Wisconsin's Nutrient Reduction Strategy

November 2013






Wisconsin's Nutrient Reduction Strategy

A Framework for Nutrient Reduction and Management

This document was developed by the Department of Natural Resources with contractual assistance from the University of Wisconsin – Extension. Substantial input from staff of other federal, state and local agencies was provided, especially on work groups convened to fill programmatic gaps and to enhance coordination. It was the intent of the Department of Natural Resources to provide information on nutrient reduction activities within Wisconsin regardless of the level of government or particular agency. To keep the document to a reasonable size, all programs and activities could not be described in detail. For more information, the reader is encouraged to go to websites identified in the text.

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This strategy and any updates of this strategy are available at:
http://dnr.wi.gov/topic/surfacewater/nutrientstrategy.html

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Executive Summary

Key Points in Wisconsin's Nutrient Reduction Strategy

Introduction

- Wisconsin's Nutrient Reduction Strategy was developed in response to the *Gulf Hypoxia Action Plan 2008* call for each state in the Mississippi River Basin to develop a strategy by 2013 to reduce the amount of phosphorus and nitrogen carried in rivers from the state to address the biological "dead zone" in Gulf of Mexico. It was also developed in response to the call from the U. S. Environmental Protection Agency (EPA) for states to develop frameworks for nutrient reduction as outlined in the March 2011 memo from Nancy Stoner, Acting Assistant Administrator for Water. Although EPA will review and provide comment on this strategy, it does not require EPA approval. Having a completed strategy may make Wisconsin eligible for additional federal funding and may be necessary to retain existing grants.
- Wisconsin's Nutrient Reduction Strategy was developed to not only meet the federal Gulf of Mexico hypoxia nutrient reduction goals, but to meet intra-state needs for Wisconsin's lakes and streams and groundwater. It also includes needs for the Great Lakes consistent with Annex 4 of the Great Lakes Water Quality Agreement of 2012.
- Past implementation efforts have reduced by about 23 percent the amount of phosphorus from Wisconsin watersheds to the Mississippi River and by about 27 percent to Lake Michigan. By continuing to implement existing state and federal programs, Wisconsin can meet the 45 percent reduction goal for the Mississippi River Basin.
- This strategy does not call for new regulations for either point sources or nonpoint sources. It builds on existing programs and existing requirements, including those adopted in the last few years.
- This strategy is generally organized around the eight elements outlined in EPA's March 2011 memo. However, it also addresses the essential strategy components to implement the *Gulf Hypoxia Action Plan 2008*. It is intended to be a "living" document that changes to reflect new developments and advances in Wisconsin's nutrient reduction efforts.

State Nutrient Reduction Strategy Components and EPA Framework Elements[1]	
Essential Strategy Components Identified by States	**EPA Framework Elements**
Characterizing Watersheds and Identifying Nutrient Sources and Contributions	1. Prioritize Watersheds on a Statewide Basis for Nitrogen and Phosphorus Loading Reductions
Priority Setting	
Evaluating and Selecting Appropriate Analytical Tools	
Establishing Quantitative Reduction Targets	2. Set Watershed Load Reduction Goals Based upon Best Available Information
Establishing Current Status and Historical Trends	
Examining Current Regulations, Programs, and Policies	
Identifying and Documenting Appropriate Management Practices and Technical Assistance Programs (Input Management, Water Management, Proven and Innovative Nonpoint Source BMPs, Point Source Management)	3. Ensure Effectiveness of Point Source Permits in Targeted/Priority Sub-watersheds for WW facilities, CAFOs, and Urban Storm water
	4. Agricultural Areas
	5. Storm Water and Septic Systems
	6. Accountability and Verification Measures
Designing and Implementing Effective Monitoring	
Identifying and Creating Economic Incentives and Funding Sources	
Additional Strategy Components Identified by States	**EPA Framework Element**
Involving and Engaging Stakeholders	
Effective Education and Outreach	
Tracking and Reporting Progress	7. Annual Public Reporting of Implementation Activities and Bi-annual Reporting of Load Reductions and Environmental Impacts Associated with Each Management Activity in Targeted Watersheds
Developing Numeric Nutrient Standards	8. Develop Work Plan and Schedule for Numeric Criteria Development

Figure ES.1 Comparison between Gulf Hypoxia Task Force components and March 2011 EPA memo elements.

Chapter 1. Targeting/Priority Setting

- Nutrient contributions come from both point sources and nonpoint sources throughout much of the state. For the Mississippi River basin portion of Wisconsin, 80% of the nonpoint source contribution of phosphorus comes from 20 of the 30 major river (HUC 8) basins. Similarly for the Lake Michigan basin, 80% of the nonpoint source contribution comes from nine of the 13 major river (HUC 8) basins. The relative point source and nonpoint source nutrient contributions vary greatly by basin

[1] Gulf Hypoxia Coordinating Committee

This strategy uses the federal agency watershed coding system, the Hydrologic Unit Classification (HUC) system. The number of digits in the code increases as the size of the watershed decreases. The average size of a HUC 10 watershed in Wisconsin is about 150 square miles (100,000 acres) while the size of a HUC 12 watershed is about 30 square miles (20,000 acres).

- Initial lists of high priority "top group" HUC 10 watersheds comprising about 10 percent of the state's watersheds were developed for the Mississippi River Basin and Lake Michigan Basin for phosphorus and nitrogen to surface waters and for nitrates in public drinking water wells. The initial list and subsequent updates of the list may be used in selection of future federally-funded implementation projects.

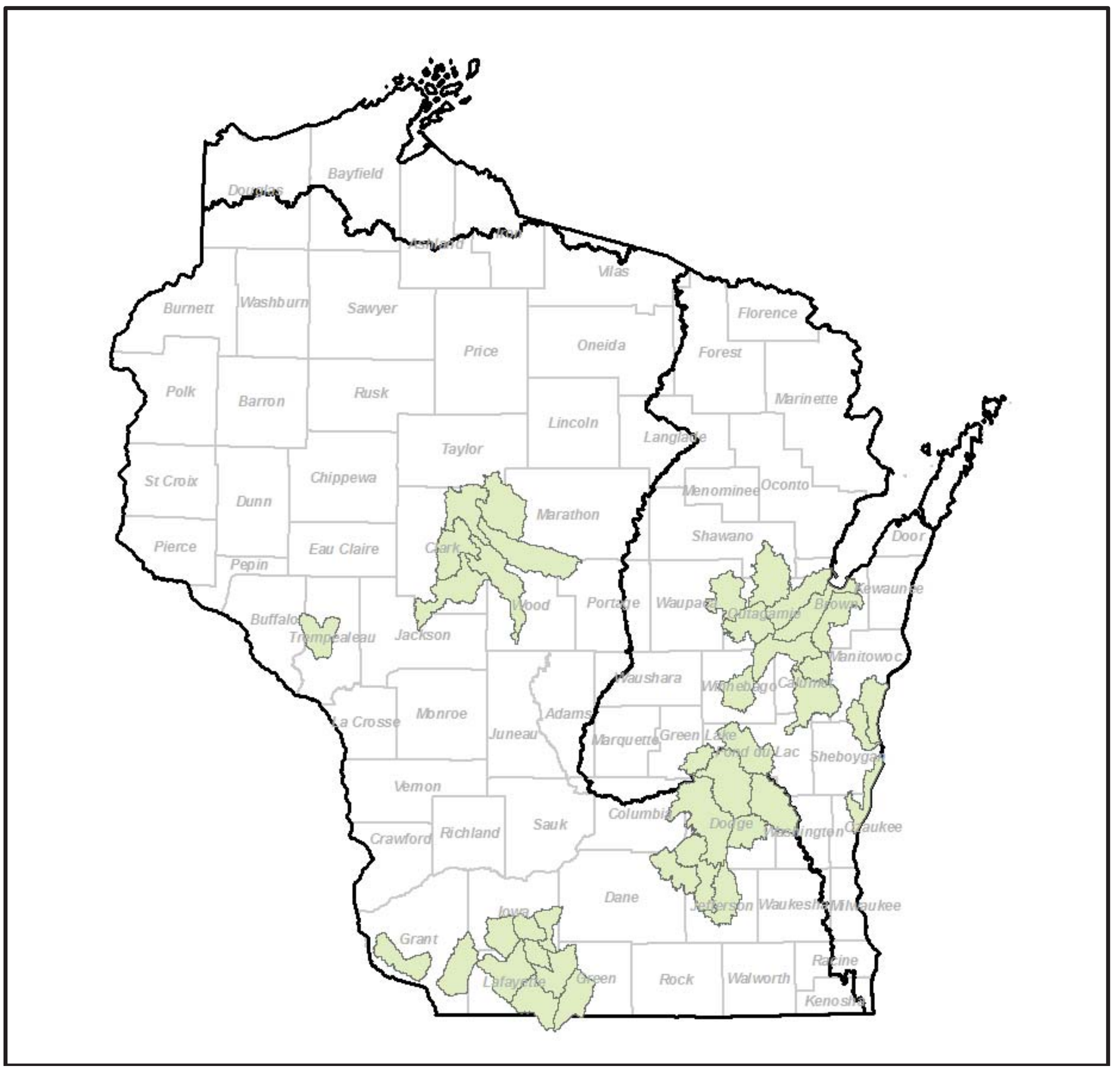

Figure ES.2 -- Top Group Watersheds for Phosphorus

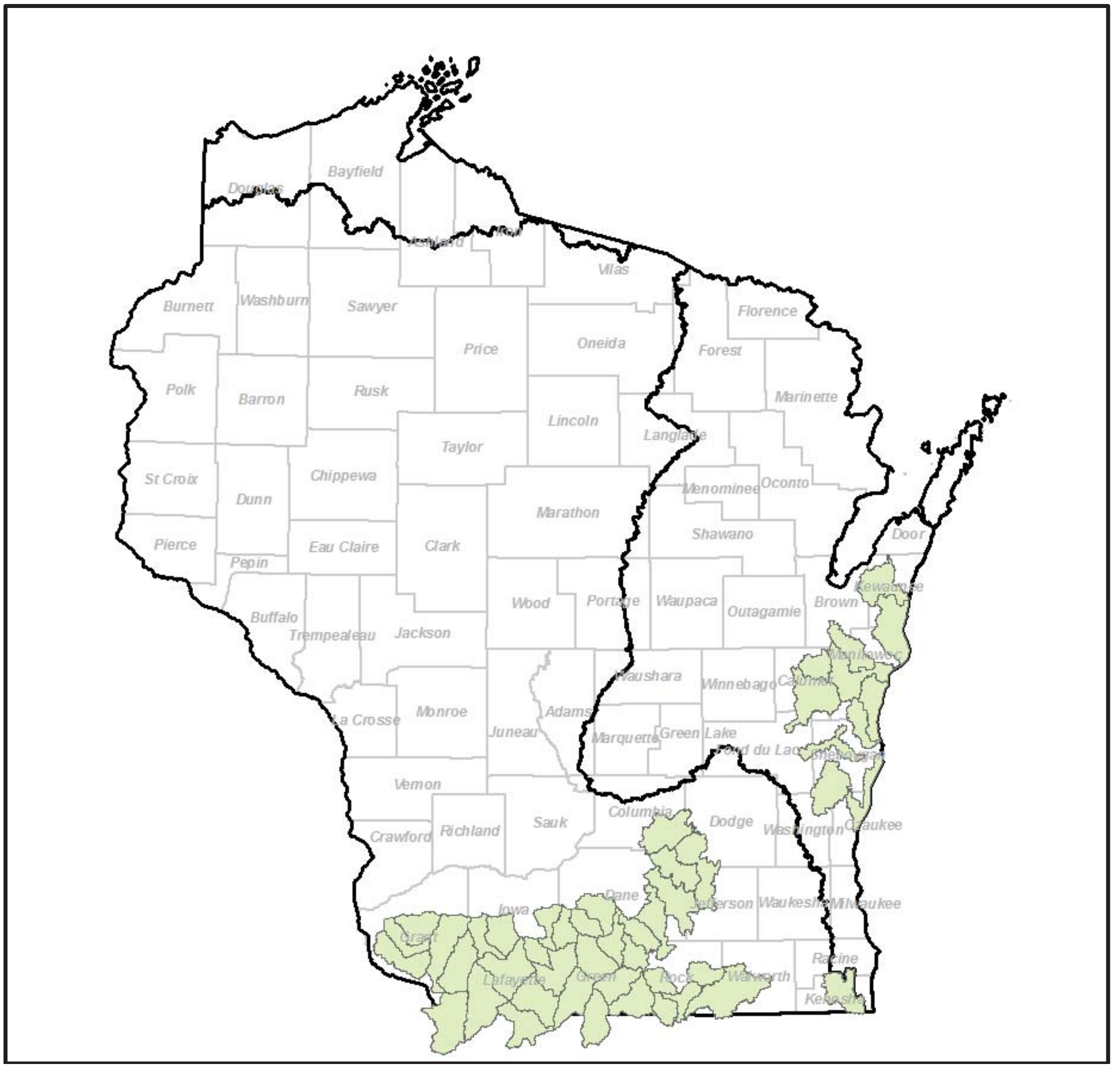

Figure ES.3 Top Group Watersheds for Nitrogen

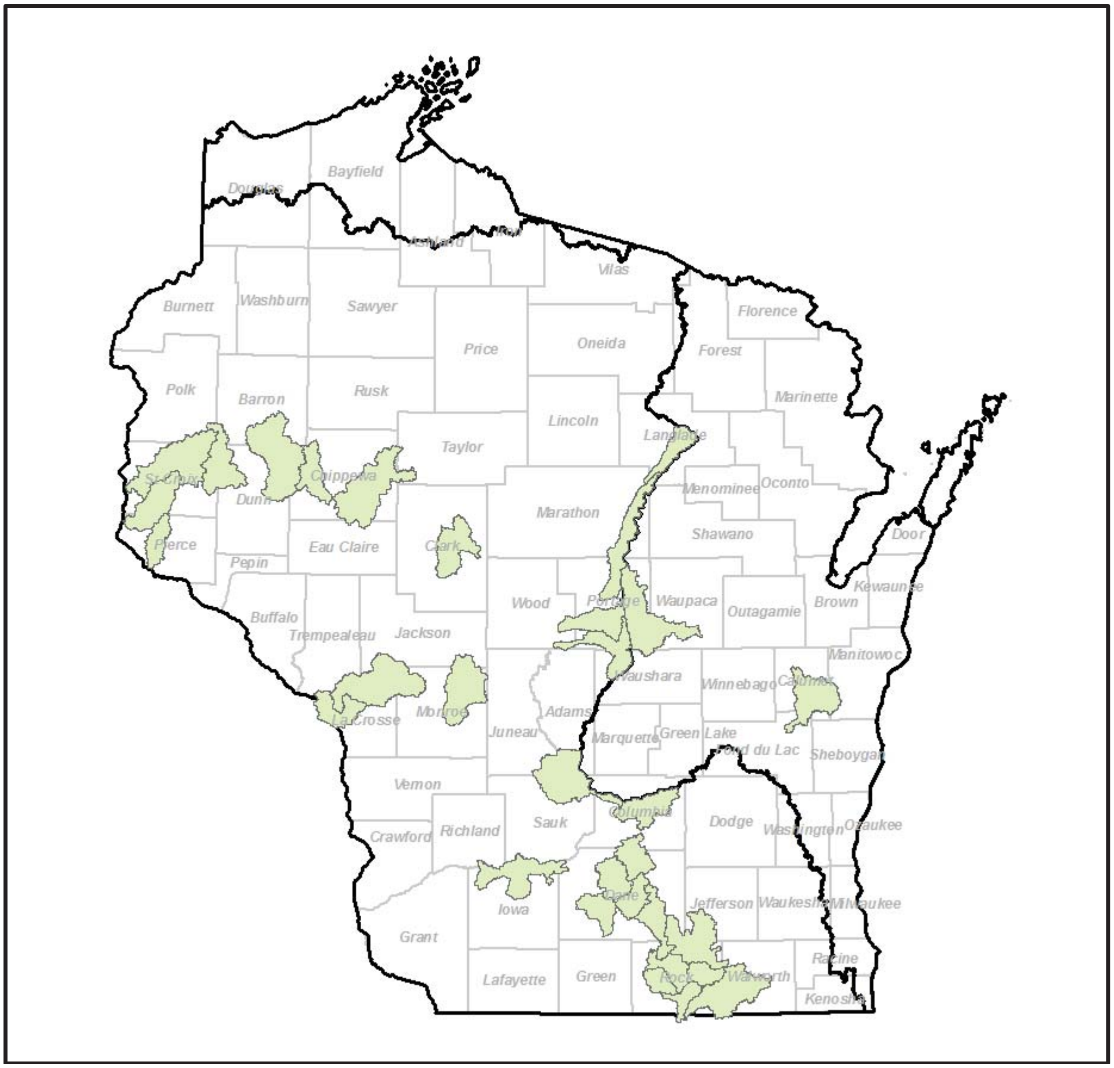

Figure ES.4 Top Group Watersheds for Drinking/Groundwater

Chapter 2. Setting Nutrient Reduction Targets

- Recent stream water quality monitoring conducted by DNR shows a broad range of phosphorus and nitrogen concentrations as illustrated in Figures ES.5 and ES.6. About half of Wisconsin streams meet the phosphorus water quality standards criterion. There are no water quality standards criteria for total nitrogen or nitrate.

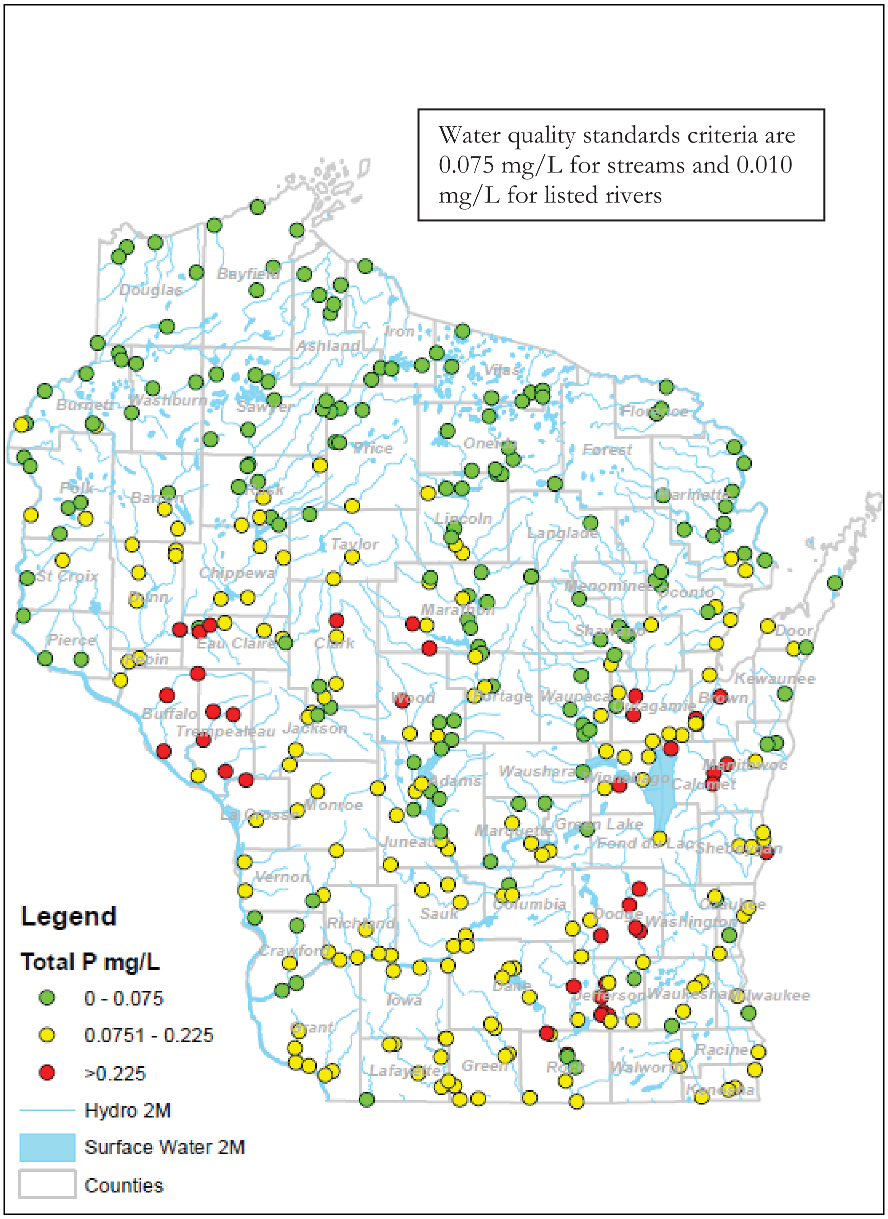

Figure ES.5 Stream Phosphorus Concentrations (median May – October)

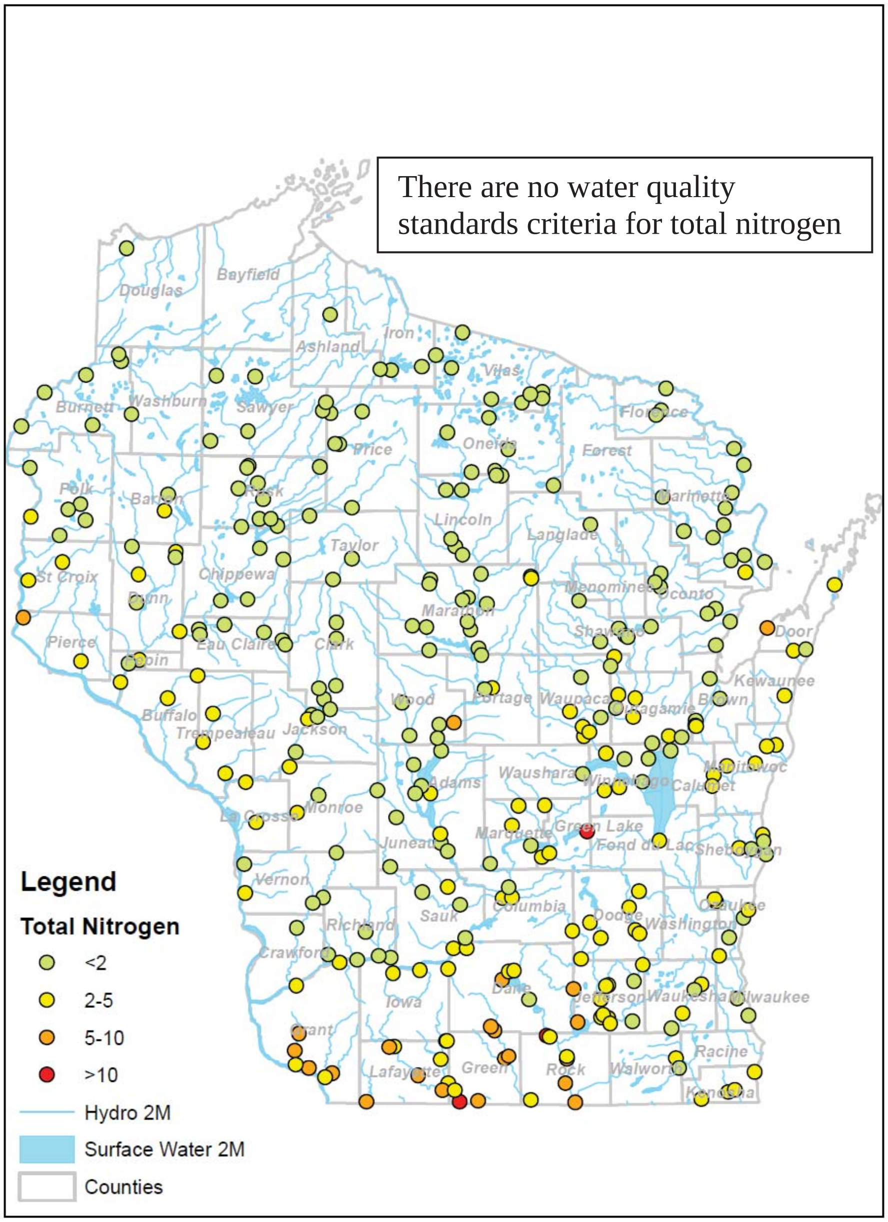

Figure ES.6 Stream Nitrogen Concentrations (median May-October)

- As shown in Figure ES.7, many of Wisconsin's public drinking water systems have elevated nitrate concentrations with some exceeding the enforcement standard of 10 mg/L.

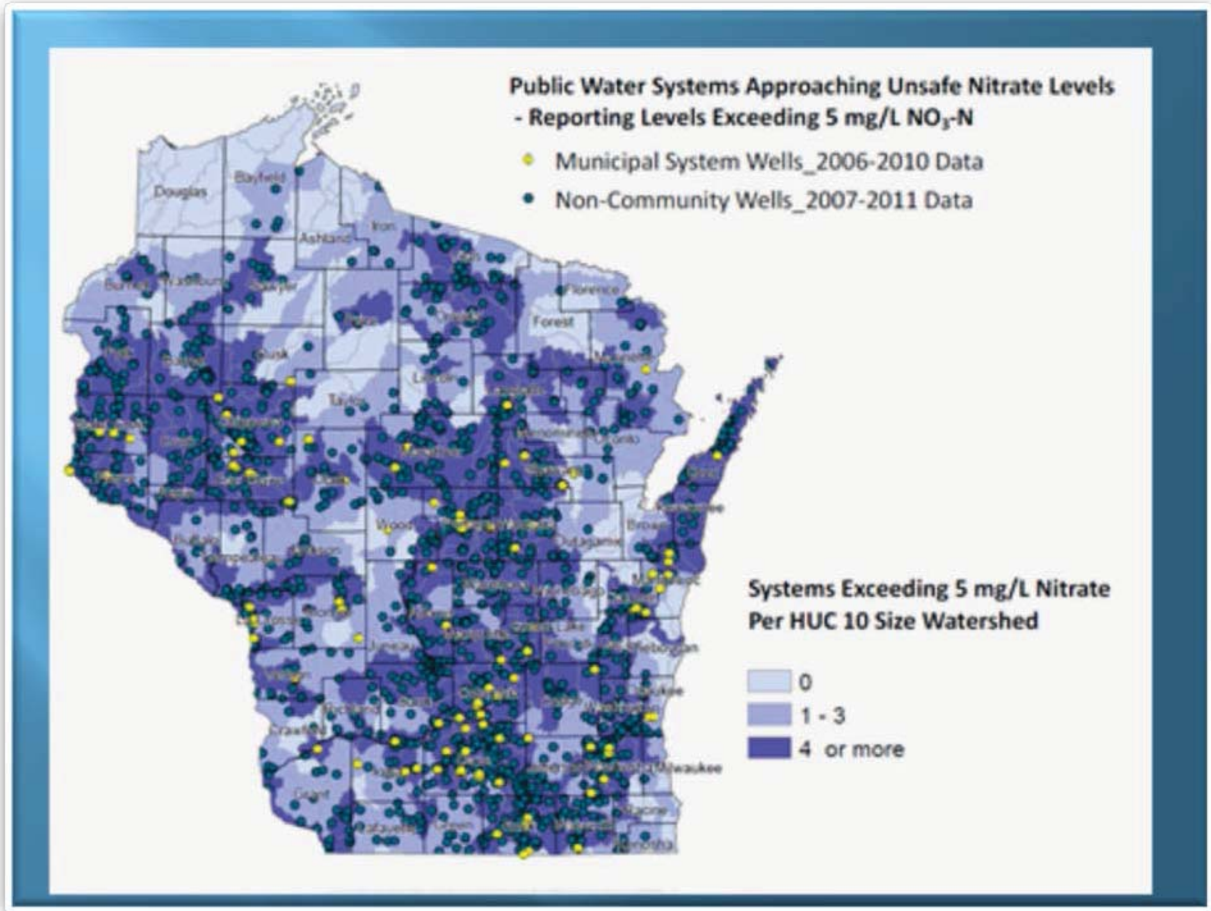

Figure ES.7 Public Water Systems with Nitrate Concentrations exceeding 5 mg/L

- An initial analysis shows that existing Wisconsin point source and nonpoint source programs have the potential to meet the Gulf Hypoxia goal of 45% load reduction for phosphorus using 1995 as a base year. For the Mississippi River Basin, about a 23% reduction has already been achieved through implementation of Wisconsin's point source phosphorus removal requirements and through a number of nonpoint source management programs. For the Lake Michigan Basin, an estimated 27% reduction has been achieved.

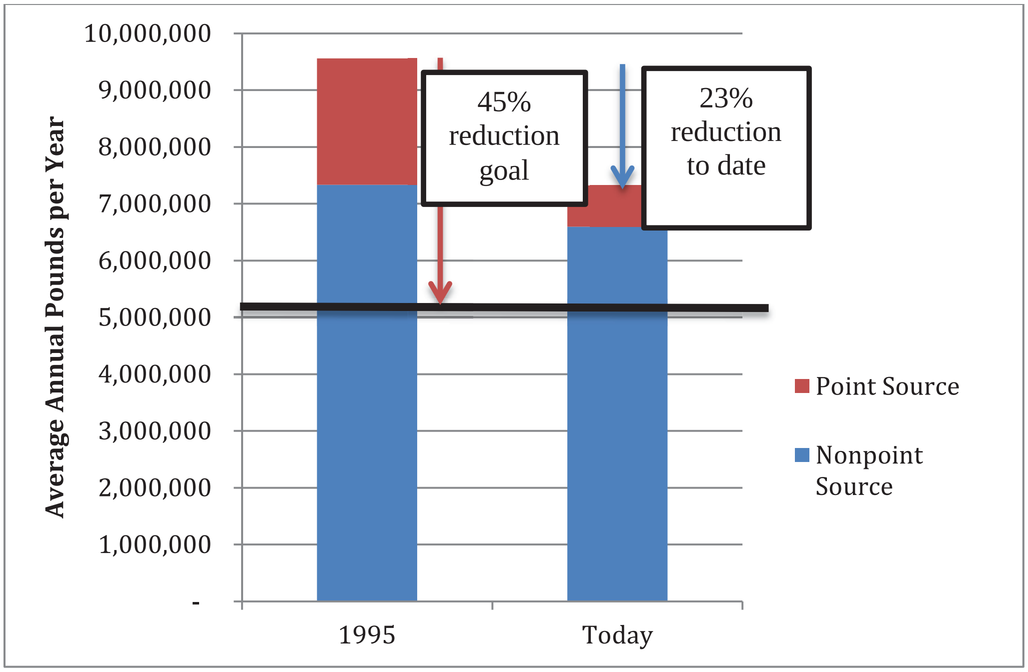

Figure ES.8 Gulf Hypoxia Phosphorus Load Reduction Goal and Estimated Progress to Date

- Trend analysis of data collected over more than three decades at long-term river monitoring sites shows a decrease in phosphorus concentrations for much of the southern half of the state. In contrast, nitrogen concentrations have increased somewhat.

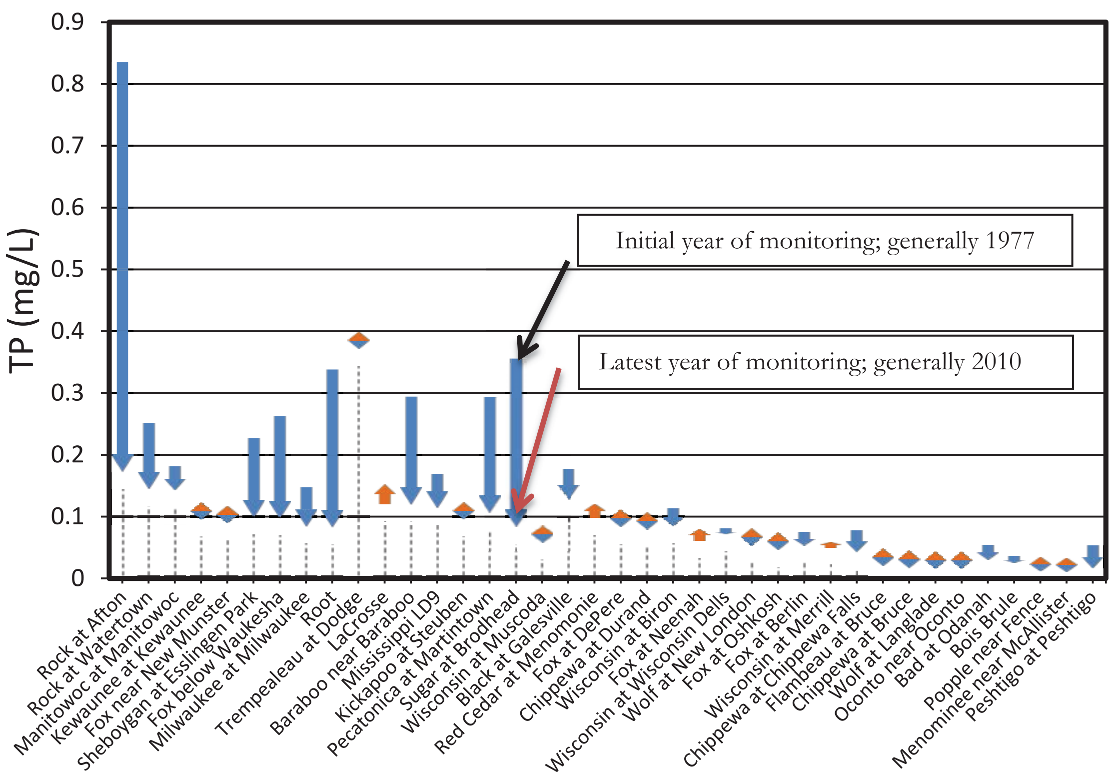

Figure ES.9 Total Phosphorus Concentration Trends at Wisconsin River Long-term Trend Sites

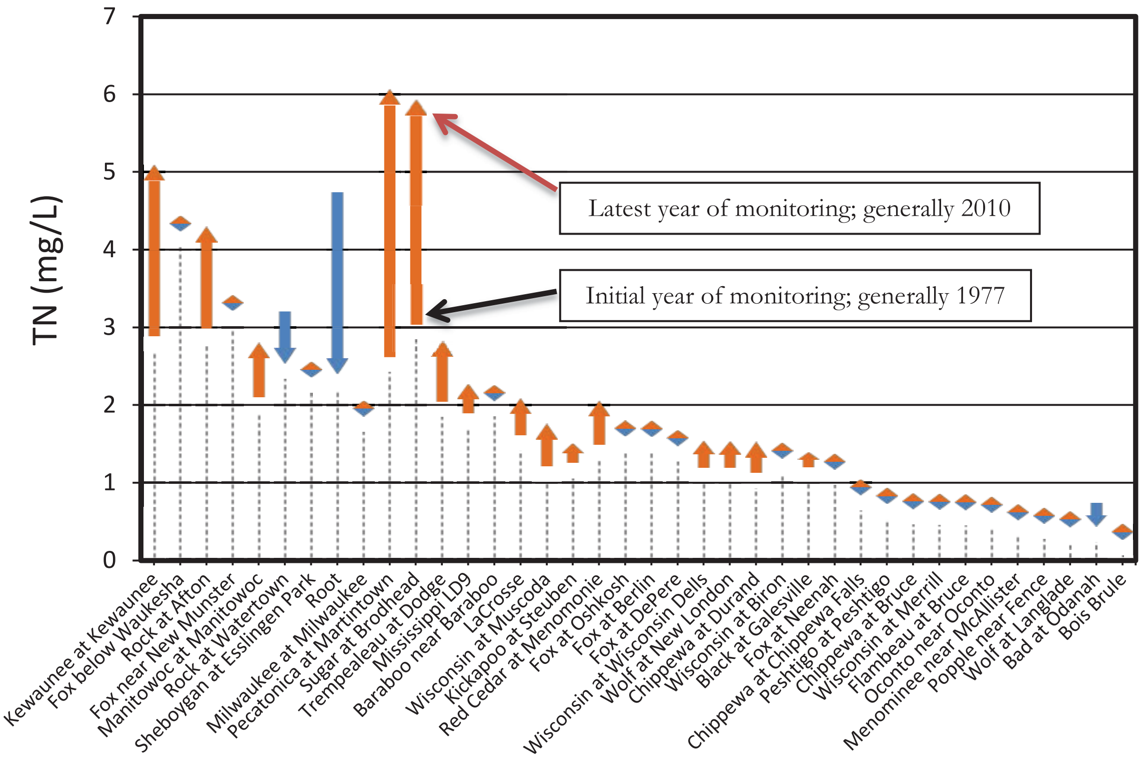

Figure ES.10 Total Nitrogen Concentration Trends at Wisconsin River Long-Term Trends Sites

Chapter 3. Point Source Permits

- Wisconsin has point source programs in place to manage phosphorus from municipal and industrial wastewater facilities, Concentrated Animal Feeding Operations (CAFOs), and municipal urban storm water. In 2010, Wisconsin adopted administrative rules requiring further discharges of phosphorus to meet water quality standards. Innovative, cost-effective compliance alternatives have been developed and approved by EPA.

Chapter 4. Agricultural Nonpoint Nutrients

- Wisconsin also has a number of federal, state and local agricultural and rural nonpoint source programs to control nutrients. Control of phosphorus was enhanced by the 2011 adoption of a phosphorus index for farmlands as part of its suite of state-adopted enforceable performance standards and prohibitions.
- In 2013, federal and state agricultural nonpoint source financial and technical assistance grants will exceed $50 million.
- This strategy recommends that a Nitrogen Science Summit be convened to identify what technical tools need to be developed to better manage nitrogen in an efficient and cost-effective manner. Although such a science summit was conducted by Iowa, many of their conclusions do not apply to Wisconsin's predominantly livestock agriculture.

Chapter 5. Integrating Point Source and Nonpoint Source Management

- Wisconsin has placed a priority on integrated point source and nonpoint source management through:
  - TMDL development and implementation;
  - Development and use of tools, such as PRESTO, to identify the relative importance of point source and nonpoint source contributions of phosphorus at both large and small watershed levels;
  - Implementation of the watershed adaptive management option, a point source compliance alternative; and
  - Allowance of water quality trading, another point source compliance alternative.

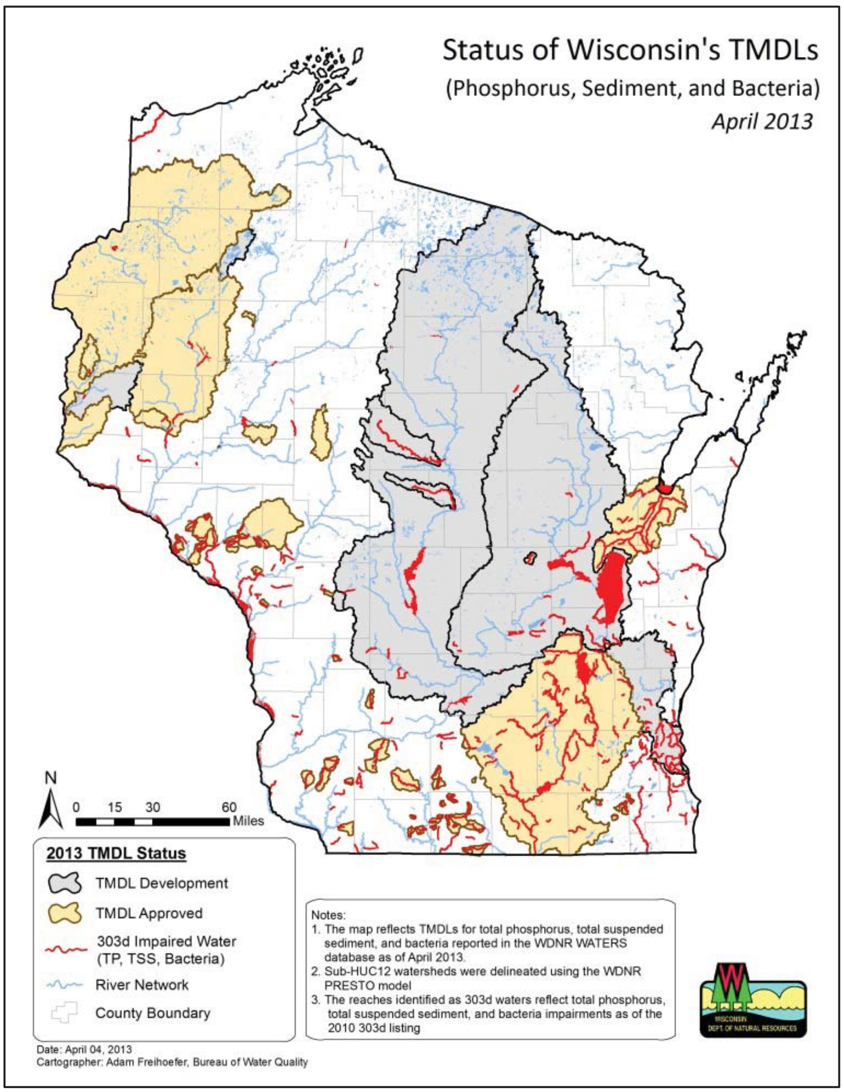

Figure ES.11 Status of Waters Impaired by Phosphorus, Sediment and Bacteria

Chapter 6. Storm Water and Septic Systems

- Wisconsin has programs in place to manage on-site disposal systems, phosphorus in lawn fertilizer and phosphorus in detergents. A number of Wisconsin's nonpoint source performance standards apply to non-permitted urban areas.

Chapter 7. Accountability and Verification Measures

- A multi-agency work group is developing an integrated tracking for agricultural nonpoint sources. It is based on county systems for tracking compliance with Chapter NR 151, Wis. Adm. Code, performance standard and prohibitions and Farmland Preservation/Working Lands Initiative. Information reported to state agencies is aggregated at the HUC 12 small watershed level along with point source tracking information. Development of the agricultural nonpoint source system will continue as a multi-agency, state-federal-local effort throughout 2013. Point source reporting for phosphorus discharges is well established. Nitrogen discharge reporting has been increased for major facilities in the Mississippi River Basin.

Chapter 8. Water Quality Monitoring

- Water quality monitoring is an integral component of many of the elements in this strategy and will continue as a multi-agency effort. DNR will continue to use its River Long-term Trend sites to analyze trends and is considering ways to enhance this fixed-station network. Many of these River Long-term Trends sites are parts of multi-state networks for the Great Lakes and Mississippi River. Other monitoring activities are identified to address nutrient-related concerns in in-state lakes, streams and rivers.

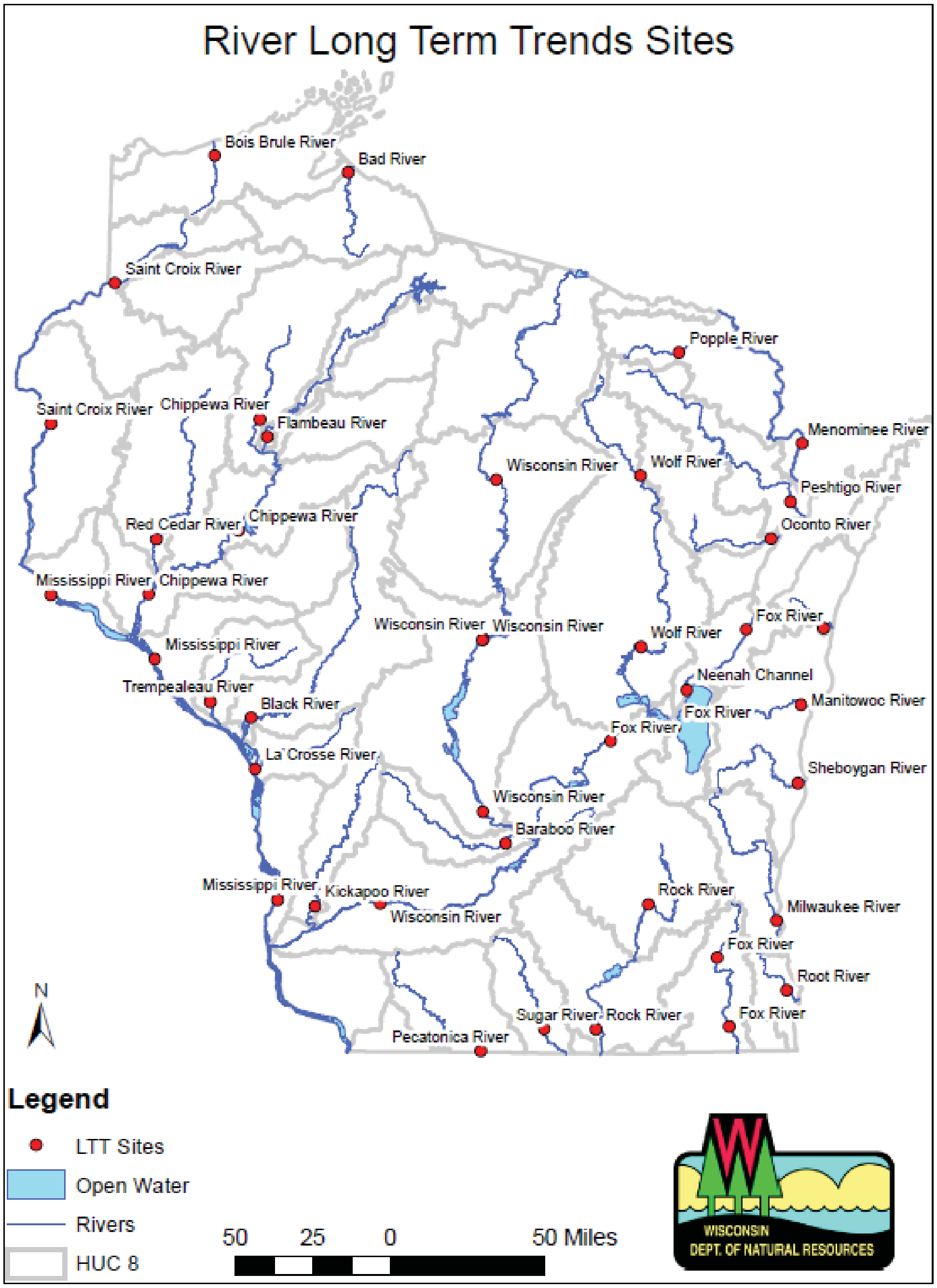

Figure ES.12 Wisconsin's River Long-Term Trends Monitoring Sites

Chapter 9. Reporting

- Wisconsin will report on nutrient reduction progress through an annual nutrient summit and information on a website, consistent with the EPA reporting element. The annual nutrient reduction summit may be held in conjunction with period point source phosphorus control summits.

Chapter 10. Numeric Nutrient Water Quality Criteria

- In 2010, Wisconsin adopted numeric phosphorus water quality standards criteria for rivers, streams, lakes, reservoirs and the Great Lakes. DNR continues to research the impact of nitrogen on biotic stream systems.

Table of Contents

Introduction

Wisconsin's Nutrient Reduction Strategy is a broad overview of nutrient management activities for both point sources and nonpoint sources in Wisconsin. This strategy documents ongoing activities whether they are implemented by federal, state or local agencies. It identifies areas where further progress is needed.

This strategy is in part a response to two federal initiatives. The *Gulf Hypoxia Action Plan 2008,* developed and approved by representatives of a number of federal agencies and 12 states, calls for each agency and state in the Mississippi River Basin to develop a nutrient reduction strategy by 2013. The *Gulf Hypoxia Action Plan 2008* further calls for the strategies to target watersheds contributing the greatest amount of nutrients and to focus implementation where both local water quality needs and Gulf of Mexico needs can be met. Similarly, in March 2011, Nancy Stoner, Acting Assistant Administrator for Water for the U. S. Environmental Protection Agency (EPA,) released a memorandum encouraging EPA Regions to work with states to develop state nutrient reduction frameworks. That memo identifies and recommends eight elements essential to adequate state nutrient reduction programs. Neither of these initiatives call for EPA approval, although EPA may review and comment on the strategy. It also includes needs for the Great Lakes consistent with Annex 4 of the Great Lakes Water Quality Agreement of 2012.

While the federal initiatives are important, it is also important to develop a state Nutrient Reduction Strategy to meet water quality needs within Wisconsin to most effectively and efficiently coordinate resources. That is, incorporate needs associated with eliminating water quality problems in local impaired streams and lakes as well as in local drinking water. Within Wisconsin, about half of the streams and rivers do not meet water quality standards for phosphorus. Analysis of water quality data collected over more than three decades at 15 of 38 sites across the state show increases in nitrogen concentrations. In addition, many local public drinking water wells have concentrations exceeding or approaching the drinking water quality standard for nitrates. Many of these well owners are facing increased costs to remove nitrates.

Gulf Hypoxia Components and EPA Framework Elements

The Gulf Hypoxia Action Plan and the March 2011 EPA memo call for similar elements in the state reduction strategies or frameworks[2]. The Table I.1 below presents a comparison of the elements.

[2] For this document, "strategy" is used to mean both the Gulf Hypoxia Action Plan 2008 strategy and the March 2011 EPA memo framework.

State Nutrient Reduction Strategy Components and EPA Framework Elements[3]	
Essential Strategy Components Identified by States	**EPA Framework Elements**
Characterizing Watersheds and Identifying Nutrient Sources and Contributions	1. Prioritize Watersheds on a Statewide Basis for Nitrogen and Phosphorus Loading Reductions
Priority Setting	
Evaluating and Selecting Appropriate Analytical Tools	
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Developing Numeric Nutrient Standards	8. Develop Work Plan and Schedule for Numeric Criteria Development

Figure I.1 Comparison between Gulf Hypoxia Task Force components and March 2011 EPA memo elements.

Development of Strategy

Although development of Wisconsin's Nutrient Reduction Strategy was coordinated by the Department of Natural Resources with assistance from the University of Wisconsin – Extension, the intent is to provide a brief compendium of federal, state and local programs being implemented in Wisconsin to reduce nutrients reaching surface waters and groundwater. To meet this intent, the strategy was developed with substantial input from staff of federal, state, and local agencies and stakeholders. It covers both point sources and nonpoint sources as well as both urban areas and rural areas.

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[3] Gulf Hypoxia Coordinating Committee

This strategy was developed with the presumption that Wisconsin has many nutrient reduction programs in place and that we, as a state, are not "starting from scratch". This does not mean that program implementation is complete. Filling programmatic gaps and enhancing coordination were two areas of emphasis in developing this strategy. This strategy does not call for new regulations for either point sources or nonpoint sources.

It is anticipated that completion of an adequate state Nutrient Reduction Strategy will enable the state to be eligible for grants from EPA and other federal agencies. In the future, an adequate state Nutrient Reduction Strategy may also be necessary to maintain current grants to states, such as the section 319 nonpoint source management grant from EPA.

While this document attempts to represent current programs and activities, it is anticipated that periodic updates will be need to keep the document up-to-date. Updates will be part of the annual reports and presented at both public meetings and the nutrient reduction website: [specific site TBD following draft review].

