Eutrophication Management Strategy

Wisconsin Department of Natural Resources

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Preface

In 2000, EPA provided Wisconsin and other states with the option of moving directly into a four year period for promulgation of nutrient criteria for lakes and streams or developing a nutrient criteria development plan that included collection and assessment of additional data needed to better identify criteria for the states surface waters. Under the option of developing a state nutrient criteria development plan, states would have an additional three years to complete the criteria promulgation process.

The Wisconsin Department of Natural Resources (Department) chose the option of developing a nutrient criteria development plan with associated monitoring for a variety of reasons, including:

- A concern with the representativeness EPA's national data base for Wisconsin conditions;
- A desire to develop a representative, statewide data base for streams;
- A concern with the 25th percentile of available approach used by EPA in identifying guidance for lakes and streams; and
- A desire to base criteria on biological and other effects in lakes and streams.

In developing the plan, the Department determined that implementation issues should be considered along with the scientific and policy aspects of the criteria development process. Thus, this nutrient criteria development plan has been referred to as an Eutrophication Management Strategy.

Presently, the Department is transitioning from collecting and analyzing data to developing a specific proposal for criteria promulgation. A "pink sheet" was developed a submitted to the Natural Resources Board, the Department's policy board, identifying the initiation of the promulgation process and identifying a target date for completion of early 2008. A copy of the pink sheet is included as an attachment to this plan.

Given this transition stage, this update reviews what was identified in previous versions of the plan, assesses to what degree the need was met, and describes whether further work is needed. The implementation of this plan has been marked by substantial budget cuts and increased staff vacancies. As a result, tasks and schedules had to be revised,

delayed or eliminated. There has been little to no progress national progress on implementing the federal – state Gulf Hypoxia management strategy. As a result, that section of the strategy remains to be developed. On the other hand, the USGS – DNR stream nutrient monitoring project has progressed and is nearly completed. In 2002, the administrative rules establishing enforceable agricultural and non-agricultural nonpoint source performance were promulgated.

Brief Overview of Section A. Establishing Resource Objectives

The original version of the strategy included a number of guiding statements. The original statements are included in italics below accompanied by a brief discussion.

- *Wisconsin DNR preference is to base nutrient criteria for water quality standards on the in-stream or in-lake effects – both biological and aesthetics. EPA's guidance is based on a statistical distribution of available data without a direct tie to effects. To be able to pursue such an approach, a stream database has to be developed to compliment the existing lake database. This strategy does not identify a "fall-back" position if an effects-based approach cannot be developed for streams. Wisconsin DNR will consider a number of options including use of values in EPA guidance, literature reviews of effects of nutrients, a frequency distribution of non-event nutrient data (especially late-summer conditions) and calculations of nutrient concentrations tied to dissolved oxygen concentrations.*

  Discussion: The Department's preference remains to base nutrient criteria for water quality standards on the in-stream or in-lake effects. A stream data base has been developed and the first of two reports analyzing the data is available. (See, "Nutrient Concentrations and Their Relations to the Biotic Integrity of Wadeable Streams in Wisconsin", by Dale M. Robertson, David J. Graczyk, Paul J. Garrison, Lizhu Wang, Gina LaLiberte, and Roger Bannerman, USGS Professional Paper 1722, prepared in cooperation with the Wisconsin Department of Natural Resources.) A specific fall back option has not been identified and the Department will continue to consider a number of options, if necessary, including use of EPA's guidance values.

- *Wisconsin's preferred form for nutrient criteria is to have criteria for lakes that include total phosphorus, chlorophyll a and some measure of transparency during the growing season. For streams the presently preferred approach is to develop criteria for total phosphorus and tie the total phosphorus concentrations to in-stream responses, such as Chlorophyll a, dissolved oxygen and aquatic community health. The specifics will need to be derived from the stream data analysis. It is possible that narrative criteria with a "translator" will be developed. At present, the role for nitrogen as*

part of the suite of criteria is unclear, but total nitrogen data will be collected for streams to allow further evaluation of the need for nitrogen criteria.

Discussion: The Department's preference remains unchanged.

