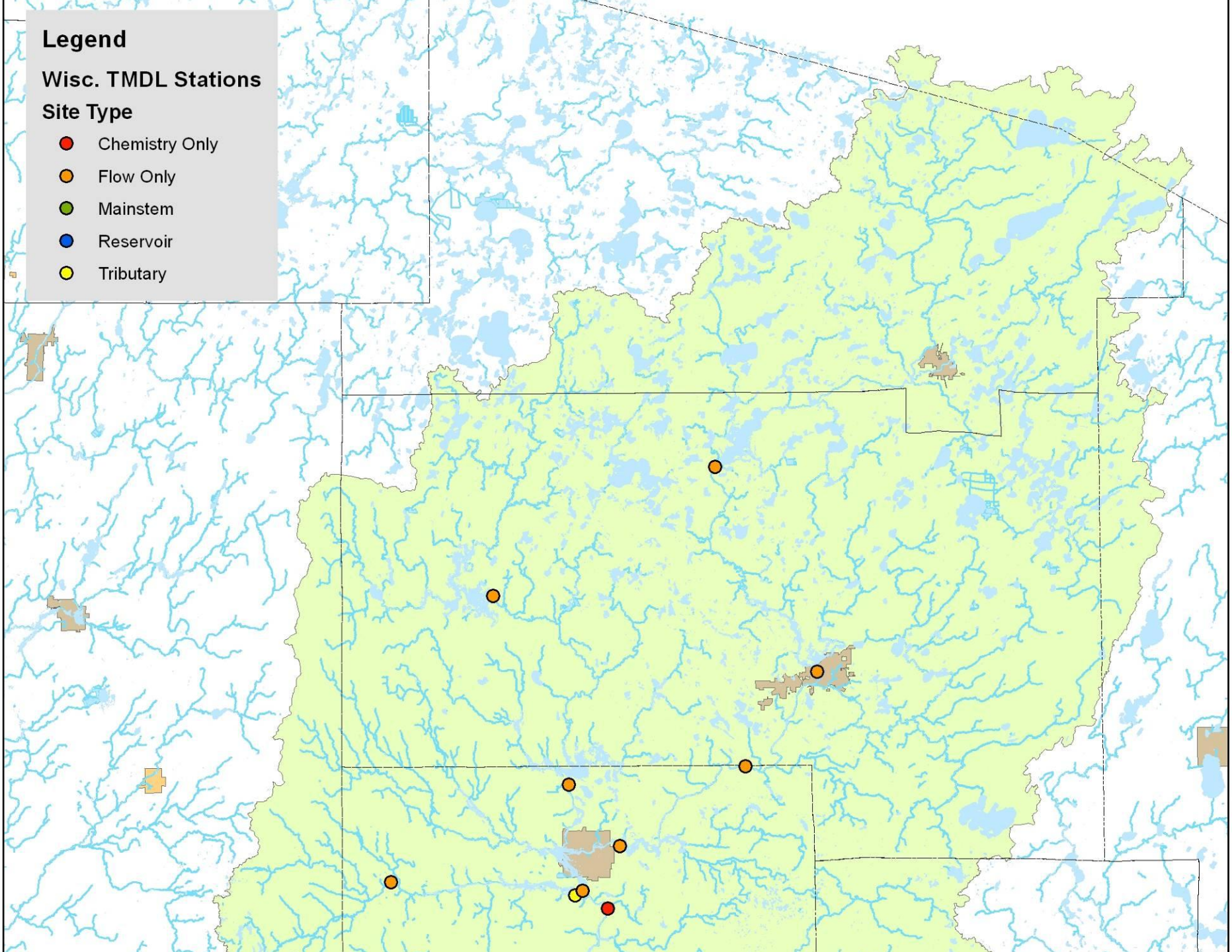
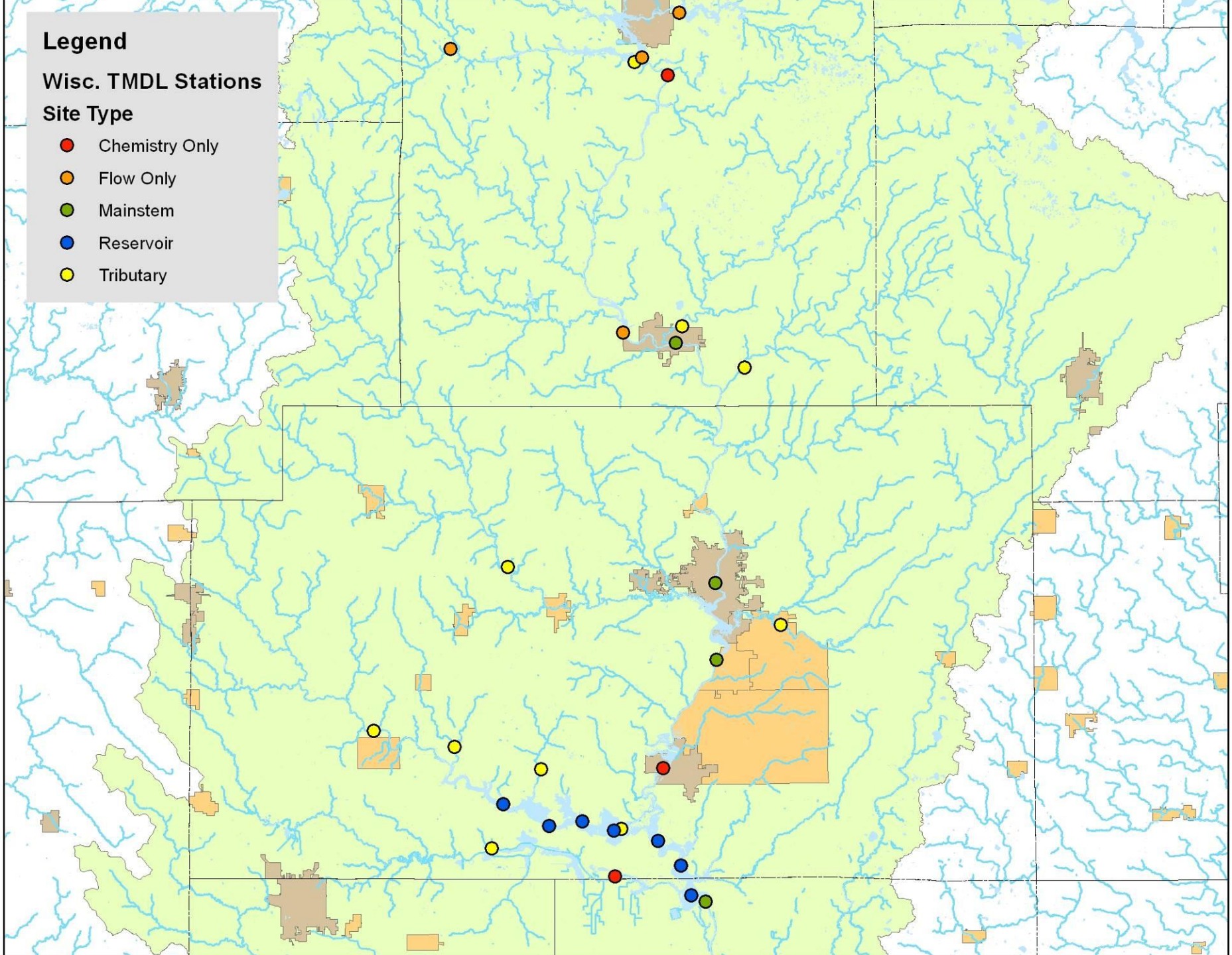
After 2 years of monitoring: What have we learned?

Pat Oldenburg
Water Resources Engineer
Wisconsin Dept. Natural Resources

Phosphorus criteria refresher

- Contained in s. NR 102.06 WI Admin. Code
- Rivers and Streams
  - Named rivers – 100 μg/L
    - Wisconsin River downstream of Rhinelander
    - Lemonweir River downstream of New Lisbon
    - Baraboo River downstream of La Valle
  - Other rivers in this study - 75 μg/L
- Lakes and Reservoirs
  - Natural lakes – 15 to 40 μg/L (none in this study)
  - Reservoirs
    - Stratified Reservoirs - 30 μg/L
      - Big Eau Pleine
    - Mixed Reservoirs - 40 μg/L
      - Lake Dubay, Petenwell, and Castle Rock


