



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION



Bureau of Clean Water

Water Resources Advisory Committee

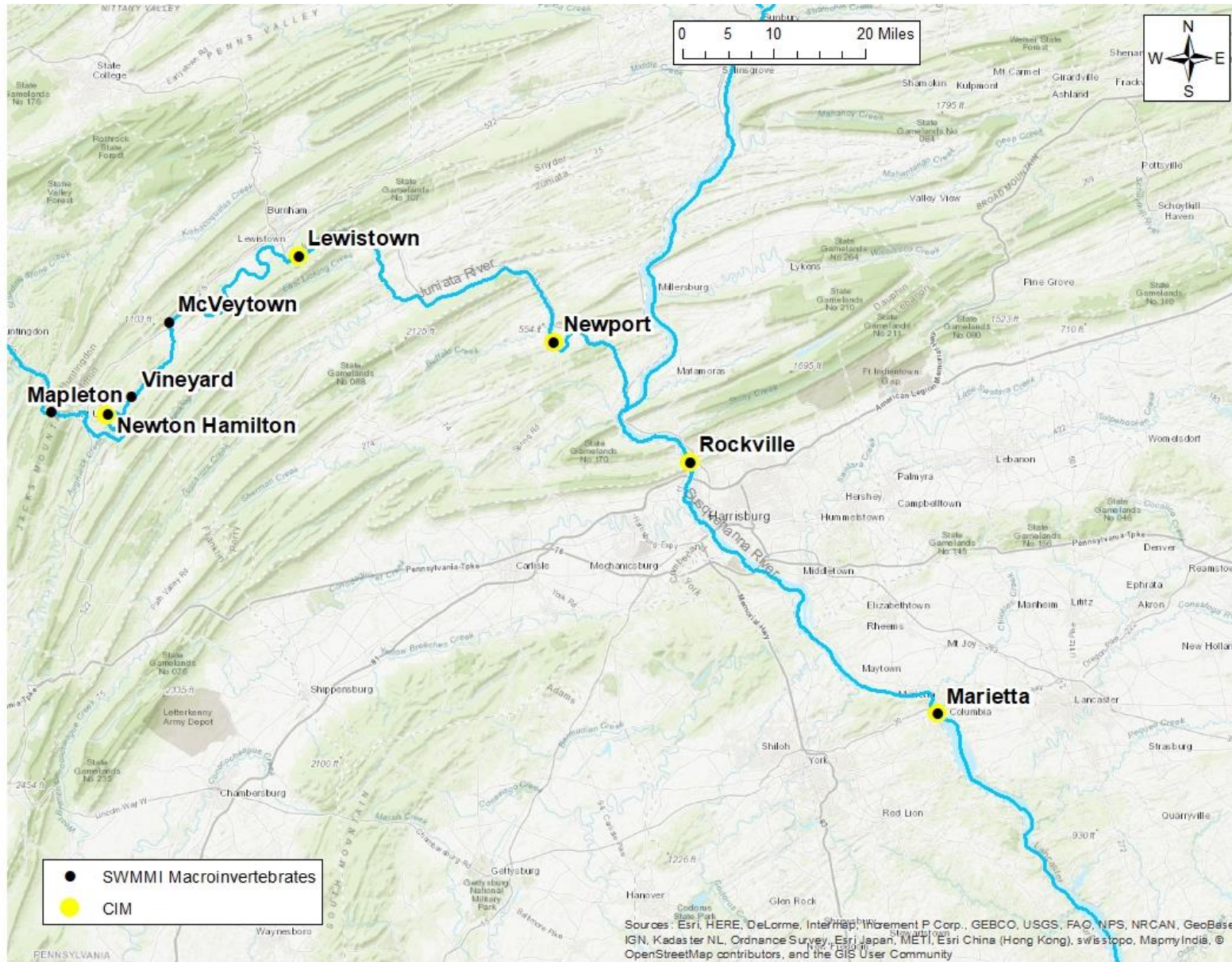
Susquehanna and Juniata Rivers Aquatic Life Use Evaluation

Tom Wolf, Governor

Patrick McDonnell, Secretary

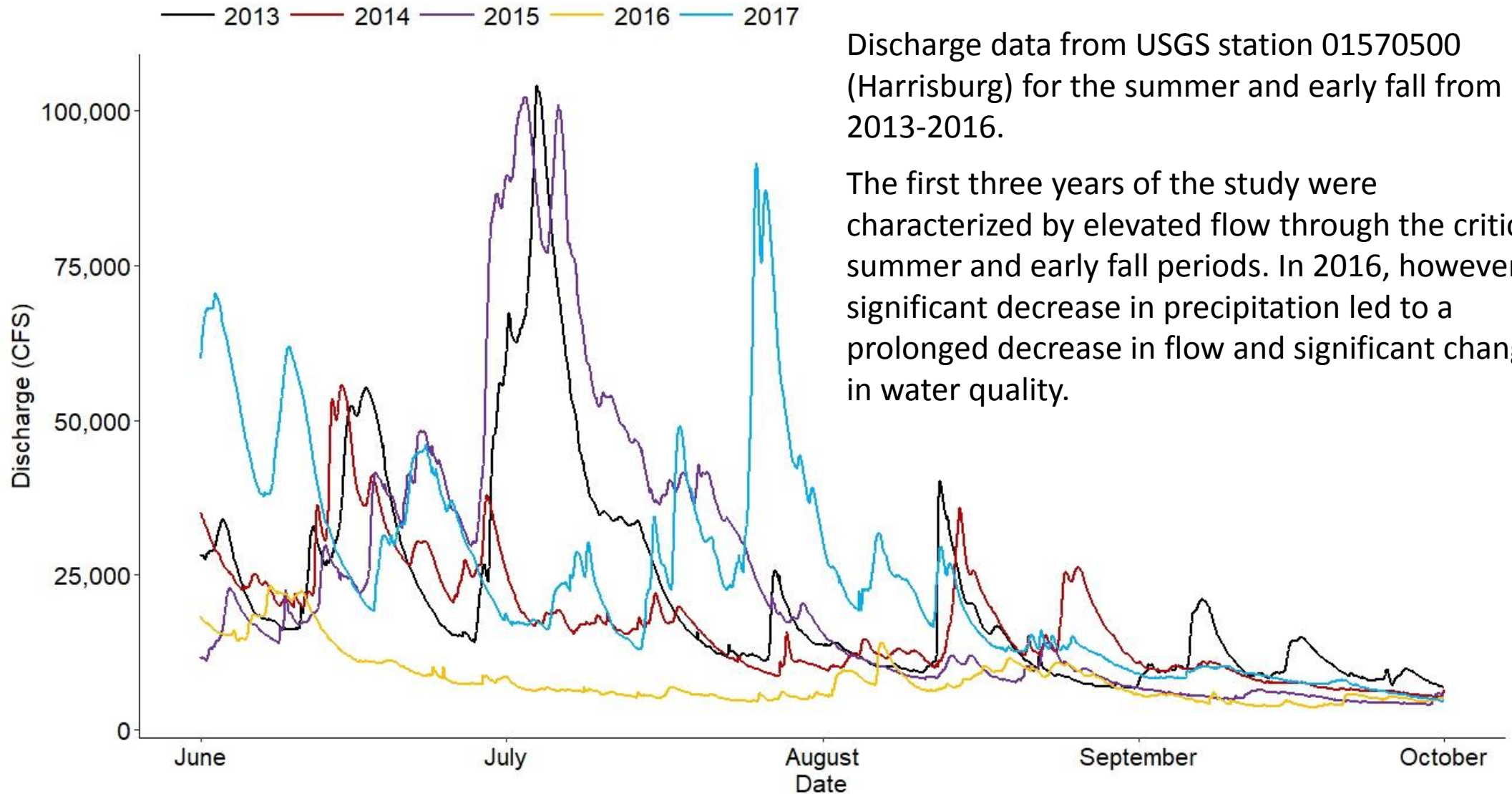
Introduction

- 2005: Young-of-year Smallmouth Bass (SMB) mortality events
- 2005 – 2012: Documented decrease in SMB population
- 2007: SMB Tech. Committee formed and met for the first time
- 2012 – 2018: DEP increases water quality monitoring effort on the Susquehanna River and eventually on large rivers statewide.
- 2012 – 2017 – PFBC data indicates an increase in the SMB population
- 2015: Causal Analysis/Diagnosis Decision Information System (CADDIS) and CADDIS report
- 2018: Largemouth Bass Virus Study with PFBC and Michigan State University
- 2018 – Aquatic Life Use of the Susquehanna and Juniata Rivers



