

# Phosphorus Forms at Different Spatial Scales in The Lower Fox River Sub-Basin

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**Lower Fox River Watershed Monitoring Project**

[www.uwgb.edu/WATERSHED](http://www.uwgb.edu/WATERSHED)



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# Primary Goal

To better understand and predict the forms of phosphorus in agricultural watersheds to enhance management decisions and improve the usability and biological integrity of our water resources.

# Presentation Outline

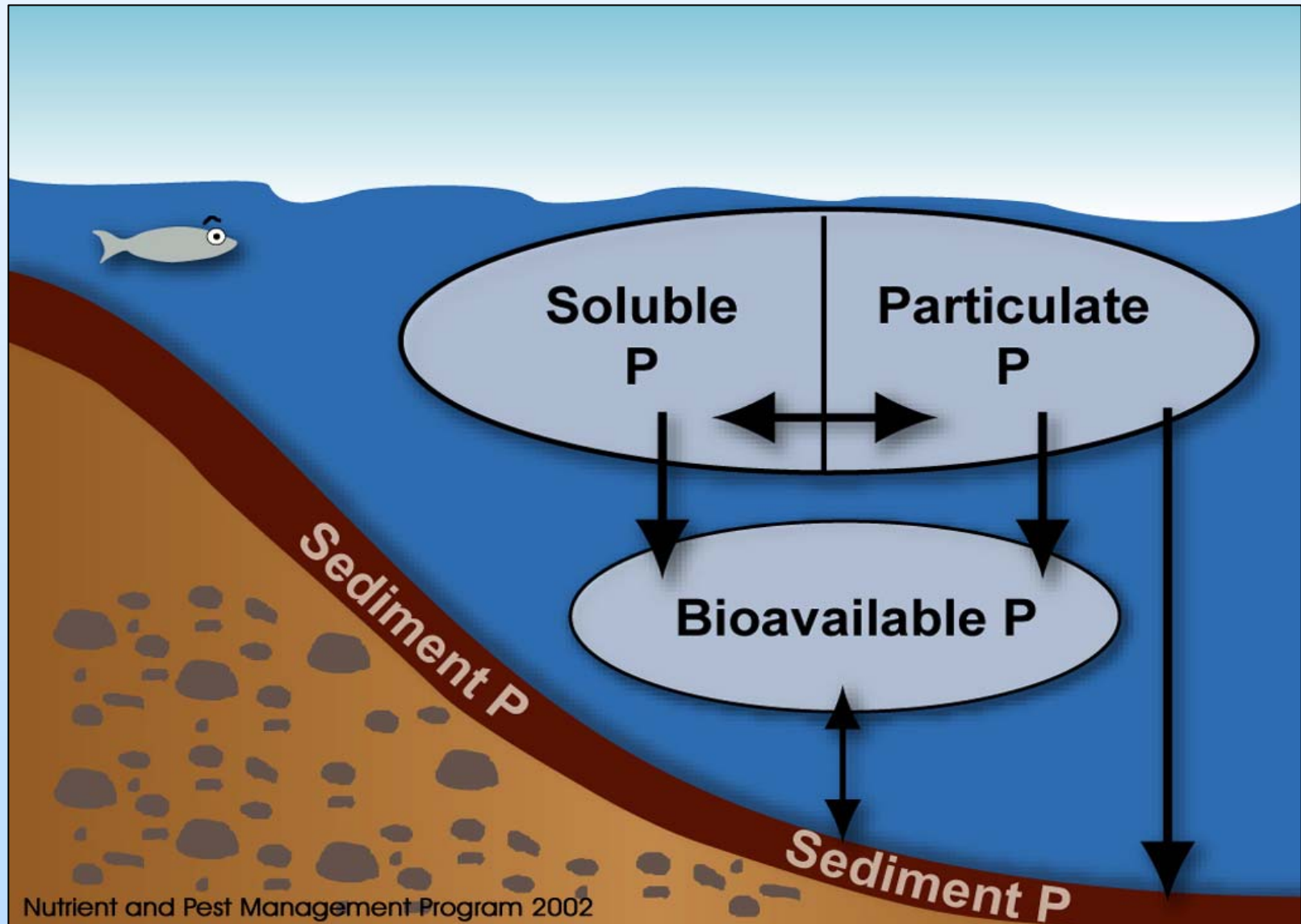
1. Effects of Phosphorus Loading
2. Phosphorus Forms
3. Description of Study Area
4. Apple Creek Phosphorus Forms Study
  - Background-Methods-Results-Conclusions
  - Multi-field Analysis with the Wisconsin P-Index
5. Conclusions



