The Effect of High Flow Events on N:P Ratio within the Missisquoi and Winooski Tributaries

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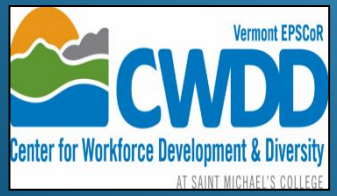
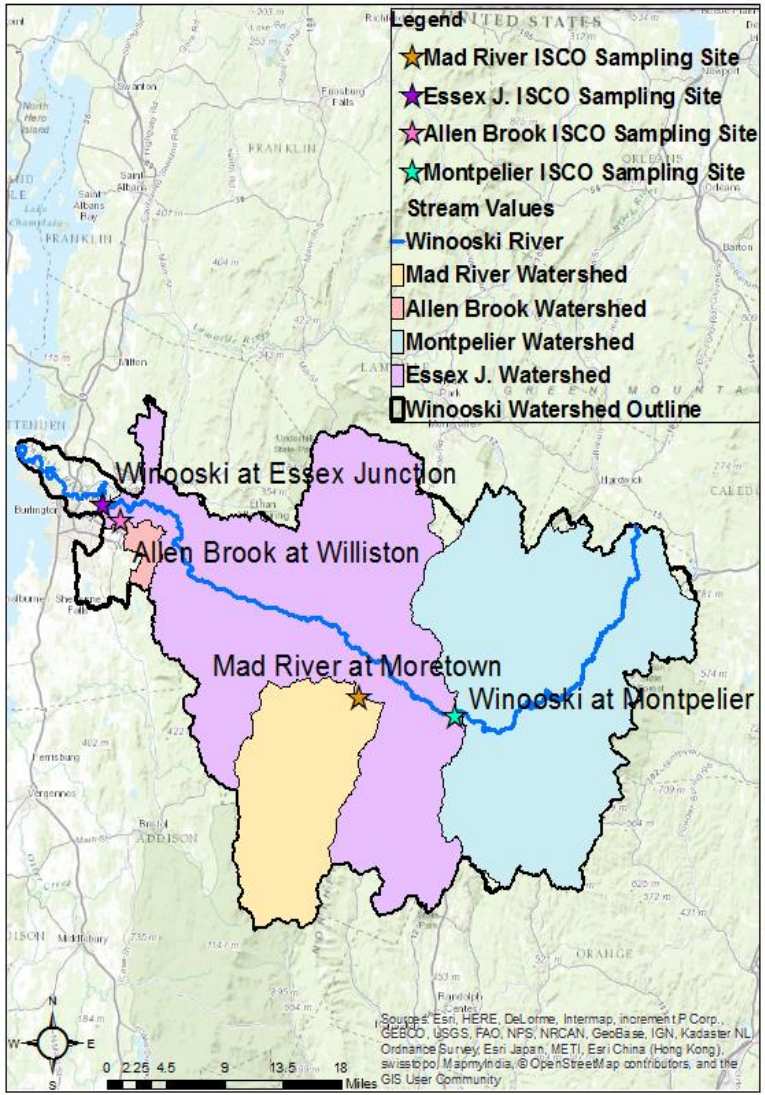
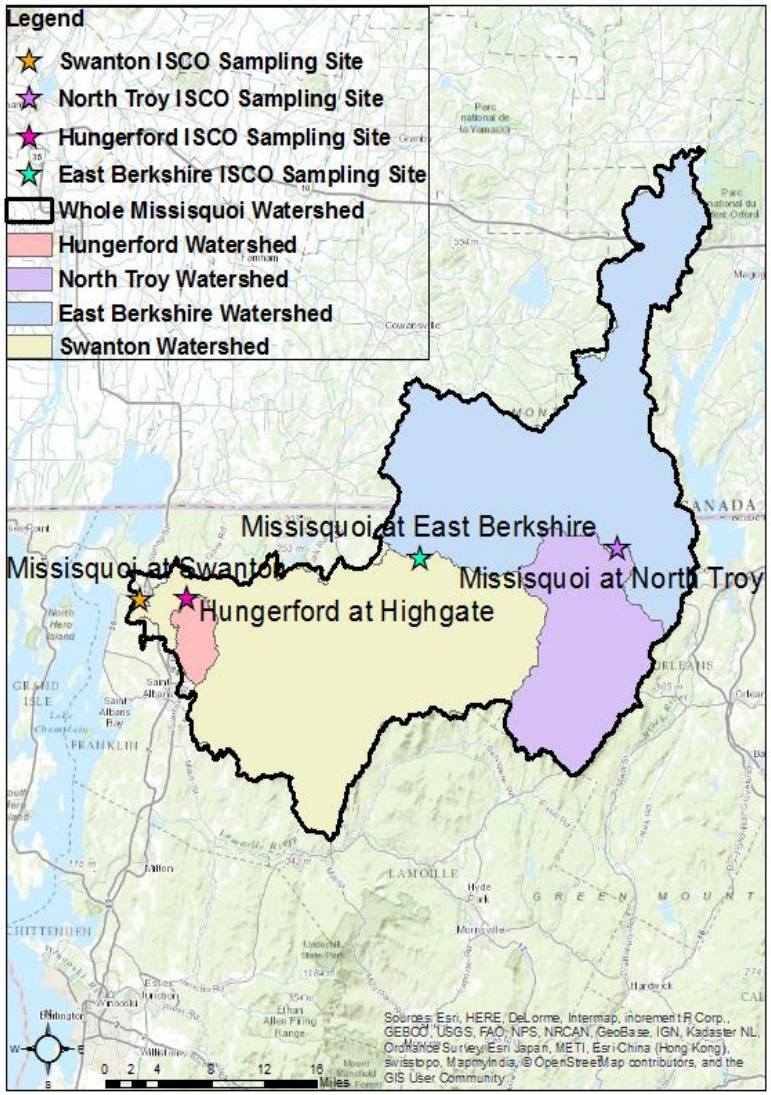


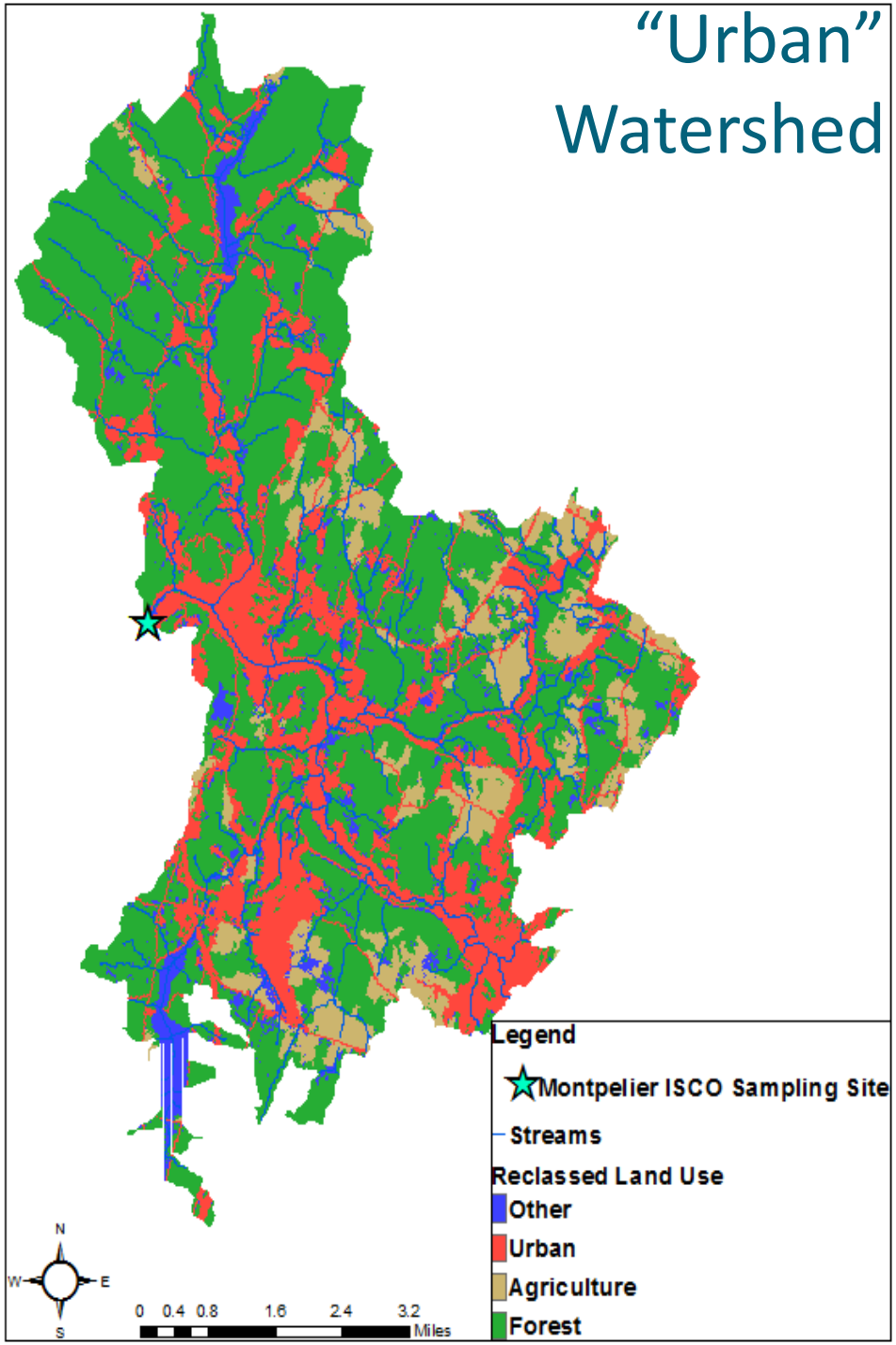
Methods

- TN and TP
- ISCOs
- 2012-2015
- Geographic Information Systems (GIS)

