A RIVER RUNS THROUGH US:

Red Cedar River near Colfax

A Water Quality Strategy for the Land and Waters of the Red Cedar River Basin

Produced by the
Red Cedar River Water Quality Partnership

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Contents

Acknowledgments

This Water Quality Strategy was written by the Red Cedar River Water Quality Partnership. The Partnership came together in 2013 to begin work on a concerted effort to address the issues of phosphorus and algae in the Red Cedar River system. Members of the Partnership who helped create and implement this Strategy include:

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CHAPTER 1

Introduction ~

The Red Cedar River Watershed

The Red Cedar river runs through a large portion of northwest Wisconsin, eventually draining into the Chippewa River about thirteen miles south of Menomonie. Its watershed is nearly 1,900 square miles and includes parts of Barron, Dunn, Chippewa, Washburn, Sawyer, Polk, Rusk, St. Croix, Burnett and Pierce Counties. The watershed features approximately 40,000 acres of open water and approximately 4,900 miles of rivers and streams.

Because the Total Maximum Daily Load (TMDL) for the Red Cedar River watershed (HUC 07050007) was written specifically for Lakes Tainter and Menomin near the bottom of the watershed, this strategy will focus on the portion of the entire Red Cedar River watershed that drains to these two lakes. As the TMDL explains, this area excludes just over 100,000 acres of the Red Cedar River watershed comprised of the area below the Lake Menomin Dam, and also the Wilson Creek watershed, which empties into Lake Menomin just above and near the dam. Being so near the dam, the flow from Wilson Creek is not considered to have much of a nutrient effect on the larger lake. It should be noted that the Red Cedar River is considered impaired below Lakes Tainter and Menomin as well, but the TMDL was written only for these lakes, and that will be the focus of this strategy. However, work will also be done below these lakes in an effort to improve water quality in the entire Red Cedar River watershed.

The TMDL portion of the Red Cedar River watershed is shown in Figure 1.1 and includes the 53 smaller, twelve-digit hydrologic unit code (HUC 12) watersheds. Land cover in the watershed (see Table 1) is dominated by forest in the far north, and agricultural land in much of the rest of the watershed. A map of the land cover classes is shown in Figure 1.2. Although all figures and data shown in the remainder of this strategy are for the area of the Red Cedar River watershed above Lakes Tainter and Menomin, which is not comprehensive for the entire Red Cedar River drainage, it will still be referred to as the Red Cedar River watershed.

Land Cover in TMDL portion of the Red Cedar River Watershed

Land Cover	Acres	%
Forest/Woodland	424,430	38.5
Cropland	283,136	25.7
Pasture/Hay	204,598	18.6
Urban/Developed	68,947	6.3
Wetlands	62,172	5.6
Water	37,988	3.5
Grassland/Herbaceous	13,554	1.2
Shrub/Barren land	7,086	0.6
Total	**1,101,911**	**100%**

Source: 2011 National Land Cover Data, USGS

TABLE 1: Land cover in the Red Cedar River watershed above Lakes Tainter and Menomin

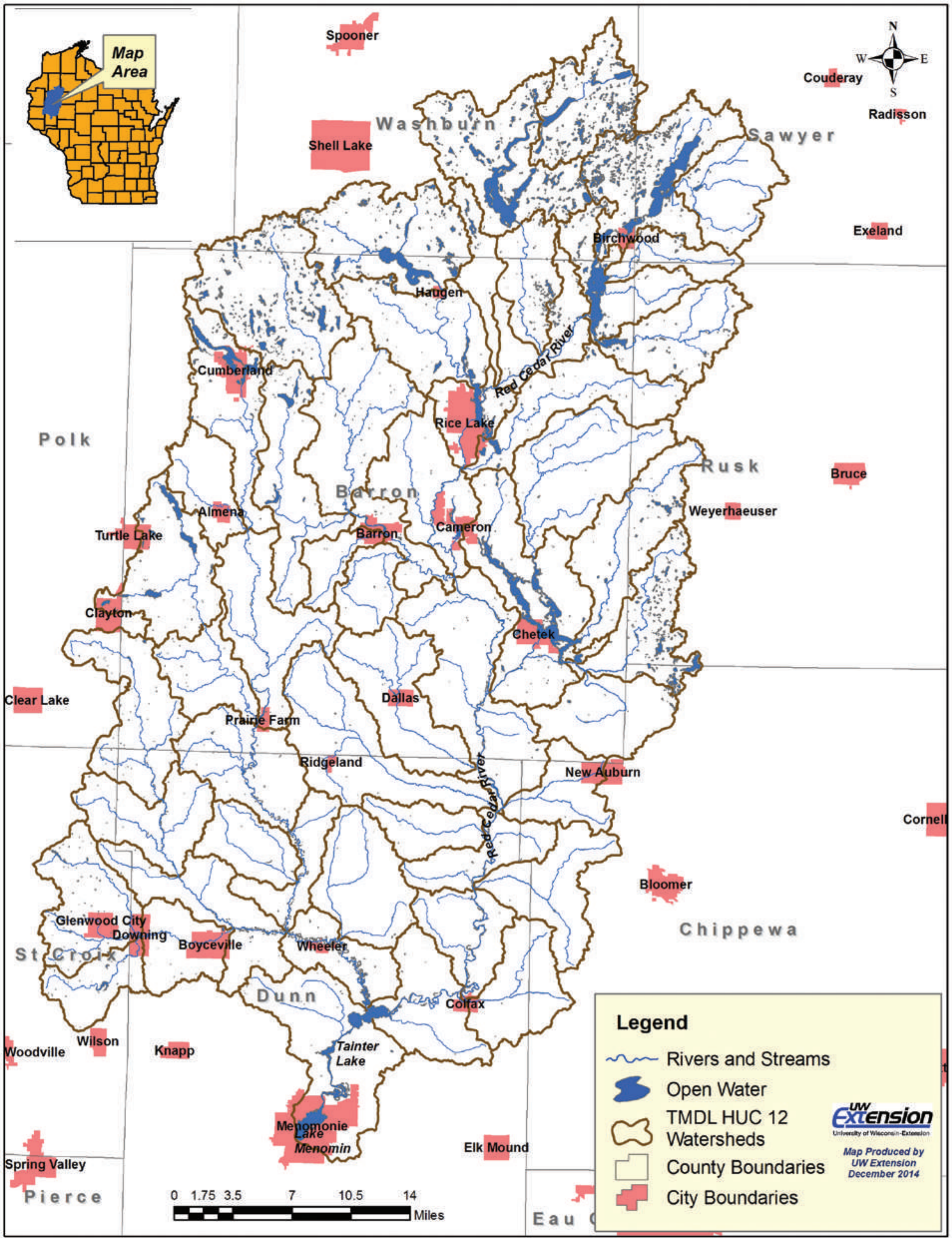

FIGURE 1.1: Map of the Red Cedar River watershed above Lakes Tainter and Menomin.

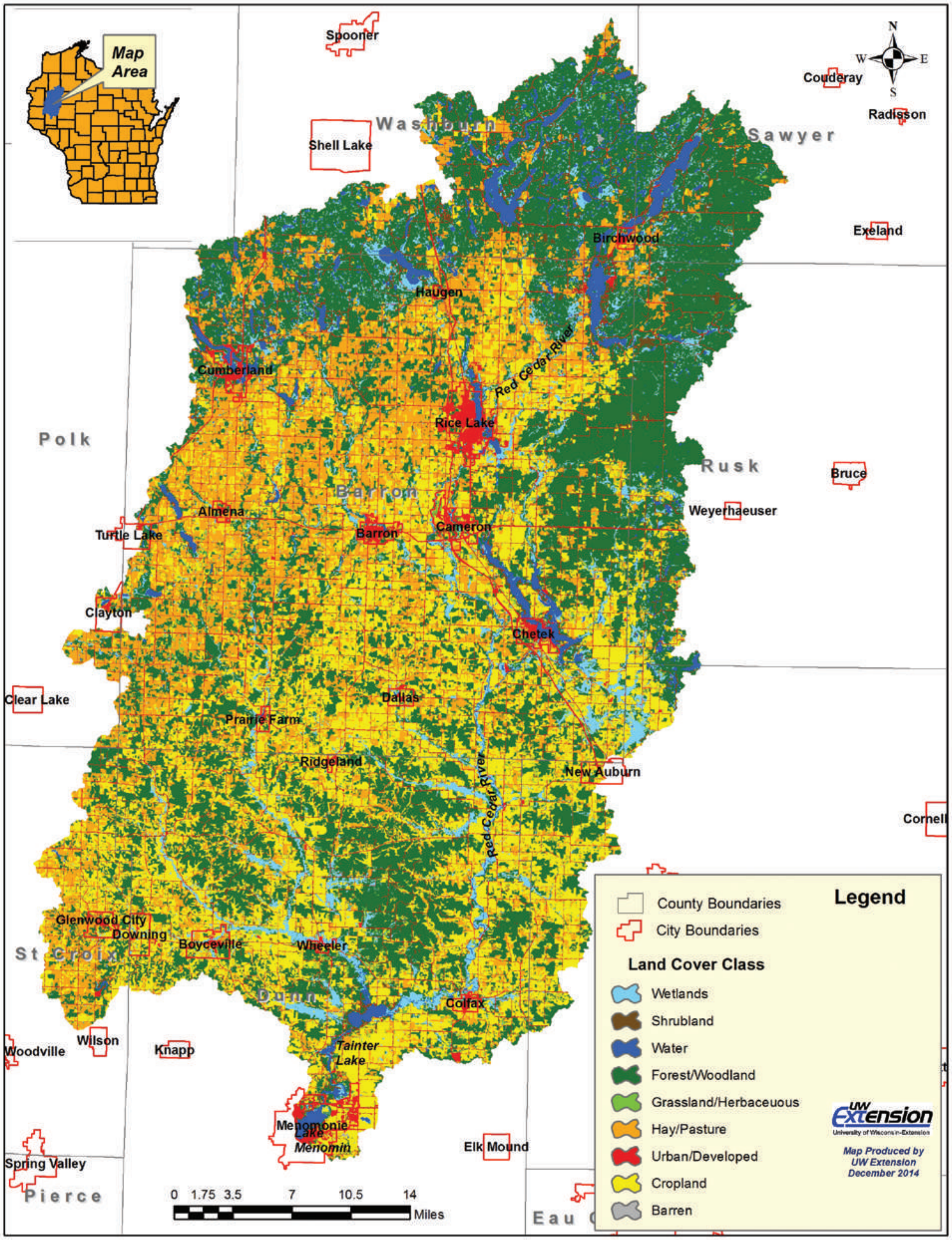

FIGURE 1.2: Land cover map of the watershed.

(Source: 2011 National Land Cover Data)

The Red Cedar River contains many lakes and impoundments that are used for recreational activities such as swimming, fishing, boating, and scenic viewing. However, the Red Cedar River and its lakes and smaller streams often suffer from severe algae blooms, where populations of algae and cyanobacteria (sometimes called "blue-green algae") can cause the rivers and lakes to turn green, lead to fish kills, and generally produce an environment that is not healthy for many aquatic organisms. Intense algae blooms on rivers and lakes in the watershed also cause health issues for people living near or recreating on these water bodies, and cause people to avoid using them for recreation. These frequent and intense algae blooms are the result of too many nutrients – most specifically phosphorus – in the Red Cedar River system. These nutrient-rich, or "eutrophic" conditions, can be mitigated, and thus lead to fewer, less intense algal blooms if ways can be found to minimize the amount of phosphorus entering this river system.

The Purpose of this Water Quality Strategy

In 2012, the US Environmental Protection Agency (EPA) approved the total Maximum Daily Load (TMDL) developed by the Wisconsin Department of Natural Resources (DNR) for Lakes Tainter and Menomin, two impounded lakes formed by dams located on the lower Red Cedar River. The TMDL describes the extent of the phosphorus issue in the watershed and prescribes levels to which phosphorus inputs to Lakes Tainter and Menomin need to be decreased in order to significantly improve water quality. The US Clean Water Act requires that states develop such TMDLs for those water bodies deemed "impaired", meaning they are not meeting water quality standards.

Red Cedar River TMDL:
http://naturalresources.uwex.edu/redcedar/pdf/Final_Tainter_TMDL_May29_2012.pdf

Once a TMDL is established, an implementation plan needs to be developed to address the water quality impairment issues facing the water body of concern. The plan is developed to describe the management measures and regulatory approaches necessary to address the pollutant load issues affecting the water body, the parties responsible for such management measures, the costs and sources of funds for these measures, methods to get participation from stakeholders, a timeline for implementation, ways to measure success, and also any adaptive management techniques employed as the plan moves forward.

This implementation strategy is a guide for the approaches and techniques that will be used over a ten-year period to reduce the levels of phosphorus entering the Red Cedar River system. Although the TMDL was written specifically for Lakes Tainter and Menomin, their location at the lower end of the Red Cedar River necessitates that this implementation process also involves geographic areas much farther upstream. Additionally, there are several other water bodies in the watershed that are impaired by phosphorus that will benefit from the recommendations of this implementation strategy. Therefore, this will be a cooperative and collaborative effort for land managers, farmers, state and local government

"Although the TMDL was written specifically for Lakes Tainter and Menomin, their location at the lower end of the Red Cedar River necessitates that this implementation process also involves geographic areas much farther upstream."

officials, shoreland property owners, urban residents, wastewater treatment plant operators, and all others throughout the watershed whose actions can help improve the water quality of the Red Cedar River system and its lakes and tributaries.

Plans such as this are often written with an expert's eye to the watershed, knowing and describing exactly what needs to be done from a professional perspective. Such plans can fail if public participation and buy-in of the process and planning do not occur. It is the residents of the watershed, by changing their management of land and runoff, who will be the ones to affect a change in water quality. Therefore, this strategy will focus strongly on citizen participation in the process of reducing phosphorus inputs to the Red Cedar River system, including Lakes Tainter and Menomin.

Organizing citizens around the idea of protecting water resources in this watershed and empowering them to take ownership of the process at all steps along the way should prove more effective at producing the changes necessary for improved water quality.

The Red Cedar River Water Quality Partnership

The authors of this strategy are the members of the Red Cedar River Water Quality Partnership, a stakeholder group that came together in 2013. Those involved in the Partnership include UW–Extension, DNR, the Natural Resource Conservation Service (NRCS), county and city officials and departments, citizens, non-governmental organizations (NGOs), lake associations, and corporate representatives.

Mike Wendt

Red Cedar River near Cedar Falls Dam.

The diversity of this group is essential to maintaining inclusive and effective implementation of this strategy. The Partnership will be the group overseeing all education, outreach, engagement and implementation activities as the process moves forward.

A Foundational Document that describes how the Partnership functions and the standards employed is included at the end of this Strategy. The Governing Document also includes a statement of identity and purpose.

CHAPTER 2

Total Maximum Daily Load (TMDL) Overview

This chapter will discuss the TMDL document written for Lakes Tainter and Menomin, and the research that went into determining the baseline phosphorus loads and levels in those lakes, sources of phosphorus, and also the goals for reducing phosphorus that were specified in the TMDL.

Water Quality Goals for Lakes Tainter and Menomin

The Tainter/Menomin TMDL is based on research done mostly in the 1990s and identifies site-specific phosphorus water quality goals for each lake. Meeting these goals equates to 61% less phosphorus concentration in Tainter Lake and 54% less phosphorus concentration in Lake Menomin.

Table 2.1 summarizes the baseline and phosphorus reduction goals for total in-lake phosphorus levels, chlorophyll-a (a measure of algae growth), secchi depth (a measure a water clarity), and the percent time when the chlorophyll is greater than 30 parts per million or milligrams per liter (mg/l), the level at which algae blooms typically arise. Even at the goal levels, these lakes will still be considered eutrophic (nutrient rich), and will still have occasional algal blooms. However, the blooms should be less intense, and occurring for shorter durations, making the lakes more appealing and more attractive for recreation, and promoting an environment more suited to a healthy and diverse aquatic community.

Tainter Lake	**Baseline (1990)**	**TMDL Goals**
Total phosphorus (mg/L)	150	59
Chlorophyll-a (mg/L)	87	25
Secchi depth (m)	0.8	1.6
Percent time >30 mg/L chloro-a	92%	28%
Lake Menomin		
Total phosphorus (mg/L)	108	57
Chlorophyll-a (mg/L)	40	25
Secchi depth (m)	1.3	2.0
Percent time >30mg/L chloro-a	54%	28%

TABLE 2.1: Tainter Lake/Lake Menomin TMDL water quality goals

Category	1990/93 Baseline Annual Phosphorus Load (pounds)	Annual Phosphorus Load Allocation (pounds)
Nonpoint Sources	463,400	157,400
WPDES Permits	42,900	20,100
Totals	**506,300**	**177,000**

TABLE 2.2: Annual phosphorus load allocation for Tainter Lake

Category	1990/93 Baseline Annual Phosphorus Load (pounds)	Annual Phosphorus Load Allocation (pounds)
Discharge from Tainter Lake at TMDL Goal	319,000	145,300
Nonpoint Sources (unsewered watershed)	3,500	2,200
Point Sources (Menomonie MS4)	3,500	2,200
General WPDES Permits		10
Totals	**326,000**	**149,710**

TABLE 2.3: Annual phosphorus load allocation for Lake Menomin

Allowable Phosphorus Loads to Lakes Tainter and Menomin

Table 2.1 discusses in-lake measurements to determine water quality. In order to achieve the water quality goals listed in Table 2.1, the Tainter/Menomin TMDL determined that the amount of phosphorus entering Tainter Lake each year (referred to as annual phosphorus load) should not exceed 177,000 pounds compared to a baseline estimate of about 506,000 pounds (see Table 2.2).

Since the vast majority of the watershed lies above Tainter Lake, which then sends its water a short distance downstream to Lake Menomin, the TMDL research determined that most of the load reduction to Lake Menomin would come from load reductions to Tainter Lake. However, as can be seen in Table 2.3, an additional load reduction is expected from the portion of the watershed that drains to Lake Menomin below Tainter Lake.

Load allocations for Lake Menomin also include the City of Menomonie's storm water (MS4) permit. The TMDL determined annual phosphorus loading to Lake Menomin should be near 150,000 pounds (all data 2012, WDNR).

