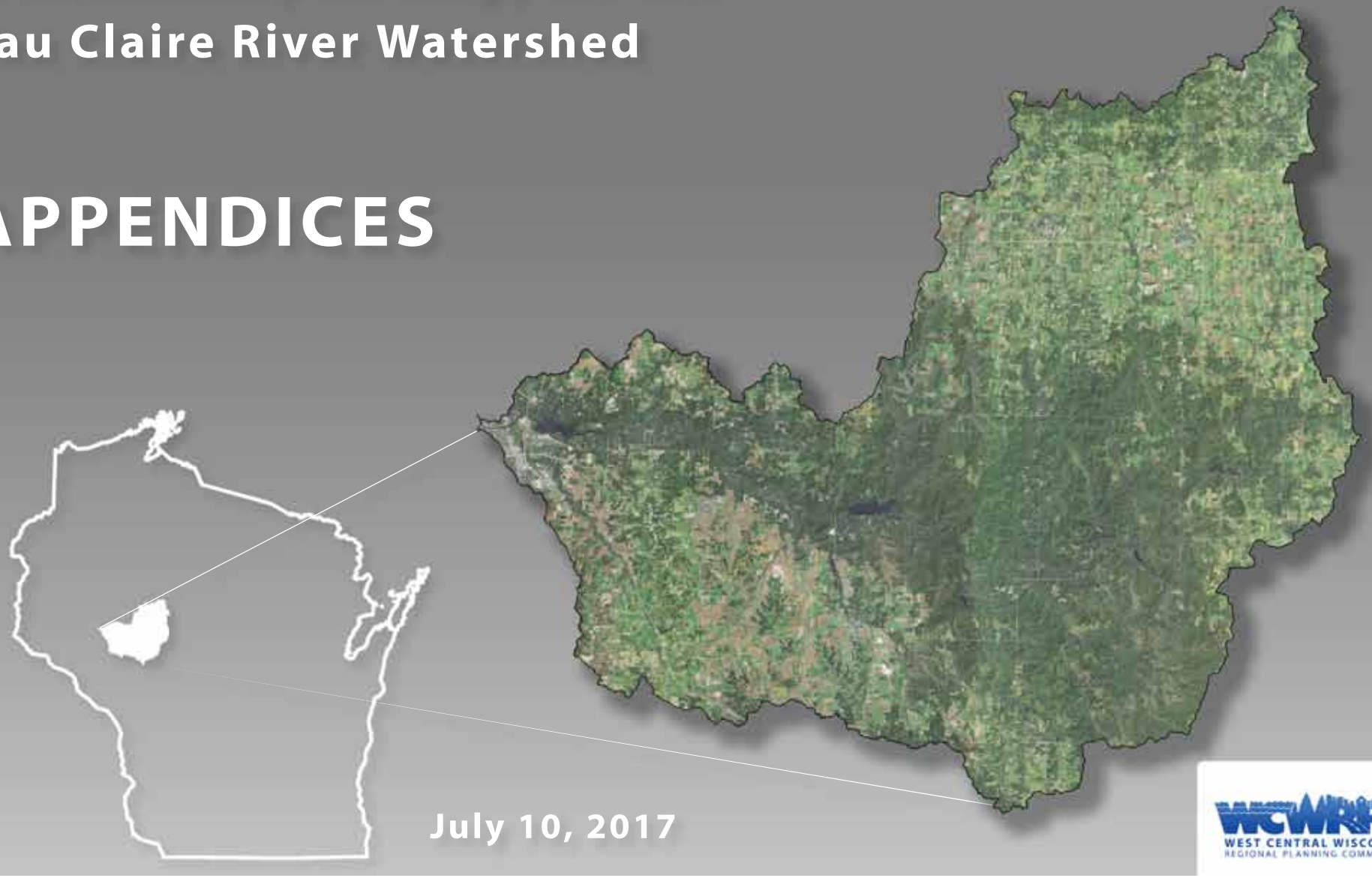
HEALTHY SOILS & HEALTHY WATERS

A Community Strategy for the Eau Claire River Watershed

APPENDICES



July 10, 2017

WCWRPC
WEST CENTRAL WISCONSIN
REGIONAL PLANNING COMMISSION

HEALTHY SOILS & HEALTHY WATERS: A COMMUNITY STRATEGY FOR THE EAU CLAIRE RIVER WATERSHED

Appendices
A - F

This Appendix provides valuable supporting information regarding characteristics, conditions, and resources for soil health and water quality planning in the Eau Claire River Watershed. This Appendix should be considered part of, not separate from, the **Healthy Soils & Healthy Waters: A Community Strategy of the Eau Claire River Watershed**.

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July 13, 2016

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APPENDIX A.
OVERVIEW OF WATER QUALITY PLANS & STANDARDS

Water Quality Plans

Wisconsin's Nonpoint Source Program Management Plan FFY 2016-2020
Approved by the EPA in September 2015, this document outlines Wisconsin's approach to addressing water quality impacts from nonpoint sources (NPS) of pollution. The Plan includes an excellent summary of related rules, programs, planning tools, trends, best management practices, partners, and resources.

Wisconsin's Nutrient Reduction Strategy
This strategy is a broad overview of nutrient management activities for both point and nonpoint sources in Wisconsin.

Lower Chippewa River Basin Water Quality Management Plan
The Eau Claire River Watershed (HUC-8) is part of the Lower Chippewa River Basin (HUC-6). The Lower Chippewa Basin Plan was created in 1996 and revised in 2001, and included many HUC-6 basin-wide recommendations and HUC-10 subwatershed recommendations that are still relevant today. Pages 101-114 of the 2001 Plan (available online) included issues, goals, objectives, and performance measures that were considered and (when appropriate) integrated into this Watershed Strategy for the Eau Claire River Watershed:

pages 102-104	**Habitat** – biodiverse, healthy aquatic ecosystem; identify & protect fisheries habitats; stream bank protection and in-stream habitat restoration to enhance sport fisheries
pages 105-106	**Sediment & Nutrient Sources** – quality improvement of impaired waters; pollution control grant activities
page 107	**Development** – buffer the effects or rural residential development adjacent to sensitive habitat
pages 109-111	**Inventory & Monitoring** – sufficient monitoring and survey data to make informed decisions
pages 112-113	**Education** – educate public on problems and potential solutions; educate on specific resource needs
pages 113-114	**Staff/Agency Concerns** – basin citizens should be represented and share responsibility; adequate support and staff resource to carry out responsibilities

APPENDIX A.
OVERVIEW OF WATER QUALITY PLANS & STANDARDS

Since 2001, the Lower Chippewa River Basin Plan has been updated in a piecemeal fashion by subshed and is available through WDNR's web-based Surface Water Data Viewer (http://dnr.wi.gov/topic/surfacewater/swdv/). WDNR staff who authored and maintains the Lower Chippewa Plan participated in the Eau Claire River Watershed planning effort to help ensure consistency between the planning efforts when appropriate.

TMDL Implementation Plans – Mead Lake TMDL Implementation and Mead Lake Management Plan
Impaired waters in Wisconsin are largely addressed through an analysis, known as a Total Maximum Daily Load (TMDL). A TMDL is the maximum, enforceable amount of a pollutant a waterbody can receive and still meet water quality standards. A Total Maximum Daily Load (TMDL) implementation plan is a document guided by the TMDL analysis that provides details of the actions needed to achieve pollutant load reductions, outlines a schedule of those actions, and specifies monitoring needed to document actions and progress toward meeting water quality standards.

Mead Lake is the only water body within the Eau Claire River Watershed to currently have an established TMDL. This TMDL was established in 2008 to reduce phosphorus and sediment loadings to Mead Lake to address, pH criteria exceedances, decrease algal blooms in summer, and address degraded habitat so Mead Lake can be improved for recreational purposes. The TMDL for Mead Lake suggests that a 30% reduction in phosphorus and sediment loads delivered to the lake via runoff and tributaries is necessary to minimize algal blooms, increase the desirability of the water for full-body-contact recreation, and to achieve compliance with water quality standards. However, this 30% reduction goal must be revisited in light of the more recent NR 217 phosphorus limits. The 2010 Mead Lake Management Plan is further summarized in the South Fork-Eau Claire River subwatershed description in Section III.

The Phosphorus Rule (Wis NR 217)

Many of the plans in this section are related to (or are required by) regulations, such as those discussed in Section II. F. One key requirement is The Phosphorus Rule adopted in 2010 for Wisconsin's surface waters. This rule established the following maximum allowable total phosphorus (TP) concentrations:

Rivers	100 ug/L	*(mouth of Eau Claire R. to Bridge Cr.)*
Streams	75 ug/L	*(all other streams in watershed)*
Lakes	15-40 ug/L	*(most of our lakes are 40 ug/L)*

Our lakes also have a "nuisance algae bloom" (i.e., >20 ug/L ChlA) rule limit of 30% of days during the sampling season. These standards are the ultimate phosphorus water quality targets for this Watershed Strategy. At the same time, agricultural NPS performance standards were revised.

In addition, many point sources also received new P limits under their WPDES permits with a 7- to 9-year compliance schedule, including municipal wastewater treatment and stormwater facilities. As of March 2016, the following facilities/point sources received WPDES permits to discharge wastewater to surface waters within the Eau Claire River Watershed:

Augusta Wastewater Treatment Facility	(municipal; Eau Claire Co.)
Fairchild Wastewater Treatment Facility	(municipal; Eau Claire Co.)
Stanley Wastewater Treatment Facility	(municipal; Chippewa Co.)
Thorp Wastewater Treatment Facility	(municipal; Clark Co.)
Village of Lublin	(municipal; Taylor Co.)
Archer Daniels Midland Company	(private, industry; Chippewa Co.)
Brookside Dairy	(private, industry; Eau Claire Co.)
Bush Brothers and Company, Inc.	(private, industry; Eau Claire Co.)
La Granders Hillside Dairy, Inc.	(private, industry; Clark Co.)
North Hendren Coop Dairy	(private, industry; Clark Co.)
Dutch Dairy, LLC near Thorp	(private, confined animal feedlot operation; Clark Co.)
City View Dairy, Inc. near Stanley	(private, confined animal feedlot operation; Chippewa Co.)
Lake Altoona Protection & Rehab District	(lake district; Eau Claire Co.)

The Eau Claire Wastewater Treatment Facility also serves part of the watershed, including the City of Altoona, though the facility itself is located outside the watershed. Please also see the discussions on point-source options, water quality trading, adaptive management, and WPDES permitting later in this appendix.

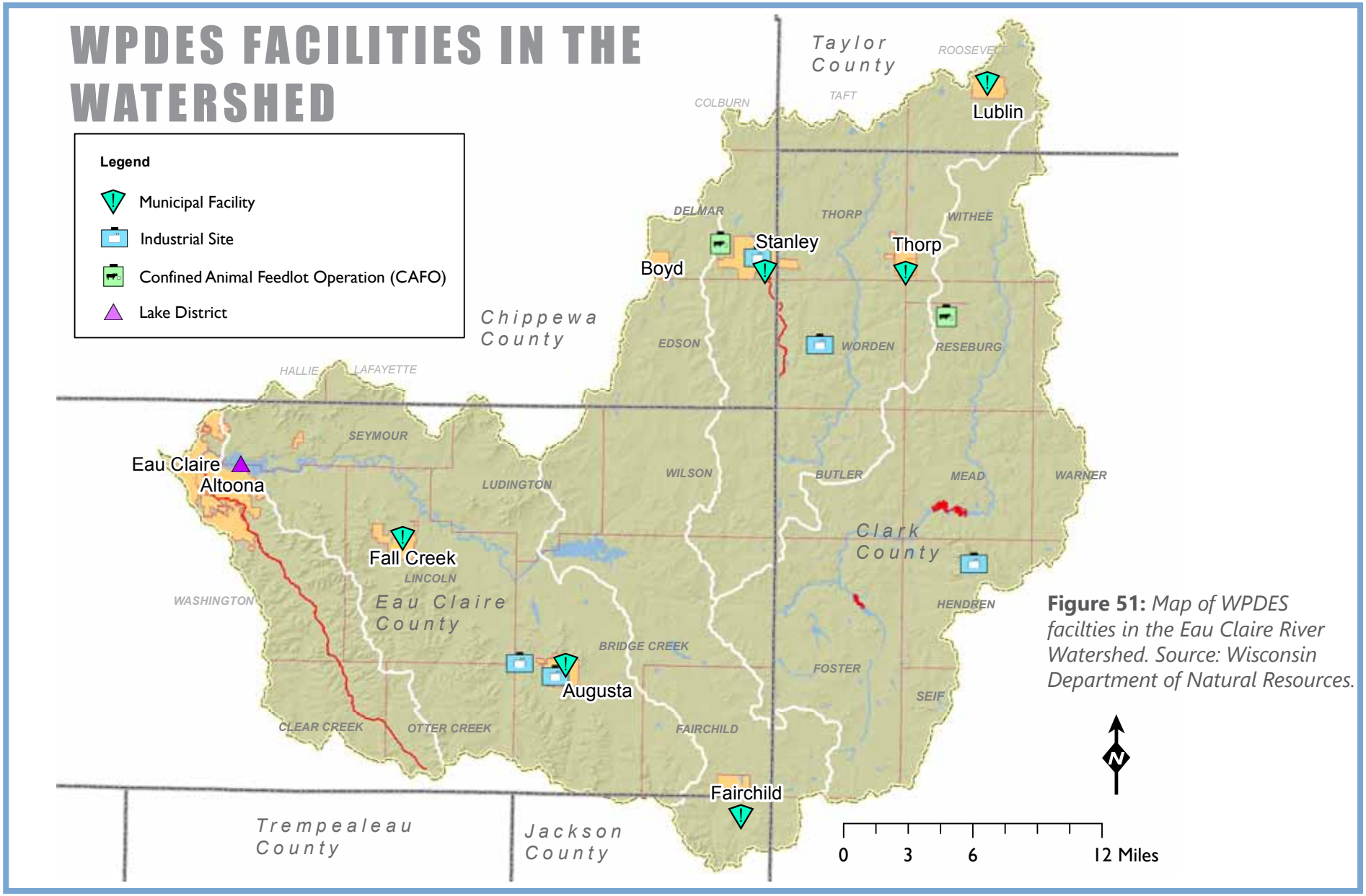

Figure 51: *Map of WPDES facilties in the Eau Claire River Watershed. Source: Wisconsin Department of Natural Resources.*

Other Lake Management and Subwatershed Plans and Studies

A number of additional lake management and subshed plans and studies have been developed and adopted within the Eau Claire River Watershed. While not driven by a formal TMDL, these plans provide important analysis, consensus building, and strategy prioritization that also "opens the door" to funding for implementation. The goals, objectives, recommendations, and general intent of these plans were integrated into this Eau Claire River Watershed Strategy directly or by reference. The following is a list of these recent or updated plans and studies, which are further summarized in the HUC-10 subwatershed summaries in Section III:

North Fork—Eau Claire River (LC 17), including Chapman Lake

- North Fork Eau Claire River Watershed Water Quality Management Plan (2010)

South Fork—Eau Claire River (LC 16), including Mead Lake

- Phosphorus and Sediment Total Maximum Daily Load (TMDL) for Mead Lake (2008)
- Mead Lake Management Plan (2010)
- Mead Lake Watershed TMDL Implementation - Phase I (2011)

Black & Hay Creeks (LC15), including Coon Fork Flowage and Lake Eau Claire

- Predicting Sediment & Phosphorus Loads to the Coon Fork Flowage Using SWAT (2002)
- Coon Fork Lake Management Plan (2004)
- Phosphorus Loading Model for Lake Eau Claire and Lake Altoona (2009)
- Lake Eau Claire Management Plan (2012)

Lower Eau Claire River (LC14), including Lake Altoona

- Hay Creek, Diamond Valley, and Thompson Valley Stream Assessments (2015)
- Lake Altoona Sedimentation Study Project Report (2015)
- Lake Altoona Management Plan (2016)

Otter Creek (LC 25)

- none

APPENDIX A.
OVERVIEW OF WATER QUALITY PLANS & STANDARDS

County Land & Water Conservation Plans

In order to meet ATCP Chapter 50, Wis. Adm. Code, each of the five counties that are part of the Eau Claire River Watershed have a county land and water conservation department. Though exact responsibilities and department names do vary by county, these departments are generally responsible for a variety of educational, coordination, and enforcement activities to protect the farmlands, waters, and natural resources of their respective counties. Each department develops and maintains a Land and Water Resource Management Plan, which identifies their resource management goals and activities. County Land Conservation Department (LCD) staff were very actively engaged throughout this planning effort to ensure coordination between the Watershed Strategy and each county's land & water conservation plan.