Chapter 1. Targeting/Priority Setting

Element 1. Prioritize Watersheds on a Statewide Basis for Nitrogen and Phosphorus Loading Reductions

1.1 EPA and Gulf Hypoxia Task Force Expectations

1.1.1 Nutrient Reduction Framework Expectation:

From EPA's WQ-26 national performance measure:

States set priorities on a watershed or source-sector basis. States may also include a combination of watershed and sector approaches in prioritizations. State should set priorities reflecting each of the three following considerations:

- **Systematic and Data-Driven:** Prioritization of sub-watersheds (or water bodies) or source sectors should reflect a systematic evaluation based on available data concerning N and P loadings, high-risk receiving water problems, public and private drinking water supply impacts, or other environmental factors. States may: (a) identify watersheds in the state which are of highest priority, or (b) identify which key source sectors or sub-sectors are of highest priority (e.g., identifying which sectors could contribute the most near-term loading reductions, such as POTWs, industrial or municipal storm water, fertilizer usage, urban or rural BMPs, etc.). States are also encouraged to utilize an adaptive approach to priority setting; i.e., as new information is available, priorities may shift. Examples: Use the USGS SPARROW model to identify major watersheds or sectors that individually or collectively account for a substantial portion of loads (e.g. 80%) delivered to waters in a state or directly delivered to multi-jurisdictional waters. Or use the Recovery Potential Screening Tool (www.epa.gov/recoverypotential/) to screen potential nutrient load reductions.

- **Appropriate scale:** For setting watershed priorities, the state should use the scale (HUC 12, HUC 8, etc.) that is most appropriate for watershed management purposes. Within each major HUC 8 watershed that has been identified as accounting for a substantial portion of the load, identify targeted/priority sub-watersheds on a HUC 12 or similar scale where subsequent activities under the strategy will be focused. For setting priorities among source sectors, the state should use an appropriate level of source detail (e.g., sector or sub-sector) for watershed management purposes.

- **Inclusive:** The state should include all state waters and water body types for which it has data available, and/or all source sectors within the state for which it has data, in its priority-setting analysis. Example: Use SPARROW to estimate N & P loadings delivered to rivers, streams, lakes, reservoirs, etc. in each major watershed and/or from each source sector across the state.

The EPA encourages states to involve the public in their priority-setting approaches, or to make the priorities available to the public.

1.1.2 Gulf Hypoxia Task Force Essential Strategy Component

- Characterize watersheds and identify nutrient sources and contributions.
- Set geographic priorities

Federal Watershed Codes

In this and other chapters we use the federal agency watershed code, the Hydrologic Unit Classification (HUC) system. The number of digits in the code increases as the size of the watershed decreases. In this document, 8-digit (HUC 8), 10-digit (HUC 10) and 12-digit (HUC 12) codes are used. The table below shows the number of HUCs in Wisconsin for each of these three commonly used levels.

Major Basin	HUC 8	HUC 10	HUC 12
Lake Superior	5	22	108
Lake Michigan	13	90	450
Mississippi River	32	256	1244
Total	50	368	1802

The average size of a HUC 10 in Wisconsin is about 150 square miles (100,000 acres) while the size of a HUC 12 is about 30 square miles (20,000 acres).

Since the federal delineation of HUC watersheds extends across state lines, a number of the HUCs have a very small area in Wisconsin with the smallest being less than 10 acres. These very small HUCs may have been combined with adjoining HUCs in the analyses described in this chapter or not included in the analysis.

Figure 1.1 HUC 8 Watersheds in Wisconsin

1.2 Wisconsin's Approach

Major sectors of nutrient contributions to lakes and streams and groundwater in Wisconsin are generally considered to include:

- Publicly (e.g. municipal) and privately (e.g. industrial) owned wastewater treatment facilities[4];
- Permitted storm sewer systems that are separate from municipal systems(MS4s);
- Industrial storm sewer systems;
- Concentrated animal feeding operations (CAFOs);
- Non-permitted municipal storm sewer systems (smaller communities);
- Septic systems and other on-site disposal systems;
- Agricultural lands, including land contributing nutrients in runoff from croplands, animal lots, dry lots as well as leaching of nitrogen through soil profiles;
- Eroding stream banks; and
- Timber harvesting sites[5].

The relative importance of these different source sectors varies greatly by receiving lake or stream. In some watersheds, point sources may be the dominant source of nutrients, while in others nonpoint sources may dominate. From a statewide perspective, all are considered important. Wisconsin has federal, state or local programs in place to control nutrients -- particularly phosphorus – from each of these major sectors.[6] Targeting and priority setting based on watersheds recognizes these disproportionate nutrient contributions.

This chapter describes Wisconsin's approaches to targeting/priority setting in two sections. In the first section (1.2.1), a brief analysis of geographic extent of phosphorus sources is presented. In the second section (1.2.2), the top group of watersheds resulting from an analysis of modeling and monitoring information is summarized. Wisconsin state, federal and local agencies conducted a systematic and data driven analysis of nutrient contributions to geographically target watersheds. This should be considered as **an initial analysis** to be revisited and refined over time.

1.2.1. Geographic Extent of Nutrient Sources

Both EPA's Nutrient Reduction Strategy and the Gulf of Mexico Essential Strategy Components call for a characterization of watersheds and identification of nutrient contributions. EPA suggests identifying geographic locations for 80% of the nutrient contribution. Tables 1.1 and 1.2 show the nonpoint source phosphorus load (average pounds per year) for each of the HUC 8s in Wisconsin within the Mississippi River Basin and Lake Michigan Basin, respectively. In general, this simple analysis shows that much of the state that is not forested contributes to that 80% of the phosphorus load. Although some geographic areas contribute more per square mile or acre than others, it is not

[4] Includes management of application of biosolids to agricultural lands
[5] Generally considered as a source of sediment and not generally considered as a major source of phosphorus.
[6] The suite of regulatory and non-regulatory programs is described in other chapters of this report.

feasible to achieve large reductions in nutrient loads to downstream waters, such as the Mississippi River or Lake Michigan, by working only in small portions of the state.

Both of the tables were developed using USGS SPARROW (SPAtially Referenced Regressions On Watershed) model results for agricultural, urban, forested and other lands.[7] In the SPARROW analysis, urban storm water runoff nutrient contributions are included as nonpoint sources even for urban areas under the WPDES storm water permit program. Wastewater treatment facilities were not included in this simple analysis. However, both point sources and nonpoint sources are included in the analyses described in Chapter 2 (Element 2). The HUC 8 river basins are listed in the tables in decreasing order of phosphorus yield (average pounds per acre per year). Yields are a better indication of the significance of the contribution, while total load tends to be more a response to the size of the basin given the wide variation in basin size. It is presumed that nitrogen contributions follow a similar geographic distribution, but a future analysis is warranted when better point source and nonpoint source information is available.

For the Mississippi River Basin, the HUC 8 river basins in southwest Wisconsin (e.g. Grant – Platte River Basin and Sugar – Pecatonica River Basin) have the highest phosphorus yields and also rank at the top for phosphorus loads (pounds per year). The Upper Rock River Basin, the Lower Wisconsin River Basin, the Buffalo --Trempealeau River Basin, the Lower Chippewa River Basin and the Central Wisconsin River Basin, although having a lower yield, also contribute relatively large phosphorus loads due to the large geographic area of each of the basins.

For the Lake Michigan Basin, the Lower Fox River, Pensaukee River and combined Manitowoc – Sheboygan Rivers HUC 8 basins contribute the highest phosphorus yields. However, the Wolf River Basin due to its very large size contributes a substantial phosphorus load.

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[7] Robertson, D. M., and Saad, D. A., 2011, Nutrient inputs to the Laurentian Great Lakes by source and watershed estimated using SPARROW watershed models: Journal of the American Water Resources Association. V. 47, p. 1011-1033, DOI: 10.1111/j.1752-1688.2011.00574.x.

Table 1.1 Nonpoint Source Phosphorus Yield and Load Contributions for the **Mississippi River Basin** – By HUC 8 (in order of decreasing yields)

Mississippi River Basin 8-digit HUC	DNR Basin	Nonpoint Source yield (lb/a/yr)	Nonpoint Source Load (lb/yr)	Cumulative Total (lb/yr)	% of total	Cumulative % of Total
Grant- Maquoketa	Grant-Platte	0.99	499,755	499,755	6.8%	6.8%
Pecatonica River	Sugar – Pecatonica	0.88	642,667	1,142,423	8.8%	15.6%
Apple-Plum Rivers	Grant-Platte	0.74	82,735	1,225,158	1.1%	16.7%
Coon-Yellow Rivers	Bad Axe – La Crosse	0.59	254,458	1,479,616	3.5%	20.2%
Des Plaines River	South East Fox	0.51	44,392	1,524,009	0.6%	20.8%
Sugar River	Sugar – Pecatonica	0.49	216,708	1,740,717	3.0%	23.7%
Kickapoo River	Lower Wisconsin	0.47	229,545	1,970,262	3.1%	26.9%
Upper Rock River	Upper Rock	0.46	401,250	2,607,935	5.5%	32.3%
Baraboo River	Lower Wisconsin	0.45	186,795	2,794,730	2.5%	34.9%
Buff-Whitewater	Buffalo-Trempealeau	0.44	206,814	3,001,544	2.8%	37.7%
Rush-Vermillion Rivers	Lower Chippewa	0.37	121,479	3,123,023	1.7%	39.4%
Lower Wisconsin River	Lower Wisconsin	0.36	538,274	3,661,298	7.3%	46.7%
Trempealeau River	Buffalo-Trempealeau	0.35	527,810	4,189,108	7.2%	53.9%
Black River	Black	0.33	477,914	4,667,022	6.5%	60.4%
La Crosse-Pine Rivers	Bad Axe - La Crosse	0.31	119,466	4,786,488	1.6%	62.1%
Lake Dubay	Central Wisconsin	0.30	519,094	5,305,582	7.1%	69.1%
Eau Claire River	Lower Chippewa	0.25	138,624	5,444,206	1.9%	71.0%
Lower Chippewa River	Lower Chippewa	0.24	317,434	5,761,639	4.3%	75.4%
Upper Fox River	South East Fox	0.23	136,103	5,897,742	1.9%	77.2%
Red Cedar River	Lower Chippewa	0.22	268,346	6,166,088	3.7%	80.9%
Lower Rock River #	Lower Rock	0.19	236,423	2,206,685	3.2%	84.1%
Lower St. Croix River	St. Croix	0.19	209,114	6,728,886	2.9%	87.0%
Jump River	Upper Chippewa	0.19	105,681	6,834,567	1.4%	88.4%
Castle-Rock	Central Wisconsin	0.17	353,684	6,519,772	4.8%	93.2%
Upper Chippewa River	Upper Chippewa	0.13	161,258	6,995,825	2.2%	95.4%
Upper St. Croix River	St. Croix	0.10	99,276	7,095,101	1.4%	96.8%
Namekagon River	St. Croix	0.08	49,827	7,144,928	0.7%	97.5%
Flambeau River	Upper Chippewa	0.08	61,762	7,206,690	0.8%	98.3%
South Fork Flambeau R	Upper Chippewa	0.08	39,125	7,245,815	0.5%	98.8%
Upper Wisconsin River	Upper Wisconsin	0.06	85,220	7,331,035	1.2%	100.0%

Note: Lower Rock River data also includes Kishwaukee River and Piscasaw Creek 8-digit HUCs

Table 1.2 Nonpoint Source Phosphorus Yield and Load Contributions for the **Lake Michigan Basin** – By HUC 8 Watershed (in order of decreasing yields)

Lake Michigan Basin 8-digit HUC	DNR Basin	Nonpoint Source yield (lb/a/yr)	Nonpoint Source Load (lb/yr)	Cumulative Total (lb/yr)	% of total	Cumulative % of Total
Lower Fox River	Lower Fox	0.65	270,672	270,672	10.6	10.6%
Pensaukee River	Green Bay	0.63	133,995	404,666	5.3	15.9%
Manitowoc -Sheboygan	Manitowoc Sheboygan	0.58	458,625	863,291	18.0	33.9%
Lake Winnebago	Upper Fox	0.48	114,353	977,644	4.5	38.4%
Door-Kewaunee	Twin-Door-Kewaunee	0.45	221,589	1,199,233	8.7	47.1%
Pike-Root Rivers	Southeast	0.44	94,562	1,293,795	3.7	50.8%
Milwaukee River	Milwaukee	0.38	212,662	1,506,457	8.4	59.2%
Upper Fox River	Upper Fox	0.22	229,076	1,735,533	9.0	68.2%
Wolf River	Wolf	0.21	489,918	2,225,451	19.2	87.4%
Oconto River	Green Bay	0.20	125,579	2,351,030	4.9	92.3%
Brule River	Green Bay	0.12	14,577	2,365,606	0.6	92.9%
Peshtigo River	Green Bay	0.11	85,594	2,451,201	3.4	96.3%
Menominee River	Green Bay	0.11	94,861	2,546,061	3.7	100.0%

1.2.2. Geographic Targeting/Priority Setting

For purposes of targeting and priority setting, HUC 10 watersheds currently provide the best match with available modeling and water quality information; even though the HUC 12 is more suitable for implementation projects. In general, analysis at the HUC 12 level would require more sophisticated modeling and water quality monitoring at many more streams or groundwater locations. Future efforts will move toward developing a HUC 12 analysis to better serve implementation project selection.

An initial suite of "top group" HUC 10 watersheds were identified through a data-driven, systematic analysis. Top groups were identified separately for the Mississippi River Basin and for the Lake Michigan Basin. Within each major basin, top groups were identified separately for phosphorus concerns and nitrogen concerns in surface waters. An initial statewide analysis of nitrogen concerns in groundwater was also conducted.

It is anticipated that the top groups of HUC 10 watersheds listed in this section will be used to help select future implementation nonpoint source projects, such as for the Mississippi River Basin Initiative (USDA – NRCS), Environmental Quality Incentives Program (EQIP) (USDA – NRCS) and the Great Lakes Restoration Initiative.[8] Several additional factors, such as local interest and capability; likelihood for the water to respond; coordination with other implementation activities; and availability of water quality monitoring data, will also be considered in future implementation

[8] Programs may also give priority to high quality waters where "threats or stressors" have been identified.

project selection. These top group HUC 10 watersheds may also be used in setting priorities for implementation programs. For example, Wisconsin federal, state and local agencies may focus water quality monitoring, technical assistance or other management tools in these watersheds.

This initial analysis uses a multiple lines of evidence approach. In such an approach, if multiple lines of evidence (e.g., SPARROW model results and monitored concentrations) identify the same top HUC 10s, there should be a high level of confidence that those HUC 10s are among the highest contributors. If different lines of evidence give substantially different rankings, then those HUC 10s are not necessarily in the top group. This is not meant to infer that any of the lines of evidence are in error, since they may measure or predict different parameters. In future analyses, it is anticipated that additional lines of evidence will be incorporated, such as likelihood of the lake or stream to respond to reduced nutrient loads.

A summary of information on each of the HUC 10 watersheds is included in Table A.1 of Appendix A. As shown on Figures 1.2 and 1.3, the HUC 10 watersheds tend to form clusters based on common land use, soils and topography. HUC 10 watersheds in the Lake Superior Basin would compare to the bottom half of watersheds in the Lake Michigan and Mississippi River Basin. Information on these Lake Superior Basin HUC 10 watersheds is included in Table A.1. Table A.1 also contains the following information:

- Percent agricultural and urban use
- Point source – nonpoint source phosphorus load ratio (identified by PRESTO model)
- The inclusion of the watershed in an EPA approved TMDL
- The presence of an Outstanding Resource Water or Exceptional Resource Water in or "touching" the watershed

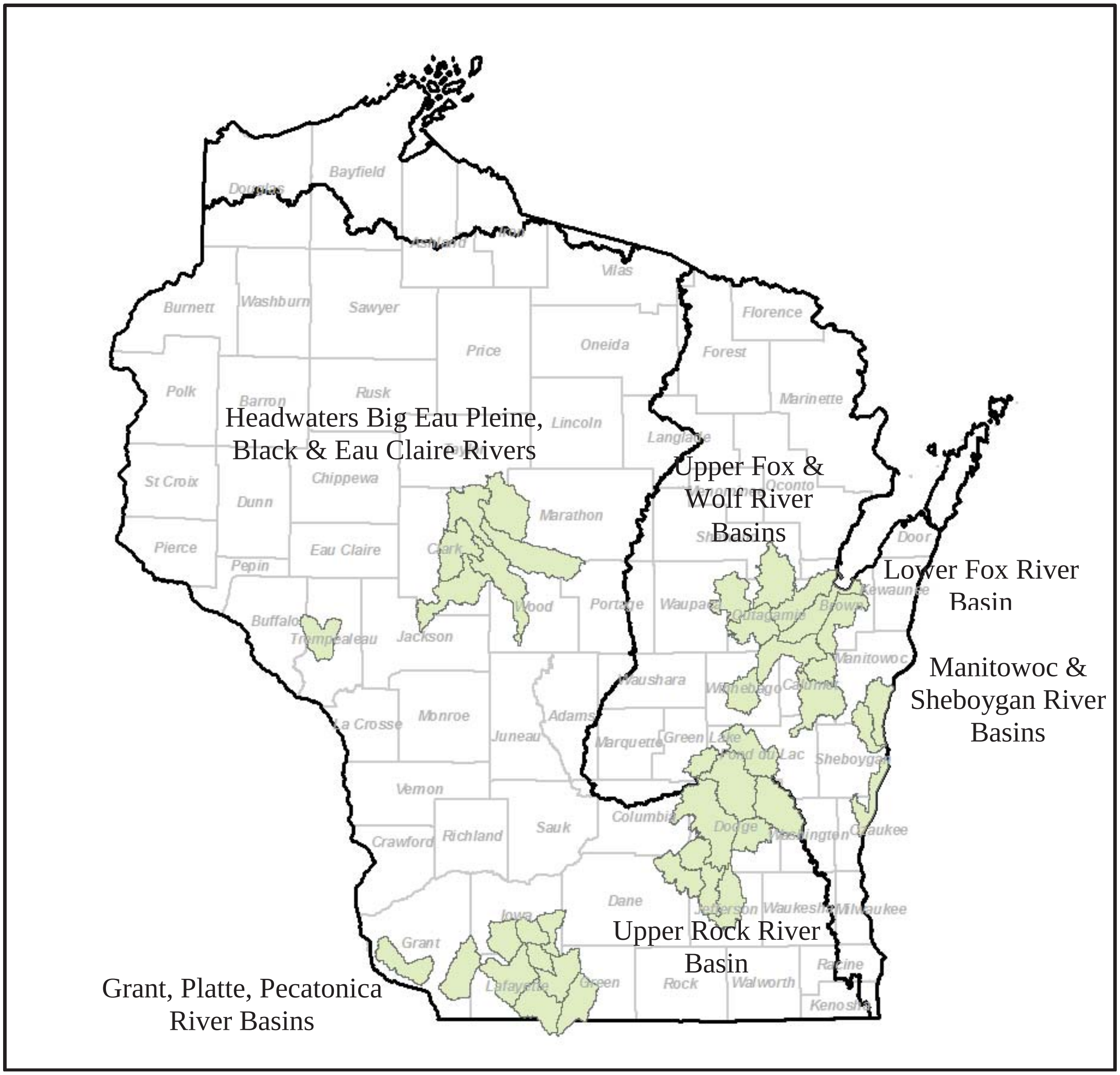

Figure 1.2 Top Group HUC 10 Watersheds for Phosphorus

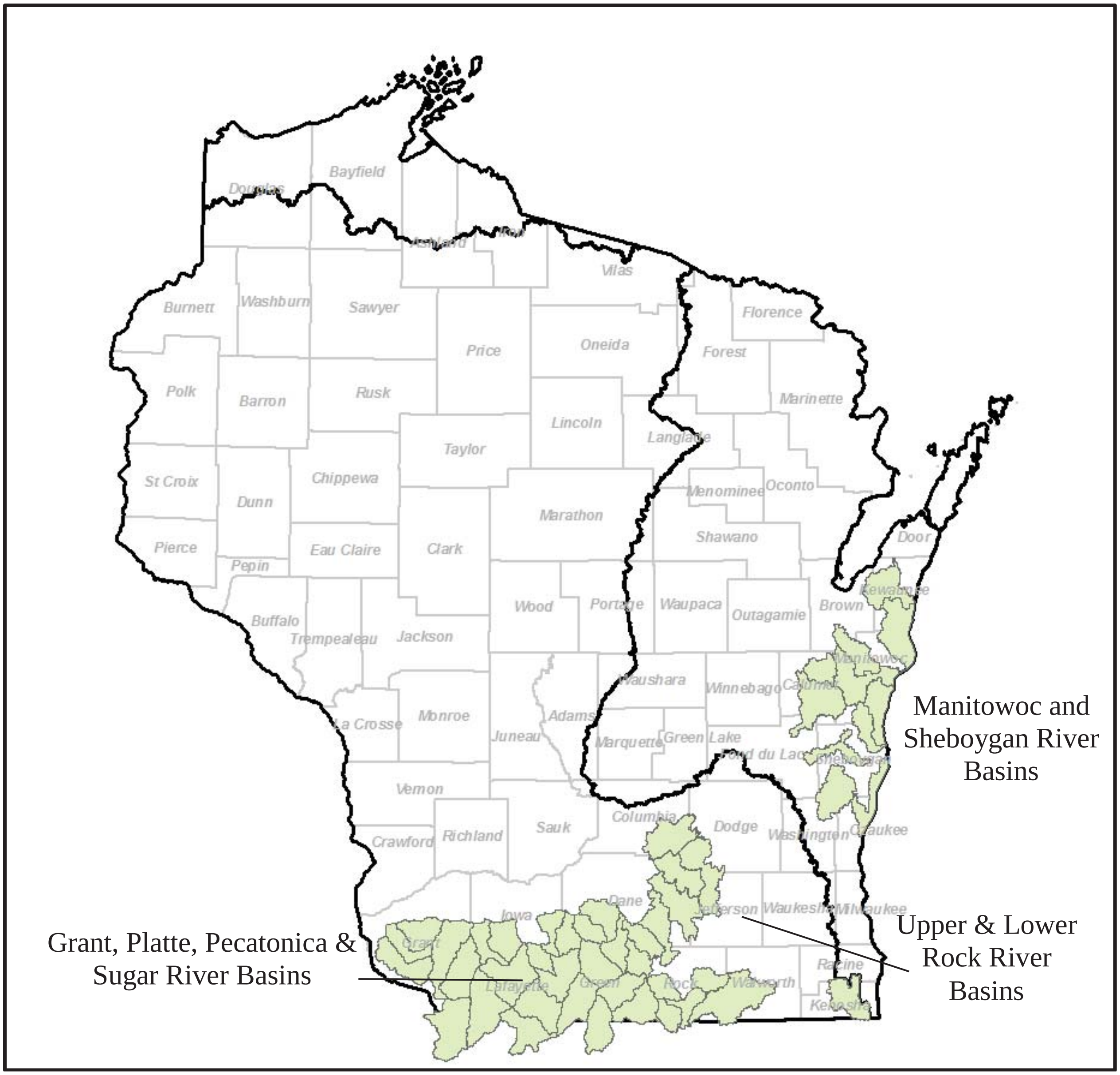

Figure 1.3 Top Group HUC 10 Watersheds for Nitrogen

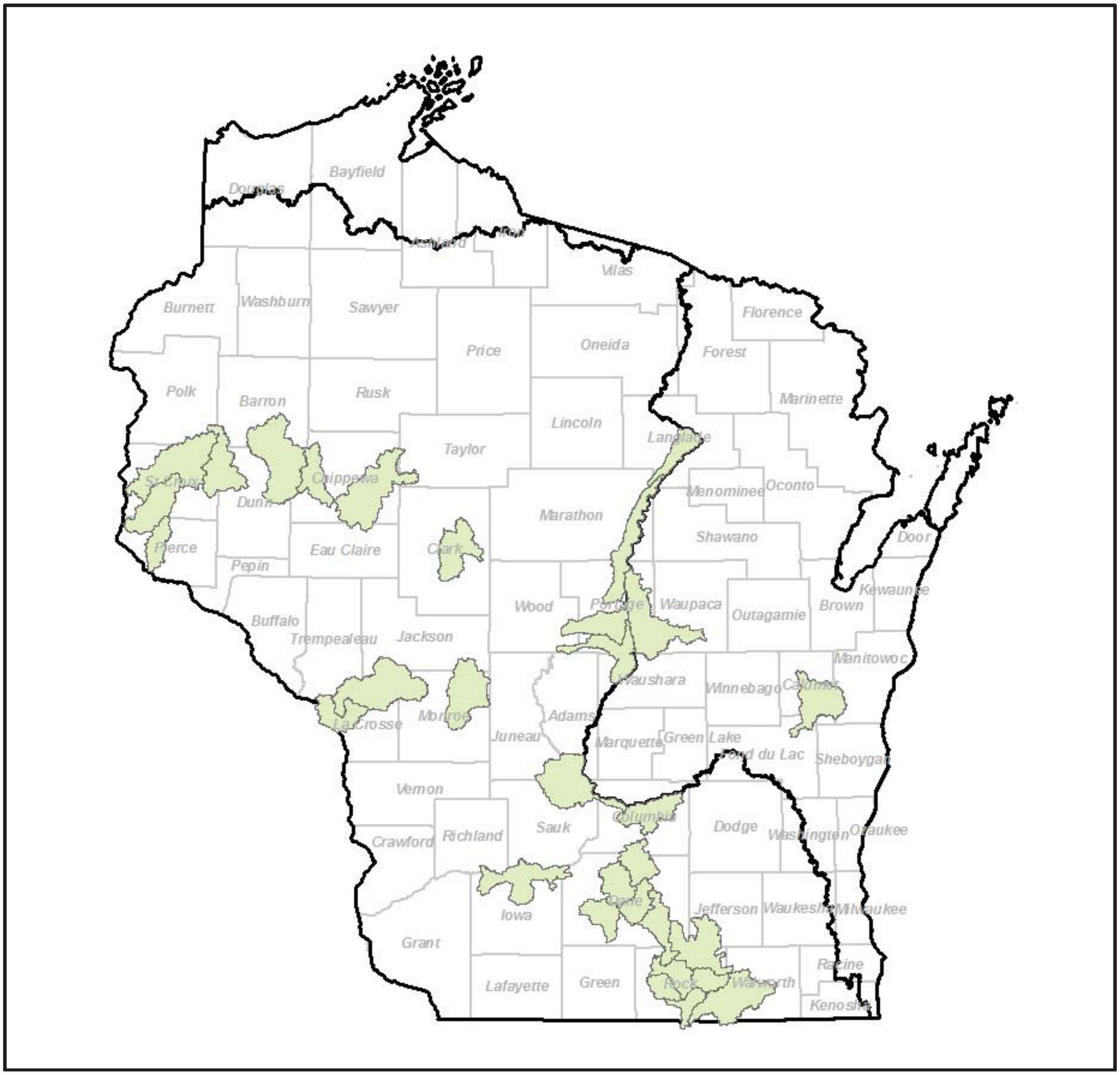

Figure 1.4 Top Group Safe Drinking Water - Nitrates

Mississippi River Basin Top Groups

Phosphorus – Surface Waters

Watersheds were analyzed according to SPARROW model incremental yields and median stream concentrations of phosphorus monitored during the growing season. The top group HUC 10 watersheds listed below comprises about 10% of the HUC 10 watersheds in the Mississippi River Basin. They are either:

- The top 20% for both SPARROW incremental yield modeling and stream monitoring growing season concentrations.

- The top 10% of either SPARROW incremental yield modeling or stream monitoring growing season concentrations and the top 30% for the other.

Headwaters of the Big Eau Pleine River, Yellow River and the Black River in western Marathon County, Wood County and Clark County.

0704000702	Popple River
0704000704	Rock Creek-- Black River
0707000215	Dill Creek – Big Eau Pleine River
0707000217	Little Eau Pleine River
0707000311	Rocky Creek – Yellow River

Watersheds in southwestern Wisconsin south of Military Ridge, including those in the Grant-Platte and Sugar-Pecatonica River basins.

0706000303	Lower Grant River
0706000304	Little Platte River
0709000301	Mineral Point Branch
0709000303	Ames Branch – Pecatonica River
0709000304	Dodge Branch
0709000306	Ridgeway Branch – Pecatonica River
0709000307	Yellowstone River
0709000308	East Branch Pecatonica River
0709000309	Spafford Creek – Pecatonica River
0709000310	Honey Creek – Pecatonica River

Watersheds in the Rock River Basin[9]

0709000101	East Branch Rock River
0709000102	West Branch Rock River – Rock River
0709000104	Sinissippi Lake – Rock River
0709000108	Maunesha River
0709000109	Beaver Dam River
0709000110	Crawfish River
0709000111	Johnson Creek – Rock River

Others

0704000504	Middle Trempealeau River
0704000709	Lake Arbutus – Black River

[9] The two HUC 10s draining to Lake Mendota are ranked lower due to the SPARROW analysis where the analytical watershed is at the outlet of Lake Mendota and not at locations entering the lake. In the Rock River TMDL analysis where the SWAT Model was used, these two HUC 10s ranked in the top five HUC 10s in the basin. It is not clear whether as a result of a revised SPARRROW analysis that these two HUC 10s would be in the top group. See sidebar.

Nutrients in Lake Mendota and the Yahara River Watershed

Multiple efforts over many years have contributed to understanding of sediment and nutrient transport within the Yahara Watershed and ongoing refinement and calibration of nutrient loading models. Analysis consistently identifies the Lake Mendota-Yahara River Watershed (HUC10-0709000206) as a major source of nutrient loading within the Yahara Watershed (see references listed below). Those studies have led to substantial investment of resources and the development of Dane County ordinances to address nutrient losses.

References

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Nitrogen – Surface Waters

Watersheds were analyzed according to SPARROW model incremental yields and median stream concentrations of total nitrogen monitored during the growing season. The top group HUC 10 watersheds listed below comprises about 15% of the HUC 10 watersheds in the Mississippi River Basin. Many of those listed are also listed for phosphorus above, but a few, such as Blackhawk Creek, are ranked very high for nitrogen but not for phosphorus. Watersheds in Marathon, Clark and Taylor Counties listed above for phosphorus, do not come out as high for nitrogen. Due to similar overall results, a larger list for nitrogen than the list for phosphorus is appropriate. The HUC 10 watersheds are listed based on being in either:

- the top 20% for both SPARROW incremental yield modeling and stream monitoring growing season concentrations.
- the top 10% of either SPARROW incremental yield modeling or stream monitoring growing season concentrations and the top 30% for the other.

Watersheds in southwestern Wisconsin south of Military Ridge, including those in the Grant-Platte and Sugar-Pecatonica river basins.

0706000301	Upper Grant River
0706000302	Middle Grant River
0706000303	Lower Grant River
0706000304	Little Platte River
0706000305	Platte River
0706000502	Sinsinawa River – Mississippi River
0706000503	Galena River
0706000505	South Fork Apple River – Apple River
0709000301	Mineral Point Branch
0709000302	Headwaters Pecatonica River
0709000303	Ames Branch – Pecatonica River
0709000305	Blue Mounds Branch
0709000306	Ridgeway Branch – Pecatonica River
0709000307	Yellowstone River
0709000308	East Branch Pecatonica River
0709000309	Spafford Creek – Pecatonica River
0709000310	Honey Creek – Pecatonica River
0709000311	Richland Creek
0709000315	Raccoon Creek
0709000401	West Branch Sugar River
0709000402	Headwaters Sugar River
0709000403	Allen Creek
0709000404	Little Sugar River
0709000405	Story Creek – Sugar River
0709000406	Sylvester Creek – Sugar River
0709000407	Taylor Creek – Sugar River

Watersheds in the Rock River

0709000107	Headwaters Crawfish River
0709000108	Maunesha River
0709000110	Crawfish River
0709000204	Koshkonong Creek
0709000208	Badfish Creek
0709000209	Lake Kegonsa – Yahara River
0709000211	Blackhawk Creek
0709000212	Bass Creek
0709000214	Turtle Creek
0709000215	City of Beloit – Lower Rock River

Others

0712000401	Headwaters Des Plaines River

Nitrogen – Drinking Water/Groundwater

HUC 10 watersheds with higher nitrogen levels in well water compared to other watersheds in Wisconsin were identified statewide basis. The analysis included both the number and percent of public wells with nitrate concentrations of 5 mg/L or greater. The threshold of 5 mg/L was chosen as being well within the range of "human activity influenced" groundwater degradation for this nutrient, and is also thought to place the public system at greater risk of exceeding the enforcement standard of 10 mg/L. The top 10% of HUC 10 watersheds statewide are considered as the top group, and comprise about 12% of the HUC 10s in the Mississippi River Basin.

The HUC 10 watersheds of the top group located within the Mississippi River Basin in order of HUC 10 number are:

0703000510	Willow River
0703000511	Kinnickinnic River
0704000103	Trimbelle River
0704000601	Halfway Creek – Mississippi River
0704000704	Rock Creek – Black River
0704000712	Fleming Creek – Black River
0705000503	Lake Wissota
0705000504	Duncan Creek
0705000705	Lake Chetek
0705000707	Lower Pine Creek – Red Cedar River
0707000211	Spring Brook
0707000301	Plover River
0707000304	Fourmile Creek
0707000305	Tenmile Creek
0707000315	Upper Lemonweir River
0707000319	Dell Creek – Wisconsin River
0707000501	Duck Creek – Wisconsin River
0707000512	City of Spring Green – Wisconsin River
0709000205	Headwaters Yahara River
0709000206	Lake Mendota – Yahara River
0709000207	Lake Monona – Yahara River
0709000209	Lake Kegonsa – Yahara River
0709000210	Lake Koshkonong – Rock River
0709000211	Blackhawk Creek
0709000212	Bass Creek
0709000213	Marsh Creek – Rock River
0709000214	Turtle Creek
0709000215	City of Beloit – Lower Rock River
0709000402	Headwaters Sugar River

Lake Michigan Basin Top Groups

Watersheds in the Lake Michigan Basin were analyzed for phosphorus and total nitrogen in surface waters and nitrogen in drinking water/groundwater in the same manner used for the Mississippi River Basin.

Phosphorus – Surface Waters

Those HUC 10s listed below comprise about 16% of the HUC 10s in the Lake Michigan Basin.

Watersheds in the Manitowoc and Sheboygan River Basins.

0403010103	North Branch Manitowoc River
0403010104	South Branch Manitowoc River
0403010107	Sevenmile & Silver Creeks – Frontal Lake Michigan
0403010108	Pigeon River
0403010112	Black R, Sauk Cr and Sucker Cr – Frontal L. Mich.

Watersheds in the Lower Fox River Basin.

0403020401	Duck Creek – Frontal Green Bay
0403020402	Plum Creek – Fox River
0403020403	East River
0403020404	Fox River – Frontal Green Bay (Apple–Ashwaubenon-Dutchman Creeks)

Watersheds surrounding or west of Lake Winnebago.[10]

0403020104	Upper Grand River
0403020112	Lake Butte des Mortes
0403020208	Shioc River
0403020213	Bear Creek – Embarrass River
0403020214	Bear Creek – Wolf River.
0403020302	Fond du Lac River

Nitrogen – Surface Waters

Those HUC 10s listed below comprise about 13% of the HUC 10s in the Lake Michigan Basin. Many of those listed are also listed for phosphorus above.

Watersheds in the Manitowoc, Sheboygan and Milwaukee River Basins.

0403010101	East Twin River – Frontal Lake Michigan
0403010103	North Branch Manitowoc River
0403010104	South Branch Manitowoc River
0403010105	Branch River

[10] The relative rank of these watersheds would be lower if the "delivered" SPARROW results are used where trapping of phosphorus within Lake Winnebago is incorporated.

0403010106	Manitowoc River – Frontal Lake Michigan
0403010107	Sevenmile & Silver Creeks – Frontal Lake Michigan
0403010108	Pigeon River
0403010109	Mullet River
0403010112	Black R, Sauk Cr and Sucker Cr – Frontal L. Mich.
0403010203	Kewaunee River
0404000301	North Branch Milwaukee River

Nitrogen – Drinking Water/Groundwater

The top 10% statewide are considered as the top group, and comprise about 2% of the HUC 10s in the Lake Michigan Basin. The HUC 10 watersheds of the top group located within the Lake Michigan Basin are:

0403010104	South Branch Manitowoc River
0403020218	Waupaca River

1.2.3 Models and Monitoring Data.

For this data-driven analysis, results from the USGS SPAtially Referenced Regressions On Watershed attributes (SPARROW) model, DNR Watershed Rotation Water Quality Monitoring (aka "pour point") data, and public drinking water systems well data were used as follows:

- USGS SPARROW Model[11] -- This model was used for this analysis since it consistently provided both phosphorus and nitrogen load information. "Incremental" nonpoint phosphorus and nitrogen yield results from the MRB3 SPARROW models (Robertson and Saad 2011) were aggregated at the HUC 10 level. Yields are expressed in average annual pounds per acre per year over several years centered around 2002, because these values are not influenced by the size of the watershed. Use of the "incremental" yield rather than the "delivered" incremental yield to downstream receiving waters places greater emphasis on local waters rather than on downstream waters, such as the Mississippi River and Gulf of Mexico.

- DNR watershed "pour point" monitoring concentrations data set – DNR collected water quality samples once per month during one year throughout the 2006-2011 period at the downstream location "pour point" of about 330 delineated watersheds on a rotating basis (50 to 60 per year. Median growing season (May through October) concentrations were used in this analysis. A minimum of four samples were needed to compute the median value. If an adequate number of samples were not available, other data specific to the watershed were used and shown in brackets in the HUC 10 table in Appendix A.

- Safe Drinking Water Nutrient Impacts – The prevalence of wells in the public drinking water supply systems reporting well water results of 5 mg/L or greater for nitrate were used as an

[11] For more information on SPARROW modeling, see http://wi.water.usgs.gov/rna/9km30/index.html

approximate indicator that groundwater quality within the watershed shows evidence of significant nutrient impact. Two factors were considered jointly; the frequency of occurrence and the ratio of impacted wells to total active public drinking water systems located in the HUC 10 watershed. Each impacted groundwater well is counted only once for the ten year period from 2003-2012.

1.2.4 Urban Watersheds

The analysis of the SPARROW model results described above did not include the municipal and industrial wastewater facility contribution identified with SPARROW for a number of reasons. Federal funding programs are likely to focus on agricultural nonpoint source management and there isn't a creditable point source nitrogen data set. However, if these wastewater point source phosphorus discharges were included, the SPARROW incremental and delivered phosphorus yields would change greatly for a small number of HUC 10 watersheds.

In the Mississippi River Basin:

- Pine Creek – Mississippi River (0704000605) due to the presence of the La Crosse wastewater facility,
- Lake Kegonsa – Yahara River (0709000209),
- Marsh Creek – Rock River (0709000213) due to the Janesville facility, and
- City of Winona – Mississippi River (0704000306) due to Winona Minnesota and other facilities

- In the Lake Michigan Basin: Pike River (0404000204).

1.2.5 Targeting within Watersheds

Although this chapter focuses on targeting watersheds for implementation funding and management activities, it is also important to recognize the Wisconsin efforts to identify critical sources areas and to target implementation activities within these watersheds. This is especially important for management of phosphorus where the majority of the phosphorus load may come from less than one-third of the croplands and from concentrated sources, such as animal lots. In many areas steeply sloped "dry lots" where livestock are located in close proximity to intermittent channels may be some of the most significant sources. Wisconsin is committed to continuing work to identify and understand management in critical source areas and their role in targeting within watersheds.
A research project in the Pleasant Valley watershed located in southwest Wisconsin, has found that about 12% of the crop and pasture lands have a P Index above 6 and contribute about a third of the phosphorus load from these agricultural lands. In addition, managing those fields so that a P Index of 6 is attained will reduce the phosphorus load by about 14%. Managing all fields above a P Index of 3 to 3 would reduce loads by 35%. (L. Ward Good, personal communication)

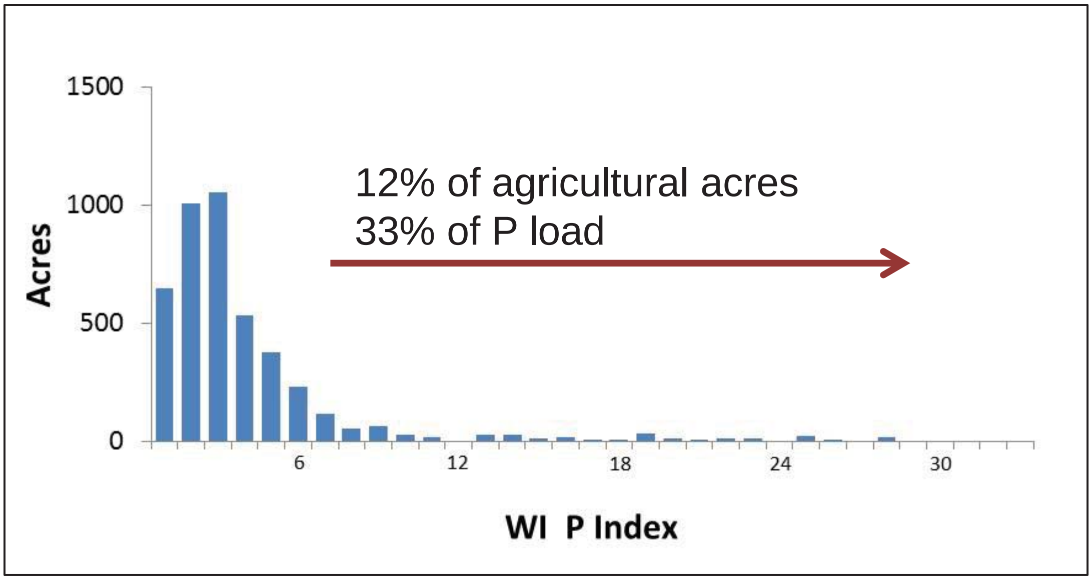

Figure 1.5 P Index values from cropland and pastures in the Pleasant Valley watershed (does not include grazed woods). Source: UW-Madison Soils.

Several other elements of this strategy also address targeting within priority watershed areas, including Chapter 4 Agricultural Nonpoint source Nutrients, Chapter 7 Accountability and Verification Measures and Chapter 8 Water Quality Monitoring.

1.3 Future Directions

Members of the multi-agency work group identified the following future directions:

1. Additional Information for Identifying Target and Priority Areas

   In future analyses, it is anticipated that additional lines of evidence, such as likelihood of the stream or lake to respond to nutrient reductions, will be also incorporated.

2. Move toward an analysis at the HUC 12 level.

   Since much of the nonpoint source implementation will take place at the HUC 12 level, it is desirable to move toward a systematic and data driven analysis at that watershed scale. This will allow variation within HUC 10 watersheds to be considered. For example, the Big Green Lake HUC 10 watershed has a wide range of topography from very flat areas in its eastern part to steeply sloped areas in its southern part. Overall, it does not rank high based on this initial analysis. However, an analysis at the HUC 12 level could result in the southern watershed areas ranking high.

   A systematic data driven analysis would, however, require further sophistication in modeling and additional monitoring. Further sophistication in modeling may include defining all model inputs at smaller than a county level, incorporation of soil groupings and bedrock geology. However, uniform "pour point" monitoring for each of the 1800 HUC 12 watersheds is beyond the staff time and money of the Department of Natural Resources. Future HUC 12 monitoring may need to be focused on those watersheds likely to rank high as nutrient contributors.

3. Incorporation of information from the Healthy Watersheds Initiative.

   The Wisconsin DNR is currently conducting a Healthy Watersheds Initiative assessment to rank watersheds on scales of health and vulnerability. These rankings may be used to target appropriate funding, focus management practices, promote protection through education and assess trends. Incorporation of this assessment could allow targeting on both a restoration and protection basis.

Chapter 2. Setting Nutrient Reduction Targets

Element 2. Set Watershed Load Reduction Goals Based Upon Best Available Information

2.1 EPA and Gulf Hypoxia Task Force Expectations

2.1.1 Nutrient Reduction Framework Expectation

From EPA's WQ-26 national performance measure:

1. Develop a methodology to evaluate the nitrogen and phosphorus loadings from all sectors.

2. Establish numeric goals for loading reductions that will likely be needed to meet water quality goals. States may opt to submit a schedule of load reduction targets within interim goals.

Quoting from the recommended elements, "[load reduction] goals should be based upon best available physical, chemical, biological, and treatment/control information from local, state, and federal monitoring, guidance, and assistance activities including implementation of agriculture conservation practices, source water assessment evaluations, watershed planning activities, water quality assessment activities, Total Maximum Daily Loads (TMDL) implementation, and National Pollutant Discharge Elimination System (NPDES) permitting reviews." For the protection of watersheds that are not impaired, instead of setting load reduction needed to meet water quality goals, the states may determine an alternative baseline for setting load reduction goals.

Load reduction goals may be set using, for example, any of the three considerations below:

- Pounds of total phosphorus and/or pounds of total nitrogen;
- Percentage of downstream pour point goal or targeted sector estimated loadings; and
- Water quality standards-based calculation based on flow/volume.

2.1.2 Gulf Hypoxia Task Force Essential Strategy Component

- Evaluate and select analytical tools
- Establish current status and trends
- Establish quantitative reduction targets

2.2 Wisconsin's Approach

As illustrated in the Table 2.1, Wisconsin's federal, state and local programs use a mixture of approaches to meet water quality standards, restore impaired waters, protect interstate downstream waters, protect high quality waters and minimize contaminants reaching groundwater. The specific programs and their implementation progress are described in subsequent elements of this strategy. The purpose of this chapter is to relate the primary program features to identified water quality goals. Specifically, this chapter describes the following:

- Analytical tools
- Current status
- Nutrient trends
- Attaining the 45% phosphorus and nitrogen load reductions to the Mississippi River and Gulf of Mexico.
- Estimating phosphorus load reduction to Lake Michigan.
- Water quality- based effluent limits for municipal and industrial wastewater facilities. (See description of point source requirements in Chapter 3)
- Wasteload and load reductions identified in EPA-approved TMDLs.

2.2.1 Analytical Tools

In developing this strategy a number of analytical tools were used primarily and fall into three groups: analysis of stream, river and well monitoring data; results of modeling and compilations of point source discharge concentrations. The following is a brief description of the analytical tools, why they were selected, how they were used and how they may be used in the future.

- Stream, river and well water monitoring data

  Stream, river and well water river monitoring data was used to provide an analysis of the current status of nutrient related water quality in Wisconsin (section 2.2.2 of this chapter), determine which waters are considered impaired under section 303(d) of the Clean Water Act, rank watersheds for targeting future actions (Chapter 1), determining trends (section 2.2.3 of this chapter), measuring and reporting progress (Chapters 8 and 9). Three sets of monitoring data were primarily used in developing this strategy. The first set is data collected at the downstream "pour point" of over 300 watersheds (about HUC 10 watershed size). At each site, data was collected monthly for a 12-month period. Between50 and 60 watersheds were monitored each year from 2006 through 2011. The second set is data collected monthly for a number of decades at long-term river trend sites across the state. Data from these sites was used to conduct the trend analysis summarized in section 2.2.4 and will be part of Wisconsin's approach for measuring progress. The third set is public well monitoring data from wells across the state. Data from these wells was used in the targeting/priority setting analysis in Chapter 1 of this strategy.

- Modeling

  Models are used extensively in nutrient management in Wisconsin with the specific model tied to the specific use. For example, the nutrient model SNAP+ is frequently used to develop cropland nutrient management plans. Total maximum daily load analyses may use a variety of models including the Soil and Water Assessment Tool (SWAT) to estimate nutrient loads reaching streams.

In preparing this strategy, the SPARROW model (see Chapter 1) was used in a number of analyses. SPARROW model results were used to estimate phosphorus and nitrogen yield and loads for HUC 8 watersheds in Chapter 1 and for targeting HUC 10 watersheds also in Chapter 1. SPARROW was selected for these analyses because it provides information for both phosphorus and nitrogen, is available for both the Mississippi River and Great Lakes Basins, is calibrated based on monitoring data and has had extensive review. For future modeling, all available models, including enhanced versions of SPARROW, will be considered.

- Discharge Monitoring Reports and Watershed Project Research Results

  Analyses in this strategy also made extensive use of discharge monitoring report information from hundreds of municipal and industrial wastewater facilities and research results from nonpoint source implementation research projects.

2.2.2 Current Status

The current status of Wisconsin's waters is illustrated by the maps in Figures 2.1, 2.2 and 2.3. For total phosphorus, Figure 2.1 shows about half of the monitoring sites meet the water quality standards criteria and about half of the sites exceed the criteria. The criterion for streams is 0.075 mg/L (75 *u*g/L) and the criterion for rivers is 0.100 mg/L (100 *u*g/L). Figure 2.2 shows the total nitrogen concentrations for these same sites. No water quality standards criteria have been adapted for total nitrogen. See Chapter 10 of this strategy for more information.

Figure 2.3 shows the locations of public (use) drinking water wells across the state. The non-community public wells include restaurants, bars, schools, etc. The drinking water quality standard is 10 mg/l for nitrate and the preventive action level is 2 mg/L.