Sources of Phosphorus in the Tainter/Menomin Lakes Watershed

The origin and distribution of phosphorus loading to Tainter Lake is depicted in Figure 2.1 along with a chart of land cover classes. Cropland contributes the majority of phosphorus to the waters of the watershed and represents the greatest potential for phosphorus load reductions. The chart of land cover indicates that, although forest and woodland is the dominant land cover class, modeling shows the majority of the phosphorus load coming from agricultural cropland. The Simulator for Water Resources in Rural Basins (SWRRB) land use model was used to estimate the percentages of phosphorus load contribution in Figure 2.1 (WDNR, 1999). Because of the age of this data, some updating is

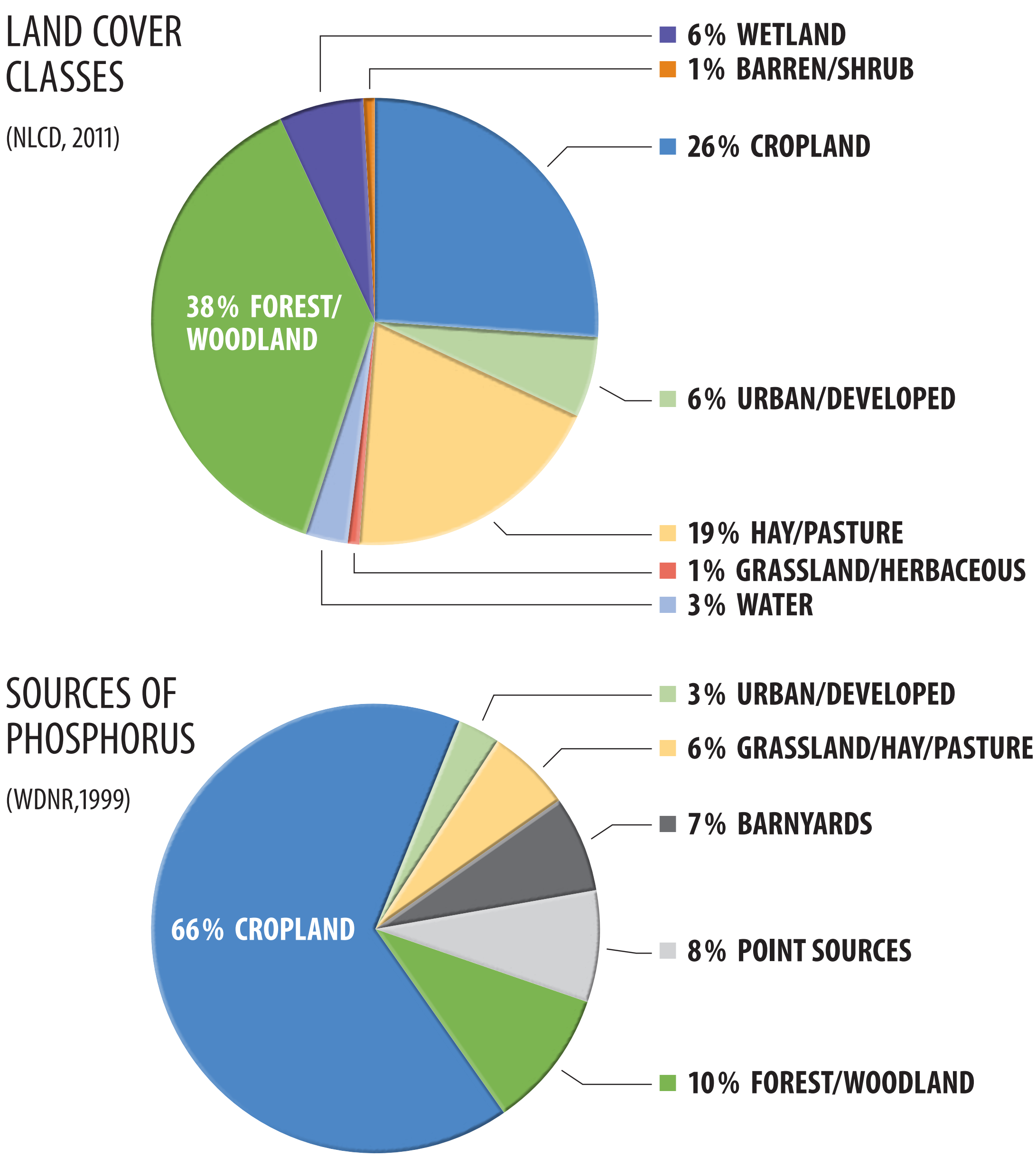

FIGURE 2.1: Sources of phosphorus compared to land use categories

necessary, and will be addressed in the next chapter. Land cover data is from the National Land Cover Dataset (NLCD) from 2011.

Generally, land that has been modified by humans, such as cropland and urban land, has a much higher runoff potential than does natural land cover such as forests or mature grasslands. This is why, although forest/woodland is the dominant land use category (38% of land cover), cropland (26% of land cover) provides a greater phosphorus load contribution to the lakes and rivers of the watershed. Certain types of urban land use have a large runoff potential as well, but since the percentage of urban land cover is low (6% of land cover), its phosphorus contribution to the watershed is also low.

It's often the case that large amounts of the runoff generated from agricultural land come from a small number of fields or farms due to many factors including slope, soil type, and management practices. Large precipitation or melting events exacerbate runoff from such fields. Climate change research indicates that although average annual rainfall amounts in northwest Wisconsin have risen slightly in the last several decades, what's more apparent is that much of the precipitation that falls is coming in fewer, more intense events, which have the potential to produce more runoff (Wisconsin Initiative on Climate Change Impacts, 2011).

Lacey Hoyt

Algae Bloom at Wolske Bay on Lake Menomin.

Required Reductions of Phosphorus Loads

According to the data in the TMDL displayed in Table 2.2, a 65% reduction in phosphorus loads entering Tainter Lake will be required to restore water quality to desired levels. This equates to reducing the amount of phosphorus entering the lake by 330,000 pounds. As the table shows, a small portion of this can come from point source reductions (point sources are those that can be characterized mostly by pollution coming from the end of a pipe), but the vast majority will come from nonpoint sources (surface runoff).

The estimates in Table 2.4 below, based on the Tainter/Menomin TMDL, provide perspective on

TMDL Total Load, Percent (%) Land Use Loads and Equivalent Pounds of Phosphorus (P)	506,300 lbs. P flows into Lake Tainter from the watershed (annual average)	
An estimated...	66% of the P load comes from cropland:	= 334,200 lbs.
	10.5% of the P load comes from forests:	= 53,200 lbs.
	8.4% of the P load comes from point sources:	= 42,500 lbs.
	6.6% of the P load comes from barnyards:	= 33,400 lbs.
	6.2% of the P load comes from grasslands:	= 31,400 lbs.
	2.5% of the P load comes from urban storm water:	= 12,700 lbs.

Table 2.4: Estimated phosphorus loads per land use category (final totals rounded for clarity)

the magnitude of the phosphorus runoff rates in the watershed and what it will take to achieve water quality goals.

Again the TMDL goal is to reduce phosphorus flowing into Tainter Lake by 330,000 pounds of phosphorus. This means that some portion of the loads from each of the sources listed in Table 2.4 needs to be reduced, all totaling up to 330,000 pounds. It's necessary in this strategy to describe the research and conclusions reached in the TMDL, but keep in mind that the data in Table 2.4 are estimates based on older data sets used in the modeling and research from the 1990s. Land use practices, suburbanization, acres in crop production, crops grown, tillage practices and many other factors have changed over time. For example, the number of feedlots and barnyards in the watershed has gone down in the last twenty years and many that remain have installed runoff controls or are roofed confinement operations with manure storage facilities. Because of this, the current load from barnyards is likely lower than the TMDL figure of 6.6%. Additionally, regulation of point sources has already brought current loads below the proposed TMDL goal for those sources. Because of such changes, some of the data in Table 2.4 will be modified in Chapter 3, based on more up-to-date information.

While all sources of phosphorus can and must be reduced, the emphasis placed on cropland runoff is apparent based on the modeled loads coming from agricultural lands. Best management practices (BMPs) that can reduce phosphorus runoff to acceptable levels are available and in use across the watershed. A significant portion of this strategy focuses on working with farmers and other land managers to identify management operations that may be contributing to loss of soil and phosphorus to runoff, and to empower and assist landowners in making decisions and finding solutions that benefit their way of life as well as the water resources on which we all depend.

"…the number of feedlots and barnyards in the watershed has gone down in the last twenty years and many that remain have installed runoff controls or are roofed confinement operations with manure storage facilities."

Phosphorus Reduction Strategies ~

In this chapter we will discuss the changes to inventory and load estimates that have taken place since the TMDL modeling was done in the 1990s. We will also discuss the targeting of the sources of phosphorus in the watershed, both point and nonpoint; what kind of load reduction goals we have for the next ten years for these sources, best management practices that will be used to reduce phosphorus loads, and some estimates of cost.

Point Sources

Looking back at Table 2.4 in the previous chapter, point sources of phosphorus were estimated to be contributing about 42,500 lbs/year of phosphorus in the early 1990s, representing about 8.4% of the total phosphorus load flowing into the Red Cedar River system. Through regulations as well as modifications installed at many of these point sources, phosphorus from these discharges declined to an average of 12,900 lbs/yr during the period 2010-2014. Prior to the adoption of the TMDL, individual permits on these facilities would have authorized increases over time up to about 29,000 lbs/yr. Recall that the goal for point source load to Tainter Lake is set at 20,100 lbs/yr (Table 2.2).

The Wisconsin Department of Natural Resources (DNR) has prepared extensive documentation on the implementation of TMDLs in the Wisconsin Pollution Discharge Elimination System (WPDES) program. They are available at:

WPDES/TMDL Guidance **(11/06/2013)**
http://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=86221960

A Water Quality Trading How to Manual **(09/09/2013)**
http://dnr.wi.gov/topic/surfacewater/documents/WQT_howto_9_9_2013signed.pdf

Guidance for Implementing Water Quality Trading in WPDES Permits **(08/21/2013)**
http://dnr.wi.gov/topic/surfacewater/documents/WQT_guidance_Aug_21_2013signed.pdf

Adaptive Management **(01/07/2013)**
http://dnr.wi.gov/topic/SurfaceWater/adaptivemanagement.html

Watershed Permitting
http://dnr.wi.gov/water/wsSWIMSDocument.ashx?documentSeqNo=102211149

TMDL Guidance for MS4 Permits **(10/20/2014)**
http://dnr.wi.gov/news/input/documents/guidance/ms4guidancefinal.pdf

The text that follows explains the permitting process for point sources in more detail, with much of the information coming from many of the linked documents above. This section contains considerable technical language geared toward the regulated point sources in the Red Cedar River Basin.

WPDES permits must be consistent with the TMDL

All WPDES permits must be consistent with point source wasteload allocations (WLAs) included in the approved TMDL. Since the adoption of the TMDL in 2012, DNR has been including TMDL-derived limits when permits in the affected area expire and are reissued.

Alternatively, different permit alternatives (e.g., watershed permitting) could be considered for TMDL implementation in the future. See the referenced separate guidance document for alternate permitting approaches.

Three different forms of phosphorus effluent limits may apply:

Total maximum daily load ***(TMDL)-derived effluent limits,*** usually expressed as a mass, must be included in a WPDES permit whenever a facility is given a wasteload allocation in an approved TMDL, in order to be consistent with the goals of that TMDL.

In addition, other potential limits include: ***A water quality based effluent limit (WQBEL)*** based on local receiving water condition and pursuant to s. NR 217.13; and/or

A technology-based effluent limit (TBEL). In those situations where a TMDL-derived limit and a TBEL are applicable, both limits should be included in the permit. When a TMDL-derived limit is given, the permittee must continue to comply with applicable TBELs even if the permittee acquires additional load or wasteload allocation through trades. Conversely, the permittee must also continue to comply with applicable TMDL-derived limits should the TBEL increase due to increased production or expansion of the facility.

Tainter Lake and Lake Menomin (Red Cedar River) TMDL

The Tainter Lake and Lake Menomin TMDL establishes total phosphorus (TP) WLAs to reduce the loading to the Lakes by 65 percent. The WLAs do not address compliance with water quality standards for tributaries to the Lakes including the Red Cedar River. Therefore, in addition to implementing the TMDL, DNR will evaluate the need for TP WQBELs to protect immediate receiving waters.

The TMDL expresses WLAs for TP as maximum annual loads (pounds per year) and maximum daily loads (pounds per day), which equal the maximum annual loads divided by the number of days in the year. Total phosphorus WQBELs for continuously discharging point sources covered by the TMDL should be derived consistent with the WI/USEPA impracticability demonstration. TP limits will be converted to a monthly average since the TMDL WLAs are derived on an effluent concentration of 1 mg/L or greater. Since the WLA is expressed as annual loads (lbs/yr), permits will require rolling 12-month sums of total monthly loads for TP as well. (See section 4.6 and 4.6.4 of the WPDES/TMDL Guidance.)

Since most of the TMDL watershed is nonpoint source-dominated, it is likely that TMDL implementation will result in water quality improvement in the direct receiving water of dischargers because nonpoint sources will be controlled in addition to point sources to meet the water quality goals downstream. If it can be demonstrated that these reductions are sufficient to meet both the local water quality goals and the downstream TMDL targets, a WQBEL pursuant to s. NR 217.13 may not be necessary in the first two permit terms. This demonstration can be made by the WPDES permit holder or the Department on a case-by-case basis.

Reserve Capacity

The TMDL for Tainter and Menomin Lakes includes a reserve capacity to allow for future additional point source loads. Specifically, the TMDL indicates: "The reserve capacity was developed in anticipation of future surface water discharge needed for domestic wastewater treatment in areas currently discharging to groundwater." DNR will address future requests for allocation of reserve capacity on a case-by-case basis through appropriate consideration of this TMDL language. Qualified dischargers that are interested in being assigned a portion of the reserve capacity should submit information to the Department which includes a demonstration of need and the proposed location of the new or increased discharge within the watershed. Reserve capacity decisions and other related permit determinations will be subject to the standard public notice and participation procedures as well as opportunities for challenge at the time of permit modification or reissuance under chapter 283, Wis. Stats.

Non-continuous Discharges

Methods for converting TMDL WLAs to permit effluent limits for non-continuous discharges are determined on a case-by-case basis. In practice the most common types of non-continuous discharges that will be encountered fall into these basic categories:

1. Discharges from stabilization ponds and cannery operations which routinely discharge during a limited period of the year.
2. Discharges from industries where interrupted production on weekends results routinely in no discharge for one or two days per week.
3. Discharges from municipal lagoon systems where effluent is held for short periods of time (usually 1-2 months) to avoid non-compliance with effluent limitations.
4. Discharges where market forces dictate whether production occurs (e.g. dairies may choose to landspread whey rather than processing it further).

For those TMDLs where the WLAs are given on an annual basis, there should be flexibility in determining whether it is practical to have monthly limits in addition to annual limits.

Compliance Schedules

At the time of permit reissuance, DNR will evaluate the potential for a discharge to exceed the TMDL-derived WQBEL to determine the need for a compliance schedule. If the WQBEL has the potential to be exceeded, a compliance schedule may be granted for existing facilities to comply with these limits when justifiable.

Procedures for granting and administering a compliance schedule may be specific to the point source type (e.g., wastewater treatment plant, municipal storm water) or specific to the pollutant (e.g., phosphorus in s. NR 217.17, Wis. Adm. Code). Prior to issuing a compliance schedule, DNR must use available information to determine if the schedule of compliance 1) will lead to compliance with the WQBEL as soon as possible, 2) is appropriate and necessary because the permittee cannot immediately achieve compliance with the WQBEL based on existing operation of its treatment facility, and 3) is consistent with this implementation strategy. The following is a brief summary of compliance schedule requirements:

- The duration of a compliance schedule should be as short as reasonably possible;
- Compliance schedules must include interim steps and may not allow more than one year between compliance dates; and
- If justified, compliance schedules may extend past the expiration date of the permit only when the permit includes both an interim limit effective upon the permit's expiration date and the final effluent limitation, which is advisory in that it does not become effective within the permit's term.

Adaptive Management and Pollutant Trading

Two relatively new ways to implement phosphorus limits in WPDES permits are Adaptive Management and Water Quality Trading. In both cases, point sources can take credit for phosphorus reductions within the watershed towards phosphorus compliance. Because the practices used to generate phosphorus reductions may be the same, these compliance options are often confused with one another. Adaptive management and water quality trading have different permit requirements, however, making them different from a permitting and timing standpoint:

- **Adaptive management and trading have different end goals:** Adaptive management focuses on achieving water quality criterion for phosphorus in the surface water; trading focuses on offsetting phosphorus from a discharge to comply with a permit limit.

- **Monitoring:** Because adaptive management focuses on water quality improvements, in-stream monitoring is required under adaptive management; this is not required under trading.
- **Timing**: Practices used to generate reductions in a trading strategy must be established before the phosphorus limit takes affect; adaptive management is a watershed project that can be implemented throughout the permit term.
- **Quantifying reductions needed:** Trading requires trade ratios be used to quantify reductions used to offset a permit limit; the reductions needed for adaptive management are based on the receiving water, not the effluent, and trade ratios are not necessary in this calculation.
- **Eligibility:** Adaptive management and trading have different eligibility.

NOTE: Since most point sources in the Red Cedar Basin are meeting phosphorus effluent goals, and the total load for point sources has been below the TMDL goal set for these sources for several years, it is anticipated that adaptive management and pollutant trading will likely not be applicable to the Basin. However, we leave these guidelines in the Plan in the event that, over the ten-year period of the plan, any point sources are suddenly in violation and have no other recourse but to investigate these options.

General Permits, Impaired Waters & TMDLs

The TMDL includes an aggregate allocation for general WPDES permits in the watershed rather than individually assigned wasteload allocations. Compliance with this allocation, therefore, will be determined by DNR in aggregate. Holders of general permits will be considered in compliance with the TMDL if they are in compliance with their general permit. Permits will be modified as necessary to ensure compliance with the aggregate wasteload allocation. Since general permits cover facilities in watersheds across the state, there needs to be permit language that requires facilities to implement measures consistent with TMDLs. Example permit language is shown below, which can be used in some general permits written for traditional wastewater discharges (not stormwater or CAFO). In this case, the pollutant of concern is phosphorus and the waterbodies are those draining into Tainter and Menomin Lakes.

1. *Report Discharge to an Impaired Surface Water.* The permittee shall report, on the annual discharge monitoring report, whether the facility has a detectable pollutant of concern discharge to an impaired surface water on the 303(d) list or a surface water with a State and EPA approved Total Daily Maximum Load (TMDL) allocation.
2. *TMDL Implementation.* Facilities discharging a pollutant of concern to an impaired water for which there is an approved TMDL under this permit must implement treatment/control measures which ensure the discharges of the pollutant of concern meet the applicable WLA in the TMDL. Existing discharges covered under this permit shall comply with any allocation granted to general permit discharges in any approved TMDLs established for the water body receiving the discharge that is in effect on the start date of this permit.
3. *New or Increased pollutant discharge to a 303(d) listed impaired surface water.* A permittee may not establish a new wastewater discharge of a pollutant of concern to an impaired water body or significantly increase an existing

"Since general permits cover facilities in watersheds across the state, there needs to be permit language that requires facilities to implement measures consistent with TMDLs."

discharge of a pollutant of concern to an impaired water body unless the new or increased discharge does not contribute to the receiving water impairment, or the discharge is consistent with an approved TMDL allocation for the impaired water body. Any new or significantly increased pollutant of concern discharge to an impaired surface water authorized under this general permit shall be consistent with the wasteload allocation for general permittees within the basin.

MS4 Stormwater Permits

In Wisconsin, stormwater discharge permits are issued pursuant to ch. NR 216, Wis. Adm. Code. As part of the TMDL process, permitted Municipal Separate Storm Sewer Systems (MS4s) are assigned individual TMDL WLAs. Two communities within the Red Cedar River Basin received individual MS4 WLAs, Rice Lake and Menomonie. In the case of Menomonie, only the portion of the municipality contributing stormwater to Lake Menomin directly is included in the allocation. In both cases, a total phosphorus loading rate of 0.445 lbs/acre/yr was used to set the TMDL WLA. For more details see referenced guidance document for MS4 permits.

Construction and Industrial Runoff

Construction stormwater activities in the Red Cedar River watershed are considered in compliance with provisions of the TMDL if they obtain a Construction General Permit under the WPDES program and properly select, install and maintain all BMPs required under the permit, including any applicable additional BMPs required for discharges to impaired waters, or meet local construction stormwater requirements if they are more restrictive than requirements of the General Permit.

Industrial stormwater activities are considered in compliance with provisions of the TMDL if they obtain an industrial stormwater general permit or Nonmetallic Mining Permit under the WPDES program and properly select, install and maintain all BMPs required under the permit. Therefore, implementation for construction and industrial stormwater includes confirming continued operation in compliance with their permit conditions.

Concentrated Animal Feeding Operations

In the TMDL, WLAs are applied to the production area of the CAFO (manure/process wastewater storage, feed storage, feedlots) and a load allocation applies to the agricultural fields that receive CAFO manure and process wastewater applications (regulated under the WPDES permit) and other cropped fields not receiving CAFO manure and process wastewater applications (not regulated under the WPDES permit).

At the time the TMDL was approved, there were 7 permitted concentrated animal feeding operations (CAFOs) in the Red Cedar River Basin. The number of CAFOs is expected to fluctuate as farms expand, change operation, or stop production. Implementation actions for these facilities include confirming their continued operation is in compliance with their permit conditions.

Although these facilities have the potential to contribute phosphorus from manure stored on site, their permits do not allow the release of any runoff containing pollutants from their production areas. Permitted CAFOs in the watershed are also required to comply with manure and nutrient management requirements for croplands associated with CAFO operations, such as Natural Resources Conservation Service (NRCS) Conservation Practice Standard 590.