The USGS-WDNR stream study analyzed total nitrogen, total Kjeldahl nitrogen and nitrate+nitrate relative to a suite of biotic and water chemistry factors, but could not arrive at consist results. The breakpoints did not cluster as they did for total and dissolved phosphorus. As a result, it is not scientifically defensible to move ahead and develop proposed criteria for nitrogen in the same phase as for phosphorus. WDNR will need to consider how to proceed with nitrogen in a second or later phase of the nutrient criteria development process.

- *Although it is possible that a single set of criteria may be developed statewide, the intent of the Wisconsin DNR is to explore regional criteria using some combination of ecoregions and basins.*

  Discussion: The Department has explored and is continuing to explore development of criteria on a geographic basis. The use of EPA ecoregions was examined in a detailed analysis by USGS. (See the above mentioned USGS report, "Nutrient Concentrations and Their Relations to the Biotic Integrity of Wadeable Streams in Wisconsin".)

- *Some revision to waterbody classification may be needed. For example, macrophyte-dominated lakes may need to be viewed in a different manner than other lakes.*

  Discussion: The Department continues to anticipate that some sub-categories of designated uses will be needed for lakes. For example, deep lakes may necessitate different criteria than shallow lakes. Similarly, drainage lakes may necessitate different criteria than seepage lakes.

- *Wisconsin DNR recognizes that effluent-dominated streams are an issue that must be evaluated.*

  The issue of effluent-dominated streams mains an important issue.

- *Promulgation of criteria for lakes and streams will be pursued concurrently with a tentative schedule for adopting criteria by the end of calendar year 2008.*

The Department prepared and submitted a "pink sheet" for the Natural Resources Board initiating the process that will lead to promulgation of nutrient criteria. The pink sheet identifies a tentative schedule for completing the process in early 2008. That schedule calls for review of Department proposals for both lakes and streams in early 2007 followed by a series of public hearings on proposed administrative rules in late-summer and fall of 2007. Based on public comment, the draft administrative rules will be reviewed and, if warranted, revised prior to taking the proposed administrative rules to the Natural Resources Board for approval in late-2007 or early 2008. The Natural Resources Board approval is subject to Legislative review.

Since preparation of that pink sheet, delays in data analysis and report preparation have caused the schedule to be modified as follows:

- An external advisory committee will be formed in the fall of 2007 to review and comment on draft criteria prepared by Department staff;
- The series of forums will be held in early 2008;
- Public hearings will be held in spring of 2008; and
- Natural Resource Board action is anticipated for August or September 2008.

The legislative oversight process may or may not take place after Natural Resource Board action. Thus, a timetable for that process cannot be anticipated.

In addition to the above "original" guiding statements, an additional guiding statement needs to be added. That is, the Department recognizes that water quality criteria must not only be protective of the individual lake or stream, but also protective of downstream waters. Downstream waters include a wide range of waters from the next stream segment downstream to the Great Lakes, Mississippi River and Gulf of Mexico.

Eutrophication Management Strategy

Introduction

Many of Wisconsin's lakes and streams are experiencing "eutrophic" conditions that are beyond what would be considered as "natural aging" of these waters. This level of eutrophication is often associated with impaired uses of those waters. The eutrophic conditions are most often caused by high concentrations of phosphorus or nitrogen. Phosphorus and nitrogen are essential nutrients necessary to support life in both terrestrial and aquatic systems. However, the presence of these nutrients in large amounts or high concentrations in the aquatic environment can result in eutrophic conditions such as nuisance algae conditions, prolific macrophyte growth, reduced dissolved oxygen, fish kills and other results of enrichment. These conditions may result in impaired use of waters, such as fish kills, unaesthetic conditions for swimming and sightseeing and undesirable changes in fish and aquatic life communities. They may also result in increased costs to treat water for human consumption from surface water supplies. As such, excess phosphorus and nitrogen are pollutants in Wisconsin's lakes and streams. This strategy is focused on reducing eutrophic conditions through adoption of protective nutrient criteria as part of water quality standards and management of nutrients on farms, cities and in treatment plants.

Phosphorus is the pollutant of concern in many of Wisconsin's impaired lakes and streams, such as Lower Green Bay, Lake Winnebago, Big Eau Pleine Reservoir, Tainter Lake, Rock River and many smaller waterbodies. It also is a concern in the Great Lakes. Nitrogen is the pollutant of concern in the Gulf of Mexico and possibly some lakes and streams in Wisconsin.

