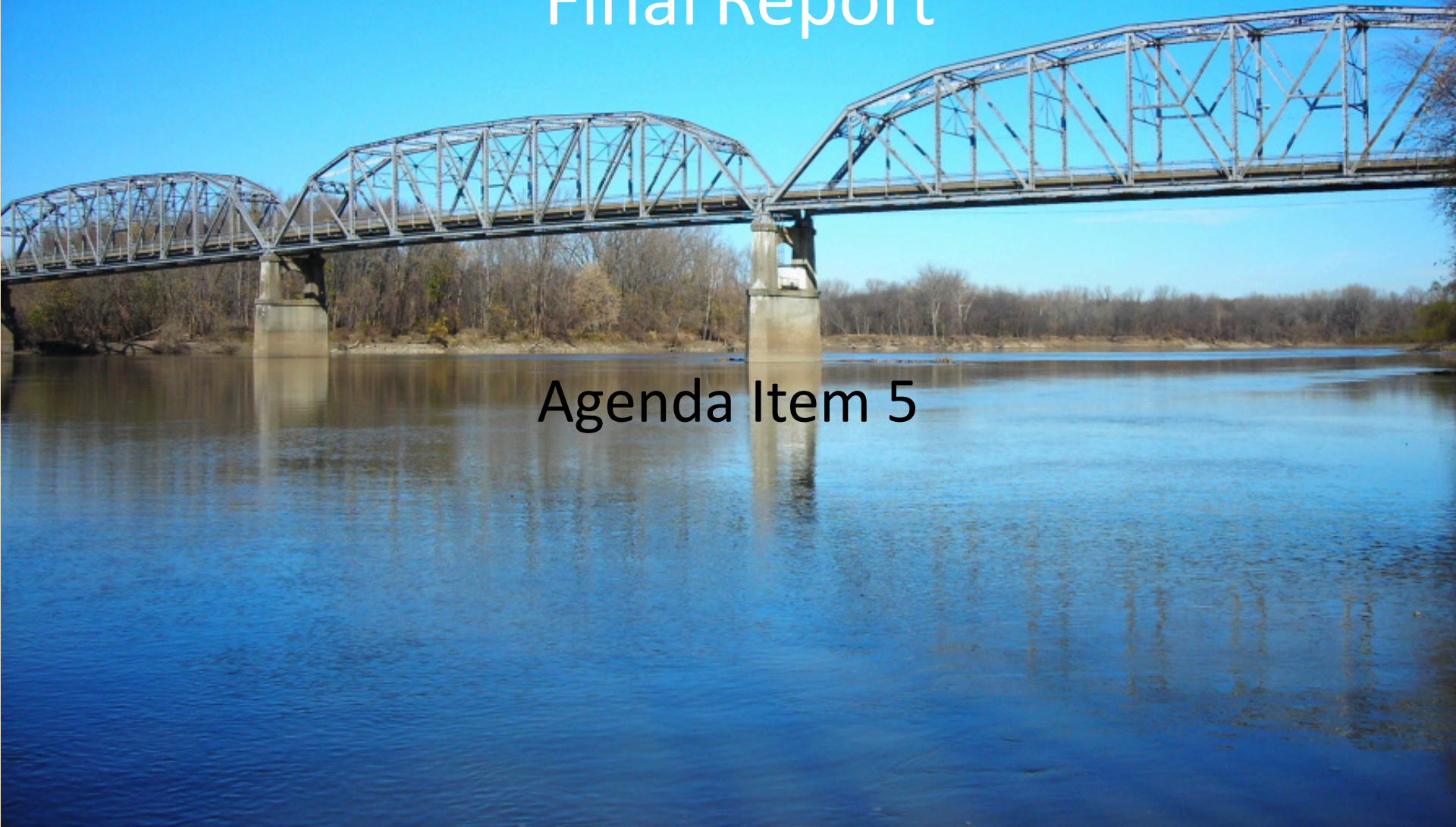


Wabash River Continuous Monitor Project: Final Report

Agenda Item 5

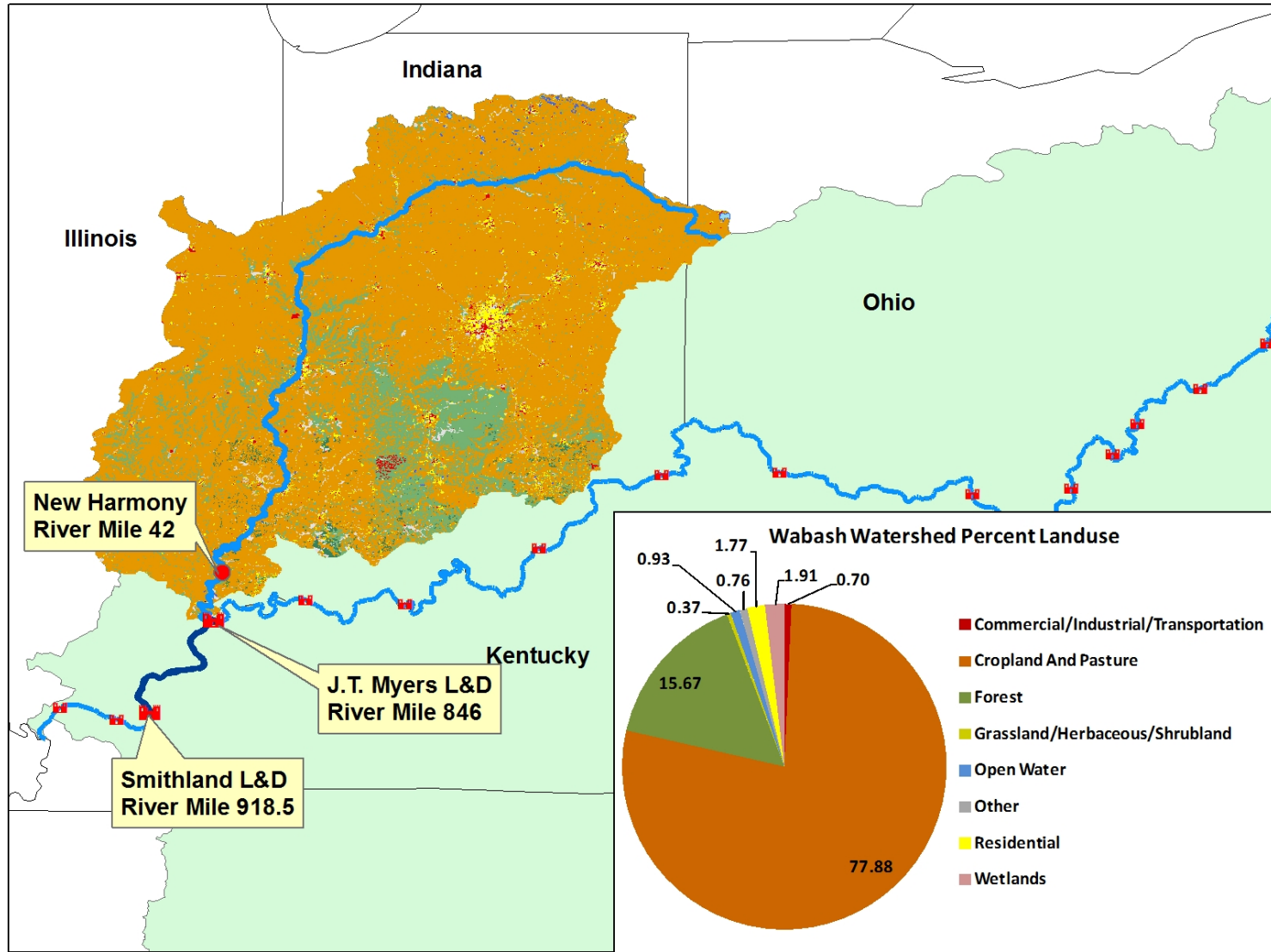


Project Goals

- 3 year project (continuation of a 1 year project). Data collected from 1/19/2012 to 1/19/2015.
- Determine annual load of nutrients from Wabash River and at JT Myers on the Ohio River.
- Evaluate the Wabash River as a possible cause of low dissolved oxygen in the Smithland Pool.