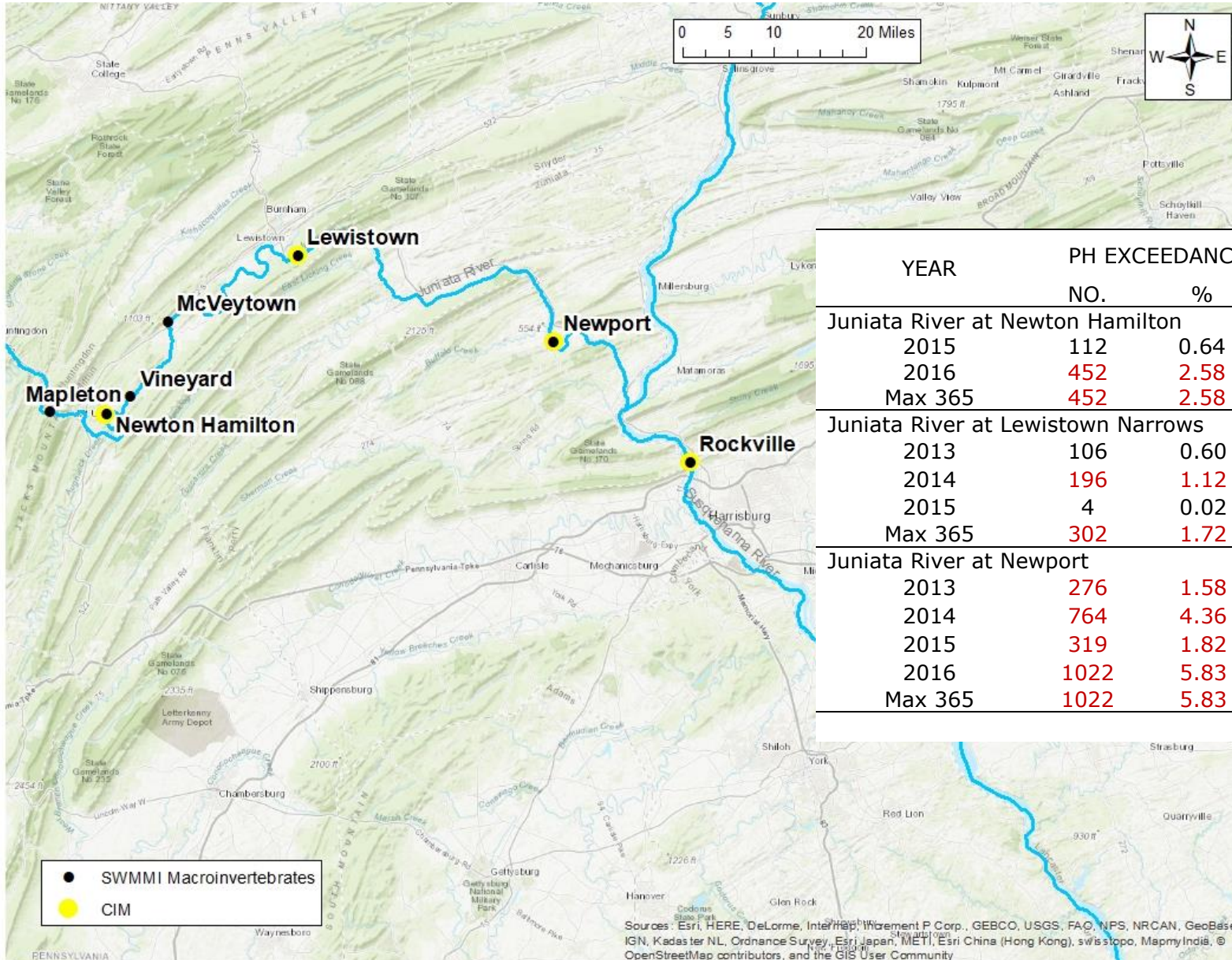
Annual Variation and Critical Conditions

- Annual variation in water quality is affected by the amount and timing of precipitation.
- Elevated discharge can reduce daily fluctuations of Dissolved Oxygen (DO), pH, and temperature.
- A significant portion of a year's Total Nitrogen (TN), Total Phosphorus (TP), and/or Suspended Sediment (SS) has been documented in a individual storm events.
- High flow years are typically characterized by high TN, TP, and SS loads, but moderate DO and pH values.



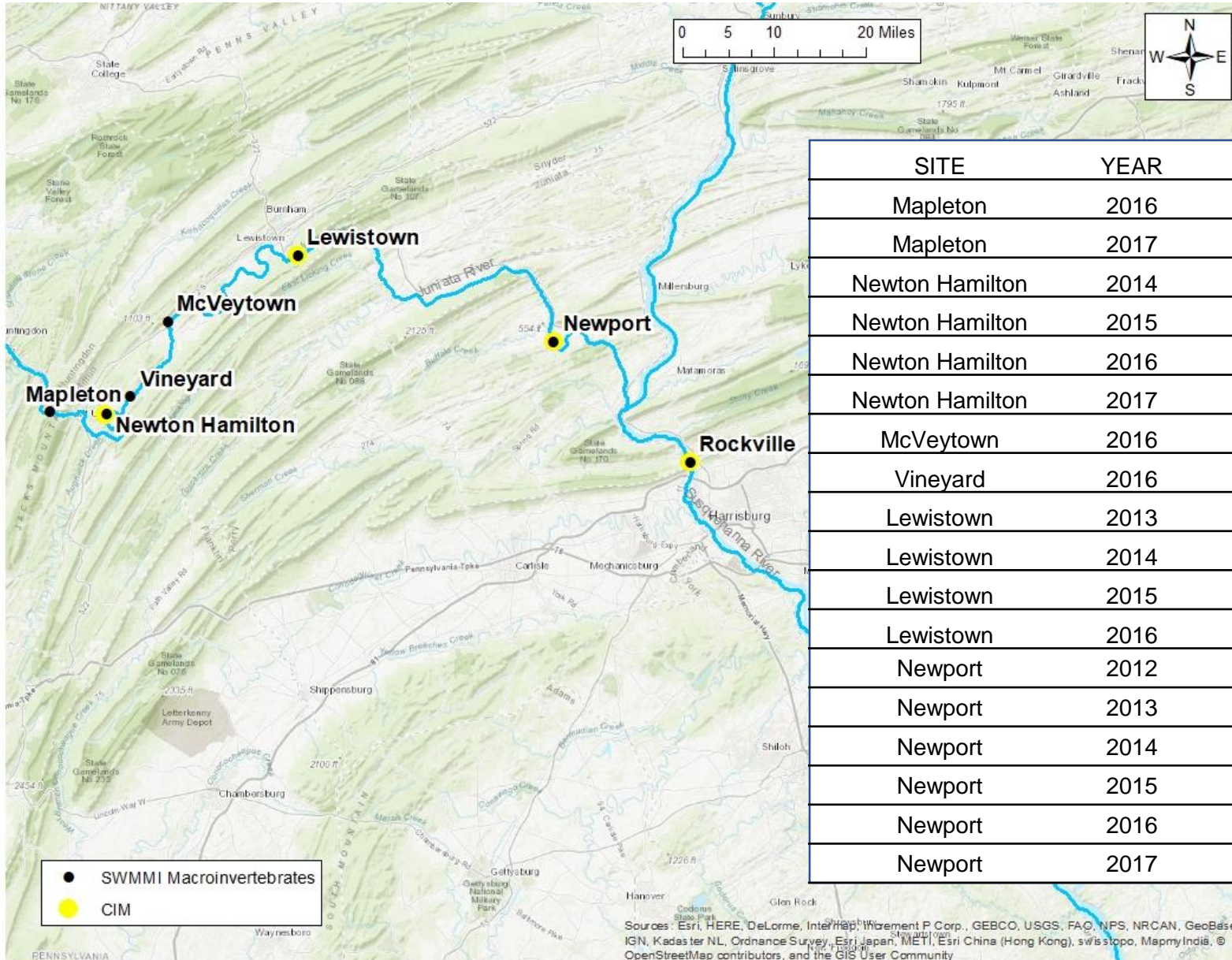
Discharge data from USGS station 01570500 (Harrisburg) for the summer and early fall from 2013-2016.