**Why Care About P Loading?**



# How Can We Decrease P Loading?



# Grassed Waterway – Apple Creek



CONSERVATION  
BUFFER

- No Plowing
- No Animal Waste
- Restricted Mowing and Spraying

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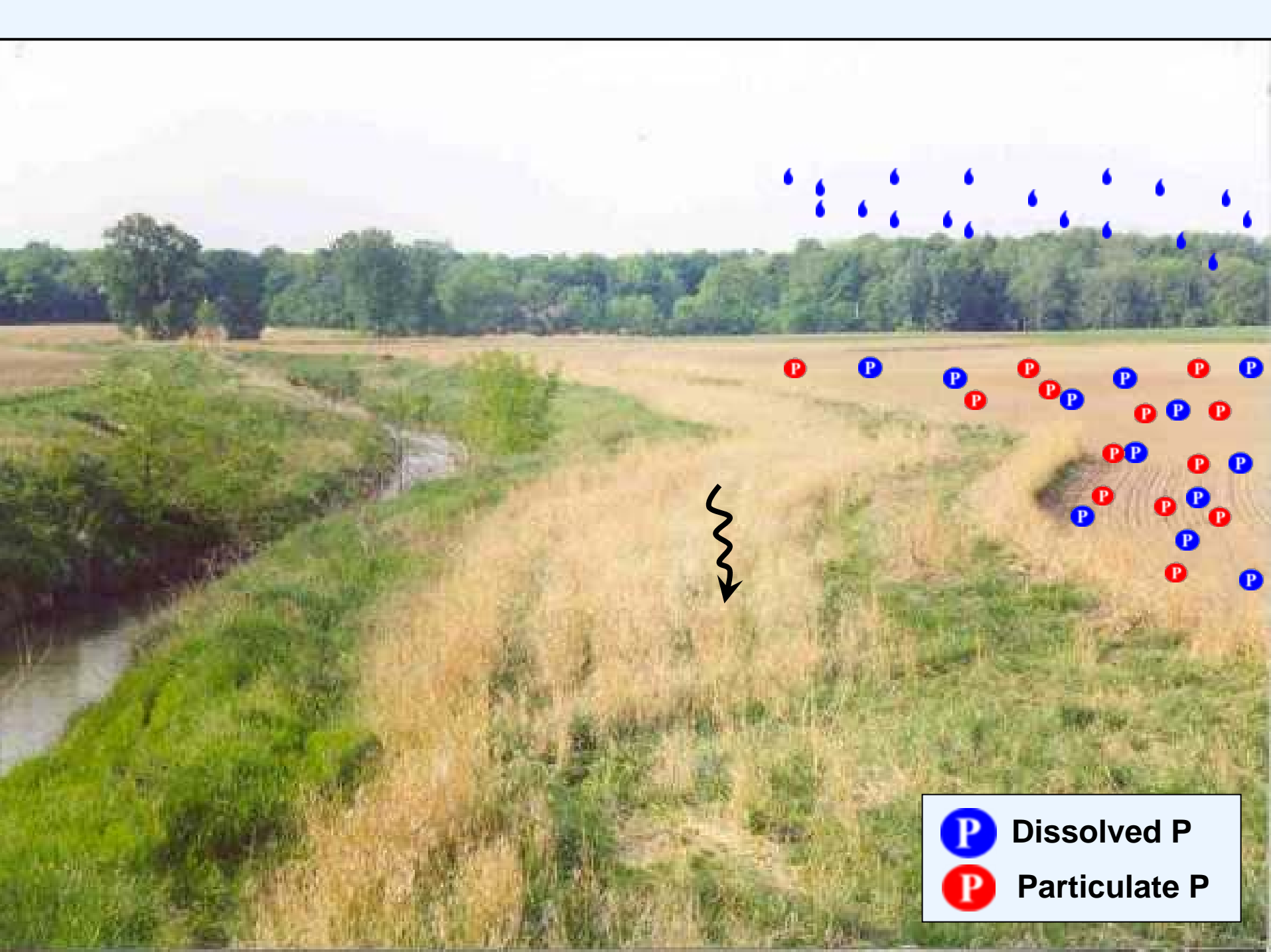
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# Why Care about P-Forms?

- 💧 Most Dissolved P is bioavailable
  - Bioavailable = Algae can consume and grow
- 💧 Particulate P can be transformed to bioavailable P in the stream
- 💧 Implications for Best Management Practices







