Total Maximum Daily Load:
Dougherty Creek
Green County, Wisconsin

Dougherty Creek, Green County, Wisconsin
Final Report prepared by:
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WISCONSIN
DEPT. OF NATURAL RESOURCES

Wisconsin Department of Natural Resources: Bureau of Watershed Management

A Total Maximum Daily Load for Dougherty Creek: Phosphorus and Biological Oxygen Demand

INTRODUCTION

Dougherty Creek is a sixteen-mile long stream that originates from springs north of Postville, Wisconsin and flows southwest from Green County into Lafayette County where it joins the East Branch Pecatonica River. The Wisconsin Department of Natural Resources (WDNR) placed the upper 2.62 miles of Dougherty Creek (from the headwaters down to Dougherty Creek Road) on the state's 303(d) impaired waters list (Table 1) as high priority in 2006. The Clean Water Act (CWA) and United States Environmental Protection Agency (US EPA) require that each state develop Total Maximum Daily Loads (TMDLs) for waters on the impaired waters list. This TMDL will define load allocations for phosphorus (TP) and corresponding biological oxygen demand (BOD) and identify management actions that will help restore the biological integrity and protect the downstream uses of Dougherty Creek. This TMDL complements the TMDL addressing sediment loading to Dougherty Creek was approved as part of the Sugar-Pecatonica TMDL in 2006 by US EPA.

Waterbody Name	WBIC	TMDL ID	Impaired Stream Segment	Existing Use	Codified Use	Pollutant	Impairment
Dougherty Creek	901000	115	Miles 13.96 - 16.59	LFF	WWSF	BOD, sediment* and P	DO, degraded habitat*

Table 1. Uses, pollutants and impairments of Dougherty Creek

*Sediment and degraded habitat were addressed for Dougherty Creek as part of the Sugar-Pecatonica TMDL approved by US EPA in 2006. The goals of this TMDL aimed to reduce sediment from 2000 tons/year to 1800 tons/year (or 1 ton/acre in the watershed to 0.9 ton/acre).

PROBLEM STATEMENT

The impaired segment of Dougherty Creek (mile 13.96 to 16.59) includes the headwaters down to Dougherty Creek Road where the USGS gaging station (#05433600) was placed (Figure 1). The watershed in this headwaters region is approximately 2.2 square miles and the land use is almost entirely agricultural (Table 2). The impaired section of Dougherty Creek is typical of a small headwaters stream – it has a small watershed area, relatively low flow, and is narrow, fairly straight, and lacks depth. Low dissolved oxygen levels and degraded habitat impairments result from loading of sediment, phosphorus, and biological oxygen demand from nonpoint source pollution.

Land Use of Impaired Watershed	% of Total Acreage
Corn	17
Soybeans	4
Other Crops	21
Fallow/Idle Crops	<1
Forest	8
Urban/Road	6
Barren	<1
Shrub	2
Pasture/Forage Crop	41
Wetland	1

Table 2. Land use of the subwatershed encompassing the impaired segment of Dougherty Creek.

This report demonstrates that TP loading in conjunction with high BOD levels depletes dissolved oxygen (DO) levels in Dougherty Creek. BOD describes the consumption of dissolved oxygen by microorganisms during decomposition of organic matter and is an indirect measure of the biodegradable organic material in the water.

Dougherty Creek is currently not meeting applicable narrative water quality criteria for nutrients as defined in Wisconsin Administrative Code, and is not meeting numeric water quality criteria for dissolved oxygen as established by the WDNR.

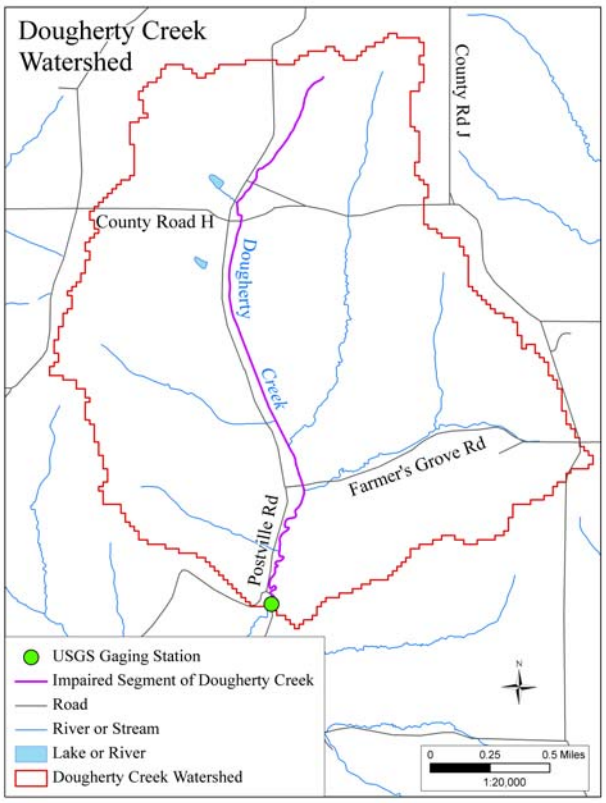

Figure 1. Map of Impaired Segment of Dougherty Creek

Exceedance of narrative criteria (nutrients)

Narrative criteria stated in NR 102.04 (1), Wis. Admin. Code are defined in the following way:

"To preserve and enhance the quality of waters, standards are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development, or other activities shall be controlled so that all waters including mixing zone and effluent channels meet the following conditions at all times and under all flow conditions:

> (c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state."