Legend
Wisc. TMDL Stations
Site Type
Chemistry Only
Flow Only
Mainstem
Reservoir
Tributary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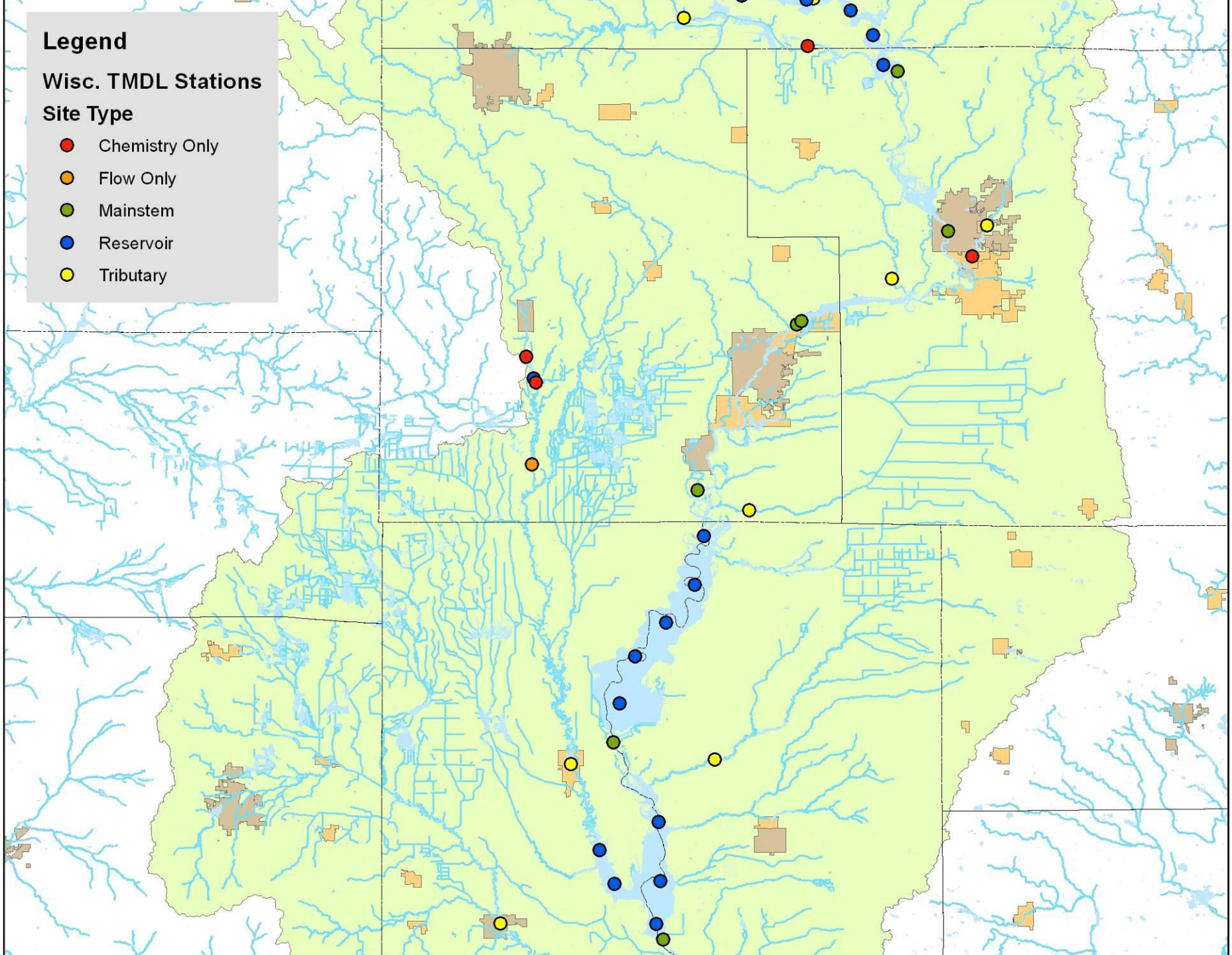
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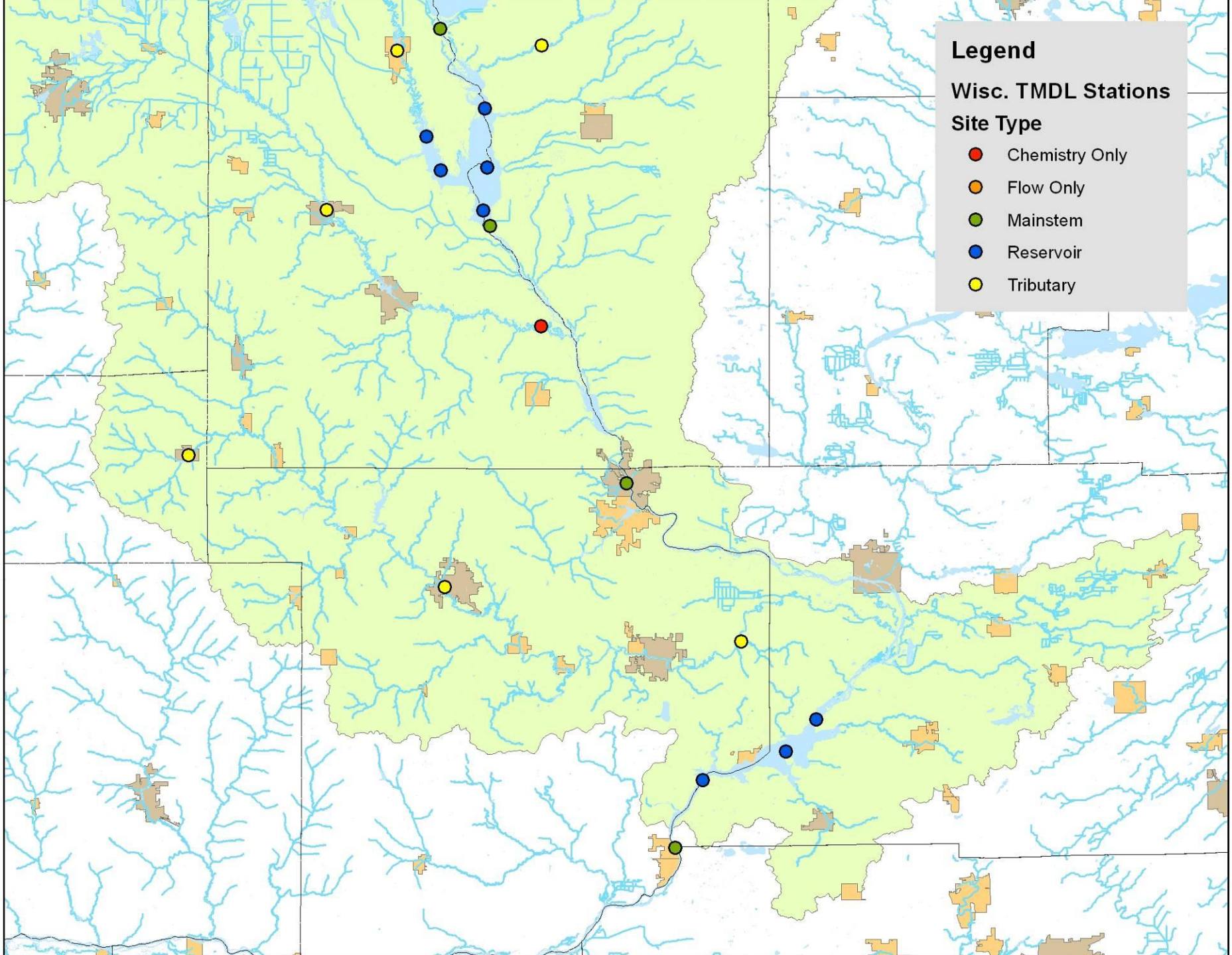
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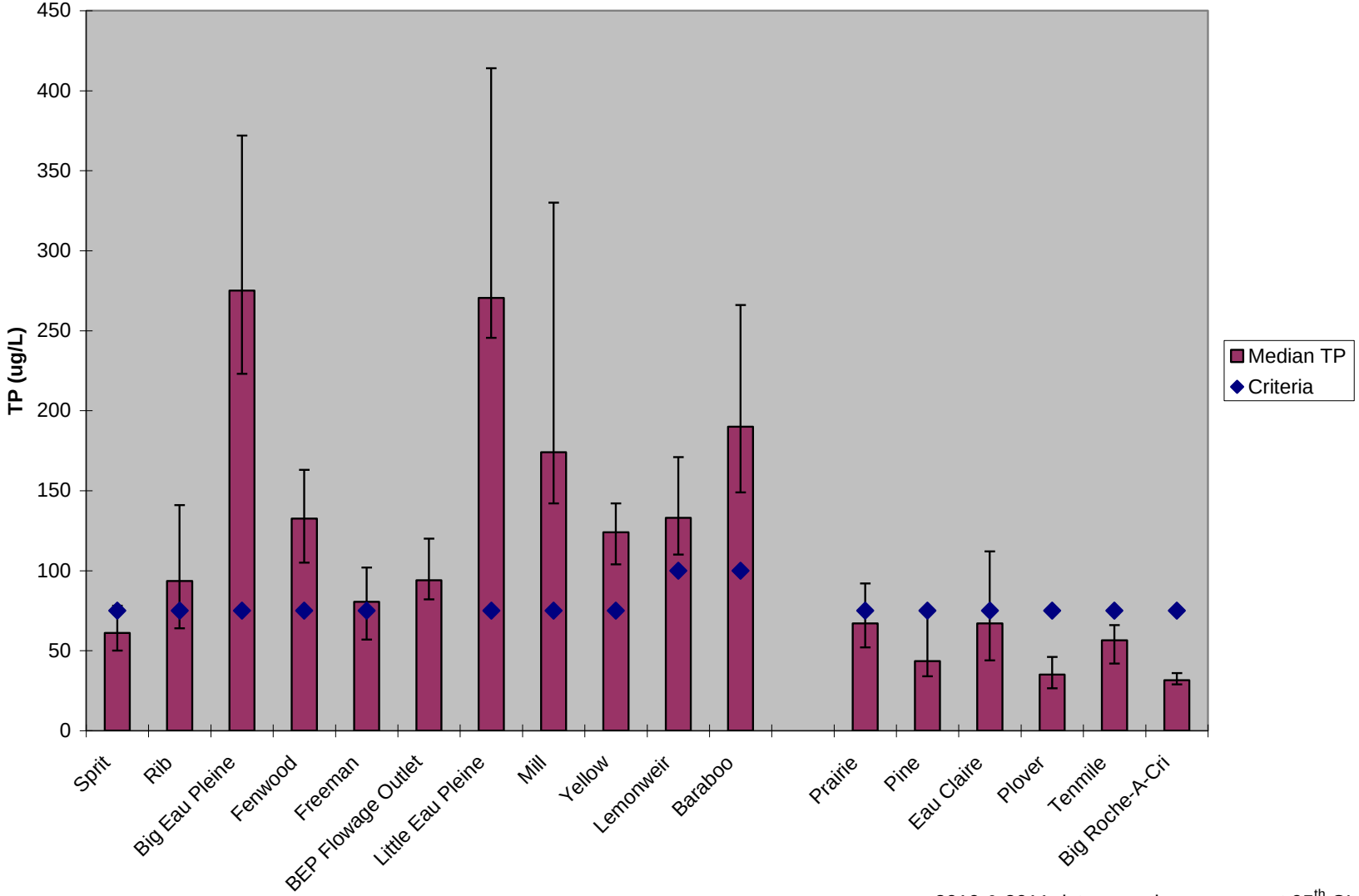
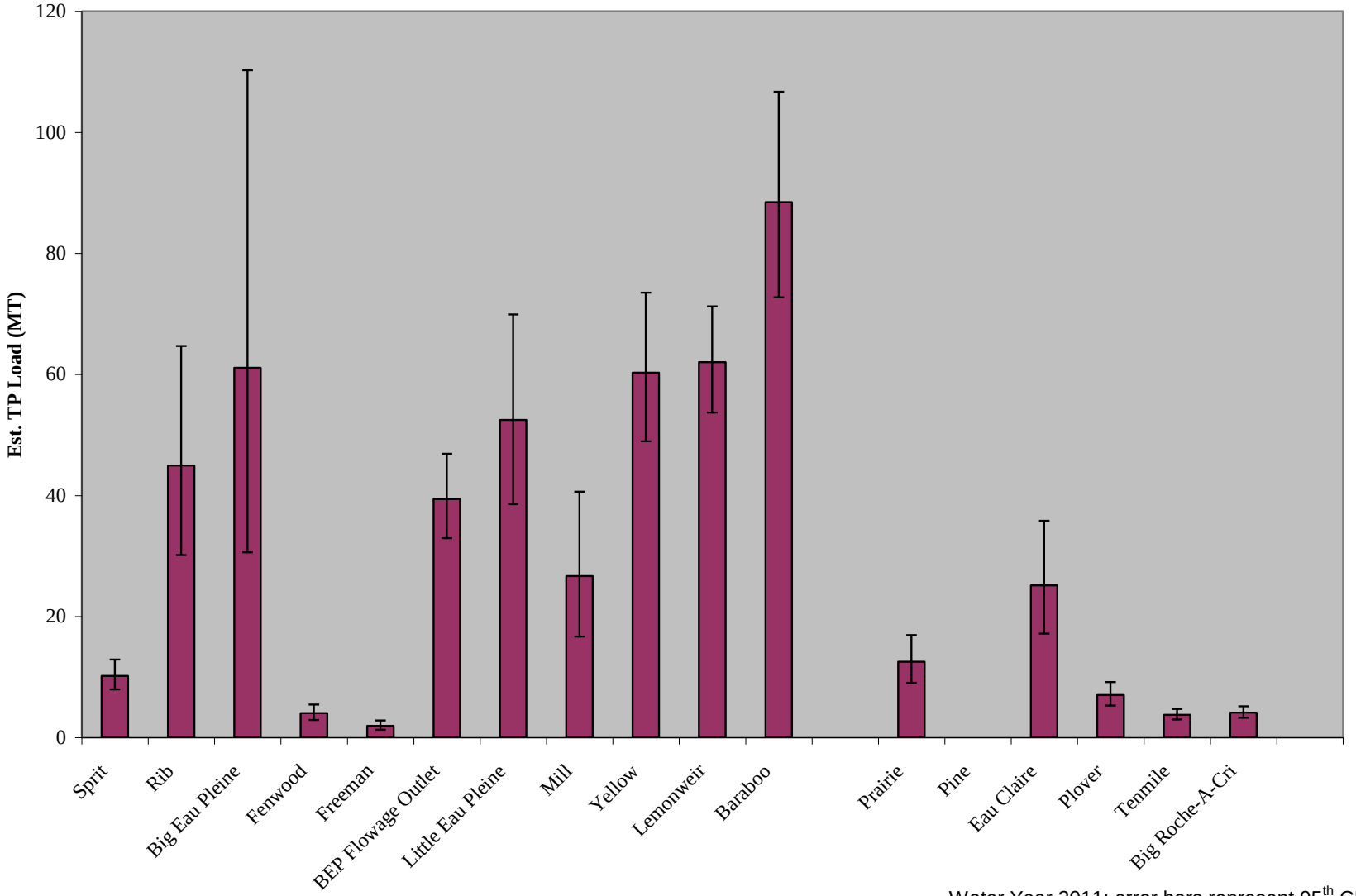
Wisconsin River Tributaries: May-Oct Medians