	Dissolved P
	Particulate P





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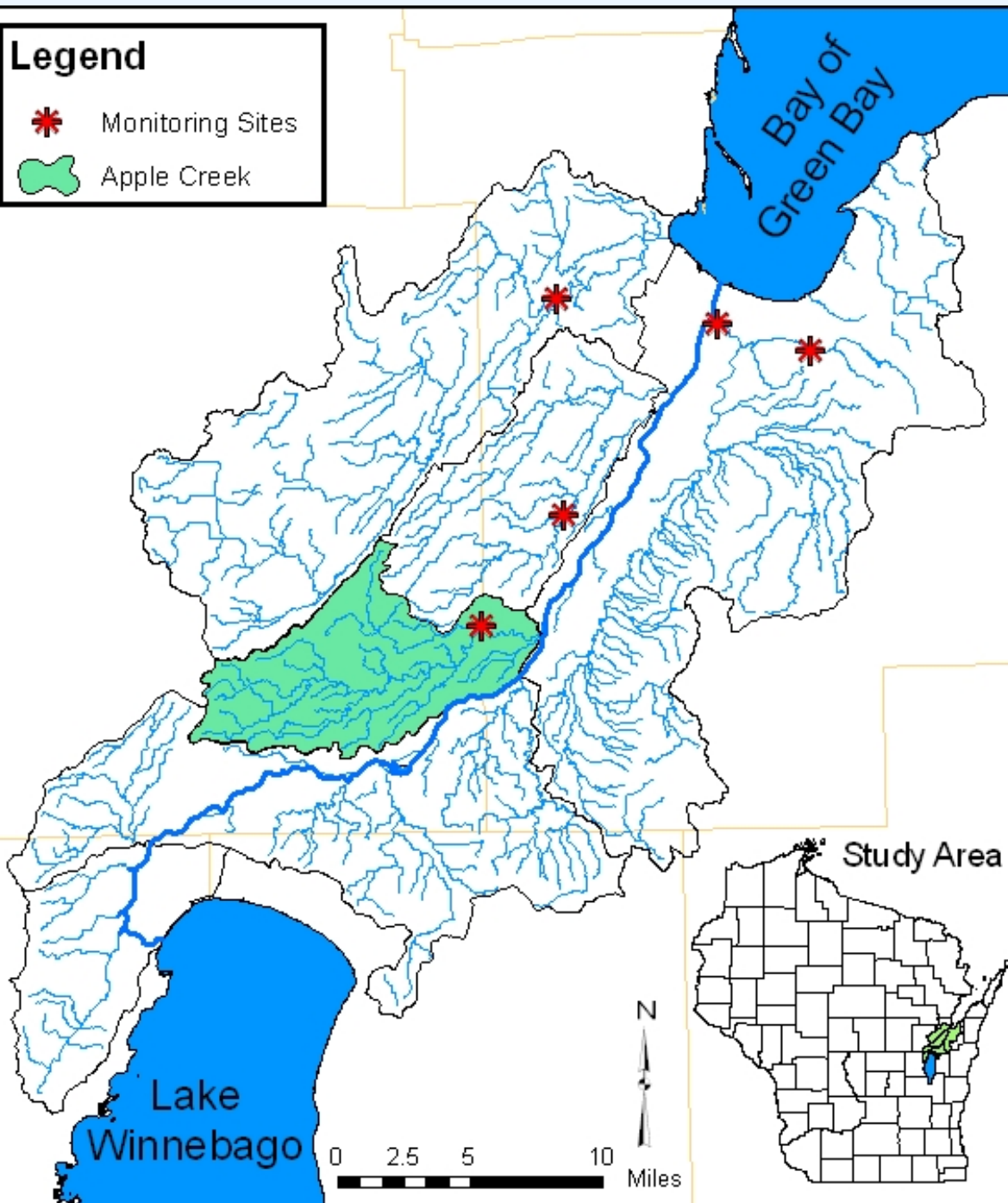
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## Legend

-  Monitoring Sites
-  Apple Creek

# Apple Creek Watershed

-  117 km<sup>2</sup>
-  63% Agriculture
-  26% urban development
-  Rapidly urbanizing southern section