High nutrient levels (particularly phosphorus) lead to algal and plant growth producing color, odor, taste, or unsightliness as referenced in part (c).

Exceedance of numeric criteria (DO)

Numeric criteria for dissolved oxygen (DO) are stated in NR 102.04 (4), Wis. Admin. Code is defined as:

"STANDARDS FOR FISH AND AQUATIC LIFE. Except for natural conditions, all waters classified for fish and aquatic life shall meet the following criteria:

"(a) Dissolved oxygen. Except as provided in par. (e) and S. NR 104.02 (3), the dissolved oxygen content in surface waters may not be lowered less than 5 mg/L at any time.

Dougherty Creek was monitored for dissolved oxygen, and found that on occasion the DO drops below 5 mg/L particularly during runoff events. Biological oxygen demand targets loads will be determined to meet DO water quality criteria of 6 mg/L[1] for this TMDL. This TMDL target is set to protect the codified use of a warm water sport fish community.

Support of Designated Uses

The current use of this section of stream is considered a "limited forage fishery" while the codified use is defaulted as a warm water sport fish community, since this section has not been formally classified. The uses applicable to the impaired segment of Dougherty Creek are as follows:

"FISH AND OTHER AQUATIC LIFE USES. The department shall classify all surface waters into one of the fish and other aquatic life subcategories described in this subsection. Only those use subcategories identified in pars. (a) to (c) shall be considered suitable for the protection and propagation of a balanced fish and other aquatic life community as provided in federal water pollution control act amendments of 1972, P.L. 92-500; 33 USC 1251 et.seq.

> "(a) Cold water communities. This subcategory includes surface waters capable of supporting a community of cold water fish and aquatic life, or serving as a spawning area for cold water fish species. This subcategory includes, but is not restricted to, surface waters identified as trout waters by the department of natural resources (Wisconsin Trout Streams, publication 6-6300 (80))."
>
> "(b) Warm water sport fish communities. This subcategory includes surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for warm water sport fish.
>
> "(c) Warm water forage fish communities. This subcategory includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life."
>
> "(d) Limited forage fish communities. (Intermediate surface waters). This subcategory includes surface waters of limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of forage fish and other aquatic life.

[1] For this TMDL, BOD targets will be set to achieve a water quality criterion of 6 mg/l which is associated with Trout Waters in NR 102. Although the codified use for this stream is a warm water sport fish community, it has the potential to be a trout stream, and occasionally trout are stocked in this portion of the stream. In addition, the 6 mg/l target for DO will protect the downstream trout community uses for the stream.

SOURCE ASSESSMENT

Point Sources

There are no point sources located on or discharging to the impaired section of Dougherty Creek.

Nonpoint Sources

Dougherty Creek is part of the Lower East Branch Pecatonica River Watershed. As mentioned previously in this report, agricultural runoff is the source of loading for phosphorus and resulting biological oxygen demand, low dissolved oxygen, and degraded habitat impairments for Dougherty Creek, and this problem has existed for a few decades. The Dougherty Creek watershed was included in the Lower East Branch Pecatonica River Priority Watershed Project from 1993 to 2003. As part of the project, a pre-appraisal report (WDNR, 1991) was conducted on streams throughout the watershed. The report states:

> *The most severe example of manure runoff in the watershed is at (the village of) Postville. At least three barnyards were constructed next to the headwaters of Dougherty Creek… At Farmers Grove Road, the most downstream part of the impaired segment the following pollution sources are found: Manure deposition in stream. Channel ditching. Low flows. Barnyards and cropland. Streambank erosion and poorest water quality observed in watershed.*

In addition, macroinvertebrate sampling indicated "poor" to "very poor" water quality in the Farmers Grove Road area based on WDNR's current assessment tool for wadeable streams (WDNR, 2002). If numeric targets chosen for this TMDL can be met through proper management of barnyards and other agricultural lands in the headwaters area of Dougherty Creek, improvements will be seen and water quality targets will be achieved.

LINKAGE ANALYSIS

Establishing the link between watershed characteristics and resulting water quality is a crucial step in TMDL development. By striving to return watershed characteristics closer to natural conditions, improvements in overall stream health can be achieved. Determining the natural streambank conditions of this stream is challenging because of a lack of historical data to represent conditions prior to human disturbance.

