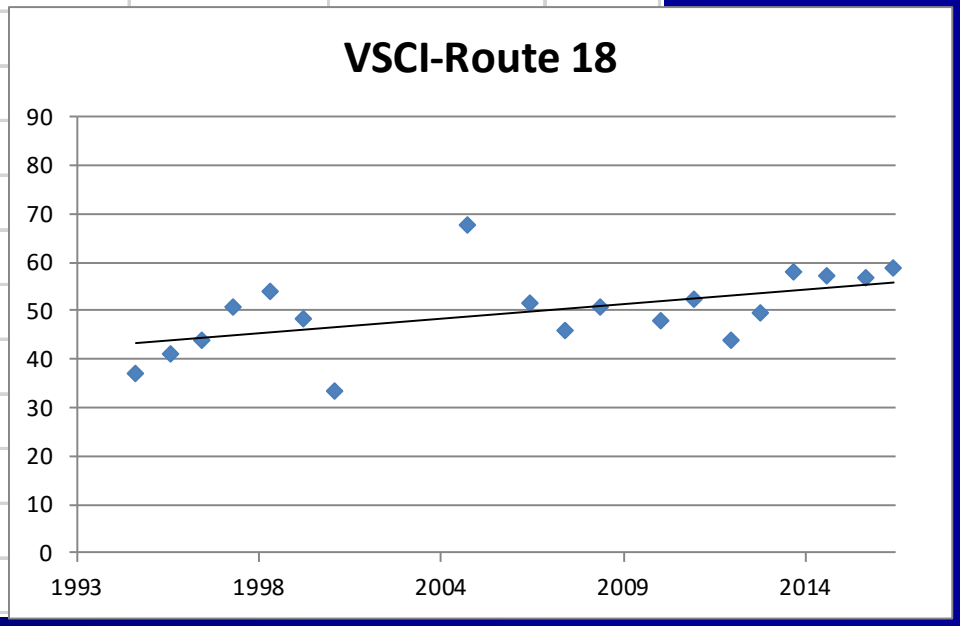
Years	Average	Point
1994-1999	77.9	
2000-2004	79.7	1.7
2008-2012	70.9	-8.8
2013-2017	75.0	4.1



VSCI Data Route 18 (Idlewilde) 1994-2017 (n=19)

StationID	CollDate	VSCI	Season	Year
2-JKS018.68	11/3/1994	37.03	Fall	1994
2-JKS018.68	12/4/1995	40.71	Fall	1995
2-JKS018.68	11/6/1996	43.77	Fall	1996
2-JKS018.68	10/7/1997	50.69	Fall	1997
2-JKS018.68	11/24/1998	53.64	Fall	1998
2-JKS018.68	11/30/1999	48.23	Fall	1999
2-JKS018.68	11/2/2000	33.01	Fall	2000
2-JKS018.68	11/1/2004	67.3	Fall	2004
2-JKS018.68	9/26/2006	51.18	Fall	2006
2-JKS018.68	10/12/2007	45.52	Fall	2007
2-JKS018.68	10/30/2008	50.39	Fall	2008
2-JKS018.68	8/23/2010	47.79	Fall	2010
2-JKS018.68	8/23/2011	52.24	Fall	2011
2-JKS018.68	10/11/2012	43.55	Fall	2012
2-JKS018.68	8/22/2013	49.38	Fall	2013
2-JKS018.68	8/26/2014	57.93	Fall	2014
2-JKS018.68	8/25/2015	56.85	Fall	2015
2-JKS018.68	11/2/2016	56.42	Fall	2016
2-JKS018.68	8/23/2017	58.55	Fall	2017

