

**Beaver Dam Lake  
Total Maximum Daily Load  
for Total Phosphorus  
June 20, 2018**

**An Amendment to the “Total Maximum Daily Loads  
for Total Phosphorus and Total Suspended Solids in  
the Rock River Basin” report dated July 2011**



Prepared by:

**Wisconsin Department of  
Natural Resources  
101 S. Webster Street, PO Box 7921  
Madison, Wisconsin 53707-7921**



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Attachment A: Copy of Public Notice

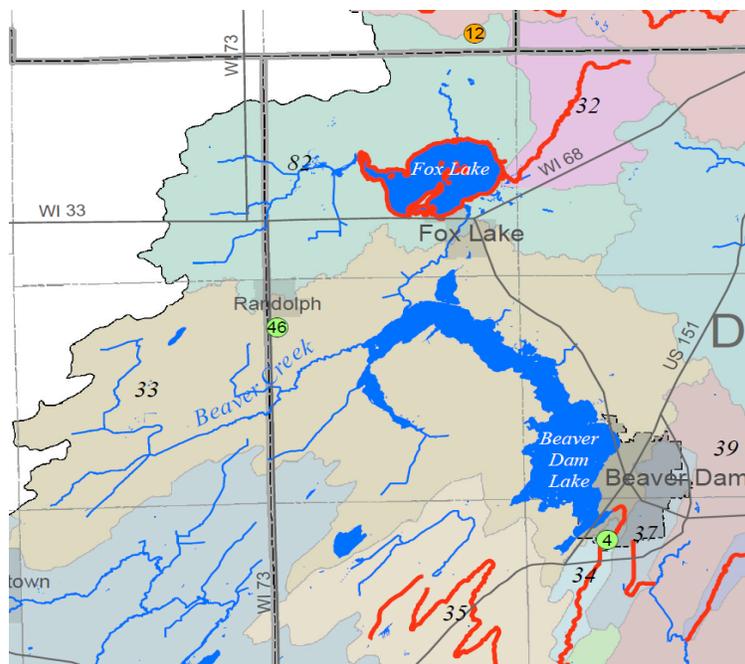
Attachment B: Copy of Public Informational Hearing Presentation

## 1.0 Introduction

Beaver Dam Lake is located near the headwaters of the Beaver Dam River, which is part of the Rock River Basin. The Rock River Total Maximum Daily Load (TMDL) was approved by the United States Environmental Protection Agency (US EPA) in September 2011 and established total phosphorus (TP) and total suspended (TSS) allocations to address impaired waters within the Rock River Basin. Beaver Dam Lake was not listed as impaired at the time the TMDL was developed and the TMDL analyses did not evaluate whether TP criteria for the lake would be met under the allocations. Pursuant to a stipulation and order dated December 27, 2017 (State of WI Div. of Hearings and Appeals: Case No. DNR 17-0010), the Department of Natural Resources is addressing the lake impairment through a proposed amendment to the TMDL.

Beaver Dam Lake was listed as impaired for TP after US EPA approval of the impaired waters list on November 2, 2012. This amendment to the Rock River TMDL verifies that the existing allocations for the lake drainage area (Rock River TMDL reaches 32, 33, and 82) are sufficient to meet TP criteria in Beaver Dam Lake and revises the allocations for the reach immediately downstream of the lake (Rock River TMDL reach 34). Permitted facilities in these reaches include municipal wastewater from the City of Beaver Dam (reach 34) and Village of Randolph (reach 33), and stormwater from the City of Beaver Dam (reaches 33, 34, 37, and 39). The location of reaches is shown on Figure 1. These reaches are in the northwest portion of the Rock River Basin. In Figure 1, the City of Beaver Dam is labeled with a 4 (in green circle) and Village of Randolph is labeled with a 46. Label 12 is for a confined animal feeding operation (CAFO); permit number 0063983. The City of Beaver Dam has a permitted municipal storm sewer system (MS4) while municipalities of Randolph and Fox Lake do not have MS4 permits.

