

# Allocations & Translation Into Municipal Wastewater Permits

Northeast Lakeshore TMDL

September 13, 2022



# Today's Meeting

- Introductions
  - Explanation on allocations and resulting permit limits
  - Q&A
- 
- The meeting recording and slides will be available on the DNR website.

<https://dnr.wi.gov/topic/TMDLs/NElakeshore.html>

or just search “NE Lakeshore TMDL”

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# NORTHEAST LAKESHORE TMDL

A FRAMEWORK FOR WATER QUALITY IMPROVEMENT



South Branch of the Manitowoc River

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The DNR, together with many partners throughout the basins, is working to improve the surface water quality of tributaries, streams, rivers and lakes within the Northeast Lakeshore (NEL) TMDL basins. The NEL TMDL is focused on addressing surface water quality impairments from phosphorus and total suspended solids. In addition, quantifying nonpoint nitrogen loading is part of the study; however, a TMDL will not be created for nitrogen because there are no surface water standards for nitrogen. The TMDL study and implementation plan will provide a strategic framework and prioritize resources for surface water quality improvement across the basins that make up Wisconsin's northeast lakeshore.

## Total Maximum Daily Loads (TMDLs)

Overview

TMDLs In Development

Approved TMDLs

Implementation

Point Source

Nonpoint Source

Map and Projects

**For more information, contact:**

**Kevin Kirsch**

TMDL coordinator

Water Quality Program

## PAST WEBINARS

### ▲ December 2021 Informational Webinar

Webinar covering lake modeling results, the allocation process, and draft allocations.

- December 16, 2021
- **Recorded presentation:** [Allocation Process & Draft Results](#) (best viewed in Chrome browser)
- [Webinar presentation slides \[PDF\]](#)

### ▲ March 2021 Informational Webinar

Baseline Load Results and Allocation Process

- March 23, 2021
- **Recorded presentation:** [Watershed Model Results & Allocation Process](#)
- [Webinar presentation slides \[PDF\]](#)

### ▲ Summer 2020 Informational Webinar Series:

#### The TMDL Process and Watershed Model Development

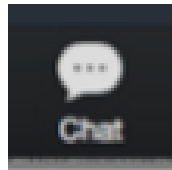
In summer 2020, the DNR presented a series of public informational webinars to introduce development of the Soil & Water Assessment Tool (SWAT) watershed model for the NE Lakeshore TMDL. The [webinar announcement flyer \[PDF\]](#) summarizes the topics of each webinar. Recordings and PDFs of the webinar presentations are below.

- ▼ **Webinar 1: TMDL process and introduction to the NE Lakeshore TMDL**
- ▼ **Webinar 2: Water Quality Data and Impairments**
- ▼ **Webinar 3: Watershed Model Introduction and Data Inputs**
- ▼ **Webinar 4: Watershed Model Setup**

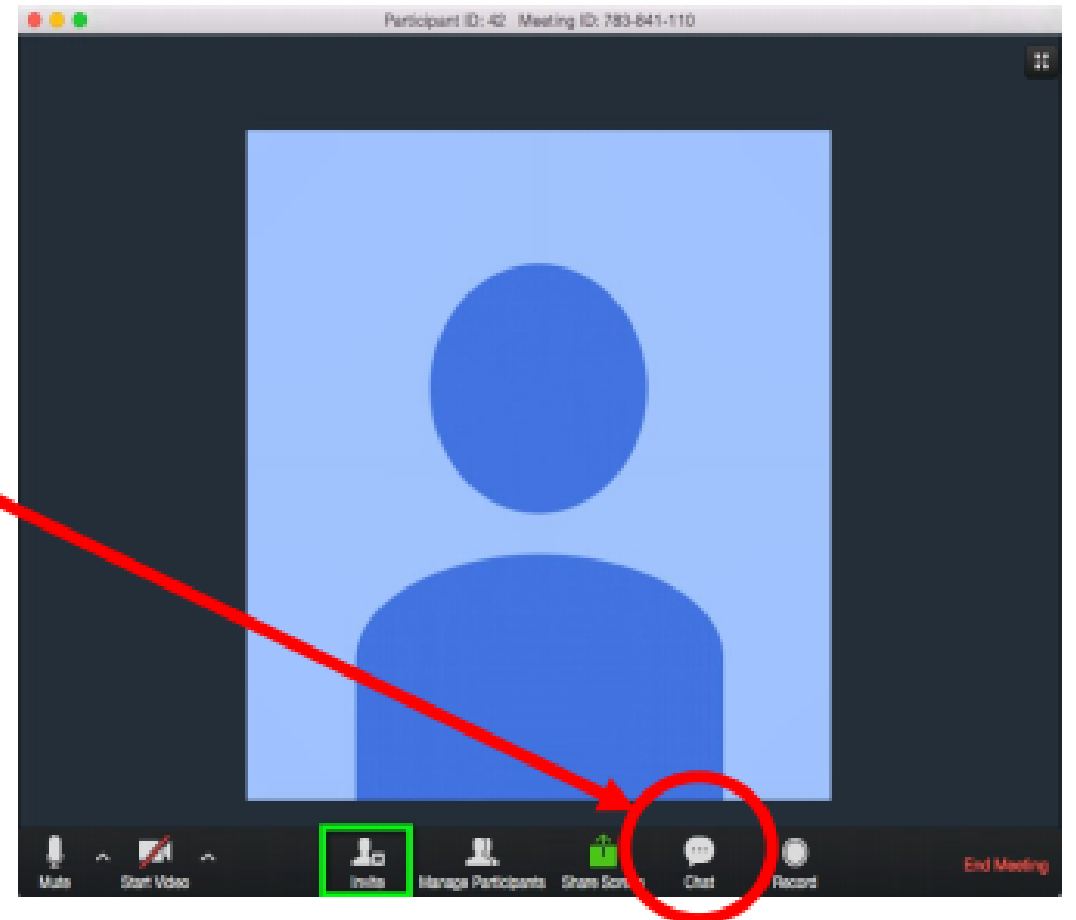


# Zoom

Click **Chat** in the meeting controls.



*NOTE: If don't see controls, tap screen and they will pop up.*



# Today's Presenters



Kevin Kirsch  
Statewide TMDL Coordinator



Nate Willis  
Wastewater Engineer

# Presentation Outline

- Allocation Comments
- Loading Capacity and Allocations
- Expression of mass allocations into permit limits



# Comments on Draft Allocations

Comments were received from the following entities: Hilbert, St. Cloud, New Holstein, Valders, Rockland Sanitary District, Reedsville, Cedar Grove, Oostburg, Denmark, and Waldo.