Project Location



Goal 1: Load Calculation

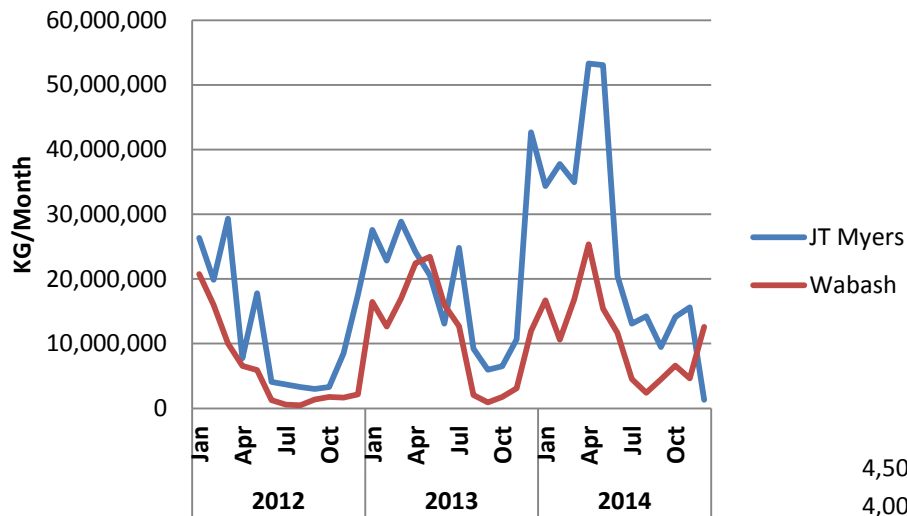
- USGS LOADEST
 - FORTRAN program for estimating loads
- Uses a time series of streamflow and constituent concentration data.
- Develops a regression model of the constituent load.
- This model is then used to estimate loads over the specified time interval.

LOADEST Inputs

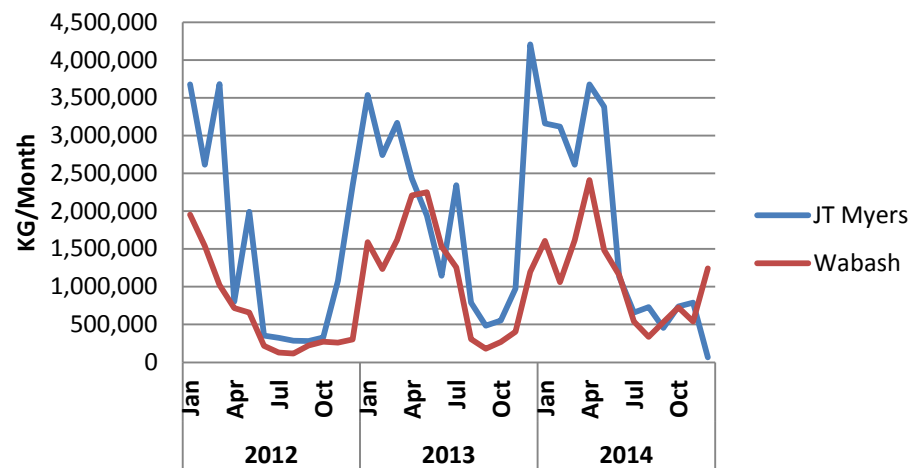
- Wabash River
 - 106 nutrients samples
 - TN calculated by adding TKN and Nitrate/Nitrite
 - Flow data from USGS gauge at New Harmony
 - New Harmony 29,234 sq mi (88% of watershed)
- Ohio River at JT Myers
 - 53 Nutrients Samples
 - Project only collects summer time data.
Additional data provided by Bi-monthly Program
 - TN calculated by adding TKN and Nitrate/Nitrite
 - Flow data from COE Cascade