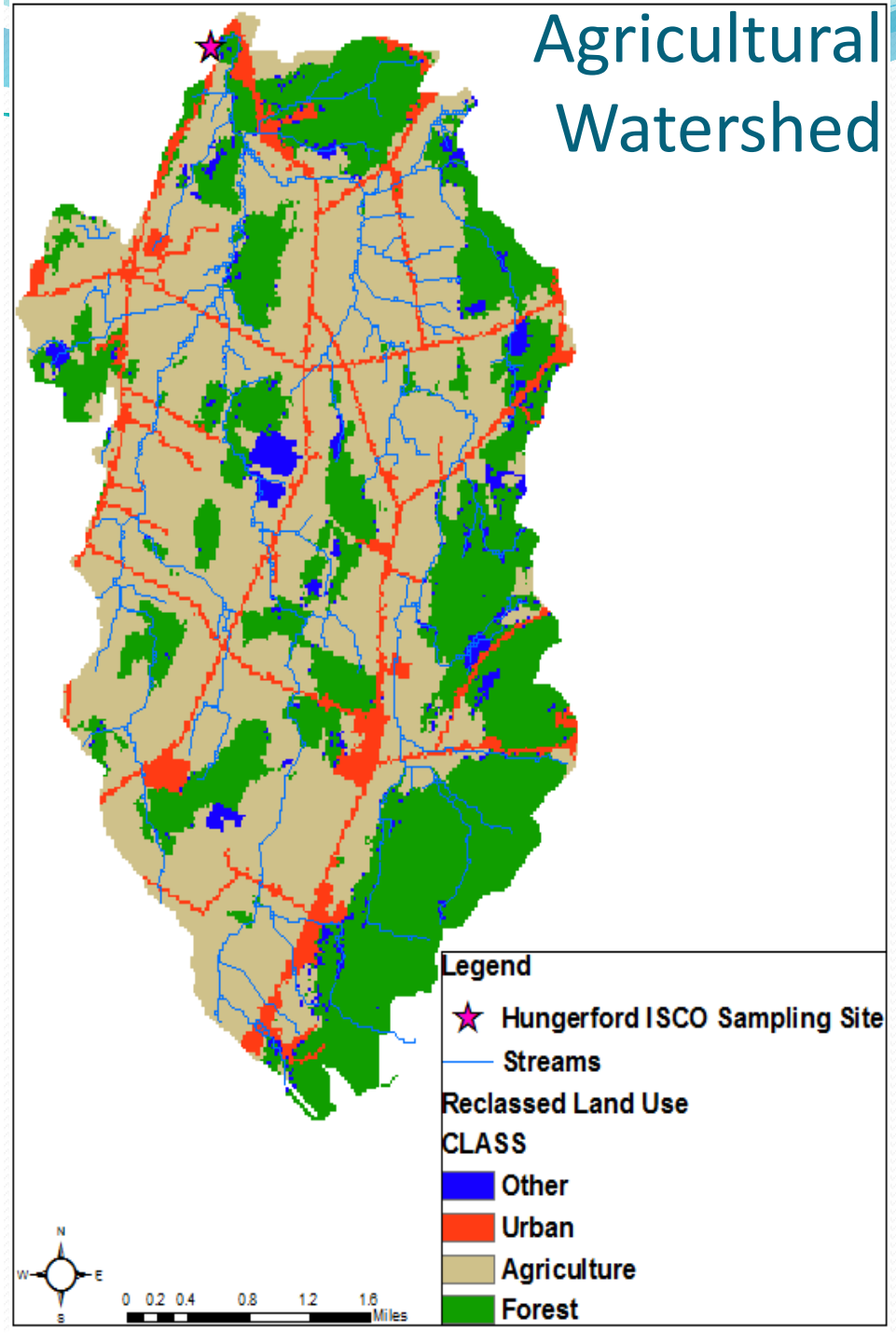




"Urban" Watershed

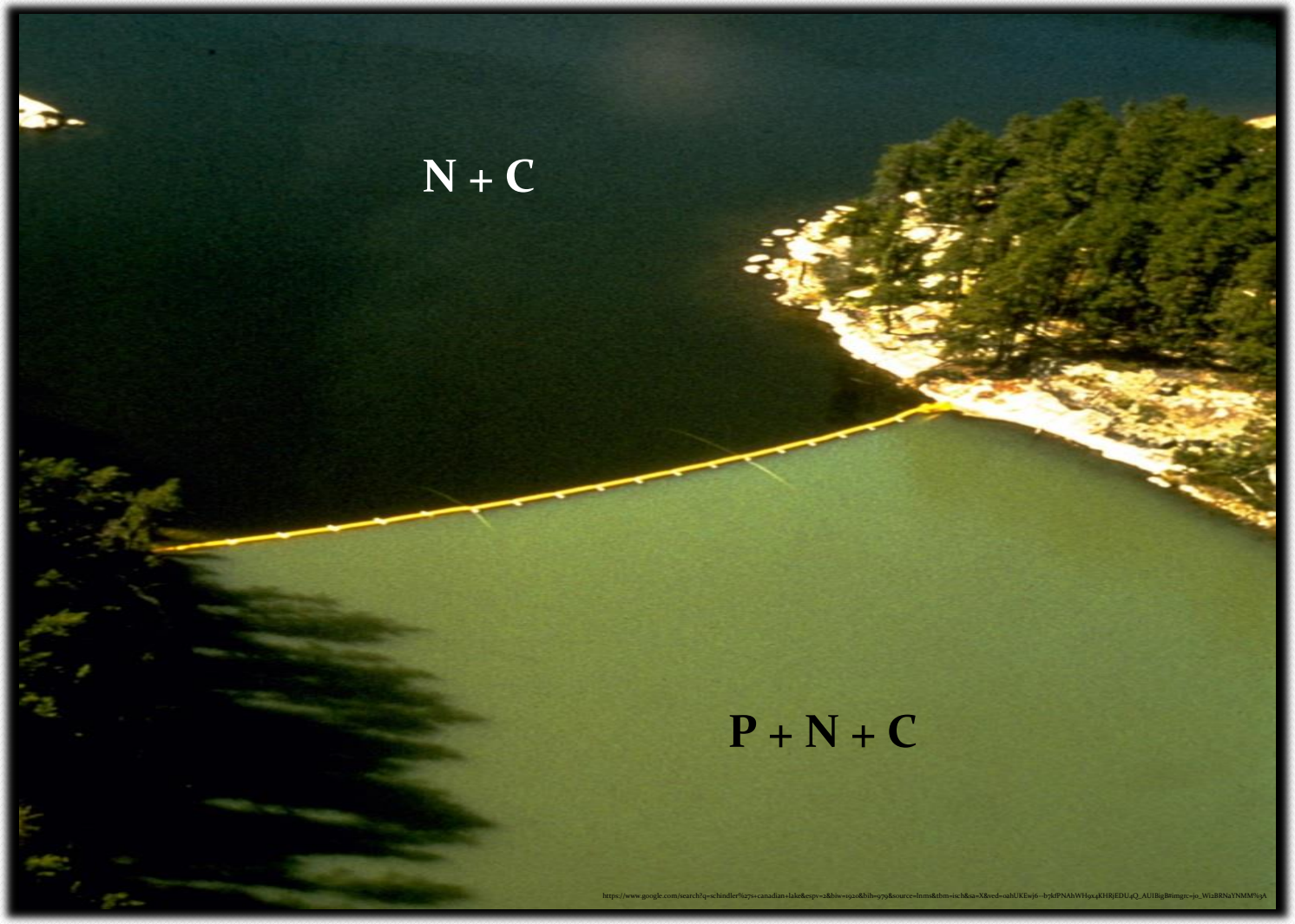


Agricultural Watershed



Schindler's Experiment: Lake 226

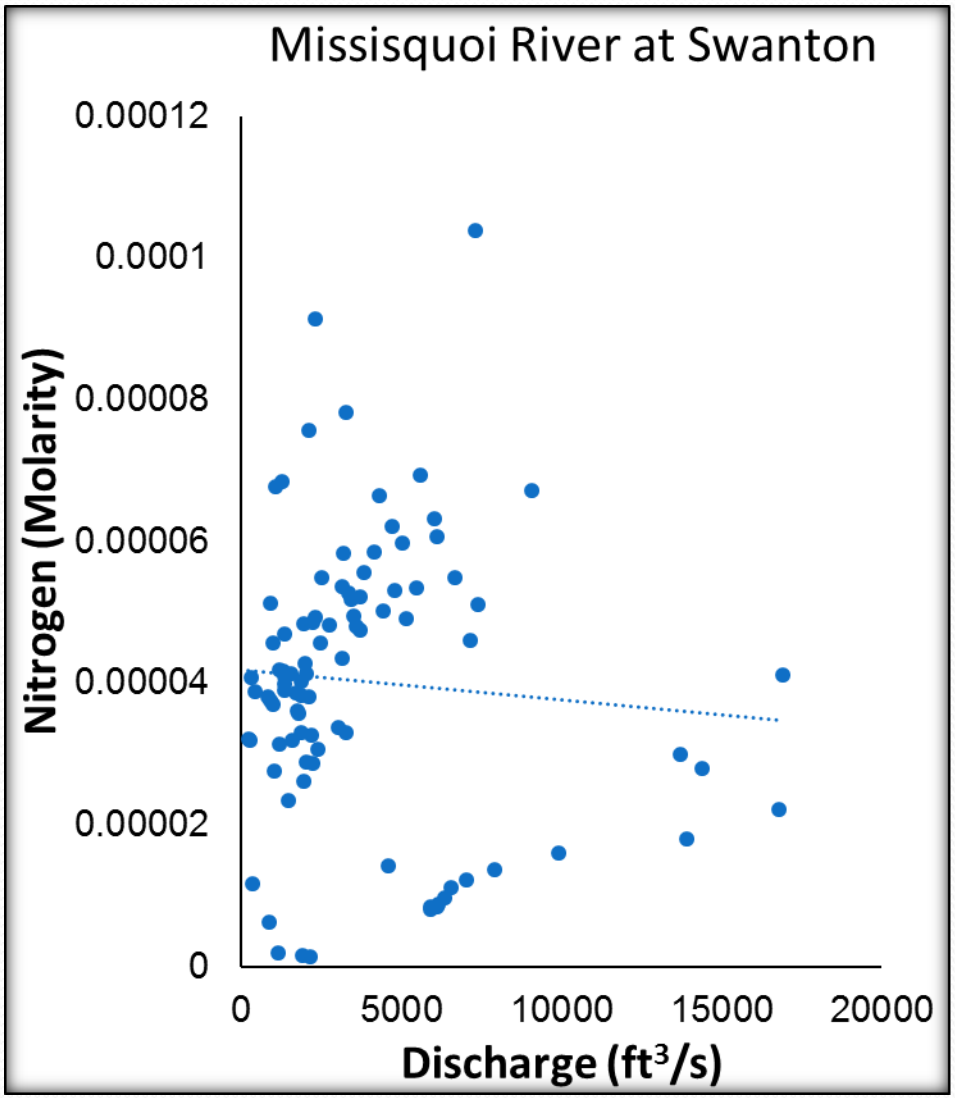
Leibig's Law of the Minimum

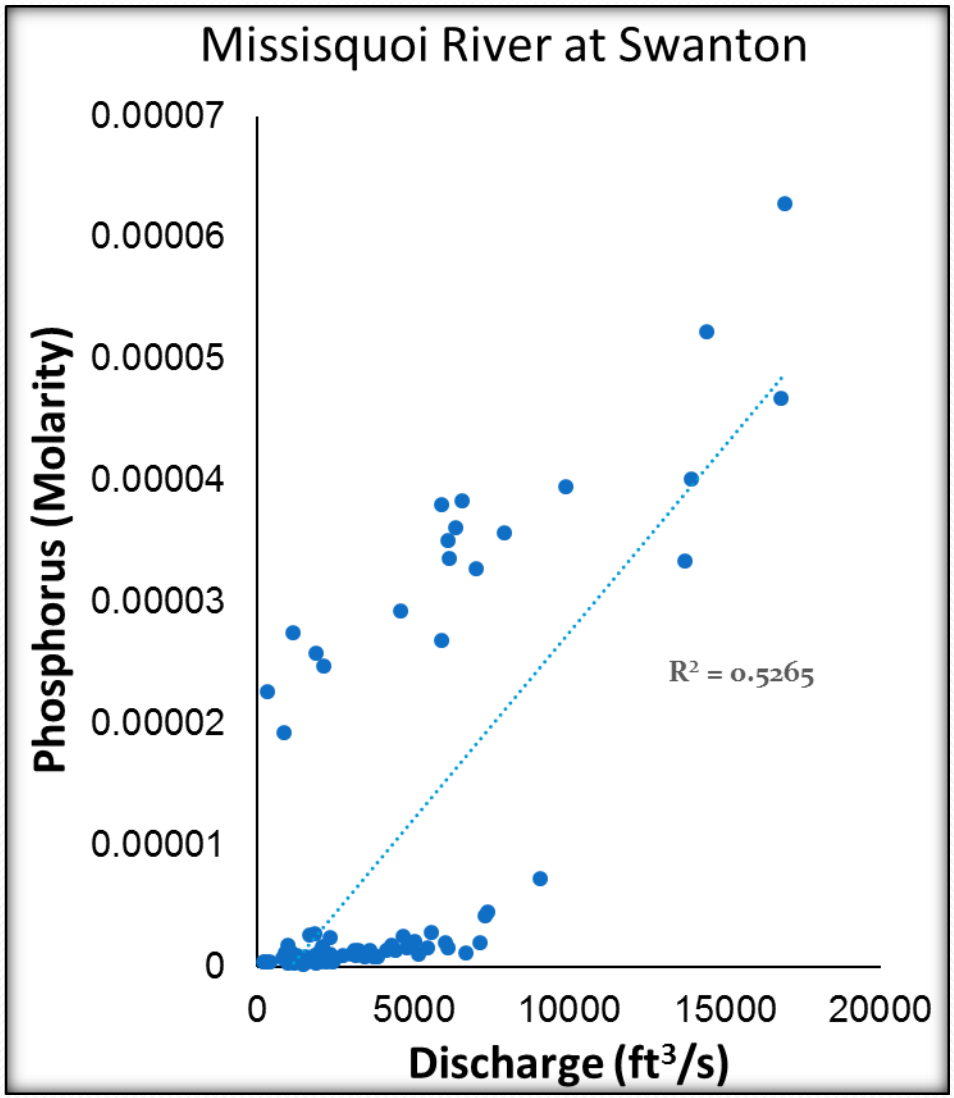


Research Questions

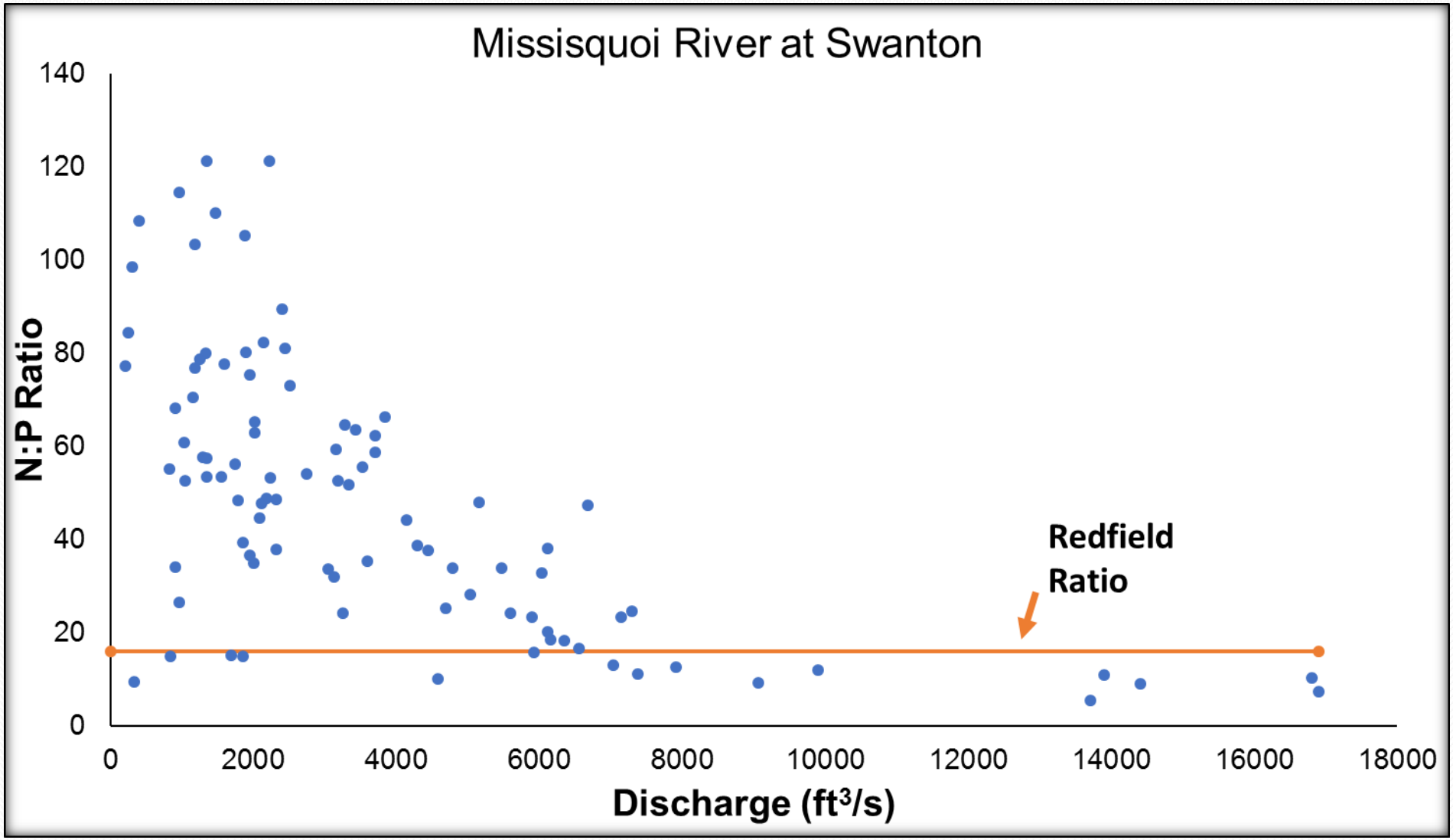
	Do concentrations change during high flow?	Do concentrations change related to land use?
N		
P		
N:P		