The first three years of the study were characterized by elevated flow through the critical summer and early fall periods. In 2016, however, a significant decrease in precipitation led to a prolonged decrease in flow and significant changes in water quality.

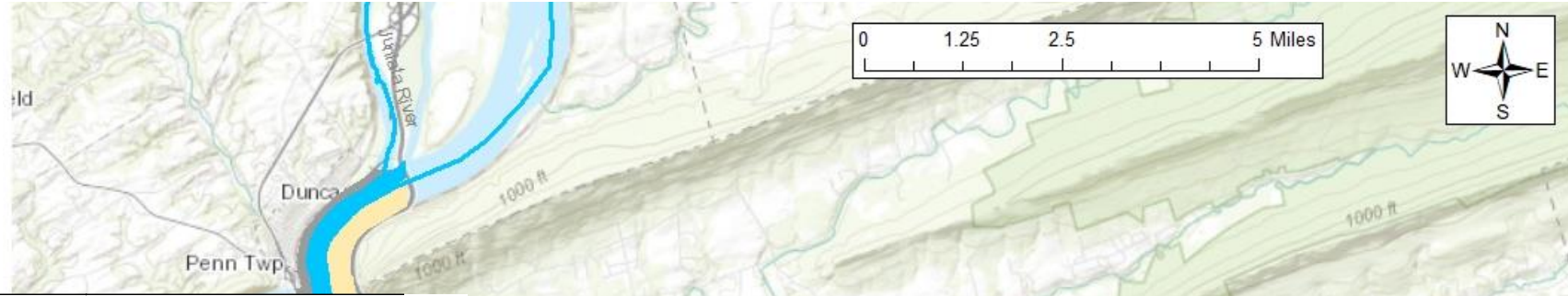


YEAR	PH EXCEEDANCE		DO EXCEEDANCE		JULY DIEL DO SWINGS (MG/L)	
	NO.	%	NO.	%	MEAN	MAX
Juniata River at Newton Hamilton						
2015	112	0.64	0	0.00	3.15	8.25
2016	452	2.58	31	0.18	6.87	8.87
Max 365	452	2.58	31	0.18		
Juniata River at Lewistown Narrows						
2013	106	0.60	0	0.00	3.31	5.23
2014	196	1.12	0	0.00	3.14	4.48
2015	4	0.02	0	0.00	1.71	3.48
Max 365	302	1.72	0	0.00		
Juniata River at Newport						
2013	276	1.58	0	0.00	4.72	6.43
2014	764	4.36	0	0.00	3.64	5.29
2015	319	1.82	0	0.00	1.94	4.17
2016	1022	5.83	0	0.00	5.24	6.28
Max 365	1022	5.83	0	0.00		

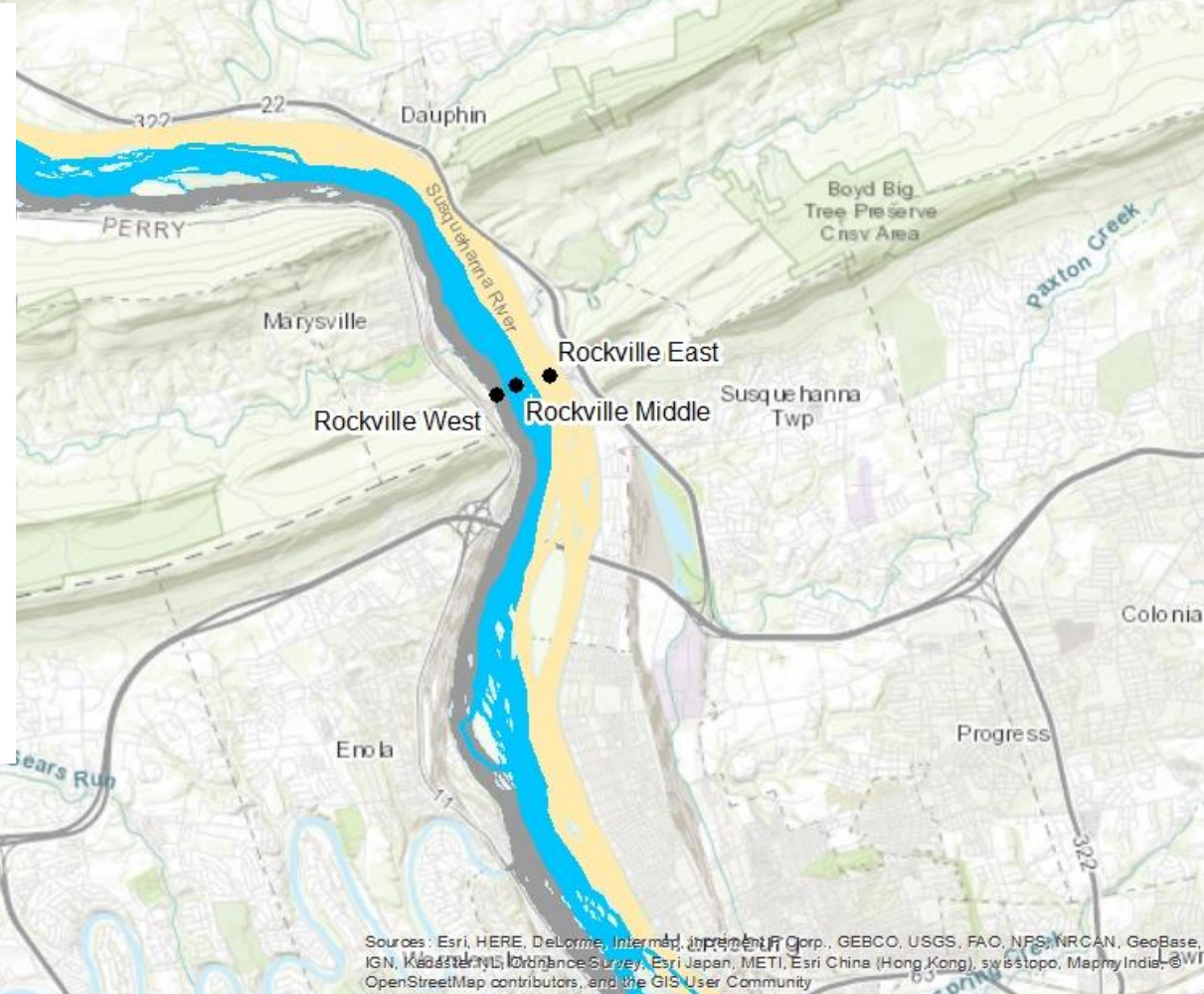
Sources: Esri, HERE, DeLorme, Intermap, Inc., Swire, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapnyIndia, © OpenStreetMap contributors, and the GIS User Community



SITE	YEAR	SUMMER SWMMI	FALL SWMMI
Mapleton	2016	42.7	32.9
Mapleton	2017	41.7	
Newton Hamilton	2014		32.5
Newton Hamilton	2015	52.0	49.0
Newton Hamilton	2016	54.9	39.6
Newton Hamilton	2017	54.4	52.7
McVeytown	2016	46.0	37.4
Vineyard	2016	58.5	29.7
Lewistown	2013	63.5	
Lewistown	2014		62.0
Lewistown	2015	62.5	67.7
Lewistown	2016	76.1	
Newport	2012	63.4	
Newport	2013	52.4	
Newport	2014		39.5
Newport	2015	26.6	44.8
Newport	2016	23.8	27.6
Newport	2017	48.6	55.5