Load Comparison of Ohio and Wabash Rivers

Nitrogen Load



Phosphorus Load



Load Calculations

Wabash River

- 3 Year load: January 2012 to December 2014
 - Flow range from 2001-2013
 - 10,207,480 cfs – 17,737,490 cfs
 - Flows 2012-2014 above average
- **340,552** metric tons TN
- **24,930** metric tons TP

Ohio River at JT Myers

- 3 Year load: January 2012 to December 2014
 - Flow range from 2001-2013
 - 35,605,368 cfs – 87,999,200 cfs
 - Flows 2012-2014 near average
- **683,112** metric tons TN
- **62,597** metric tons TP

Wabash River is about 10% of load to Gulf of Mexico

Goal 2: Causes of DO Impairment

- Evaluation of DO data
- Evaluation of nutrient concentrations
- BOD as a source of DO impairment
- Algae as a source of DO impairment

Dissolved Oxygen

Station	# days >6mg/L fluctuation	# days <5 mg/L average	# days <4 mg/L instant
Wabash R.	81	25	66
JT Myers L&D	0	0	0
Smithland L&D	2	17	14

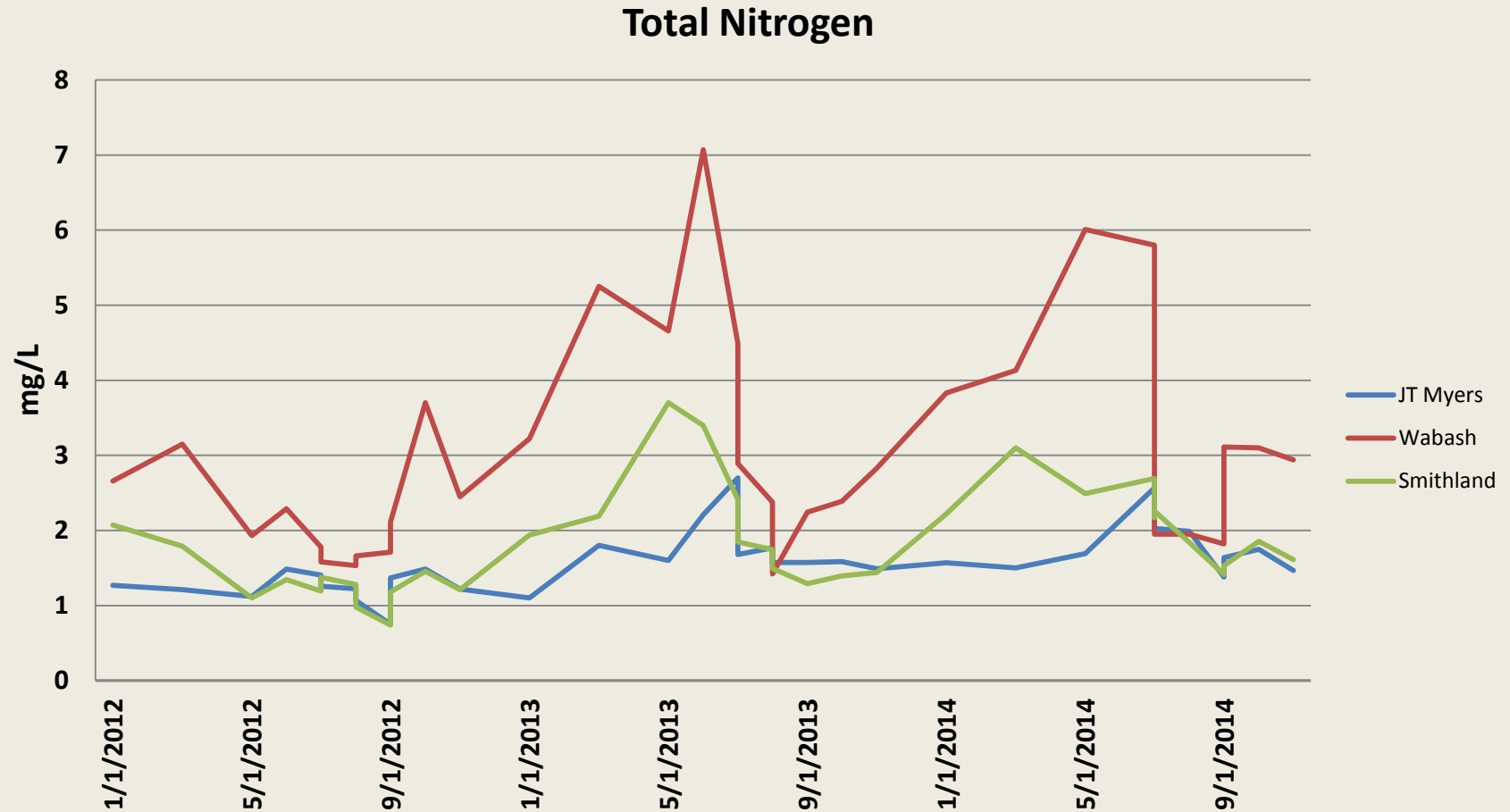
Diurnal fluctuation is caused by algal respiration

