Wisconsin River Basin TMDL

June 14, 2018

Lake Wisconsin Alliance Meeting

WISCONSIN
DEPT. OF NATURAL RESOURCES

Why the TMDL was Started

2001-2004
Unsuccessful Funding Proposals

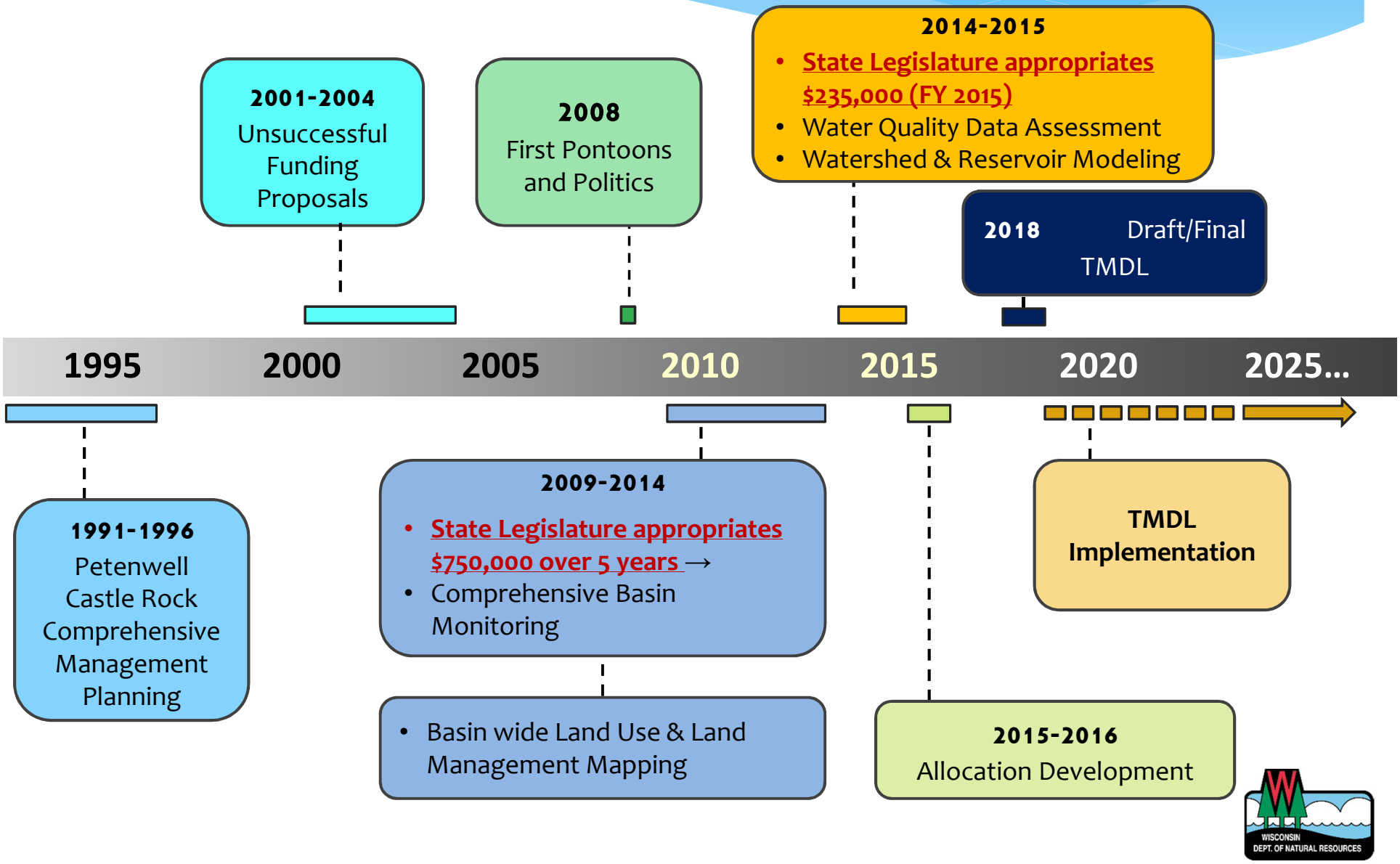
2008
First Pontoons and Politics

1995 2000 2005 2010

1991-1996
Petenwell Castle Rock Comprehensive Management Planning

WISCONSIN DEPT. OF NATURAL RESOURCES

Multi-year effort with more than $2.8 million in State and Federal Spending



Draft Report

Section 1: Introduction

Section 2: Watershed Characterization

Section 3: Monitoring

Section 4: Source Assessment

Section 5: Pollutant Loading Capacity

Section 6: Pollutant Load Allocations

Section 7: TMDL Implementation

Section 8: Public Participation

Total Maximum Daily Load for Total Phosphorus in the Wisconsin River Basin

February 21, 2018 DRAFT

02/21/2018

Including Adams, Clark, Columbia, Dane, Jackson, Juneau, Langlade, Lincoln, Marathon, Monroe, Oneida, Portage, Price, Richland, Sauk, Shawano, Taylor, Vilas, Waushara, and Wood Counties, Wisconsin

Prepared For :
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Appendices

Moon Bay, Lake Wisconsin July, 2008

What are TMDLs?

* EPA requires that waters not meeting water quality standards be listed as impaired on Wisconsin's 303-d list and have TMDLs or a comparable water quality restoration plan developed.
* TMDLs determine the amount of a pollutant a waterbody can receive and still meet water quality standards.