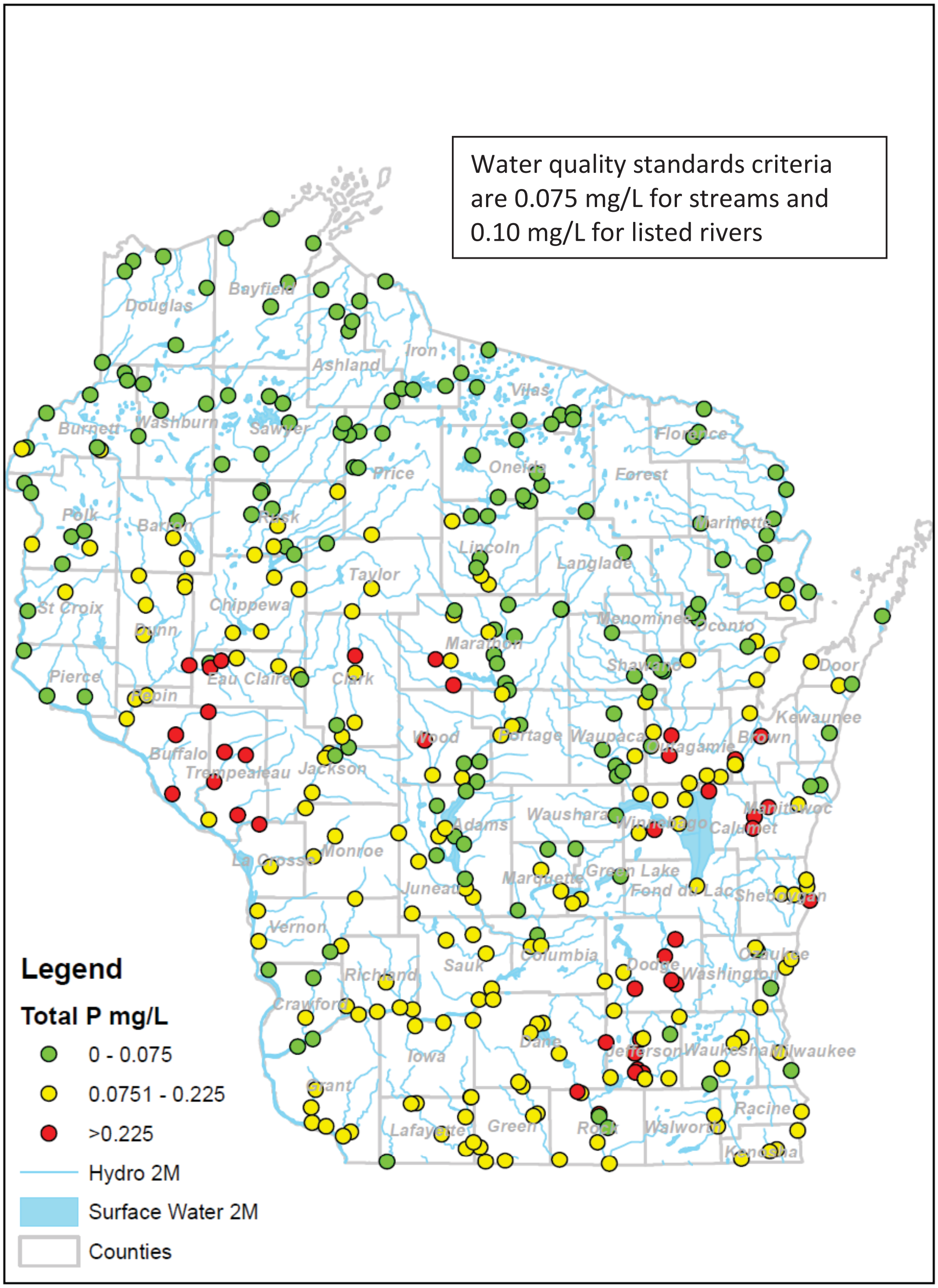

Figure 2.1 Stream Phosphorus Concentrations (Median May-October)

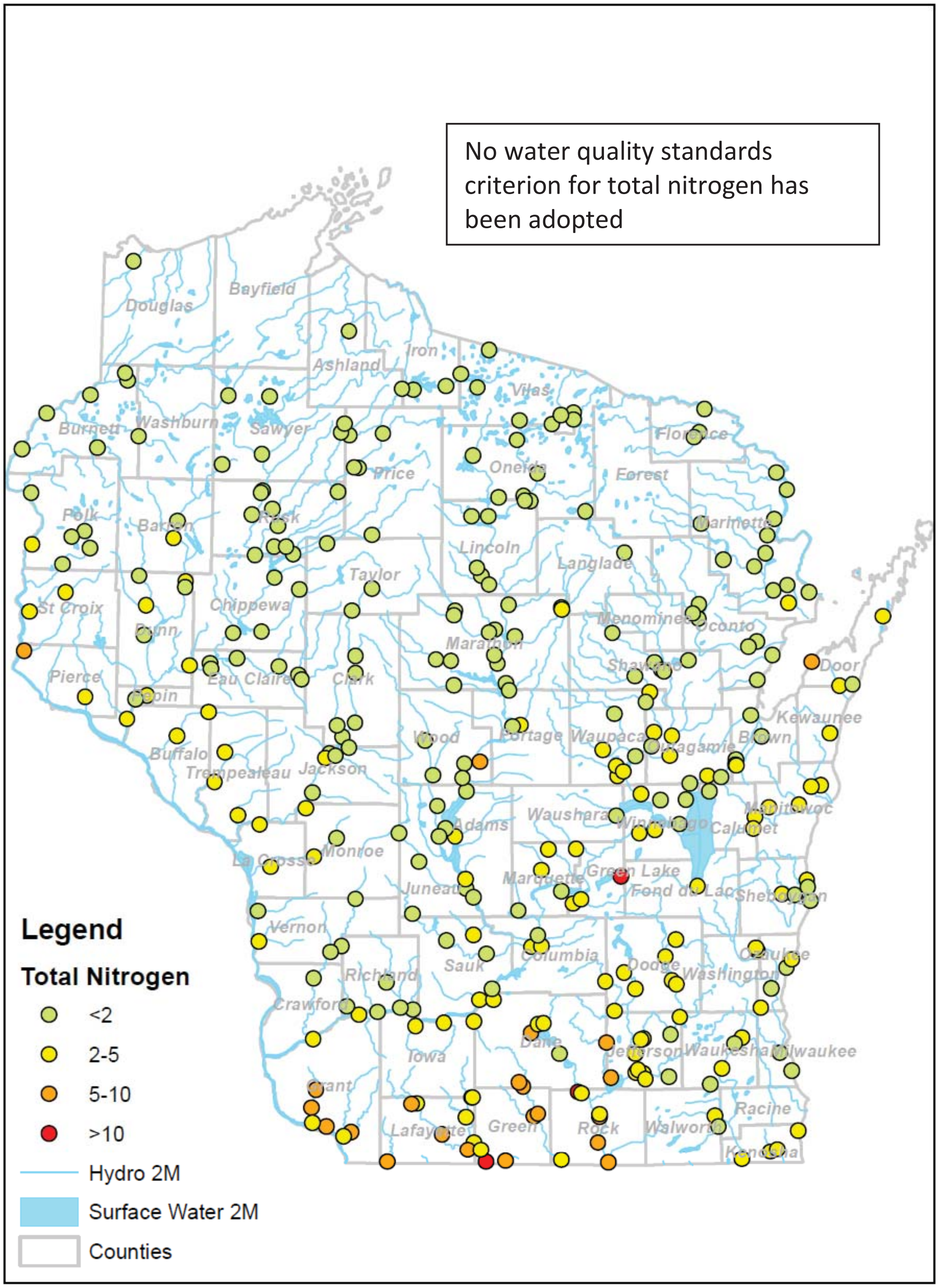

Figure 2.2 Stream Nitrogen Concentrations (Median May-October)

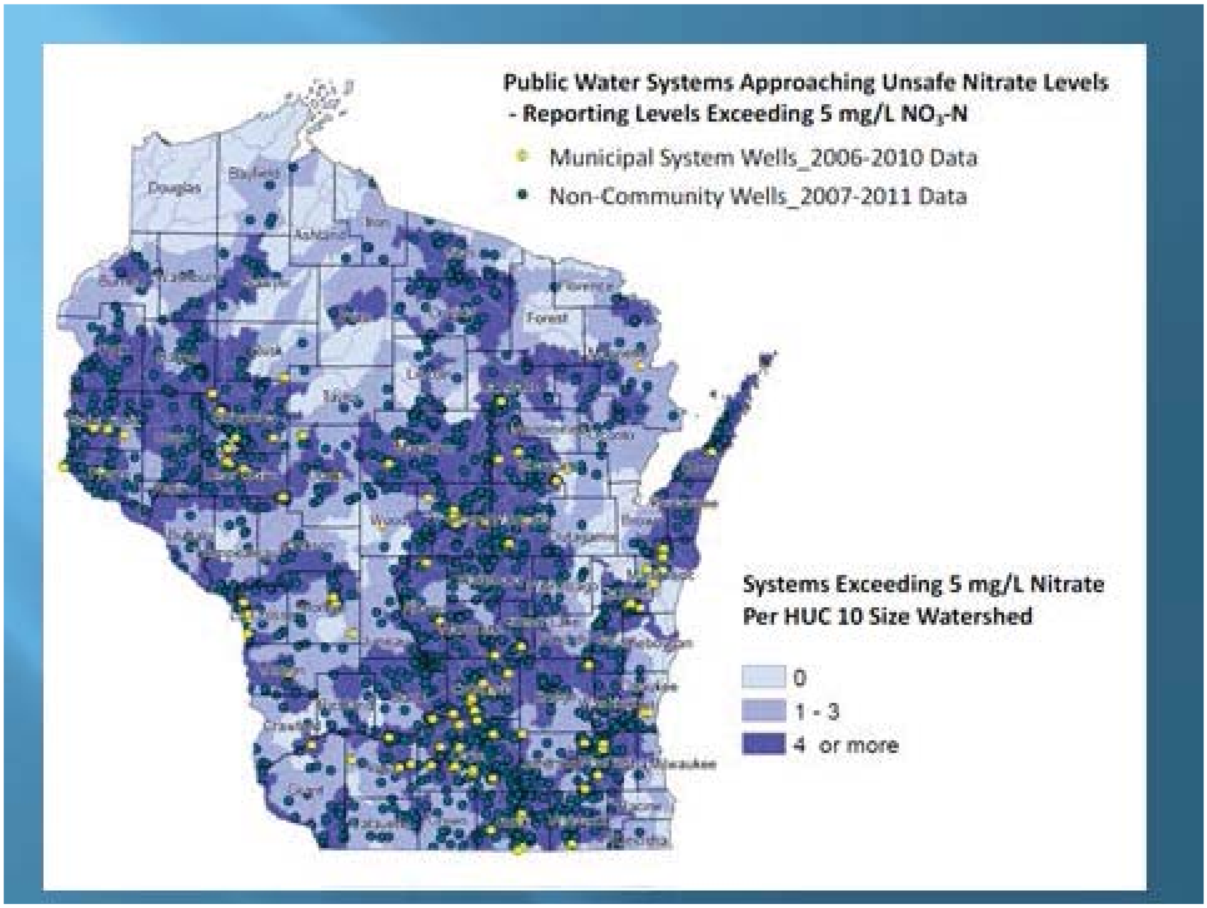

Figure 2.3 Public Water Systems with nitrate concentrations exceeding 5 mg/L.

2.2.3 Nutrient Trends

Data from the DNR Long-term River Trend sites and USGS flow gaging stations were used to analyze nutrient trends at over 30 locations across Wisconsin. In general, the phosphorus trends in the southeast and southwest Wisconsin show a decrease in phosphorus concentrations over the last few decades. Locations in the central and northern Wisconsin generally show no change; with the concentrations remaining relatively low. In contrast the total nitrogen concentrations tend to increase in southern Wisconsin. The numbers associated with the bars on Figures 2.4 and 2.5 indicate the period of record, such as "77" means that 1977 was used as the initial year for analysis. The analysis does not indicate the cause of the increase or decrease. Decreases in phosphorus concentrations are likely a combination in reductions from both point sources and nonpoint sources.

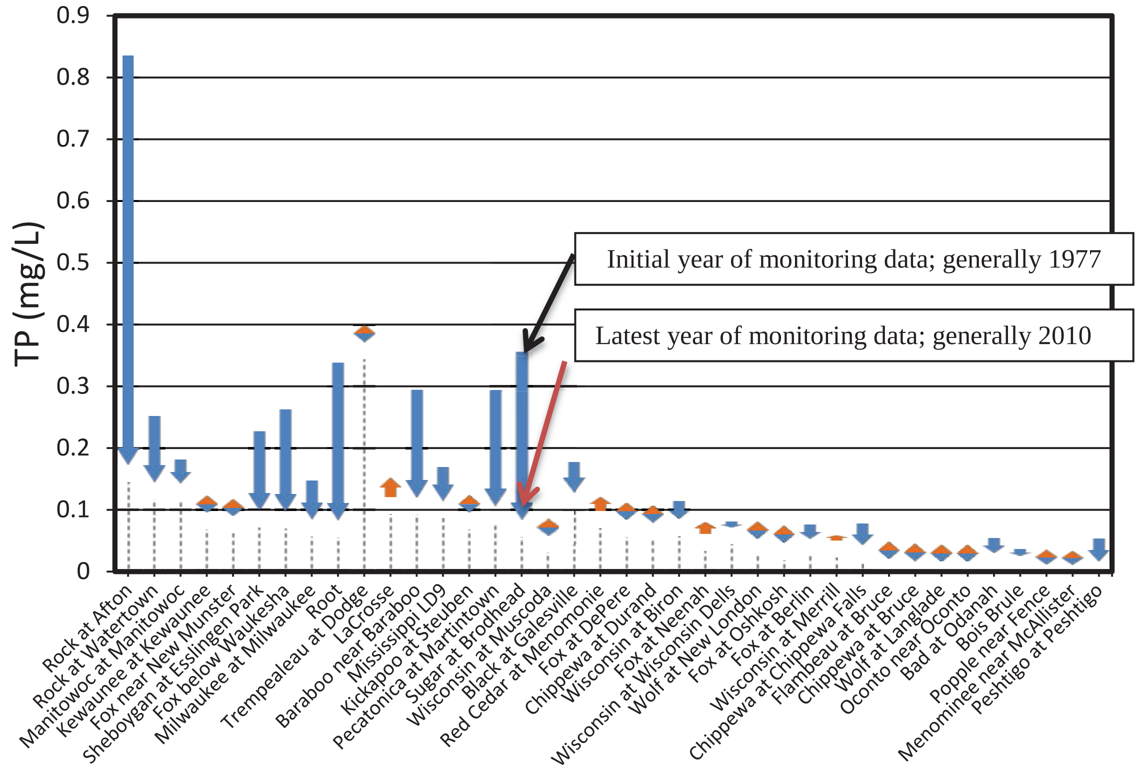

Figure 2.4 Total phosphorus concentration trends at Wisconsin River Long-Term Trend sites.

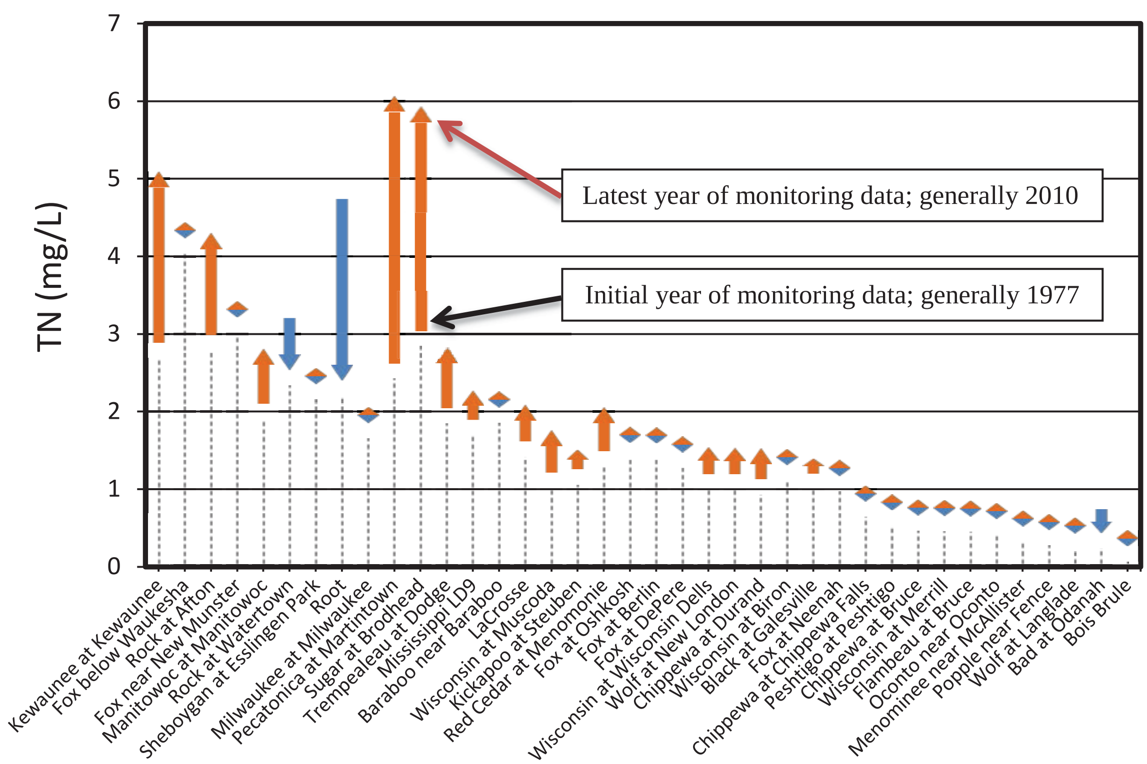

Figure 2.5 Total nitrogen concentration trends at Wisconsin Long-term River Trend sites.

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2.2.4 General Approach for Nutrient Management in Wisconsin

Wisconsin programs use a variety of technology-based and water quality based approaches to manage nutrients. Technology-based approaches tend to be uniform and tied to readily available technology or practice. They do not vary by the condition of the water quality. They may, however, be adequate to result in water quality standards being met in various locations. In contrast, water quality-based approaches tailor the level of management to the specific water quality needs. For example, a total maximum daily load (TMDL) analysis for a watershed tailors both the point source and nonpoint source management to meet water quality standards. Table 2.1 shows the mix of technology-based and water quality-based approaches used by Wisconsin programs.

Table 2.1 Overview of Wisconsin Water Quality-Based Approach by Sector

Sector (described in subsequent chapters)	Technology or uniform approach	Water quality standards – based approach	Other
Agricultural nonpoint sources	State adopted performance standards and prohibitions and local ordinance requirements. Practices to implement performance standards and prohibitions designed to minimize impact on groundwater.	Potentially identified as part of a TMDL implementation plan	Other conservation practices and programs, such as stream bank stabilization, riparian buffers, enrollment in Conservation Reserve Program, animal lot abandonment. Also, through source water (wellhead) protection plans
Concentrated Animal Feeding Operations -- WPDES permits	Federal and state-enacted requirements on "no discharge" from animal lot (less than 25-year, 24-hour storm) and compliance with state adopted performance standards (NR 243). Practices to implement performance standards and prohibitions designed to minimize impact on groundwater.	Potentially identified as part of a TMDL implementation plan Permits may include specific requirements to meet groundwater quality standards	
Municipal Separate Storm Sewer Systems – WPDES permits	Federal minimum management measures and state-enacted performance standards. Practices to implement performance standards and prohibitions designed to minimize impact on groundwater.	Potentially identified as part of a TMDL implementation plan	
Non-permitted urban areas or activities	State adopted performance standards and prohibitions. Practices to implement	Potentially identified as part of a TMDL implementation plan	

	performance standards and prohibitions designed to minimize impact on groundwater.		
Publicly and privately owned (e.g. municipal and industrial) wastewater treatment facilities – WPDES permits	Federal and state adopted technology-based requirements, including Subchapter II of NR 217 (1 mg/L or alternate limit). Also federal and state groundwater protection requirements.	Water quality based effluent limits based on federal and state requirements, including Subchapter III of NR 217 for phosphorus and NR 106 for ammonia	Note: Water quality based effluent limit compliance may be achieved through water quality trading or through implementation of a watershed adaptive management option plan
On-site waste disposal systems	State adopted WPDES requirements or state sanitary code.		

2.2.5 Mississippi River Basin/Gulf Hypoxia – 45% Reduction Goal

Wisconsin should be able to reach the 45% reduction goal for phosphorus load reduction to the Mississippi River and subsequently to the Gulf of Mexico, based on an analysis conducted by the Department of Natural Resources. This presumes a 1995 base year and phosphorus reduction from point sources and nonpoint sources within the Mississippi River Basin within Wisconsin beginning in that base year and going into the future. The analysis assumes current programs and current requirements for those programs.

1995 Baseline. Consistent with the Gulf Hypoxia Action Plan, 1995 was selected as a base year. Phosphorus loads were derived for the Wisconsin portion of each of the 32 HUC 8s in Wisconsin's Mississippi River Basin using 1995 point source monitored loads and "2002 normalized" SPARROW nonpoint source load estimates.[12] For most of the Mississippi River Basin, the 1995 point source load was not the dominant source of the estimated phosphorus loads, and the substitution for the 1995 point source loads for the 2002 point source loads would not significantly influence the baseline loads.

Under the derived 1995 baseline, the combination of point source and nonpoint source loads by HUC 8 are shown in the Table 2.2 and Figure 2.6. Although Wisconsin's technology-based phosphorus effluent limits became effective statewide in late 1992, they were phased-in primarily in the late-1990s as new permits were issued with compliance dates set within the five-year permit term.

Projected Reduction. The projected reduction is estimated for both point sources and nonpoint sources using existing data and a series of assumptions. This projection does not specify a time period.

[12] For wastewater point sources 1995 discharge monitoring report data were used, if available. If not, data from the closest year were used. The 2002 SPARROW model results were deemed appropriate for a 1995 nonpoint source baseline since the calibration data used by USGS were collected near to 2002, including data that may have been collected five, ten or more years prior to 2002. For each HUC 8, the 2002 point source loads were subtracted from the total "2002-normalized: SPARROW load to derive a nonpoint source estimate.

For municipal and industrial wastewater treatment facilities, the projected reduction is based on comparing the actual or estimated 1995 baseline phosphorus loads to the actual 2009 point source contribution on a facility-by-facility basis using discharge monitoring report information. Discharges for 2009 are very similar to those for 2010 and 2011, and reflect current conditions and compliance with state WPDES permit program technology-based phosphorus control requirements described in Subchapter II of NR 217, Wis. Adm. Code. For the basin as a whole, the wastewater point source phosphorus discharge has been reduced by **67percent** since the 1995 baseline. Compliance with the more recent water quality-based requirements in Subchapter III of NR 217 may produce additional load reductions. However, compliance with these newer requirements may come in the form of water quality trading or implementation of watershed plans under the Wisconsin watershed adaptive management option. As such, there could be some overlap with the nonpoint source load reduction. Thus, the 2009 conditions are used in conservatively estimating future phosphorus loads from these facilities.

For storm water management in urban areas, the analysis assumes a 10% phosphorus load reduction. Current WPDES permits call for a 20% or 40% reduction in suspended solids loads. It is assumed that the phosphorus load reduction will be one-third to one-half of the reduction for suspended solids load reduction. Thus, the 10% load reduction is conservatively assumed for urban areas. Some TMDLs may call for further reduction.

For agricultural lands, two assumptions are made:

- A 10% load reduction from 1995 to present. With substantial implementation of federal, state and local conservation programs, a higher reduction could be assumed. However, available data, such as from the NRCS Natural Resource Inventory, shows a degree of backsliding in Wisconsin and other states during this period. Taking land out of the Conservation Reserve Program is commonly cited as one of the reasons for falling back. On the other hand there is much anecdotal information from across the state that many smaller animal lots immediately adjacent to streams have been removed, and new slope diversions have been installed on many other animal lots. Thus, the 10% reduction represents a conservative reduction from 1995 to present.
- A 30% reduction into the future. Experience in the Pleasant Valley watershed project in southwestern Wisconsin shows that a 25 to 30% reduction is reasonable to achieve through meeting the phosphorus index performance standard. Compliance with other performance standards will increase the percent reduction. Thus, a 30% future reduction is deemed a reasonable further reduction.[13] This reduction may be achieved through the programs listed in Chapter 3 of this strategy, including NRCS's Environmental Incentives Program, DNR's Runoff Management Program (including Targeted Runoff Management Grants and Notice of Discharge grants); DATCP's Farmland Preservation/Working Lands Initiative and county programs.

For all other lands, such as wetlands, barren lands and wooded lands, no reduction is assumed.

Using the above assumptions, about a 40% reduction is estimated. It is further expected that reductions in phosphorus load needed to implement TMDLs will bridge the remaining gap to

[13] Personal communication Laura Ward Good, University of Wisconsin – Madison.

achieve the 45% reduction goal. Table 2.3 and Figure 2.7 show the projected reduction for each Mississippi River Basin HUC 8 watershed using the assumptions described above.

Table 2.2. 1995 Baseline Phosphorus Loads by HUC 8 Watershed (listed in order of decreasing nonpoint source yields)

8-Digit HUC Name	Nonpoint Source Load (lb/yr) (1)	1995 Point Source Load (lb/yr) (2)	1995 Total Load (lb/yr)	% Nonpoint Source	% Point Source
Grant-Little Maquoketa	499,755	27,404	527,159	95%	5%
Pecatonica River	642,667	19,391	662,058	97%	3%
Apple-Plum Rivers	82,735	7,293	90,028	92%	8%
Coon-Yellow Rivers	254,458	15,657	270,115	94%	6%
Des Plaines River	44,392	8,283	52,675	84%	16%
Sugar River	216,708	27,743	244,451	89%	11%
Kickapoo River	229,545	19,359	248,904	92%	8%
Lower Rock River	236,423	379,639	616,062	38%	62%
Upper Rock River	401,250	330,414	731,664	55%	45%
Baraboo River	186,795	28,045	214,840	87%	13%
Buffalo-Whitewater Rivers	206,814	7,482	214,296	97%	3%
Rush-Vermillion Rivers	121,479	13,780	135,259	90%	10%
Lower Wisconsin River	538,274	21,454	559,728	96%	4%
Trempealeau River	527,810	45,467	573,277	92%	8%
Black River	477,914	55,769	533,683	90%	10%
La Crosse-Pine Rivers	119,466	255,094	374,560	32%	68%
Lake Dubay	519,094	124,151	643,245	81%	19%
Eau Claire River	138,624	2,706	141,330	98%	2%
Lower Chippewa River	317,434	59,941	377,375	84%	16%
Upper Fox River	136,103	61,372	197,475	69%	31%
Red Cedar River	268,346	35,295	303,641	88%	12%
Castle-Rock	353,684	514,524	868,208	41%	59%
Lower St. Croix River	209,114	27,256	236,370	88%	12%
Jump River	105,681	2,245	107,926	98%	2%
Upper Chippewa River	161,258	549	161,807	100%	0%
Upper St. Croix River	99,276	1,238	100,514	99%	1%
Namekagon River	49,827	-	49,827	100%	0%
Flambeau River	61,762	46,602	108,364	57%	43%
South Fork Flambeau River	39,125	5,243	44,368	88%	12%
Upper Wisconsin River	85,220	81,442	166,662	51%	49%
Totals	7,331,035	2,224,838	9,555,873	77%	23%

Table Notes:

(1)Nonpoint sources include agricultural lands, urban lands, wetlands, woodlands, etc.

(2) Point source loads do not include urban storm water runoff, CAFOs, and biosolids application to land. These runoff related point sources are included in the nonpoint source column.

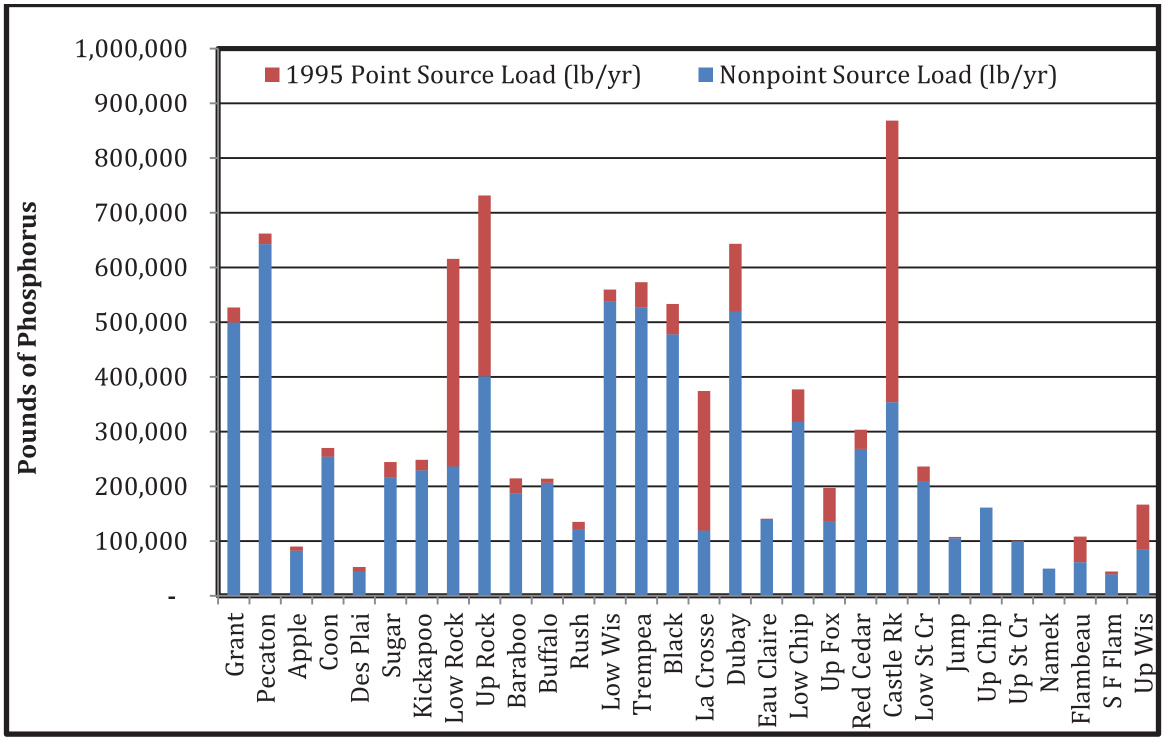

Figure 2.6 Estimated 1995 Baseline Phosphorus Load for Mississippi River Basin by HUC 8 Watershed

Table 2.3 Projected Phosphorus Reduction for Mississippi River Basin using Existing Point Source and Nonpoint Source Programs – By HUC 8 Watershed

HUC 8 Name	Nonpoint Source Load (lb/yr)	1995 Point Source Load (lb/yr)	1995 Total Load	Projected Nonpoint Source Load	Projected Point Source Load	Projected Total Load	% Reduc'n
Grant- Maquoketa R	499,755	27,404	527,159	315,601	10,593	326,194	38%
Pecatonica River	642,667	19,391	662,058	401,970	14,130	416,100	37%
Apple-Plum Rivers	82,735	7,293	90,028	51,426	6,928	58,354	35%
Coon-Yellow Rivers	254,458	15,657	270,115	169,543	12,336	181,879	33%
Des Plaines River	44,392	8,283	52,675	30,274	1,195	31,469	40%
Sugar River	216,708	27,743	244,451	137,511	11,574	149,085	39%
Kickapoo River	229,545	19,359	248,904	151,100	4,614	155,714	37%
Lower Rock River	236,423	379,639	616,062	157,748	145,897	303,645	51%
Upper Rock River	401,250	330,414	731,664	260,691	63,461	324,152	56%
Baraboo River	186,795	28,045	214,840	121,254	14,234	135,488	37%
Buffalo-Whitewater	206,814	7,482	214,296	137,540	2,338	139,878	35%
Rush-Vermillion Rivers	121,479	13,780	135,259	78,122	7,819	85,941	36%
Lower Wisconsin River	538,274	21,454	559,728	355,509	20,679	376,188	33%
Trempealeau River	527,810	45,467	573,277	345,743	6,074	351,817	39%
Black River	477,914	55,769	533,683	345,370	11,803	357,173	33%
La Crosse-Pine Rivers	119,466	255,094	374,560	84,331	31,059	115,390	69%
Lake Dubay	519,094	124,151	643,245	372,779	46,747	419,526	35%
Eau Claire River	138,624	2,706	141,330	97,542	1,873	99,415	30%
Lower Chippewa River	317,434	59,941	377,375	219,067	27,445	246,512	35%
Upper Fox River	136,103	61,372	197,475	96,493	56,714	153,207	22%
Red Cedar River	268,346	35,295	303,641	185,054	14,731	199,785	34%
Castle-Rock	353,684	514,524	868,208	254,443	118,066	372,509	57%
Lower St. Croix River	209,114	27,256	236,370	143,881	15,759	159,640	32%
Jump River	105,681	2,245	107,926	86,386	1,306	87,692	19%
Upper Chippewa River	161,258	549	161,807	142,102	259	142,361	12%
Upper St. Croix River	99,276	1,238	100,514	84,715	429	85,144	15%
Namekagon River	49,827	-	49,827	45,421	-	45,421	9%
Flambeau River	61,762	46,602	108,364	57,522	20,980	78,502	28%
S. Fork Flambeau River	39,125	5,243	44,368	35,745	906	36,651	17%
Upper Wisconsin River	85,220	81,442	166,662	79,670	56,242	135,912	18%
Total Mississippi River Basin	7,331,035	2,224,838	9,555,873	5,044,554	726,191	5,770,745	
% Reduction				31%	67%	40%	

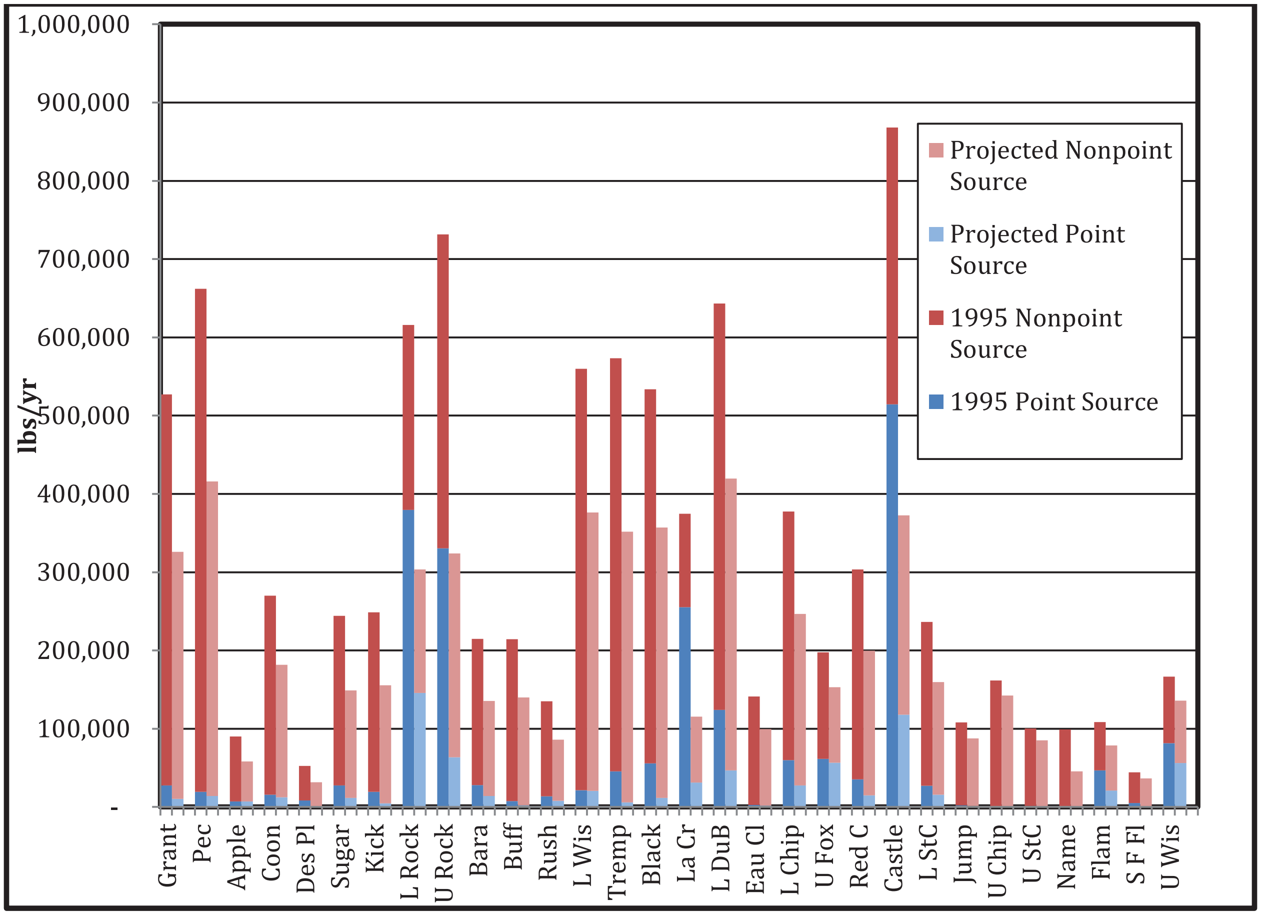

Figure 2.7 Estimated 1995 Baseline and Projected Future Phosphorus Loads for Mississippi River Basin by HUC 8 Watershed

<u>Progress to date – Gulf Hypoxia Goals</u>

The Gulf Hypoxia goals call for a 45% reduction in the phosphorus and nitrogen load (amount or mass) reaching the Gulf from each state using the early to mid-1990s as a base period. As shown in Figure 2.3 and described in greater detail in Chapter 2 of this strategy, the total average annual amount of phosphorus reaching surface waters in the Mississippi River Basin in 1995, the base year selected for this strategy, was estimated to be about 9,600,000 pounds. During 1995, municipal and industrial wastewater treatment facilities discharged about 2,200,000 pounds, about 23% of the total amount. The remainder is in a broad "nonpoint source" category that includes urban storm water runoff (many locations now under point source permits), agricultural sources (including Concentrated Animal Feeding Operations), forested areas, wetlands, etc.

Today the phosphorus loads have been reduced. There has been substantial implementation of the technology-based phosphorus removal requirements adopted in 1992 for municipal and industrial wastewater point sources. The average annual phosphorus discharge from these point sources in the Mississippi River Basin has decreased by 67% to about 700,000 pounds; representing an overall reduction of nearly 16%. From 1995 to present, phosphorus has also been reduced from nonpoint sources; however, the specific amount cannot currently be accurately determined. Clearly much implementation has taken place. For example, the Wisconsin Nonpoint Source Pollution Abatement Program Priority Watershed Projects alone expended over $200 million in state funds with much of the expenditures occurring after 1995.[14] The federal Environmental Quality Incentives Program (EQIP), administered by the Natural Resources Conservation Service (NRCS), made comparable expenditures. A conservative estimate is that the nonpoint source phosphorus loads have been reduced by 10% or about 730,000 pounds since 1995. It can be argued that a higher estimate is appropriate.

Together, the documented wastewater point source reduction and the conservatively estimated nonpoint source reduction have decreased the Mississippi River phosphorus load by about 23%, halfway to the 45% reduction goal. (See Figure 2.8.)

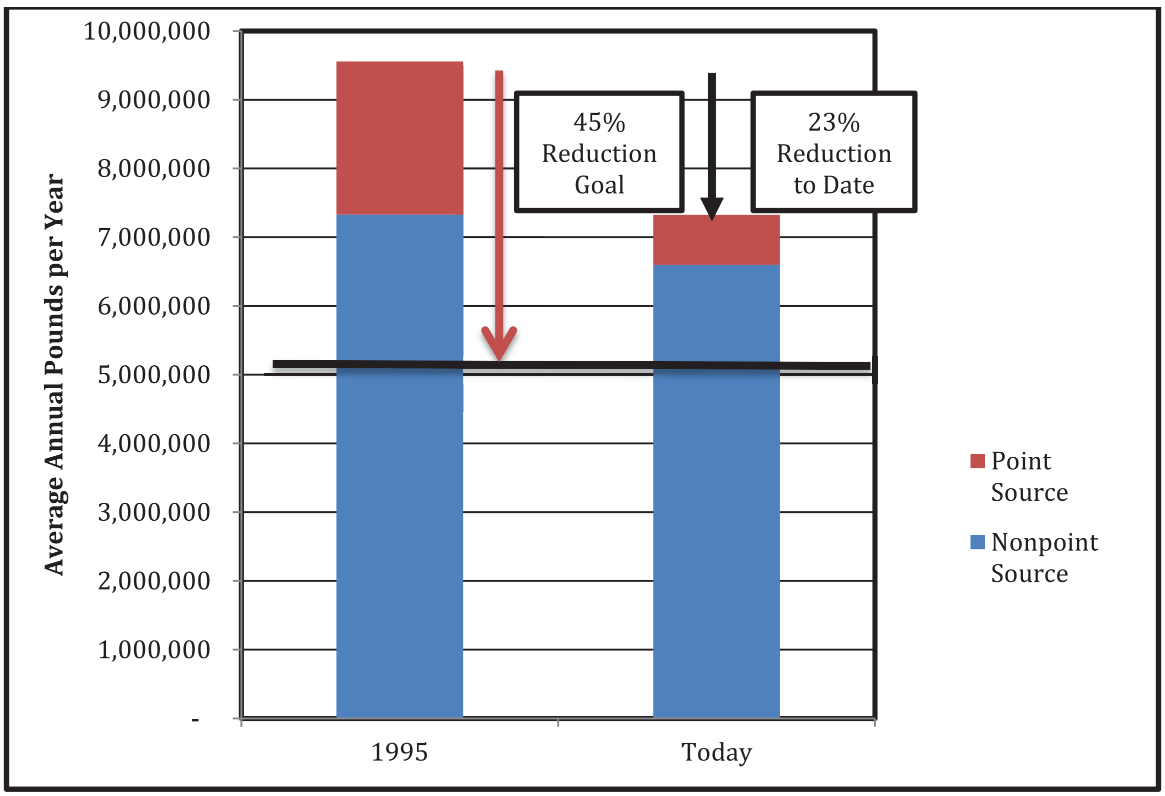

Figure 2.8. Gulf Hypoxia Phosphorus Load Reduction Goal and Estimated Progress to Date

[14] "Nonpoint Source Water Pollution Abatement and Soil Conservation Programs", Informational Paper 69, Wisconsin Legislative Fiscal Bureau, January 2013.

2.2.6 Lake Michigan – Estimated Phosphorus Load Reduction

No phosphorus or nitrogen load reduction goal has been identified for Lake Michigan. Presently, open water portions of Lake Michigan are meeting the phosphorus water quality standards criterion of 7 *u*g/L. Nearshore waters may be exceeding the water quality standards criterion. A load reduction, however, can be estimated through implementation of ongoing programs.

A phosphorus load reduction is estimated for Lake Michigan, including Green Bay, using the same assumptions, data inputs and analysis described for the Mississippi River Basin above and shown in Table 2.4 and Figure 2.9 below. The following items help illustrate differences between the two major basins:

- The majority of the municipal wastewater treatment plant discharge reduction came in the 1980s, prior to the base year, as a result of international agreements for phosphorus reductions for the Great Lakes. As a result, the point source phosphorus loads have remained unchanged or even increased in some of the HUC 8s since 1995.
- Some reductions in municipal wastewater facility phosphorus discharges have occurred, with the largest being at the Milwaukee Metropolitan Sewerage District plants.
- There has been a decrease in phosphorus discharges since 1995 from industrial wastewater facilities.
- For this analysis, urban storm water discharges are included in the nonpoint source category (as they are in SPARROW). Given the large urban areas within a number of the HUC 8s of the Lake Michigan Basin, this is a large component of the nonpoint source load for those HUC 8s.

Table 2.4 Projected Phosphorus Reduction for Lake Michigan using Existing Point Source and Nonpoint Source Programs – By HUC 8

HUC 8 Name	Nonpoint Source Load (lb/yr)	1995 Point Source Load (lb/yr)	1995 Total Load	Projected Nonpoint Source Load	Projected Point Source Load	Projected Total Load	% Reduc'n
Lower Fox River	270,672	344,201	614,873	193,293	157,807	351,100	43%
Pensaukee River	133,995	524	134,519	90,204	748	90,952	32%
Manitowoc-Sheboygan	458,625	87,646	546,271	300,839	69,289	370,128	32%
Lake Winnebago	114,353	19,628	133,981	77,207	18,942	96,149	28%
Door-Kewaunee Rivers	221,589	6,530	228,119	147,842	4,927	152,769	33%
Pike-Root Rivers	94,562	925,951	1,020,513	72,623	364,311	436,934	57%
Milwaukee River	212,662	80,206	292,868	157,419	41,982	199,401	32%
Upper Fox River	229,076	30,374	259,450	155,161	25,945	181,106	30%
Wolf River	489,918	49,403	539,321	350,479	25,945	376,424	30%
Oconto River	125,579	6,720	132,299	97,447	7,847	105,294	20%
Brule River	14,577	-	14,577	13,626		13,626	7%
Peshtigo River	85,594	10,733	96,327	69,133	4,278	73,411	24%
Menominee River	94,861	38,367	133,228	86,870	6,323	93,193	30%
Total Lake Michigan Basin	2,546,061	1,600,283	4,146,344	1,812,143	728,344	2,540,487	
% Reduction				29%	54%	39%	

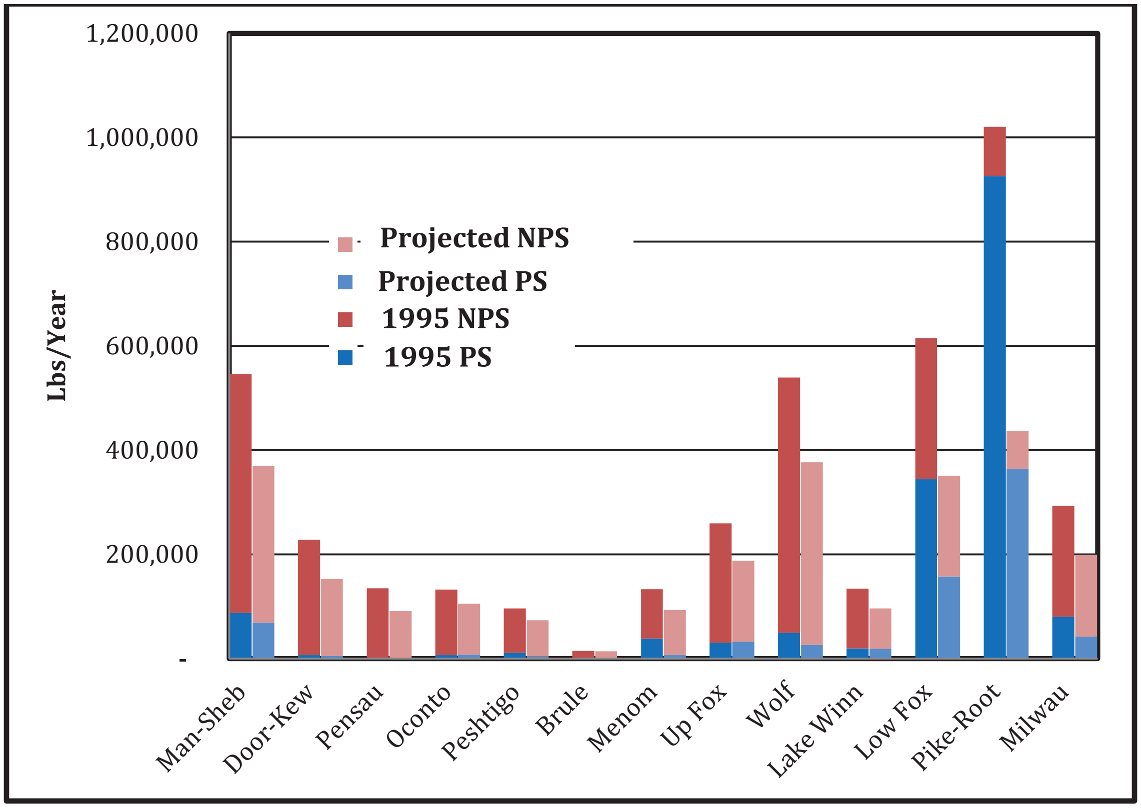

Figure 2.9 Estimated 1995 Baseline and Projected Future Phosphorus Load for Lake Michigan Basin by HUC 8 Watershed[15]

Progress to Date – Lake Michigan Basin

As shown in Figure 2.10, there has been an estimated 27% reduction since 1995 using the same analysis as used for the Mississippi River Basin. The municipal and industrial wastewater point sources' phosphorus loads have been reduced by 54%. However, there has been substantial reduction in phosphorus discharges in the 1980s, prior to the 1995 base year. No phosphorus or nitrogen load reduction goals have been identified for Lake Michigan.

[15] Man-Sheb = Manitowoc and Sheboygan; Pensau = Pensaukee; Menom = Menominee; Up Fox = Upper Fox; Lake Winn = Lake Winnebago; Low Fox = Lowr Fox and Milwau = Milwaukee

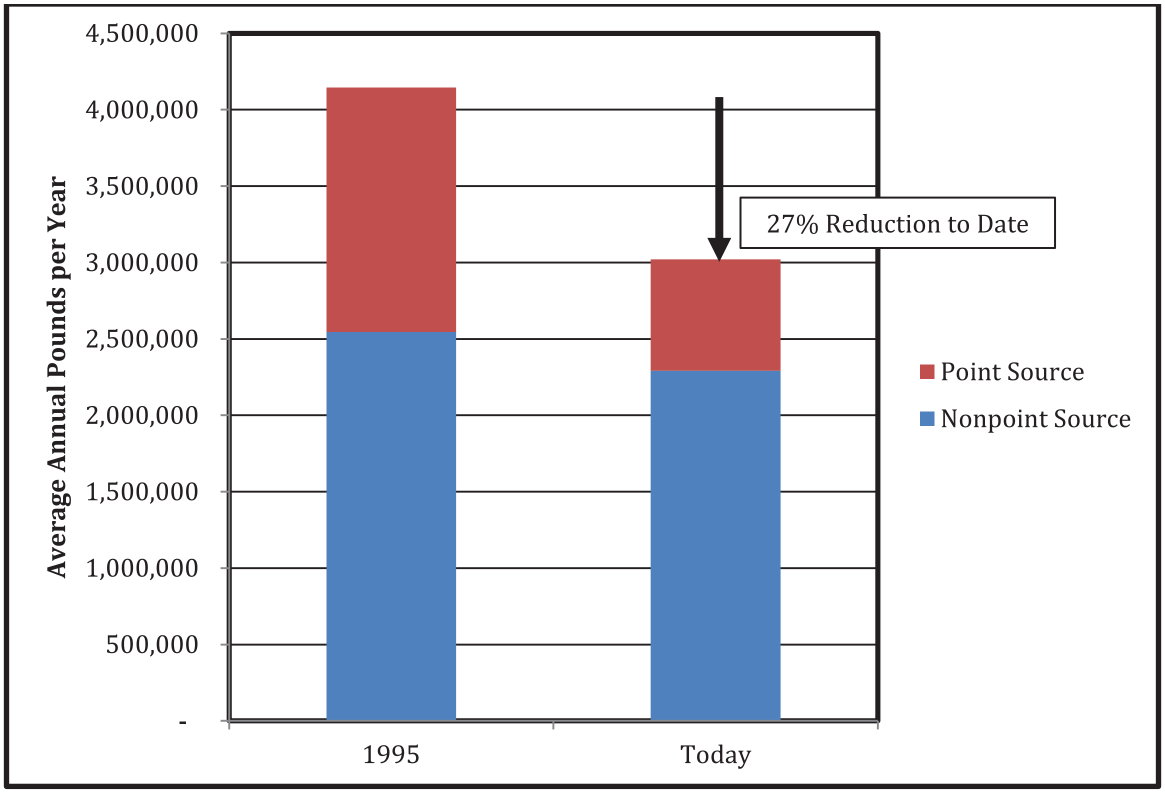

Figure 2.10 Lake Michigan Basin Phosphorus Load Reduction Estimated Progress to Date

2.2.7 Total Maximum Daily Load Analyses

Implementation of TMDLs will provide additional phosphorus load reductions beyond what would be achieved through compliance with the Chapter NR 151, Wis. Adm. Code, performance standards and prohibitions (see Chapter 4 for more information). TMDLs are the primary means for setting watershed specific load reductions for Wisconsin lakes and streams identified as impaired (not meeting water quality standards). In each TMDL analysis involving nutrients, such as phosphorus, specific load reductions are identified for both point sources and nonpoint sources (wasteload allocations and load allocations) that are necessary to attain water quality standards.