Sewer Service Area Plans

Sewer service area (SSA) plans are water quality plans. As required under Section 204 of the Federal Water Pollution Control Act Amendment, SSA planning is a water quality protection process designed to anticipate the future needs for wastewater treatment systems for urban areas exceeding 10,000 in population. SSA plans are a formal element of state areawide water quality management plans (basin plans) as defined under state administrative rules (NR 121), and thus require WDNR review and approval. SSA plans identify a sewer service area boundary in which growth could potentially be provided municipal sewer within a 20-year planning horizon, while protecting environmentally sensitive areas, such as floodplains and steep slopes. The Chippewa Falls-Eau Claire Urban Area Sewer Service Area Plan includes the far western portion of the Eau Claire River Watershed and is administered by West Central Wisconsin Regional Planning Commission and the Metropolitan Planning Organization.

Stormwater Management Plans and Utilities

A stormwater management plan describes community-wide surface water management needs. This local tool is useful in determining actions to improve surface water quality and stormwater detention needs. County and local jurisdictions often incorporate stormwater management requirements as part of subdivision regulations and building codes, in part to ensure consistency with state construction site erosion controls. State law (NR 216) also requires landowners to develop an erosion control plan and obtain necessary WDNR erosion control and stormwater discharge permits for all construction sites where one or more acres of land will be disturbed. The exceptions to this are for public buildings and WisDOT projects which have special regulations.

Currently, municipalities in Census-defined urbanized areas and municipalities with more than 10,000 population are required by state and federal law[1] to develop a stormwater programs with measurable goals, required permitting, and educational efforts for municipal-owned stormwater conveyances which discharge to public waters. Cities, villages, and towns with village powers may create a stormwater utility that is responsible for maintaining and managing the surface water management system. Stormwater utilities have the ability to charge fees to

[1]Rules applicable to stormwater management can be found in the Federal Clean Water Act and Chapter NR 216, Wis. Admin. Code and are regulated through the EPA's National Pollutant Discharge Elimination System (NPDES) and permitted under the Wisconsin Pollutant Discharge Elimination System (WPDES). More information can be found at: http://www.dnr.state.wi.us/runoff/stormwater.htm.

generate revenue to support these activities, and fee structures are often based on the amount of impervious surface area of a parcel or equivalent residential unit size.

Outdoor Recreation Plans (ORPs)
Outdoor recreation plans inventory a community's parks and outdoor recreation facilities, identify related needs, and establish goals for the acquisition, development, and improvement of such facilities. ORPs can play an important role in protecting water quality. By adopting an outdoor recreation plan which is reviewed and accepted by WDNR, a community becomes eligible to participate in the Land and Water Conservation Fund Program (LAWCON), the Stewardship Local Assistance Programs, and other related funding programs to enhance nature-based outdoor recreation opportunities.

Comprehensive Plans
Comprehensive plans are important tools for establishing community goals and guiding municipal decision-making. Under Wis. Stats. §66.1001, if a town, city, village, or county enacts or amends any of the following ordinances, those ordinances shall be consistent with (i.e., furthers and not contradicts) the objectives, goals, and policies of that local governmental unit's comprehensive plan: official mapping, zoning, subdivision regulations, or shoreland/shoreland-wetland zoning. Comprehensive plans must encompass nine elements; water quality issues, goals, and strategies are often addressed as part of a community's agricultural, natural, and cultural resources element. Surface and groundwater quality consistently ranked highest among the natural resources most important to residents during planning surveys. Within the watershed, many of the municipalities and all of the counties, except Clark, have adopted a comprehensive plan

Golden Triangle AEA

The Golden Triangle AEA was created and approved in 2015 and encompasses 21,745 acres in Eau Claire County within the heart of the Eau Claire River Watershed. The goals for the Golden Triangle AEA included preservation of agriculturally-productive lands and the agricultural economy, promoting small-scale agriculture, supporting the local food movement, and supporting agriculture-related businesses. The 26 farmers who signed the petition to form the AEA are a core group of community-minded landowners that have been represented during the development of the Eau Claire River Watershed Strategy and are an important partner for successful implementation.

County Forest Management Plans
A significant portion of the watershed includes forest lands owned by Eau Claire and Clark counties. Each County Forest is managed in accordance with a 15-year comprehensive forest plan that includes best management practices for maintaining a healthy forest, including practices for protecting water quality, in order to maintain stewardship and sustainability certifications.

Working Lands Initiative and Farmland Preservation Planning
The Wisconsin Working Lands Initiative was signed into law in 2009 to preserve farmland through the creation of the Purchase of Agricultural Conservation Easement (PACE) program and the revamping of the State farmland preservation program to include Agricultural Enterprise

Areas (AEAs). The Wisconsin Farmland Preservation Program is designed to help local governments and landowners preserve agricultural land, minimize conflicting land uses, and promote soil and water conservation. Owners of farmland who voluntarily participate in the program receive income tax credits as incentives, if their county has adopted a farmland preservation plan. To claim the credit, landowners must comply with state soil and water conservation standards. The amount of the tax credit varies based on participation in farmland preservation zoning and whether the property is located within an AEA. AEAs are designated by the submittal of a petition to the Department of Agriculture, Trade and Consumer Protection; petitions must be submitted jointly by landowners and town and county governments.

Point-Source Alternatives for Meeting Phosphorus Limits

A number of watershed communities, such as Augusta and Thorp, have been considering their options to meet the 2010 Phosphorus Rule and their respective permit limits for their wastewater facilities. Point-source P limits can be addressed through one or more the following:

- **Facility operational or treatment changes.** Improvements at treatment facilities to meet permit limits can be costly. Some point sources may find it financially or technically impossible to meet P limits and must consider other options.
- **Water Quality Trading.** New projects and BMPs that improve water quality can be used to create credits for both WT and AM. Under WT, a point source purchases pollutant reduction credits from a reduction at other point or nonpoint sources typically upstream to meet a specific ("end of pipe") P or other pollutant discharge/effluent limit. WT uses trade ratios to quantify and achieve reductions prior to issuance of a permit limit. For example, to meet its P discharge limit, Facility A purchases credits from Facility B upstream, which made improvements and is under its limit. Facility A may also work with

Example Adaptive Management (AM) Project: City of Oconomowoc WWTF

The wastewater treatment facility (WWTF) in Oconomowoc, WI, could not meet its final total P limits under its 2011 WPDES permit renewal without significant, costly facility improvements. After study, AM was selected as the best alternative given costs and opportunities for improvement. The City worked with a variety nonpoint source partners, county LCDs, and others to identify and develop an AM plan, including the formation of a Farmer Leadership Group. The AM Plan included a watershed inventory, established load reduction goals, and identified where reductions will occur. The plan estimated load reductions for specific proposed management measures and projects, including:

- nutrient management planning
- cover crops and improved tillage
- riparian buffers and grassed waterways
- retention ponds
- barnyard improvements
- wetland restoration

The AM plan included details on the costs of these BMPs, an implementation schedule, a monitoring plan, and the financial commitment by the City of Oconomowoc.

other landowners to earn credits by funding nonpoint source reductions (e.g., agricultural BMPs). WT can also involve a third-party credit broker to help bring together multiple credit generators and credit users.

- **Adaptive Management.** AM is a watershed approach where a point source funds BMPs addressing nonpoint sources to meet in-stream P criteria for waters that are currently exceeding P criteria. The reductions are based on the receiving water, not effluent. For example, Facility A works with partners to develop and implement an AM plan that identifies and funds projects and BMPs within the watershed with a 10-15 year project life. AM generates credits within the permit term and plans can be adjusted over time. In-stream water quality is monitored with the intent of meeting P criteria goals at the end the project life; if this criteria is not met, other alternatives to meet the P limits may be required. While AM is more flexible, WT offers more certainty since AM is tied to in-stream criteria.
- **Water Quality Standards Variance.** With approval of WDNR and U.S. EPA, facility-specific variances from permit limits may be possible if there is credible evidence that attaining standards are not possible for certain reasons.

AM and WT can be economically preferable for a point source, compared to costly facility improvements, but require planning and partnering to be effective. Multiple communities and point sources can also collaborate in the creation of their AM and WT programs. This Watershed Strategy and the Eau Claire River Watershed Coalition can have a role in encouraging such cooperation.

WATER QUALITY STANDARDS

As discussed in the main text, we need to consider and have an understanding of existing water quality standards and rules. However, a decision was made that this Watershed Strategy should primarily focus on changing attitudes and behaviors, not through rules and regulations, but through education, civic leadership, voluntary incentives, and partnerships. The standards and regulations potentially influencing or protecting water quality are diverse, complex, lengthy, and involve all levels of government. These standards are also subject to change over time. As such, the intent of this section is to provide a brief overview and context, rather than an exhaustive review, of the water quality standards potentially impacting the watershed.

Federal Clean Water Act – As a water quality strategy principally focused on the nonpoint source (NPS) pollution of our rivers, lakes, and streams, this Watershed Strategy is ultimately supported under the federal Clean Water Act (CWA). It is Section 303(d) of the CWA that requires Wisconsin to:

- submit a list of impaired surface waters that are too polluted or degraded to meet water quality standards
- establish priority rankings for waters on this list and develop Total Maximum Daily Loads (TMDLs) for these waters.

APPENDIX A.
OVERVIEW OF WATER QUALITY PLANS & STANDARDS

In 1987, Congress amended the CWA to establish the Section 319 Nonpoint Source (NPS) Management Program. Section 319 provides grant funding for NPS planning and programming, including this planning effort.

Nonpoint Sources (NPS) – Wisconsin's regulatory approach to nonpoint source (NPS) pollution reduction centers on statewide enforceable agricultural, manure management, and non-agricultural performance standards under Wis. Stats. §92 and NR 151 and ATCP 50 of the Wisconsin Administrative Code. These performance standards are the minimum expectations that apply to:

- phosphorus delivery
- cropland erosion
- construction erosion
- post-construction stormwater management
- developed urban areas
- transportation facilities

Agricultural Performance Standards - In addition, ATCP 50 requires each county to have a soil and water conservation program and focuses on agricultural performance standards (and related grant programming), including:

- **soil erosion** (all cropland and pastures must meet tolerable soil loss ["T"] levels)
- **phosphorus index** (all cropland and pastures must comply with the PI standard under NR 151.04, where the PI applies; a nutrient management plan meeting the standard may demonstrate PI compliance)
- **nutrient management** (a NM plan that meets NRCS 590 standards is required, except for certain pastures; soil testing is required when nutrients are mechanically applied)
- **tillage setback** (cropland must be managed to include a minimum 5 feet setback from the top of the channel of surface water; county LCD staff may increase the setback width to maintain bank stability for specific location; no tillage and adequate vegetation [70% coverage] must be maintained in the setback zone)
- **process wastewater** (livestock operators must prevent a "significant" discharge of feed storage runoff, milkhouse wastewater, or other process wastewater)

- **all performance standards and prohibitions in NR 151** including:
  - prevent direct runoff from feedlots or stored manure to waters of the state
  - limit livestock access along waters to maintain vegetative cover
  - maintain manure storage technical standards for construction and abandonment
  - for areas near surface water or susceptible to groundwater contamination, do not stack manure in an unconfined pile and divert clean water away from feedlots, manure storage, and barnyards

Cost-share funding may be available to farmers to assist with meeting these standards, and changes to the Farmland Preservation Program allows famers to meet these standards over time.

Urban Standards - For urban areas and land development, Section 402 of the Clean Water Act requires that all construction sites on one acre or greater of land, as well as municipal, industrial, and commercial facilities that discharge wastewater or stormwater directly from a point source (a pipe, ditch or channel) into a surface water of the United States (a lake, river, and/or ocean) must first obtain permission under the National Pollutant Discharge Elimination System (NPDES). In Wisconsin, this federal requirement is addressed through the Wisconsin Pollutant Discharge Elimination System (WPDES) program under NR 216 of the Wisconsin Administrative Code. In 2009, Wisconsin adopted a Zero-Phosphorus Fertilizer Law that restricts the use, sale, and display of lawn fertilizers that contain phosphorus or phosphates by homeowners, renters, municipalities, retailers, and lawn care professionals, except under certain specific exemptions.

MS4 Permits - As a federally-designated urbanized area, Chippewa and Eau Claire counties, as well as many of their local governments, have also been required to obtain a Municipal Separate Storm Sewer System (MS4) permit to reduce polluted storm water runoff by implementing storm water management programs with best management practices. While MS4 permits usually do not include effluent limits like other WPDES permits, MS4 communities are required to conduct a variety of educational, enforcement, and best practices activities. The regional Rain to Rivers of Western Wisconsin group was created, in part, to meet MS4 public outreach requirements. These state and federal MS4 storm sewer discharge permits, collectively, are frequently referred to as the Phase I and Phase II rules, with Phase I mainly affecting the largest communities such as Madison and Milwaukee, and Phase II later impacting smaller municipalities. Now, more than 200 Wisconsin municipalities must meet these Phase I and II rules. In the Eau Claire River Watershed this includes: Chippewa County, Eau Claire County, City of Altoona, City of Eau Claire, and Town of Washington.

Wetlands - Section 404 of the Clean Water Act requires federal permits for the disposal of dredge or fill material into "waters of the United States," which generally includes wetlands that are adjacent to or have a hydrologic connection to navigable water ways. This generally includes the conversion of wetlands to uplands through drainage for farming and forestry; drainage systems installed prior to 12/23/85 can be

maintained in most cases. Disturbances in "isolated" wetlands are not regulated under the CWA, but are also subject to review and approvals under Wisconsin's wetland rules (Wis. Stats. 281.36, NR 103, NR 299, NR 300, NR 353). Wisconsin law requires state review and approval of construction activities in all wetlands, regardless of size, location, or wetland type. Keep in mind that some wetland areas (especially ephemeral ponds and wetlands less than 5 acres in size) are not shown on Wisconsin Wetland Inventory Maps, but these wetlands are still regulated. It is also important to note that under the Swampbuster provision of the 1985 Farm Bill, a landowner who drains, deforests, fills, or otherwise alters a natural wetland so it can be cropped may lose eligibility for USDA programs and benefits. However, wetland laws pertaining to agriculture can be very complicated and some dredging or other disturbances of wetlands may be allowable under certain situations. It is advisable to contact both the WDNR and U.S. Army Corps of Engineers if there is a concern that a wetland disturbance is or may be violating state or federal laws. For agricultural lands, the U.S. NRCS may also become involved, as well as the local zoning office in zoned communities.

Shorelands - Additional administrative codes (e.g. NR 102, NR 115, NR 217) identify specific criteria that must be met to protect public welfare and our ecosystem. In the case of Wisconsin's Shoreland Protection Program (NR 115), Act 55 in 2015 amended State regulations to specify that the standards within a county's shoreland cannot be more restrictive than the NR 115 standards; additional changes to the State's shoreland rules were adopted in early 2016. Wisconsin's Nonpoint Source Program Management Plan provides an excellent overview of these and other State regulations and programs related to NPS pollution and water quality.

Other - At the local level, counties and communities have a number of tools available to assist in protecting surface water quality, such as, but not limited to:

• County shoreland zoning and City/Village shoreland-wetland zoning	*Wis. Stats. §59.692, 61.351 & 62.231; NR 115*
• Shoreland management ordinances (not commonly used)	*Wis. Stats. §92.17*
• Floodplain zoning, including zoning of hydraulic dam shadows	*Wis. Stats. §87.30 & NR116*
• Land-use zoning (may include additional performance standards)	*Wis. Stats. §59.59, 60.62, 61.35, 62.23*
• Sanitary ordinances for private sewage systems	*Wis. Stats. §59.065*
• Solid waste management	*Wis. Stats. §59.70, 59.07, and 144.437*
• Recycling ordinance	*Wis. Stats. §144.449, 59.07,159.17, and NR 502*
• Manure Storage and Management Ordinances	*Wis. Stats. §92.16 & NR 151*
• Livestock Facility Siting Ordinances	*Wis. Stats. §93.90 & ATCP 51*
• Mining Regulations	*Wis. Stats. §295.13, 295.20, & NR 135*
• Construction site stormwater/erosion control permits	*NR 216 and NR 151*
• Groundwater, drinking water, wells, and wellhead protection	*various sections of NR Admin. Code*
• Various other permitting, licensing and nuisance ordinances	*varies*

APPENDIX A.
OVERVIEW OF WATER QUALITY PLANS & STANDARDS

The adoption and requirements of the above regulatory tools varies across the watershed. Some of the above, such as floodplain and shoreland (or shoreland-wetland) zoning must be adopted at the county or community level and include specific standards. Others, like zoning, vary significantly by county, city, village, and town. For example, Eau Claire, Chippewa and Jackson counties have a livestock facility siting ordinance, while Taylor County has three towns with their own livestock siting ordinance.