Total Maximum Daily Load =

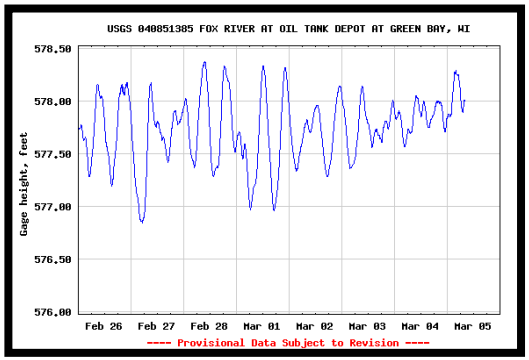
Load Allocation

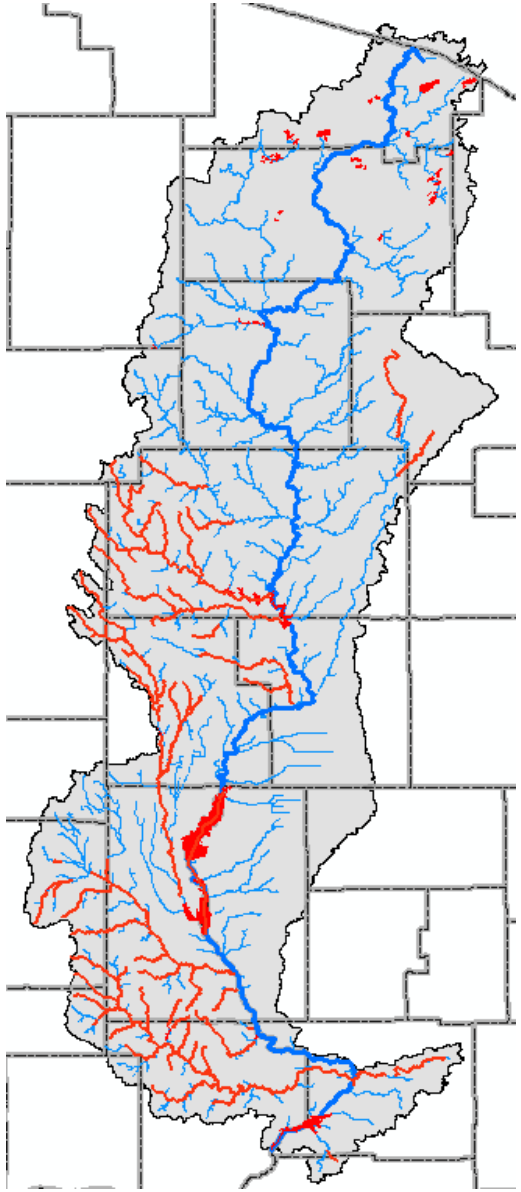
+

Waste Load Allocation

+

Margin of Safety





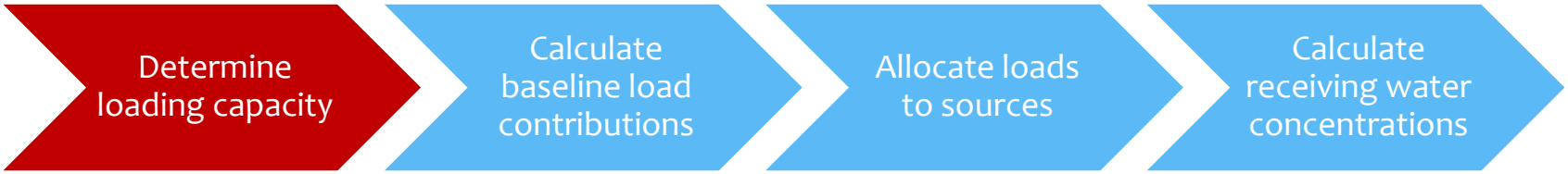
- Phosphorus Impaired Waters (2016)
  - 110 streams/rivers segments
  - 38 lakes/reservoirs

Report Section 3

Monitoring

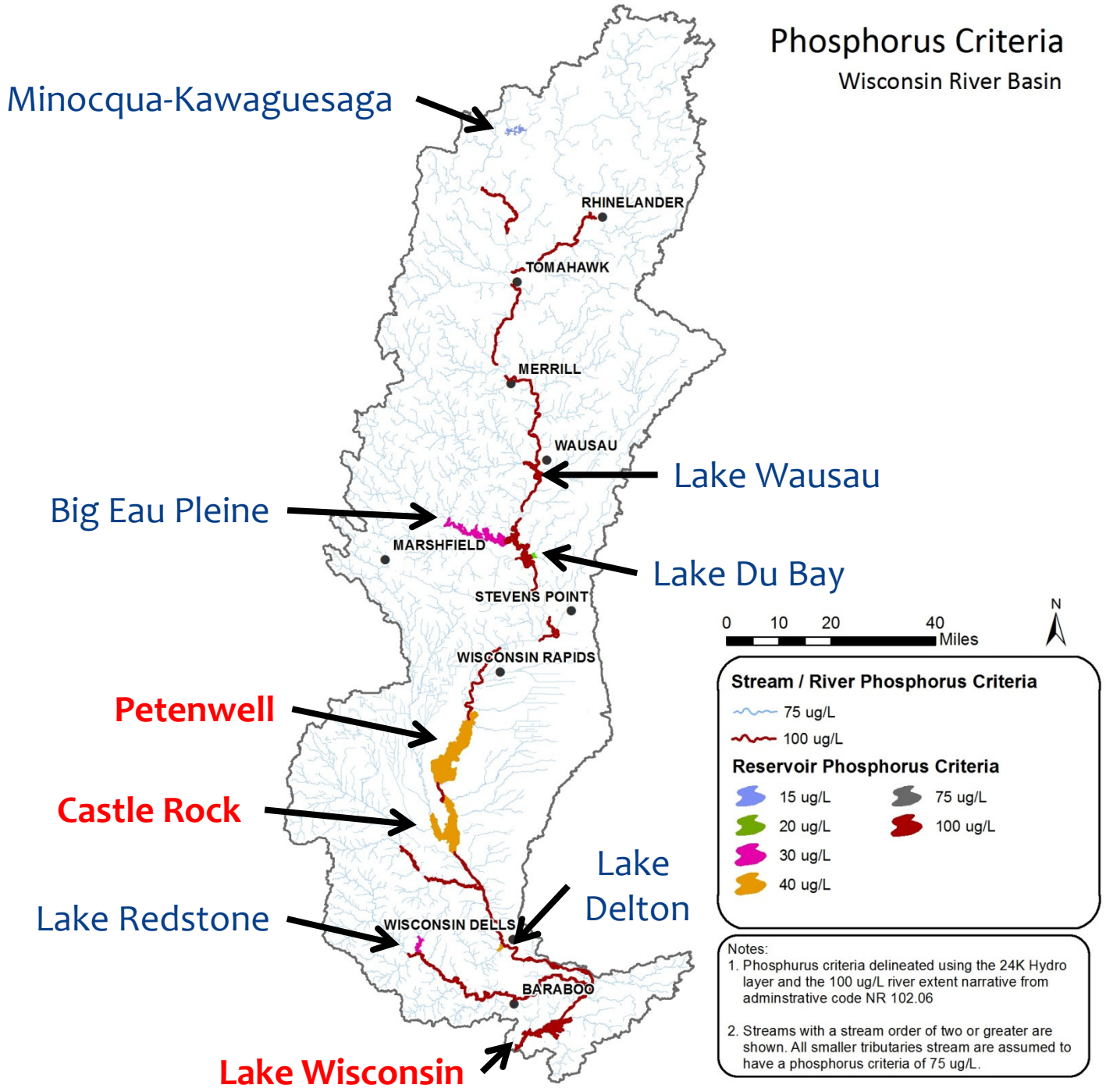
* Extensive water quality monitoring 2010 – 2013
  * 13 main stem Wisconsin River sites
  * 19 tributary sites
  * 20 reservoir sites
  * Water quality samples every 2 weeks
  * Continuous river flow
* Foundation of all other project components

TMDL Development Process



* For each reach:
  * Loading capacity = Water Quality Target * Flow

* For lakes and reservoirs a response model is needed to simulate loads based on waterbody characteristics to determine pollutant response (algal growth vs TP)

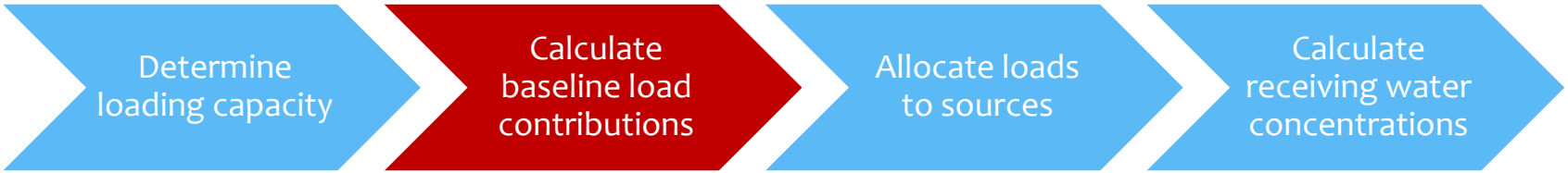

Phosphorus Criteria
Wisconsin River Basin
Minocqua-Kawaguesaga
RHINELANDER
TOMAHAWK
MERRILL
WAUSAU
Lake Wausau
Big Eau Pleine
MARSHFIELD
Lake Du Bay
STEVENS POINT
WISCONSIN RAPIDS
Petenwell
Castle Rock
Lake Delton
Lake Redstone
WISCONSIN DELLS
BARABOO
Lake Wisconsin
0 10 20 40 Miles
N
Stream / River Phosphorus Criteria
75 ug/L
100 ug/L
Reservoir Phosphorus Criteria
15 ug/L
20 ug/L
30 ug/L
40 ug/L
75 ug/L
100 ug/L
Notes:
1. Phosphurus criteria delineated using the 24K Hydro layer and the 100 ug/L river extent narrative from adminstrative code NR 102.06
2. Streams with a stream order of two or greater are shown. All smaller tributaries stream are assumed to have a phosphorus criteria of 75 ug/L.

