Wisconsin River Basin Water Quality Improvement Project

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Ann Hirekatur, Wisconsin River TMDL Project Manager

Photo by Jean Unmuth
Wisconsin River Basin Water Quality Improvement Project

- Part I. Project Overview
- Part II. TMDL Development Process
- Part III. Status and Results
- Part IV. Where to find more information
Wisconsin River Basin Water Quality Improvement Project

Part I
PROJECT OVERVIEW
Why develop a TMDL?

Baseline Pollutant Load

Does not meet water quality standards

Total Maximum Daily Load

Meets water quality standards
Developing a TMDL

Baseline Pollutant Load

What is the magnitude of the **Total Maximum Daily Load**?
Developing a TMDL

Baseline Pollutant Load

How will the load be apportioned among sources?
WRB Total Maximum Daily Load (TMDL)

Each subwatershed is assessed for:

**Load Allocation**
- Runoff from the landscape

**Background Load**
- Naturally occurring from wetlands, forests

**Waste Load Allocation**
- Municipal Wastewater
- Industrial Wastewater
- Permitted Municipal Storm Sewer Systems
- CAFO Production Areas

TMDL = Load Allocation + Waste Load Allocation + Margin of Safety
Total Maximum Daily Load (TMDL) = Framework for Water Quality Improvement

A TMDL answers the following questions:

- How much is the existing pollutant load? What is the contribution from each source?
- How much does pollution need to be reduced in order for waterways to achieve water quality standards?
- How will the pollutant load reductions be achieved?
The Wisconsin River Basin (WRB)
Water Quality Improvement Project
Water Quality Concerns within the WRB

Fish Kills in Big Eau Pleine Reservoir

Runoff in the Baraboo
How did we get a Water Quality Project in the WRB?

- **2001**: WDNR/USACE develop joint TMDL monitoring proposal for $1.5 million. *Proposal not funded*
- **2004**: WDNR proposal to USEPA for river water quality monitoring. *Proposal not funded*
- **2008**: First Pontoons and Politics at Petenwell Castle Rock
- **2009**: State legislature appropriates $750,000 ($150,000/yr. for 5 years) for monitoring upstream of Castle Rock
- **2009 – 2013**: Wisconsin River TMDL Monitoring
- **2010**: WDNR receives Section 22 Planning Assistance from USACE
A Common Question About the WR TMDL...

My facility doesn’t discharge directly to the Wisconsin River, so the TMDL won’t affect me....right?
Wrong.

Wisconsin has statewide nutrient criteria, therefore

• Every point source with a surface water discharge will get an allocation
  – Regardless of whether the receiving water is impaired
  – Regardless of whether the discharge is to the main stem or a tributary of the Wisconsin River

• Allocation will be protective of nutrient criteria for both immediate and downstream receiving waterway
Statewide Phosphorus Criteria

Rivers
100 µg/L

Streams ¹
75 µg/L

Reservoirs
• Not Stratified = 40 µg/L
• Stratified = 30 µg/L

Inland Lakes²
Ranges from 15-30 µg/L

Great Lakes
• Lake Michigan = 7 µg/L
• Lake Superior = 5 µg/L

¹All unidirectional flowing waters not in NR 102.06(3)(a). Excludes Ephemeral Streams.
²Excludes wetlands and lakes less than 5 acres
Wisconsin River Basin Phosphorus Criteria - Central/South

Stream / River Phosphorus Criteria
- 75 ug/L
- 100 ug/L

Reservoir Phosphorus Criteria
- Requires SSC
- 40 ug/L
- 15 ug/L
- 40 ug/L or SSC (Undetermined)
- 20 ug/L
- 75 ug/L
- 30 ug/L
- 100 ug/L

Notes:
1. Phosphorus criteria delineated using the 24K Hydro layer and the 100 ug/L river extent narrative from administrative 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.
Wisconsin River Basin
Phosphorus Criteria - North

Stream / River Phosphorus Criteria
- - - 75 ug/L
- - - 100 ug/L

Reservoir Phosphorus Criteria
- Requires SSC 40 ug/L
- 15 ug/L 40 ug/L or SSC (Undetermined)
- 20 ug/L 75 ug/L
- 30 ug/L 100 ug/L

Notes:
1. Phosphorus criteria delineated using the 24K Hydro layer and the 100 ug/L river extent narrative from administrative 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.
What it looked like when we started the TMDL

No numeric phosphorus criteria!

2010

Number of Phosphorus Impaired Waters = 12

What it looked like when we started the TMDL

No numeric phosphorus criteria!
303(d) List of Phosphorus Impaired Waters

2012 Draft*
Number of Phosphorus Impaired Waters = 28

*Awaiting USEPA Approval
303(d) List of Phosphorus Impaired Waters

Number of Phosphorus Impaired Waters = 85

2014 Draft*

*Public Comment Period open until Thursday, March 6, 2014
Wisconsin River Basin Water Quality Improvement Project

Part II

TMDL DEVELOPMENT
TMDL Development Overview
TMDL Process Overview: Monitoring

What are the measured flows, and pollutant concentration/loads:
- Entering from tributaries?
- On the main stem of the river?