Phosphorus loading in water bodies can cause eutrophication of streams and is characterized by excessive plant growth, dense algal growth, and results in diurnal fluctuations in dissolved oxygen levels due to algal oxygen consumption during growth and bacterial consumption of oxygen in the decaying process of dead algae and plant material. Algal growth can reduce desirable periphyton communities that support macroinvertebrates at the base of the food chain. Phosphorus may enter the stream bound to soil particles that transport it during runoff from barnyards and overgrazed pastures adjacent to the stream channel, and nutrient rich manure spread within close proximity

(e.g. 30 feet) of the stream, especially prior to rainfall events or on frozen and snowcovered ground.

When elevated levels of BOD lower the concentration of dissolved oxygen in Dougherty Creek, there can be profound effects on the water body itself as well as the resident aquatic life. The lower the oxygen concentration, the greater the stress. DO fluctuations act as a stressor on aquatic insect and fish communities, particularly to DO sensitive species such as trout. Eventually species sensitive to low DO levels are replaced by species that are more tolerant. This decreases the diversity of the stream and, because of these factors, the fish community is likely to shift from specialists such as trout to more omnivorous non-game species.

TMDL DEVELOPMENT

A TMDL is a quantitative analysis of the amount of specific pollutants reaching an impaired lake or stream to the extent that water quality standards will be met. As part of a TMDL, the amount of pollutant that the water can tolerate and still meet water quality standards must be identified. The goal of this TMDL is to reduce TP and BOD loading to Dougherty Creek to a level that water quality standards will be met and the stream will be restored to meet the designated and potential uses of the stream.

TMDL Monitoring & Modeling

This Total Maximum Daily Load (TMDL) study was designed to monitor the impaired portion of the creek to determine the amount, timing, and type of pollutant loading and the level of impairment caused by these pollutants. Monthly water chemistry samples were taken at Farmers Grove Road (upstream of the USGS gauge station at Dougherty Creek Road, #05433600 near Postville, WI) and analyzed for total suspended solids (TSS), BOD, TP, ammonia, and bacteria (fecal coliform and *E. Coli*). In addition to these samples, 6 event samples were budgeted for water chemistry sampling during rain or other runoff events. Continuous multi-parameter water quality data sondes were periodically deployed to monitor dissolved oxygen, temperature, pH, and conductivity over a 7 to 10 day period. Fisheries and macroinvertebrate surveys were conducted at various sites on the stream to determine the present status of biota of the stream. Continuous flow data was recorded from spring 2006 through fall 2007 using a USGS flow gauge.

Based on the amount of data and limited options for models suitable for the size of this data set, it was determined that the load duration curve (LDC) approach would be the best way to model the P and BOD loading to Dougherty Creek. Load duration curves were developed for Dougherty Creek based on methods outlined by Cleland (2002). To calculate the flow duration curves, continuous daily stream flow from USGS Gage Station #05433600 located at Dougherty Creek Road (Figure 1). Current TP and BOD loads were estimated by multiplying the sampled concentrations by the flow at the time of the sample.

Based on a recent USGS/WDNR study of wadeable streams in Wisconsin which evaluated biological responses to in-stream concentrations of total phosphorus, 0.075 mg/L TP was selected as the target value for this TMDL analysis. The TP concentration

target was established by averaging the measured TP concentration in 240 environmentally varying streams where a recognized biologic response of several biotic indices correlated to phosphorus concentrations occurred (Robertson et. al., 2006[2]). The target value of 0.07 mg/L was also plotted on the LDC. The resulting LDC for TP indicates that all measured TP concentrations during all flow conditions are greater than the target value for the stream. Loading of TP is occurring during all flow regimes.

The target for BOD for this TMDL was chosen using a similar approach in the way water quality based effluent limits for BOD are calculated for point sources. WDNR's Effluent Limitation Calculation Guidance Document basically calculates the dilution needed from point source discharges for BOD (26 lbs) to meet an in-stream decrease in DO (to meet instream water quality standards for DO). In this document, there is also a Streeter-Phelps model (formula), which is a more complicated version of the simple equation used to reach the number of 26 lbs. DNR used this method for point sources beginning in the 1970's and 1980's and it has been concluded since that the "26 lb method" is accurate for small streams where there are limited multiple discharge inputs. Discussions with WDNR point source staff decided that a similar approach could be taken in a nonpoint situation when determining BOD target numbers for the TMDL.

It was estimated that approximately 13 lbs per cfs of BOD could be added to the stream during the summer time and 26 lbs per cfs of BOD could be added to the stream during winter time (due to the change in water temperature and dissolved oxygen carrying capacity between the seasons).