APPENDIX B: WATER QUALITY GRANT & ASSISTANCE RESOURCES

APPENDIX B.
WATER QUALITY GRANT & ASSISTANCE RESOURCES

As of February 2016, the following tables provide a summary of the key grant and assistance resources most commonly used and potentially available to support implementation of the Eau Claire River Watershed Strategy. This summary is not exhaustive of all potential resources. These programs (and new programs) are subject to change over time.

Many of the grant programs are competitive and may require some type of local cash and/or in-kind cost sharing (grant match). However, many of these resources can also be leveraged and combined into a larger project in order to maximize effectiveness and increase their feasibility.

Those programs identified with a Section 319 funded tag are the grant primary programs funded, in part, by Federal Section 319 Clean Water Act-NPS dollars. In most cases, a 9-key element plan (such as this Watershed Strategy) is a pre-requisite when applying for these Section 319-funded grant programs for implementation projects.

Red Cedar Basin Assessment Project
- An Example Model for Leveraging Resources -

Lessons learned and models from other watersheds can provide guidance and inspire. As one example, to more effectively implement the Red Cedar River Watershed TMDL Plan, additional biophysical, economic, and sociological data was needed. In 2015, a partnership was created to gather this data that included the following contributions:

- **U.S. Army Corp of Engineers (USACOE)** $300,000
  Planning Assistance to State Program, including some subcontracted work to UW-Stout.
- **WDNR Lake Management Plan Implementation Grant** $200,000
  UW-Stout social, economic, and civic engagement work, plus project administration by West Central Wisconsin Regional Planning Commission.
- **Tainter-Menomin Lake Improvement Assoc.** $54,000
  In-kind match using the value of the annual Red Cedar Land, Water, & People Conference.
- **Dunn County, Barron County, & UW-Extension** $58,700
  In-kind staff and resource contributions from existing budgets for project support.

The USACOE program required a 50% local match, which was met by WDNR Lake Grant and local in-kind contributions. The 25% match for the WDNR Lake Grant was more than met by the value of the USACOE technical assistance. Implementation of this three-year project began in Spring 2016. (NOTE as of 2/13/16 – grant proposals are pending; remove or revise this summary if not funded)

APPENDIX B.
WATER QUALITY GRANT & ASSISTANCE RESOURCES

RESOURCE	BRIEF DESCRIPTION
Federal & State Grant Programs - Lakes, Rivers and Stormwater Management	
WDNR – Lake Management Planning Grants and Lake Protection Grants Section 319 funded	This is a frequently used funding source for Lake District & Association projects and includes the following sub-programs: • Lake Classification & Ordinance Development • Land/Easement Acquisition • Wetland & Shoreline Habitat • Lake Management Plan Implementation • Healthy Lakes Project
WDNR – River Protection Grants Section 319 funded	This funding includes the following sub-programs: • River Planning • River Management • Land/Easement Acquisition
WDNR – Aquatic Invasive Species Grants	Also frequently used by lakes groups, this funding includes the following sub-programs: • Early Detection & Response • Education, Prevention, & Planning • Clean Boats Clean Water Use • Established Population Control • Maintenance & Containment Use
WDNR - Targeted Runoff Management Grants Section 319 funded	For agricultural or urban nonpoint source pollution control projects in targeted, critical geographic areas. Large scale ($1 mil) and small scale ($150,000) available. 30% match.
WDNR - Urban Nonpoint Source & Stormwater Management Grants Section 319 funded	Commonly used by cities and village for planning and construction of stormwater runoff pollution prevention and controls.
USDA FSA – Source Water Protection Program	SWPP is designed to protect surface and ground water used as drinking water by rural residents. The program targets states based on their water quality and population.

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WATER QUALITY GRANT & ASSISTANCE RESOURCES

RESOURCE	BRIEF DESCRIPTION
Federal & State Grant Programs - Lakes, Rivers and Stormwater Management	
Other Various Water-Related Grants	The following additional water-related grant programs are available: • WDNR Dam Municipal Grant Program and Dam Removal Grant Program • WDNR Municipal Flood Control Grants • WDNR Discharge Cost-Share Grants (for pollution controls at livestock operations) • WDNR Well Abandonment; Well Compensation if contaminated • WDNR Fisheries Production Grants (e.g., Wisconsin Walleye Initiative) • WDSPS Wisconsin Fund provides grants to homeowners and small commercial businesses to help offset a portion of the cost for the repair, rehabilitation, or replacement of existing failing Private Onsite Wastewater Treatment Systems (POWTS) • Municipalities may also be eligible for a number of local and grant programs for infrastructure improvements that may benefit water quality and stormwater management, such as HUC Community Development Block Grants, USDA-Rural Development grant programs, or FEMA Hazard Mitigation Grants • Under the Clean Water Act, the EPA's Water Pollution Control (Section 106) and Nonpoint Source Management Program (Section 319) grants are available to states and eligible tribes. The Coalition would access these dollars through existing WDNR services and grant programs. Section 319 funded • EPA Environmental Justice Grant supports and empowers communities working on solutions to local environmental and public health issues, including the building of collaborative partnerships. • EPA Pollution Prevention (P2) grants prioritize three emphasis areas: (i) climate change mitigation, (ii) pollution prevention in food processing sector, and (iii) hazardous materials source reduction activities. • U.S. Geological Survey (USGS) may be able to provide research and data collection to support the examination of the geological structure, water, mineral, and biological resources, and products of the national domain, if federal dollars are not available from another source.

APPENDIX B.
WATER QUALITY GRANT & ASSISTANCE RESOURCES

Federal & State Grant Programs - Agriculture, Conservation, and Habitat	
WDNR – Fish & Wildlife Management Grant Program (County Conservation Aids)	Allocated to Counties, typically implemented through county land & water conservation departments to enhance fish and wildlife programs.
WDNR – Knowles Nelson Stewardship Fund & Related Federal Programs	Nature-based outdoor recreation and stewardship activities, including: • Aids for the Acquisition & Development of Local Parks • Urban Green Space • Urban Rivers • Acquisition of Development Rights • Land and Water Conservation Fund • Recreational Trails Act
WDNR/DATCP – Notice of Intent/ Discharge Cost-Share Grants Section 319 funded	WDNR and DATCP offer cost-share funding grants to governmental units working with owners and operators of livestock operations to meet pollution control requirements imposed by the DNR.
WI DATCP – Nutrient Management Farmer Education Grants	This program has two tiers: Capped at $20,000, Tier I grants fund projects that offer incentive payments to farmers for soil testing and other elements needed to complete a nutrient management plan. These grant projects also include workshops, on-farm visits, developing methods for farmers to measure their manure application rates, and completion of a nutrient management plan. Capped at $2,500, Tier II grants fund projects that educate farmers about soil testing and nutrient management without providing any financial incentives to them.
WI DATCP – Producer-Led Watershed Protection Programs (new in 2016)	Water quality projects that are led by a producer group (min. 5 farmers) with the assistance of a collaborating entity. Can include planning, education/outreach, pilot project, BMPs, monitoring, and incentives. (max. $20,000 award; 50% match)
WI DATCP – Soil and Water Resources Management Program Section 319 funded	DATCP awards annual grants to eligible county Land Conservation Committees (LCCs) and other cooperators to support conservation activities. DATCP awards grants to counties to pay for county conservation staff and to finance landowner cost sharing.
USDA FSA – Conservation Reserve Program (CRP)	The Farm Service Agency's CRP program provides yearly rental payment in exchange for farmers removing environmentally sensitive land from agricultural production and planting species that will improve environmental quality In our region, the CRP-SAFE Program was established to target Karner Blue Butterfly habitat.

APPENDIX B.
WATER QUALITY GRANT & ASSISTANCE RESOURCES

Federal & State Grant Programs - Agriculture, Conservation, and Habitat	
USDA FSA – Conservation Reserve Enhancement Program (CREP)	An offshoot of CRP, CREP targets high-priority conservation issues identified by government and non-governmental organizations. Farm land that falls under these conservation issues is removed from production in exchange for annual rental payments.
USDA FSA – Farmable Wetlands Program (FWP)	FWP is designed to restore wetlands and wetland buffer zones that are farmed. FWP gives farmers and ranchers annual rental payments in return for restoring wetlands and establishing plant cover.
USDA NRCS – Agricultural Management Assistance (AMA) Section 319 funded	The Natural Resources Conservation Service's AMA program helps agricultural producers use conservation to manage risk and solve natural resource issues through natural resources conservation. Include technical and financial support.
USDA NRCS – Conservation Stewardship Program (CSP) Section 319 funded	CSP helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resources concerns. Participants earn CSP payments for conservation performance.
USDA NRCS – Environmental Quality Incentives Program (EQIP) Section 319 funded	EQIP provides financial and technical assistance to agricultural producers in order to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.
USDA NRCS – Agricultural Conservation Easement Program (ACEP) Section 319 funded	ACEP provides financial assistance to help conserve agricultural lands and wetlands. ACEP includes a Wetland Reserve Easements component to restore, protect, and enhance enrolled wetlands.
U.S. Fish & Wildlife Service – Partners for Fish & Wildlife Program (PFWP)	The PFWP provides technical assistance and financial cost sharing to private landowners for voluntary habitat restoration on private lands for the benefit of Federal trust species. In addition, USF&WS provides technical assistance for habitat-related education/outreach, research, restoration, and protection efforts. The majority of other USF&WS financial support grant programs are available to states or specific qualifying areas.
U.S. Fish & Wildlife Service – Fishers & Farmers Partnership (FFP) Aquatic Habitat Proposals	The FFP for the Upper Mississippi River Basin is a self-directed group of non-governmental agricultural and conservation organizations, tribal organizations, and state and federal agencies united to add value to farms while protecting, restoring, and enhancing the 30,700 miles of streams and rivers of the Upper Mississippi River Basin. The FFP Aquatic Habitat Project provides funding for stream habitat project. The Eau Claire River Watershed Coalition may wish to monitor, and, perhaps, become a partner with FFP given the share mission and FFP's technical resources and the potential for future funding.
Other WDNR Habitat-Related Grants for Landowners	• WDNR Landowner Incentive Program ($2,500 - $25,000; 25% match) • WDNR Forest Landowner Grant Program (max 50% reimbursement for projects)

APPENDIX B.
WATER QUALITY GRANT & ASSISTANCE RESOURCES

Technical Assistance	
U.S. Army Corps of Engineers (USACOE)	USACOE can provide technical assistance involving wetlands, flood risk management, levee safety, water navigation, invasive species, and environmental/ecosystem protection, remediation, and restoration projects, depending on the nature of the project and location. Through the USACOE Planning Assistance to States program, the Corps can assist states, tribes, and local governments with water-related plans and studies. In addition, under the Corp's Continuing Authorities Program (CAP), USACOE can plan, design, and implement certain types of water resources projects of limited size, cost, scope, and complexity.
USDA FSA & NRCS	With offices in each county, the USDA Farm Service Agency and Natural Resource Conservation Service are well positioned to assist farmers, landowners, local units of government, and the Eau Claire River Watershed Coalition. The NRCS promotes coordination with NRCS partners to deliver conservation programs to farmers through agreements under the Regional Conservation Partnership Program.
Wisconsin Department of Natural Resources	WDNR technical assistance was critical to the development of this Watershed Strategy and will likewise be critical to plan implementation. A very strong relationship has been established between the Watershed Coalition and WDNR regional staff, including the Lake Management Coordinator, the NR Basin Coordinator, and the Water Resources Management Specialist. WDNR Targeted Runoff Management and Notice of Discharge Programs (Section 319 funded) can also help address difficult environmental sites.
Wisconsin Department of Natural Resources – Water Quality Monitoring	WDNR staff also perform water quality monitoring, as well as support lake and stream volunteer monitoring efforts through the Citizen-Based Water Monitoring Network of Wisconsin, the Citizen Lake Monitoring Network, and the Water Action Volunteers-Citizen Stream Monitoring program. The WDNR manages these programs with the support of county land conservation offices, lake groups, local organizations (e.g., Beaver Creek Reserve), and committed citizen volunteers.
Wisconsin Department of Agriculture, Trade and Consumer Protection	DATCP's soil and water resource management program operates in cooperation with county land conservation committees/departments, the Land and Water Conservation Board, the Department of Natural Resources, and other state and federal agencies to provide technical assistance, resources, and enforcement related to ATCP 50. For example, the web-based Wisconsin Manure Management Advisory System is a set of maps to help farmers and others who apply nutrients to identify suitable cropland areas for spreading, including maps for short-term runoff risk assessment, daily application planning, and longer-term Wisconsin NRCS 590 nutrient management.

APPENDIX B.
WATER QUALITY GRANT & ASSISTANCE RESOURCES

Technical Assistance	
County Land & Water Conservation Departments (LCDs)	The LCDs of each of the 5 counties included in the watershed actively participated in the development of this Watershed Strategy and, likewise, will be critical to implementation. In cooperation with USDA, WDNR, and UW-Extension staff, these LCDs are working everyday with landowners, farmers, lake groups, and communities to enhance water quality. The LCDs can also bring additional County resources to the table as needed and available.
UW-Extension	UW-Extension Agricultural Agents and the region's Natural Resource Educator were also very important resources during development of this Watershed Strategy and are important technical and coordinating resources to ensure successful implementation.
River Country Resource Conservation & Development Council	River Country RC&D is a 501(c)3 based in Eau Claire that covers all of the Eau Claire River Watershed, except that portion in Taylor County. The RC&D provides assistance to urban and rural economies, communities, and landscapes, including private land management support, grant assistance, water quality BMP projects, grazing network events, and educational efforts.
West Central Wisconsin Regional Planning Commission (WCWRPC)	As a multi-county governmental body covering the majority of the watershed, WCWRPC is well positioned to assist with watershed-led level planning, grant-writing, and collaboration.
Universities & Technical Colleges	Universities and technical colleges can provide research, and sometimes community service and volunteer support, for water quality efforts. Our watershed is fortunate to have access to numerous nearby higher educational resources, including UW-Eau Claire, UW-Stout, UW-Stevens Point, and Chippewa Valley Technical College. For example, UW-Eau Claire has established the Watershed Institute for Collaborative Environmental Studies.

Other Implementation Support	
EPA – Environmental Education (EE) Grant Program	The EE Program supports environmental education projects that promote environmental awareness and stewardship and help provide people with the skills to take responsible actions to protect the environment. This grant program provides financial support for projects that design, demonstrate, and/or disseminate environmental education practices, methods, or techniques. (2016 max award about $91,000; 25% match)
Lakes Associations and Districts	The lake associations and districts of the Eau Claire River Watershed have long been "on the frontline" for improving water quality and fisheries. Summaries of for each active district and association are provided within the HUC-10 descriptions of Section III of this Watershed Strategy. Statewide support and advocacy on lakes issues is provided through Wisconsin Lakes.