What are possible implications of any changes?		

N & P with Discharge





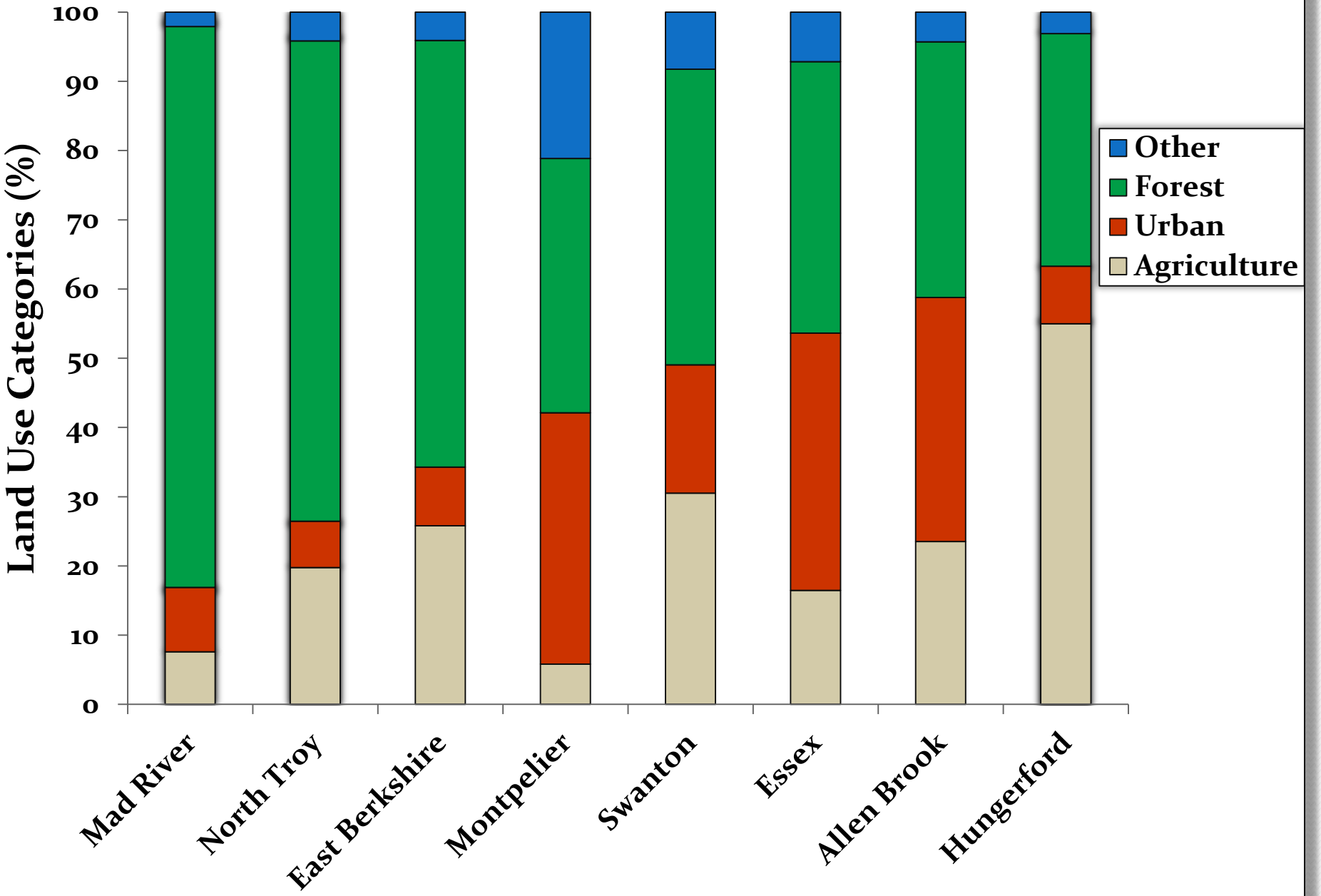
N:P with Discharge



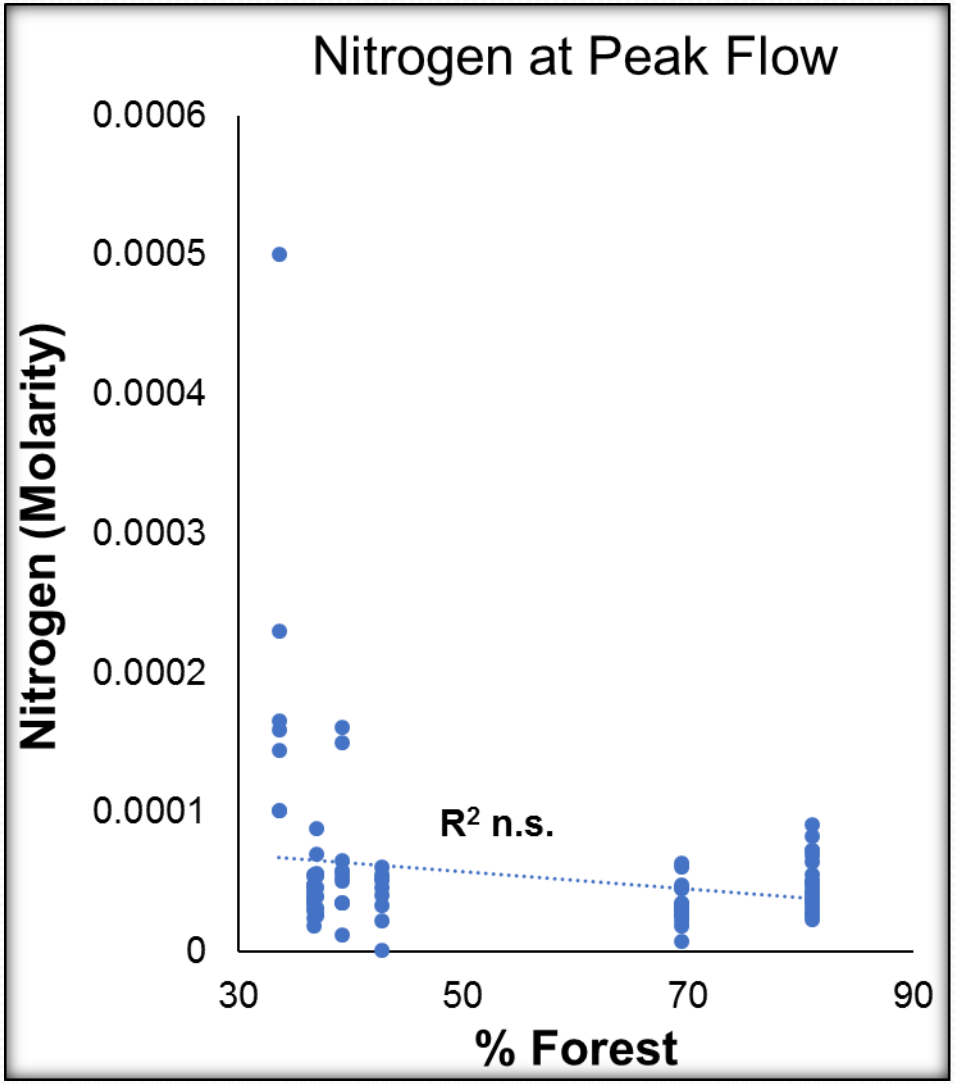
Research Questions

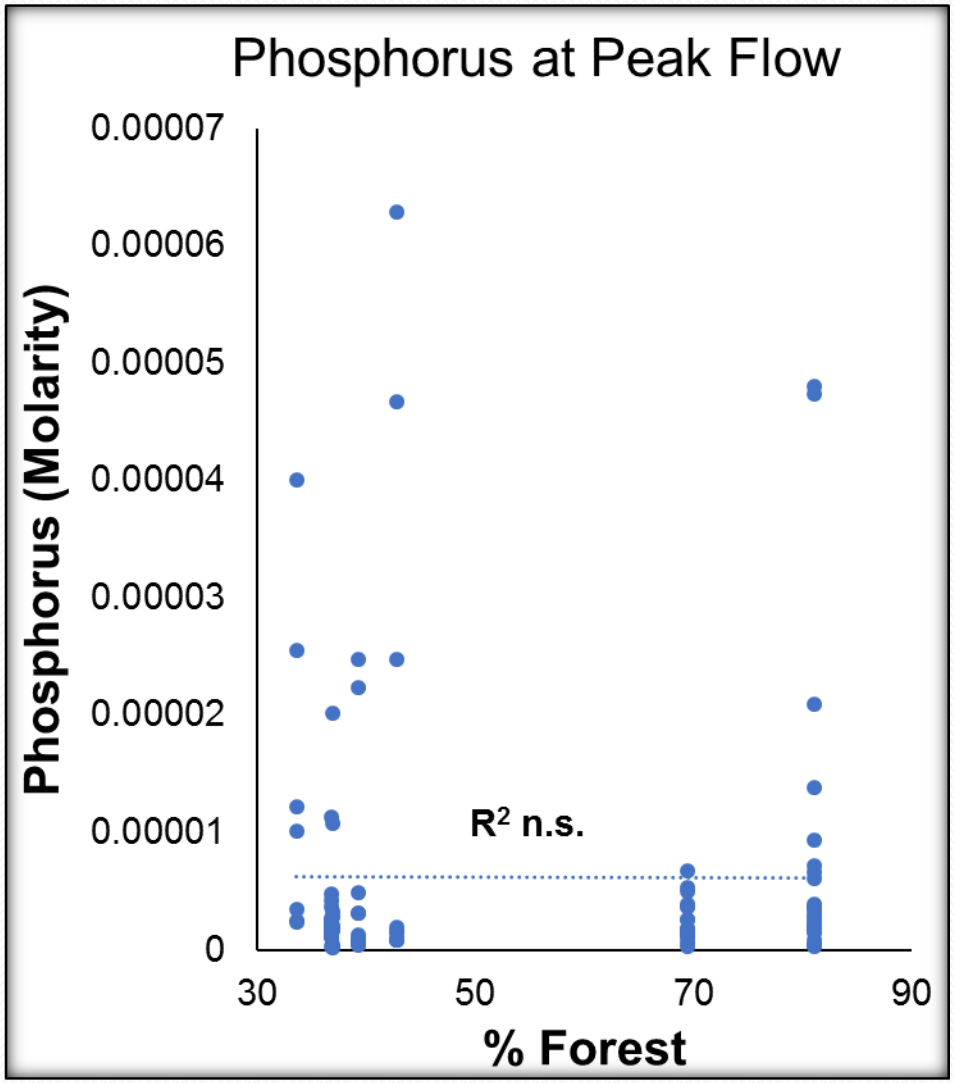
	Do concentrations change during high flow?	Do concentrations change related to land use?
N	**No**	
P	**Increase**	
N:P	**N:P decrease, Variation decrease**	
What are possible implications of any changes?		