For many TMDL analyses, a level of nutrient reduction for nonpoint sources will exceed the reduction provided by the Chapter NR 151 performance standards and prohibitions. That is, compliance with the performance standards and prohibitions may not be adequate to achieve phosphorus water quality standards criteria. Implementation plans for approved TMDLs will specify what additional control is needed.

Chapter 3 – Point Source Permits

Element 3. Ensure Effectiveness of Point Source Permits in Targeted/Priority Sub-watersheds for Wastewater facilities, CAFOs, and Urban Storm Water

3.1 EPA and Gulf Hypoxia Task Force Expectations

EPA's expectation emphasizes ensuring that point source control permits in targeted or priority watersheds are effective with respect to:

"A. Municipal and Industrial Wastewater Treatment facilities that contribute to significant and measureable N & P loadings,

"B. All Concentrated Animal Feeding Operations (CAFOs) that discharge or propose to discharge, and/or

"C. Urban Storm water sources that discharge into N & P- impaired waters or are otherwise identified as a significant source [of nitrogen and phosphorus]."

3.2 Wisconsin's Approach

Wisconsin conducts a statewide water quality permit program to control phosphorus contributions from municipal and industrial wastewater treatment facilities, concentrated animal feeding operations (CAFO), and urban storm water sources. The Wisconsin Pollutant Discharge Elimination System (WPDES) permit program is established by Chapter 283, Wisconsin Statutes, and delegated authority to administer the federal Clean Water Act permit program. WPDES permits are issued by the DNR Bureaus of Water Quality and Watershed Management, with federal oversight from EPA. Wisconsin's Office of the Attorney General provides legal resources for enforcement. Permits for groundwater discharges are issued under state law. DNR is responsible for the issuance, reissuance, modification, and enforcement of all WPDES permits issued for discharges into the waters of Wisconsin, except discharges occurring on Native American lands which are regulated directly by EPA.

Wisconsin regulates discharges to both groundwater and surface water. Facilities discharging wastewater from a specific point (end of a pipe) must meet either the federal minimum requirements for secondary treatment for municipalities and technology-based categorical (or base level) limits for industries; or, the discharges must meet levels necessary to achieve water quality standards, whichever is more stringent. Land disposal systems also receive permits with limits established to protect groundwater.

WPDES permits contain all the monitoring requirements, special reports, and compliance schedules appropriate to the facility in question. Permits are issued for five-year periods as either individual or general permits. Individual WPDES permits are issued to municipal and industrial facilities discharging to surface water and/or groundwater. Approximately 350 industrial facilities and approximately 650 municipalities hold individual WPDES permits.

General WPDES permits are issued for specific categories of industrial, municipal and other wastewater discharges. DNR may issue WPDES general permits applicable to categories or classes of point source discharges. When a general permit is issued, many facilities meeting its requirements may be covered under the same general permit. Several WPDES general permit categories have the potential to influence nutrient loads, including: land application of by-product solids, industrial sludge, and industrial waste; pit/trench dewatering; Sanitary Sewer Overflows (SSO) from Sewage Collection Systems, and more (see http://dnr.wi.gov/topic/wastewater/Permits.html).

WPDES permit information is available at: http://dnr.wi.gov/topic/wastewater/PermitLists.html. Locations of permit discharges may be found on the DNR surface water data viewer at: http://dnr.wi.gov/topic/surfacewater/swdv/

3.2.1 Permits for Municipal and industrial wastewater treatment facilities

Phosphorus

Wisconsin, through the provisions of Chapter NR 217, Wis. Adm. Code (hereafter in this chapter referred to as ch. NR 217) has technology-based phosphorus limits that have been in effect since the early 1980s for the Great Lakes basin and statewide since 1993. Wisconsin enacted additional administrative rules for phosphorus water quality standards criteria and resulting water quality based effluent limits in 2010.

Subchapter 2 of NR 217, Wis. Adm. Code, regulates technology based limits enacted in 1992. Wisconsin's publically owned treatment works and privately owned domestic sewage works that discharge more than 150 pounds of total phosphorus per month have been limited to a 1 mg/L effluent concentration or an alternative limit as a monthly average for more than two decades. An effluent limitation equal to 1 mg/L total phosphorus or an alternative limit as a monthly average also applies in certain cases. These cases are where the discharge of wastewater from all outfalls of a facility other than those subject to ch. NR 210, Wis. Adm. Code (generally non-municipal), contains a cumulative total of more than 60 pounds of total phosphorus per month. The 1 mg/L discharge limit is a Technology Based Effluent Limit (TBEL). The intent of technology-based effluent limits is to require a minimum level of treatment of pollutants for point source discharges based on available treatment technologies, while allowing the discharger to use any available control technique to meet the limits. Since 1993 there has been about a 67% reduction in phosphorus discharged from wastewater facilities in the Mississippi River basin as a result of complying with the technology based requirements and a 54% reduction in the Great Lakes Basin.

Some WPDES permits now include a water quality based effluent limit (WQBEL), based on the quality of the receiving water, rather than available treatment technologies. These provisions became effective in 2010 and have been approved by EPA as part of the delegation agreement. In order to ensure the protection of water quality and the designated uses of the receiving water, WQBELs may be more stringent than technology-based effluent limits. As specified in ch. NR 217, Wis. Adm. Code, a WQBEL may be used in WPDES permits if the following conditions are met:

- When the discharge from a point source contains phosphorus at concentrations or loadings that will cause, has the reasonable potential to cause, or contribute to an exceedance of the

criteria in s. NR 102.06, Wis. Adm. Code, in either the receiving water or downstream waters; and
- The technology based effluent limitation is less stringent than necessary to achieve the applicable water quality standard for phosphorus in s. NR 102.06, Wis. Adm. Code.

Since the WQBELs enacted in the 2010 revisions to ch. NR 217, Wis. Adm. Code, are potentially much more stringent than TBEL that have been in effect since 1993, there is some flexibility in how the WQBEL is achieved. WPDES permittees may be eligible for two approaches that blend point source and nonpoint source phosphorus control for overall water quality benefits. These approaches (water quality trading and the watershed adaptive management option, discussed in greater detail in chapter 5 of this strategy) allow WPDES permittees to meet their obligations by working with other WPDES permittees or nonpoint sources to reduce phosphorus in waterways.

Nitrogen

Historically, since phosphorus is the key nutrient of concern causing eutrophication in freshwater systems in the Midwest, the requirements for monitoring and controlling nitrogen in surface water discharges has been limited mainly to ammonia due to its toxicity to fish and aquatic life. Monitoring and discharge limits for ammonia have been included in WPDES permits since the 1980s. Generally total nitrogen discharge limits have not been included in WPDES permits.

Since 2008, DNR has required a single analysis of nitrate/nitrite and total Kjeldahl nitrogen for all facilities with their permit applications. Recently, Wisconsin implemented additional monitoring and reporting actions for WPDES permittees in the Mississippi River Basin consistent with the Gulf Hypoxia Task Force Action Plan. The following actions are currently taking place or being phased in as permits are renewed:

- Include total nitrogen (ammonia nitrogen, organic nitrogen, and nitrate/nitrite) quarterly monitoring for major municipalities (greater than 1 MGD) discharging to the Mississippi River Basin.
- Require quarterly total nitrogen permit monitoring for facilities whose permit application shows levels of total nitrogen greater than 40 mg/L.
- Include total nitrogen monitoring in reissued permits for larger cheese plants.
- Monitor meat processors for total nitrogen.
- Continue to require a single analysis of total nitrogen for all facilities with the permit application.
- Since data from paper mills indicate low levels of total nitrogen discharged, no additional permit related monitoring of these discharges is warranted.
- Evaluate future data to determine whether a seasonal variability exists.
- Ensure that the DNR wastewater database tracks which facilities have biological phosphorus removal to enable a future evaluation on the relationship between biological phosphorus and total nitrogen removal.

Wisconsin regulates total nitrogen in groundwater discharges consistent with the 1984 enactment of Wisconsin's groundwater law, Chapter 160, Wisconsin Statutes. For wastewater facilities that discharge treated effluent to groundwater, it is assumed that all forms of nitrogen discharged eventually convert naturally to nitrate, for which there is a health-based drinking water standard of

10 mg/L. DNR limits total nitrogen to 10 mg/L and requires data collection for facilities that discharge to groundwater.

3.2.2 CAFO permits

Phosphorus contributions and to some degree nitrogen contributions from Concentrated Animal Feeding Operations (CAFOs) are controlled by WPDES permits. A Wisconsin livestock operation with 1,000 animal units or more is a Large CAFO. Large CAFOs must have a WPDES permit to operate. These water quality protection permits ensure farms use proper planning, nutrient management, structures, and systems to protect Wisconsin waters. Wisconsin's CAFO permit requirements are in Chapter NR 243, Wis. Adm. Code. DNR may designate a smaller-scale animal feeding operation (fewer than 1,000 animal units) as a CAFO if it has pollutant discharges to navigable waters or contaminates a well.

Under ch. NR 243, Wis. Adm. Code, WPDES permitted CAFOs have the following requirements (not exhaustive):

- Operators must complete the Animal Units Calculation Worksheet so they can determine if they are a CAFO and need to apply for the WPDES permit.
- Operators must complete the WPDES preliminary and final permit applications. If an operation plans to become a CAFO it must submit a preliminary permit application 12 months prior to reaching CAFO size and a final detailed application six months prior to reaching CAFO size.
- WPDES permitted CAFOs must construct manure and process wastewater storage and handling systems in accordance with accepted design standards. There is a zero discharge standard for feedlot and feed storage runoff.
- CAFOs must properly dispose of animal carcasses and develop an emergency response plan for addressing catastrophic spills.
- Farms must develop and implement a nutrient management plan for when, where and how much manure and process wastewater they will apply on cropped fields.
- Manure spread on land must be set back from drinking water wells, sinkholes and fractured bedrock. Additional restrictions apply to manure and process wastewater spread on shallow soils over fractured bedrock.
- Operators may not spread liquid manure on frozen or snow–covered ground unless it's injected or immediately incorporated into soil or there is an emergency outside the operation's control.
- Operators may not spread solid manure on frozen or snow-covered ground during February and March unless immediately incorporated. Farmers can stack solid manure in fields or store it in a designed structure during February and March.
- Six months of liquid manure storage is required with some exceptions.
- There are also inspection, monitoring and reporting requirements, which are included in the Wisconsin CAFO Compliance Calendar.

In addition to the WPDES permit requirements of ch. NR 243, Wis. Adm. Code, CAFOs must also meet Wisconsin's agricultural performance standards and prohibitions, as detailed in ch. NR 151, Wis. Adm. Code. These standards and prohibitions must be met by all agricultural operations, not just permitted operations. More discussion of these performance standards and prohibitions can be found in Chapter 4 of this strategy.

3.2.3 Municipal Storm Water Discharge Permits

Approximately 220 municipalities in Wisconsin are currently required to have a Municipal Separate Storm Sewer System (MS4) permit. A MS4 permit is required for a municipality that meets one of the following criteria:

- It is located within a federally-designated Urbanized Area,
- Its population equals 10,000 or more based on the latest decennial census; or
- DNR designates the municipality for permit coverage in accordance with s. NR 216.025, Wis. Adm. Code. The MS4 permits are effective for a period of up to five years, at which point the permits are updated and re-issued.

The MS4 permits require municipalities to reduce polluted storm water runoff by implementing storm water management programs with best management practices. The MS4 permits do not contain numerical effluent limits like other WPDES permits. Municipal storm water management programs cover a wide array of activities that occur within a municipality. The permits contain the following required elements:

- Public Education and Outreach: The MS4 permit specifies that public education and outreach programs be developed to encourage the public and businesses to modify their behaviors and procedures to reduce storm water pollution.
- Public Involvement and Participation: In addition to public education and outreach, the MS4 permit requires municipalities to encourage participation from individuals to prevent storm water pollution. Some examples of public involvement are volunteer stream monitoring, storm drain stenciling, presenting information to established community groups, or planting a community rain garden.
- Illicit Discharge Detection and Elimination: Storm sewers that carry rain water runoff are not intended for other fluids and waste material. These pollutants are illicit discharges and may have the potential to harm people, animals and aquatic life in the downstream rivers, lakes and wetlands. Municipalities are required to develop programs to identify, prevent, and eliminate illicit discharges to their storm sewer systems. The DNR has developed additional illicit discharge detection and elimination guidance to assist municipalities with this requirement.
- Construction Site Pollutant Control: Municipalities are required to develop a soil erosion control ordinance and enforce it on construction sites. Municipalities may use state-recommended technical standards for methods and products used to control erosion and prevent sediment-laden water from discharging into a lake, stream or wetland.
- Post-Construction Storm water Management: Municipalities are required to develop a post-construction ordinance and enforce it to ensure that areas of new and redevelopment will include structural measures to control pollutants, control peak flow, maintain infiltration, and establish vegetated protective areas adjacent to waterways and wetlands. Municipalities may use state-recommended technical standards for post-construction storm water management practices.

- Pollution Prevention Practices for the Municipality: MS4 storm water programs are to include practices to prevent pollutants from municipally-owned transportation infrastructure, maintenance areas, storage yards, sand and salt storage areas, and waste transfer stations entering the storm sewer system.
- Developed Urbanized Area Standard: Municipalities are required to control the Total Suspended Solids (TSS) carried in storm water from existing urban areas as compared to no controls. Many municipalities have already achieved the state standard of 20% TSS. Compliance with the standard is achieved by implementing a system of practices and activities, which has been verified by a storm water computer model.
- Storm Sewer System Maps: Municipalities covered by a MS4 permit area are required to maintain a map of the storm sewer system. These maps identify storm sewer conveyances such as pipes and ditches, and also identify roads, streams and lakes.
- Impaired Waters: Many streams and lakes in Wisconsin are polluted or impaired to a point that animal and plant communities in the receiving waters are significantly impacted. If the storm sewer system discharges a pollutant of concern to an impaired water, a municipality covered by a MS4 permit is required to develop a plan to reduce those pollutants.

3.3 Future Directions

Wisconsin partners will continue to work with regulated entities to manage nutrients through traditional permits and innovative approaches such as pollutant trading and the Watershed Adaptive Management Option discussed in Chapter 5 of this strategy.

Chapter 4. Agricultural Nonpoint Nutrients

Element 4. Agricultural Areas

4.1 EPA and Gulf Hypoxia Task Force Expectations

Quoted from EPA's recommended elements:
"In partnership with Federal and State Agricultural partners, NGOs, private sector partners, landowners, and other stakeholders, develop watershed-scale plans that target the most effective practices where they are needed most. Look for opportunities to include innovative approaches, such as targeted stewardship incentives, certainty agreements, and N & P markets, to accelerate adoption of agricultural conservation practices. Also, incorporate lessons learned from other successful agricultural initiatives in other parts of the country."

4.2 Wisconsin's Approach

For more than 30 years, an array of governmental and nongovernmental partners in Wisconsin have cooperated to implement a suite of federal, state, and local agricultural nonpoint source programs to control nutrients, sediments, and other pollutants. Collectively, these programs operate statewide using a blend of education, technical assistance, financial assistance, and compliance. Coordination occurs through a number of committees, forums, and both formal and informal working arrangements. Wisconsin's long history in this area includes many innovations, including the former Priority Watershed Program, rules specifying agricultural performance standards and prohibitions, and new approaches currently underway (described in Chapter 5 of this strategy) for reducing phosphorus through pollutant trading and the watershed adaptive management option. An expanded discussion of Wisconsin's approach including partners, statutory and administrative authority, planning framework, and implementation programs can be found in Wisconsin's Nonpoint Source Program Management Plan (http://dnr.wi.gov/topic/nonpoint/aboutnpsprogram.html). This chapter outlines some of Wisconsin's approach for agricultural areas by describing the agricultural performance standards and prohibitions and highlighting several agency programs and coordination forums.

4.2.1 Agricultural Performance Standards and Prohibitions

Wisconsin's agricultural performance standards and prohibitions identify requirements to control runoff from agricultural fields, pastures, and livestock facilities. All farmers in Wisconsin must comply with the requirements if cost-sharing is made available. As noted in Chapter 3, CAFOs must also follow additional requirements outlined in WPDES permits. Farmers must demonstrate compliance to participate in some state and local programs (such as the Wisconsin's Farmland Preservation Tax Credit) or to obtain local and state permits (e.g., for livestock siting and manure storage facilities). A variety of educational, technical assistance, and financial assistance programs are available to help farmers comply with the standards and prohibitions. Several are described in more detail later in this chapter. A partial list includes:

- Targeted Runoff Management Grants – DNR

- Urban Runoff Management Grants – DNR
- Notice of Discharge Grants – DNR
- Managed Forest Program – DNR
- Clean Water Fund loans and grants – DNR
- Soil and Water Management Grants – DATCP
- Clean Sweep
- Farmer Nutrient Management Plan training – UWEX
- Environmental Quality Incentives Program (EQIP) – NRCS
- Conservation Stewardship Program (CSP) – NRCS
- County grants and technical assistance

Table 4.1 Selected Federal and State Funding Programs

Program	Agency	2013 Funding ($ million)
Environmental Quality Incentives Program	NRCS – USDA	29.0
Conservation Stewardship Program (2012)	NRCS -- USDA	3.1
Funding to Counties -- staffing	DATCP	8.6
Funding to Counties – cost sharing	DATCP	5.8
Targeted Runoff Management	DNR	4.8
Total for listed programs		51.83

Additional resources, including federal programs, are identified in the Wisconsin's Nonpoint Source Program Management Plan (http://dnr.wi.gov/topic/nonpoint/aboutnpsprogram.html).

A brief description of the agricultural performance standards and manure management prohibitions from ch. NR 151, Wis. Adm. Code, is included here. The tillage setback and PI performance measure noted below became effective in 2011. The full rule can be found at: http://legis.wisconsin.gov/rsb/code/nr/nr151.pdf.

Wisconsin's Agricultural Performance Standards and Prohibitions:

- Tillage setback: A setback of 5 feet from the top of a channel of a waterbody for the purpose of maintaining stream bank integrity and avoiding soil deposits into state waters. Tillage setbacks greater than 5 feet but no more than 20 feet may be required if necessary to meet the standard. Harvesting of self-sustaining vegetation within the tillage setback is allowed.
- Phosphorus Index (PI): A limit on the amount of phosphorus that may run off croplands as measured by a phosphorus index with a maximum of 6, averaged over an eight-year accounting period, and a PI cap of 12 for any individual year.
- Process wastewater handling: a prohibition against significant discharge of process wastewater from milk houses, feedlots, and other similar sources.
- Meeting TMDLs: A standard that requires crop and livestock producers to reduce discharges if necessary to meet a load allocation specified in an approved Total Maximum Daily Load (TMDL). Producers must implement targeted performance standards specified for the TMDL area using best management practices specified in ch. ATCP 50, Wis. Adm. Code. If a more stringent or additional performance standard is necessary, it must be promulgated by rule before compliance is required.

- Sheet, rill and wind erosion: All cropped fields shall meet the tolerable (T) soil erosion rate established for that soil. This provision also applies to pasture lands.
- Manure storage facilities: All new, substantially altered, or abandoned manure storage facilities shall be constructed, maintained or abandoned in accordance with accepted standards, which includes a new margin of safety. Failing and leaking existing facilities which pose an imminent threat to public health or fish and aquatic life or violate groundwater standards shall be upgraded or replaced.
- Clean water diversions: Runoff from agricultural buildings and fields shall be diverted away from contacting feedlots, manure storage areas and barnyards located within water quality management areas (300 feet from a stream or 1,000 feet from a lake or areas susceptible to groundwater contamination).
- Nutrient management: Agricultural operations applying nutrients to agricultural fields shall do so according to a nutrient management plan. This standard does not apply to applications of industrial waste, municipal sludge or septage regulated under other DNR programs provided the material is not commingled with manure prior to application.
- Manure management prohibitions include: no overflow of manure storage facilities, no unconfined manure piles in a water quality management area, no direct runoff from feedlots or stored manure into state waters, no unlimited livestock access to waters of the state in locations where high concentrations of animals prevent the maintenance of adequate or self-sustaining sod cover.

4.2.2 Best Management Practices for Nonpoint Source Pollution Control

Wisconsin has identified best management practices (BMPs) that may be used to address agricultural, urban, and other categories or sources of NPS pollution and to meet the statewide performance standards and prohibitions. BMPs are enumerated in chs. NR 154 and ATCP 50, Wis. Adm. Code. See Table 4.2. Other practices may be approved when determined necessary to meet water quality objectives.

Table 4.2 Best Management Practices Outlined in ch. NR 154 and ch. ATCP 50, Wis. Adm. Code.

Legal Authority		BMP	Primary Pollutant(s) Addressed
NR 154.04	ATCP 50.62	Manure storage systems	Nutrients
NR 154.04	ATCP 50.63	Manure storage systems closure	Nutrients
NR 154.04	ATCP 50.64	Barnyard runoff control systems	Nutrients
NR 154.04	ATCP 50.65	Access roads and cattle crossings	Sediment, Nutrients
NR 154.04	ATCP 50.66	Animal trails and walkways	Sediment, Nutrients
NR 154.04	ATCP 50.67	Contour farming	Sediment, Nutrients
NR 154.04	ATCP 50.68	Cover and green manure crop	Sediment, Nutrients
NR 154.04	ATCP 50.69	Critical area stabilization	Sediment, Nutrients
NR 154.04	ATCP 50.70	Diversions	Sediment, Nutrients
NR 154.04	ATCP 50.71	Field windbreaks	Sediment, Nutrients
NR 154.04	ATCP 50.72	Filter strips	Sediment, Nutrients
NR 154.04	ATCP 50.73	Grade stabilization	Sediment, Nutrients
NR 154.04	ATCP 50.74	Heavy use area protection	Sediment, Nutrients
NR 154.04	N/A	Lake sediment treatment	Sediment, Nutrients
NR 154.04	ATCP 50.75	Livestock fencing	Sediment, Nutrients
NR 154.04	ATCP 50.76	Livestock watering systems	Sediment, Nutrients
NR 154.04	ATCP 50.77	Milking center waste control systems	Nutrients
NR 154.04	ATCP 50.78	Nutrient management	Sediment, Nutrients
NR 154.04	ATCP 50.79	Pesticide management	Pesticides

Legal Authority		BMP	Primary Pollutant(s) Addressed
NR 154.04	ATCP 50.80	Prescribed grazing	Sediment, Nutrients
NR 154.04	ATCP 50.81	Relocating or abandoning animal feeding operations	Sediment, Nutrients
NR 154.04	ATCP 50.82	Reside management	Sediment, Nutrients
NR 154.04	ATCP 50.83	Riparian buffers	Sediment, Nutrients
NR 154.04	ATCP 50.84	Roofs for animal lot and manure storage structures	Nutrients
NR 154.04	ATCP 50.85	Roof runoff systems	Nutrients
NR 154.04	ATCP 50.86	Sediment basins	Sediment, Nutrients
NR 154.04	N/A	Shoreline habitat restoration for developed areas	Sediment, Nutrients
NR 154.04	ATCP 50.87	Sinkhole treatment	Nutrients
NR 154.04	ATCP 50.88	Streambank and shoreline protection	Sediment, Nutrients
NR 154.04	ATCP 50.89	Strip-cropping	Sediment, Nutrients
NR 154.04	ATCP 50.90	Subsurface drains	Sediment, Nutrients
NR 154.04	ATCP 50.91	Terrace systems	Sediment, Nutrients
NR 154.04	ATCP 50.92	Underground outlets	Sediment, Nutrients
NR 154.04	ATCP 50.93	Waste transfer systems	Nutrients
NR 154.04	ATCP 50.94	Wastewater treatment strips	Nutrients
NR 154.04	ATCP 50.95	Water and sediment control basins	Sediment, Nutrients
NR 154.04	ATCP 50.96	Waterway systems	Sediment, Nutrients
NR 154.04	ATCP 50.97	Well decommissioning	Nutrients
NR 154.04	ATCP 50.98	Wetland development	Sediment, Nutrients
NR 154.04	N/A	Urban best management practices	Sediment, Nutrients

Refer here for complete details about chapters NR154 and ATCP50:
(http://legis.wisconsin.gov/rsb/code/nr/nr154.pdf
http://legis.wisconsin.gov/rsb/code/atcp/atcp050.pdf)

4.2.3 Programs intended to control agricultural nitrogen and phosphorus

As noted, Wisconsin's approach to reducing agricultural nonpoint source pollution includes many programs conducted by federal, state, and local governments, generally in cooperation with nongovernmental organizations. Many of the programs include connections to Wisconsin's agricultural performance standards and prohibitions. Several key programs are described below. Additional programs and details are described in Chapter 4 of Wisconsin's Nonpoint Source Program Management Plan (http://dnr.wi.gov/topic/nonpoint/aboutnpsprogram.html).

<u>EPA Section 319 Grants (and TMDL implementation)</u>
Federal funds provided to Wisconsin through EPA's Section 319 program address agricultural watersheds through direct projects and through multiple programs. These include:

- DNR Targeted Runoff Management (TRM) grants. This program supports implementation of nutrient reduction practices in large and small watersheds of both TMDL and non-TMDL classification.
- DNR Lake Management grants. Qualified units of government are eligible for funding to collect and analyze information needed to protect and restore lakes and their watersheds, including nutrient reduction actions.
- Funds also support DNR and DATCP technical and administrative capacity to implement nonpoint source programs.

USDA-NRCS Environmental Quality Incentives Program (EQIP)
EQIP has been the core of NRCS's agricultural conservation practice incentives program since 1997. EQIP is predominantly a source of non-targeted funding that pays cost-sharing for numerous structural and non-structural nutrient and sediment reduction practices on cropland, farmsteads and stream-side sites.

Common practices funded for Wisconsin producers include grassed waterways, cover crops, nutrient management planning, contour farming and strip-cropping, stream bank management practices and manure storage structures. There are several dozen total practices. The EQIP program is a combination of technical and financial assistance in one program and is implemented by NRCS with support from county land conservation departments. For more information, see: http://www.wi.nrcs.usda.gov/programs/eqip.html).

NRCS Conservation Stewardship Program (CSP)
CSP was created by the 2002 Farm Bill as an alternative strategy to incentivize installation of conservation practices. For EQIP a resource concern (problem) must exist to be eligible for financial assistance. Under CSP a producer fills out a Conservation Management Tool to describe the nature of their farming operation. The tool rates the relative level of conservation protection existing on the farm and establishes an annual base level payment. Farmers accepted into the program are required to maintain their existing level of conservation protection over the 5-year contract period and must implement additional conservation activities as agreed. The annual payment is based on the initial level of conservation performance and the level of protection offered by the additional conservation activities. For more information see: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046181.pdf)

NRCS – Great Lakes Restoration Initiative (GLRI) projects
Wisconsin NRCS participates in the GLRI, a multi-federal-agency effort to restore priority watersheds in the Great Lakes basin (Figure 4.1). Technical assistance is currently available to producers located in the Lower Fox, Manitowoc-Sheboygan, and Milwaukee watersheds to assist with conservation planning needs. Financial assistance through EQIP/GLRI is anticipated to be available in 2013 for implementation of select conservation practices. (for more information: http://www.wi.nrcs.usda.gov/programs/eqip/GLRI/glri.html)

NRCS – Mississippi River Basin Healthy Watersheds Initiative (MRBI) projects
To improve the health of the Mississippi River Basin, NRCS has established the Mississippi River Basin Healthy Watersheds Initiative (MRBI). Through this Initiative, NRCS and its partners help producers in selected watersheds in the Mississippi River Basin voluntarily implement conservation practices that avoid, control, and trap nutrient runoff; improve wildlife habitat; and maintain agricultural productivity.

Wisconsin NRCS currently has a MRBI-EQIP project in place in the Six-mile Creek watershed in Dane County (see http://www.wi.nrcs.usda.gov/programs/mrbi.html). This targeted technical and financial assistance program supports the Watershed Adaptive Management option process being led by numerous partners, including producers, Dane County Department of Land and Water Resources and Madison Metropolitan Sewerage District and its customers.

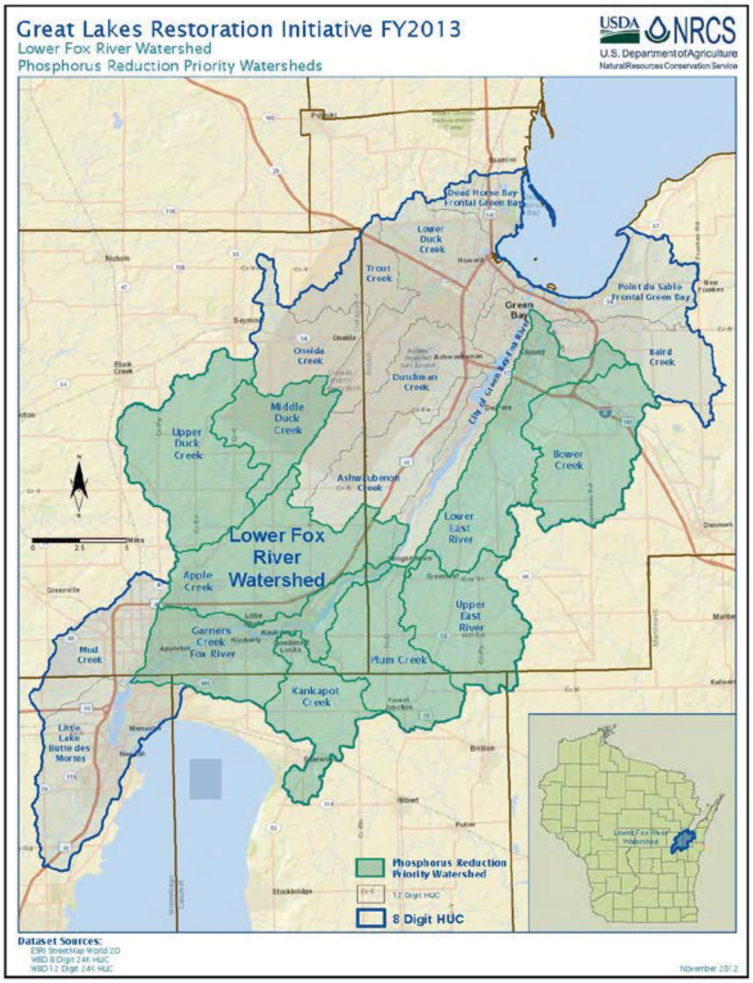

Figure 4.1 Map of NRCS-GLRI Project for the Lower Fox River Watershed

NRCS National Water Quality Initiative

This relatively new initiative by NRCS provided funding for nutrient and sediment reduction practices in watersheds selected with input from several state and local partners. These HUC 12 watersheds were selected in part because they contained water bodies included on Wisconsin's Impaired Waters list. NRCS field offices work in partnership with county land conservation departments to provide technical assistance to landowners. Funding is provided through EQIP.

Funding for FY 2012 was allocated in these locations (HUC 12 Watersheds):

- Lower Waumandee Creek – Buffalo County
- Ward Creek-Little Sugar River - Dane and Green Counties (additional funding provided by DNR through Gulf Hypoxia Project funding)
- Big Green Lake - Green Lake County

FY 2013 funding will continue in the Big Green Lake project and two additional watersheds.
http://www.wi.nrcs.usda.gov/programs/eqip/nwqi.html

USDA Farm Service Agency – Conservation Reserve Program (CRP)
Like many states, the CRP program in Wisconsin has played a significant role in trying to improve water quality by getting permanent cover on thousands of acres of highly erodible land. These grasslands reduce sediment and nutrient delivery to streams. In Wisconsin, this is especially true in the un-glaciated Driftless region within the Mississippi River Basin.

The program, administered by FSA, pays landowners annual rent in exchange for taking cropland out of production. NRCS, supported by county land conservation departments, provides technical assistance. Increasing market prices for commodities such as corn and soybeans—and the pressure that places on land rents—has created strong incentive for landowners to place these lands back into production once contracts expire. This trend may impact nutrient loading and related water quality conditions.

FSA also administers the Conservation Reserve Enhancement Program (CREP), through a federal-state-local partnership with NRCS, DATCP, DNR and participating county land conservation departments throughout much of the state. CREP provides an opportunity for Wisconsin landowners to voluntarily enroll agricultural lands into conservation practices, such as riparian buffers, filter strips, wetland restorations, waterways and establishment of native grasslands in the grassland project area. Wisconsin landowners have enrolled 44,000 acres of these practices in CREP with benefits for reduction of phosphorus, nitrogen, and sediment. (http://datcp.wi.gov/Environment/Land_and_Water_Conservation/CREP/)

DATCP Farmland Preservation/Working Lands cross compliance requirements
The Wisconsin Working Lands Initiative, administered by DATCP, includes the Farmland Preservation Program, Agricultural Enterprise Area Program, and Purchase of Agricultural Conservation Easement Program. The Initiative seeks to preserve areas that are significant for current and future agricultural uses and requires cross-compliance with the ch. NR 151, Wis. Adm. Code, agricultural performance standards and prohibitions discussed above. For more information, visit (http://datcp.wi.gov/Environment/Working_Lands_Initiative/).

County Land and Water Resource Management Plan Implementation
The Land and Water Resource Management (LWRM) Planning Program, administered by DATCP, is an important vehicle for targeting and implementing conservation practices. The program requires that counties develop LWRM plans to conserve soil, water and other natural resources. The plans advance land and water conservation and attempt to reduce NPS pollution by:

- Inventorying water quality and soil erosion conditions in the county.
- Setting water quality goals, in consultation with the DNR.
- Identifying priority farm areas using a range of criteria (e.g., impaired waters, manure management, high nutrient applications).
- Identifying key water quality and soil erosion problems, and practices to address those problems.
- Identifying strategies to promote voluntary compliance with statewide performance standards and prohibitions, including information, cost-sharing, and technical assistance.
- Identifying enforcement procedures, including notice and appeal procedures.
- Including a multi-year work plan to achieve soil and water conservation objectives.
- Identifying relevant state and local regulations, and any inconsistencies between them.

County Land Conservation Department (LCD) staff are key stakeholders in the development and implementation of comprehensive watershed management plans that address water quality impairments. The knowledge, skills, and connections to local landowners and producers that local LCDs provide are a key component in the development of any comprehensive watershed plan, as well as implementation of practices and programs designed to improve water quality.

DNR Targeted Runoff Management (TRM) Grant and Notice of Discharge (NOD) grant-funded projects
TRM grants may be used to cost share the installation of best management practices and support a variety of local administrative and planning functions. Projects are selected through a competitive scoring system and generally take two to three years to complete. The TRM grant program has evolved into a three-tiered structure to provide flexibility in addressing a range of scales, from single sites to small sub-watersheds. (For more information, see Chapter 4.7a of Wisconsin's Nonpoint Source Program Management Plan at http://dnr.wi.gov/topic/nonpoint/documents/npsprogrammgmtplan6282011.pdf).

DNR Safe Drinking Water Protection Pilot Projects
DNR Bureau of Drinking Water and Groundwater is conducting pilot projects to target sub-watersheds with high levels of nitrate identified in public drinking water systems (greater than 5 mg/L) and potential agricultural contributions. The pilot projects seek to assess and control potential agricultural contributions through a mix of incentives.

Information and Education
Information and education programs and activities are conducted through the network of agencies and organizations involved in nutrient reduction. Efforts include statewide programs organized by state and federal agencies and nongovernmental partners (see coordination forums below), as well as local field days, farm visits, skills training, informational workshops, and development and delivery of educational materials. For more information, see section 4.6 of Wisconsin's Nonpoint Source Program Management Plan.

Wisconsin's Farmer-led Initiative
Wisconsin is exploring new approaches to engage farmers in solving water quality restoration and protection challenges related to agricultural nonpoint sources. Based on successful models in Iowa and Minnesota, conservation partners in Wisconsin are providing coordination and technical support for farmer-led watershed councils in tributary watersheds to the St Croix River basin and the Red Cedar River basin. Each farmer-led watershed councils establishes performance measures to address production and water quality issues.

UW Discovery Farms and UW Pioneer Farm
UW Discovery Farms focus on economic and environmental effects of agricultural practices through on-farm research and outreach and training programs. In cooperation with working farms, UW Discovery Farms considers a comprehensive, whole-farm approach to understanding interactions between agricultural practices, farm profitability, farm management, and water quality. (http://uwdiscoveryfarms.org). UW Pioneer Farm, part of UW-Platteville's School of Agriculture, conducts systems and applied research on management practices in a working farm setting and provides training and outreach for students, agencies, producers, and the public. (http://www.uwplatt.edu/pioneerfarm/)

University of Wisconsin System

Beyond the UW Discovery Farms and UW Pioneer Farm programs described above, many research partnerships coordinated through the University of Wisconsin System also address agricultural nutrients and water quality. In many cases, research is coordinated with agencies, local governments, agricultural associations, and other stakeholders, and encompasses research on private working farms and university research facilities. Several examples include ongoing projects led by various faculty members at UW institutions including UW-Madison through the College of Agricultural and Life Sciences (CALS), College of Engineering, and the network of UW Agricultural Research Stations. Numerous UW Extension centers and teams also address issues of agricultural nutrients. UW also has two members serving on the Wisconsin Groundwater Coordinating Council. Additional information can be found through web searches on key terms.

Runoff Risk Advisory Forecast

Wisconsin DATCP and numerous partners developed this useful online tool designed to help farmers evaluate the future risk of manure runoff due to snowmelt or rainfall. The tool consists of a map indicating day-to-day risk of manure runoff, based on National Weather Service (NWS) flood forecast model that incorporates precipitation potential, soil moisture and the physical characteristics of 242 NWS basins. The tool (http://144.92.93.196/app/runoffrisk) is accessible in a variety of mobile electronic formats.

SnapPlus Nutrient Management Software

SnapPlus (Soil Nutrient Application Planner) is software to prepare nutrient management plans according to the NRCS Nutrient Management Standard 590. Developed by the University of Wisconsin, SnapPlus generates the following outputs:

- Crop nutrient requirements (N-P-K) according to soil test results and nutrient credits
- Soil loss assessment based on the Revised Universal Soil Loss Equation (RUSLE-2)
- A phosphorus index for all fields across a crop rotation
- A rotational phosphorus balance for using soil test P as the criteria for phosphorus management

SnapPlus is used heavily by private crop consultants, farmers and other nutrient management planners and is regularly updated to incorporate new tools and information. For more information visit snapplus.wisc.edu.

4.2.4 Forums for coordination and engagement

A number of forums exist for coordination and engagement among agencies, NGOs, and agricultural interests that address nutrient management and reduction. These include:

- NRCS State Technical Committee – provides advice to NRCS on a variety of program and policy issues relevant for Wisconsin conservation. (http://www.wi.nrcs.usda.gov/about/stc.html)
- Wisconsin Land and Water Conservation Board – reviews and makes recommendations on county land and water conservation plans, makes recommendations for funding allocations, and provides a forum for land and water conservation issues. (http://datcp.wi.gov/Environment/Land_and_Water_Conservation/Land_and_Water_Conservation_Board/index.aspx)
- Biosolids Symposium -annually addressing applications on agricultural lands
- Governmental Affairs Seminar for point sources
- Standards Oversight Council (SOC) – a multi-agency council that oversees the development and maintenance of conservation technical standards for Wisconsin (http://socwisconsin.org)
- Wisconsin Crop Management Conference (WCMC) – a 3-day annual event drawing 1,500 attendees focused on the agronomic inputs industry. (http://www.soils.wisc.edu/extension/wcmc/)
- UW-Extension Soil, Water, and Nutrient Management Meetings (SWNM) – annual meetings held across the state drawing 600 attendees annually
- Many watershed-level forums and initiatives – for example, annual conference and coordination events focused on specific river basins and watersheds.
- Many ad hoc statewide workgroups such as a recent effort to improve the effectiveness of agricultural nutrient management convened by WLWCA, DATCP, and others.

4.3 Future Directions

Wisconsin is moving forward on many initiatives related to understanding and managing nutrients from agricultural areas and their impacts on surface water and groundwater. Those issues continue to be a focus for the broad set of partners discussed in this chapter. Among them are questions of reducing nitrogen losses or increasing nitrogen use efficiency, particularly in coarse soil; understanding and increasing actual implementation of nutrient management plans; understanding the dynamics of surface to subsurface flows of nitrogen and phosphorus in tile drainage; expanding development and use of 9-element watershed plans; and gaining experience with the innovative integrated approaches described in the next chapter. Two current additional activities relevant to nutrient reduction are the NRCS 590 Nutrient Management Standard revisions and a proposed Nitrogen Science Summit, both discussed below.

NRCS 590 Nutrient Management Standard Revision

Many questions are being addressed through an ongoing process to revise the NRCS 590 Nutrient Management Standard. This process, led by NRCS and coordinated through the Wisconsin Standards Oversight Council (SOC), involves a review team to provide interdisciplinary input to revise the standard. The effort includes input from farmers, researchers, water quality and agricultural agency staff and agricultural service providers. The 590 review process will address nitrogen use efficiency and losses, along with several other significant technical issues with regard to nutrient management planning, including[16]:

- Creation of a Nitrogen Loss Risk Assessment Tool
- Developing a winter nutrient spreading risk assessment tool
- Soil test phosphorus criteria
- Soil test recommendation revisions from UW-Extension
- Add analysis for manure ammonium nitrogen content (consistent with the NRCS national 590 practice standard)
- Evaluate the potential for transport of nutrients to tile drainage
- Adaptive nutrient management - develop a process to establish a representative yield check strip when nutrients are applied above the rates established by the standard unanticipated crop production conditions
- Developing a manure land base estimate (for animal feeding operations) - to address requirements for addressing the remaining volume of manure or other nutrient source if an adequate land base is NOT available

Exploring these technical issues through the revision to NRCS 590 will address a number of nutrient management issues, particularly relating to nitrogen losses to both surface water and groundwater. The NRCS 590 revision work is expected to continue through 2014.

Nitrogen Science Summit

Wisconsin is considering initiating a separate long-term process for examining nitrogen management beginning with a Nitrogen Science Summit to identify what is known and what is unknown focusing both on surface water and groundwater needs.

While a major commitment has been made by agencies and universities in Wisconsin over more than two decades to develop tools and indices to manage phosphorus on agricultural lands, comparable tools and indices are likely needed to better manage nitrogen. The purpose of a Nitrogen Science Summit would be to create new tools to determine which practices are recommended on a given site and how effective they may be – especially considering the very complex nature of nitrogen use and mobility on agricultural lands. A Nitrogen Science Summit would draw from recent development from other states, including Iowa and Minnesota.

The Nitrogen Science Summit could include literature reviews and discussion of the following items:

- Definition of Wisconsin's surface water quality needs and groundwater quality needs related to nitrogen.
- Pathways of nitrogen to both surface waters and groundwater and the relative contribution of nitrogen in runoff verses nitrogen in groundwater reaching streams and lakes.
- Movement of nitrogen through the many diverse soils present in Wisconsin.
- Determination of relative nitrogen contribution of cropped fields, pastures, animal lots and other lands.
- Geographic variation across Wisconsin and the potential use of agro-ecoregion designations as a tool.

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[16] Standards Oversight Council 590 Nutrient Management Team Charge, November 15, 2012 (NRCS, custodian)

- Compilation of existing data and information from research projects, including Pioneer Farm and Discovery Farms, and N management/loss research currently performed by the Agricultural Research Service (ARS) and the UW Soils Department.
- Assessment of the practicality and effectiveness of N loss reduction materials such as slow release urea/urease inhibitors.
- Role of field-based targets and surrogates to guide management.
- Economic costs and benefits – both on farm and off site – related to nitrogen management.
- Role of pilot projects to test and mold implementation and education processes, as well as to measure water quality changes resulting from project implementation.
- Identify research needed to fill knowledge gaps.
- Other items identified by a Summit scoping group.

The Nitrogen Science Summit would build upon Wisconsin's long-standing practice of using partnerships and coordination forums to exchange thoughts, ideas and information. Participants would include university, state, and federal researchers; water quality experts; federal, state and local agency program managers; consulting agronomists; practicing farmers; agricultural economists; educational experts; and others identified by a Nitrogen Science Summit scoping committee.

Chapter 5. Integrating Point Source and Nonpoint Source Management

Chapters 3 and 4 describe Wisconsin's programs for controlling nutrients from point sources and nonpoint sources. However, a description of Wisconsin programs would be incomplete without a short description of activities that assess or manage nutrients in an integrated manner. This chapter describes four of these activities: Total Maximum Daily Load (TMDL) analyses; a model called PRESTO; the Watershed Adaptive Management Option; and water quality trading. All four activities address aspects of a number of elements for Wisconsin's Nutrient Reduction Strategy.

5.1 Total Maximum Daily Loads (TMDLs)

All states, including Wisconsin, are required by EPA to develop TMDL analyses for impaired waters, (those not meeting water quality standards). TMDLs, as authorized under the federal Clean Water Act, determine the pollutant load (mass) reduction needed to attain and maintain water quality standards. TMDL analyses also allocate the maximum allowable load between each point source and nonpoint sources. As a result, in watersheds where both point sources and nonpoint sources are significant contributors of nutrients, the entire load reduction is not necessarily assigned to the point sources. As shown in Figure 5.1 Wisconsin has many approved TMDLs and is developing new TMDLs.

TMDL implementation comes through the point source programs described in Chapter 3 and the suite of federal, state and local nonpoint source programs described in Chapter 4. In the near future, implementation may also come through Watershed Adaptive Management Option projects and water quality trading described below.

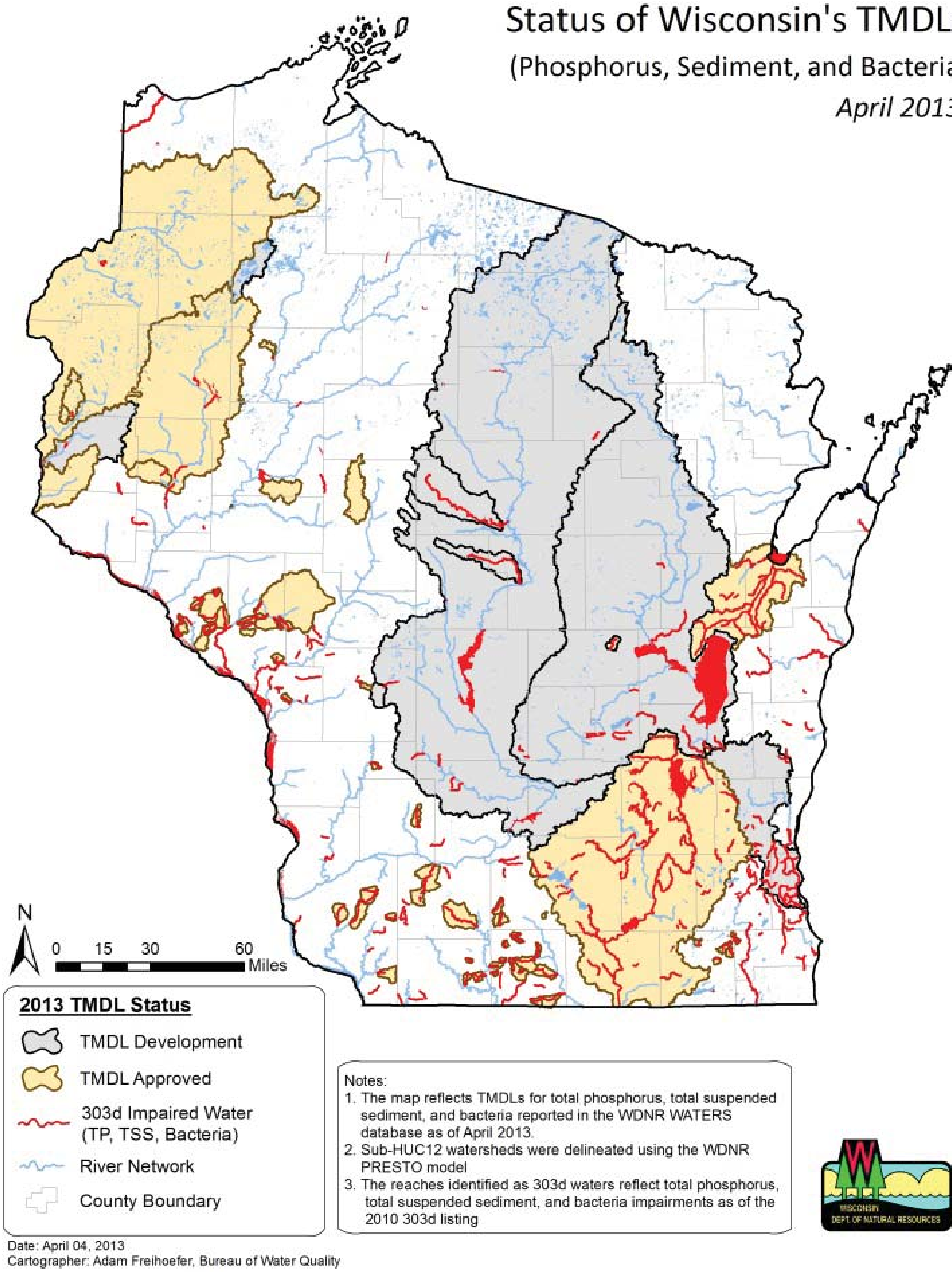

Figure 5.1 Status of Impaired Waters for Total Phosphorus.

5.2 PRESTO

The Pollutant Load Ratio Estimation Tool (PRESTO) is a screening level GIS-based tool that calculates and compares annual phosphorus loads for watersheds in Wisconsin from point sources and nonpoint sources. PRESTO was originally developed by the Wisconsin DNR to help permitted municipal and industrial facilities determine eligibility for the watershed adaptive management option to comply with the phosphorus water quality-based effluent limits in the facility's WPDES permit. Section NR 217.18, Wisconsin Adm. Code, limits the application of this option to situations where nonpoint sources, including urban storm water, contribute more than 50% of the annual phosphorus load.