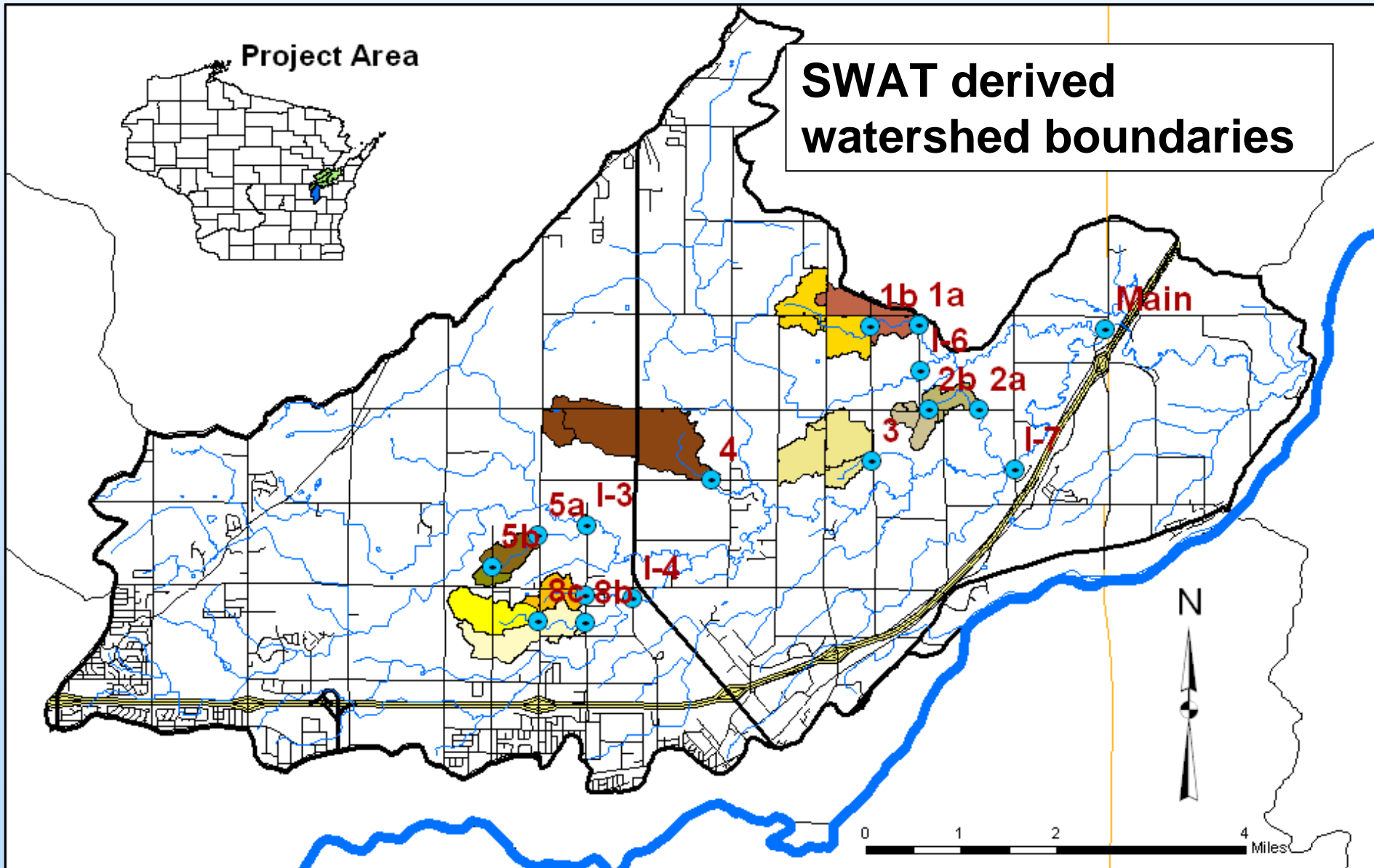
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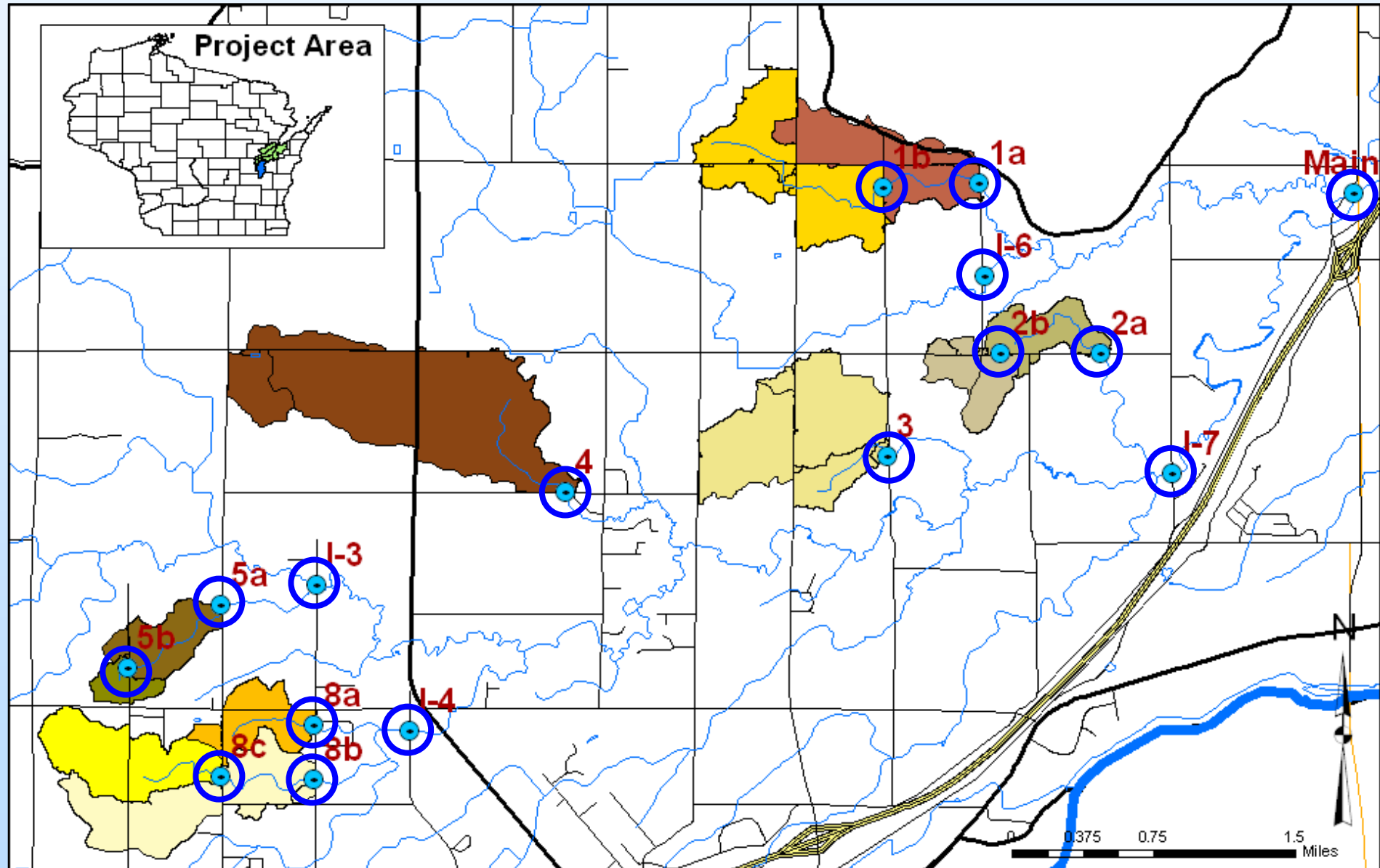
# P-Forms Objectives