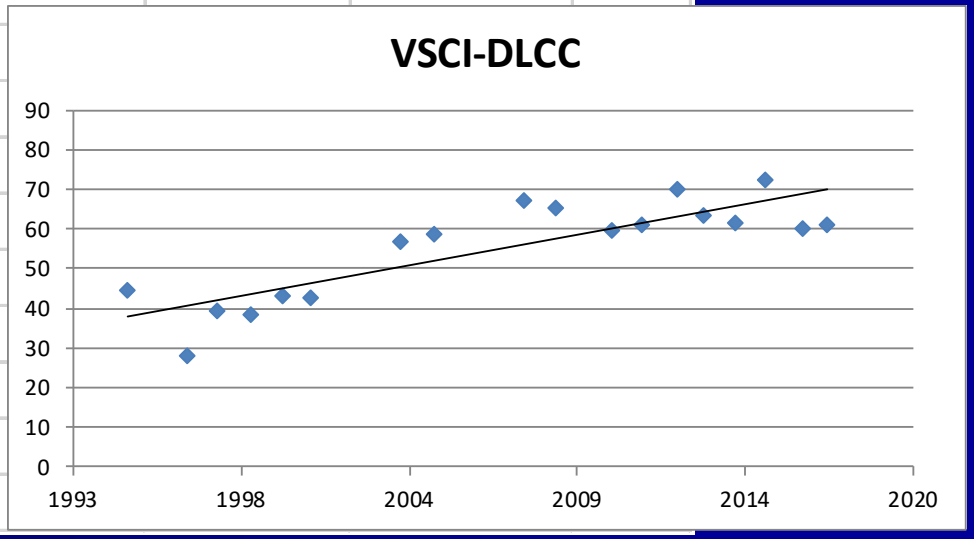
Years	Average	Point
1994-1999	45.7	
2000-2007	49.3	3.6
2008-2012	48.5	-0.8
2013-2017	55.8	7.3



VSCI Data DLCC (Community College) 1994-2017 (n=18)

StationID	CollDate	VSCI	Season	Year
2-JKS006.67	11/4/1994	44.41	Fall	1994
2-JKS006.67	10/21/1996	28.01	Fall	1996
2-JKS006.67	10/15/1997	39.55	Fall	1997
2-JKS006.67	11/19/1998	38.29	Fall	1998
2-JKS006.67	11/30/1999	43.03	Fall	1999
2-JKS006.67	11/2/2000	42.63	Fall	2000
2-JKS006.67	10/15/2003	56.88	Fall	2003
2-JKS006.67	11/3/2004	58.8	Fall	2004
2-JKS006.67	10/12/2007	67.2	Fall	2007
2-JKS006.67	10/30/2008	65.5	Fall	2008
2-JKS006.67	8/24/2010	59.39	Fall	2010
2-JKS006.67	8/24/2011	60.8	Fall	2011
2-JKS006.67	10/11/2012	70.19	Fall	2012
2-JKS006.67	8/21/2013	63.33	Fall	2013
2-JKS006.67	8/27/2014	61.33	Fall	2014
2-JKS006.67	8/26/2015	72.23	Fall	2015
2-JKS006.67	11/3/2016	60.03	Fall	2016
2-JKS006.67	8/24/2017	60.97	Fall	2017

Years	Average	Point
1994-1999	38.7	
2000-2007	56.4	17.7
2008-2012	64.0	7.6
2013-2017	63.6	-0.4



Summer Tailwater Study with VDGIF

Station Location	StationID	Date	VSCI
Clearwater Park	2-JKS030.65	7/27/2016	68.19
Clearwater Park	2-JKS030.65	7/20/2017	61.19
Clearwater Park	2-JKS030.65	8/8/2018	77.82
Indian Draft	2-JKS034.04	7/27/2016	73.25
Indian Draft	2-JKS034.04	7/20/2017	67.39
Indian Draft	2-JKS034.04	8/8/2018	74.02
Sycamore Bend	2-JKS036.11	7/27/2016	73.7
Sycamore Bend	2-JKS036.11	7/12/2017	70.93
Sycamore Bend	2-JKS036.11	8/8/2018	73.57

Summary…..

- Benthic Algae levels….decrease after each pulse improving habitat, pulses help reduce algae throughout the growing season, well controlled at Rt 18, Low Moor, and DLCC. City Park trending in a positive direction.
- Nutrient Levels…historically low-levels for the Jackson River. Not putting additional load into James River.
- VSCI…further confirmation of DLCC and Upper James delist. Rt 18 looked better as does Low Moor Cave site. Reference site above Covington among best scores in the state (Above 90th percentile).
- Fish community…habitat metric(s), % tolerant, % omnivore, % benthic feeder look improved at most places. Similar fish community at reference site in tailwater (Intervale) pre and post pulse years.
- VDEQ will continue to conduct significant chemistry water quality monitoring and biomonitor fish/macroinvertebrate communities

Questions?