To view a map of all the permitted facilities in the Red Cedar River watershed, WDNR's Surface Water Data Viewer is available on the Internet, and will have the most up-to-date facilities and information. The Data Viewer can be found at the following link:

http://dnr.wi.gov/topic/surfacewater/swdv

Nonpoint Sources

Recall from Chapter 2 that, in addition to changes in point source phosphorus load contribution since the TMDL research was done in the 1990s, there have been changes in land cover and the methods by which land cover is categorized, the number of barnyards, and other factors affecting nonpoint sources of phosphorus. As part of preparing this document, a new barnyard Inventory was done, analysis of land cover was updated, the entire watershed was subdivided into 53 sub-watersheds (HUC 12s), and loads for each were calculated using modeled loads per acre from the SWRBB model. Those baseline loads for the entire watershed above Tainter and Menomin Lakes are displayed in Table 3.1.

The new baseline load is different than the combined nonpoint source loads for Lakes Tainter and Menomin of 466,900 lbs/yr taken from Tables 2.1 and 2.2 based on 1990s data. This is mostly due to two factors. One was the decision to convert to the modern, HUC 12 sub-watershed boundaries, which brought an additional 16,500 acres into the watershed that was formerly thought to drain elsewhere. This brought with it an estimated additional 17,000 lbs of phosphorus. Proportionate adjustments were made when the SWRRB loading rates were used to estimate loads for each HUC 12 in the watershed. (A complete estimate of loads per HUC 12 watershed can be found in Table 3.4, and unit area loads can be found in Table 3.5.) The second factor is the substantial decline in phosphorus loads coming from barnyards, likely due to fewer barnyards as well as installed controls. A new inventory using 2014 aerial photography and records, combined with use of the BARNY model for simulating barnyard runoff estimates that phosphorus loads from barnyards amount to 4,287 lbs. per year; a substantial decrease from the 1990s estimate of 33,410 lbs. per year.

As mentioned in Chapter 2, the TMDL analysis for Tainter Lake identified the need to reduce phosphorus loads from entering the lake by approximately 330,000 pounds annually, based on data available at the time of modeling in the early 1990s. With adjustments based on newer data, that load reduction number becomes 306,000 pounds per year of phosphorus load reduction from nonpoint sources needed to meet the total TMDL goal of 65% reduction. In this section we will identify the scope and relative importance of management practices needed to achieve this amount of phosphorus reduction. For this strategy, we have set a timeline of ten years to achieve a portion of the total load reduction, with the ten-year goal of 40% reduction, or approximately 207,000 pounds of phosphorus.

Many individual and groups of stakeholders are needed to develop an implementation strategy for reducing phosphorus loads from nonpoint sources. They can help identify a range of best management practices (BMPs) to pursue, establishing implementation strategies and conducting evaluation activities.

The Red Cedar River Basin has been studied extensively in the past, and much is known about the nature and extent of its water quality problems. However, much less is known about how extensively best management practices proven to minimize pollutant losses are currently used. For example, we don't know the acreage of nutrient management for phosphorus control being practiced in the watershed. Nor do we know the acreage of land in reduced tillage practices. There are some indirect measures of practice trends

Land Use	Cropland	Forest	Grassland	Urban	Totals
Baseline Load (lbs/yr)	314,028	59,641	34,301	42,764	**450,735**
+ Barnyards					**4,287**
Total					**457,022**

Table 3.1: Recalculated baseline phosphorus loads for entire TMDL watershed from different land cover types.

> "This section combines BMP effectiveness information available in the literature with land use characteristics of the Red Cedar Basin compiled through the TMDL process."

over time, including county trends in average soil phosphorus level and number of agricultural soil samples collected. The lack of basic inventory information necessitates the use of more generic, literature-based approaches to estimating the potential benefits associated with various nonpoint source BMPs. This section combines BMP effectiveness information available in the literature with land use characteristics of the Red Cedar Basin compiled through the TMDL process. The resultant information illustrates the relative opportunities for control of phosphorus from nonpoint sources in the basin.

In 1999, the DNR completed a water quality model for the Red Cedar Basin that estimates sediment and nutrient (phosphorus) loading. The Basin was divided into seven watersheds, approximating what are now the HUC 10 watersheds in the Basin. Each of the seven were analyzed with the Simulator for Water Resources in Rural Basins (SWRRB) model. The model identified and assigned unit area loading coefficients to a range of distinct land use categories, and predicted annual sediment and phosphorus loads delivered to Tainter Lake. Updating that information for this strategy required phosphorus loading data from SWRRB for the seven watersheds to be extrapolated to 53 sub-watersheds at the HUC 12 scale. This necessitated some interpolation along a few boundaries. The result was load estimates for each HUC 12 watershed as well as unit area loads, which form the basis for current watershed level management (see Tables 3.4 and 3.5). This extrapolation was confined to SWRRB land use estimates. Barnyard estimates were completely revised using 2014 aerial photographic interpretation.

Controllable Phosphorus Loads

The semi-quantitative analysis that follows later in this chapter predicts phosphorus reductions from selected BMP applications on agricultural phosphorus sources. Most of the analysis is directed at answering the question, "How much phosphorus can be controlled by implementing X amount of BMPs in the basin?" This analysis has several fundamental conditions that are important to keep in mind.

1. The BMP applications are generally applied over the entire basin area unless otherwise indicated as targeted. Targeting the implementation of BMPs to those lands delivering the highest amounts of phosphorus will make all BMP investments more effective. The individual analyses indicate the extent to which targeting was utilized. Additional detailed planning could further target BMP applications to take full advantage of variable land use conditions in the individual drainage areas.
2. The estimations developed in this document are of the "back of the envelope" variety and are not as accurate as more rigorous mathematical analysis like the SWAT Model (Soil and Water Assessment Tool) or even the simpler STEPL Model (Spreadsheet Tool for Estimating Pollutant Loads).
3. Credits or assignments of P reduction estimates by BMP do not take into consideration that some of these BMPs may overlap others. This analysis assumes that each BMP is independent of each other. Estimating load reductions through the application of several BMPs on the same site would produce different results.

Using methods explained in the narratives below, the practices summarized in Table 3.2 are based on averages and were developed with limited inventory information. Better inventory information could be used to adjust the figures. Examples of needed inventory information are more cropland P Index values, acres of cropland receiving winter manure applications and a number of failing septic systems.

Setting an Interim Goal

The Partnership selected an interim goal for phosphorus reductions from nonpoint sources over ten years (by 2025) based on anticipated reductions in phosphorus loads coming from multiple sources, but realizing the difficulty of achieving the full TMDL goals in only ten years. The result is a goal for an overall reduction from all nonpoint sources of 40% or 186,000 lbs/yr above Tainter Lake over the next ten years. Additional reductions would occur when similar efforts are made in the watershed area between Tainter and Menomin Lakes.

As a group, watershed point sources are already below their final TMDL phosphorus wasteload allocation goal. Some individual point sources have not attained their wasteload allocation goals but will receive compliance schedules to move them toward compliance as WPDES permits expire.

Best Management Practice Examples (example evaluation from area draining to Tainter Lake only)	**Lbs/yr P Reduced**
No-till method on 86,000 cropland acres without targeting or 60,000 acres if high delivery areas are targeted	63,000
Eliminate winter manure spreading on 6,000 acres by adding 50 manure storage structures	34,000
Draw phosphorus levels down to 25 PPM on ⅓ of cropland with the highest delivery rates (86,000 acres)	31,500
Plant cover crops on 107,000 acres (40%) of cropland	18,000
Traditional conservation practices on 10% of cropland acres	11,000
Add treatment of milk houses waste at 50 farms	6,600
Control of urban stormwater P delivery outside MS4 areas	5,700
Install stream buffers on 15% of stream miles	4,600
Add runoff control to 62 barnyards	4,200
Replace all failing, critically located septic systems (440)	420
Control stormwater on all rural, residential properties near waterbodies (2200 lots ¼ acre in size)	220
200 acres of wetland restoration	210
Past barnyard load reductions	27,000
Total of example reductions	206,450
Interim, ten-year goal of 40% reduction in nonpoint source load	186,000
TMDL final reduction goal for nonpoint source load	306,000

Table 3.2: Estimated load reductions from various best management practices in the Red Cedar River Basin in the TMDL area of concern

(Note – The sum of load reductions in this table does not match that in the tables of individual sub-watershed goals in Chapter 2 due to the additional watershed area contributing to Lake Menomin but not Tainter Lake.)

Phosphorus Load Reductions from Various Best Management Practices

Table 3.2 illustrates how a combination of BMPs can be applied to conditions thought to exist in Red Cedar Basin to obtain substantial watershed phosphorus reductions. The numbers in the table are generally expressed only to two significant figures in recognition that these are simple approximations without watershed inventory data in most cases. It is important to recognize the relative significance of each identified practice as well as the need to make progress in many areas to obtain the reductions identified in the TMDL. This list will likely be revised and edited as the strategy proceeds. For example, rotational grazing, forestry practices and control of silage leachates are not numerically estimated in this report but are viable methods to reduce phosphorus delivery. The experience gained while working toward the interim goal should guide the practices utilized to attain the final goal.

What follows are individual analyses of each of these BMPs, calculating what could be achieved in the TMDL portion of the Red Cedar River Basin incorporating each of these practices at reasonably estimated scales. Costs of on-the-ground practices and installations are included in most of the calculations below. However, it will take more than just cost-share or construction dollars to make many of the changes on the land. Personnel will be needed to help make such land management changes happen. This will be discussed in detail in the next chapter, where cost estimates for that aspect of the strategy will also be calculated.

CONSERVATION TILLAGE – NO-TILL

The term “conservation tillage” includes a number of different tillage systems currently used in Wisconsin and around the nation. To qualify for cost sharing in Wisconsin, guidelines require that the tillage practices maintain at least 30% crop residue cover. Studies show that residue below this level reduces conservation effectiveness, while residue above this level optimizes soil erosion control and infiltration. Transect studies completed by both Barron and Dunn Counties reveal that residue levels vary widely over the basin and are dependent on variables including crop type, soil type, tillage implement, and operator style. While most of the cropland in this basin may appear to be under conservation tillage, in fact only a small percentage of cropland meets the 30% residue threshold (15% in Dunn County and 8% in Barron County). It is apparent that improvements in tillage practices that result in higher crop residue levels will result in phosphorus load reduction.

Analysis:

Cropland in the HUC 12 sub-watersheds of the Red Cedar Basin above Lake Menomin was divided into 6 categories for simulation of application of conservation tillage. For both Barron and Dunn Counties, SNAP-Plus (Soil Nutrient Application Planner) analysis of glacial till soils, outwash soils and soils overlying sandstone were performed. Soil phosphorus levels were set to the county average and multiple common crop rotations were simulated. A weighted average result for each sub-watershed was calculated based on the percentage contribution of the common crop rotations in that sub-watershed.

Scenario 1 (No targeting) – Applying no-till randomly across the watershed yielded an average 64% reduction in the phosphorus index. For this analysis, this was translated to a 64% reduction in watershed phosphorus loading.

- The estimated phosphorus loss from croplands in the Red Cedar Basin is about 300,000 lbs/yr coming from 268,000 acres. Applying no-till without any targeting to ⅓ of this acreage, 88,400 acres, at a 64% reduction rate eliminates 63,400 lbs/yr of phosphorus.

300,000 × 0.33 × 0.64 = **63,400 lb/yr reduction from 88,400 acres**

Conservation Tillage – No-Till Analysis (continued)

Approximate cost calculations:

Cost share for conservation tillage is $30 per acre.

$30 × 88,400 acres = **$2,652,000**

Scenario 2 (Targeting) – Similar to the above scenario, the SNAP-Plus model was used to estimate the benefit of focusing this practice in the 24 HUC12 sub-watersheds with the highest phosphorus loss rates estimated by the SWRRB model. These high loading areas included 87,000 acres of cropland or 32% of all watershed cropland acres.

- The estimated current phosphorus loss rate from these 24 sub-watersheds is 110,000 lbs/yr. This analysis estimated the number cropland acres that would need to be treated to eliminate 63,400 lbs/yr of phosphorus (same amount attained by randomly treating ⅓ of all cropland acres). The sub-watershed average from adding no-till in these areas ranged from 75% to 100% reduction in cropland phosphorus loss among the 24 sub-watersheds.

Current estimated loss rate from 24 high delivery HUC12s = 110,000 lbs/yr

Loss rate after no-till application to all cropland = 19,000 lbs/yr

Difference 110,000 – 19,000 = 91,000 lbs/yr

Pounds of phosphorus reduced per acre = 91,000 lbs/ac / 87,000 acres=1.056 lbs/ac/yr

60,000 acres × 1.056 lbs/ac/yr = **63,400 lbs/yr from applying no-till to 69% of the cropland acreage in high delivery watersheds.**

Approximate cost calculations:

$30 × 60,000 acres = **$1,800,000**

Presuming the same cost share incentives are used in all cases, targeting high delivery sub-watersheds can yield the same result at lower cost.

Lance Klessig

Touring a No-Till Field in the Town of Grant in Dunn County

COVER CROPS

Cover crops are plants seeded into agricultural fields, either within or outside of the regular growing season, with the primary purpose of improving soil health. They are typically not harvested. Primary examples include cereal rye planted after corn silage and soybeans, and a variety of summer annuals after snap beans.

Analysis:

The SNAP-Plus modeling procedure used to estimate effects of tillage change was also used to estimate the effect of adding cover crops. As with tillage change the effects of adding a cover crop were applied randomly across the entire watershed. A targeted analysis was not performed. Applying cover crops across all SNAP-Plus scenarios yielded an average 15% reduction in the phosphorus index. For this analysis, this was translated to a 15% reduction in watershed phosphorus loading. The estimated phosphorus loss from croplands in the Red Cedar Basin is about 300,000 lbs/yr coming from 268,000 acres. Applying cover crops without any targeting to 40% of this acreage, 107,200 acres, at a 15% reduction rate eliminates 18,000 lbs/yr of phosphorus.

300,000 × 0.4 × 0.15 = **18,000 lb/yr reduction from 107,000 acres**

Approximate cost calculations:

Cost share for cover crops = $30 per acre

$30 × 107,000 = **$3,210,000**

Tyler Gruetzmacher

Cover Crop of Radish and Oats in Barron County

NUTRIENT MANAGEMENT TO MEET CROP PHOSPHORUS NEED

Nutrient management practices have been promoted through a number of state programs that provide cost sharing and technical services to crop producers, and have been a requirement of State law in the Red Cedar River watershed since 2005 due to its impaired status.

Despite the emphasis placed on this practice in recent years, many acres of Wisconsin cropland are not currently under a nutrient management plan (NMP). Nutrient management will continue to be promoted and it is expected that significant gains in adoption and implementation of NMPs will occur over the next ten years. The use of nutrient management as a water quality tool is based on reducing nutrient inputs to levels required by crops. There is evidence from the UW-Madison Plant and Soil Laboratory that phosphorus levels in cropland soils in this watershed remain well above crop need (Combs and Peters, Wisconsin Soil Test Summary: 1974-1999, Department of Soil Science, UW-Madison).

Nutrient management can effectively balance inputs with crop uptake and through this method reduce the amount of excess nutrients vulnerable to runoff. The estimation of phosphorus reductions with this practice uses assumptions related to unit area load concentrations of phosphorus, cropland acreage, soluble versus particulate phosphorus, relationship of runoff P concentrations to soil test P concentrations, average soil test P levels and nutrient management practice adoption rates.

The Phosphorus Index (P Index) has emerged as the preferred field scale model for cropland nutrient management in Wisconsin. Studies in a watershed in southern Wisconsin on the frequency distribution of cropland P Index values found that 11% of cropland delivered 20% of the cropland P load (Laura Ward Good unpublished data). These concepts were used to estimate the potential benefits of nutrient management in the Red Cedar Watershed. The frequency distribution of cropland P index values is not available for the Red Cedar Basin; therefore the distribution found in the southern Wisconsin study was used for the following calculations.

Notes:

The P Index estimates the average runoff P delivery from each field to the nearest surface water over the course of a year. Each field's soil conditions, crops, tillage, manure and fertilizer applications, and long-term weather patterns are considered. Considering the site-specific nature of the P index, we did not attempt to project P index values for the Red Cedar River Basin.

This analysis projects that nutrient management practices would be used to draw the soil phosphorus level down to crop need, defined here as 25 PPM Bray P. This can be significantly different than nutrient management planning where phosphorus is added to meet crop need irrespective of soil phosphorus levels, and the prevailing soil phosphorus level remains above crop need.

Analysis:

The SWRRB model analysis, adjusted to 2011 land use data indicates that the 300,000 lbs/yr of phosphorus comes from cropland.

ESTIMATING HIGH PHOSPHORUS REDUCTIONS FROM HIGHEST DELIVERY FIELDS:

As stated earlier, 11% of cropland is estimated to deliver 20% of the cropland P load.

11% of watershed cropland acres = 268,000 acres × .11 = **29,480 ac of high delivery fields**

20% of cropland load = 300,000 lb P × 0.2 = **60,000 lb P**

60,000lb / 29,480 ac = **2.03 lb/ac average delivery to waterways from highest delivery fields**

Nutrient Management to Meet Crop Phosphorus Need Analysis (continued)

Based on generic application of P Index concepts to Barron County soils it was estimated that taking fields with a soil phosphorus (Bray) level of 100 PPM (high delivery fields) to crop need at 25 PPM, all else remaining the same, would reduce phosphorus delivery by 30%.

60,000 lb P × .3 = **18,000 lb P reduced from highest delivery fields**

ESTIMATING MODERATE PHOSPHORUS REDUCTION FROM MODERATE DELIVERY FIELDS:

From southern Wisconsin studies, 32% of cropland fields deliver 50% of the cropland P load. Moderate delivery fields are 32% of cropland acreage minus the highest delivery fields (11% of the acreage), or 21% of the 268,000 cropland acres in the basin.

268,000 ac × .21 = **56,280 ac of moderate delivery fields**

High and moderate delivery fields together deliver 50% of the P load. Phosphorus from moderate delivery fields is the total of the high and moderate field delivery minus the P from the high delivery fields.

300,000 lb × .5 – 60,000 lb (high delivery fields) = **90,000 lb P from moderate delivery fields**

90,000 lb/56,280 ac = **1.60 lb/ac average delivery to waterways from moderate delivery fields**

Based on generic application of P index concepts to Barron County soils it was estimated that taking fields with a soil phosphorus (Bray) level of 50 PPM to crop need at 25 PPM, all else remaining the same, would reduce phosphorus delivery by 15%.

90,000 lb × .15 = **13,500 lb P reduced from moderate delivery fields**

NO ADDITIONAL NUTRIENT MANAGEMENT ON REMAINDER OF WATERSHED:

From southern Wisconsin studies, 68% of the (lower delivery) cropland fields deliver 50% of the cropland P load.

268,000 ac × .68 = **182,240 ac of lower delivery cropland fields**

300,000 lb × .5 = **150,000 lb P from lower delivery cropland fields**

150,000 lb/182,240 ac = **0.82 lb/ac average delivery to waterways from lower delivery cropland fields**

COMBINED EFFECTS OF NUTRIENT MANAGEMENT ON HIGHEST DELIVERY FIELDS (11% OF WATERSHED ACREAGE) AND MODERATE DELIVERY FIELDS (21% OF WATERSHED ACREAGE):

18,000 lb + 13,500 lb = **31,500 lb P reduced from highest and moderate delivery fields**

Approximate cost calculations:

Cost share for 4-year nutrient management plans – $28 per acre.

$28 × (28,480 ac of high delivery fields + 56,280 ac of moderate delivery fields) = **$2,373,280**

BARNYARD RUNOFF MANAGEMENT SYSTEMS

An inventory of the number of barnyards in need of better management in the watershed was conducted using aerial photography from April 2014. This included a total of 78 dairy barnyards and 54 beef barnyards with an estimated average capacity of 80 head.