## General Comments:

- *Communication:* DNR utilizes GovDelivery and in setting up this meeting conducted a test of the system. To our knowledge, there have been no reported issues. The GovDelivery system proves and effective, efficient, and reliable method to communicate project updates to all interested stakeholders in a timely manner. We believe previous issues with internet providers have been resolved.
- *Comment Period:* There were concerns expressed regarding the short comment period. DNR used a comment period length consistent with the other five webinars. These first six comment periods were informal; however, like other TMDL projects there will be two additional comment periods. One with the draft report that brings everything together as well as a comment period on the final report. Comments and responses during these last two comment periods become part of the final TMDL document.
- *Why do allocations and effluent limits vary by facility and are not uniform?*

# Loading Capacity and Allocations

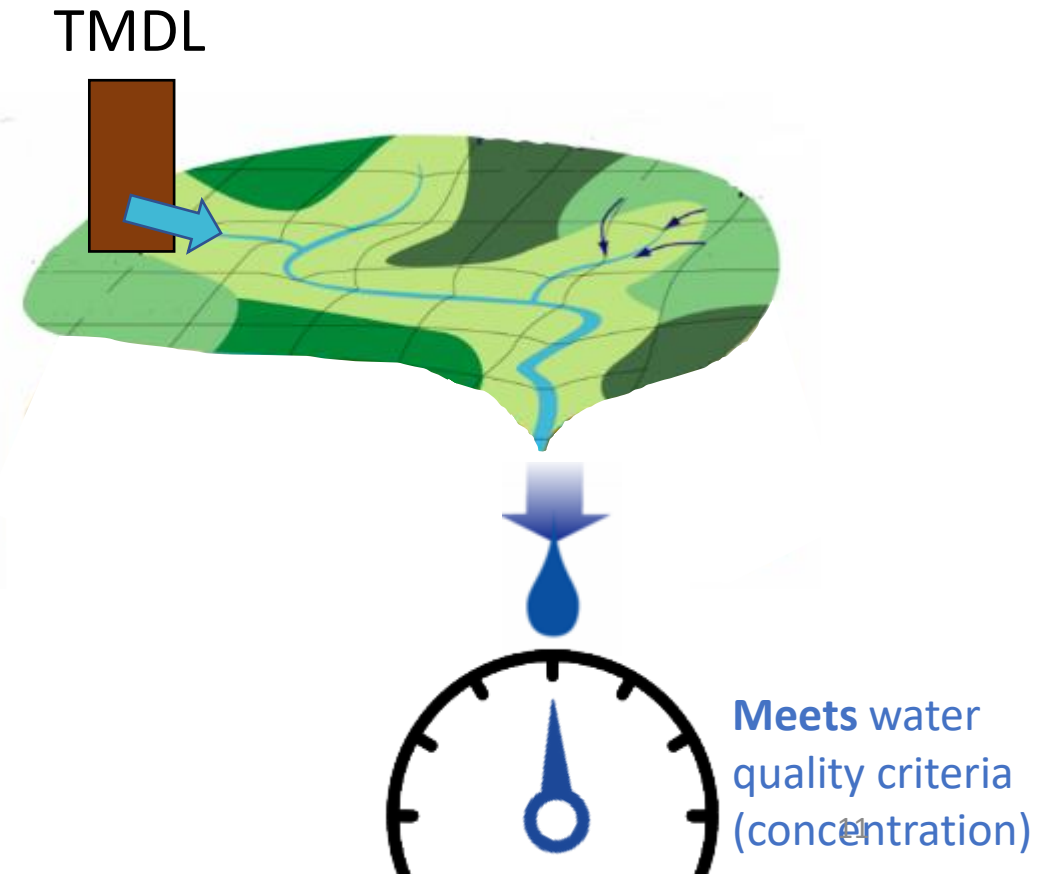
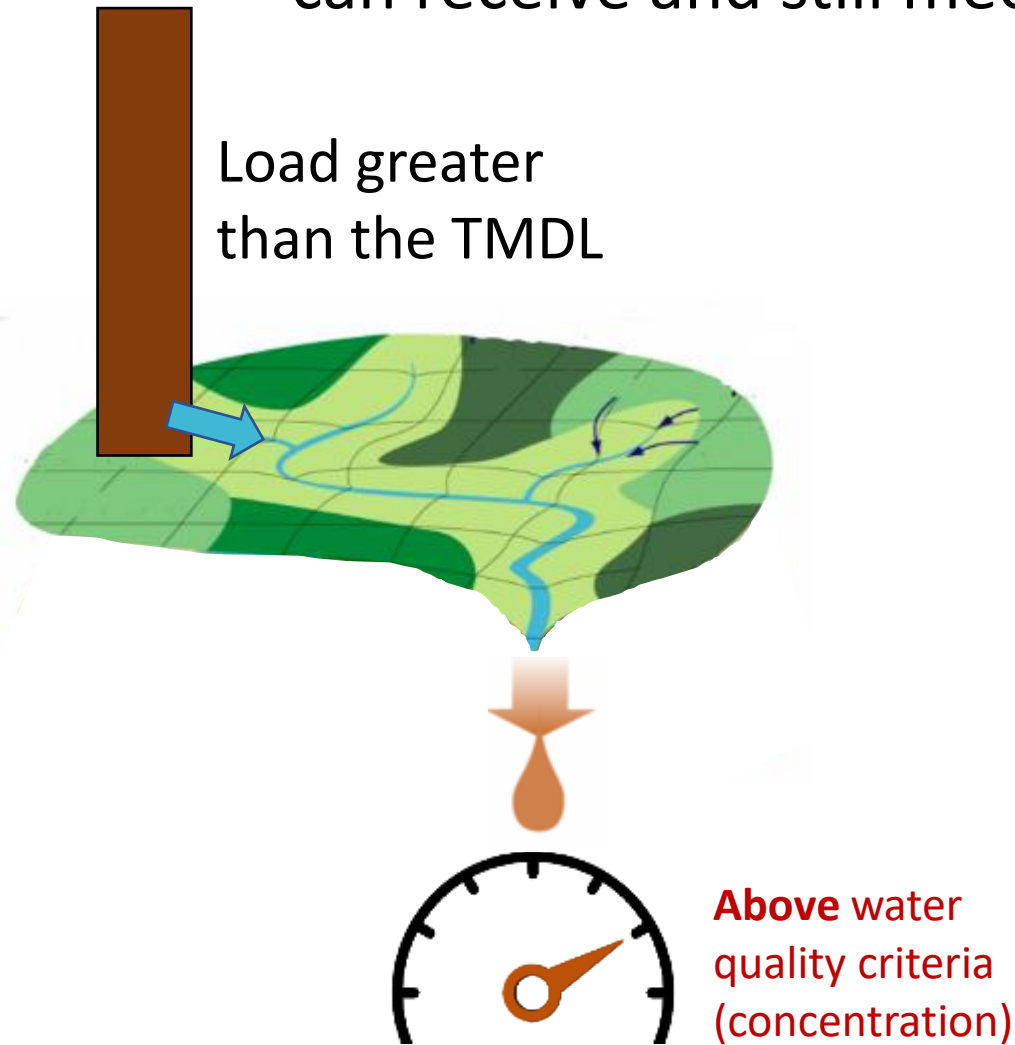
Kevin Kirsch, PE

Wisconsin Department of Natural Resources

[Kevin.Kirsch@Wisconsin.gov](mailto:Kevin.Kirsch@Wisconsin.gov)

# ***Total Maximum Daily Load (TMDL):***

Estimates the ***amount*** of pollutant a waterbody can receive and still meet water quality standards.



# Total Maximum Daily Loads

- \* EPA requires that waters not meeting water quality standards or criteria be listed as impaired on Wisconsin's 303-d list and have TMDLs or a comparable water quality restoration plan developed.
- \* TMDLs **do not** create new rules or regulatory requirements but rather rely on existing rules for implementation. For point source phosphorus allocations, NR 217 Wis. Admin. Code lays out implementation requirements, the calculation of water quality based effluent limits, the expression of limits, and the relationship of NR 217.13 derived limits to TMDL wasteload allocations.