Wabash R. low DO associated with large diurnal flux

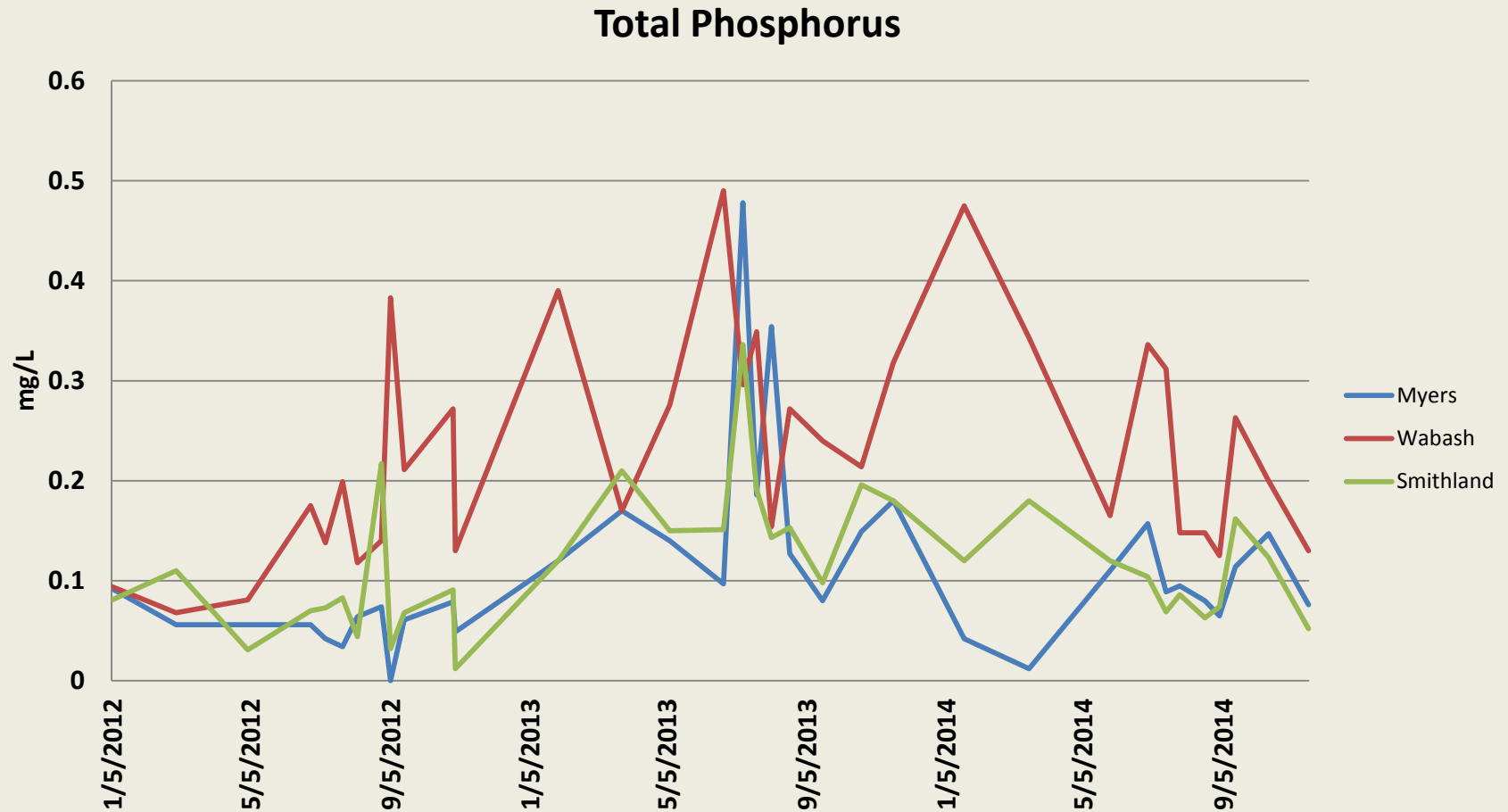
Smithland low DO associated with minimal diurnal flux