2010 & 2011 data; error bars represent 95th CI

Wisconsin River Tributaries: Preliminary Loads



Water Year 2011; error bars represent 95th CI

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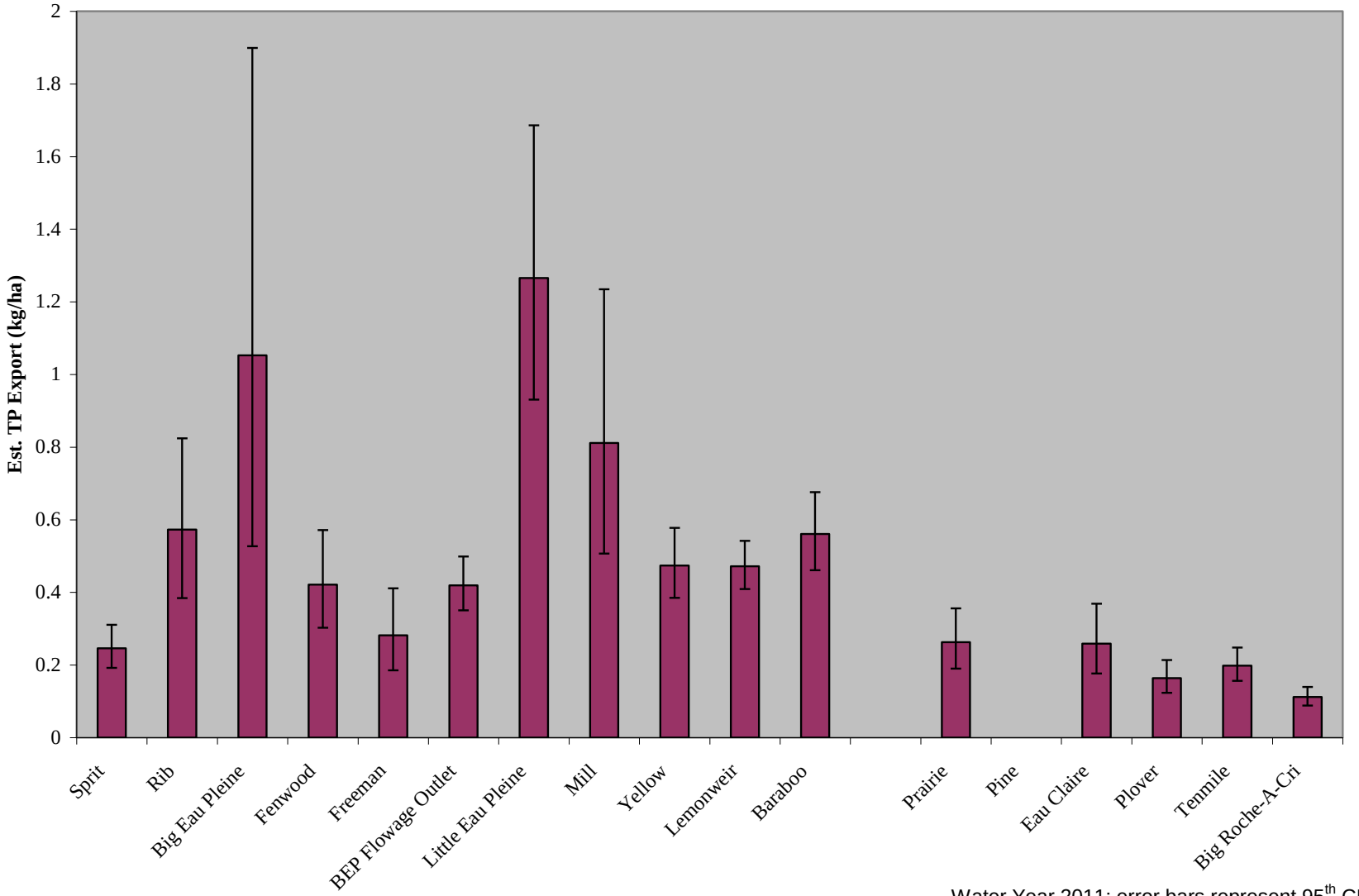