Phosphorus and nitrogen reach lakes and streams from many point and nonpoint sources, and are ubiquitous in nature. Phosphorus and nitrogen are discharged from sanitary sewerage systems and many types of industrial operations, and carried in runoff from farm fields, animal feed lots, construction sites, urban streets, lawns, etc. Phosphorus is also added to many drinking water supplies to reduce leaching of lead from certain pipes. Although phosphorus is naturally found in varying amounts in Wisconsin's soils, substantial amounts are imported from Florida and other states and used as fertilizer and as an additive for cattle feed.

Need for a Strategy

The concern of eutrophic conditions in waters and the tie to nutrients has been recognized for decades, dating back to at least to the studies of Birge and Juday in the 1930's. Although much has been done in the last 25 years to control nutrients reaching the state's waters, the Department has not developed a comprehensive strategy for managing nutrients causing eutrophic conditions in lakes and streams. Nor has the Department

developed a strategy to prevent degradation of high water quality waters that do not now experience eutrophic conditions. The combination of a number of federal and state issues and directives (drivers) are emphasizing the need for developing a Eutrophication Management Strategy for Wisconsin.

The state and national drivers include:

- **Public concern.**

  Public concern has been expressed repeatedly over the conditions in specific Wisconsin lakes and streams. The problems tend to be chronic. At times, however, they become worse than normal. For example, during 1999, 2000 and 2001 the algal blooms in Lake Winnebago were very intense, resulting in numerous articles in Fox Valley newspapers and more public awareness of nutrient enrichment.

- **Clean Water Act requirements --**

  - **National Nutrient Criteria**

    EPA has prepared national nutrient criteria (phosphorus and nitrogen) guidance for states to use in developing criteria to be adopted as part of state water quality standards. National guidance has been developed for lakes and reservoirs and streams and rivers. USEPA recommends that States develop nutrient criteria development plans or adopt nutrient standards by 2004. States that have developed nutrient plans will be given additional flexibility in the timeframe and approach used to adopt criteria.

  - ***TMDL Regulations***

    Many of the waters on Wisconsin's 303(d) list of impaired waters are on the list due to excessive amounts of phosphorus. TMDL development for these waters hinges on in-water nutrient criteria and phosphorus based implementation actions.

  - **Storm Water Phase 2 Regulations**

    About 200 Wisconsin municipalities are coming under coverage of point source storm water discharge permits. Phosphorus and nitrogen are to be controlled indirectly through management measures that include to controlling pollutants from construction sites, educating landowners on proper leaf collection and fertilizer management, etc.

- **USDA and EPA AFO/CAFO Strategy**

  As part of a unified federal animal feeding operation strategy, EPA and USDA called for NRCS to develop a comprehensive nutrient management plan policy and implement that policy nationwide. This policy calls for applying nitrogen and phosphorus at levels corresponding to crop yield based needs. Soils on most Wisconsin farms tend to have very high levels of phosphorus due to past application of manure, fertilizer and municipal and industrial biosolids. Phosphorus levels in soils have been increasing since about 1960 when commercial fertilizer use became common. For most dairy farms, crop phosphorus needs can be met without any application of phosphorus in commercial fertilizer. With respect to nitrogen, many Wisconsin farmers tend to over-apply nitrogen as "cheap insurance" against crop losses.

- ***Gulf Hypoxia Issue***

  The low levels of oxygen in a major portion of the Gulf of Mexico is prompting development of a strategy that would be applied throughout Mississippi River basin. A target of 30% reduction in nitrogen has been identified. An action plan has been published with the starting point yet to be determined.

- **Wisconsin Requirements –**

  - **Wisconsin Nonpoint Source Performance Standards and Prohibitions**

    The Department of Natural Resources, DATCP and other state agencies have developed agricultural performance standards and prohibitions and non-agricultural performance standards designed to meet water quality standards. An objective of performance of a number of the proposed performance standards is to control phosphorus and nitrogen.

  - **NR 217, Wis. Adm. Code Phosphorus Effluent Limitations**

    By administrative rule, municipal and industrial point sources discharging more than specified amounts of phosphorus per month are required to limit effluent discharges to no more than 1 mg/L or an alternative effluent limit.

This strategy will be reviewed and revised annually. Progress on each item will be included in the revised text. All revisions will be reviewed, and where appropriate, discussed with EPA Region 5 staff.