Focus Areas and Land Use Percentages

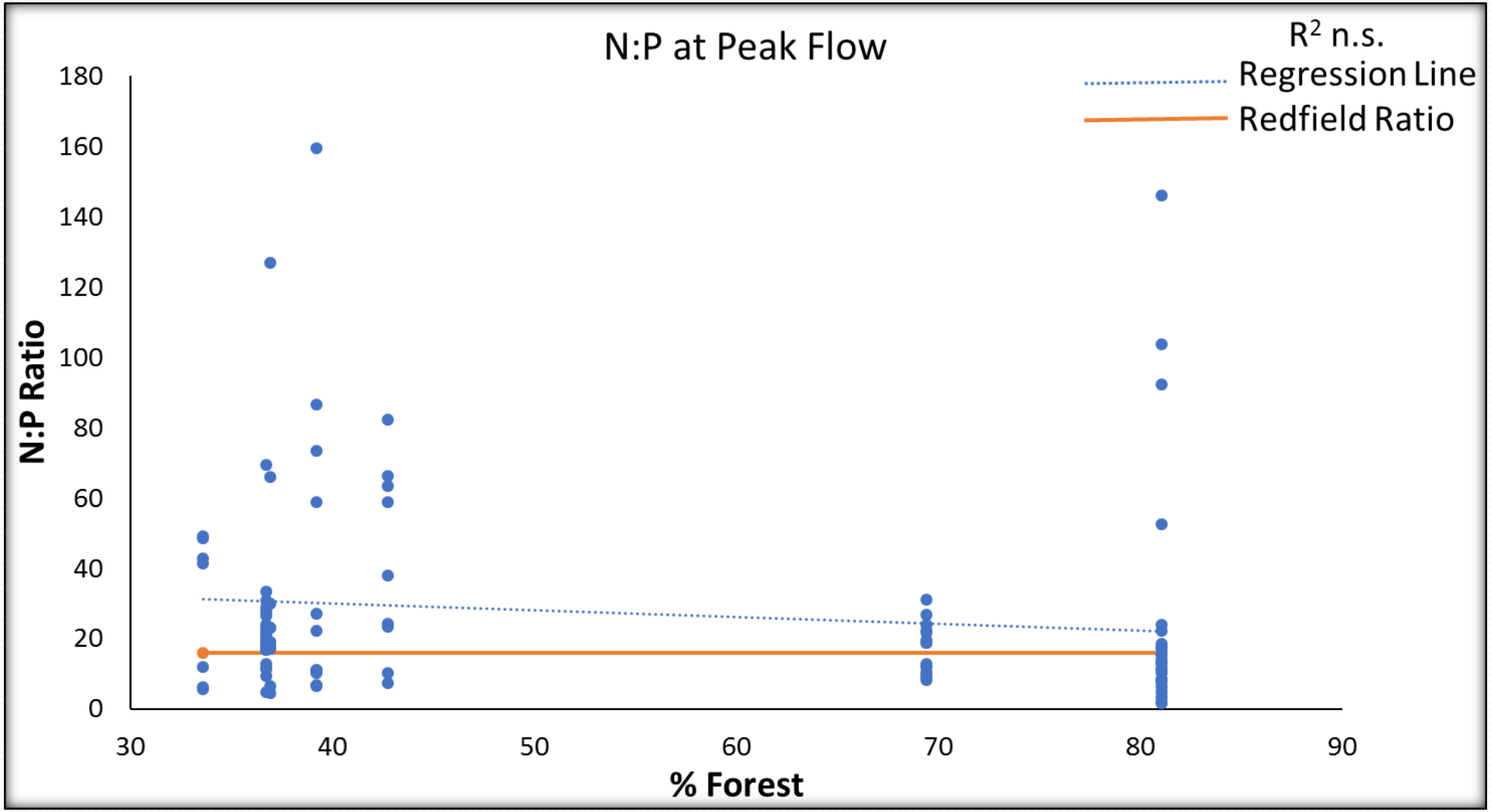


N & P with Land Use





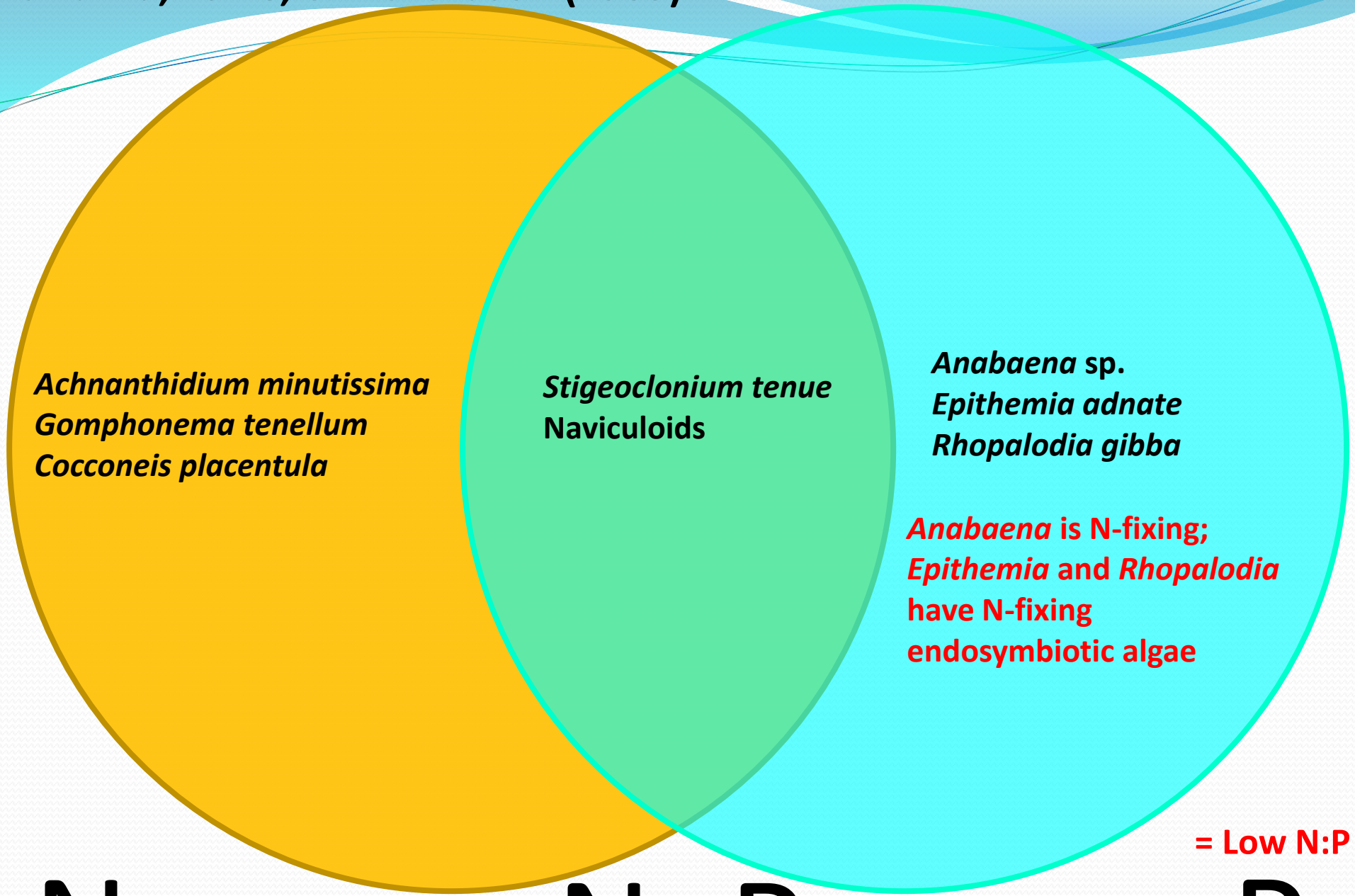
N:P with Land Use



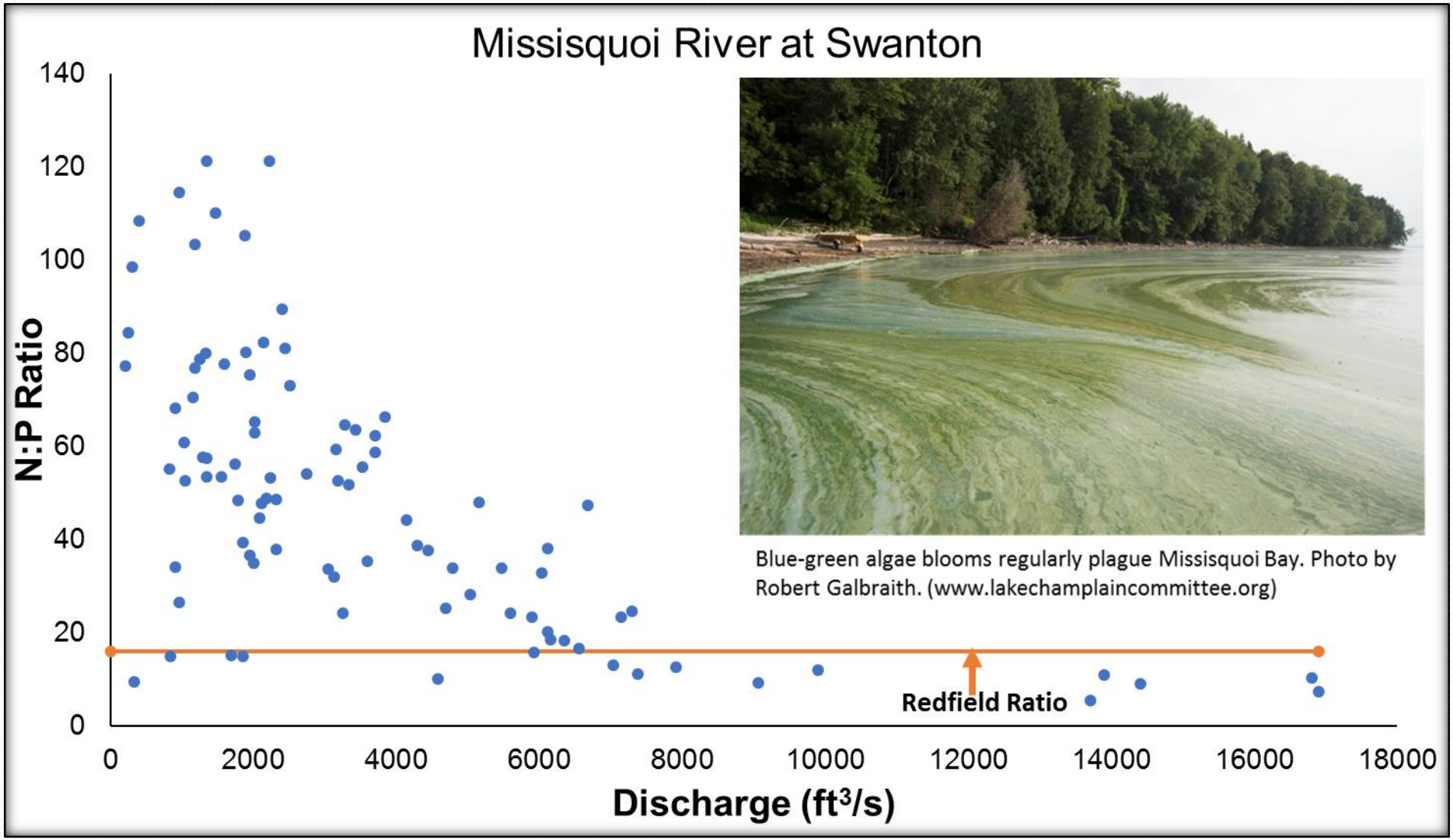
Research Questions

	Do concentrations change during high flow?	Do concentrations change related to land use?
N	**No**	**No**
P	**Increase**	**No**
N:P	**N:P decrease, Variation decrease**	**No**
What are possible implications of any changes?		