Total annual phosphorus loss was estimated at 6,287 lbs (calculations done using the BARNY model). This is substantially lower than the 33,410 lbs/yr estimated as being lost from barnyards in the 1990s (the 1990s estimate of 33,410 lbs/yr was done by sampling several barnyards for WDNR's Priority Watershed Projects at the time using BARNY principles, and then extrapolating those figures to the entire watershed).

The number of dairy farms in WI has declined about 45% since the early 1990s (WI Milk Marketing Board). During this same time period, the number of cattle and calves in Dunn and Barron Counties has declined about 27% (USDA-NASS). Putting 27% fewer cattle and calves on 45% fewer barnyards means the average size of the barnyards would increase about 30%. In addition to this consolidation, a higher percentage of barnyards have applied runoff management practices than prevailed in the mid-1990s. Most of the barnyard problems observed included violations of state performance standards.

The results of the inventory:

Dairy	78 lots – 4,178 lbs/yr
Beef	54 lots – 2,109 lbs/yr
Total	132 lots – 6,287 lbs/yr

Change since last inventory =
33,410 lbs/yr - 6,287 lbs/yr = 27,123 lbs/yr

Analysis:

If 62 of the highest loading barnyards received treatment, their estimated load change would be from a current 4,489 lbs/yr (avg of 72 lbs/yr/lot) to 310 lbs/yr (average of 5 lbs/yr/lot). This is a reduction of **4,179** lbs/yr, leaving 2,108 lbs/yr.

2,108 lbs/yr is 34% of the estimated current load from barnyards and 6% of the load estimated in the 1990s.

4,179 lbs/yr from additional barnyard runoff control systems

Approximate cost calculations:

The average estimated cost to upgrade the top 62 barnyards is $47,164 each

62 lots × $47,164 = **$2,924,168**

MANURE STORAGE

Phosphorus reductions associated with manure storage are derived from the absence of winter land spreading. With winter storage, manure spreading can be distributed over a much larger number of acres, and be confined to non-winter periods, thereby avoiding phosphorus loss due to runoff during snow melt and rainfall events with frozen ground conditions.

Analysis:

As part of the 2014 barnyard inventory, 50 farms were identified as possibly needing manure storage. Adding storage to these would eliminate winter spreading from about 4,000 dairy cows. Presuming that 1.5 acres of cropland is needed to appropriately process the manure from each cow:

4,000 cows × 1.5 acres cropland/cow = **6,000 acres served**

Addition of manure storage presumes that the storage facility is properly managed and the manure applied in accordance with a nutrient management plan which eliminates winter manure applications. Future phosphorus applications would continue to supply some P to runoff at a rate significantly lower than the 20-50% loss rate when winter spreading occurs on critical acres as reported by Barron County (personal communication).

The assumed application rate is 25 tons/acre/year of manure or 33 lb P/acre/year (UWEX Fast Facts). It is assumed that all nutrients applied are from manure. A 20% P loss rate is used as a gross estimation of loss of land-applied P on the 1,680 acres prior to being served by manure storage, and amounts to approximately 6.6 lb/acre annually. This number is supported by field investigation at the watershed level (Hazuga, 2009).

33 lb P/acre/year × 6,000 acres x .2 = **39,600 lb P lost prior to installation of manure storage**

This is the rate of loss associated with winter spreading of manure. If manure is applied during spring or fall there will be some runoff associated with this activity at a reduced rate. Manure applied from spring or fall applications is estimated to lose 1 lb P/acre/year (the watershed average) as compared to the 6.6 lb P/acre/year from winter applications.

1 lb P/acre/year × 6,000 acres = **6,000 lb P lost with winter storage in place**

39,600 lb P – 6,000 lb = **33,600 lb P controlled by use of winter storage**

Approximate cost calculations:

The estimated average cost of a manure storage system is $100,000.

50 farms × $100,000 = **$5,000,000**

MILK HOUSE WASTE

Phosphorus reduction from milk houses can provide significant control opportunities, due to the relatively large amount of phosphorus contained in some of the acid washes in daily cleaning. Several hundred gallons per day of discharge can find its way to channelized flow areas and eventually into nearby surface waters. There are various different control technologies used to manage milk house waste discharge. Estimates of control are based on UWEX publication A3592. The average phosphorus load from milk house waste is 72 lbs/year for farms with 28 to 60 cows or about 1.64 lbs P/cow/yr.

Analysis:

Milk house waste losses are typically addressed when manure storage is added. In the examples above 50 dairy farms had manure storage added likely capturing the milk house waste as well. The estimated number of dairy cows in these 50 barnyards is 4,000.

4,000 cows × 1.64 lbs P/cow/yr = **6,560 lbs P/yr enhanced milk house treatment**

Approximate cost calculations:

The average cost to collect and transfer the milkhouse waste to a new or existing manure storage facility is $10,000.

50 farms × $10,000 = **$500,000**

TRADITIONAL SOIL EROSION CONTROL

For many years, the use of "traditional" practices like crop rotations, contour farming, strips, grassed waterways and terraces have been promoted and implemented across the Red Cedar Basin. Reduction of cropland erosion through "traditional" practices and through conservation tillage has been estimated and reported in the Barron and Dunn County Land and Water Resource Management Plans. These plans estimate that about 50% of the cropland soil erosion control accomplished is due to "traditional" soil erosion control practices. Another 50% are due to tillage practices, independent of "traditional" BMPs.

Despite the acceptance of these practices over the years, there remain a number of farming operations that have not implemented these practices. In addition, there is some evidence reported by both Land Conservation Departments that some practices like grassed waterways are actually being removed as an outcome of the use of newer larger implements.

The Land and Water Plans also estimate the number of acres that are below and above the "T" level of soil erosion ("Tolerable Soil Loss", near 5 tons/acre/yr). These estimates are derived from transect studies conducted in both counties, and are based on trained visual observations of croplands at assigned sample points.

Analysis:

Assume that 27,000 of the 268,000 cropland acres in the Red Cedar Basin (10%) could achieve better erosion control from traditional conservation practices. This work would need to be targeted to cropland above "T" with a goal to bring it below 5 tons/acre soil loss.

Assume that traditional conservation practices will reduce erosion from 5 tons/acre to 4 tons/acre at the field level.

Traditional Soil Erosion Control Analysis (continued)

Further assume that cropland erosion contains 4 lb P/ton of soil (Panuska personal communication). Then 27,000 tons of soil loss prevented × 4 lb P/ton of sediment = 108,000 lb P controlled at the field level.

The WIN sediment delivery model developed by the DNR for use in the Priority Watershed Program indicated that only about 10% of this one ton/acre gross cropland soil erosion loss is actually delivered to a water body. Correcting for this:

108,000 lb P × .1 = 10,800 lb P controlled by use of "traditional" conservation practices.

Approximate cost calculations:

Approximately $100,000 in cost share money would be needed per county for Barron and Dunn Counties, and approximately $50,000 each for St. Croix and Chippewa Counties, = $300,000 per year.

STREAM BUFFERS

The Red Cedar watershed above Lake Menomin has an estimated 750 miles of streams, plus lake frontage. It is unknown how much of these riparian areas are in need of buffers. A Barron County field survey reported in the Barron County Land and Water Plan identified 485 potential buffer sites.

In Dunn County, virtually all riparian reaches will eventually have buffers of 20-35 ft. through ordinance. For this analysis it was assumed 15% of the stream miles have buffers added and all of it was adjacent to cropland.

Analysis:

750 mi × 2 (sides of the stream) = 1,500 miles of stream riparian frontage.

1,500 miles of frontage × .15 = 225 miles of buffer frontage added.

The average phosphorus control achieved by 20-50 foot buffers was estimated to be 50% (Cook DNR, 1999). The effective up-gradient treatment area associated with this buffer was set to 300 feet wide.

300 feet x 225 mi × 5,280 ft/mi / 43,559 ft2/acre = 8,200 acres of treatment area draining to buffer

8,200 acres cropland × 1.11 lb P/acre × .5 = **4,550 lb P controlled by buffers.**

Approximate cost calculations:

One possible approach for this practice would be to incorporate the CREP (Conservation Reserve Enhancement Program) from NRCS on the acres of concern.

15 year CREP contract = $2,500 per acre

Perpetual easement = $3,500 per acre

15 year cost = 8,200 ac × $2,500 = **$20,500,000**

Perpetual cost = 8,200 ac × $3,500 = **$28,700,000**

At the time these calculations were done, there was uncertainty about the future of the Dunn County ordinance mentioned above due to actions by state lawmakers. So modifications of these calculations may be needed in future strategy revisions.

RUNOFF CONTROL IN INCORPORATED AREAS AND RURAL ROADS

Because of the rural nature of the Red Cedar River Basin, urban runoff contributions are estimated to be a small contributor of phosphorus. Much of the area's urban land use is actually paved rural roads. The SWRRB model, adjusted for year 2011 land use, estimated an urban storm water phosphorus load of 39,900 lb P/yr which is 7.8% of the total load coming from above Tainter Lake. Construction sites of one acre or more and industrial sites are regulated by DNR permit as are the municipal areas of Rice Lake, and Menomonie draining into Lake Menomin. These are included in the point source wasteload allocation of the TMDL.

Communities regulated by storm water permits (Menomonie & Rice Lake) are expected to implement BMPs to reduce suspended solids and phosphorus delivery to comply with their wasteload allocations under the TMDL. Other incorporated areas within the basin would fall into the category of voluntary compliance and utilize the same urban BMPs including temporary detention basins, infiltration practices, public education, etc. Because temporary detention basins trap mostly sand, they are less effective at reducing phosphorus which is largely attached to silt and clay and not effectively trapped. Urban BMPs that infiltrate storm water rather than routing it to surface water are much better at eliminating phosphorus delivery. When selecting urban storm water BMPs in the basin it will be important to give consideration to their ability to reduce phosphorus. This includes rural roadways.

These MS4 allocations in the TMDL were based on an expected goal for their urban areas of 0.445 lbs/ac. Loading from the non-MS4 urban areas of the watershed was estimated by SWRRB at an average of 0.65 lbs/ac/yr. This is an average expected reduction of 31%. It has been estimated that the 40% suspended solids reduction in an urban area using a variety of practices will also reduce phosphorus delivery by about 24% (Rortvedt & Kirsch 2010). This analysis estimated that the non-MS4 urban areas would move halfway from their current loading rate (0.65 lbs/ac/yr) to the 0.445 lbs/ac/yr rate expected of the MS4 areas or a 15.5% reduction.

Analysis:

Urban non-MS4 acres above Tainter Lake = 60,794 ac – 3800 ac for Rice Lake MS4 = 57,000 ac

57,000 ac × 0.65 lbs/ac/yr = 37,050 lbs/yr from urban non-MS4 areas

37,050 lbs/yr × 0.155 reduction = **5,740 lbs/yr reduction**

Estimate the combined effect of future regulation of urban storm water in Rice Lake and partial, voluntary control by other communities. Partial, voluntary control would likely take place in conjunction with future development or rehabilitation projects where incorporation of storm water BMPs could be economically added.

The US Census Bureau 2008 estimates the Rice Lake population at 8,257, and all other incorporated areas at 16,782. Based on this, it was estimated that ⅓ of urban storm water generated in the watershed upstream from Tainter Lake originates in Rice Lake. Similarly, ⅓ of the urban P load (Rice Lake) will be 24% controlled by achieving the 40% suspended solids control requirement. It is assumed that for ⅔ of the urban P load, 25% of the urban source area will voluntarily install BMPs to achieve 24% control of the P from the source area.

12,500 lb P/yr (from all urban areas) × .33 = 4,125 lb P/yr currently from Rice Lake and anticipated to be subject to regulatory control

12,500 lb P/yr × .67 = 8,375 lb P/yr currently from other urban areas

8,375 lb P/year other urban areas × .25 = 2,094 lb P/yr anticipated to receive voluntary control

(4,125 lbs P/yr from Rice Lake + 2,094 lbs P/yr from other areas) × .24 = **1,492 lbs P controlled from urban sources**

Runoff Control in Incorporated Areas and Rural Roads Analysis (continued)

Approximate cost calculations:

Because of the varying nature of BMPs needed for control from such sources, a cost projection for this practice is difficult to estimate, so none is given here.

WETLAND RESTORATION

Restored wetlands have some water quality benefits in addition to the obvious improvements of biological diversity and wildlife and fisheries habitat. This practice can be considered for use in the Red Cedar River Basin and is currently being implemented through a variety of cost share and financial incentive programs. Phosphorus uptake by wetland plants in the spring and summer can effectively diminish the amount of phosphorus from incoming runoff water. However, studies indicate that during plant decay in the fall of the year some of this phosphorus is released and is subject to movement downstream. One way to estimate the ability of wetlands to control phosphorus is by predicting accumulation rates of P per unit area of wetland. As with many of the BMPs there are wide ranges of controllability depending on the specific variables of the practice. Wetland phosphorus accumulation rates have been reported at .05 to .22 g/m^2/year (Cook, DNR, 1999). These rates can be used to estimate the P controllability associated with restored/created wetlands.

Analysis:

The average accumulation rate is 0.14 g/m^2/year.

0.14 g/m^2/year $\times$ .03527 ounces/g $\times$ 1 lb/16 oz. = 0.0003086 lb/m^2/year

After conversion of m^2 to acres, the phosphorus accumulation rate is 1.055 lb P/acre/year, similar to the unit area loading rate for croplands in the basin (DNR 1999). Note that some restoration of wetlands would retire croplands, and reduce P loading by a small amount.

Assume 200 acres of restored or re-created wetlands.

200 acres $\times$ 1.055 lb P/acre/year = **211 lb P accumulated/retained from 200 acres of wetland restoration**

Approximate cost calculations:

The average cost of a wetland restoration is approximately $1,500 per acre.

$1,500 $\times$ 200 acres = **$300,000**

REPLACING FAILING SEPTIC SYSTEMS

Phosphorus tends to bind to soil particles and does not easily move through the soil column to reach groundwater, unlike nitrogen which readily passes through soil. Human sewage entering septic systems contains phosphorus. In properly operating systems in good soils, phosphorus tends to remain in the soil adjacent to the septic system. However, as septic systems age, the binding capacity of the soil can be saturated, particularly in sandy soils. Under these conditions, phosphorus can begin to move off the site in groundwater. In addition, failing septic systems often discharge wastewater to the surface and create an additional opportunity for phosphorus to leave the site. A study in Minnesota has estimated the phosphorus delivery from riparian septic systems at 0.32 kg/capita/yr for failing (surfacing) systems and 0.16 kg/capita/yr for other systems (Barr Engineering 2004). A study by WI DATCP estimates the percentage of failing septic systems in WI at 20% (Wisconsin Department of Commerce, 1998).

An investigation in a nearby watershed that applied the above figures estimated a phosphorus delivery of 1 lb/mi^2 of watershed from rural, riparian septic systems (Trombly, Dec. 2009). This study also indicated a density of 0.84 rural, riparian residences per mi^2 of watershed area. This number was used to estimate the phosphorus from rural residential properties near waterways in the watershed upstream from Tainter Lake. To account for the high density of residential properties around Tainter and Menomin Lakes, the Lake Improvement Association reported membership of 836 households was added the above total. Not all of these have lakefront property but for the purposes of this estimate all were treated as riparian property.

Analysis:

1,660 mi^2 watershed above Tainter Lake × 1 lb/mi^2 = 1,660 lb P from septic systems near waterways in the watershed.

836 × 0.2 households × 2.5 residences per household × 0.32 kg/cap/yr = 133.7 kg/yr or 294 lb P/yr from the estimated 20% of failing riparian septic systems.

836 × 0.8 households × 2.5 residences per household × 0.16 kg/cap/yr = 267.5 kg/yr or 589 lb P/yr from the estimated 80% of functioning riparian septic systems.

Total estimated septic load = 1,660 + 294 + 589 = 2,543 lb P/yr from riparian household septic systems.

Replacing the 20% of the failing septic systems reduces their loads by 50%, which results in a 17% reduction overall in riparian septic load.

2,543 lb/yr × .17 = **423 lb P reduced watershed septic load achieved by replacing failing riparian septic systems.**

The total number of rural riparian septic systems is 1,660 mi^2 × .84 riparian residences per mi^2 (1,394 residences) plus 836 Lake Tainter riparian residences, for a total of 2,230 riparian residences.

Approximate cost calculations:

Since we don't know the exact number of septic systems, and the degree to which they may need replacing or repair, it is difficult to offer an estimate of costs, so none was calculated.

Peggy Compton

Septic System Installation

STORM WATER CONTROL ON RURAL, RIPARIAN, RESIDENTIAL PROPERTIES

From the septic analysis it was estimated that 2,230 rural residences are close to waterways in the Tainter-Menomin watershed. Installation of practices to infiltrate storm water on residential riparian property can be estimated to reduce the phosphorus delivery about 0.4 lb/ac/yr (Panuska 2004).

Analysis:

If the average size of rural residential properties in the riparian zone is ¼ acre then the estimated benefit from controlling rural residential storm water phosphorus is:

2,230 residences × .25 acres/residence × 0.4 lb P saved = **223 lb P controlled**

Approximate cost calculations:

Since we don't know the extent to which these properties may need or be amenable to infiltration practices, no estimate is given for the cost of this practice.

ADDITIONAL PRACTICES WITH POTENTIAL TO CONTROL PHOSPHORUS IN THE WATERSHED

(BUT WITHOUT NUMERIC PROJECTIONS)

There are other possible methods for reducing phosphorus runoff to the lakes and rivers of the Red Cedar Basin for which it is more difficult to estimate the load reduction possibilities. When appropriate and possible, these techniques will be promoted in the watershed.

- Conversion of existing farm operations to **rotational grazing systems** has been documented as having potential to reduce phosphorus loss where cropland and sparsely vegetated feedlots are converted to dense perennial grasses.
- Some **lake management techniques** have the potential to decrease the amount of available phosphorus in Tainter and Menomin Lakes. These include not only local practices designed specifically to benefit these two lakes but also those benefiting upstream lakes in the watershed if those practices result in reduction of phosphorus leaving the lake and entering the watershed.
- Leachate from silage contains phosphorus and sometimes reaches surface water. Addition of **leachate capture and treatment practices** can reduce this phosphorus source.

Lynn Betts, NRCS

Movable rotational grazing fence.

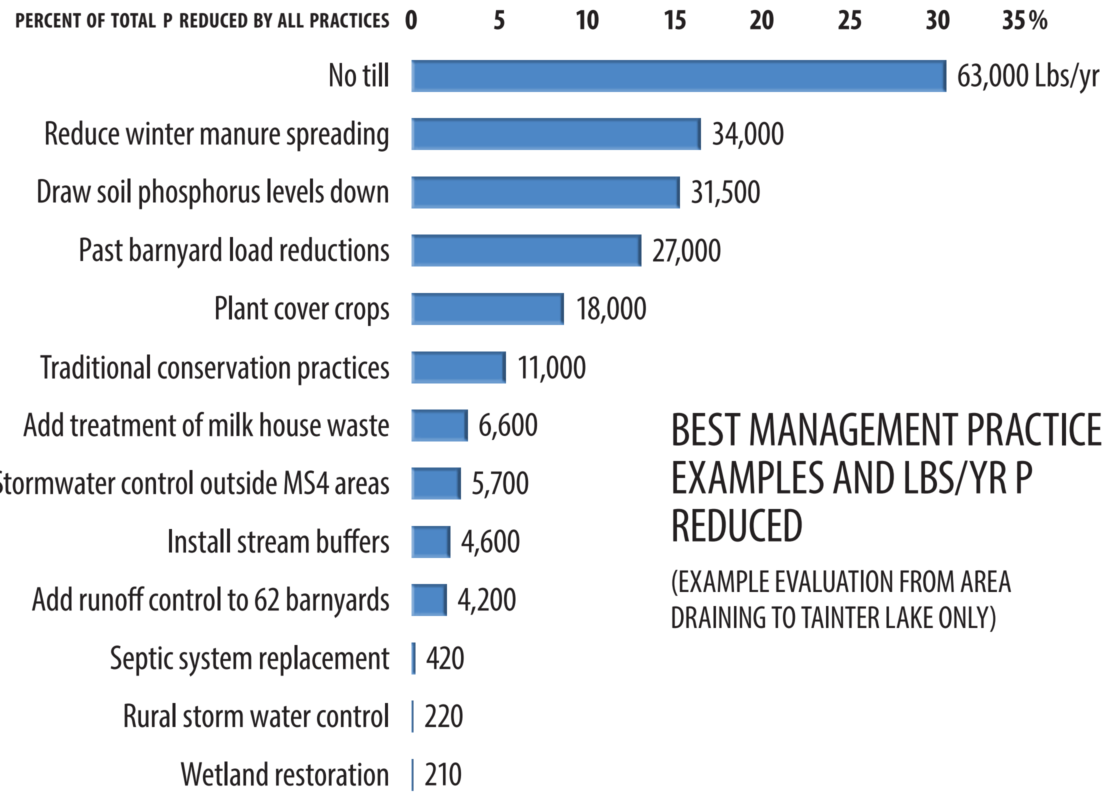

FIGURE 3.1: Potential load reductions by percentage from all proposed best management practices.