ALLOCATIONS

The total annual loading capacity for phosphorus and BOD is the sum of the wasteload allocations for permitted sources, the load allocations for nonpoint sources, and the margin of safety, as generally expressed in the following equation:

$$\text{TMDL Load Capacity} = \text{WLA} + \text{LA} + \text{MOS}$$

WLA = Wasteload Allocation (from Point Sources)
LA = Load Allocation (from Nonpoint Sources)
MOS = Margin of Safety

Waste Load Allocation

Since there are no point sources in the watershed, the wasteload allocation is zero. If a point discharge were proposed, one of the following would need to occur:

- Effluent limits of zero phosphorus and BOD loads would be included in the WPDES permit
- An offset would need to be created through some means, such as pollutant trading.

[2] Biotic indices and the data used to develop the TP target for Wisconsin wadeable streams can be found in Table 23 of Robertson *et.al.*, 2006.

- A re-allocation of phosphorus and BOD loads would need to be developed and approved by EPA.

Load Allocation

The load allocation (LA) component of the TMDL defines the load capacity for a pollutant that is related to nonpoint source pollution.

To achieve the total phosphorus reductions and corresponding biological oxygen demand water quality criteria, reductions in phosphorus are needed in the agricultural land use portion of the watershed. The percent reductions under different flow conditions in the LA is based on average TP loads under all flow conditions with a goal of the daily target stream concentration of 0.075 mg/L TP, 13 lbs per cfs of BOD in the summer, and 26 lbs per cfs of BOD in the winter. See Table 3 below for the P and BOD loads to Dougherty Creek.

Margin of Safety

The margin of safety (MOS) accounts for the uncertainty about the relationship between the pollutant of concern and the response in the waterbody. For the Dougherty Creek TMDL, an explicit MOS is provided for each of the flow periods of the TP and BOD load duration curves. In this TMDL, the MOS was calculated based on the difference between the loading capacity calculated at the mid-point of each flow zone and the loading capacity calculated at each minimum flow of each zone. The MOS assures that load allocations will not exceed the load associated with the minimum flow in each zone and recognizes that water quality varies over different flow conditions. (See Table 3 for the MOS for Dougherty Creek, reference: EPA 841-B-07-006, 2007).

Total Load Capacity

The total load capacity was captured for the Dougherty Creek TMDL using LDCs with a 2-year set of continuous flow data with monthly water quality data and a few event samples, and a water quality target concentration of 0.075 mg/L TP and 13 lbs/26 lbs BOD in summer/winter respectively. As seen below in Table 3 the stream meets the BOD target during mid-range to low flow conditions during the winter season only. Significant reductions are needed for both P and BOD during high flow and moist stream conditions, especially during the summer season.

SEASONALITY AND CRITICAL CONDITIONS

The potential for Dougherty Creek to display eutrophic conditions as a result of TP and BOD concentrations occurs in the summer during low flow conditions, when phosphorus is actively taken up by aquatic plants and algae, causing diurnal fluctuations in dissolved oxygen. However, Dougherty Creek is most susceptible to TP loading in late winter and early spring snow melt and heavy rain events. During these time periods the soils are exposed because it's early in the growing season and plants haven't established cover to protect the soil. Increased phosphorus loading also occurs as the result of heavy rainfall events during the summer. Increased TP loading is dependant on flow conditions rather than seasonality. Runoff of manure accumulated in and near barnyards adds significant

phosphorus and BOD to the stream during rainfall events. The spectrum of flow conditions that would be expected during any season are represented by using load duration curves to set the TMDL. The load duration curves for Dougherty Creek were created using two years worth of daily flow data, thereby accounting for variations in flow among different years as well as seasonal differences.

TP	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flow
Current Load (lbs/day)	20.25	11.28	2.47	0.96	0.69
TMDL = LA + WLA + MOS	2.83	1.38	0.57	0.40	0.24
LA (lbs/day)	1.94	0.73	0.49	0.28	0.21
WLA (lbs/day)	0.00	0.00	0.00	0.00	0.00
MOS (lbs/day)	0.89	0.65	0.08	0.12	0.03
Load Reduction	**86%**	**88%**	**77%**	**58%**	**65%**

Summer					
BOD	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flow
Current Load (lbs/day)	254.26	397.74	15.11	9.87	6.15
TMDL = LA + WLA + MOS	98.80	44.20	20.80	10.79	7.41
LA (lbs/day)	65.00	24.70	16.90	7.93	6.76
WLA (lbs/day)	0.00	0.00	0.00	0.00	0.00
MOS (lbs/day)	33.80	19.50	3.90	2.86	0.65
Load Reduction	**61%**	**89%**	**n/a**	**n/a**	**n/a**

Winter					
BOD	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flow
Current Load (lbs/day)	254.26	397.74	15.11	9.87	6.15
TMDL = LA + WLA + MOS	135.20	91.00	33.80	28.60	19.5
LA (lbs/day)	122.20	39.00	31.20	24.96	17.68
WLA (lbs/day)	0.00	0.00	0.00	0.00	0.00
MOS (lbs/day)	13.00	52.00	2.60	3.64	1.82
Load Reduction	**47%**	**77%**	**n/a**	**n/a**	**n/a**

Table 3. Load Duration Curve results and the Total Maximum Daily Loads for Dougherty Creek.