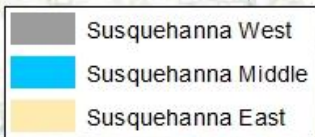
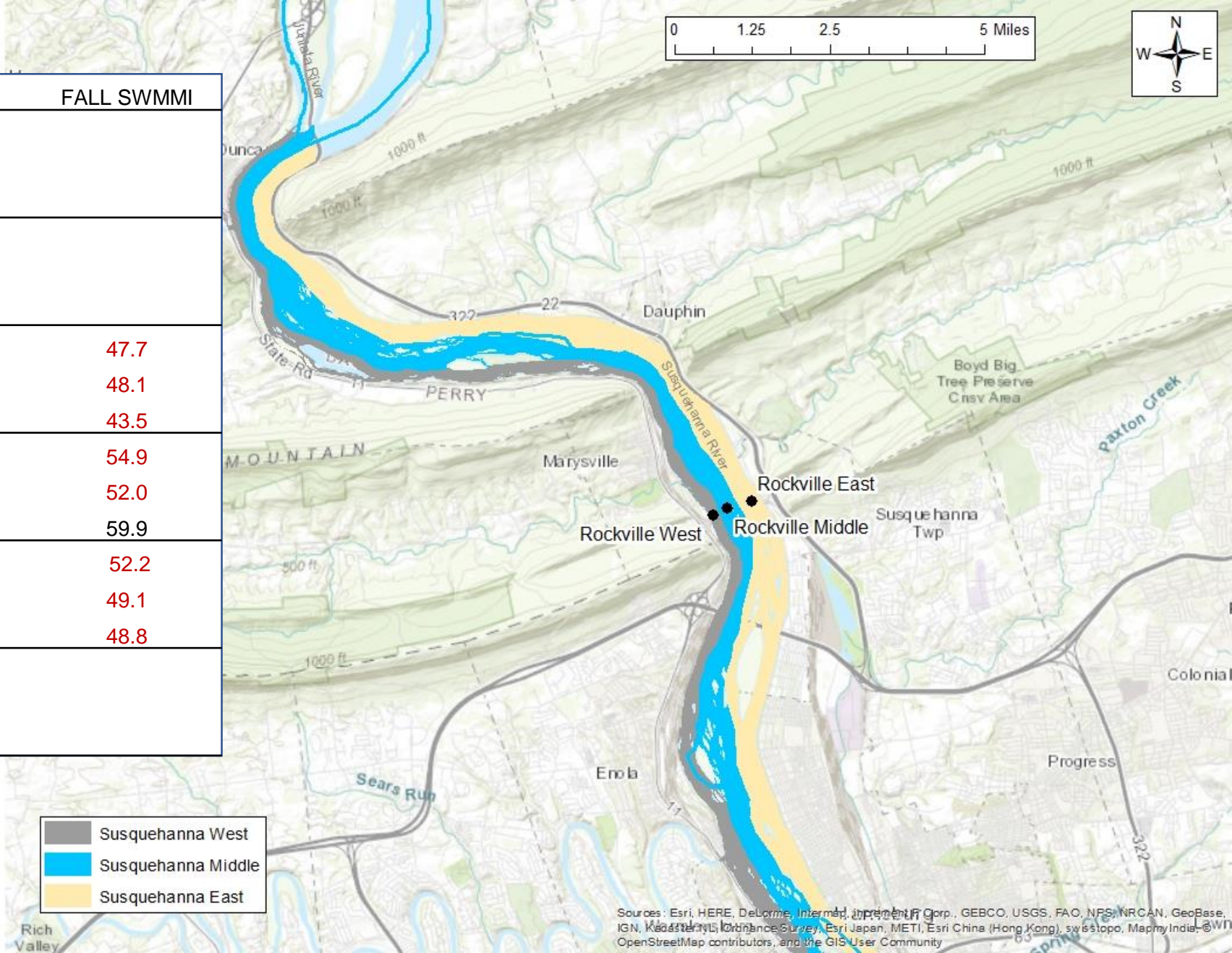


YEAR	PH EXCEEDANCE		DO EXCEEDANCE		JULY DIEL DO SWINGS (MG/L)	
	NO.	%	NO.	%	MEAN	MAX
Susquehanna River at Rockville West						
2013	0	0.00	0	0.00	1.14	3.74
2014	666	3.80	0	0.00	4.71	6.42
2015	204	1.16	0	0.00	2.13	7.10
2016	565	3.22	151	0.86	6.54	7.54
Max 365	734	4.19	151	0.86		
Susquehanna River at Rockville Middle						
2013	123	0.70	0	0.00	2.16	3.85
2014	11	0.06	0	0.00	2.12	2.63
2015	0	0.00	0	0.00	1.14	2.45
2016	560	3.20	0	0.00	3.43	4.09
Max 365	560	3.20	0	0.00		
Susquehanna River at Rockville East						
2013	181	1.03	0	0.00	0.94	2.32
2014	507	2.89	0	0.00	1.32	3.28
2015	79	0.45	0	0.00	0.87	1.92
2016	10	0.06	0	0.00	1.76	2.53
Max 365	590	3.37	0	0.00		



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

SITE	YEAR	SUMMER SWMMI	FALL SWMMI
Rockville East	2012	78.5	
Rockville Middle	2012	81.9	
Rockville West	2012	59.7	
Rockville East	2013	73.5	
Rockville Middle	2013	76.4	
Rockville West	2013	74.1	
Rockville East	2014	45.1	47.7
Rockville Middle	2014	56.4	48.1
Rockville West	2014	47.9	43.5
Rockville East	2015	81.9	54.9
Rockville Middle	2015	77.5	52.0
Rockville West	2015	71.8	59.9
Rockville East	2016	79.2	52.2
Rockville Middle	2016	51.7	49.1
Rockville West	2016	56.9	48.8
Rockville East	2017	43.5	
Rockville Middle	2017	59.8	
Rockville West	2017	39.1	