COST EFFECTIVENESS AND TARGETING

Historic economic incentive practices were used to develop the estimates in Table 3.3. Some practices offer a more cost effective approach in terms of how much phosphorus load reduction can be achieved per dollars spent on the ground. It's also quite clear from Table 3.3 that costs appear almost insurmountable for some of the BMPs needed for phosphorus control. It should be noted that through the methods of civic engagement and civic governance explained in Chapter 4 of this document, we believe the costs will be considerably less than what is listed here. The calculations that have been included in Table 3.3 are based mostly on cost-share programs (incentive payments for a BMP or different way of managing land) and other "carrots" provided by various levels of government. We believe that the approach explained in Chapter 4 will create more willingness to participate with less of a need for cost-share money or certain government programs. Peer-to-peer learning, building of trust, and creating community will go a long way toward lowering the potential costs of what's needed. This approach will require organizations funding agricultural efforts to put less emphasis on money for incentive payments and more emphasis on fostering peer networking.

Best Management Practice	Pounds of P Reduced	Cost
Conservation Tillage	63,000	$1,800,000
Cover Crops	18,000	$3,210,000
Nutrient Management to Crop Phosphorus Need	31,500	$2,373,300
Barnyard Runoff Management Systems	4,200	$2,924,168
Manure Storage	33,600	$5,000,000
Milk House Waste	6,600	$500,000
Traditional Soil Erosion Control	10,800	$300,000
Stream Buffers	4,600	$21,000,000 to $29,000,000 (using CREP)
Runoff Control in Incorporated Areas and Rural Roads	5,700	Unknown
Wetland Restoration	200	$300,000
Replacing Failing Septic Systems	400	Unknown
Storm Water Control on Rural, Riparian, Residential Properties	200	Unknown
Total (40% Goal)	**178,800**	

TABLE 3.3: Potential load reductions from each type of BMP including cost estimates to reach the 40% interim goal of this strategy based on historic economic practices.

SOIL HEALTH

Soil health management systems are one of the easiest and most effective ways farmers can increase productivity and profitability and at the same time, improve water quality. Soil contains its own ecosystem of billions of microbes and other organisms that all play a role in how well that soil grows plants, how well it filters water, and how well it stays in place and doesn't wash away in runoff during storms or spring melting events.

Three of the BMPs listed in Table 3.3 – conservation tillage, cover crops, and nutrient management – are critical components of creating and keeping healthy soil in place for growing plants. These three practices also represent a large portion of the desired phosphorus load reduction for the Red Cedar River system.

Considering the benefit to both water quality and farm economics, the idea of promoting soil health will be a critical component of our approach to controlling runoff and phosphorus loading. The NRCS and County Land and Water Conservation Departments are working together to make soil health a priority in their programs including the Farmer-Led Councils. This will be beneficial in meeting the goals of the Partnership and the NRCS nationwide challenge of helping farmers understand the economic and environmental benefits of healthy soil.

Influence of Local Government Rules and Regulations on Implementation

There may be situations where rules and regulations put in place by local governments are/will be more restrictive than state or federal rules, especially in the areas of agricultural runoff, and storm water. Local governments have options and guidelines to consider when putting such rules in place. Below are some relevant sections of NR 151 and NR 281 and WDNR guidance that spell out the procedures for local governments to enact more stringent standards for agriculture and storm water:

AGRICULTURE

NR 151.096
https://docs.legis.wisconsin.gov/code/admin_code/nr/100/151/II/096

NR 92.11 – soil and water
https://docs.legis.wisconsin.gov/statutes/statutes/92/11

NR 92.15 – livestock operations
http://docs.legis.wisconsin.gov/statutes/statutes/92/15

NR 92.17 – shorelands
http://docs.legis.wisconsin.gov/statutes/statutes/92/17

STORM WATER

NR 281.33(6)(a)
https://docs.legis.wisconsin.gov/statutes/statutes/281/III/33

DNR Guidance on Stormwater standards
http://dnr.wi.gov/topic/stormwater/documents/2013Act20Guidance.pdf

The Partnership will continue to work with local units of government to explore means by which local rules and regulations may be helpful in meeting the goals of the strategy. Some examples of regulations already or soon to be in place that will be more restrictive than required by the state and will be helpful in reducing phosphorus loads to the Red Cedar River system, include the City of Menomonie's adoption of Minimum Impact Design Standards (MIDS) and Low-Impact Development (LID), and also Dunn County's Zoning Ordinance.

The MIDS/LID standards currently being proposed in Menomonie, if enacted, will mean that Total Suspended Solids (TSS) and Phosphorus (P) removal for redevelopment and new development will be more restrictive when compared to existing DNR storm water model ordinances. It's unclear at this point just how much more restrictive since the City is in the early stages of evaluation. But it's believed that redevelopment TSS removal will move from a 40% requirement to close to 70% and new development will move from 80% TSS removal to closer to 90%. More TSS removal also means more P removal.

In June of 2012, the Dunn County Board of Supervisors adopted shoreland zoning standards that will become effective on July 1, 2015 under Chapter 59 of Wisconsin Statutes and NR 115, Wisconsin's Administrative Code for shoreland protection. These standards affect land use adjacent to navigable water and are more restrictive than State standards found in NR 151, Wisconsin's Administrative Code for runoff from farms. These standards were adopted because "Uncontrolled use of shorelands and pollution of the navigable waters of Dunn County will adversely affect the public health, safety, convenience, and general welfare, and impair the tax base." (2015 Dunn County Shoreland Zoning Ordinance).

Wisconsin NR 151 calls for a 5 to 20 foot tillage setback from surface water. Dunn County's shoreland zoning standard requires: "35 feet of land free of row crops and seeded to grass, alfalfa or other close-growing crop be maintained between the farmed area and the edge of the ordinary high water mark. This buffer may be reduced to 20 feet upon evidence provided by the landowner that the

Ron Verdon

Canoeing the Red Cedar River

buffer or adjacent cropland field has a phosphorus index of 2 or less. Cropland converted to buffer may be harvested." (2015 Dunn County Shoreland Zoning Ordinance).

Wisconsin NR 151 requires limiting or managing the grazing of livestock along lakes, streams, and wetlands so that adequate vegetative cover is maintained and erosion is prevented. The Dunn County shoreland zoning standard prohibits the pasturing of livestock within 35 feet of a navigable stream unless done in accordance with an approved NRCS 528 Managed Grazing Plan.

At the time this strategy was written there were discussions taking place and proposals being introduced by state lawmakers that would hinder counties' abilities to enact zoning laws more restrictive than state standards, such as the Dunn County ordinance listed above. It may be that state law may make the above more restrictive guidelines illegal. When the strategy is revisited and state rules are refined, the strategy may be changed to reflect any modifications to current law.

	land use (acres)					baseline load (lbs/yr)						goal load (lbs/yr)		
HUC	Cropland	forest	grassland	urban	Total	Cropland	forest	grassland	urban	barnyards	total	Cropland	urban	total
101	57	16120	951	453	17,580	53	920	145	310	0	1427	26	256	1347
102	194	26272	1616	1,459	29,541	180	1499	246	999	0	2923	90	824	2658
103	131	7703	1293	391	9,517	121	439	197	267	0	1025	61	221	917
104	263	17998	628	719	19,608	244	1027	95	492	0	1858	122	406	1650
105	150	14001	1985	1,121	17,257	139	799	302	767	18	2025	70	633	1803
201	1170	25318	8128	2,027	36,644	1519	2407	1237	1195	50	6408	760	1049	5452
202	5797	7184	11390	1,528	25,899	7524	683	1733	901	157	10997	3762	790	6968
203	4549	8656	14480	1,406	29,090	5904	823	2203	829	360	10119	2952	727	6705
204	1999	1747	2717	939	7,403	2595	166	413	554	0	3728	1297	486	2363
205	5370	1809	2612	667	10,458	6969	172	397	393	5	7937	3485	345	4399
206	3470	2128	2883	977	9,458	4504	202	439	576	0	5721	2252	505	3398
301	80	18662	1147	740	20,629	97	2129	185	499	0	2911	48	414	2777
302	1166	27274	3389	1,717	33,546	1412	3112	548	1159	0	6232	706	962	5328
303	2250	7379	3681	678	13,989	2726	842	595	458	43	4664	1363	380	3180
304	1568	3634	3575	456	9,232	1899	415	578	308	0	3200	950	255	2198
305	3086	5697	4101	766	13,649	3739	650	663	517	0	5568	1869	429	3611
306	1489	24640	3813	1,491	31,432	1803	2811	616	1006	0	6237	902	835	5164
307	3624	11073	8635	1,836	25,168	4391	1263	1396	1239	86	8375	2195	1028	5883
308	6413	11240	3861	1,071	22,585	7768	1282	624	723	63	10461	3884	600	6391
309	1936	2623	2429	414	7,402	2345	299	393	279	0	3316	1172	232	2096
310	7243	4406	8858	2,456	22,962	9400	419	1348	1448	310	12924	4700	1270	7737
401	4930	23448	2192	1,170	31,740	4500	3121	375	768	70	8834	2250	644	6391
402	4915	18341	1541	970	25,767	4487	2441	264	636	36	7864	2243	534	5482
403	8547	7814	1831	1,169	19,361	7802	1040	313	767	0	9922	3901	643	5898
404	5708	13494	1119	872	21,193	5211	1796	191	572	79	7849	2605	480	5073
405	12921	17484	4274	3,937	38,616	11794	2327	731	2583	0	17436	5897	2168	11123
501	4531	9326	10127	1,419	25,403	4705	798	1733	998	387	8622	2352	815	5699
502	7701	7844	3219	1,125	19,889	7996	671	551	792	301	10311	3998	646	5866
503	3694	3239	3696	650	11,278	3836	277	633	457	37	5240	1918	373	3201
504	7686	4555	8578	1,527	22,347	7981	390	1468	1075	190	11104	3990	877	6726
505	6520	4111	2103	1,033	13,767	6770	352	360	727	36	8244	3385	593	4690
506	11055	8628	2189	1,081	22,953	11478	738	375	761	262	13614	5739	621	7473
601	2438	1891	7929	960	13,218	3115	252	1131	639	168	5305	1558	533	3473
602	2501	8931	9107	2,238	22,777	3196	1189	1299	1490	84	7257	1598	1243	5329
603	3686	8186	12219	1,599	25,689	4710	1090	1743	1064	71	8677	2355	888	6075
604	2992	5904	5056	690	14,642	3824	786	721	459	36	5826	1912	383	3802
605	6923	8932	8837	1,628	26,320	8847	1189	1260	1083	157	12537	4424	904	7777
606	8307	9555	3940	1,032	22,834	10615	1272	562	687	383	13519	5308	573	7715
607	4350	5892	1775	556	12,573	5559	784	253	370	344	7310	2780	309	4126
608	4589	6146	517	517	11,769	5864	818	74	344	215	7315	2932	287	4111
609	4768	15428	1233	1,057	22,486	6094	2054	176	704	43	9070	3047	587	5863
610	5050	6773	1124	872	13,818	6453	902	160	581	36	8131	3226	484	4773
701	11655	7622	4880	1,514	25,672	11836	1160	835	1008	101	14940	5918	841	8754
702	5940	5104	1424	672	13,140	6032	776	244	447	142	7642	3016	373	4410
703	14730	11164	5023	1,773	32,689	14958	1698	860	1180	144	18840	7479	984	11021
704	17278	12763	7145	2,425	39,612	22425	1214	1087	1430	1	26157	11213	1255	14768
705	3690	6022	923	500	11,135	3747	916	158	333	63	5217	1874	278	3225
706	10716	6276	2452	742	20,186	10882	955	420	494	834	13584	5441	412	7227
707	6443	4871	1845	670	13,829	6543	741	316	446	130	8175	3271	372	4700
708	8026	6619	2693	1,036	18,375	8151	1007	461	690	292	10600	4075	575	6119
709	5768	7566	1410	727	15,471	5857	1151	241	484	122	7856	2929	404	4725
710	7935	9024	2247	1,322	20,528	8058	1373	385	880	388	11084	4029	734	6521
1003	15136	13159	3333	4,353	35,981	15370	2002	570	2897	43	20882	7685	2417	12674
Totals	283136	531675	218152	65,147	1,098,110	314028	59641	34301	42764	6287	457022	157014	35877	286834
Interim load goal for barnyards														2108
Interim goal for total landuse plus barnyards														288942
Adjustments made to two HUC 12s to recognize Rice Lake's MS4 allocation:														
309=	3,881	-3467	414											
308=	1,404	-333	1,071											
MS4=		-3800												
Interim load goals based on 50% reduction from cropland and moving urban areas 1/2 way from current condition to 0.445 lbs/ac/yr														

TABLE 3.4: List of total estimated phosphorus loads per HUC 12 watershed in the Red Cedar River Basin

HUC column shows last 3 digits of the HUC 12 code (for example, 070500070101 is abbreviated to 101).

	baseline unit area load (lbs/ac/yr)				interm goal unit area load (lbs/ac/yr)			
HUC	Cropland	forest	grassland	urban	Cropland	forest	grassland	urban
101	0.927	0.057	0.152	0.685	0.464	0.057	0.152	0.565
102	0.927	0.057	0.152	0.685	0.464	0.057	0.152	0.565
103	0.927	0.057	0.152	0.685	0.464	0.057	0.152	0.565
104	0.927	0.057	0.152	0.685	0.464	0.057	0.152	0.565
105	0.927	0.057	0.152	0.685	0.464	0.057	0.152	0.565
201	1.298	0.095	0.152	0.590	0.649	0.095	0.152	0.517
202	1.298	0.095	0.152	0.590	0.649	0.095	0.152	0.517
203	1.298	0.095	0.152	0.590	0.649	0.095	0.152	0.517
204	1.298	0.095	0.152	0.590	0.649	0.095	0.152	0.517
205	1.298	0.095	0.152	0.590	0.649	0.095	0.152	0.517
206	1.298	0.095	0.152	0.590	0.649	0.095	0.152	0.517
301	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
302	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
303	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
304	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
305	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
306	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
307	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
308	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
309	1.211	0.114	0.162	0.675	0.606	0.114	0.162	0.560
310	1.298	0.095	0.152	0.590	0.649	0.095	0.152	0.517
401	0.913	0.133	0.171	0.656	0.456	0.133	0.171	0.551
402	0.913	0.133	0.171	0.656	0.456	0.133	0.171	0.551
403	0.913	0.133	0.171	0.656	0.456	0.133	0.171	0.551
404	0.913	0.133	0.171	0.656	0.456	0.133	0.171	0.551
405	0.913	0.133	0.171	0.656	0.456	0.133	0.171	0.551
501	1.038	0.086	0.171	0.704	0.519	0.086	0.171	0.574
502	1.038	0.086	0.171	0.704	0.519	0.086	0.171	0.574
503	1.038	0.086	0.171	0.704	0.519	0.086	0.171	0.574
504	1.038	0.086	0.171	0.704	0.519	0.086	0.171	0.574
505	1.038	0.086	0.171	0.704	0.519	0.086	0.171	0.574
506	1.038	0.086	0.171	0.704	0.519	0.086	0.171	0.574
601	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
602	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
603	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
604	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
605	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
606	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
607	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
608	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
609	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
610	1.278	0.133	0.143	0.666	0.639	0.133	0.143	0.555
701	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
702	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
703	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
704	1.298	0.095	0.152	0.590	0.649	0.095	0.152	0.517
705	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
706	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
707	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
708	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
709	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
710	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555
1003	1.015	0.152	0.171	0.666	0.508	0.152	0.171	0.555

TABLE 3.5: List of unit area phosphorus loads per HUC 12 watershed in the Red Cedar River Basin based on aggregate watersheds created for 1990s SWRBB model

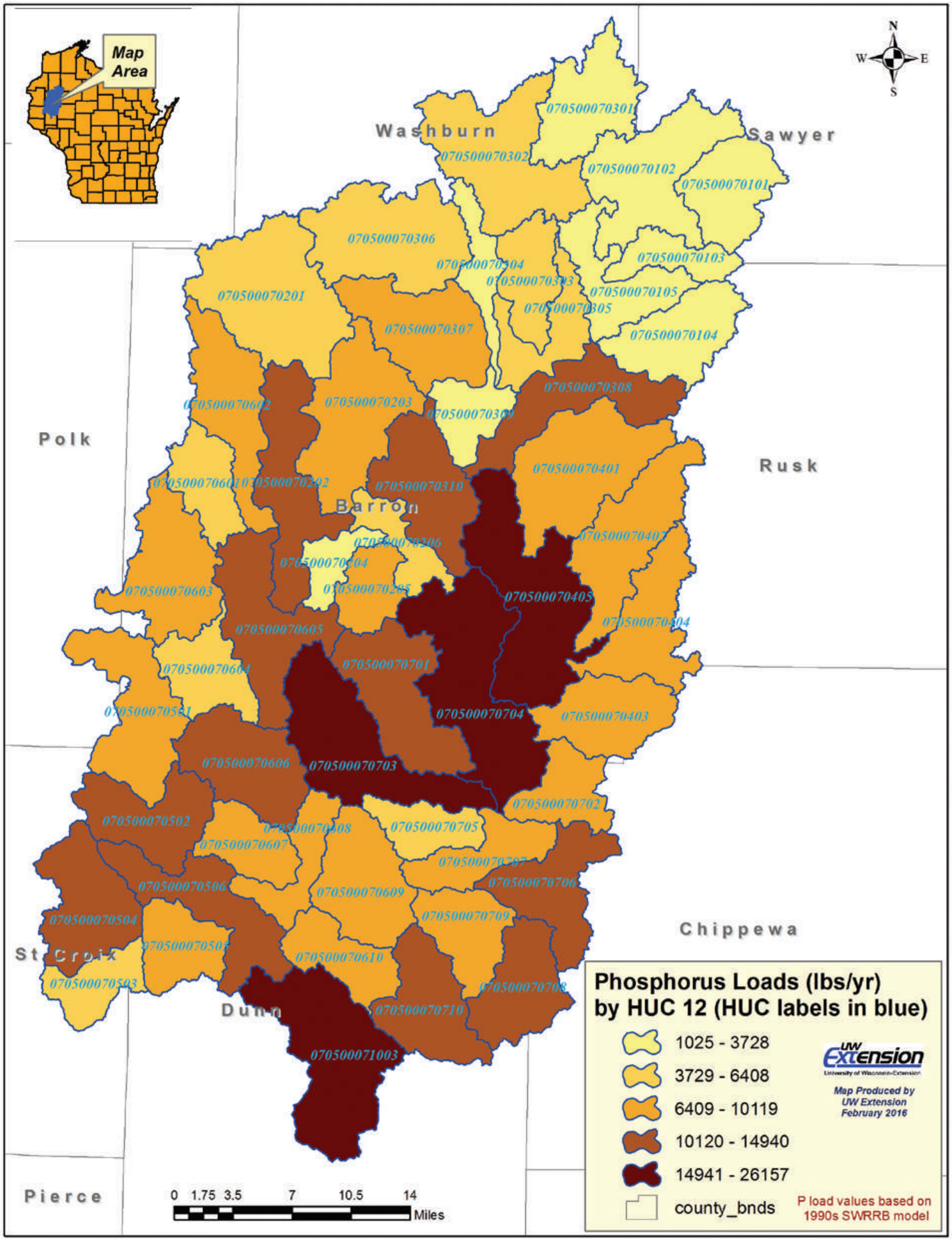

FIGURE 3.2: Red Cedar River Watershed showing HUC 12 sub-watersheds and their respective total phosphorus load estimations based on the 1990s SWRBB model