- Determine DP & TP concentrations and the DP fraction in streams at different scales
- Relate results to watershed characteristics (i.e. soils, topography, and land management)
- Apply Wisconsin P Risk Index to source areas and compare to water quality

# Apple Creek P-Forms Study Sites



# Apple Creek P-Forms Study Sites – Close up



# P-Forms Methods





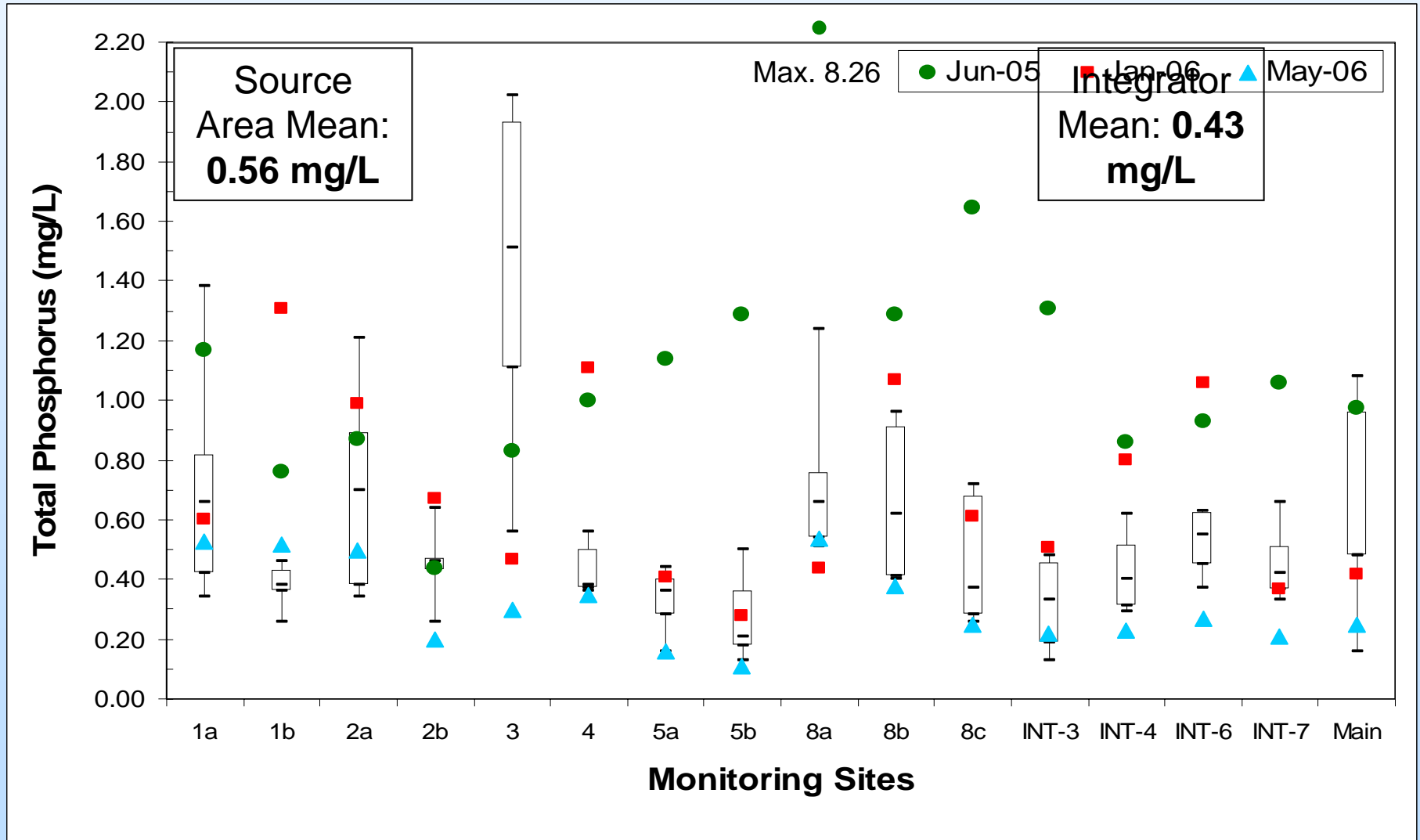
# Monitoring Methods

- Study Period: 2004 – 2006
- EVENT SAMPLING: Targeted uniform precipitation events
  - Grab samples at 11 source area (0.2 to 2.3 km<sup>2</sup>) and 4 integrator sites (12 to 85 km<sup>2</sup>), at or near peak flow
- Main stem USGS site: Continuous discharge & automated sample collection (117 km<sup>2</sup>)
- TSS, TP, and DP analysis at Green Bay Metropolitan Sewage District Lab