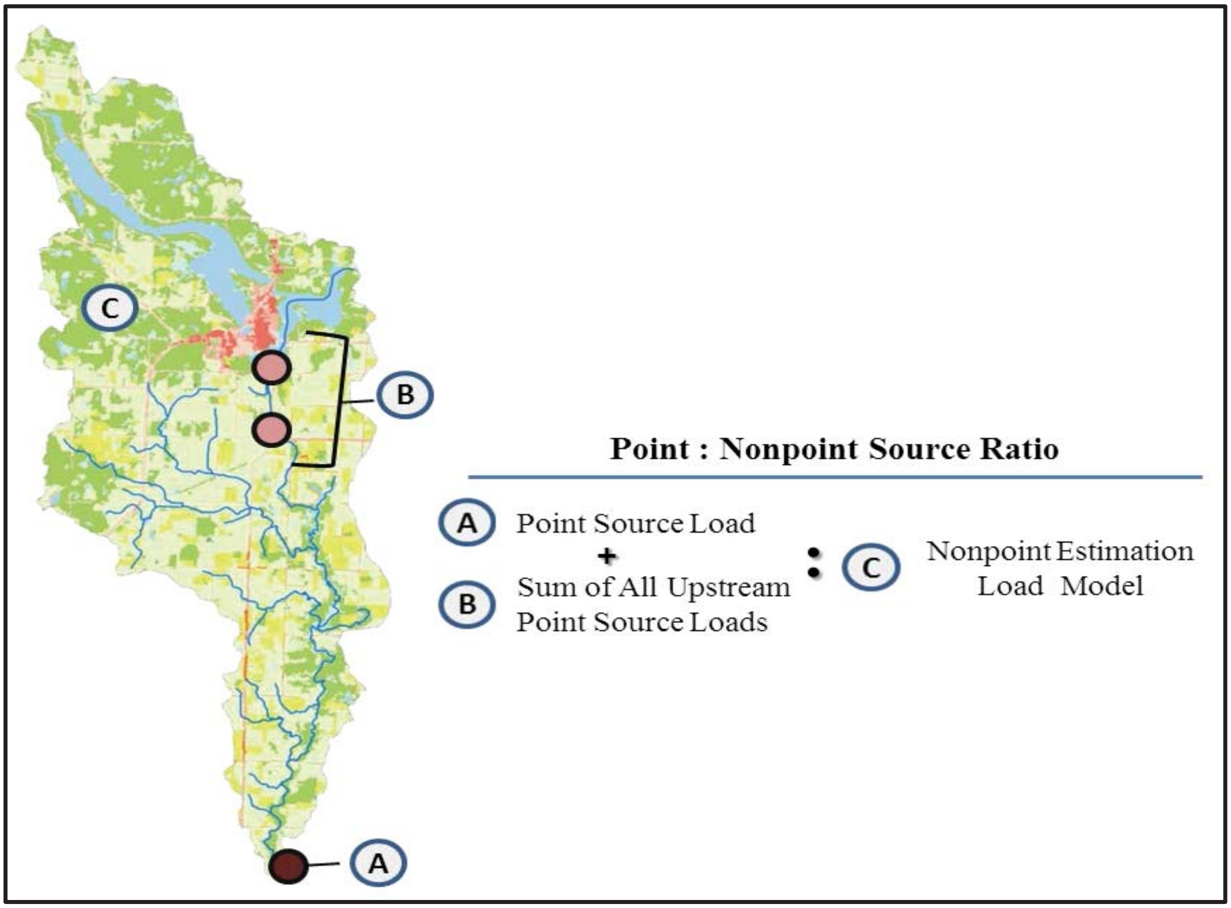

Figure 5.2 Example of PRESTO generated point to nonpoint ratio

PRESTO has been used to estimate the percent point source and percent nonpoint source contribution for the watershed upstream of 652 point source outfalls. Data from point source discharge monitoring reports is used to calculate the point source contribution while three different regression models are used to estimate the nonpoint source contribution. Results of this analysis can be found at http://dnr.wi.gov/topic/surfacewater/presto.html. PRESTO has also been used to estimate relative point source and nonpoint source contributions for HUC 10 watersheds.

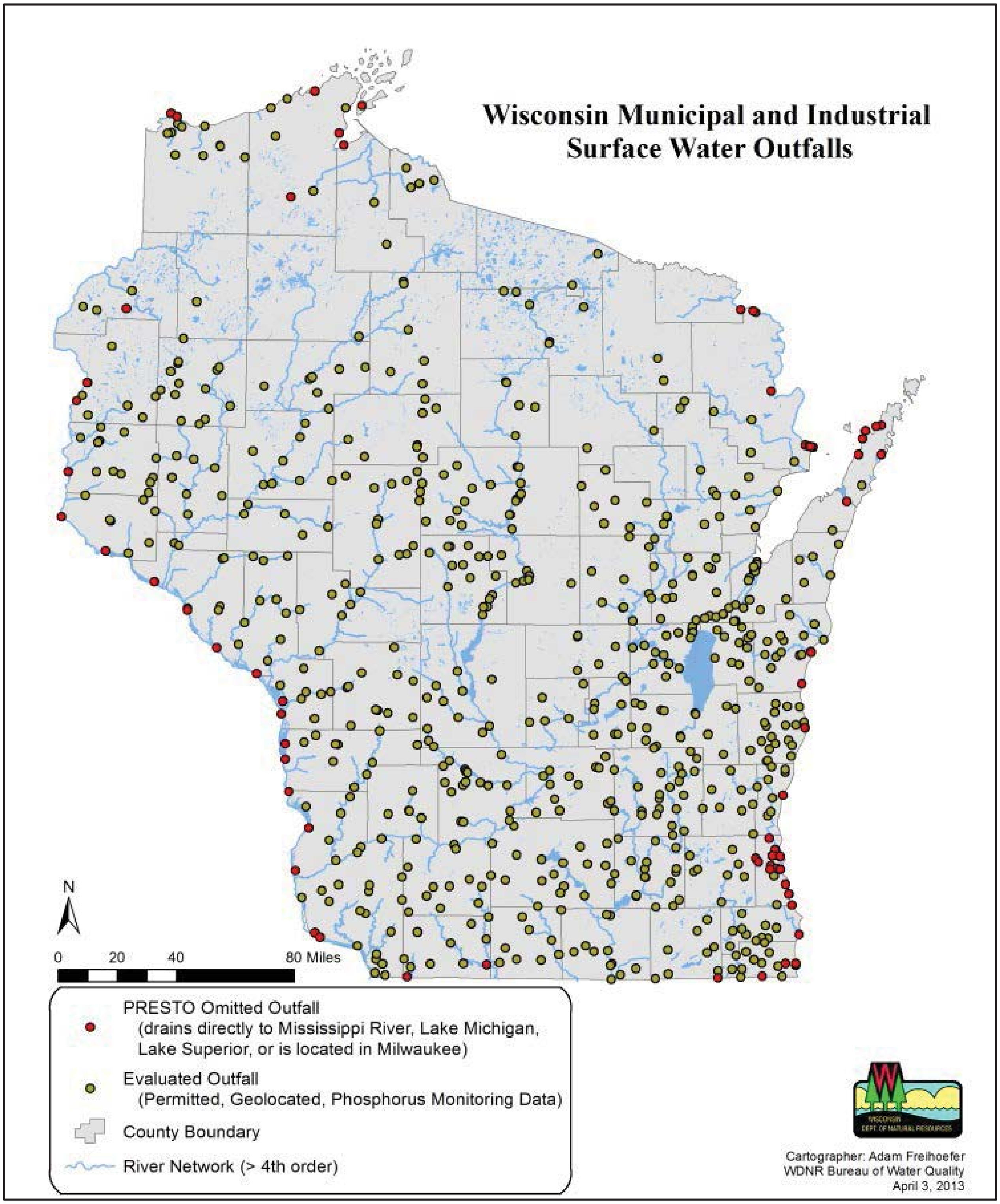

Figure 5.3 PRESTO pre-calculated source outfall points

5.3 Watershed Adaptive Management Option

The Watershed Adaptive Management Option is a compliance option for point source facilities having both stringent phosphorus effluent limits and nonpoint sources that are the dominant contributor of phosphorus to the stream, river or lake receiving the facility's effluent. It is based on the concept that control of nonpoint sources within the point source facility's upstream watershed will result in attaining and maintaining water quality standards at far less cost than installing phosphorus filtration technology at the treatment plant. It was created in s. NR 217.18, Wis. Adm. Code (effective December 2010) and was approved for use in the WPDES point source permit program by EPA in 2012. At this time, this option is only available in Wisconsin.

Under this option, point source facilities must accept interim phosphorus limits and work with watershed partners to develop and implement a watershed plan that will control phosphorus. The watershed plan when implemented should result in improved water quality in the watershed and potentially allow the effluent limit to be adjusted. The watershed plan may use a variety of implementation tools, such as education, technical assistance and financial assistance. Water quality monitoring must be a component of the plan. Facilities, along with their watershed partners, have two five-year permit terms to implement the watershed plan. Depending on the progress, the third permit may require compliance with the water quality-based effluent in the permit.

The Wisconsin Department of Natural Resources has developed a technical handbook and other guidance information to guide use of this option. These are available at http://dnr.wi.gov/topic/SurfaceWater/AdaptiveManagement.html.

5.4 Water Quality Trading

Point source facilities with stringent effluent limits may also pursue water quality trading as a compliance option. Water quality trading typically involves a permit holder facing relatively high pollutant reduction costs compensating another party to achieve less costly pollutant load reduction while providing a greater water quality benefit. In a trade, the permit holder enters into an agreement with a municipality, other point source or nonpoint source landowners within a watershed to offset a portion of the permittee's specific effluent discharge. This offset must control a greater amount of phosphorus based on model simulations than what would have to be controlled at the treatment facility to comply with the facility's effluent limit. Consistent with EPA guidance, trade ratios are used to account for uncertainties and other factors such that a greater amount of pollutant is removed. Trade thresholds and acceptable trade calculation tools are also specified in the guidance documents.

Wisconsin, as with many other states, has developed a trading framework and implementation guidance. Trading applies to a limited number of pollutants, but more detail is provided for total phosphorus and total suspended solids given the recently promulgated water quality standards criteria for phosphorus and recently approved total maximum daily loads for phosphorus and suspended sediment. For more information on water quality trading, see http://dnr.wi.gov/topic/surfacewater/adaptivemanagement.html.

Chapter 6. Storm Water and Septic Systems

Element 5.Storm Water and Septic Systems

6.1 EPA and Gulf Hypoxia Task Force Expectations

Quoted from EPA's recommended elements:
"Identify how the State will use state, county and local government tools to assure N and P reductions from developed communities not covered by the Municipal Separate Storm Sewer Systems (MS4) program, including an evaluation of minimum criteria for septic systems, use of low impact development/ green infrastructure approaches, and/or limits on phosphorus in detergents and lawn fertilizers."

6.2 Wisconsin's Approach

Wisconsin has programs in place to address communities not covered by the MS4 storm water system, septic systems, and the use of phosphorus in detergents and lawn fertilizers. Programs entail a mixture of regulatory controls and financial incentives to address potential nutrient sources that are not covered under a WPDES permit structure. Construction and post-construction sites are subject to performance-based standards while certain municipalities must meet minimum standards designed to reduce pollution potential. Septic systems are regulated through county ordinances and through state regulations administered by the Department of Safety and Professional Services (DSPS), which also administers a financial assistance program for failing septic systems. Wisconsin state law also restricts phosphorus in lawn fertilizers and household detergents.

6.2.1 Construction Sites, Post-Construction Sites, and Non-Permitted Municipalities

Construction sites not covered under a Municipal Separate Storm Sewer System (MS4) permit may be regulated by:

- A general construction site permit issued by the DNR, if the site has a disturbed areas of more than one acre;
- The Uniform Dwelling Code for one and two family residential construction administered by the Department of Safety and Professional Services, regardless of size;
- By technical standards of the Department of Transportation for highway construction sites; or
- By local government ordinance.

Under the general construction site permit program, ch. NR 151, Wis. Adm. Code, requirements include the following:.

- Construction on any size site shall limit sediment losses to a maximum of 5 tons/acre/year.
- Construction site erosion control BMPs (Best Management Practices) located in navigable waters or wetlands are disallowed, except for re-development sites where the BMP is on an intermittent waterway and all applicable permits are received.
- Storm water management plans are required to be implemented following construction on sites of one acre or more. The plans shall include BMPs to:
    - Reduce total suspended solids losses.
    - Reduce peak runoff discharge rates to match the pre-development peak flow rates, using the 1-year 24 hour design storm and the 2-year, 24 hour design storm as peak flow rates.
    - Infiltrate initial runoff except where groundwater contamination could occur. (The rule specifies 3 levels of connected impervious conditions and assigns an infiltration percentage to each level, reflecting the ability of the development to meet the goal.)
    - Maintain a permanent 50 foot vegetative buffer area around lakes, rivers, streams and wetlands in the construction area.
    - Maintain a permanent 75 foot vegetative buffer zone around high quality wetlands such as sedge meadows, open and coniferous bogs, low prairies, calcareous fens, coniferous swamps, lowland hardwood swamps, and ephemeral ponds.
    - Control petroleum products in runoff from fueling and vehicle maintenance areas.

The construction site requirements in the Uniform Dwelling Code, s. SPS 321.125, Wis. Adm. Code, parallel and reference the requirements in ch. NR 151, Wis. Adm. Code. Similarly, performance standards for highway construction used by the Wisconsin Department of Transportation and identified in ch. NR 151, Wis. Adm. Code. More information on these regulations can be found at http://dnr.wi.gov/topic/stormwater/construction/overview.html

6.2.2 Septic Systems

Septic Systems, formally called private onsite waste treatment systems (POWTS), are under the purview of the DSPS (formerly the Department of Commerce). Chapter SPS 383, Wis. Adm. Code contains policies and procedures to establish uniform standards and criteria for the location, design, installation, inspection and management of septic system to ensure that systems will not harm public health and the waters of the state. Standards are based on the premise that soil column properties will treat the wastewater to a point where adverse impacts to surface and groundwater are minimized. Specifically:

- Soil percolation rates or soil morphological features (texture, shape, grade) dictate the maximum application rate in gallons per square foot per day. Five-day biological oxygen demand and total suspended solids of the influent also factor into the maximum application rate.
- Soil texture, percent coarse fragments, and fecal coliform levels dictate whether 24, 36, or 60 inches of unsaturated soils are required for discharge.
- Soil profile borings instead of previous "perc" tests are required to determine drain field siting.

  County Sanitarians administer the program at the local level.

Failing septic systems that were installed prior to July 1, 1978, are eligible for financial assistance to replace or rehabilitate the system. Chapter SPS 387, Wis. Adm. Code, governs this assistance program. A failing septic system is defined in s. 145.245 (4), Stats, and is one which causes or results in any of the following conditions:

- The discharge of sewage into surface water or groundwater.
- The introduction of sewage into zones of saturation, which adversely affects the operation of a private sewage system.
- The discharge of sewage to a drain tile or into zones of bedrock.
- The discharge of sewage to the surface of the ground.
- The failure to accept sewage discharges and the back up of sewage into the structure served by the private sewage system.

6.2.3 Lawn Fertilizer

Wisconsin prohibits the use and sale of fertilizer containing phosphorus except under certain conditions. State law restricts the use and sale of phosphorus containing fertilizer to only those establishing new lawn or those whose soil tests indicate a need for applied phosphorus. The statutes also restrict the retail display of fertilizer to only those products not containing phosphorus. Agricultural fertilizer use is exempted from these restrictions. The term "fertilizer" does not include manipulated animal or vegetable manure or finished sewage sludge product. Restrictions are administered by DATCP under the authorities of s. 94.643 Wisconsin Stats.

The use restrictions are:

- fertilizer containing phosphorus may not be used unless the person is establishing grass or if a soil test (taken within the last 36 months) indicates a phosphorus deficiency in the soil.
- fertilizer, manipulated animal or vegetable manure, or finished sewage sludge product may not be applied to turf when the ground is frozen.
- fertilizer, manipulated animal or vegetable manure, or finished sewage sludge product may not be intentionally applied to an impervious surface.

The sales restrictions are:

- No person may sell a retail turf fertilizer that is labeled as containing phosphorus or available phosphate if the person knows that the purchaser intends to use the fertilizer for a purpose other than one of the following:
    - For establishing grass, using seed or sod, during the growing season in which the purchaser began establishing the grass.
    - For application to an area if the soil in the area is deficient in phosphorus, as shown by a soil test performed no more than 36 months before the application by a laboratory.
    - For application to pasture, land used to grow grass for sod, or any other land used for agricultural production.

More information on the restrictions for use and sale of lawn fertilizer is available here:
http://datcp.wi.gov/Environment/Fertilizer/Turf_Fertilizer/Retailers/

6.2.4 Phosphorus in Detergents.

Wisconsin limits phosphate in detergents for washing machines and automatic dishwashers. Regulations restricting the sale of detergent products are enforced through DATCP Consumer Protection Division. Specific restrictions and exemptions are included in section 110.28 Wisconsin Statutes found, here: http://docs.legis.wisconsin.gov/statutes/statutes/100/28.

6.3 Future Directions

Wisconsin will continue to implement existing programs and emphasize improving their integration with watershed planning and management efforts.

Chapter 7. Accountability and Verification Measures

Element 6. Accountability and Verification Measures

7.1 EPA and Gulf Hypoxia Task Force Expectations

Quoted from EPA's recommended elements:

"A. Identify where and how each of the tools identified in sections [Elements] 3, 4, and 5 will be used within targeted/priority sub-watersheds to assure reductions will occur.
"B. Verify that load reduction practices are in place.
"C. Assess/Demonstrate progress in implementing and maintaining management activities and achieving load reduction goals:
1) establish a baseline of existing N & P loads and current Best Management Practices (BMP) implementation in each targeted/priority sub-watershed,
2) conduct ongoing sampling and analysis to provide regular seasonal measurements of N & P loads leaving the watershed, and
3) provide a description and confirmation of the degree of additional BMP implementation and maintenance activities."

7.2 Wisconsin's Approach

Wisconsin is developing an integrated point source and nonpoint source tracking and reporting system to be used at the 12-digit HUC level. Presently, the state relies on discharge monitoring reports and efforts by County Land and Water Conservation Departments, supported by state agencies, for tracking and reporting of BMPs. The current proposal is to build upon this framework to develop a comprehensive nutrient tracking system.

7.2.1 Point Source Tracking

As summarized in Chapter 3 of this document, Wisconsin requires discharge monitoring reports from WPDES permit holders for phosphorus discharges. Data exist back to the mid-1990s. For tracking nitrogen point source discharges, DNR is phasing in enhanced discharge monitoring for nitrogen for wastewater treatment facilities in the Mississippi River basin (see Chapter 8).

7.2.2 Watershed based nutrient tracking for practices to reduce Nonpoint Sources

As described in previous chapters (and also in Wisconsin's Nonpoint Source Program Management Plan, http://dnr.wi.gov/topic/nonpoint/aboutnpsprogram.html) many programs administered in Wisconsin rely on some level of BMP tracking. Wisconsin counties lead the state's efforts to track compliance issues and water quality management practices associated with the NR 151 performance standards and prohibitions. Capacity and type of tracking system varies by county and are inconsistent across the state. DATCP and DNR compile summaries of BMP data and prepare annual reports. While developing this Nutrient Reduction Strategy, a Tracking and Reporting Work Group began outlining an integrated tracking system that could serve an expanded set of state and local needs. Current and future efforts will help build capacity for county-level tracking that addresses these multiple program needs. Federal agency partners will continue to conduct separate compliance assessments related to their programs.

DATCP and the Tracking and Reporting Work Group members have surveyed counties to learn the extent, variety, and capabilities of county BMP and compliance tracking systems. Current systems range from paper files to highly sophisticated GIS-based data management systems. DATCP and the Tracking and Reporting Work Group is compiling a comprehensive statewide summary of county systems, including the type of tracking system in place (if any), the practices and related information in the database, and how those data are collected and updated. Outcomes from this assessment and their implications for the creation of an integrated nutrient tracking system are addressed in the Future Directions portion of this chapter.

Table 7.1 Sample of current nutrient reduction tracking needs

Lead Organization	Program/Tracking Need	Information Collected	Reporting
DNR	Verification of funded BMPs through multiple grant and financial assistance programs	BMP implementation; compliance with NR151	Reports to state and EPA
DNR	Public wells meeting health standards	Nitrate levels	State, EPA, database
DATCP	Compliance with NR151 and Working Lands Initiative	Nutrient Management Plans (acres and farms)	Annual reports; WLI compliance checking
Count Land & Water Conservation Departments	NR151 compliance and county ordinance	BMPs	County, state

7.3 Future Directions

Building on innovative GIS-based tracking and inventory systems developed by multiple counties, DATCP, DNR, and the Wisconsin Land and Water Conservation Association (WLWCA) are exploring options to make efficient tracking systems available to all Wisconsin counties. The systems should be able to meet multiple data management and BMP tracking needs, and would be most efficient if they could be accessed from farm fields. While reviewing county tracking systems, WLWCA, DNR, and DATCP will examine inventory technologies, assess effectiveness with counties, and establish needed support mechanisms for counties to install and operate a tracking system. By coordinating trainings and work groups, project partners will establish an effective communication network for system users to share successes, failures, and new approaches to inventorying farms and conservation practices.

The Tracking and Reporting Work Group will systematically evaluate issues related to a potential integrated statewide tracking system throughout 2013. On initial review, systems in Outagamie County (east-central Wisconsin), Marathon County (central Wisconsin), and Eau Claire County (western Wisconsin) hold promise for an integrated statewide effort. Screen shots from the three systems are included in Figures 7.1, 7.2, and 7.3. Additional systems may be identified through the statewide assessment currently underway.

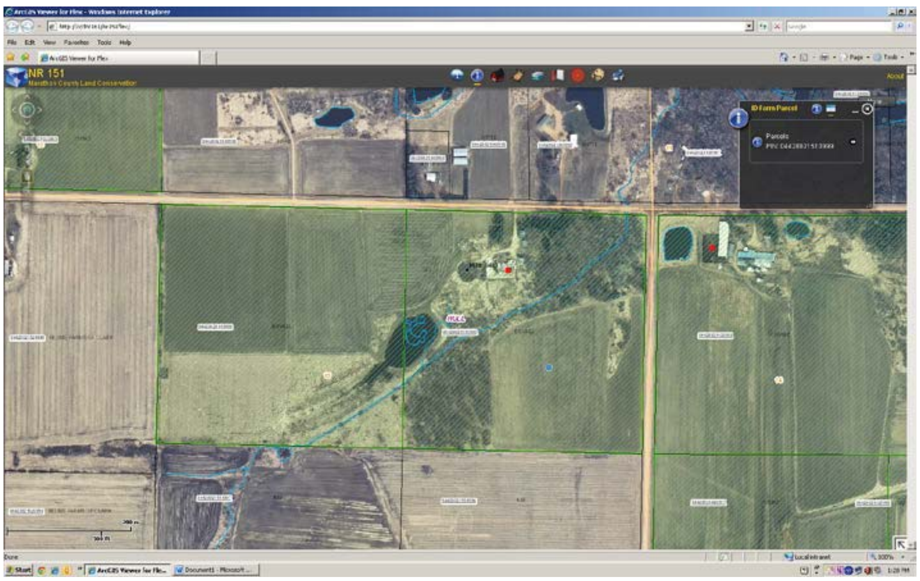

Figure 7.1 Marathon County Tracking System – ability for zoom-in view of individual parcels

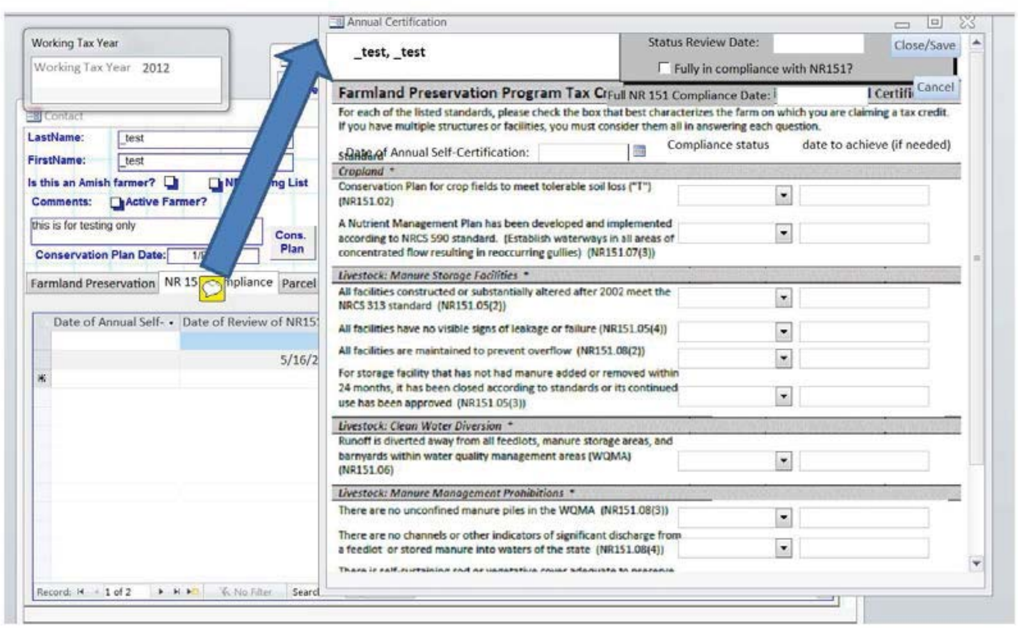

Figure 7.2 Eau Claire County Tracking System – links to multiple county data sets

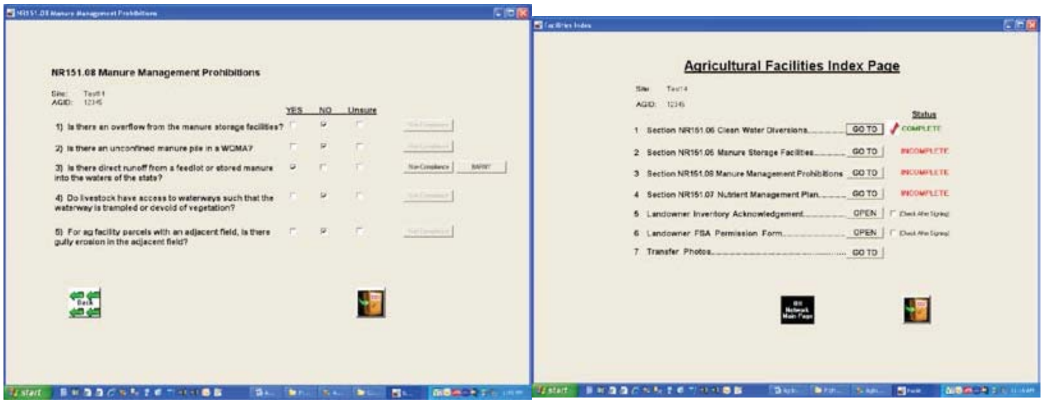

Figure 7.3 Sample screens from Outagamie County Tracking System

The Tracking and Reporting Work Group identified several issues to address in coming months. A selection of key issues is listed here.

<u>Tracking System Structures</u>

- Explore and develop the ability to aggregate tracking information for a variety of programs and purposes.
- Pursue the aggregation of tracking information to the HUC 12 level. This aggregation should be kept simple for reporting purposes and would not target individual farm-level information.
- Evaluate the addition of a nutrient reduction component to existing county tracking systems.

<u>Baseline Issues</u>

It is challenging to determine a "baseline" for tracking purposes, because the baseline differs according to its purpose. A baseline that enables determination of a base load is not the same as one that enables determination of a load reduction.

<u>Models</u>

Future meetings will determine how to use aggregated tracking data for models. Models may be used to evaluate and quantify non-cropland sources of nutrients. Groundwater modeling may provide additional data to track nutrients, especially those from field-tile sources.

<u>Reporting</u>

The Tracking and Reporting Work Group identified these topics concerning reporting on nutrients:

- Who is the intended audience for various reporting, especially for new reporting mechanisms?
- How will nutrient tracking reports best be generated and conveyed to these audiences?
- How could an annual Nutrient Summit play a role that combines summarizing tracking information, and relaying specific efforts to further reduce nutrient loads?

Chapter 8. Water Quality Monitoring

8.1 EPA and Gulf Hypoxia Task Force Expectations

EPA Expectations for water quality monitoring are an implied component of all 8 elements in the Nutrient Reduction Framework, the Gulf Hypoxia essential elements, and related programs. Monitoring data are critical for targeting and prioritizing watersheds (Element 1), supporting determination of load reductions (Element 2), determining the effectiveness of permit programs (Element 3), understanding nutrient concentrations in agricultural areas (Element 4), documenting conditions in urbanized areas and from septic systems (Element 5), accountability and verification of efforts (Element 6), reporting (Element 7), and establishing numeric criteria for nutrients (Element 8). Other EPA programs, such the Section 319 Program for addressing nonpoint source pollution, also emphasize water quality monitoring of implementation projects. Simply stated, EPA expects Wisconsin to have an effective monitoring program as well as the capability to determine trends and implement a Nutrient Reduction Strategy.

8.2 Wisconsin's Approach – Surface Water

Extensive water quality monitoring has occurred in Wisconsin for decades. DNR is the lead state agency for surface water quality monitoring but other state agencies, including DATCP, the Department of Health Services (DHS) and the University of Wisconsin System also conduct monitoring activities. In addition federal agencies, including USGS and NRCS, counties through their Land & Water Conservation Departments or health departments), non-profit organizations, volunteers, and many other local partners conduct monitoring activities. Each agency and organization conducts monitoring designed to meet specific programmatic needs, resulting in a tremendous body of information about the status of Wisconsin's waters. A partial listing of programs is included in Table 8.1.

8.2.1 Coordination of water monitoring efforts

Wisconsin's multiple water quality monitoring efforts recognize the importance of effective monitoring to (1) calculate nutrient loads from major basins, (2) identify those basins with highest contributions (mass and yield), (3) determine trends, and (4) document progress. The workgroup assembled to address monitoring needs associated with the Nutrient Reduction Strategy identified opportunities for improving coordination and data management among Wisconsin's multiple monitoring efforts to support the strategy. Several key monitoring programs are discussed below.

8.2.2 Key Monitoring Program Components

DNR Long-Term Trend (LTT) River Monitoring

Wisconsin's Long Term Trend (LTT) River water quality monitoring network is maintained by DNR. The LTT River network consists of 42 sites, with a minimum of one site per major river basin, generally located near the mouth of each river, most often at a site of a USGS gaging station.[17] The sites are identified in Figure 8.1. Selection of the 42 trend monitoring sites considered different land coverage in the state varying from urban areas in the southeast, heavy agricultural use in central and southwest, and forest cover dominating the north. Just over half the sites (24) are sampled monthly and other sites quarterly. Monthly sites are generally located near the mouth of major rivers, whereas quarterly sites are often located at additional locations some distance above. DNR collaborates with other agencies that provide water quality measurements for some sites on the Mississippi River (e.g., Lock and Dams (LD) 3 and 4). Water quality samples are analyzed for nutrients, solids, specific conductance, pH, hardness, alkalinity, bacteria, and chlorophyll. Biannually they are analyzed for triazine herbicides during winter and summer. All analyses follow approved U.S. EPA methods.

Information from long-term trends sites has been used to calculate annual loads to the Great Lakes as part of EPA's reporting to the International Joint Commission. LTT River data have also contributed to background information for biennial Integrated Reports ("305b" Reports to US Congress), Wisconsin phosphorus rules, and development of current trends analysis (Robertson and Diebel, in preparation). Many LTT River sites are proposed to be included in a tributary load monitoring network for the Mississippi River. Information from these sites has also been used to calculate nutrient trends briefly described in Chapter 2.

DNR Watershed Rotation Water Quality Monitoring

The Watershed Rotation Water Quality Monitoring activity was initiated in 2006 to collect water chemistry information at the downstream location, "pour point," of each of 333 DNR watersheds (approximately HUC 10 size). If the watershed had multiple pour points, the largest stream was monitored. Water chemistry sampling was conducted at a monthly interval (e.g., every second Wednesday of the month) to avoid weather related bias. Field parameters included temperature, dissolved oxygen, pH and turbidity (using a transparency tube). Lab parameters include total phosphorus, ammonia-N, total Kjeldahl-N, nitrite-nitrate-N and suspended solids. This monitoring ended in September 2011. This information has been used in the targeting and priority setting analysis described in Chapter 1.

DNR TMDL Development

TMDL development across the state has resulted in an increased level of monitoring to help determine pollutant load reductions necessary to meet water quality criteria. The monitoring associated with each TMDL varies widely and depends on the pollutant(s) of concern, the existing monitoring data, the geographic scale of the TMDL, and other factors. Often, DNR leads the monitoring efforts associated with TMDL development but a number of other entities contribute

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[17] from "Wisconsin's Long Term Trend Water Quality Monitoring Program for Rivers: July 2001-June 2005." Prepared by the DNR Bureau of Watershed Management River Long Term Trends Work Group. November 2006.

effort. County Land & Water Conservation Departments, USGS, wastewater treatment facilities, local citizen groups, and others have contributed to DNR or third party TMDL development efforts.

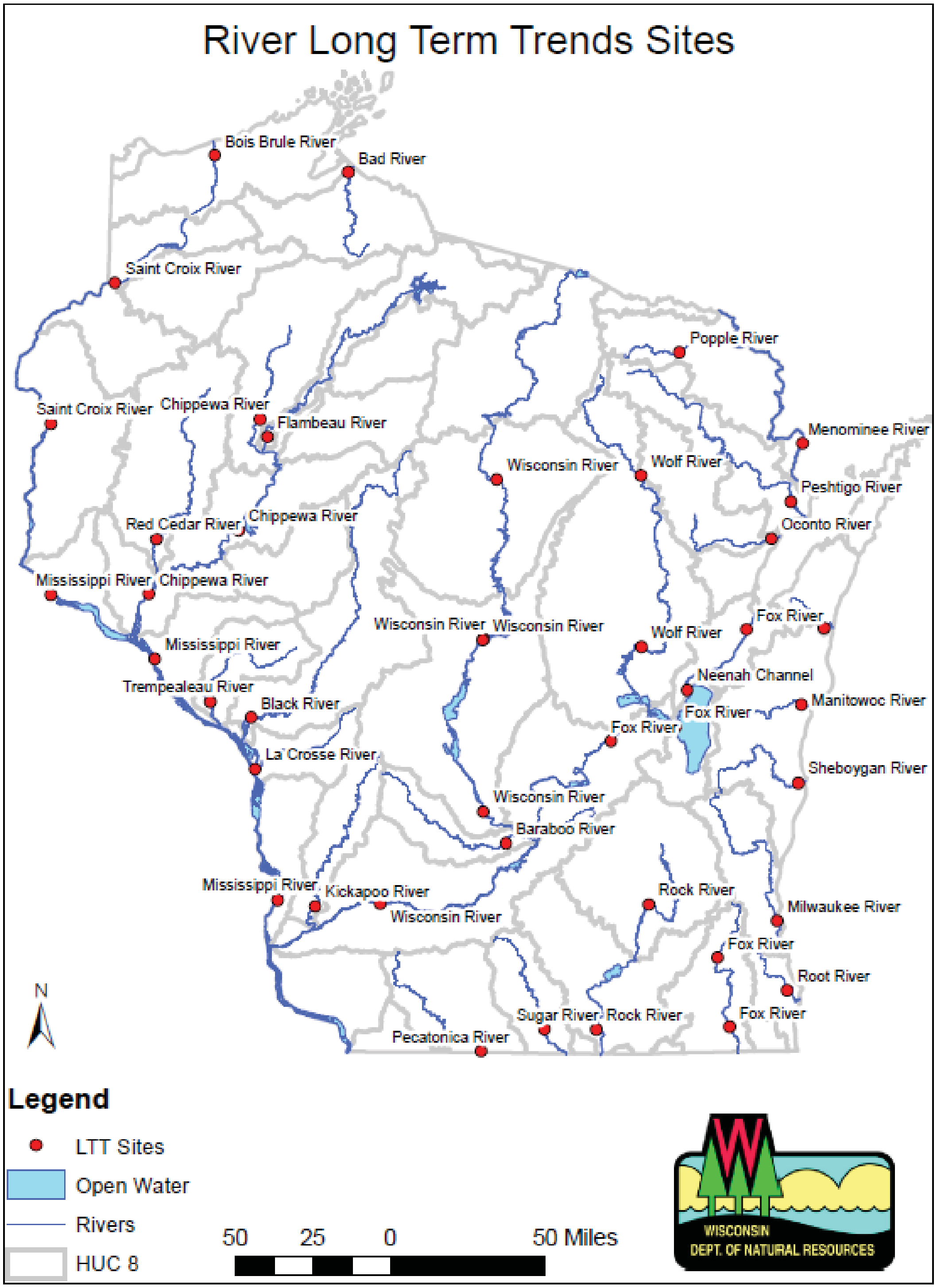

Figure 8.1 Wisconsin's River Long-Term Trend Monitoring Sites

USGS Flow Gaging and Water Quality Monitoring

The USGS is active in water quality monitoring and research across Wisconsin. USGS maintains a large network of flow gaging stations, including many long-term sites across the state that provide information used in a number of water quality programs, such as for calculating nutrient loads and point source permit effluent limits. Additional water quality monitoring sites are maintained through partnerships with DNR and others as part of various studies. These partnerships take advantage of USGS's equipment, expertise, and historical involvement in Wisconsin.

NRCS Monitoring

NRCS in collaboration with USGS, has organized monitoring efforts primarily through the Mississippi River Basin Initiative (MRBI). This three-tiered approach supports efforts to reduce nutrient loading from fields to waterways. The three tiers include edge-of-field monitoring, small watershed monitoring, and large watershed monitoring. These three tiers are intended to examine the impact field-level nutrient reduction practices have on loadings to adjacent waterways while also examining in-stream water quality at a number of scales. NRCS does not conduct monitoring itself but works with multiple partners to provide that service.

Multi-Partner Monitoring

A number of additional monitoring efforts that are collaborative between multiple agency and organizational partners generate substantial water quality data for Wisconsin. Two projects focus on the water quality trading and watershed adaptive management options for meeting nutrient standards (see chapter 5 of this document). Municipal wastewater treatment facilities often partner with county Land & Water Conservation Departments to conduct the monitoring for these projects. County Land & Water Conservation Departments also frequently partner with agencies for other water quality monitoring efforts, including for TMDL development. Permitted wastewater discharge facilities (municipal and industrial) individually collect water quality data, and as a group, they provide data for selected urban areas of the state. Another set of monitoring efforts that collectively provide water quality data for the state is the volunteer monitoring program guided by DNR and UW-Extension. Volunteers are trained in techniques to ensure that the data they collect adheres to agency standards and is pertinent to statewide monitoring goals. Volunteer monitoring is often conducted by non-profit groups and individuals. An additional outcome of volunteer monitoring programs is increased awareness of water quality issues statewide.

Table 8.1 Select water quality monitoring programs in Wisconsin

Monitoring Program	Water Quality Management Needs				
	Determine status/ impaired	Calculate Nutrient Loads	Identify High Yield Watersheds	Determine Trends	Document Progress
DNR					
River Long Term Trend		X	X	X	X
Great Lakes Tributary Nutrient Monitoring (LTT)		X		X	X
Mississippi River Basin Nutrient Analysis (proposed)		X		X	X
Watershed Rotation Water Quality			X	X	
TMDLs		X	X		
Impaired Waters Evaluation	X				X
Lake Long Term Trend		X	X	X	X
Lake Michigan Cladophora/Nutrient Study	X				X
NRCS					
Three-Tier Monitoring	X				X
USGS					
Rural Water Quality Research Studies		X			
Stream flow (gauge) sites		X		X	X
Cooperative Water Quality Studies	X	X	X		X
Metropolitan Sewerage Districts					
Green Bay Ambient Water Quality Monitoring		X		X	X
Milwaukee Water Quality Monitoring		X		X	X
Multi-Partner					
Adaptive Management		X			X
Water Quality Trading		X			X
Upper Mississippi River Long Term Resource Monitoring Program	X	X			X
Volunteer Lake and Stream Monitoring	X		X	X	X
Municipal/Industrial Discharge Monitoring		X			X
Other County monitoring					

8.3 Wisconsin's Approach – Groundwater and Drinking Water

Groundwater monitoring in Wisconsin occurs primarily through public water system testing associated with federal Safe Drinking Water Act (SDWA) requirements, private well testing for drinking water quality by individual homeowners, and formal monitoring programs conducted by DNR, DATCP, GNHS and USGS. The University of Wisconsin Stevens Point also maintains an extensive statewide database with water quality results from private wells and winter stream base-flow monitoring. The information collected from these efforts is used for various public health and environmental management purposes. Although groundwater monitoring programs frequently include nitrogen, phosphorus, due to the absence of human health concerns and low mobility in groundwater is rarely included.

None of the above programs is focused on characterizing statewide groundwater with respect to nutrients or other contaminants. Compared to surface water monitoring, groundwater monitoring is more difficult due to the expense of constructing wells and considerations of contaminant transport, travel times, depth, and aquifer type. Because of the expense and these considerations there is no ambient groundwater quality network in Wisconsin.

8.3.1 Coordination of water monitoring efforts

In 1983 the Wisconsin Groundwater Coordinating Council (GCC) was created to serve as a means of increasing the efficiency and facilitating the effective functioning of state agencies in activities related to groundwater management. The GCC is composed of representatives from six state agencies, the State Geologist and Governor's representative and advises and assists state agencies in the coordination of nonregulatory programs and the exchange of information related to groundwater.

One of the GCC's main concerns has been groundwater monitoring and research activities and through their efforts groundwater monitoring has improved due to increased communication and eliminated duplication of effort. The GCC has coordinated the Joint Solicitation for proposals to Wisconsin's Groundwater Research and Monitoring Program Since 1991 The DNR, UWS, DATCP, and Commerce have funded over 400 groundwater monitoring and research projects.

The GCC prepares a report each year that, among other thing, summarizes the condition of the groundwater resource. Nitrate, being a leading threat to groundwater, is discussed at length in the report at: http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Nitrate.pdf

8.3.2 Key Monitoring Program Components

Wisconsin's multiple groundwater quality monitoring efforts recognize the importance effective monitoring to characterize the quality of the resource, respond to groundwater quality problems, and assess the effectiveness of management efforts.

DNR Public Water System Monitoring

The DNR's Bureau of Drinking Water and Groundwater implements and enforces the requirements of the Safe Drinking Water Act in Wisconsin. There are approximately 11,500 public water systems in the state and each must monitor the quality of the water it provides. These systems monitor for nitrate-nitrogen at least annually.

An example of recent use of public water supply data for resource monitoring purposes is DNR's "Wisconsin Safer Drinking Water Nitrate Initiative. The initiative is targeted at reducing nitrate levels in groundwater by making the most efficient use of nitrogen in agricultural production. Activities in project areas include measuring all current nitrogen inputs and baseline groundwater nitrate levels, calculate agricultural input and production costs, determine and implement best nitrogen management practices that optimize groundwater conditions and agricultural production efficiency, and measure whether predicted results are achieved. Target areas were selected by reviewing statewide at non-community public well data (see Figure 8.2). Project areas have been selected in Rock and Sauk Counties within subwatersheds with large numbers of public drinking water systems approaching unsafe levels of nitrate contamination. DNR is currently working with stakeholders to determine an optimal nitrogen management system. In the next phase of the project the nitrogen management system will be applied in one of the project areas. Monitoring of nitrogen inputs, groundwater nitrate levels, production costs will continue and costs of nitrogen management will be compared to water treatment costs.

Private Drinking Water Supply Well Monitoring

Regulations do not require that private water well be sampled for nitrate. However many well owners do have their well tested because of concerns about contamination. DNR, DATCP and UW-SP track this data where available. Since sampling is done for only a minority of wells the data is difficult to use to characterize the resource. However, DATCP has conducted 4 statewide surveys (1994, 1996, 2001 and 2007) using a stratified random sampling procedure that were used to represent groundwater accessible by private wells. The 2007 survey (http://datcp.wi.gov/uploads/Environment/pdf/ARMPub180.pdf) estimated that the proportion of wells that exceeded the 10 mg/l enforcement standard for nitrate-nitrogen was 9.0%. The UW-SP maintains a private well sampling program and a statewide database of private well water quality. The data is accessible through their Groundwater Quality Viewer (http://gissrv2.uwsp.edu/cnr/gwc/pw_web/) map viewer which displays groundwater quality information from private wells around the state.

Contaminated Site Monitoring

DNR, DATCP and DSPS monitor sites of groundwater and soil contamination for the purpose of implementing the groundwater standards contained in ch. NR 140, Wis. Adm. Code. Monitoring occurs at sites associated with: spills, hazardous substance release sites, abandoned containers, drycleaners, brownfields, leaking underground storage tanks, closed wastewater and solid waste facilities, hazardous waste corrective action and generator closures, and sediment cleanup actions, proposed, active, and inactive solid waste facilities and landfills, municipal and industrial wastewater discharges, by-product solids and sludge disposal from wastewater treatment systems, and wastewater land treatment/disposal systems. Many of these sites are monitored for nitrate and/or ammonia concentrations but the data is somewhat difficult to access.

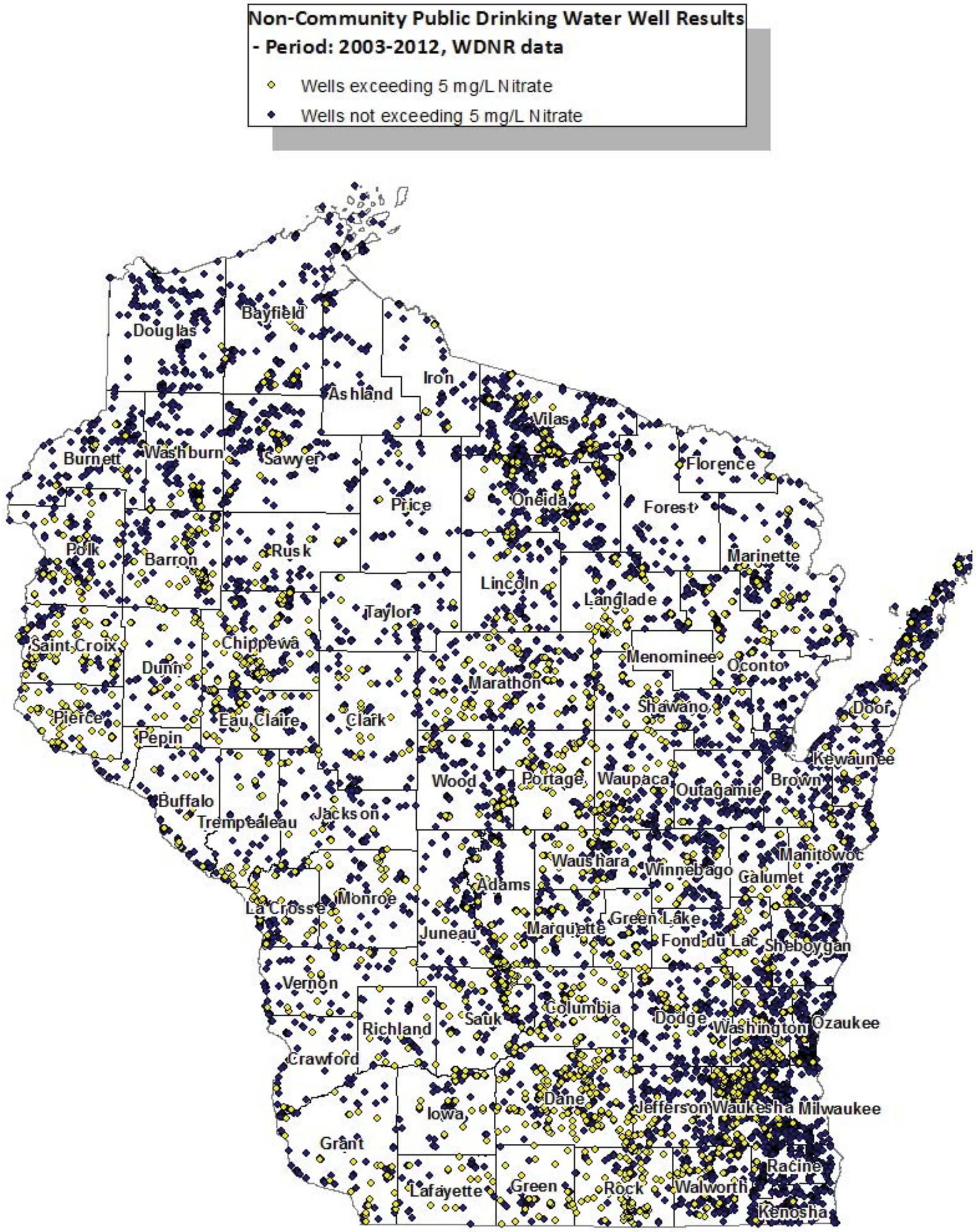

Figure 8.2 Non-community public wells with raw water samples exceeding 5 mg/L Data source: DNR Drinking Water System, 2013.

Groundwater Management Practice Monitoring Projects

DNR, UWS, DATCP and DSPS/Commerce/DILHR have funded over 400 Groundwater Research and Monitoring projects since 1983. Many of these projects have contributed to the understanding of nitrogen occurrence in Wisconsin's groundwater. A list of projects is here: http://dnr.wi.gov/topic/groundwater/documents/GCC/MonitoringResearch/AllProjects.pdf. A partial listing of groundwater monitoring programs is included in Table 8.2.

Table 8.2 Selected groundwater and drinking water quality monitoring programs

Monitoring Program	Objective	Agency	Identify High Yield Watersheds	Determine Trends	Document Progress
Public water system monitoring	Determine Compliance - SDWA requirements	DNR – DG	No	Yes	Yes
Private well monitoring	Determine compliance - bacteria	DNR-DG	Possibly	Possibly	In limited cases
Private well monitoring	Determine compliance – pesticides and nitrate	DATCP	Possibly	Possibly	In limited cases
Private well monitoring	Homeowner information	UW-SP	Possibly	Possibly	In limited cases
Landfill	Determine compliance – groundwater standards	DNR – WMM	Possibly	Yes	Yes
Contaminated and cleaned-up sites	Determine compliance – groundwater standards	DNR-RR	Possibly	Yes	Yes
Wastewater discharges, by-product solids, and sludge disposal	Determine compliance – Groundwater standards	DNR-WQ	Possibly	Yes	Yes
County monitoring	Various	Some Counties	Various	Various	Various
Management Practice Monitoring and Research	Evaluate effectiveness of management practices and various other	DNR, UWS, DATCP, USGS, WGNHS and others	Possibly	Possibly	Possibly

8.4 Future Directions for Monitoring Improvement

The multiple agency partners involved in developing this Nutrient Reduction Strategy are exploring opportunities to ensure that existing monitoring efforts are coordinated into an expanded framework for water quality monitoring. The workgroup determined that an improved state monitoring framework could enhance communication and coordination among monitoring entities, guide future monitoring efforts, and continue to meet the specific and multiple programmatic needs for analysis and reporting. The vision for an improved monitoring framework involves coordinating existing efforts through multiple levels. There are three levels of monitoring for surface water and three levels for groundwater.