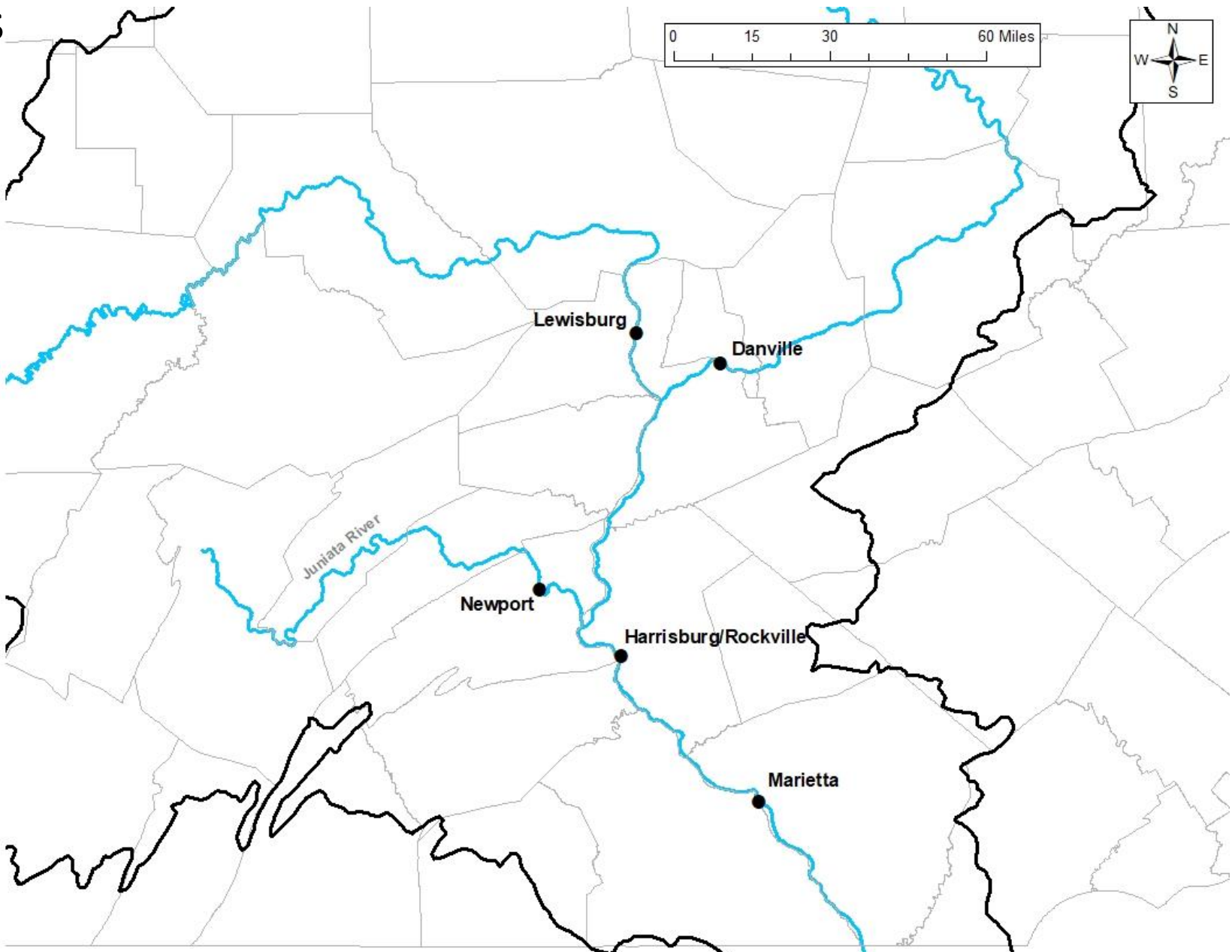


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Suspended Sediment

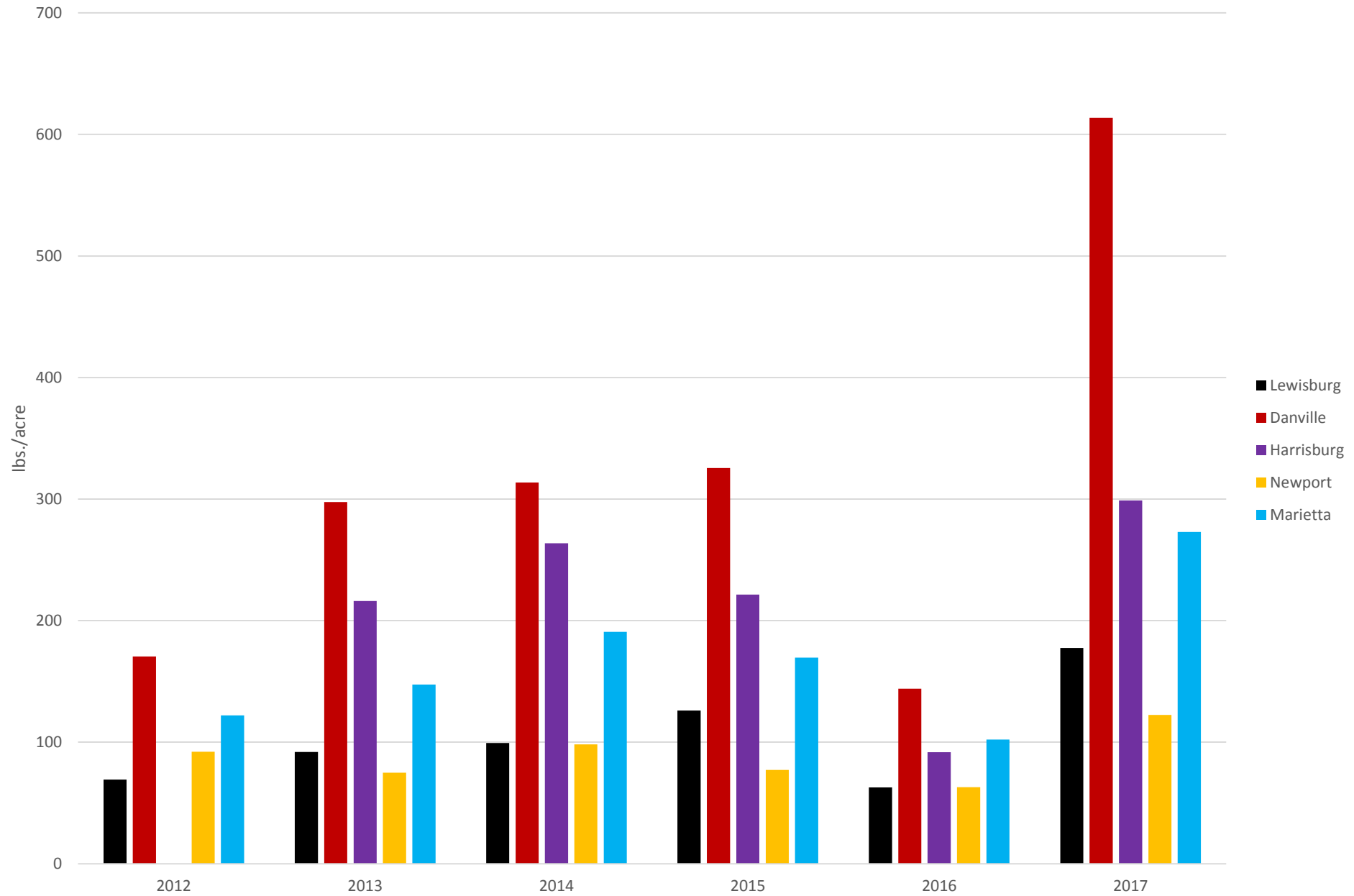
Total Phosphorus

Total Nitrogen

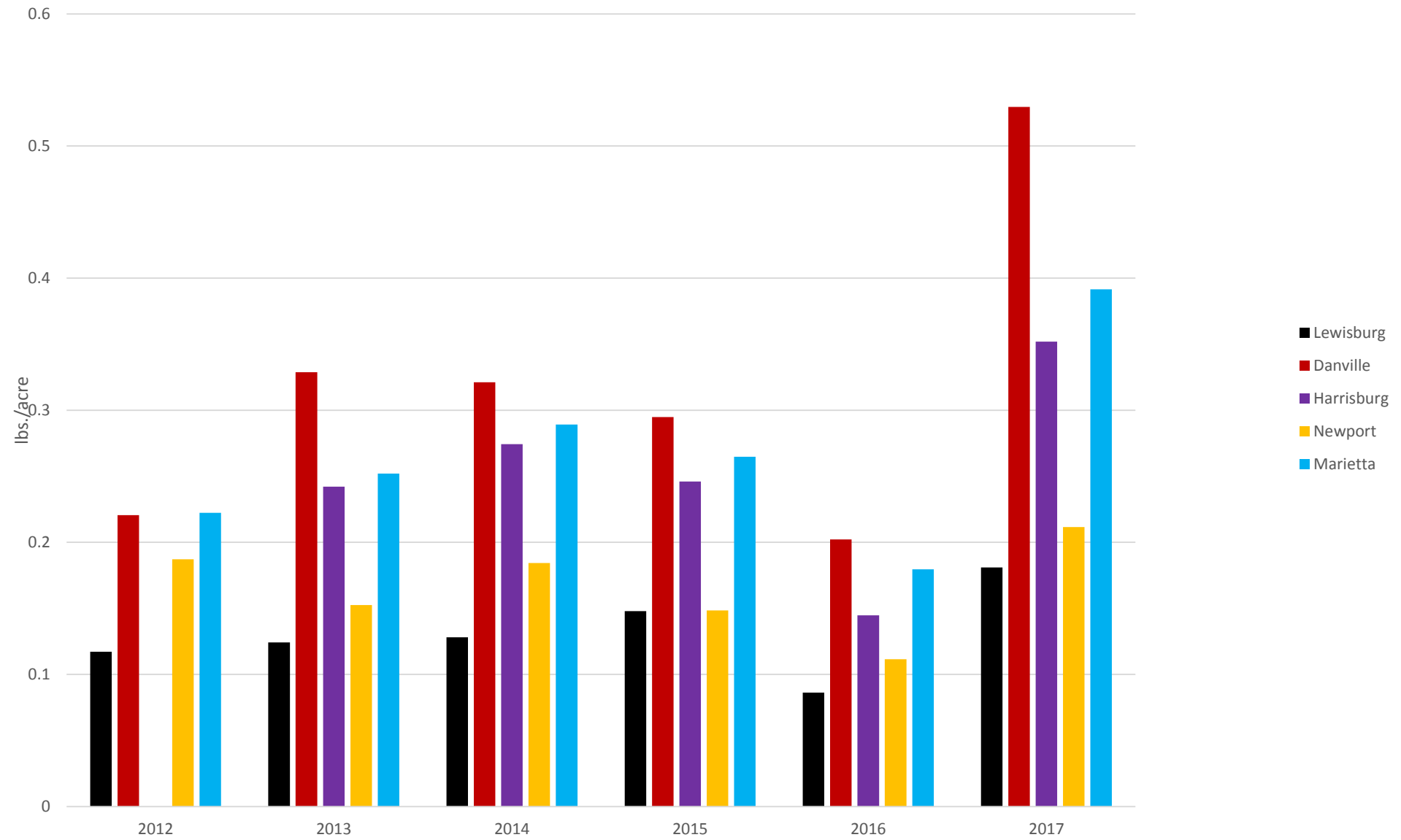