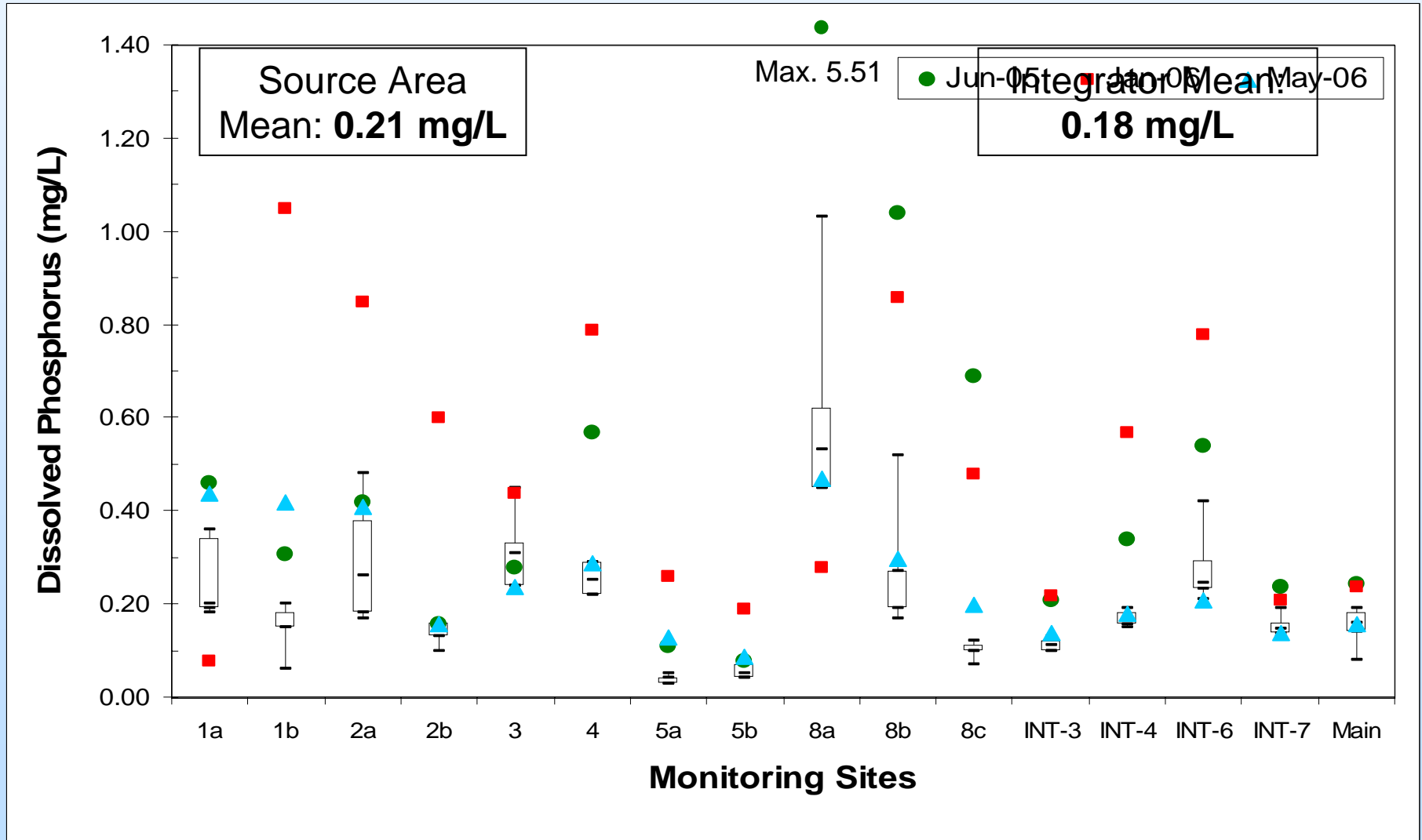
# Results

P-Forms Study  
WY 2004-2006

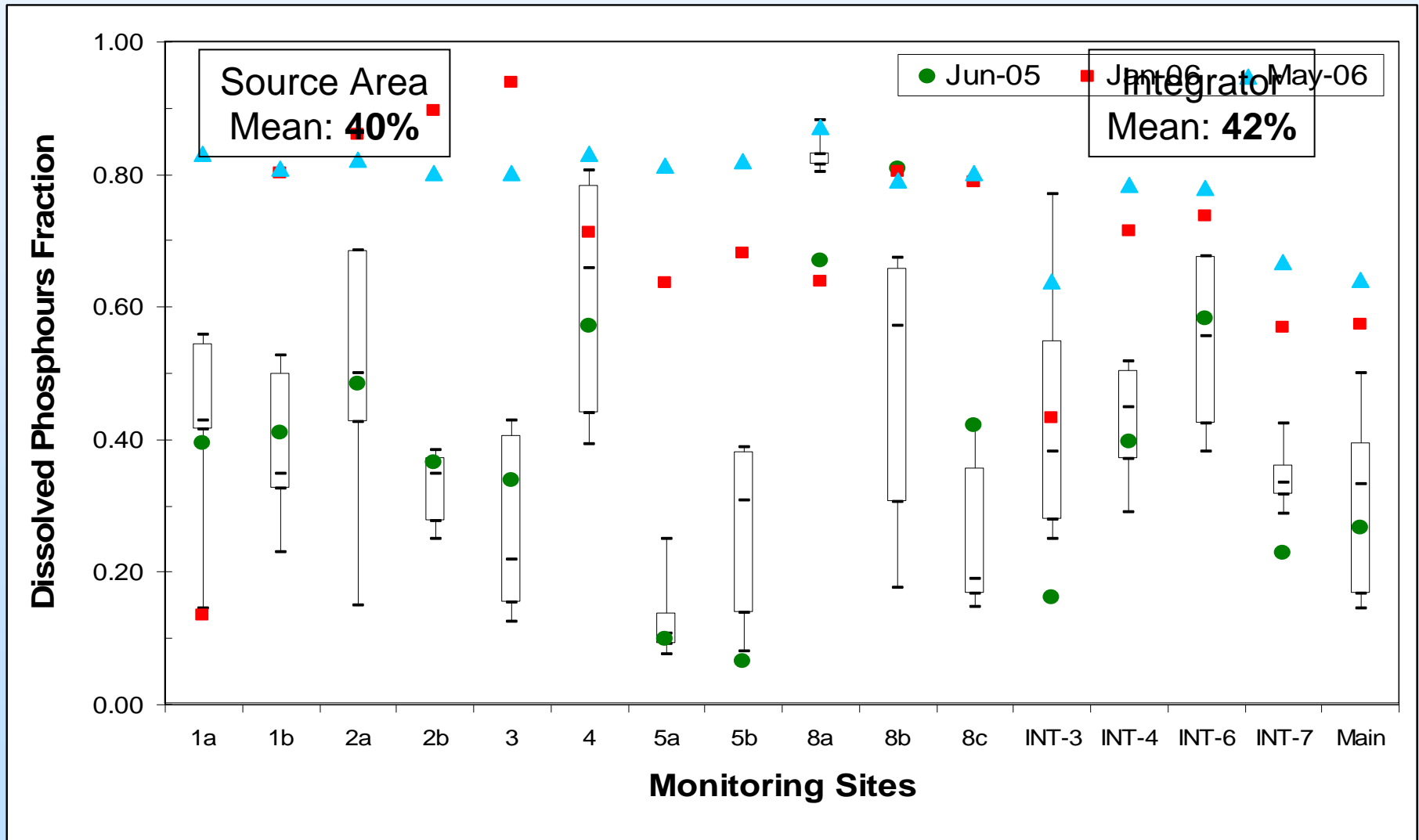