Site-Specific Total Phosphorus Criteria for Petenwell Flowage, Castle Rock Flowage, and Lake Wisconsin

Reservoir	Existing TP Criterion (µg/L)	Recommended Site-Specific TP Criterion (µg/L)
Petenwell Flowage	40	53
Castle Rock Flowage	40	55
Lake Wisconsin	100	47

Calculated to support recreational use by preventing excessive algae (Chlorophyll a shall not exceed 20 µg/L more than 30% of days during July 15 – Sept 15)

TMDL Development Process



* Baseline conditions based on existing regulatory requirements or current discharge for point sources.

* Nonpoint source baseline represents existing land management (See Section 5).

Defining Land Management

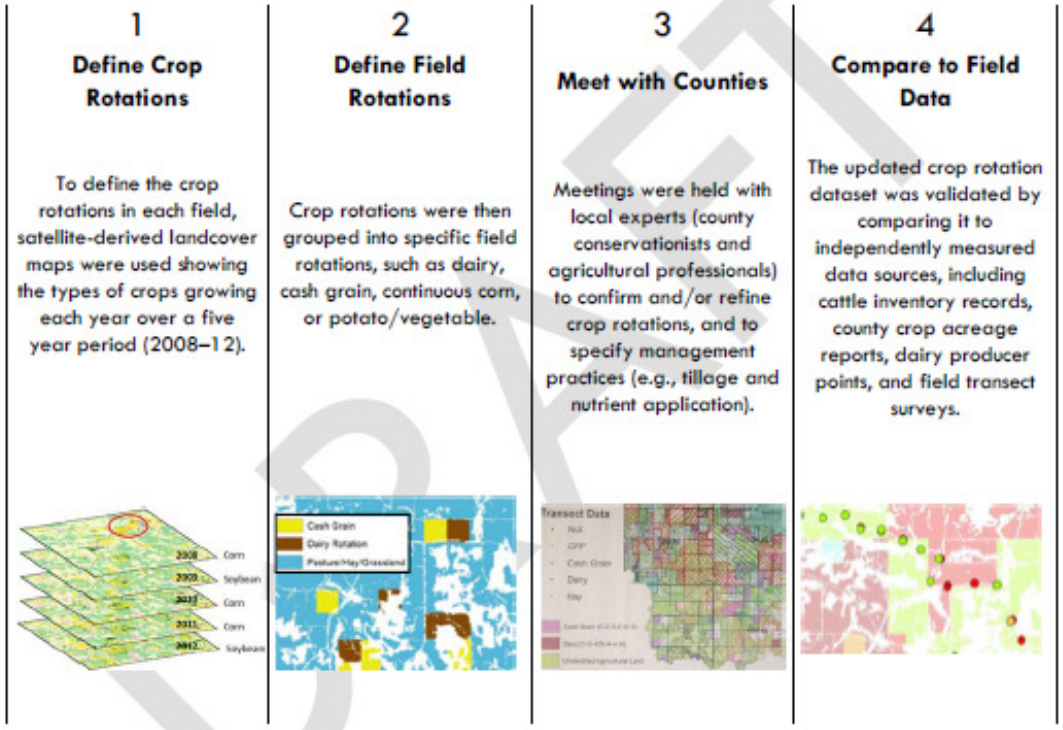
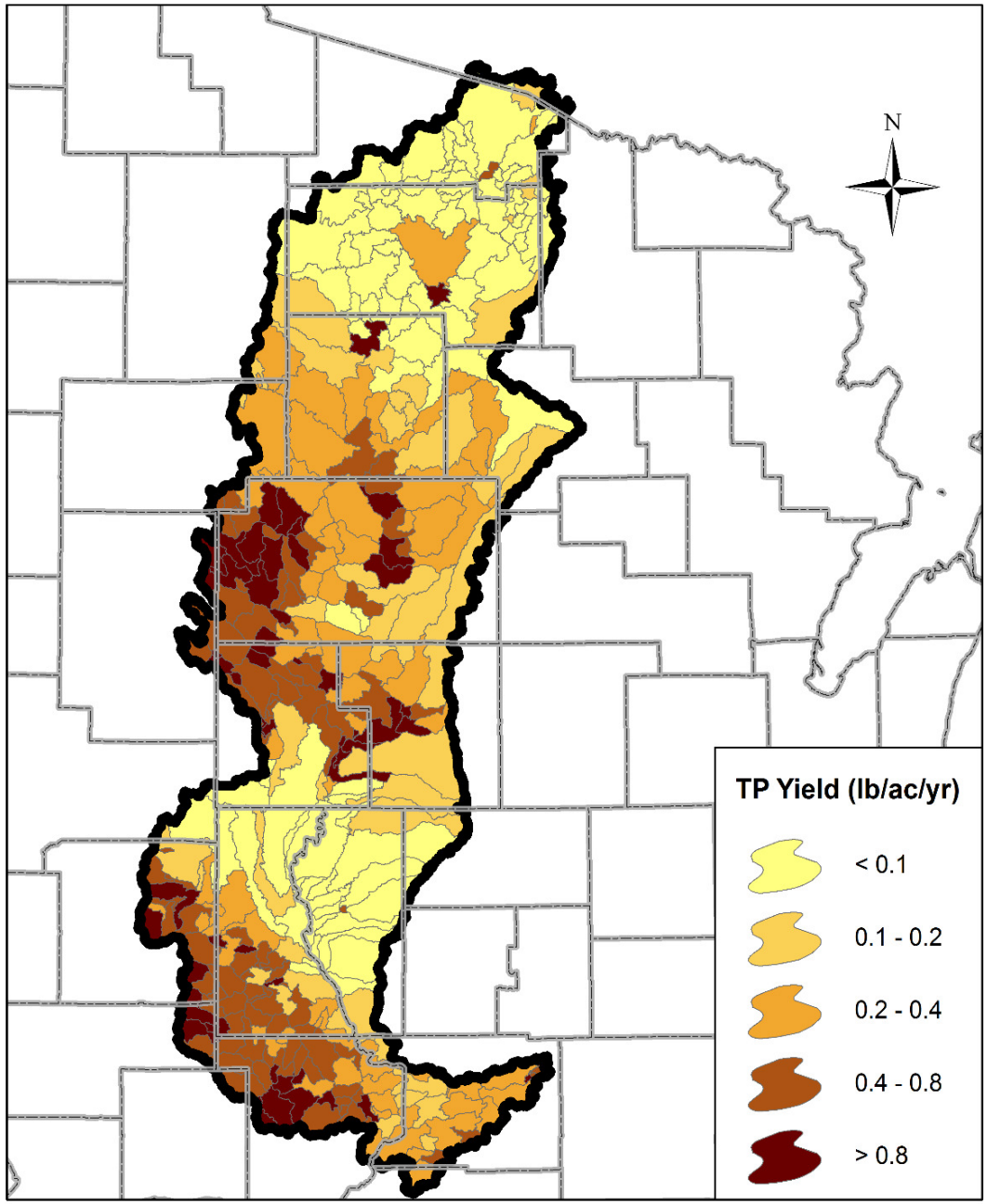


FIGURE 19. DEFINING LAND COVER AND LAND MANAGEMENT IN AGRICULTURAL AREAS.