APPENDIX B.
WATER QUALITY GRANT & ASSISTANCE RESOURCES

Other Implementation Support	
Lower Chippewa River Alliance	LCRA was organized to support the conservation, preservation, and stewardship of the Lower Chippewa River Basin, which includes the Eau Claire River Watershed.
Cooperative Invasive Species/ Weed Management Areas	Two CISMAs exist within the watershed—the Lower Chippewa Invasive Partnership includes Chippewa and Eau Claire counties and the Upper Chippewa CWMA includes Taylor County. CISMAs are local organizations that bring together landowners and land managers to coordinate action and share expertise and resources to manage invasive species. As an example, “Spread the word, not the plant” is LCIP’s motto, and the mission of LCIP is to control invasive plants by fostering partner cooperation and community action.
Rain to Rivers of Western Wisconsin	Rain to Rivers of western Wisconsin is a partnership between several local and county governments, including Chippewa and Eau Claire counties, who are all required to have state permits to regulate storm water. Rain to Rivers facilitates the coordination of information and education programs among the different members and can be an important partner in providing public outreach.
Municipalities and Elected Officials	Municipalities have a statutory, economic, health, and societal interest in good water quality. Our counties, cities, villages, and towns are important stakeholders and can provide local community/ networking, equipment, technical resources, and financial support for projects. The County Towns Associations offer a convenient way to outreach to the unincorporated towns.
Private-Sector Businesses and the Agri-Business Sector	Local businesses (and their employees) use and value clean water. These businesses (or their foundations) may be valuable partners for funding, in exchange for name recognition and the good public relations. For example, Leinenkugals Brewing Company has provided substantial support for water quality efforts in the Little Lake Wissota Watershed. Business groups, such as county economic development corporations, chambers/tourism bureaus, and realtors associations, can provide important avenues to outreach to businesses within the watershed. Due to their relationship to farmers, the agri-business sector (e.g., cooperatives, crop consultants, seed suppliers, food processing) can be very valuable partners.

APPENDIX B.
WATER QUALITY GRANT & ASSISTANCE RESOURCES

Other Implementation Support	
Other Federal & State Grants	The following web sites are additional places to search for or monitor federal and state grant programs and announcements: • www.grants.gov The federal government's primary, overall grant "search engine" and management tool. Many departments also maintain their own grant webpages. • www.cfda.gov The Catalog of Federal Domestic Assistance (CFDA) in federal grants and other assistance programs. • https://attra.ncat.org/calendar/funding.php A National Sustainable Agriculture Assistance Program (ATTRA) by the National Center for Appropriate Technology (NCAT) • http://datcp.wi.gov/Business/Grants_and_Financial_Aid/ Wisconsin DATCP grants. • http://dnr.wi.gov/aid/grants.html Wisconsin DNR grants
Foundation Grants	A variety of private foundations (e.g., Xcel Energy, McKnight Foundation) have been used in other watersheds to support water quality and conservation efforts. The L.E. Philips Memorial Library has a subscription to The Foundation Center's online database, which allows an opportunity to research potential foundation grants by subject and geographic area.
Other Stakeholders and Partners	Section X of this Watershed Strategy identifies other key stakeholders and partners that are necessary for success, not the least of which are the landowners themselves. This list in Section X is long, but includes the following as examples of potential partners and other assistance resources that may play an active or supporting role in strategy implementation: • Volunteers to actively serve on the Coalition, support Coalition activities, and help implement Watershed Strategy recommendations, such as monitoring efforts. • Agricultural organizations and producer-led groups, such as the Farmer Bureau, Farmers Union, FFA, and Golden Triangle AEA. • Recreation groups and service organizations, such as rod & gun clubs, paddler clubs, Trout Unlimited, Augusta Area Bass Club, and Ducks Unlimited. • Environmental and advocacy organizations, such as Wisconsin Dragonfly Society, Wisconsin Wetlands Association, River Alliance of Wisconsin, The Nature Conservancy, and Beaver Creek Reserve. • Youth organizations, schools, and clubs.

APPENDIX C: CHARACTERISTICS OF THE FIVE HUC-10 SUBWATERSHEDS

APPENDIX C.
CHARACTERISTICS OF THE FIVE HUC-10 SUBWATERSHEDS (LC 17)

I. NORTH FORK - EAU CLAIRE RIVER (LC 17)

Overview

WATERSHED OVERVIEW (LC17)	
BASIC INFO	
Watershed Size:	206 sq mi
Stream Miles:	412 mi
Lake Acres:	302 ac
Wetland Acres:	18,395 ac
Trout Waters:	21.9 mi
Population:	8,840
Pop/Sq Mile:	42.9

The North Fork of the Eau Claire River watershed lies within four Wisconsin counties: Clark (53 percent), Chippewa (19 percent), Taylor (16 percent) and Eau Claire (12 percent). As shown on the map on the following page, the North Fork watershed also includes the Wolf River, Chapman Lake, and a number of smaller streams. The watershed is composed of primarily agricultural and forested landscapes. There are several thousand acres of wetlands and the watershed is located in three ecological landscapes: Forest Transition, the North Central-Forest and the Central Sand Plains.

Population & Land Use

Population in the watershed is estimated around 8,840 people with around 3,203 housing units. The two largest developed areas in this watershed are the cities of Thorp - population 1,621 and Stanley - population 3,608 (U.S. Census 2010).

The watershed is comprised primarily of cropland and forest. The growing season in this part of the state is long enough that agriculture is viable, although climatic conditions are not as favorable as in southern Wisconsin.

LAND USE (LC17)	
USGS 2006	
Cropland	50%
Forest	38%
Urban/Developed	5%
Others	5%
Pastureland	2%
Water	>1%

The historic vegetation of the Forest Transition was primarily northern hardwood forest. These northern hardwoods were dominated by sugar maple and hemlock, and contained some yellow birch, red pine and white pine. Forested areas consist primarily of northern hardwoods and aspen, with smaller amounts of oak and lowland hardwoods. The eastern portion of the Ecological Landscape differs from the rest of the area in that it remains primarily forested, and includes some ecologically significant areas. Throughout the Ecological Landscape, small areas of conifer swamp are found near the headwaters of streams, and associated with lakes in kettle depressions on moraines.

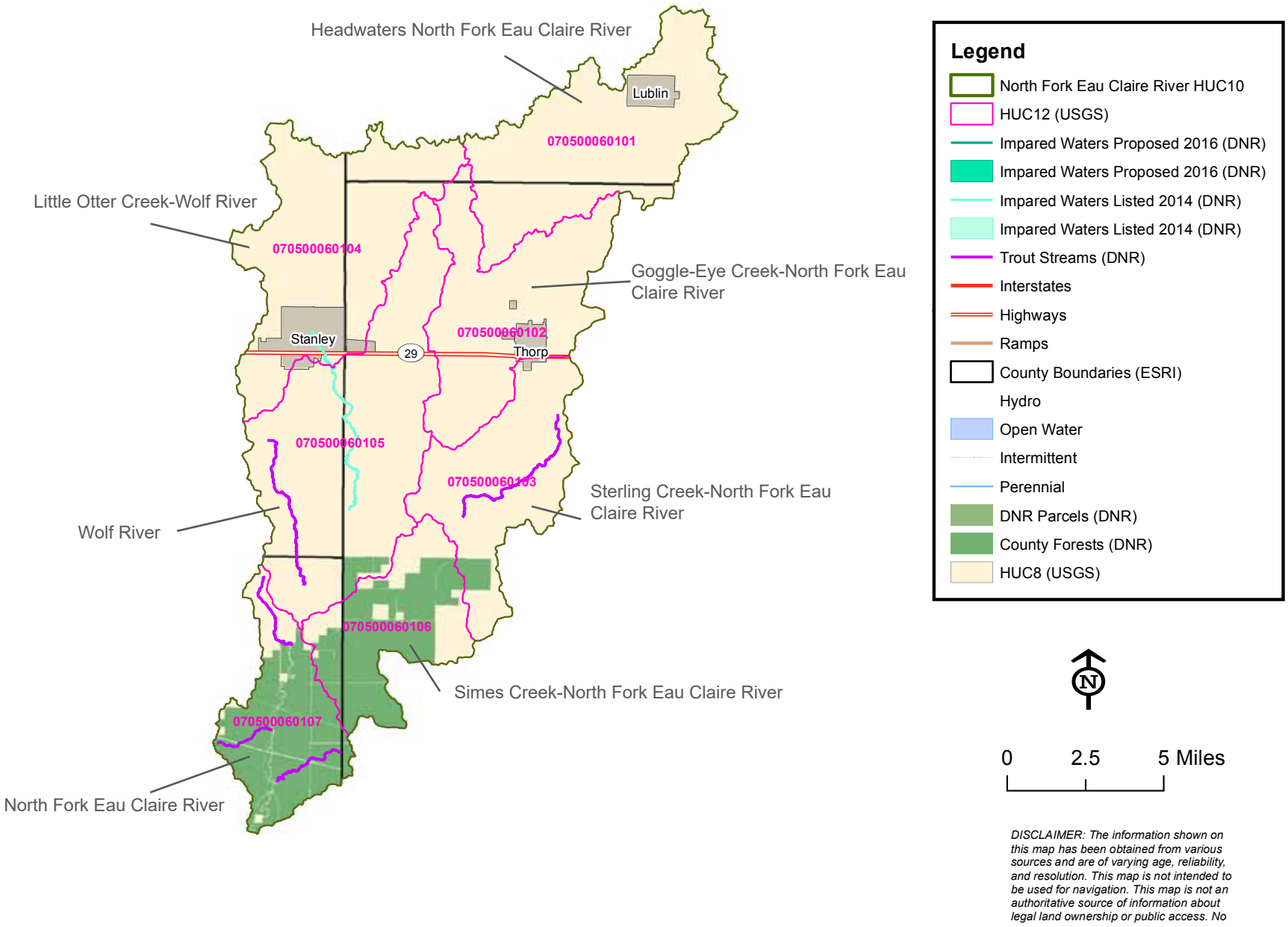
Most of the historic wetlands were drained early in the 1900s and are now used for vegetable cropping. The forested portion is mostly oak-dominated forest, followed by aspen and pines and a minor portion consists of maple-basswood forest and lowland hardwoods.

Water Quality

OUTSTANDING, EXCEPTIONAL, AND ASNRI WATERS

A 4.96-mile stretch of Swim (or Swan) Creek in southeastern Chippewa County is the only Exceptional Resource Water within the North Fork—Eau Claire River Watershed. The watershed has

APPENDIX C.
CHARACTERISTICS OF THE FIVE HUC-10 SUBWATERSHEDS (LC 17)



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no Outstanding Resource Waters. As shown on the inset map, this watershed does include 4.9 miles of Class I, 10.2 miles of Class II, and 6.6 miles of Class III trout streams. Many of the larger rivers and streams, or parts thereof, are also designated as ASNRI waters due to the existence of endangered, threatened or other animal or plant species of concern.

IMPAIRED WATERS

Wolf River - 9.02 miles (Impaired)
Of the nearly 400 miles of streams in the watershed, Wolf River is the only 303d listed impaired water. The Wolf River is a 24-mile long warm water tributary to the North Fork of the Eau Claire River that meanders through portions of Clark, Taylor, Chippewa and Eau Claire counties. This clear, medium hard water stream originates in southwestern Taylor County and flows south into Chapman Lake, a millpond in the City of Stanley. The Wolf River flows south out of Chapman Lake and joins the North Fork Eau Claire River in northeastern Eau Claire County. At least 70 percent of the land adjacent to the stream has been cleared in addition to 94 percent of the land included in the watershed area. There is no public land adjoining the stream; however, public access is possible from six road crossings. There is one industrial and one municipal point source discharge in the watershed.

The Wolf River, from the Chapman Lake dam downstream to Worden Road, is not supporting its designated use due to dissolved oxygen standards violations. Therefore, this section of river is identified as impaired on the Federal 303d list. Streambank erosion and pasturing, as well as cropland erosion that cause in-stream sedimentation and aquatic habitat loss are the major nonpoint source concerns. Transect survey data from 2011 indicates that the average annual soil loss rate in this watershed is 1.7 tons per acre per year. Excessive nutrient loading has also impacted the river. Regardless of the source, nutrient discharges result in low dissolved oxygen levels in streams when base flow is reduced during dry weather periods. The groundwater contamination potential ranking for the North Fork Eau Claire River Watershed is high, the stream ranking is low and the overall NPS ranking is high.

Watershed Plans & Studies

NORTH FORK EAU CLAIRE RIVER WATERSHED: WATER QUALITY MANAGEMENT PLAN UPDATE (2010)

PLAN PURPOSE

This report describes conditions of the watershed which includes a list of projects, actions and recommendations. See Section IV for detailed findings of this report.

PLAN RECOMMENDATIONS

- A TMDL needs to be completed for the 303d listed impaired reach of the Wolf River.
- Trout stream classifications of some streams may need to be changed as a result of the additional monitoring identified above.
- Stream assessment monitoring should be completed on Swim, Sterling, Shambaugh, Loper and Beeman Creeks to determine appropriate stream classifications. These streams are classified as trout water even though historic data does not support a cold water designation or data does not exist.
- Volunteer monitoring lake water quality and invasive species should be established at Chapman Lake.

- Chapman Lake habitat would benefit from placement of woody structure in the form of tree drops or cribs.
- With 58% of original wetlands already lost, preservation of remaining wetland functional values, such as fish and wildlife habitat, runoff storage and filtering capacity should be a high priority.
- Where opportunities arise, wetland restoration should be promoted.
- Cropland practices that increase soil cover and decrease erosion and runoff to wetlands should be promoted.
- Reduce phosphorus loading to reduce excessive algae growth in Lakes Eau Claire and Altoona.
- Implement key best management practices on agricultural lands in the upper portion of this watershed for phosphorus control.
- Complete land use modeling report and use the results to better direct BMP selection in all contributing watersheds.

Other Watershed Projects & Activities

RUNOFF MANAGEMENT PROJECT (2013)

PROJECT PURPOSE

Project to address inadequate manure storage sources of direct runoff to Mead Lake and both the North and South Forks of the Eau Claire River and waters of the state cited in the Notice of Intent issued by the Department.

TARGETED RUNOFF MANAGEMENT GRANT, BMP (2015)

PROJECT PURPOSE

Several projects to address nonpoint sources of pollution for compliance with the following performance standard and prohibition:

- Sheet, rill and wind erosion
- Phosphorus index
- New manure storage construction
- Process wastewater handling
- Clean water diversion
- Nutrient management
- No manure storage overflow
- No direct runoff

II. SOUTH FORK - EAU CLAIRE RIVER (LC 16)

Overview

WATERSHED OVERVIEW (LC16)	
BASIC INFO	
Watershed Size:	**229 sq mi**
Stream Miles:	**422 mi**
Lake Acres:	**308 ac**
Wetland Acres:	**23,720 ac**
Trout Waters:	**23.5 mi**
Population:	**2,524**
Pop/Sq Mile:	

The South Fork of the Eau Claire River watershed is the largest HUC-10 within the Eau Claire River Watershed and encompasses parts of three Wisconsin counties: Clark (94 percent), Eau Claire (5 percent) and Taylor (1 percent). Located in the far eastern part of the watershed, the South Fork includes Mead Lake, Rock Dam Lake, Black Creek, and Hay Creek (not to be confused with other Black and Hay Creeks in the larger HUC-8). Mead Lake is the only water body within the Eau Claire River Watershed with an improved and enforceable TMDL; this TMDL establishes a pollutant loading limit for phosphorus. The watershed is composed of primarily county forest in the southern half and the northern half is used for agriculture. There are several thousand acres of wetlands and the watershed is located in two ecological landscapes: Forest Transition and the Central Sand Plains.

Population & Land Use

Population in the watershed is estimated around 2,524 people with around 1,190 housing units. The two largest developed areas in this watershed include the towns of Withee - population 966 and Reseburg - population 776 (U.S. Census 2010).