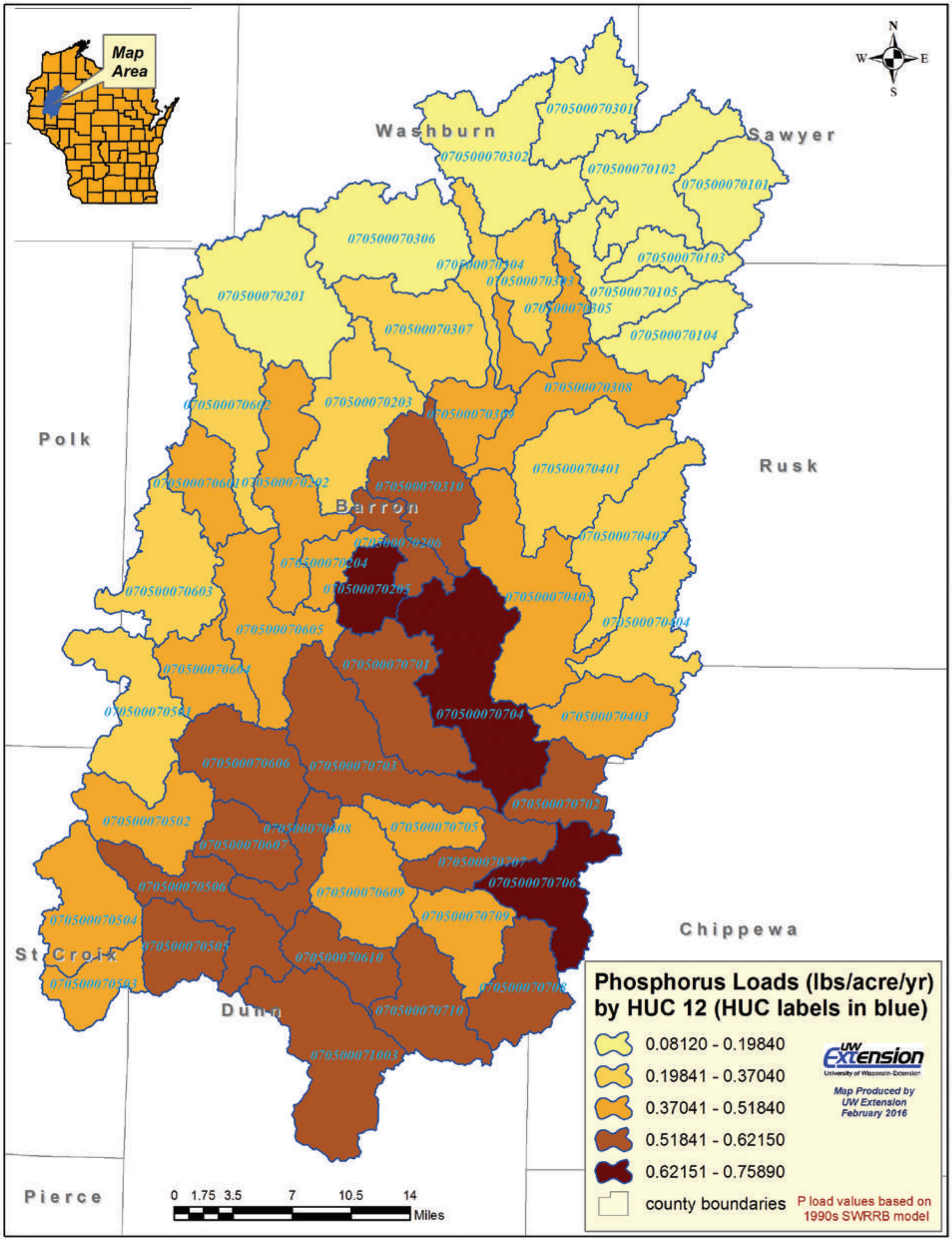

FIGURE 3.3: Red Cedar River Watershed showing HUC 12 sub-watersheds and their respective phosphorus load estimations in lbs/acre/year based on the 1990s SWRBB model

CHAPTER 4

Education, Outreach, Civic Engagement/Governance, and Implementation Strategies ~

In this chapter we will discuss some of the approaches and techniques used to increase awareness, engagement, and participation among all stakeholders in moving this strategy forward. If true water quality improvements are to be achieved, residents of the greater Red Cedar River watershed community must do more than the statewide minimum in changing and managing land use and inputs of phosphorus pollution.

There are many stakeholders whose investment in this effort will help it be successful. This includes policy makers and government agencies, citizens and advocacy groups, land users with property along waterways in the watershed, and land users affecting the largest acreage contributing to runoff of phosphorus pollution (specifically agricultural producers). Finally, we must invest in identifying and addressing the largest sources of phosphorus pollution first and foremost. This chapter outlines the plan for accomplishing these goals through civic engagement and civic governance.

Participatory Education and Outreach

Watershed management involves complex challenges that require a new approach and greater citizen engagement for the future if we are to achieve the most effective water resource management in Wisconsin. While we have learned a great deal about the best use of science and technology to characterize the causes and sources of pollution, we have been limited in using this information to get work done on the ground.

In the past, the focus was on providing technical information and financial incentives to land users and stakeholders, particularly farmers, on how best to manage their land for water quality. This top-down, or "expert" model has limitations in two ways:

1. There is often a lack of buy-in from land managers in how they can best manage their land to reduce nonpoint source pollution runoff, and
2. Landowners were not often directly involved in the development of the nonpoint source pollution reduction strategies, often resulting in lower than needed participation rates.

To address these limitations, we must take a different approach, one which focuses on inspiring the civic imagination and developing the leadership skills of citizens within watersheds by directly including watershed residents in the development of nonpoint source pollution runoff control strategies.

Civic organizing, guided by civic governance principles, is a new approach for water quality improvement and encouraging greater citizen engagement. Working locally with residents of the watershed, we can build greater capacity to manage our waters. Active civic engagement develops trust, expands awareness, builds partnerships, establishes strategic relationships, and ultimately raises the level of involvement by citizens in the watershed. It also builds networks and provides the infrastructure to maintain sustainable solutions to water quality problems. While we characterize this as a "new" approach, it can also be thought of as a very old approach – one that has been used by many cultures and communities throughout human history, whereby a community comes together to work with each other to solve a problem that is shared by the community, with solutions that are also employed and shared by the community.

Progress towards these efforts is already underway in the Red Cedar River Watershed. The Partnership authoring this strategy was brought together with civic engagement principles in mind, and meetings are conducted in light of that process. The Partnership represents many different organizations including state and county government, non-governmental organizations (NGOs), private lake groups, the corporate sector, and farm interests. Additionally, we engage citizens through an annual Red Cedar River Watershed conference that began in 2012, bringing together different stakeholders, including farmers, to develop their own expertise and coordinate efforts across organizations.

Julia Olmstead

The 2015 Red Cedar River Conference drew 300 people from many different backgrounds, including over 60 farmers. The Partnership works with local county government departments to create new initiatives and positions focused on water quality. We also work with UW–Extension, WDNR, Tainter Menomin Lake Improvement Association, and the McKnight Foundation on initiatives ranging from remediating erosion sites along rivers, to developing Farmer-Led Councils in northwest Wisconsin, including one in the Red Cedar watershed in Dunn County. The Farmer-Led Council is particularly encouraging, in that a sub-watershed of the Hay River and its farmers are developing their own ways to expand the use of the best management practices (BMPs) that make the most sense among their fellow land managers. These BMPs benefit water quality as well as benefit the producers' bottom line.

Additionally, several members of the Red Cedar River Water Quality Partnership are currently involved in ongoing training focused on civic governance. The training class also includes others from outside the Red Cedar River Basin from both western Wisconsin and eastern Minnesota. This training stresses the civic principles, civic standards, organizing disciplines, and political skills needed to create and conduct civic governing organizations focused specifically on water quality issues in our region.

"The Farmer-Led Council is particularly encouraging, in that a sub-watershed of the Hay River and its farmers are developing their own ways to expand the use of the best management practices (BMPs)…"

Civic Engagement and Civic Governance

There are two main ways in which we envision education and outreach as participatory: civic engagement and civic governance.

Civic engagement creates an empowered, engaged, and accountable electorate. This entails regular discourse, coordination, and compromise across NGOs, private firms, and other watershed residents and stakeholders, solving problems in an iterative and sustainable manner.

http://www.extension.umn.edu/community/civic-engagment

Civic governance means creating the infrastructure to govern for the common good; in this case focused on water quality concerns. Furthermore, civic governance means incorporating feedback from stakeholders in measurable ways that are reported in open forums. This allows for further adjustments in sustainable policies to improve livelihoods and resources for current and future generations. Without a grounded focus on civic governance any efforts at civic engagement are futile, so both must be in place, expanded upon, and assessed for true participatory education and outreach to occur.

The formation of groups organized to focus on water quality issues is an important element of this strategy. Such "civic organizing groups" seldom come together without initial assistance at the beginning, but often can become self-sustaining and operate with much less outside help once established for a period of time. Civic organizing groups can be farmer-led councils, coalitions of professionals, a local neighborhood group working to build rain gardens to control storm water, or can take any number of forms.

By organizing citizens to be more engaged and take ownership of the process of decision-making and governing for the common good of improved water quality, it is expected that citizen participation in land management changes will occur at higher rates. It is also anticipated that the amount of money needed for cost-share government programs (that pay farmers and others to enlist best management practices on the land that lead to better water quality) will decline. The Partnership expects this because peer-to-peer learning will require less government assistance.

Building community capacity focused on better land management will create a prevailing attitude within these communities that moves them toward governing for the common good (see Figure 4.1). Building community among the partners and the civic organizing groups leads to greater organizational and relational capacity within the community, and leads to more sustainable watershed solutions.

There are three metrics we will use to measure civic engagement and civic governance, in ways borrowed from the Knight Foundation:

1. Civic engagement among many stakeholders,
2. Civic governance efforts as reflected by self-reporting of policy makers and practitioners,
3. Studying citizens' perspectives on the effectiveness of civic governance.

http://www.knightfoundation.org/digitalcitizenship/measuring/

These metrics are loosely outlined in Appendix A, to be evaluated every other year over a ten-year period, both quantitatively and qualitatively, starting with year two. With iterative, semi-annual administration of these efforts, we will be able to see any ways in which this participatory model is perceived as effective by policy makers, practitioners, and other residents of the watershed.

The remaining challenge is to connect civic engagement and civic governance to phosphorus reduction in the Red Cedar River and its lakes and tributaries. Many of the BMPs needed to reduce phosphorus loading to water bodies have small to significant lag times when looking for actual water quality improvements. Therefore tying civic engagement and civic governance to water quality improvements will be done through surrogates such as the number of citizens participating in activities. Some of these activities will include organizing (such as how many civic organizing groups are established, and the number of participants in each), BMPs installed via these organized groups, innovation sprouting from such organizing, etc. Measuring civic engagement and civic governance on a regular basis will require further resources beyond those designated in other parts of this strategy, including survey testing, implementation, collection, and quantitative analysis and reporting, as well as interviews, focus groups, ethnographic field methods, and qualitative analysis and reporting.

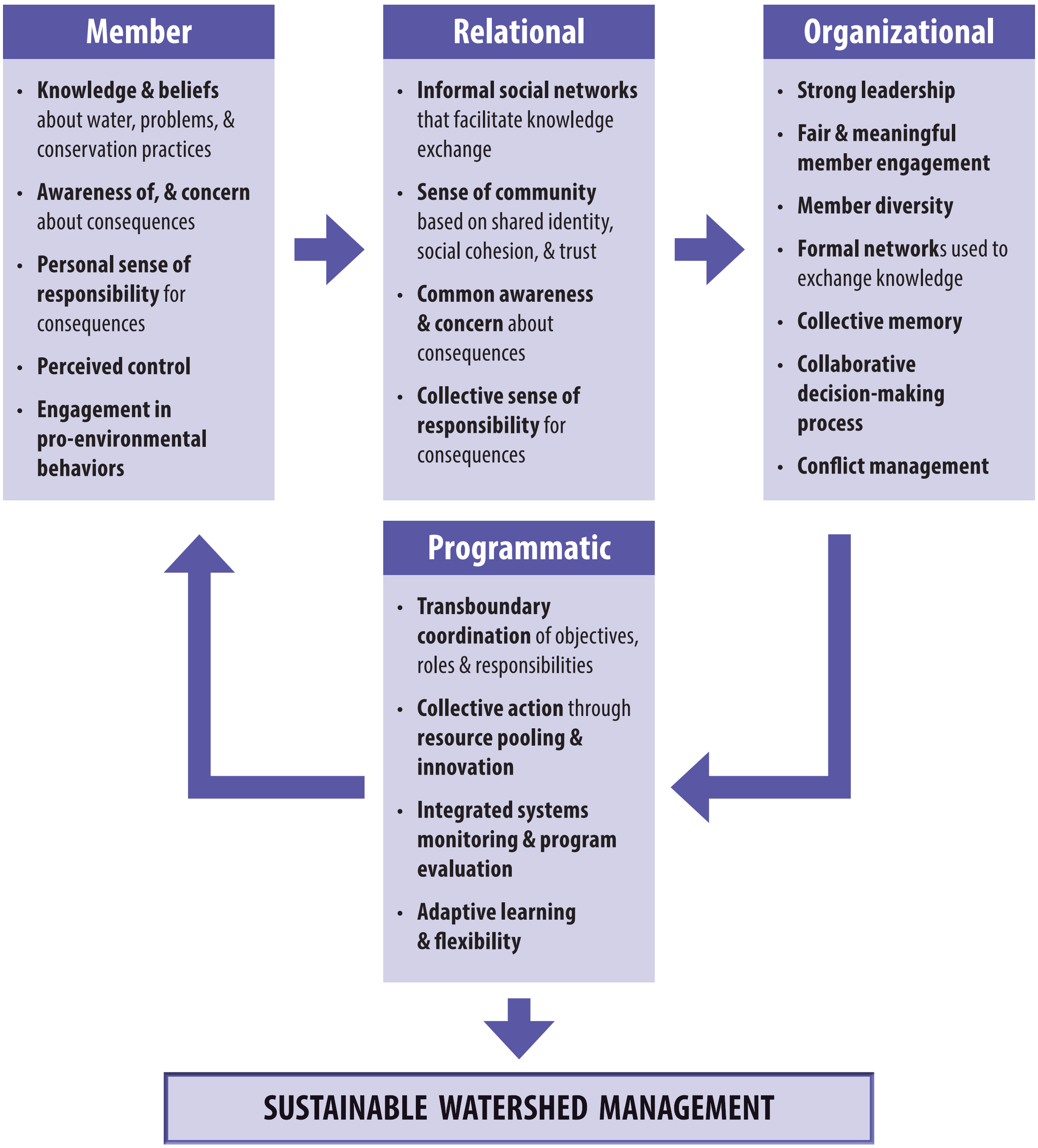

FIGURE 4.1: Multilevel Community Capacity Model (Davenport and Seekamp, 2013)

Process and Necessary Resources for Implementation

Process for implementation will follow and expand upon recent and current efforts in the Red Cedar River watershed over the ten-year period of this strategy. The primary space for expanding upon our participatory approach to education and outreach is through the Farmer-Led Council initiative, already in place in one sub-watershed. This effort follows the successful example set in Iowa with the Iowa State University Extension and Outreach Farmer-Led Initiatives.

This initiative currently requires one person who coordinates Farmer-Led Councils in Dunn County and three other counties in western Wisconsin outside of the Red Cedar River watershed. The coordinator's responsibilities include working one-on-one with individual farmers, as well as with land conservation staff in each county, on a regular basis. More importantly, this position also coordinates regular meetings among farmers in each sub-watershed, as well as regular meetings within each county and monthly meetings across four counties (Dunn, as well as watersheds outside the Red Cedar River watershed in Polk, St. Croix, and Pierce Counties). The coordinator also ensures continuous reporting and grant writing to sustain the initiatives already in place. In Dunn County, there is also a half-time conservationist dedicated to the sub-watershed efforts, meeting with all farmers engaged in the Farmer-Led Council, farmers interested in using incentives designated by the council (e.g. soil testing, grass waterway construction, etc.), and providing farmers the services designated by the council.

UW–Extension hosts a website that spotlights the farmer-led councils in northwest Wisconsin. This site includes a start-up guide for those wishing to explore the idea of a farmer-led council in more detail, based on what has been learned thus far in the farmer-led councils in northwest Wisconsin. The website can be found here:

http://blogs.ces.uwex.edu/wflcp

Given the fifty-three HUC 12 watersheds in the Red Cedar River Basin, we hope to acquire funds to serve civic engagement in at least a quarter of the land used, targeted to areas responsible for larger contributions of phosphorus run-off. This would require people with a skill base that includes agriculture conservation and education, water quality, communications, and civic organizing and facilitation. These positions would be dedicated to engaging with farmers and facilitating governance processes to determine the best ways of incentivizing land use changes. These individuals would follow the patterns established already in the Red Cedar River watershed, working with other county and state citizens, policy makers, and conservation practitioners. They would also serve as capacity builders and coordinators with other overlapping initiatives in environmental sustainability and community building within the watershed. To most efficiently manage areas, we will focus on HUC 12 sub-watersheds within the entire Red Cedar River Basin as a way of dividing workloads and measuring success. However, coordination will be maintained throughout the Basin at all times across initiatives. Pilots of this approach currently operating locally suggest that ¾ of a staff person is needed to provide appropriate technical and administrative support for each civic organizing group. In the early stages of implementation, this likely translates into 3-4 full-time people supporting 3-4 organizing groups. As implementation reaches full scale, this would increase to as many as 10 people supporting 13-14 of these groups.

"These positions would be dedicated to engaging with farmers and facilitating governance processes to determine the best ways of incentivizing land use changes."

There are several ways other land users may be engaged in changing other management strategies that can affect water quality:

1. **Dunn County Shoreland Protection Ordinance, Adopted June 2012:**

   On July 1, 2015, language in this ordinance will require changes in land use among waterfront properties. Vegetated buffers are required on all waterfront properties including residential lots and agricultural fields adjacent to all navigable waters. Grazing adjacent to navigable waters is allowed only if done according to an NRCS-approved managed grazing plan. This will be a large effort for county staff to manage, but by establishing the equivalent of a citizen-led council it may diffuse responsibility and engage citizens in adapting their land use as required under the new buffer ordinance. (At the time of writing, there was uncertainty if new state laws would be enacted that may render this ordinance illegal; thus modification of this portion of the strategy may be needed at a later date.)

2. **Storm Water Management:**

   The City of Rice Lake was recently brought into the Wisconsin storm water permit program and will soon be reducing the amount of phosphorus entering the Red Cedar River Basin. The City of Menomonie is voluntarily updating their storm water plan which will include minimum impact design standards (MIDS) that will incorporate greater infiltration of storm water and reduce the amount of runoff to Lake Menomin and the Red Cedar River. Continued engagement in storm water management education and outreach are important for all urban areas in the TMDL. Establishment of rain gardens and other storm water control practices, some of which can be installed in public settings as educational tools, will be promoted and implemented by individuals already working within UW-Stout, UW–Extension, UW-Barron County, the Rice Lake District, and the Dunn County Land and Water Conservation Division.

3. **Stream Bank Erosion:**

   There are currently 58 stream bank erosion sites identified on the Red Cedar River in Dunn County alone, along with a management plan mapped out by Interfluve, a GIS-oriented hydrology and geology firm from Dane County, with assistance from the Army Corp of Engineers. Such sites contribute sediment to the rivers, streams and lakes of the watershed. Though the amount of phosphorus coming from these sites is small, and stream bank stabilization is not a cost-effective way of addressing phosphorus issues in this situation, some of these sites are quite large and, if addressed, will provide some sediment and phosphorus pollution reductions.

