Columbia County Land and Water Resource Management Plan

Draft Revision 5/13/2020

2021-2030

Prepared by:
Columbia County Land and Water Conservation Department

Acknowledgments

The following individuals are recognized for giving of their time and effort toward development of the 2020 edition of this plan.

Their contributions are greatly appreciated.

The 2020 update was developed off the 2011 plan platform and 2015 update.

Columbia County Land and Water Resource Management Plan
Citizens Advisory Committee

Gordon Carncross, Farmer, T. of Lodi
Adam Hahn, Farmer, T. of Courtland
David MacLeish, Farmer, T of Caledonia
Mark Martin, Enviro Group/Landowner
Bill Paine, Farmer, T. of Columbus
Laura Paine, Farmer, T. of Columbus
Harlan Baumgartner, T. of Otsego
Paul Becker, T. of Lowville
Becky Gutzman, T. of Springvale
Ken Ireland, V. of Randolph
Jim Sanderson, T. of Columbus
Darren Schroeder, T. of Columbus
William Schroeder, T. of Fort Winnebago
Phil Sommers, T. of Scott
JoAnn Wingers, Farmer, T. of Courtland
Ron Grasshoff, Planning Commission, T. of West Point
Shawn Murphy, C. of Portage
Zach Navin, Public Works, C. of Columbus
Jim Schmitt, Pardeeville Lakes Mngt. District
Mike Weyh, Co. Board (Farm Bureau)

Staff Advisors

Kurt Calkins, Director
Kelly Maginnis, Office Administrator
Todd Rietmann, Senior LWRM Specialist
Tim O'Leary, LWRM Specialist
Harold McElroy, LWRM Specialist
Chris Arnold, LWRM Specialist
Dean Kaderabek, Columbia County Land Information Director

Coordinating Agencies

United States Department of Agriculture
Twyla Kite, NRCS

University of Wisconsin Extension
Kathleen Haas, CRD
George Koepp, Agriculture

Wisconsin Department of Agriculture, Trade and Consumer Protection
Lisa Trumble, DATCP

Wisconsin Department of Natural Resources

Dylan Bell, Forester
Nathan Nye, Fish Biologist
Andrew Craig, Water Resource Specialist
Sara Kehrli, Wildlife Manager
Dale Gasser, Water Resources Specialist

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Introduction

Welcome to the Columbia County Land and Water Resource Management Plan. This plan is a 10-year management plan (2021-2030), built as a revision of the 2006 Columbia County Land and Water Resource Management Plan. The process of revising the existing plan benefited from guidance from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP), Wisconsin Department of Natural Resources (WDNR) and a valuable large-scale citizen involvement. This revision process began in the Winter of 2019 in preparation for a deadline spring of 2020. A local Citizen Advisory Committee (CAC)/Technical Advisory Committee (TAC) was formed to complete the 2021 revision, this process was used as foundation for this plan. A series of 2 meetings with the CAC/TAC agencies took place on December 17, 2019 and January 16, 2020. This plan was completed, in part, to meet the requirements set forth by the DATCP to remain eligible for state program participation, as well as, to serve as a vision and guiding document for the Columbia County Land & Water Conservation Department.

It is with this vision that our plan demonstrates a wide range of resource issues, assessments and impacts. The resource concerns range from groundwater quality protection to an overall increase in information and educational efforts on the full scope of natural resource issues in Columbia County. Throughout this plan you will see that we have done our best to use current and up-to-date data to provide a clear picture of natural resource management in Columbia County.

The plan begins by providing a detailed review and assessment of all Columbia County's natural resource issues. A review of all our major surface water resources including location, description and assessment is provided. It is clear that there are many trends in different areas and issues in the County that are impacting land and water conservation. This plan also offers suggestions of how to deal with these changing trends and how to integrate resource protection and management effectively.

In October 2002, the state legislature passed rules to help protect Wisconsin's lakes, streams and groundwater resources. Department of Natural Resources (WDNR) rule NR 151 sets performance standards and prohibitions for farms. It also sets urban performance standards to control construction site erosion, manage runoff from streets and roads and manage fertilizer use on large turf areas. As a requirement of this plan, you will find Columbia County's strategy for the implementation of the agricultural standards found in NR 151. This updated version of the plan now includes the most up to date information available to us regarding watershed management driven water quality goals found in the TMDL's that now exist for all 3 basins that make up the watershed footprint for Columbia County.

In addition to the WDNR rules, the existing CAC/TAC input we received from 21 citizens were essential in the development of this plan. This group made up of local citizens, elected officials, cooperating agency and local staff provided input and decision-making. Together we identified resource issues and concerns across Columbia County. A detailed summary of those resource issues and priority concerns are included in the plan.

This plan identifies both long and short-range goals for resource protection and enhancement throughout Columbia County. The plan includes a listing of all resource driven CAC/TAC issues along with some broader action items. The specific annual goals and objectives will be captured in the annual workplan submitted each year to DATCP. Our goals and action items range from Best Management Practice (BMP) implementation, ordinance development and enhancement, to larger visionary goals such as increasing issue awareness through information and educational activities in the County.

Monitoring the long and short-term effectiveness of this plan will begin with the ongoing use of our existing CAC committee as needed. We plan to continue to utilize our LWCC meeting structure to provide a venue an annual review process that will allow us to discuss and keep the citizen base abreast of the progress towards implementation of the plan's goals and discuss and or update issues as they present themselves. The annual budget process at the county level has proven to be a valuable opportunity to connect priority issues found in this document to the reality of budgeted goals in our local departmental planning efforts. The development and continued use of our GIS Data Management System and the use of water quality monitoring data will be the target of our monitoring. Spatial GIS data will allow us to manage and track implementation of conservation priorities. The development of water quality monitoring processes will help us make scientific conclusions about the effectiveness of our resource protection efforts and help us target resources were necessary. The department continues to expand our use of GIS/Imaging systems to allow us to continue to better manage and monitor landscape improvements. The ability to track and monitor BMP installation is a very important tool we are developing to help us manage this task. The 590 NMP tracking mechanism and the Farmland Preservation Program tracking tools we have built are great examples of how we can continue to enhance our ability to track progress and look for opportunities.

Chapter 1. Plan Development (2006), Update Process (2011), Revision Process (2020)

2006

At the time of this update it was felt that our current 2006 plan was a solid plan developed to address long-term LWRM issues in Columbia County. The results we received from our 2011 update survey of citizens reinforced this fact. Citizens widely support the continuation of priority issues along with actions and objectives outlined in the current plan. We chose to complete this update based on the assumption that we would use our current 2006 plan and build into in additional priorities that came up during our CAC interactions in 2010.

(2006) The development of this original plan began in January of 2005. The Columbia County Land and Water Conservation Department (LWCD) notified the public through the local media of the process and requested citizen involvement. We requested that any citizen interested in being part of our Citizen Advisory Committee (CAC) for the Land and Water Resource Management Planning process please contact the LWCD.

This call for involvement was answered by a wide range of citizens interested in learning more and being part of our revision process. A diverse mix of stakeholders; including many active farmers; a WPDES permitted farmer, rural landowners, environmentalists, County Board Supervisors, Lake District representatives and a large number of City, Village and Township representatives, were assembled.

In addition to the creation and utilization of our CAC, we enlisted the help and input of colleagues who also work to protect Columbia County's natural resources. We received help and comments from many WDNR associates, Natural Resource Conservation Service (NRCS), UW Extension and Farm Service Agency (FSA). ***The WDNR participated throughout our process. Their involvement included three Basin Team Coordinators, an Animal Waste Management Specialist, a Wildlife Manager, a Fisheries Biologist and a Forester.*** A complete listing of all those who participated can be found in the acknowledgement section of this plan.

The CAC and advisors worked on the plan in three main public meetings. The first meeting was held March 30, 2005, and included background work setting the stage for our second meeting. The second meeting, held on May 10, 2005, was our information gathering and problem-solving meeting. We spent the majority of the evening taking input from members in regard to natural resource issues facing Columbia County. We also spent a large amount of time talking about what we can do to address these issues and what the group, as a whole, felt we should use for strategic planning in regards to our needs and priorities.

Based on the results of the first two meetings a draft LWRM plan was put together by the LWCD staff with input and comments from our cooperating advisors. At the third CAC meeting, held on June 30, 2005, full-scale presentation of the Draft LWRM Plan was given to the CAC members. Discussion took place and changes were made as suggested.

During this entire plan development process the departments governing body, the Columbia County Land and Water Conservation Committee (LWCC), was kept abreast of the process through regular monthly meetings. The LWCC was encouraged to attend the CAC meetings to further their knowledge of the plan, in preparation for County Board approval in January of 2006.

2011

The update process began with the development of a survey that was designed to determine if the existing CAC priority resource issues were still priority issues. We also used the survey to determine support and understanding associated with specific goals and objectives outlined in the current plan. The survey was completed in the summer of 2010. We had 54 citizens complete the survey. We developed a targeted mailing list requesting participation in the survey from our existing CAC committee along with numerous other citizens, governmental leaders and organizations. We were very satisfied with both the number of survey responses we received along with the content of their responses. People responding to the survey were able to leave comments specific to the issues being discussed. There were also able to list other or updated resources issues that were not addressed in the 2006 list of issues and concerns. We held a public meeting on July 27, 2010. During this meeting we presented a summary of the results of the survey followed by a detailed discussion reporting past plans accomplishments over the last 5 years and how they measured up to goals and objectives. The final task for the meeting was to receive final input on priority resources issues and concerns that citizens would like to see added to the current list of resource issues and concerns. The LWCD then used the current and updated list of resource issues and concerns to update and develop goals and objectives that will be used to work towards address those issues. A draft revision (2011) was submitted to DATCP for review at the end of August 2010. The LWCB approved the plan at its December LWCB meeting. The Columbia County Board of Supervisors approved the Final 2011 at its December meeting.

2020

The Columbia County Land and Water Planning process will result in a 10-year working document that will serve multiple stackholders simultaneously in a variety of capacities. The CAC allows for local stockholders and interested members of the public to provide valuable insight and input for local conservation needs and ultimately into conservation policy. The resulting resource driven LWRMP will serve as a blue print and unifying guidance for the CCLWCD staff and the public they serve. The LWRM Plan will also provide a clear focus for the priorities and implementation of the conservation needs of Columbia County. Furthermore, showing the intentional approach detailing the interactions of how Columbia County plans to utilize local, state and federal programs to promoting conservation

awareness and stewardship at the local level. As a result, the Columbia County Land and Water Department LWRM Plan will meet the statutory requirement in Chapter 92.10 requiring a Land and Water Resource Management Plan. The public participation planning process occurred over the winter of 2019/2020. Two meetings on December 17, 2019 and January 16, 2020 were used to introduce the CAC/TAC to the past plan and reprioritize the conservation needs of Columbia County moving forward.

Chapter 2. General County Information

General Characteristics:

Columbia County is located in the south-central part of Wisconsin. It covers about 774 square miles and has a total land area of about 495,300 acres. It has a county population of 57,358 (2018 Census). There are 56 lakes totaling 11,982 acres, of which Lake Wisconsin is the largest with a total acreage of 9,000 acres. It also has 50 miles of trout streams and includes 35 miles of the Wisconsin River. Portage is the County seat and largest city with a population estimated at 10,662 (2010 Census). There are 4 cities, 10 villages and 21 civil townships are within Columbia County. Agriculture encompasses 296,236 acres or 60% of the county, making it the main land use.

History:

For hundreds of years, prior to European settlement, Native American tribes inhabited the land that is now Columbia County. Mascoutins, Illinois, Kickapoos, Miamis, Sacs, Winnebagoes and Menominees used the land extensively for hunting, fishing and travel.

The county was located within the Winnebago and Menominee Territories until the land was turned over to the government as a result of treaty agreements. The first treaty was signed with the Winnebago tribe on August 1, 1829. This gave the government ownership of land in what is now the southwest portion of the county. The borderlines ran west of a line that runs south through Duck Creek Marsh and the area south of the Fox River. On February 13, 1833, a second treaty was signed with the Winnebago tribe. This included the land east of the Duck Creek Marsh and east of the Fox River, or what is now the southeast portion of the county. With these two treaties signed, only the townships of Caledonia, Newport, Lewiston and Fort Winnebago, west of the Fox River were still owned by the Native American tribes. A treaty signed in November of 1837, with the Winnebago tribe gave the government ownership of the township of Caledonia. The Menominee tribe signed the final treaty on January 23, 1849, giving the government ownership of the rest of the townships of Fort Winnebago, Newport and Lewiston, or the whole area of Columbia County.

The importance of the Fox and Wisconsin Rivers and their navigable tributaries has been recognized throughout history, in written records by all nations and tribes in the region. With the numerous prehistoric sites found along the rivers, one may conclude that the rivers have furnished a medium of livelihood and transportation even before written historical records. The “portage” occupies a central and important position in this transportation route.

Father Jacques Marquette and Louis Joliet are recorded as the first European settlers to discover Columbia County. They first set foot on Columbia County at the “portage.”

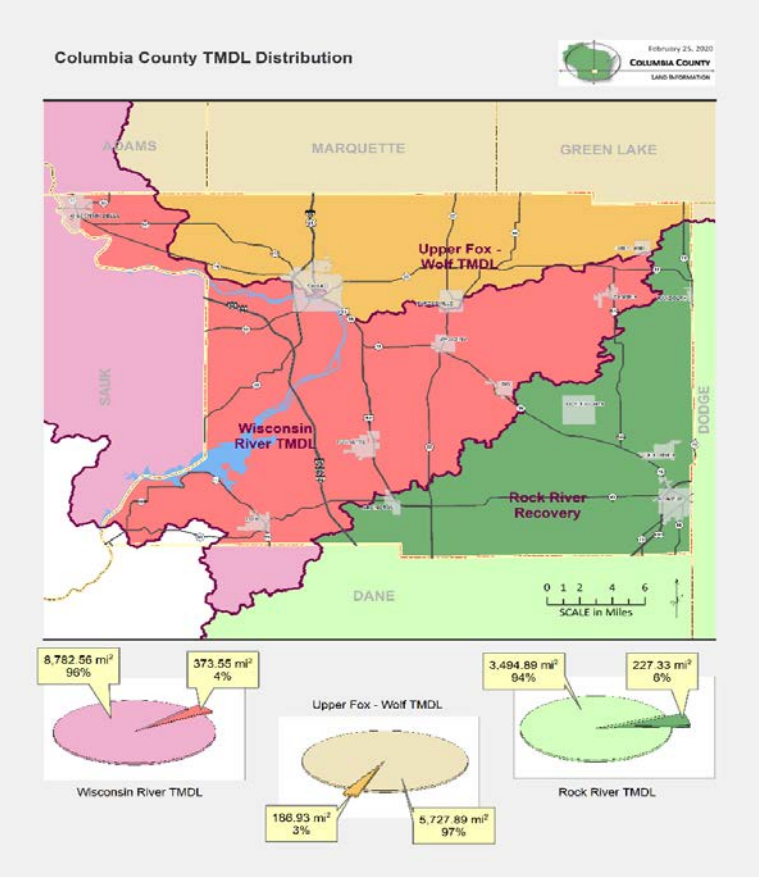
The rich productive soils, producing abundant quantities of grain, such as oats, wheat and rye and supporting livestock production have given Columbia County a rich agricultural history. Corn was introduced early in history as a staple crop. Soybeans have more recently been added to the list of common crops in the county. Canning companies became an integral part of nearly every community and production of vegetable crops for the canning industry flourished. The farming industry in Columbia County has been a rewarding lifestyle choice for many generations.

Chapter 3. Related Trends and Issues

Cropland Soil Erosion & Nutrient Delivery

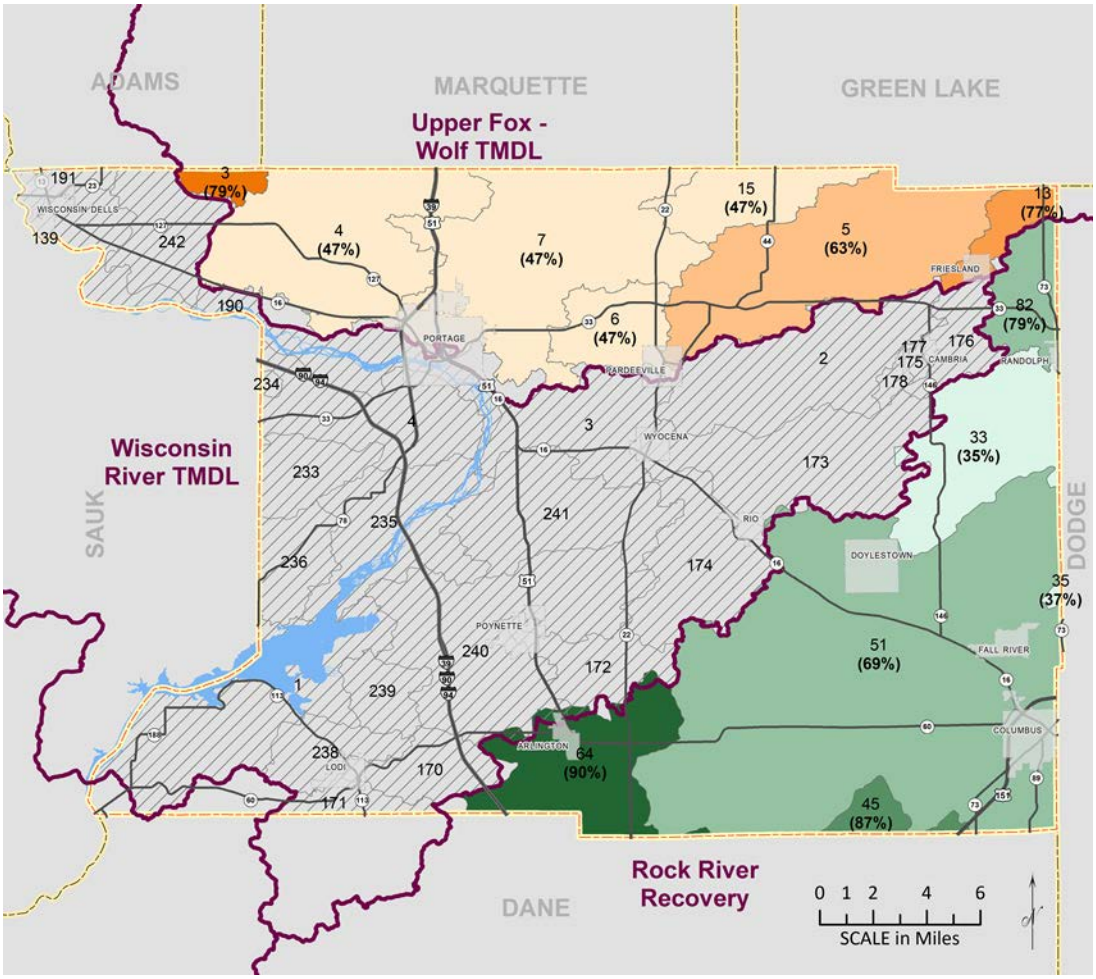
Soil conservation practices to reduce soil erosion and sediment delivery continue to be utilized by crop farmers throughout Columbia County. Beginning in 2001 the LWCD began an annual process of completing a transect survey, which is targeted at giving us a realistic idea of where we sit in regards to meeting tolerable soil loss or "T" on all fields throughout Columbia County.

Due to the changes in Wisconsin statewide programming, initiatives and shifts in agricultural, have resulted in the Columbia County LWCD shifting away from the Cropland Roadside Transect Survey and using the available data from TMDL modeling at the larger scale and Snap Plus at the field scale. As seen below, the unique drainage patterns of Columbia County have resulted in 3 TMDL's covering the majority of the county: Rock River Recovery, Wisconsin River Basin, Upper Fox and Wolf River Basins.



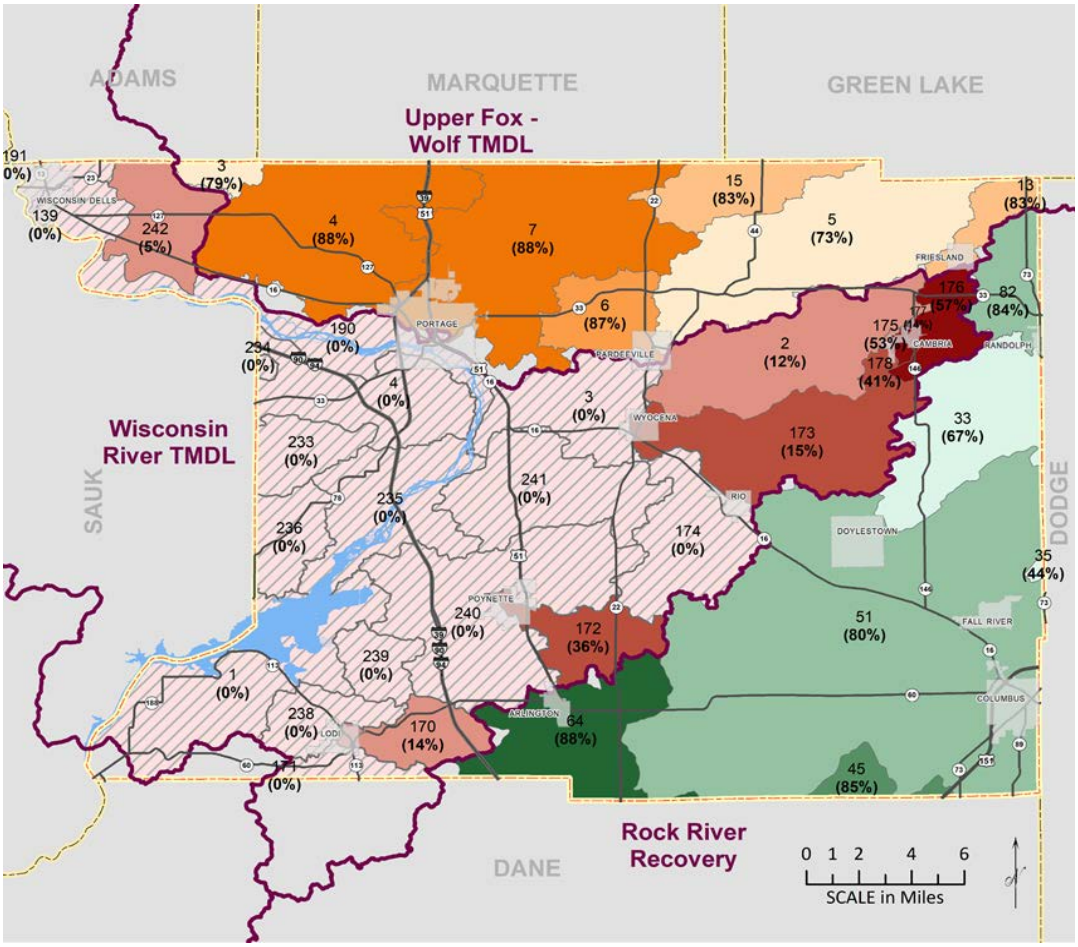
The resulting comprehensive modeling effort associated with these three TMDL's has provided the CCLWCD ample data to prioritize and track soil erosion.

When combining the 3 TMDL Total Suspended Solids (TSS) Percent Reduction, as seen below, we then rank the top 10 modeled sub basins based on their % reduction.



TSS Rank	TMDL	Sub Basin ID	% Reduction
1a	Rock River	64	90
2	Rock River	45	87
3	Rock River	82	79
4	Upper Fox Wolf River	3	79
5	Rock River	51	69
6	Upper Fox Wolf River	5	63
7a	Upper Fox Wolf River	4	47
7b	Upper Fox Wolf River	6	47
7c	Upper Fox Wolf River	7	47
10	Upper Fox Wolf River	15	47

Following up and combining the 3 TMDL Total Phosphorus (TP) Percent Reduction, as seen below, we can than rank the top 10 modeled sub basins based on their % reduction.



TP Rank	TMDL	Sub Basin ID	% Reduction
1a	Upper Fox Wolf River	4	88
1b	Upper Fox Wolf River	7	88
1c	Rock River	64	88
4	Upper Fox Wolf River	6	87
5	Rock River	45	85
6	Rock River	82	84
7a	Upper Fox Wolf River	13	83
7b	Upper Fox Wolf River	15	83
9	Upper Fox Wolf River	3	79
10	Upper Fox Wolf River	5	73

When prioritizing sub basins and watersheds for large scale multiyear projects or prioritizing sub basins with other interested stakeholders we can locate and prioritize geographical areas based on combining the rankings. As projects in the various geographical areas are planned and implemented the CCLWCD will use the 179,079 acres of 590 NMP plans to analyze, plan and implement specific approaches at the field scale level.

Development and Land Use Trends

Columbia County continues to be dominated by a mixture of agricultural land, forests and wetlands. Residential development has been primarily located in and around smaller cities and villages. However, the counties relatively close proximity to the Madison metropolitan area and the increasing growth of the area's commuting shed is beginning to put increasing development pressures on the southern portion of Columbia County. This southern area is within easy commuting distance to Madison. Communities such as Lodi and Poynette will continue to see Madison growth pressure. Townships such as West Point, Lodi, Arlington and Leeds, which lie in the southern portion of the County, contain many of our most productive prime soils. Balancing the emerging development values for these areas with their value in agricultural production will continue to be a tough challenge. From 2010 to 2018 Columbia County has experienced a 0.9% population growth rate, compared to a statewide population growth rate of 2.2%. Proper land use planning and implementation of that planning will be very important for the future of Columbia County and for sound resource management and conservation. The use of Agricultural Enterprise Areas through the Working Lands Initiative will provide some tools to work towards continued preservation of agricultural areas.

Agricultural Trends

Farm numbers within Columbia County are on the decline and remaining farms are shrinking in land base each year. Animal numbers related to dairy farms and dairy farm numbers are on the decline, opening the door for more cash grain operation acres. The face of agriculture continues to change in Columbia County. Pressures related to low milk prices, tights profit margins, competition for land (agricultural, residential, and recreational) and off farm labor opportunities are all part of the reasons for change.

Columbia County has 1357 farms with an average size of 224 acres. There are 117 dairy and more than 520 beef, sheep, hog, goat farms, along with 200 farms with poultry. These livestock farms produce manure that is used as an organic nutrient source for growing crops and improving soil health by following prescriptive nutrient management plans. It is also home to large cash grain operations of 500-1000 acres and 5-10 acres fresh market vegetable producers. Farmers own and manage 304,058 acres of land. Horticulture and Greenhouse operations are also an important part of Columbia County Agriculture. Sand and muck soils found in the Wisconsin and Fox River systems support vegetable enterprises, while high quality prairie soils in the southern and eastern parts of the county help the County garner the number six position in Wisconsin's grain industry.

Columbia County Farmers produce: $101.7 million in grain, $73.5 million in milk, 29.3 million in cattle and calves, $4.5 million in vegetables, and $3.7 million in hay and other crops. Columbia County farmers also grow specialty crops of hops and industrial hemp for CBD oil and grain.

Columbia County is home to two ethanol plants producing fuel and high-quality protein supplements for livestock. Five vegetable processing facilities and four dairy processing facilities call Columbia County home to improve the marketability of farm products locally and for neighboring counties. You will also find three breweries and one winery within the county boarders.

Columbia County currently has four WDNR WPDES permitted farms. These are farms with more than 1000 AU (animal units). They include:

	Current AU	Projected AU
Dean's Eggs/Naturelink Farms – Pulfus Facility	560	1538
Blue Star Dairy	1692	1692
Ron Ziegler Farm	999	1717
UW-Arlington Ag Research Station	2179	2179

Agriculture continues to be big business in Columbia County. It has an overall $1.5 billion annual economic impact. Agriculture provides 5,262 jobs throughout the county. $1 million worth of ag product are sold directly to consumers. The wind turbines in the northeast corner of the county continue to provide a reliable source of renewable energy. 96% of the farms remain family owned and operated farms.

Chapter 4. Natural Resources and Assessments

Geology and Topography

The entire county is underlain with Precambrian bedrock of which is igneous or metamorphic. Some bedrock outcrop through the Cambrian layer of sandstone, siltstone, shale and dolomite can also be found. (See *Appendix B*)

Preglacial, glacial and postglacial erosion formed the bedrock topography surface. Most of the bedrock valleys were part of a preglacial drainage system.

The bedrock surface ranges from about 500 feet above sea level in some valleys, to about 1,400 feet above sea level, west of the Wisconsin River. Bedrock valleys that underlay and control present surface drainage are filled with drift that form important aquifers.

The drift is largely glacial sediment laid down by the Green Bay lobe during Wisconsin Glaciation, but they also include some alluvium and marsh deposits. Distinctive landforms (end moraine, ground moraine, outwash and lake plains) resulting from glaciation are composed of sediment types determined by their mode of deposition. (See *Appendix C*)

The topography of Columbia County generally consists of a ground moraine with gentle slopes. (See *Appendix D*) The valleys of Neenah Creek and the Fox River occupy an area of glacial lake deposits characteristically broad and flat. Land surface elevations vary from the Baraboo area west of the Wisconsin River (elev. 1200-1400 feet) to the Wisconsin River at Prairie du Sac (elev. 740 feet). The divide that separates the Wisconsin River and Rock River Watershed is 1,000 feet to 1,150 feet above sea level. **Information taken from 1978 Soil Survey of Columbia County.*

Fishery Resources

The waters of Columbia County provide a diverse fishery resource. There are ten classified trout streams totaling about 55 miles of water which represent the highest level of water quality. Stocking maintains about 80% of these waters as they lack habitat conditions necessary for the level of natural

reproduction necessary to sustain trout populations without stocking. Wild strain trout stocking provides 3 times higher survival rates than previous domestic strain stocking. Trout require a high standard of water quality. Thus, it is extremely important that good land use practices are conducted in these watersheds. Increasing impervious surface areas from urban development have the potential to increase water temperatures which may threaten cold water fish species. Therefore, proper storm water management is of the utmost importance. Runoff from agricultural fields and pastures carries sediment and nutrients to streams and lakes which can have a negative impact on physical habitat and water quality. Because of this, agricultural impacts of livestock, soil erosion, and chemicals continue to require best management practices. In addition to proper land-use practices, beaver activities can have a significant impact on water quality through warming of impounded water and trapping of sediment in impounded areas which covers rock and gravel substrate needed for trout spawning and invertebrate production. Beaver dams can also block trout from migrating to spawning areas in a stream. Therefore, trapping and dam removals are critical to preserving the quality of our trout streams.

Many watersheds of the county contain some trout water. They include the Duck Creek (Jennings, Middle Duck, Roelke creeks) system and the receiving portion of the north branch of Duck Creek. Upper Prentice Creek above Highway 78 supports a native brook trout fishery up into its headwaters in Sauk County. Rowley Creek rises in the Baraboo Hills in Columbia County and holds brook trout in its upper reaches before entering Sauk County and transitioning to a mixed brook and brown trout fishery. Spring Creek, which arises from a large spring complex in Dane County, supports trout throughout. However, because of natural reproduction within the City of Lodi, trout are most abundant in the lower reaches of the stream. The East Branch of Spring Creek, also known as Bohlman Branch, is classified trout water, holds populations of brown and brook trout, and provides significant coldwater input to Spring Creek at the confluence of the two streams in downtown Lodi. The Rowan Creek drainage including its major tributary, Hinkson Creek, are the gems of the trout resource, not only in the county but the southern portion of the State. Upper Rowan Creek supports an excellent self-sustaining brown trout fishery and Hinkson Creek supports a mixed fishery of native brook trout and brown trout that enter Hinkson Creek from Rowan Creek. Finally, eight miles of the middle portion of Rocky Run Creek maintains water quality that supports stocked brown trout. The Mud Lake Waterfowl Area impounds its headwaters and many miles of stream from there down to Highway 22 have been ditched. Below Highway 22, increased spring flow and an unaltered creek corridor reestablish water of sufficient temperature and quality to support trout. Anglers fishing Rocky Run may also encounter gamefish such as smallmouth bass and northern pike.

There are eight waters larger than 50 acres within Columbia County that support managed warm water fisheries and have developed public access. They include Lake Columbia, Lazy Lake, Long Lake, Park Lake, Silver Lake, Swan Lake, Lake Wyona, and the 9,000-acre Lake Wisconsin which includes the 35 miles of Wisconsin River upstream to the Kilbourn Dam in Wisconsin Dells. The main flowage at French Creek Wildlife Area along with Mud Lake at Mud Lake Wildlife Area are large waterbodies that are managed as waterfowl impoundments, but also support viable fisheries that have developed public access. Several smaller lakes that have developed public access and are popular local fisheries include West Lake, Tarrant Lake, Spring Lake, Lake George, and Crystal Lake (east of Pardeeville). Warm water streams in the county with sport fish importance include the lower Baraboo River, Big Slough/Neenah Creek, Crawfish River and tributaries, Duck Creek system, and the Fox River. Dominant sport fish species in these waters include largemouth bass, smallmouth bass, rock bass, northern pike, bluegill, and crappie. Swan Lake supports an excellent stocked walleye fishery and a diverse fishery overall because of its open connection to the Fox River. The Lake Wisconsin/Wisconsin

River fishery of walleye, sauger, white bass, largemouth bass, smallmouth bass, panfish, channel catfish, flathead catfish, musky, northern pike, and lake sturgeon provides one of the finest, most diverse overall fishing experiences in southern Wisconsin.

Chronic detrimental factors affecting warm water resources are sedimentation, agricultural ditching (wetland loss), high levels of nutrients and development activities near riparian zones. Acute influences from agricultural chemicals and manure occur infrequently, but are direct causes of catastrophic fish kills. Loss of spawning areas and fish habitat, periodic low oxygen levels and over abundant aquatic plant growth are problems common to most waters. Fish passage at the Prairie du Sac Dam has been mandated through the FERC licensing process, but the exact method by which it will be accomplished has yet to be decided. Fish passage is important because dams act as barriers to natural fish movement on the river. While the Prairie du Sac Dam does allow for significant downstream movement out of Lake Wisconsin, fish from the lower Wisconsin River are not able to pass the dam in an upstream direction to reach habitat further up the lake and beyond. Several fish and mussel species occur downstream from the dam at Prairie du Sac and not above. Most noteworthy are the paddlefish, shovelnose sturgeon, and blue sucker. Historically, lake sturgeon inhabited the Wisconsin River upstream to Stevens Point. However, due to pollution from paper mills and habitat fragmentation by several dams constructed during the early 1900's, their distribution was limited for many years to waters downstream from the Kilbourn Dam in Wisconsin Dells. Rehabilitation efforts have been underway since the late 1990s to restore lake sturgeon upstream from the Kilbourn Dam to Wausau. Lake sturgeon are stocked annually in this stretch of river, with wild parents collected below the Kilbourn Dam used as the brood stock. Studies show significant downstream movement of walleye and sauger from Lake Wisconsin through the Prairie du Sac Dam, and muskellunge and lake sturgeon have been shown to move downstream through the dam as well. The removal of the last of the dams on the Baraboo River in 2001 allowed a segment of the Wisconsin River fishery (i.e. Smallmouth bass, walleye, sauger, and catfish) to utilize areas of the Baraboo as summer habitat. Additionally, the 5 miles of riffles in the City of Baraboo will allow for walleye, sucker, and eventually lake sturgeon spawning. Lake sturgeon rehabilitation efforts are underway on the Baraboo River, with annual stockings of 500 yearling fish raised from wild Wisconsin River parent fish.

Diurnal fluctuating discharge, from the dam at the Dells, for the tour boat operations during low water periods, cause two to four feet water level changes, which negatively impact aquatic life and downstream recreation use. Invertebrates and forage fish species, though less documented, are critical as food sources for sport fish and indicators of detrimental environmental conditions. Reduced species diversity and loss of intolerant species occur where habitat and water quality have been reduced.

*This information was gathered in collaboration with WDNR fisheries staff and Basin Coordinators. Including the State of the Basin Reports for Lower Wisconsin, Rock River and Upper Fox.

Groundwater Resources

Columbia County receives an average of 32 inches of precipitation annually. Almost two-thirds (roughly 20 inches) of this precipitation ends up back in the atmosphere by direct evaporation or by passing through plants in the process of transpiration. The remaining 12 inches either soaks into the ground past the root zone of plants or, may runoff directly into lakes, rivers, streams, or wetlands. The rate at which water soaks into the ground is determined mostly by the uppermost soil layer. Runoff is generated when rain falls (or snow melts) faster than water can infiltrate, or soak into the soil.

Fine-textured soils such as clay do not allow water to infiltrate very quickly. They generate more runoff than coarse-textured soils made up of mostly sand, which allow more infiltration. On average, only about 2 inches of water reaches lakes and rivers as runoff.

The remaining 10 inches of annual precipitation is an estimate of what actually infiltrates past the root zone of plants and ultimately becomes groundwater. The infiltrating water moves downward because of gravity until it reaches the water table, the point at which all the empty spaces between the soil particles or rock are completely filled with water. The water table represents the top of the groundwater resource. Groundwater moves very slowly between particles of sand and gravel or through cracks in rocks. Water-bearing geological units such as sand and gravel are called aquifers.

Groundwater is always moving. It is able to move because the empty spaces within aquifers are interconnected. The size and connectivity of the spaces within an aquifer determine how quickly groundwater moves, how easily it is contaminated, and how much water a well is able to pump.

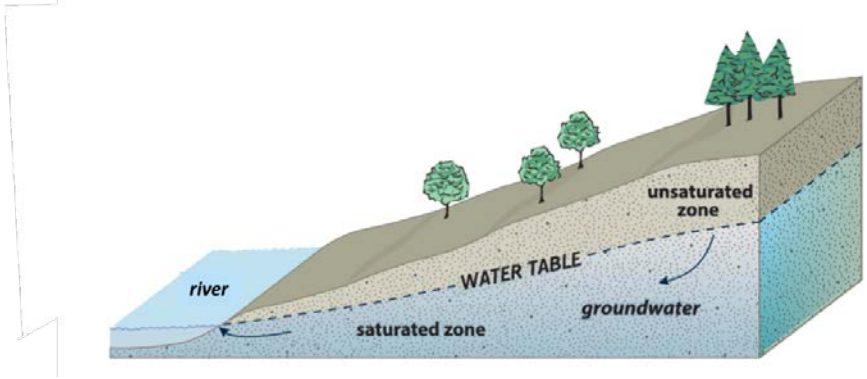


Figure 1. Groundwater and the water table from Groundwater Resources of Columbia County Wisconsin, Water-table elevation. Educational Series 52-1 | 2012.

Groundwater moves as a result of differences in energy. Water at any point in an aquifer has energy associated with it, and its movement can be predicted by measuring changes in energy between two locations. More simply, groundwater moves from high energy to low energy. One measurement of energy is groundwater elevation.

Groundwater elevation maps show the height of the top of the groundwater above a common measuring point, which is sea level. Those maps indicate that the water table is not flat; it is oftentimes a more muted version of the actual land surface. From a map of groundwater elevation, groundwater flow direction can be determined.