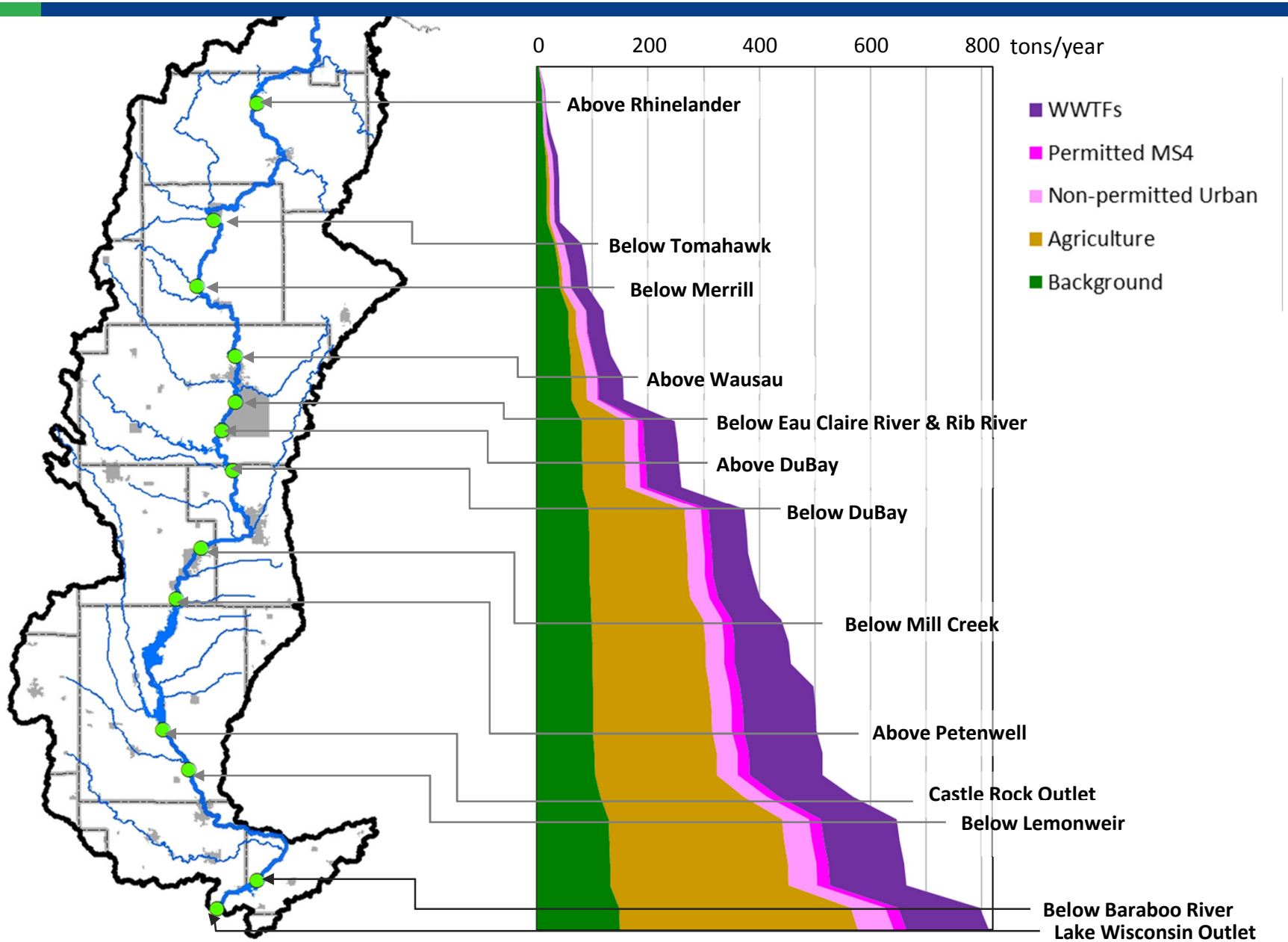


Model Results

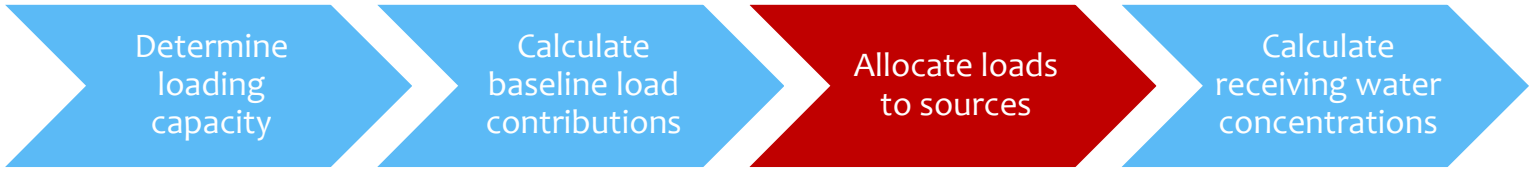
* Streamflow and TP loads per subbasin
* TP loads split by source type

Figure 18. Total phosphorus yields per subbasin

Average Annual Total Phosphorus Load



TMDL Development Process



* Allocation strategy consistent with other TMDLs.

    1. Start with baseline condition,
    2. evaluate alternative limits and bring everyone to the same level,
    3. apply needed reductions using a proportional reduction (by mass, equal percent reduction) approach.

* Allocations driven by local water quality requirements **and** downstream reservoirs.

* Calculated allocations with and without SSC.

Load Allocation

+

Waste Load Allocation

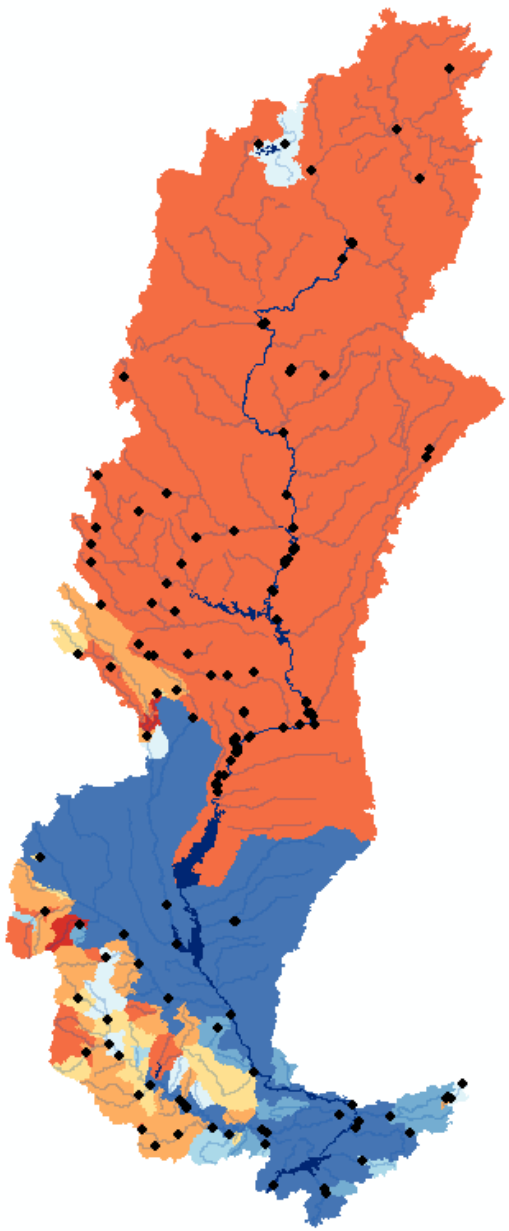
Load Allocation

* Agricultural (includes load from CAFO land spreading)
* Non-permitted Urban
* Background

Waste Load Allocation

* WWTPs / POTWs
* Industries
* Permitted MS4s
* Non-Metallic Mines
* Construction Sites
* NCCWs
* CAFOs