**Figure 1. Excerpt from Rock River TMDL Large Format Map**



## 2.0 Watershed and Water Body Characterization

Beaver Dam Lake, a 6,542-acre impoundment, is shallow (max depth 8 ft.) and hypereutrophic. Urban and agricultural polluted runoff and a dominance of rough fish have severely degraded the water quality. Water clarity is very poor and significant blue-green algae blooms are common. WDNR first undertook a rough fish eradication project here in 1987 and additional efforts continue. Water quality conditions improved the following year after the first treatment for rough fish in 1987; turbidity, suspended solids and chlorophyll A levels were all reduced and clarity increased. However, blue-green algae blooms, fed by elevated TP concentrations, continue to occur and have impaired aquatic plant growth.

Beaver Dam Lake is in the Beaver Dam River watershed which is 290.25 square miles in size. Land use in the watershed is primarily agricultural (71%), wetland (11%) and a mix of suburban (7%) and other uses (10%). This watershed has 421.30 stream miles, 3,607.03 lake acres and 29,349.96 wetland acres. Permitted facilities in the drainage basin include municipal wastewater from the Village of Randolph and stormwater from the City of Beaver Dam.

## 3.0 Applicable Water Quality Standards

Per s. NR. 102, Wis. Adm. Code, Beaver Dam Lake is classified as a shallow lowland lake with the corresponding summer mean TP criterion of 40 micrograms per liter ( $\mu\text{g/L}$ ). Beaver Dam Lake was placed on the impaired waters list in 2010 (approved by US EPA on November 2, 2012) under Category 5A, TMDL needed. The 2016 assessments showed continued impairment with TP concentration data overwhelmingly exceeding 2016 Wisconsin’s Consolidated Assessment and Listing Methodology (WisCALM) listing thresholds for the Recreation use (REC) and Fish and Aquatic Life use (FAL), and chlorophyll data overwhelmingly exceeded FAL thresholds and exceeded REC thresholds. Beaver Dam Lake was listed under Category 5A because it was unknown at the time of listing if the existing allocations contained in the Rock River TMDL were adequate to meet water quality criterion for Beaver Dam Lake.

The applicable TP criteria for the streams in reaches 32, 33, 82, and 34 is 75  $\mu\text{g/L}$ . Fox Lake located in reach 82 has a criterion of 40  $\mu\text{g/L}$ . The approved allocations in the Rock River TMDL were set to ensure that these criteria were obtained; however, additional evaluation, covered in this report, was needed to ensure Beaver Dam Lake meets TP criterion. Table 1 provides a summary for the Beaver Dam Lake listing on Wisconsin’s impaired waters list.

**Table 1. Impaired Water Summary**

Water body	Description	County	Waters ID	Pollutants	Impairments	Current Use	Designated Use	Supporting Designated Use
Beaver Dam Lake	Lake	Dodge	11411	TP	Eutrophication and Excess Algal Growth	WWSF-Not Supporting	Default FAL	NR102 Classification

WWSF = Warmwater sport fishery

Default FAL = No use classification survey completed for Fish and Aquatic Life Use

## 4.0 Source Assessment

The analysis for Beaver Dam Lake is using the same source assessment and allocation process used in the Rock River TMDL. However, additional analysis revealed that the SWAT model (Soil and Water Assessment Tool) used in the TMDL calculations underestimates flow at the USGS gage on the Beaver Dam River (USGS gage 05425912) located immediately downstream of Beaver Dam Lake, especially during the months of October-January. To adjust for this, measured flow data were substituted for modeled flow estimates in the TMDL calculations to better estimate loading capacity for the Beaver Dam River. As used in the original TMDL analysis, the 33<sup>rd</sup> percentile flow is used for calculating loading capacity for the reach. The flows in Table 2 were calculated for the gage period of record (1986-2015) and the SWAT model period (1989-1998). The design flow of the Beaver Dam WWTP was also increased to 5.5 million gallons per day (MGD) to reflect changes in flow over the baseline assumptions used in the original TMDL.

## 5.0 Pollutant Loading Capacity for Beaver Dam Lake and Reach 34

Beaver Dam Lake is classified as a shallow lowland lake, and has a summer mean TP criterion of 40 µg/L. The mean annual TP concentration of a natural lake can be estimated from an empirical relationship developed by Canfield and Bachmann (1981)<sup>1</sup>. While Beaver Dam Lake is a reservoir, the equation for natural lakes was used because its flushing rate (1.15 yr<sup>-1</sup>) is more like the natural lakes (5 yr<sup>-1</sup>) in the Canfield and Bachmann study than the artificial lakes (35 yr<sup>-1</sup>).