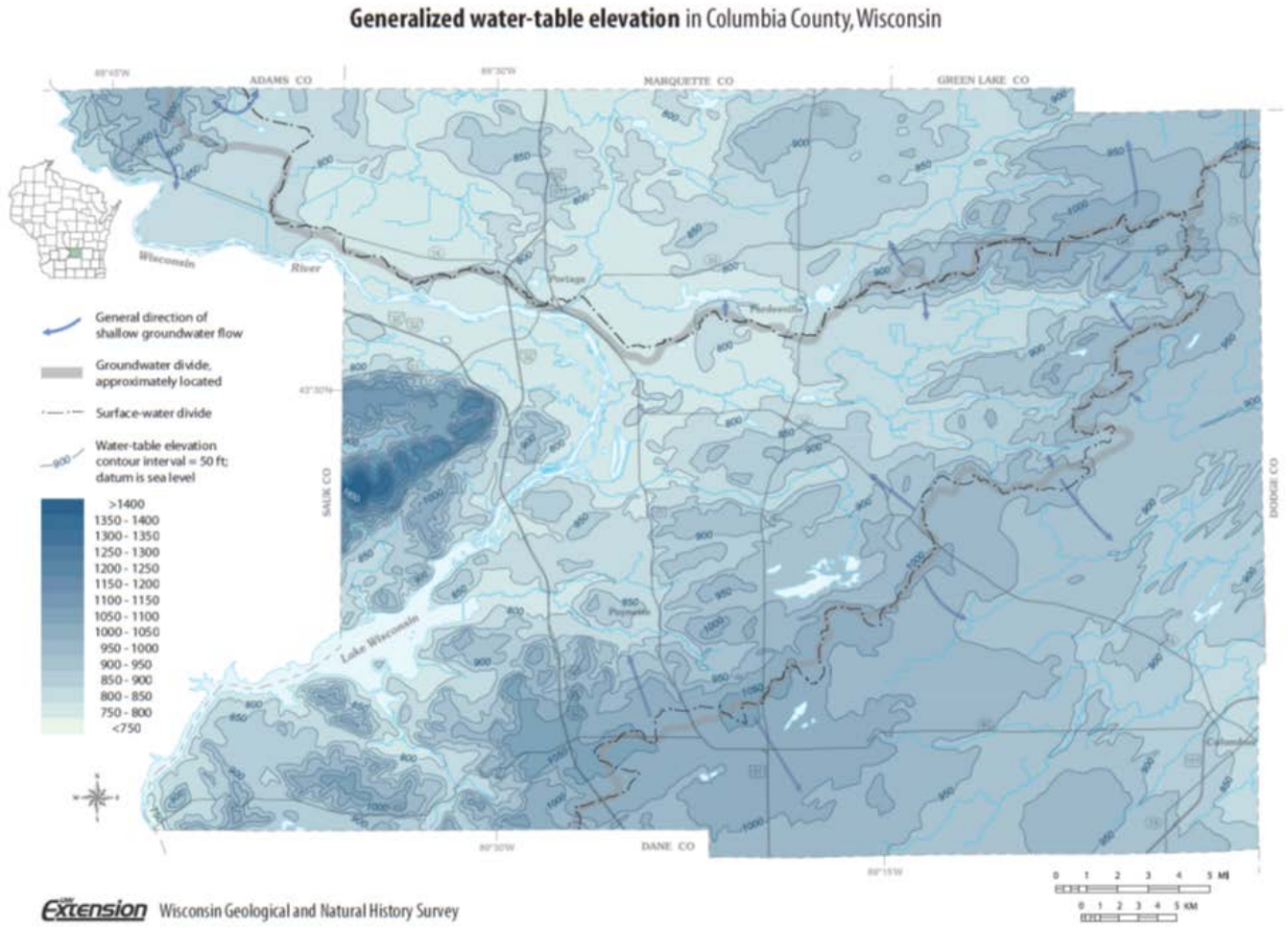


Figure 2. Groundwater flows from areas of high water-table elevation (dark blue) to areas of lower water-table elevation (light blue). The approximate groundwater divides are show in the shaded gray regions and the blue arrows represent generalized groundwater flow direction. Diagram from Groundwater Resources of Columbia County Wisconsin, Water-table elevation. Educational Series 52-1 | 2012.

Groundwater generally moves from areas where the water table elevation is higher to areas where it is lower. The water-table elevation map illustrates how groundwater generally moves towards these low spots on the landscape. In Wisconsin, rivers, lakes, and streams are considered groundwater discharge locations and are located at areas where the water table intersects the land surface. Because they are connected, scientists generally consider surface waters and groundwater as a single resource.

There are two significant groundwater divides in Columbia County. Both start in the northeastern corner of the county and soon separate. The divide that extends to the southwest separates the groundwater that flows to rivers in the Rock River Basin to the south of the divide and water that flows to rivers in the Wisconsin River Basin north of the divide. The divide that meanders its way to the northwestern part of Columbia County separates the water that flows south in the Wisconsin River Basin and that which flows to rivers in the Upper Fox River Basin. Groundwater recharge near groundwater divides often has the ability to penetrate the aquifer much deeper than groundwater recharge near rivers

and streams. Therefore, if groundwater influences exist in these areas, the contamination can often penetrate the aquifer much deeper.

Groundwater Supply

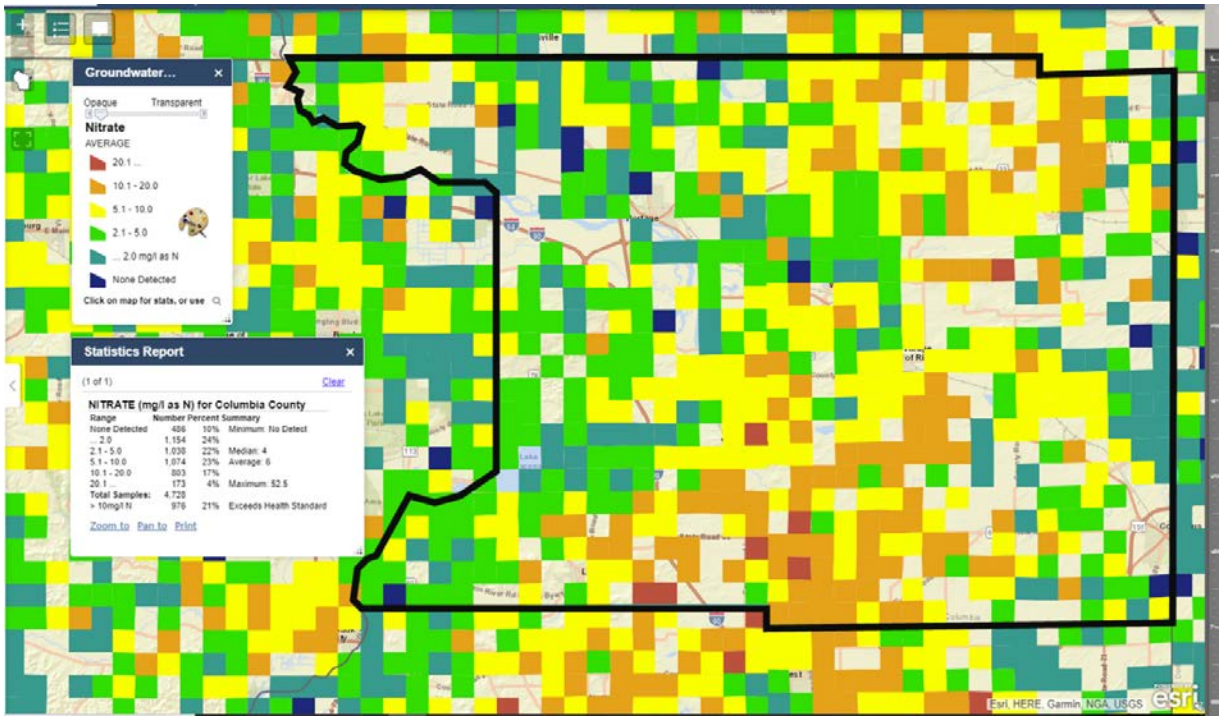
Two aquifers supply potable groundwater. The sand-and-gravel aquifer supplies the groundwater for industrial, irrigation and municipal uses. The aquifer is composed of the permeable sediments within the saturated unconsolidated materials. The second aquifer is the sandstone aquifer. This aquifer is an important source of water throughout the county. It is the principal source for most municipal, industrial and private domestic supplies. To help protect groundwater resources, all municipal wells are required to delineate a source area protection. A source water protection area recognizes that the primary groundwater recharge areas for that municipal well should be protected from possible contamination. Source water protection areas take into consideration the groundwater flow direction and rate of flow through the different aquifer materials in order to determine those areas.

Groundwater Quality

Groundwater resources in Columbia County are, for the most part, of good quality but a significant number of wells show elevated levels of nitrate. Agriculture is the primary source of nitrate to groundwater; nitrogen fertilizers, manure, and other bio-solid applications to agricultural fields that doesn't get removed while growing crops drains to groundwater as nitrate. In other areas, septic system drain fields can also represent a source of nitrate to groundwater.

Twenty-one percent of private wells in Columbia County exceed the 10 mg/L nitrate-nitrogen drinking water standard. The extent of nitrate contamination is more noticeable in certain towns (Table 1). This is more than twice the 8.2% of private wells that exceed the nitrate standard statewide (DATCP, 2018).

Figure 3. Average nitrate-nitrogen concentration by section for Columbia County and surrounding areas. Sections not colored contain insufficient data to summarize. Source: WI Well Water Viewer. 2020. https://www.uwsp.edu/cnr-ap/watershed/Pages/WellWaterViewer.aspx



Approximately 90% of wells tested measured greater than 2 mg/L, which provides evidence that land-use activities are having a noticeable effect on private well water quality in Columbia County. Soil drainage properties combined with areas of concentrated agricultural land cover help to explain both the extent and magnitude of nitrate concentrations in Columbia County.

Table 1. Summary of nitrate-nitrogen data for Columbia County towns. Source: WI Well Water Viewer. 2020. https://www.uwsp.edu/cnr-ap/watershed/Pages/WellWaterViewer.aspx

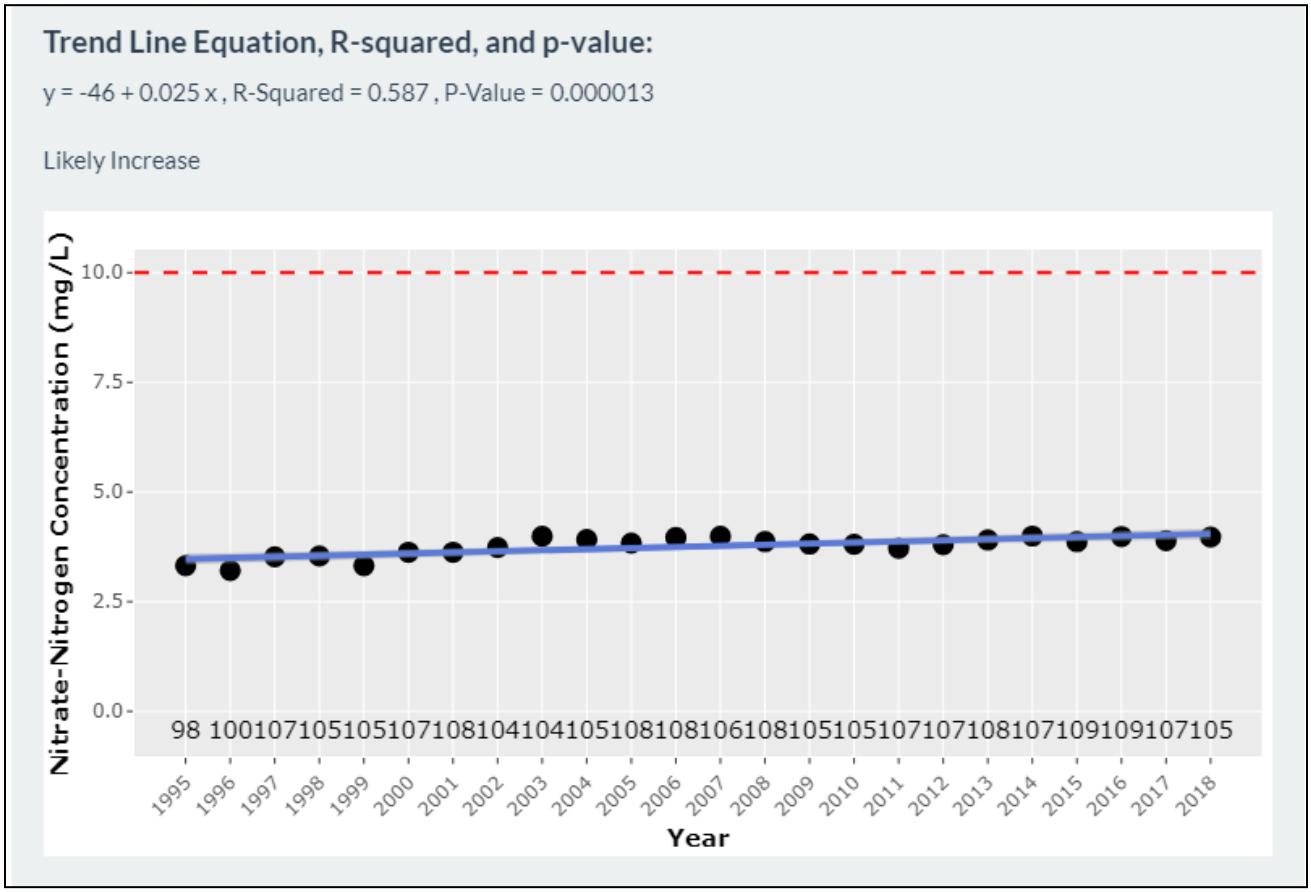
Municipality	Number of Samples	Minimum	Maximum	Mean	Median	% > 10 mg/L
T. of Arlington	144	<0.1	39.4	12.8	12.3	54
T. of Caledonia	333	<0.1	22.5	3.7	3	6
T. of Columbus	86	<0.1	43.3	5.2	2.9	17
T. of Courtland	66	<0.1	32.1	4.6	0.9	18
T. of Dekorra	501	<0.1	42.8	5.1	2.8	13
T. of Fountain Prairie	119	<0.1	17.4	3.2	0.6	10
T. of Ft. Winnebago	156	<0.1	20.1	4.5	3	9
T. of Hampden	75	<0.1	19.4	9	9.7	47
T. of Leeds	224	<0.1	43	13.4	12.7	66
T. of Lewiston	273	<0.1	21.8	3.7	1.6	13
T. of Lodi	291	<0.1	52.5	4.5	2.3	15
T. of Lowville	215	<0.1	34.7	8.5	7.8	29
T. of Marcellon	276	<0.1	36.2	8.9	7.1	38
T. of Newport	132	<0.1	22	5.1	4.9	13
T. of Otsego	96	<0.1	24.5	7.9	7.8	40
T. of Pacific	461	<0.1	29.2	3.7	2.5	7
T. of Randolph	177	<0.1	27.7	8	6.6	40
T. of Scott	124	<0.1	30.2	9.3	8.5	40
T. of Springvale	81	<0.1	29	7.5	6.9	30
T. of West Point	421	<0.1	21.8	4.3	3.2	11
T. of Wyocena	342	<0.1	35.7	4.5	3.3	10
Columbia County	**4,728**	**<0.1**	**52.5**	**6.0**	**4.0**	**21**

New wells with deeper casing may be an option to avoid elevated nitrate levels in parts of Columbia County. However, at Highway 60 and the 90/94 Interstate, drillers are installing as much as 400 feet of casing to reach safe water. Much of the usable aquifer is badly contaminated with nitrate in parts of Columbia County. There may come a time when there are no drilling solutions to the nitrate problem; therefore, efforts to help stabilize and eventually try to reduce nitrate losses to groundwater should be investigated and implemented when proven to be successful.

Nitrate Trends

Public water supply wells are required to be tested for nitrate on a regular basis. These results are reported to the WI Department of Natural Resources and serve as a valuable long-term dataset of nitrate water quality. These historical records can be used to assess how groundwater quality is changing in those areas where the wells are located. Wells with more than a 20-year record of nitrate concentrations was used to determine a long-term average trend for Columbia County nitrate concentrations. That information shows that nitrate concentrations in public water supplies have increased at a rate of 0.25 mg/L for the period from 1995-2018, with most of that increase occurring from 1995 to 2003. Since 2003 the county nitrate-nitrogen average has remained fairly stable.

Figure 4. Average nitrate-nitrogen concentration for all public water systems that have a testing history of 20 years or more. Number of wells used to calculate average listed above each year. Likely increase signifies a p-value less than 0.05 and a rate of change equal or greater than 0.025 (0.25 mg/L for a 10-year period). Data Source: WI DNR Groundwater Retrieval Network.

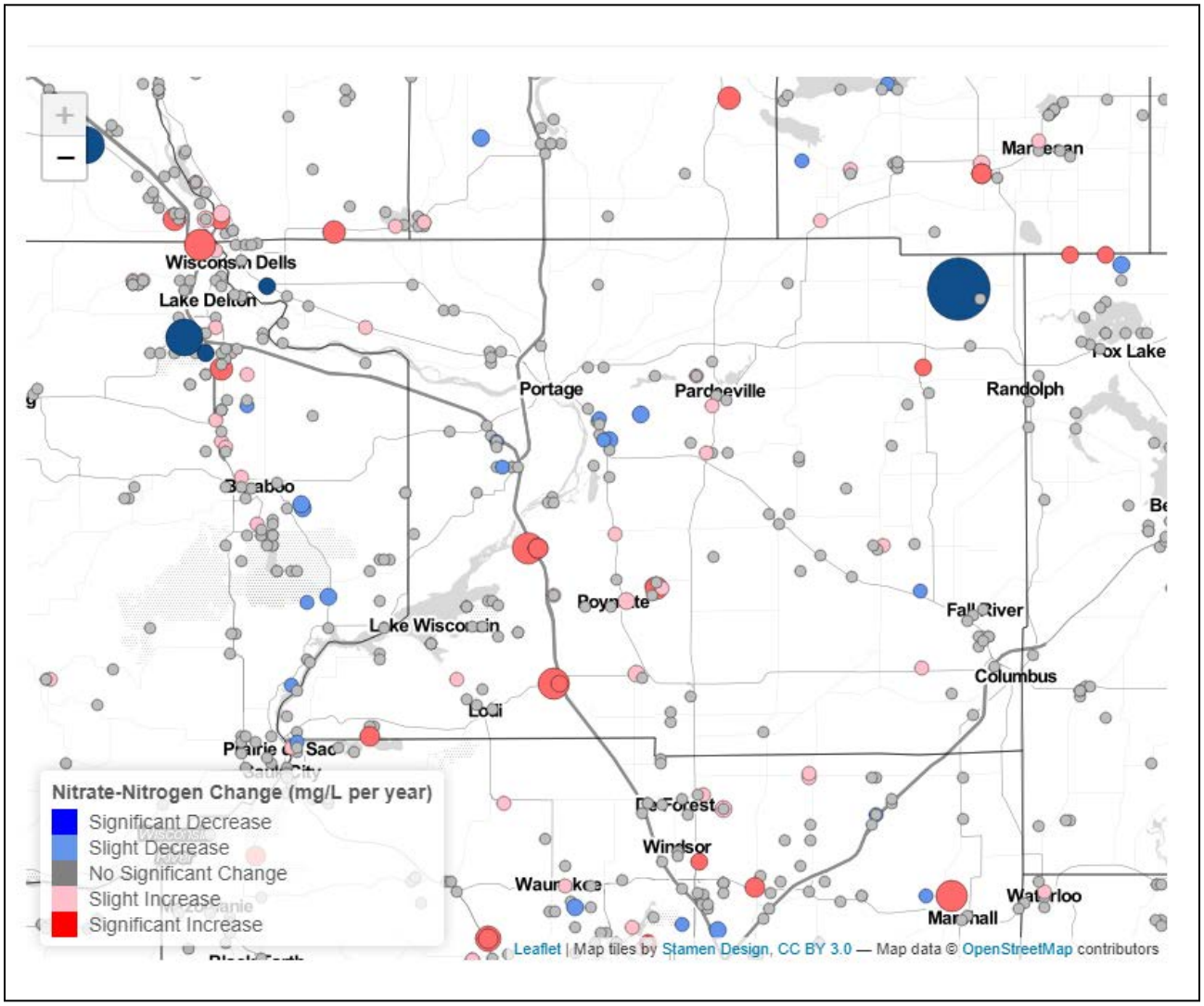


When looking at all public wells with more than 6 years of data, the majority of Columbia County public wells show no significant change. Twenty-two wells have shown increasing nitrate concentrations, while eleven wells show evidence of improvements or reductions in nitrate concentrations over time.

Table 2. Summary of public supply well data for all wells in Columbia County with more than 6 years of testing data and a sample submitted within the past 3 years.

Nitrate Trend	Number of Wells
Significant Increase (p-value <0.05 *and* rate of change > 0.025)	9
Slight Increase (p-value <0.05 *and* 0.01 > rate of change < 0.025)	13
No Significant Change (p-value > 0.05 *or* rate of change < 0.01)	122
Slight Decrease (p-value <0.05 *and* (-)0.01 > rate of change < (-)0.025)	9
Significant Decrease (p-value <0.05 *and* rate of change < (-)0.025)	2

Figure 5. Map showing general location of public water supply wells. Color indicates whether there is a significant change and if so, the magnitude and direction of the change. Source: Nitrate in Wisconsin Public Water Systems. 2020.



Groundwater Contamination Susceptibility

Figure X shows the groundwater contamination susceptibility within Columbia County. This WDNR map is a composite of the following five physical resource characteristics that are important in determining how easily a contaminant can be carried through overlying materials to groundwater:

> Depth to bedrock; type of bedrock; soil characteristic; depth to water table; characteristics of surficial deposits. This maps may be used in conjunction with high concentrations of agricultural acres to identify priority farms (see chapter 6).

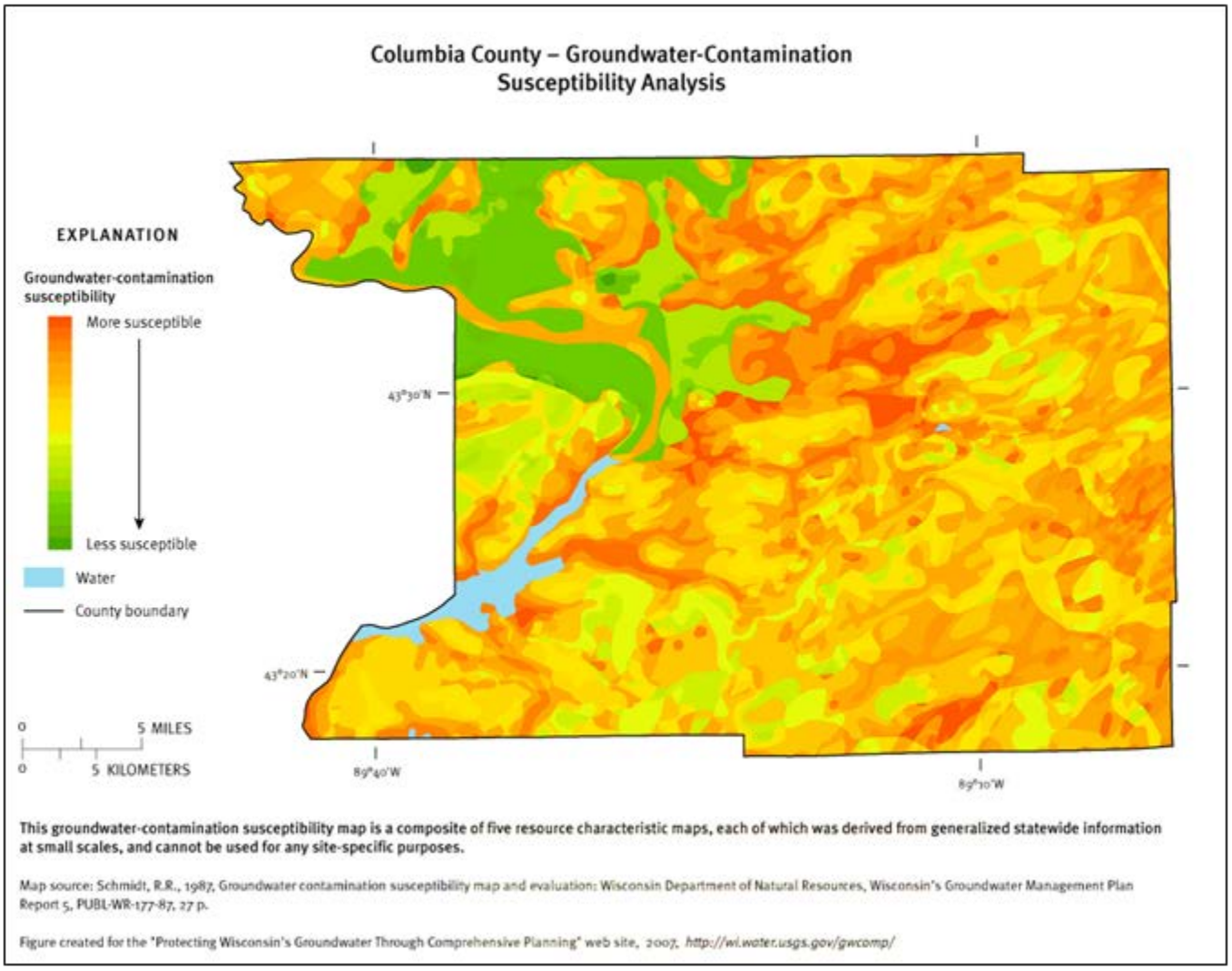


Figure X. Groundwater contamination susceptibility within Columbia County Source: WI Department of Natural Resources. 1987 - https://wi.water.usgs.gov/gwcomp/find/columbia/susceptibility.html.

Atrazine

Some wells in the county have tested above the state standard for atrazine levels. To help reduce the levels of atrazine in groundwater, Atrazine Prohibition Areas are identified in the county. This means in these areas no atrazine may be applied to the land. Columbia County has six Atrazine Prohibition Areas, equaling about 80,000 acres, in portions of Arlington, Leeds, Hampden, Marcellon, Caledonia, Courtland, Randolph, Lewiston, Fort Winnebago, Dekorra and Lowville Townships. For more detailed maps of the prohibition areas, see the Columbia County Land Conservation Department or Chapter ATCP 30 of the Wisconsin Administrative Code.

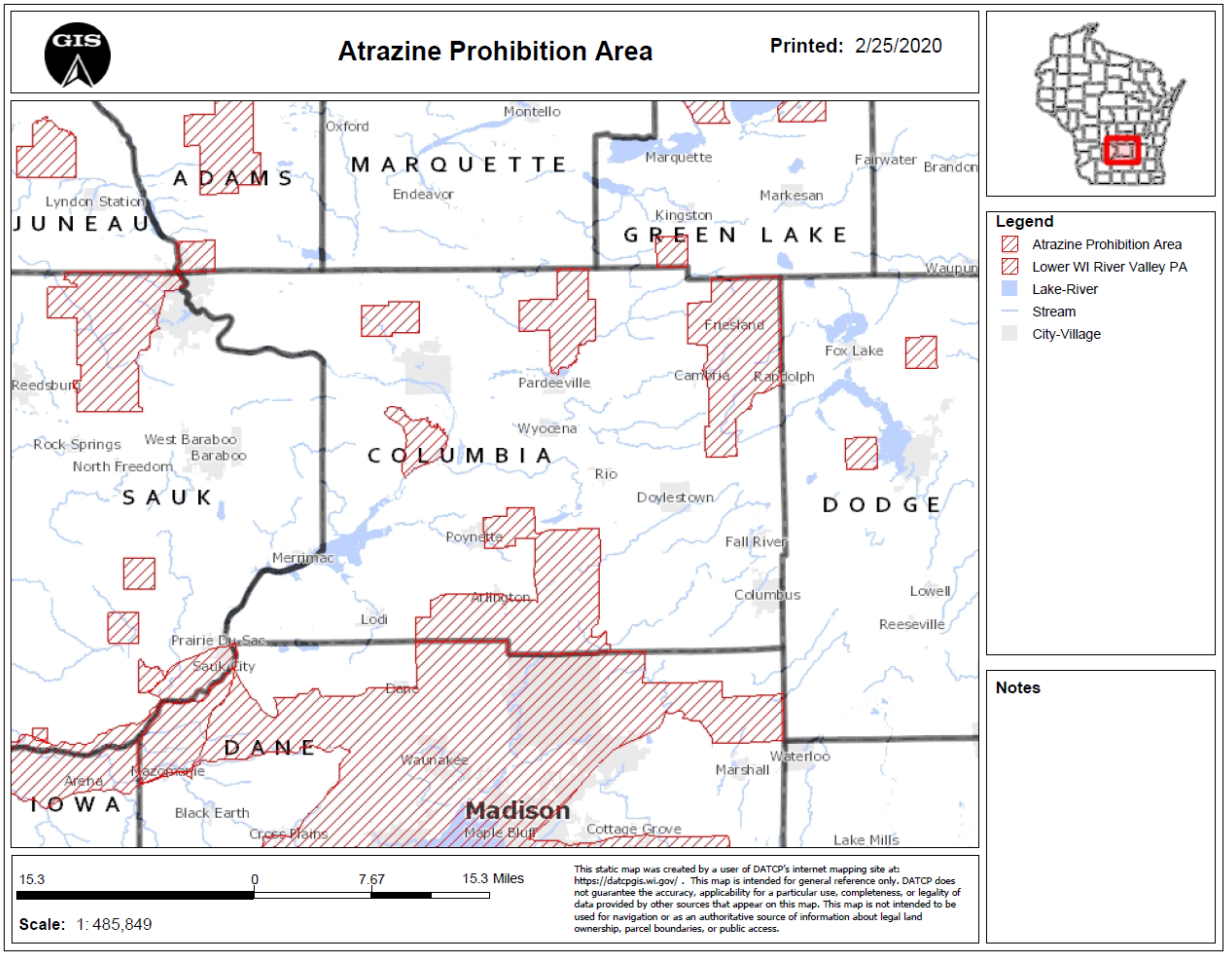


Figure 3. Map of atrazine prohibition areas. Source: WI Department of Agriculture, Trade and Consumer Protection. 2020 https://datcp.wi.gov/Pages/Programs_Services/Atrazine.aspx

General Groundwater Quality

Columbia County's groundwater can generally be characterized as slightly basic (mean pH = 7.96), hard water (mean total hardness = 308 mg/L as CaCO3), and high alkalinity (mean = 266 mg/L as CaCO3). Overall, the water on average is well balanced and aesthetically pleasing.

The aesthetic characteristics of the water are largely influenced by the geologic materials groundwater is stored and transported in. Groundwater in eastern Columbia County tends to be harder with slightly higher alkalinity. In western Columbia County, total hardness and alkalinity are generally lower, particularly areas west of the Wisconsin River. Water with total hardness concentrations and alkalinity greater than 200 mg/L as CaCO3 is likely to cause aesthetic problems, mainly scale formation. As a result, water softeners are expected to be common-place for most households in the county.

Chloride provides additional insight into the effects of land-use on water quality; background levels of chloride in groundwater are typically less than 10 mg/L. The mean in Columbia County is 30.5 mg/L; 54% of wells show levels greater than 10 mg/L suggesting land-use impacts. Elevated chloride concentrations are likely a result of agricultural activity (mainly potash fertilizers) and development density (i.e. roads and septic systems).

Table 2. Columbia County well water quality summary for other parameters. Source: WI Well Water Viewer. 2020. https://www.uwsp.edu/cnr-ap/watershed/Pages/WellWaterViewer.aspx

Parameter (units)	Number of Samples	Minimum	Maximum	Mean	Median	Exceed Health Standard
Alkalinity	1,715	No Detect	484	266	272	NA
Arsenic (ppb)	1,387	No Detect	247	2.0	No Detect	3%
Atrazine (ppb)	1,369	No Detect	20.5	0.6	0.1	ND
Chloride (mg/L)	1,717	No Detect	578	30.5	12.8	NA
Conductivity (umhos/cm)	1,713	37	2800	623	578	NA
Iron (mg/L)	779	No Detect	30.9	0.223	0.007	NA
Manganese (ppb)	977	No Detect	2746	19	No Detect	1%
pH (std units)	1,714	6.08	9.43	7.96	7.97	NA
Sulfate (mg/L)	959	No Detect	116	17.3	15.6	NA
Total Hardness	1,566	5	720	308	304	NA

NA Not Applicable – No health-based groundwater standard
ND Not able to be determined from the dataset

. **Information provided by Kevin Masarik, UW-Stevens Point & UW-Madison Division of Extension*

Surface Water Resources

Columbia County has numerous lakes, rivers and streams. The various lake types represented in the county are glacial, impoundments, excavations and oxbows. There are 56 lakes covering a total of 11,982 acres, Lake Wisconsin being the largest. The Fox, Baraboo, Wisconsin and Crawfish are the rivers that flow through Columbia County. There are also fifty miles of trout streams with ten miles being Class I trout streams (Prentice Creek, Roelke Creek and Rowan Creek). Many other streams, springs and ponds enhance Columbia County's water resources.

Outstanding Resource Waters and Exceptional Resource Water
The County has 1 lake and 46.48 miles of stream, creek and river listed as Outstanding Resource Waters (ORW's) and Exceptional Resource Waters (ERW's), by the WDNR.

Official Waterbody Name	Water Type	Mileage	ORW	ERW
Crystal Lake	Lake	0	x	
Prentice Creek	River	1.94		x
Rowan Creek	River	3.58		x
Rowan Creek	River	2.76		x
Rowley Creek	River	3.47		x
South Branch Duck Creek	River	1.45		x
Wisconsin River	River	33.28		x

**Information gathered from WDNR website.*

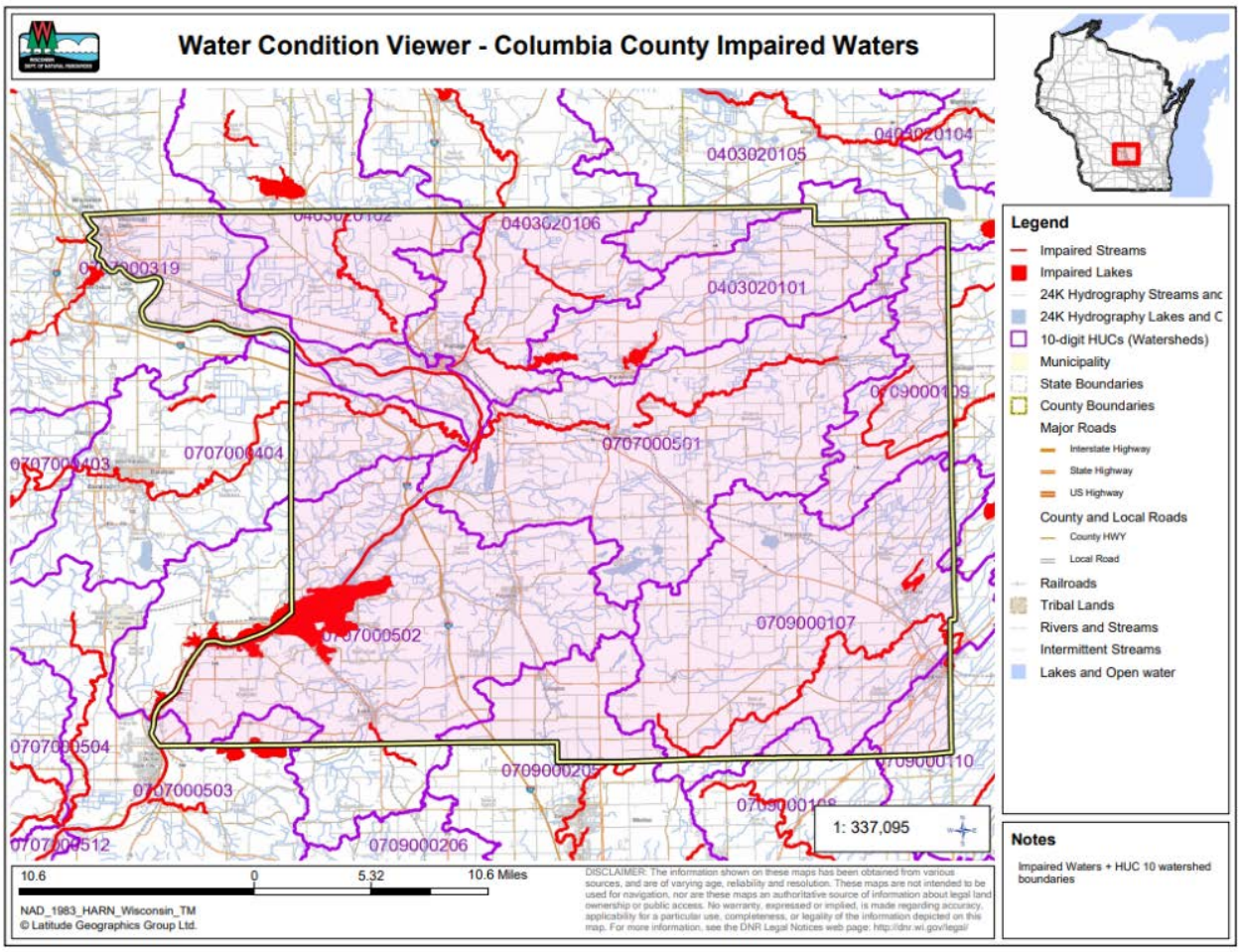
Impaired Water Resources
Section 303(d) of the Clean Water Act requires the State to prepare a list of impaired water bodies that will remain so even after the application of technology-based standards typically applied to point sources of pollution. The State is to identify the pollutants causing the problem, identify the sources of that pollution and develop a Total Maximum Daily Load (TMDL) of that pollution that a water body can receive and still meet water quality standards. The State is then required to set priorities for implementing strategies to meet the TMDL.