**Total Maximum Daily Load =  
Load Allocation**



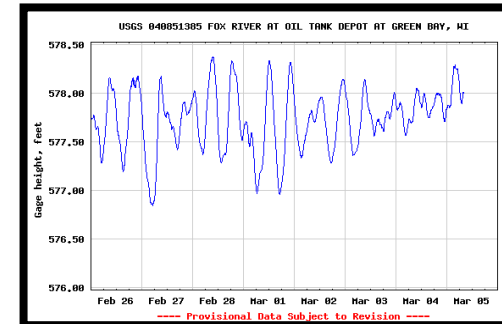
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**Waste Load Allocation**



+

**Margin of Safety**

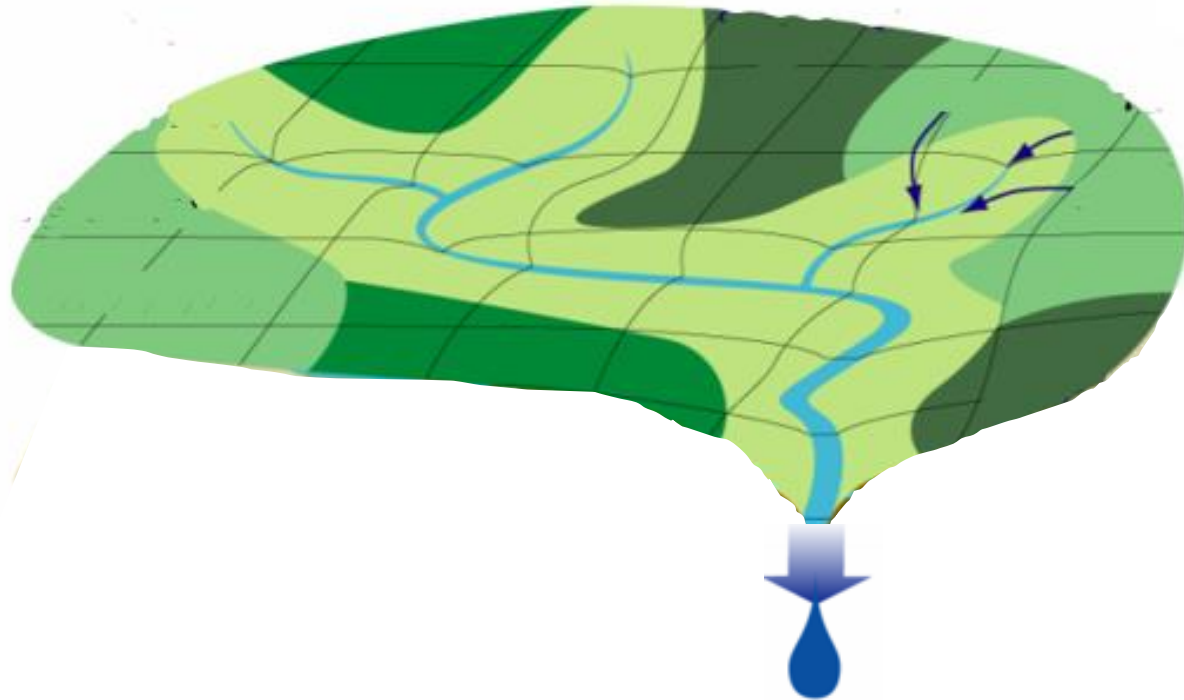


Determine Loading Capacity  
(TMDL)

What amount of pollutant can a waterbody receive?

Stream flow from watershed model

Unique value for each subbasin.



X

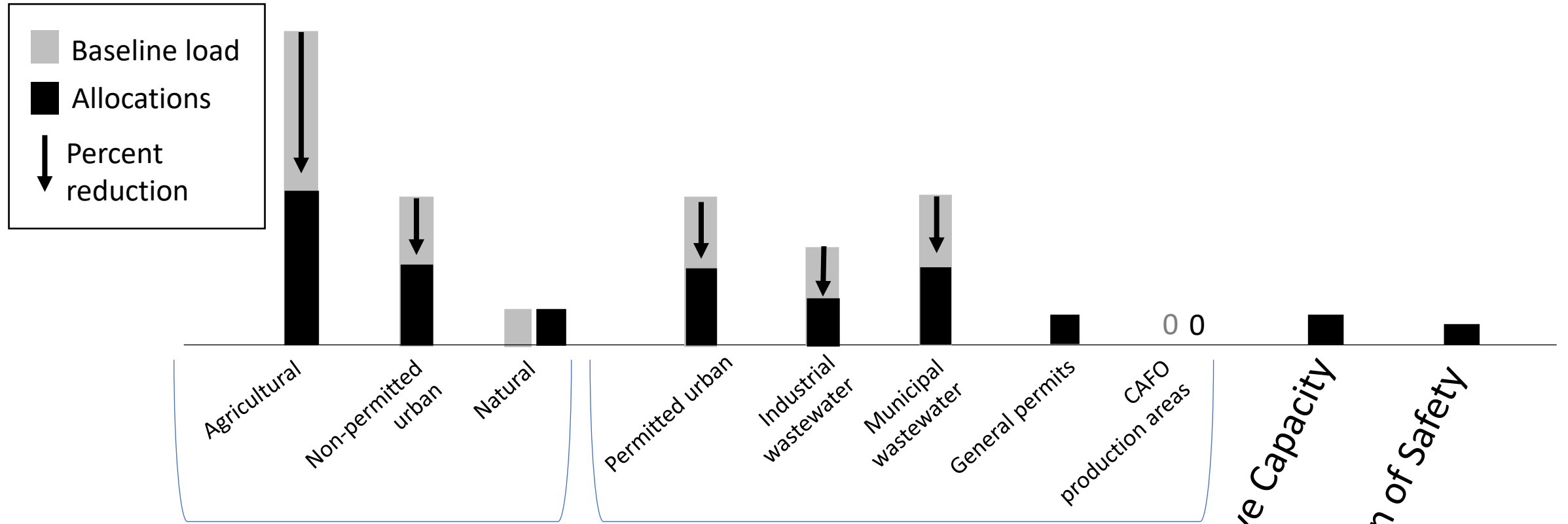
Water quality criteria or target

Total phosphorus (NR 102.06)

- Most streams and rivers in NE Lakeshore area 75 ug/L
- Manitowoc River 100 ug/L
- Sheboygan 100 ug/L