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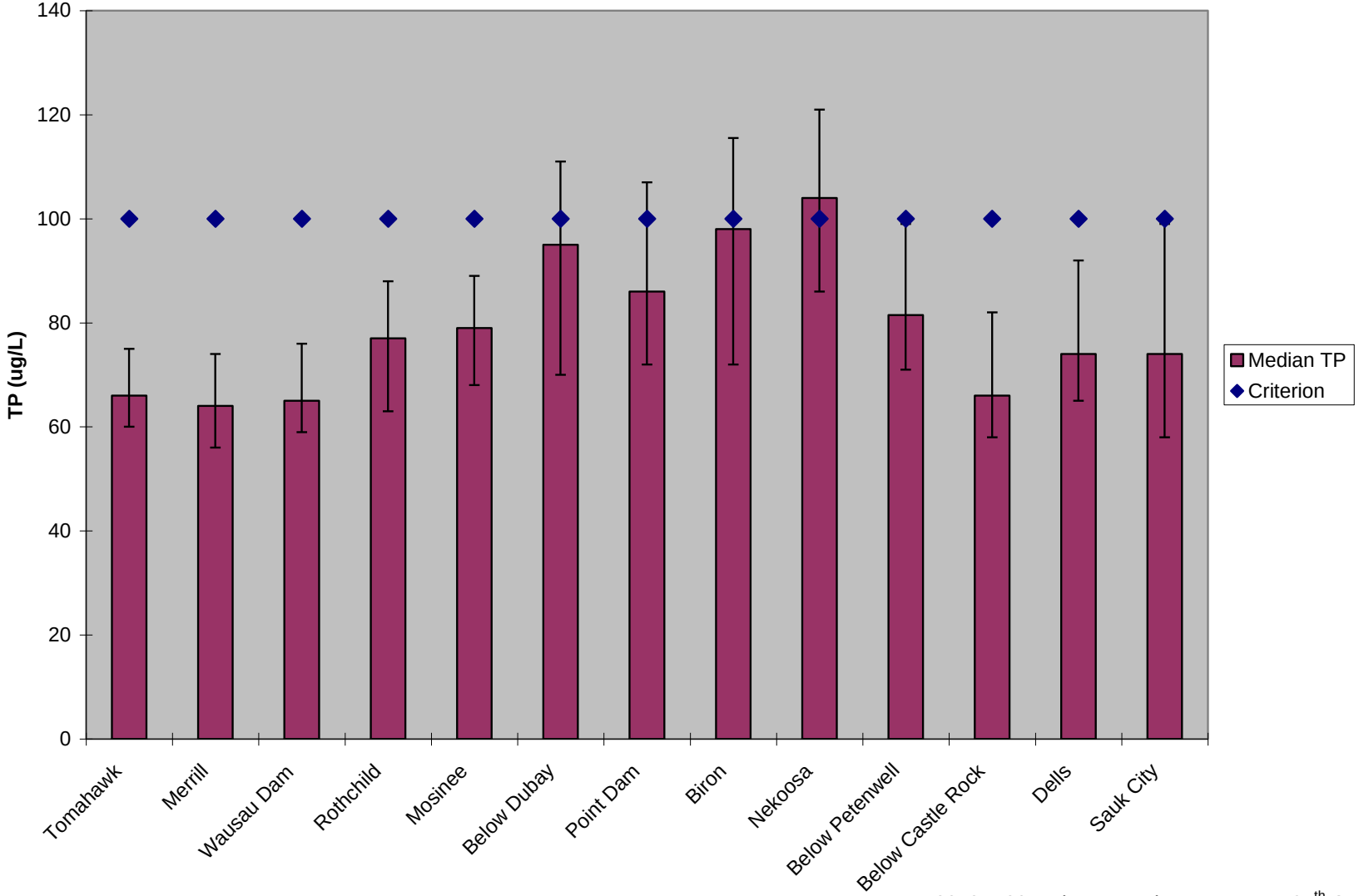
Wisconsin River: May-Oct Medians



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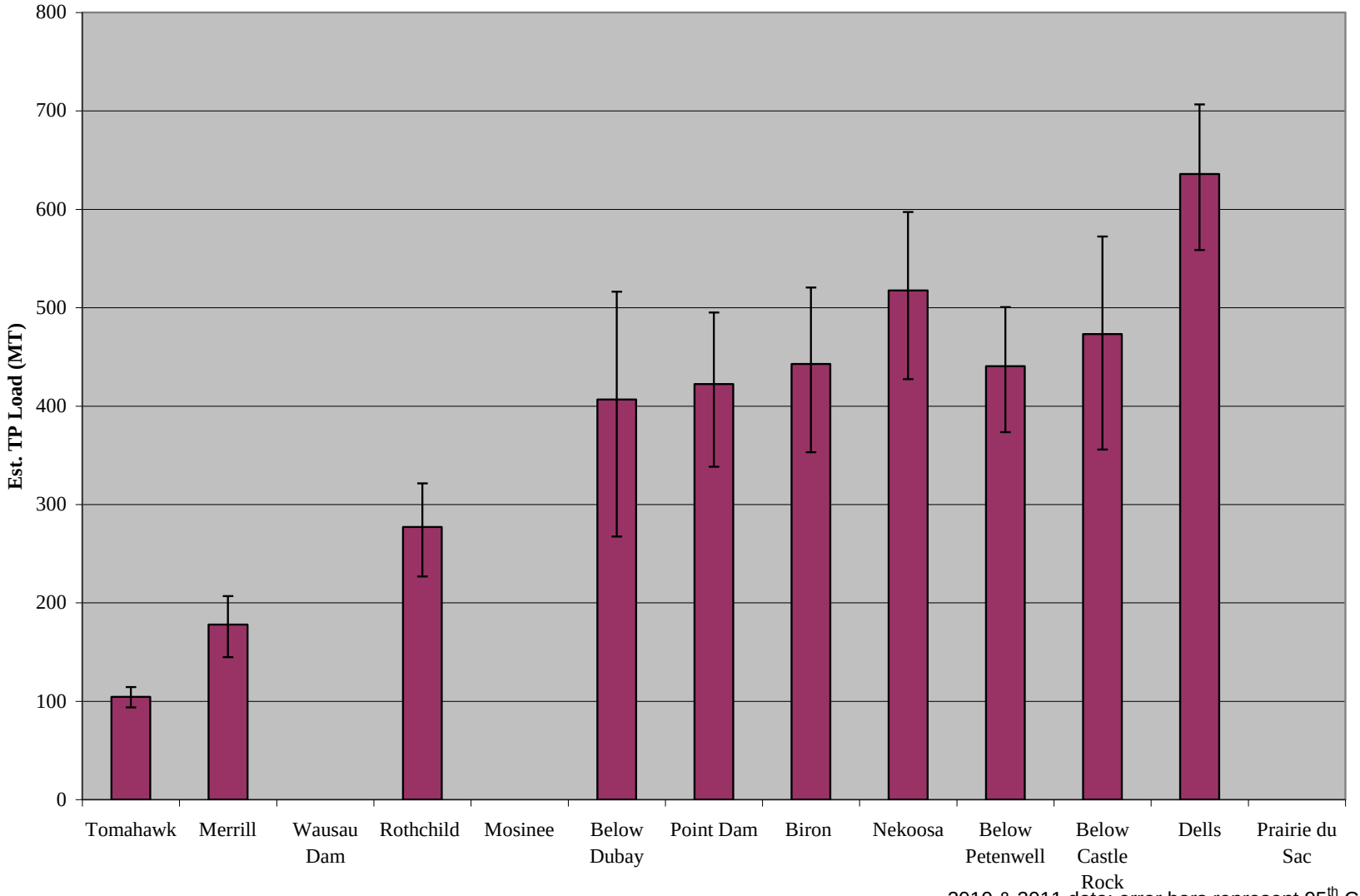

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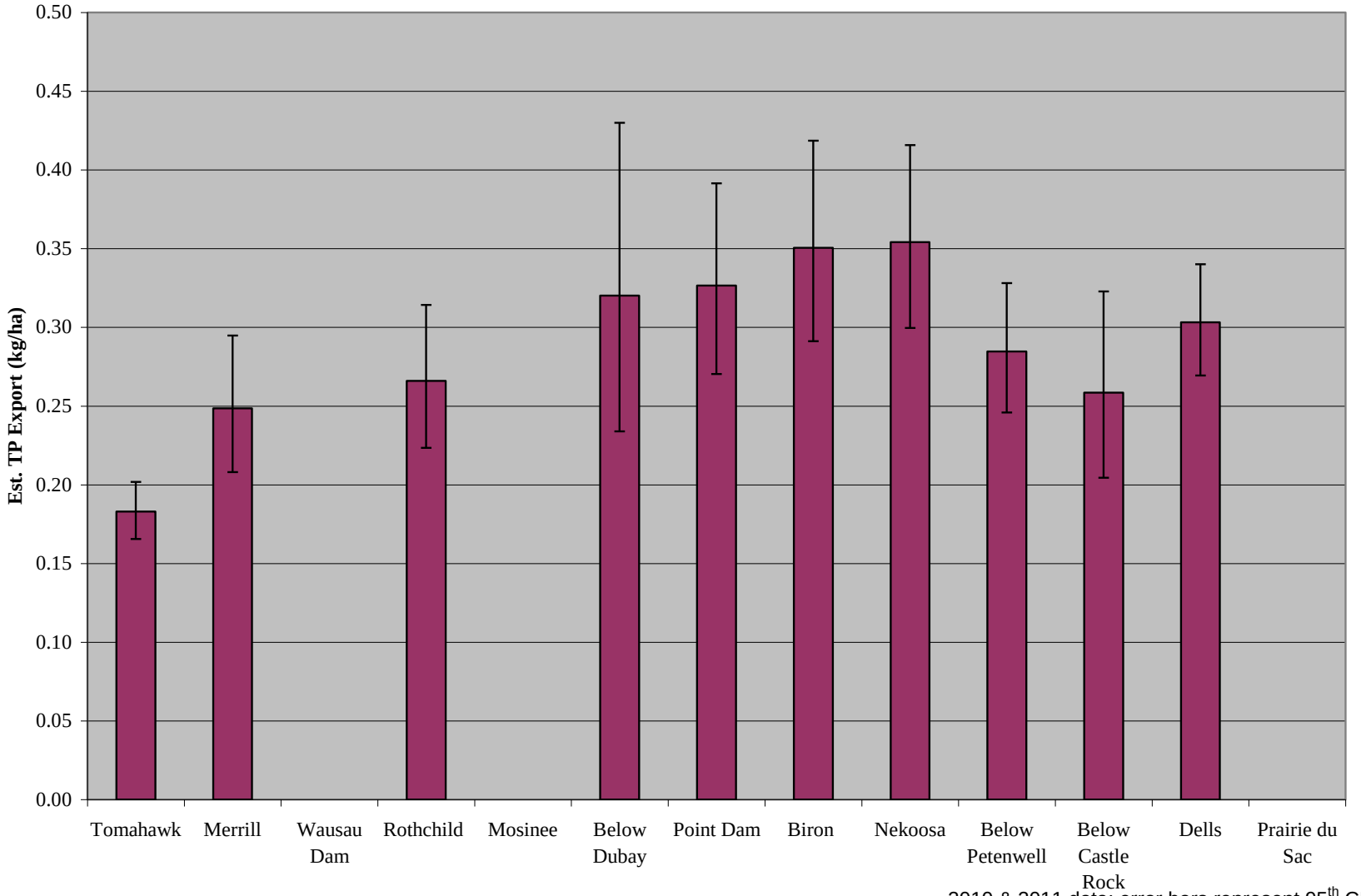
Wisconsin River: Preliminary Loads