Percent Reduction Maps

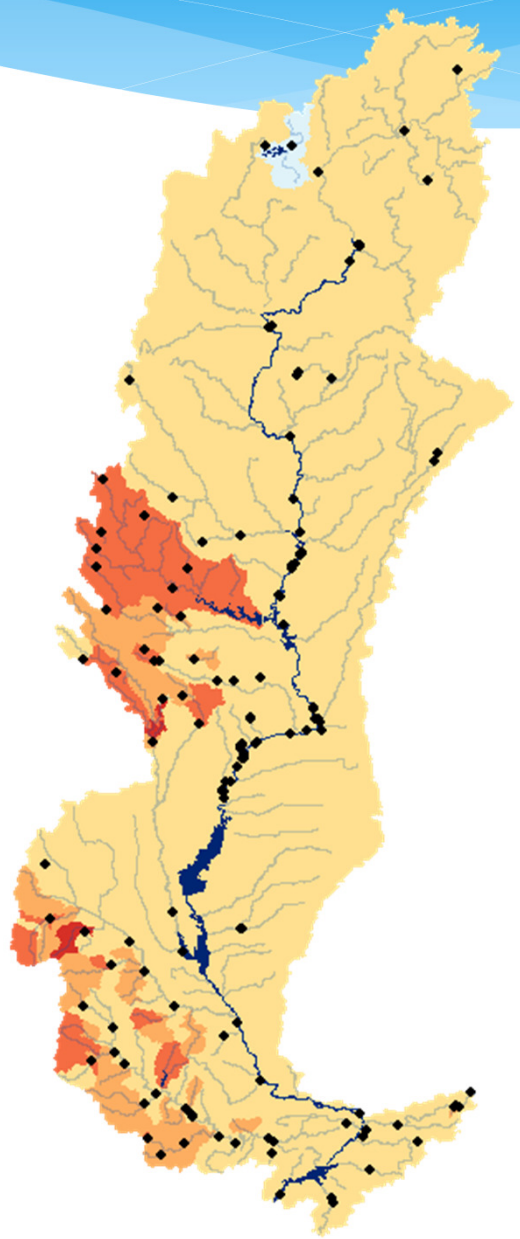


Current Criteria

Percent Reduction

- 0%
- 1 - 25%
- 25.1 - 50%
- 50.1 - 60%
- 60.1 - 70%
- 70.1 - 80%
- 80.1 - 90%
- 90.1 - 93%

Outfalls



SSC

Allocations to Wastewater

* As a result of the TMDL, wastewater facilities will receive mass allocations that meet water quality standards for both local and downstream reservoirs.

* Once EPA has approved the TMDL, the next permit must contain an expression of the WLAs consistent with the TMDL.

Allocations to MS4s & NPS

* Permitted MS4s (See Table J3 and J4, K3 and K4)
  * Apply percent reduction to "no-controls"/baseline condition as outlined in the TMDL MS4 guidance.
  * Extended compliance option with agreed upon benchmarks.

* Nonpoint Source (See Table J4 and K4)
  * Compliance with more stringent performance standards is voluntary unless promulgated through NR 151.004 to become a performance standard. Cost share requirements still in place.

Questions

- Is phosphorus really the main cause of algae blooms?
- Doesn’t some of the phosphorus come from the lake bottom sediment?
- What phosphorus concentration will support recreational water quality standards in Lake Wisconsin?
- How much reduction in algae can we expect when the TMDL goals are met?

Is phosphorus really the main cause of algae blooms?