8.4.1 Surface Water Monitoring

The three levels of surface water quality monitoring coordination are described below. Together, they outline a structure to organize current monitoring efforts occurring across Wisconsin based on their goals, characteristics, and outcomes. The levels will be clarified and further refined as the Monitoring Work Group reviews details of monitoring efforts, such as scale, purpose, and potential for coordination.

Level 1 – A fixed statewide network to describe status and trends

The objective of Level 1 is to characterize nutrient concentrations and loads and quantify long-term nutrient trends from HUC 6 and HUC 8 watersheds. To best achieve this objective a spatially distributed network of fixed stations co-located with flow gaging stations would be operated over a long term. Sites within the Wisconsin network may also be part of multi-state networks for the Great Lakes or Mississippi River Basin. Water chemistry samples should be collected at least on a monthly basis and analyzed for nutrients, and suspended sediment/solids. Flow should be monitored on a continuous basis. The existing DNR River LTT network described above and the Great Lakes Nutrient Load monitoring with their associated USGS flow gaging stations fit into this level. Wisconsin will continue to conduct long-term trend monitoring through DNR LTT River network. Data will be used for trend analysis, the biennial Integrated Report, and more.

Level 2 – A flexible network to identify high nutrient concentration surface waters

The objective of Level 2 is to identify lakes, streams and rivers with high concentrations of nutrients that occur especially during the growing season (May through October). These waters will probably have high nutrient loadings. To best achieve this objective a spatially distributed network of stations corresponding to HUC 10s or HUC 12s is needed. Water chemistry samples for this objective should generally be taken on a monthly basis and analyzed for phosphorus, nitrogen and suspended sediment/solids. Given the size of such a network, continuous flow gaging is not practicable. The DNR Watershed Rotation Water Quality Monitoring activities fit into this level, and preliminary analysis is underway. More detailed monitoring would be needed – possibly in targeted HUC 10s – to best identify implementation projects at the HUC 12 scale. Sites in this network could be sampled on a rotational basis. Self help volunteer monitoring of lakes (for Secchi depth, total phosphorus, and cholorphyll a) and volunteer stream monitoring (for phosphorus) could also fit into this level. Data from Level 2 would also contribute to the biennial Integrated Report and to TMDL development and implementation.

Level 3 – Special projects to quantify surface water process and effects of management practices

Monitoring at this level addresses specific questions to determine cause and effect of implementing specific land use practices. Nutrient loads in surface water in watersheds of varying sizes across the state would be analyzed before and after implementation of the practices. Comparisons would be made to determine the effects of the practices on nutrient loads. The spatial scale for this level is generally at HUC 12 or smaller, depending on the specific questions being answered. Flow and concentration measurements would be made to support load calculations. Depending on the duration of the effort, this level may support trend identification. The frequency of monitoring and other details would vary by project and often specified in a quality assurance program plan or the program's standard operating procedures. Several existing efforts fit into this level, including NRCS small watershed projects (e.g., East River, Dane Co projects), and UW projects including Pioneer and Discovery Farms, and volunteer monitoring within a specific watershed. An example of an emerging application for this level could be in-stream sampling by POTWs associated with trading or the Watershed Adaptive Management Option.

8.4.2 Groundwater Monitoring

The two levels of groundwater quality monitoring coordination are described below. Together, they outline a structure to organize current monitoring efforts occurring across Wisconsin based on their goals, characteristics, and outcomes. The levels will be clarified and further refined as the Monitoring Work Group reviews details of monitoring efforts, such as scale, purpose, and potential for coordination.

Level 1 – A fixed statewide network to describe status and trends

The goal at this level is to carry out regular monitoring of groundwater across the state to characterize the status and long-term trends of nitrate-nitrogen concentrations in Wisconsin's groundwater. As with surface water monitoring at this level, this would allow for patterns to be analyzed and areas flagged for further study if high concentrations are observed. Ideally, a network of fixed sites that are spatially and geologically distributed and representative of groundwater statewide is needed. These sites would be maintained over the long term and would be monitored semi-annually or annually. The three-dimensional nature of factors that affect groundwater pose challenges to developing a monitoring network at this level. Different geologic formations vary in their susceptibility to contamination and thus well depth and aquifer information are important considerations. A network of this type is currently far beyond the financial resources available.

In 2012-2013 the GCC's Research and Monitoring Subcommittee evaluated options for achieving this goal and arrived at three options: 1) using available private well data; 2) using a statistical approach similar to what DATCP published in 2008 sampling a relatively small number of private wells at strategic locations and settings; and 3) using non-community public water well data as shown in Figure 8-2. Option 1 is a good tool to address issues such as where and when wells have been drilled and abandoned and can add some insight to where nitrate is most prevalent but is fraught with problems related to the disparate nature of the data set. Option 2 is a solid, cost-effective approach but the budget of approximately $100,000 is currently out-of-reach. This leaves Option 3 as the best currently attainable method. The 2008 DATCP report is available here: (http://datcp.wi.gov/uploads/Environment/pdf/ARMPub180.pdf).

Level 2 – Identification of high nitrate concentration in groundwater using existing wells

Monitoring at this level addresses specific questions to determine cause and effect of implementing specific land use practices on water levels and nutrient concentration in groundwater as needed across the state. Numerous Management Practice Monitoring Projects have monitored specific nitrogen-contributing agricultural or waste disposal practices to evaluate the effect of various geological conditions and management practices on nitrogen loading to groundwater. Another example of this kind of work is DNR's "Wisconsin Safer Drinking Water Nitrate Initiative" which is targeted at reducing nitrate levels in groundwater by making the most efficient use of nitrogen in agricultural production. By focusing on small project areas an optimal nitrogen management system is more likely to be effective.

8.4.3 Moving Forward

Agency partners have already identified many issues to address as part of their discussions exploring the potential for this tiered approach. Issues include identifying additional sites for the Long Term Trends (LTT) monitoring, identifying sampling frequency and methods for sites within various levels, and protocols for reporting and sharing data.

Table 8.3 Potential levels for coordinating water quality monitoring

Level	Spatial Scale	Key Measurements	Duration	Monitoring Goals	Trend Analysis	Monitoring Frequency	Lead Monitors
1 - surface	Approx. HUC 8	Flow and concentrations	Ongoing	Broad	Yes	Monthly	DNR/USGS
2 - surface	Approx. HUC 10 or 12	Concentrations	Periodic (perhaps every 5 years)	Inventory of conditions and for flagging waterways with high concentrations for follow up study.	Possibly, but would be at a coarse scale	Monthly for 12 months	DNR
3 - surface	Various scales, generally HUC 12 or smaller	Flow and Concentration	Variable	Answering specific questions; local interest	Variable, project specific	Variable, project specific	Variable, project specific. Volunteers, others, publically owned wastewater treatment systems
1 - ground	Statewide, stratified by geologic factors and land use	Nitrate concentrations	In develop-ment	Broad - identifying spatial patterns, problem areas	Yes	Annually at minimum	DNR/USGS/ WGNHS/DATCP
2 - ground	Localized	Nitrate concentration	Variable	Answering specific questions	Variable, project specific	Variable, project specific	Variable, project specific

Chapter 9. Reporting

<u>Element 7.</u> Annual public reporting of implementation activities and biennial reporting of load reductions and environmental impacts associated with each management activity in targeted watersheds

9.1 EPA and Gulf Hypoxia Task Force Expectations

Quoted from EPA's recommended elements:

"A. Establish a process to annually report for each targeted/priority sub-watershed: status, challenges, and progress toward meeting N & P loading reduction goals, as well as specific activities the state has implemented to reduce N & P loads such as: reducing identified practices that result in excess N & P runoff and documenting and verifying implementation and maintenance of source-specific best management practices.

"B. Share annual report publically on the state's website with request for comments and feedback for an adaptive management approach to improve implementation, strengthen collaborative local, county, state, and federal partnerships, and identify additional opportunities for accelerating cost effective N & P load reductions."

9.2 Wisconsin's Approach

Wisconsin plans to report on implementation activities and estimated nutrient reductions. Reporting will occur through a new annual forum or summit. This new annual event will highlight key issues and activities related to the strategy, provide a review of new information regarding watershed targeting, tracking, and monitoring, and help establish priorities and actions for partner agencies and organizations for the following year.

Summary information about nutrient reduction and related activities will also be reported through websites and through the biennial Integrated Report to Congress (the 305b Report). Efforts tied to specific programs and funding sources will also be reported through those program's required reporting structures (e.g., EPA 319 accomplishment reporting).

9.3 Future Directions

The first annual report would take place at a summit in June 2014. Options for reporting additional nutrient information through websites are under consideration.

Chapter 10. Numeric Nutrient Water Quality Criteria

Element 8. Develop Work Plan and Schedule for Numeric Criteria Development

10.1 EPA and Gulf Hypoxia Task Force Expectations

Both the EPA Framework and the Gulf Hypoxia Action Plan call for states to develop numeric water quality standards for both phosphorus and nitrogen. EPA has provided further elaboration in its national performance measure WQ-26, where, if a state has not completed adoption of numeric criteria, it must provide a schedule of activities with annual milestones for adoption no later than 2016. That schedule must include milestones for each of these activities:

1. Planning for criteria development
2. Collection of information and data
3. Analysis of information and data
4. Proposal of criteria
5. Adoption of criteria into the state's or territory's water quality standards (related to measure WQ-1a)

WQ-26 implies that states may have the option to scientifically justify that criteria are not needed for certain waters, such as phosphorus criteria are sufficient and nitrogen criteria are not needed.

10.2 Wisconsin's Approach and Future Directions

Phosphorus Criteria

In 2010, the Wisconsin Department of Natural Resources adopted numeric phosphorus water quality standards criteria for three categories of waters: rivers and streams; lakes and reservoirs; and nearshore and open waters of the Great Lakes within Wisconsin jurisdiction. These numeric phosphorus water quality criteria were approved by EPA in December 2010 and met the EPA imposed deadline of December 31, 2010.

The table below shows the adopted phosphorus water quality standards criteria by type of water body. The specific water body types are defined in the s. NR 102.06, Wis. Adm. Code.

Adopted Phosphorus Criteria by Type of Water Body	Total Phosphorus in *u*g/L
NR 102.06 listed rivers	100
All other streams	75
Stratified reservoirs	30
Non-stratified reservoirs	40
Stratified "two-story" fishery lakes	15
Stratified drainage lakes	30
Non-stratified (shallow) drainage lakes	40

Stratified seepage lakes	20
Non-stratified (shallow) lakes	40
Impoundments	Same as inflowing river or stream
Lake Michigan open and nearshore waters	7
Lake Superior open and nearshore waters	5
Note: There are some exclusions, such as lakes under 5 acres and ephemeral streams	

The adopted criteria for streams and rivers were based primarily on two peer-reviewed published reports by the U. S. Geological Survey and the Wisconsin Department of Natural Resources: "Nutrient Concentrations and Their Relations to Biotic Integrity of Wadeable Streams in Wisconsin" (USGS Professional Paper 1722, 2006) and "Nutrient Concentrations and Their Relations to Biotic Integrity of Nonwadeable Rivers in Wisconsin" (USGS Professional Paper 1754, 2008). These research studies analyzed the relations between phosphorus and nitrogen and biotic indices, such as those for fish and aquatic insects. In general, the studies showed stronger relations for phosphorus than nitrogen, but there appeared to be an influence on biotic integrity from nitrogen.

Nitrogen Criteria – Surface Waters

EPA maintains a position that states must develop both phosphorus and nitrogen water quality standards criteria "unless the state provides a strong technical and scientific justification, considering both local and downstream effects, that one or the other is not needed" (EPA WQ-26). Where a state has not completed adoption of numeric nutrient criteria, EPA requires the state to provide a full set of performance measure milestone information for adopting numeric criteria (EPA WQ-26). Each year the state must report on progress for adopting criteria for at least one class of water, such as streams, lakes or estuaries, by 2016.

EPA has identified the following key activities and requires milestones be established for each of the activities:

1. Planning for criteria development
2. Collection of information and data
3. Analysis of information and data
4. Proposal of criteria
5. Adoption of criteria into the state's water quality standards.

Each of these activities is briefly described below.

1. Planning for criteria development -- completed

   As mentioned above, the wadeable stream and non-wadeable river studies were designed to analyze the relations of both phosphorus and nitrogen on biotic indicators. Water quality samples were collected and analyzed for both phosphorus and nitrogen.

In 2011, the Department of Natural Resources convened a work group of technical experts from the Department, USGS, EPA and the University of Wisconsin to review previous work and identify any additional study needs. The work group recommended that additional information be collected on streams with relatively higher nitrogen concentrations and lower phosphorus concentrations. A working list of 15 to 20 of these streams was prepared.

2. Collection of information and data -- completed

   In 2011 and 2012, water chemistry and biotic data was collected on the selected streams. Laboratory analysis of the collected samples was completed in late 2012.

3. Analysis of information and data – planned to be completed July 2014

   Statistical analysis and expert review of the data is planned for 2013 and extending into 2014. The data from the new sites will be assessed both as a group and as part of the previously compiled data set on about 240 wadeable streams. The scientific review will include analysis of the strength of relations between nitrogen and biotic indices and conform to the suite of EPA guidance.

4. Proposal of criteria

   Whether the Department of Natural Resources proposes criteria or pursues the option of showing that nitrogen criteria are not needed will be determined after the scientific analysis in the step 3 above is completed..

5. Adoption of criteria

   Any proposed criteria will need to go through Wisconsin's process for adoption of administrative rule development. Generally, this includes approval from the Natural Resources Board and Governor to pursue rule development, convening of a stakeholder advisory committee, presentation of proposed rules for public comment, development of an economic impact analysis, approval by the Natural Resources Board, legislative review and approval by EPA. Often this is at least a three year process. Included in the review process is an assessment of whether nearby states have adopted similar water quality standards criteria.

Nitrogen Standards – Groundwater and Drinking Water

Wisconsin has adopted nitrogen water quality standards for groundwater and drinking water. Specifically, ch. NR 140, Wis. Adm. Code, includes a concentration of 10 mg/L nitrate (expressed as N) as the enforcement standard for groundwater. Similarly, ch. NR 809, Wis. Adm. Code identifies a nitrate concentration of 10 mg/L as a maximum contaminant level for drinking water. Chapter NR 809 also identifies 1 mg/L as a maximum contaminant level for nitrite.

Appendix 1. Wisconsin's Nutrient Reduction Framework HUC 10 Data Table

The following table contains summary information for all HUC 10s in Wisconsin. The table rows are divided by major basin: Lake Superior (listed first), Lake Michigan (listed second), and Mississippi River (listed third). The table includes thirteen columns with information about each HUC 10 watershed. Below is a column-by-column description.

Columns 1 and 2 are watershed identifiers.

1. **HUC 10 Code.** The federal Hydrologic Unit Classification 10-digit number for the watershed. HUC 10s do span state boundaries and some have very small areas in Wisconsin.

2. **HUC 10 Name.** The federal Hydrologic Unit Classification 10-digit watershed official name.

Columns 3 ("% agriculture") through 8 ("Contains ORW/ERW Water") provide contextual information about each watershed to supplement the ranking information in columns 9 through 13.

3. **% Agriculture.** The percent of the land area within the HUC 10 watershed in agricultural use (source: Wisconsin statewide GIS land cover and hydrography data sets)

4. **% Urban.** The percent of the land area within the HUC 10 watershed in urban use (source: Wisconsin statewide GIS land cover and hydrography data sets)

5. **PRESTO PS NPS Ratio.** The percent of the phosphorus contribution within the HUC 10 watershed estimated from point sources and nonpoint sources using the Pollutant Load Ratio Estimation Tool (PRESTO). The wastewater point source information is from the 2009-2011 Discharge Monitoring Reports submitted by the facilities. The nonpoint source contribution is based on a suite of models with the middle range result used. The values are expressed as percentages.

6. **Contains Nutrient/Sediment Impaired Water.** Identifies if the HUC 10 watershed includes a water body listed as impaired for nutrients or sediments. Information is based on the 2012 303(d) list. Since sediment impaired waters generally require similar management of phosphorus impaired waters, they are also included as reference information. In a few cases, bacteria impaired waters are included. None of the waters are impaired due to total nitrogen.

7. **Within Approved TMDL**. Identifies if the HUC 10 watershed is within the basin or watershed included in an EPA approved TMDL.

8. **Contains ORW/ERW Water.** Identifies if the HUC 10 watershed contains a state Outstanding Resource Water (ORW) or Exceptional Resource Water (ERW).

Columns 9A through 12 contain ranking information separately for phosphorus and nitrogen. HUC 10s with only a few square miles in Wisconsin are not given values and are marked "na". For these columns, HUC 10 watersheds in the Lake Superior Basin were not ranked (see additional notes below).

9. **TP Yield Decile (SPARROW Model)**. This column has two parts. Both are based on phosphorus attributes of the USGS SPARROW model for nonpoint sources. Yields are loads per unit area, such as pounds per acre per average year. The left part ("Incr.") contains the incremental yield for use when considering local impacts. The right part ("Del'd") contains the delivered yield for use when considering transport of phosphorus to downstream waters, such as the Mississippi River or Lake Michigan. All values are expressed in deciles. For example, the highest 10 percent are in decile 10, while the lowest 10 percent are in decile 1. HUC 10 watersheds in the Lake Superior Basin were not ranked as the decile range is comparable to deciles 1-4 for Lake Michigan and Mississippi River.

10. **TP Concentration Decile (monit'd).** This column uses monitored stream information to rank HUC 10 watersheds based on median growing season phosphorus concentrations. Deciles are based on highest to lowest concentrations. Over 80 percent of the information is from a 2006 to 2011 WDNR rotation watershed study of watersheds (described in chapter 8) where, if practical, the downstream "pour" point was measured. A minimum of four samples was needed to use the information. For about 10 percent of the HUC 10 watersheds, information from similar studies was used. For the remaining HUC 10s, results were extrapolated from similar, nearby HUC 10s. For deciles 1 through 4, the median concentrations were less than the Wisconsin water quality standards criterion for phosphorus. HUC 10 watersheds in the Lake Superior Basin were not ranked as the decile range is comparable to deciles 1-4 for Lake Michigan and Mississippi River.

11. **TN Yield Decile (SPARROW Model).** This column has two parts. Both are based on nitrogen attributes of the USGS SPARROW model for nonpoint sources. Yields are loads per unit area, such as pounds per acre per average year. The left part ("Incr.") contains the incremental yield for use when considering local impacts. The right part ("Del'd") contains the delivered yield for use when considering transport of nitrogen to downstream waters, such as the Mississippi River or Lake Michigan. All values are expressed in deciles. For example, the highest 10 percent are in decile 10, while the lowest 10 percent are in decile 1. HUC 10 watersheds in the Lake Superior Basin were not ranked as the decile range is comparable to deciles 1-4 for Lake Michigan and Mississippi River.

12. **TN Concentration Decile (monit'd).** This column uses monitored stream information to rank HUC 10 watersheds based on median growing season total nitrogen concentrations. Deciles are based on highest to lowest concentrations. Over 80 percent of the information is from a 2006 to 2011 WDNR rotation watershed study of watersheds (described in chapter 8) where, if practical, the downstream "pour" point was measured. A minimum of four samples was needed to use the information. For about 10 percent of the watersheds, only nitrite-nitrate results were used due to the lack of laboratory results for Total Kjeldahl Nitrogen. For about 5 percent of the HUC 10 watersheds, information from similar studies

was used. For the remaining HUC 10s, results were extrapolated from similar, nearby HUC 10s. HUC 10 watersheds in the Lake Superior Basin were not ranked as the decile range is comparable to deciles 1-4 for Lake Michigan and Mississippi River.

13. **Safe Drinking Water Nutrient Impacts.** The last column also uses decile ranking of watersheds with safe drinking water nutrient impacts. The deciles are based on the number and frequency of public drinking water wells located in the HUC 10 watershed with nitrate concentrations exceeding 5 mg/L based on samples from the wells reported to WDNR. A HUC 10 ranking high would have a number of public wells with a high percent with nitrate levels exceeding 5 mg/L. A HUC 10 ranking low could have low concentrations, few wells or only a small number of the wells with concentrations exceeding 5 mg/L.

HUC 10 CODE	HUC 10 NAME	% Agr	% Urban	PRESTO PS NPS Ratio	Contains Nutrient/Sediment Impaired Water	Within Appr'd TMDL	Contains ORW/ ERW Water	TP Yield Decile (SPARROW Model) (1) Incr.	TP Yield Decile (SPARROW Model) (1) Del'd	TP Conc Decile (Monit'd)	TN Yield Decile (SPARROW Model) (1) Incr.	TN Yield Decile (SPARROW Model) (1) Del'd	TN Conc Decile (Monit'd)	Safe Drinking Water Nutrient Impacts
	Lake Superior Basin													
0401020116	St. Louis River	2	19	25:75			Yes			1-4			1-3	1
0401030101	South Fork Nemadji River	13	3	0:100						1-4			1-3	1
0401030102	Upper Nemadji River	-	-	0:100						1-4			1-3	1
0401030103	Black River	4	2	0:100			Yes			1-4			1-3	1
0401030104	Middle Nemadji River	8	3	0:100	Yes		Yes			1-4			1-3	1
0401030105	Lower Nemadji River	15	9	0:100	Yes		Yes			1-4			1-3	1
0401030106	Amnicon River-Frontal Lake Superior	12	4	0:100			Yes			1-4			1-3	1
0401030107	Bois Brule River	2	5	2:98			Yes			1-4			1-3	1
0401030108	Iron River-Frontal Lake Superior	8	6	5:95			Yes			1-4			1-3	1
0401030109	Bayfield Pen NW-Frontal L Superior	3	4	1:99			Yes			1-4			1-3	1
0401030110	Bayfield Peninsula SE-Fr Lake Superior	4	4	0:100			Yes			1-4			1-3	1
0401030111	Fish Creek-Frontal Chequamegon Bay	18	6	0:100			Yes			1-4			1-3	1
0401030201	Montreal River	2	5	4:96			Yes			1-4			1-3	1
0401030202	Tyler Forks	2	3	0:100			Yes			1-4			1-3	1
0401030203	Headwaters Bad River	1	4	3:97			Yes			1-4			1-3	1
0401030204	Marengo River	12	4	0:100			Yes			1-4			1-3	1
0401030205	Potato River	4	3	0:100			Yes			1-4			1-3	1
0401030206	White River	6	3	0:100			Yes			1-4			1-3	1
0401030207	Bad River	2	2	0:100						1-4			1-3	1
0402010102	Black River	-	2	0:100						1-4			1-3	1
0402010103	Presque Isle River	0	5	0:100						1-4			1-3	3
0402010201	South Branch Ontonagon River	0	4	0:100						1-4			1-3	1
	Lake Michigan Basin													
0403010101	East Twin River-Frontal Lake Michigan	70	7	0:100			Yes	7	8	*5*	10	10	8	5
0403010102	West Twin River	73	8	3:97	Yes			10	10	*5*	9	9	7	6
0403010103	North Branch Manitowoc River	73	7	7:93	Yes			10	10	10	10	10	9	1
0403010104	South Branch Manitowoc River	70	7	7:93	Yes			9	9	10	9	9	9	10
0403010105	Branch River	75	6	2:98			Yes	9	10	6	9	9	10	8
0403010106	Manitowoc River-Frontal Lake Michigan	62	12	5:95	Yes		Yes	7	8	9	8	9	9	9
0403010107	Sevenmile & Silver Crs-Frontal L Mich	75	10	1:99	Yes			9	9	9	10	10	8	1
0403010108	Pigeon River	71	11	4:96				10	10	8	10	10	10	1
0403010109	Mullet River	56	10	32:68			Yes	6	7	8	10	10	9	1
0403010110	Onion River	76	7	21:79	Yes		Yes	6	8	9	10	10	4	1
0403010111	Sheboygan River-Frontal Lake Michigan	60	11	12:88	Yes		Yes	7	7	8	8	8	5	6
0403010112	Black R, Sauk & Sucker Crs-Frl L. Mich	67	17	10:90				8	8	10	10	10	7	1
0403010201	Upper Door Peninsula	41	9	3:97			Yes	5	6	*1*	4	7	9	7
0403010202	Ahnapee River and Stony Creek	70	6	2:98	Yes			8	9	7	7	8	7	5
0403010203	Kewaunee River	78	6	1:99			Yes	10	10	*4*	10	10	8	4
0403010204	Red River and Sturgeon Bay	60	8	0:100			Yes	8	9	7	7	8	10	3
0403010301	Pensaukee River-Frontal Green Bay	51	6	1:99				7	8	7	7	8	4	1
0403010302	Suamico & L. Suamico Rs-F Green Bay	60	8	0:100				5	7	9	7	8	6	1
0403010401	South Branch Oconto River	9	4	0:100			Yes	2	4	*2*	3	5	1	5
0403010402	North Branch Oconto River	5	4	7:93			Yes	2	4	*3*	2	4	3	4

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								Incr.	Del'd		Incr.	Del'd		
0403010403	Peshtigo Brook	7	4	0:100				2	4	3	2	5	5	2
0403010404	Little River	55	5	1:99				7	8	7	6	7	4	1
0403010405	Oconto River	38	8	21:79			Yes	5	6	4	5	7	5	4
0403010501	Rat River	3	3	6:94			Yes	2	3	3	2	2	1	1
0403010502	Upper Peshtigo River	5	3	0:100			Yes	2	3	3	2	3	1	1
0403010503	Middle Inlet-Lake Noquebay	14	5	0:100			Yes	1	2	1	3	3	2	3
0403010504	Middle Peshtigo River	4	4	11:89			Yes	2	4	2	1	2	3	6
0403010505	Little Peshtigo River	42	5	5:95			Yes	4	6	6	5	7	5	7
0403010506	Lower Peshtigo River	31	8	7:93				4	6	6	4	6	7	2
0403010601	North Branch Paint River	-	-	0:100				na	na	na	na	1	3	1
0403010603	Iron River-Brule River	1	3	0:100			Yes	3	4	2	1	1	2	1
0403010605	Brule River	7	3	0:100			Yes	1	3	2	2	3	2	1
0403010801	Popple River	2	2	0:100			Yes	1	3	2	1	2	2	1
0403010802	Pine River	2	2	0:100			Yes	2	3	1	1	2	2	2
0403010805	Pemebonwon River	4	4	0:100			Yes	1	2	1	1	3	1	8
0403010806	Pike River	3	4	0:100			Yes	1	3	1	2	3	1	1
0403010807	Squaw Creek-Menominee River	9	5	48:52			Yes	4	5	3	2	3	2	4
0403010809	Menominee River	13	6	33:67			Yes	2	4	3	3	5	1	3
0403020101	Swan Lake-Fox River	63	6	0:100				5	4	1	7	4	10	9
0403020102	Neenah Creek	49	5	10:90	Yes		Yes	4	2	4	6	4	5	7
0403020103	Montello River	42	6	13:87			Yes	3	1	7	4	2	7	9
0403020104	Upper Grand River	81	6	33:67				9	6	9	9	6	10	7
0403020105	Lower Grand River	62	4	0:100				5	5	7	6	5	10	9
0403020106	Buffalo and Puckaway Lakes-Fox River	42	6	6:94	Yes			4	2	6	5	3	5	8
0403020107	Mecan River	38	5	0:100			Yes	3	1	2	4	3	8	4
0403020108	White River	37	7	13:87			Yes	3	2	3	4	4	7	8
0403020109	Big Green Lake	63	8	12:88	Yes		Yes	7	1	4	5	1	10	6
0403020110	Rush Creek	67	4	0:100				7	6	8	9	7	8	7
0403020111	City of Berlin-Fox River	54	5	20:80	Yes		Yes	5	5	4	7	6	5	5
0403020112	Lake Butte des Mortes	56	19	57:43	Yes			8	6	10	8	6	7	2
0403020201	Swamp Creek	4	4	0:100			Yes	1	1	3	1	1	2	5
0403020202	Lily River	5	4	0:100			Yes	1	1	2	2	1	1	6
0403020203	Evergreen River-Wolf River	7	4	0:100			Yes	2	1	3	2	1	3	5
0403020204	West Branch of the Wolf River	9	4	0:100			Yes	3	1	2	3	1	3	3
0403020205	Red River	24	4	6:94			Yes	3	2	2	4	2	3	8
0403020206	Shawano Lake	29	9	0:100			Yes	4	3	6	3	2	3	3
0403020207	Legend Lake-Wolf River	6	5	0:100			Yes	3	2	4	3	2	4	
0403020208	Shioc River	65	6	4:96			Yes	8	6	10	8	6	8	2
0403020209	School Section Creek-Wolf River	38	6	28:72			Yes	6	5	5	6	5	9	2
0403020210	Middle & South Branches Embarrass R	32	6	6:94			Yes	5	4	5	4	3	4	8
0403020211	Pigeon River	47	7	20:80			Yes	6	5	8	6	5	4	9
0403020212	North Branch & Mainstem Embarrass R	38	5	11:89			Yes	5	4	5	5	4	5	9
0403020213	Bear Creek-Embarrass River	62	5	2:98	Yes		Yes	9	6	9	8	6	6	5
0403020214	Bear Creek-Wolf River	59	10	16:84			Yes	10	7	9	8	6	9	1
0403020215	Flume Creek-Little Wolf River	32	4	0:100			Yes	3	2	4	3	2	6	9
0403020216	South Branch of the Little Wolf River	41	5	12:88			Yes	4	3	4	5	4	8	5
0403020217	Blake Creek-Little Wolf River	50	5	1:99			Yes	6	5	4	6	5	6	7

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								Incr.	Del'd		Incr.	Del'd		
0403020218	Waupaca River	51	7	21:79			Yes	4	3	*5*	5	4	6	10
0403020219	Partridge Lake-Wolf River	47	6	16:84			Yes	6	5	6	6	4	8	5
0403020220	Willow Creek-Pine Rver	44	5	14:86	Yes	Yes	Yes	4	2	*5*	5	4	4	6
0403020221	Lake Poygan	57	6	6:94	Yes			5	5	9	7	5	8	8
0403020301	West Shore of Lake Winnebago	65	23	0:100	Yes			9	7	7	5	5	1	2
0403020302	Fond du Lac River	65	10	8:92	Yes	Yes	Yes	9	7	10	9	7	10	3
0403020303	East Shore of Lake Winnebago	65	17	4:96	Yes			8	7	9	7	7	10	7
0403020304	Lake Winnebago (2)	0	0	na	Yes			na	na	na	na	1	na	1
0403020401	Duck Creek-Frontal Green Bay	60	16	2:98	Yes	Yes		10	9	8	8	8	4	1
0403020402	Plum Creek-Fox River	43	40	70:30	Yes	Yes		10	10	10	8	9	6	1
0403020403	East River	65	20	3:97	Yes	Yes		10	10	10	9	9	5	1
0403020404	Fox River-Frontal Green Bay	55	30	53:47	Yes	Yes		10	10	10	9	9	6	1
0404000201	Oak Creek-Frontal Lake Michigan	10	61	89:11	Yes			7	8	*5*	4	7	3	1
0404000202	Root River Canal	78	8	11:89	Yes			8	9	8	10	10	2	1
0404000203	Root River	35	42	7:93	Yes			8	9	8	3	6	2	1
0404000204	Pike River-Frontal Lake Michigan	32	47	43:57	Yes			8	9	7	8	9	7	1
0404000205	Waukegan River-Frontal Lake Michigan	26	32	0:100				na	na	na	na	1	na	1
0404000301	North Branch Milwaukee River	65	6	13:86	Yes		Yes	6	7	7	9	9	9	2
0404000302	East & West Brs Milwaukee R-Milw R	52	10	23:77			Yes	6	7	*5*	6	8	7	8
0404000303	Cedar Creek	55	14	31:69				6	8	*6*	7	8	6	7
0404000304	Menomonee River	18	61	66:34	Yes			9	9	6	3	6	9	5
0404000305	Kinnickinnic River	-	83	31:69	Yes			9	10	6	4	7	3	1
0404000306	Milwaukee River-Frontal Lake Michigan	29	45	29:71	Yes			7	8	8	6	8	6	2

(1) The SPARROW incremental yield should be used when considereing nutrient contributions to nearby waters. The SPARROW delivered yield should be used when considering nutrient contributions to Lake Michigan

(2) The Lake Winnebago HUC 10 only consists of the lake itself.

"na" is used when the HUC 10 has less than a few square miles of land in Wisconsin

Phosphorus concentrations less than the water quality standards criterion of 0.075 mg/L (75 ug/L) are in italics

	Mississippi River Basin													
0703000101	Upper St. Croix-Eau Claire Rivers	1	6	0:100		Yes	Yes	1	1	*1*	1	1	1	1
0703000102	Moose River-Saint Croix River	1	3	0:100		Yes	Yes	2	2	*2*	2	2	3	1
0703000103	Upper Tamarack River	1	2	0:100		Yes	Yes	3	3	*2*	2	2	1	1
0703000104	Shell Lake-Yellow River	24	7	1:99		Yes	Yes	2	2	*4*	2	2	3	1
0703000105	Yellow Lake-Yellow River	7	6	0:100	Yes	Yes	Yes	2	1	*2*	2	2	1	5
0703000106	Lower Tamarack River	0	1	0:100		Yes		2	2	*2*	2	2	1	1
0703000108	North Fork of the Clam River	28	4	0:100		Yes	Yes	3	3	5	1	1	1	2
0703000109	Clam River	18	5	2:98		Yes	Yes	3	3	*4*	3	3	1	1
0703000112	Chases Brook-Saint Croix River	4	4	0:100		Yes	Yes	2	2	*3*	2	2	3	1
0703000201	Upper Namekagon River	4	5	0:100		Yes	Yes	1	1	*1*	2	2	1	3
0703000202	Trego Lake-Namekagon River	9	6	0:100		Yes	Yes	2	2	*1*	2	2	1	2
0703000203	Totagatic River	2	4	0:100		Yes	Yes	1	1	*2*	1	1	1	1
0703000204	Namekagon River	5	5	0:100		Yes	Yes	1	1	*1*	2	2	1	1
0703000501	Wood River	28	5	13:87		Yes		2	2	*4*	3	3	1	3

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								Incr.	Del'd		Incr.	Del'd		
0703000502	Goose Creek-Saint Croix River	1	4	0:100		Yes	Yes	1	1	2	2	2	3	1
0703000505	Trade River	28	5	4:96		Yes		3	3	2	3	3	1	1
0703000506	Wolf Creek-Saint Croix River	44	4	0:100		Yes	Yes	3	4	3	4	4	3	3
0703000507	Beaver Brook-Apple River	37	5	6:94		Yes	Yes	3	4	5	4	4	5	6
0703000508	Balsam Branch-Apple River	48	6	7:93	Yes	Yes	Yes	3	3	5	4	4	3	8
0703000509	Big Marine Lake-Saint Croix River	45	7	58:42		Yes	Yes	5	5	3	4	4	7	8
0703000510	Willow River	65	7	3:97	Yes	Yes	Yes	6	6	6	5	6	8	10
0703000511	Kinnickinnic River	73	8	8:92		Yes	Yes	7	6	3	7	7	9	10
0703000512	Lake Saint Croix	45	14	71:29	Yes	Yes	Yes	5	5	3	4	5	9	8
0704000101	Big River-Mississippi River	65	6	4:96	Yes		Yes	7	7	3	6	7	8	9
0704000103	Trimbelle River	63	6	0:100			Yes	5	5	3	6	7	8	10
0704000104	Hay Creek-Mississippi River	31	16	45:55	Yes			na	na	na	na	na	na	9
0704000105	Rush River	70	7	5:95			Yes	9	9	1	8	8	9	9
0704000107	Lake Pepin	47	6	7:93				8	8	1	6	6	8	7
0704000301	Harvey Creek-Buffalo River	52	6	1:99	Yes		Yes	6	6	10	7	7	7	8
0704000302	Elk Creek-Buffalo River	43	4	0:100				7	7	10	7	7	8	2
0704000304	Waumaundee Creek	41	4	0:100	Yes	Yes		7	7	10	8	8	6	6
0704000306	City of Winona-Mississippi River	18	5	9:91	Yes	Yes		5	6	10	5	5	6	7
0704000501	Pigeon Creek	50	5	0:100				6	6	10	7	8	6	4
0704000502	Upper Trempealeau River	45	5	3:97	Yes	Yes	Yes	5	5	10	6	7	7	4
0704000503	Elk Creek	54	4	0:100				7	7	10	8	8	7	7
0704000504	Middle Trempealeau River	56	5	2:98	Yes	Yes		9	9	9	8	9	8	1
0704000505	Lower Trempealeau River	48	4	6:94	Yes	Yes		8	8	9	7	8	5	8
0704000601	Halfway Creek-Mississippi River	29	11	20:80	Yes			5	6	10	4	5	7	10
0704000602	Upper La Crosse River	14	8	3:97	Yes	Yes	Yes	4	4	4	4	4	2	5
0704000603	Middle La Crosse River	46	6	6:94	Yes		Yes	6	7	7	6	7	7	4
0704000604	Lower La Crosse River	38	11	3:97	Yes	Yes	Yes	7	7	8	5	6	7	3
0704000605	Pine Creek-Mississippi River	3	42	94:6				5	5	3	4	5	5	9
0704000701	Black-Little Black Rivers	36	6	8:92				5	5	7	4	4	5	2
0704000702	Popple River	68	5	9:91				10	10	10	9	9	4	6
0704000703	Trappers-Pine Creeks-Black River	45	4	7:93				9	9	5	9	9	2	4
0704000704	Rock Creek-Black River	68	5	2:98				10	10	9	10	10	4	10
0704000705	Wedges Creek	20	4	0:100				3	4	4	4	4	3	4
0704000706	East Fork of the Black River	13	3	0:100				2	3	3	3	3	3	1
0704000707	Morrison Creek	3	4	0:100			Yes	1	1	2	2	2	2	3
0704000708	Halls Creek	38	5	1:99			Yes	3	4	1	5	6	7	4
0704000709	Lake Arbutus-Black River	47	5	4:96			Yes	9	9	9	7	7	4	3
0704000710	Robinson Creek-Black River	15	7	5:95			Yes	2	3	5	3	4	3	5
0704000711	Beaver Creek	41	5	4:96	Yes		Yes	6	6	9	6	7	6	4
0704000712	Fleming Creek-Black River	34	5	1:99	Yes	Yes	Yes	4	4	10	5	5	7	10
0705000101	West Fork Chippewa River	0	3	0:100			Yes	2	1	2	2	1	1	1
0705000102	East Fork Chippewa River	2	3	0:100			Yes	2	2	3	2	2	1	1
0705000103	Lake Chippewa	2	3	0:100			Yes	1	1	1	1	1	2	4
0705000104	Couderay River	9	5	0:100			Yes	2	2	1	2	2	1	4
0705000105	Brunet River-Chippewa River	8	3	0:100			Yes	3	3	2	3	3	2	1
0705000106	Thornapple River	5	2	0:100			Yes	3	3	3	2	3	3	3
0705000107	Soft Maple Creek-Chippewa River	19	4	1:99	Yes	Yes	Yes	3	3	4	3	3	2	6

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								Incr.	Del'd		Incr.	Del'd		
0705000108	Deer Tail Creek	30	5	1:99				5	5	5	4	4	3	1
0705000109	Holcolmbe Flowage-Chippewa River	14	4	0:100			Yes	3	3	6	3	3	4	7
0705000201	Manitowish River	0	5	0:100			Yes	1	1	1	1	1	1	5
0705000202	Bear River	1	5	0:100			Yes	1	1	1	1	1	2	2
0705000203	Flambeau Flowage-Headwaters Flambeau River	0	3	0:100			Yes	2	1	1	1	1	1	2
0705000204	Butternut Creek	10	4	0:100	Yes		Yes	3	3	2	2	2	2	1
0705000205	Upper Flambeau River	4	3	59:41			Yes	6	6	2	2	2	4	2
0705000206	Middle Flambeau River	1	2	0:100			Yes	2	2	2	2	2	2	1
0705000207	Lower Flambeau River	13	6	48:52			Yes	4	5	9	3	3	5	2
0705000301	Elk River	9	3	11:89	Yes		Yes	2	1	2	2	2	3	4
0705000302	Headwaters South Fork Flambeau River	2	3	0:100			Yes	1	1	2	1	1	3	3
0705000303	South Fork Flambeau River	4	2	3:97			Yes	2	2	4	2	2	4	1
0705000401	South Fork Jump River	7	3	4:96			Yes	3	3	5	2	2	3	1
0705000402	North Fork Jump River	13	3	2:98			Yes	4	4	8	3	3	3	1
0705000403	Main Creek	26	4	1:99			Yes	5	5	4	4	4	3	1
0705000404	Lower Jump River	22	3	1:99	Yes		Yes	4	4	4	3	3	4	3
0705000501	Fisher River-Chippewa River	35	4	7:93			Yes	5	5	6	5	5	4	7
0705000502	Upper Yellow River	19	3	1:99			Yes	4	4	6	3	3	4	1
0705000503	Lake Wissota	46	5	1:99	Yes	Yes		5	5	7	6	6	1	10
0705000504	Duncan Creek	68	8	2:98			Yes	8	8	9	8	8	4	10
0705000505	Trout Creek-Chippewa River	41	27	59:41			Yes	2	2	9	5	6	4	8
0705000506	Elk Creek	62	6	0:100			Yes	4	4	10	5	6	8	9
0705000507	Lowes Creek-Chippewa River	47	14	40:60	Yes	Yes	Yes	8	8	10	5	5	6	9
0705000508	Muddy Creek-Chippewa River	63	6	12:88	Yes			4	4	10	6	6	8	8
0705000509	Muddy Creek-Chippewa River	55	5	0:100				3	4	10	6	6	8	9
0705000510	Eau Galle River	61	6	6:94	Yes		Yes	4	5	6	4	4	5	5
0705000511	Plum Creek	58	5	1:99				5	6	6	8	8	7	3
0705000512	Bear Creek-Chippewa River	40	4	4:96	Yes			5	5	6	1	2	8	8
0705000601	North Fork Eau Claire River	52	5	4:96	Yes		Yes	7	6	5	7	6	4	5
0705000602	South Fork Eau Claire River	32	3	1:99	Yes	Yes		5	5	3	5	5	2	6
0705000603	Hay Creek-Eau Claire River	26	4	0:100			Yes	3	3	7	3	3	4	7
0705000604	Otter Creek	61	13	0:100				4	4	10	5	5	3	7
0705000605	Eau Claire River	46	7	1:99			Yes	4	4	6	4	5	5	9
0705000701	Red Cedar Lake	7	4	0:100		Yes	Yes	2	2	3	1	1	2	3
0705000702	Yellow River	54	6	2:98		Yes	Yes	7	7	7	6	6	7	5
0705000703	Brill River-Red Cedar River	35	7	8:92	Yes	Yes	Yes	4	4	4	3	3	3	8
0705000704	Lake Chetek	34	6	2:98	Yes	Yes	Yes	1	1	8	1	1	1	10
0705000705	South Fork of the Hay River	61	5	2:98		Yes		6	5	4	6	6	7	7
0705000706	Hay River	51	5	3:97		Yes	Yes	6	6	7	6	5	5	8
0705000707	Lower Pine Creek-Red Cedar River	57	5	2:98	Yes	Yes	Yes	5	5	8	7	6	9	10
0705000710	Lake Menomin-Red Cedar River	53	8	7:93	Yes	Yes		5	5	7	6	6	6	7
0706000101	Coon Creek	48	5	3:97			Yes	8	9	7	6	7	6	6
0706000103	Bad Axe River	56	6	7:93			Yes	9	9	6	7	8	6	7
0706000105	Mormon Creek-Mississippi River	29	5	5:95				7	7	3	4	5	5	5
0706000107	Rush Creek-Mississippi River	34	4	1:99	Yes		Yes	8	8	4	5	6	6	3
0706000110	Bloody Run-Mississippi River	24	9	32:68	Yes			8	9	4	4	5	5	1
0706000301	Upper Grant River	77	6	1:99	Yes	Yes	Yes	10	10	6	9	9	10	5

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0706000302	Middle Grant River	81	7	3:97				10	10	7	10	10	9	3
0706000303	Lower Grant River	77	5	0:100				10	10	8	10	10	10	5
0706000304	Little Platte River	82	7	2:98	Yes	Yes	Yes	10	10	8	10	10	10	8
0706000305	Platte River	76	5	1:99	Yes	Yes	Yes	10	10	6	10	10	9	3
0706000307	Sny Magill Creek-Mississippi River	38	5	6:94	Yes			10	10	5	7	8	8	4
0706000502	Sinsinawa River-Mississippi River	85	7	1:99	Yes			10	10	4	10	10	10	7
0706000503	Galena River	87	6	6:94	Yes		Yes	10	10	4	10	10	10	2
0706000505	South Fork Apple River-Apple River	93	4	0:100				10	10	4	10	10	10	1
0707000101	Deerskin River	2	4	11:89			Yes	1	1	2	1	1	1	1
0707000102	Eagle River	2	5	14:86			Yes	1	1	1	1	1	2	5
0707000103	Pioneer Creek-Wisconsin River	2	5	0:100			Yes	1	1	2	1	1	2	2
0707000104	Rainbow Flow-Mud Creek-Wisconsin R	4	4	0:100			Yes	1	1	3	1	1	2	7
0707000105	Gillmore Creek-Big St. Germain River	0	6	0:100			Yes	1	1	2	1	1	2	8
0707000106	Rhinelander Flowage-Upper Wisconsin R	4	5	8:92			Yes	1	1	1	1	1	2	5
0707000107	Pelican River	4	4	0:100			Yes	2	1	3	1	1	1	5
0707000108	Upper Tomahawk River	2	6	8:92			Yes	1	1	3	1	1	2	5
0707000109	Middle Tomahawk River	2	2	0:100			Yes	1	1	2	1	1	2	3
0707000110	Lower Tomahawk River	2	4	0:100			Yes	1	1	1	1	1	1	6
0707000111	Somo River	2	3	0:100			Yes	2	2	2	1	1	2	2
0707000112	Spirit River	5	3	0:100	Yes		Yes	3	2	5	2	1	1	2
0707000113	Lake Mohawksin-Lake Alice-Wisconsin R	5	6	86:14			Yes	2	1	2	2	1	2	2
0707000201	New Wood River	1	2	0:100			Yes	3	2	2	1	1	2	
0707000202	Copper River	12	2	0:100			Yes	3	3	5	3	2	3	
0707000203	Prairie River	11	5	4:96			Yes	2	2	3	2	2	2	3
0707000204	Alexander Lake-Wisconsin River	15	5	0:100			Yes	3	3	4	3	2	4	5
0707000205	Pine River	24	3	0:100			Yes	3	3	3	3	3	4	1
0707000206	Trappe River	30	4	0:100			Yes	6	5	3	4	4	4	1
0707000207	Black Creek	59	5	7:93			Yes	9	9	3	7	5	6	4
0707000208	Wood Creek-Big Rib River	22	4	1:99			Yes	5	4	4	6	5	2	3
0707000209	Little Rib River	55	6	0:100				6	5	2	6	5	6	9
0707000210	Scotch Creek-Big Rib River	60	9	10:90				8	7	6	8	6	5	8
0707000211	Spring Brook	46	6	30:70	Yes		Yes	4	3	7	8	6	9	10
0707000212	Black Brook-Eau Claire River	24	5	0:100			Yes	3	2	3	3	3	6	9
0707000213	Big Sandy Creek-Eau Claire River	40	7	0:100			Yes	5	4	3	5	4	4	9
0707000214	Eau Claire Flowage-Wisconsin River	35	18	62:38			Yes	10	9	4	5	4	4	6
0707000215	Dill Creek-Big Eau Pleine River	72	6	7:93	Yes		Yes	10	9	10	9	8	5	9
0707000216	Lake Dubay-Big Eau Pleine River	56	5	1:99	Yes			9	7	8	8	5	3	7
0707000217	Little Eau Pleine River	58	6	6:94				8	7	10	8	6	5	9
0707000218	Lake Dubay-Wisconsin River	26	7	56:44			Yes	7	6	4	4	3	5	6
0707000301	Plover River	34	8	0:100			Yes	4	4	1	4	4	7	10
0707000302	Mill Creek	66	8	32:68	Yes			8	8	9	9	8	1	2
0707000303	City of Stevens Point-Wisconsin River	36	11	75:25			Yes	7	6	9	5	4	1	9
0707000304	Fourmile Creek	59	10	0:100			Yes	4	4	1	5	5	10	10
0707000305	Tenmile Creek	63	5	0:100			Yes	3	2	1	5	5	5	10
0707000306	Fourteenmile Creek	46	9	0:100				2	2	1	4	4	3	6
0707000307	Petenwell Lake	19	9	88:12	Yes		Yes	8	7	4	3	3	3	6
0707000308	Big Roche a Cri Creek	35	6	0:100			Yes	2	2	1	4	5	7	6