What are the measured reservoir conditions in response to loads/flows?
TMDL Process Overview: Conceptualization

What’s going on in the watershed?
- Land use/management
- Climate
- Soils, topography, slope
- Hydrography

What’s going on in the reservoir system?
- Size, shape, depth, volume
- Hydrologic budget (rain, evaporation, inflow, outflow)
- Pollutant concentration
- Chemical conditions
Watershed Modeling

- What is the existing/baseline load?
- How much of the load is coming from each source?

Reservoir Modeling

- How does system respond to current conditions?
- What load reduction is needed to meet water quality standards?
Watershed Modeling

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- How much of the load is coming from each source?

Reservoir Modeling

- How does system respond to current conditions?
- What load reduction is needed to meet water quality standards?
TMDL Process Overview: Modeling

Watershed Modeling

- What is the existing/baseline load?
- How much of the load is coming from each source?

Reservoir Modeling

- How does system respond to current conditions?
- What load reduction is needed to meet water quality standards?
TMDL Process Overview: Modeling

Watershed Modeling
- What is the existing/baseline load?
- How much of the load is coming from each source?

Reservoir Modeling
- How does system respond to current conditions?
- What load reduction is needed to meet water quality standards?
TMDL Process Overview: Modeling

Watershed Modeling
- What is the existing/baseline load?
- How much of the load is coming from each source?

Reservoir Modeling
- How does system respond to current conditions?
- What load reduction is needed to meet water quality standards?
Proportional Allocation Method

- Proportional allocation method is developed from baseline conditions
- Baseline Conditions reflect current regulatory requirements
- The TMDL load for each reach is divided proportionally according to each source’s baseline load contribution

Baseline conditions are not based on a facilities current level of performance
TMDL Process Overview: Implementation

TMDL waste load allocations are incorporated into permit limits

- Municipal and Industrial Wastewater
- Permitted Municipal Storm Sewer Systems
- CAFO Production Areas (zero allowable discharge)
Work with county staff and other partners to implement agricultural land management practices to achieve nonpoint TMDL load reductions

- **Fair Share** - Everyone needs to do what they reasonably can
- **Targeting** – Use available resources to put extra effort towards high loading watersheds/areas
What is the Project Timeline?

Estimated TMDL Development Timeline (as of February 2014)

- Watershed & Reservoir Monitoring
- Conceptualization

- Water Quality Data Assessment, Watershed & Reservoir Modeling

2009 - 2013

2014

2015

2016

2017

Draft TMDL

Allocation Development

Final TMDL

Baseline

TMDL
Part III
CURRENT STATUS AND RESULTS
Where are We Today?

Monitoring

Conceptualization

Modeling

Allocations

Implementation
Where are We Today?

- Monitoring Conceptualization
- Complete
- In Progress

- Modeling
- Allocations
- Implementation
Main stem Loads
13 stations with daily discharge & bi-monthly water quality
2009-2013
Wisconsin River TMDL Monitoring

- **Tributary Watershed Loads**
  - 19 stations with daily discharge & bi-monthly water quality
  - 2009-2013
Wisconsin River TMDL Monitoring

Reservoirs
5 major reservoirs
Big Eau Pleine, Lake Dubay, Petenwell, Castle Rock, & Lake Wisconsin
2009-2013
Wisconsin River TMDL Monitoring

- **Phosphorus Evaluation Sites**
  - 98 stations with monthly P samples
Main Stem Monitoring Results

Total Phosphorus Concentration

- Tomahawk: 65
- Merrill: 64
- Wausau Dam: 62
- Rothchild: 70
- Mosinee: 75
- Below Dubay: 95
- Point Dam: 80
- Biron: 90
- Nekoosa: 95
- Below Petenwell: 81
- Below Castle Rock: 67
- Dells: 76
- Sauk City: 78

2010-2013 May-Oct Median TP (μg/L)
Tributary Monitoring Results

Total Phosphorus Concentration

West Tributaries

- Spirit
- Rib
- Big Eau Pleine
- Fenwood
- Freeman
- BEP Outlet
- Little Eau Pleine
- Mill
- Yellow
- Lemonweir
- WB Baraboo
- Baraboo Reedsburg
- Baraboo

- Median TP (μg/L)
  - 2010-2013 May-Oct Median TP (μg/L)

East Tributaries

- Prairie
- Pine
- Eau Claire
- Plover
- Tenmile
- Big Roche-A-Cri

- 2010-2013 May-Oct Median TP (μg/L)
Major Reservoir Monitoring Results

Total Phosphorus Concentration

- Upper: 199 μg/L
- Above Park: 145 μg/L
- Below Park: 121 μg/L
- Lower: 104 μg/L
- Northern: 85 μg/L
- Central: 92 μg/L
- Southern: 91 μg/L