Official Name	Start Mile	End Mile	Water Type	County	Pollutant	Impairment	Status
Duck Creek	0.00	11.96	River	Columbia	Total Phosphorus	Impairment Unknown	TMDL Approved
Crawfish River	49.50	79.45	River	Columbia, Dodge	Total Phosphorus	Impairment Unknown	303d Listed
Big Slough	0.00	10.41	River	Columbia	Total Phosphorus	Impairment Unknown	TMDL Development
Beaver Creek	0.00	14.86	River	Columbia, Dodge	Total Phosphorus	Degraded Biological Community	303d Listed
North Branch Duck Creek	0.00	20.21	River	Columbia	Total Phosphorus	High Phosphorus Levels	TMDL Approved

Lake Wisconsin			Impoundment	Columbia, Sauk	Total Phosphorus	Low DO, Eutrophication, Recreational Restrictions - Blue Green Algae	TMDL Approved
Crystal Lake			Lake	Columbia, Dane	Total Phosphorus	High Phosphorus Levels	303d Listed
Park Lake			Lake	Columbia	Total Phosphorus	Eutrophication, Excess Algal Growth	TMDL Development
Lazy Lake (Fall R Millpond)			Lake	Columbia	Total Phosphorus	High Phosphorus Levels, Excess Algal Growth	303d Listed
Spring Creek	0.00	5.32	River	Columbia	Total Phosphorus	Impairment Unknown	TMDL Development
Baraboo River	0.00	28.16	River	Columbia, Sauk	Total Phosphorus	High Phosphorus Levels	TMDL Approved
Yahara River	47.02	63.02	River	Columbia, Dane	Total Phosphorus	Impairment Unknown	TMDL Approved
Unnamed	0.00	3.78	River	Columbia, Dane	Total Phosphorus	Impairment Unknown	TMDL Development
Lake Wisconsin			Impoundment	Columbia, Sauk	Mercury	Mercury Contaminated Fish Tissue	303d Listed
Wisconsin River	90.60	115.81	River	Columbia, Sauk	Mercury	Mercury Contaminated Fish Tissue	303d Listed
Wisconsin River	138.07	158.68	River	Adams, Columbia, Juneau, Sauk	Mercury	Mercury Contaminated Fish Tissue	303d Listed
Wisconsin River	115.81	137.63	River	Columbia, Sauk	Mercury	Mercury Contaminated Fish Tissue	303d Listed
Fox-Wis Portage Canal			Bay/Harbor	Columbia	Lead	Lead Contaminated Sediments	303d Listed
Fox-Wis Portage Canal			Bay/Harbor	Columbia	Mercury	Mercury Contaminated Sediments	303d Listed
Lake Wisconsin			Impoundment	Columbia, Sauk	PCBs	PCBs Contaminated Fish Tissue	303d Listed
Wisconsin River	90.60	115.81	River	Columbia, Sauk	PCBs	PCBs Contaminated Fish Tissue	303d Listed

Fox River	145.65	162.10	River	Columbia, Marquette	PCBs	PCBs Contaminated Fish Tissue	303d Listed
Fox River	162.10	166.56	River	Columbia	PCBs	PCBs Contaminated Fish Tissue	303d Listed
Columbus Mill Pond			Impoundment	Columbia, Dodge	PCBs	PCBs Contaminated Fish Tissue	303d Listed
Wisconsin River	138.07	158.68	River	Adams, Columbia, Juneau, Sauk	PCBs	PCBs Contaminated Fish Tissue	303d Listed
Wisconsin River	57.66	90.60	River	Columbia, Dane, Iowa, Sauk	PCBs	PCBs Contaminated Fish Tissue	303d Listed
Wisconsin River	115.81	137.63	River	Columbia, Sauk	PCBs	PCBs Contaminated Fish Tissue	303d Listed
Fox-Wis Portage Canal			Bay/Harbor	Columbia	PCBs	PCB Contaminated Sediments, PCBs Contaminated Fish Tissue	303d Listed
Crawfish River	49.50	79.45	River	Columbia, Dodge	Sediment/Total Suspended Solids	Degraded Habitat	303d Listed
Rowan Creek	0.00	10.41	River	Columbia	Sediment/Total Suspended Solids	NA	Water Delisted
Park Lake			Lake	Columbia	Sediment/Total Suspended Solids	Eutrophication	TMDL Development
Yahara River	47.02	63.02	River	Columbia, Dane	Chloride	Chronic Aquatic Toxicity	303d Listed
Swan Lake			Lake	Columbia	Unknown Pollutant	Excess Algal Growth	303d Listed

Source: WNDR Impaired Waters Search Tool



Source: WNDR Water Condition Viewer
**Information gathered from WDNR website.*

Wetland Resources

A Wisconsin Wetland Inventory has been conducted for Columbia County based on 1978 to 1979 aerial photography and a minimum size of 5 acres. This inventory identifies 74,921 acres of wetland distributed throughout the county. Acreage is not available for wetlands less than 5 acres in size. The wetland areas documented in the late 1970's are probably less than half the total wetland acreage that existed in the county prior to the late 1800's.

Three wetland habitat types are found in Columbia County; the Emergent Wetland, the Scrub-shrub Wetland and the Forested Wetland. Each of these represents a unique ecosystem based on hydrologic conditions, vegetation and location in relationship to other wetlands, drier upland sites, or adjacent water bodies.

Many large wetland complexes are associated with the stream and river systems. These include the Wisconsin River, Fox River, Baraboo River, Crawfish River, Neenah Creek, French Spring Creek, Duck Creek, Rowan Creek, Rocky Run Creek, Hinkson Creek, Lodi Spring Creek, Prentice Creek, Rowley Creek and Beaver Creek. Several large wooded tamarack type wetlands include the Lewiston Marsh,

Big Slough and Hampden Marsh. There are numerous large, shallow to deep self-contained wetlands that include Mud Lake, Grassy Lake, Schoeneberg Marsh, Goose Pond, Swan Lake, Weeting Lake and Corning Lake. Several other large, shallow to deep wetlands that are impounded include French Creek, Park Lake, Wynona Lake and Lazy Lake.

Much of the wetland drainage in the county has been a result of attempts to increase acreage suitable for agricultural production and filling for urban development. This has resulted in degraded water quality; loss of natural filtration and storage areas, increased localized flooding and loss of important fish and wildlife habitats. Deep, organic soil wetlands of significant acreage were drained for organic or "muck" farming operations. However, the trend seems to be turning.

In recent years, some areas have been removed from cropland production and entered into the "Wetland Reserve Program." This is a voluntary program offering landowners the opportunity to protect, restore and enhance wetlands on their property. ***Since 1992 the Agricultural Conservation Easement Program (ACEP) formally the "WRP" program has worked with over 75 Columbia County landowners to restore over 7300 acres of wetland habitat.***

In addition to providing habitat for fish, waterfowl and other wildlife species, the remaining wetlands are very important for recharging of aquifers and the protection of groundwater quality. Wetlands are extremely efficient at trapping and filtering out nutrients and sediments contained in runoff and they provide highly effective flood storage areas. It is critical the remaining wetland resources in Columbia County are protected from further destruction. Restoration of previously drained wetlands should be encouraged. Existing county, state and federal regulatory protection mechanisms need to be integrated and enforced to a greater extent than they are now. In addition, technical and financial resources for stream bank and shoreline erosion control measures need to be expanded to ensure the protection of wetlands adjacent to lakes and rivers.

Purple loosestrife, hybrid cattails and the non-native phragmites are invasive exotic plant species, which currently threatens the quality of our wetlands. Purple loosestrife invades wetlands and shades out most native vegetation. It drives marsh wrens and least bitterns completely from the wetland and the numbers of muskrats and waterfowl decrease dramatically. All three species result in the elimination of our diverse wetland vegetation and any endangered or threatened plant species that may exist there. One way to protect wetland is to stop the encroachment by invasive species.

**Information gathered from multiple sources including: State of Basin Reports for Lower Wisconsin, Upper Fox and Rock River, 1978 Soil Survey of Columbia County and Priority Watershed Plans for Columbia County.*

Wildlife Resources

Columbia County has a very diverse landscape that entails excellent farmland, numerous lakes, streams, wetlands and significant woodlands. The total acreage of the county is 495,300 acres, of which cropland comprises 275,000 (55%), woodlands 98,000 (19%) and wetlands (i.e. farmed and unfarmed) 76,000 (15%). Such a composite mixture means significant habitats exist for numerous wildlife species. Wildlife populations include, waterfowl, deer, turkey and many small game species (squirrel, rabbit, pheasant, etc.) and fur-bearing animals (fox, coyote, muskrat, mink, racoon, beaver, otter, etc.).

The lakes, wetlands, rivers and stream tributaries of Columbia County have provided a prime waterfowl habitat for centuries. The Department of Natural Resources has established several large wetland areas and stream tributary systems as state-owned wildlife area projects. Also, under the Waterfowl Production Area Program, the U.S. Fish and Wildlife Service has protected some smaller wetlands through land acquisition. These areas and private lands, provide very good duck hunting opportunities during the fall season for primarily mallards, blue-winged teal and wood ducks. Significant numbers of migrating Canada geese use private farm lands for feeding and resting during the fall and spring migrations. Resident Canada geese populations have been steadily increasing. Agricultural crop loss claims for goose damage are increasing and 5-10 shooting permits have been issued annually in the last ten years.

The diverse landscape with its mixture of wildlife habitats has allowed for an excellent deer population to develop. The county has regularly been among the Wisconsin top twenty counties for annual deer harvest during the past ten years, with the harvest range being 5,000 to 12,000 animals. In the past few years, many landowners and hunters have become more selective when taking antlered deer. Yearling bucks are being bypassed with the intent for those animals to become two or three-year-old animals (or older) and thus allow for greater antler development as "trophy sized" animals. Also, without the Earn-A-Buck (EAB) program in place, many hunters are opting to shoot less does, and in the past five years, overall harvest has been hovering between 5,000 to 7,000 animals.

With this plenty comes problems. The whitetail deer population in Columbia County has remained high in many areas, well over population goals. Agricultural crop loss claims and deer shooting permits (10 to 20 per year) are issued annually. Coincidentally, in 2002 a fatal deer disease "Chronic Wasting Disease" (CWD) was found in the deer population of southern Wisconsin. This included a CWD positive deer in southwest Columbia County. Since then, ten townships in the county have had deer test positive for this disease, with West Point, Lodi, Caledonia and Dekorra townships showing the highest prevalence rates.

The rich woodland resources of the county also provide excellent habitat for the reintroduced wild turkey. Wild turkeys have been restored to the county and are common throughout. Spring and fall turkey hunting seasons provide considerable hunting opportunities.

The eastern and southern parts of Columbia County were historically part of a prairie grassland environment that covered much of southern and eastern Wisconsin. Large acreages of grasslands are disappearing quickly in the county with a loss of CRP acreage/conversion to row cropping. Grassland birds, such as pheasants, are losing habitat and their numbers are declining. This issue is not exclusive to Columbia County as this trend is happening across the country.

The county also has many special "concern resources" that require protection and recognition in planning and implementing land and water resource management. Many natural communities exist around the county associated with private and public lands and the waters of the county. These include various wetlands, prairie and forest and oak-savanna communities. There are multiple species of both flora and fauna that are either listed as state or federally endangered or threatened.

However, there are success stories of species coming off the endangered/threatened lists. In the the first Breeding Bird Atlas conducted from 1995 to 2000 there was only one pair of bald eagles and no ospreys nesting in Columbia County. In Breeding Bird Atlas II (2015-2019) there were 15 bald eagle pairs and

around 19 pairs of ospreys confirmed nesting in the county. Seven of the eagle pairs were found on State Wildlife Areas, a federal Waterfowl Production Area, and on Wetland Reserved Program land. In addition to eagles being close to the Wisconsin River and larger bodies of water they are nesting in woodlots far from water and probably making part of their living from road kills. Ospreys are very adaptable and some nests have been far from waters containing fish. All osprey nests have been on man-made structures including power lines (some with nest platforms), communication towers, and nesting poles with platforms. One osprey nest is in the city of Portage on a communications tower and another nest is in Pardeeville at the high school on stadium lights.

Along with some of these large birds of prey establishing breeding territories in southern Wisconsin, in the past 5 years there have been more frequent sightings of black bear and timber wolves here in Columbia County. There is confirmation of a breeding timber wolf pack in the county. There has been evidence of a few single black bears living in the county through the winter, but no indication yet of sows with cubs. Most of the known resident bear and wolves are in the northern portion of the county, however each year there are sightings of both species in southern Columbia Co. Most of these sightings occur in late spring or early summer seasons. In most cases these animals are 1 to 2 years old and most often males that have been forced from the maternal family group. Mostly they appear to be searching for new territories in these nomadic movements and generally don't stay in the area long. However, if those populations continue to increase these sightings will likely occur on a more continuous basis in southern Columbia County.

**Information provided by Sara Kehrli, WDNR Wildlife Biologist for Columbia County.*

Forestry Resources

Forested land comprises about 94,100 acres or approximately 19% of the land area of Columbia County. The acreage by forest types is as follows:

Oak & Hickory	72,589
Oak & Pine	2,311
Pine	10,716
Elm, Ash, Cottonwood	9,943
Maple & Basswood	6,507
Aspen	1,527

County growing stock is estimated at 162,504,603 cubic feet and saw-timber at 595,805,500 board feet. Quality of woodlands, like the soils of the county, vary from excellent to poor.

The demands on county woodlands continue to increase on many fronts. Development for housing, recreation, and the clearing of small forested tracts for agriculture are all adding to the pressure on the remaining woodlands. Insect pests and tree diseases also threaten county woodlands. It has been quite a few years since a gypsy moth outbreak, but future outbreaks are still possible. Emerald Ash Borer has infested most ash trees in the County. Wide spread mortality of ash will occur over the next five years, nearly eliminating ash from the landscape. The areas that are being hit the hardest are those with the highest forest composition of ash. These locations tend to be low lying areas prone to frequent flooding. Re-foresting these areas will be challenging due to the fluctuating water tables, invasive species, and lack of water transpiration with the loss of the ash trees. Silver maple, river birch, red maple, swamp white oak, tamarack, and sycamore are possible options for reforestation of these areas. Oak wilt continues threatening our forests, especially when oaks are damaged or cut during the growing season.

Two lined chestnut borers are a threat to oaks as well, causing stress, mortality, and symptoms similar to oak wilt. Bur oak blight is another threat to the old prairie oaks scattered in the county. There are a host of insects and diseases on the horizon that threaten Columbia County woodlands as well that we are keeping an eye out for. Maintaining healthy forests and keeping a vigilant eye out for forest health issues is our primary defense.

The greatest threat to the woodlands of Columbia County are the wide spread invasive plants, shrubs, and trees. Buckthorn, honeysuckle, garlic mustard, and reed canary grass are presenting the biggest issues on the landscape in the county. The dense canopy created by these plants displaces native vegetation and prevents desirable seedlings from establishing. A substantial portion of the oak forests in the county are over 150 years old and starting to die out. If an understory of invasives is present, most trees are unable to compete and re-forest these stands. Over time, we will see a continued decline of the forests due to the heavy understories of invasives. New invasives are being recognized or discovered in the County as well. Phragmites and Amur Cork Tree are two invasives that have been identified and are spreading. Preventing invasives from becoming established is the most effective means of control. Once invasives are established, eradication is usually not feasible. Control is the best outcome at that point. Controlling invasives long enough to establish new saplings is very labor intensive and expensive to achieve. The one-two punch of well-established invasives and high levels of deer browse are the greatest challenges the woods of Columbia County faces currently. Grant programs are offered through the State and Federal Government for invasive control to Landowners that have sustainable forestry management plans.

The DNR's Managed Forest Law Program (MFL) is widely used and accepted within the county to gain valuable long-term forestland management. The MFL program has encouraged the regeneration of earlier successional forest types such as aspen and oak. These younger forest types are highly valuable for wildlife along with aesthetics and timber value.

The forestry resource in Columbia County as well as statewide has forest succession occurring. The forests are heading from an oak/hickory cover type to a maple climax forest. This in turn, will cause a shift in wildlife species. Wildlife managers agree maple tree species offer very little wildlife value. Exotics such as buckthorn, black locust, honey suckle, autumn olive, garlic mustard, and over browsing by deer is hindering all facets of the forest resource throughout Wisconsin.
Domestic timber markets and foreign exports play a strong role in forestry as well. Forestry management becomes an expense if there are no markets for forestry products or Loggers to conduct the harvests. Global markets have made timber prices and demand highly volatile and competition for the markets fierce. The demand for wood products from Wisconsin Paper Mills are a key component to keeping forests healthy and productive. The loss of pulpwood markets would be detrimental to sustainable forestry management not only in Columbia County, but across Wisconsin.

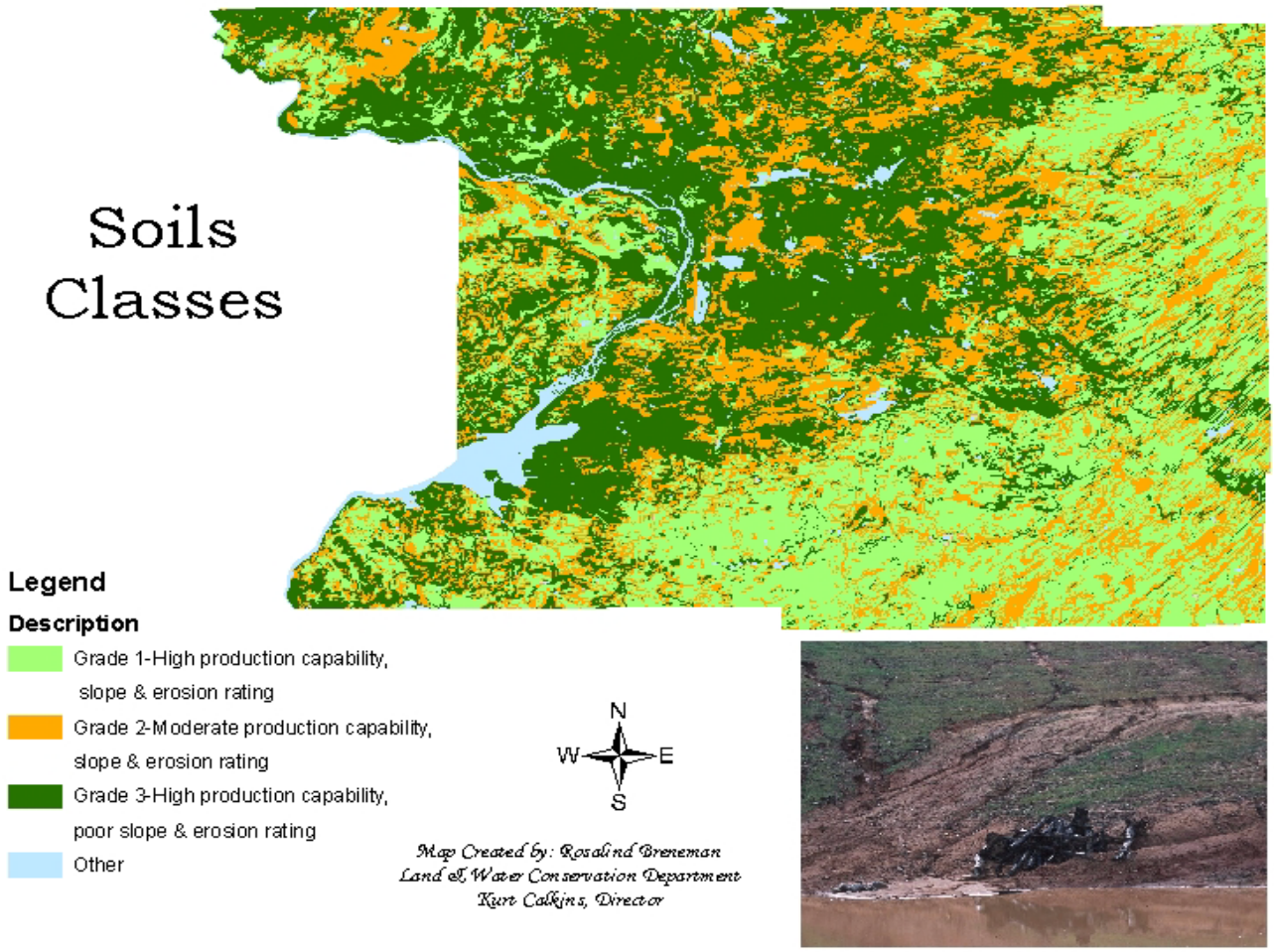
There has been forestry assistance available to forest landowners of Columbia County for decades. The Wisconsin DNR has renewed its efforts to reach unengaged forest landowners in Columbia County and across Wisconsin. Many Private Forestry Consultants and a handful of Timber Buyers with quality reputations serve Columbia County as well. Non-profit organizations such as the Wisconsin Woodland Owners Association and the Aldo Leopold Foundation provide networking, information, and workshops for woodland landowners. The opportunities are present for landowners. The challenge is reaching the public with those opportunities. How people receive their information continues to change at an increasing pace. Business, Government, and Non-Profits need to adapt to those changes.

Maintaining a diverse and healthy forest across Columbia County will make them more resilient to the changes to come over the next decade and beyond.

**Information provided by Dylan Bell, WI DNR Forester Columbia County.*

Mineral Resources

Mineral resources are abundant and contributed substantially to the development of Columbia County. - Large deposits of dolomitic limestone are available and are used for agricultural lime, road paving and riprap. The glacier deposited large volumes of sand and gravel utilized for road construction and building construction. Southeast of Portage, silicone sand is mined and shipped to foundries for casting molds. Currently Columbia County has 20 operators working 38 open mines on 784 acres. In total there are 2,450 acres approved to be open for mining. There is growing concern for increasing the oversight and management of these active and inactive mines. Utilization of a sound process to assure long term compliance and rehabilitation will be very important for Columbia County.



Soils

Individual soil types, with specific and unique characteristics, directly influence land uses. There are 69 different soil types are found throughout Columbia County. These are grouped into 11 major soil associations that have distinctive soil patterns, relief and drainage features. The Columbia County Soil Survey contains detailed descriptions for each soil type, including information of suitability and limitations for various types of land use and land management. The Columbia County Land and Water Conservation Department extensively uses the soils information. The availability and utilization of the Digital Soils Survey through our GIS system has made access to this information more useful.

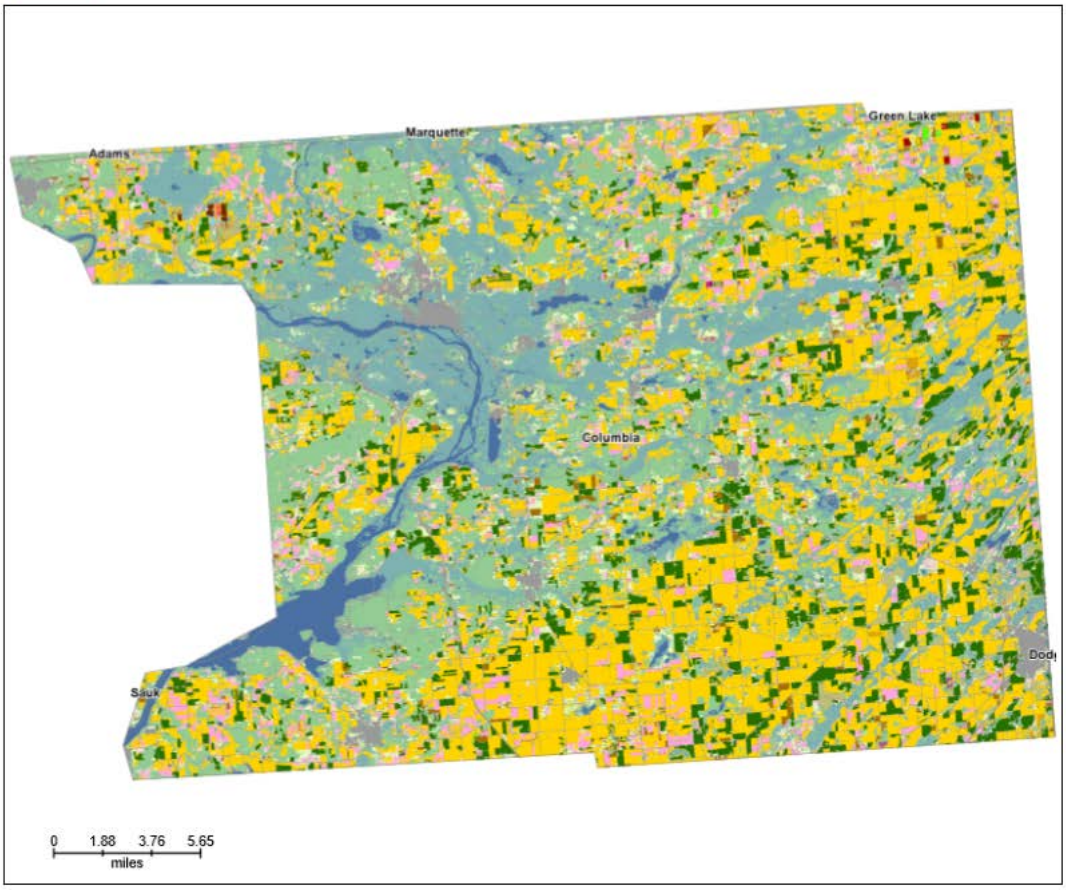
Soil Associations

- Plano-Griswold-Saybrook association: Well drained and moderately well drained silty soils that have silty or loamy subsoil; underlain by sandy loam glacial till.
- St. Charles-Ossian-Dodge association: Well drained, moderately well drained and poorly drained silty soils that have silty subsoil; underlain by sandy loam glacial till or silty sediment.
- Mt. Carroll-Seaton-Dresden association: Well drained and moderately well drained silty and loamy soils that have silty or loamy subsoil; underlain by stratified silt and sand, silty sediment, or stratified sand and gravel.
- McHenry-Baraboo-St. Charles association: Well drained and moderately well drained silty soils that have dominantly silty subsoil; underlain by sandy loam glacial till or quartzite bedrock.
- Plainfield-Okee association: Excessively drained and well drained sandy soils that have sandy or loamy subsoil; underlain by sandy sediment or sandy loam glacial till.
- Boyer-Oshtemo-Dresden association: Well-drained sandy and loamy soils that have a loamy subsoil; underlain by sand or stratified sand and gravel
- Oshtemo-Plainfield-Briggsville association: Excessively drained to moderately well drained sandy and loamy soils that have a sandy, loamy or clayey subsoil; underlain by sandy sediment, sand and gravel, or clayey sediment.
- Lapeer-Wyocena association: Well-drained loamy and sandy soils that have a loamy subsoil; underlain by sandy loam or loamy sand glacial till.
- Grellton-Gilford-Friesland association: Well drained, moderately well drained and poorly drained loamy soils that have a dominantly loamy subsoil; underlain by sandy loam glacial till, stratified silt and sand, or silty sediment.
- Granby-Alluvial land, loamy, wet-Morocco association: Somewhat poorly drained to very poorly drained sandy soils that have a sandy subsoil and are underlain by sandy sediment; and loamy alluvial land.
- Houghton-Adrian-Palms association: Very poorly drained organic soils; underlain in places by sandy or loamy sediment

Agricultural Land Use

Using CropScape - http://nassgeodata.gmu.edu/CropScape - the following maps and data describe Agricultural land use with Columbia County, as of 2019. Approximately 267,000 acres out of a total of 505,650 total acres within Columbia County are under agricultural production. The top four crops grown are: corn, soybeans, alfalfa hay and grass/pasture.

CDL2019 Area of Interest



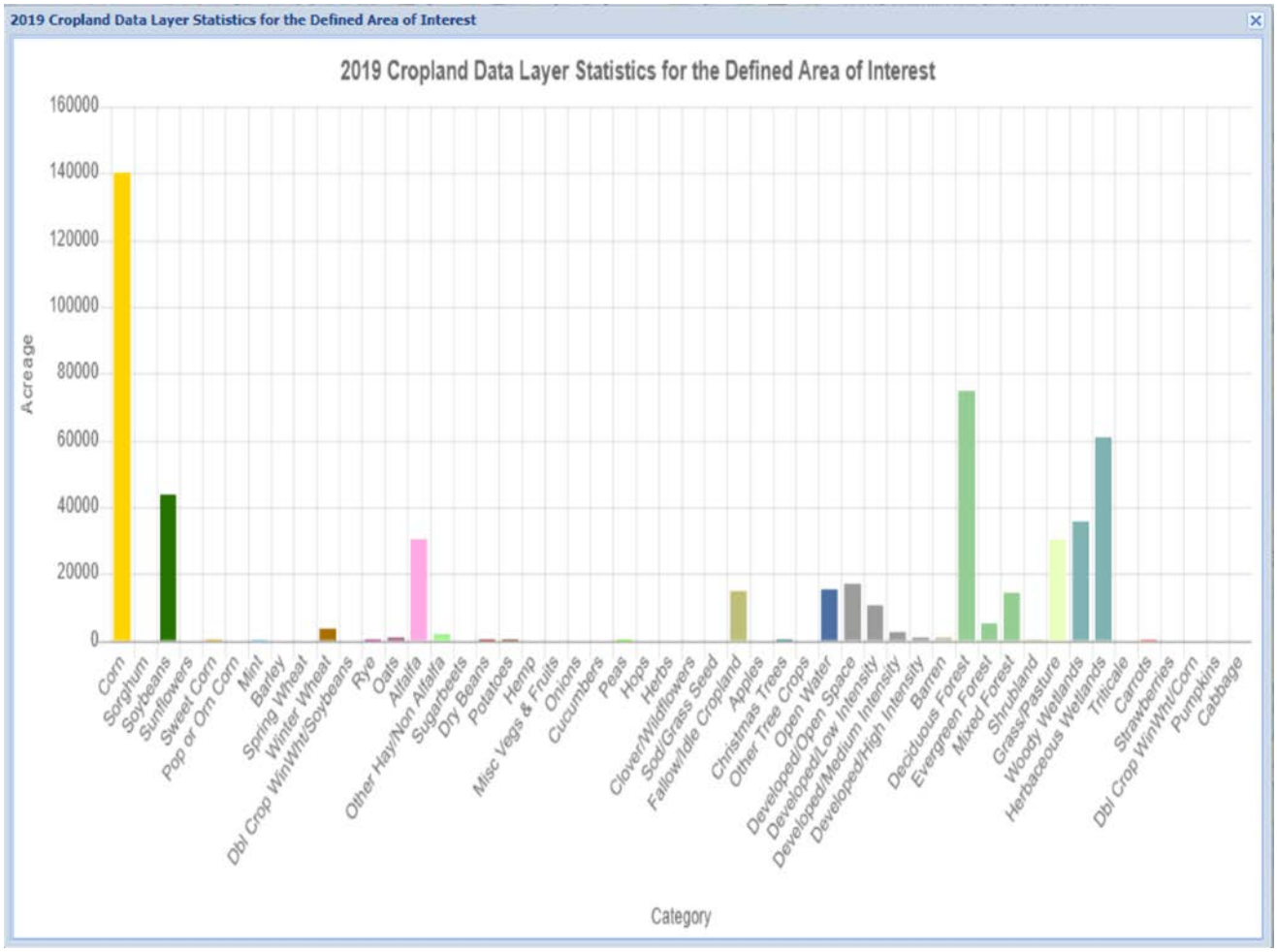
Land Cover Categories
(by decreasing acreage)

AGRICULTURE*
- Corn
- Soybeans
- Grass/Pasture
- Alfalfa
- Fallow/Idle Cropland
- Winter Wheat
- Other Hay/Non Alfalfa
- Oats
- Sweet Corn
- Potatoes
- Dry Beans
- Peas
- Mint
- Rye
- Christmas Trees
- Carrots

NON-AGRICULTURE**
- Deciduous Forest
- Herbaceous Wetlands
- Woody Wetlands
- Developed/Open Space
- Open Water
- Mixed Forest

Produced by CropScape - http://nassgeodata.gmu.edu/CropScape

Top 16 agriculture categories / Top 6 non-agriculture categories listed



Crop	Acres
Corn	140,310
Soybeans	43,556
Grass/Pasture	30,530
Alfalfa	30,259
Fallow/Idle Cropland	14,542
Winter Wheat	3,498
Other Hay/Non Alfalfa	1,707
Oats	851
Sweet Corn	472
Potatoes	305
Dry Beans	303
Peas	221
Mint	107
Rye	107
Christmas Trees	105
Carrots	86
Onions	41
Other Crops	87
Total	**267,087**

Compiled 1978 – Soil Survey of Columbia County, Wisconsi

Chapter 5. Basin Summaries

Lower Rock River Basin

The Lower Rock River Basin is located in the Rock River TMDL.
The Rock River TMDL was officially approved by the USEPA in September of 2011. The TMDL establishes the amount of Total Phosphorus (TP) and Total Suspended Solids (TSS) a waterbody can receive and still meet water quality standards in the Rock River Basin. The TMDL will help serves to restore impaired waters and protect downstream receiving waters so they meet applicable water quality standard.

Yahara River/Lake Mendota Watershed:

General Characteristics:

The Yahara River/Lake Mendota Watershed is in the south-central portion of the county. The watershed lies within the Lower Rock River Basin and has a drainage area of 230 square miles. Of this about 205 square miles (88%) of the watershed are in Dane County and 28 square miles (12%) are in Columbia County. The townships of Leeds and Arlington contain approximately 14,196 acres that are in the watershed. The township of Arlington, including the village of Arlington, is one of the top 5 townships for growth in Columbia County. This growth may affect land use along with nutrient and sediment loading in the future.

The Yahara River/Lake Mendota Watershed was selected as a priority watershed project in 1993; planning and inventory began in 1994. Inventory results have shown sediment and nutrient delivery from both agricultural and urban sources to be the most significant nonpoint sources of pollution in the watershed; delivery from agricultural sources is the most significant in Columbia County. The watershed plan was approved April, 1997. Signing of landowner cost-share agreements for installation of Best Management Practices (BMP's) was initiated in June of 1998. The watershed project is projected to continue through the year 2009 and will officially expire in 2019.

Agriculture is the main land use in the watershed. In Columbia County 12,405 acres of the 14,196 acres, or about 87% of the land, is agriculture. Most of the agriculture is cash grain farming, vegetable crops for the canning industry and dairy farming.

Note: Assessment Information was compiled from use of current reference materials such as WDNR Basin Plans, Priority Watershed Plans and other current applicable data sources. This information was reviewed and discussed with local WDNR Basin Coordinators and in the field WDNR fisheries staff. We feel based on this combination of reference sourcing, we are providing a detailed up to date assessment of our current resource conditions.

Assessment of Main Tributary Resources:

Goose Lake:

Goose Lake or Goose Pond, as is commonly known, is located in the northern portion of the Yahara River & Lake Mendota Watershed. It is in the townships of Arlington and Leeds and covers about 9.1 square miles. Goose Pond is listed as a sub watershed and because of being internally drained, it does not impact the water quality of the other sub watersheds. Goose Pond

is approximately 60 acres in size with a maximum depth of 7 feet. The watershed area that drains to Goose Pond is primarily agriculture, with the land use being dominated by cash grain operations. Prairie wetlands like goose pond benefit from drought about 1 in 10 years.

Several factors are affecting the water quality of Goose Pond. Goose Pond water levels have fluctuated from dry to normal to high over recent years. Other factors include destruction of wetlands for agricultural uses, sediment and nutrient loading from agricultural runoff and abundant macrophyte growth. Fish are fathead minnows and in high quality waterfowl wetlands thare are no fish.

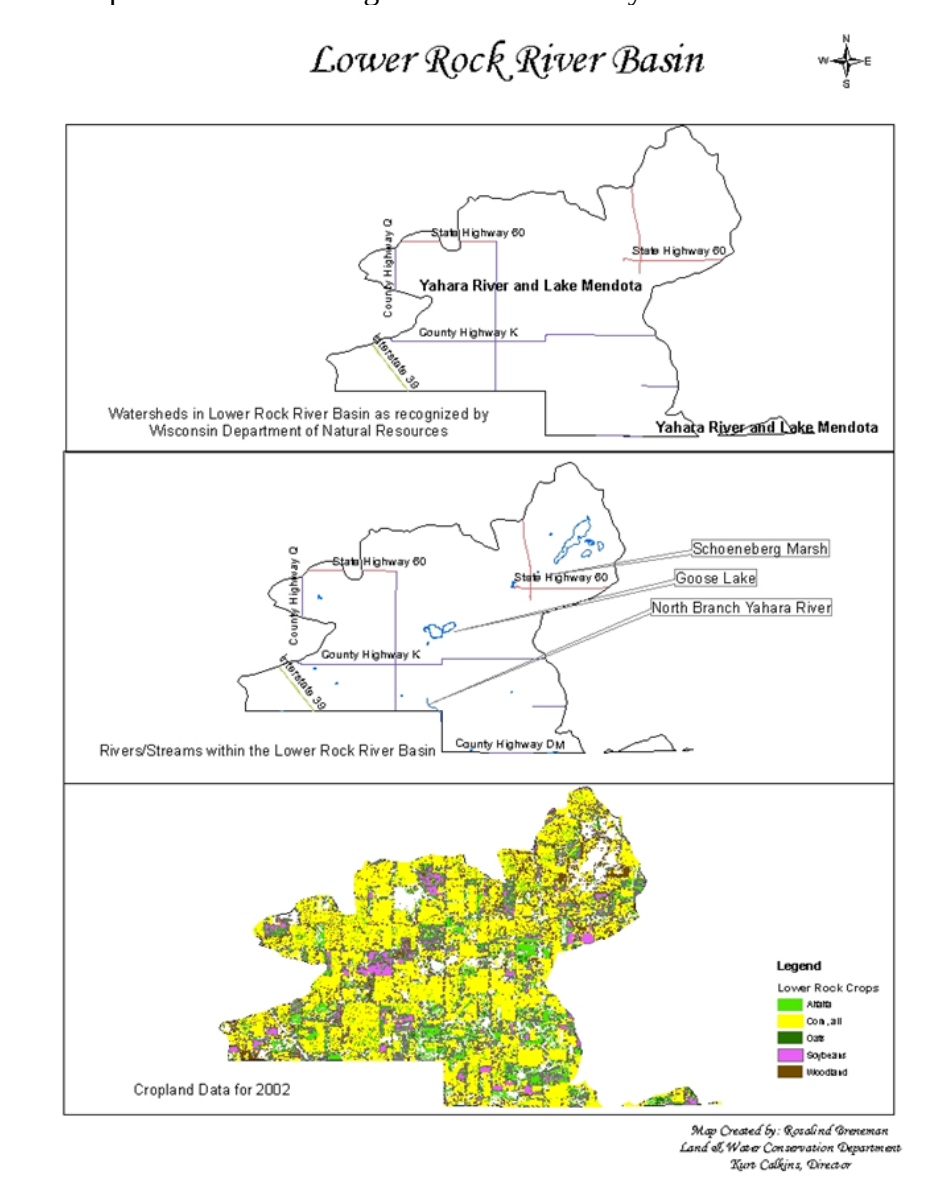
Schoeneberg Marsh: (2,797 ac.)
The marsh is located in the northern part of the Yahara River/Lake Mendota Watershed, in the Township of Leeds and covers about 4.4 square miles. It also is an internally drained sub watershed and does not impair water quality of adjacent sub watersheds. The open water area of this wetland is approximately 120 acres and has a maximum depth of 3 feet. Schoeneberg Marsh is classified as a deep-water marsh. The United States Fish and Wildlife Service and Madison Audubon have concentrated on establishing grasslands and legume cover around the perimeter of the wetland. The major source of sediment and nutrient loading is from agricultural activities. There is a grassed waterway on the northwest corner of the wetland and tiled water from the south are the main source of nutrient loading whereas, the rest of the perimeter is considered well buffered and stable.

North Branch Yahara River:
The North Branch of the Yahara River flows through the southern portion of the watershed in Columbia County and into Dane County. It is located in the townships of Leeds and Arlington and covers about 14.5 square miles in Columbia County. The Yahara River originates in the lower portion of Columbia County and flows southward through Deforest, Windsor and eventually into Cherokee Wetland and Lake Mendota in Dane County. Columbia County's portion of the watershed contains no surface water, only intermittent streams. The major sources of nonpoint pollution are nutrient and sediment loads caused by agricultural practices.