4. **Runoff from Roads and Other Impervious Surfaces:**

   Reconstruction of roads should include plans for infiltration management of runoff from such impervious surfaces outside of the areas that have a storm water permit. These plans would require creating infrastructure and human capital that could be linked to the above efforts, but may necessitate several further temporary specialized positions.

5. **Traditional Soil Conservation Projects:**

   As described in Chapter 3, conservation planning and the installation of BMPs, such as barnyard runoff systems, grassed waterways, diversions, and stream bank protection, all help to reduce surface runoff and pollutant loading to water bodies. The Counties receive funds to cost share projects from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) annually. They can also apply for funds from the DNR Targeted Runoff Management (TRM) grants program for larger projects.

6. **Farmland Preservation Program:**

   Landowners who participate in the state's Farmland Preservation Program must meet state runoff performance standards. Counties can conduct status reviews and assist participants in meeting these standards.

7. **General Land Management for Water Quality:**

   Land practices discussed in Chapter 3, such as no-till farming and the use of cover crops are promoted through county conservation programs.

8. **Lake Associations and Lake Districts:**

   Projects funded by lake associations and districts, whether through internal funding or external grants, can help decrease phosphorus loads entering water bodies. Members of these organizations can also install practices on their own lands and maintain their septic systems to provide additional phosphorus control.

9. **Red Cedar Demonstration Farm:**

   The Red Cedar Demonstration Farm is located on approximately 150 acres of farmland owned by Dunn County and the City of Menomonie on the east side of Menomonie within the Red Cedar Basin. In the spring of 2015, the County entered into a five-year lease with the Chippewa Valley Technical College (CVTC) for the purpose of changing land management practices to those that would promote soil health and water quality. Extensive soil health testing is being done to document the existing soil conditions following many years of corn and soybean production using conventional tillage and planting methods. Future tests will be taken to demonstrate anticipated increases in soil organic matter, soil microorganisms, and water infiltration rates. The Red Cedar Demonstration Farm provides an opportunity for agency staff to experience the challenges that farmers in the Red Cedar Basin will face as soil health is instituted throughout the Basin.


Katie Wantoch

Touring a Soil Pit at the Red Cedar Demonstration Farm.

County and city workers in many of the above efforts would be the point people in connecting with the stakeholders in the Red Cedar River Basin. This would facilitate coordination among residents, government agencies, farmers, NGOs, and other stakeholders to create civic governance and civic engagement in multiple characterizations, capacities, and scales. The cost of this human capital is approximated in Appendix B.

Recognition of Partners

Outreach and education about the project will include recognition of participants. Landowners and farmers could receive a sign for their yard or entrance to their operation that says, "Red Cedar River Water Quality Partner", or "Member of Farmer-Led Council", or something similar, depending on the level of participation. Other types of recognition could be at public events, such as the annual Red Cedar River Watershed Conference, conservation field days, and other events. Such recognition provides good will between those making changes on the ground and those providing resources and support for such changes. Additionally, it adds to the peer-to-peer learning capabilities of the project, inspiring curiosity and participation among other potential partners, while helping keep the project in the public eye.

Tracking, Monitoring, and Strategy Modification ~

Previous chapters have explained the issue of phosphorus in the Red Cedar River watershed, and laid out details regarding how this strategy will address that issue. In this chapter, we will discuss the various ways that we will track the progress of implementing this strategy. Progress will be in four basic realms;

1. Attitudes, knowledge, and social networks;
2. Participation by stakeholders (farmer-led councils, attending field days, soil testing, farm assessments, etc.);
3. Land management changes on the ground that directly reduce phosphorus loads to rivers and lakes; and
4. Water quality monitoring.

The above measures are also in relative chronological order. We expect to do much of the social science work early in the process, and then move toward increasing participation and activities on the ground. This will in turn lead to anticipated water quality changes several years into the strategy.

Also in this chapter we will discuss how the strategy itself will be revisited and modified if necessary as time proceeds. The deadlines for all assessments and modifications will be at the end of the state fiscal year which is June 30th.

Tracking Attitudes, Knowledge and Social Networks

Survey work will be done to measure people's awareness of issues and solutions that pertain to the phosphorus issues in the Red Cedar River watershed. Questions may pertain to people's level of awareness of the problem, how they see the issue, what they are doing on their land, their willingness to do something different, obstacles to change, etc.

Such survey work every other year will provide a good baseline and subsequent measures of change. Results from such surveys will provide the Partnership with information valuable in determining how further outreach, education, and engagement efforts can be tailored to promote greater awareness and participation.

As surveys are designed to gauge some of these factors, and as initial baseline results begin to be collected, the Partnership will set goals for what types of improvement on what issues/questions we would like to see over the course of subsequent years' surveys. Possible examples of meaningful change might be the ratio of environmental knowledge to actual changes in land management; or a change in willingness to work with a government agency. Changing attitudes and knowledge levels should help lead to increased participation and engagement of stakeholders in efforts to control phosphorus.

Some of the tracking of knowledge and social attitudes will include:

- Values of water quality
- Values of government agencies and workers
- Values of education programs
- Values of soil health
- General environmental conservation values

Tracking Engagement and Participation

Formation of and participation in farmer-led councils is a crucial element of this strategy. There is currently one farmer-led council in the Red Cedar River watershed. Farmer-led councils can be seen as "civic organizing groups", whereby a community of citizens comes together to govern for the common good, and take ownership of shaping, creating and executing policy that has, as a goal, water quality improvements. Civic organizing groups can be created in many different ways, focused on different aspects of land and water management, with farmer-led councils being one variety.

The Partnership's goal, over the ten years of the strategy, is to establish 2-5 new civic organizing groups in the first five years of the strategy, and 5-10 new civic organizing groups by year ten. These would preferably be organized on a sub-watershed scale, but could also be organized around townships, municipalities, school districts, church congregations, or any number of geographic, political or social entities.

Some types of participation may be occurring, but may not be easily documented. For example, some farmers may begin choosing to manage land differently in a way that benefits water quality, but without participating in a civic organizing group or government cost-share program. In such cases, it may be true that no agency or partner is aware that any change took place. Such changes may be tracked using the transect surveys done by counties, whereby county land conservation staff does a windshield survey of a selected route through part of the county and watershed, looking at how land is managed in those areas, and tracking any changes to those areas over time. Counties will do transect surveys once per year.

Other movement toward better land management that does not necessarily involve management changes can include such things as attendance at workshops, soil sampling, having a conservation "walk-through" of one's farm, etc. These will be tracked as well through the partners who currently

Nels Paulson

LAKES REU Staff and Students

conduct workshops and assist farmers and others on their land.

Some tracking of engagement and participation will include:

- Participation in education programs and technical support
- Participation in farmer councils
- One-on-one work with conservation agencies and UW–Extension workers
- Participation in cost-share programs
- Participation in farmer organizations and other environmental organizations
- Overall structure of watershed social networks
- Individual farmer positions within social networks

Tracking Land Management Changes that Affect Phosphorus Loading

Installation of best management practices (BMPs) by and resulting from civic organizing groups will lead to reductions in phosphorus load. It should be noted that not all the BMP activity will come from such groups.

Work by county conservation staff, Natural Resources Conservation Service (NRCS), and others will continue to promote BMPs on individual farms, and work with farmers on problematic barnyards, nutrient management systems, manure storage systems, and other practices. However, we see the civic organizing groups as being the innovative step needed to move more producers toward better soil health and less export of phosphorus from their land. We see the successful actions of these civic organizing groups as being a catalyst to move other producers and landowners in the direction of sustainable watershed management.

Since actual on-the-ground management changes will likely lag behind the education, outreach and engagement efforts mentioned above, we expect to see such changes developing toward the latter part of the ten-year period. Returning to the list of load reductions expected from various types of BMPs (Table 3.2), we would expect to see 20% of these practices and potential load reductions to be in place by year six of the plan, 50% by year eight, and 100% of the interim goal by year ten.

Tracking installation of BMPs will require coordination and cooperation among all partners involved in such work. There are a variety of tools that have been developed for such work in other states and other watersheds. The Partnership will explore various options for efficiently tracking BMPs and will have something in place within the first two years of strategy implementation with annual tracking of BMPs to continue throughout the remaining ten-year period. Counties will likely each be doing their own tracking of BMPs, which will present a need for resources necessary for such work.

Transect surveys are done periodically in the counties to estimate the number of practices on the ground county-wide. As identification of areas targeted for concentrated resources/engagement moves forward,

> "We see the successful actions of these civic organizing groups as being a catalyst to move other producers and landowners in the direction of sustainable watershed management."

more detailed surveys of these areas will be done to better understand what is already present on the ground.

Other tracking of implementation will include:

- County average soil phosphorus levels over time
- Trends in agriculture commodities relevant to conservation
- Trends in land use change
- Edge-of-field monitoring in watersheds receiving management focus
- Tracking by DNR of soil phosphorus level trends in fields receiving manure from confined animal feeding operations (CAFOs)
- Tracking of soil phosphorus levels or Phosphorus Index numbers (PI) by local, state and federal programs/agencies that require nutrient management plans

BMP Depreciation

It's possible that best management practices do not always function properly. This can happen for many reasons. The BMP may be poorly planned or installed; conditions on the ground may have changed that alter the functionality of the BMP; land management and/or ownership may have changed since the BMP was installed; or a number of other issues. Because of this, it's important to maintain and inspect BMPs to insure proper functionality.

Members of the Partnership will oversee the installation of practices whenever possible, making sure that technical specifications and guidelines are properly followed. Additionally, periodic inspection by those partners initially involved in the installation will be encouraged. If goals for land management changes are met to the degree the Partnership desires, time and resources may prevent the inspection of all BMPs. However, efforts will be made by all to make sure that changes taking place on the land remain in place, and continue their function. Municipalities will inspect their runoff management installations such as detention ponds and swales, and county land conservation offices and federal agencies will work to make sure BMPs installed on farms and rural areas are installed to technical specifications, and that they are in place in the years beyond installation.

For further information about BMP depreciation, and some of the techniques that will be used to monitor BMPs after installation, see the US EPA technical memo, "Adjusting for Depreciation of Land Treatment When Planning Watershed Projects". It can be found at the following link:

http://www.epa.gov/sites/production/files/2015-10/documents/tech_memo_1_oct15.pdf

Water Quality Monitoring

The ultimate goal of this strategy is to improve water quality in the Red Cedar River watershed. Monitoring of water quality is crucial to determining if change is occurring. The phosphorus load reduction goals for the ten-year duration of this plan have been spelled out in chapter 3.

It is expected that load reduction activities on the land will lead to changes in water quality. However, it must be emphasized that changes in land use and management often do not lead to immediate changes in water quality. There is a lag time between land management changes and subsequent water quality changes, depending on what types of BMPs are being employed. Therefore, it is expected that any significant water quality changes will occur in the later years of strategy implementation. Below is a listing of how the Partnership will monitor water quality in the Red Cedar River Watershed.

- DNR will continue monitoring phosphorus loads monthly throughout the ten years of the strategy at the US Geological Survey (USGS) gauge on the Red Cedar River in Menomonie.

- In 2015-2016 DNR and UW-Stout will team up to monitor P loads biweekly at two USGS gauges entering Tainter Lake, and funding will be acquired to continue this over the ten-year period of the strategy
- In 2015 and beyond (throughout the ten-year strategy) the WDNR, Tainter-Menomin Lake Improvement Association, and UW-Stout's Center for Limnological Research and Rehabilitation will collaborate to conduct comprehensive research on Lakes Tainter and Menomin. At least three stations in Tainter, and two stations in Menomin will be monitored at biweekly intervals between May and September for water clarity, nitrogen and phosphorus species, and algal biomass (as chlorophyll). This information will be combined with constituent loading to examine reservoir water quality and cyanobacteria response to BMP implementation.
- In 2015-2016, UW-Stout Research Education for Undergraduates (REU) students will conduct intensive monitoring of Lakes Tainter and Menomin. These data will be used to revise the lake and watershed modeling which is now over 20 years old. It is anticipated that a lake grant from DNR will help pay for this effort.
- Each Lake District and Association in the basin is expected to provide volunteer monitors for tracking the trends in their lake's trophic state over time and report such data throughout the duration of the strategy (DNR provides lab capacity).
- Other possible monitoring sites set up in individual watersheds where focused work is being done, such as work by the citizen-led Red Cedar Basin Monitoring Group.

Other monitoring may take place in other subwatersheds by school groups or other citizen volunteers. These various monitoring efforts should provide enough data to determine if changes are occurring, and also provide new baseline data for improved water quality modeling in the watershed.

Strategy Modification

It is often true that aspects of any plan do not come to fruition in the ways anticipated by the planners. The Partnership understands that this is a possibility. Resources may not be acquired when necessary, participation may not happen at the levels and pace desired, and results may not measure up to what was expected. Or, things may move more quickly than anticipated, leading to participation and progress on a more rapid scale. Therefore, it will be necessary to revisit the strategy periodically to determine if we are on task and on schedule, and determine what changes may be needed to adapt.

The Partnership will revisit the Strategy at year three, year seven, and year ten. At years three and seven, any revisions will be addressed by the Partnership to correct for those events and occurrences that may have caused deviations from the strategy. As mentioned above, we expect to see 20% of practices and potential load reductions in place by year six of the strategy. If we reach year six and are far short of projections – lower than 15% – it will be necessary to revise the entire strategy, as further milestones will likely not be attainable. At that time, new goals and milestones will need to be established. If plans go mostly as expected and goals are reached, then in year ten the Partnership will begin the process of writing a new plan to proceed toward the final goals for load reduction based on the current TMDL, or perhaps based on new modeling that is developed, as mentioned above.

Other local rules and regulations, such as those discussed in Chapter 3, may come into play during the course of strategy implementation. In those years when the strategy is reevaluated, the Partnership will also examine any relevant new, local rules and regulations that may be applicable to implementation, and also reexamine state regulations to see if there are rules and regulations that could be proposed locally that would have the potential to be more effective than state rules.

Year	1	2	3	4	5	6	7	8	9	10
Surveys of Watershed Residents	X		X		X		X		X	
Tracking of Engagement and Participation by Stakeholders in the Watershed		X		X		X		X		X
Tracking of Best Management Practices Installed		X	X	X	X	X	X	X	X	X
Water Quality Monitoring (USGS gauge in Red Cedar River in Menomonie)	X	X	X	X	X	X	X	X	X	X
Water Quality Monitoring (special UW-Stout project in Lakes Tainter and Menomin)	X	X								
Water Quality Monitoring (Water Action Volunteers and other volunteers at various lakes)	X	X	X	X	X	X	X	X	X	X
Strategy Modification			X				X			X

TABLE 5.1: Timeline for tracking different aspects of strategy implementation and results over time.

Foundational Document for the Red Cedar River Water Quality Partnership

STATEMENT OF IDENTITY AND PURPOSE – ***The Red Cedar River Water Quality Partnership is a Civic Organizing entity that works for the common good of water quality within the Red Cedar River Basin through the practice of Civic Governance; whereby the partners develop the civic imagination, and organize the civic infrastructure needed to produce sustainable water quality, while coordinating the implementation of water quality strategies for the Basin.***

Concept: Civic governance offers an opportunity to address complex, challenging problems through an authentic citizen engagement process that promotes productive results. This approach depends on a non-partisan, citizen-centered, transparent environment that builds trusting relationships. The Partnership recognizes the importance of citizen engagement in addressing water quality issues in the Red Cedar River Basin. Essential to the success of this approach is recognition that each person is a citizen and a policy maker, regardless of what organization they represent or position they hold. Civic governance encourages all stakeholders to suspend judgment, exercise civic imagination, and cultivate their leadership while leveraging resources to find productive solutions to water quality issues in the Basin. This approach ensures long-term sustainable action toward the common good of water quality.

Process: As the members of the Partnership work together as a civic organizing entity, they also work within their own jurisdictions and with their own constituencies to foster civic governing principles outside the Partnership, among others in the Basin. Working one-on-one with key stakeholders, participants begin to learn about other points of view in order to shape the next steps in addressing a particular problem, and in finding shared solutions to the shared problems of water quality.

The Partnership meets periodically, with the frequency of the meetings decided by the Partnership (currently every other month). Meeting locations alternate within the Basin, equally distributing travel time for participants. Agendas are sent out before the meeting. A "check-in" is done at each meeting, where each attendee discusses developments and actions within their jurisdictions related to water quality and the work of the Partnership. At the end of each meeting, an evaluation is done by each attendee, rating the meeting on a scale of 1 to 5, with 5 being the best. The ratings are based on how well the meeting stayed true to the agenda, if the goals of the meeting were met, and level of satisfaction with the meeting and process. A summary of the meeting is written afterward and distributed to all partners.

Decision-making by the Partnership is based on these civic standards*:

- All those impacted by the problem are stakeholders and help define the problem in light of civic principles and the realities of their situation.
- All stakeholders are accountable for contributing resources (leadership/time, knowledge, constituencies & dollars) to solve the problem.
- All stakeholders are engaged in decision-making and policy-making that contributes to the common good.
- All stakeholders implement policies grounded in civic principles in the places where they have the authority to act.

*These standards, and other portions of this document, come from a Civic Governance Policy Document, produced by Civic Organizing, Inc., 2013.

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Appendices

Appendix A

Metrics used to track levels of civic engagement and civic governance

1. Who participated?	• Number of participants • Demographics/diversity • Prior level of engagement
2. Who was affected?	• Participants • Targeted beneficiaries • Other stakeholders
3. Did we do what we said?	• Stated goals • Unintended consequences • Effectiveness
4. What changed? Impact?	• Individual vs. collective value • Short, medium, long-term • Trust and efficacy

Appendix B

The cost of human capital in outreach, education, and engagement efforts

Social Science Research Center evaluation estimates (based on an hourly rate of $68.40):

Survey Design (× 5 for every other year in 10-year strategy): $2,763

Survey Administration (× 5): $9,235 (hourly rate of labor, postage, and gas)

Data Analysis (× 5): $5,472

Reporting (× 5): $5,472

Total: $22,942 × 5 = $114,710

Other human capital and mitigation estimates:

Approximately 10 positions added incrementally over the ten-year period, likely county-based, to work on implementation of BMPs, technical support, engineering, coordination of farmer-led councils, and other outreach, education and engagement activities:

10 × $75,000 to $100,000 per year = $750,000 to $1,000,000 (if full-time in this role)

= $562,500 to $750,000 (if ¾-time)

Appendix C*

Comments from WDNR and US EPA on the Plan

*Note: These comments were received in January 2016, and were addressed in the Plan by the Partnership in February 2016. Page numbers here may not match page numbers above due to editing and formatting after receipt of the comments.

Review Comments for Watershed Plan and EPA 9 Key Elements – section 319 funds

Plan Name: A River Runs Through It: A WQ strategy for the Red Cedar River Basin - basin above Lakes Tainter and Menomin.

Plan Date: 08/30/2015

1. **Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve the load reductions in this plan (and any other goals identified in the watershed based plan).** Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g., X number of dairy cattle feedlots needing upgrading, including rough estimate of number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control).

☑ Plan meets this requirement:

Page 4, figure 1.2 shows 2011 National Land Cover Use Map of the Red Cedar basin; the map's land use categories coincide with 2012 Tainter/Menomin TMDL report and other pollutant sources described in plan (e.g. figure 2.1)

Pages 8-10 identify causes and sources of impairment within the Red Cedar basin using the EPA approved 2012 Tainter/Menomin TMDL report. Point and nonpoint sources are identified and causes of P impairment to the two lakes, both of which are located at the mouth of the Red Cedar basin. Algal blooms resulting from excess phosphorus loading are the cause of impairment for Lakes Tainter and Menomin. The proposal references the Red Cedar River TMDL for Lakes Tainter and Menomin (at the base of the watershed), and reiterates the TMDLs conclusions that most of the pollution is nonpoint source in nature.