# Total Phosphorus (mg/L) – 2004 - 2006



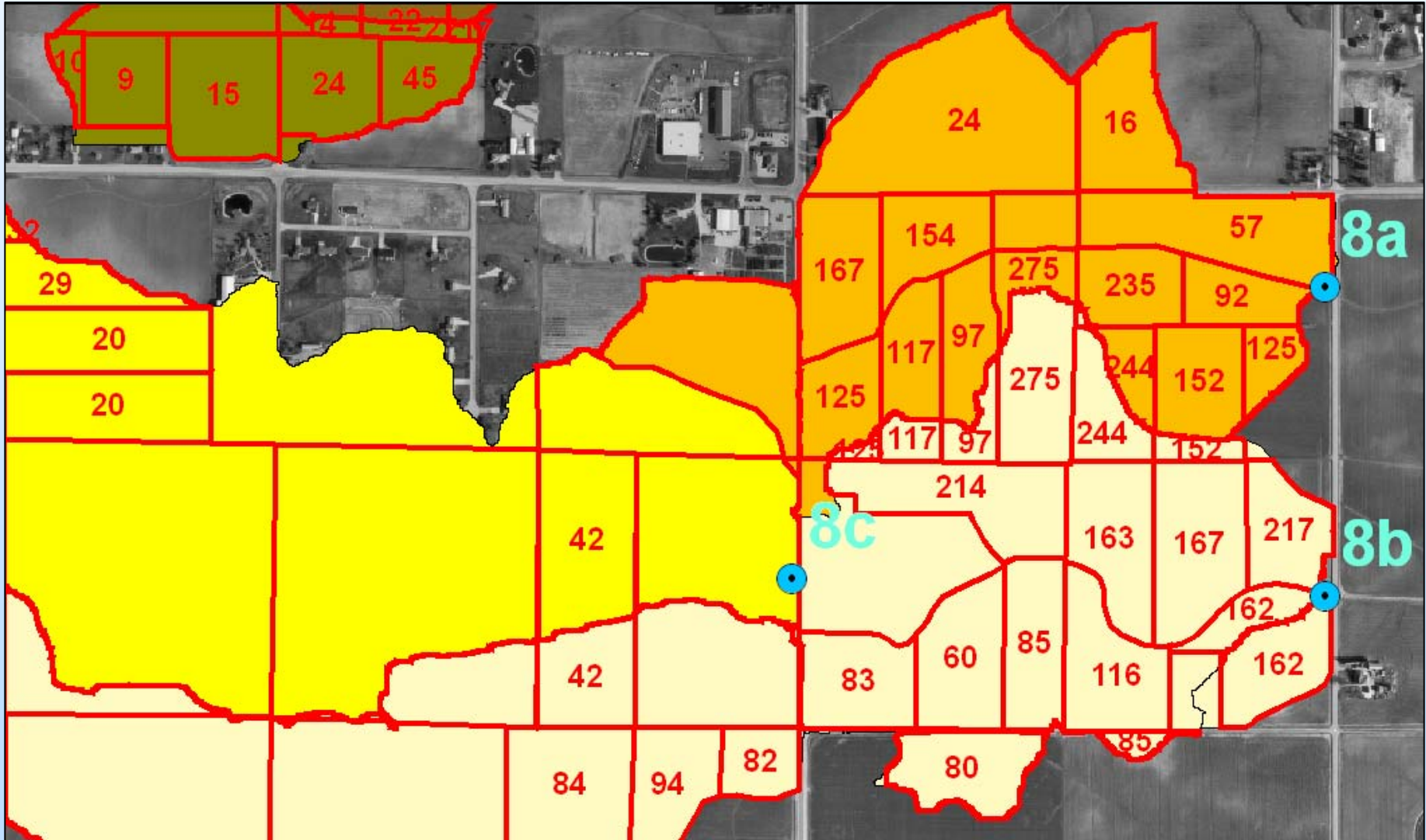
# Dissolved Phosphorus (mg/L) – 2004 - 2006