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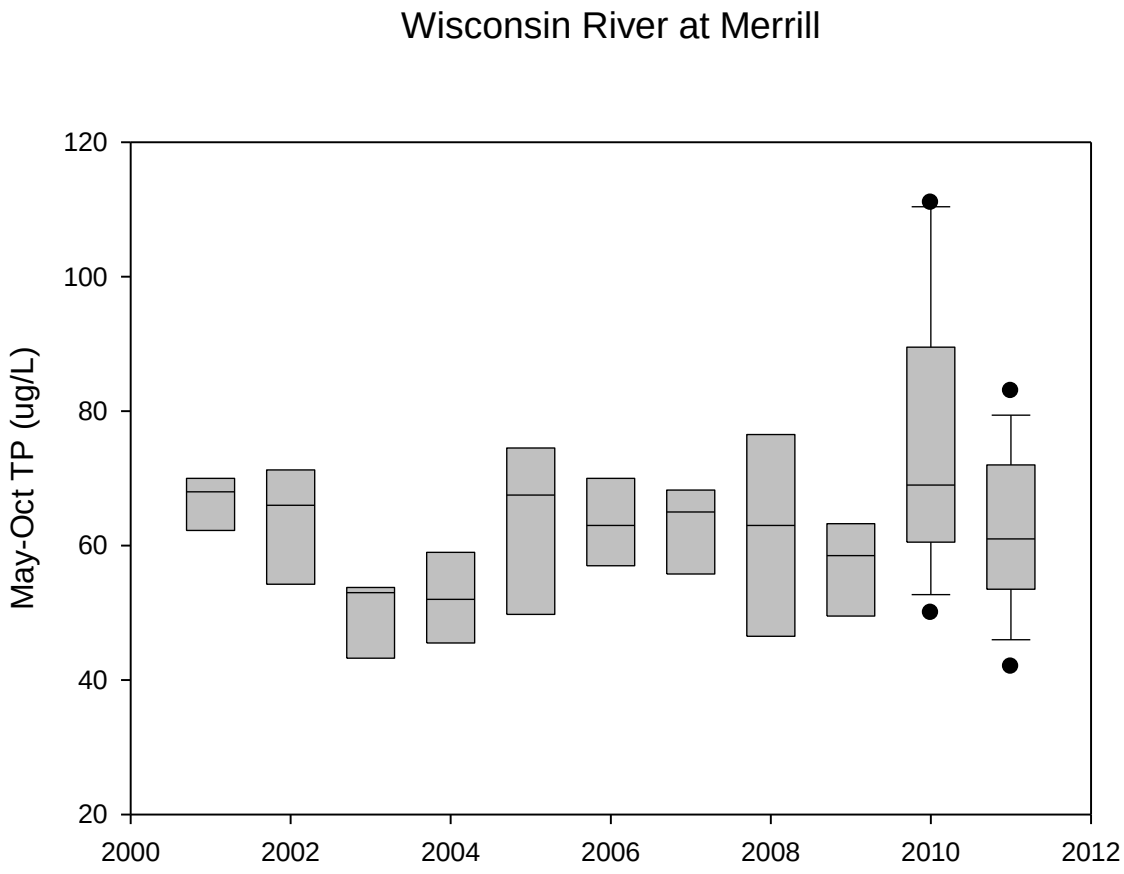
Longer Term Comparisons



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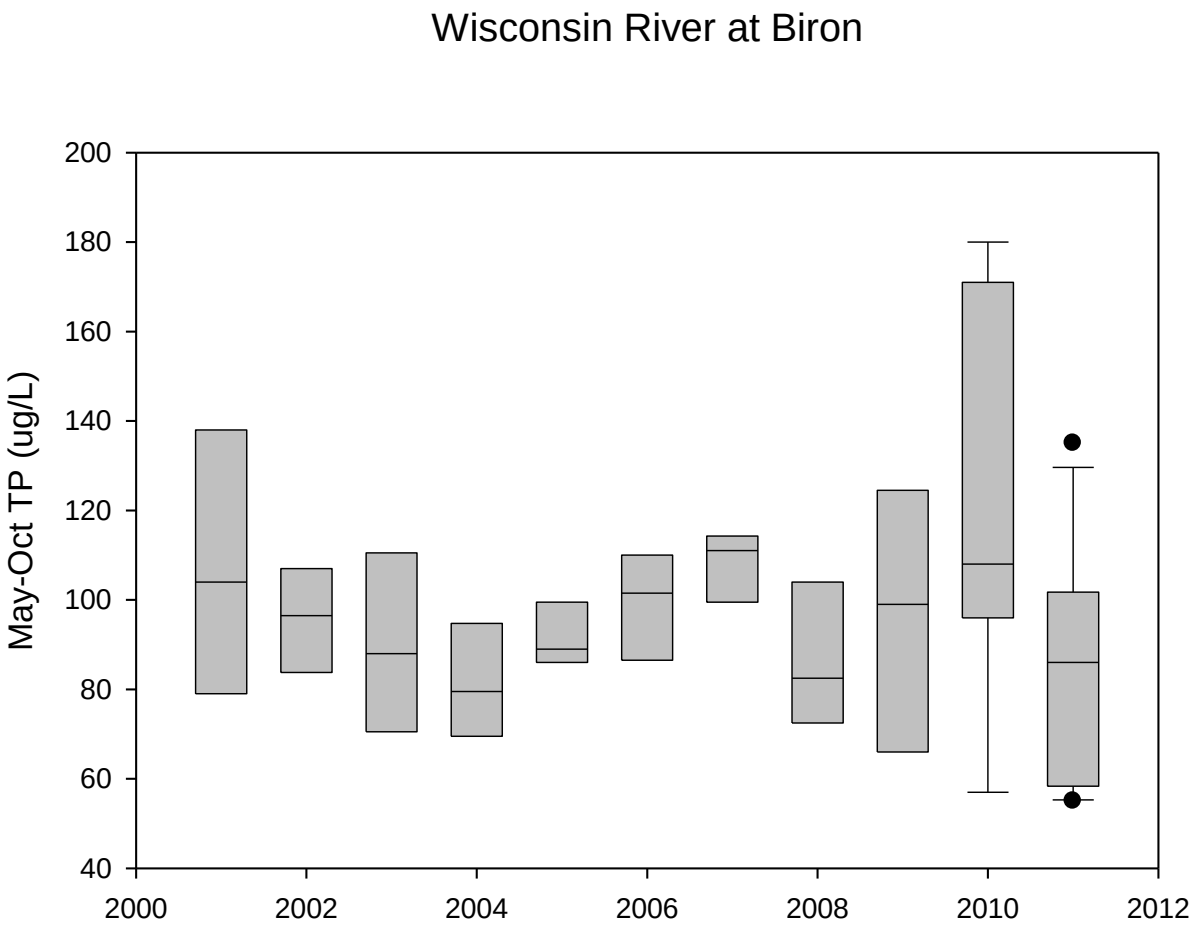