Pages 10-11, Table 2.4, provides a breakdown of pollutant sources by land use category and necessary load reductions by source using land use data and assumptions from 1990's. The proposal identifies cropland (424,430 acres – Table 1) as the major source of P, but states that reductions will be needed from all sources to achieve the TMDL. Barnyards are identified as a major P contributor although at a lower extent than predicted in the TMDL as data have been updated.

Chapter 3, Pages 18-19, tables 3.1, 3.4 and 3.5 contain more pollutant source identification using more current land use, livestock facility inventory and pollutant source data P unit area load calculations (by HUC 12) throughout the basin. The practices and load reduction estimates in the plan are based upon this more recent data analysis. Predicted P loading by land use is presented in Table 3.1 along with estimates for barnyard loading.

Pages 26-27 describe an aerial photography study in April 2014 showing "78 dairy barnyards and 54 beef barnyards with an estimated average capacity of 80 head." Furthermore, "50 farms were identified as possibly needing manure storage."

ADDITIONAL COMMENTS:

Is there an estimate/actual count of the number of barnyards in 1990 or number of barnyards with installed controls that justify the decrease from 33,410 lbs/y to 4,287 lbs/yr? Or is the change in value simply attributed to using the BARNY model instead of the prior SWRRB model? If this change is only related to the use of a different model, a brief explanation of why the new model is more accurate would add strength to the changes (e.g., the BARNY model has been parameterized more accurately and therefore returns more accurate results).

☐ Plan does not meet this requirement. The following information is required:

2. **An estimate of load reductions expected for the recommended management measures described in item 3 (below). E**stimates should be provided at the same level as in item 1 above (e.g., total load reduction expected for dairy cattle feedlots or acres of row crops under improved nutrient management or sediment control).

☑ Plan meets this requirement:

Pages 10-11, Table 2.4, describe pollutant load reductions necessary to meet element 8 criteria, by pollutant source.

Pages 18-19, tables 3.1, 3.4 and 3.5 show recalculated baseline loads and load reduction estimates based upon recent analysis of current land use (number of acres of cropland), number of livestock operations and operations with installed controls and cropping/tillage practices for the entire basin and are used for many load reduction estimates in plan. P unit area load calculations for the Red Cedar river basin by HUC-12 are provided and may also be used to refine load reduction estimates for the management measures in plan as plan is implemented over time.

Page 20, Table 3.2 , describes management measures to address identified nonpoint sources (i.e., cropland practices, manure spreading, runoff controls for barnyards and wastewater, failing septic systems, stormwater runoff, stream buffers and other field runoff controls) and corresponding estimated load reductions associated with each practice to meet the plan's interim pollutant load reduction goals (40% P reduction, 186,000lbs) over a ten year time period. An interim reduction goal of 40% is used in plan due to the recognized difficulty in meeting the full TMDL 65% P reduction goal within ten years. Many management measures focus upon cropland, the majority pollutant source described in plan.

Pages 22-34 describe the load reduction estimate calculations for management measures listed in plan. WDNR staff were involved in making the calculations; SNAP+ software was used to estimate pollutant reductions for some cropland practices described in plan (e.g., cover crops, reduced tillage, reduced soil P concentrations and corresponding P delivery).

The four measures selected to reduce P export from cropland in order to reach the goal of a 40% reduction in P loading are no-till; reduction of P levels to 25 ppm; planting of cover crops; and cropland conservation practices. The application of these various methods should take into account diminishing returns/pollutant reductions over time, as in practice a farm will likely be targeted to implement a number of these BMPs and not all implemented practices may be maintained or function with the same pollutant reduction efficiency over time. Accordingly, please describe in this section of the plan the following EPA technical memorandum on BMP depreciation will be reviewed and used to evaluate plan implementation; please also include the EPA memo in plan appendix http://www.epa.gov/sites/production/files/2015-10/documents/tech_memo_1_oct15.pdf

Page 35, Table 3.3, summarizes planned management measures, estimated P reductions and costs for practices, which include staff time and presume landowner participation.

ADDITIONAL COMMENTS:

Page 24, *Notes,* first sentence, states: this analysis is based upon P delivery to waterways while P Index values are P delivered to the field edge. P Index values are conservative estimates of the amount of P delivered from a field edge to nearest perennial stream, via grassed waterways; the P Index is not an estimate of P delivered to field edge.

Does the calculation for P reduction from no-till agriculture take into account reduction in P transport from to the 30% crop residue threshold (observed on 15% of Dunn County farms and 8% in Barron County)?

Furthermore, there is not enough cropland to apply only one of these BMPs (no-till; reduction of P levels to 25 ppm; planting of cover crops; and cropland conservation practices) to an individual farm at their current percentages/acreages described above.

Rotational grazing as a means of P load reductions should be included as another practice to reduce P and sediment loads from barnyards/animal lots.

☐ Plan <u>does not</u> meet this requirement. The following information is required

3. Description of the NPS management measures that will need to be implemented to achieve load reductions in item 2, and identification (using a map or description) of the critical areas in which those measures will be needed to implement the plan.

☑ Plan meets this requirement:

Page 4, figure 1.2 shows 2011 National Land Cover Use Map of the Red Cedar basin; the map's land use categories coincide with the 2012 Tainter/Menomin TMDL report and other sections of plan (table 1, figures 1.1 and 2.1). Figure 1.1 shows all HUC-12 sized watersheds within the basin. A table listing the various land uses and a corresponding map of these land covers are included in the document. This table and map show the acreage of cropland, which is identified as a critical area.

Pages 2, 4 and 9 contain or refer to pie charts showing the changes in estimates for the various land cover classes from 1999 – 2011.

Pages 12-17, describe:

- point source permits (individual and general) requirements that need to be implemented to achieve point source load reductions described in element 2,
- estimates the number of permits issued within the planning basin for some but not all permit types.
- as a group, watershed point sources are already below the final 2012 TMDL Lakes Tainter and Menomin wasteload allocation.
- Other compliance strategies (WQ Trading and Adaptive Management) some point sources may elect to use to meet permit limits.

Page 20, Table 3.2 describes management measures that will be used to achieve nonpoint load reductions set in plan and estimated cost associated with each measure.

Page 35, Table 3.3, summarizes planned management measures, estimated P reductions and costs.

Pages 39-40,Tables 3.4 and 3.5, can be relied upon to identify priority HUC-12 watersheds for implementation of management measures described in plan. Some of the management measures described on pages 22-34 also include prioritizing areas/fields for management measures based upon soil or barnyard conditions (proximity to surface waters, amount of discharge, etc.). Individual HUC 12 land cover, base loads, and goals for P reduction are included in Table 3.5. The amount of P contributed as a percentage by HUC 12 is included in Table 3.4.

ADDITIONAL COMMENTS:

We request the plan be revised to include the following items to reflect element 3 and to assist in tracking progress and evaluating plan implementation (elements 7, 8 and 9).

a. Another map that displays all HUC 12's within the Red Cedar Basin (i.e., figure 1) and the HUC watershed identification values used in figures 3.4 and 3.5 (e.g., HUC 101, 102, 103, etc.). Such map will make it easier to spatially define where the various pollutant sources are distributed within the Red Cedar basin, can be used to prioritize areas for implementation of practices, and also can be used to track plan implementation actions/milestones. Please include this map after figures 3.4 and 3.5. This approach is consistent with Page 45-46 of plan, which describes how the civic engagement actions listed in the plan will focus upon HUC-12 sub-watersheds within the entire Red Cedar river basin as a way of dividing workloads and measuring success.

b. table showing all permitted operations within the Red Cedar basin, permit type and estimated HUC 12 location (using HUC 12 codes in figures 3.4 and 3.5) for each permitted facility. Please include this table, with reference to map described in a. above, on page 18 after Concentrated Animal Feeding Operations section.

Critical areas are loosely addressed in the proposal. Specific sites should be recommended for improvements and included in the plan; pages 22-34 describe how soil or barnyard conditions will be used to prioritize areas/sites from management measure.

Tables 3.4 and 3.5 can be used to identify critical areas. A map classifying these HUCs by their loading severity or the amount of proposed reductions or both, would be helpful to the reader.

In addition, the following maps may be helpful for tracking plan implementation:

- Map of the HUC 12s by land cover and their perceived loading severity
- Map and corresponding table that weighs the HUC 12s by number of barnyards
- Map of which river miles will be proposed for the addition of stream buffers.

A brief spatial analysis conducted on the streams could further help prioritize some areas over others (e.g., a stream with "urban" development on both sides may not be a suitable area for a buffer). Additionally, as was mentioned in the proposals storms are becoming less frequent but stronger in nature for the watershed. This should be taken into consideration when addressing stream management; sediment loading may not only be attributed to runoff but also due to bank and bed scour during high flow events.

☐ Plan <u>does not</u> meet this requirement. The following information is required:

4. Estimate of the amounts of technical and financial assistance needed, costs, and/or the sources and authorities that will be relied upon to implement this plan.

☑ Plan meets this requirement:

Page 20, Table 3.2 describes management measures that will be used to achieve nonpoint load reductions set in plan and estimated cost associated with each measure; cost estimates appear to include technical and financial assistance amounts. Sources identified in the document include 319-grants, NRCS funding (stream buffers, soil health and BMP promotion), DNR (lake grants, etc.), local government involvement, and any funding/assistance that may be provided by local conservation organizations.

Promoting soil health (via NRCS and local county land conservation department staff) is a critical technical/ financial assistance and educational component of the plan to increase farm productivity and reduce cropland runoff and P loading.

Page 35, Table 3.3, summarizes planned management measures, estimated P reductions and costs; cost estimates appear to include technical and financial assistance amounts.

Pages 36-37 describe the authorities that may be used to implement the plan.

Page 49 provides metrics and cost estimates for the civic engagement/information and education component of the plan (see element 5 below).

Additional Comments:

Ideally it would be better to have an explicit budget for all aspects of the program, but an estimate of the cost to implement the BMPs is a good start. Future calculations should include the costs of the education and informational components of the plan. Given Farmer-Led Councils within and adjacent to plan area have been recently established, cost estimates (e.g., UWEX administrative and county, NRCS and WDNR staff support, private foundation incentive grants/ payments,) should be available and included in plan in appendix .

☐ Plan <u>does not</u> meet this requirement. The following information is required:

5. An information/education component used to enhance public understanding of the project and early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

☑ Plan meets this requirement:

Chapter 4, pages 41-51 describe the plan's civic engagement efforts, farmer-led councils and other efforts that serve as the plan's information and education component to enhance public understanding of the project and for continued participation in selecting, designing, and implementing the NPS management measures in plan. Civic engagement is used as both a means of educating the public and to build capacity and buy-in at the local level.

Page 45-46 describes civic engagement actions listed in the plan will focus upon HUC-12 sub-watersheds within the entire Red Cedar river basin as a way of dividing workloads and measuring success. Basic informative education may occur as an offshoot of public notice for new environmental regulations (if necessary) to meet TMDL goals/objectives. The plan sets a milestone to create more Farmer-Led Councils that mimic the one found in a HUC-12 located in Dunn County - which HUC-12 is this?. The plan states the goal for Farmer-Led Councils is to support implementation of practices action in at least a quarter of the watershed agricultural acres, with preference on fields with greater P runoff risk.

Page 36 describes how promoting soil health (via NRCS and local county land conservation department staff) is a critical educational/technical/ financial assistance component that the plan will rely upon to increase farm productivity and help reduce cropland runoff and P loading.

ADDITIONAL COMMENTS:

If possible, can a guidance plan or process be developed to create additional Farmer-Led Councils and included in plan? This would expedite the creation of these councils and allow the implementers to learn from successes. This should be a general guidance, not a strict plan and will likely evolve over time. The recognition of partners and participants is a great approach to increase support for the watershed plan. Perhaps some sort of local government presentation of awards or public notice of any awards will increase their attractiveness

☐ Plan does not meet this requirement. The following information is required:

6. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

☑ Plan meets this requirement:

Plan load reduction goals, technical/financial assistance, costs, civic engagement/ information and education actions and milestones all reflect the plan's ten year schedule (2015-2015).

Pages 45-46 provide a process for expanding civic engagement and contain associated goals in the section "Process and Necessary Resources for Implementation".

☐ Plan does not meet this requirement. The following information is required:

7. A description of interim, measurable milestones for determining whether the NPS management measures or other control actions are being implemented.

☑ Plan meets this requirement:

Page 49 and 51 describe metrics for the civic engagement/information and education component of the plan (see element 5 above). Civic participation milestones are for there to by 2-5 new groups in the first five years, and 5-10 groups by year 10.

Pages 52-54, provide milestones for tracking how land management practices reduce P loading, WQ monitoring activities and criteria for evaluating plan implementation at specific intervals; table 5.1 summarizes the milestone criteria and timing. BMPs have interim goals of 20% adoption by year six, 50% by year eight, and full adoption by year 10. Table 5.1 lays out the 10-year timeline for tasks integral to the watershed plan (e.g., tracking of BMPs installed, etc.).

Please see additional comments described under element 3 above re: creation of new HUC 12 map. This map can help spatially track where plan milestones for Farmer-Led Councils, civic engagement efforts, practices, ordinances, etc. listed in the plan have or have not been met. This approach is consistent with Page 45-46 of the plan, which describes how the civic engagement actions listed in the plan will focus upon HUC-12 sub-watersheds within the entire Red Cedar river basin as a way of dividing workloads and measuring success.

☐ Plan does not meet this requirement. The following information is required:

8. A set of criteria that can be used to determine whether load reductions are being achieved over time and substantial progress is being made toward attaining WQ standards and, if not, the criteria for determining whether the plan needs to be revised, or if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.

☑ Plan meets this requirement:

Page 7, table 2.1, describes the WQ goals for (TP, Sechi Disk Depth, Chlorophyll, Percent Time > 30 mg/chorlophyll-a) the plan from the EPA approved 2012 Tainter/Menomin TMDL. These criteria can be used to determine whether implemented practices have met load reductions over time and/or substantial progress is being made toward attaining WQ standards.

Pages 52-54, provide milestones for tracking how land management practices reduce P loading, WQ monitoring activities and criteria for evaluating plan implementation at specific intervals; table 5.1 summarizes the milestone criteria and timing and describes the minimum threshold criteria that will be used to determine when the plan needs to be revised if little or no progress is made.

Page 52 describes a milestone for the Red Cedar Partnership to explore options for efficiently tracking land management changes/measures implemented within the first two years of the plan and then conduct annual tracking thereafter. Please see additional comments described under element 3 above re: creation of new HUC 12 map. This map can help spatially track monitoring measures and other actions (e.g., Farmer-Led Councils, civic engagement efforts, ordinances, etc.) listed in the plan. This approach is consistent with Page 45-46 of the plan, which describes how the civic engagement actions listed in the plan will focus upon HUC-12 sub-watersheds within the entire Red Cedar river basin as a way of dividing workloads and measuring success.

☐ Plan does not meet this requirement. The following information is required:

9. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against criteria established in item 8 immediately above.

☑ Plan meets this requirement:

Page 7, table 2.1, describes WQ monitoring criteria (TP, Sechi Disk Depth, Chlorophyll, Percent Time > 30 mg/chorlophyll-a) the plan will follow. The criteria are from the EPA approved 2012 Tainter/Menomin TMDL and will be used to determine if implemented practices help to meet plan load reductions over time and/or if substantial progress is being made toward attaining WQ standards.

Pages 52-54, describe four measures for monitoring plan implementation; the measures are set in chronological order. The four measures each have milestone criteria for evaluating progress towards meeting each measure. Table 5.1 summarizes all monitoring efforts and criteria for evaluating progress. Page 54 also describes the minimum threshold criteria that will be used to determine when the plan needs to be revised if little or no progress is made towards the plan's measures/milestones.

Pages 53-54, describe specific WQ monitoring activities planned over the plans ten year time period. These pages describe each lake district that other monitoring may take place in other sub-watersheds by school groups or volunteers.

The plan to develop a new baseline for the watershed modeling/TMDL modeling is an excellent inclusion in this plan. "In 2015-2016 UW-Stout Research Education for Undergraduates (REU) students will conduct intensive monitoring of Lakes Tainter and Menomin. That being said the plan does not address the fact that there is no inventory of currently implemented BMPs. This lack of an existing inventory precludes any estimation of watershed wide BMP adoptions; lack of BMP inventory may and likely will lead to an overestimation of load reductions. The model updates proposed in the plan from the UW baseline should take into account any existing BMPs.

Looking into alternative sources of funding for the monitoring program might be wise in case the lake grant funds are not awarded.

See additional comment described under element 3 re: creation of new HUC 12 map. A map can help spatially track WQ and other monitoring measures listed in the plan.

This approach is consistent with Page 45-46 of plan, which describes how the civic engagement actions listed in the plan will focus upon HUC-12 sub-watersheds within the entire Red Cedar river basin as a way of dividing workloads and measuring success.

ADDITIONAL COMMENT:

We request the plan (pages 52-54) be revised to describe (and include in appendix) the following October 2015 EPA technical memo related to BMP Depreciation will be reviewed and its methods will be used to evaluate plan implementation (elements 7, 8 and 9): http://www.epa.gov/sites/production/files/201510/documents/tech_memo_1_oct15.pdf

☐ Plan does not meet this requirement. The following information is required:

Other Comments:

- Please add Red Cedar River – 07050007 - HUC to the document.
- Page 20 - Please change the note for Table 3.2 from "Estimated load reductions from various best management practices in the Red Cedar River Basin" to Estimated load reductions from various best management practices for the Tainter Lake Basin. Or something on those lines
- Page 21 - It should be made clear that the calculations in the subsequent sections are only for the Tainter Lake Basin. – see page 21
- Page 24 - Can the title "Nutrient Management to Crop Phosphorus Need" be modified, it reads a bit odd? Nutrient Management to meet Crop P need?
- Page 41 - Participatory Education and Outreach section first paragraph – Recommend removing the sentence, "Surprisingly little emphasis in the Midwestern United States and beyond has been put toward establishing and expanding upon ways of organizing people to solve public problems in a manner that is collaborative, disciplined, transparent, and accountable." The sentence does not add anything to the proposal and is also arguably subjective.
- The area to be included in the plan's analysis should contain all surficial hydro logically connected acreage to both Tainter Lake and Lake Menomin. From our understanding, there may be areas that do contribute to Lake Menomin, but these are not included in the land use area calculations? Please clarify if this is attributed to the area that is close to the Dam if so is the expected loading low enough that warrants its exclusion? The same can be said for Wilson Creek, proximity may reduce the amount of loading, but on an annual basses mass loading reduction can add up. The reasoning for excluding the creek is that it enters the lake just above the dam, if the "dam" is a weir I support the exclusion of this source. If not a brief estimate of P loading from this source (e.g., 0.1% of overall lake loading, etc.) would support its exclusion.
- Water quality trading was mentioned in the proposal, but seems irrelevant because the point sources are already below their permitted levels. It would be odd and likely inappropriate to "trade" point source effluent reductions to a nonpoint source. For this reason, it may be appropriate to remove the entire section "Adaptive Management and Pollutant Trading". A simple overview of the adaptive management process (e.g., a diagram) might sufficiently explain the concept, if it is even necessary – see pages 15-1.
- Please amend Tables 3.4 and 3.5 b/c the majority of the HUCs are missing "0"'s. It is not clear if these are preceding or trailing zeros, but if those are supposed to be HUC 12s then there should be 4 digits for each of the HUCs, with the parent HUC-8 being 07050007.
- What is the margin of error for the effectiveness of the BMPs being implemented if there is no base data for existing BMPs or general good practices within the watershed? Can an evaluation of existing BMPs be completed in next two years, via a transect or representative survey(s), by county/NRCS staff and Farmer-Led Councils?


Ron Verdon

Sunrise on Tainter Lake

A RIVER RUNS THROUGH US:

A Water Quality Strategy for the Land and Waters of the Red Cedar River Basin

Produced by the Red Cedar River Water Quality Partnership

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Questions about this document can be directed to any of the partners, and more information can be obtained by contacting:
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