ENVIRONMENTAL Science & Technology

Feature

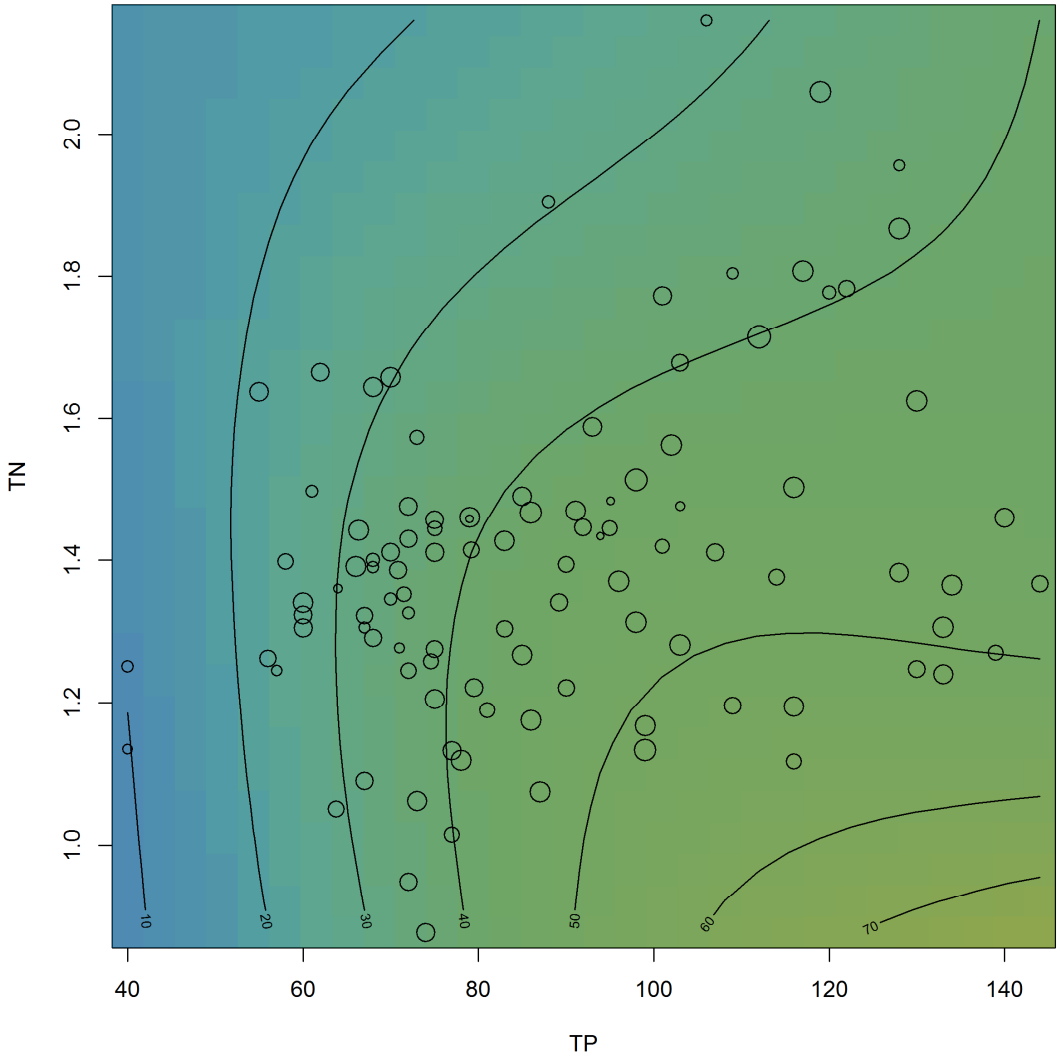
pubs.acs.org/est

Reducing Phosphorus to Curb Lake Eutrophication is a Success

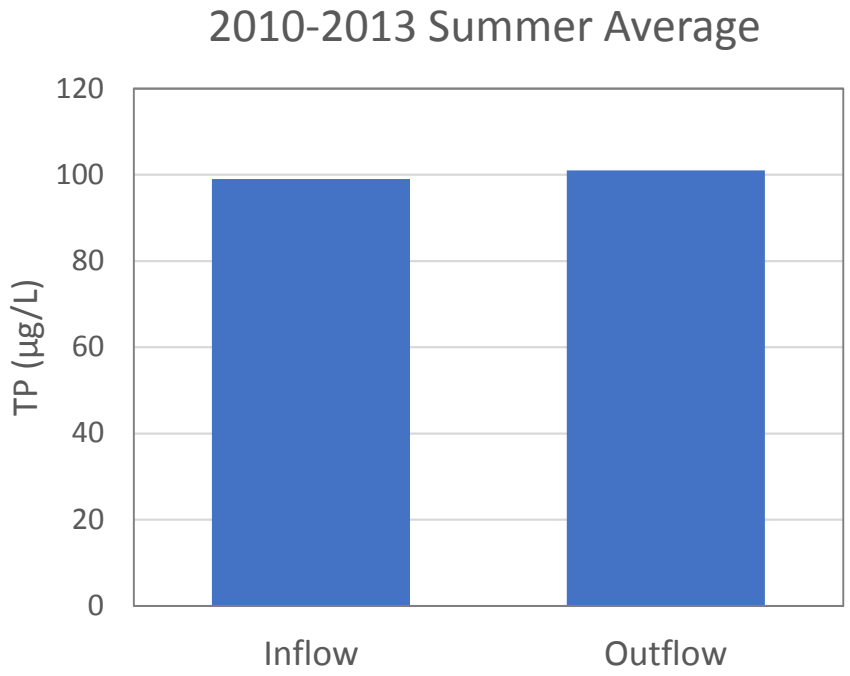
David W. Schindler,*,† Stephen R. Carpenter,‡ Steven C. Chapra,§ Robert E. Hecky,‖ and Diane M. Orihel⊥

"Here we review the evidence, finding that numerous long-term studies
of lake ecosystems in Europe and North America show that controlling algal blooms and other symptoms of eutrophication depends on reducing inputs of a single nutrient: **phosphorus**."

Is phosphorus really the main cause of algae blooms?



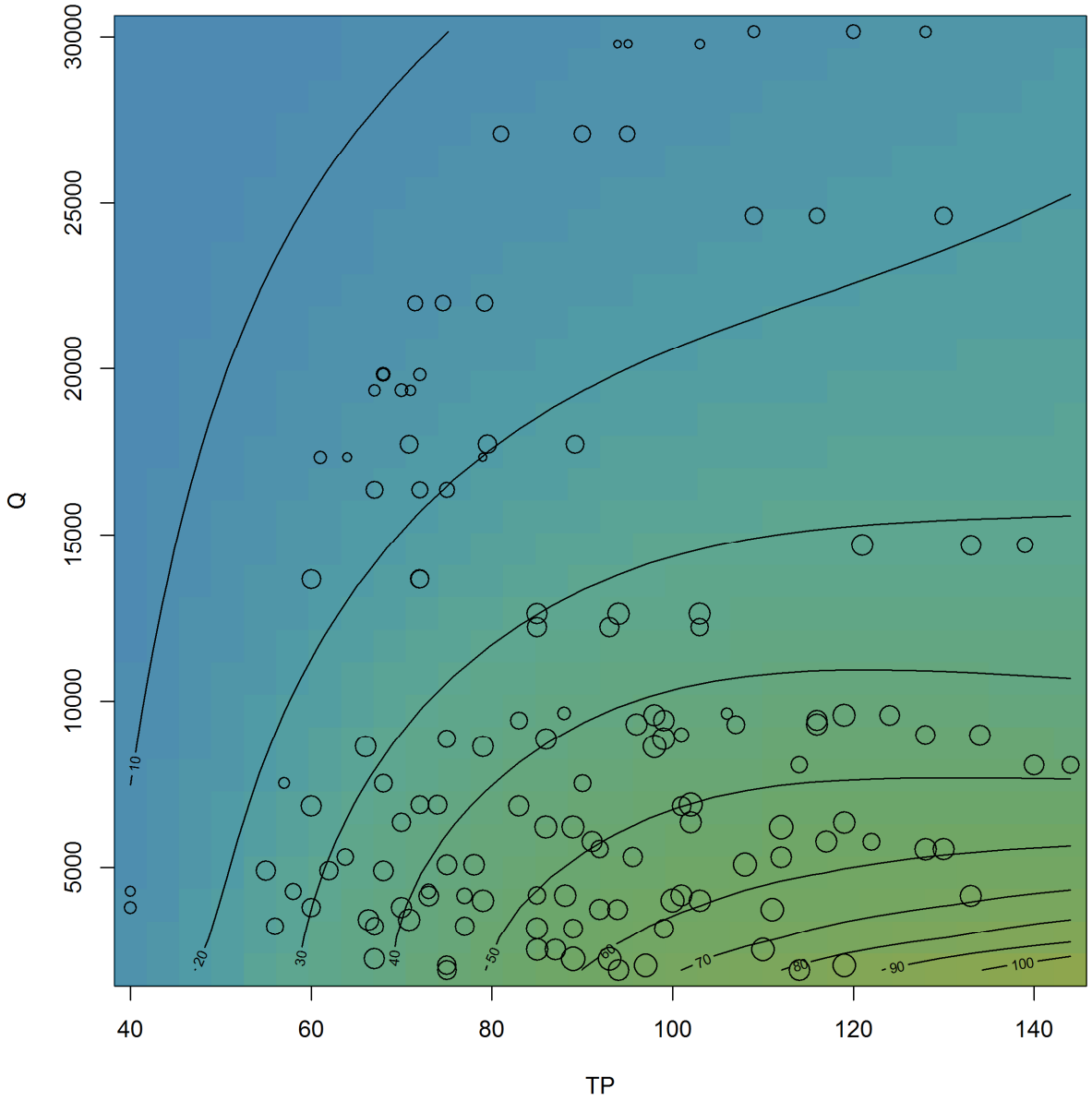
Doesn’t some of the phosphorus come from the lake bottom sediment?