Fairchild, Lowe, & Richardson (1985)



Redfield Ratio, 16N: 1P molar



Thank you

Citations

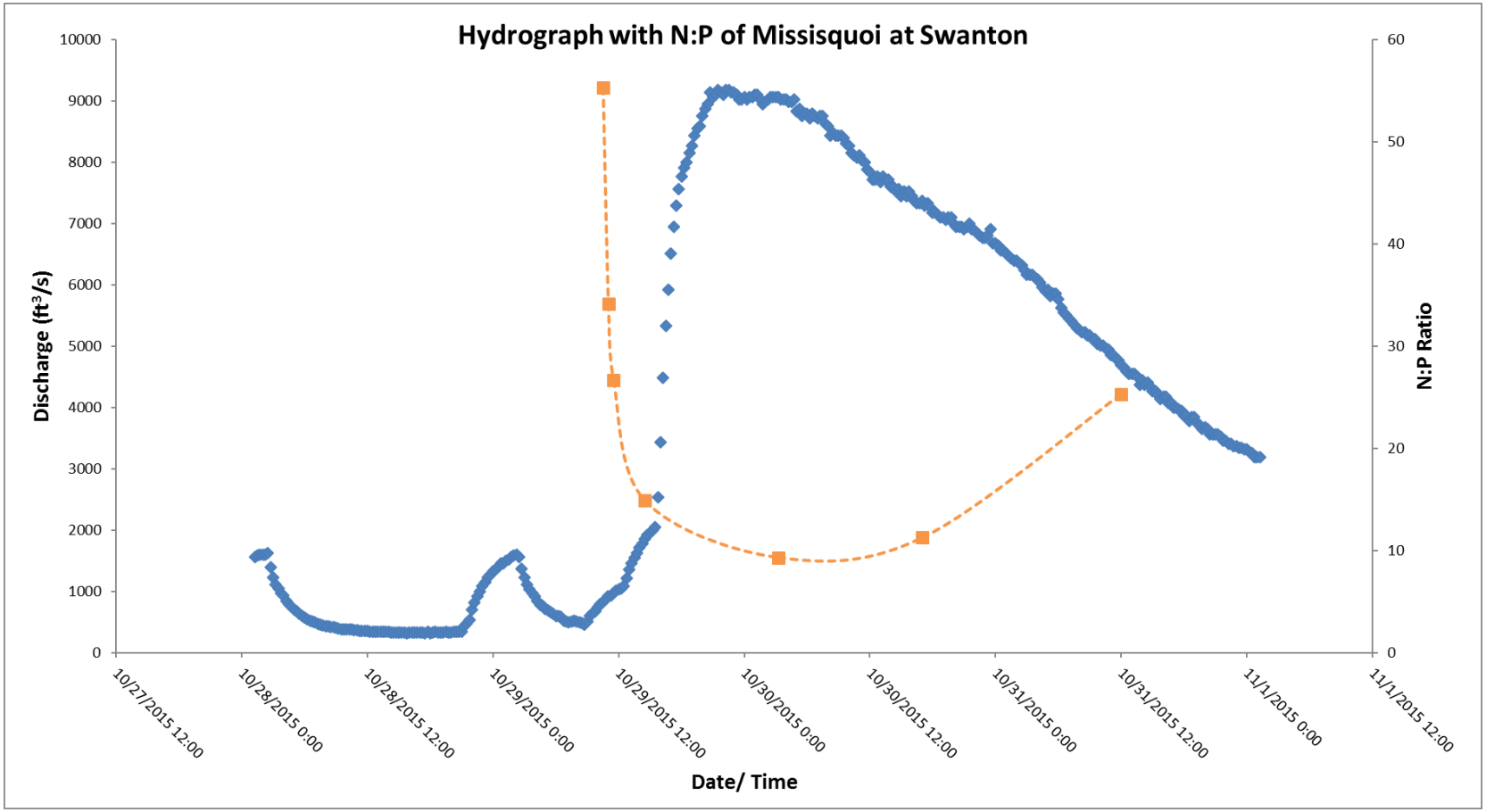
Fairchild, GW, RL Lowe, & WB Richardson. 1985. Algal periphyton growth on nutrient-diffusing substrates: An *in-situ* bioassay. Ecology 66(2): 465-472.

University of Vermont Spatial Analysis Lab, 2007. *Land Use/Land Cover for the Lake Champlain Basic, Circa 2001.* Burlington, Vermont 3: 1-11.

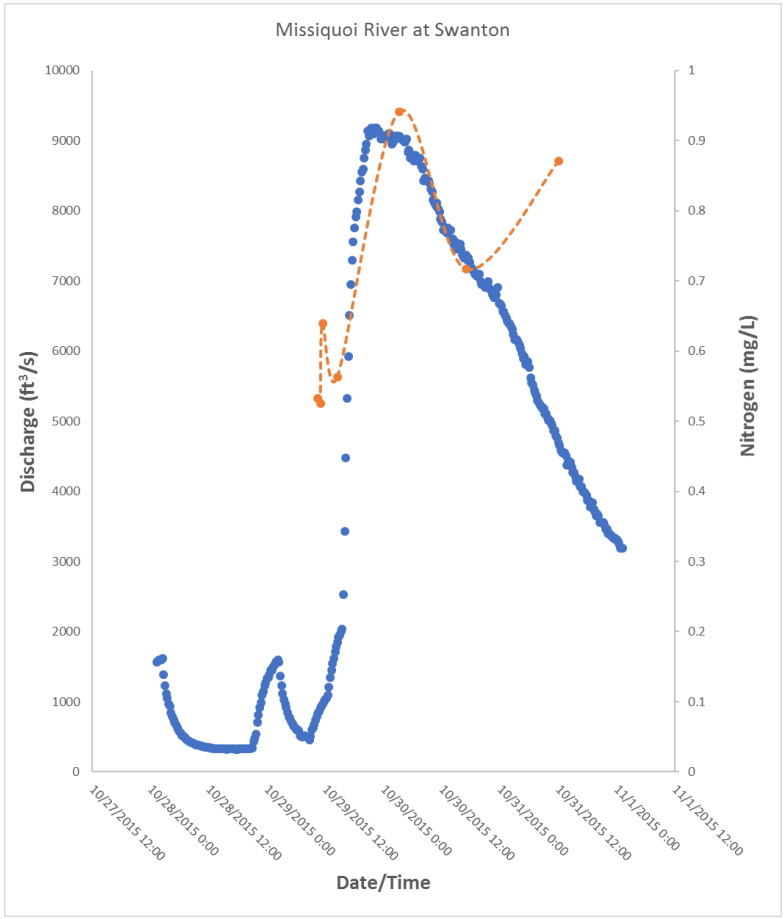
Vermont Center for Geographic Information, Inc., United States Geological Survey (USGS), EROS Data Center, 2002. *ElevationDEM_DEM24.* Sioux Falls, South Dakota 2002: 1-6.

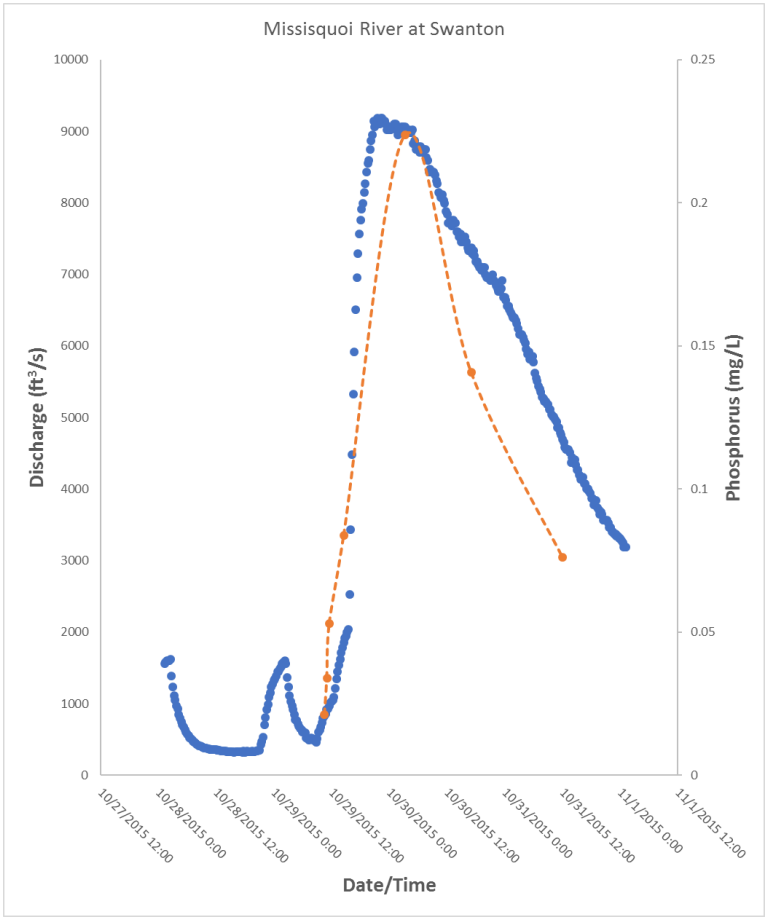
Funding provided by NSF Grant EPS 1101317