The State of Rock River Basin Report completed April, 2002 (Pub WT-668-2002)

WDNR Basin Recommendations and Priorities:
- Increase citizen participation in water quality through information and education efforts
- Implement basin-wide stream water quality monitoring
- Develop new financial incentives to restore wetlands
- Promote wise land use planning to support Smart Growth
- Increase utilization of Stormwater Management Programs
- Promote CRP, CREP and WRP
- Encourage Whole Farm Conservation Planning
- Education related to nutrients and lawns, storm drains and septic systems
- Establish 40,000 feet of shoreland buffers and 1,500 acres of wetland restoration
- Identify and prioritize shoreland and wetlands in need of protection
- Restore 100 acres of oak savannahs and prairies in basin
- Increase monitoring efforts related to resource protection benefits
- Identify streambank protection sites

- Address gully, rill and sheet erosion on agricultural lands
- Increase local ordinance protection and enforcement of construction site erosion
- Prevent and control non-native and invasive plant and animal species
- Promote and protect groundwater recharge areas
- Demonstrate 5 proper well abandonments
- Support Wellhead Protection plans and ordinances
- Promote Nutrient and Pesticide Management (NPM) Plan utilization
- Improve, enhance and promote recreational trails in basin
- Increase adult and youth participation in conservation and other outdoor activities
- Identify facilities, boat and recreational needs and increase these types of access areas within basin
- Implement Deer Management 2000 and Beyond recommendations



Upper Rock River Basin

The Upper Rock River Basin is located in the Rock River TMDL. The Rock River TMDL was officially approved by the USEPA in September of 2011. The TMDL establishes the amount of Total Phosphorus (TP) and Total Suspended Solids (TSS) a waterbody can receive and still meet water quality standards in the Rock River Basin. The TMDL will help to restore impaired waters and protect downstream receiving waters so they meet applicable water quality standards

Upper Crawfish River Watershed

General Characteristics:

The Upper Crawfish River Watershed is located in the southeastern corner of Columbia County with 160 square miles located in Columbia County and 9 square miles in Dane and Dodge Counties. Columbia County's portion of the watershed is located in the townships of Otsego, Fountain Prairie, Leeds, Hampden and Columbus. The villages of Doylestown, Fall River and the City of Columbus are in the watershed. The major land use in the watershed is farming, mainly dairy, cash crops, or feeder animals. The entire river is classified as a warm water sport fishery.

Note: Assessment Information was compiled from use of current reference materials such as WDNR Basin Plans, Priority Watershed Plans and other current applicable data sources. This information was reviewed and discussed with local WDNR Basin Coordinators and in the field WDNR fisheries staff. We feel, based on this combination of reference sourcing, we are providing a detailed up to date assessment of our current resource conditions.

Assessment of Main Tributary Resources:

North Branch Crawfish River:

Lazy Lake is a 161-acre impoundment reaching approximately 8 feet deep and is on the North Branch of the Crawfish River in and near Fall River. The lake has many problems such as, low dissolved oxygen, excessive alga blooms and submergent aquatic plant growth. Lazy Lake has a very good bass, northern pike and bluegill population. Overall, monitoring indicates polluted agricultural runoff, low levels of dissolved oxygen and low flow problems exist for the North Branch Crawfish River.

Babcock Creek:

Babcock Creek is a tributary to the North Branch of Crawfish River. Despite heavy stream bank pasturing and significant sediment loads in the stream, the stream's water clarity is exceptional. (WDNR 1994)

Upper Crawfish River:

The entire length of this river is classified as a Warm Water Sport Fishery (WWSF). Sedimentation problems with agricultural nonpoint pollution, especially barnyard runoff and cropland erosion, have degraded its quality. Portions of the upper or headwater reaches have been channelized and wetlands have been drained for agricultural production. These activities have resulted in holes formed by rocky substrate being filled and habitats lost in slower flowing portions of the river. The stream has many riffle areas with a rocky cobble bottom, which should provide good habitats above State Highway 16 (WDNR, 1994).

Lower Crawfish River Watershed

General Characteristics:

The Lower Crawfish River Watershed is located in the southeast corner of Columbia County. Most of the 172 square mile watershed is predominately agriculture and is located in Dane, Dodge and Jefferson County with approximately 10 square miles located in Columbia County in the township of Columbus, including a portion of the City of Columbus.

Assessment of Main Tributary Resources:

The Lower Crawfish River Watershed has approximately one mile of the Crawfish River running through Columbia County. An unnamed tributary empties into the Crawfish River in Columbia County.

Beaver Dam River Watershed

General Characteristics:

The Beaver Dam River Watershed is 292 square miles in size with the majority of the watershed located in Dodge County. In Columbia County, 38 square miles are located in the townships of Randolph, Courtland and Fountain Prairie. This area also includes the Village of Randolph.

The Beaver Dam River Watershed was selected as a priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1990. In 1993, project implementation began with the project now having an ending date of 2005. The primary objective of this project is to reduce nonpoint source pollution to the Beaver Dam River and to enhance and protect the water quality of the streams and lakes in the watershed.

Columbia County's portion of this watershed is primarily agriculture. Sedimentation from row cropping has impacted the habitat and is the main nonpoint source pollution in this watershed.

Assessment of Main Tributary Resources:

Beaver Creek:

Beaver Creek has a considerable number of wetlands including the Paradise Marsh State Wildlife Area in Columbia County. Numerous drainage ditches feed Beaver Creek and the bottom is primarily silt and muck. The water is occasionally turbid. Cropland runoff accounts for 91% of the upland sediment load to Beaver Creek. Beaver Creek has a severely impacted warm water forage fishery, although the potential for a warm water sport fishery is possible. Cultivation and poor land management practices are extensive in this sub watershed. An intensive nonpoint source management effort is needed to improve the condition of the stream so it can support a warm water sport fishery. The headwater wetlands of this creek provide potential spawning habitat for northern pike in Beaver Dam Lake.

Cambra Creek:

Cambra Creek is a watershed with many small tributaries and extensive wetland areas. The stream bottom is primarily silt and muck and the water is turbid. In stream habitat quality is poor and high nutrient levels exist. Cropland runoff accounts for 96% of the upland sediment load to Cambra Creek. Stream bank erosion appears to be minimal with a majority of the stream well buffered. Some areas along the Cambra Creek are grazed during the summer. Cambra Creek, which feeds Fox Lake, is relatively clear due to extensive filtering and buffering by adjacent cattail-dominated wetlands. However, extensive farming within the sub-watershed is very likely

delivering nutrients and sediment to Fox Lake. Carp use the shallow and extensive fringe wetlands adjacent to the stream and lake. This area has excellent potential for widespread wetland restoration to improve water quality and wildlife habitat.

Calamus Creek Watershed

General Characteristics:

Calamus Creek Watershed is located mostly in Dodge County with about one square mile of the watershed in the Township of Fountain Prairie. Calamus Creek's land use is agricultural. Monitoring is needed to determine what, if any, water quality problems exist.

Maunesha River Watershed

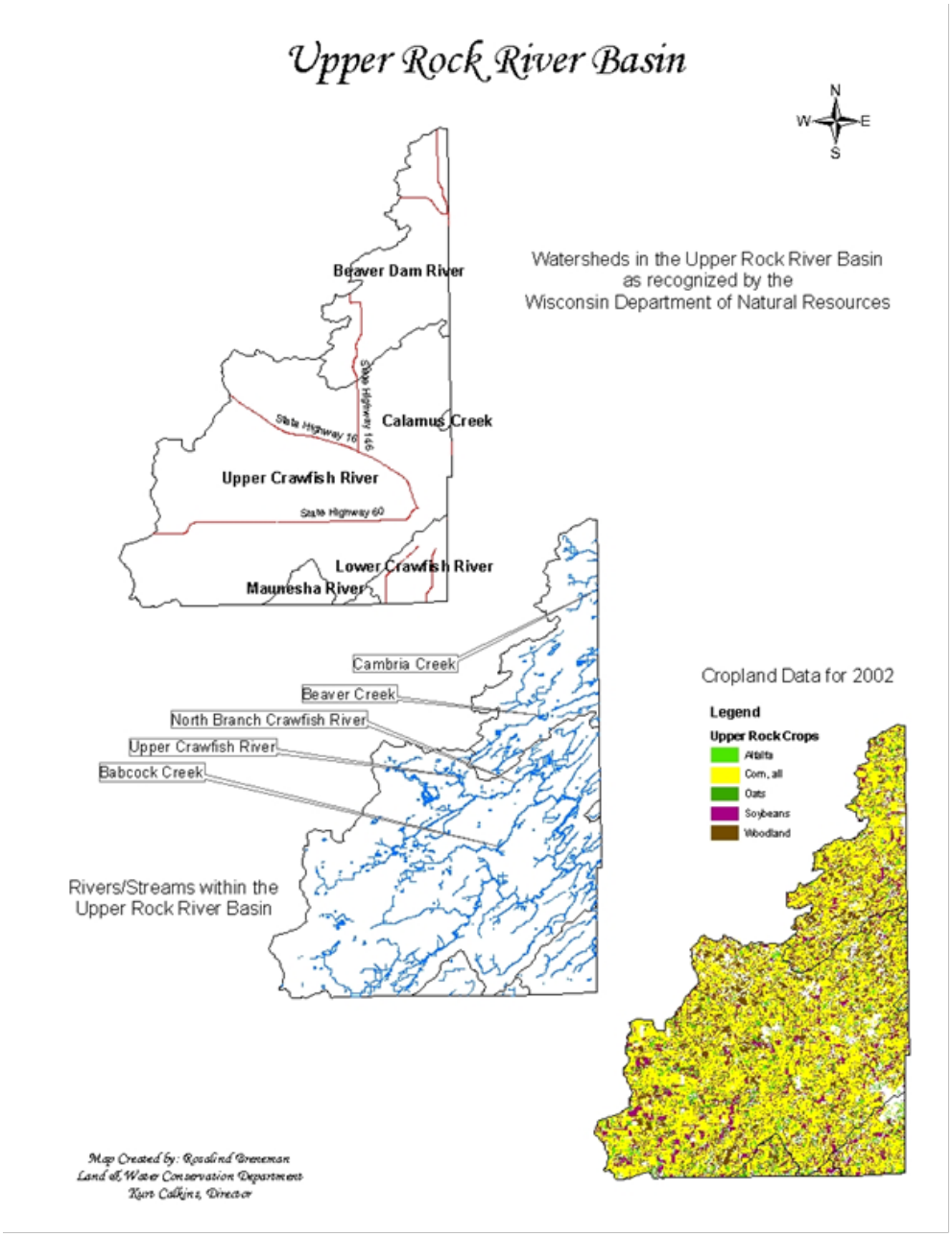
General Characteristics:

The Maunesha River Watershed is located in Dane, Dodge and Jefferson Counties and about 5 square miles in Columbia County. Columbia County's portion of the watershed is in the southern portion of the townships of Hampden and Columbus. Agriculture is the primary land use in the watershed.

Assessment of Main Tributary Resources:

Maunesha River:

The river flows along the Dane/Columbia County line and easterly through Dane County. The 1990 water quality data indicates the Maunesha River has fairly good water quality. The river carries heavy silt loads due to cropland erosion and there is concern over low dissolved oxygen levels and high bacteria count during the summer. Much of the watershed in Dane County is drained wetland under cultivation. Most of the tributary streams in Dane County have been ditched. The stream is shallow with a low gradient and ditching has occurred in the reach within Deansville Marsh. In 1999, the WDNR conducted baseline monitoring in the river. The water quality, fishery and habitat assessment found the stretch that was evaluated to have a very poor fishery. The habitat Index showed the stream to be in fair to poor condition. Water quality data collected in 1990 indicates the river has fairly good water quality. There is a concern over low dissolved oxygen levels and high bacteria counts during summer. The mean nitrate level in the river has increased during the period between 1976 and 1990 and may be the result of continued and increased use of agricultural fertilizers. The river has had rough fish population problems in the past. Polluted runoff is likely the primary water quality and in-stream habitat problem; the river carries heavy silt loads due to erosion from nearby farm fields.


Upper Rock River Basin
N
W
E
S
Watersheds in the Upper Rock River Basin
as recognized by the
Wisconsin Department of Natural Resources
Beaver Dam River
State Highway 116
Calamus Creek
State Highway 16
Upper Crawfish River
State Highway 60
Lower Crawfish River
Maunesha River
Cambria Creek
Beaver Creek
North Branch Crawfish River
Upper Crawfish River
Babcock Creek
Rivers/Streams within the
Upper Rock River Basin
Cropland Data for 2002
Legend
Upper Rock Crops
Alfalfa
Corn, all
Oats
Soybeans
Woodland
Map Created by: Rosalind Breneman
Land & Water Conservation Department
Kurt Calkins, Director

Lower Wisconsin River Basin

The Lower Wisconsin River Basin is located in the Wisconsin River TMDL. The Wisconsin River TMDL was officially approved by the USEPA on April 26, 2019.

The TMDL establishes the amount of Total Phosphorus (TP) a waterbody can receive and still meet water quality standards in the Wisconsin. River Basin. The TMDL serves to restore impaired waters and protect downstream receiving waters so they meet applicable water quality standards

Lower Wisconsin River:

General Characteristics:

The Lower Wisconsin River makes up part of the boundary between Sauk and Columbia Counties and flows through Columbia County developing the boundary between Caledonia and Lewiston, Pacific and Dekorra townships. The Lower Wisconsin River is classified as supporting a balanced warm water fish and aquatic life community. More than 3,000 acres of wetland adjoin the river. Pine Island Wildlife Area, along with other areas, makes for excellent waterfowl habitats.

Overall, the water quality monitoring stations indicate generally good water quality. The Wisconsin River is not only a natural resource asset to Columbia County, but also has historical significance with the Portage Canal between the Fox River and Wisconsin River. Canoes and outboard motorboats heavily use the Wisconsin River.

Lake Wisconsin Watershed

General Characteristics:

Lake Wisconsin Watershed is located in Dane, Sauk and the central portion of Columbia County. Of its 199.5 square miles, approximately 148 square miles are located in Columbia County. Caledonia, West Point, Lodi, Dekorra, Lowville, Arlington and Leeds townships, the Village of Poynette, the City of Lodi and lakeshore development areas of Harmony Grove and Okee have land within the Lake Wisconsin Watershed boundaries.

Note: Assessment Information was compiled from use of current reference materials such as WDNR Basin Plans, Priority Watershed Plans and other current applicable data sources. This information was reviewed and discussed with local WDNR Basin Coordinators and in the field WDNR fisheries staff. We feel based on this combination of reference sourcing, we are providing a detailed up to date assessment of our current resource conditions.

Assessment of Main Tributary Resources:

Rowan Creek:

Rowan Creek is classified as a trout stream for 12 miles of its length with some natural reproduction of brown trout. About 4 miles are Class I trout waters and designated as exceptional resource water (ERW), and 8 miles are Class II. The stream has been known as one of the best trout streams in southern Wisconsin. Surveys conducted in 1998, found the stream to have fair to good fish community health and good to excellent habitat quality. There are nonpoint source pollution problems in its upper end due to cattle access, bank erosion and cropland erosion. In addition, new housing developments are springing up, which has resulted in problems with storm water runoff including increasing water temperature. A River Planning grant, sponsored by Columbia County, has been granted to help examine current and potential storm water issues

along Rowan Creek. The grant will help with future storm water planning and management to control this prospective source of pollution.

As a result of the threat from nonpoint sources and the streams potential to support a healthy and fishable population of trout, the stream has been ranked as a high priority for nonpoint source pollution and would benefit as a nonpoint source pollution reduction project. The Friends of Rowan Creek have also received a River Planning Grant. The grant will be used to facilitate educational and outreach activities in the watershed and will also help the group to address problems and issues that affect the overall health of the watershed.

Hinkson Creek:
Hinkson Creek is a small, low gradient, coldwater, Class II, tributary to Rowan Creek. Despite impoundments and a heated discharge from a canning factory in the headwaters, the stream is capable of supporting brook trout. Natural reproduction occurs in the upper stream while the lower half depends on stocking. Surrounding wetlands buffer the stream from adjacent land uses. Some cattle are present in the stream corridor on the lower end. Dense tag alder growth along some sections and beaver dams are the biggest management problems. Surveys conducted in 1998 found the fish community to be of good condition. Habitat quality was determined to be from fair to good.

Spring Creek (Lodi Creek): Spring Creek flows into Lake Wisconsin in Columbia County. It is a Class II brown trout stream and the 4 miles of Class II in Dane County are considered an exceptional resource water (ERW). The stream flows through the Lodi Marsh State Wildlife Area above Lodi, thus is fairly well buffered from agricultural impacts. Significant spawning occurs in the riffles within the city limits. The stream has been straightened and lacks suitable hiding cover for fingerling fish. The WDNR has made efforts to address this problem and have completed a total of about one mile of stream habitat improvement work on different sections of the stream. In addition, a 15” minimum size limit has increased the number of 12” to 14” and 15” fish on the lower section of the stream. Additional habitat improvement along the stream on village parklands would help to improve numbers of larger size trout. Soil loss in the town of Lodi has been estimated at 6.1 tons per acre per year. This addition of soil to the stream, combined with sedimentation due to bank erosion and inputs from nearby barnyards can potentially cause more problems in the stream. One further threat to the creek is the result of the tremendous growth in the Town and City of Lodi. Housing and industrial development has increased in the past 5 years. This development contributes a large volume of storm water to the stream and is a major source of nonpoint source pollution and thermal impact. Spring Creek receives point source discharge from both a municipal and industrial source. The City of Lodi has recently renovated their treatment plant.

The Friends of Scenic Lodi Valley are interested in protecting the stream and have proposed a citizen stream-monitoring program. Monitoring was conducted in 1999 and 2000, to collect some baseline data for this project. Fisheries surveys found several coldwater indicator species in the creek and a few pollution intolerant species, but overall, there were more pollution tolerant species (white suckers and creek chubs) than other species. Similarly, macro invertebrates collected were indicative of good quality water, yet below the city, the macro invertebrates collected were indicative of stream disturbance, which could potentially be attributed to urban storm water runoff from the City of Lodi. To assist them with their efforts to protect and improve Spring Creek, the Friends of the Scenic Lodi Valley have received a River Planning Grant. The

grant will help them to organize a stream-monitoring network. The monitors will gather valuable information that will help to evaluate the overall health of the stream. The Friends plan on using the grant to conduct a watershed assessment to identify potential pollution sources and inventory land use near the stream. The grant is a cooperative project between the City of Lodi, the WDNR, Trout Unlimited, Lodi Canning and the Friends of the Scenic Lodi Valley

Prentice Creek:
Prentice Creek, north of Highway 78, is a Class I trout stream. Prentice Creek headwater begins in Sauk County and flows through the township of Caledonia in Columbia County, into Lake Wisconsin.

Lake Wisconsin:
Lake Wisconsin is a large impoundment of the Wisconsin River created by the hydroelectric dam at Prairie du Sac. It has a good sport fishery and is used extensively for recreation. Because it is an impoundment, sedimentation and nutrient loading to the lake and toxic substance accumulation in bottom sediments, are concerns. The nutrient loading impacts the lake by fostering algae blooms and affecting dissolved oxygen levels. Low levels of mercury and high levels of PCBs have been detected in sturgeon from the lake. A fish consumption advisory for PCBs has been issued for the lake's sturgeon. Contaminated sediment sites exist in Grubers Grove Bay, an arm of the lake near the Badger Army Ammunition Plant (BAAP). Grubers Grove Bay received process wastewater from the BAAP wastewater treatment facility in the past. Sediment samples were found to have extremely high mercury concentrations as well as high levels of lead and ammonia. In response to this, a major dredging project was conducted to remove the contaminated sediment, but it has been determined that additional dredging is needed. There are plans to restore the aquatic habitat in the Bay through the planting of rooted aquatic plants and shoreline trees as well as fish crib deployment.
The Harmony Grove Lake Protection and Rehabilitation District recently received a Lake Planning Grant to conduct a sediment study on the sediment in the bay. Harmony Grove Bay is located on the Columbia County side of Lake Wisconsin north of Pine Bluff.
Wisconsin Power & Light Company, owner of the Prairie Du Sac Dam, as part of the Federal Energy Regulatory Commission (FERC) relicensing process conducted water quality, algal, fisheries and sediment contaminant studies during 1992. Continuous dissolved oxygen monitoring at the dam tailrace showed the water quality standard of 5 mg/l was violated more hand half of July, a good portion of August and a few days in September, 1992. The worst 2-day period occurred July 27-28, when the maximum dissolved oxygen was 3.6 mg/l, the minimum 1.7 mg/l. The suggested cause of the problem is a combination of the existence of the dam and the high nutrient loads in the river. This leads to excessive algae growth in Lake Wisconsin. When the algae die off, they deplete oxygen near the dam. Nutrient loading can come from barnyard runoff and other forms of nonpoint source pollution. One dairy farmer has been found to have multiple manure discharges to the lake. These sources of pollution need to be addressed and curtailed to help improve the health of Lake Wisconsin. In addition, fluctuating water levels below the Dells and Prairie du Sac dams remain a major concern on the Wisconsin River. Fish passage at all dams on the Wisconsin River is important to the fish communities and the river ecosystem as a whole. In 2004, a federal court of appeals ordered Alliant Energy to install safe upstream and downstream fish passage. This will be the first such facility in the State of Wisconsin. In addition, long-term database studies are in progress to look at walleye and sturgeon reproduction. A no harvest 20-28” slot regulation is proposed to improve fishing for larger size walleye. Sturgeon harvest has been curtailed by implementing an alternating season size limit of 50” and 70”. The lake sturgeon resource in the lake and river both up and

downstream needs to be carefully managed. This is a rare and long-lived fish of which there are few remaining fisheries in North America. Efforts are underway to expand the fishery upstream to its original home range. Pollution had eliminated it upstream from the Kilbourn Dam at Wisconsin Dells. A significant shovelnose sturgeon fishery also can be found in the lower Wisconsin River below the Prairie du Sac dam.

Duck/Rocky Run Creek Watershed

General Characteristics:

Duck/Rocky Run Creek Watershed is approximately a 147.5 square mile watershed located in central Columbia County. The villages of Cambria, Wyocena, Rio and areas of Pardeeville and Friesland are located in the watershed. The watershed has 2 main tributaries, Duck Creek and Rocky Run Creek, both of which flow directly into the Wisconsin River. Approximately 7,149 acres of public land are within the watershed boundaries.

Assessment of Main Tributary Resources:

Rocky Run Creek:

Rocky Run is a popular trout stream in Columbia County that begins at Mud Lake and flows to the Wisconsin River. From Highway 22 west to Highway 51 the stream is trout water and 6 miles are Class II while another 2 miles are Class III. In warmer years however, the trout waters begin further downstream of Highway 22. Beaver activities continue to cause ongoing problems. A rare aquatic species has been found in the creek in past surveys. Manure management and cattle access to the stream are problems in the upper reaches below the Mud Lake State Wildlife Area. The creek has been impounded on the upper end to create the Mud Lake State Wildlife Area. Portions of the upper reach above Highway 22 have been ditched. There is also a private impoundment above Highway 22 that warms the water. There are 1 to 2 miles of trout waters have been lost due to increased water temperatures. There are not really any impacts on the trout section of the stream although irrigation permits may cause a problem during periods of low flow.

Rocky Run receives point source discharges from Alliant/WI Power and Light and a tributary to the stream receives discharge from the Rio wastewater treatment plant. The creek has been ranked as a high priority for nonpoint source pollution and would benefit from a nonpoint pollution reduction project.

Duck Creek:

Duck Creek is a tributary to the Wisconsin River. The creek runs through Wyocena and has been impounded at the junction of the North and Middle Branches of Duck Creek to create Wyona Lake in Wyocena. The creek supports a warm water sport fishery, although it has become dominated by Carp. The creek receives point source discharges from Unimin, Chaquita Processed Foods and Grande Cheese.

Jennings Creek:

Jennings Creek is a tributary to Duck Creek. The stream supports a Class II trout fishery. Although the creek is fairly well protected by wetlands, there are still in-stream habitat and water quality issues. Straightening of the stream has resulted in poor in-stream habitat in some locations. In addition, a campground diverts a portion of the stream flow to form a lake. The lake acts to warm the water and once the water is discharged back to the stream, it has an increased

temperature and can cause water quality and habitat problems. Beavers cause ongoing problems in Jennings Creek.

Middle Branch of Duck Creek:
Middle Branch Duck Creek joins with North Branch Duck Creek at Wyona Lake to form the main stem of Duck Creek. The creek is a Class III trout stream for 2.5 miles of its length. Water quality in the upper reaches of the stream, above muck farms, has good water quality. Portions of the creek have been channelled, as have some of the unnamed tributaries. The stream carries a heavy sediment load, particularly from some muck farms adjacent to the stream. One landowner along the middle branch of Duck Creek, has land in the Wetland Reserve Program and that helps to improve the water quality within the stream. Public access to the stream could be improved.

North Branch of Duck Creek:
The North Branch of Duck Creek rises in northeastern Columbia County. Tributaries to the stream have been extensively modified. The stream does not support a balanced sport fishery and bank and adjacent farm field erosion are thought to be problems. Manure storage and management are also an issue of concern. The North Branch Duck Creek receives point source discharges from Del Monte Foods and the Cambria wastewater treatment plant. A small impoundment, which washed out in 2003 is being reconstructed on the stream in Cambria to reestablish Lake Tarrant.

South Branch Duck Creek (Roelke Creek):
The South Branch of Duck Creek is a small tributary to the Duck Creek system. The stream is pretty much protected by wetlands. The creek has been classified as a Class I trout stream and an exceptional resource water (ERW). There is a muck farm on the creek that is discharging water and sediment into Roelke Creek. One of the impacts has been that the stream has left its channel and follows the drainage ditch created by the muck farm. One large wetland that drained into Roelke Creek has been restored through the Wetland Reserve Program. Public access to this stream could be improved.

Columbia Lake:
Lake Columbia is the manmade cooling impoundment of the Columbia Generating Station. It was constructed by building a dike around 500 acres of wetlands adjacent to the Wisconsin River in the 1970's. The plant went on line in 1977. A lake depth of seven feet is fairly uniform throughout. A center dike allows water to circulate around the lake from the hot discharge to the cooler intake. Typically, there is a 25 F degree difference between the discharge and intake with 15-20 F degree dissipation occurring on the hot side of the lake. Cooling towers operate during summer months and/or when power generation heats the lake intake above a certain temperature. Water loss from evaporation and seepage through the dike requires make-up water to be pumped into the lake from the Wisconsin River. The hot water creates a harsh aquatic environment. Entire lake temperatures from May–November exceed 90 F degrees. Aquatic vegetation, which typically supports aquatic invertebrates, which in turn provide forage for fish, cannot survive these extreme temperatures. Fish species which have adapted to this environment are large and smallmouth bass, bluegill, bullheads, channel catfish and gizzard shad. Many of the smaller fish are in poor condition. When the predator species become larger, i.e. bass greater than 14 inches and catfish greater than 16 inches, they can utilize the larger gizzard shad and gain weight. Hybrid striped bass are stocked to provide a unique fishery and control the shad population.

Since the lake doesn't freeze, it provides anglers with an open water fishing opportunity throughout the winter. The lake receives treated discharges of domestic sewerage from the power plant and the acidic runoff from the coal pile.

Tarrant Lake:
Tarrant Lake is an impoundment that was constructed in 2007 after a dam failure on the North Branch of Duck Creek in Cambria. The lake is 25 acres and shallow. The pond is turbid and experiences problems with nonpoint sources of pollution. This has led to a fertile, turbid condition and the lake experiences algae and weed problems. The lake will be restocked with bluegill, bass and Northern Pike.

Wyona Lake (Wyocena Millpond):
The lake is a manmade 93-acre lake in the village of Wyocena and has a maximum depth of 12 feet. The lake's fishery is northern pike, largemouth bass and pan fish. The lake experiences some problems as a result of algae growth and carp.

Lower Baraboo River Watershed

General Characteristics:

The Lower Baraboo River watershed is in Sauk, Adams and the western portion of Columbia Counties within the township boundaries of Caledonia. Of the 144 square mile watershed, 60 square miles are in Columbia County.

Predominant land use is agriculture, with a significant cultivation on moderate to steep slopes. Major forested areas occur in lowlands along the river and uplands in the Baraboo Hills Range.

Assessment of Main Tributary Resources:

Baraboo River:
The Baraboo River water quality impacts from point sources are generally small. Nonpoint impacts on the Baraboo River are substantial. Extensive row cropping and stream bank erosion have resulted in turbidity and sedimentation in the Baraboo River. The river is generally turbid and extensive flooding occurs in the spring. An estimated 824 acres of wetland adjoin the river. Waterfowl are common. Wood ducks utilize cavaties in trees along the river. A dam removal project was completed on the Baraboo River, removing dams and restoring natural flows.

Rowley Creek:
Rowley Creek is a small, high gradient stream, draining from high in the Baraboo Hills Range in Caledonia Township, westward into Sauk County and the Baraboo River. Lost Lake intermittently is the headwaters due to seepage of groundwater and farther downstream, several springs sustain summer flow. This stream sustains a trout population and fluctuating ground water conditions regulate stream flow, which affects the trout habitat.

Corning Lake:
Corning Lake is a shallow bog lake with a maximum depth of 4 feet in large marshy deposits. The lake is surrounded by the Lewiston Marsh, a large tamarack forest. A channelized stream connects Corning Lake to the Wisconsin River.

Roxbury Creek Watershed

General Characteristics:

The Roxbury Creek Watershed is 67 square miles; mostly in Dane County with about 6 square miles of the watershed located in southwestern Columbia County in the Township of West Point.

The majority of the Columbia County portion drains to Crystal Lake (an internally drained lake) in Dane and Columbia Counties. Some areas drain to Fish Lake in Dane County with a small portion draining directly to the Wisconsin River.

Crystal Lake:

Crystal Lake is a 527-acre shallow, eutrophic, seepage lake, which up until the mid-1980s, was a marsh. Hydrologic changes of the ground water has caused the lake level to increase dramatically, thereby allowing its fishery to change from a winterkill plagued bullhead and minnow lake to one of the best bass and pan fish producing waters in the state. Dense, aquatic plants grow in some near shore areas and a mid to late summer algal bloom occurs. Dead timber lines the shoreline as a result of the recent rise in water level. Rising water has been an ongoing challenge for system. A pumping project has been utilized with some short-term success, in lowering water elevations. The long-term viability of pumping is still and ongoing discussion. Access on the lake is inadequate. A fishery survey was conducted on the lake in 2000.

Duck Creek Watershed

General Characteristics:

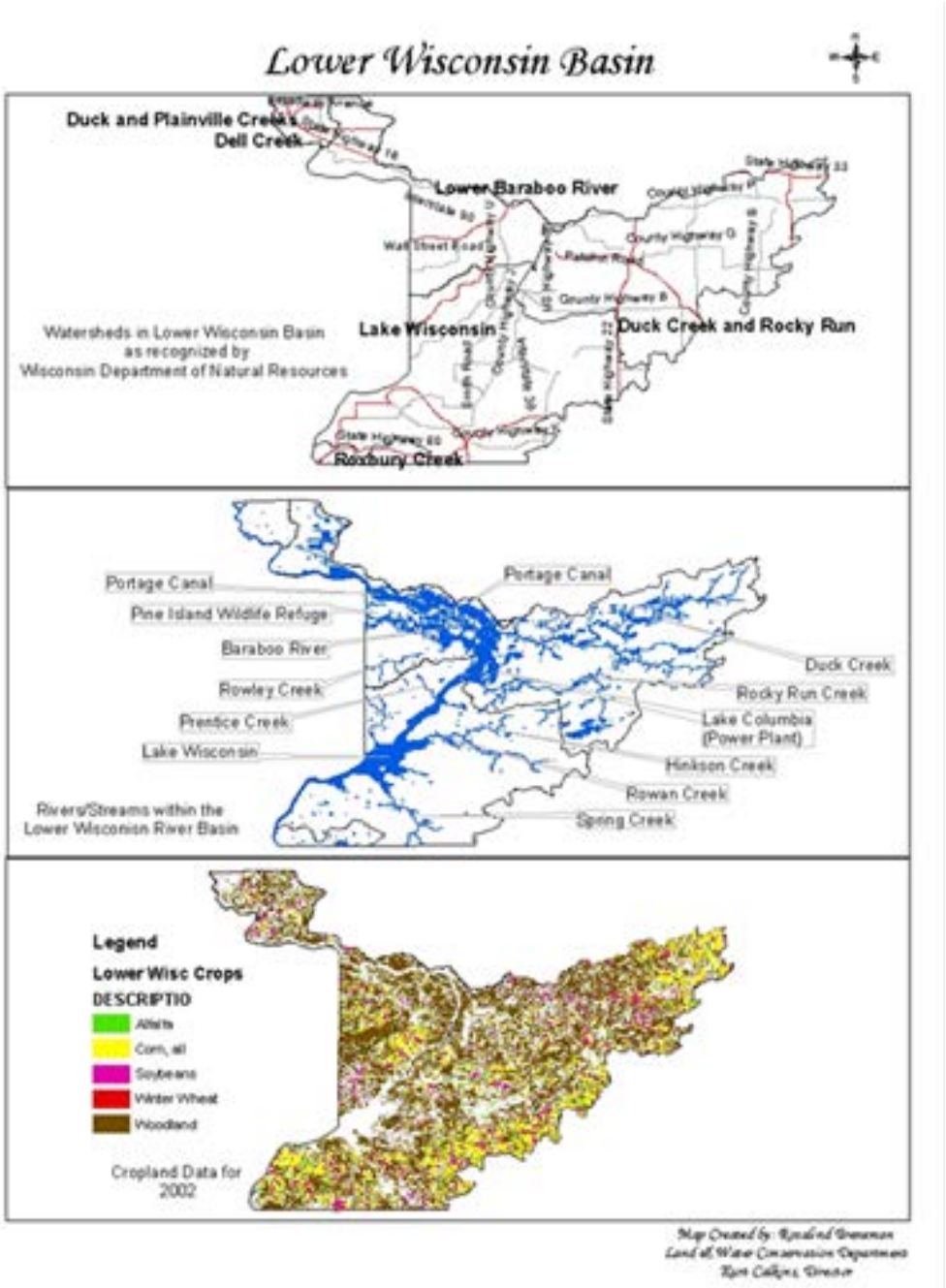
Duck Creek Watershed is 182 square miles, most of which is located in Adams County. An estimated 9 square miles are located in Newport Township of Columbia County. Part of the City of Wisconsin Dells is in the Columbia County part of Duck Creek Watershed. A portion of the Wisconsin River is in the Duck Creek Watershed and has an area 3.6 miles long below the Wisconsin Dells dam and a one-mile portion immediately above the dam is known as the Dells, an important scenic attraction. Companies control extensive river frontages in this area capitalizing on the scenic attractions. The Dells area, below the dam, also experiences large fluctuations of water levels for the tour boat operation. These daily fluctuations are very detrimental to fish and aquatic life.

The State of Lower Wisconsin River Basin Report completed July 2002 (Pub WT-559-2002)

WDNR Basin Recommendations and Priorities:

- Promote Citizen Based Monitoring Programs
- Assist wide range of citizen-based resource groups in securing funding to support their efforts
- Increase cooperation between partners to improve recreational opportunities
- Develop and improve canoe trails within Basin
- Increase public access to quality streams, rivers and land for recreation
- Evaluate streams in regards to trout or other game fish possibilities
- Promote hunting and fishing opportunities within basin
- Develop and maintain swimming beaches
- Identify areas were implementing a no-kill fishery would improve fishery
- Implement baseline monitoring program for streams
- Monitor and access declining trends in fish populations within basin
- Develop an assessment strategy to evaluate streams and watersheds that do not have a known nonpoint source priority rank

- Protect spring heads and headwater streams
- Assess the impacts of removal of dams on the Baraboo River
- Conduct sediment monitoring on select lakes in Basin
- Develop grassland buffers, grassed waterways to trap sediment and nutrients.
- Promote watershed protection programs such as CREP
- Utilize TRM grant program efforts in Basin
- Identify priority areas in need of streambank protection
- Seek federal and state sources for cost sharing to install BMP in watersheds in Basin
- Greater use of Nutrient Management Plans in Basin
- Address streambank grazing in basin
- Develop and implement stormwater Management and erosion control ordinances in Basin
- Develop and implement construction site erosion control ordinances
- Promote and develop wellhead protection plan in basin
- Promote proper abandonment of unused wells


Lower Wisconsin Basin
Duck and Plainville Creeks
Dell Creek
Lower Baraboo River
Watersheds in Lower Wisconsin Basin
as recognized by
Wisconsin Department of Natural Resources
Lake Wisconsin
Duck Creek and Rocky Run
Roxbury Creek
Portage Canal
Pine Island Wildlife Refuge
Baraboo River
Rowley Creek
Prentice Creek
Lake Wisconsin
Rivers/Streams within the
Lower Wisconsin River Basin
Portage Canal
Duck Creek
Rocky Run Creek
Lake Columbia
(Power Plant)
Hinkson Creek
Rowan Creek
Spring Creek
Legend
Lower Wisc Crops
DESCRIPTIO
Alfalfa
Corn, all
Soybeans
Winter Wheat
Woodland
Cropland Data for
2002
Map Created by: Rosalind Grossman
Land & Water Conservation Department
Ron Collins, Director

Upper Fox River Basin

The Upper Fox River Basin is located in the Upper fox and Wolf River Basins (UFW) TMDL. The UFW TMDL was submitted to the U.S. EPA for review on January 21, 2020.

The TMDL establishes the amount of Total Phosphorus (TP) and Total Suspended Solids (TSS) a waterbody can receive and still meet water quality standards in the Upper Fox and Wolf River Basins. The TMDL will help restore impaired waters and protect downstream receiving waters so they meet applicable water quality standards

Neenah Creek Watershed

General Characteristics:

Neenah Creek Watershed is a 169 square mile watershed that covers parts of Adams, Columbia and Marquette Counties. The watershed covers 50.7 square miles within Columbia County. Land use within the watershed is approximately 42% agriculture, 27% forested, 14% wetlands, 9% roads, ditches, etc., 6% developed and 2% lakes. The Columbia County portion of the watershed is comprised entirely of rural unincorporated areas immediately northwest of the City of Portage. The watershed encompasses portions of Fort Winnebago, Lewiston and Newport townships.

Neenah Creek Watershed was selected as a Priority Watershed Project in 1992 and is scheduled to be completed in 2005. The purpose of the project is to reduce nonpoint source pollution delivered to the surface water and groundwater within the watershed area.

Note: Assessment Information was compiled from use of current reference materials such as WDNR Basin Plans, Priority Watershed Plans and other current applicable data sources. This information was reviewed and discussed with local WDNR Basin Coordinators and in the field WDNR fisheries staff. We feel based on this combination of reference sourcing; we are providing a detailed up to date assessment of our current resource conditions.

Assessment of Main Tributary Resources:

Big Slough:

The Big Slough, an 8-mile tributary with several unnamed tributaries, flows into the Neenah Creek and drains approximately a 37 square mile area. Big Slough is a warm water fishery with a potential for improvement. Factors impacting water quality include: sediment and nutrient loading from agricultural runoff, barnyard runoff, low dissolved oxygen, channelization of streams and large tracts of wetlands converted to cropland.