A. Establishing Resource Objectives[1]

Assumptions

- Lake and stream rule promulgation will take place at the same time.
- For some parameters, such as algal biomass, stream data is lacking and needs to be collected. For other parameters, data collected through ongoing studies need to be compiled and summarized. Collection of these data will control the timing of the entire schedule.
- The Department will have some type of advisory committee consisting of stakeholders and interest groups in place starting in 2004 and extending through the development of administrative rules. The form and role of the advisory committee may change as the strategy evolves.

The initial version of this strategy contained the three assumptions stated above. In brief, all three assumptions remain valid, but an update is needed. The rule promulgation is proposed to include both lakes and streams. A stream data base has been developed, and analysis of the data has largely controlled to pace of the criteria development process. And, an external advisory committee will be formed in the fall of 2007.

Below are the tasks previously identified. All have been reviewed, and where appropriate, updated. Discussion of the status is included, where warranted.

1. By the end of December 2001 and updated annually, consistent with EPA guidance, develop a plan for nutrient criteria development and promulgation including the activities below and begin to implement that plan.

   Discussion: This strategy has been revised periodically.

   ### A. Streams[2]

   i. Develop a stream data base that serves as background for nutrient criteria development and promulgation and allows analysis of relationships (or lack of relationship) between causal parameters (P and N), response parameters (e.g. algal biomass) and measures of meeting or not meeting designated uses.

      A statewide stream data base was developed by 2004, as part of the DNR/USGS stream study. In 2001, data was collected on about 150 small, headwater wadeable streams. In 2002, using the same procedures, data was

[1] Signficant policy issues are identified as PI

[2] See also other sections. It is assumed that all of the parts and activities in these sections will need to inter-relate and be coordinated. For example, policy issues on independent samples vs. seasonal mean values are dependent upon the particular parameters identified for streams, etc.

collected on about 80 larger, wadeable streams. In 2003, data was collected on 30-some non-wadeable streams and rivers. Information collected included total and dissolved phosphorus, various forms of nitrogen, Secchi tube turbidity, specific conductance, pH, instantaneous dissolved oxygen, discharge, suspended chlorophyll a and benthic chlorophyll a. All water chemistry samples were collected monthly from May through October. Various fish and aquatic insect data were either previously collected at the sites or collected as part of this study. All water chemistry data were reported in the USGS Water Resources Data Wisconsin Reports for 2001, 2002 or 2003. Data collected for wadeable streams Is also included in appendices to the USGS report, "Nutrient Concentrations and Their Relations to the Biotic Integrity of Wadeable Streams in Wisconsin".

ii. Working with EPA Region 5 and other Region 5 states, assess the relationship between nutrient concentration and dissolved oxygen in streams.

A study conducted by the Minnesota Pollution Control Agency found a strong relationship between nutrient concentrations, water column chlorophyll a, BOD and dissolved oxygen flux in sampled rivers. Minnesota's work is likely applicable to Wisconsin rivers.

iii. Complete the analysis of stream information and develop proposed nutrient related causal and response values, including phosphorus concentrations, nitrogen concentrations, some measure of chlorophyll a and some measure of turbidity.

The first round of analysis of the data for wadeable streams is completed and published in the USGS publication "*Nutrient Concentrations and Their Relations to the Biotic Integrity of Wadeable Streams in Wisconsin"*. It is anticipated that additional analysis of the data in this publication will be conducted during the criteria development process.

A second publication describing the analysis of data from non-wadeable streams will be completed in late-2007.

In the fall of 2007, the Department will propose draft criteria for streams based on the studies above.

iv. Assess the manner in which nutrient criteria might best be applied to effluent dominated streams.

Throughout the EPA Region 5 states and to some degree in Wisconsin, representatives from major wastewater treatment plants are raising concerns over the technological and economic feasibility of attaining nutrient criteria in effluent dominated streams.

Preliminary work is being done to determine example sites. However, this is a topic that will be addressed to a much greater degree in the administrative rule development process.

B. Lakes[3]

Although the EPA nutrient criteria efforts are identified as the primary driver behind this section, there also is a need to develop this strategy in concert with "The Water Way", a ten-year lake management strategy developed jointly by the Wisconsin Association of Lakes, the University of Wisconsin – Extension and the Department of Natural Resources.