The equation is:

$$P = \frac{L}{z(0.162 \left(\frac{L}{z}\right)^{0.458} + p)}$$

Where  $P$  is the predicted mixed lake TP concentration (µg/L),  $L$  is the areal TP load (mg/m<sup>2</sup> of lake area/yr),  $z$  is the mean lake depth (m), and  $p$  is the lake flushing rate (yr<sup>-1</sup>). For Beaver Dam Lake,  $L = 87$ ,  $z = 1.39$ , and  $p = 1.15$ . If the TMDL allocations for reaches draining to Beaver Dam Lake are achieved, the resulting predicted lake TP concentration is 28 µg/L; which meets the 40 µg/L TP criterion for Beaver Dam Lake.

This predicted TP concentration is an annual average, but summer TP concentrations tend to be higher than annual average concentrations in shallow lakes. The average summer TP concentration was estimated to be 37 µg/L by multiplying the annual average (28) by an adjustment factor (1.33), which is the ratio of the average TP in summer months to annual average TP in nearby Fox Lake, which has a large TP dataset. The summer adjustment factor can

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<sup>1</sup> Canfield, D.E., and R.W Bachmann. 1981. Prediction of total phosphorus concentrations, chlorophyll-a, and Secchi depths in natural and artificial lakes. Canadian Journal of Fisheries and Aquatic Sciences 38: 414-423.

be considered to represent internal loading of TP from lake sediments to the water column. Based on this estimate, Beaver Dam Lake meets its TP criterion if the approved allocations in the Rock River TMDL Report dated July 2011 are implemented. Therefore, no revisions are proposed to allocations for reaches 32, 33, and 82; the current TMDL (approved in 2011) addresses the phosphorus impairments for Beaver Dam Lake.

Under the existing allocations, the TP concentration in the outflow from Beaver Dam Lake will range from 16 µg/L in January to 39 µg/L in August. The original TMDL did not account for the impact of Beaver Dam Lake on concentrations entering reach 34. The outflow concentration of Beaver Dam Lake is significantly lower than the TP criterion for TMDL reach 34 of the Beaver Dam River (75 µg/L) which effectively increases the loading capacity for reach 34. Therefore, the wasteload allocations for the City of Beaver Dam WWTP, which discharges to reach 34, can be increased (Table 2) along with the load allocation for reach 34 and still meet the reach criterion. Consistent with the methodology in the original TMDL, increased loading capacity resulting influence of Beaver Dam Lake were only applied to reach 34 and were not distributed downstream.

**Table 2. Summary of monthly TMDL revisions: streamflow in reach 34 and allocations for Beaver Dam WWTF**

<i>Month</i>	<i>USGS 33% flow</i>	<i>SWAT 33% flow</i>	<i>Lake TP (µg/L)</i>	<i>TP Load (lbs)</i>	<i>TP Conc (µg/L)</i>	<i>TSS Load (tons)</i>
Jan	48.8	12.0	16	635.05	457	20.88
Feb	62.9	33.0	16	853.71	614	20.85
Mar	106.0	48.1	23	886.16	637	20.88
Apr	85.1	65.9	30	898.24	646	20.84
May	95.9	75.0	23	804.05	578	20.88
Jun	51.2	76.4	36	533.97	384	20.84
Jul	19.8	55.1	36	333.87	240	20.88
Aug	15.8	26.7	39	231.79	167	20.62
Sep	12.0	10.4	31	235.73	169	19.46
Oct	16.7	7.3	33	268.88	193	20.88
Nov	29.2	5.5	31	350.96	252	20.84
Dec	40.3	5.4	23	480.44	345	20.88

**Key:** USGS 33% flow: Flows from USGS gaging station (replaces SWAT predicted flows)  
 SWAT 33% flow: Original modeled flows used in TMDL generated from SWAT model  
 Lake TP (µg/L): Resulting phosphorus concentration in Beaver Dam Lake  
 TP Load (lbs): Resulting total phosphorus mass allocation for Beaver Dam WWTF  
 TP Conc (µg/L): Equivalent effluent concentration based on facility design flow  
 TSS Load (tons): Resulting TSS mass allocation for Beaver Dam WWTF

## 6.0 Pollutant Load Allocations

The results of the modeling show that the current allocations in the approved Rock River TMDL for reaches 32, 33, and 82 allow Beaver Dam Lake to meet the TP water quality criteria of 40 µg/L. No modifications to the allocations are needed for Beaver Dam Lake to meet criterion.