Lower Grand River Watershed

General Characteristics:

The Lower Grand River Watershed covers parts of Marquette, Green Lake and a small portion of Columbia County. The Lower Grand River Watershed is an approximate 120.3 square mile watershed that encompasses about 20.2 square miles in Columbia County. The watershed covers small areas of Marcellon, Scott and Randolph townships. Columbia County's portion of the watershed has no significant water resources within the county. Primary water quality problems in the watershed include: nonpoint source pollution, hydrologic modifications (particularly the drainage of wetlands) and excessive carp populations.

Swan Lake Watershed

General Characteristics:

The Swan Lake Watershed is an 81 square mile watershed that includes the headwaters of the Fox River. It is located in north central Columbia County and a small part of southern Green Lake County. The watershed encompasses parts of Randolph, Scott, Marcellon, Fort Winnebago, Pacific, Wyocena and Springvale townships. Pardeeville is the only village in the watershed. Agriculture is the dominant land use in the watershed with approximately 78% of the land being cropped or pastured.

The Fox River is the principal tributary in the watershed that flows through Pardeeville and Park Lake. It then resumes flow to Swan Lake.

Assessment of Main Tributary Resources

Fox River:
Water quality information for the Fox River is limited. Nonpoint source pollution is a serious problem due to intensive agriculture. Nonpoint source pollution created from agriculture includes: animal waste management problems, stream bank trampling and sediment, nutrient and pesticide loading from agricultural runoff.

Park Lake:
Park Lake at 312 acres is the uppermost impoundment on the Fox River. Agricultural impacts have contributed sediment and nutrients to the lake causing siltation and vegetation growth. Macrophytes were chemically treated in the 1980's. Carp and gizzard shad now dominate a once excellent bass, northern pike and pan fishery. Heavy predator stocking efforts by the Lake District and WDNR are being attempted to control shad. The strong 1997-year class of carp are declining naturally.

Park Lake sub watershed encompasses approximately 95% of the Swan Lake Watershed and was scheduled for formal designation as a Nonpoint Source Priority Watershed Project in August of 1999. The closer of the Priority Watershed Program has forced us to look at alternate scenarios for watershed management projects and funding for this watershed. Currently the LWCD is working in cooperation with the Park Lake Management District on this endeavor. Several years of inventory work have been completed and TRM grants and Lake Planning grants have been applied for.

Swan Lake:
Swan Lake is a natural 406-acre impoundment of the Fox River downstream from Park Lake. It contains a good fishery of bass, northern pike, catfish, pan fish and stocked musky and walleye. It too has recently become plagued with gizzard shad. It differs from Park Lake by being very deep 60' to 80', thus water quality and shad abundance are partially masked by its volume.

Spring Lake:
Spring Lake is a small, deep, natural lake immediately downstream from the electric powerhouse discharge of Park Lake. A variety of fish species exist with good sizes of bass, northern pike, catfish and pan fish are present. The peaking operation of the electric turbine may be causing dewatering of fish spawning areas.

Buffalo Lake and Lake Puckaway Watershed

General Characteristics:
The Buffalo Lake and Lake Puckaway Watershed is a 232 square mile watershed that covers parts of Columbia, Green Lake and Marquette Counties. The watershed covers approximately 56.8 square miles of land in Columbia County and is located northeast of Portage encompassing a portion of the City of Portage and the townships of Fort Winnebago, Lewiston, Marcellon and Pacific. There are two state wildlife areas within the watershed in Columbia County, French Creek and the Swan Lake Wildlife Area.

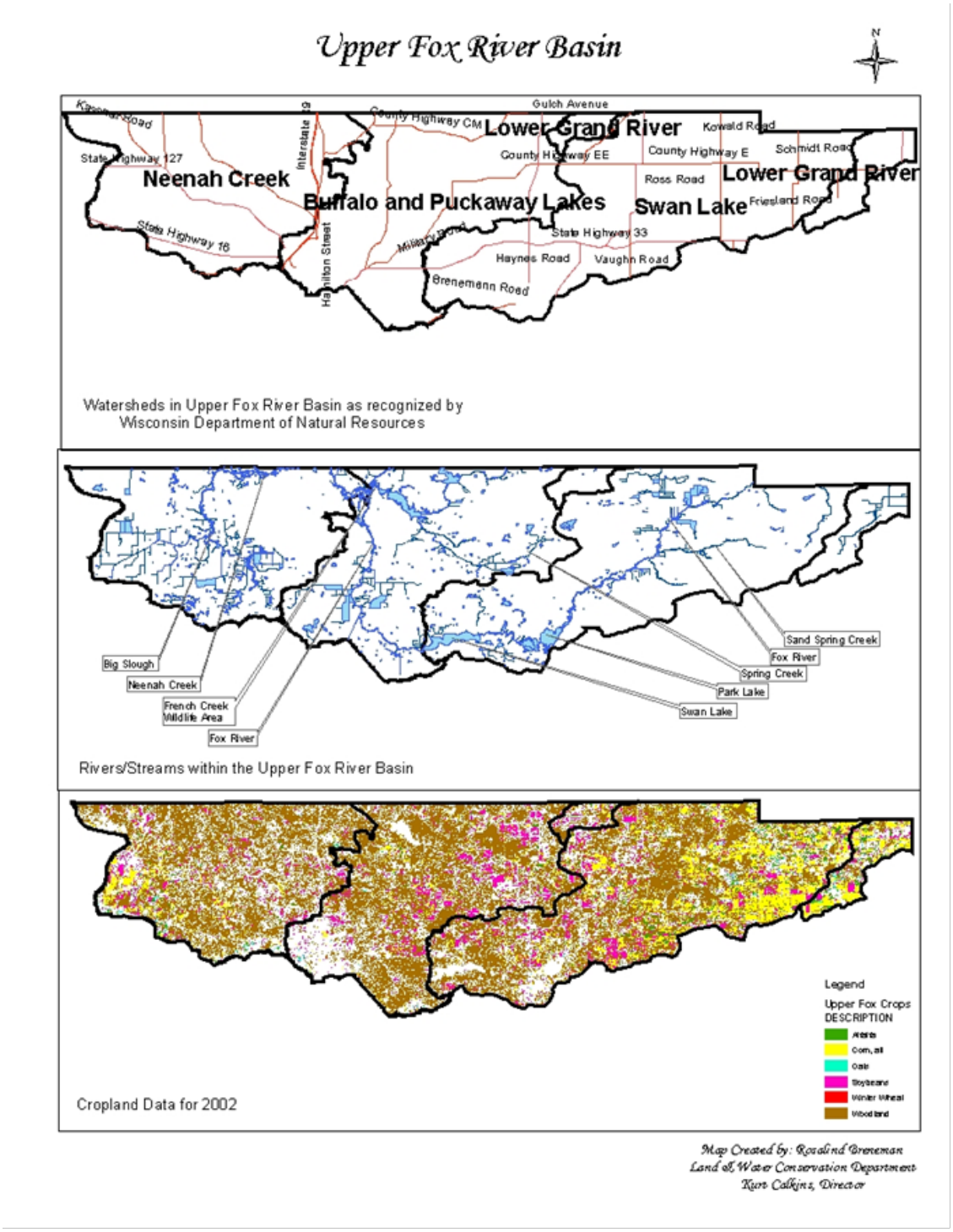
Assessment of Main Tributary Resources

Fox River:
The Fox River is the principal tributary in the watershed. This portion of the Fox River is a warm water sport fishery that has a fish consumption advisory for certain types of fish due to the PCB's and/or pesticides found in fish tissue samples. Factors impacting water quality include: sediment and nutrient loading from agricultural runoff, excessive rough fish population, habitat destructions, decreased levels of dissolved oxygen, elevated levels of bacteria and toxic pollutants.

French Creek
French Creek is approximately a 12-mile creek. The creek originates in Marquette County and feeds into the Fox River in Fort Winnebago Township. Largely wetlands and Spring Creek feed the creek. The Department of Natural Resources (WDNR) manages approximately 2,025 acres along the creek in Columbia County. The WDNR operates two impoundments on the creek that they use to manipulate water levels to manage wildlife. Another privately owned impoundment (Dates Mill Pond) is also beneficial to wildlife and provides a good fishery.
The State Fox River Basin Report completed Oct 2001 (Pub WT-665-2001)

WDNR Basin Recommendations and Priorities:
- Pursue ecologically sound water level management on shallow lakes
- Provide information and education to the public on the importance of shallow lake ecology
- Pursue strategies to reduce carp induced destruction of aquatic plan communities and water quality impacts
- Provide information and education on the impact of shoreline development on aquatic and terrestrial ecology
- Pursue restoration of shoreline habitat on the Winnebago Pool and other lakes
- Provide information and education on habitat loss and impacts on fish and wildlife populations
- Continue monitoring shallow lakes to document changes in water quality
- Provide information and education for lake management organizations and local officials to help them identify critical wetlands and sensitive areas that should be protected.
- Provide educational programs for local governments and agencies on proper management and permitting of shoreland activities
- Protect littoral zone habitat

- Limit nutrient, sediment and organic loading to waterways from point and nonpoint sources
- Provide information and education on animal waste management to the Ag industry
- Participate in Smart Growth with local governments
- Properly regulate land spreading of septage
- Reduce discharge of untreated stormwater to waters of the state
- Provide information and education to the construction industry on sediment control techniques and requirements
- Provide information and education on aquatic exotic species that currently exist in the basin as well as those that may be introduced in basin
- Provide information and education on arsenic, nitrates and bacteria to the public and local governments
- Ensure the public has a safe, secure source of potable water
- Nutrient and Pest Management
- Proper abandonment of unused wells
- Problem assessment monitoring of private wells



Chapter 6. NR 151 Performance Standard Implementation and Nutrient Reduction Strategies

Wisconsin's rules to control polluted runoff from farms, as well as other sources, went into effect October 1, 2002 and were modified in 2012 and again in 2018. The State legislature passed the NR 151

rules to help protect Wisconsin's lakes, streams and groundwater. Wisconsin's NR 151 standards can be found here: https://docs.legis.wisconsin.gov/code/admin_code/nr/100/151.pdf

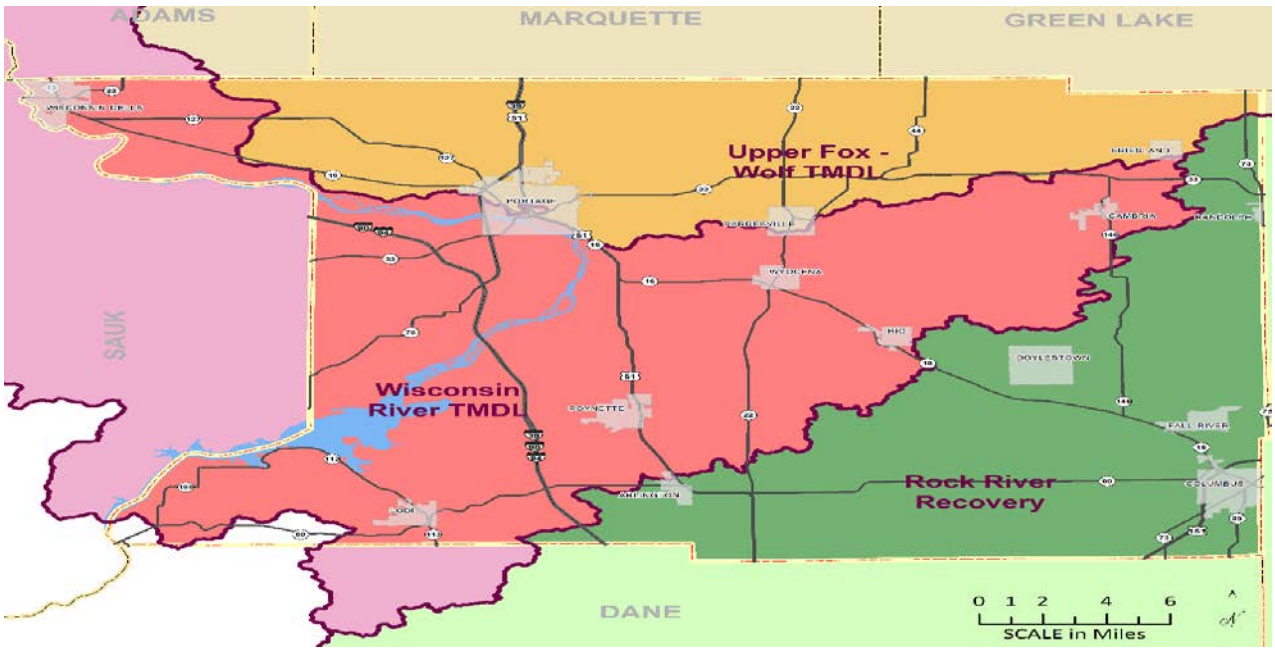
WDNR Administrative Rule NR 151 sets performance standards and prohibitions for Wisconsin farms and cropland. It also set urban performance standards to control construction site erosion, manage runoff from streets and roads and manage fertilizer use on large turf areas.

DATCP Administrative Rule ATCP 50 identifies conservation practices that farmers must follow to meet the NR 151 performance standards. The CCLWCD will continue to utilize various different pathways to continue to implement NR 151, the balance of which are explained below.

Nutrient Management Plan (NMP) development and utilization is a requirement in NR 151. Implementing NMPs can also help meet the NR 151 sheet rill and wind erosion and phosphorus-index performance standards for cropland. Columbia County will continue to use the 700 + FPP certified properties and the 4-year requirement for inspections as the basis for monitoring NR 151 compliance with this standard, and use this information to continue to expand our ability to document and implement further nutrient reductions. CCLWCD will also use various funding sources to continue to increase 590 NMP coverage. Using local agricultural publications and township level initiative meetings CCLWCD has a goal of 70% NMP coverage in our TMDL sub basins.

TMDL

As can be seen below Columbia County has portions of 3 TMDL's within its' borders: Rock River Recovery, Upper Fox and Wolf River, Wisconsin River. The Rock River Recovery TMDL was approved in 2011 is currently being implemented. , The UFW is under review and pending EPA approval in Spring of 2020. The Wisconsin River TMDL was approved in 2019 and has just started implementing. As TMDL implementation continues, Columbia County will assist with TMDL-implementation efforts for cropland and livestock operations as opportunities and staff resources allow. If and when staff resources do exist, Columbia County will focus on reducing TP and TSS cropland or livestock runoff to make progress towards or meet the applicable TMDL Total Phosphorus and/or TSS Reduction goals shown in appendices E and F.

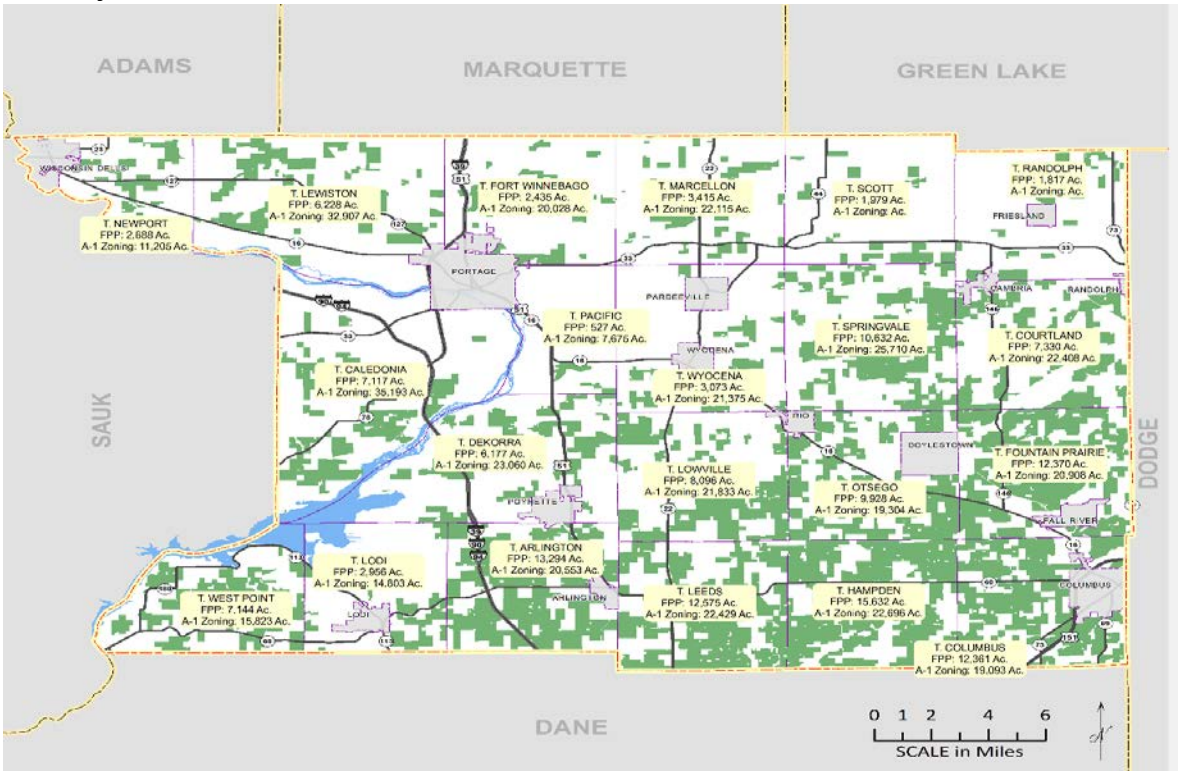


Farmland Preservation Program

Chapter 91 created the Farmland Preservation Program, which provides incentives for local units of government to plan for agriculture preservation along with conservation compliance. Columbia County has 18 Towns under County Zoning. Columbia County has a state certified zoning district in these 18 Towns. The Town of Courtland has adopted its own certified zoning district. The Towns of Randolph and Scott are not zoned but have several remaining FPP agreements that are active with some landowners. The Town of West Point has a state certified AEA area, with 6 long term agreements signed with DATCP. The ability to use the certified agricultural zoning as a tool to enroll landowners in this tax credit program has and will continue to be a very important tool for Columbia County. The Farmland Preservation Program is the program providing the CCLWCD the largest access to the agricultural producers and agricultural lands of Columbia County. The Columbia county LWCD has issued 738 Residents Certificate of Compliance's making them eligible to receive the FPP tax credit on 147,773 acres. These enrolled acres are reviewed every 4 years for compliance with State Agriculture Performance Standards provisions found NR 151. FPP certificates of compliance are not the same as a NR 151 compliance determination, issued to NR 151.09 or 151.095. Columbia County will continue work with DNR regarding consistency associated with NR 151 compliance determinations and/or local ordinance determinations.

When landowners apply for the FPP Credit LWCD staff will:

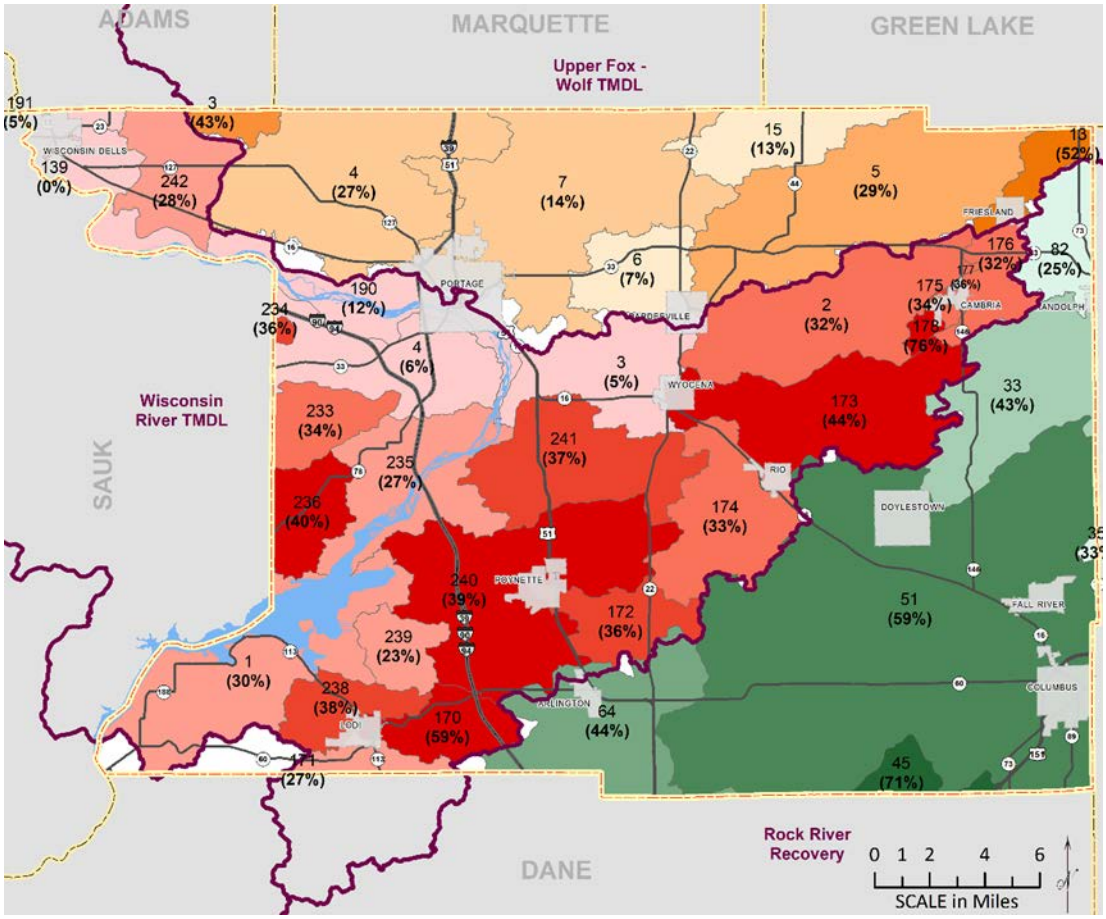
- Perform farm inventory & determine eligibility
- If found not compliant with state performance standards, a schedule of compliance will be developed. Technical assistance will be provided and if eligible, financial assistance may be secured to bring them into compliance.
- Once brought into compliance, a status review process will be used to review compliance every 4 years.



Nutrient Management Plans

Nutrient Management Plans (NMP's) are used to manage the amount(rate), source, placement, (method of application), and timing of plant nutrients and soil amendments to minimize nutrient loss to surface or groundwater. NMPs also help reduce/control cropland soil erosion and phosphorus loss to surface waters. This allows producers the ability to budget, supply, conserve nutrients and soil resources for plant production while minimizing agricultural nonpoint source pollution of surface and groundwater. Columbia County has set an implementation threshold of 70% NMP coverage on agricultural fields using DATCP, WDNR and other funding sources.

The 70% threshold as can be seen below while current NMP coverage is considerable there is still agricultural assessed lands in need in of NMP. When a sub basin hits the 70% goal the CCLWCD will use non-traditional approaches to promote NMP for the remaining 30% of the agricultural lands in need of NMP. To implement TMDL subbasin based TP and TSS % reductions shown in Appendices E and F. The CCLWCD will use a combination of tools such as but not limited to Erosion Vulnerability Assessment for Agricultural Lands (EVAAL) and Snap Plus to look for and verify cropland reductions that go beyond current NR 151 requirements.



Alternative Phosphorus Reduction Strategies

In the last few years several alternative opportunities have been developed statewide in the realm of nutrient reduction. Currently programs such as Water Quality Trading, Adaptive Management and Multiple Discharger Variance create situations in which point source discharges that are permitted under a WPDES permit. These compliance alternatives can include looking for offsetting phosphorus discharge by obtaining phosphorus reductions on agricultural landscapes in adjacent watersheds. These alternatives can include looking for offsetting reductions on agricultural landscapes in adjacent watersheds. These alternatives if chosen can create positive opportunities for the CCLWCD to partner with these permit holders to provide technical assistance to implement conservation practices that achieve phosphorous reductions. Currently Columbia County has been working with several WPDES permit holders that are evaluating these alternatives. We are open to working with them. Each situation is unique and requires a specific arrangement. Our most current negotiation is ongoing with the City of Columbus, who is looking to contract with CCLWCD to provide technical assistance to agricultural landowners to install a range of conservation practices to reduce phosphorous runoff. We currently have an ongoing agreement with Yahara WINNs, to provide the same services in our portion of the Rock River Recovery TMDL watershed.

Stormwater Management & Erosion Control

Columbia County and its rural nature does not have an intensive urban based stormwater and erosion control footprint. Columbia County has adopted some specific “Erosion Control and Stormwater Management Standards” in (16-140-090) of Columbia County’s Zoning Code. Title 16 Chapter 100 does require specific standards be met, based on area of disturbance, slope of land and in some cases specific uses. The Land and Water Conservation staff work in cooperation with Planning and Zoning staff to review compliance with accepted standards.

Financial Considerations Within NR 151

Many farmers voluntarily install many conservation practices on their farms to help improve water quality and wildlife habitat and to help prevent soil erosion. Cost share dollars will still find priority with landowners looking to voluntarily implement BMP on their lands. Columbia County will continue to offer voluntary cost sharing as program funds and priorities become available.

The agricultural performance standards and prohibitions found in NR 151 require 70% cost sharing be offered to change an existing cropland practice or livestock facility to bring them into compliance with the new standards. The opportunity exists for an increase to 90% cost sharing if economic hardship is proven.

The cost sharing requirements for NR 151 compliance applies to sites not found to be in compliance prior to October 1, 2002. This excludes Nutrient Management which has its own timeline related to geographical location, which was covered earlier in this section. Farmers who are in compliance with NR 151 on or after that date are not eligible for cost sharing if they later fall out of compliance. Farmers who establish new facilities may be eligible for cost sharing, but cost sharing is not required for compliance. Those farms covered under a WPDES permit are not eligible for state cost sharing to meet performance standards and prohibitions required under their permits.

Local Implementation Consideration and Process

The Columbia County Land and Water Conservation (LWCD) will take the lead role in the implementation of NR 151. We will be working in close cooperation with the Wisconsin Department of Natural Resources (WDNR) and other agencies towards a practical implementation process that serves all involved. *Regulatory and enforcement activities described under this section will be completed utilizing the following; NR 151.090 and NR151.095, ATCP 50, Columbia County Animal Waste Management Ordinance (Title 15) and Columbia Counties Soil and Water Conservation Standards for the Farmland Preservation Program. As a portion of the partnership with DNR, the County may look to DNR to provide regulatory support under the state enforcement process. It is anticipated that the majority of enforcement action will take place in a pro-active manner designed to bring landowners into compliance. Currently Columbia County does not have an official MOU with DNR regarding enforcement of NR 151. In the event that Columbia County can't achieve compliance through voluntary proactive landowner participation and or local ordinance enforcement, DNR will be utilized as the next step in this process to obtain compliance with NR 151. In the future Columbia County may request a more formal NR 151 MOU with DNR be developed and approved by both agencies.*

PLEASE NOTE: *The Implementation of each component of the Columbia County Land and Water Conservation Departments strategy to implement the NR 151 Performance standards is dependent on the LWCD receiving adequate funds to cover both staff resources and cost sharing resources as well as cooperation from potentially affected landowners. It is anticipated that WDNR and DATCP will be the major financial resources we will look to for partnership in this process.*

Local Process Components "Priority Farm"

Definition of a Priority Farm:

For the purpose of this document a **"Priority Farm"** will be defined as a farm that meets one of the bullet criteria below and having one or more issues of non-compliance with the Water Quality Performance Standards found in WDNR Administrative Code NR 151:

- lying within the Water Quality Management Area (WQMA)
- within a priority TMDL TP or TSS reduction watershed (see chapter 3, cropland soil erosion & nutrient delivery)
- within an HUC 12/TMDL sub-basin with high baseline total phosphorus or sediment loading (see appendix E)
- within a section with a significant number of wells with elevated levels of nitrate high groundwater contamination or high groundwater contamination susceptibility (see figures 3 and X in Chapter 4. Natural Resources and Assessments)

Information and Educational Activities:

The LWCD realizes the implementation of the Performance Standards will require a large amount of emphasis in regards to "Getting the Word Out" to landowners within Columbia County to increase understanding and cooperation. The LWCD will distribute information and educational material from various sources such as WDNR, DATCP and LWCD to affected landowners. We will use a series of

public meetings, direct mailings, workshops, newsletters, news media and on-site visits as our avenue for information distribution.

Our educational materials will be designed to accomplish the following:

1. Educate landowners about Wisconsin's agricultural performance standards and prohibitions, county ordinances, applicable conservation practices and funding opportunities;
2. Promote voluntary implementation of conservation practices necessary to meet standards and prohibitions;
3. Inform landowners of requirements and compliance procedures and the role the LWCD will have within those procedures;
4. Make landowners aware of expectations for compliance and consequences for non-compliance;
5. Develop for use an educational suite of tools that landowners would be required to review as a condition of receiving financial or technical assistance thru LWCD. The goal is to make sure we are doing everything we can to inform landowner of all required compliance provisions.

NR 151 Evaluation and Compliance Status:

The LWCD has begun the process of staging a before and after NR 151 October 1, 2002 scenario for all parcels within Columbia County. The Columbia County Land Information System and our Geographical Information System (GIS) will be the foundation for this process. We are building a GIS layer that will associate levels of compliance for all provisions found in NR 151. We expect this GIS Layer to be complete by 2028.

Our current GIS database includes a growing data set of current conservation plans, 590 NMP, BMP's and Permits issued. This growing GIS database will allow us to track projects in compliance on or before the implementation date. The department has fully developed a Farmland Preservation Program participation and compliance program thru the Ascent land records system. We have also fully developed a module in this system to track 590 NMP plans. We are currently in final stages of completing the BMP tracking module, and have started to import related documents into our File Director imaging software that will connect documentation to BMP's.

The GIS digital ortho photos from 2002 will be used as the base map. We also have access to a set of historical high-altitude aerial flights that the LWCD had been completing from about 1980 thru early 2000.

Along with the creation of a NR 151 compliance layer, the GIS system will be used to begin and continue the process of investigating and searching out non-compliant parcels within Columbia County. Using the combined data, layers can be developed to identify "potential problem areas" within the Water Quality Management Area or other priority farm criteria described above. Early identification of livestock operations within these areas would be defined as high priority. The process of using the various data layers available to us through our GIS system and easy access to parcel mapping information and addressing information will allow us to easily create mailing lists to focus on these areas through I/E and on-site visits.

Our GIS system will be used as a database which tracks conservation plans, nutrient management plans, installed BMP's, cost share agreements and various county permits. This system will assist staff and

landowners in monitoring progress towards the goals of our LWRM Plan. Monitoring and modeling information will be used to direct staffing efforts to accomplish implementation of the work plan and evaluate plan success.

As we develop our delivery program to incorporate TMDL based pollutant reduction goals within Columbia County, we will need to explore the development of tools to help us track actual and % pollutant reductions per practice selected watershed areas. The development of a tool that combines the basic parcel mapping tools in our current system, with pollutant reductions associated with various cropland BMP's will be a great combined tool to help us track compliance with baseline NR 151 expectations and plot a course for TMDL reduction tracking.

WDNR is currently developing tracking software title BITS or "Best Management Practice Implementation Tracking System". Columbia County has developed a similar internal system for tracking and will work with DNR to coordinate the sharing of this important spatially represented information associated with state wide NPS reduction efforts.

On Site Farm Visits:

On site farm visits will be the next step in the process of utilizing our GIS layer development as mentioned above. Priority Farms that fall within the Water Quality Management Area or other priority farm criteria will be reviewed through a systematic onsite review process. This onsite review process will begin with an informational mailing. The informational mailing will include materials related to the process, performance standards and prohibitions and anticipated results. The process for onsite will include one on one visits with landowners to go over and discuss the utilization of our NR 151 status review form.

The number, frequency and location of the onsite farm visits will strongly hinge on the current and future level of staff funding and cost sharing resources that will be available to the LWCD from DATCP and other sources and cooperation from potentially affected landowners.

On site visits will conclude with the determination and documentation as to the extent of current compliance with each of the performance standards and prohibitions. Where non-compliant, determine costs and eligibility for cost sharing and discuss timelines.

Note: Cost share requirements are based upon whether or not the evaluated cropland or livestock facility is new or existing and whether or not corrective measures entail eligible costs. See NR 151.09(4)(b-c) and 151.095(5)(b-c). Cost share requirements are also based upon staff and financial resources made available to the LWCD from DATCP and other sources.

Documentation and NR 151 status report:

Following completion of GIS work and on-site evaluation, prepare and issue an NR 151 status report to affected owners of the evaluated parcels. The status report will include at a minimum the following information:

1. Current status of compliance of parcel with each of the performance standards and prohibition

2. Corrective measure options and rough cost estimates to comply with each of the performance and prohibitions for which a parcel is not in compliance.
3. Status of eligibility for public cost sharing
4. Grant funding sources and technical assistance available from Federal, State and Local government and third-party service providers.
5. An explanation of conditions that apply if public cost share funds.
6. A timeline for completing corrective measures, if necessary.
7. Signature lines indicating landowner agreement or disagreement with report findings.
8. Process and procedures to contest evaluation results to LWCC
9. (Optional) a copy of performance standards and prohibitions and technical design standards
10. Based on established TP reduction numbers or modeled results, TP reductions will be tracked by watershed.

Note: A cover letter signed by the LWCD describing the ramifications and assumptions related to the status report will be attached

Maintaining Public Records and Landowner Notification:

The compliance records and related information related to specific parcels will remain public record. In an effort to ensure that subsequent landowners are made aware of (and have access to) NR 151 compliance on their property we will continue to work on a long-term notification process. This process will include the partnership of the Columbia County Land Information Department and the development of the programming capabilities that would tie our GIS data layers to the counties land records system and information related to parcel transactions. This relationship would allow the LWCD to be notified through the land records system when a parcel with relationships to NR 151 compliance would change ownership through the Register of Deeds office. Discussion with LIO and the process to accomplish this are ongoing and we hope to be able to utilize this process within the next couple of years.

Technical Assistance and Cost Sharing to Install BMP's (Conservation Practices):

Voluntary Participation (Cooperative):

1. Receive request for cost-share and/or technical assistance from landowner
2. Confirm cost-share grant eligibility and availability of cost-share and technical assistance to meet one or more NR 151 agricultural performance standards.
3. Develop and issue cost-share contract listing BMP's to be installed or implemented, estimated costs, project schedule and notification requirements under NR 151.09(5-6) and/or 151.095(6-7).

Non-voluntary component (Non-Cooperative)

In the event that a landowner chooses not to install corrective measures either with or without cost sharing, the landowner will be issued notification per NR 151.09(5-6) and/or 151.095(6-7).

The notification will include the following information:

1. If eligible costs are involved, this notification shall include an offer of cost sharing.

2. If no eligible costs are involved, then notification will not include offer of cost sharing and will explain justification why cost sharing does not apply.
3. A description of the performance standard and prohibition being addressed.
4. The compliance status determination of which best management practice or other corrective measures are needed and which, if any, are eligible for cost sharing.
5. An offer to provide or coordinate technical assistance.
6. A compliance period for meeting the performance standard or prohibition
7. An explanation of possible consequences if the owner or operator fails to comply with provisions of the notice.
8. An explanation of local appeals procedures.

If cost sharing is involved, the LWCD will draft a program specific cost share agreement including a schedule for installing or implementing BMP's. Potential practices and cost share rates can be found in ATCP 50.

The LWCD will provide technical assistance and oversight for all conservation practices as staff time allows.

These technical services include:

1. Provide conservation plan assistance
2. Provide engineering design assistance
3. Review engineering designs provided by other parties
4. Provide construction oversight
5. Evaluate and certify installation of conservation practices

Note: *At this time, the LWCD does not have the capacity to provide NPM 590 plan development, from start to finish for all landowners. We will provide assistance with conservation planning, critical spreading areas and other information we regularly provide. Landowners will be directed to work with Certified Crop Consultants or self-certification program for Nutrient Management Plan development. The LWCD will continue to use NMFE grants to support a local avenue for landowners to develop NMP 590 Plans. In the future if staff resources and technical skills are available, we would like to expand our technical assistance in this area.*

Re-evaluate Parcel for Compliance:

After corrective measures are applied, conduct an evaluation to determine if parcel is now in compliance with relevant performance standard(s) or prohibition(s).

If site is compliant, update "NR 151 Status Report" and issue "Letter of NR 151 Compliance."

Note: *A letter of NR 151 compliance serves as official notification that the site has been determined to now be in compliance with applicable performance standards and prohibitions. This letter would also include an appeals process if a landowner wishes to contest the findings.*

If not compliant, seek non-regulatory remedies or initiate enforcement action.

Enforcement Action:

If a landowner refuses to respond appropriately to official notice of non-compliance or is in breach of a cost share contract, the LWCD will prepare and issue a "Notice of NR 151 Violation" letter. This Notice will be pursuant to processes outlined and authorities obtained in the Columbia County Animal Waste Management Ordinance (Title 15).

Note: *Enforcement begins with this letter. It will be pursued in circumstances where:*

(1) A breach of contractual agreement has occurred including failure to install, implement or maintain BMP's and

(2) Non-regulatory attempts to resolve the situation have failed

Process for Appeal of Non-Compliance Decision:

Landowners wishing to appeal a notice of NR 151 Non-Compliance may do so to the Columbia County LWCC. This process will be spelled out in detail within the anticipated revision of the Columbia County Animal Waste Management Ordinance (Title 15). Details related to the appeal process will be forwarded to all landowners receiving a notice of non-compliance.

Where Does Implementation Start and how do we set Inter-Departmental Priorities?

The Implementation process related to the performance standards and prohibitions found in NR 151 can and will be a large and very time-consuming task. So it's realistic to evaluate and set priorities within Columbia County.

Currently the LWCD has begun the process of utilizing GIS and on-site visits to begin the inventory of several watersheds within Columbia County. It is likely that based on the shortage of staff and cost sharing resources that we will utilize information gathered through those inventories to continue our implementation process. It is likely some watershed-based emphasis will take place in regards to implementing NR 151 on priority farms. Much of this emphasis will likely relate to available staff and cost sharing resources that become available. The Farmland Preservation Program combined with the most current TMDL information for specific watersheds (see appendices E and F), will be utilized to help focus discussions on which watershed areas are high priority implementation areas. This will be specifically true for upland loading, because achieving reductions and modeling them will be dependent on the existing and access to the most current cropping and soils information that is nested in a 590 NMP Plan and the associated Snap Plus database. We will continue to evaluate opportunities to use this data overlap to focus our NR 151 compliance efforts and continue making progress towards meeting TMDL cropland reductions for TSS and TP. The NPS source compliance issues found associated with farmstead feedlot sources or fixed location sources, will continue to be evaluated and implemented according to the priority farm approach outlined in this plan.

Due to the fact that workloads are at an all-time high with LWCD and staff funding is not keeping up with the workload, we will be continuing to search out collaborative funding endeavors with other entities throughout Columbia County. These collaborative funding avenues and potential access to cost share implementation dollars will likely guide our priority setting over the next 10 years.

If an increase in staff support and cost sharing availability becomes a reality, we will adjust our implementation schedule accordingly.

Response to Public Complaints Alleging Noncompliance:

The LWCD will respond to complaints by investigating allegations with a file review, on-site visit. If the review demonstrates significant violation of Agricultural Performance Standards, the LWCD will proceed with a strategy for compliance. This process will include the above discussions found within the NR 151 implementation strategy.