Contact Info

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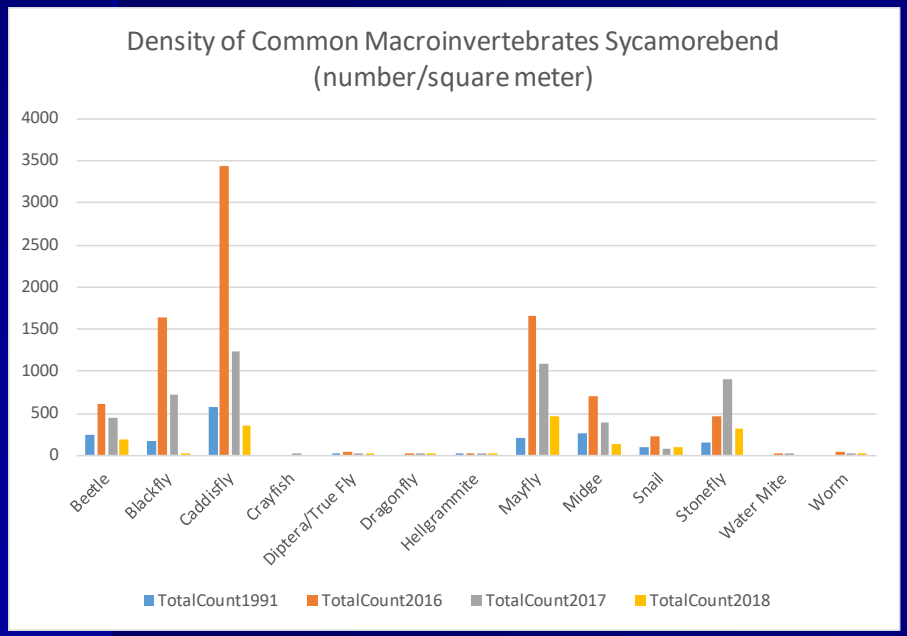
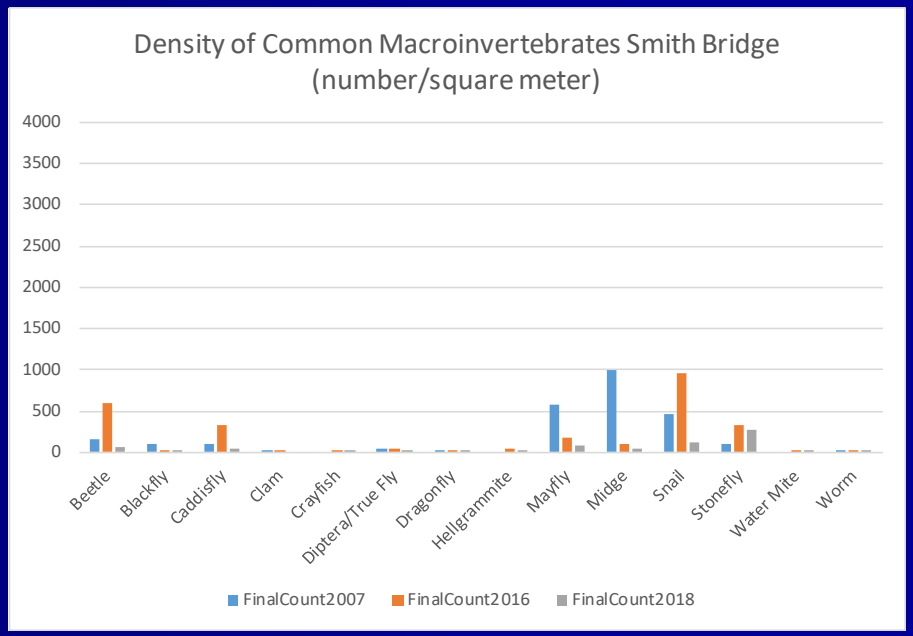
Extra Slides?? Paul could use?

Sycamore Bend	TotalCount1990	TotalCount1991	TotalCount2016	TotalCount2017	TotalCount2018
Total Taxa	16	25	36	37	31
Total Individuals (per sq meter)	693	1771	8894	4971	1609

Smith Bridge	FinalCount2007	FinalCount2016	FinalCount2018
Total Taxa	25	31	31
Total Individuals (per sq meter)	2949	2634	684

**Smith 2007 density estimate could be 2564 as VDEQ does not usually count water boatman (corixidae)*