REASONABLE ASSURANCE

There are currently no point sources discharging to Dougherty Creek. To ensure the reduction goals of this TMDL are attained, management measures must be implemented and maintained to control nutrient loadings from nonpoint source pollution. Many of these measures require local participation to properly implement. The WDNR will work with the Green County Land Conservation Department (LCD) to determine the best way to deal with problems in the operation of the farms at the headwaters of the stream.

Dougherty Creek was included in the implementation of the Lower East Branch Pecatonica River Priority Watershed Project and farmers could voluntarily employ certain best management practices (BMPs) to reduce nonpoint source runoff with the state providing 70% cost share for installation of the practices. As a result, cement barnyards were constructed on farms along the stream at Postville and at Farmers Grove Road. Two-hundred twenty-eight acres of land south of CTH H was put into perpetual set aside under the Conservation Reserve Enhancement Program (CREP). While these actions addressed some of the sediment concerns from runoff from pastures and croplands, there is still some concern as to the affects of the barnyards which lie immediately adjacent to the stream and may serve as a source of nutrients (especially P) and BOD impacts to the stream. In addition, 16 miles of Dougherty Creek, including the impaired segment of the stream is listed in the streambank protection stewardship list. This allows WDNR to purchase easements along the stream to help improve water quality.

The WDNR and Green County LCD will implement the state agricultural performance standards and manure management prohibitions listed in Chapter NR 151, Wisconsin Administrative Code., to address nutrients in the Dougherty Creek watershed. Many landowners voluntarily install BMPs to help improve water quality and comply with the performance standards. Cost sharing is available for many of these BMPs.

The *Green County Land & Water Resource Management (LWRM) Plan* workplan for 2006-2008 includes goals that address reductions for nutrient loadings. The county's LWRM Plan also includes a strategy to implement the state agricultural performance standards and prohibitions.

BMPs to address possible NR 151 agricultural performance standards violations including including direct runoff from feedlots and overgrazing of the riparian corridor and streambank areas, may include, but not be limited to: addressing housekeeping practices, clean water diversions and roofing to divert water away from the barnyards, limiting the number of animals to allow the barnyards to function properly, fencing and cattle crossings or buyout of the farms.

The Green County LCD and other local units of government may apply for Targeted Runoff Management (TRM) Grants through the WDNR. The TRM Grant Program provides competitive cost-sharing grants to support small-scale, 2-year projects to reduce nonpoint source pollution. TRM Grants fund up to 70% of eligible project costs, with the grant amount capped at $150,000.

The Environmental Quality Incentive Program (EQIP) is another option available for landowners in the watershed. EQIP is a federal cost-share program administered by the Natural Resources Conservation Service (NRCS) that provides landowners with technical and financial assistance. Landowners may receive up to seventy-five percent reimbursement for installation and implementation of certain runoff management practices. Projects include, but are not limited to, terraces, waterways, diversions, and contour strips. These practices help manage agricultural waste, promote stream buffers, and control erosion on agricultural lands.

MONITORING

WDNR will periodically monitor this section of stream to determine the status of the fishery, especially to determine if trout continues to occur and carryover in this section of stream.

PUBLIC PARTICIPATION

The Dougherty Creek TMDL was subject for public review from June 11th, 2008 to July 14th, 2008. On June 11th, a public notice and news release was sent to local newspapers, television stations, radio stations, interest groups, and interested individuals in the south-central region portion of the state. The news release indicated the public comment period and how to obtain copies of the public notice and the draft TMDL. The news release, public notice, and draft TMDL were also placed on the DNR's website: http://dnr.wi.gov/org/water/wm/wqs/303d/Draft_TMDLs.html

WDNR received zero public comments on the Dougherty Creek TMDL. In addition, EPA Region 5 submitted comments during the public comment period. All comments were documented, considered, and addressed, with many incorporated into the final report. Comments and responses can be found in Appendix B of this report.

REFERENCES

Cleland, 2003. TMDL Development from the "Bottom-Up" – Part III: Duration Curves and Wet-Weather Assessments.

Hilsenhoff, William. 1987. An Improved Biotic Index of Organic Stream Pollution. The Great Lakes Entomologist. Vol. 20. No. 1. Pages 31-39.

Lyons, J., L. Wang, and T. Simonson. 1996. Development and Validation of an Index of Biotic Integrity for Coldwater Streams in Wisconsin. North American Journal of Fisheries Management. 16: 241-256.