Period: 1/1/2012 to 1/19/2015 (3 summers)

Nutrient Concentrations (2012-2014)

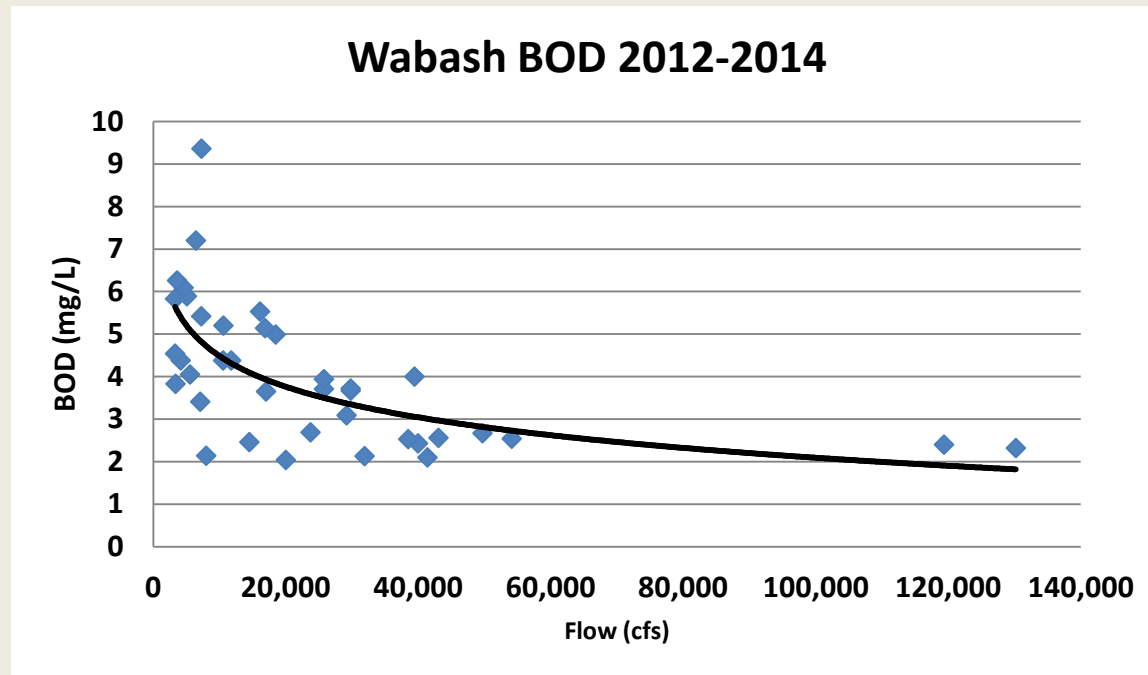


Nutrient Concentrations (2012-2014)