# Allocation Process Summary

*How is the TMDL divided among sources?*

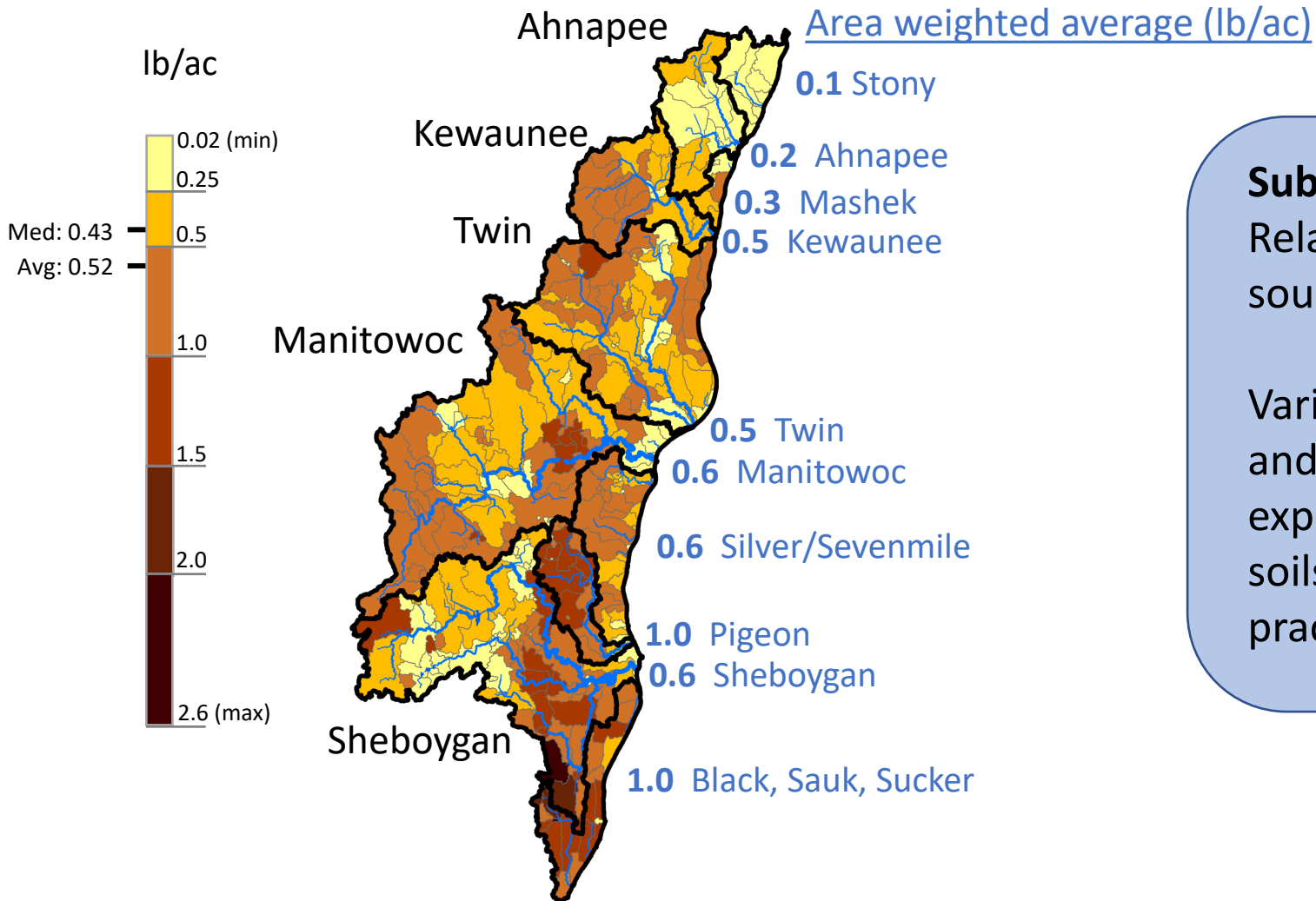


**TMDL** = Load allocation *Nonpoint source* + Wasteload allocation *Point source* + Reserve Capacity + Margin of Safety

# Baseline TP Rate (lb/ac)

SWAT modeled results represent delivered loads aggregated by subbasin

Nonpoint Sources (agricultural, urban, natural)



**Subbasin scale, used for allocations:**  
Relative contributions varied among sources (ag, urban, point source)

Variability in nonpoint phosphorus and TSS loading rates generally explained by variations in land cover, soils, slope and management practices.

## What are the sources?

### 1) Load allocation

*Nonpoint sources*



### 2) Wasteload allocation

*Point sources*



### 3) Margin of Safety

### 4) Reserve Capacity

# Allocation Process

Divides the TMDL among sources

- Previous TMDLs in Wisconsin have had more uniform reductions. This was a result of the TMDL allocations being driven by downstream lakes or reservoirs with lower criteria.
- The allocations in the NE Lakeshore TMDL are driven by local water quality in each subbasin.
- In some cases, elimination of upstream sources may resolve downstream impairments without any local reduction.



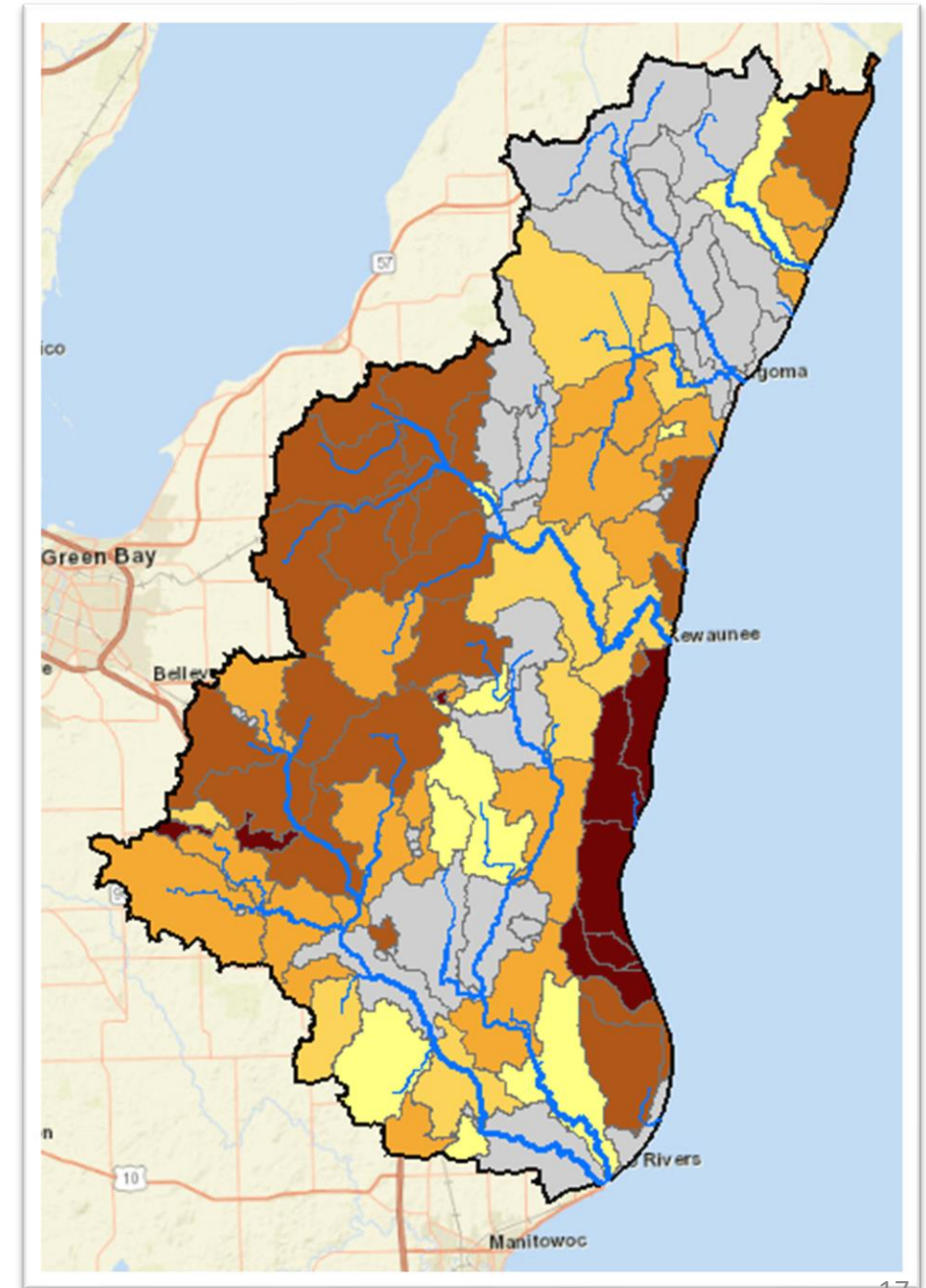
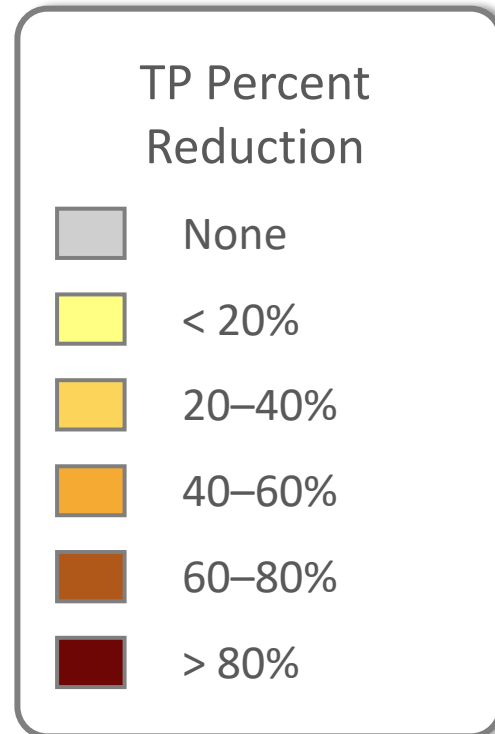
# Percent Reductions