Just in Case

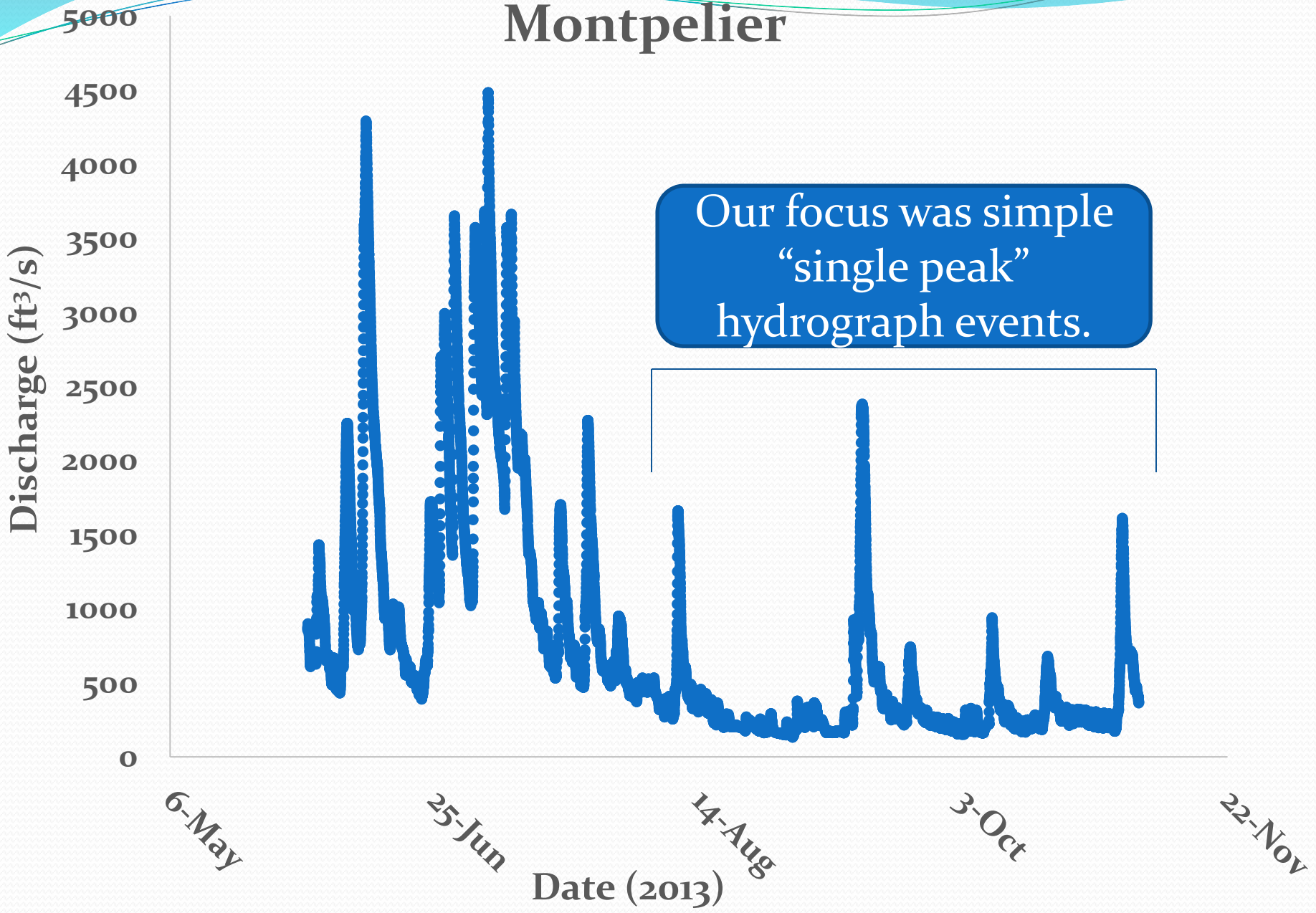

Hydrograph with N:P of Missisquoi at Swanton
Discharge (ft³/s)
N:P Ratio
Date/ Time
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
60
50
40
30
20
10
0
10/27/2015 12:00
10/28/2015 0:00
10/28/2015 12:00
10/29/2015 0:00
10/29/2015 12:00
10/30/2015 0:00
10/30/2015 12:00
10/31/2015 0:00
10/31/2015 12:00
11/1/2015 0:00
11/1/2015 12:00

Just in Case Part 2

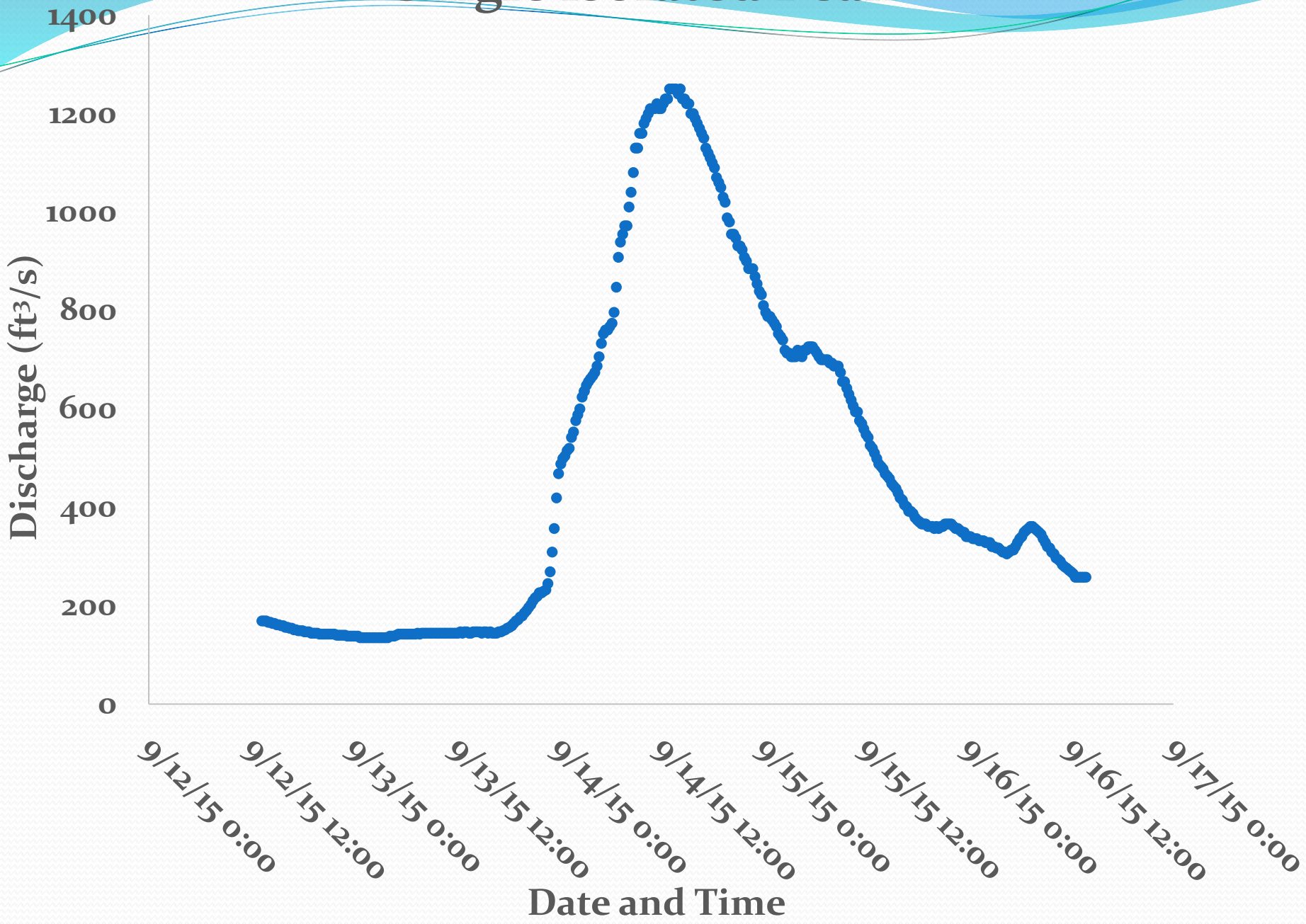




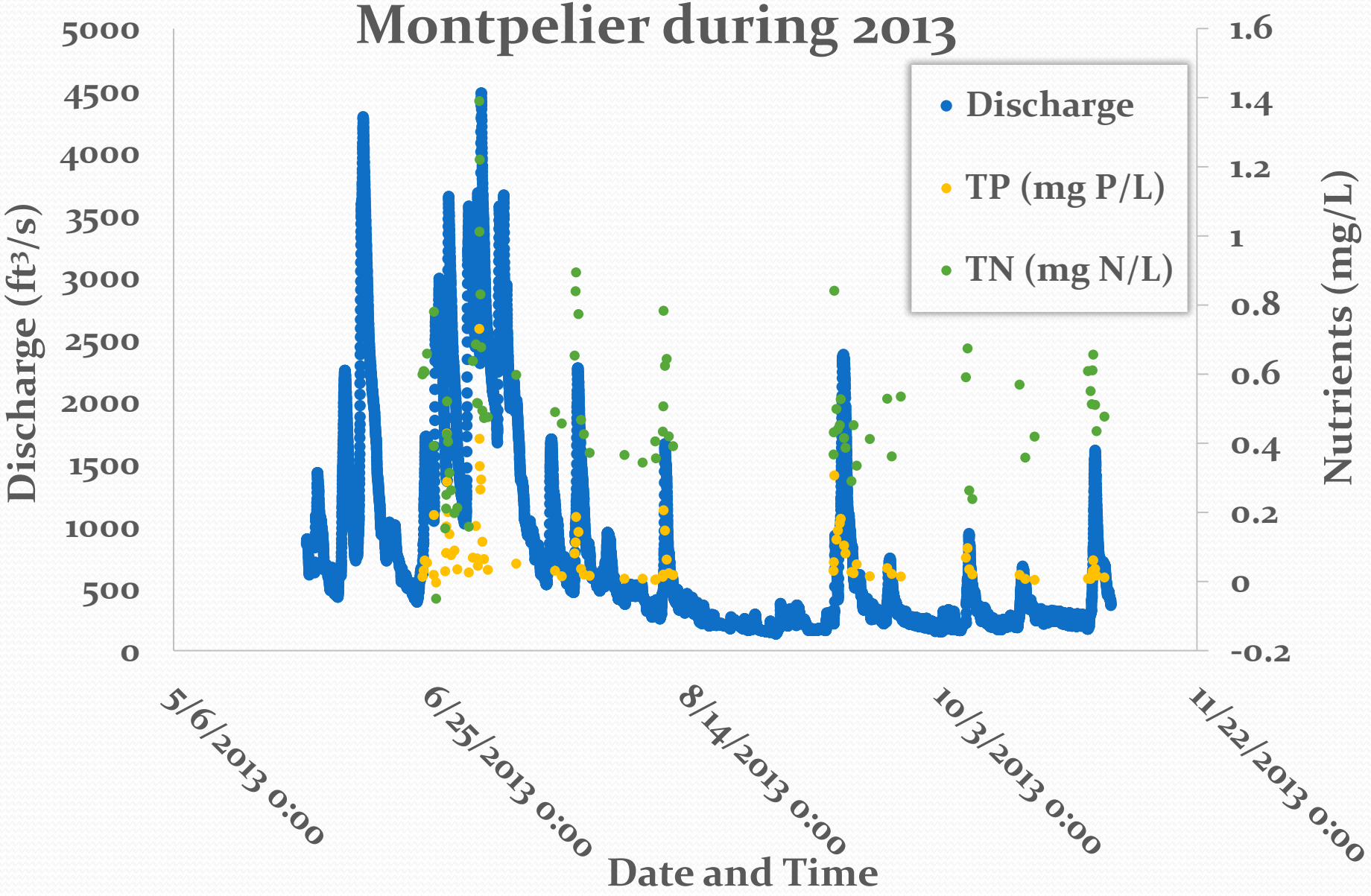
Discharge for the Winooski River at Montpelier