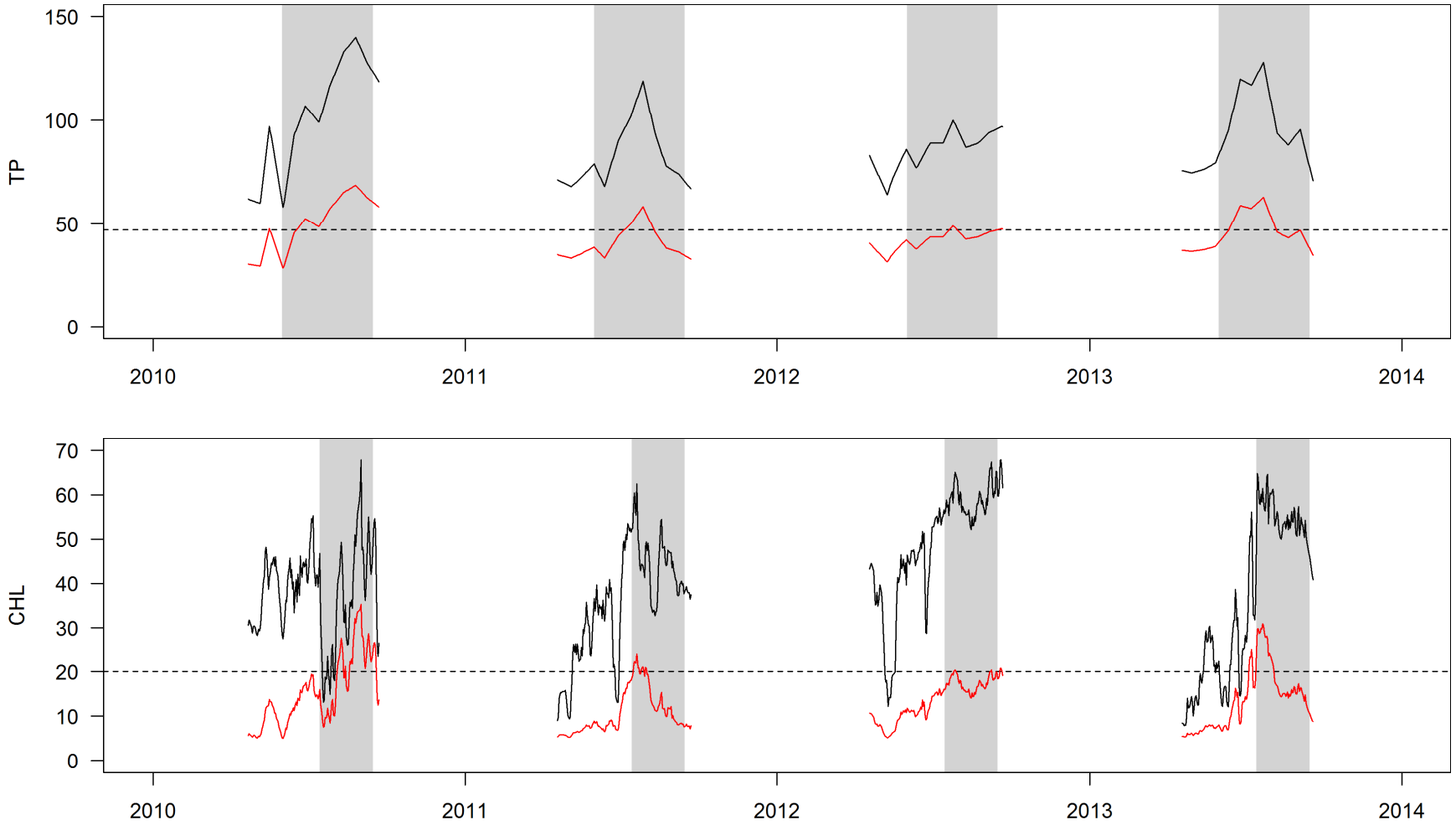
Site-Specific Total Phosphorus Criteria for Petenwell Flowage, Castle Rock Flowage, and Lake Wisconsin

- Wisconsin Administrative Code NR 102.06(7) states that site-specific criteria (SSC) for total phosphorus (TP) may be adopted where site-specific data and analysis using scientifically defensible methods and sound scientific rationale demonstrate a different criterion is protective of the designated use of the specific surface water segment or waterbody.
- TP SSC were estimated for Petenwell Flowage, Castle Rock Flowage, and Lake Wisconsin that are **expected to meet the chlorophyll *a* (CHL) target for recreational use (70th percentile CHL < 20 µg/L during July 15 – September 15).**
- The SSC are based on empirical estimates of the effects of TP concentration, river discharge, and day of year on CHL concentration.
- The recommended SSC for Petenwell and Castle Rock are 53 and 55 µg/L TP, respectively, as a summer (June 1 – September 15) mean concentration, which is higher than the existing criteria (40 µg/L TP).
- The recommended SSC for Lake Wisconsin is 47 µg/L TP, which is lower than the existing criterion (100 µg/L TP).
- See TMDL report Appendix C for details.