The following are excerpts from the section **Managing Lakes and Watersheds for Healthy Ecosystems and Quality Outdoor Recreation and Living**.

The Vision

Using science- and community-based goal-setting processes to direct the protection and restoration of lake ecosystems and watershed health.

Goal D

Managing lakes and watersheds to maximize ecosystem health

The Strategies

1. Develop and utilize a scientific process for evaluating and defining lake management goals and performance standards, based on ecosystem potential, for sustainable lake water quality, habitat, fisheries and watershed conditions.

2. Develop or revise scientific methods, regulations, policies and management strategies to direct technical, human and monetary resources toward implementing lake and watershed goals.

[3] See also other sections. It is assumed that all of the parts and activities in these sections will need to inter-relate and be coordinated. For example, policy issues on independent samples vs. seasonal mean values are dependent upon the particular parameters identified for lakes, etc.

3. Develop educational and marketing strategies to foster social and political support for the establishment of lake and watershed goals.

4. Build coalitions with local government and management organizations to implement lake and watershed management strategies that will achieve goals for lake ecosystem health.

The Performance Measures

- We (DNR) have developed guidance explaining the philosophy of and strategy for managing lakes and watersheds as sustainable ecosystems.

- **We (DNR) have developed lake standards for nutrients, habitat, fisheries and biological integrity for use in modeling for lake and watershed planning, protection and restoration projects.** (emphasis added)

- We (DNR) have used information from the statewide baseline lake monitoring program as well as other data on lake water quality, habitat, fisheries and other aquatic organisms to set goals for lake ecosystem health.

- We (DNR) have used the Total Maximum Daily Load (TMDL) process for individual lakes in need of restoration.

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i. Assess the relationship between TP/Chlorophyll a/Secchi depth and lake fisheries.

There is a significant concern over implementation of nutrient-based water quality criteria and potential detrimental impacts on a lake's fishery. There is a fear among some anglers that nutrient reductions will be detrimental to a lake's fishery. Bone Lake, for example, the alternative of an alum treatment to improve water clarity by "tying up" phosphorus in the bottom sediments was rejected due to a concern over potential impact on the lake's fishery. To address this concern, a better understanding of the relationship between nutrient-related parameters and lake fisheries needs to be developed.

The Department will use information available in the scientific literature, including information and studies cited in "Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria", third edition, Minnesota Pollution Control Agency, September 2005.

ii. Consideration of lake user perception data.

Perception information collected by lake Self-help Monitoring volunteers exists for hundreds for Wisconsin lakes. User perception information has not been tied to specific types of uses, such as swimming, boating and angling. It is likely different users will have different perceptions of lake water quality.

The State of New York obtained a grant from EPA to coordinate efforts among states to analyze existing lake user perception data from a number of states, but did not include Wisconsin due to a difference in data collected

During 2006 and 2007, the Department will further consider user perceptions in developed proposed lake criteria.

iii. Assess the application of nutrient criteria application to macrophyte dominated lakes**.**

Research in Minnesota has shown the relationship between nutrient concentrations and algal growth in macrophyte dominated lakes. See, for example," Shallow Lakes of Southwestern Minnesota: Status and trend summary for selected lakes", Minnesota Pollution Control Agency, July 2003

iv. Determine how the dissolved oxygen and pH criterion in the existing water quality standards should be applied to lakes or propose an alternative criterion that would apply.

This activity will not be conducted.

v. Determine whether lake designated uses need to be refined.

It is highly likely that subcategories of lakes will be identified as part of a suite of nutrient criteria for lakes. For example, a 1997 Department report suggested that lakes be divided into deep vs. shallow lakes and seepage vs. drainage lakes.

vi. Determine whether changes need to be made to the antidegradation policy contained in administrative rules to provide for additional protection of high quality lakes.

The concept of preventing degradation of high quality lakes will be considered as part of a proposal for nutrient criteria for lakes. Where this is approached through a suite of criteria for lakes or through a change to the antidegradation policy has not be examined or determined.

vii. Complete the analysis of lake information and develop proposed nutrient related causal and response values, including phosphorus concentrations, nitrogen concentrations, some measure of chlorophyll a and some measure of turbidity.

In the fall of 2007, the Department will propose draft criteria for lakes based on the parameters identified above.