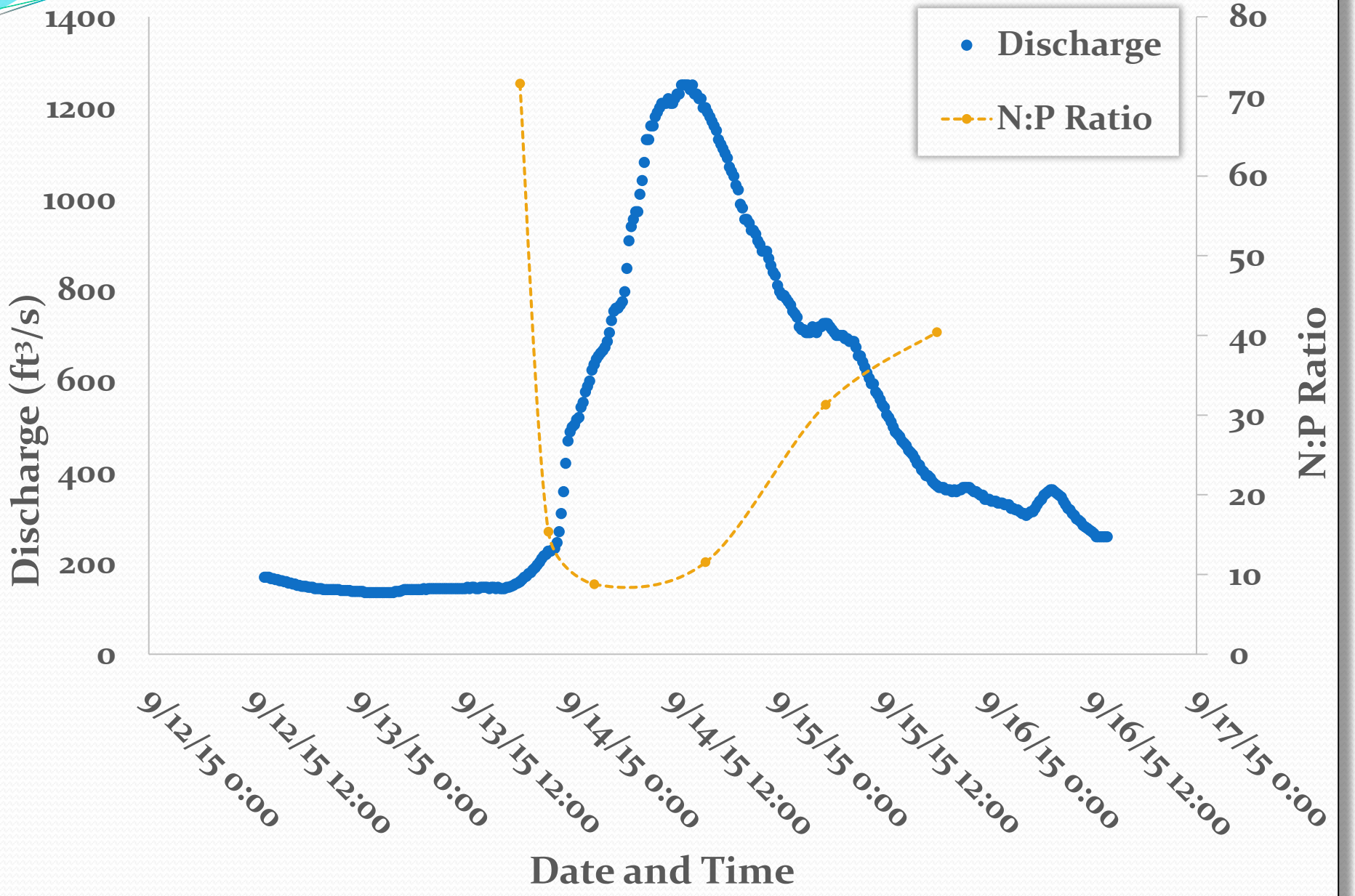
Single Isolated Peak



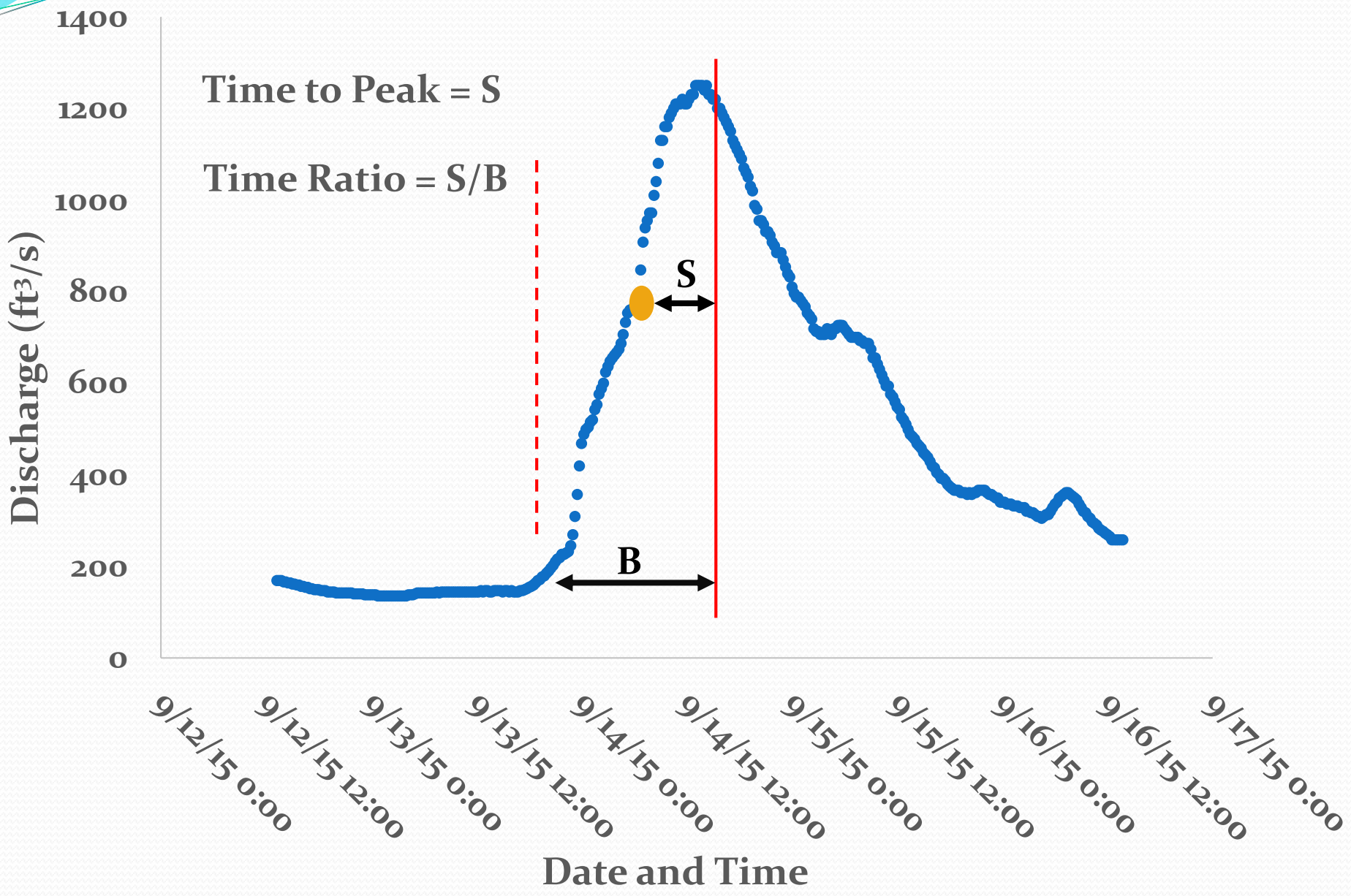
Total Nitrogen, Total Phosphorus, and Discharge for the Winooski River at Montpelier during 2013



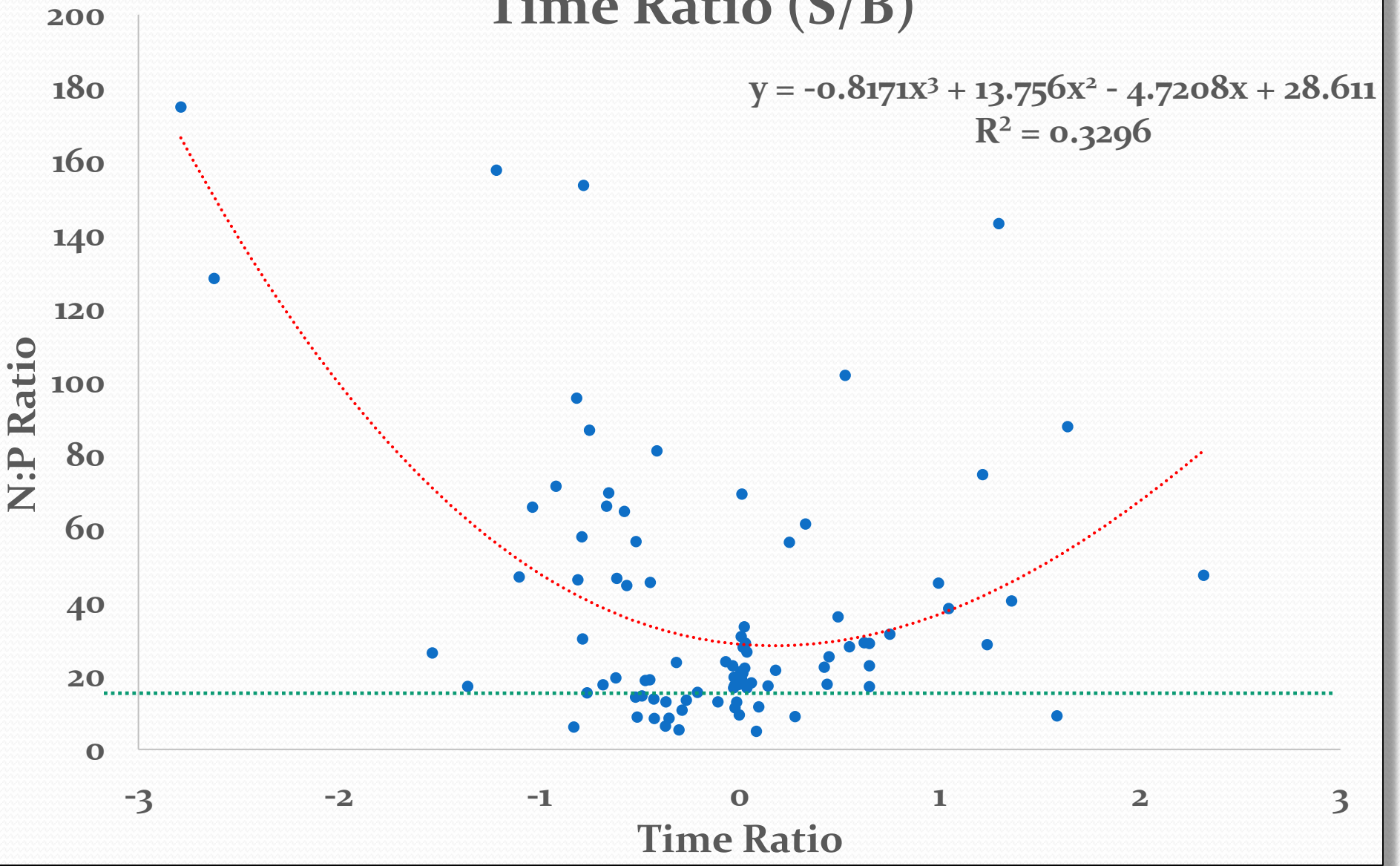
Single Isolated Peak



Time to Peak

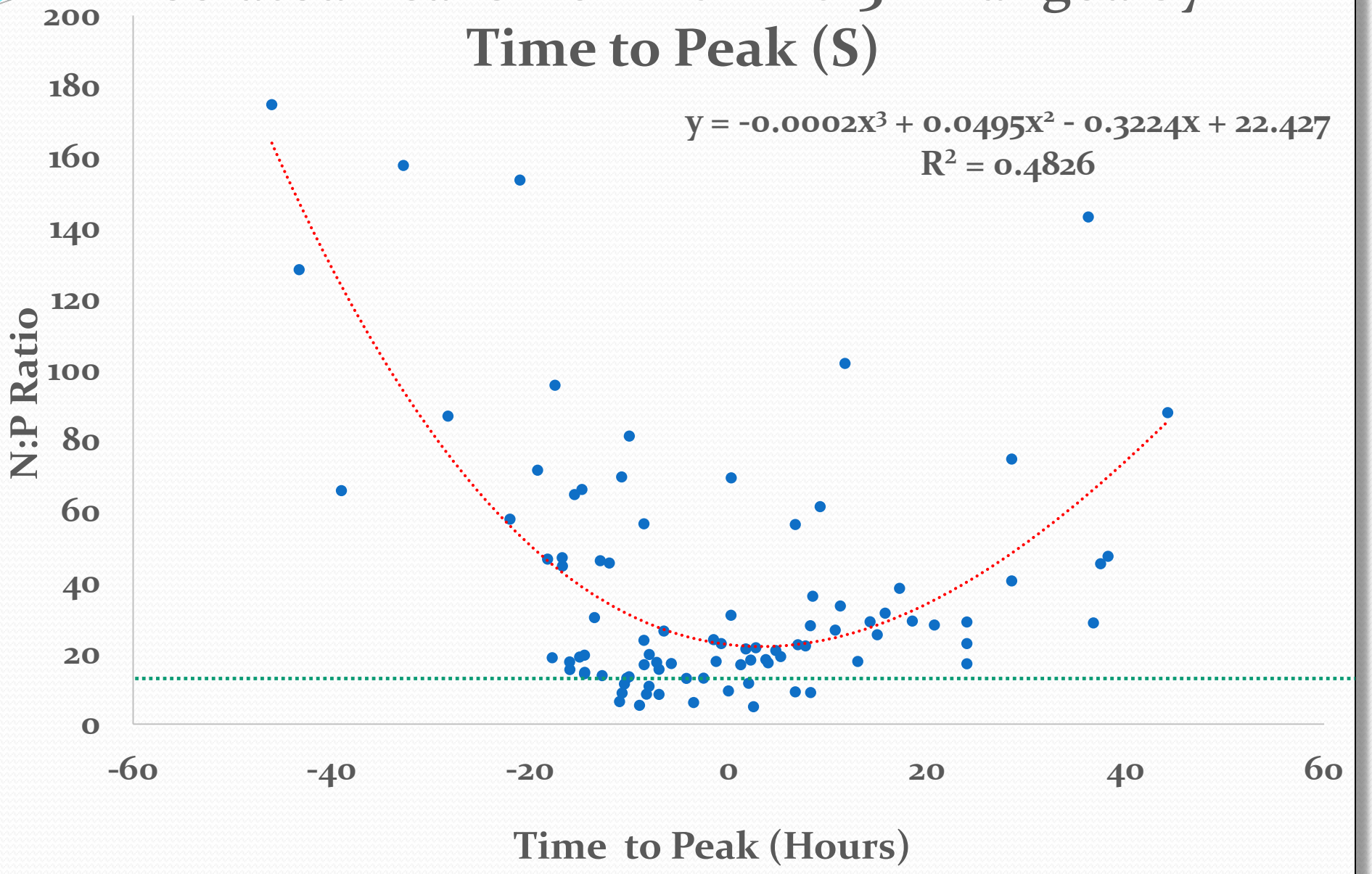

Time to Peak = S
Time Ratio = S/B
S
B
Discharge (ft³/s)
1400
1200
1000
800
600
400
200
0
9/12/15 0:00
9/12/15 12:00
9/13/15 0:00
9/13/15 12:00
9/14/15 0:00
9/14/15 12:00
9/15/15 0:00
9/15/15 12:00
9/16/15 0:00
9/16/15 12:00
9/17/15 0:00
Date and Time