## Total Phosphorus

### Kewaunee River Basin Region

#### Main Takeaway(s):

- Most subbasins have reductions except for those within the Ahnapee River basin



# Percent Reductions

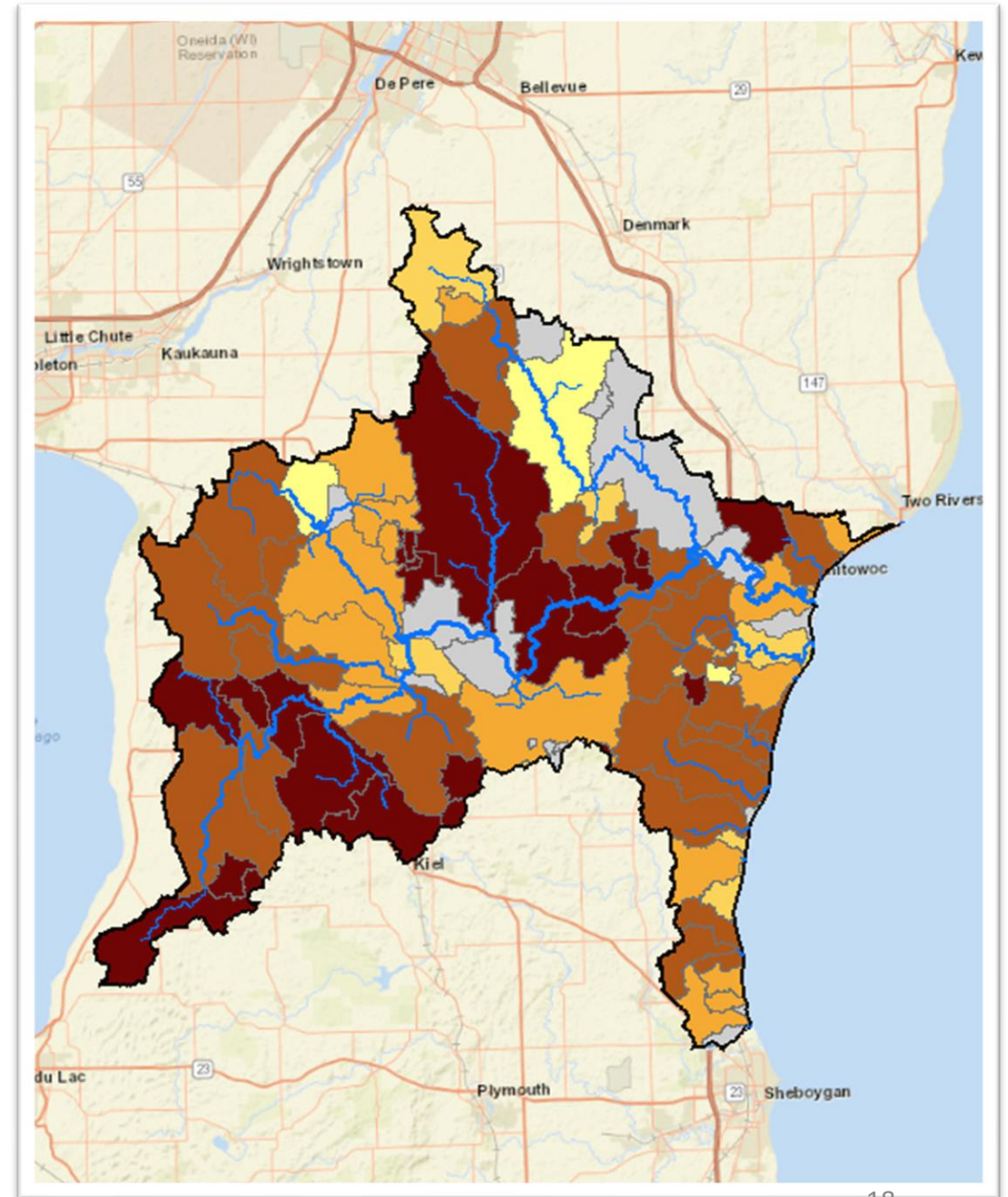
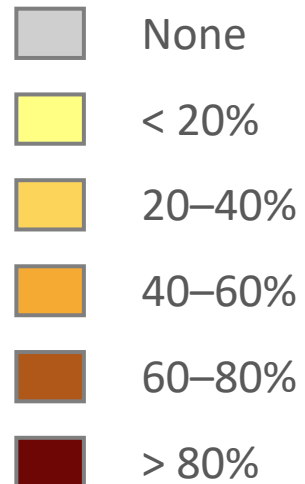
## Total Phosphorus

### Manitowoc River Basin Region

#### Main Takeaway(s):

- Almost all subbasins have reductions, and those that are in the major agricultural areas have the highest, upwards of 80%

#### TP Percent Reduction



# Percent Reductions

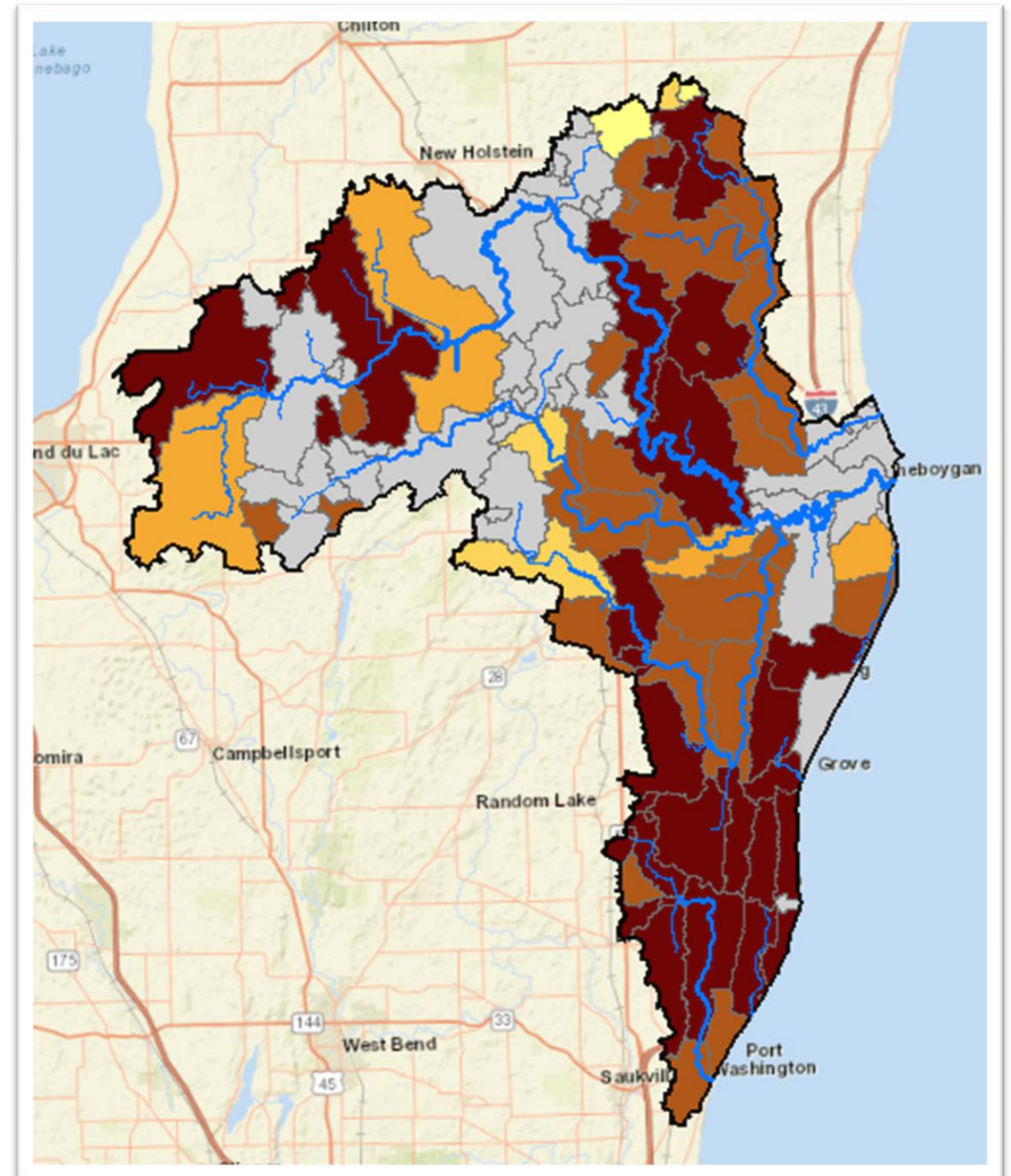
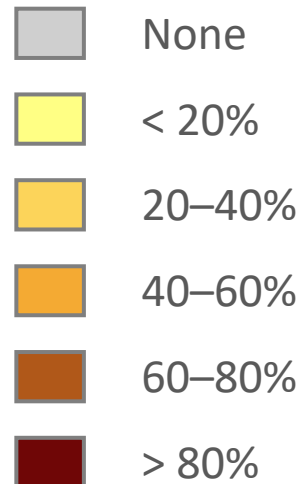
## Total Phosphorus