Lyons, John. 2006. A Fish-based Index of Biotic Integrity to Assess Intermittent Headwater Streams in Wisconsin, USA. Environmental Monitoring and Assessment (2006) 122: 239-258.

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US EPA, 2007. An Approach for Using Load Duration Curves in the Development of TMDLs (EPA 841-B-07-006), August 2007 or found at http://www.epa.gov/owow/tmdl/techsupp.html

WDNR, 1991. Lower East Branch Pecatonica Watershed Priority Watershed Project. Water Resources Appraisal Report. Wisconsin Department of Natural Resources. January, 1991. 34 pages.

WDNR, 2002. Guidelines for Evaluating Habitat of Wadeable Streams. Wisconsin Department of Natural Resources, Bureau of Fisheries Management. June 2002.

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WDNR, 2008. Fisheries Management Database. Wisconsin Department of Natural Resources. Bureau of Fisheries Management. March, 2008.

APPENDIX A – LOAD DURATION CURVES

Flow duration curves display the cumulative frequency of the distribution of the daily flow for the period of record. Flow duration curves are transformed into load duration curves by multiplying the flow values along the curve by the respective pollutant water quality target and appropriate conversion factors. The x-axis represents the flow recurrence interval and the y-axis represents the allowable load for the water quality parameter. The measured pollutant loading points that are plotted above the target line on the load duration curve exceed the pollutant water quality target level; those that fall below the line meet the pollutant water quality target. The flow duration interval (%) is derived from a set of average daily flow data, and indicates the percent of days where flow was exceeded (0% indicates the highest flow periods or "flood conditions", and 100% indicates the lowest flow periods or "dry conditions").

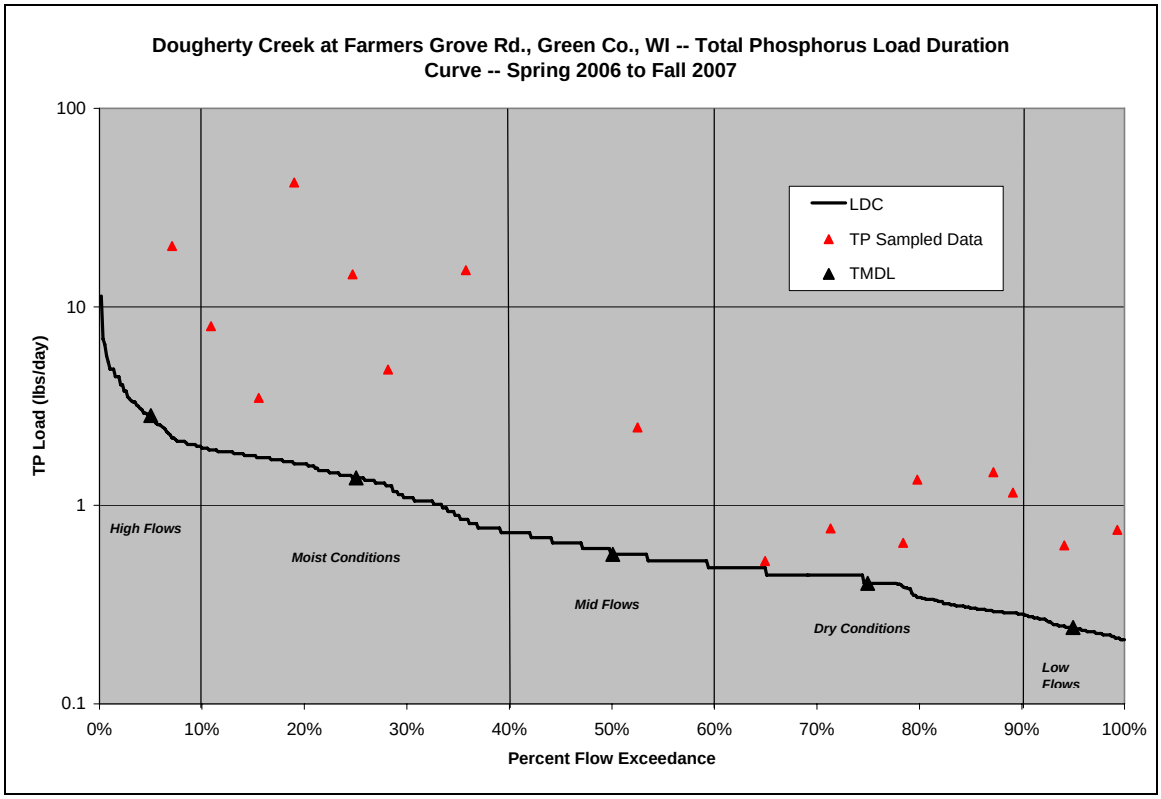

Figure A-1. Dougherty Creek Load Duration Curve for Phosphorus. This figure shows that all sampled total phosphorus data was above the target value under all flow conditions.