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								Incr.	Del'd		Incr.	Del'd		
0707000309	Little Roche a Cri Creek	33	6	5:95			Yes	2	2	2	4	4	7	4
0707000310	Hemlock Creek	52	5	2:98				4	4	7	4	4	3	1
0707000311	Rocky Creek-Yellow River	59	6	2:98			Yes	8	8	10	7	8	5	4
0707000312	Cranberry Creek	20	5	0:100	Yes			7	6	1	3	3	2	1
0707000313	Mead Marsh-Yellow River	6	5	1:99				1	2	6	1	2	3	3
0707000314	Beaver Creek	4	3	0:100				1	2	5	2	3	4	1
0707000315	Upper Lemonweir River	32	8	2:98	Yes		Yes	4	4	7	3	4	5	10
0707000316	Middle Lemonweir River	38	6	4:96			Yes	3	4	7	5	6	5	2
0707000317	Lower Lemonweir River	49	7	4:96			Yes	4	5	6	6	6	4	6
0707000318	Petenwell Lake	25	6	0:100	Yes		Yes	2	2	3	3	4	7	5
0707000319	Dell Creek-Wisconsin River	36	9	14:86			Yes	4	5	5	4	5	6	10
0707000401	Headwaters of the Baraboo River	62	6	3:96	Yes		Yes	8	8	9	8	8	4	6
0707000402	Little Baraboo River-Baraboo River	60	6	4:96	Yes			9	9	8	8	9	5	4
0707000403	Narrows Creek-Baraboo River	62	7	14:86				9	9	9	9	9	5	9
0707000404	Devil's Lake-Baraboo River	44	9	8:92			Yes	7	7	8	7	8	6	5
0707000501	Duck Creek-Wisconsin River	57	5	6:94			Yes	6	6	5	7	7	8	10
0707000502	Prairie du Sac Dam-Wisconsin River	55	7	15:85	Yes		Yes	7	7	7	6	7	7	9
0707000503	Otter Creek-Wisconsin River	53	8	3:97			Yes	6	6	7	7	8	9	7
0707000504	Honey Creek	55	4	2:98				7	8	8	7	8	8	4
0707000505	Black Earth Creek	55	7	5:95	Yes		Yes	6	6	5	5	5	7	6
0707000506	Blue Mounds Creek	40	5	0:100			Yes	6	7	5	9	9	4	4
0707000507	Trout Creek-Mill Creek	41	5	0:100			Yes	7	8	7	7	8	6	7
0707000508	Otter Creek	50	4	0:100	Yes	Yes	Yes	9	9	5	8	9	6	3
0707000509	Bear Creek	42	4	0:100	Yes		Yes	5	6	9	5	7	6	1
0707000510	Willow Creek	49	4	1:99	Yes	Yes	Yes	6	7	6	7	8	9	1
0707000511	Pine River	48	5	6:94			Yes	9	10	7	6	7	4	5
0707000512	City of Spring Green-Wisconsin River	35	5	4:96	Yes		Yes	5	5	1	5	6	4	10
0707000513	Hoosier Hollow-Mill Creek	47	4	0:100			Yes	7	8	7	7	8	5	2
0707000514	Blue River	56	4	1:99	Yes	Yes	Yes	8	9	8	8	8	9	4
0707000515	Knapp Creek	38	4	0:100			Yes	7	7	5	6	7	5	1
0707000516	Big Green River	48	5	0:100			Yes	9	9	4	7	8	7	1
0707000517	City of Boscobel-Wisconsin River	35	6	2:98			Yes	7	7	3	5	7	7	8
0707000518	Wisconsin River	34	5	0:100			Yes	7	7	4	5	7	6	3
0707000601	Headwaters Kickapoo River	58	5	2:98			Yes	9	10	7	9	9	5	1
0707000602	West Fork Kickapoo River	57	5	0:100			Yes	8	9	4	7	8	6	3
0707000603	Bear Creek-Kickapoo River	43	5	2:98	Yes	Yes	Yes	8	8	9	7	8	5	4
0707000604	Tainter Creek-Kickapoo River	48	6	2:98			Yes	8	9	5	6	7	5	7
0707000605	Kickapoo River	41	4	1:99	Yes		Yes	8	9	5	6	7	7	1
0709000101	East Branch Rock River	72	8	13:87	Yes	Yes		8	7	10	8	6	8	7
0709000102	West Branch Rock River-Rock River	62	6	37:63	Yes	Yes		9	8	10	9	6	7	6
0709000103	Rubicon River	65	13	25:75		Yes		7	6	10	8	8	7	8
0709000104	Sinnissippi Lake-Rock River	71	7	17:83	Yes	Yes		8	8	10	8	7	8	2
0709000105	Oconomowoc River	43	18	42:58	Yes	Yes	Yes	3	3	4	7	7	3	8
0709000106	Ashippun River-Rock River	70	8	9:91	Yes	Yes		7	7	6	8	7	8	3
0709000107	Headwaters Crawfish River	80	5	3:97		Yes		8	8	7	9	9	9	9
0709000108	Maunesha River	77	7	6:94	Yes	Yes		9	8	9	10	9	8	9
0709000109	Beaver Dam River	72	7	26:74	Yes	Yes		8	6	10	8	6	7	8

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								Incr.	Del'd		Incr.	Del'd		
0709000110	Crawfish River	76	7	10:90	Yes	Yes		9	9	10	10	10	8	1
0709000111	Johnson Creek-Rock River	68	10	31:69	Yes	Yes		10	9	9	10	9	6	3
0709000201	Scupperenong River	57	5	25:75	Yes	Yes		6	6	7	8	7	6	3
0709000202	Whitewater River	64	9	31:69		Yes	Yes	7	6	8	8	7	9	7
0709000203	Bark River	48	15	26:74		Yes		7	6	9	7	6	7	9
0709000204	Koshkonong Creek	70	10	32:68		Yes		6	6	9	9	9	9	9
0709000205	Headwaters Yahara River	76	14	13:87	Yes	Yes		1	1	7	1	1	9	10
0709000206	Lake Mendota-Yahara River	53	24	3:97	Yes	Yes	Yes	1	1	8	1	1	10	10
0709000207	Lake Monona-Yahara River	27	43	7:93	Yes	Yes		5	4	4	3	3	4	10
0709000208	Badfish Creek	78	9	90:9	Yes	Yes	Yes	6	6	10	10	10	10	8
0709000209	Lake Kegonsa-Yahara River	66	12	18:82	Yes	Yes		6	5	9	9	9	9	10
0709000210	Lake Koshkonong-Rock River	61	9	49:51	Yes	Yes	Yes	8	8	9	8	8	9	10
0709000211	Blackhawk Creek	75	16	0:100	Yes	Yes		6	7	4	9	9	10	10
0709000212	Bass Creek	86	5	8:92	Yes	Yes	Yes	7	7	5	10	10	10	10
0709000213	Marsh Creek-Rock River	66	16	82:18	Yes	Yes		5	5	2	8	9	9	10
0709000214	Turtle Creek	76	11	21:79	Yes	Yes	Yes	7	7	4	10	10	10	10
0709000215	City of Beloit-Lower Rock River	65	21	69:31	Yes	Yes		10	10	5	9	9	9	10
0709000301	Mineral Point Branch	84	6	2:98	Yes			10	10	8	10	10	9	1
0709000302	Headwaters Pecatonica River	86	4	0:100	Yes			10	10	7	10	10	10	1
0709000303	Ames Branch-Pecatonica River	88	5	1:99				10	10	9	10	10	10	5
0709000304	Dodge Branch	75	7	2:98	Yes	Yes		10	10	8	9	9	8	3
0709000305	Blue Mounds Branch	69	5	0:100	Yes	Yes	Yes	9	10	6	9	9	9	5
0709000306	Ridgeway Br-East Br Pecatonica R	71	6	14:86	Yes			10	10	8	9	9	8	7
0709000307	Yellowstone River	75	4	0:100				10	10	8	9	9	8	2
0709000308	East Branch Pecatonica River	77	4	1:99	Yes	Yes		10	10	9	10	10	9	8
0709000309	Spafford Creek-Pecatonica River	86	5	1:99	Yes	Yes		10	10	9	10	10	10	4
0709000310	Honey Creek-Pecatonica River	79	7	3:96	Yes	Yes		10	10	8	10	10	10	7
0709000311	Richland Creek	89	7	0:100	Yes	Yes	Yes	10	10	6	10	10	10	3
0709000312	Waddams Creek-Pecatonica River	na	na	na				na	na	na	na	na	na	na
0709000315	Raccoon Creek	74	5	0:100			Yes	8	8	5	9	10	10	6
0709000316	Pecatonica River	na	na	na				na	na	na	na	na	na	na
0709000401	West Branch Sugar River	70	6	2:98			Yes	9	9	7	9	9	10	8
0709000402	Headwaters Sugar River	66	17	19:81	Yes		Yes	9	9	6	9	9	9	10
0709000403	Allen Creek	82	7	12:88			Yes	7	8	6	9	10	10	9
0709000404	Little Sugar River	75	5	2:98	Yes	Yes	Yes	9	9	8	10	10	10	7
0709000405	Story Creek-Sugar River	76	5	2:98			Yes	7	8	6	10	10	10	7
0709000406	Sylvester Creek-Sugar River	82	5	3:97	Yes	Yes	Yes	9	9	8	10	10	9	6
0709000407	Taylor Creek-Sugar River	76	5	4:96	Yes		Yes	8	8	9	9	10	9	9
0709000408	Sugar Creek	86	2	0:100				na	na	na	na	na	na	1
0709000501	Keith Creek-Rock River	na	na	na				na	na	na	na	na	na	na
0709000603	Piscasaw Creek	85	9	67:33				6	7	8	6	7	10	8
0712000401	Headwaters Des Plaines River	60	15	5:95				9	8	8	10	9	8	1
0712000402	Mill Creek	63	12	17:82				9	8	6	6	5	8	1
0712000403	Bull Creek-Des Plaines River	na	na	na				na	na	na	na	na	na	na
0712000601	Pewaukee River-Fox River	27	45	68:32	Yes			5	3	7	3	2	6	6
0712000602	Mukwonago River	45	17	0:100			Yes	4	3	1	4	3	5	9
0712000603	Wind Lake Drainage	55	17	15:85	Yes			6	4	7	5	4	9	2

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								Incr.	Del'd		Incr.	Del'd		
0712000604	Sugar Creek	68	10	0:100	Yes	Yes		4	3	5	8	5	8	6
0712000605	Honey Creek	67	8	6:94	Yes	Yes		3	2	5	7	4	8	6
0712000606	White River	47	18	17:83	Yes		Yes	4	3	6	5	3	6	6
0712000607	Eagle Creek-Fox Creek	47	19	42:58			Yes	4	3	8	6	3	9	6
0712000608	North Branch Nippersink Creek	64	13	12:88				6	4	8	8	4	10	3
0712000609	Nippersink Creek	94	4	0:100				9	5	8	9	4	10	1
0712000610	Squaw Creek-Fox River	51	14	45:55				4	3	6	9	5	6	2

Appendix 2. Wisconsin Watershed Rotation Water Quality Monitoring Data (Pour Point data)

DRAFT

Total Phosphorus (median May-October in mg/L) (minimum of 4 sample results)			
HUC 10	Watershed	Location Description	conc. (mg/l)
Lake Superior Basin			
0401030104	*Middle Nemadji River*	*NEMADJI RIVER - 50YDS ABOVE FINN RD BRIDGE*	*0.045*
0401030206	*WhiteRiver*	*WHITE RIVER DOWNSTREAM OF STH 13*	*0.044*
0401030203	*Headwaters Bad River*	*BAD RIVER*	*0.041*
0401030105	*Lower Nemadji*	*NEMADJI RIVER - AT CTH C, NEAR SOUTH SUPERIOR WI*	*0.040*
0401030204	*Marengo River*	*MARENGO RIVER - AT GOVERNMENT ROAD, NEAR HIGHBRIDGE*	*0.038*
0401030110	*Bayfield Peninsula SE -- Frontal LS*	*SIOUX RIVER - OFF OF FRIENDLY VALLEY RD*	*0.036*
0401030108	*Iron River -- Frontal Lake Superior*	*IRON RIVER - 100 METERS UPSTREAM OF ORIENTA FALLS*	*0.036*
0401030106	*Amnicon River -- Frontal Lake Superior*	*AMNICON RIVER - 464 METERS DOWNSTREAM OF HWY 13 STATION #1*	*0.035*
0401030109	*Bayfield Peninsula NW -- Frontal LS*	*BARK RIVER - HWY 13, STATION #1*	*0.035*
0401030111	*Fish Creek -- Front. Chequamegon Bay*	*NORTH FISH CREEK AT OLD US 2, NEAR MOQUAH WI*	*0.035*
0401030201	*Montreal River*	*MONTREAL RIVER - HWY 122*	*0.034*
0401030107	*Bois Brule River*	*BOIS BRULE RIVER WINNEBOUJOU CANOE LAUNCH*	*0.032*
0401030202	*Tyler Forks*	*TYLER FORKS, AT FOOTBRIDGE ABOVE BROWNSTONE FALLS*	*0.030*
0401030206	*White River*	*WHITE RIVER - AT SUTHERLAND BRIDGE TO PRIMITIVE CAMPSITE*	*0.027*
0402010103	*Presque Isle*	*CRAB CREEK - AT CTH B*	*0.021*
0401030205	*Potato River*	*POTATO RIVER - 10 METERS UPSTREAM OF POTATO RIVER RD*	*0.016*
Lake Michgian Basin			
0403010103	North Branch Manitowoc River	MANITOWOC RIVER - NORTH BRANCH RIVER VIEW RD	0.522
0403010112	Black, Sauk and Sucker Creeks	BLACK RIVER AT INDIAN MOUND RD	0.382
0403010104	South Branch Manitowoc River	SOUTH BRANCH MANITOWOC RIVER AT LEMKE ROAD	0.354
0403020302	Fond du Lac River	Fond du Lac River -- comparable data set	0.296
0403020402	Plum Creek -- Fox River	PLUM CREEK - COUNTY HWY ZZ BRIDGE WRIGHTSTOWN	0.288
0403020404	Fox River -- Frontal Green Bay	APPLE CREEK - ROSIN RD	0.286
0403020208	Shioc River	SHIOC RIVER AT STH 187 BRIDGE	0.255
0403020403	East River	BOWER CREEK (1) 50M UPSTREAM OF HWY GV	0.255
0403020112	Lake Butte des Mortes	SPRING BROOK - AT HWY 21	0.252
0403010106	Manitowoc River -- Fr Lake Michigan	MUD CREEK - HILLTOP ROAD	0.243
0403020214	Bear Creek -- Wolf River	BEAR CREEK AT STH 76 IN STEPHENS	0.241
0403020402	Plum Creek -- Fox River (2)	UNNAMED TRIB TO LAKE WINNEBAGO AT OLD HIGHWAY RD	0.236
0403020104	Upper Grand River	Grand River upstream of Markesan -- comparable data set	0.234
0403010107	Sevenmile & Silver Crs. Fr. Lake Mich	multiple streams -- Sevenmile -- Silver watershed	0.230
0403020221	Lake Poygan	ARROWHEAD RIVER - OAKRIDGE (LAKEVIEW) ROAD	0.222
0403010112	Black, Sauk and Sucker Creeks (2)	SAUK CREEK - SOUTH WISCONSIN STREET	0.213
0403020213	Bear Creek -- Embarrass River	BEAR CREEK	0.211
0403010302	Suamico and Little Suamico	LITTLE SUAMICO RIVER AT CTH J	0.201
0403020402	Plum Creek -- Fox River	FOX RIVER - AT KIMBERLY BOAT LANDING	*0.196*
0403020303	East Shore Lake Winnebago	DE NEVEU CREEK AT 4TH ST (CTH T)	0.182
0403010110	Onion River	ONION RIVER - UPSTREAM OF BROADWAY STREET	0.175

0403020402	Plum Creek -- Fox River (2)	KANKAPOT CREEK - CTH Z DODGE STREET	0.174
0403010108	Pigeon River	PIGEON RIVER - COUNTY HIGHWAY LS	0.173
0403020213	Black, Sauk and Sucker Creeks (2)	SUCKER CREEK - SUCKER BROOK LANE	0.171
0403020221	Lake Poygan (2)	RAT RIVER - SOUTH ROAD	0.162
0403010109	Mullet River	MULLET RIVER - AT CTY HWY M	0.149
0403020110	Rush Creek	WAUKAU CREEK - AT CTH E	0.146
0404000202	Root River Canal	Root River Canal -- exptrapolated from Root River	0.142
0404000203	Root River	100M UPSTREAM OF MEMORIAL DRIVE BRIDGE	0.142
0404000306	Milwaukee River -- Frontal Lake Mich	Milwaukee River -- comparable data set	0.132
0403010111	Sheboygan River -- Fr. Lake Michigan	SHEBOYGAN RIVER - 14TH ST	0.127
0403020211	Pigeon River (Waupaca)	PIGEON RIVER - AT KLEMP ROAD	0.126
0403020401	Duck Creek - Fr. Green Bay	DUCK CREEK - VELP AVE BRIDGE HOWARD	0.124
0403010204	Red River and L. Sturgeon Bay	SUGAR CREEK - SUGAR CREEK COUNTY PARK	0.122
0404000204	Pike River -- Frontal Lake Michigan	PIKE RIVER - AT HWY E	0.121
0404000301	North Branch Milwaukee River	MILWAUKEE RIVER NORTH BRANCH @ HWY M	0.115
0403020402	Plum Creek -- Fox River (2)	NEENAH SLOUGH	0.112
0403010404	Little River	LITTLE RIVER - AT STH 22	0.108
0403010301	Pensaukee River -- Fr. Green Bay	PENSAUKEE RIVER - AT CTH S BRIDGE	0.103
0403020105	Lower Grand River	GRAND RIVER - AT CTH H, NEAR KINGSTON WI	0.102
0403010202	Ahnapee River -- Stony Creek	AHNAPEE RIVER - CTH X NR FORESTVILLE	0.100
0403020402	Plum Creek -- Fox River (2)	MUD CREEK AT CTH BB	0.100
0403020103	Montello River	KLAWITTER CREEK #1	0.097
0403020301	West Shore L. Winnebago	LAKE WINNEBAGO TRIB - CTH A	0.093
0403020101	Swan Lake -- Fox River	Fox R upstr of Swan Lake -- extrapolated from Belle Fountain Creek	0.091
0403010506	Lower Peshtigo River	TROUT CREEK - TOWNLINE ROAD	0.090
0404000304	Menomonee River	LITTLE MENOMONEE 2 (AT DONGES BAY RD)	0.090
0403020106	Buffalo & Puckaway Lakes -- Fox R	FOX RIVER - GRAND RIVER LOCKS ACCESS	0.089
0403020206	Shawano Lake	PICKEREL CREEK @ JAMES ST	0.087
0403010505	Little Peshtigo River	LITTLE PESHTIGO RIVER - AT CTH W	0.083
0403020219	Partridge L - Wolf River	WOLF RIVER - SHAW LANDING ACCESS	0.080
0404000305	Kinnickinnic River	KINNICKINNIC RIVER - AT 11TH STREET, AT MILWAUKEE WI	0.078
0403010105	Branch River	BRANCH RIVER AT N UNION RD	0.076
0404000303	*Cedar Creek*	*CEDAR CREEK - CEDAR CREEK AND LAKEFIELD ROAD*	*0.075*
0404000302	*East & West Br Milwaukee*	*MILWAUKEE RIVER - AT CTH A (BI)*	*0.075*
0403010101	*East Twin River - Fr. Lake Michigan*	*EAST TWIN RIVER - STEINERS CORNERS*	*0.073*
0403020213	*Bear Creek-- Embarrass (2)*	*EMBARRASS R @ SPUR RD*	*0.073*
0403020212	*North Br. & Mainstem Embarrass*	*EMBARRASS RIVER - AT CTH M*	*0.073*
0403020210	*Middle and South Br. Embarrass R*	*MIDDLE BRANCH EMBARRASS RIVER - AT WEASEL DAM ROAD*	*0.070*
0403010102	*West Twin River*	*WEST TWIN RIVER - HWY Q*	*0.070*
0403020219	*Partridge L - Wolf River (2)*	*WOLF RIVER - GILLS LANDING ACCESS*	*0.069*
0403020212	*North Br & Mainstem Embarrass R (2)*	*EMBARRASS RIVER - WEST MAIN STREET (CTH C)*	*0.068*
0403020209	*School Section Cr -- Wolf River*	*ROSE BROOK - ROSE BROOK ROAD*	*0.066*
0403020218	*Waupaca River*	*WAUPACA RIVER AT WEYAUWEGA DAM*	*0.064*
0404000201	*Oak Creek -- Fr Lake Michigan*	*OAK CREEK - AT OAK CR PARKWAY 3M (BI)*	*0.061*
0403010202	*Ahnapee River -- Stony Creek (2)*	*STONY CREEK - AT ROSEWOOD RD*	*0.059*
0403020220	*Willow Creek -- Pine Rivers*	*WILLOW CREEK AT CTH D*	*0.059*
0403010203	*Kewaunee River*	*KEWAUNEE RIVER - AT CTH F, NEAR KEWAUNEE WI*	*0.054*

0403020109	*Big Green Lake*	*DAKIN CREEK - MAUG ROAD*	*0.054*
0403020215	*Flume Creek -- Little Wolf River*	*Flume Creek -- extrapolated from South Branch Little Wolf River*	*0.051*
0403020216	*South Branch Little Wolf*	*S BRANCH LITTLE WOLF R 20FT UP STREAM FROM BRIDGE SUNNYVIEW RD*	*0.051*
0403010405	*Oconto River*	*SPLINTER CREEK AT STILES ROAD*	*0.050*
0403020111	*City of Berlin -- Fox River*	*Barnes Creek -- comparable data set*	*0.049*
0403020219	*Partridge Lake -- Wolf River (2)*	*WALLA WALLA CREEK - MARSH ROAD BRIDGE*	*0.048*
0403020102	*Neenah Creek*	*HEENAH CREEK-HWY 23*	*0.042*
0403020207	*Legend Lake -- Wolf River*	*WOLF RIVER - WOLF RIVER CANOE LAUNCH 1*	*0.042*
0403020217	*Blake Creek -- Little Wolf River*	*WHITCOMB CREEK UPSTREAM FROM CTY RD OO*	*0.037*
0403020108	*White River*	*WHITE RIVER AT 22 AVE SE OF NESHKORO*	*0.035*
0403010402	*North Branch Oconto River*	*OCONTO RIVER - STH 32 BRIDGE-SURING*	*0.035*
0403010809	*Menominee River*	*MENOMINEE RIVER - UPPER SCOTT FLOWAGE - ACCESS AT STH 180*	*0.033*
0403010807	*Squaw Creek -- Menominee R*	*MENOMINEE RIVER - AT CTH Z*	*0.030*
0403020201	*Swamp Creek*	*WOLF RIVER - UPSTREAM FROM CTH B BRIDGE*	*0.029*
0403010402	*North Branch Oconto River (2)*	*NORTH BRANCH OCONTO RIVER*	*0.029*
0403010501	*Rat River*	*RAT RIVER AT HARPER RD*	*0.028*
0403010502	*Upper Peshtigo River*	*Peshtigo River -- extrapolated from Rat River*	*0.028*
0403010403	*Peshtigo Brook*	*Peshtigo Brook -- extrapolated from Oconto and N. Br. Oconto*	*0.027*
0403020203	*Evergreen River -- Wolf River*	*Evergreen River -- extrapolated from Red River*	*0.026*
0403020204	*West Branch Wolf River*	*West Branch Wolf River -- extrapolated from Red River*	*0.026*
0403020205	*Red River*	*RED RIVER - AT MAPLE AVENUE*	*0.026*
0403020107	*Mecan River*	*CHAFFEE CREEK - CTH Y IBI STATION 1*	*0.025*
0403020202	*Lily River*	*LILY RIVER APPROX 50M ABOVE HWY 55 BRIDGE AT LARGE BOULDER ON RI*	*0.024*
0403010504	*Middle Peshtigo River*	*PESHTIGO RIVER AT HWY W*	*0.023*
0403010506	*Lower Peshtigo River (2)*	*PESHTIGO RIVER AT CTH E*	*0.023*
0403010603	*Iron River -- Brule River*	*Brule River headwaters -- extrapolated from Brule River*	*0.022*
0403010605	*Brule River*	*BRULE RIVER AT US 2/14*	*0.022*
0403010801	*Popple River*	*WOODS CREEK - HWY 101*	*0.019*
0403010401	*South Branch Oconto River*	*SOUTH BRANCH OCONTO RIVER @ STH 32*	*0.018*
0403010802	*Pine River*	*PINE RIVER - AT STH 101*	*0.018*
0403010504	*Middle Peshtigo River (2)*	*THUNDER RIVER AT COUNTY PARK FOOT BRIDGE JUST ABOVE VETERANS FA*	*0.016*
0403010806	*Pike River*	*PIKE RIVER AT PIKE R ROAD*	*0.016*
0403010503	*Middle Inlet Creek -- Lake Noquebay*	*MIDDLE INLET CREEK - AT CTH X*	*0.015*
0403010809	*Menominee River*	*WAUSAUKEE RIVER AT JAMROS ROAD*	*0.014*
0403010805	*Pemebonwon River*	*NORTH BRANCH PEMEBONWON RIVER - AT CTH R*	*0.012*
0403010201	*Upper Door Peninsula*	*HIBBARDS CREEK AT CTH A*	*0.010*
Mississippi River Basin			
0709000213	*Marsh Creek -- Rock River*	*ROCK RIVER - AT USH 14 BRIDGE*	*0.452*
0707000217	Little Eau Pleine River	LITTLE EAU PLAINE RIVER AT RANGELINE ROAD BRIDGE	0.399
0704000502	Upper Trempeauleau	extrapolated from Elk Creek	0.385
0704000503	Elk Creek (Trempealeau)	ELK CREEK - SWEDE VALLEY RD, TN RD NENE SEC 14 T22 R9W	0.385
0709000110	Lower Crawfish River	CRAWFISH RIVER - AT STH 18	0.371
0709000104	Sinissippi Lake	ROCK RIVER AT STH 60 DOWNSTREAM FROM LAKE SINISSIPPI	0.339
0707000215	Upper Big Eau Pleine River	BIG EAU PLEINE R - AT STH 97 BRIDGE	0.332

0705000604	Otter Creek (nr. Eau Claire)	OTTER CREEK @ MOROVITZ HOLLOW RD	0.323
0704000501	Pigeon Creek (Tremplealeau)	PIGEON CREEK AT STH 53	0.307
0709000111	Middle Rock River	ROCK RIVER - AT STH 106	0.304
0704000304	Waumandee Creek	WAUMANDEE CREEK AT WAUMANDEE CREEK ROAD	0.297
0704000306	City of Winona -- Mississippi River	extrapolated from Waumanee	0.297
0707000311	Upper Yellow (Central Wis.)	YELLOW RIVER AT STH 13/73	0.296
0709000109	Beaver Dam River	BEAVER DAM RIVER AT CTH J BRIDGE	0.294
0709000208	Badfish Creek	BADFISH CREEK - AT CASEY ROAD	0.294
0704000302	Lower Buffalo River	BUFFALO RIVER - AT STH 37	0.289
0709000103	Rubicon River	RUBICON RIVER - AT CTH EE	0.283
0709000101	East Branch Rock River	ROCK RIVER, EAST BRANCH - AT CTH TW BRG	0.278
0705000507	Lowes Creek (nr. Eau Claire)	LOWES CREEK - SILVER SPRINGS DR	0.275
0705000506	Elk Creek	ELK CREEK AT 960TH STREET / CRESCENT AVE	0.271
0705000508	Muddy Creek -- Chippewa River	Extrapolated from Elk Creek	0.271
0705000509	Muddy Creek -- Chippewa River	Extrapolated from Elk Creek	0.271
0704000702	Popple River (Black River)	POPPLE RIVER AT STATE HWY 73 (FH STA 1)	0.269
0704000712	Lower Black River	FLEMING CREEK	0.267
0704000601	Halfway Creek -- Mississippi River	extrapolated from Fleming Creek	0.267
0709000111	Lower Koshkonong (on Rock)	05427085 - ROCK RIVER @ STH 12 BRIDGE, FORT ATKINSON	0.264
0704000301	Upper Buffalo River	BUFFALO RIVER - SEGERSTROM RD	0.260
0709000102	Upper Rock River	ROCK RIVER - AT STH 33 IN HORICON	0.253
0709000109	Beaver Dam River (2)	ROCK RIVER - AT CTH B	0.252
0709000203	Bark River	BARK RIVER - CTH N, FORT ATKINSON	0.248
0704000504	Middle Trempealeau River	TURTON CREEK AT OAK STREET	0.240
0704000711	Beaver Creek & Lake Marinuka	BEAVER CREEK AT HWY 53	0.237
0709000109	Calamus Creek (2)	CALAMUS CREEK AT HWY S (CTH T)	0.225
0707000509	Bear Creek (Lower Wisconsin)	BEAR CREEK AT CTH JJ	0.220
0709000108	Maunesha River	MAUNESHA RIVER UPSTREAM STH 19	0.219
0705000504	Duncan Creek	DUNCAN CREEK - SPRING STREET (CHIPPEWA FALLS)	0.215
0705000505	Trout Creek -- Chippewa River	Extrapolate from Duncan Creek	0.215
0709000309	Spafford Cr -- Pecatonica R	PECATONICA RIVER - STH 176 S WAYNE	0.213
0704000704	Cawley and Rock Creeks (Black)	ROCK CREEK - ROCK CREEK STATION	0.210
0707000403	Narrows Cr. & Baraboo River	BARABOO RIVER - SHAW STREET IN BARABOO	0.208
0709000210	Lake Koshkonong -- Rock River	Extrapolated from Koshkonong Creek	0.202
0709000407	Lower Sugar River	SUGAR RIVER - AT NELSON ROAD	0.202
0704000712	Big and Douglas Creeks (2)	BIG CREEK	0.202
0709000204	Lower Koskonong	KOSHKONONG CREEK AT STH 106	0.202
0707000302	Mill Creek (Central Wisc)	MILL CREEK - AT CTH PP BRIDGE	0.199
0707000303	City of Stevens Point -- Wisconsin R	Extrapolated from Mill Creek	0.199
0704000709	O'Neill and Cunningham Creeks	CUNNINGHAM CREEK - AT STH 95/73 BRIDGE	0.197
0709000303	Middle Pecatonica	PECATONICA RIVER AT WALNUT ROAD	0.195
0709000209	*Yahara R and Lake Kegonsa*	*YAHARA RIVER - AT STH 59*	*0.194*
0704000505	Lower Trempealeau	TAMARACK CREEK AT CTH G	0.187
0707000401	Seymour Creek and Upper Baraboo	BARABOO RIVER - AT CTH FF IN WONEWOC	0.186
0705000207	Holcombe Flowage	MUD CREEK AT CTH D	0.186
0707000603	Middle Kickapoo	KICKAPOO RIVER - BANKER PARK IN VIOLA	0.186
0709000308	Lower East Branch Pecatonica	EAST BRANCH PECATONICA RIVER AT CISSERVILLE ROAD	0.182

0709000111	Johnson Creek	JOHNSON CREEK - AT CTH B IN JOHNSON CREEK	0.179
0704000709	O'Neill and Cunningham Creeks(2)	BLACK RIVER - AT STH 95 BRIDGE	0.174
0706000303	Lower Grant River	GRANT RIVER - HWY 133	0.173
0709000307	Yellowstone River	YELLOWSTONE RIVER - AT OLD Q ROAD	0.170
0704000604	Lower La Crosse River	BOSTWICK CREEK STATION 1 - CTH "B" BRIDGE	0.168
0712000607	Middle Fox River (SE)	FOX RIVER @ CTH I	0.167
0709000304	Dodge Branch	Extrapolated from East Branch Pecatonica	0.166
0709000306	Upper East Br. Pecatonica	PECATONICA RIVER, E BRANCH - FOOT BRIDGE OFF WATER ST BLANCHARDV	0.166
0707000402	Crossman & Little Baraboo	BARABOO RIVER - AT STH 23, BRIDGE IN REEDSBURG	0.162
0707000404	Lower Baraboo	BARABOO RIVER AT COUNTY HIGHWAY U	0.161
0712000401	Headwaters Des Plaines River	DES PLAINES @ MB	0.161
0709000406	Sylvester Creek -- Sugar River	Sugar River at Ten Eyck Rd	0.161
0709000202	Whitewater Creek	WHITEWATER CREEK - FREMONT ROAD IN COLD SPRING	0.160
0707000504	Honey Creek	HONEY CREEK AT STATE HIGHWAY 60	0.159
0705000402	North Fork Jump River	From USGS nutrient study	0.158
0705000704	Lake Chetek	CHETEK RIVER AT 4 1/2 AVENUE CROSSING	0.156
0709000206	Six Mile and Pheasant Br Creeks	SIX MILE CREEK AT COUNTY HWY M	0.156
0705000707	Pine and Red Cedar	1 LOWER PINE CR - CTH V	0.155
0709000301	Mineral Point and Sudan Branches	MINERAL POINT BRANCH - CTH O (BI)	0.154
0709000202	Whitewater Creek (2)	WHITEWATER CREEK - FREMONT ROAD IN COLD SPRING	0.153
0709000310	Honey and Richland Creeks	HONEY CREEK - 50M UPSTREAM OF CTH P BRIDGE	0.152
0707000216	Lower Big Eau Pleine River	FENWOOD CREEK AT FAIRVIEW ROAD	0.151
0712000401	Headwaters Des Plaines River	DES PLAINES RIVER	0.151
0709000404	Little Sugar River	LITTLE SUGAR RIVER AT TIN CAN ROAD	0.149
0706000304	Little Platte River	LITTLE PLATTE RIVER - OAK RD (BI)	0.146
0707000514	Blue River	BLUE RIVER AT STATE HIGHWAY 133	0.145
0712000608	North Branch Nippersink Creek	From USGS nutrient study	0.145
0712000609	Nippersink Creek	Extrapolated from North Branch Nippersink Creek	0.145
0709000603	Piscasaw Creek	Extrapolated from North Branch Nippersink Creek	0.015
0707000211	Springbrook Creek	SPRING BROOK - BEFORE EAU CLAIRE R AT NOLAN RD	0.145
0707000207	Black Creek (Cent. Wis)	BLACK CREEK AT CTH H	0.143
0706000101	Coon Creek	COON CREEK - NEAR MOUTH	0.141
0705000706	Hay River	HAY RIVER @ CTH V	0.139
0707000511	Pine Creek	PINE RIVER AT STH 60	0.139
0705000702	Yellow River (Red Cedar)	YELLOW RIVER - CTY O	0.138
0705000207	Lower Flambeau River (2)	MEADOW BROOK AT STH 27	0.135
0709000401	West Br Sugar River	W BR OF SUGAR R - 100YDS UPSTR FROM BRIDGE OFF MONTROSE RD	0.135
0706000302	Middle Grant River	GRANT RIVER - AT PIGEON RIVER ROAD	0.133
0709000302	Upper West Branch Pecatonica R	PECATONICA RIVER, WEST BRANCH - OAK PARK RD	0.133
0709000107	Headwaters Crawfish River	Crawfish River in Columbus at Lundington	0.132
0707000315	Upper Lemonweir River	Extrapolated from Little Lemonweir	0.129
0707000503	Roxbury Creek	ROXBURY CREEK AT STH 78	0.129
0707000316	Little Lemonweir River	LITTLE LEMONWEIR AT MCEWEN RD BRIDGE	0.129
0709000201	Scuppernong River	SCUPPERNONG RIVER - AT STH 106	0.127
0712000603	Wind Lake Drainage	Older comparable study	0.126
0704000603	Little La Crosse River	LITTLE LA CROSSE RIVER AT ICEBOX RD (PREVIOUSLY NAMED 7TH AVE)	0.124
0705000603	Black and Hay Creeks	HAY CREEK - HAY CREEK 1, CTH NL	0.123

0707000513	Mill and Indian Creeks	MILL CREEK - AT STATE HIGHWAY 60	0.122
0704000701	Black and L. Black Rivers	BLACK RIVER - DIVISION DRIVE	0.121
0705000502	Yellow River	YELLOW RIVER AT 350TH ST	0.121
0707000507	Trout and Mill Creeks	MILL CREEK AT CTH C	0.120
0709000206	Lake Mendota -- Yahara (2)	PHEASANT BRANCH - CTH M EAST BRIDGE	0.116
0712000601	Pewaukee - Fox River	FOX RIVER AT RIVER RD (BI SUR)	0.116
0705000707	Lower Pine - Red Cedar (2)	RED CEDAR RIVER IBI - STH 64	0.115
0707000601	Headwaters Kickapoo	KICKAPOO RIVER - STH 33 IN ONTARIO	0.115
0707000310	Hemlock Creek	HEMLOCK CREEK AT NECEDAH ROAD	0.113
0707000502	Prairie du Sac Dam -- Wisconsin R	From USGS nutrient study	0.113
0705000710	Lake Menomin -- Red Cedar	WILSON CREEK AT 390TH ST BRIDGE	0.113
0709000205	Headwaters Yahara	YAHARA RIVER - AT STH 113, AT MADISON WI	0.113
0705000510	Eau Galle River	EAU GALLE RIVER - AT CTH P	0.112
0705000511	Plum Creek	1-PLUM CREEK CTH N	0.112
0703000510	Willow River	WILLOW RIVER - 160TH AVE	0.111
0704000709	Lake Arbutus - Black River (2)	BLACK RIVER - BELOW POWER HOUSE-HATFIELD DAM	0.111
0705000512	Bear Creek	BEAR CREEK AT HIGHWAY 85	0.111
0709000311	Richland Creek	RICHLAND CREEK - CTH P BRIDGE UPSTREAM 660M TO SHUEYVILLE RD BRID	0.111
0705000503	Lake Wissota	YELLOW RIVER - AT CTH XX	0.109
0706000305	Platte River	PLATTE RIVER - BANFIELD BRIDGE ACCESS	0.109
0712000606	White River	WHITE RIVER	0.109
0709000309	Honey Creek- Pecatonica River (2)	SKINNER CREEK - CHEESE COUNTRY RECREATION TRAIL IN BROWNTOWN	0.108
0712000402	Mill Creek	Extrapolated from stream in 0712000401	0.108
0707000511	Pine River (2)	PINE RIVER @ STH 14 RICHLAND CENTER	0.106
0706000103	Bad Axe	BAD AXE RIVER - NEAR MOUTH @ WILLENBERG ROAD BRIDGE	0.106
0707000317	Lower Lemonweir River	LOWER LEMONWEIR RIVER AT HWY HH BRIDGE	0.104
0706000301	Upper Grant	GRANT RIVER - UNIVERSITY FARM RD	0.103
0709000305	Blue Mounds Branch (2)	GORDON CREEK AT COUNTY HIGHWAY H	0.103
0707000313	Mead Marsh -- Yellow River	YELLOW RIVER ABOVE NECEDAH TREATMENT PLANT OUTFALL	0.103
0709000402	Headwaters Sugar River	Older comparable study	0.103
0705000501	Fisher River -- Chippewa River	FISHER RIVER - 240TH AVE	0.102
0705000109	Holcombe Flowage	Extrapolated from Fisher River	0.102
0709000106	Ashippun River	ASHIPPUN RIVER AT SKI SLIDE ROAD	0.102
0712000610	Squaw Creek -- Fox river	FOX RIVER AT WILMOT WI	0.101
0709000403	Allen Creek	Extrapolated from Story Creek -- Sugar River	0.100
0709000405	Story Creek -- Sugar River	SUGAR RIVER - AT CTH EE	0.100
0707000510	Willow Creek	From TMDL study	0.100
0705000605	Eau Claire River	EAU CLAIRE RIVER ADJACENT TO CTH QQ - COUNTY LAND	0.099
0707000210	Scotch Creek -- Rib River	LOWER RIB RIVER (UW-23)	0.099
0707000505	Black Earth Creek	BLACK EARTH CREEK - AT MORRILL ROAD	0.098
0707000319	Dell Cr -- Wisconsin River	DELL CREEK AT STATE HIGHWAY 23	0.098
0706000307	Sny Magill Cr -- Mississippi R	MCCARTNEY BRANCH - IRISH RIDGE RD	0.097
0707000605	Kickapoo River	PINE CREEK STATION 1-1975-NE 1/4 NW 1/4 SEC 18	0.095
0703000507	Beaver Brook -- Apple River	BEAVER BROOK - DOWNSTREAM OF 85TH STREET APPROX 10 METERS	0.094
0704000710	Robinson Creek	ROBINSON CREEK AT ROBINSON ROAD	0.094
0705000303	South Fork Flambeau R	SKINNER CREEK	0.093
0707000515	Knapp Creek	KNAPP CREEK @ WINDING WAY DR	0.092

0707000604	Tainter Creek -- Kickapoo R	HALLS CREEK-CTY HWY E DOWNSTREAM	0.091
0709000212	Bass Creek	BASS CREEK - CTH D, AFTON	0.091
0709000315	Racoon Creek	Extrapolated from Bass Creek	0.091
0709000215	City of Beloit -- Lower Rock River	Extrapolated from Bass Creek	0.091
0705000108	Deer Tail Creek	DEER TAIL CREEK - AT BROKEN ARROW RD	0.090
0707000202	Copper River	COPPER RIVER - AT CTH E	0.090
0712000604	Sugar Creek	SUGAR CREEK UPSTREAM OF POTTER ROAD	0.090
0712000605	Honey Creek	Extrapolated from Sugar Creek	0.090
0703000509	Big Marine L, -- St. Croix R	OSCEOLA CREEK APPROX 20 METERS UPSTREAM OF HWY 35	0.090
0703000108	North Fork Clam River	NORTH FORK CLAM RIVER - AT MALONE ROAD CROSSING	0.089
0707000508	Otter Creek	OTTER CREEK AT HWY C	0.088
0707000501	Duck Cr -- Wisconsin R	DUCK CREEK AT DUCK CREEK ROAD	0.087
0707000314	Beaver Creek	BEAVER CREEK UPSTREAM OF STH 21	0.085
0707000506	Blue Mounds Creek	Comparable study	0.083
0707000112	Spirit River	SPIRIT RIVER-BELOW CONFLUENCE WITH SQUAW CREED	0.083
0705000601	North Fork Eau Claire R	EAU CLAIRE RIVER - NORTH FORK, NE1/4 OF SE1/4 SEC10	0.081
0704000703	Trappers -- Pine -- Black R	BLACK RIVER	0.080
0705000401	South Fork Jump River	SOUTH FORK JUMP RIVER ALONG CTH I	0.079
0707000204	Alexander L -- Wisconsin River	DEVIL CREEK - SCOTT ROAD	0.078
0709000214	Turtle Creek	TURTLE CREEK - COLLEY ROAD IN BELOIT	0.078
0705000705	South Fork Hay River	SOUTH FORK HAY RIVER - S FORK HAY RIVER 1, CTH F	0.078
0704000602	Upper LaCrosse River	LACROSSE RIVER	0.077
0712000601	Pewaukee River -- Fox River (2)	PEWAUNEE RIVER UPSTREAM OF STH 164 AT STEINHAFEL'S ENTRANCE	0.077
0709000207	Lake Monona -- Yahara River	YAHARA RIVER - AT USH 51	0.077
0706000107	*Rush Creek -- Mississippi River*	*RUSH CREEK ST 1 - BRIDGE ON RUSH CREEK ROAD*	*0.073*
0706000110	*Bloody Run -- Mississippi River*	*Extrapolated from Rush Creek*	*0.073*
0707000218	*L. Dubay -- Wisconsin River*	*LITTLE EAU CLAIRE RIVER - AT CTH X BRIDGE*	*0.073*
0707000218	*L. Dubay -- Wisconsin River*	*JOHNSON CREEK AT CTH C*	*0.073*
0709000105	*Oconomowoc River*	*OCONOMOWOC RIVER*	*0.072*
0707000602	*West Fork Kickapoo River*	*KICKAPOO RIVER, WEST FORK - SE 1/4 OF NW 1/4 SEC 33*	*0.071*
0705000404	*Lower Jump River*	*JUMP RIVER AT HIGHWAY 73*	*0.070*
0703000109	*Clam River*	*CLAM RIVER @ LYNCH BRIDGE ROAD*	*0.069*
0706000503	*Galena River*	*FEVER (GALENA) RIVER - AT ENSCHE & BUNCOMBE ROADS*	*0.067*
0705000403	*Main Creek*	*MAIN CREEK AT BROKEN ARROW ROAD*	*0.065*
0705000703	*Brill River-- Red Cedar River*	*RED CEDAR RIVER ACCESS - 19TH ST (N45 26' 41.8" W091 45' 54.2")*	*0.065*
0707000516	*Big Green River*	*From USGS reference study*	*0.065*
0707000307	*Petenwell Lake*	*MOCCASIN CREEK AT STH 54, STATION 1*	*0.065*
0707000518	*Wisconsin River*	*MILLVILLE CREEK AT CTH C*	*0.064*
0703000104	*Shell Lake -- Yellow River*	*YELLOW RIVER - DOWNSTREAM OF YELLOW RIVER ROAD APPROX 10 METER*	*0.063*
0705000107	*Soft Maple -- Chippewa River*	*DEVILS CREEK - LOW SITE AT HWY 40 BRIDGE*	*0.063*
0703000508	*Balsam Branch -- Apple River*	*BALSAM BRANCH AT 105TH AVE - UPSTREAM OF LAKE WAPPOGASSETT*	*0.062*
0704000705	*Wedges Creek*	*WEDGES CREEK AT MIDDLE RD*	*0.062*
0707000208	*Wood Creek -- Rib River*	*BIG RIB RIVER AT CTH A*	*0.062*
0709000211	*Blackhawk Creek*	*SPRING BROOK - AT MAIN STREET, JANESVILLE*	*0.061*
0703000501	*Wood River*	*WOOD RIVER AT WEST RIVER ROAD CROSSING (1MI ABOVE ST CROIX R)*	*0.059*
0703000508	*Balsam Branch -- Apple River (2)*	*APPLE RIVER @ CHURCH ROAD*	*0.059*
0707000206	*Trappe River*	*TRAPPE RIVER AT SHADY LANE, STATION 1*	*0.057*

0707000214	Eau Claire Flowage -- Wisconsin River	Extrapolated from Trappe River	0.057
0703000507	Beaver Brook -- Apple River (2)	APPLE RIVER - APPLE RIVER COUNTY PARK (N45 23' 15.5" W092 22' 05.2")	0.057
0707000318	Petenwell Lake	WHITE CREEK AT CTH Z	0.057
0707000313	Mead Marsh -- Yellow River (2)	LITTLE YELLOW RIVER	0.056
0707000203	Prairie River	From USGS nutrient study	0.055
0707000212	Black Brook -- Eau Claire River	EAU CLAIRE RIVER AT W BEAR LAKE ROAD	0.055
0703000112	Chases Brook -- St. Croix River	ST CROIX RIVER - NORWAY POINT LANDING	0.054
0705000102	East Fork Chippewa River	CHIPPEWA RIVER, EAST FORK - CTH B AB FLOWAGE	0.054
0705000404	Lower Jump River	JUMP RIVER	0.053
0705000602	south Fork Eau Claire River	EAU CLAIRE RIVER, SOUTH FORK - SOUTH FORK EAU CLAIRE RIVER	0.053
0704000706	East Fork Black River	BLACK RIVER, EAST FORK - E FORK RD	0.053
0707000108	Upper Tomahawk River	TOMAHAWK RIVER - ADJACENT TO CEDAR FALLS RD	0.052
0703000510	Willow River (2)	WILLOW RIVER - BELOW LITTLE FALLS	0.051
0707000113	L. Mohawksin -- Lake Alice -- Wis R	WISCONSIN RIVER - OFF CAMP 10 RD	0.050
0705000205	Upper Flambeau River	NORTH FORK FLAMBEAU RIVER BELOW CROWLEY DAM	0.049
0703000506	Wolf River -- St. Croix River	WOLF CREEK @ 275TH STREET	0.049
0707000517	City of Boscobel -- Wisconsin River	From USGS nutrient study	0.047
0705000205	Upper Flambeau River	SWAMP CREEK AT CTH F	0.047
0705000701	Red Cedar Lake	KNUTESON CREEK	0.047
0703000512	Lake St. Croix	Lake St. Croix -- extrapolated from Kinnickinnic	0.046
0706000105	Mormon Creek - Mississippi River	Mormon Creek -- from USGS nutrient study	0.046
0704000605	Pine Creek -- Mississippi River	extrapolated from Mormon Creek	0.046
0707000213	Big Sandy Creek -- Eau Claire River	EAU CLAIRE RIVER - AT CAMP PHILLIPS RD	0.046
0703000511	Kinnickinnic River	KINNICKINNIC RIVER - CTH F BRIDGE	0.046
0707000104	Rainbow Flowage -- Mud Creek	WISCONSIN RIVER - TAILWATER BELOW OTTER RAPIDS DAM	0.045
0707000113	L. Mohawksin -- Lake Alice -- Wis R	NOISY CREEK - AT WOODFORD RD	0.045
0707000604	Tainter Creek -- Kickapoo R (2)	TAINTER CREEK	0.045
0707000107	Pelican River	PELICAN RIVER AT GERMOND RD	0.045
0704000101	Big River -- Mississippi River	Big River -- Mississippi River -- extrapolated from Trimbelle R	0.044
0705000106	Thornapple River	THORNAPPLE RIVER - CTH A NW LADYSMITH	0.044
0707000205	Pine River	From TMDL study	0.044
0704000103	Trimbelle River	TRIMBELLE RIVER 1-50' US OF STH 35	0.044
0707000201	New Wood River	NEW WOOD RIVER - AT TESCH RD	0.043
0707000105	Gilmore Creek -- Big St. Germain R	GILMORE CREEK - AT CTH D	0.042
0705000301	Elk River	ELK RIVER	0.041
0705000107	Soft Maple -- Chippewa River	CHIPPEWA RIVER AT BOAT LANDING NEAR CTH H AND STH 40	0.040
0707000101	Deerskin River	DEERSKIN RIVER AT RANGELINE RD	0.040
0709000213	MarshCreek -- Rock River	MARSH CREEK - CTH E	0.040
0703000105	Yellow Lake -- Yellow River	YELLOW RIVER DOWNSTREAM OF LOWEST HWY 35 CROSSING APPROX 20 M	0.040
0703000505	Trade River	TRADE RIVER APPROX 100 METERS DWONSTREAM OF EVERGREEN AVENUE	0.040
0705000105	BrunetRiver -- ChippewaRiver	BIG WEIRGOR CREEK - DOWNSTREAM OF SHORT CUT ROAD	0.040
0707000103	Pioneer Creek -- Wisconsin R	WISCONSIN RIVER AT CTH G EAGLE RIVER	0.040
0704000707	Morrison Creek	MORRISON CREEK - AT HWY K	0.039
0707000309	Little Roche Cri Creek	LITTLE ROCHE A CREEK AT CTH J	0.038
0717000209	Little Rib River	LITTLE RIB, (NORTH OF) STEWART AVE, SITE 1	0.037
0705000204	Butternut Creek	BUTTERNUT CREEK	0.036
0707000109	Middle Tomahawk River	Tomahawk River at Prairie Rapids Road	0.036