The modeling of Beaver Dam Lake and subsequent adjustment in stream flows below Beaver Dam Lake based on the USGS gaging station does allow for an adjustment in allocations for reach 34 (Beaver Dam River, Calamus Creek to mile 30). The revised allocations for reach 34 are shown in Tables 3 and 4. These tables modify the original allocation tables for reach 34 that can be found in Appendices J and K respectively. The modifications to the allocations for reach 34 are not significant enough to alter the percent reductions shown for nonpoint or MS4 sources contained in Appendix H of the approved Rock River TMDL Report. Adjustments to the wasteload allocation for the City of Beaver Dam WWTF are reflected in Tables 3 and 4. Upon approval of this modification to the Rock River TMDL, the WPDES permit for Beaver Dam WWTF will be modified to reflect the revised TP wasteload allocations.

Changes to the loading capacity and subsequent allocations have not been extended below reach 34; allocations below reach 34 remain unchanged. Additional modeling beyond what was conducted for this study would be needed to verify if downstream reaches could be adjusted do the changes in flow and and still meet water quality criteria.

In addition to the TP allocations, the TSS and sediment allocations for reach 34 were adjusted based on the increased flows. The adjusted TSS allocations are summarized in Table 4.

### Margin of Safety and Reserve Capacity

In addition to the margin of safety (MOS) included in the approved Rock River TMDL, an additional implicit MOS for Beaver Dam Lake stems from the lake modeling that shows that the allocations result in predicted lake TP concentration of 28 µg/L with the average summer TP concentration estimated to be 37 µg/L. Both these results are less than the TP criterion for Beaver Dam Lake of 40 µg/L and provide an additional MOS for Beaver Dam Lake. The MOS for the other reaches remains unchanged.

No modifications to the reserve capacity have been made. Baseline flows for Beaver Dam WWTF were updated to reflect increased flows at the facility since approval of the Rock River TMDL.

## Seasonal Variation

The loading capacity analysis was performed using monthly loading data from the SWAT model for the period 1989 – 1998 and the lake modeling for Beaver Dam Lake was evaluated on both an annual basis and a seasonal basis by evaluating the average summer concentrations.

**Table 3. Revised daily total phosphorus allocations for reach 34 (replaces values in Appendix J).**

Reach Waterbody Name and Extents	Allocation Component	Daily TP Load (lbs/day)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
34 Beaver Dam River Calamus Creek to Mile 30	Total Loading Capacity	48.98	72.99	68.51	71.82	62.25	42.77	25.93	17.96	18.86	20.79	28.01	37.06
	Load Allocation	0.01	0.1	0.17	0.23	0.23	0.19	0.14	0.05	0.05	0.04	0.03	0.01
	Background	0	0.04	0.03	0.04	0.01	0.02	0.02	0.01	0.01	0.01	0	0
	Ag/Non-Permitted Urban	0.01	0.06	0.14	0.19	0.22	0.17	0.12	0.04	0.04	0.03	0.03	0.01
	Wasteload Allocation	48.97	72.89	68.34	71.59	62.02	42.58	25.79	17.91	18.81	20.75	27.98	37.05
	General Permit Sources	0	0	0	0	0	0	0	0	0	0	0	0
	MS4	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.04	0.03	0.02	0.02	0.01
Point Source	48.96	72.87	68.32	71.56	61.99	42.54	25.74	17.87	18.78	20.73	27.96	37.04	