## Sheboygan River Basin Region

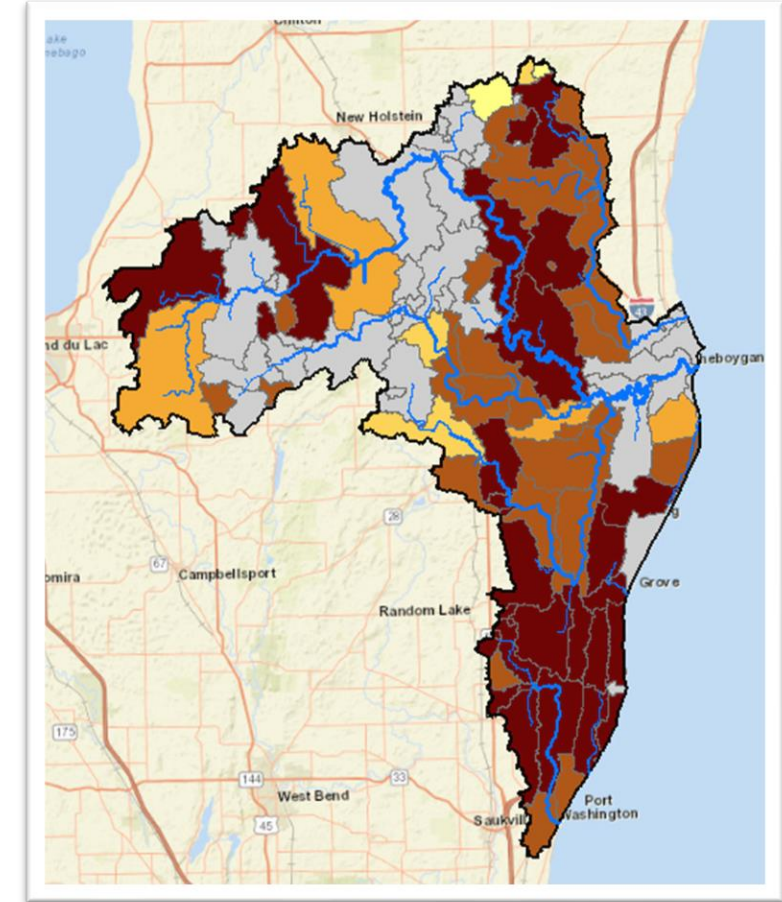
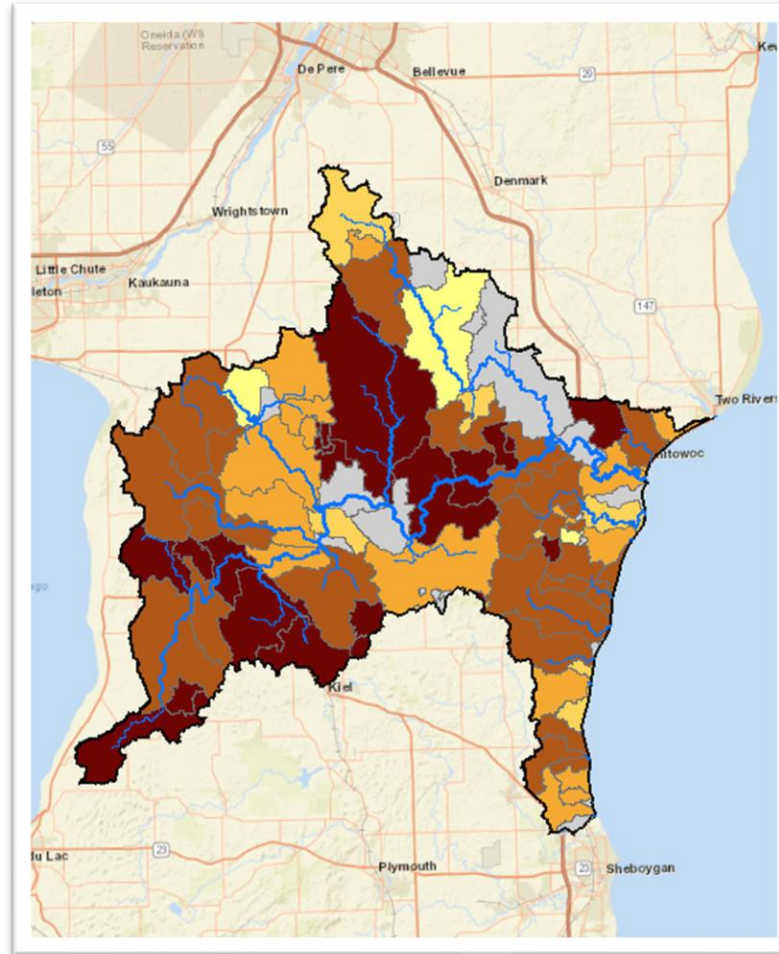
### Main Takeaway(s):

- The Onion River, Black River, and Sauk Creek on the south end have high reductions
- Areas with expansive wetland areas (such as the Mullet River and Sheboygan Marsh areas) have no reductions

### TP Percent Reduction



# Questions



# Expression of mass allocations into permit limits

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# Implementation Overview



Agricultural

MS4

**Wastewater**

- TMDL wasteload allocations implemented through NR 217 and WPDES permits.

Once EPA has approved the TMDL (anticipated 2023), permits can be issued with the TMDL derived mass allocations.

- Typically, the TMDL limit will become effective upon the next permit reissuance.