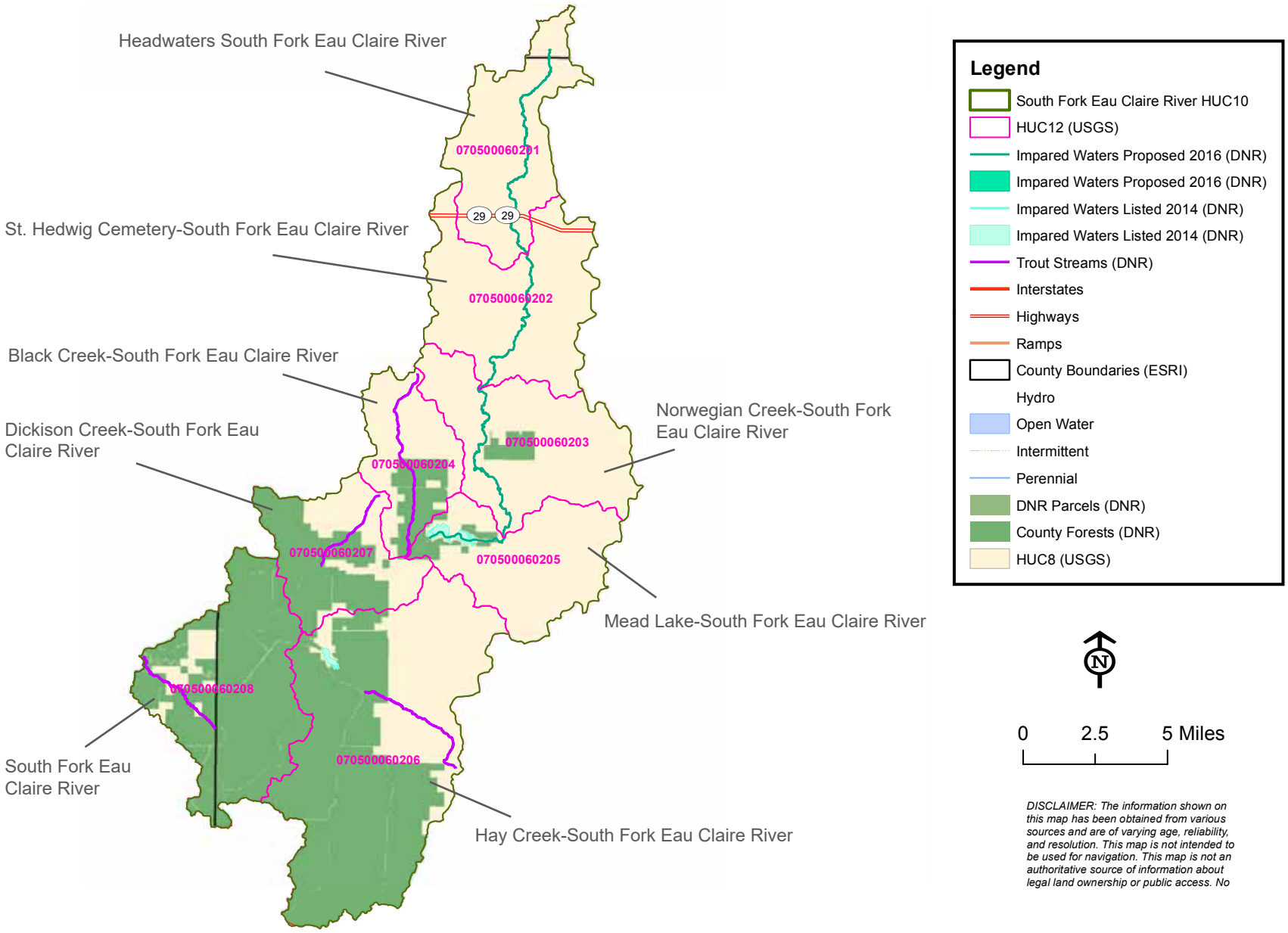
LAND USE (LC16)	
USGS 2006	
Forest	**56%**
Cropland	**29%**
Others	**9%**
Urban/Developed	**3%**
Pastureland	**2%**
Water	**>1%**

The watershed is comprised primarily of forest and cropland. The growing season in this part of the state is long enough that agriculture is viable, although climatic conditions are not as favorable as in southern Wisconsin. The historic vegetation of the Forest Transition was primarily northern hardwood forest. These northern hardwoods were dominated by sugar maple and hemlock, and contained some yellow birch, red pine and white pine.

Forested areas consist primarily of northern hardwoods and aspen, with smaller amounts of oak and lowland hardwoods. The eastern portion of the Ecological Landscape differs from the rest of the area in that it remains primarily forested, and includes some ecologically significant areas. Throughout the Ecological Landscape, small areas of conifer swamp are found near the headwaters of streams, and associated with lakes in kettle depressions on moraines.

The historic vegetation of the area included extensive wetlands of many types, including open bogs, shrub swamps, and sedge meadows. Prairies, oak forests, savannas and barrens also occurred in the area. Most of the historic wetlands were drained early in the 1900s and are now used for vegetable cropping. The forested portion is mostly oak-dominated forest, followed by aspen and pines. A minor portion is maple-basswood forest and lowland hardwoods.

APPENDIX C.
CHARACTERISTICS OF THE FIVE HUC-10 SUBWATERSHEDS (LC 16)



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Water Quality

OUTSTANDING, EXCEPTIONAL, AND ASNRI WATERS

The South Fork—Eau Claire River Watershed has no designated Outstanding or Exceptional Resource Waters. As shown on the inset map, this watershed does include 9.6 miles of Class II, and 13.9 miles of Class III trout streams. Many of the larger rivers and streams, or parts thereof, are also designated as ANRSI waters due to the existence of endangered, threatened or other animal or plant species of concern.

Nearly all tributaries in the South Fork Eau Claire River Watershed are meeting their potential use as a warm water fishery. There are two impoundments, Mead Lake and Rock Dam Lake that support a warm water sport fishery and other recreational activities.

IMPAIRED WATERS

South Fork/EC River - 29.12 miles (Impaired)
South Fork Eau Claire River is considered a Cool-Cold Headwater, Cool-Cold Mainstem, Cool-Warm Mainstem and is currently impaired and proposed for 303d listing due to one or more pollutants and associated water quality impacts.

The South Fork Eau Claire River from headwaters to Mead Lake miles downstream was assessed during the 2016 listing cycle and total phosphorus sample data overwhelmingly exceed 2016 WisCALM listing criteria for the Fish and Aquatic Life use. Biological impairment was observed (i.e. at least one macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the poor condition category) for the segment that extends from just south of Cth 29 up to the headwaters.

Mead Lake - 310.27 acres (Impaired)
Mead Lake is a eutrophic soft-water impoundment of the South Fork of the Eau Claire River with a surface area of 320 acres and a maximum depth of 16 feet. Mead Lake was placed on Wisconsin's 1998 list of impaired waters due to impairments caused by excessive sediment and phosphorus.

Mead Lake has good populations of walleye, bass, musky, and panfish. The shoreline of Mead Lake is highly developed with seasonal cabins and homes. The Clark County Forestry and Parks Department owns and operates the dam that creates the impoundment. They also own and operate a 71 site campground, swimming beach, and a day-use picnic playground area.

TMDLs have been established for phosphorus and sediment, which address three impairments in Mead Lake: degraded habitat, excess algal growth, and pH exceedances. The recommended seasonal (growing season) reduction written into the TMDL for Mead Lake, and based on the monitoring and modeling work, is a 30% reduction of sediment and a 30% reduction of phosphorus inputs to Mead Lake. Such reductions should decrease the frequency and intensity of algal blooms and improve the water quality of Mead Lake.

Rock Dam Lake - 125 acres (Impaired)
Rock Dam Lake is an impoundment of Hay Creek in Clark County. Flooding in 1993 damaged the dam and drained most of the lake. While the lake was drained, some landowners dredged small areas around their docks. After Clark County repaired the dam, bass and northern pike were stocked by WDNR fisheries staff. Due to the scarcity of lakes in thls region, this impoundment is an important recreational resource to the area.

Rock Dam Lake became 303d listed in 1998 for impairments due to one or more pollutants that include mercury. It has a surface area of 125 acres and a maximum depth of 10 feet. It is classified as being eutrophic and is It has a limited warm water sport fishery, with bass and panfish the primary species. The watershed is primarily forested with numerous wetlands. The shoreline on the lake is highly developed. The Clark County Forestry and Parks Department operates a 150 site campground, swimming beach, and picnic areas on the lake.

Rock Dam Lake was assessed during the 2014 and 2016 listing cycles and total phosphorus sample data exceeded WisCALM listing thresholds for recreation. However, total phosphorus and chlorophyll data met thresholds for both Fish and Aquatic Life use.

South Fork/Eau Claire River - 19 miles (Proposed)
The South Fork of the Eau Claire River is proposed for listing due to total phosphorus pollutants which includes water quality use restrictions and a medium TMDL priority. Surface water quality in the South Fork Eau Claire River Watershed that drains to Mead Lake is impacted by cropland erosion, pastured streambanks, and low stream flow levels.

Transect survey data from 2011 estimates that the South Fork Eau Claire River Watershed has an annual average soil loss of 2.8 tons per acre per year. There is one industrial point source discharge and one concentrated animal feeding operation in the Mead Lake Watershed.

Watershed Plans & Studies

MEAD LAKE MANAGEMENT PLAN (2010)

PLAN PURPOSE
This plan was created under a lake implementation grant by the Mead Lake and Watershed Partnership to implement and achieve the TMDL water quality goals established in 2008.

PLAN RECOMMENDATIONS
The recommendation of this plan are summarized in the Mead Lake and Watershed Partnership description later in subsection VI.

FINAL REPORT: MEAD LAKE TMDL IMPLEMENTATION LAKE PLANNING GRANT (2009-2010)

PROJECT PURPOSE
This report summarizes the activities completed under a lake implementation grant in 2009 and 2010 to help meet water quality goals established in the TMDL for Mead Lake. The project established a decision-making process for local citizen advocacy groups that led to the formation of the Mead Lake and Watershed Partnership (further described later in this section). Four primary activities were completed under the project:

- Sociological Surveys of 297 lake users, 116 lake property owners, and 171 watershed farmers.
- Literature Review that compiled existing data about Mead Lake and its watershed.
- Development of the Mead Lake Management Plan described previously.
- Four Educational Kiosks were erected at boat landings and picnic areas around the lake.

Other Watershed Projects & Activities

PHOSPHORUS AND SEDIMENT TOTAL MAXIMUM DAILY LOAD (TMDL) FOR MEAD LAKE, CLARK COUNTY, WISCONSIN (2008)

STUDY PURPOSE

The goal of this TMDL is to reduce external loadings of phosphorus and sediment by 30 percent to Mead Lake to address pH criteria exceedances, decrease algal blooms in summer, and address degraded habitat so Mead Lake can be improved for recreational purposes.

More specifically, the TMDL established a summer epilimnetic mean phosphorus goal of 93 ppb. This site-specific target represents an approximate 24% decrease in mean growing season P and a 34% decrease in mean chlorophyll levels. The phosphorus goal also corresponds to a 29 percent reduction in the amount of time the lake experiences summer algal bloom conditions in excess of 30 µg/L chlorophyll. A seasonal sediment reduction goal of 30% was also set for the TMDL.

However, the TMDL phosphorus goal for Mead Lake was set prior to the existence of statewide phosphorus standards for Wisconsin. The 2010 phosphorus rule set a total phosphorus goal of 40 ug/L for lakes like Mead. The TMDL may need to be updated to address this goal.

The establishment of the TMDL also required development of an implementation plan (see below) and water quality monitoring. While there are currently no point sources discharging in the Mead Lake watershed, the TMDL does influence any future point-source or non-point source permitting.

MEAD LAKE WATERSHED TMDL IMPLEMENTATION - PHASE I: LAKES 319 INCREMENTAL PROJECTS (2011)

PROJECT PURPOSE

This grant-funded project began Phase I implementation of the Mead Lake Total Maximum Daily Load and is largely facilitated through the Clark County Land Conservation Department. Implementation actions included:

- Preliminary Watershed Inventory
- Field Assessment of Potential Sites
- Prioritization of Sites for Conservation Implementation
- Public Involvement
- Design and Permitting
- Construction and Inspection
- Maintenance and Monitoring

A 2002-2003 study of the South Fork-Eau Claire River found, that on average, 83% of phosphorus loading to Mead Lake came from direct drainage from the lake's tributaries upstream.

AQUATIC INVASIVES GRANT (2011)

PROJECT PURPOSE

The Friends of Beaver Creek Reserve (BCR), in conjunction with BCR's Citizen Science Center (CSC), proposes to continue coordination of Clean Boats, Clean Waters (CBCW) outreach and monitoring at boat landings on 18 lakes and the St. Croix River in Chippewa, Clark, Dunn, Eau Claire and St. Croix Counties. Key project elements to include: 1) Funding for Regional AIS

Coordinator, CSC Director, and four Watercraft inspector positions; 2) Travel and registration costs associated with staff training and CBCW activities; 3) Outreach to lake associations and garden centers; 4) Other outreach events and signage; 5) Water access inventory, and 6) Rearing Purple Loosestrife Beetles.

RUNOFF MANAGEMENT PROJECT (2013)

PROJECT PURPOSE

Provide 70% cost-sharing to assist in addressing inadequate manure storage sources of direct runoff to Mead Lake, the South Fork of the Eau Claire River, and waters of the state cited in the Notice of Intent issued by the Department of Natural Resources.

Lake Districts & Associations

ROCK DAM LAKE ASSOCIATION
(see following summary)

MEAD LAKE DISTRICT
(see following summary)

MEAD LAKE AND WATERSHED PARTNERSHIP
(see following summary)

SUMMARY OF ROCK DAM LAKE ASSOCIATION

CONTACT INFO

N8486 Hay Creek Rd.
Willard, WI 54493

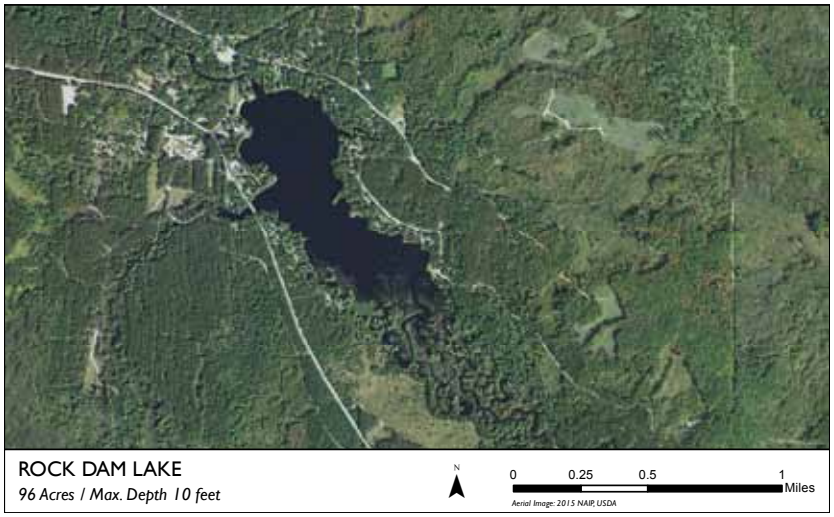
BOARD MEMBERS

Tom Scrivner
President

James Tiry
SHLM

Bruce Williams
Other Contact

The Rock Dam Lake Association was founded in 1993 and is responsible for assisting with the planning and management of Rock Dam Lake in the Town of Foster in western Clark County, Wisconsin. The Rock Dam Lake Association monitors the clarity of their lake using a secchi disk and volunteers have been monitoring the lake since 1995.



SUMMARY OF MEAD LAKE DISTRICT

The Mead Lake District was founded in 2000 and is responsible for assisting with the planning and management of Mead Lake in Clark County, Wisconsin. The Mead Lake District monitors the clarity of their lake using a secchi disk and volunteers have been monitoring the lake since 1996.

Recent Projects & Lake Management Activities Include:

- Grants - Lake Planning Grant
- Grants - Lake Protection Grant
- Monitoring - Water Clarity
- Newsletters
- Ordinances - Septic Ordinance
- Plans - Lake Management Plan
- Shoreland Restoration/Protection
- Watercraft Inspection

CONTACT INFO

PO Box 117
Greenwood, WI 54437

BOARD MEMBERS

Dennis Humke
Chairperson

Timothy Pedretti
Treasurer

Brad Lovelace
Secretary

To address water quality, the District and its members have been active participants and supporters of the Mead Lake and Watershed Partnership described on the following page. This includes development and implementation of the Mead Lake Management Plan.

SUMMARY OF MEAD LAKE AND WATERSHED PARTNERSHIP

The Mead Lake & Watershed Partnership's mission is to create and implement strategies to raise awareness of the interdependent link between people, land and water, and to protect and restore Mead Lake and its watershed in order to preserve the ecological, recreational and aesthetic value of these resources for future generations. The Mead Lake and Watershed Partnership formed in 2008 after more than seventy residents of the Mead Lake watershed met in Greenwood to discuss their concerns, and how to protect the lake.

In 2010 the Partnership completed the Mead Lake Management Plan, which included the following goals and recommendations:

Goal 1: Improve water quality and decrease the frequency and intensity of algae blooms, by decreasing sediment and phosphorus inputs to the lake.

- Develop a comprehensive watershed restoration and protection strategy (i.e., 9-key element plan).
- Apply for lake protection grants to target sources of phosphorus and sediment loading.
- Groundwater testing.
- Education on the sources of P and sediment, and management techniques.