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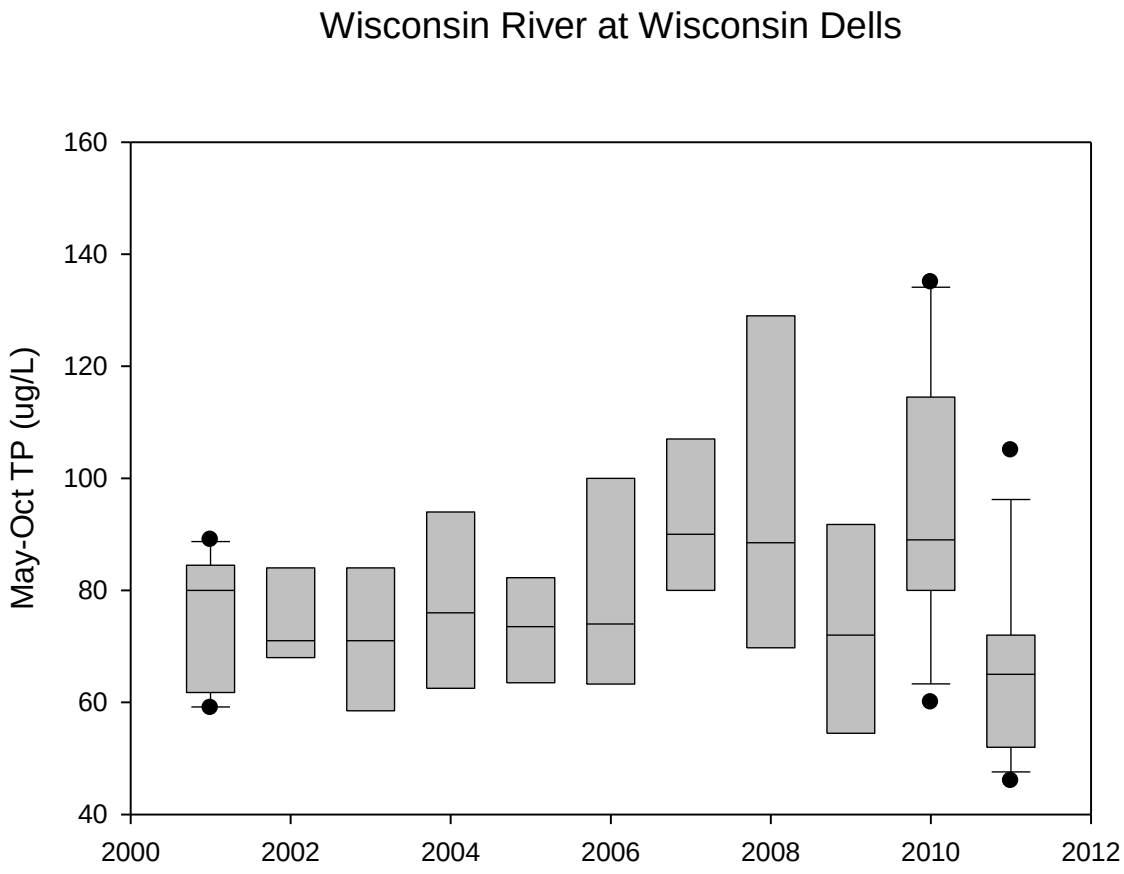
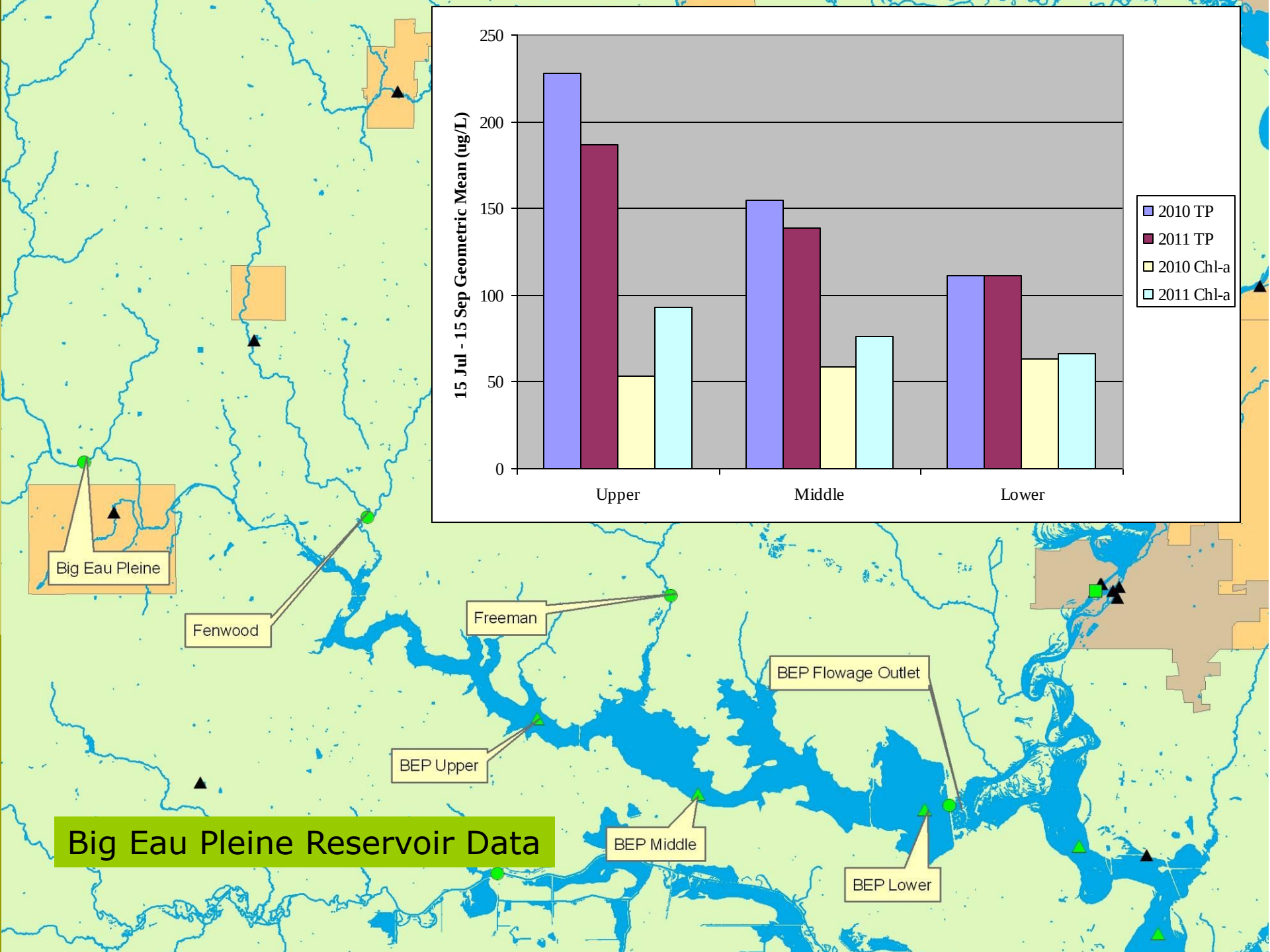
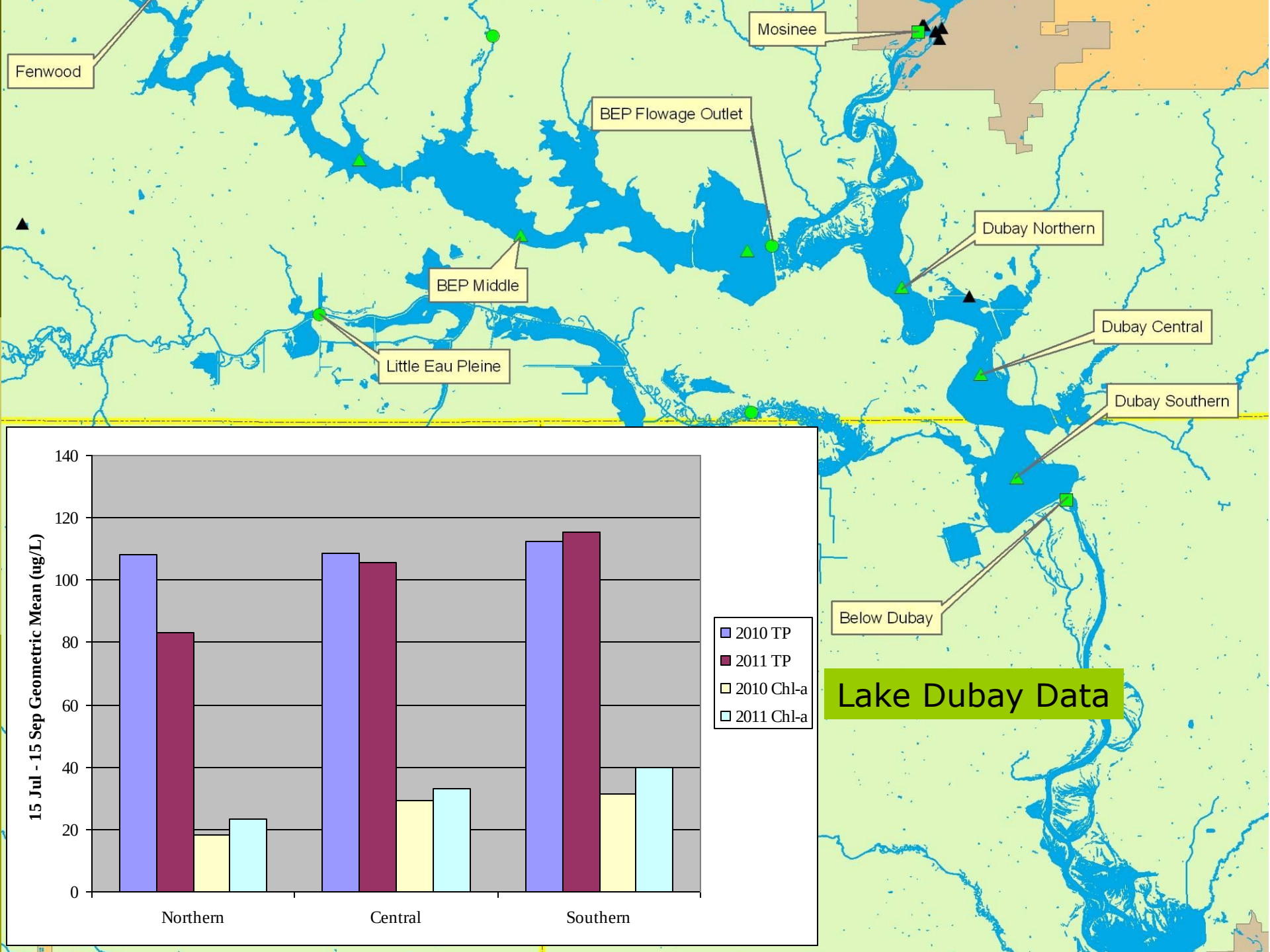
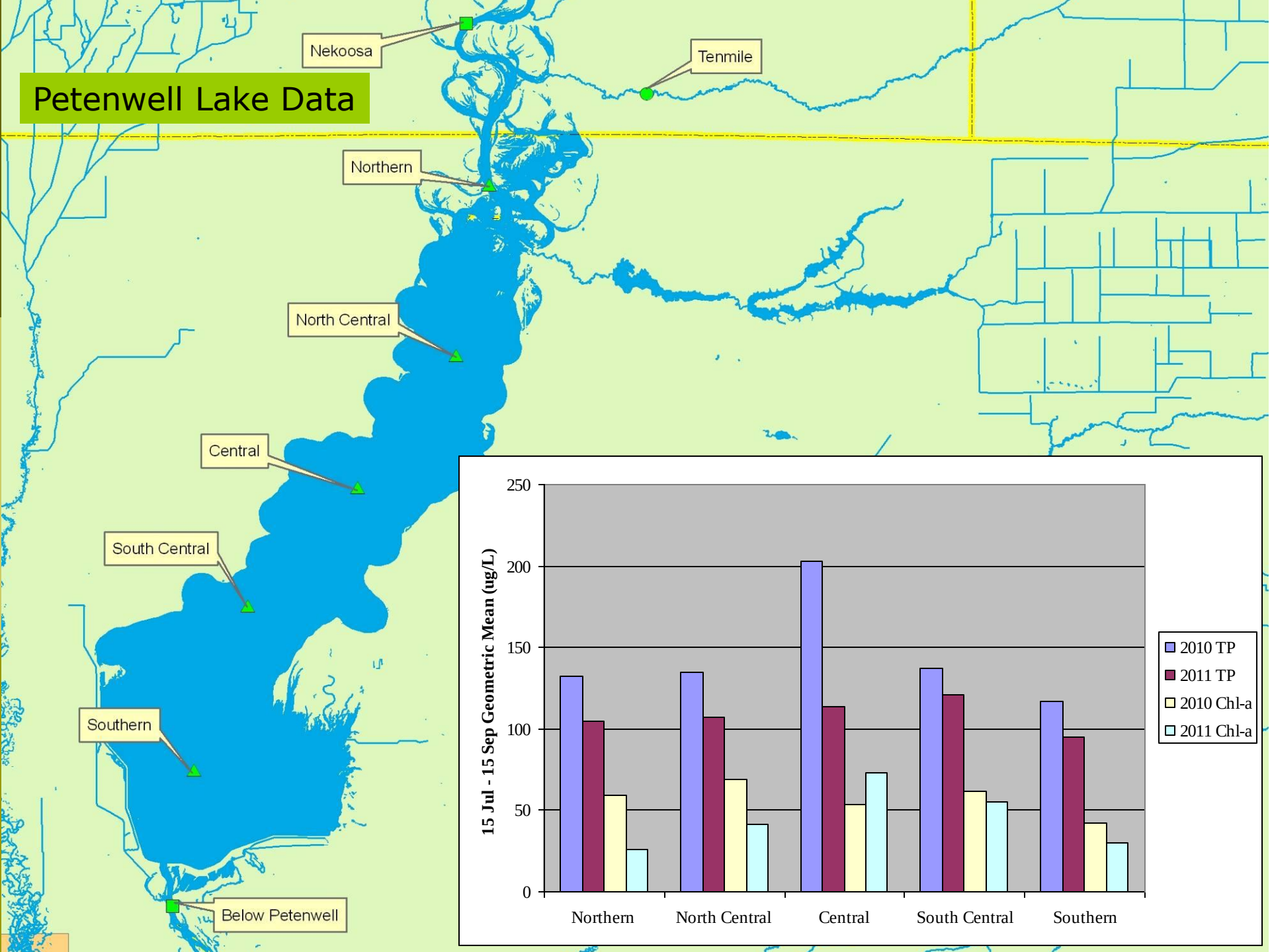