C. **Basin Approach**

i. Complete an analysis of the impact that application of suggested lake and stream values may have to each basin's lakes, streams and downstream segments. This analysis would assess the impact as well as be protective of uses of the lakes and streams. Ecoregion and other geographic based information will be used as inputs to this process. For example, the Department's 1997 phosphorus technical work group recommended lakes be clustered into three regions based on soils and land cover.

In the USGS report, "Nutrient Concentrations and Their Relations to the Biotic Integrity of Wadeable Streams in Wisconsin", ecoregions and other geographic regions are analyzed. The report generally concludes that the EPA ecoregions are largely based on land cover, and that, if land cover is excluded, Wisconsin streams are most responsive to the clay content of the soil. Except for the clayey soils, the other geographic areas show similar response curves and may not warrant separate consideration.

D. Other Policy Issues

i. Determine the advantages and disadvantages of promulgating numeric criteria verses narrative criteria supported by interpretation guidance.

In the fall of 2007, the Department will propose draft criteria for lakes based on the parameters identified above. Both options will be considered.

ii. Assess issues associated with determination of exceedances, such as independent applicability of causal and response parameters and average seasonal concentrations vs. independent sample results. In addition, the role and process for site-specific criteria should be recommended**.**

In the fall of 2007, the Department will propose draft criteria for lakes based on the parameters identified above. These issues will be considered.

E. Tie to Monitoring Strategy

i. Incorporate a stream nutrient monitoring component into the Department's monitoring strategy for wadeable and non-wadeable streams.

The Department's monitoring strategy is evolving year-by-year. Nutrient sampling of streams and rivers is likely to be conducted as a Tier 2 activity. That is, where other information indicates a likely impairment.

Monitoring of nutrients is a component of many volunteer monitoring projects.

ii. Consider additional nutrient monitoring of lakes in the Department's monitoring strategy for lakes.

Similar to streams, the Department's monitoring strategy is evolving. Presently, the baseline or Tier I monitoring includes use of satellite imagery and volunteer monitoring. Many of the lakes monitored by volunteers include collection of phosphorus samples. In addition, about 68 lakes are monitored as part of the long term trend lakes activity. The monitoring of these lakes includes either phosphorus or nitrogen sampling, as appropriate for the limiting nutrient.

Tier II monitoring includes monitoring to further identify impairments. As protocols for Tier II monitoring are developed, it

is likely that monitoring for both phosphorus and nitrogen will be considered. As a special project, Wisconsin DNR is participating in a national lake study where a number of lakes will be monitored for a variety of parameters, including both nitrogen and phosphorus.

The Department will continue to work with EPA Region 5 to further define the monitoring strategy for lakes to adequately consider monitoring for both phosphorus and nitrogen, as appropriate and as warranted given the severe limitations of monitoring funds.

F. Case Studies of Achievability

Complete an assessment of attainability of recommended nutrient criteria in both lakes and streams and complete an evaluation of the impact of phosphorus reductions for both point and nonpoint sources. It is anticipated that this assessment will focus on case studies. Case studies should be identified by the end of 2003. Case studies, out of necessity will need to make substantial use of modeling.

A number of TMDLs and lake studies will serve as case studies.

In addition, lake and stream projects could be used to demonstrate application of proposed criteria and pre-test policy alternatives.

- In the fall of 2007, the Department will prepare a proposal for incorporating nutrient criteria into Wisconsin's water quality standards. The Department will conduct an internal review of scientific information and proposals from other nearby states, and then take that proposal an outside advisory committee. In spring of 2008, the Department intends to hold a series of public hearings across the state. Approval by the Natural Resources Board and pertinent Legislative committees is required. EPA must also accept the changes to water quality standards.

B. Gulf Hypoxia Basin Plans for Nitrogen

The starting year is dependent on federal guidance and funding. To date, EPA has not prepared guidance and no funding has been available.

- **By Summer +1**, Wisconsin will assign representatives to Mississippi River "sub-basin" committees to coordinate implementation of the Gulf Hypoxia Action Plan by sub-basin (a sub-basin constitutes multiple basins in Wisconsin), including coordination among smaller watersheds, Tribes and States in each of those sub-basins.

  The Department has identified a coordinator.