**Original Allocation table from Appendix J (TP) for reach 34:**

Reach Waterbody Name and Extents	Allocation Component	Daily TP Load (lbs/day)												Annual Load Allocation (lbs/year)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
34 Beaver Dam River Calamus Creek to Mile 30	Total Loading Capacity	5.42	6.27	5.83	6.22	6.03	6.33	6.08	5.94	5.93	5.60	5.66	5.42	927.18
	Load Allocation	0.01	0.10	0.17	0.23	0.23	0.19	0.14	0.05	0.05	0.04	0.03	0.01	37.95
	Background	0.00	0.04	0.03	0.04	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	5.70
	Ag/Non-Permitted Urban	0.01	0.06	0.14	0.19	0.22	0.17	0.12	0.04	0.04	0.03	0.03	0.01	32.25
	Wasteload Allocation	5.41	6.17	5.66	5.99	5.80	6.14	5.94	5.89	5.88	5.56	5.63	5.41	889.23
	General Permit Sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MS4	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.04	0.03	0.02	0.02	0.01	9.74
WWTF	5.40	6.15	5.64	5.96	5.77	6.10	5.89	5.85	5.85	5.54	5.61	5.40	879.49	

**Table 4. Revised daily total suspended solids allocations for reach 34 (replaces values in Appendix K).**

Reach Waterbody Name and Extents	Allocation Component	Daily Load (tons/day)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
34 Beaver Dam River Calamus Creek to Mile 30	Total Loading Capacity	1.67	1.91	1.68	1.76	1.72	1.75	1.67	1.62	1.58	1.64	1.69	1.66
	Load Allocation	0.02	0.09	0.06	0.08	0.09	0.07	0.04	0.01	0.01	0.01	0.02	0.02
	Background	0	0	0	0	0	0	0	0	0	0	0	0
	Ag/Non-Permitted Urban	0.02	0.09	0.06	0.08	0.09	0.07	0.04	0.01	0.01	0.01	0.02	0.02
	Wasteload Allocation	1.65	1.82	1.62	1.68	1.63	1.68	1.63	1.61	1.57	1.63	1.67	1.64
	General Permit Sources	0	0	0	0	0	0	0	0	0	0	0	0
	MS4	0.04	0.04	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.03
Point Source	1.61	1.78	1.61	1.66	1.61	1.66	1.61	1.59	1.55	1.61	1.66	1.61	

Note: Total annual allocations are not included in these tables because the daily wasteload allocations for point sources include a multiplier (2.39) to allow for variability in daily discharge, and summing these values would inflate the annual load.

**Original Allocation table from Appendix K (TSS) for reach 34:**

Reach Waterbody Name and Extents	Allocation Component	Daily TSS Load (tons/day)												Annual Load Allocation (tons/year)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
34 Beaver Dam River Calamus Creek to Mile 30	Total Loading Capacity	1.08	1.26	0.77	0.71	0.66	0.65	0.51	0.52	0.58	0.66	0.75	1.07	130.75
	Load Allocation	0.02	0.09	0.06	0.08	0.09	0.07	0.04	0.01	0.01	0.01	0.02	0.02	15.67
	Background	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ag/Non-Permitted Urban	0.02	0.09	0.06	0.08	0.09	0.07	0.04	0.01	0.01	0.01	0.02	0.02	15.67
	Wasteload Allocation	1.06	1.17	0.71	0.63	0.57	0.58	0.47	0.51	0.57	0.65	0.73	1.05	115.08
	General Permit Sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MS4	0.04	0.04	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.03	8.18
WWTF	1.02	1.13	0.70	0.61	0.55	0.56	0.45	0.49	0.55	0.63	0.72	1.02	106.90	

## **7.0 Implementation**

In addition to the reasonable assurance section and implementation actions laid out in the approved Rock River TMDL Report, there have been implementation efforts directed specifically for Beaver Dam Lake. In September 2015, a Comprehensive Management Plan was developed for Beaver Dam Lake which lays out detailed implementation efforts in and around the lake. This plan expanded on earlier efforts to control carp (Beaver Dam Lake Planning Grant #LPL1477-12) and to reduce nonpoint loads through conservation programs including the “Conservation Reserve Enhancement Program (CREP) and Wetland Reserve Program (WRP) Planning Project – Beaver Dam Lake Watershed”). These reports and other relevant information can be found on the WI DNR website at:

<https://dnr.wi.gov/water/waterDetail.aspx?wbic=835100>

## **8.0 Public Participation**

Per s. NR 212.77 Wis. Admin. Code, the proposed update to the Rock River TMDL was public noticed followed by a 30-day comment period. A public informational hearing was conducted on April 9, 2018, followed by the 30-day comment period. A copy of the public notice can be found in Attachment A. The public notice was placed on the DNR website ( <http://dnr.wi.gov/Calendar/Hearings/> ) and placed in regional newspapers. The public hearing was attended by the Director of Beaver Dam Utilities, Rob Minnema and their consultant, James Smith. A copy of the presentation from the public hearing can be found in Attachment B.