# Dissolved/Total Phosphorus Ratio – 2004- 2006

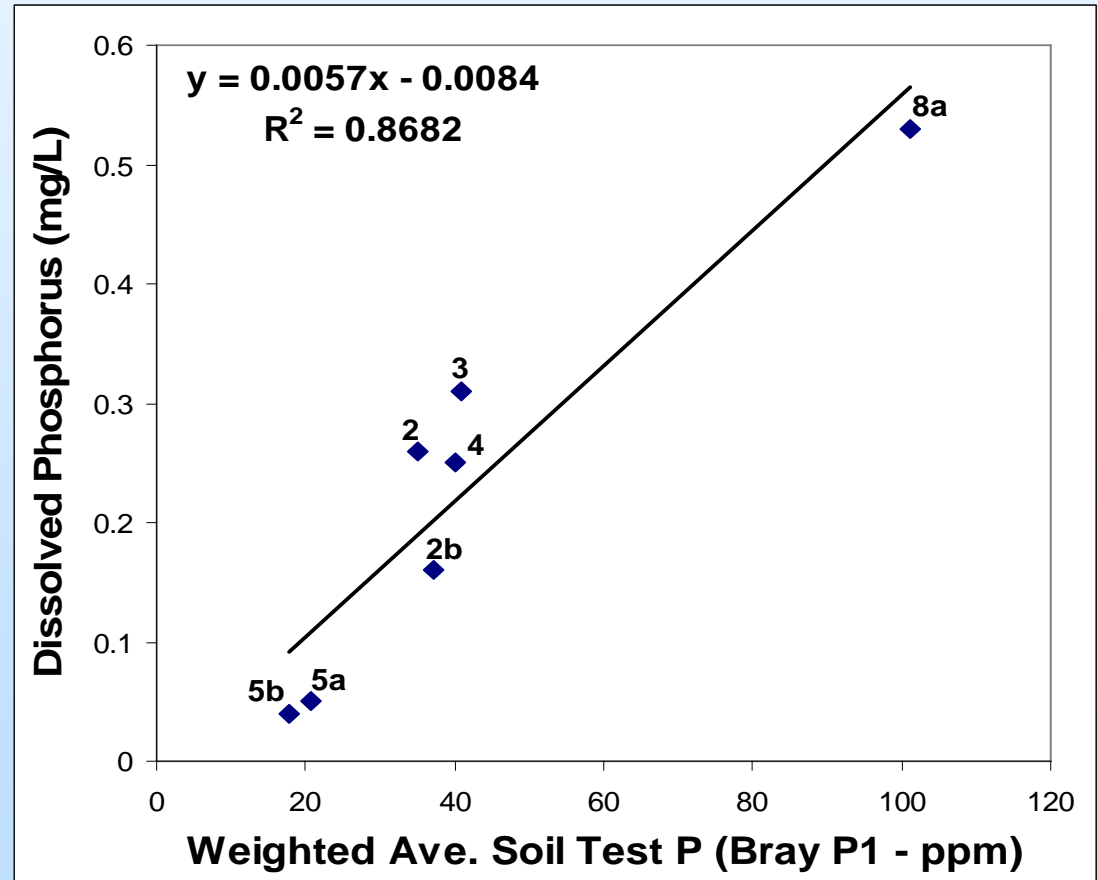


# Soil-Test P levels in Apple Creek Sub-Watershed (ppm Bray-P1)



# Soil Test P vs. DP in Streams

- Strong response to increasing STP on DP in streams



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# Conclusions

- DP fraction is high at main stem sites (40-70%)
    - Similar to earlier findings in LFR Sub-Basin
  - In stream DP conc. predicted well by soil test P (Bray-P1) and P-Index
  - In some areas, managing nutrients (i.e. lowering STP) may be the most effective means of reducing TP in streams
  - DP fractions were similar at the small scale to previous findings
  - No obvious net concentration change observed at different scales
- Main stem → Integrator → Source Areas

# Final Quote

💧 “...the answer to the question, Which form of P is predominant in surface runoff from agricultural land, dissolved or particulate?, is that it depends very much on the individual circumstances.”

Hart et. al., 2004

# Acknowledgements

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  - Dave Graczyk, Paul Reneau, Dale Robetson, and Troy Rutter (U.S. Geological Survey)
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# Questions?

[www.uwgb.edu/WATERSHED](http://www.uwgb.edu/WATERSHED)

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THE LOWER FOX RIVER



Watershed  
Monitoring  
Program