- **By Spring +2**, the Department, in cooperation with others, will expand existing monitoring efforts within the Basin to provide a coarse resolution assessment of the nutrient contribution of various sub-basins and high resolution modeling technique in smaller watersheds to identify additional management actions to help mitigate nitrogen losses to the Gulf, and nutrient loadings to local waters, based on the interim guidance established by the National Water Quality Monitoring Council.

  As a first phase, complete collection of monthly grab samples at USGS gaging stations for the purpose of estimating nitrogen loading to the Mississippi River. Locations should include the following rivers:

  St. Croix River:
  Chippewa River;
  Black River;
  Wisconsin River; and
  Rock River.

  All cites are included in the Long-Term Trends monitoring element of the Department's monitoring strategy.

  - **By Fall +2**, Wisconsin representatives working on sub-basin committees, will develop strategies for nutrient reduction. These strategies will include setting reduction targets for nitrogen losses to surface waters, establishing a baseline of existing efforts for nutrient management, identifying opportunities to restore floodplain wetlands (including restoration of river inflows) along and adjacent to the Mississippi River, detailing needs for additional assistance to meet their goals, and promoting additional funding.

    - This activity has not begun.

- **By January +3**, or a time frame established by the sub-basin committees, the Department and other Clean Water Act authorities within the basin, will identify point source dischargers with significant discharges of nutrients and undertake steps to reduce those loadings consistent with the sub-basin strategies.

- **By Spring +3**, or on a time frame established by the sub-basin committees, States and Federal Agencies will increase assistance to landowners for voluntary actions to restore, enhance, or create wetlands and vegetative or forested buffers along rivers and streams within priority watersheds (not necessarily Wisconsin priority watersheds) consistent with the sub-basin strategies.

    - Much of the Missisippi River drainage area is eligible for riparian lands to be enrolled in Wisconsin's Conservation Reserve Program.

    - EPA is contracting with USGS to use the SPARROW model to rank watersheds based on likely nutrient loadings to the Mississippi River.

C. Implementation Tools and Approaches

The Department has developed and promulgated nonpoint source performance standards and prohibitions for agricultural and non-agricultural nonpoint sources. In addition, the Department has progressed quite far in completing incorporation of phosphorus effluent limitations for point sources under the authority of Ch. NR 217, Wis. Adm. Code.

Given the magnitude of these efforts, the number of short-term implementation tool and approach development efforts are relatively limited.

1. Nonpoint Sources – short-term

    - Continue program roll out of agricultural performance standards and prohibitions and non-agricultural (including urban) performance standards. Establish a program to evaluate the impact on water quality as a result of application of the performance standards.

    - Coordinate implementation or performance standards and TRM projects with TMDL implementation.

    - During 2001 to 2003, participated in University of Wisconsin Phosphorus Research Roundtable discussions and subsequent conferences or work shops. These roundtable discussions are aimed primarily at controlling phosphorus on Wisconsin farmland.

    - Continue to cooperate with UWEX and others on the Pioneer Farm and Discovery Farm efforts to identify, evaluate and promote innovative management practices.

    - Continue to assist research funding, to the extent practicable, and cooperation on means to reduce the amount phosphorus in livestock feed as a means to reduce the amount of phosphorus in manure applied to fields.

    - Continue to work with NRCS, DATCP and UWEX on nutrient management concepts for farms including application of NRCS standard 590 and the concept of the phosphorus index.

    - As part of a Gulf Hypoxia effort, identify best management practices applicable to control nitrogen from farms.

2. Point Sources – short-term

- The table below shows the phosphorus load reduction from point sources as limitations required under ch. NR 217. The initial year is 1993.

- In coordination with Gulf Hypoxia activities, assess the need for denitrification of wastewater discharges. Timing will be determined through the Gulf Hypoxia activities.

- Administer urban storm water phase 2 discharge permits authorized under Ch. NR 216, Wisconsin Administrative Code. About 200 municipalities are covered by storm water permits by 2003. The first phase of performance standards for already developed areas should produce about a 20% reduction in phosphorus.

- Review, assess and compare to nonpoint source performance standards, the management requirements for the land application of biosolids, wastewater applied to land and septage applied to land. Where appropriate, propose changes to improve management. Such an assessment should be based on minimizing the potential for nutrients to reach surface waters and should consider:

    - Requiring application rates tied to the crop uptake of phosphorus.