Loads
Yields
Trends

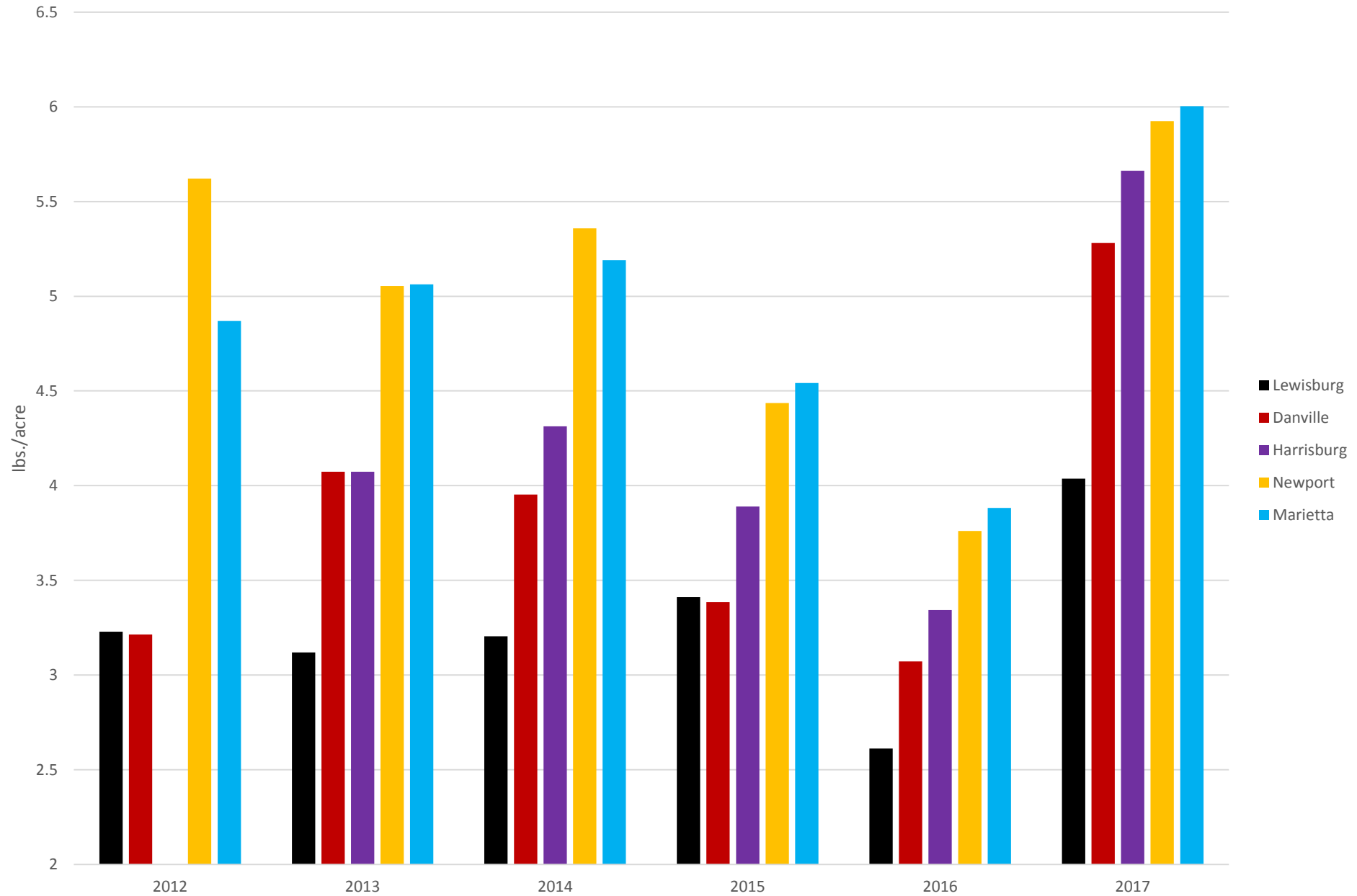
Yearly Suspended Sediment Yield (lbs./acre)



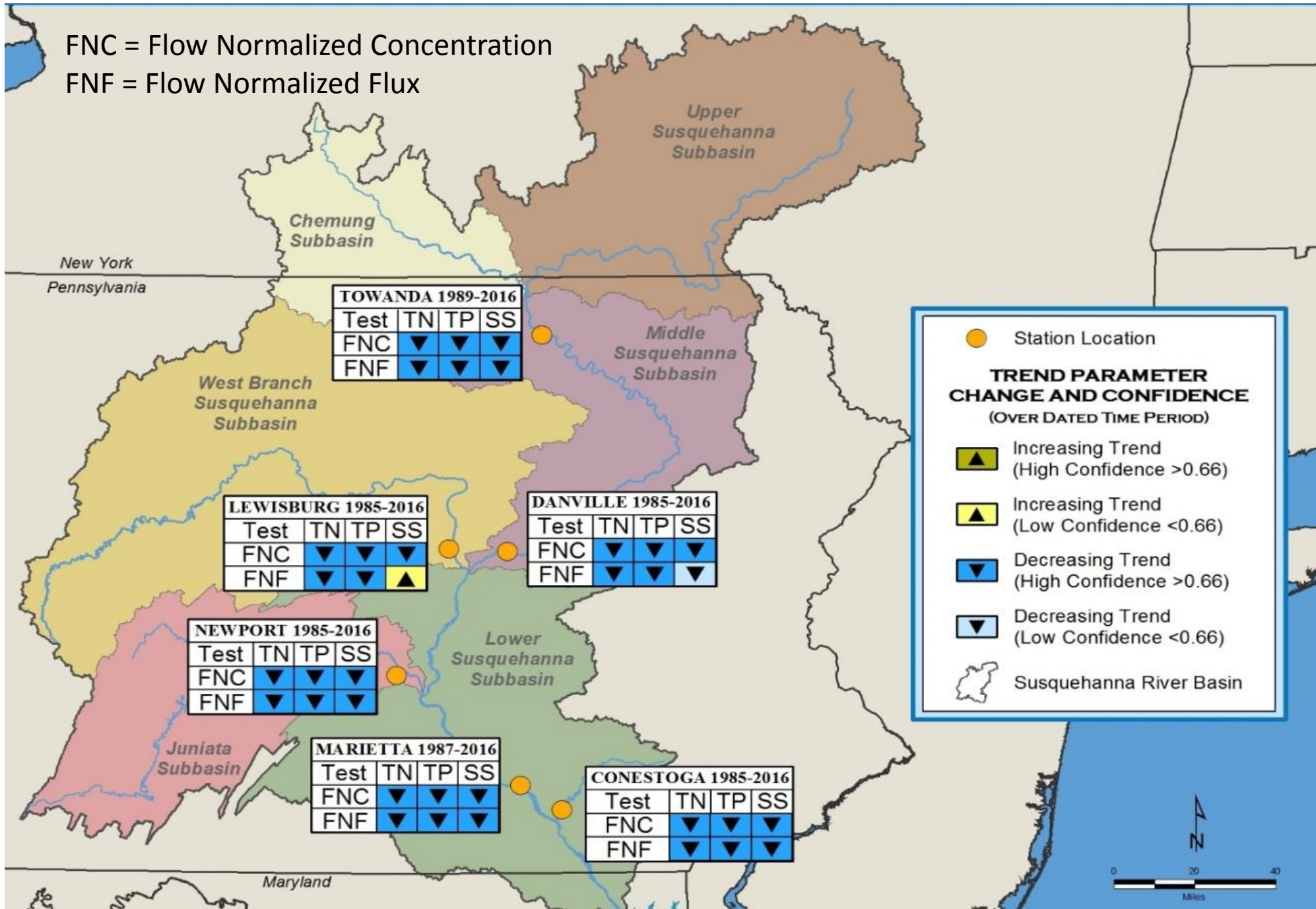
Yearly Total Phosphorus Yield (lbs./acre)