Note: Follow-up, on-site visits and access to cost share funding will all be dependent on current availability of local and state financial resources. Inadequate staff time and lack of adequate cost sharing resources could result in slower than normal enforcement and follow up.

Ongoing Evaluations to verify Ongoing Compliance:

The LWCD will develop a long-term plan to balance workload relating to servicing new NR 151 non-compliant issues and spot-checking existing on-going compliance issues. It is likely that a combination of spot-checking, self-certification forms and other in-field evaluation tools will be used to maintain a long-term monitoring plan to assure ongoing compliance.

Chapter 7. CAC/TAC Resource Issues and Concerns 2021-2030

The following is a comprehensive list of resource issues and concerns developed during the 2021 update of this plan, the listng order is not relative to importance or priority. These LWRM Citizen Advisory Committee & Technical Advisory Committee resource issues and concerns represent the information gathered through the nominal group process and the related main points of citizen input. These points are provided as background information to the plan and the process. The long-term action items found further into this document were developed based on philosophies and themes uncovered during this process. These philosophies and themes were related to the functionality of programs, services and opportunities that exist within the Land and Water Conservation Department. The annual workplan developed each year will draw from these themes and long-term action items. The specific goals, objectives and measurable benchmarks found in the annual workplan will be developed as realistic annual progress approaches to address the resource issues and concerns brought forth by the CAC and TAC.

1. **Groundwater Quality and Quantity**
    a. Groundwater Recharge and Wellhead Protection
    b. Groundwater Nitrate Contamination Concerns
    c. Note See also Flooding Issues
    d. I/E regarding well construction/septic systems/waste storage structures/nutrient applications and how they impact groundwater

2. **Surface Water Resource Quality and Impacts Associated With Degraded Quality**
    a. Watershed management
        i. TMDL Implementation
        ii. Adaptive Management
        iii. Nutrient Trading
        iv. 303d listed impaired waters
        v. NR 151 Performance Standards & Prohibitions
    b. Create partnerships for future funding
    c. Phosphorous loading
    d. Sedimentation
    e. Inventory of non-point source impacts on surface waters

3. **Flooding Issues**
    a. I/E to citizens and local units of government related to flooding issues/high groundwater issues throughout Columbia County.
    b. Provide venues for people to better understand long- and short-term impacts associated with runoff events and help them understand what storm water management planning does provide and does not provide

4. **Increase and Promote Awareness Of Wetland Restoration Efforts And Opportunities**
    a. Protect existing wetland areas
    b. Promote restoration of wetlands

5. **Lakeshore and Shoreline**
    a. Information/Education in regards to land use adjacent to surface water
    b. Information/Education of best management practices
    c. Partner with Planning and Zoning with implementing shoreland zoning
    d. Increase, educate and Promote Native shoreline buffers

6. **Promote use of a Stream and Lake Water Quality Monitoring Process**
    a. LWCD provides leadership, management and partner with other stake holders

7. **Animal Waste Management and Nutrient Application Management Impacts On Water Quality**
    a. Utilize manure management work group/producer led councils
    b. Implementation of NR 151 Prohibitions & Performance Standards
    c. Implement County's Agricultural Performance Standards and Agricultural Waste Management Ordinance (Title 15)
    d. Connection of livestock producers to cash crop growers
    e. NMP Implementation with priorities focused on land application of nutrients/amendments with compliance monitoring
    f. Promote adoption of rotational grazing as a management tool

8. **Drained Agricultural Lands**
    a. Value of use as farmland or wetlands
    b. Information and education to citizens related to how drainage districts function and the applicability in certain areas and not in others.
    c. Impacts of drainage

d. Value of promoting conservation initiatives associated with drainage systems

9. Soil Erosion

a. Provide staff resources to implement conservation management plans
b. Increase use of grassed waterways
c. Promote and install best management practices with an emphasis on critical areas
d. Encourage production of forage crop rotations that promote soil health
e. Promote the use of cover crops

10. Land Spreading Of Waste

a. Growing concerns related to accountability associated with all source waste being land applied on agricultural lands, this includes septage, industrial and agricultural inputs. There needs to be better accountability for all parameters associated with these land application practices

11. Livestock Farms

a. Location/Odor/Acres/Nutrient and Pesticide Management
b. Proper land use planning to address potential conflicts and the future of growing livestock farms in Columbia County
c. Information & education regarding land use expectations

12. Promotion and Preservation Of Livestock Operations In Columbia County

a. Discuss and promote the value that livestock brings to the agricultural industry in Columbia County
b. Livestock provides long-term agricultural land preservation
c. Need to work with manure handling issues to provide long term growth
d. Understanding challenges associated with a dynamic livestock industry
e. Promoting diversity of livestock operations
f. Impacts of changing farming systems related to soil erosion
g. Develop systematic approach to monitor animal waste storage structures including condition, use and functionality

13. Agricultural Preservation

a. Preserve Prime Soils
b. Use Smart Growth Planning and Zoning as our updated tool
c. Increased use of Zoning to maintain Agricultural land
d. Farmland Preservation Program County participation should be a priority tool to assist in preservation and economic support for Agriculture in Columbia County
e. Increase Incentives through farmland preservation and other stewardship-based programs

14. Storm water And Erosion Control Impacts

a. Concerns over Future development impacts
b. Correction of existing development storm water problems
c. Promote infiltration of storm water
d. Partnering with Planning Zoning to implement existing regulations

15. **Wildlife & Habitat Concerns**
    a. Provide increased marketing to general public in regards to detrimental impacts of a large deer herd on agriculture, reforestation, tree planting, natural forest regeneration, public highway travel/safety and the overall health of the deer herd
    b. Agriculture Wildlife Damage Program
    c. Threatened & Endangered Species
    d. Enhance, promote and protect critical habitats

16. **Forestry**
    a. Forestry health and repopulation for future
    b. Promote good forestry practices
    c. Maintain and support Tree Sales Program and infrastructure
    d. Increased use of necessary forestry resources to promote good forestry
    e. Work with partners related to invasive forest problems

17. **Non-Native Invasive Species Control**
    a. Information/Education on programs, needs and resources
    b. Concerns related to Terrestrial and Aquatic species
    c. Locating potential funding sources for programs participation for relevant concerns and threats
    d. County can continue to serve as venue for I/E and program cooperator as need arises to implement state and federal programs
    e. Bring partners together to address and control non-native phragmites while it's still controllable.

18. **Air Quality**
    a. Burning of refuse materials
    b. County should continue to support disposal opportunities and programs for landowners to deal with Ag related waste that may end up being burned (Silage bags etc.)

19. **Climate Change Resiliency**
    a. Changing Rainfall Frequency & Intensity
    b. Challenges to Infrastructure Both Subsurface and Surface
    c. Slow down overland flow/promote infiltration
    d. Promote Soil Health Dialog
    e. Columbia County needs to be looking at and thinking about things such as carbon trading, green energy, wind and bio fuels as we move forward over the next decade. What role can Columbia County have related to these issues
    f. Impact on ground water

20. **Preservation Of Wildlife, Fishery, Natural Areas And Open Spaces**
    a. Work with other partners to evaluate important tax delinquent properties that may additional public interest
    b. Support State and Federal programs that provide opportunities for landowners to participate in conservation easements and purchase of development rights opportunities
    c. Support preservation of wildlife, fisheries, natural areas and open spaces.

21. Information And Education On Natural Resource issues

a. Holistic watershed management
b. Land use impacts on natural resources
c. More media coverage to carry message
d. Increase development and value of web page
e. Outreach to youth, organizations, citizens, and general public
f. Create short course educational program for participants that receive technical and financial assistance thru department

22. Financing Of Land And Water Resource Management Plan

a. Increased County recognition and financial commitment to Conservation
b. Increased State and Federal long-range funding

23. Increased Inter-governmental Cooperation On Natural Resource Issues

a. Local/state/federal partnerships and better understanding of local needs

24. Increased Enforcement Tools For Columbia County LWCD

a. Implementation process, citations…etc.…
b. Ordinance enforcement

25. Recreational/Natural Area Infrastructure Improvements

a. Public access to waterways fish/swim/boat
b. Foster more partnerships to enhance public recreational areas
c. Continue to develop existing park infrastructure in Columbia County and take advantage of and improve on the resources and opportunities we have

26. Columbia County Board Buy In And Support For Local Natural Resource Protection Programs

a. Make long term water quality and natural resource protection a top priority for Columbia County

27. Property Tax Implications Associated With Conservation Practice Adoption

a. There is a growing disconnect associated with preservation of forest land, wetland and cropland related to our current property tax structure. The current structure in many cases can actually encourage a landowner to move away from conservation practice adoption

28. Partnerships To Further Conservation

a. Look at opportunities that may exist to partner with private entities and or business partnerships that may assist in funding conservation programs and policies
b. Promote the development and use of Producer Led Councils

29. Green Energy

a. Promote and pursue program that supports engagement of green energy movement

Chapter 8. Summarized CAC/TAC Priority Resource Concerns

1. Soil erosion and sediment delivery
2. Protection and improvement of surface water quality
3. Protection and improvement of ground water quality-Nitrate contamination
4. Habitat protection and restoration
5. Invasive species prevention and management
6. Climate change resiliency

Chapter 9. 2021-2030 Long-Term Action Items (Goals/Objectives)

These long-term action items represent specific examples of actions that the CCLWCD can and will use to address priority resource concerns now and into the future. Specific actions with more measurable benchmarks will be captured in the annual workplan submitted as part of the SWRM grant process and may also be reviewed and discussed with WDNR staff. This list of action items is not inclusive or exclusive. It represents action items developed as part of the 2021 CAC/TAC participatory process. Many of the action items represented below will have overlapping relationships with multiple priority resource concerns.

- Continue to utilize the Farmland Preservation Program not just an agricultural preservation tool but as an NR 151 implementation tool, and a watershed nutrient reduction tool. This includes expanding participation, compliance reviews, and utilization of existing 590 NMP plans to reduce/control cropland driven nutrient delivery to surface water and groundwater.

- Work to expand FPP eligibility to Towns of Scott and Randolph either through Zoning or AEA development

- Continue to work towards more 590 NMP coverage in Columbia County. The use of existing NMP parcel mapping information should continue to help us develop focus on selected areas. Once we hit a goal of 70% coverage in a watershed, we can start enhancing our use of targeted reductions utilizing BMP’s on cropland areas, that will benefit overall TMDL reduction goals.

- Expand 590 NMP adoption thru utilization of cost sharing and Nutrient Management Farmer Education (NMFE) grants.

- Work with landowners and partners to explore development of “Producer Led Council” development in Columbia County. The development and utilization may help us explore outside the box collaboration to get us further down the road of cropland adoption of nutrient reducing practices.

- Explore development of strategies to enhance conservation programming and projects in areas with groundwater nitrate levels exceeding standards. Continue to promote well water testing

- Provide technical assistance and cost sharing to abandon unused groundwater wells.

- Use Columbia County G-Flow model to evaluate groundwater capture zones and potential impacts

- Continue to develop and integrate FPP/BMP/NMP/NR 151/TMDL tracking database thru the Columbia County Ascent land records system. Coordinate with WDNR to assure compatibility with DNR "BITS" tracking system.

- Continue to implement NR 151 runoff management standards by focusing on priority livestock farms and priority cropland farms. This includes the use of most current GIS data and modeling data to further focus priority areas reductions. Cordinate with WDNR as necessary to verify or maintain compliance with NR 151 runoff management standards.

- Work with DNR to enhance utilization of TMDL reduction goals for TSS and TP, and evaluate how use of this targeted information could be woven into existing implementation strategies. This could include a more focused small-scale watershed improvement plan, such as a 9 key element plan for priority watershed areas.

- Continue to annually apply for DNR TRM funding to get access to state cost sharing to bring landowners into compliance with NR 151 performance standards or to enhance TMDL nutrient reduction goals.

- Complete the final revisions necessary to Columbia County Title 15 Agriculture Performance Standards and Agricultural Waste Management Ordinance.

- Continue the promotion and utilization of "Managed Intensive Grazing Systems". This includes developing technical and financial resources to assist landowners with implementation. This could include partnering with Golden Sands RC&D to provide higher level of technical assistance.

- Work with landowners to promote adoption of basic upland conservation practices that deal directly with identified active soil erosion issues. These include installation of grassed waterways, wascob's and terrace systems.

- Promote adoption of basic "Soil Health" practices, including the utilization of cover crops, reducing tillage frequency and other soil health developing practices.

- Continue to use DNR Lake Planning Grants and Lake Protection Grants to enhance data collection, planning and overall improvement of surface water bodies in Columbia County. This includes developing a strong correlation to how TMDL reductions connect to surface water quality and expectations.
- Promote CREP as a valuable tool to protect vulnerable fields, and aid in nutrient reduction goals.

- Work with producers to limit winter application of manure on vulnerable areas (e.g. soils with shallow bedrock or groundwater). This includes investing time and energy into more I/E with producers regarding what is expected of them with or without manure storage.

- Provide program opportunities and I/E to public concerning control and management of terrestrial and aquatic invasive species. This includes taking advantage of programs and partnerships that could be developed to build on local program with or without outside financial funding. Evaluate opportunity to partner with Golden Sand RC&D to provide technical assistance.

- Promote more universal public understanding of role livestock production has in Columbia County agriculture and demonstrate work that has been done to improve impact that livestock production can have on surface water and groundwater.

- Utilize local surface water monitoring program to better understand and demonstrate impacts and improvements associated with implementation of NR 151 runoff stnadards with selected watersheds.

- Provide for increased I/E sharing thru various media streams to education and inform citizens on challenges or progress relation to all priority resource issues.

- Promote sustainable habitat management. This includes forest, wetland and other niche habitats. Department will work with partners to take advantage of opportunities to develop the capacity to help landowners manage, restore or develop these types of habitats.

- Build program and practice capacity that recognizes the ideology of “Climate Change Resiliency”. This should be done with the understand that rainfall frequency and intensity is changing. These changes are challenging surface and subsurface infrastructure. We need to promote slowing down overland flow and promote infiltration.

- Evaluate use of “alternative nutrient reduction” partnerships such as Nutrient Trading, Adaptive Management or Multiple Discharger Variance. This evaluation will include how developing these partnerships can help implement existing department program goals.

Chapter 10. Utilization of Existing Available Funding Sources for Cost Share Dollars

Current and future funding levels to fund implementation of cost sharing components of this plan are unknown. It is the hope that the LWRMP program funds to implement BMP’s through this plan will increase in the future. It will be the policy of the LWCD to utilize a percentage-based breakdown of existing LWRM cost sharing dollars each year. This breakdown will be streamlined internally through departmental policy but will likely result in a split of 60% for voluntary participation and 40% for enforcement and regulatory activities related to this plan. Flexibility will be utilized depending on the demands and specific site needs.

It is also the intent of the LWCD to encourage utilization of funds from CREP, EQIP and other federal and state programs as they become available. It is also the intent of the LWCD to utilize the WDNR Targeted Runoff Management (TRM) grant program as an avenue to target specific enforcement and voluntary activities related to NR 151 and other applicable standards. We will also be looking to utilize Lake Protection Grant program funds in areas where we have cooperatively been working in the realm of Lake Planning grants to help implement needed BMP's.

Targeting of Specific Geographical Locations within Columbia County

The question of where we begin implementation of specifics within this plan will be addressed by departmental policy. This policy will reflect some level of priority status for areas in the 303(d) listed TMDL watersheds or areas with demonstrated groundwater contamination. The emphasis on other areas will largely depend on our ability to partner and gain access to increased levels of cost share dollars and staff dollars to carry out the work we need to do in regards to BMP implementation in Columbia County. Overall, implementation of NR 151 will concentrate on areas within the Water Quality Management Area (WQMA) and/or priority TMDL sub-basins throughout Columbia County. We do anticipate evaluating how to use TMDL data into our watershed approach. Water quality monitoring data will also be used to help focus implementation areas. We will use a combination of available funding sources and willing alternative opportunities for partnering. All things being equal, referencing the TMDL TP and TSS reduction rankings will be a major contributor toward geographical selection.

Monitoring and Evaluation

The evaluation and long-term monitoring of this plan will include several approaches. Many of the goals and objectives will be easily measurable within a given time frame. Evaluation of things such as the number of Nutrient Management Plans written or grassed waterways installed are all things that can be measured and used in evaluation of the effectiveness of this plan. The LWCD will meet regularly with the LWCC and will annually update the committee and CAC on current issues and trends related to meeting our LWRMP objectives. This along with annual reports submitted to DATCP during our application/report process will serve as a monitoring mechanism. These tangible measurements and their successes and or failures will be discussed and reviewed fully. In the event that resources are not available to meet goals and objectives the LWCD will work with DATCP, LWCC and CAC, to evaluate resources needed and make adjustments as necessary. It is likely that through our implementation process, issues will come up in regards to availability of resources and yearly work plan adjustments will be made through updated work plans.

It is the goal of the Columbia County LWCD to develop a strong water quality monitoring program. In the summer of 2005, we began this process. Working with folks like WAV, Rock River Coalition, WDNR and UWSP we are currently completing monitoring programs within the Park Lake, Lazy Lake and Tarrant Lake watersheds. It is our hope to learn and gain the resources needed to expand this process to other surface water systems within Columbia County. This data gathered through these efforts will be yet another tool we will use to monitor the long-term benefits of many of the programs and initiatives we are working on.

The use of nonpoint source inventories will also be used in monitoring and evaluating our plan and future plan objectives and goals. The LWCD continues to conduct an annual Transect Survey looking at

cropland erosion trends; we will continue to use this as a measurement tool. Numerous other inventory data sets are and will continue to be utilized. Things such as NRI land use information and Land Sat Photos for land cover will be utilized as needed.

The utilization of our GIS system and its data sets and corresponding layers will be our main tool for monitoring and evaluation. We will be tracking inventory data related to the NR 151 Performance Standards and all other program related BMP installations. The ability to inventory and return for review and status using GIS will prove to be the most important management tool we have to evaluate the overall status of resource needs within Columbia County.

Monitoring the effectiveness of information and educational goals and objectives within this plan will prove to be challenging. The ability to make direct connections with these types of initiatives will need to be accepted through increased measurements in other areas of program responsibility. Although the value of information and education is often overlooked and tough to measure, the LWCD believes good connections can be made to other measurable program goals and objectives.

Acronym Guide

DATCP	WI Department of Agriculture, Trade and Consumer Protection
CAC	Citizen Advisory Committee
WDNR	WI Department of Natural Resources
LWCD	Columbia County Land and Water Conservation Department
NRCS	Natural Resource Conservation Service
FSA	Farm Service Agency
LWRM	Land and Water Resource Management
GIS	Geographical Information System
FPP	Farmland Preservation Program
TMDL	Total Maximum Daily Load
WRP	Wetland Reserve Program
CWD	Chronic Wasting Disease
BMP	Best Management Practice
WWSF	Warm Water Sport Fishery
NMP	Nutrient Management Plan
NR 151	WDNR Administrative Rule 151
AWAC	Animal Waste Advisory Committee

WQMA	Water Quality Management Area
WAV	Water Action Volunteers
UWSP	University of Wisconsin Stevens Point
CREP	Conservation Reserve Enhancement Program
EQIP	Environmental Quality Incentive Program
TRM	Targeted Runoff Management Program
ATCP 50	DATCP Administrative Rule 50
BMP	Best Management Practice, interchangeable with conservation practice

Glossary of Terms

303(d) WATERS:
A list submitted to the U.S. Environmental Protection Agency, which identifies waters that do not meet water quality standards for specific substances or the designated use. This list is required under the Clean Water Act and determined by the WDNR.

ALGAE:
Microscopic, photosynthetic water plants. Algae give off oxygen during the day as a product of photosynthesis and consume oxygen during the night as a result of respiration. Therefore, algae affect the oxygen content of water. Nutrient-enriched water increases algae growth.

ANIMAL WASTE MANAGEMENT:
A group of practices including barnyard runoff management, nutrient management and manure storage facilities designed to minimize the effects of animal manure on surface and groundwater resources.

BASIN WATER QUALITY MANAGEMENT PLANS:
A plan to document water quality conditions in a drainage basin and make recommendations to protect and improve basin water quality. Each Wisconsin basin must have a plan prepared for it, according to Section 208 of the Clean Water Act.

BEST MANAGEMENT PRACTICE (BMP):
The most effective, practical measures to control non-point sources of pollutants that run off from land surfaces.

BUFFER STRIPS:
Strips of grass, shrubs, trees and other vegetation between disturbed areas and a stream, lake or wetland

CHAPTER 92:
The portion of Wisconsin Statutes detailing the soil and water conservation, agricultural shore land management and animal waste management laws and policies of the State.

COST-EFFECTIVE:
A level of treatment or management with the greatest incremental benefit for the money spent.

ECOSYSTEM:
The interacting system of a biological community and its non-living surroundings.

ENVIRONMENTAL PROTECTION AGENCY (US EPA):
The federal agency responsible for enforcing federal environmental regulations. The Environmental Protection Agency delegates some of its responsibilities for water, air and solid waste pollution to state agencies.

EROSION:
The wearing away of land or soil by wind or water.

EUTROPHIC:
Refers to a nutrient-rich lake. Large amounts of algae and weeds characterize a eutrophic lake (see also "oligotrophic" and "mesotrophic").

EUTROPHICATION:
The process of nutrient enrichment of a lake leading to increased production of aquatic organisms. Eutrophication can be accelerated by human activity such as agriculture and improper waste disposal.

GEOGRAPHICAL INFORMATION SYSTEM (GIS):
A computer system used to organize data geospatially by mapping and creating layers of information that are geographically in place. Allows users to visualize data for analysis and decision-making.

GLOBAL POSITIONING SYSTEM (GPS):
A system, which uses satellites to determine the exact location of a site, which can then be downloaded onto a computer for mapping and tracking purposes.

GROUNDWATER:
Underground water-bearing areas generally within the boundaries of a watershed, which fill internal passageways of porous geologic formations (aquifers) with water that flows in response to gravity and pressure. Often used as the source of water for communities and industries.

HABITAT:
The place and environmental conditions under which a plant or animal will naturally live and grow.

HERBICIDE:
A type of pesticide that is specifically designed to kill plants and may be toxic to other organisms.

IDENTIFIED FARM:
A critical site found to be in violation of NR 151.

MITIGATION:
The effort to lessen the damages from a particular project through modifying a project, providing alternatives, compensating for losses, or replacing lost values.

NONPOINT SOURCE POLLUTION:
Pollution whose sources cannot be traced to a single point such as a municipal or industrial wastewater treatment plant discharge pipe. Nonpoint sources include eroding farmland and construction sites, urban streets and barnyards. Pollutants from these sources reach water bodies in runoff, which can best be controlled by proper land management.

NR 151:
State Administrative code that establishes runoff pollution performance standards for non-agricultural facilities and transportation facilities and performance standards and prohibitions for agricultural facilities.

NUTRIENT MANAGEMENT PLAN:
A guidance document that provides fertilizer and manure spreading recommendations for crop fields based upon soil test results and crop needs. Plans are sometimes referred to as NRCS 590 plans for the Natural Resources Conservation Service Standard that guides their preparation.

OLIGOTROPHIC:
Refers to an unproductive and nutrient-poor lake. Such lakes typically have very clear water (see also "eutrophic" and "mesotrophic").

PERFORMANCE STANDARDS:
The land management activities or threshold levels necessary to reduce or eliminate negative effects on land and water resources.

PESTICIDE:
Any chemical agent used to control specific organisms, such as insecticides, herbicides, fungicides, etc.

PHOSPHORUS:
A nutrient that, when reaching lakes in excess amounts, can lead to over-fertile conditions and algae blooms.

POINT SOURCES:
Sources of pollution that have discrete discharges, usually from a pipe or outfall.

POLLUTION:
The presence of materials or energy whose nature, location, or quantity produces undesired environmental effects.

PRIORITY FARM:
A farm identified by the county for having excessive soil erosion and/or manure runoff resulting in existing or potential water quality problems.

PRIORITY WATERSHED:
A drainage area selected to receive state money to help pay the cost of controlling non-point source pollution.

PRODUCTIVITY:
A measure of the amount of living matter which is supported by an environment over a specific period of time. Often described in terms of algae production for a lake.

PROHIBITIONS:
Land management activities that are not allowed by local or state regulatory processes.

REDUCED TILLAGE:
Planting row crops while only slightly disturbing the soil so that a protective layer of plant residue stays on the surface and erosion rates decrease.

RIPARIAN:
Belonging, living, or relating to the bank of a lake, river, or stream.

RIPRAP:
Broken rock, cobbles, or boulders placed on the bank of a stream to protect it against erosion.

RUNOFF:
Water from rain, snowmelt, or irrigation that flows over the ground surface and returns to streams and lakes. Runoff can collect pollutants from air or land and carry them to receiving waters.

SEDIMENT:
Soil particles suspended in and carried by water as a result of erosion.

SEPTIC SYSTEM:
Sewage treatment and disposal for homes not connected to sewer lines. The system usually includes a tank and drain field. Solids settle to the bottom of the tank. Liquid percolates through the drain field.

STORM SEWERS:
A system of sewers that collect and transport rain and snow runoff. In areas that have separated sewers, such storm water is not mixed with sanitary sewage.

SUSPENDED SOLIDS (SS):
Small particles of solid pollutants suspended in water.

TOLERABLE SOIL LOSS:
The tolerable soil loss rate in tons per acre per year, commonly referred to as "T," is the maximum average annual rate of soil erosion for each soil type that will permit a high level of crop productivity to be sustained economically and indefinitely (ATCP 50.01(16)).

TOTAL MAXIMUM DAILY LOADS (TMDL):
The maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TROPHIC STATUS:
The level of growth or productivity of a lake as measured by phosphorus content, algae abundance and depth of light penetration.

TURBIDITY:
Having suspended or stirred up particles, referring to a lack of water clarity. Turbidity is usually closely related to the amount of suspended solids (sediment or algae) in water.

UNIFORM DWELLING CODE:
A statewide building code for communities larger than 2,500 residents specifying requirements for electrical, heating, ventilation, fire, structural, plumbing, construction site erosion and other construction related practices.

UNIVERSAL SOIL LOSS EQUATION:
An equation used to estimate the amount of soil lost annually per acre from crop fields. It takes into consideration the following factors: rainfall, slope, slope length, soil erodibility, crop rotations and crop practices (NRCS Agricultural Handbook 537).

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):
A special outreach and education branch of the state university system.

VARIANCE:
Government permission for a delay or exception in the application of a given law, ordinance, or regulation. Also, see water quality standard variance.

WASTE:
Unwanted materials left over from manufacturing processes; refuse from places, of human habitation or animal habitation.

WATER QUALITY CRITERIA:
A measure of the physical, chemical, or biological characteristics of a waterbody necessary to produce and maintain different water uses (fish and aquatic life, swimming, etc.).

WATER QUALITY STANDARDS:
The legal basis and determination of the use of a water body and the water quality criteria; (physical, chemical, or biological traits of a waterbody) that must be met to make it suitable for a specified use.

WATER QUALITY STANDARD VARIANCE:
When natural conditions of a water body preclude meeting all conditions necessary to maintain full fish and aquatic life and swimming, a variance may be granted.

WATER Quality Management Area (WQMA):
An area defined as being within 1,000 feet of a lake or 300 feet of a stream, river, creek or tributary.

WATERSHED:
The land area that drains into a lake or river.

WETLANDS:
Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WISCONSIN ADMINISTRATIVE CODE:
The set of rules written and used by state agencies to implement state statutes. Administrative codes are subject to public hearing and have the force of law.

WISCONSIN NON-POINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:
A state cost-share program established by the state Legislature in 1978 to help pay the costs of controlling non-point source pollution. Also known as the non-point source element of the Wisconsin Fund or the Priority Watershed Program.

List of Best Management/Conservation Practices Commonly Used Towards Addressing Water Quality/Soil Erosion Issues *The most current and up to date list of conservation practices can be found in ATCP 50 Subchapter VIII-Standards for Cost-Shared Practices.

Access Road
Animal Trails and Walkways
Brush Management
Manure Storage closure
Manure Storage Structures
Contour Buffer Strips
Conservation Tillage
Contour Farming
Critical Area Seeding
Diversion
Forest Stand Improvement
Grade Stabilization Structure
Grassed Waterway
Heavy Use Protection
Nutrient and Pesticide Management
Prescribed Burning
Residue Management
Stream bank and Shoreline Protection
Barnyard Runoff Control
Terrace
Tree/Shrub Establishment
Prairie Restoration
Wetland Restoration
Use Exclusion
Well Abandonment
Prescribed Grazing

Description of Related Regulations

NR 151, Wis. Admin Code: Establishes Water Quality Performance Standards and Prohibitions

ATCP 50, Wis. Admin Code: Establishes NPM and Sheet/Rill Standards, FPP program and conservation compliance standards, technical standards for cost shared practices and cost sharing requirements for existing facilities.

Comprehensive Planning Law, ss 66.1001 and 16.965, Wis. Stats: Defines comprehensive plan and consistency requirements between plan and land use decisions after January 1, 2010.

Columbia County Animal Waste Management Ordinance (Title 15): Adopted under authority by Section 59.02, 59.03, 92.16 and 281.16(3)(a)1.4 Wis. Stats to require permits for manure storage structure construction, operation and abandonment along with various other manure related issues such as NPM, manure stacking and direct runoff from feedlots.

Columbia County Zoning Ordinance (Title 16): Comprehensive Zoning Ordinance controlling Zoning, Land Subdivision, Private Sewage, Floodplain, Shoreland/Wetland Protection and Non-Metallic Mining.

Soil and Water Conservation Standards for the Farmland Preservation Program: Adopted under s 92.105, Stats, sets standards for conservation compliance and program eligibility.

Related Reference Materials:

The State of Lower Wisconsin River Basin, completed in July of 2002 by the Wisconsin DNR. (Publ WT-559-2002)

The State of the Rock River Basin, completed in April of 2002 by the Wisconsin DNR. (Publ WT-668-2002)

The Upper Rock River Watershed Management Plan, Upper Rock River Watershed Appendix, completed in April of 2002 by the Wisconsin DNR (Publ WT-668b-2002)

The State of the Upper Fox River Basin, completed in October 2001 by the Wisconsin DNR. (Publ WT-665-2001)

The Future of Rowan Creek Watershed: Connecting Land Use and Management with Water Quality completed in 2002 by the Gaylord Nelson Institute for Environmental Studies UW-Madison.

Beaver Dam River Priority Watershed Plan (1994)

Yahara-Mendota Priority Watershed Plan (1997)

Neeneh Creek Priority Watershed Plan (1994)

Columbia County Agricultural Preservation Plan updated in 1988.

Soil Survey of Columbia County (1978)

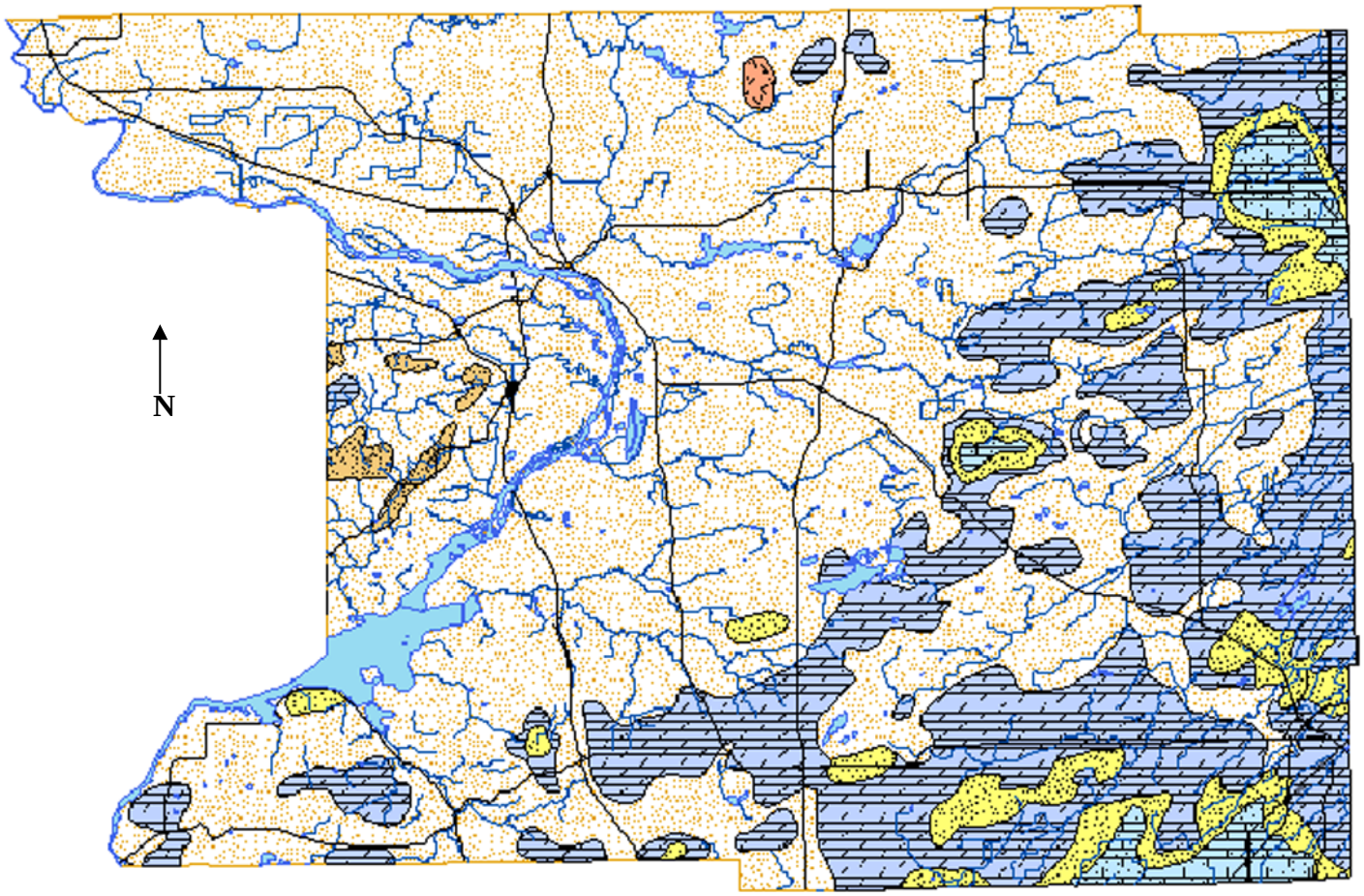
Improving The Water Quality of Park Lake: Recommendations and Options for the Future completed in 2001 by the Gaylord Nelson Institute for Environmental Studies UW-Madison

Total Maximum daily Loads for Total Phosphorus and Total Suspended Solids in the Rock River Basin
file:///C:/Users/lcdcra/Downloads/Final_Rock_River_TMDL_Report_with_Tables%20(4).pdf

Total Maximum Daily loads for Total Phosphorus in the Wisconsin River Basin
https://dnr.wi.gov/topic/TMDLs/documents/WisconsinRiver/Report/WRBApprovedTMDL20190426.pdf

Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids Upper Fox and Wolf Basins
https://dnr.wi.gov/topic/TMDLs/documents/UFW/UFWDraftTMDLReport20200117.pdf