Big Eau Pleine

Lake DuBay

2010-2013 Mid-June – Mid Sept (μg/L)
Major Reservoir Monitoring Results

Total Phosphorus Concentration

- Northern: 95
- North Central: 111
- Central: 121
- South Central: 113
- Southern: 82
- Northern Main: 76
- CTH G: 121
- Yellow River Arm: 98
- Central Main: 80
- Southern Main: 81

2010-2013 Mid-June – Mid Sept (µg/L)
Major Reservoir Monitoring Results

Lake Wisconsin

Total Phosphorus Concentration

- Northern: 90 µg/L
- Central: 109 µg/L
- Southern: 98 µg/L

2010-2013 Mid-June – Mid Sept (µg/L)
Defining Land Management in Agricultural Areas

- Crop rotation
- Tillage
- Nutrient applications
Defining Land Management in Agricultural Areas

Example: Upper Little Eau Pleine Watershed
Defining Land Management in Agricultural Areas

**Agriculture**
- Urban
- Forest
- Grassland
- Wetland

**Dairy**
- Cg-Cs-Oa/A-A-A-A (Disk/Chisel Plow)
- Cg-Oa/A-A-A-A-A (Cultivator/Moldboard Plow)
- Cs-Cs-Cg-Oa/A-A-A (Moldboard Plow)
- Cs-Cs-Oa/A-A-A-A (Disk/Chisel Plow)

**Cash Grain**
- Cg-Cg-So-WW-Cg-So (Cultivator/Disk Plow)
- Cg-So-Cg-So-Cg-So (Cultivator/Disk Plow)
- Cg-So-Cg-So-Cg-So (No Till)

**Other**
- Continuous Corn
- Po-Vg-Vg-Po-Vg-Vg
- Pasture/Hay

Map showing land management practices in different agricultural areas with specific crop rotations and plowing methods.
Defining Land Management in Agricultural Areas

Agriculture
Urban
Forest
Grassland
Wetland

Dairy
Cg-Cs-Oa/A-A-A-A (Disk/Chisel Plow)
Cg-Oa/A-A-A-A-A (Cultivator/Moldboard Plow)
Cs-Cs-Cg-Oa/A-A-A (Moldboard Plow)
Cs-Cs-Oa/A-A-A-A (Disk/Chisel Plow)

Cash Grain
Cg-Cg-So-WW-Cg-So (Cultivator/Disk Plow)
Cg-So-Cg-So-Cg-So (Cultivator/Disk Plow)
Cg-So-Cg-So-Cg-So (No Till)

Other
Continuous Corn
Po-Vg-Vg-Po-Vg-Vg
Pasture/Hay

Hwy 13
Hwy 153
Hwy 97
Marshfield
Part IV
FOR MORE INFORMATION
Technical Stakeholder Meeting Proceedings

• Meetings on November 6th and 13th 2013 at Central Wisconsin Environmental Station
• WDNR and US Army Corps presented approach outlined in Wisconsin River TMDL Technical Scope of Work
• Small and large group discussion to listen to concerns / questions / ideas
• 67 Attendees

Wisconsin River TMDL Spatial Data Viewer

Spatial Viewer Developers:
Mark Binder
Aaron Ruesch
Adam Freihoefer
Theresa Nelson
Wisconsin River TMDL Spatial Data Viewer

What’s Available NOW?
• TMDL Basin and Major Tributary Drainages
• Flow/Water Quality Monitoring Stations
• Waste water outfalls
• Waterways
• Political Boundaries

What’s Coming Soon?
• Landcover
• Urban areas
• Citizen Groups
• Model Sub-basins
• Impaired Waters
• Phosphorus Criteria

http://dnr.wi.gov/topic/SurfaceWater/restorationviewer/
Wisconsin River TMDL Spatial Data Viewer
Wisconsin River TMDL Website

What’s Available On the Website?

• Project overview, maps, timeline, FAQ, contacts
• Link to TMDL Spatial Viewer
• Technical Scopes
• Technical Stakeholder Meeting Presentations
• Wisconsin River Basin Publications E-Library
• WR TMDL Presentations
• WR TMDL Webinars
• Wisconsin River Symposium Presentations (coming soon!)

http://dnr.wi.gov/water/tmdls/wisconsin/
Who Can I Contact?

Ann Hirekatur
Project Manager
Ann.Hirekatur@wisconsin.gov
608-266-0156

Adam Freihoefer
Modeling/Technical Lead
Adam.Freihoefer@wisconsin.gov
608-264-6021

Pat Oldenburg
Monitoring Coordinator
Patrick.Oldenburg@wisconsin.gov
715-831-3262

Terry Kafka
Nonpoint Source Sector Lead
terence.kafka@wisconsin.gov
715-355-1363

Brad Johnson
Stormwater Sector Lead
BradleyA.Johnson@wisconsin.gov
715-359-2872

Doug Casina
CAFO Sector Lead
Douglas.Casina@wisconsin.gov
715-359-2874

VACANT
Wastewater Sector Lead

Or, contact the Wisconsin River TMDL Project Team at
dnrwisconsinrivertmdl@wisconsin.gov
Wisconsin River Basin Water Quality Improvement Project

QUESTIONS?