    - Requiring implementation of riparian buffers, where applicable, for fields where biosolids and other wastes are applied;

    - Requiring reduced soil erosion rates for applications of biosolids and other wastes with high concentrations of nutrients; and

    - Applying the concepts of a phosphorus index for cropland adopted by NRCS.

- The Department has progressed and is incorporating phosphorus control concepts into CAFO permits. The Department intends to continue move more and more in this direction – especially for impaired and high quality waters. Previously, the Department has used the nitrogen-based criteria for protecting ground and surface waters contained in Natural Resources Conservation Service (NRCS) Standard 590, March 1999, as general guidelines for reviewing and approving these plans.

PHOSPHORUS LOADING SUMMARY (annual point source loadings in pounds)

	Industrial Mass Loadings				Municipal Mass Loadings				Total Mass Loadings			
Basin	**1st year**	**2001**	**change**	**%**	**1st year**	**2001**	**change**	**%**	**1st year**	**2001**	**change**	**%**
ST. Croix	1,080	1,059	-21	-2	44,400	19,395	-25,005	-56	45,479	20,454	-25,025	-55
Upper Chippewa	33,586	25,908	-7,678	-23	14,550	11,951	-2,599	-18		37,859	-10,277	-21
Lower Chippewa	14,808	4,179	-10,629	-72	79,848	54,206	-25,642	-32	94,656	58,385	-36,271	-38
Black–Buffalo–Trempealeau	21,038	13,824	-7,214	-34	78,706	22,571	-56,135	-71	99,744	36,395	-63,349	-64
La Crosse – Bad Axe	2,541	1,681	-860	-34	421,165	30,568	-390,597	-93	423,706	32,249	-391,457	-92
Upper Wisconsin	545,237	331,914	-213,323	-39	101,842	63,665	-38,177	-37	647,079	395,579	-251,500	-39
Lower Wisconsin	8,281	5,933	-2,348	-28	118,729	52,272	-66,457	-56	127,010	58,205	-68,805	-54
Grant-Platte-Sugar-Pecatonica	16,038	11,492	-4,546	-28	23,169	19,055	-4,114	-18	39,207	30,547	-8,660	-22
Upper Rock	84,558	95,905	11,347	13	272,326	225,455	-46,871	-17	356,884	321,361	-35,523	-10
Lower Rock	1,038	485	-553	-53	297,983	259,266	-38,717	-13	299,022	259,750	-39,272	-13
Fox (Illinois)	395	225	-170	-43	81,549	63,595	-17,954	-22	81,944	63,820	-18,124	-22
Lake Superior	8,367	2,787	-5,580	-67	6,238	9,151	2,913	47	14,604	11,938	-2,666	-18
Wolf	13,783	2,476	-11,307	-82	20,388	14,355	-6,033	-30	34,171	16,831	-17,340	-51
Upper Fox	34	33	-1	-3	37,259	44,856	7,597	20	37,293	44,889	7,596	20
Lower Fox	168,359	110,495	-57,864	-34	121,012	82,345	-38,667	-32	289,371	192,840	-96,531	-33
Upper Green Bay	41,517	20,690	-20,827	-50	18,739	11,936	-6,803	-36	60,255	32,626	-27,629	-46
Door - Twin – Manitowoc	6,408	2,605	-3,803	-59	49,536	35,481	-14,055	-28	55,944	38,086	-17,858	-32
Sheboygan	3,005	304	-2,701	-90	40,604	35,545	-5,059	-12	43,609	35,879	-7,730	-18
Milwaukee	24,241	10,167	-14,074	-58	674,635	371,890	-302,745	-45	698,877	382,057	-316,820	-45
Root - Pike	14,989	16,342	1,353	9	169,030	115,044	-53,986	-32	184,019	131,386	-52,633	-29
Great Lakes Basins	280,703	165,899	-114,804	-41	1,137,441	720,603	-416,838	-37	1,418,143	886,532	-531,611	-37
Mississippi River Basins	728,600	492,605	-235,995	-32	1,534,267	821,999	-712,268	-46	2,262,867	1,314,604	-948,263	-42
Statewide	1,009,303	658,504	-350,799	-35	2,671,708	1,542,602	-1,129,106	-42	3,681,010	2,201,136	-1,479,874	-40