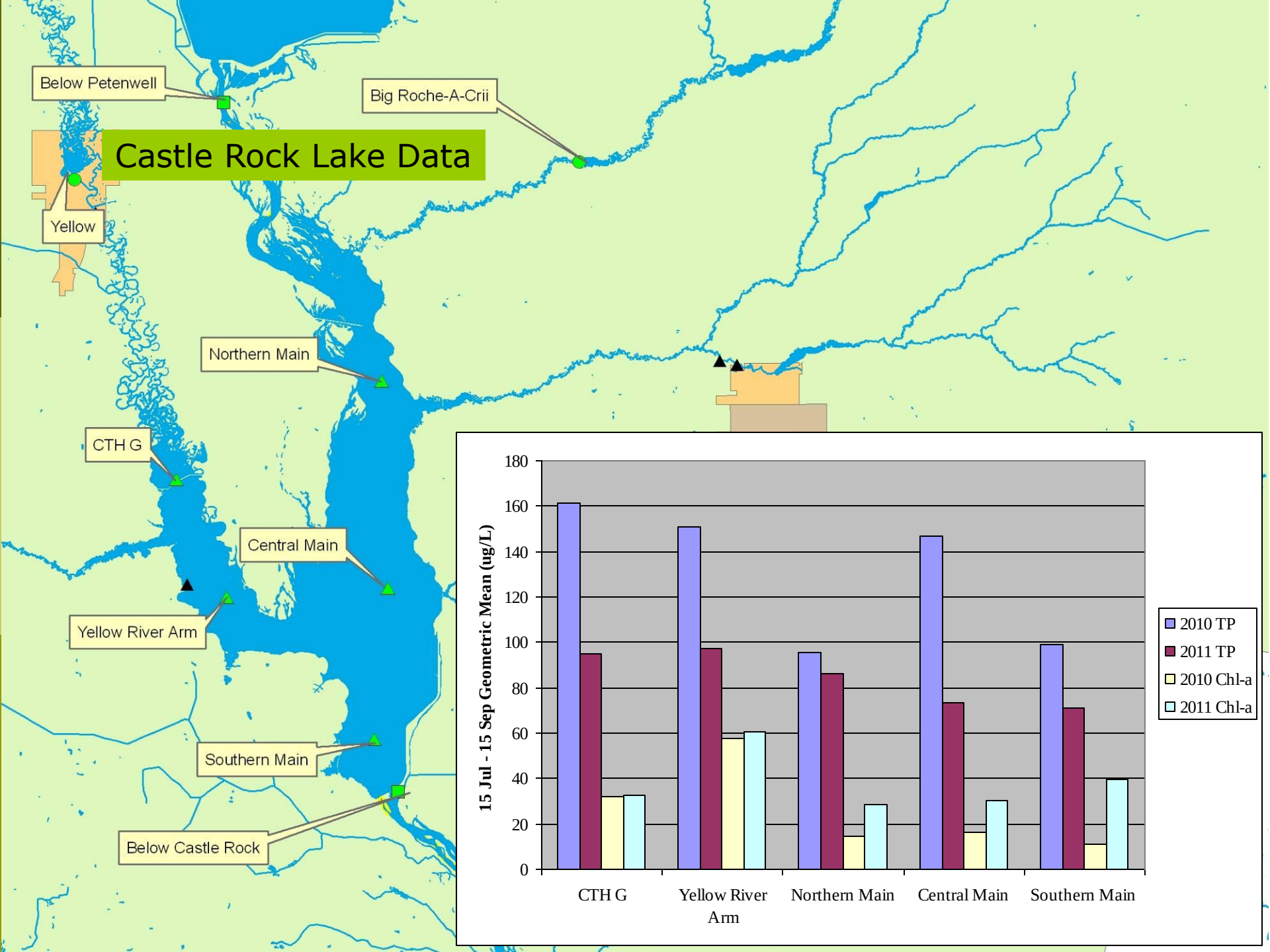
Big Eau Pleine Reservoir Data


Fenwood
Mosinee
BEP Flowage Outlet
Dubay Northern
BEP Middle
Dubay Central
Little Eau Pleine
Dubay Southern
Below Dubay
Lake Dubay Data
15 Jul - 15 Sep Geometric Mean (ug/L)
0
20
40
60
80
100
120
140
Northern
Central
Southern
2010 TP
2011 TP
2010 Chl-a
2011 Chl-a