# Wastewater Allocation and Equivalent Concentration Summary Tables

Municipal Facilities: Mass allocations and equivalent concentrations calculated using design flow.

| Municipal Facilities |            |                     | Total Phosphorus (TP)      |                          |                         |  | Total Suspended Solids (TSS)                               |                             |                            |                                |                               |   |  |   |
|----------------------|------------|---------------------|----------------------------|--------------------------|-------------------------|--|--|-----------------------------|----------------------------|--------------------------------|-------------------------------|---|--|---|
| Facility Name        | Permit No. | Baseline Flow (MGD) | TMDL TP WLA (lbs per year) | TP Month Limit (lbs/day) | TP 6-mo Limit (lbs/day) | TP Equivalent Monthly Concentration - Baseline flow (mg/L) | TP Equivalent 6-Month Concentration - Baseline flow (mg/L) | TMDL TSS WLA (lbs per year) | TSS Limit Mo avg (lbs/day) | TSS Limit weekly avg (lbs/day) | TSS Limit daily max (lbs/day) | TSS Equivalent Monthly Concentration (mg/L) | TSS Equivalent weekly Concentration (mg/L) | TSS Equivalent Daily Concentration (mg/L) |

| Total Phosphorus (TP)      |                          |                         |  |  |
|----------------------------|--------------------------|-------------------------|--|--|
| TMDL TP WLA (lbs per year) | TP Month Limit (lbs/day) | TP 6-mo Limit (lbs/day) | TP Equivalent Monthly Concentration - Baseline flow (mg/L) | TP Equivalent 6-Month Concentration - Baseline flow (mg/L) |

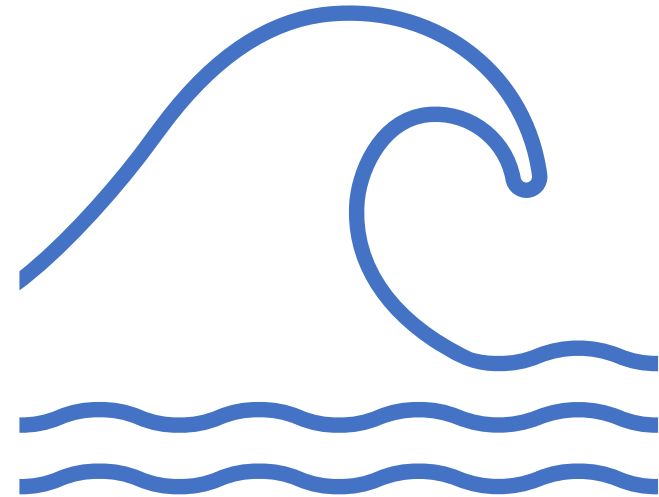
# How are limits expressed in permits?

- Limits expressed in permits in accordance with:
  - 40 CFR 122.45(d): “For continuous discharges all permit effluent limitations, standards, and prohibitions, including those necessary to achieve water quality standards, shall unless impracticable be stated as:
    - (1): Maximum daily and average monthly discharge limitations for all dischargers other than publicly owned treatment works; and
    - (2): **Average weekly** and **average monthly** discharge limitations for POTWs”
  - Promulgated in state code as s. NR 205.065(7), Wis. Adm. Code
  - S. NR 212.76(4), Wis. Adm. Code: “WQBELs derived from TMDL wasteload allocations shall be expressed consistent with the provisions specified in s. NR 205.065 **unless impracticable or an alternative expression of limitations is determined appropriate by the department and is consistent with the assumptions of the TMDL.**”



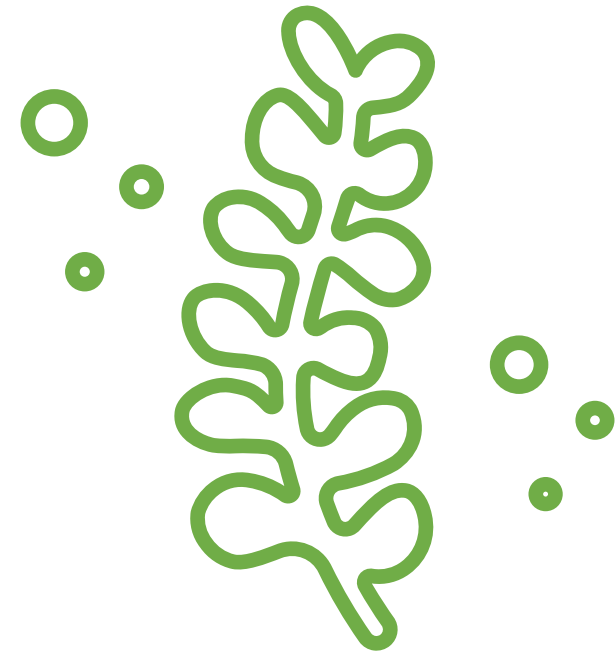
# Why is phosphorus expressed differently?

- DNR has an EPA-approved [‘impracticability determination’](#) which allows TP limits to be expressed as **monthly** and **6-month averages**.
- EPA agreed that **it’s impracticable to establish monthly TP limits when the limit is 0.3 mg/L or less.**
- Since the risk of impact to the waterbody increases with TP concentrations, permits with higher concentration limits have shorter averaging periods.



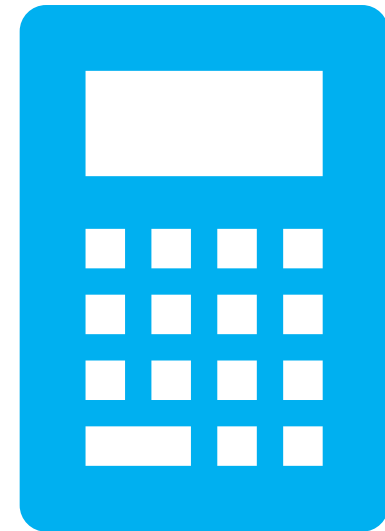
# How is my TP limit calculated?

- Calculations are performed in accordance with DNR's [TMDL Implementation Guidance for Wastewater](#)
- Today we'll work through example calculations for the following facilities:
  - New Holstein WWTP
  - Forestville WWTP
  - Kewaunee WWTP
  - Valders WWTP



# How is my TP limit calculated?

- Determine Wasteload Allocation from TMDL
- Calculate equivalent effluent concentration to determine limit form (monthly only or 6-month & monthly combo)
- Determine monitoring frequency
- Determine effluent variability (CV)
- Calculate multiplier



# How is my TP limit calculated?

- **Step 1a: Calculate 'Equivalent Concentration' of WLA using the following:**
  - Annual wasteload allocation
  - Design flow of facility
- **Example: New Holstein WWTP**
  - Annual TP wasteload allocation: 1,002 lbs TP/year
  - Design flow of facility: 1.33 MGD

$$\text{Eq. Concentration} = \frac{\frac{1,002 \text{ lbs TP}}{\text{year}}}{\frac{365.25 \text{ days}}{\text{year}} \times \frac{1.33 \text{ million gallons}}{\text{day}} \times \frac{8.34 \text{ lbs Water}}{\text{gal}}} = 0.247 \text{ mg/L}$$

# How is my TP limit calculated?

- **Step 1b: Compare calculated equivalent concentration with 0.3 mg/L**
- Example: New Holstein WWTP
  - **0.247 mg/L < 0.3 mg/L**
  - Now we need to calculate:
    - 6-month average limit
    - Monthly average limit (6MA x 3)

| Equivalent Effluent Concentration | Limit Expression  |
|-----------------------------------|---|
| > 0.3 mg/L                        | Monthly Avg.  |
| ≤ 0.3 mg/L                        | 6-Month Avg.<br>and<br>Monthly Avg.<br>(3 x 6-Month Avg.) |

# How is my TP limit calculated?

- **Step 2a: Determine appropriate multiplier using CV and monitoring frequency**

- CV = Coefficient of Variability = Standard Deviation / Mean of TP Data
- CV = 0.6 as default when future effluent variability unknown

- **Example: New Holstein WWTP**

- Monitor 3x/week
- 6-month average multiplier: **1.17**

| Effluent Monitoring Frequency | 6-Month Average Permit Limits | Monthly Average Permit Limits |
|-------------------------------|-------------------------------|-------------------------------|
| Daily                         | 1.11                          | 1.28                          |
| 6 Times per Week              | 1.12                          | 1.32                          |
| 5 Times per Week              | 1.13                          | 1.35                          |
| 3 Times per Week              | <b>1.17</b>                   | 1.47                          |
| Twice per Week                | 1.21                          | 1.59                          |
| Weekly or Less                | 1.30                          | 1.90                          |