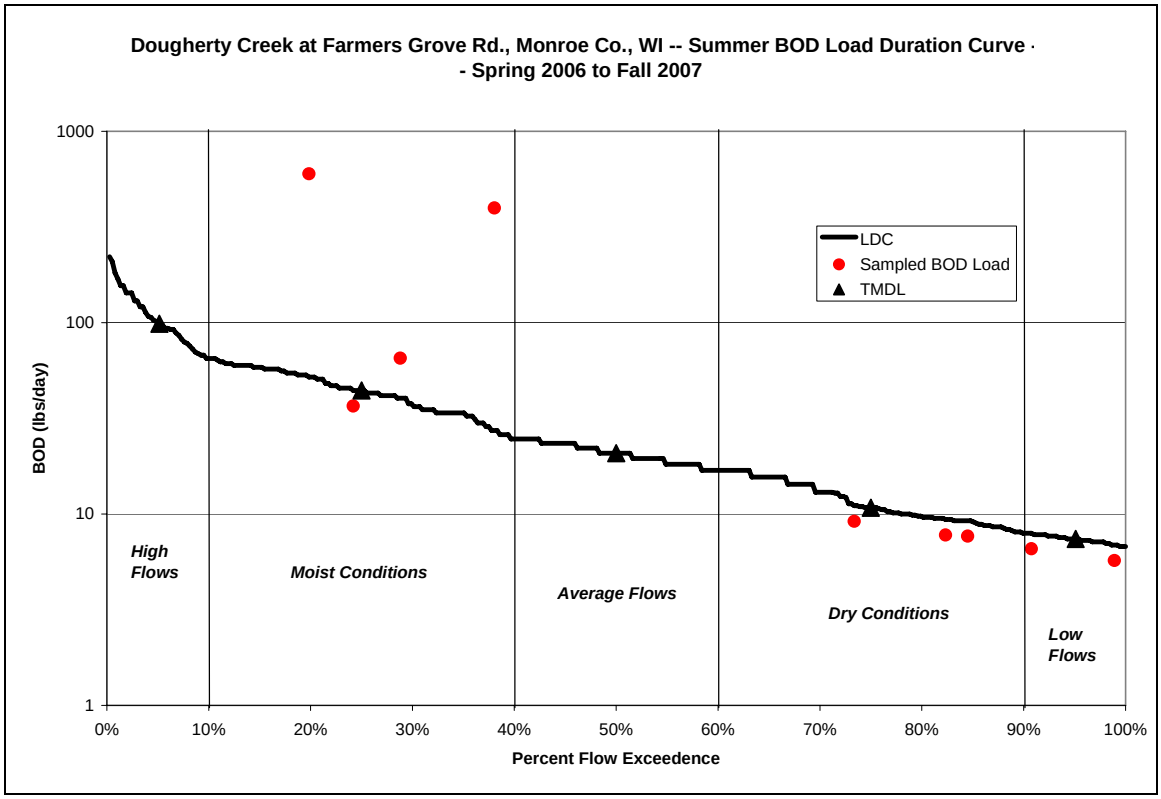

Figure A-2. Dougherty Creek Load Duration Curve for Summer Biological Oxygen Demand. This figure shows that during rain events biological oxygen demand loading is high in summer months.