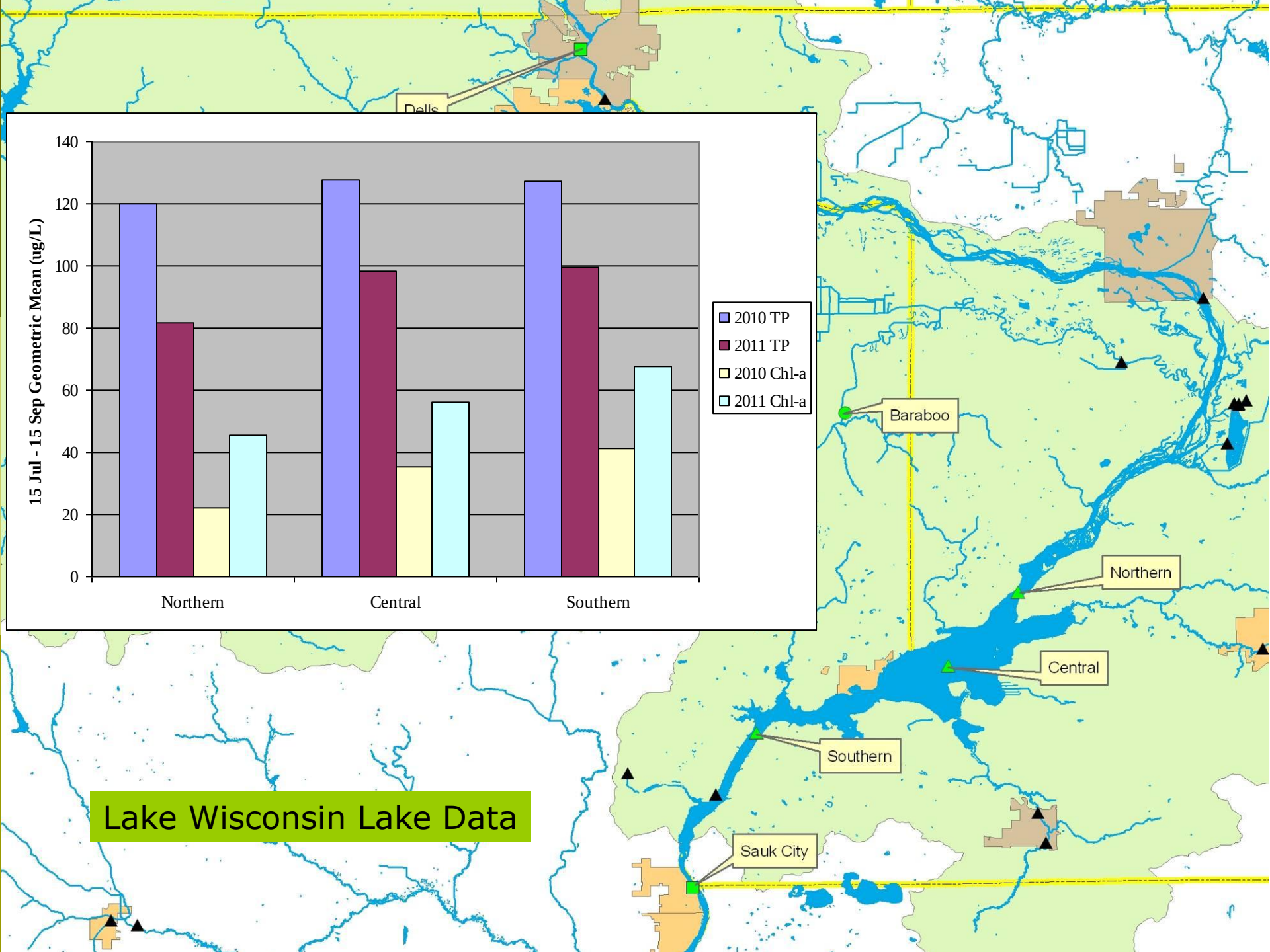
Petenwell Lake Data



Castle Rock Lake Data

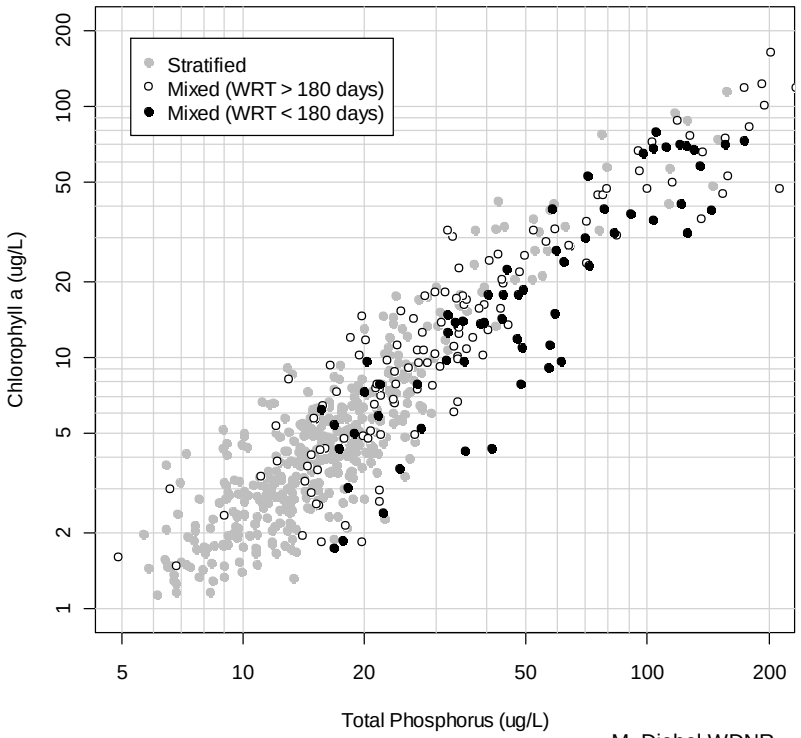


Lake Wisconsin Lake Data



Statewide look

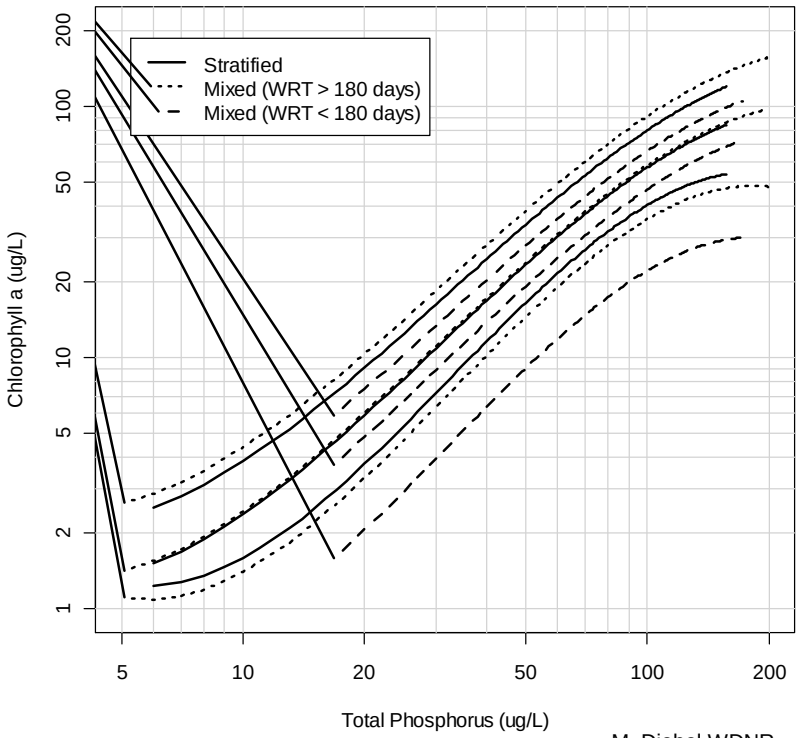
- Data from 249 lakes
  - Collected between 15 July and 15 September
  - Paired geometric means of phosphorus and chlorophyll
- Three lake types used in analysis
  - Stratified
  - Mixed (water retention time >180 days)
  - Mixed (water retention time <180 days)



M. Diebel WDNR

Statewide look

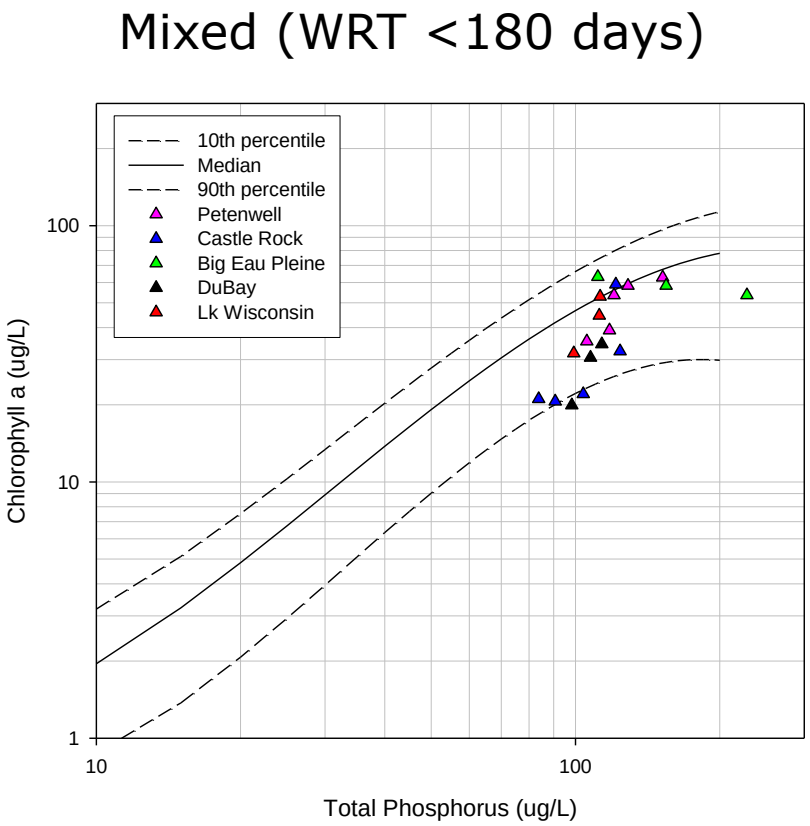
- Quantile regression analysis to describe chlorophyll-phosphorus relationship
- Results
  - Stratified and mixed (WRT >180 days) lakes produce similar amounts of chlorophyll for given amount of phosphorus
  - Mixed (WRT <180 days) lakes produce less chlorophyll for given amount of phosphorus than other types



M. Diebel WDNR

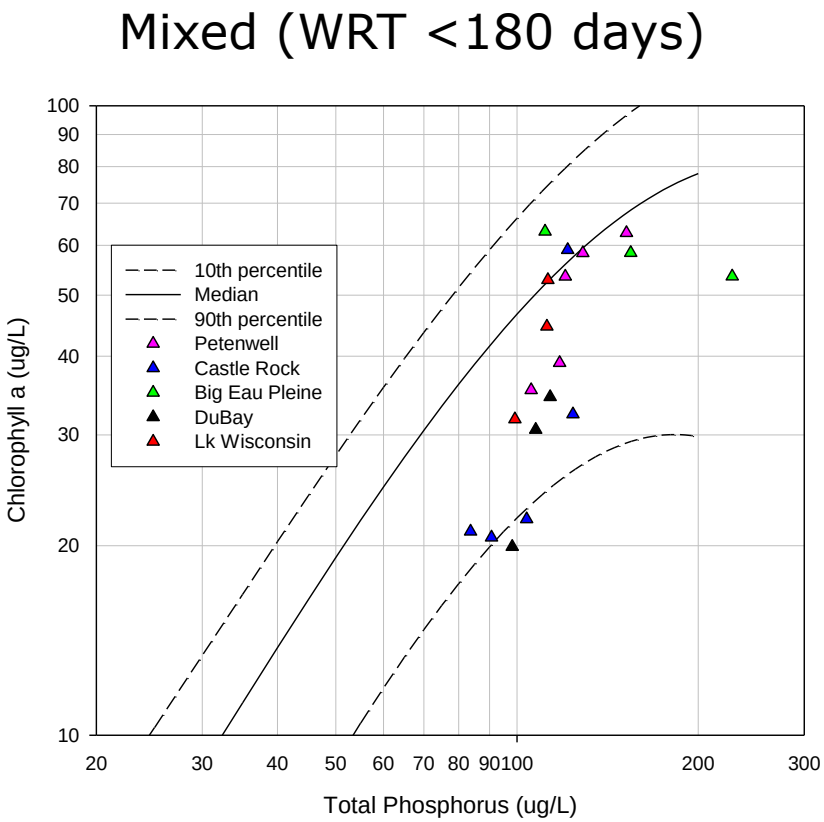
Wisconsin River flowages

- WI River flowages on the high end of data set



Wisconsin River flowages

- WI River flowages on the high end of data set
- Variation among flowages
- Variation among sites within flowages
- Needs further response analysis (i.e. modeling)



Conclusions

- Wisconsin River phosphorus concentrations generally increase north to south
  - Big Eau Pleine, Petenwell and Castle Rock appear to act as net sinks for phosphorus
  - Lake Dubay and Lake Wisconsin less clear
- Western tributaries exhibit much higher phosphorus concentrations and unit area loads than eastern tributaries
- Flowages generally exhibit poor water quality (Chlorophyll > 25 μg/L)
  - Algae blooms are variable and heterogeneous
  - Some sites are sensitive to hydraulic residence time (flushing rates)