Appendix A. Columbia County Bedrock Geology



Sinippee dolomite

St. Peter sandstone

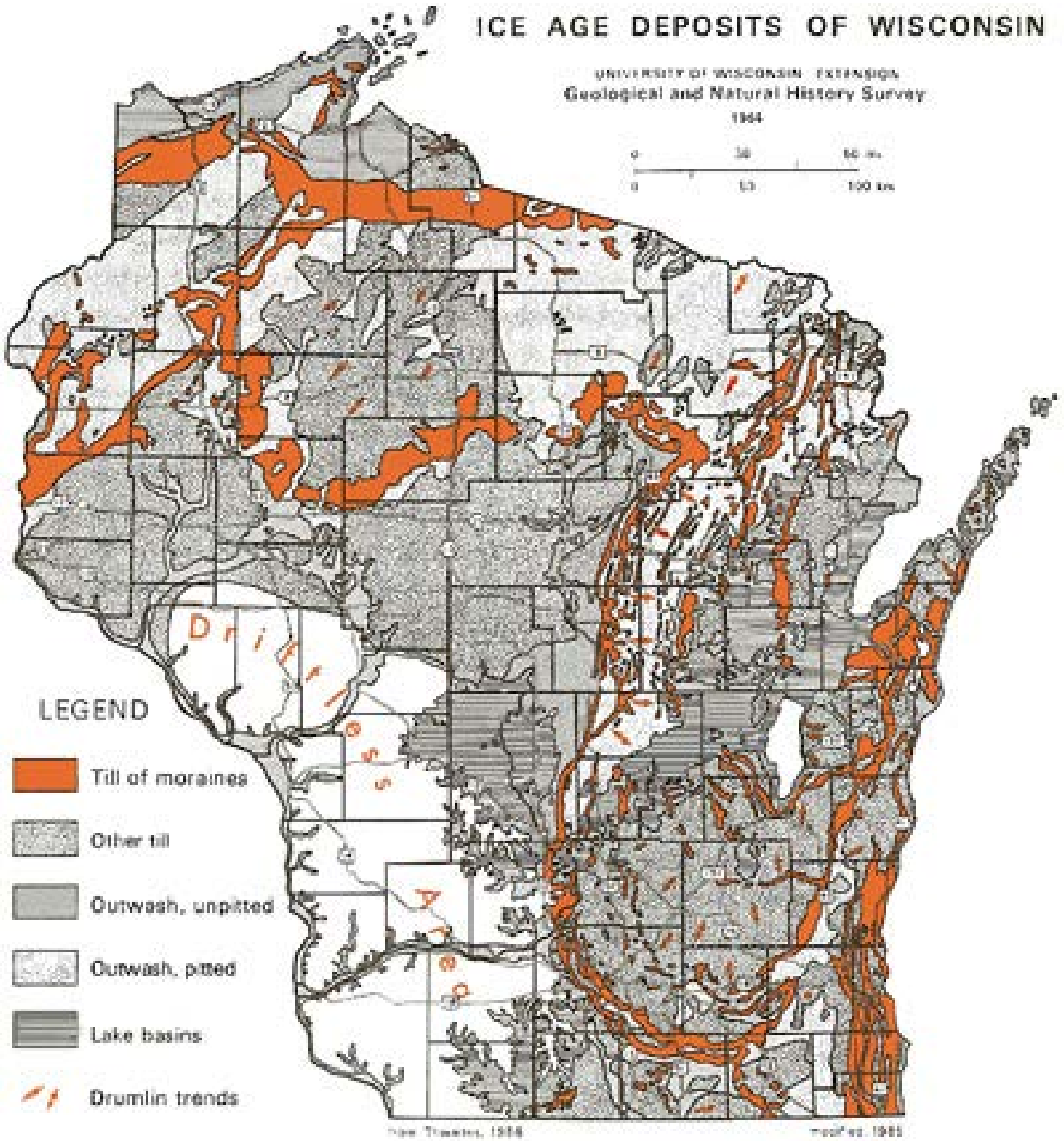
Prairie du Chien dolomite

Cambrian sandstone

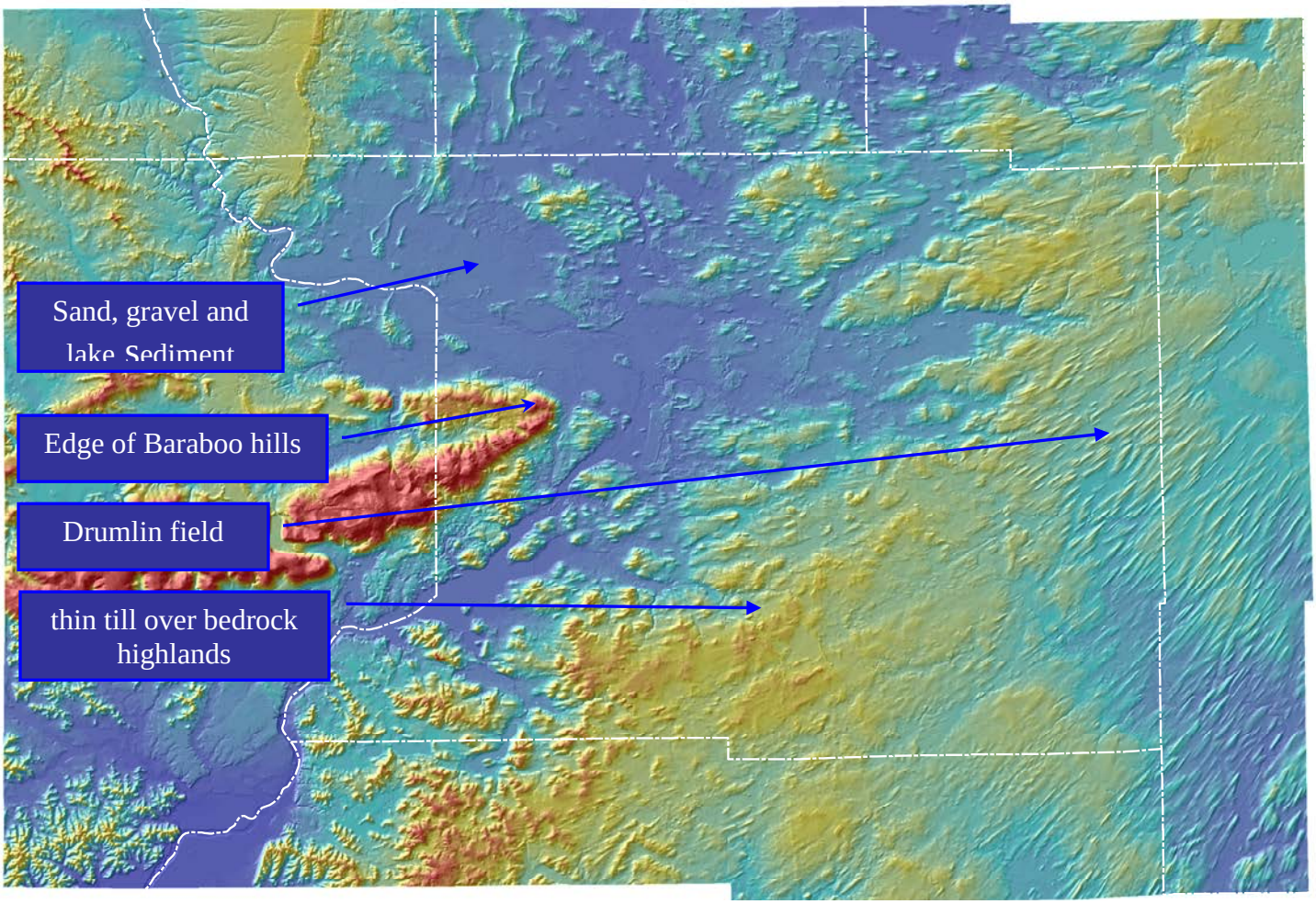
quartzite

granite

Appendix B. Ice Age Deposits of Wisconsin

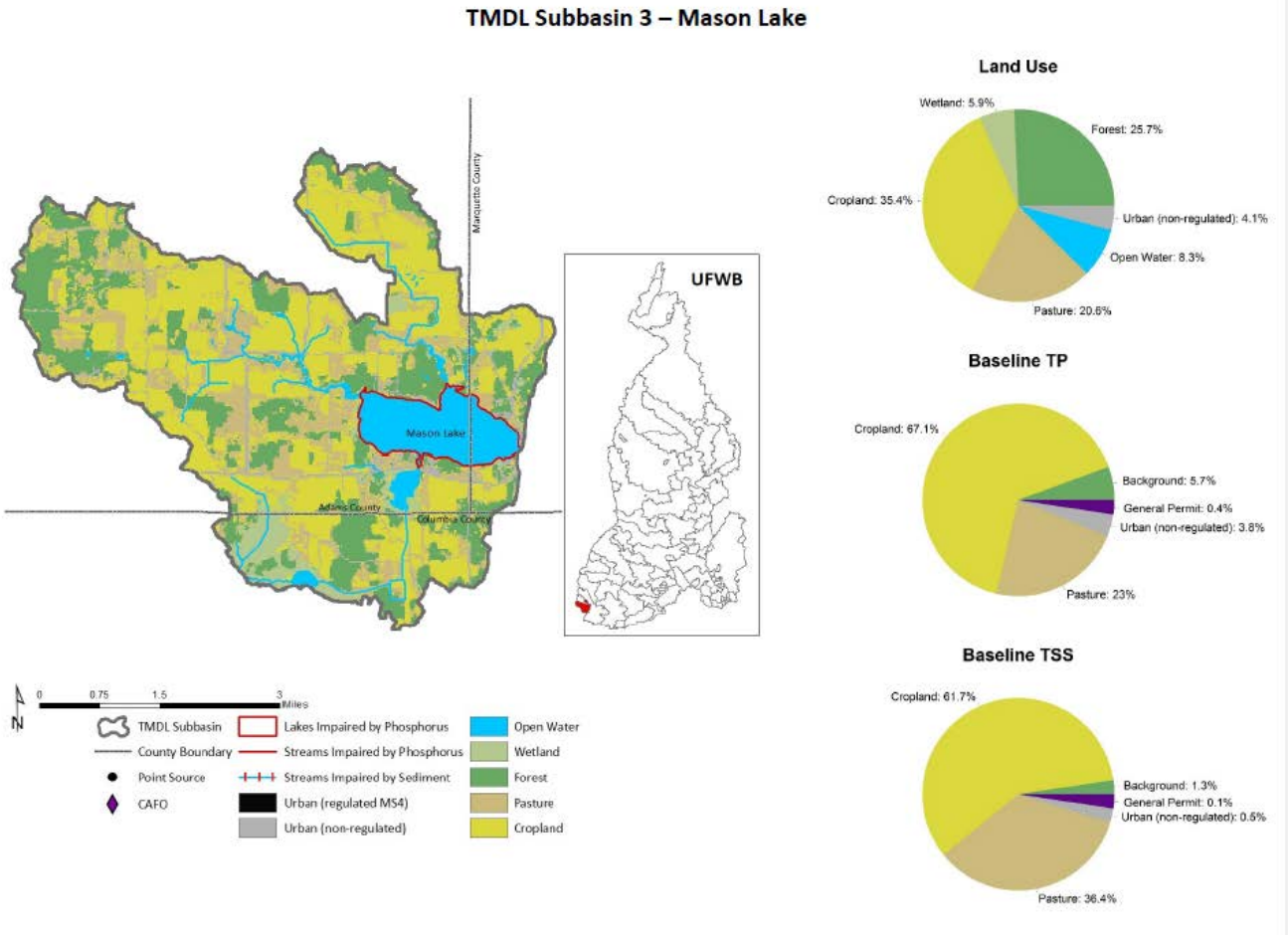


Appendix C. Landforms of Columbia County

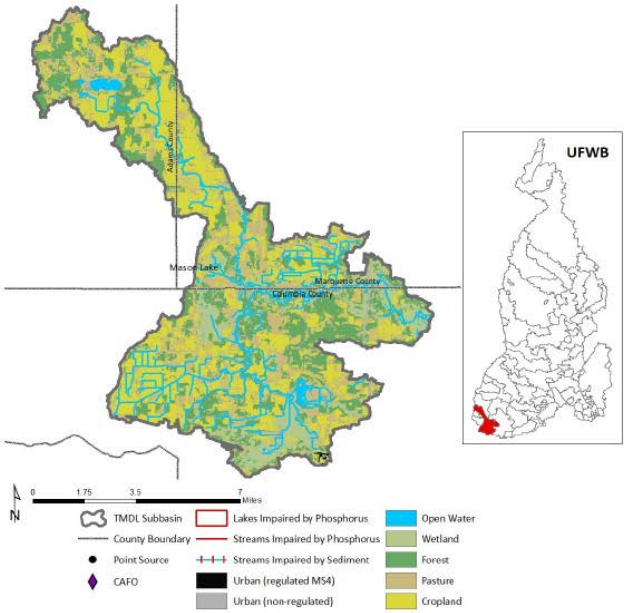


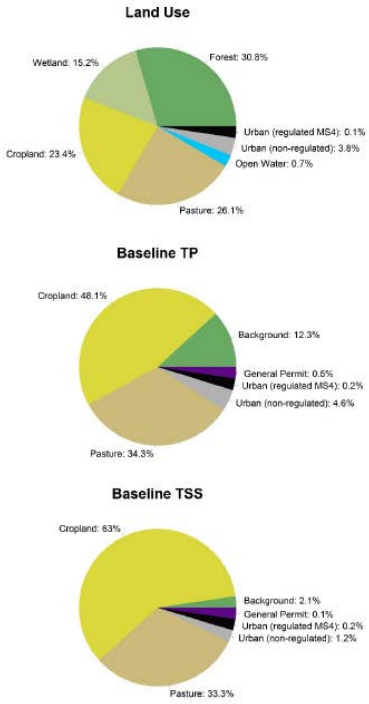
Appendix D. Sub Basin Land Use

Upper Fox and Wolf River

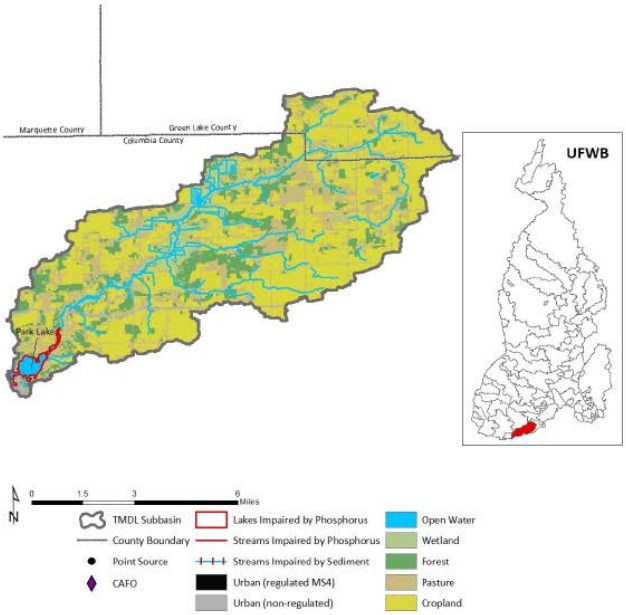


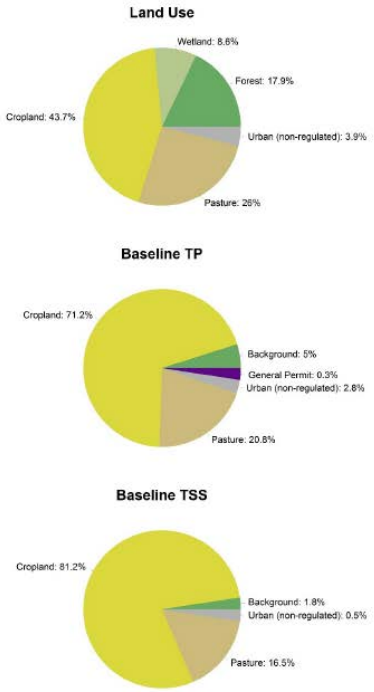
TMDL Subbasin 4 – Neenah Creek



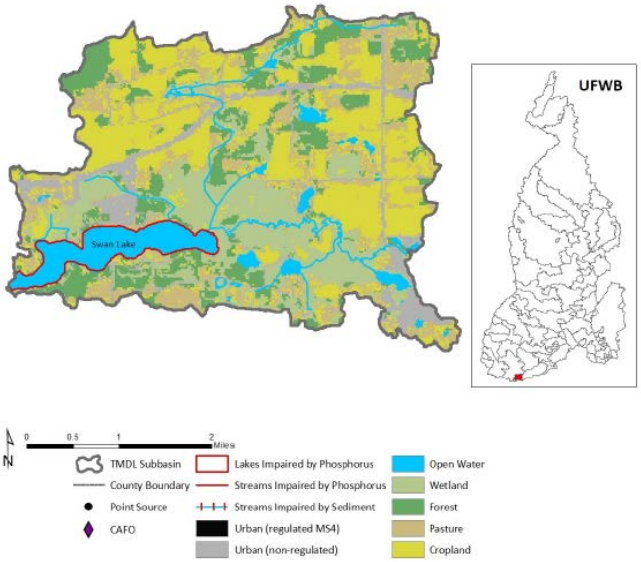


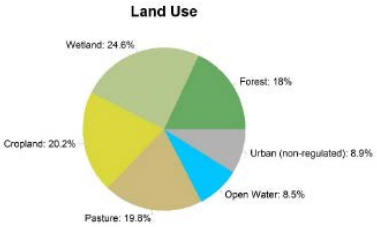
TMDL Subbasin 5 – Park Lake

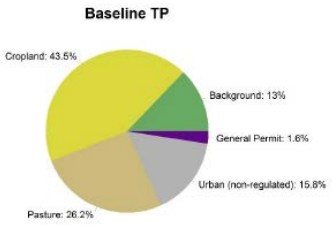


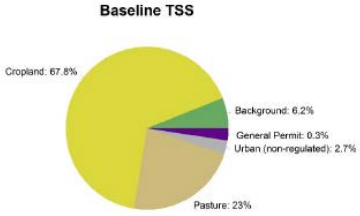


TMDL Subbasin 6 – Swan Lake

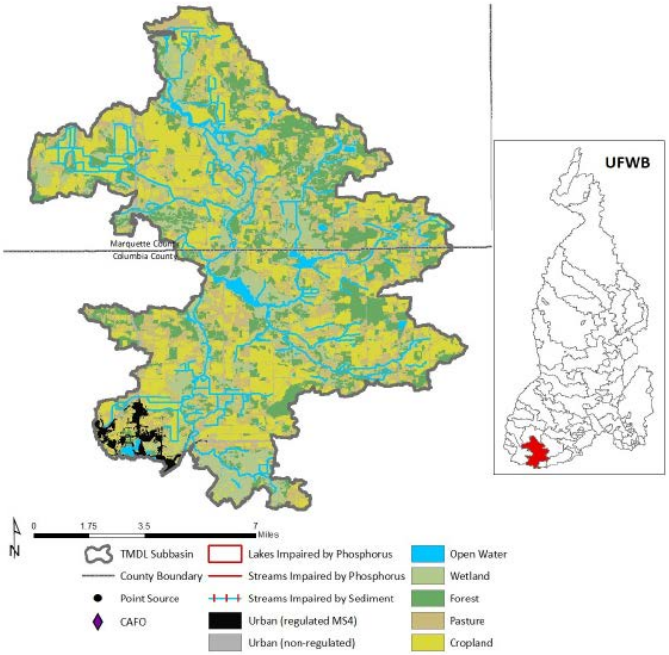


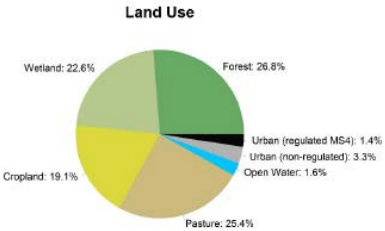


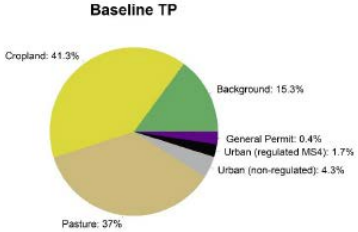


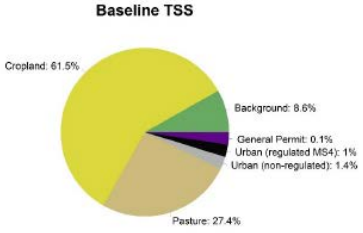


TMDL Subbasin 7 – Buffalo Lake Inflow

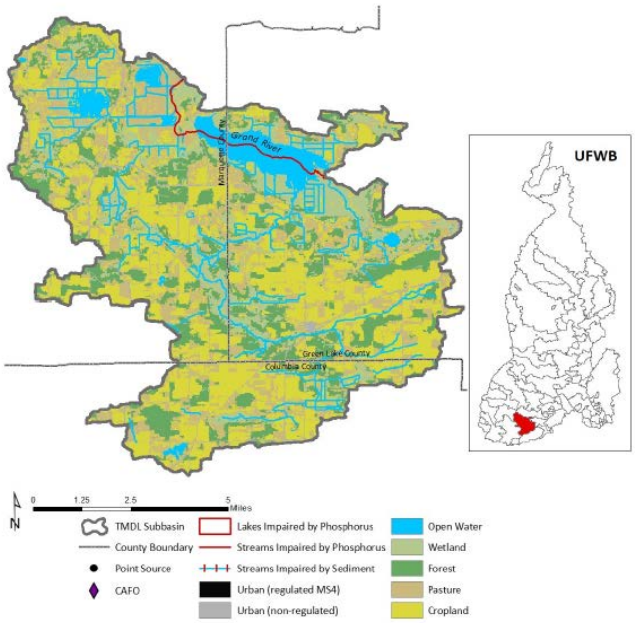




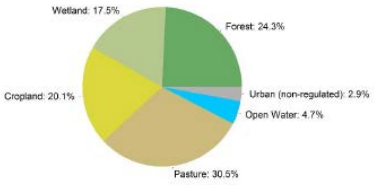




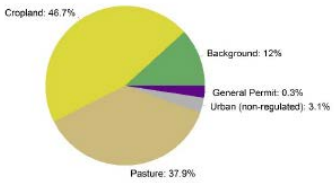
TMDL Subbasin 15 – Lower Grand River



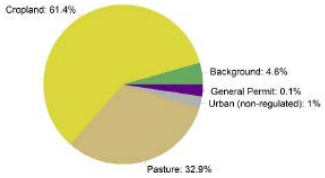
Land Use



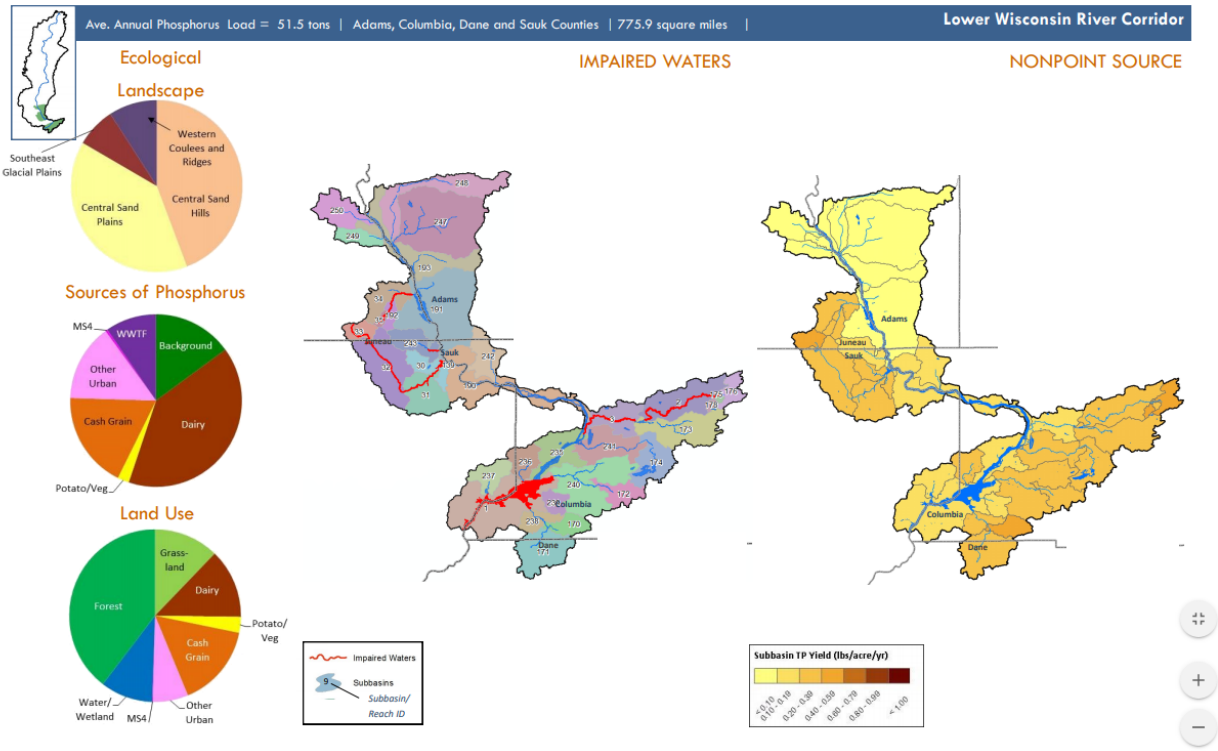
Baseline TP

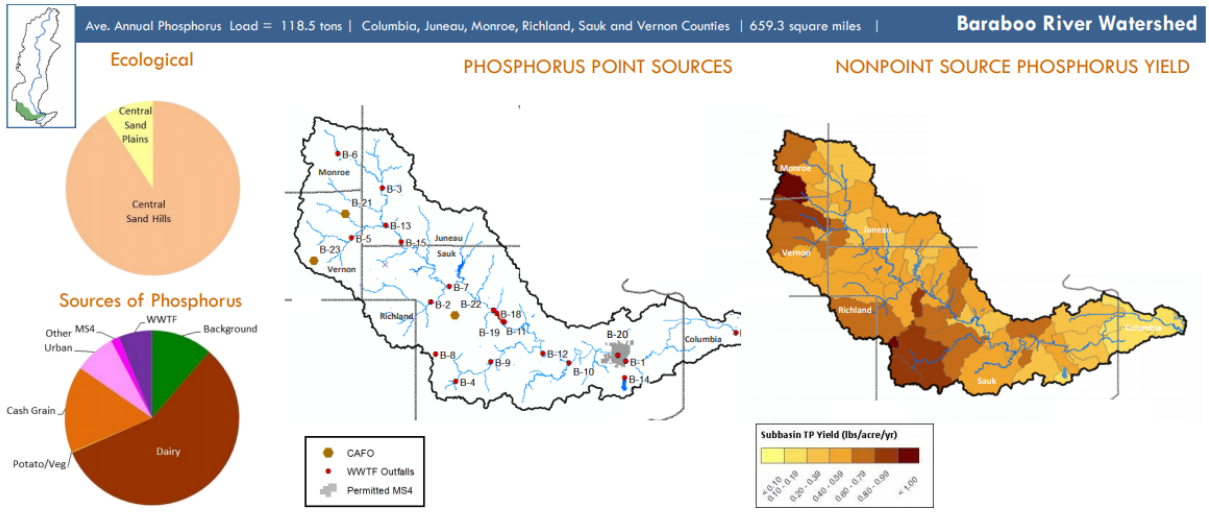


Baseline TSS



Wisconsin River





Municipal WWTFs

Permittee	Permit No.	No. Outfalls	Map ID
Baraboo	0020605	1	B-1
Cazenovia	0031801	1	B-2
Elroy	0023931	1	B-3
Hill Point San Dist	0035483	1	B-4
Hillsboro	0020583	1	B-5
Kendall	0020516	1	B-6
LaValle	0028878	1	B-7
Lime Ridge	0036447	1	B-8
Loganville	0029114	1	B-9
N. Freedom	0028011	1	B-10
Reedsburg	0020371	1	B-11
Rock Springs	0029041	1	B-12
Union Center	0025640	1	B-13
Devils Lake Park	0060241	1	B-14
Wonewoc	0029688	1	B-15

Industrial WWTFs

Permittee	Permit No.	No. Outfalls	Map ID
Foremost Farms	35	1	B-16
Goetz Co. Inc.	35483	1	B-17
Lakeside Foods	57738	3	B-18
Saputo Cheese	59404	1	B-19

Permitted MS4s

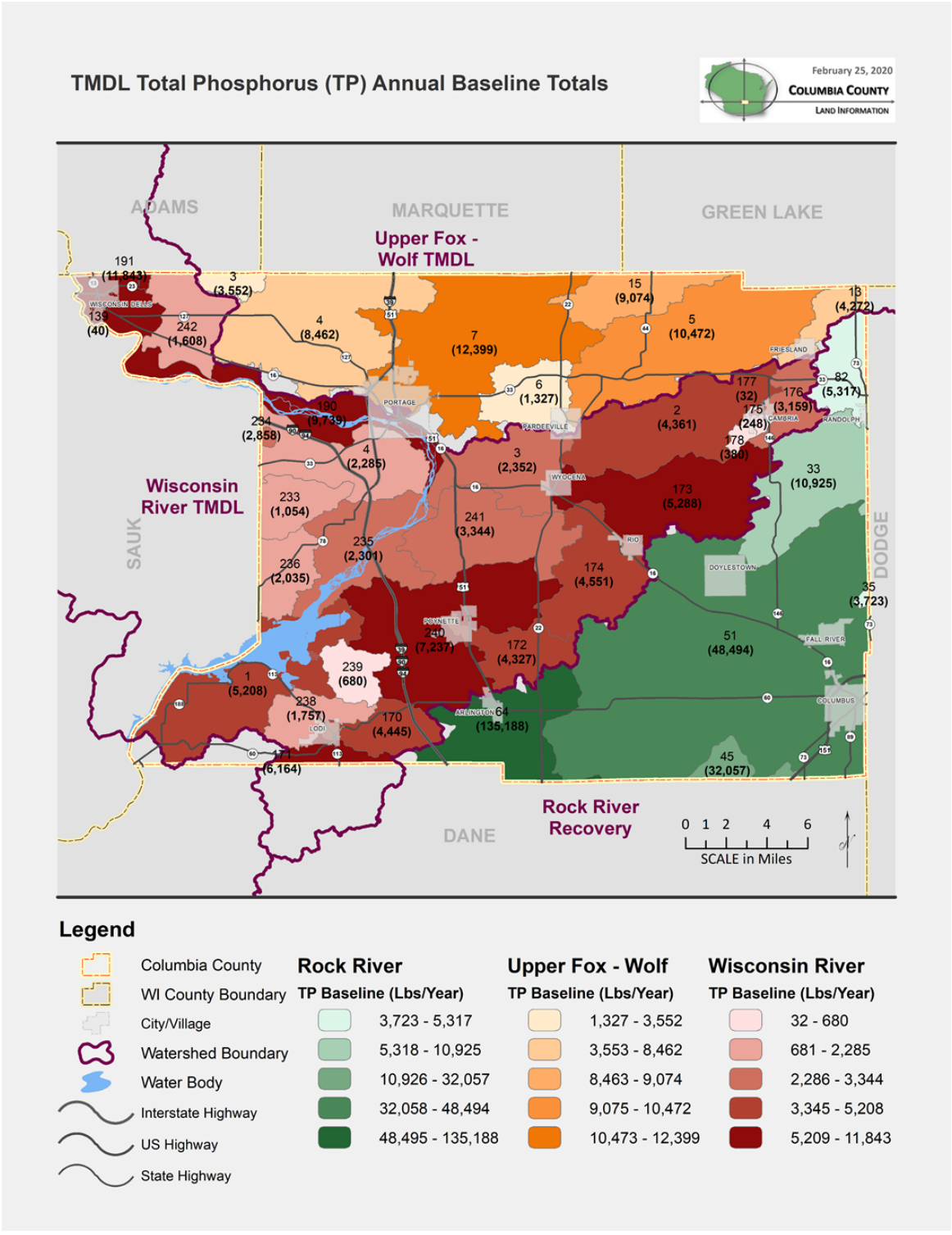
(Covered by WPDES Gen. Permit WI-S050075-2)

Permittee	Permit No.	Map ID
City of Baraboo	0031420	B-20

CAFOs

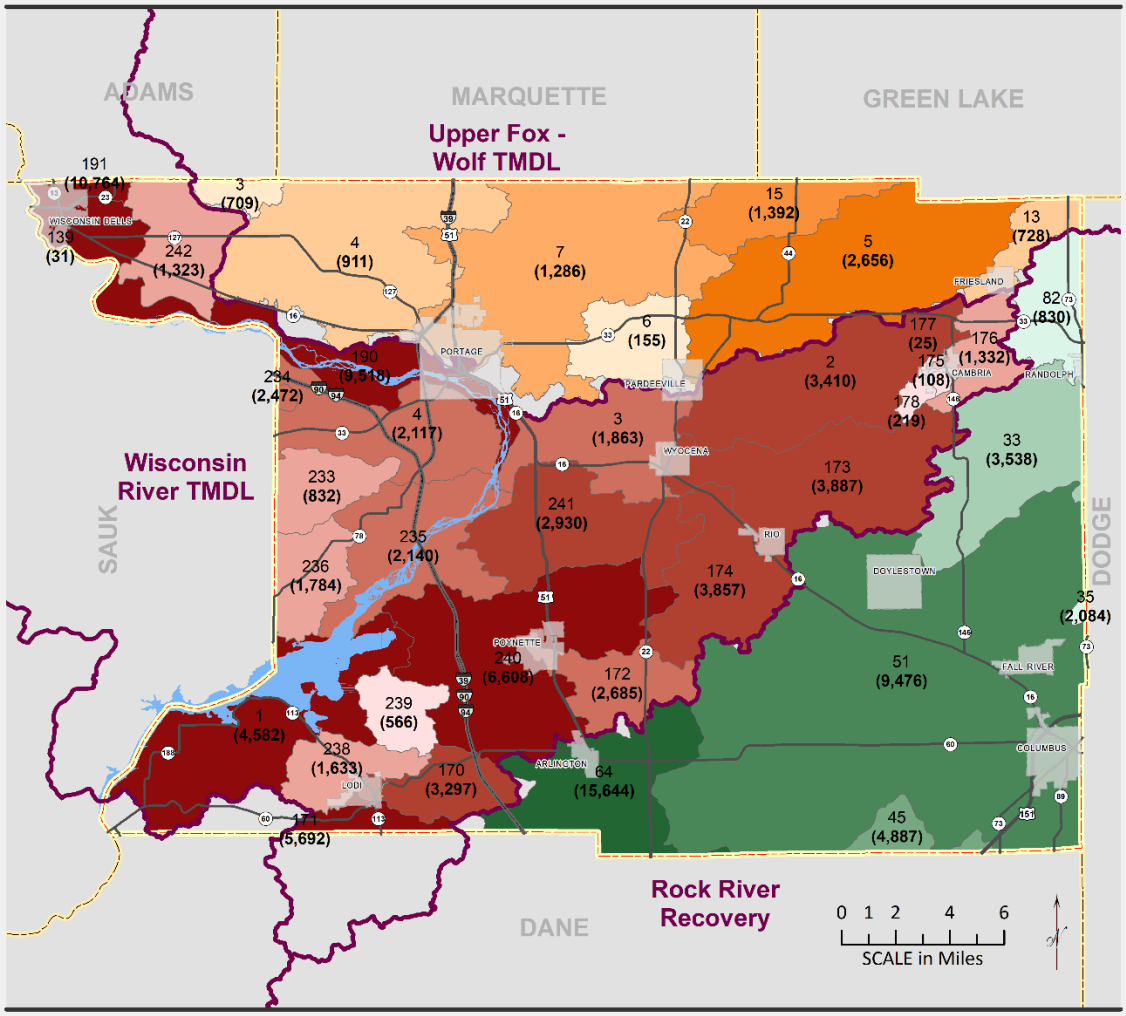
Permittee	Permit No.	Map ID
Hills Prairie Dairy LLC	0062634	B-21
Kinnamon Ridge Dairy LLC	0065129	B-22
Ocooch Dairy	0065081	B-23

Appendix E. Columbia County TP (Baseline, Allocation, % Reduction)



TMDL Total Phosphorus (TP) Annual Allocation Totals

February 25, 2020
COLUMBIA COUNTY
LAND INFORMATION



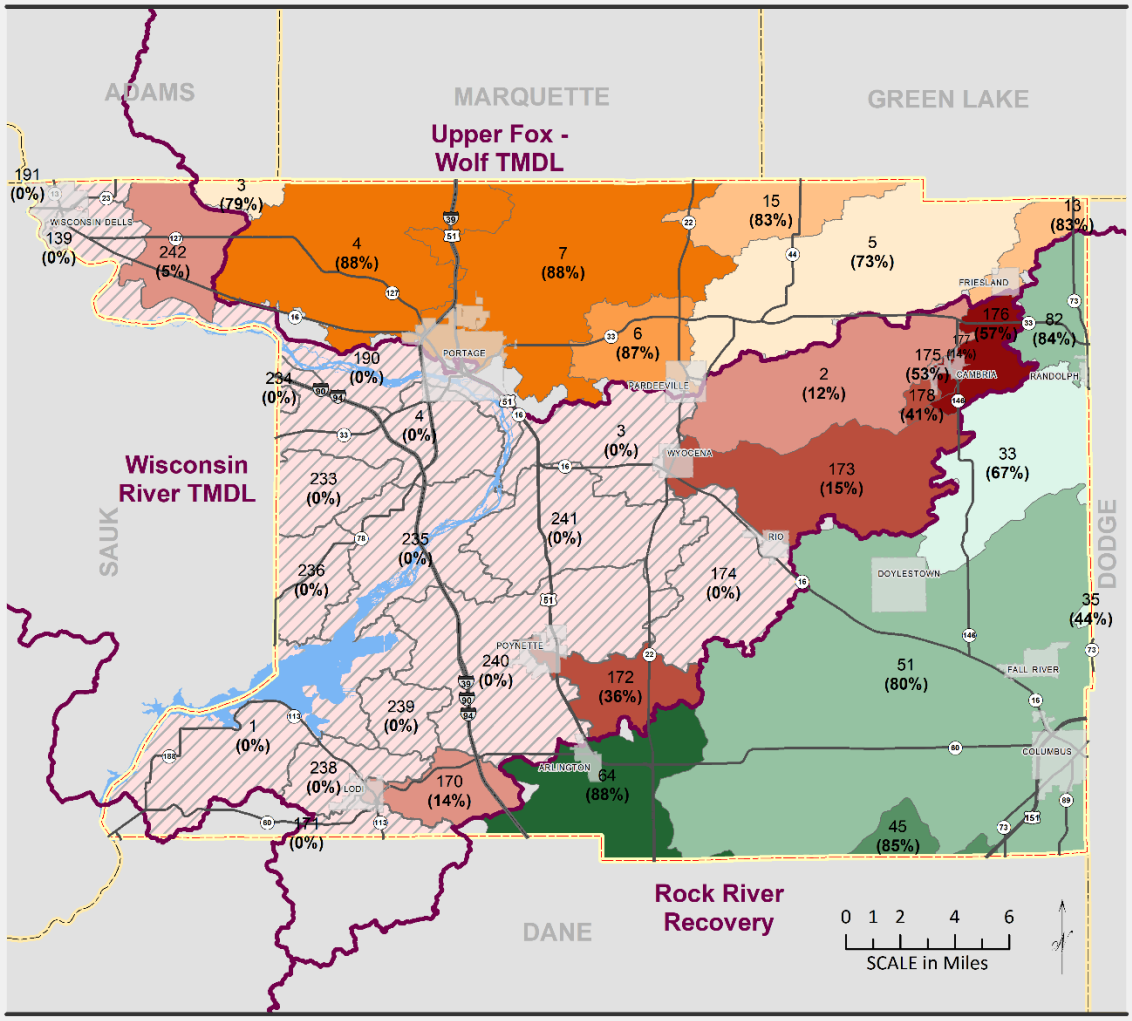
Legend

- Columbia County
- WI County Boundary
- City/Village
- Watershed Boundary
- Water Body
- Interstate Highway
- US Highway
- State Highway

Rock River TP Allocation (Lbs/Year)	Upper Fox - Wolf TP Allocation (Lbs/Year)	Wisconsin River TP Allocation (Lbs/Year)
830 - 2,084	155 - 709	25 - 566
2,085 - 3,538	710 - 911	567 - 1,784
3,539 - 4,887	912 - 1,286	1,785 - 2,685
4,888 - 9,476	1,287 - 1,392	2,686 - 3,887
9,477 - 15,644	1,393 - 2,656	3,888 - 10,764