No comments were received during the public hearing. Per s. NR 212.77(2) Wis. Admin. Code, once the TMDL is approved by US EPA, the TMDL is automatically incorporated into all applicable areawide water quality management plans.

## **Attachment A: Copy of Public Notice**

### **STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES PUBLIC NOTICE OF INFORMATIONAL HEARING FOR PROPOSED AMMENDMENT TO THE ROCK RIVER BASIN TOTAL MAXIMUM DAILY LOAD STUDY**

The DNR will conduct a public informational hearing on Monday April 9, 2018 at 2:00 p.m. to outline a proposed amendment to the report titled “Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Rock River Basin” (RR TMDL). The informational hearing will be held in the Gathering Waters/ Glaciers Edge conference room at the Wisconsin Department of Natural Resources Fitchburg office located at 3911 Fish Hatchery Road in Fitchburg, WI to provide the public with an overview of the analysis and explain how to access the proposed amendment.

The RR TMDL was approved by United States Environmental Protection Agency (U.S.EPA) in September 2011 and established total phosphorus (TP) and sediment/total suspended sediment (TSS) allocations for impaired waterbodies in the Rock River Basin. Beaver Dam Lake is near the headwaters of the Beaver Dam River, which is part of the Rock River Basin. Beaver Dam Lake was not listed as impaired for TP at the time the RR TMDL was developed; however, it was subsequently listed as impaired for TP on November 2, 2012.

The RR TMDL did not evaluate whether TP criteria for Beaver Dam Lake would be met if the stream allocations in the contributory drainage areas are achieved. Pursuant to a stipulation and order dated December 27, 2017 (State of WI Div. of Hearings and Appeals: Case No. DNR 17-0010), the Department is addressing the lake impairment through a proposed amendment to the RR TMDL. The allocations are based on the applicable water quality criterion for Beaver Dam Lake in chapter Ch. NR 102, Admin. Code.

In the RR TMDL, the contributory drainage area for Beaver Dam Lake is comprised of reaches 32, 82, and 33. Beaver Dam Lake discharges to TMDL reach 34. The proposed amendment adjusts both load allocations and wasteload allocations within these reaches. Specific wasteload allocations affected include the City of Beaver Dam WWTP, the City of Beaver Dam urban stormwater wasteload allocation, and the waste load allocation for the Village of Randolph WWTP. For those who are unable to attend the hearing, comments on the proposed amendment may be submitted through May 8, 2018 to [Kevin.Kirsch@wisconsin.gov](mailto:Kevin.Kirsch@wisconsin.gov) or by mail to:

Kevin Kirsch  
Wisconsin Department of Natural Resources  
101 S. Webster St. PO Box 7921  
Madison, WI 53707-7921

The proposed amendment will be available electronically at <http://dnr.wi.gov/topic/tmdls/rockriver/> starting on April 6, 2018. Oral comments, received during the public meeting, and written comments received prior to the close of the comment

period will be considered prior to making a final approval and submittal to U.S. EPA. Written and oral comments carry the same weight. Once finalized, the amendment to the RR TMDL will be sent to EPA for their review and approval. A summary of comments and responses shall be included in the submittal to U.S. EPA.

Reasonable accommodation, including the provision of informational material in an alternative format, will be provided for qualified individuals with disabilities upon request.

###

## Attachment B: Copy of Public Informational Hearing Presentation

### Public Informational Hearing

#### Draft Beaver Dam Lake Total Maximum Daily Load for Total Phosphorus

An Update to the “Total Maximum  
Daily Loads for Total Phosphorus and  
Total Suspended Solids in the Rock  
River Basin” report dated July 2011

April 9<sup>th</sup>, 2018  
2:00pm  
DNR Fitchburg Office

Draft Beaver Dam Lake  
Total Maximum Daily Load  
for Total Phosphorus  
April 2018

An Update to the “Total Maximum Daily Loads for  
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Prepared by:  
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## Agenda

1. Background and overview of the TMDL study
2. Short QA session before on the record comments
3. Commencement of oral statements

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## Why DNR Initiated This Update

1. After U.S. EPA approval of the Rock River TMDL, Beaver Dam lake was added to the impaired waters list for impairments caused by phosphorus.
2. As part of a contested case hearing, DNR was required to evaluate approved allocations to see if water quality standards in Beaver Dam Lake were met and if not, modify allocations accordingly.

### Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Rock River Basin

Columbia, Dane, Dodge, Fond du Lac, Green, Green Lake, Jefferson, Rock, Walworth, Washington, and Waukesha Counties, Wisconsin

July 2011

Prepared for:

U.S. Environmental Protection  
Agency  
Region 5  
77 W. Jackson Blvd.  
Chicago, IL 60604

Wisconsin Department of  
Natural Resources  
101 S. Webster Street, PO Box 7921  
Madison, Wisconsin 53707-7921



Prepared by:  
CADMUS

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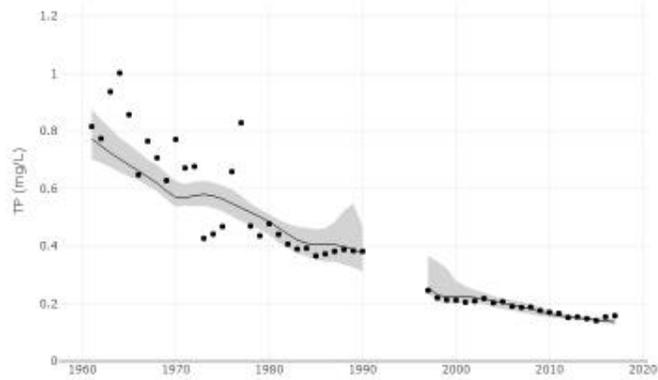
## TMDL for TP and TSS/Sediment

Beaver Dam Lake  
| Vehicle Retrieval  
| 50's - 60's Nash  
| September 6th  
2016



4

# Trend in TP



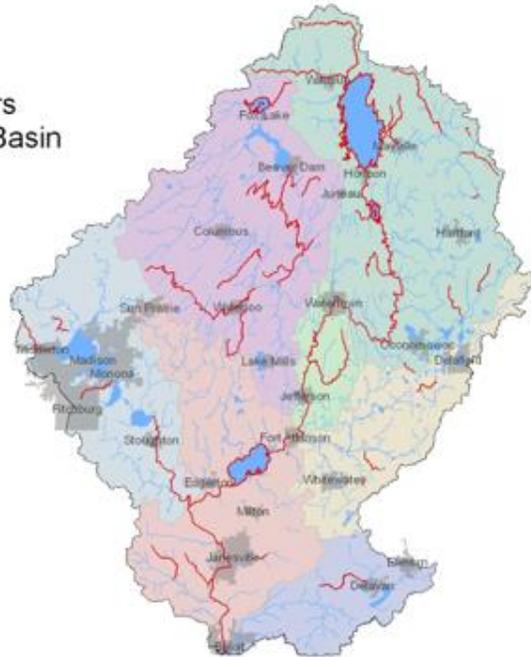
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## Impaired Waters in the Rock River Basin

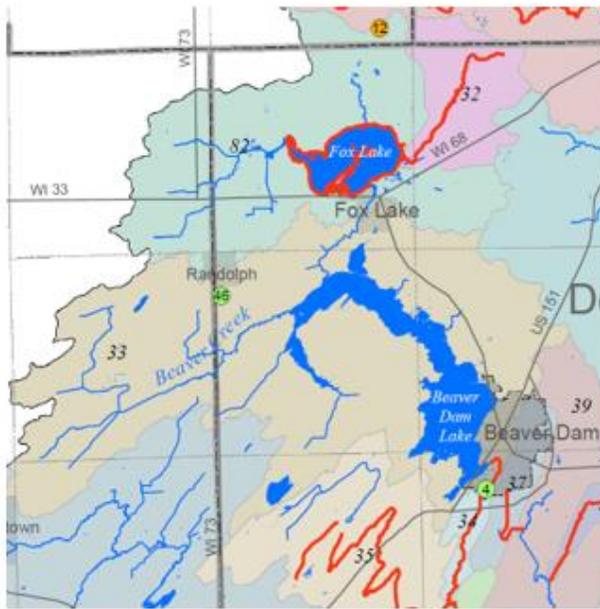


Impaired Waters

0 5 10 20 Miles



6



Proposed updated to address Beaver Dam Lake evaluates TMDL reaches 32, 82, 33, and 34.