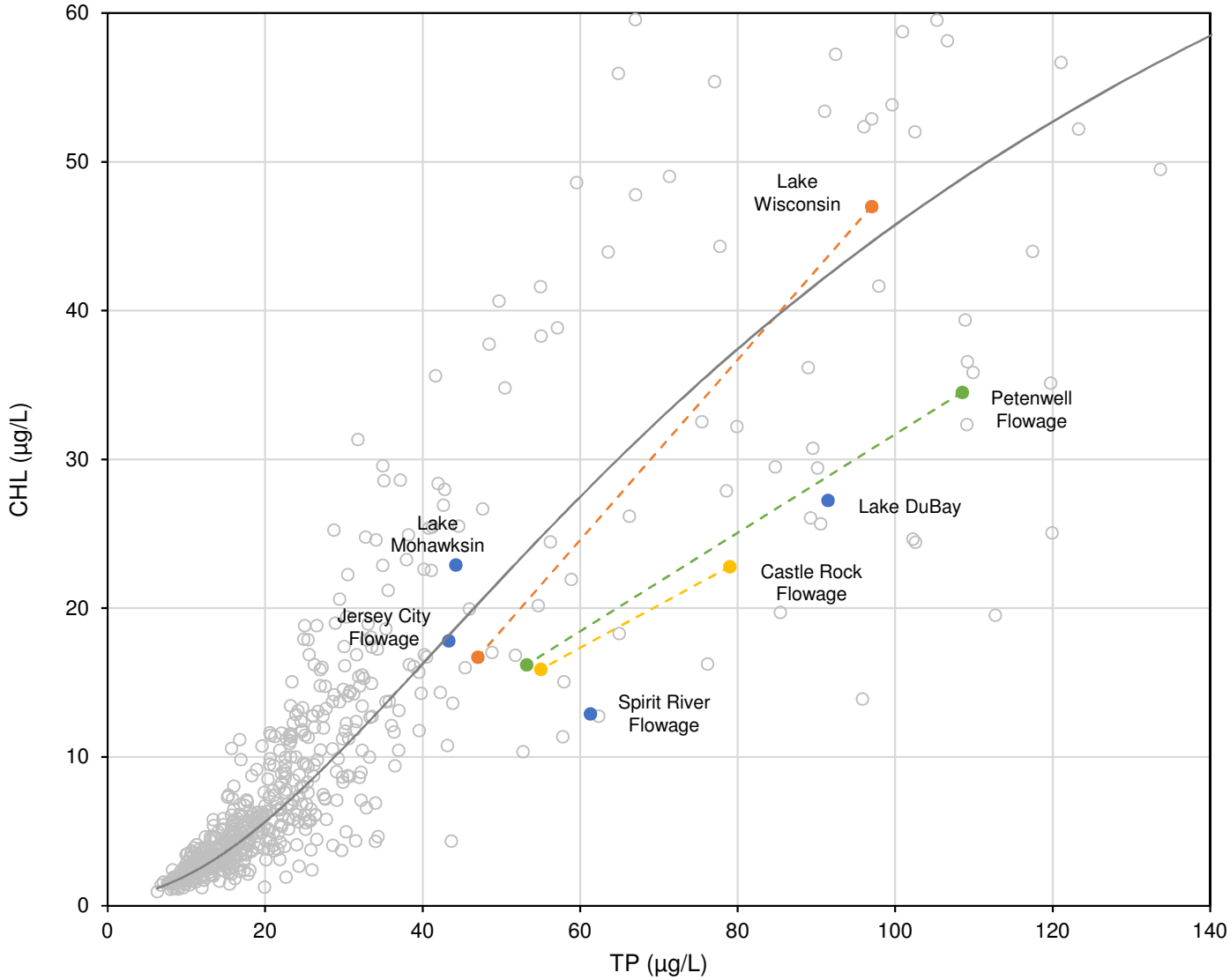
Lake Wisconsin Chlorophyll Model



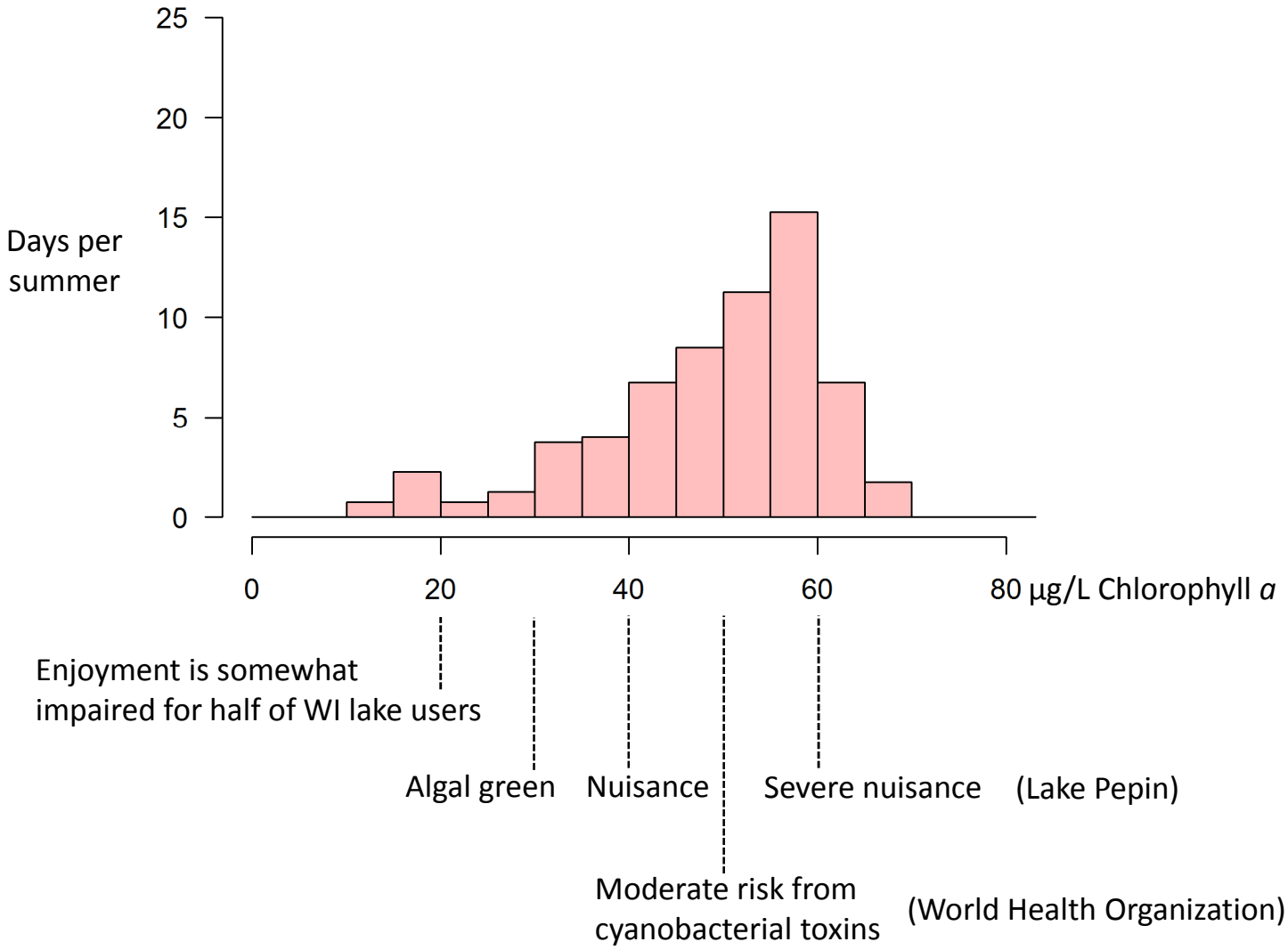
Lake Wisconsin



Comparison with Other Lakes



How much reduction in algae can we expect when the TMDL goals are met?



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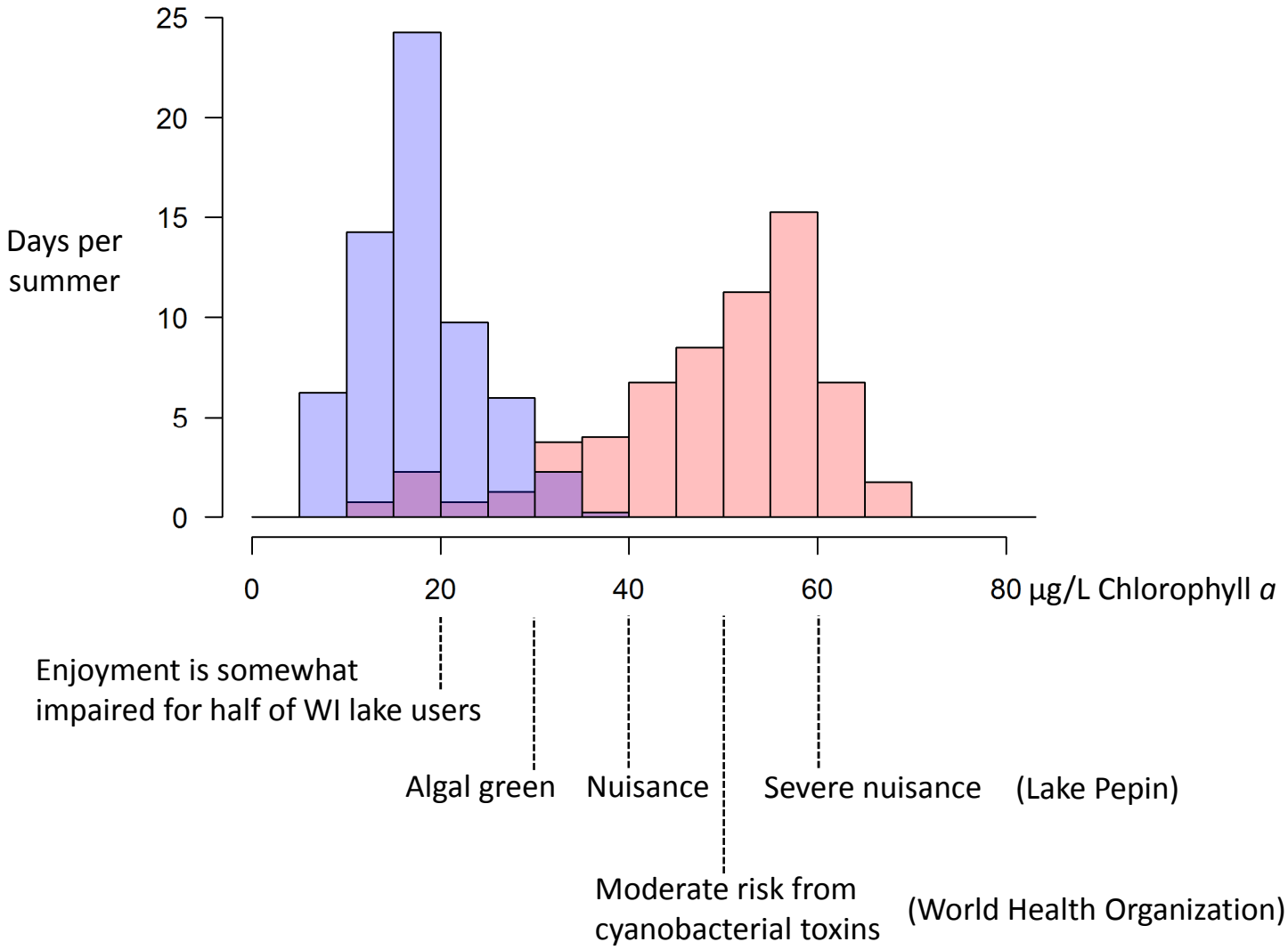

Moving Forward

* Finish addressing comments from preliminary public review
* Official 30-Day Public Informational Hearing Process
* Finalize TMDL and Send for EPA Approval