Goal 2: Increase natural vegetation to produce biologically productive shore land that minimizes erosion and enhances natural aesthetics.

- Survey current lakeshore riparian conditions
- Installation of Vegetated Shoreland Buffers

Goal 3: Maintain healthy fishery with desirable species, and a diverse native aquatic plant community.

- Create a new lake bathymetric and physical habitat map.
- Promote and develop a more self-sustaining fishery.
- Education on the state of the fishery and how to maintain its health

The plan included additional goals and recommendations regarding the prevention of invasive and exotic species and the provision of safe, diverse recreational opportunities for all. The Partnership has not met regularly since 2013.

CONTACT INFO

Clark County Land Conservation Department
Neillsville, WI

PARTNERSHIP MEMBERS

Tom Scrivner
President

James Tiry
SHLM

Bruce Williams
Other Contact

III. BLACK & HAY CREEKS (LC 15)

Overview

WATERSHED OVERVIEW (LC15)	
BASIC INFO	
Watershed Size:	160 sq mi
Stream Miles:	289 mi
Lake Acres:	1,005 ac
Wetland Acres:	19,248 ac
Trout Waters:	47.8 mi
Population:	3,030
Pop/Sq Mile:	18.9

The Black and Hay Creeks watershed lies within four Wisconsin counties: Eau Claire (62 percent), Chippewa (22 percent), Clark (8.5 percent) and Jackson (7.5 percent). This HUC-10 is unique given that Black Creek flows toward the Eau Claire River from the south and Hay Creek flows to the River from the north. In addition, Lake Eau Claire, Coon Fork Lake, Fairchild Pond, and many smaller streams are located within this watershed. The watershed is dominated by forests and agriculture and is ranked medium for nonpoint source issues affecting groundwater. There are several thousand acres of wetlands and the watershed is located in two ecological landscapes: Forest Transition and the Central Sand Plains.

Population & Land Use

Population in the watershed is estimated around 3,030 people with around 1,649 housing units. The villages of Boyd (population 552) and Fairchild (population 550) are the only two incorporated communities in the watershed.

The watershed is comprised primarily of forest and cropland. The growing season in this part of the state is long enough that agriculture is viable, although climatic conditions are not as favorable as in southern Wisconsin.

LAND USE (LC15)	
USGS 2006	
Forest	58%
Cropland	24%
Others	11%
Urban/Developed	4%
Pastureland	1%
Water	1%

The historic vegetation of the Forest Transition was primarily northern hardwood forest. These northern hardwoods were dominated by sugar maple and hemlock, and contained some yellow birch, red pine and white pine. Forested areas consist primarily of northern hardwoods and aspen, with smaller amounts of oak and lowland hardwoods. The eastern portion of the Ecological Landscape differs from the rest of the area in that it remains primarily forested, and includes some ecologically significant areas. Throughout the Ecological Landscape, small areas of conifer swamp are found near the headwaters of streams, and associated with lakes in kettle depressions on moraines.

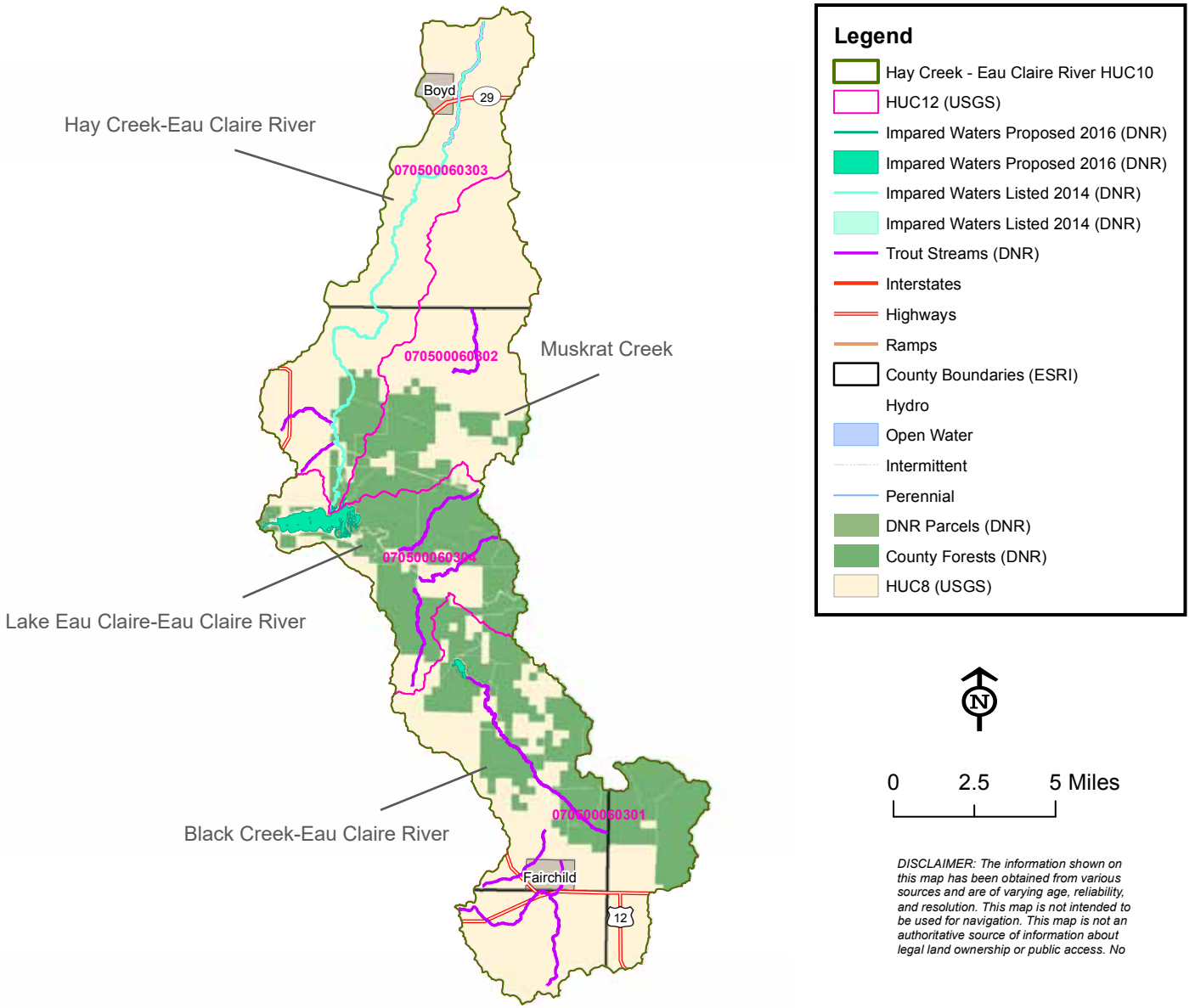
Most of the historic wetlands were drained early in the 1900s and are now used for vegetable cropping. The forested portion is mostly oak-dominated forest, followed by aspen and pines. A minor portion is maple-basswood forest and lowland hardwoods.

Water Quality

OUTSTANDING, EXCEPTIONAL, AND ANRSI WATERS

A 2.55-mile segment of Darrow Creek about 2.5 miles north of Lake Eau Claire is the only Exceptional Resource Water within

APPENDIX C.
CHARACTERISTICS OF THE FIVE HUC-10 SUBWATERSHEDS (LC 15)



the Black and Hay Creek Watershed. The watershed has no Outstanding Resource Waters. As shown on the inset map, this watershed does include 8 miles of Class I, 29 miles of Class II, and 10.5 miles of Class III trout streams. Many of the larger lakes, rivers, and streams (or parts thereof), including the Eau Claire River and Lake Eau Claire and to the south, are also designated as ASNRI waters due to the existence of endangered, threatened or other animal or plant species of concern. Lake Eau Claire is also a designated Priority Navigable Water for musky and walleye.

IMPAIRED WATERS

Hay Creek - 8.34 miles (Impaired)
Hay Creek became 303d listed in 2014. This water was assessed during the 2014 listing cycle and total phosphorus sample data exceed 2014 WisCALM listing criteria for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category). Hay Creek begins north of the city of Boyd and flows 27 miles south before entering Lake Eau Claire. Hay Creek flows through some intense agricultural areas and wetlands that are heavily pastured or surrounded by agriculture. The lower five miles are surrounded by county forest where riffles are common and banks are stabilized. Further upstream, Hay Creek is more sluggish while flowing through wetland and agricultural areas.

Lake Eau Claire - 25 acres (Impaired)
Lake Eau Claire, in the Black and Hay Creeks and Lower Eau Claire River Watersheds, is a 1,359 acre lake in Eau Claire County. It is the largest single body of water in the county with an entire lake shore of 24.25 miles. This lake is managed for fishing and swimming and is currently impaired and proposed for 303d listing due to one or more pollutants and associated water quality impacts. This water was assessed during the 2016 listing cycle and total phosphorus sample data exceeded 2016 WisCALM listing thresholds for recreation use. Chlorophyll data also exceeded recreation thresholds.

Phosphorus loading has resulted in toxic algal blooms and eutrophication. As a result, much of the internal volume of the lake is a lifeless dead zone because of rapid anoxic (lack of oxygen) conditions from May to October in most years. In addition, sedimentation and erosion has decreased the lake's navigable surface area by as much as 20% over the last 75 years and this is continuing.

Coon Fork Flowage - 75 acres (Impaired)
Coon Fork Lake is managed for fishing and swimming and is impaired and proposed for 303d listing due to one or more pollutants and associated water quality impacts. This water was assessed during the 2016 listing cycle and total phosphorus sample data exceeded 2016 WisCALM listing thresholds for recreation use and Fish and Aquatic life use. Chlorophyll data also exceeded recreation thresholds.

Watershed Plans & Studies

PREDICTING SEDIMENT & PHOSPHORUS LOADS TO THE COON FORK FLOWAGE USING SWAT (2002)

PLAN PURPOSE
The SWAT (Soil and Water Assessment Tool) was used to predict flow, sediment, and phosphorus loads for the Coon Fork Flowage in West Central Wisconsin.

PLAN RECOMMENDATIONS

- Management efforts are focused on subbasins 3 and 5.
- Management efforts emphasize reduced dietary phosphorus and nutrient management planning.
- An adaptive management strategy is implemented that includes post implementation monitoring and evaluation followed by additional management actions as needed.

COON FORK LAKE MANAGEMENT PLAN (2004)

PLAN PURPOSE

This plan identifies water quality concerns for Coon Fork Lake along with strategies and recommendations for future lake management.

PLAN RECOMMENDATIONS

- Management strategies that protect the vegetated shoreland, maintain public ownership of the shoreland, and improve fish and wildlife habitat will add to the quality of this public park.
- The in-lake water quality goal is 55 (ug/L) of Total Phosphorus and 13 (ug/L) of Chlorophyll_a. To achieve this goal we need to reduce nutrient loading in the watershed by 30%.
- Recommendation is to follow current tillage practices in the watershed and continue the practice of hauling manure daily but reduce the phosphorus level fed to cattle.
- In addition, livestock operators will implement Nutrient Management Plans based upon the phosphorus index. These practices, along with following the NR 151 Standards and maintaining Best Management Practices will help reach this goal of reducing the nutrient loading.
- Water quality goals will be assessed through in-lake water quality monitoring and watershed nutrient loading monitoring.

PHOSPHORUS LOADING MODEL FOR LAKE EAU CLAIRE AND LAKE ALTOONA (2009)

PLAN PURPOSE

This Soil and Water Assessment Tool (SWAT)Model was used to estimated average phosphorus loading to Lake Eau Claire and Lake Altoona. Results estimate average phosphorus of approximately 40,000 kilograms (88,000 pounds) with 15,000 kilograms (33,000 pounds) during the summer (May-Sept) months to Lake Eau Claire. Lake Altoona has an annual phosphorus loading of 62,000 kilograms (136,000 pounds) with a summer loading of 24,000 kilograms (53,000 pounds).

PLAN RECOMMENDATIONS

- SWAT simulations show that implementing strategies to reduce phosphorus availability (e.g., soil test phosphorus), runoff generation (e.g., reduced tillage) and reduced soil erosion (e.g., contour and strip cropping) could provide phosphorus export reductions up to 20 to 30 percent from the watershed.

LAKE EAU CLAIRE PLANNING SURVEY REPORT (2010)

PLAN PURPOSE

The Lake Eau Claire Association contracted with the Beaver Creek Reserve Citizen Science Center to develop and conduct a sociological survey of lake residents as part of the development of the Lake Eau Claire Aquatic Plant Management Plan.

LAKE EAU CLAIRE MANAGEMENT PLAN (2012)

PLAN PURPOSE

The Lake Eau Claire Management Plan, prepared by the Lake Eau Claire Protection and Rehabilitation District, was designed to address and stabilize or correct problems that developed since the Lake was created in 1937. These identified problems range from the lake filling in (becoming smaller) due to sedimentation, to a large increasing potential eutrophication threat due to internal nutrient loading. The Plan included general goals and policy guidance, as well as the analysis and recommendation of specific, technical mitigation actions.

PLAN RECOMMENDATIONS

Water Quality

- Reduce level of internal load to improve the eutrophic conditions that develop during the summer months.
- Reduce internal P with the installation of a destratification system (Option 3, Section V.A.3c). Modeled estimates from the Army Corps are that this will reduce in-lake TP from 105 ug/l to 63 ug/l and that mean chlorophyll a would be reduced from 56 ug/l to 34 ug/l. This TP loading reduction reduces the frequency of exceeding 50 ug/l chla by 61% from a 45% frequency of occurrence to 18% frequency of occurrence.
- A further reduction in the TP external loading is expected as part of the Lake Eau Claire restoration plan from the spreading of the present river flow over as much as 200 additional acres (810,000 m2).
- A significant reduction in flow velocity transport and increased residence time through the restored floodplain above the lake should promote aquatic plant growth and nutrient reduction.

Fisheries & Habitat

- Addition of woody habitat throughout the lake on controlled basis (50 - 100 installations per year)

Sedimentation & Erosion

- Maintain existing sediment traps at Hay Creek, the Beach Creek, and Sandy Point Creek.
- Add two new sediment traps on Muskrat Creek and NW Creek. Brings total to five along the north shore resulting in 6,900-8,500 yd3/year reduction in sediment advancement.
- To reduce sedimentation in the eastern part of the lake, install sediment traps at Troubled Water Bridge, near the abandoned gravel pit, and at the Skid Row boat landing.
- Undertake river flow reduction and habitat restoration projects, such as removing jams, stabilizing the channel, and recover lost wetlands that have been isolated from the main channel.

The plan also included a variety of educational and community involvement objectives and recommendations including empowering local lay people to be actively involved in environmental matters such as shoreline restoration and assisting in establishing and preserving habitat.

Other Watershed Projects & Activities

There are other city, town or village plans and projects related to water quality that may be referenced here.

Lake Districts & Associations

LAKE EAU CLAIRE PROTECTION & REHABILITATION DISTRICT
(see following summary)

LAKE EAU CLAIRE ASSOCIATION, INC.
(see following summary)

APPENDIX C.
CHARACTERISTICS OF THE FIVE HUC-10 SUBWATERSHEDS (LC 15)

SUMMARY OF LAKE EAU CLAIRE PROTECTION & REHABILITATION DISTRICT

The Lake Eau Claire Protection and Rehabilitation District was recently formed and held its first annual public meeting in August 17, 2013. The purpose of the District is to work to protect the lakes ecology, enhance the natural scenic beauty, minimize invasive species, protect the fisheries, control sediment transport into the lake, and provide for safe boating, swimming, fishing, and other recreational opportunities. A publicly elected Lake District Board of Commissioners is responsible for the governance of the Lake District and carries out those activities as authorized at the annual meeting or arranged special meetings. The primary responsibilities of the Board are to define the scope and oversee the projects as defined in the Lake Management Plan and establish the annual budget to conduct the defined projects. Final decisions on these responsibilities are approved by public vote at the annual meeting in August of each year. The duties and rules governing the District's operation are defined in more detail in its bylaws.

The district works closely with the Lake Eau Claire Association to accomplish specific tasks and projects in and around the lake. See the following Association Summary Sheet for a list of recent projects and management activities by these two partner organizations.