TP/TSS sources evaluated:

Nonpoint (MS4, background, and Agricultural)

Village of Randolph WWTF  
 Beaver Dam WWTF  
 City of Beaver Dam Permitted MS4

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## What are TMDLs?

- \* EPA requires that waters listed as impaired on Wisconsin's 303-d list have TMDLs developed.
- \* TMDLs determine the amount of a pollutant a waterbody can receive and still meet water quality standards.

Total Maximum Daily Load =



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# Water Quality Standards

- \* Designated Uses:
  - \* Fish & Aquatic Life
  - \* Public Health
  - \* Recreation
- \* Water Quality Criteria:
  - \* Numeric: dissolved oxygen, pH, bacteria, toxic substances, phosphorus, etc.
  - \* Narrative: "no objectionable deposits," "substances in concentrations or combinations shall not be harmful to humans, fish, plants, or other aquatic life."
- \* Per Wis. Stat. s. 281.15 water quality standards must be adopted by rule.



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# Water Quality Targets - TP

- \* NR 102 Phosphorus Criteria
  - \* 0.075 mg/L for wadable small streams
  - \* 0.100 mg/L for non-wadable rivers
  - \* 0.100 mg/L for Lake Koshkonong
  - \* 0.075 mg/L for Lake Sinissippi
  - \* 0.040 mg/L for lakes (Fox Lake and Beaver Dam Lake)



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## Evaluation of Beaver Dam Lake

- \* Used phosphorus loads from Rock River TMDL (SWAT modeled loads from 1989-1998).
- \* Lake phosphorus concentration evaluated using the Canfield-Bachmann relationship.
- \* Results show that existing allocations for reaches 32, 33, and 82 allow Beaver Dam Lake to meet water quality criteria.



Canfield, D.E., and R.W. Bachmann. 1981. Prediction of total phosphorus concentrations, chlorophyll a, and Secchi depths in natural and artificial lakes. *Canadian Journal of Fisheries and Aquatic Sciences* 38: 414-423.

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## Evaluation of TMDL Reach 34

- \* Modified loading capacity due to TP retention in Beaver Dam Lake and increased flow in reach 34.
- \* Allocations updated in Tables 3 and 4 which update Appendix J and Appendix K in the Rock River TMDL. Percent reductions do not change for nonpoint or MS4 sources.

	USGS	SWAT	Lake TP	TP Load	TP Conc.	TSS Load
Month	33% flow	33% flow	(µg/L)	(lbs)	(µg/L)	(tons)
Jan	48.8	12.0	16	635.05	457	20.88
Feb	62.9	33.0	16	853.71	614	20.85
Mar	106.0	48.1	23	886.16	637	20.88
Apr	85.1	65.9	30	898.24	646	20.84
May	95.9	75.0	23	804.05	578	20.88
Jun	51.2	76.4	36	533.97	384	20.84
Jul	19.8	55.1	36	333.87	240	20.88
Aug	15.8	26.7	39	231.79	167	20.62
Sep	12.0	10.4	31	235.73	169	19.46
Oct	16.7	7.3	33	268.88	193	20.88
Nov	29.2	5.5	31	350.96	252	20.84

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**Draft Beaver Dam Lake  
Total Maximum Daily Load  
for Total Phosphorus  
April 2018**

An Update to the "Total Maximum Daily Loads for  
Total Phosphorus and Total Suspended Solids in the  
Rock River Basin" report dated July 2011



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## More Information and Access Report

<http://dnr.wi.gov/topic/tmdls/rockriver/>

Or on the main DNR page search for  
"Rock River TMDL"

<http://dnr.wi.gov/>

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## Questions and Comments



**Comments accepted through May 8, 2018**

For those who are unable to attend the hearing, comments on the proposed amendment may be submitted through May 8, 2018 to [Kevin.Kirsch@wisconsin.gov](mailto:Kevin.Kirsch@wisconsin.gov) or by mail to:

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