Yearly Total Nitrogen Yield (lbs./acre)



FNC = Flow Normalized Concentration
 FNF = Flow Normalized Flux



TOWANDA 1989-2016

Test	TN	TP	SS
FNC	▼	▼	▼
FNF	▼	▼	▼

LEWISBURG 1985-2016

Test	TN	TP	SS
FNC	▼	▼	▼
FNF	▼	▼	▲

DANVILLE 1985-2016

Test	TN	TP	SS
FNC	▼	▼	▼
FNF	▼	▼	▼

NEWPORT 1985-2016

Test	TN	TP	SS
FNC	▼	▼	▼
FNF	▼	▼	▼

MARIETTA 1987-2016

Test	TN	TP	SS
FNC	▼	▼	▼
FNF	▼	▼	▼

CONESTOGA 1985-2016

Test	TN	TP	SS
FNC	▼	▼	▼
FNF	▼	▼	▼

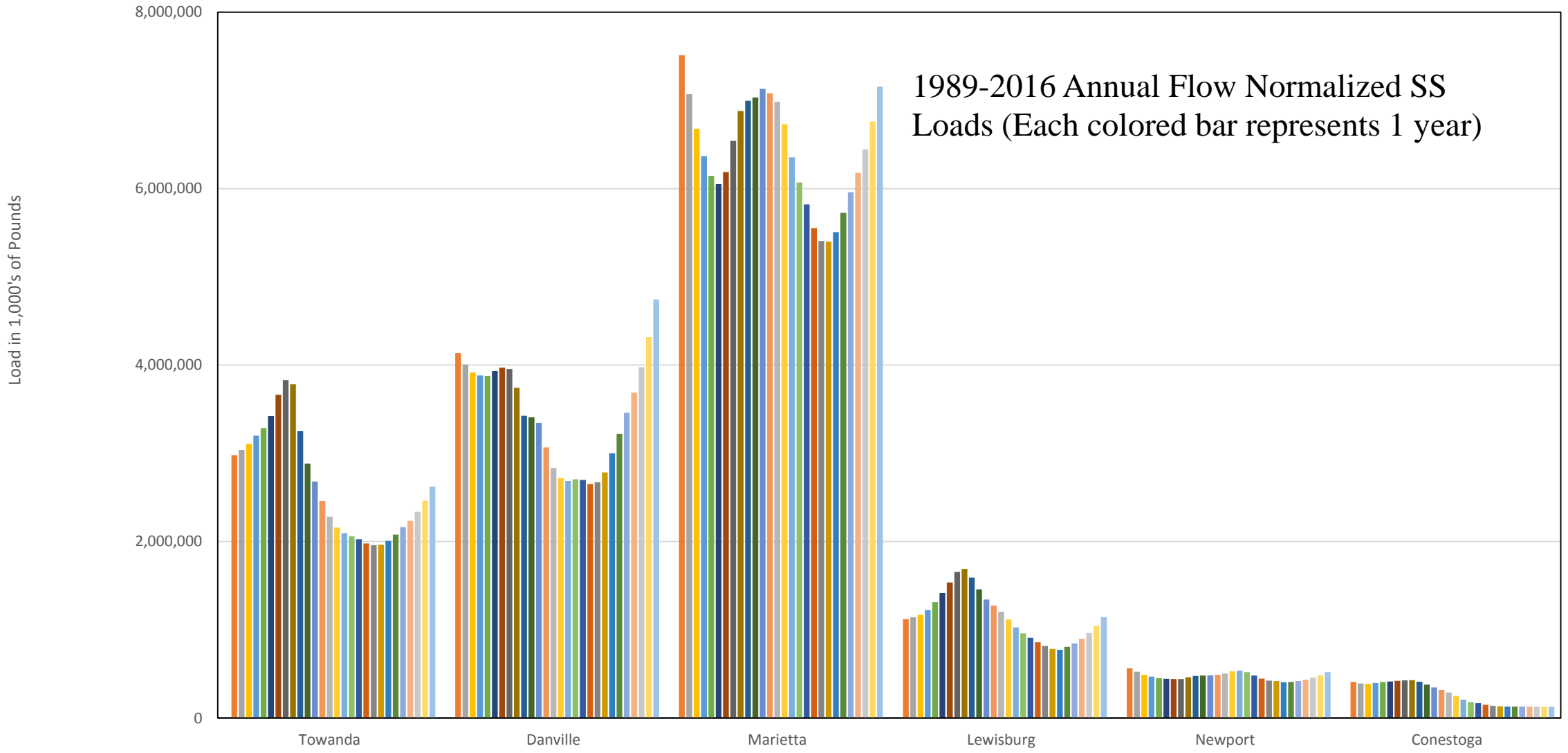
● Station Location

TREND PARAMETER CHANGE AND CONFIDENCE
 (OVER DATED TIME PERIOD)

- ▲ Increasing Trend (High Confidence >0.66)
- ▲ Increasing Trend (Low Confidence <0.66)
- ▼ Decreasing Trend (High Confidence >0.66)
- ▼ Decreasing Trend (Low Confidence <0.66)