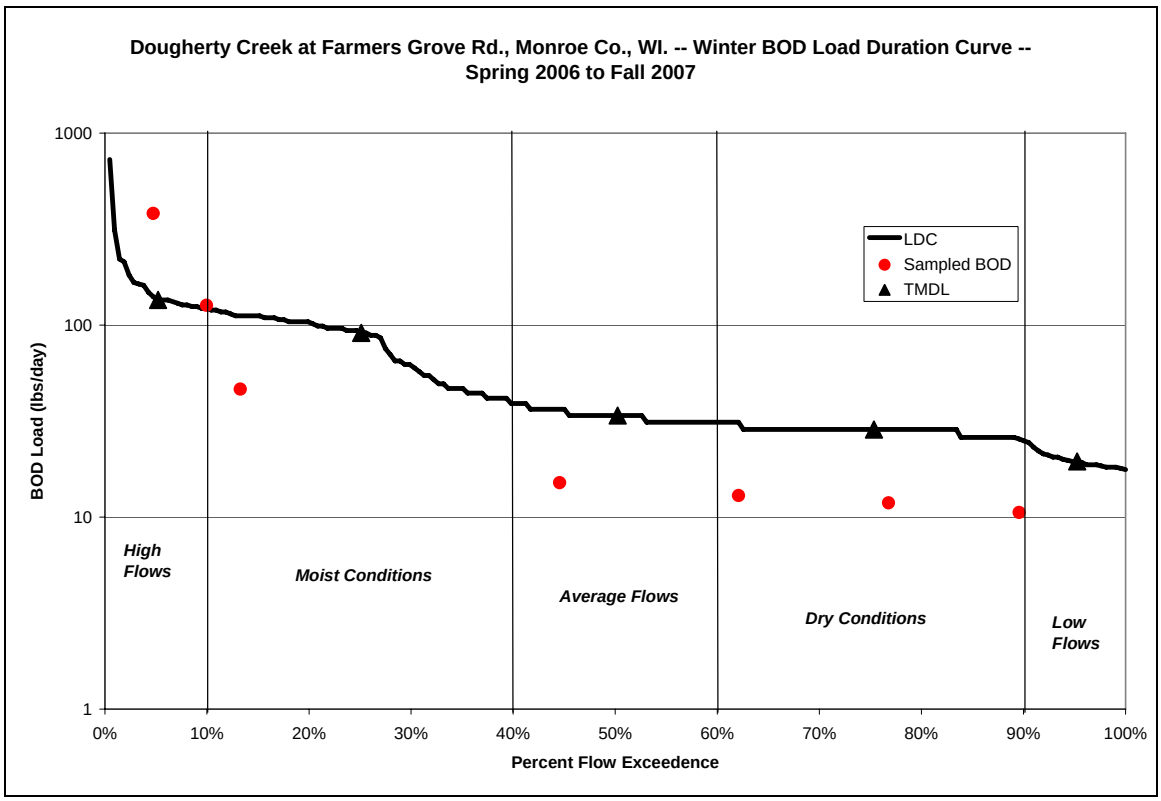

Figure A-3. Dougherty Creek Load Duration Curve for Winter Biological Oxygen Demand. This figure shows that during high flow events, biological oxygen demand loading is high in winter months.

Appendix B - EPA Comments and WDNR Responses
Dougherty Creek TMDL

Compiled by Nicole Richmond, July 28, 2008

1. Page 4: The TMDL Report should clearly indicate which use (codified or existing) the TMDL loadings are designed to protect. It is inferred that the TMDL is protective of the codified use (i.e. warm water sport fish communities), but this will need to be clearly stated in the Report.

WDNR: This comment was addressed in the text. The TMDL is protective of the codified use as a warm water sport fish community. The BOD values also attempt to be protective of the stream potential of a cold water (trout) community.

2. Page 5: The TMDL states that macroinvertebrate sampling indicates "poor" to "very poor" water quality at Farmers Grove Road. Please describe Wisconsin's method for determining the level of water quality based on the macroinvertebrate community. For example, does the state uses a qualitative survey or procedure for linking the water quality to the condition of the macroinvertebrate community, and if so, this (i.e. the survey or procedure) should be identified and explained in the TMDL Report.

WDNR: Currently the WDNR uses the “Guidelines for Evaluating Habitat of Wadeable Streams” established by our fisheries management to determine how macroinvertebrates relate to water quality in small streams. This document uses a quanitative approach to assess if the water quality of a stream ranges from “poor” to “excellent.”

3. Page 6, 4th Paragraph: Please identify the U.S. Gage Station # (this appears to have been inadvertently deleted).

WDNR: The USGS Gage Station and location were document in the text.

4. Page 6, 5th Paragraph: This section should explain why a 0.075 mg/L TP target is appropriate by describing the biological responses to in-stream concentrations at the target level, above the target level, and below the target level, as indicated by the USGS/WDNR study referenced earlier in this same paragraph.

WDNR: This comment was addressed in the text and the actual report and table used were cited.

5. Page 7, First full paragraph: The TMDL states that the BOD target was chosen "by using a similar approach in the way we treat point sources in Wisconsin," but it is unclear what this approach is. This section will need to describe the approach used to derive the BOD target.

WDNR: The approach was further described in an additional paragraph to the document.

6. Page 7, Allocation Section: This section references sediment as the pollutant (twice), should this be phosphorus and BOD instead?

WDNR: This was a mistake. The document now refers to Phosphorus and BOD in the allocation section.

7. Page 8, Margin of Safety (MOS) section: An explicit MOS was included in the TMDL, but is not

consistently applied for each loading. For example, a 46% MOS is applied to the TP load during high flows; a 88% MOS was applied to TP during moist conditions. The TMDL Report should: 1). identify in Table 3 what percent of each load has been allocated to the MOS, and 2). explain why different MOS are used for different flow zones and the rationale supporting this.

WDNR: Table 3 identifies the amount of the total loading capacity that MOS applies to under each flow condition for this TMDL. The rationale has been explained in the report and was taken from the EPA document on Load Duration Curves (http://www.epa.gov/owow/tmdl/duration_curve_guide_aug2007.pdf).

8. Page 8, Total Load Capacity section: This section states that "As seen in Table 3 the stream meets the BOD target during mid-range to low flow ." This section should be clarified to indicate that this is true only for the winter season BOD loads and not the summer season.

WDNR: This comment has been addressed in the text.