TMDL Total Phosphorus (TP) - Percent Reduction

February 25, 2020
COLUMBIA COUNTY
LAND INFORMATION

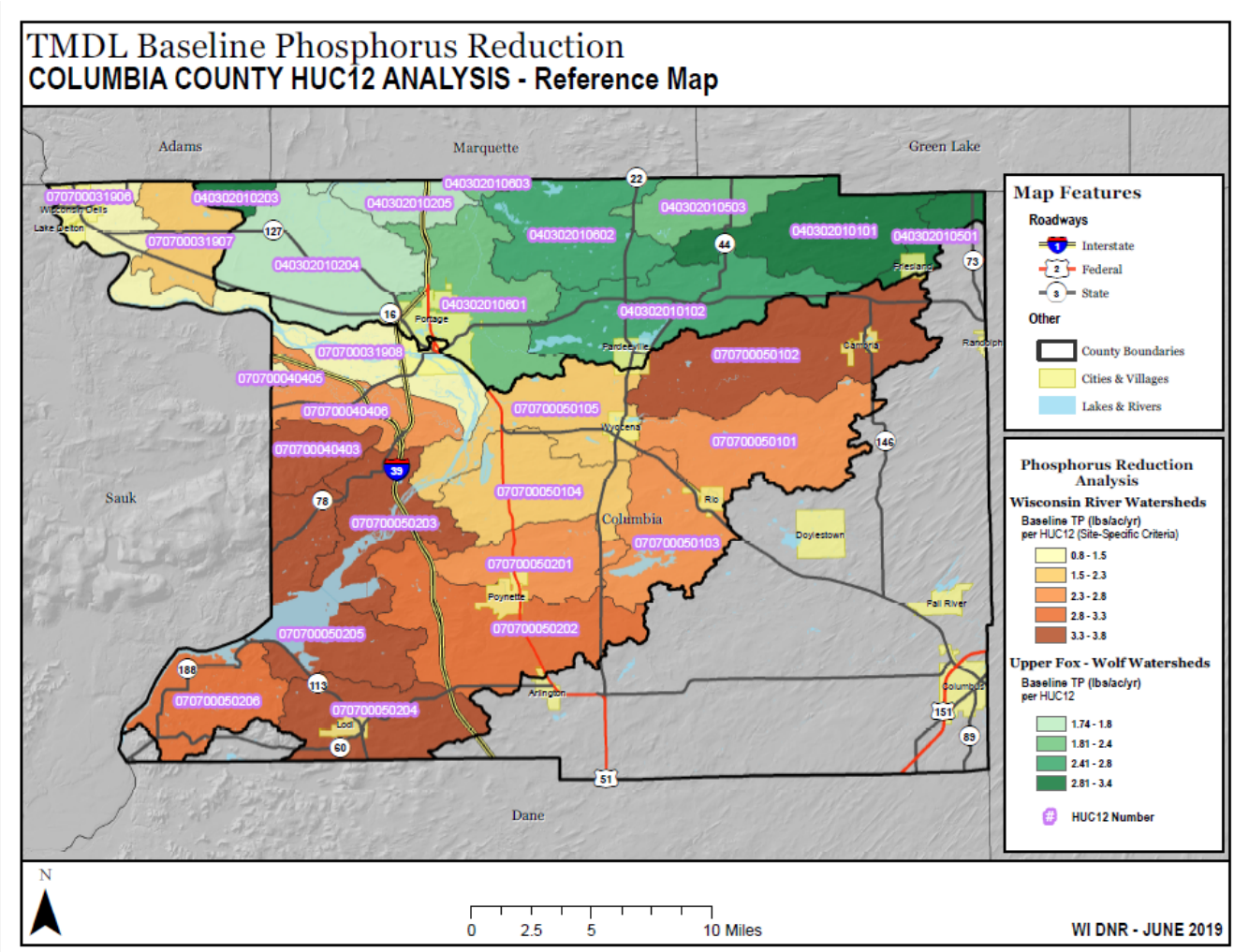


Legend

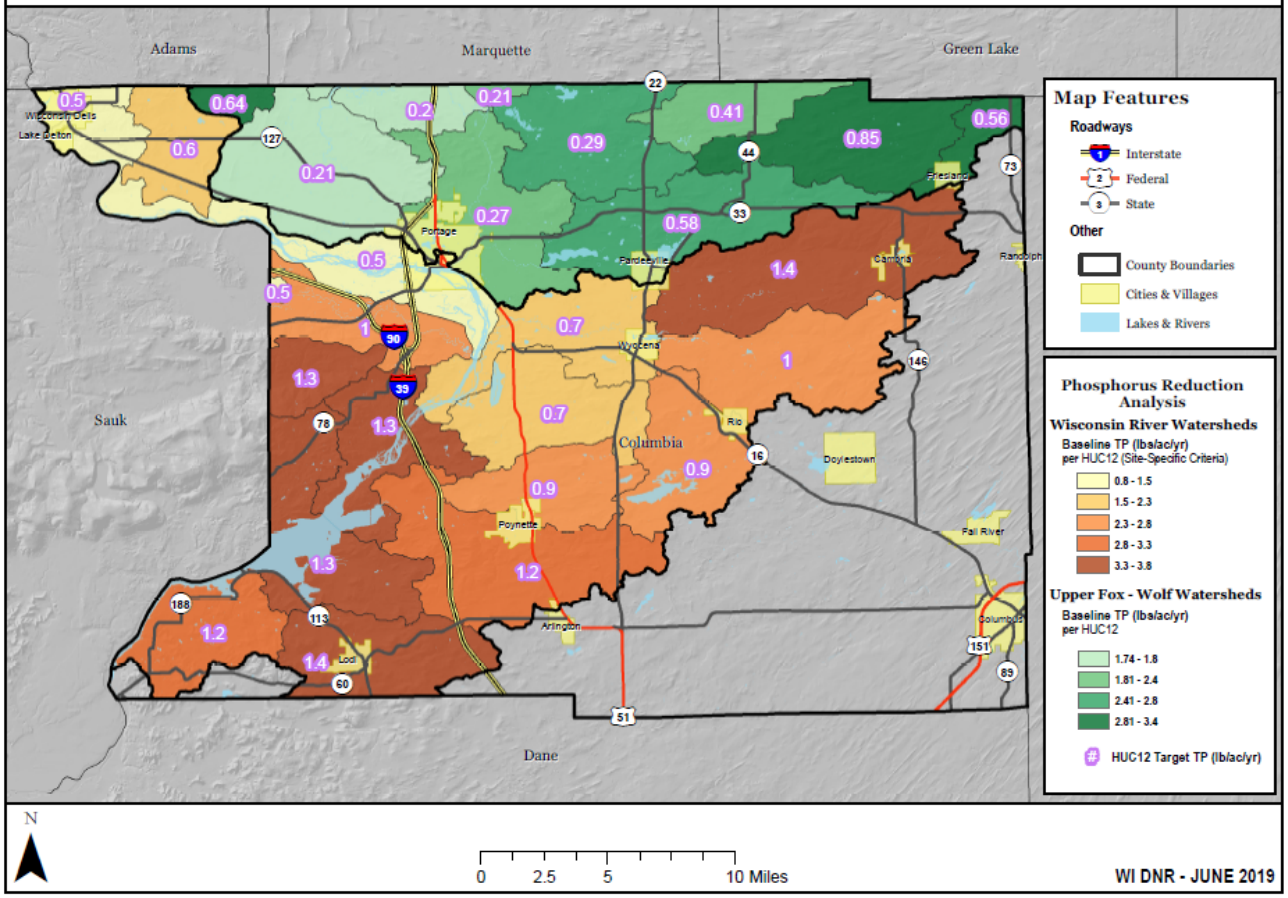
- Columbia County
- WI County Boundary
- City/Village
- Watershed Boundary
- Water Body
- Interstate Highway
- US Highway
- State Highway

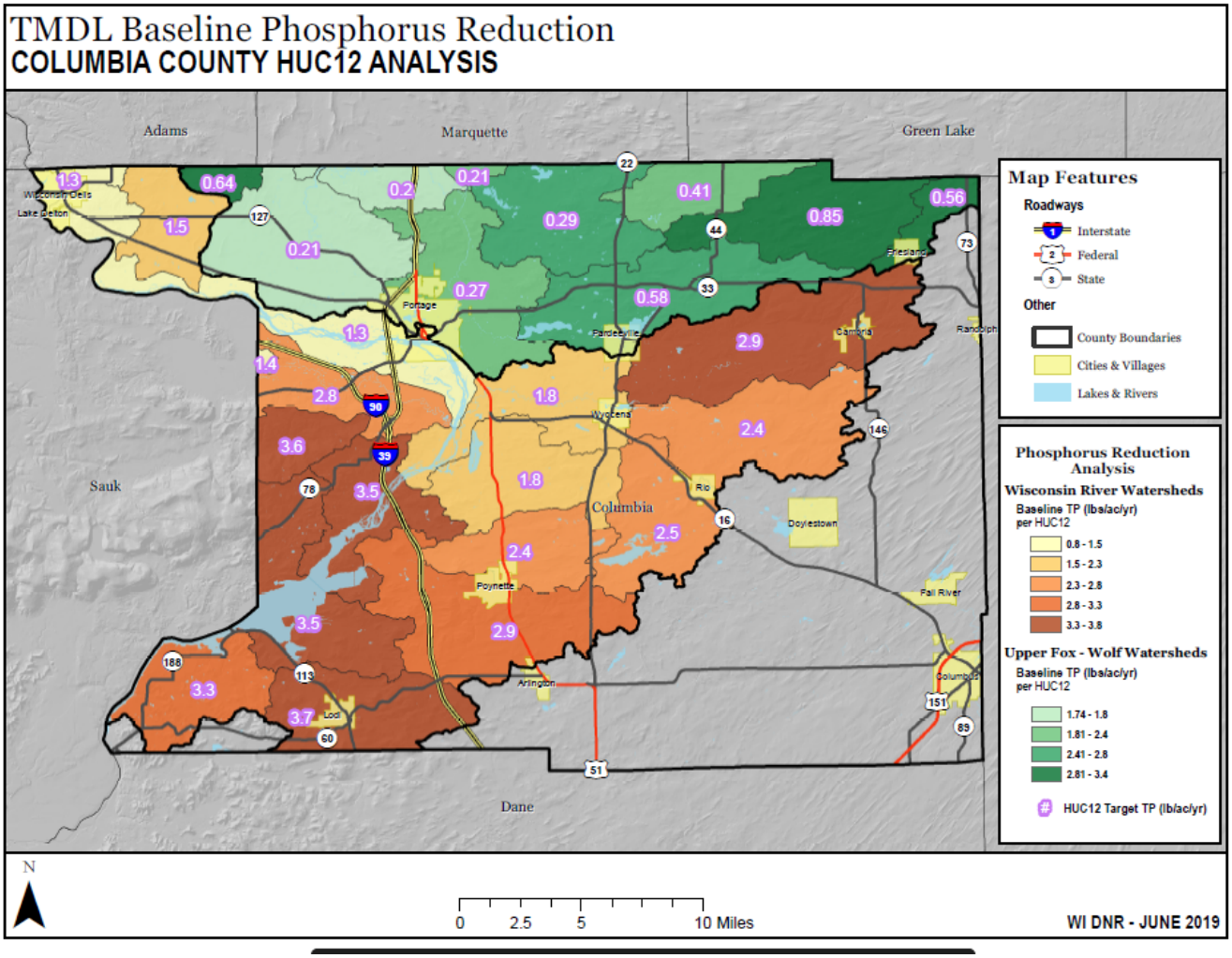
Rock River TP Percent Reduction	Upper Fox - Wolf TP Percent Reduction	Wisconsin River TP Percent Reduction
44% - 67%	73% - 79%	No Reduction
68% - 84%	80% - 83%	1% - 14%
85%	84% - 87%	15% - 41%
86% - 88%	88%	42% - 57%

Rock River TMDL Baseline and Reduction Target Loads – Columbia County TMDL Reach Data			
Reach	TMDL edge of field - Baseline P Loss (lbs/ac/yr)	TMDL Percent Reduction	TMDL edge of field - Reduction Target (lbs/ac/yr)
33	6	34%	4.0
45	6	35%	3.9
51	6	30%	4.2
64	6	41%	3.5
82	6	40%	3.6
AVG	**6**	**36%**	**3.8**

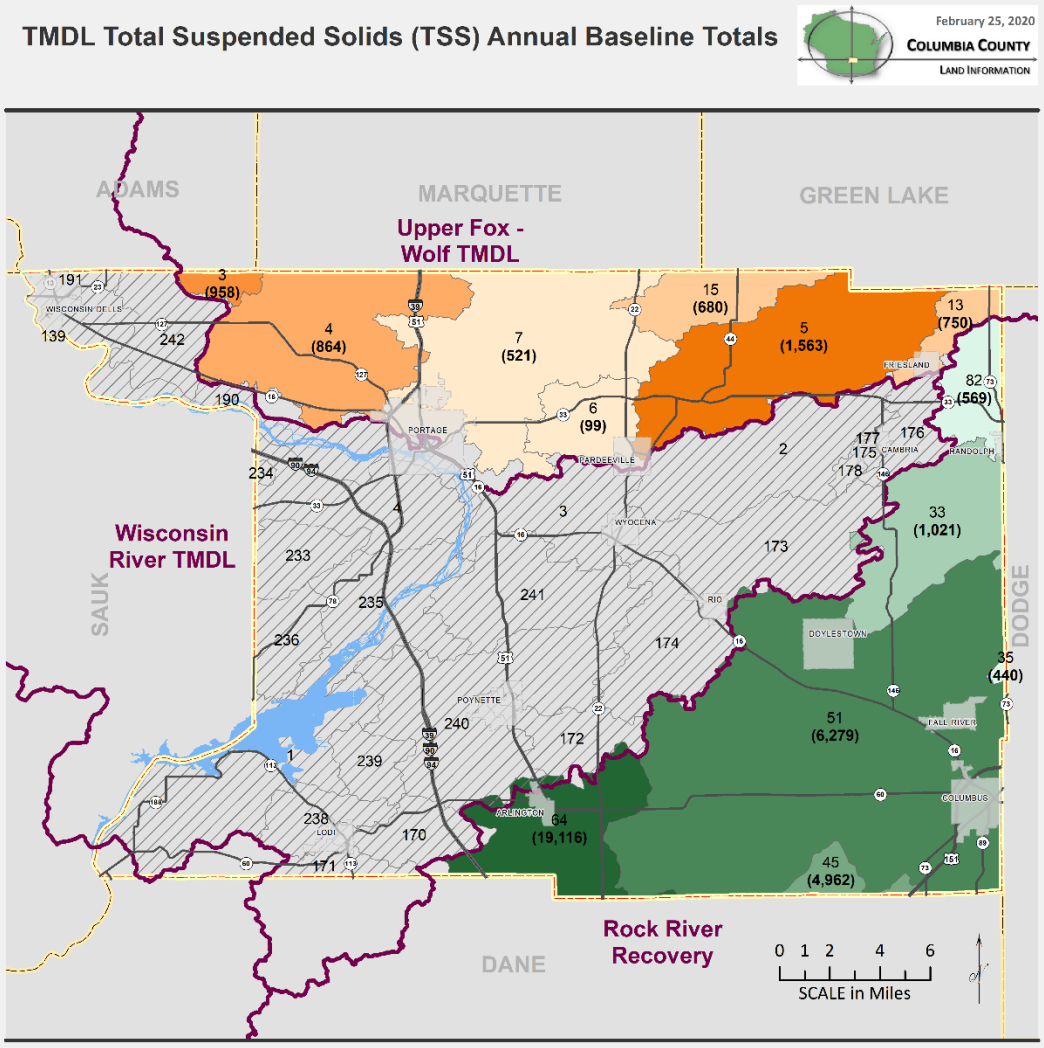


TMDL Baseline Phosphorus Reduction
COLUMBIA COUNTY HUC12 ANALYSIS - Site-Specific Criteria



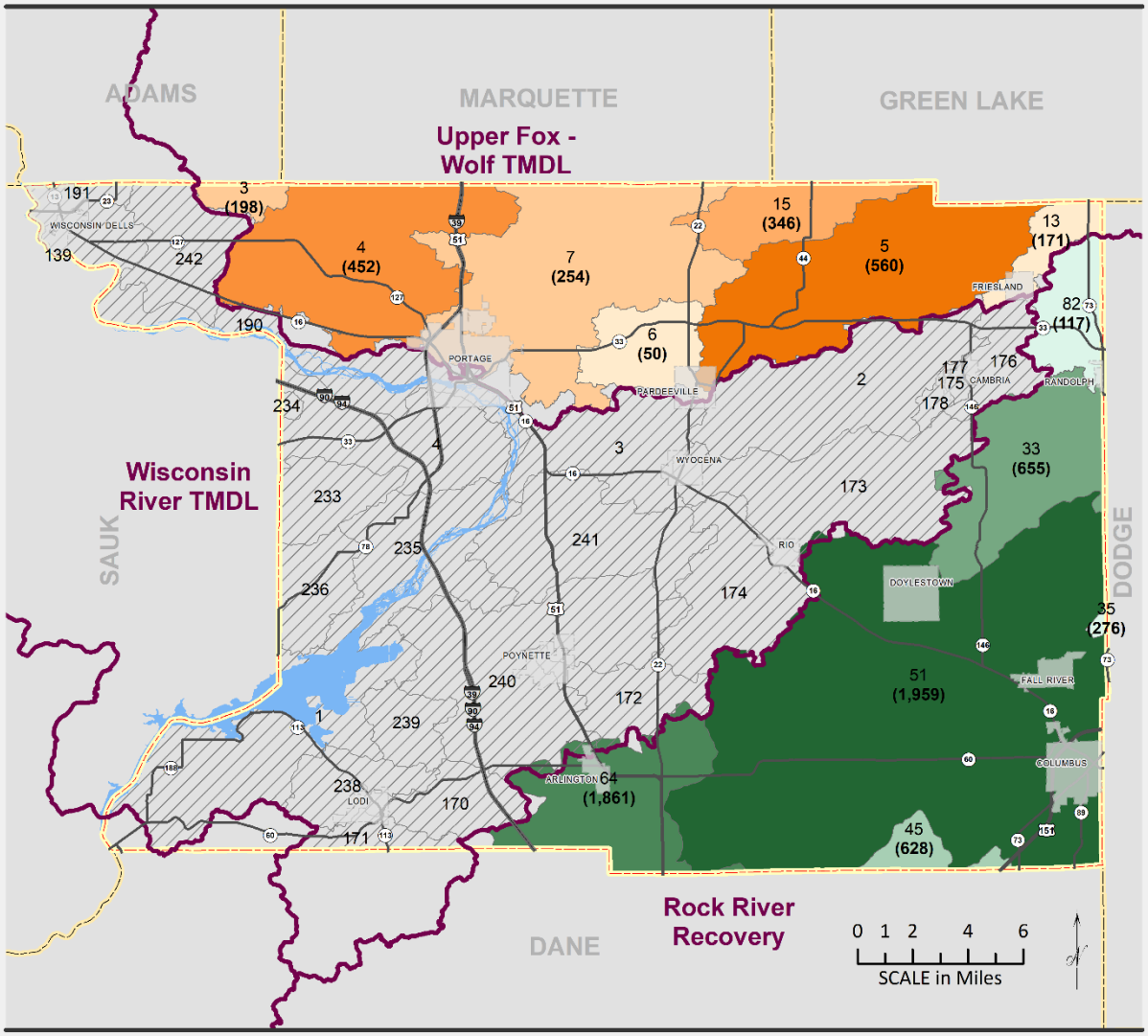

TMDL Baseline Phosphorus Reduction
COLUMBIA COUNTY HUC12 ANALYSIS
Adams
Marquette
Green Lake
Sauk
Columbia
Dane
Map Features
Roadways
Interstate
Federal
State
Other
County Boundaries
Cities & Villages
Lakes & Rivers
Phosphorus Reduction Analysis
Wisconsin River Watersheds
Baseline TP (lbs/ac/yr) per HUC12
0.8 - 1.5
1.5 - 2.3
2.3 - 2.8
2.8 - 3.3
3.3 - 3.8
Upper Fox - Wolf Watersheds
Baseline TP (lbs/ac/yr) per HUC12
1.74 - 1.8
1.81 - 2.4
2.41 - 2.8
2.81 - 3.4
HUC12 Target TP (lb/ac/yr)
N
0
2.5
5
10 Miles
WI DNR - JUNE 2019

Appendix F. TSS (Baseline, Allocation and % Reduction)



TMDL Total Suspended Solids (TSS) Annual Allocation Totals

February 25, 2020
COLUMBIA COUNTY
LAND INFORMATION



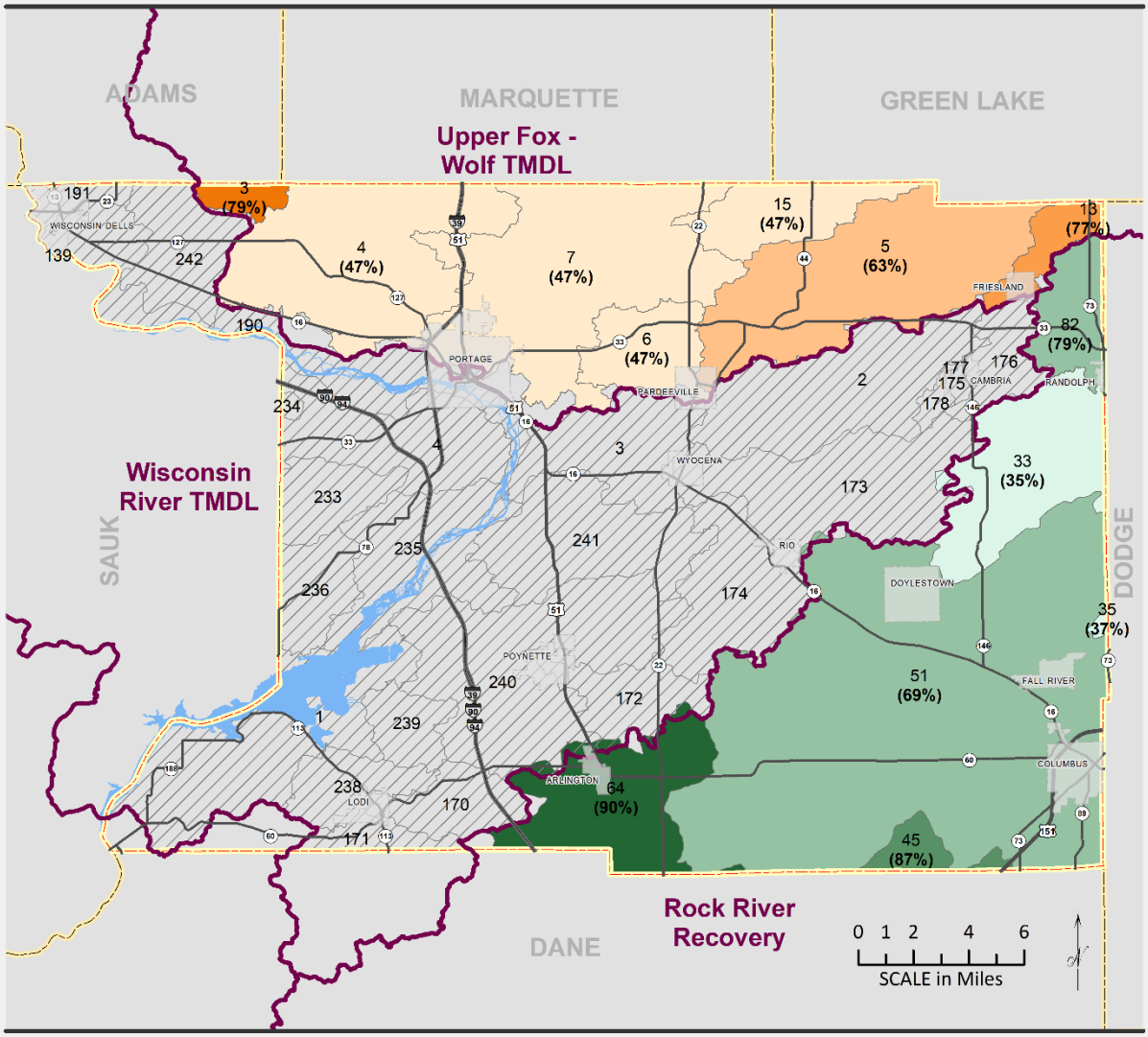
Legend

- Columbia County
- WI County Boundary
- City/Village
- Watershed Boundary
- Water Body
- Interstate Highway
- US Highway
- State Highway

Rock River TSS Allocation (Short Tons/Year)	Upper Fox - Wolf TSS Allocation (Short Tons/Year)	Wisconsin River TSS Allocation (Short Tons/Year)
117 - 276	50 - 171	No Allocations
277 - 628	172 - 254	
629 - 655	255 - 346	
656 - 1,861	347 - 452	
1,862 - 1,959	453 - 560	

TMDL Total Suspended Solids (TSS) - Percent Reduction

February 25, 2020
COLUMBIA COUNTY
LAND INFORMATION

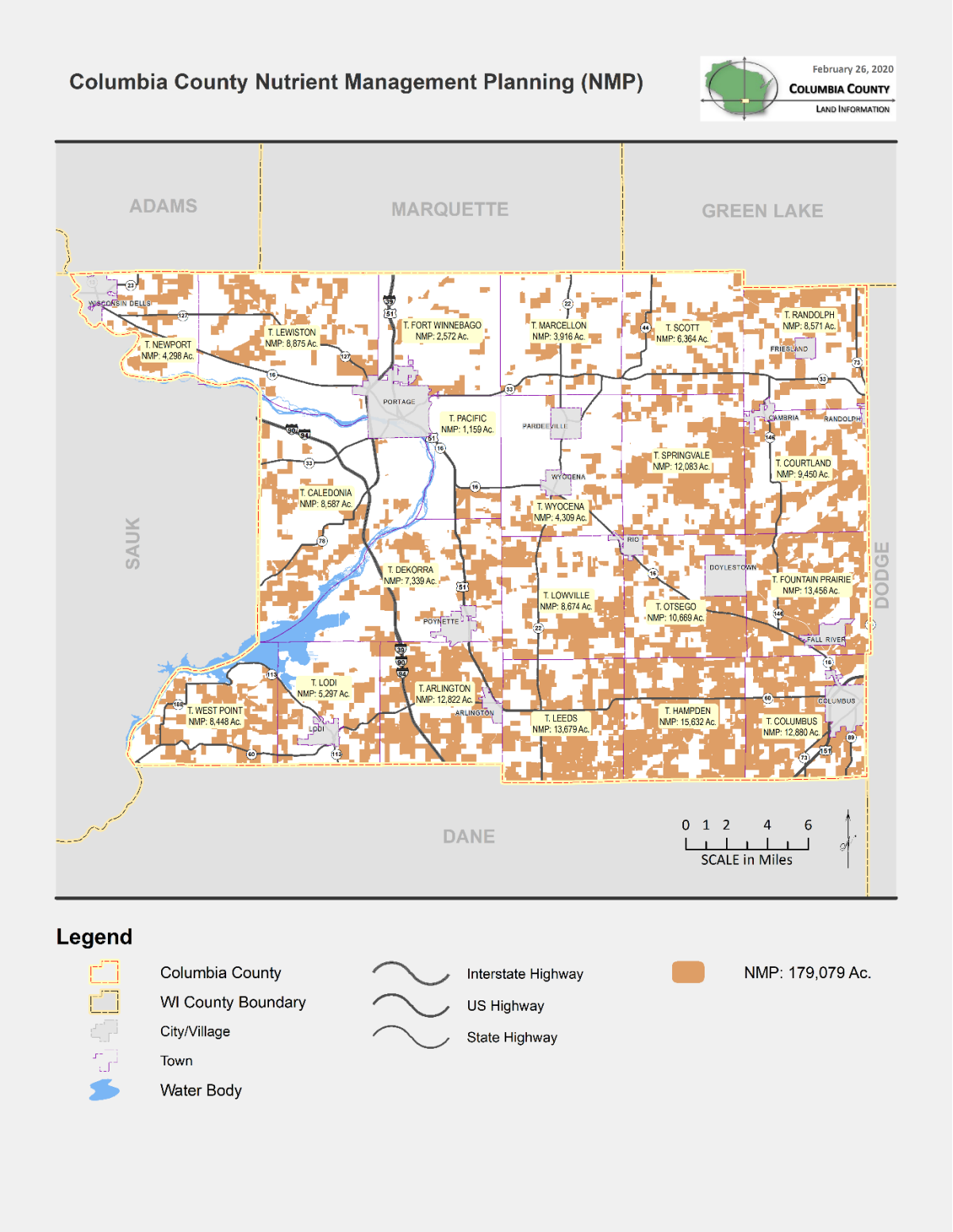


Legend

- Columbia County
- WI County Boundary
- City/Village
- Watershed Boundary
- Water Body
- Interstate Highway
- US Highway
- State Highway

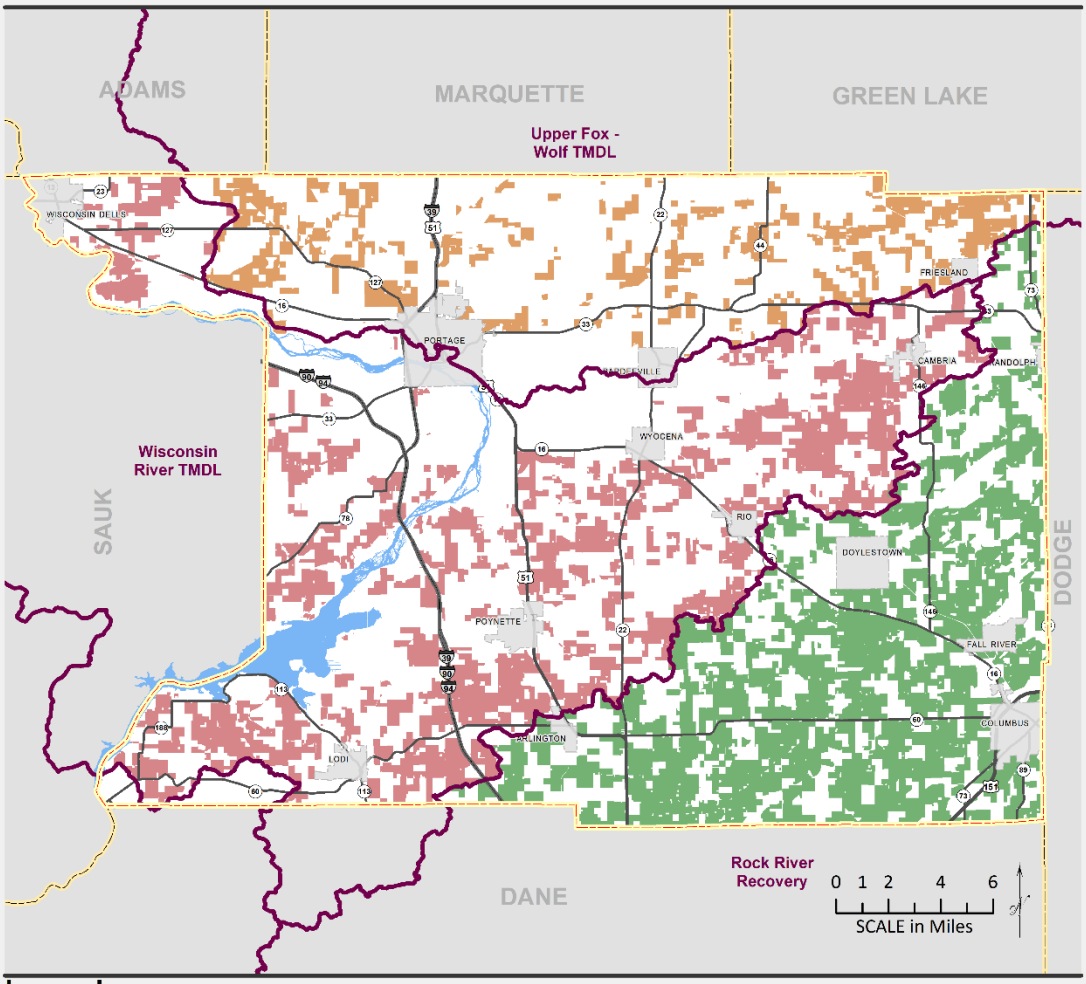
Rock River TSS Percent Reduction	Upper Fox - Wolf TSS Percent Reduction	Wisconsin River TSS Percent Reduction
35% - 37%	47%	No Reduction
38% - 79%	48% - 63%	
80% - 87%	64% - 77%	
88% - 90%	78% - 79%	

Appendix G. Nutrient Management



Columbia County Nutrient Management Planning (NMP)

February 26, 2020
COLUMBIA COUNTY
LAND INFORMATION



Legend

- Columbia County
- WI County Boundary
- City/Village
- Water Body
- Interstate Highway
- US Highway
- State Highway

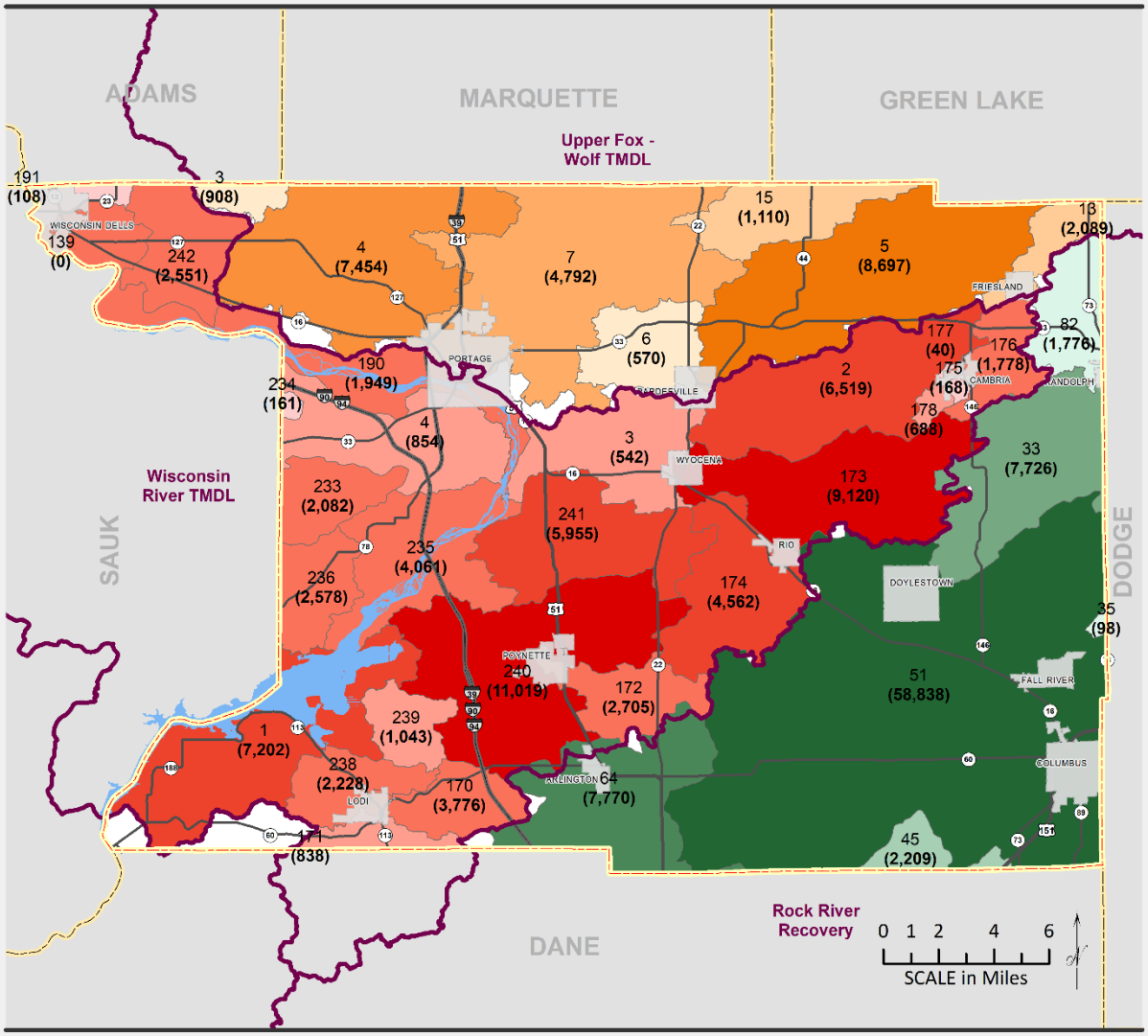
Rock River TMDL
NMP: 78,890 Ac.

Upper Fox - Wolf TMDL
NMP: 26,165 Ac.

Wisconsin River TMDL
NMP: 72,563 Ac.

Columbia County Nutrient Management Planning (NMP)

February 27, 2020
COLUMBIA COUNTY
LAND INFORMATION

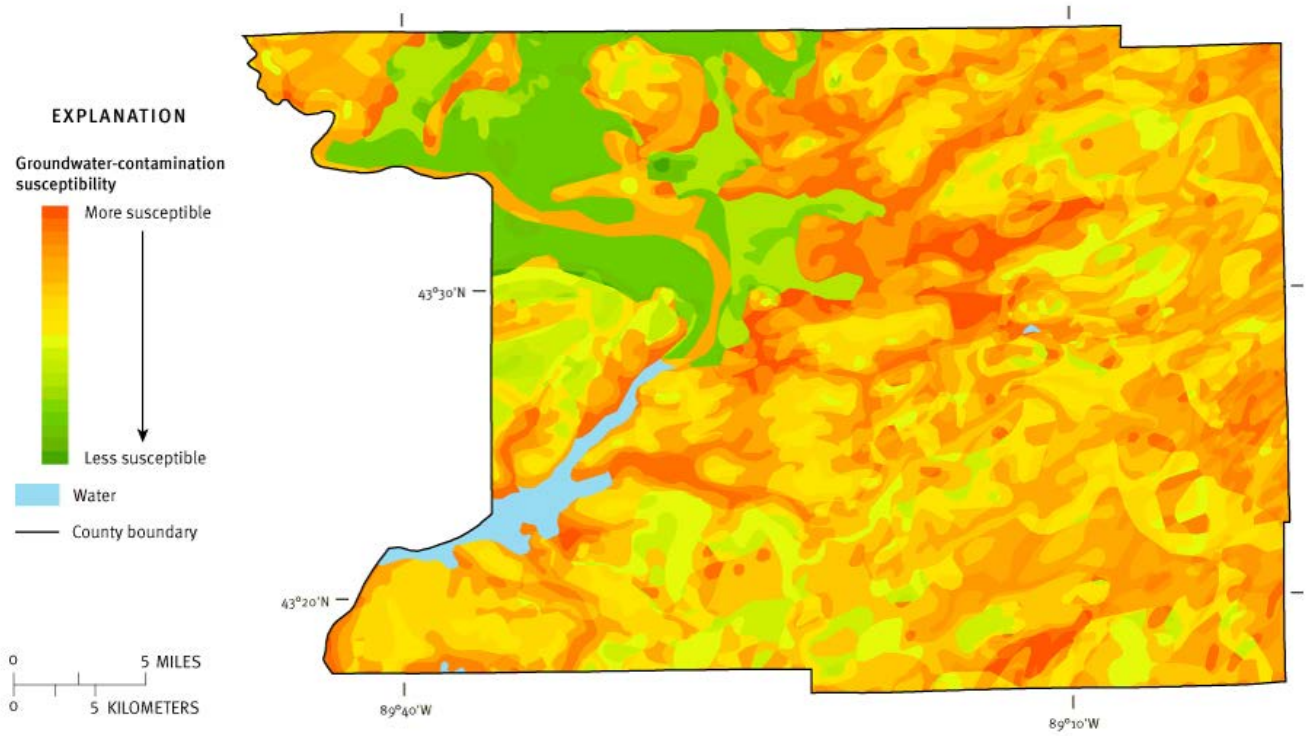


Legend

- Columbia County
- WI County Boundary
- City/Village
- Water Body
- Interstate Highway
- US Highway
- State Highway

Rock River NMP Acres	Upper Fox - Wolf NMP Acres	Wisconsin River NMP Acres
98 - 1,776	570 - 908	0 - 168
1,777 - 2,209	909 - 2,089	169 - 1,043
2,210 - 7,726	2,090 - 4,792	1,044 - 4,061
7,727 - 7,770	4,793 - 7,454	4,062 - 7,202
7,771 - 58,838	7,455 - 8,697	7,203 - 11,019

Columbia County – Groundwater-Contamination Susceptibility Analysis



This groundwater-contamination susceptibility map is a composite of five resource characteristic maps, each of which was derived from generalized statewide information at small scales, and cannot be used for any site-specific purposes.

Official Waterbody Name	Water Type	Size (Ac)	Pollutant	Date Listed
Big Slough	River	10.41	Total Phosphorus	2018
Spring Creek	River	4.46	PCB's	2018
Fox-Wis Portage Canal	Bay/Harbor	13.68	Lead	2016
Fox-Wis Portage Canal	Bay/Harbor	13.68	Mercury	2016
Fox-Wis Portage Canal	Bay/Harbor	13.68	PCB's	2016
Duck Creek	River	10.41	Total Phosphorus	2014
Swan Lake	Lake	407.5	Unknown Pollutant	2014
North Branch Duck Creek	River	20.21	Total Phosphorus	2014
Lazy Lake	Lake	206	Total Phosphorus	2012
Park Lake	Lake	329.53	Sediment/Total Suspended Solids	2006
Park Lake	Lake	329.53	Total Phosphorus	2006
Fox River	River	4.46	PCB's	2002