CONTACT INFO

PO box 129
Augusta, WI 54722
www.lakeeauclaire.org

BOARD MEMBERS

Marlo Orth
Chairperson

Dean Boehne
Treasurer

Gary Gibson
Vice Chair & Commissioner

Lynn Norheim
Bridge Creek Town Representative

Mike O'Connor
Secretary

SUMMARY OF LAKE EAU CLAIRE ASSOCIATION, INC.

The Lake Eau Claire Association is a non-profit organization dedicated to protect and improve the water quality and fishery of Lake Eau Claire for the benefit of the lake residents and general public. It works in close affiliation with the Lake District to provide complementary services such as fund raising, organizing and conducting events, providing informational resources such as newsletters and public forums, and conducting activities as part of the Lake Management largely through the use of volunteer members of the community.

Recent Projects & Lake Management Activities of the District and Association Include:

- The installation and use of a new aeration system to the deep western basin of Lake Eau Claire. 15 aerators add tiny air bubbles from an aeration compressor housed near the northwest corner of the lake. Initial observations of water quality throughout the summer and fall show exciting clean, clear water results.
- Work commissioned by the Lake Eau Claire District board to provide an updated review of our Lake Management Plan continues throughout this fall with its aim of completion this winter.
- The need for technical data to be assembled in a study report for Hay Creek has been identified and shared at the 2015 Lake District Annual Meeting.
- An investigation has begun to identify and potentially use a new spoils site for dredged sediment from any or all of our three major sediment traps--Troubled Waters Bridge Trap, Gravel Pit Trap, and the Skid Row Trap or a new one east of the present location.
- A cost-sharing agreement between the lake district and Eau Claire county has provided funding for a clean-out of the sand traps at Troubled Waters and the Gravel Pit scheduled for this January or when conditions allow.
- The Lake Eau Claire Association was awarded a WDNR Lake Protection Grant in 2012 for the implementation of the following major project elements recommended in the Lake Eau Claire Management Plan: (a) establishment of sediment traps, (b) installation of aerator, (c) re-establishment of habitat including course woody debris, and (d) water quality sampling. These activities have now been concluded and a final report was prepared by the Association for the WDNR.
- The Lake Eau Claire district and association continue to work as close partners in restoring and improving our lake as well as creating social opportunities and fundraising through events like our Holiday Party,Triathlon and Annual Golf Tournament.

CONTACT INFO

PO box 229
Augusta, WI 54722
www.lakeeauclaire.org

BOARD MEMBERS

Fred Poss
President

Vicki Reed
Vice President

Lori Bechtel
Secretary

Dean Boehne
Treasurer

Other Board Members:
Phil Kalscheur
Ed Wilson
Ed Henry
Dale Zank
Pam Hanson
Duane Ives
Al Hendricks

IV. LOWER EAU CLAIRE RIVER (LC 14)

Overview

WATERSHED OVERVIEW (LC14)	
BASIC INFO	
Watershed Size:	**216 sq mi**
Stream Miles:	**414 mi**
Lake Acres:	**937 ac**
Wetland Acres:	**10,770 ac**
Trout Waters:	**108.5 mi**
Population:	**13,805**
Pop/Sq Mile:	**63.9**

The Lower Eau Claire River watershed lies within three Wisconsin counties: Eau Claire (96.5 percent), Chippewa (3 percent) and Jackson (.5 percent) and includes Lake Altoona, as well as a number of longer cool/cold water streams. It is a large HUC-10 extending from near Fairchild to the confluence of the Eau Claire River with the Chippewa River in downtown Eau Claire. The watershed is dominated by forests and agriculture and is ranked high for nonpoint source issues affecting groundwater. There are several thousand acres of wetlands and the watershed is located primarily in the Western Coulee and Ridges Ecological Landscape in southwestern and west central Wisconsin which is characterized by its highly eroded, driftless topography and relatively extensive forested landscape.

Population & Land Use

Population in the watershed is estimated around 13,805 people with around 5,706 housing units. The watershed includes the cities of Augusta and Fall Creek, as well as portions of the cities of Altoona and Eau Claire.

LAND USE (LC14)	
USGS 2006	
Forest	**37%**
Cropland	**33%**
Pastureland	**13%**
Others	**8%**
Urban/Developed	**7%**
Water	**1%**

The watershed is comprised primarily of forest and cropland. With Euro-American settlement, most of the land on ridgetops and valley bottoms was cleared of oak savanna, prairie, and level forest for agriculture. The steep slopes between valley bottom and ridgetop, unsuitable for raising crops, grew into oak-dominated forests after the ubiquitous presettlement wildfires were suppressed. Current vegetation is a mix of forest, agriculture and grassland with some wetlands in the river valleys.

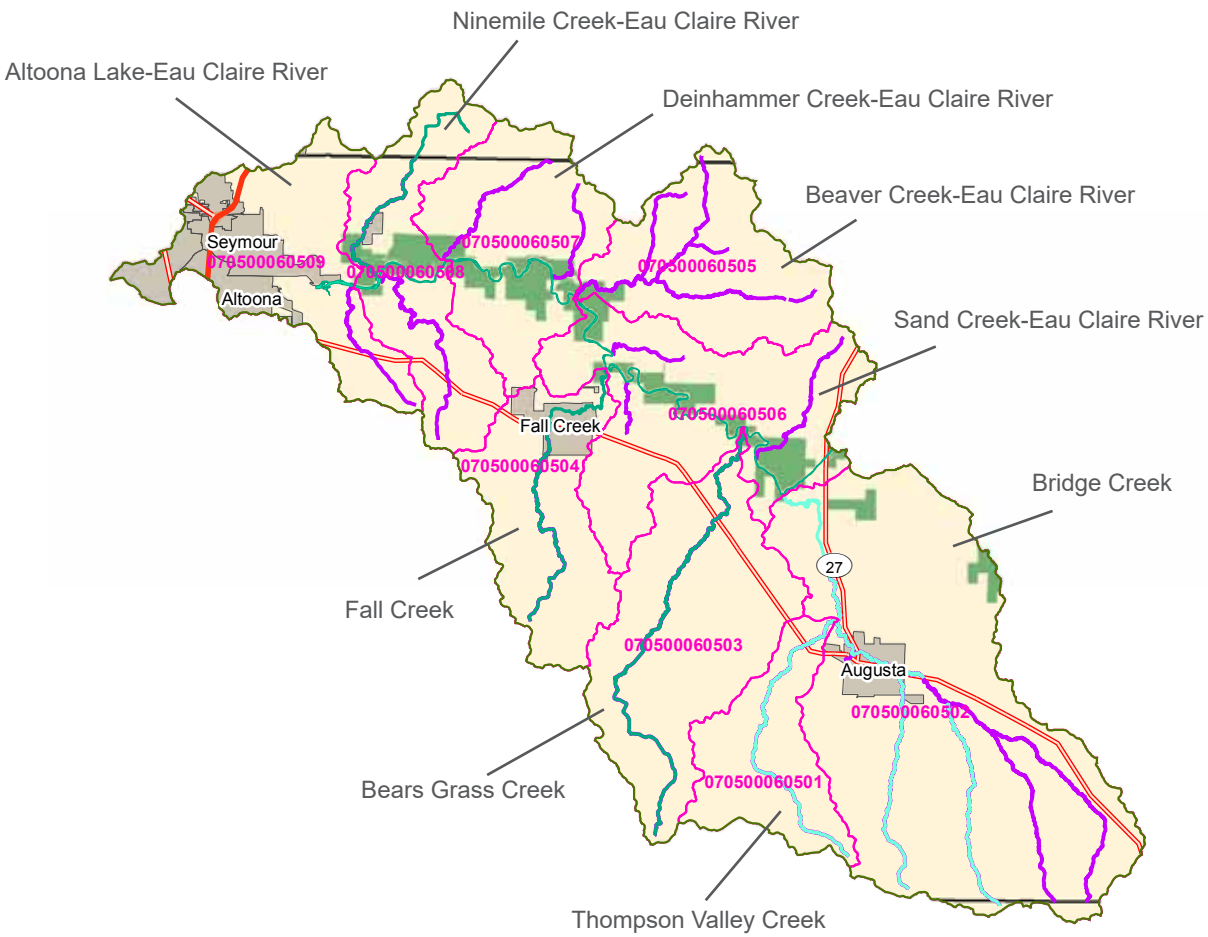
The primary forest cover is oak-hickory (51%) dominated by oak species and shagbark hickory. Maple-basswood forests (28%), dominated by sugar maple, basswood and red maple, are common in areas that were not subjected to repeated presettlement wildfires. Bottomland hardwoods (10%) are common in the valley bottoms of major rivers and are dominated by silver maple, ashes, elms, cottonwood, and red maple. Relict conifer forests including white pine, hemlock and yellow birch are a rarer natural community in the cooler, steep, north slope microclimates.

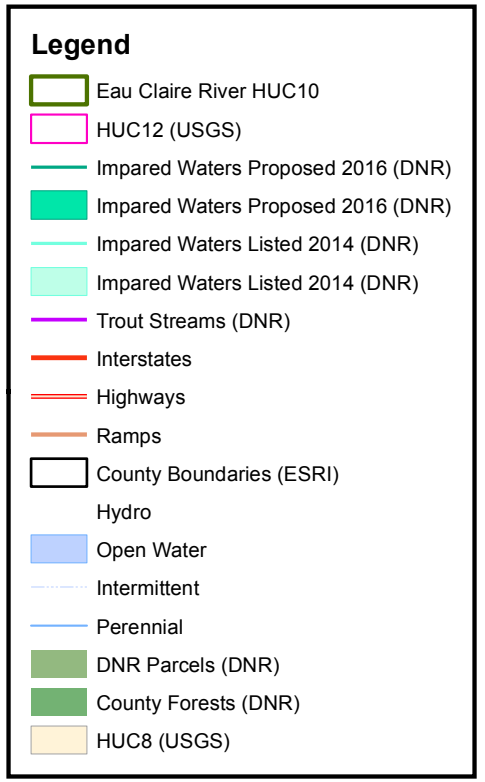
Water Quality

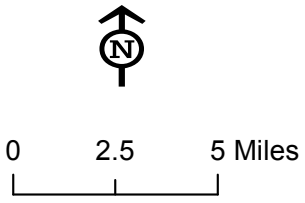
OUTSTANDING, EXCEPTIONAL, AND ANRSI WATERS

The Lower Eau Claire River Watershed includes a number of Exceptional Resource Waters:

APPENDIX C.
CHARACTERISTICS OF THE FIVE HUC-10 SUBWATERSHEDS (LC 14)







DISCLAIMER: The information shown on this map has been obtained from various sources and are of varying age, reliability, and resolution. This map is not intended to be used for navigation. This map is not an authoritative source of information about legal land ownership or public access. No

- 7.07 miles of Hay Creek located south of Augusta
- 8.24 miles of Beaver Creek north and east of the Eau Claire River
- A 3.03 mile unnamed tributary to Beaver Creek
- A 1.1 mile unnamed stream north of Beaver Creek
- A 4.72 mile segment of Sevenmile Creek just east of Lake Altoona

This watershed has no designated Outstanding Resource Waters. As shown on the inset map, this watershed includes 32.1 miles of Class I, 74.5 miles of Class II, and 14.2 miles of Class III trout streams. Many of the larger rivers and streams (or parts thereof) including the Eau Claire River and Lake Altoona, are also designated as ANRSI waters due to the existence of endangered, threatened or other animal or plant species of concern. Lake Altoona is also a designated Priority Navigable Water for musky and walleye.

Several Wisconsin special concern species of dragonfly have been documented in the Lower Eau Claire River watershed. These insects require clean, fast-moving streams, since the first phase of their life begins in water. The existence of these dragonflies indicates good water quality and deterioration of water quality would harm these populations.

IMPAIRED WATERS

Bridge Creek - 9.12 miles (Impaired)
Bridge Creek is considered a Cool-Cold Mainstem, Cool-Warm Mainstem under the state's Natural Community Determinations. This river is impaired and became 303d listed in 2014 due to one or more pollutants and associated water quality impacts. Ammonia concentrations entering the upper portion of the creek from the Augusta wastewater treatment plant has the potential to hurt the fishery under low flow conditions and WDNR is currently revising its standards and policies for ammonia.
Bush Brothers operates a cannery with a cooling water discharge to a dry run tributary to Bridge Creek that is classified as a variance water. The upper section of Bridge Creek was assessed during the 2016 listing cycle and total phosphorus sample data exceed 2016 WisCALM listing criteria for the Fish and Aquatic Life use.

Thompson Valley Creek - 9.76 miles (Impaired)
Thompson Valley Creek is considered a Coldwater, Cool-Cold Headwater under the state's Natural Community Determinations. The water is impaired and became 303d listed in 2014 due to one or more pollutants associated with water quality impacts that include elevated water temperature, water quality use restrictions and degraded habitat. Thompson Valley Creek from headwaters to second crossing of HWY R was assessed during the 2016 listing cycle and temperature data exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use. From the same assessment, total phosphorus sample data overwhelmingly exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use.

Diamond Valley Creek - 7.09 miles (Impaired)
Diamond Valley Creek is considered a Cool-Cold Headwater under the state's Natural Community Determinations. The river is impaired and became 303d listed in 2014 from impairments that include water quality use restrictions and degraded habitat. This water was assessed during the 2014 listing cycle and total phosphorus sample data overwhelmingly exceed 2014 WisCALM listing thresholds for the Fish and Aquatic Life use. Diamond

Valley Creek from city limits of Augusta to headwaters was also assessed during the 2016 listing cycle and temperature data exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use.

Hay Creek - 7.07 miles (Impaired)
Hay Creek is considered a Cool-Cold Headwater, Macroinvertebrate, Cool-Warm Headwater. This river is an outstanding/exceptional resource water under NR102 as well as a Class I Trout Water under the Fisheries Program. The river is impaired and became 303d listed in 2014 due to degraded biological communities, elevated water temperatures and degraded habitat.

Hay Creek from Chippewa/Eau Claire County line to the mouth was assessed during the 2016 listing cycle and temperature data exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use. Biological impairment was also observed (i.e. at least one macroinvertebrate or fish Index of Biotic Integrity (IBI) average scored in the poor condition category).

Bears Grass Creek - 15.94 miles (Impaired)
Bears Grass Creek is a Cool-Cold Headwater tributary of the Eau Claire River. This river is impaired and proposed for 303d listing due to one or more pollutants and associated quality impacts. This water was assessed during the 2016 listing cycle and total phosphorus sample data overwhelmingly exceed 2016 WisCALM listing thresholds for the Fish and Aquatic Life use.

Several changes have occurred in Bears Grass Creek since initiation of the priority watershed project. Despite noticeable improvements to the stream corridor, elimination of several beaver dams appears to have resulted in downstream sediment redistribution, virtually eliminating cover and gravel riffle areas in some reaches. Remaining extensive sediment deposits may be a result of a variety of causes including the low stream gradient and consequent lack of scouring, and continuing sources of new sediment from cropland runoff.

Fall Creek - 10.69 miles (Impaired)
Fall Creek is considered a Coldwater, Cool-Warm Mainstem that is currently impaired and proposed for 303d listing due to one or more pollutants and associated water quality impacts. This water was assessed during the 2016 listing cycle and total phosphorus sample data overwhelmingly exceed 2016 WisCALM listing thresholds for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the “poor” condition category).

Fall Creek Pond is a 17 acre impoundment of Fall Creek located in the Village of Fall Creek. The upstream 4-mile portion of Fall Creek is managed as a Class II brown trout fishery, and the portion below the pond is managed as a warm water forage fishery. The trout fishery is maintained by annual stocking of yearling brown trout and an early priority watershed project objective was developed to increase trout reproduction and survival by reducing organic and sediment loading to the stream. According to an evaluation conducted in 1995, this objective had not yet been achieved because accumulated sediments needed to be scoured and the underlying gravel riffle areas needed to be exposed.

Little improvements have occurred on Fall Creek since the last evaluation in 1995. The brown trout fishery (above the pond) is limited due to the lack of a well-developed pool-riffle-run structure and high amounts of silt/sand sediment deposition. As was

concluded in the 1995 study, shifting sediment deposition is the limiting factor in stream degradation because streambanks are generally stable and the stream has good water quality.

Streambank protection mechanisms need to be implemented for streambed stabilization and scouring of these sediments to occur. As concluded in the 1995 survey, in-stream devices such as channel deflectors and sediment traps could be used for this purpose. Once the stream bottom is stabilized, lunker structures and other in-stream cover devices could be implemented to increase fish habitat.