N:P Ratios During High Discharge Isolated Peaks from 2012-2015 Arranged by Time Ratio (S/B)

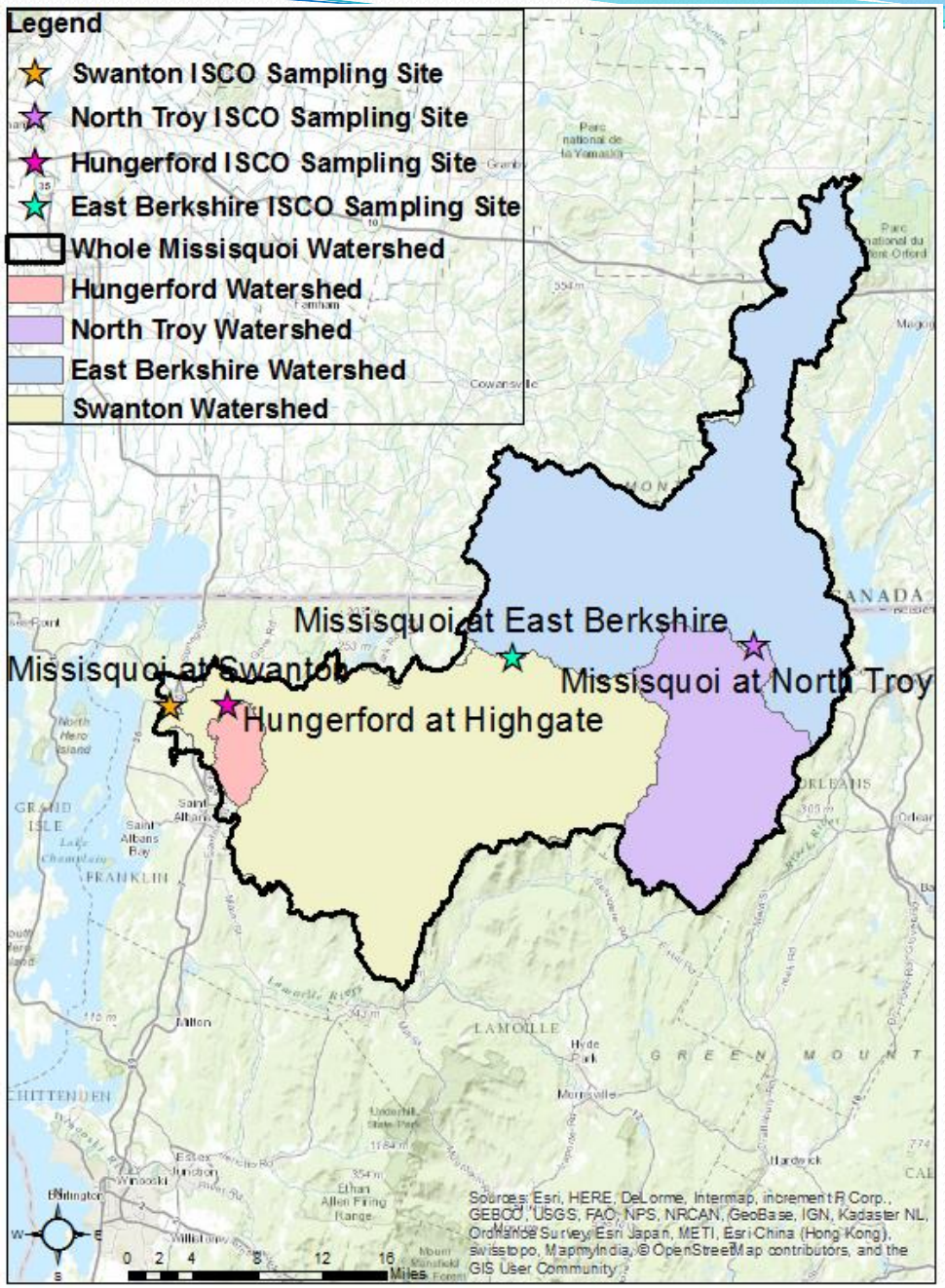


N:P Ratios During High Discharge

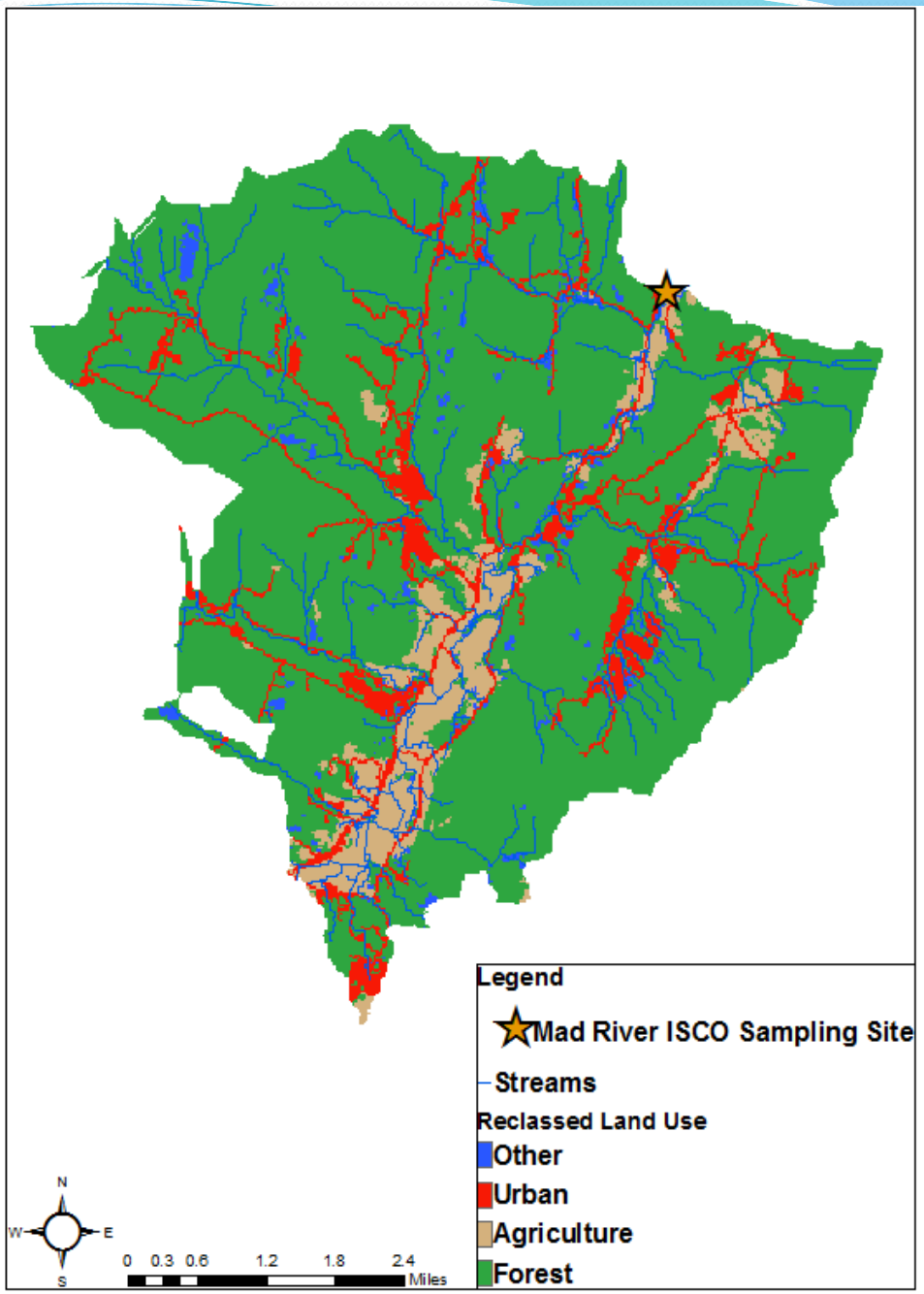
Isolated Peaks from 2012-2015 Arranged by Time to Peak (S)



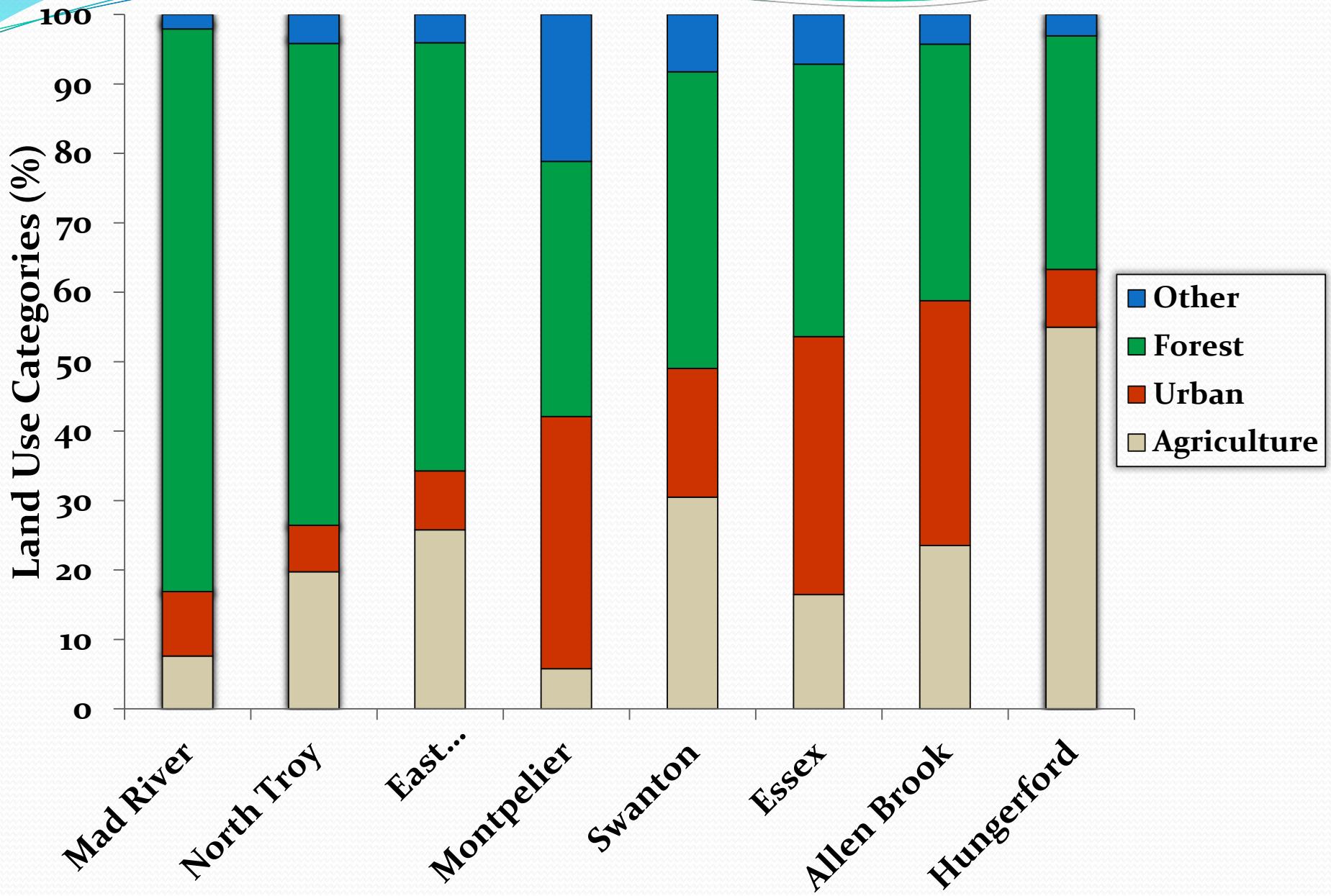
Missisquoi Basin and Sub-basins



Mad River Focus Area



Focus Areas and Land Use Percentages



4 Watersheds in the Winooski Basin