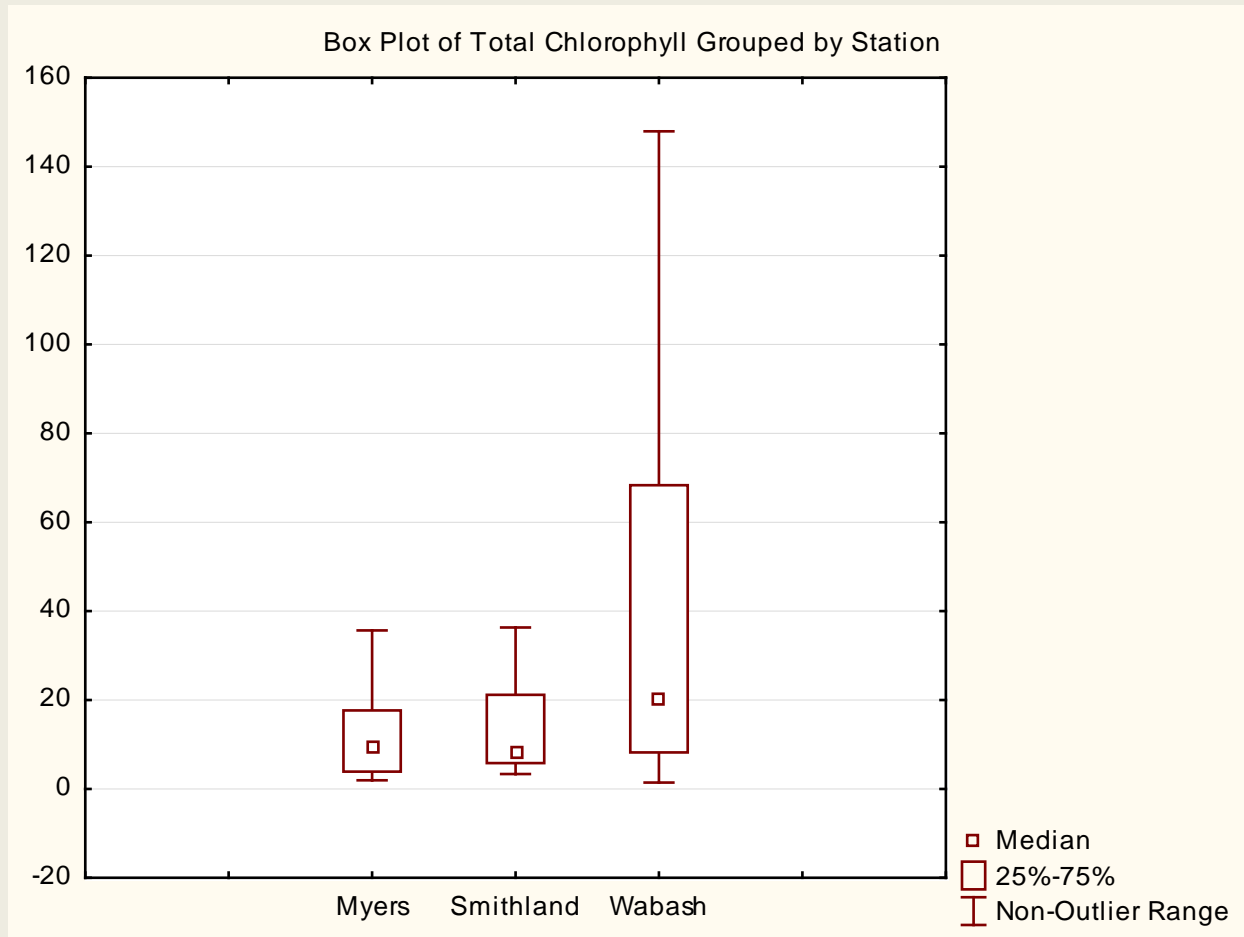


Biochemical Oxygen Demand

	Wabash	JT Myers	Smithland
# BOD Detections	46	3	3



Chlorophyll *a*



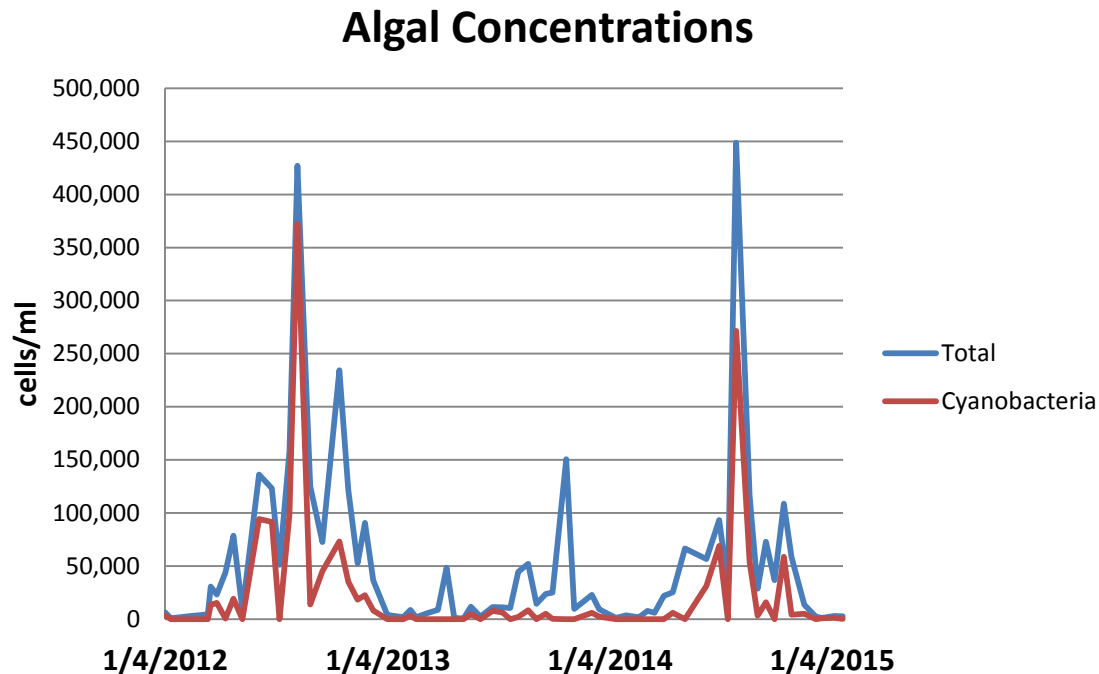
Harmful Algae Blooms

WHO Guidance Levels for HABs

Guidance Level	Concentration	How Guidance Level Derived	Health Risks
Low probability of health effects	20,000 cells/ml (primarily cyanobacteria)	Human bathing epidemiological study	Short term- skin irritations, gastrointestinal illness
Moderate probability of health effects	100,000 cells/ml (primarily cyanobacteria)	Provisional drinking water guideline value for microcystin and other cyanotoxins	Potential for long term illness as well as short term health effects
High probability of health effects	Scum formation in areas where whole body contact occurs	Inference from oral animal lethal poisonings and human illness case histories	Potential for acute poisoning

HAB Formation 2012-2014

Station	Low Level	Moderate Level
Wabash River	12	3
JT Myers	1	0
Smithland	3	0



Conclusions

- Wabash River continues to be a major source of nutrients.
 - For study period Wabash River was 33.3% of N load, 28.5% of P load, 20.1% of flow
 - Wabash River is 23.6% of drainage area
- DO Standard exceedances on Ohio River occurred in 2012
 - DO pattern indicates Ohio River low DO not caused by algae
- Algae concentration does not show effect of Wabash River on Smithland Pool
- High water year on the Wabash River. Low problem year for DO on the Ohio River
- Wabash River is a source of BOD to Ohio River.
 - BOD primarily associated with algae blooms

Questions?