# How is my TP limit calculated?

- **Step 2b: Calculate the mass limits!**

$$6 - \text{month limit} = \text{Multiplier} \times \frac{\text{annual WLA}}{365.25 \text{ days/yr}}$$

$$\text{Monthly average limit} = 6MA \times 3$$

- Example: New Holstein WWTP

$$6 - \text{month limit} = 1.17 \times \frac{1,002 \frac{\text{lbs}}{\text{year}}}{365.25 \frac{\text{days}}{\text{yr}}} = \mathbf{3.2 \text{ lbs/day}}$$

$$\text{Monthly average limit} = 3.2 \frac{\text{lbs}}{\text{day}} \times 3 = \mathbf{9.6 \text{ lbs/day}}$$

# What's the equivalent concentration of my mass limit?

- Example: New Holstein WWTP

$$6MA \text{ Eq. Concentration} = \frac{\frac{3.2 \text{ lbs TP}}{\text{day}}}{\frac{1.33 \text{ million gallons}}{\text{day}}} \times \frac{8.34 \text{ lbs Water}}{\text{gal}} = \mathbf{0.289 \frac{mg}{L}}$$

$$MA \text{ Eq. Concentration} = 0.289 \frac{mg}{L} \times 3 = \mathbf{0.868 \frac{mg}{L}}$$



# Example 2 – Forestville WWTP

- Annual wasteload allocation (WLA): 364 lbs/year
- Design Flow: 0.119 MGD
- WLA Equivalent Concentration: 1.0 mg/L
  - Monthly Limit
- Monitoring Frequency: Weekly
- Monthly Limit Multiplier: 1.90

| Effluent Monitoring Frequency | 6-Month Average Permit Limits | Monthly Average Permit Limits |
|-------------------------------|-------------------------------|-------------------------------|
| Daily                         | 1.11                          | 1.28                          |
| 6 Times per Week              | 1.12                          | 1.32                          |
| 5 Times per Week              | 1.13                          | 1.35                          |
| 3 Times per Week              | 1.17                          | 1.47                          |
| Twice per Week                | 1.21                          | 1.59                          |
| Weekly or Less                | 1.30                          | 1.90                          |

## Example 2 – Forestville WWTP

- Calculate limit:

$$\text{Monthly Average Limit} = 1.90 \times \frac{364 \frac{\text{lbs}}{\text{year}}}{365.25 \frac{\text{days}}{\text{yr}}} = 1.9 \frac{\text{lbs}}{\text{day}}$$

- Translated into an equivalent concentration:

$$\text{MA Eq. Concentration} = \frac{\frac{1.9 \text{ lbs TP}}{\text{day}}}{\frac{0.119 \text{ million gallons}}{\text{day}}} \times \frac{8.34 \text{ lbs Water}}{\text{gal}} = 1.9 \frac{\text{mg}}{\text{L}}$$

# Example 3 – Kewaunee WWTP

- Annual wasteload allocation (WLA): 1,273 lbs/year
- Design Flow: 0.539 MGD
- WLA Equivalent Concentration: 0.775 mg/L
  - Monthly Limit
- Monitoring Frequency: 3x/week
- Monthly Limit Multiplier: 1.47

| Effluent Monitoring Frequency | 6-Month Average Permit Limits | Monthly Average Permit Limits |
|-------------------------------|-------------------------------|-------------------------------|
| Daily                         | 1.11                          | 1.28                          |
| 6 Times per Week              | 1.12                          | 1.32                          |
| 5 Times per Week              | 1.13                          | 1.35                          |
| 3 Times per Week              | 1.17                          | 1.47                          |
| Twice per Week                | 1.21                          | 1.59                          |
| Weekly or Less                | 1.30                          | 1.90                          |

## Example 3 – Kewaunee WWTP

- Calculate limit:

$$\text{Monthly Average Limit} = 1.47 \times \frac{\frac{1,273 \text{ lbs}}{\text{year}}}{365.25 \frac{\text{days}}{\text{year}}} = 5.1 \frac{\text{lbs}}{\text{day}}$$

- Translated into an equivalent concentration:

$$\text{MA Eq. Concentration} = \frac{\frac{5.1 \text{ lbs TP}}{\text{day}}}{\frac{0.539 \text{ million gallons}}{\text{day}}} \times \frac{8.34 \text{ lbs Water}}{\text{gal}} = 1.1 \frac{\text{mg}}{\text{L}}$$

# Example 4 – Valders WWTP

- Annual wasteload allocation (WLA): 168 lbs/year
- Design Flow: 0.287 MGD
- WLA Equivalent Concentration: 0.198 mg/L
  - 6-month average + monthly average limits
- Monitoring Frequency: Weekly
- 6-Month Average Limit Multiplier: 1.3

| Effluent Monitoring Frequency | 6-Month Average Permit Limits | Monthly Average Permit Limits |
|-------------------------------|-------------------------------|-------------------------------|
| Daily                         | 1.11                          | 1.28                          |
| 6 Times per Week              | 1.12                          | 1.32                          |
| 5 Times per Week              | 1.13                          | 1.35                          |
| 3 Times per Week              | 1.17                          | 1.47                          |
| Twice per Week                | 1.21                          | 1.59                          |
| Weekly or Less                | 1.30                          | 1.90                          |

# Example 4 – Valdres WWTP

- Calculate limits:

$$6MA \text{ Limit} = 1.3 \times \frac{168 \text{ lbs}}{\text{year}} \times \frac{1 \text{ year}}{365.25 \text{ days}} = 0.60 \frac{\text{lbs}}{\text{day}}$$

$$MA \text{ limit} = 0.60 \frac{\text{lbs}}{\text{day}} \times 3 = 1.8 \frac{\text{lbs}}{\text{day}}$$

- Translated into an equivalent concentration:

$$6MA \text{ Eq. Concentration} = \frac{0.60 \text{ lbs TP}}{\text{day}} \times \frac{1 \text{ day}}{0.287 \text{ million gallons}} \times \frac{8.34 \text{ lbs Water}}{\text{gal}} = 0.25 \frac{\text{mg}}{\text{L}}$$

$$MA \text{ limit} = 0.25 \frac{\text{mg}}{\text{L}} \times 3 = 0.75 \frac{\text{mg}}{\text{L}}$$

# Disclaimer

- Limits shown in the draft WLA table may not be exact, as they depend on factors that may change, such as:
  - Whether final WLAs approved by EPA change from the draft WLAs
  - Total phosphorus monitoring frequency for the next permit reissuance.
  - CVs for facilities may differ based on site-specific variability



# Summary

- Expression of limits for phosphorus differs from other pollutants
- Most facilities receiving relief from s. NR 217.13 limits currently in permits
- After TMDL approval, inclusion of TMDL-based limits will take place at either the next permit issuance or as part of a permit modification depending on permit timing and other site-specific factors.





# Questions



Send General TMDL and Allocation  
Questions to:

[kevin.kirsch@wisconsin.gov](mailto:kevin.kirsch@wisconsin.gov)

Cell Phone 608-571-9227

Send Questions Regarding WLA and  
Wastewater Discharges to:

Nate Willis

[nathaniel.willis@wisconsin.gov](mailto:nathaniel.willis@wisconsin.gov)

Cell Phone 608-535-2369

# NE Lakeshore TMDL

## Next Steps

### NORTHEAST LAKESHORE TMDL

A FRAMEWORK FOR WATER QUALITY IMPROVEMENT



South Branch of the Manitowoc River

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