○ Susquehanna River Basin



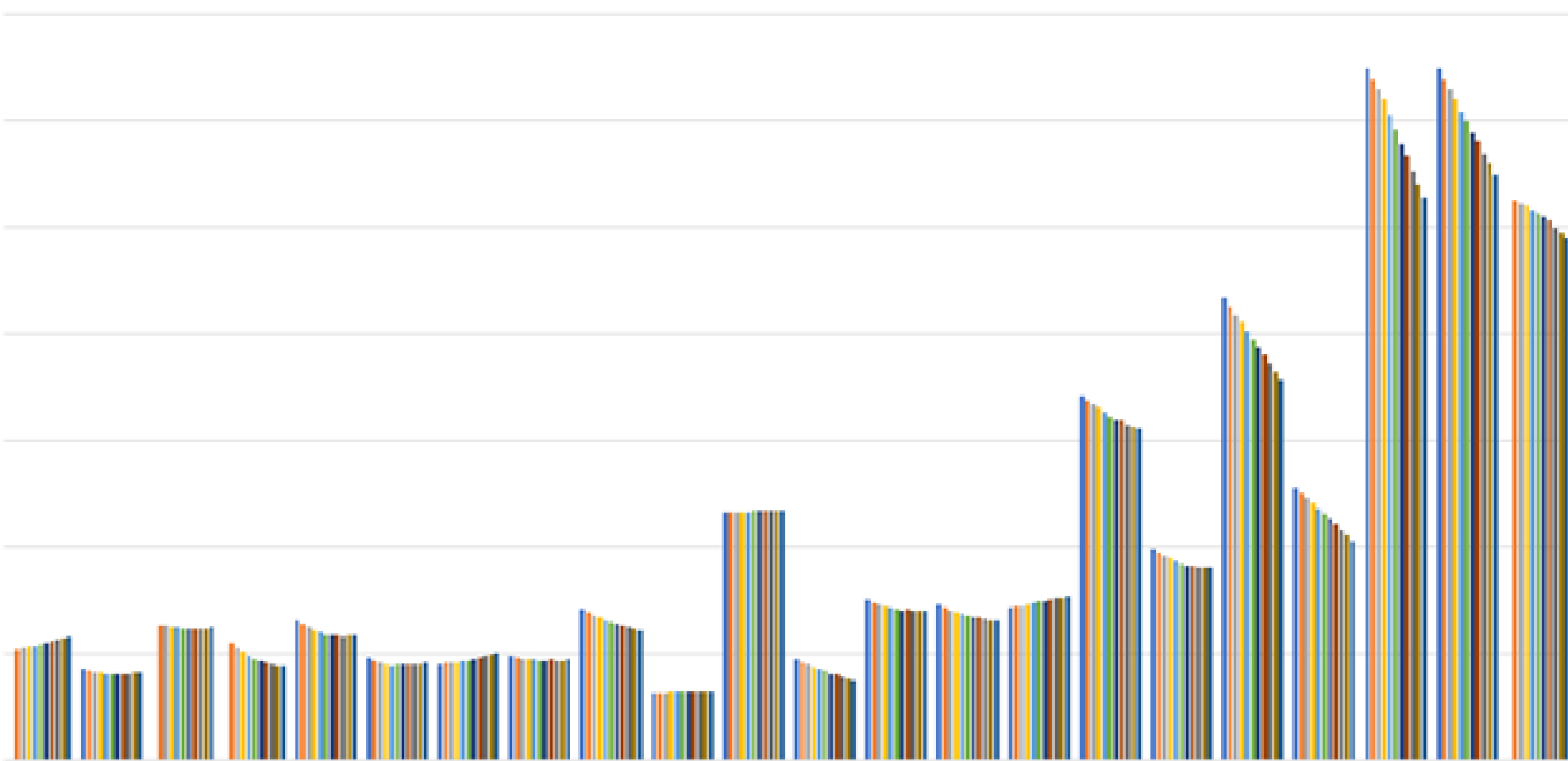



TN Flow Normalized Yields

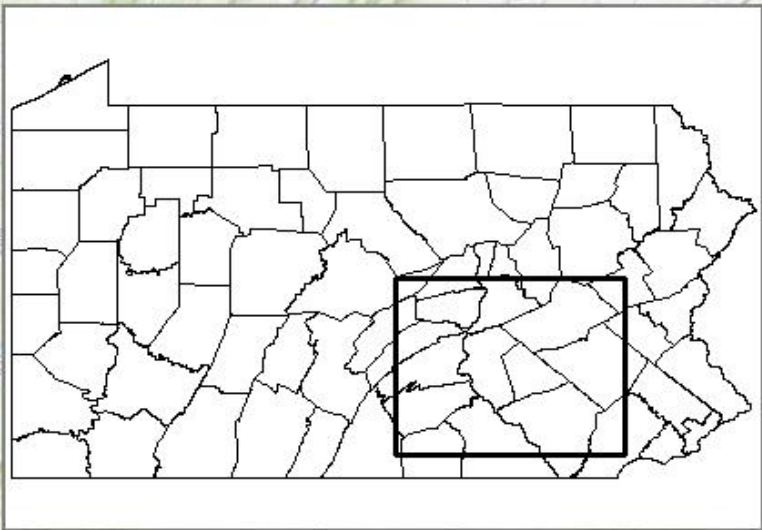
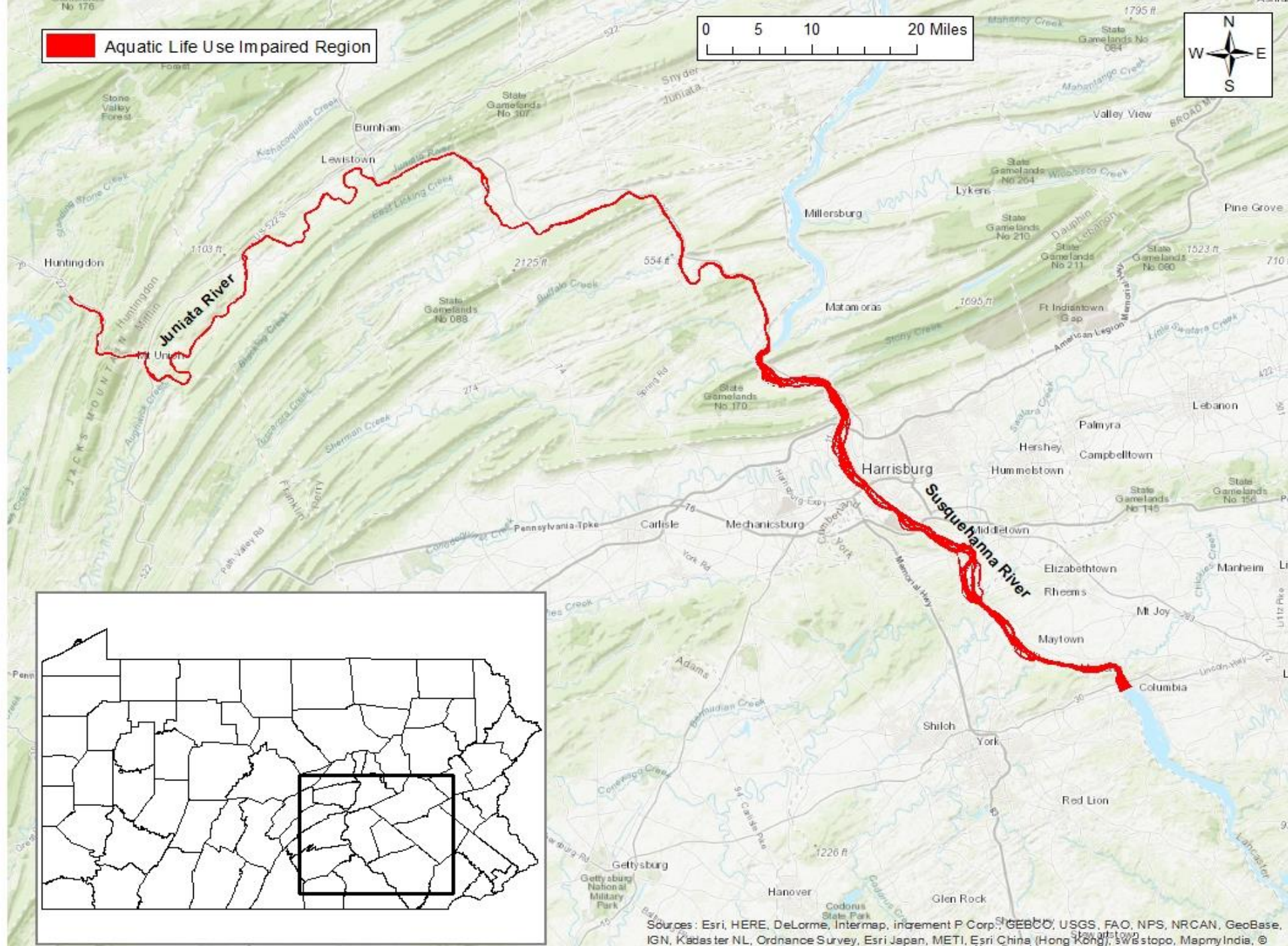
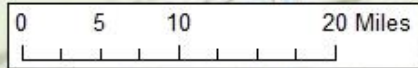
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00

Cohocton
Chemung
Unadilla
Conklin
Smithboro
Towanda
Wilkes Barre
Danville
Marietta
Karthaus
Jersey Shore
Lewisburg
Saxton
Newport
Penns Creek
Conodoguinet
Shermans
Swatara
W. Conewago
Conestoga
Pequea
Octoraro

■ 2005 ■ 2006 ■ 2007 ■ 2008 ■ 2009 ■ 2010 ■ 2011 ■ 2012 ■ 2013 ■ 2014 ■ 2015



 Aquatic Life Use Impaired Region



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



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