0707000113	L. Mohawksin -- Lake Alice -- Wis R (3)	TOMAHAWK RIVER - AT PRAIRIE RAPIDS RD	0.036
0703000112	Goose Creek -- St. Croix	Goose Creek -- St. Croix -- extrapolated form 0703000102	0.035
0705000101	West Fork Chippewa River	WEST FORK CHIPPEWA RIVER ADJACENT TO COUNTY HIGHWAY S	0.035
0705000206	Middle Flambeau River	FLAMBEAU RIVER AT BOAT LANDING UPSTREAM OF STH 70	0.035
0705000302	Headwaters South Fork Flambeau R	SOUTH FORK FLAMBEAU RIVER	0.035
0703000102	Moose River - St Croix R	ST CROIX RIVER AT CCC BRIDGE	0.035
0707000218	Lake Dubay -- Wisconsin River	FOURMILE CREEK - AT CTH KK	0.034
0705000205	Upper Flambeau River	NORTH FORK FLAMBEAU RIVER AT HOLTS LANDING	0.034
0703000103	Upper Tamarack River	UPPER TAMARACK RIVER - CTH T BRIDGE	0.033
0703000106	Lower Tamarack River	Lower Tamarack -- extrapolated from 0703000103	0.033
0707000111	Somo River	SOMO RIVER - AT ZENITH TOWER RD	0.033
0705000302	Headwaters Flambeau River	FLAMBEAU RIVER - SOUTH FORK, AT STH 13 WAYSIDE SOUTH OF FIFIELD	0.032
0705000206	Middle Flambeau River	PINE CREEK AT COUNTY HWY EE	0.031
0703000203	Totagatic River	TOTAGATIC RIVER - THOMPSON BRIDGE ROAD CROSSING	0.030
0707000218	Lake Dubay -- Wisconsin River	BULL JUNIOR CREEK - AT OLD 51 BRIDGE	0.030
0707000305	Tenmile Creek	TENMILE CREEK - AT HWY 13	0.030
0705000203	Headwaters Flambeau River	FLAMBEAU RIVER	0.029
0704000105	Rush River	4-RUSH RIVER - 385TH ST	0.029
0704000107	Lake Pepin	Lake Pepin -- extrapolated from Rush River	0.029
0707000301	Plover River	PLOVER RIVER (UW-12)	0.029
0707000308	Big Roche A Cri Creek	BIG ROCHE A CRI CREEK @ 20TH AVE, SITE 1	0.028
0707000512	City of Spring Green -- Wisconsin R	From USGS nutrient study	0.028
0703000101	Upper St. Croix -- Eau Claire Rivers	ST CROIX RIVER - AT OLD HWY 53	0.027
0707000105	Gilmore Creek -- Big St. Germain R (2)	ST GERMAIN RIVER - AT STH 70	0.027
0707000110	Lower Tomahawk River	LITTLE RICE CREEK AT CTH N	0.027
0707000102	Eagle River	EAGLE RIVER AT STH 70	0.027
0707000306	Fourteenmile Creek	FOURTEENMILE CREEK AT CTH Z BRIDGE	0.026
0703000202	Trego Lake -- Namekagon River	NAMEKAGON RIVER - DOWNSTREAM OF CTH K BRIDGE APPROX 40 METERS	0.025
0707000113	L. Mohawksin - L Alice- Wis R (3)	CRESCENT CREEK - 370 METERS DS FROM FIRE TOWER RD	0.025
0703000201	Upper Namakagon River	NAMEKAGON RIVER - AT HOSPITAL ROAD	0.024
0705000103	Lake Chippewa	HAY CREEK - AT MOOSE LAKE ROAD	0.024
0707000312	Cranberry Creek	CRANBERRY CREEK AT 8TH STREET	0.024
0703000202	Trego Lake -- Namekagon River (2)	NAMEKAGON RIVER	0.023
0705000202	Bear River	BEAR RIVER - UPSTREAM BRIDGE RD	0.022
0712000602	Mukwanago River	MUKWONAGO RIVER - AT CTH I 2M (BI SUR)	0.022
0704000708	Halls Creek	Used USGS nutrient study data from Vismal Creek	0.021
0705000104	Couderay River	COUDERAY RIVER	0.021
0707000106	Rhinelander Flowage	PINE LAKE CREEK AT FOREST LN	0.021
0703000204	Namekagon River	NAMEKAGON RIVER DOWNSTREAM OF NAMEKAGON TRAIL APPROX 30 MET	0.020
0705000201	Manitowish River	TROUT RIVER - BELOW WILD RICE LAKE	0.018
0707000304	Fourmile Creek	Fourmile Creek at Buena Vista at Griffith Ave	0.015
0705000201	Manitowish River	MANITOWISH RIVER - AT US 51	0.015
0707000204	Alexander L -- Wisconsin River (2)	FOURMILE CREEK AT GRIFFITH AVENUE	0.015

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)			
HUC 10	Watershed	Location_Description	(mg/L)
Lake Superior Basin			
0401030104	Middle Nemadji River	NEMADJI RIVER - 50YDS ABOVE FINN RD BRIDGE	0.00
0401030105	St. Louis and Lower Nemadji River	NEMADJI RIVER - AT CTH C, NEAR SOUTH SUPERIOR WI	0.53
0401030107	Bois Brule River	BOISE BRULE RIVER - WINNEBOUJOU CANOE LAUNCH	0.00
0401030108	Iron River	IRON RIVER, ABOUT 100M UPSTREAM OF ORIENTA FALLS	0.00
0401030109	Bayfield Peninsula NW -- Frontal Lake Superior	BARK RIVER - 15M UPSTREAM, HWY 13, STATION #1	0.03
0401030110	Bayfield Peninsula SE -- Frontal Lake Superior	SIOUX RIVER - OFF OF FRIENDLY VALLEY RD	0.02
0401030111	Fish Creek - Frontal Chequamegon Bay	NORTH FISH CREEK AT OLD US 2, NEAR MOQUAH WI	0.05
0401030201	Montreal River	MONTREAL RIVER HWY 122	0.09
0401030202	Tyler Forks	TYLER FORKS, AT FOOTBRIDGE ABOVE BROWNSTONE FALL	0.04
0401030203	Headwaters Bad River	BAD RIVER - EAST TYLER RD, BRIDGE ON NE SIDE OF MELLE	0.75
0401030204	Marengo River	MARENGO RIVER-AT GOVERNMENT ROAD, NEAR HIGHBRID(	0.06
0401030205	Potato River	POTATO RIVER, 10M UPSTREAM OF POTATO RIVER RD	0.00
0401030206	White River	WHITE RIVER AT SUTHERLAND BRIDGE TO PRIMITIVE CAMP	0.00
0401030206	White River	WHITE RIVER DOWNSTREAM OF STH 13	0.00
0402010103	Presque Isle River	CRAB CREEK - AT CTH W	0.45
Lake Michigan Basin			
0403020109	Big Green Lake	DAKIN CREEK MAUG ROAD	14.11
0403010204	Red River and Sturgeon Bay	SUGAR CREEK-SUGAR CREEK COUNTY PARK-150FT UPSTRE	5.80
0403020302	Fond du Lac River	extrapolated from De Nevue Creek	4.88
0403020303	East Shore Lake Winnebago	DE NEVEU CREEK AT 4TH ST (CTH T)	4.88
0403020101	Swan Lake -- Fox River	extrapolated from Belle Fountain Creek	4.53
0403020105	Lower Grand River	BELLE FOUNTAIN CREEK AT CTH B (BI)	4.53
0403020104	Upper Grand River	extrapolate from Belle Fountain Creek	4.35
0403010108	Pigeon River	PIGEON RIVER - COUNTY HIGHWAY LS	3.76
0403010105	Branch River	BRANCH RIVER AT N UNION RD	3.72
0403010109	Mullet River	MULLET RIVER - AT CTY HWY M	3.68
0403010104	South Branch Manitowoc River	SOUTH BRANCH MANITOWOC RIVER AT LEMKE ROAD	3.65
0403010106	Manitowoc River -- Frontal Lake Michigan	MUD CREEK - HILLTOP ROAD	3.43
0403020209	School Section Creek -- Wolf River	ROSE BROOK-ROSE BROOK ROAD	3.43
0403010201	Upper Door Peninsula	HIBBARDS CREEK AT CTH A	3.42
0403020214	Bear Creek -- Little Wolf River	BEAR CREEK AT STH 76 IN STEPHENS	3.28
0403010103	North Branch Manitowoc River	MANITOWOC RIVER - NORTH BRANCH RIVER VIEW RD	2.97
0404000301	North Branch Milwaukee River	MILWAUKEE RIVER NORTH BRANCH @ HWY M	2.90
0404000304	Menomonee River	LITTLE MENOMONEE 2 AT DONGES BAY RD	2.71
0403010101	East Twin River	EAST TWIN RIVER-EAST TWIN RIVER-STEINERS CORNERS	2.70
0403010107	Sevenmile & Silver Crs -- Fr Lake Michigan	comparable study	2.66
0403020216	South Branch Little Wolf River	S BRANCH LITTLE WOLF R, 20FT UPSTREAM FROM BRIDGE S	2.65
0403020219	Partridge Lake -- Wolf River	WALLA WALLA CREEK AT MARSH ROAD	2.61
0403020110	Rush Creek	WAUKAU CREEK - AT CTH E	2.59
0403020105	Lower Grand River	GRAND RIVER - AT CTH H, NEAR KINGSTON WI	2.54
0403020107	Mecan River	CHAFFEE CREEK CTH Y IBI STATION 1	2.54
0403010203	Kewaunee River	KEWAUNEE RIVER - AT CTH F, NEAR KEWAUNEE WI	2.53
0403020208	Shioc River	SHIOC RIVER AT STH 187 BRIDGE	2.45
0403020221	Lake Poygan	RAT RIVER - SOUTH ROAD	2.43
0403020402	Plum Creek -- Fox River (2)	FOX RIVER - AT KIMBERLY BOAT LANDING	2.40
0404000302	East and West Branches Milwaukee River	MILWAUKEE RIVER - AT CTH A (BI)	2.33
0403010202	Ahnapee River and Stony Creek	AHNAPEE RIVER - CTH X NR FORESTVILLE	2.32
0403010102	West Twin River	WEST TWIN RIVER-HWY Q	2.28

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)			
HUC 10	Watershed	Location_Description	(mg/L)
0403010112	Black R & Sauk and Sucker Creeks -- Fr LM	SUCKER CREEK - SUCKER BROOK LANE	2.23
0403020212	North Br & Mainstem Embarrass R (2)	EMBARRASS RIVER, WEST MAIN STREET (CTH C)	2.21
0404000204	Pike River	PIKE RIVER - PIKE RIVER3 AT HWY E	2.20
0403020108	White River	WHITE RIVER AT 2ND AVE SE OF NESHKORO	2.20
0403020402	Plum Creek -- Fox River	PLUM CREEK - COUNTY HWY ZZ BRIDGE, WRIGHTSTOWN	2.19
0403020212	North Br & Mainstem Embarrass R (2)	BEAR CREEK	2.17
0403020103	Montello River	KLAWITTER CREEK #1 - BRIDGE ON CTH B	2.09
0403020112	Lake Butte Des Mortes	SPRING BROOK - AT HWY 21	2.07
0403010506	Lower Peshtigo River	TROUT CREEK-TOWNLINE ROAD	2.04
0403020215	Flume Creek -- Little Wolf River	extrapolated form Waupaca River	2.01
0403020218	Waupaca River	WAUPACA RIVER AT WEYAUWEGA DAM	2.01
0403020219	Partridge Lake -- Wolf River (2)	WOLF RIVER - GILLS LANDING ACCESS	2.01
0403010302	Suamico and Little Suamico Rivers	LITTLE SUAMICO RIVER AT CTH J	1.98
0403020404	Fox River -- Fr Green Bay	APPLE CREEK - ROSIN RD	1.92
0403020217	Blake Creek -- Little Wolf River	WHITCOMB CREEK UPSTREAM FROM CTY RD OO	1.80
0404000306	Milwaukee River - Frontal Lake Michigan	USGS nutrient study	1.71
0403020402	Plum Creek -- Fox River	NEENAH SLOUGH	1.69
0403010202	Ahanapee and Stony Creek (2)	STONY CREEK - AT ROSEWOOD RD	1.67
0404000303	Cedar Creek	CEDAR CREEK - CEDAR CREEK AND LAKEFIELD ROAD	1.66
0403020213	Bear Creek Embarrass River	EMBARRASS RIVER - AT SPUR RD	1.62
0403020102	Neenah Creek	NEENAH CREEK-HWY 23	1.59
0403020403	East River	BOWER CREEK (1) 50M UPSTREAM OF HWY GV	1.57
0403020212	North Br & Mainstem Embarrass R	EMBARRASS RIVER AT STONEY HILL ROAD	1.55
0403020402	Plum Creek -- Fox River (2)	KANKAPOT CREEK - CTH Z DODGE STREET, 100FT UPSTREA	1.47
0403010505	Little Peshtigo River	LITTLE PESHTIGO RIVER - AT CTH W	1.41
0403010111	Sheboygan River -- Frontal Lake Michigan	SHEBOYGAN RIVER 14TH ST	1.41
0403010112	Black R & Sauk & Sucker Creeks -- Fr LM (2)	BLACK RIVER AT INDIAN MOUND RD	1.40
0403020303	East Shore Lake Winnebago	UNNAMED TRIB TO LAKE WINNEBAGO AT OLD HIGHWAY RD	1.40
0403020106	Buffalo and Puckaway Lakes	FOX RIVER 30FT DOWNSTREAM FROM HISTORICAL MARKER	1.38
0403020111	City of Berlin -- Fox River	extrapolated from Buffalo -- Puckaway	1.38
0403010403	Peshtigo Brook	extrapolated from Oconto River	1.36
0403010405	Oconto River	SPLINTER CREEK AT STILES ROAD	1.36
0403020402	Plum Creek -- Fox River (2)	FOX RIVER - WRIGHTSTOWN LAUNCH	1.35
0403010112	Black R & Sauk & Sucker Creeks -- Fr LM (2)	SAUK CREEK - SOUTH WISCONSIN STREET	1.33
0403020210	Middle & South Br Embarrass R	MIDDLE BRANCH EMBARRASS RIVER AT WEASEL DAM ROAD	1.31
0403020219	Partridge Lake -- Wolf River (2)	WOLF RIVER - SHAW LANDING ACCESS	1.31
0403020220	Willow Creek -- Pine River	WILLOW CREEK AT CTH D	1.24
0403020211	Pigeon River	PIGEON RIVER - AT KLEMP ROAD	1.22
0403010404	Little River	LITTLE RIVER - AT STH 22	1.16
0403020402	Plum Creek	MUD CREEK AT CTH BB	1.09
0403010301	Pensaukee River	PENSAUKEE RIVER - CTH S BRIDGE	1.09
0403010110	Onion River	ONION RIVER-UPSTREAM OF BROADWAY STREET	1.06
0403020207	Lake Legend -- Wolf River	WOLF RIVER - WOLF RIVER CANOE LAUNCH 1	1.02
0403020401	Duck Creek	DUCK CREEK - VELP AVE BRIDGE HOWARD	0.99
0403020106	Buffalo and Puckaway Lakes (2)	FOX RIVER - GRAND RIVER LOCKS ACCESS	0.97
0404000305	Kinnickinnic River	KINNICKINNIC RIVER AT 11TH STREET AT MILWAUKEE WI	0.97
0403020205	Red River	RED RIVER AT MAPLE AVENUE	0.96
0403020203	Evergreen River -- Wolf River	extrapolate from Red River	0.96
0403020204	West Branch Wolf River	extrapolate from Red River	0.96
0404000201	Oak Creek - Fr. Lake Michigan	OAK CREEK AT OAK CR PARKWAY 3M (BI)	0.93
0403010402	North Branch Oconto River	OCONTO RIVER - STH 32 BRIDGE-SURING	0.91
0403020221	Lake Poygan	ARROWHEAD RIVER (0743-B)	0.86

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)			
HUC 10	Watershed	Location_Description	(mg/L)
0403010504	Middle Peshtigo River	PESHTIGO RIVER AT HWY W	0.63
0403010506	Lower Peshtigo River	PESHTIGO RIVER AT CTH E	0.62
0403020206	Shawano Lake	PICKEREL CREEK AT JAMES ST	0.62
0403010801	Popple River	WOODS CREK - HWY 101	0.62
0404000202	Root River Canal	extrapolated from Root River	0.61
0404000203	Root River	100M UPSTREAM OF MEMORIAL DRIVE BRIDGE	0.61
0403010809	Menominee River	MENOMINEE RIVER UPPER SCOTT FLOWAGE ACCESS AT ST	0.56
0403010402	North Branch Oconto River	NORTH BRANCH OCONTO RIVER	0.56
0403010603	Iron River -- Brule River	extrapolated from Brule River	0.55
0403010605	Brule River	BRULE RIVER AT US 2/14	0.55
0403020201	Swamp Creek	WOLF RIVER - UPSTREAM FROM CTH B BRIDGE	0.55
0403010503	Middle Inlet -- Lake Noquebay	MIDDLE INLET CREEK - AT CTH X	0.54
0403010807	Pemebonwon and Middle Menominee Rivers	MENOMINEE RIVER AT CTH Z	0.53
0403010802	Pine River	PINE RIVER - ELECTROFISHING STATION 2, BEGINS AT HWY	0.52
0403010805	Pemebonwon River	NORTH BRANCH PEMOBONWON RIVER AT CTH R	0.51
0403010401	South Branch Oconto River	SOUTH BRANCH OCONTO RIVER @ STH 32	0.46
0403010809	Menominee River	WAUSAUKEE RIVER AT JAMROS ROAD	0.44
0403020202	Lily River	LILY RIVER LILY RIVER APROX 50M ABOVE HWY 55 BRIDGE	0.44
0403010806	Pike River	PIKE RIVER AT PIKE R. ROAD	0.42
0403010504	Middle Peshtigo River	THUNDER RIVER AT COUNTY PARK FOOT BRIDGE JUST ABO	0.39
0403010501	Rat River	RAT RIVER AT HARPER RD	0.38
0403010502	Upper Peshtigo River	extrapolated from Rat River	0.38
0403020301	West Shore Lake Winnebago	LAKE WINNEBAGO TRIB - CTH A	0.37
0404000205	Waukegan River -- Frontal Lake Michigan		na
0403010601	North Branch Paint River		na
Mississippi River Basin			
0709000211	Blackhawk Creek	SPRING BROOK - MAIN STREET IN JANESVILLE	12.85
0709000208	Badfish Creek	BADFISH CREEK - CASEY ROAD	12.39
0709000310	Honey Creek-Pecatonica River	HONEY CREEK - 50M UPSTREAM OF CTH P BRIDGE	10.08
0709000311	Richland Creek	RICHLAND CREEK - CTH P BRIDGE UPSTREAM 660M TO SHU	9.84
0709000603	Piscasaw Creek	extrapolated from N. Br Nippersink	7.78
0712000608	North Branch Nippersink Creek	From USGS Nutrient Study -- W Br Nippersink	7.78
0712000609	Nippersink Creek	Extrapolated form N. Br Nippersink	7.78
0709000303	Ames Branch-Pecatonica River	extrapolated from Pecatonica at Walnut Rd	7.39
0709000309	Spafford Creek-Pecatonica River	PECATONICA RIVER AT WALNUT ROAD	7.39
0706000303	Lower Grant River	GRANT RIVER - HWY 133	7.33
0706000304	Little Platte River	LITTLE PLATTE RIVER - OAK RD (BI)	7.00
0709000309	Spafford Creek-Pecatonica River	PECATONICA RIVER - STH 176 SOUTH WAYNE	6.94
0709000212	Bass Creek	BASS CREEK - CTH D, AFTON	6.73
0709000315	Raccoon Creek	extrapolated from Bass Creek	6.73
0706000301	Upper Grant River	GRANT RIVER - UNIVERSITY FARM RD	6.43
0709000403	Allen Creek	extrapolated from Sugar River at CTH EE	6.10
0709000405	Story Creek-Sugar River	SUGAR RIVER - AT CTH EE	6.10
0709000206	Lake Mendota-Yahara River	PHEASANT BRANCH CTH M EAST BRIDGE	6.02
0706000502	Sinsinawa River-Mississippi River	extrapolated from Galena River	5.98
0706000503	Galena River	GALENA RIVER - AT BEEBE ROAD	5.98
0706000505	South Fork Apple River-Apple River	extrapolated from Galena River	5.98
0707000304	Fourmile Creek	FOURMILE CREEK AT GRIFFITH AVENUE	5.91
0709000401	West Branch Sugar River	WEST BRANCH SUGAR RIVER AT CTH PB	5.90
0709000404	Little Sugar River	LITTLE SUGAR RIVER AT TIN CAN ROAD	5.76

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)			
HUC 10	Watershed	Location_Description	(mg/L)
0709000302	Headwaters Pecatonica River	PECATONICA RIVER, WEST BRANCH - OAK PARK ROAD	5.58
0709000214	Turtle Creek	TURTLE CREEK - COLLEY ROAD IN BELOIT	5.52
0703000511	Kinnickinnic River	KINNICKINNIC RIVER - CTH F BRIDGE	5.47
0703000512	Lake Saint Croix	extrapolated from Kinnickninnic River	5.47
0709000213	Marsh Creek-Rock River	MARSH CREEK - CTH E	5.42
0709000211	Blackhawk Creek	SPRING BROOK - MAIN STREET IN JANESVILLE	12.85
0709000208	Badfish Creek	BADFISH CREEK - CASEY ROAD	12.39
0709000310	Honey and Richland Creeks	HONEY CREEK - 50M UPSTREAM OF CTH P BRIDGE	10.08
0709000311	Honey and Richland Creeks	RICHLAND CREEK - CTH P BRIDGE UPSTREAM 660M TO SHU	9.84
0709000603	Piscasaw Creek	extrapolated from N. Br Nippersink	7.78
0712000608	North Branch Nippersink Creek	From USGS Nutrient Study -- W Br Nippersink	7.78
0712000609	Nippersink Creek	Extrapolated form N. Br Nippersink	7.78
0709000303	Ames Branch -- Pecatonica River	extrapolated from Pecatonica at Walnut Rd	7.39
0709000309	Lower Pecatonica River	PECATONICA RIVER AT WALNUT ROAD	7.39
0706000303	Lower Grant River	GRANT RIVER - HWY 133	7.33
0706000304	Little Platte River	LITTLE PLATTE RIVER - OAK RD (BI)	7.00
0709000309	Lower Pecatonica River (2)	PECATONICA RIVER - STH 176 SOUTH WAYNE	6.94
0709000212	Bass Creek	BASS CREEK - CTH D, AFTON	6.73
0709000315	Racoon Creek	extrapolated from Bass Creek	6.73
0706000301	Upper Grant River	GRANT RIVER - UNIVERSITY FARM RD	6.43
0709000403	Allen Creek and Middle Sugar River	extrapolated from Sugar River at CTH EE	6.10
0709000405	Allen Creek and Middle Sugar River	SUGAR RIVER - AT CTH EE	6.10
0709000206	Six Mile and Pheasant Branch Creeks	PHEASANT BRANCH CTH M EAST BRIDGE	6.02
0706000502	Sinsinawa River -- Mississippi River	extrapolated from Galena River	5.98
0706000503	Galena River	GALENA RIVER - AT BEEBE ROAD	5.98
0706000505	South Fork Apple River -- Apple River	extrapolated from Galena River	5.98
0707000304	Fourmile and Fivemile Creek	FOURMILE CREEK AT GRIFFITH AVENUE	5.91
0709000401	West Branch Sugar River - Mt. Vernon Cre	WEST BRANCH SUGAR RIVER AT CTH PB	5.90
0709000404	Little Sugar River	LITTLE SUGAR RIVER AT TIN CAN ROAD	5.76
0709000302	Upper West Branch Pecatonica River	PECATONICA RIVER, WEST BRANCH - OAK PARK ROAD	5.58
0709000214	Turtle Creek	TURTLE CREEK - COLLEY ROAD IN BELOIT	5.52
0703000511	Kinnickinnic River	KINNICKINNIC RIVER - CTH F BRIDGE	5.47
0703000512	Lake St. Croix	extrapolated from Kinnickninnic River	5.47
0709000213	Marsh Creek	MARSH CREEK - CTH E	5.42
0709000215	City of Beloit-Lower Rock River	Extrapolated from Marsh Creek	5.42
0706000302	Middle Grant River	GRANT RIVER - PIGEON RIVER RD	5.35
0709000402	Headwaters Sugar River	SUGAR RIVER - AT STH 69, BELLEVILLE	5.33
0709000210	Lake Koshkonong-Rock River	extrapolated from Koshkonong Creek	5.31
0709000204	Koshkonong Creek	KOSHKONONG CREEK AT STH 106	5.31
0707000510	Willow Creek	From USGS Nutrient Study -- Willow Cr	5.27
0709000204	Koshkonong Creek	KOSHKONONG CREEK AT CTH O	5.07
0709000406	Sylvester Creek-Sugar River	Sugar Creek at Ten Eyck Road	4.93
0706000305	Platte River	PLATTE RIVER - BANFIELD BRIDGE ACCESS	4.91
0709000301	Mineral Point Branch	MINERAL POINT BRANCH CTH O (BI)	4.86
0709000205	Headwaters Yahara River	YAHARA RIVER AT STH 113 AT MADISON WI	4.82
0709000107	Headwaters Crawfish River	CRAWFISH RIVER - IN COLUMBUS-LUDINGTON	4.78
0709000407	Taylor Creek-Sugar River	SUGAR RIVER - AT NELSON ROAD	4.71
0709000209	Lake Kegonsa-Yahara River	YAHARA RIVER - AT STH 59, NEAR FULTON WI	4.70
0709000308	East Branch Pecatonica River	EAST BRANCH PECATONICA RIVER AT CISSERVILLE ROAD	4.62
0709000206	Lake Mendota-Yahara River	SIX MILE CREEK AT COUNTY HWY M	4.59
0707000514	Blue River	BLUE RIVER AT STATE HIGHWAY 133	4.42
0712000603	Wind Lake Drainage	extrapolated from Eagle & Fox Creeks	4.40

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)			
HUC 10	Watershed	Location_Description	(mg/L)
0712000607	Eagle Creek-Fox Creek	FOX RIVER @ CTY HWY I	4.40
0709000213	Marsh Creek-Rock River	*ROCK RIVER - AT USH 14 BRIDGE*	*4.33*
0709000305	Blue Mounds Branch	GORDON CREEK AT COUNTY HIGHWAY H	4.30
0707000211	Spring Brook	SPRING BROOK - BEFORE EAU CLAIRE R AT NOLAN RD	4.26
0709000202	Whitewater River	WHITEWATER CREEK - FREMONT ROAD IN COLD SPRING	4.13
0705000707	Lower Pine Creek-Red Cedar River	1 LOWER PINE CREEK - CTH V	4.11
0707000503	Otter Creek-Wisconsin River	ROXBURY CREEK AT STH 78	4.09
0712000401	Headwaters Des Plaines River	DES PLAINES AT MB	4.03
0712000402	Mill Creek	extrapolated from headwaters Des Plaines	4.03
0705000512	Bear Creek-Chippewa River	BEAR CREEK AT HIGHWAY 85	4.03
0709000310	Honey Creek-Pecatonica River	SKINNER CREEK - CHEESE COUNTRY RECREATION TRAIL IN	3.95
0709000101	East Branch Rock River	ROCK RIVER, EAST BRANCH - AT CTH TW BRIDGE	3.91
0707000501	Duck Creek-Wisconsin River	DUCK CREEK AT DUCK CREEK ROAD	3.79
0709000104	Sinnissippi Lake-Rock River	ROCK RIVER AT STH 60 DOWNSTREAM FROM LAKE SINISSIP	3.78
0712000604	Sugar Creek	SUGAR CREEK UPSTREAM OF POTTER ROAD	3.69
0712000605	Honey Creek	extrapolated from Sugar Creek	3.69
0706000307	Sny Magill Creek-Mississippi River	MCCARTNEY BRANCH - IRISH RIDGE RD	3.64
0709000304	Dodge Branch	extrapolated from 0709000306	3.62
0709000306	Ridgeway Br-East Br Pecatonica R	PECATONICA RIVER, E BRANCH-FOOTBRIDGE OFF WATER S	3.62
0703000510	Willow River	WILLOW RIVER - 160TH AVE	3.43
0704000101	Big River-Mississippi River	extrapolated from Trimbelle River	3.40
0704000103	Trimbelle River	TRIMBELLE RIVER 1-50' US OF STH 35	3.40
0704000504	Middle Trempealeau River	TURTON CREEK AT OAK STREET	3.35
0709000108	Maunesha River	MAUNESHA RIVER UPSTREAM STH 19	3.35
0709000106	Ashippun River-Rock River	ASHIPPUN RIVER AT SKI SLIDE ROAD	3.30
0707000504	Honey Creek	HONEY CREEK AT STATE HIGHWAY 60	3.10
0709000307	Yellowstone River	YELLOWSTONE RIVER AT OLD Q ROAD	3.10
0704000302	Elk Creek-Buffalo River	BUFFALO RIVER - AT STH 37	3.07
0704000105	Rush River	4-RUSH RIVER - 385TH ST	3.04
0705000506	Elk Creek	ELK CREEK AT 960TH STREET/CRESENT AVE	3.04
0705000508	Muddy Creek-Chippewa River	extraplated from Elk Creek	3.04
0705000509	Muddy Creek-Chippewa River	extrapolated from Elk Creek	3.04
0709000110	Crawfish River	CRAWFISH RIVER - STATE HIGHWAY 18	3.02
0707000502	Prairie du Sac Dam-Wisconsin River	From USGS Nutrient Study -- Hinkson Cr	2.93
0707000308	Big Roche a Cri Creek	BIG ROCHE A CRI CREEK AT 20TH AVE SITE 1	2.92
0707000309	Little Roche a Cri Creek	Bingham Creek at 11th Avenue	2.89
0709000103	Rubicon River	RUBICON RIVER - CTH EE	2.88
0709000111	Johnson Creek-Rock River	ROCK RIVER - CTH B & US 94	2.83
0709000102	West Branch Rock River-Rock River	ROCK RIVER - AT STH 33 IN HORICON	2.83
0707000605	Kickapoo River	PINE CREEK STATION STARTS AT WALKER HOLLOW RD BRI	2.80
0703000510	Willow River	WILLOW RIVER - BELOW LITTLE FALLS DAM	2.80
0709000109	Beaver Dam River	BEAVER DAM RIVER AT CTH J BRIDGE	2.79
0704000601	Halfway Creek-Mississippi River	extrapolated from Fleming Creek	2.79
0704000712	Fleming Creek-Black River	FLEMING CREEK	2.79
0704000604	Lower La Crosse River	BOSTWICK CREEK STATION 1 - CTH B BRIDGE	2.78
0707000516	Big Green River	WISCONSIN RIVER - BIG GREEN RIVER ACCESS	2.77
0704000502	Upper Trempealeau River	extrapolated from Elk Creek	2.75
0704000503	Elk Creek	ELK CREEK - SWEEDE VALLEY RD	2.75
0704000603	Middle La Crosse River	LITTLE LA CROSSE RIVER AT ICEBOX RD (PREVIOUSLY NAM	2.68
0703000509	Big Marine Lake-Saint Croix River	OSCEOLA CREEK ST STH 35	2.60
0707000505	Black Earth Creek	BLACK EARTH CREEK AT MORRILL ROAD	2.54
0705000511	Plum Creek	1-PLUM CREEK CTH N	2.54

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)			
HUC 10	Watershed	Location_Description	(mg/L)
0705000705	South Fork of the Hay River	SOUTH FORK HAY RIVER - S FORK HAY RIVER 1, CTH F	2.53
0709000203	Bark River	BARK RIVER CTH N FORT ATKINSON	2.52
0707000517	City of Boscobel-Wisconsin River	From USGS Nutrient Study -- Crooked Cr	2.51
0707000318	Petenwell Lake	WHITE CREEK AT CTH Z	2.51
0707000301	Plover River	PLOVER RIVER (UW-12)	2.48
0709000109	Beaver Dam River	CALAMUS CREEK AT HWY S (CTH T)	2.45
0705000702	Yellow River	YELLOW RIVER - CTY O	2.42
0704000708	Halls Creek	HALLS CREEK-CTY HWY E DOWNSTREAM	2.42
0704000301	Harvey Creek-Buffalo River	BUFFALO RIVER SEGERSTROM RD	2.40
0704000711	Beaver Creek	BEAVER CREEK AT HWY 53	2.34
0709000111	Johnson Creek-Rock River	JOHNSON CREEK AT CTH B IN JOHNSON CREEK	2.33
0712000401	Headwaters Des Plaines River	DES PLAINS RIVER	2.31
0704000712	Fleming Creek-Black River	BIG CREEK	2.31
0712000610	Squaw Creek-Fox River	FOX RIVER AT WILMOT WI	2.29
0707000508	Otter Creek	OTTER CREEK AT HWY C	2.26
0707000507	Trout Creek-Mill Creek	MILL CREEK AT CTH C	2.18
0707000319	Dell Creek-Wisconsin River	DELL CREEK AT STATE HIGHWAY 23	2.17
0712000601	Pewaukee River-Fox River	FOX RIVER AT RIVER RD (BI SUR)	2.12
0704000501	Pigeon Creek	PIGEON CREEK AT STH 53	2.11
0704000304	Waumaundee Creek	WAUMANDEE CREEK AT WAUMANDEE CREEK ROAD	2.09
0704000306	City of Winona-Mississippi River	extrapolated from Waumandee	2.09
0707000518	Wisconsin River	MILLVILLE CREEK AT CTH C	2.06
0706000103	Bad Axe River	BAD AXE RIVER NEAR MOUTH AT WILLENBERG ROAD BRIDG	2.03
0707000404	Devil's Lake-Baraboo River	BARABOO RIVER AT COUNTY HIGHWAY U	1.99
0705000710	Lake Menomin-Red Cedar River	WILSON CREEK AT 390TH ST BRIDGE	1.89
0707000207	Black Creek	BLACK CREEK AT CTH H	1.79
0709000201	Scupperenong River	SCUPPERNONG RIVER - AT STH 106	1.77
0707000212	Black Brook-Eau Claire River	EAU CLAIRE RIVER AT W BEAR LAKE ROAD	1.76
0707000209	Little Rib River	LITTLE RIB, (NORTH OF) STEWART AVE, SITE 1	1.76
0707000602	West Fork Kickapoo River	KICKAPOO RIVER, WEST FORK - SE 1/4 OF NW 1/4 SEC 33	1.75
0705000507	Lowes Creek-Chippewa River	LOWES CREEK - SILVER SPRINGS DR	1.74
0707000509	Bear Creek	BEAR CREEK AT CTH JJ	1.72
0712000606	White River	WHITE RIVER	1.66
0707000501	Duck Creek-Wisconsin River	PINE RIVER AT STH 60	1.62
0706000101	Coon Creek	COON CREEK NEAR MOUTH	1.61
0707000217	Little Eau Pleine River	LITTLE EAU PLAINE RIVER AT RANGELINE ROAD BRIDGE	1.57
0705000707	Lower Pine Creek-Red Cedar River	RED CEDAR RIVER IBI - STH 64	1.55
0706000107	Rush Creek-Mississippi River	RUSH CREEK ST.1 - BRIDGE ON RUSH CREEK ROAD	1.54
0706000110	Bloody Run-Mississippi River	extrapolated from Rush Creek	1.54
0707000403	Narrows Creek-Baraboo River	BARABOO RIVER - AT SHAW STREET IN BARABOO	1.53
0707000601	Headwaters Kickapoo River	KICKAPOO RIVER STH 33 IN ONTARIO	1.52
0707000402	Little Baraboo River-Baraboo River	BARABOO RIVER AT STH 23 BRIDGE IN REEDSBURG	1.48
0705000207	Lower Flambeau River	MEADOW BROOK AT STH 27	1.47
0707000603	Bear Creek-Kickapoo River	KICKAPOO RIVER - BANKER PARK IN VIOLA	1.45
0704000605	Pine Creek-Mississippi River	extrapolated from Mormon Creek	1.42
0706000105	Mormon Creek-Mississippi River	from USGS nutrient study	1.42
0712000602	Mukwonago River	MUKWONAGO RIVER AT CTH I 2M (BI SUR)	1.41
0705000510	Eau Galle River	EAU GALLE RIVER @ CTH P	1.40
0705000507	Lowes Creek-Chippewa River	LOWER CREEK - SILVER SPRINGS DR	1.40
0707000315	Upper Lemonweir River	extrapolated from Little Lemonweir	1.39
0707000316	Middle Lemonweir River	LITTLE LEMONWEIR AT MCEWEN RD BRIDGE	1.39
0705000706	Hay River	HAY RIVER @ CTH V	1.38

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)

HUC 10	Watershed	Location_Description	(mg/L)
0707000515	Knapp Creek	KNAPP CREEK AT WINDING WAY DR	1.35
0707000218	Lake Dubay-Wisconsin River	JOHNSON CREEK AT CTH C	1.34
0707000311	Rocky Creek-Yellow River	YELLOW RIVER AT STH 13/73	1.34
0707000210	Scotch Creek-Big Rib River	LOWER RIB RIVER (UW-23)	1.33
0704000701	Black-Little Black Rivers	BLACK RIVER - AT DIVISION DRIVE	1.30
0707000604	Tainter Creek-Kickapoo River	TAINTER CREEK	1.30
0712000601	Pewaukee River-Fox River	PEWAUNEE RIVER UPSTREAM OF STH 164 AT STEINHAFEL'S	1.27
0704000505	Lower Trempealeau River	TAMARACK CREEK AT CTH G	1.23
0705000605	Eau Claire River	EAU CLAIRE RIVER, ADJACENT TO CTH QQ - COUNTY LAND	1.21
0707000215	Dill Creek-Big Eau Pleine River	BIG EAU PLEINE RIVER AT STH 97	1.21
0703000507	Beaver Brook-Apple River	BEAVER BROOK - UPSTREAM OF 85TH STREET, APPROX 10	1.20
0707000513	Hoosier Hollow-Mill Creek	MILL CREEK - STATE HIGHWAY 60	1.20
0707000305	Tenmile Creek	TENMILE CREEK - AT HWY 13	1.19
0704000702	Popple River	POPPLE RIVER AT STATE HWY 73 (FH STA 1)	1.19
0704000709	Lake Arbutus-Black River	BLACK RIVER BELOW POWER HOUSE HATFIELD DAM	1.18
0709000207	Lake Monona-Yahara River	YAHARA RIVER AT USH 51	1.15
0707000506	Blue Mounds Creek	West Br Blue Mounds at Frame Road	1.15
0707000401	Headwaters of the Baraboo River	BARABOO RIVER - AT CTH FF IN WONEWOC	1.15
0705000205	Upper Flambeau River	SWAMP CREEK AT CTH F	1.14
0707000204	Alexander Lake-Wisconsin River	DEVIL CREEK - SCOTT ROAD	1.14
0705000502	Upper Yellow River	YELLOW RIVER AT 350TH ST	1.13
0707000512	City of Spring Green-Wisconsin River	From USGS Nutrient Study -- Lowery Cr	1.13
0705000507	Lowes Creek-Chippewa River	CHIPPEWA RIVER - SHORT ST EAU CLAIRE	1.12
0707000511	Pine River	PINE RIVER - AT STH 14 RICHLAND CENTER	1.12
0705000504	Duncan Creek	DUNCAN CREEK - SPRING STREET, CHIPPEWA FALLS	1.11
0705000505	Trout Creek-Chippewa River	extrapolated from Duncan Creek	1.11
0707000213	Big Sandy Creek-Eau Claire River	EAU CLAIRE RIVER - AT CAMP PHILLIPS RD	1.09
0707000317	Lower Lemonweir River	LOWER LEMONWEIR RIVER AT HWY HH BRIDGE	1.08
0707000205	Pine River	extrapolated form Trappe River	1.08
0707000206	Trappe River	TRAPPE RIVER AT SHADY LANE, STATION 1	1.08
0707000214	Eau Claire Flowage-Wisconsin River	extrapolated from Trappe River	1.08
0705000207	Lower Flambeau River	MUD CREEK AT CTH D	1.06
0704000709	Lake Arbutus-Black River	BLACK RIVER - AT STH 95 BRIDGE	1.05
0705000404	Lower Jump River	JUMP RIVER AT HIGHWAY 73	1.04
0704000704	Rock Creek-Black River	ROCK CREEK ROCK CREEK STATION	1.04
0707000218	Lake Dubay-Wisconsin River	BULL JUNIOR CREEK AT OLD 51 BRIDGE	1.02
0707000314	Beaver Creek	BEAVER CREEK UPSTREAM OF STH 21	1.02
0705000303	South Fork Flambeau River	SKINNER CREEK	1.01
0705000603	Hay Creek-Eau Claire River	HAY CREEK - HAY CREEK 1, CTH NL	1.00
0705000109	Holcolmbe Flowage-Chippewa River	extrapolated from Fisher River	1.00
0705000501	Fisher River-Chippewa River	FISHER RIVER - 240TH AVE	1.00
0707000604	Tainter Creek-Kickapoo River	TAINTER CREEK @ WEST POINT ROAD	1.00
0705000601	North Fork Eau Claire River	EAU CLAIRE RIVER, NORTH FORK - NE 1/4 OF SE 1/4 SEC 10	0.99
0707000218	Lake Dubay-Wisconsin River	FOURMILE CREEK @ CTH KK	0.99
0705000604	Otter Creek	OTTER CREEK - STATION 1/SPOONER AVE	0.99
0703000506	Wolf Creek-Saint Croix River	WOLF CREEK @ 275TH STREET	0.99
0705000401	South Fork Jump River	SOUTH FORK JUMP RIVER ALONG CTH I	0.97
0704000709	Lake Arbutus-Black River	CUNNINGHAM CREEK AT STH 95/73 BRIDGE	0.96
0707000307	Petenwell Lake	MOCCASIN CREEK MOCASSIN CREEK AT STH 54 STATION 1	0.96
0707000218	Lake Dubay-Wisconsin River	LITTLE EAU CLAIRE RIVER - AT CTH X BRIDGE	0.94
0705000703	Brill River-Red Cedar River	RED CEDAR RIVER	0.94
0705000108	Deer Tail Creek	DEER TAIL CREEK @ BROKEN ARROW RD	0.92

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)			
HUC 10	Watershed	Location_Description	(mg/L)
0704000706	East Fork of the Black River	BLACK RIVER, EAST FORK - E FORK ROAD	0.91
0703000112	Chases Brook-Saint Croix River	ST CROIX RIVER NORWAY POINT LANDING	0.91
0707000216	Lake Dubay-Big Eau Pleine River	FENWOOD CREEK AT FAIRVIEW ROAD	0.88
0707000202	Copper River	COPPER RIVER AT CTH E	0.86
0707000310	Hemlock Creek	HEMLOCK CREEK AT NECEDAH ROAD	0.84
0703000502	Goose Creek-Saint Croix River	extrapolated from Moose River	0.84
0703000102	Moose River-Saint Croix River	ST CROIX RIVER - AT CCC BRIDGE OR ST CROIX TRAIL	0.83
0704000710	Robinson Creek-Black River	ROBINSON CREEK AT ROBINSON ROAD	0.83
0709000105	Oconomowoc River	OCONOMOWOC RIVER	0.83
0705000403	Main Creek	MAIN CREEK AT BROKEN ARROW ROAD	0.83
0703000508	Balsam Branch-Apple River	APPLE RIVER AT CHURCH ROAD	0.82
0707000313	Mead Marsh-Yellow River	YELLOW RIVER ABOVE NECEDAH TREATMENT PLANT OUTF	0.82
0703000104	Shell Lake-Yellow River	YELLOW RIVER - UPSTREAM OF YELLOW RIVER ROAD, APPR	0.81
0705000302	Headwaters South Fork Flambeau River	SOUTH FORK FLAMBEAU RIVER	0.81
0703000507	Beaver Brook-Apple River	APPLE RIVER - APPLE RIVER COUNTY PARK 40 METERS DOV	0.79
0705000402	North Fork Jump River	JUMP RIVER	0.79
0705000301	Elk River	ELK RIVER	0.76
0705000302	Headwaters South Fork Flambeau River	FLAMBEAU RIVER, SOUTH FORK - AT STH 13 WAYSIDE, SOU	0.76
0705000106	Thornapple River	THORNAPPLE RIVER - CTH A NW LADYSMITH	0.73
0707000306	Fourteenmile Creek	FOURTEENNILE CREEK AT CTH Z BRIDGE	0.73
0704000705	Wedges Creek	WEDGES CREEK AT MIDDLE RD	0.72
0707000511	Pine River	PINE RIVER AT STH 14 RICHLAND CENTER	0.72
0704000707	Morrison Creek	MORRISON CREEK AT HWY K	0.70
0705000602	South Fork Eau Claire River	EAU CLAIRE RIVER, SOUTH FORK EAU CLAIRE RIVER	0.68
0704000703	Trappers-Pine Creeks-Black River	BLACK RIVER	0.67
0705000107	Soft Maple Creek-Chippewa River	DEVILS CREEK - LOW SITE AT HWY 40 BRIDGE	0.66
0704000602	Upper La Crosse River	LACROSSE RIVER @ FINCH AVE	0.66
0705000105	Brunet River-Chippewa River	BIG WEIRGOR CREEK - DOWNSTREAM OF SHORT CUT ROAD	0.65
0707000208	Wood Creek-Big Rib River	BIG RIB RIVER AT CTH A	0.65
0707000108	Upper Tomahawk River	TOMAHAWK RIVER, ADJACENT TO CEDAR FALLS RD	0.63
0707000201	New Wood River	NEW WOOD RIVER AT TESCH RD	0.63
0707000111	Somo River	SOMO RIVER - AT ZENITH TOWER RD, DOWNSTREAM OF BR	0.62
0707000105	Gillmore Creek-Big St. Germain River	GILMORE CREEK - UPSTREAM FROM CTH-D (UPSTREAM OF	0.61
0707000203	Prairie River	from USGS Nutrient Study	0.60
0705000206	Middle Flambeau River	FLAMBEAU RIVER AT BOAT LANDING UPTREAM OF STH 70	0.59
0707000104	Rainbow Flow-Mud Creek-Wisconsin R	WISCONSIN RIVER - TAILWATER BELOW OTTER RAPIDS DAM	0.59
0705000202	Bear River	BEAR RIVER - UPSTREAM BRIDGE RD	0.58
0707000113	Lake Mohawksin-Lake Alice-Wisconsin R	WISCONSIN RIVER OFF CAMP 10 RD	0.57
0707000106	Rhinelander Flowage-Upper Wisconsin R	PINE LAKE CREEK AT FOREST LN	0.56
0705000701	Red Cedar Lake	KNUTESON CREEK	0.56
0705000203	Flambeau Flowage-Headwaters Flam R	FLAMBEAU RIVER	0.54
0705000103	Lake Chippewa	HAY CREEK @ MOOSE LAKE ROAD	0.53
0707000312	Cranberry Creek	CRANBERRY CREEK AT 8TH STREET	0.53
0705000204	Butternut Creek	BUTTERNUT CREEK	0.52
0707000102	Eagle River	EAGLE RIVER AT STH-70	0.52
0707000103	Pioneer Creek-Wisconsin River	WISCONSIN RIVER - AT CTH G EAGLE RIVER	0.52
0707000109	Middle Tomahawk River	TOMAHAWK RIVER - AT PRAIRIE RAPIDS RD, UPSTREAM FRO	0.51
0703000508	Balsam Branch-Apple River	BALSAM BRANCH AT 105TH AVE - UPSTREAM OF LAKE WAPF	0.50
0707000105	Gillmore Creek-Big St. Germain River	ST GERMAIN RIVER - BELOW STH 70, ABOVE DAM	0.49
0707000113	Lake Mohawksin-Lake Alice-Wisconsin R	CRESCENT CREEK - FIRETOWER RD	0.45
0703000109	Clam River	CLAM RIVER AT LYNCH BRIDGE ROAD	0.45
0707000113	Lake Mohawksin-Lake Alice-Wisconsin R	NOISY CREEK AT WOODFORD RD	0.43

Total Nitrogen (median May - October) (minimum of 4 sample results) (underlined values -- nitrate only)			
HUC 10	Watershed	Location_Description	(mg/L)
0703000501	Wood River	WOOD RIVER AT WEST RIVER ROAD CROSSING (1MI ABOVE	0.40
0705000206	Middle Flambeau River	PINE CREEK AT CTY HWY EE	0.40
0703000204	Namekagon River	NAMEKAGON RIVER DOWNSTREAM OF NAMEKAGON TRAIL A	0.39
0703000105	Yellow Lake-Yellow River	YELLOW RIVER DOWNSTREAM OF LOWEST HWY 35 CROSSI	0.38
0707000101	Deerskin River	DEERSKIN RIVER AT RANGLINE RD	0.37
0705000201	Manitowish River	MANITOWISH RIVER - NEXT TO BENSON LAKE ROAD	0.36
0707000302	Mill Creek	MILL CREEK AT CTH PP BRIDGE	0.36
0707000303	City of Stevens Point-Wisconsin River	extrapolated from Mill Creek	0.36
0705000201	Manitowish River	TROUT RIVER BELOW WILD RICE LAKE	0.35
0703000201	Upper Namekagon River	NAMEKAGON RIVER @ HOSPITAL RD	0.33
0707000110	Lower Tomahawk River	LITTLE RICE CREEK AT CTH-N	0.33
0705000104	Couderay River	COUDERAY RIVER	0.31
0703000505	Trade River	TRADE RIVER AT EVERGREEN AVENUE	0.26
0705000704	Lake Chetek	CHETEK RIVER AT 4 1/2 AVENUE CROSSING	0.23
0705000503	Lake Wissota	YELLOW RIVER AT CTH XX	0.18
0707000112	Spirit River	SPIRIT RIVER-BELOW CONFLUENCE WITH SQUAW CREED	0.10
0707000107	Pelican River	PELICAN RIVER AT GERMOND RD	0.07
0705000101	West Fork Chippewa River	WEST FORK CHIPPEWA RIVER ADJACENT TO COUNTY HIGH	0.06
0705000102	East Fork Chippewa River	CHIPPEWA RIVER, EAST FORK - CTH B ABOVE FLOWAGE	0.06
0703000202	Trego Lake-Namekagon River	NAMEKAGON RIVER	0.05
0705000205	Upper Flambeau River	NORTH FORK FLAMBEAU RIVER AT HOLTS LANDING	0.04
0703000201	Upper Namekagon River	NAMEKAGON RIVER	0.03
0705000205	Upper Flambeau River	NORTH FORK FLAMBEAU RIVER BELOW CROWLEY DAM	0.03
0703000203	Totagatic River	TOTAGATIC RIVER AT THOMPSON BRIDGE ROAD CROSSING	0.02
0703000101	Upper St. Croix-Eau Claire Rivers	ST CROIX RIVER AT OLD HWY 53	0.00
0703000103	Upper Tamarack River	UPPER TAMARACK RIVER AT CTH T BRIDGE	0.00
0703000108	North Fork of the Clam River	NORTH FORK CLAM RIVER AT MALONE ROAD CROSSING	0.00
0704000104	Hay Creek-Mississippi River	na	na
0709000409	Keith Creek-Rock River	na	na
0703000106	Lower Tamarack River	na	na
0704000107	Lake Pepin	na	na
0709000312	Waddams Creek-Pecatonica River	na	na
0709000316	Pecatonica River	na	na
0709000408	Sugar Creek	na	na
0712000403	Bull Creek-Des Plaines River	na	na