Sevenmile Creek - 7.19 miles (Impaired)
Sevenmile Creek is a Coldwater, Cool-Cold Headwater that flows into the Eau Claire River just before it enters Lake Altoona. The river is currently impaired and proposed for 303d listing due to one or more pollutants and associated water quality impacts.

This water was assessed during the 2016 listing cycle and total phosphorus sample data overwhelmingly exceed 2016 WisCALM listing thresholds for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category).

Watershed Plans & Studies

HAY CREEK ASSESSMENT (2015)

PLAN PURPOSE
This plan provides a detailed assessment of the overall health and conditions of Hay Creek. It also includes a list of management recommendations for improving water quality. See Section VI for detailed findings of this plan.

PLAN RECOMMENDATIONS
- Restoration of vegetated buffer areas around the stream, full or partial exclusion of livestock, and in stream habitat restoration is needed to improve the quality of this stream.
- Stabilized stream banks and buffers would decrease the amount of sedimentation in the stream. Increased buffers and overhanging vegetation would stabilize streambanks and reduce the amount of solar inputs to the stream and decrease water temperatures.
- Sediment and nutrient loading from agricultural land use should be evaluated to determine reductions needed to reduce nutrient concentrations.
- Reductions in sediment from uplands should decrease sedimentation to Hay Creek and improve habitat conditions.
- Evaluations should also be conducted to determine sources of organic loading to the stream to improve conditions of the aquatic community.
- Surveys in 2015 are proposed to assess the overwintering and reproductive success of the feral brook trout that are being stocked in the stream.

FALL CREEK ASSESSMENT (2015)

PLAN PURPOSE
This plan provides a detailed assessment of the overall health and conditions of Fall Creek. It also includes a list of management recommendations for improving water quality. See Section VI for detailed findings of this plan.

PLAN RECOMMENDATIONS

- Fall Creek will be recommended for 303(d) listing for exceeding Wisconsin's total phosphorus standard and for not meeting its attainable use of trout water caused by degraded habitat conditions.
- Sediment and nutrient loading from agricultural land use in the watershed should be evaluated to determine reductions needed to improve in-stream habitat conditions and reduce total phosphorus concentrations.
- Reduction of sediment and phosphorus would also improve water quality conditions in Fall Creek Pond and Lake Altoona.
- Physical in-stream habitat improvement projects are needed to narrow and deepen the stream channel and scour fine sediments.
- Re-sloping the channel and stabilizing streambanks would reduce erosion and increase overhead cover.
- Surveys in 2015 are proposed to assess the overwintering and reproductive success of the feral brook trout that are being stocked in the stream.

DIAMOND VALLEY CREEK ASSESSMENT (2015)

PLAN PURPOSE

This plan provides a detailed assessment of the overall health and conditions of Diamond Valley Creek. It also includes a list of management recommendations for improving water quality. See Section VI for detailed findings of this plan.

PLAN RECOMMENDATIONS

- DVC was added to the draft 2014 impaired waters list for exceeding Wisconsin's total phosphorus standard and for not meeting its attainable use of reproducing trout water caused by degraded habitat conditions.
- Sediment and nutrient loading from agricultural land use in the watershed should be evaluated to determine reductions needed to improve in-stream habitat conditions and reduce total phosphorus concentrations.
- Reduction of sediment and phosphorus would also improve water quality conditions in Lake Altoona an impoundment on the Eau Claire River.
- Cattle pasturing is extensive throughout the riparian area of DVC. Livestock trampling of the streambank causes excessive erosion and creates unstable conditions. As a result there is more sedimentation and loss of overhead cover due to collapsing banks and lack of overhanging vegetation.
- Creating a healthy riparian area by eliminating or restricting cattle access to the stream would improve instream habitat conditions.
- In some situations trout habitat improvement measures may be needed to improve habitat conditions.
- Surveys in 2015 are proposed to assess the overwintering and reproductive success of the feral brook trout that are being stocked in the stream.
- Repairs to improve a failing dam structure upstream of CTH M will occur by winter 2015. Efforts will be made to avoid impacts to trout reproduction by limiting construction to non-spawning season.

THOMPSON VALLEY CREEK ASSESSMENT (2015)

PLAN PURPOSE

This plan provides a detailed assessment of the overall health and conditions of Thompson Valley Creek. It also includes a list of management recommendations for improving water quality. See Section VI for detailed findings of this plan.

PLAN RECOMMENDATIONS

- TVC was added to the draft 2014 303(d) impaired waters list for exceeding Wisconsin's total phosphorus standard and for not meeting its attainable use of supporting reproducing trout water caused by degraded habitat conditions.
- Sediment and nutrient loading from agricultural landuse in the watershed should be evaluated to determine reductions needed to improve in-stream habitat conditions and reduce total phosphorus concentrations.
- Reduction of sediment and phosphorus would also improve water quality conditions in Lake Altoona an impoundment on the Eau Claire River.
- Cropland practices that promote infiltration of water would reduce warm water overland discharges to the stream and should help moderate the variability in stream water temperatures.
- Degraded habitat conditions are also caused by past land use practices including historic channelization and sedimentation.
- Physical in-stream habitat improvement projects are needed to re-slope and stabilize streambanks, narrow and deepen the stream channel and increase overhead cover.
- Maintaining adequate buffers adjacent to the stream would help improve habitat.
- Surveys in 2015 are proposed to assess the overwintering and reproductive success of the feral brook trout that are being stocked in the stream.

BEARS GRASS CREEK MONITORING REPORT (2004-2005)

PLAN PURPOSE

The purpose of this report is to compare stream data in 2004 and 2005 on Bears Grass
Creek to data from the 1993 report and track changes over the last 12 years.

PLAN RECOMMENDATIONS

- In order for all objectives of the 1993 study to be met, improvements still need to be made in the upper portions of Bears Grass Creek.
- One restricting factor may be the lack of optimal habitat for natural reproduction of trout and the macroinvertebrates necessary for their survival.

LAKE ALTOONA SEDIMENTATION STUDY REPORT (2015)

PLAN SUMMARY

Prepared by GO Environmental Services, this report was prepared for the Lake Altoona Rehabilitation and Protection District to develop new conceptual strategies for sediment mitigation. The study reviewed past studies, provided historical trends in sources and sinks of sediment supply, and established an accurate estimate of the annual magnitude of sediment loading of Lake Altoona. The study also reviewed mitigation options and recommended future sediment projects and studies.

PLAN RECOMMENDATIONS

- Use of LIDAR Data to Determine Erosion Hot-Spots and Historical Trends.
- Regular Scheduling of Lake Bathymetric Maps.
- Establish River Stage Continuous Monitoring Site and Calibrate for Discharge Rate (Flow).
- Determine River Transported Sediment Type and Size Distribution.
- Establish Relationship for Stream Discharge Rate vs. Sediment Transport Rates to Predict Lake Sediment Loading.
- Coring to Characterize Lake Sediment.
- Subsurface Profiling of River Channel.
- Create Accurate Elevation Map of River Bed, Backwater, and Potential Aggregation Sites.
- Identify Best Locations for Upstream Sediment Traps and Catchment Basins.
- Identify and Design Re-connectivity and Improved Habitat Projects.

LAKE ALTOONA MANAGEMENT PLAN (2016)

PLAN SUMMARY

This plan was prepared by the Lake Altoona Rehabilitation & Protection District with the assistance of Beaver Creek Reserve and incorporated the recommendations of the 2015 Sedimentation Study Report.

PLAN RECOMMENDATIONS

The plan identifies management goals and implementation plans for three primary “pillars of focus”:

1. Sediment management
    - Mitigation activities, including continued dredging, installation of sediment traps upstream, stream flow reduction strategies, and expanded floodplain areas.
    - Implement those recommendations in the 2015 Sedimentation Study Report.

2. Maintain healthy fisheries and increase aquatic and shoreline habitats
    - Increase coarse woody habitat, stabilize in-lake sediment and aquatic plant communities, and monitor/prevent invasive species.

3. Improve water quality
    - Reduce nutrient runoff through implementation of the watershed 9-key element plan.
    - Educate and generate awareness to: increase area of healthy shoreline buffers, reduce fertilize use, and stabilize gullies and washout ditches.

Other Watershed Projects & Activities

THOMPSON VALLEY CREEK CITIZEN-BASED STREAM MONITORING PROJECT (2011)

PROJECT PURPOSE

Collect chemical, physical, and/or biological water quality data to assess the current overall stream health. The data can inform management decisions and may be used to identify impaired waters for biennial lists.

FRIENDS OF BEAVER CREEK RESERVE, INC. EAU CLAIRE MUSSEL, MONITOR (2011)

PROJECT PURPOSE

The Friends of Beaver Creek Reserve proposes to partner with resource professionals and train citizen volunteers to survey streams throughout Eau Claire County for the presence of mussel species. Major project elements to include: 1) Citizen recruitment and training, 2) Mussel surveys, 3) Water access identification, 4) GPS mapping, 5) Water quality sampling, 6) Data analysis and reporting.

Lake Districts & Associations

LAKE ALTOONA REHABILITATION & PROTECTION DISTRICT

(see following summary)

SUMMARY OF LAKE ALTOONA REHABILITATION AND PROTECTION DISTRICT

The Lake Altoona Rehabilitation and Protection District was founded in 1975 and is responsible for assisting with the planning and management of Lake Altoona in Eau Claire County, Wisconsin.

Recent Projects & Lake Management Activities Include:

- Fish Stocking
- Grants - Lake Planning Grant
- Insurance
- Monitoring - Water Clarity
- Monitoring - Water Chemistry
- Newsletters
- Plans - Lake Management Plan
- Shoreland Restoration/Protection
- Dredging

CONTACT INFO

PO Box 92
Altoona, WI 54720
www.lakealtoonaprotect.org

BOARD MEMBERS

Paul Johnson
President

Steve Toperzer
Treasurer

Doug Kranig
Town of Seymour

Bruce Willett
County Board Rep.

Greg Kotecki
Secretary

V. OTTER CREEK (LC 25)

Overview

WATERSHED OVERVIEW (LC25)	
BASIC INFO	
Watershed Size:	71 sq mi
Stream Miles:	143 mi
Lake Acres:	18 ac
Wetland Acres:	1,733 ac
Trout Waters:	26.53 mi
Population:	20,738
Pop/Sq Mile:	292.1

The Otter Creek watershed lies entirely in Eau Claire County and is transected by Interstate 94 and U.S. Highway 53 along most of its length, which has disrupted some natural drainage systems. Overall, the watershed is dominated by agriculture and forests and is ranked high for runoff impacts on streams and high for runoff impacts to groundwater. The northern part of the watershed is in the Eau Claire urban area and is largely developed, making it the most heavily populated area within the watershed. There are several thousand acres of wetlands and the watershed is located primarily in the Western Coulee and Ridges Ecological Landscape in southwestern and west central Wisconsin which is characterized by its highly eroded, driftless topography and relatively extensive forested landscape.

Population & Land Use

Population in the watershed is estimated around 20,738 people with around 9,766 housing units. The two largest developed areas in this watershed include large portions of the cities of Eau Claire - population 66,260 and Altoona - population 6,726 (U.S. Census 2010).

LAND USE (LC25)	
USGS 2006	
Cropland	42%
Forest	21%
Pastureland	18%
Urban/Developed	14%
Others	5%
Water	>1%

The watershed is comprised primarily of forest and cropland. Historical vegetation consisted of southern hardwood forests, oak savanna, scattered prairies, and floodplain forests and marshes along the major rivers. With Euro-American settlement, most of the land on ridgetops and valley bottoms was cleared of oak savanna, prairie, and level forest for agriculture. The steep slopes between valley bottom and ridgetop, unsuitable for raising crops, grew into oak-dominated forests after the ubiquitous presettlement wildfires were suppressed.

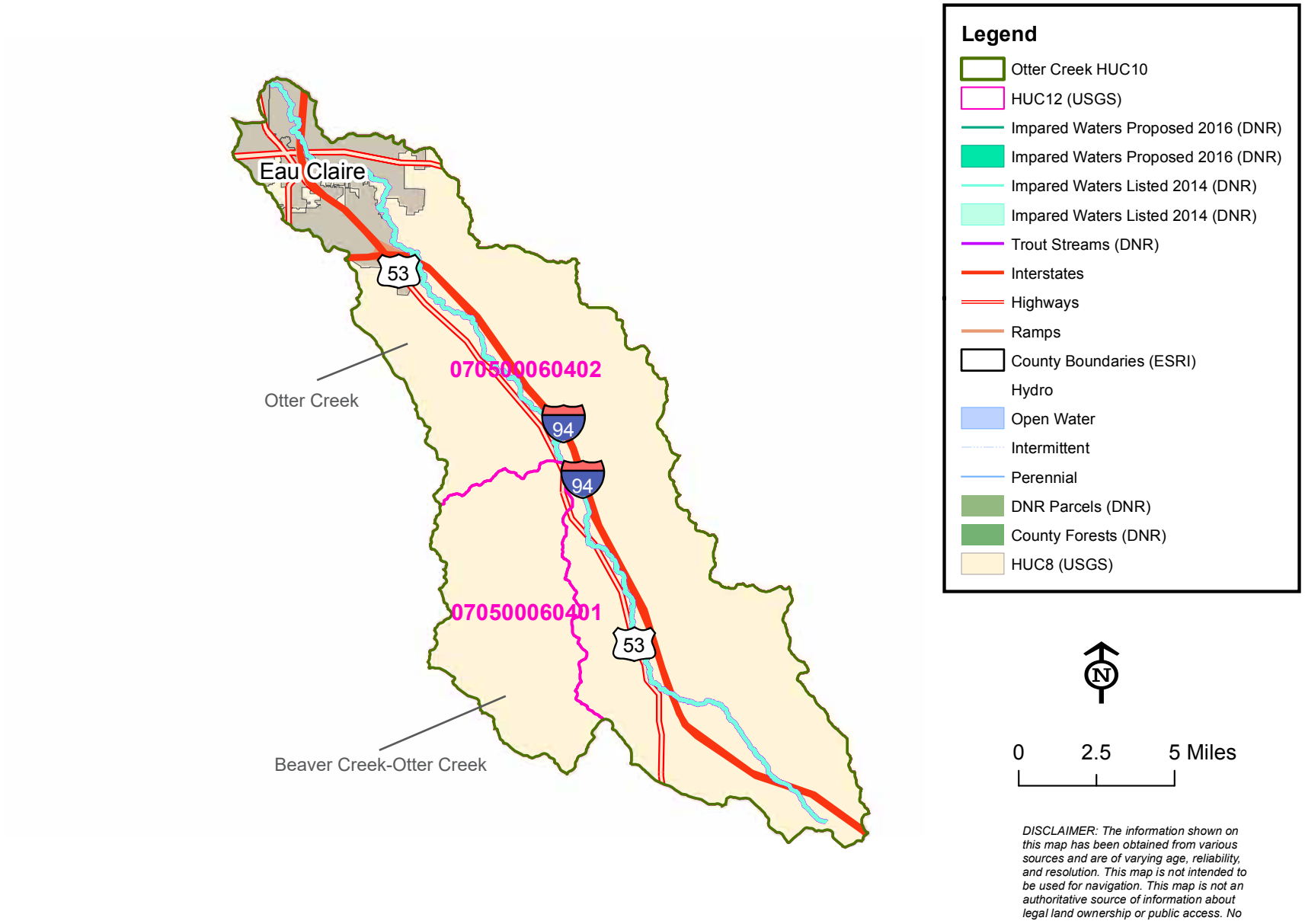
The primary forest cover is oak-hickory (51%) dominated by oak species and shagbark hickory. Maple-basswood forests (28%), dominated by sugar maple, basswood and red maple, are common in areas that were not subjected to repeated presettlement wildfires. Bottomland hardwoods (10%) are common in the valley bottoms of major rivers and are dominated by silver maple, ashes, elms, cottonwood, and red maple. Relict conifer forests including white pine, hemlock and yellow birch are a rarer natural community in the cooler, steep, north slope microclimates.

Water Quality

OUTSTANDING, EXCEPTIONAL, AND ANRSI WATERS

The Otter Creek Watershed has no designated Outstanding or Exceptional Resource Waters. As shown on the inset map,

APPENDIX C.
CHARACTERISTICS OF THE FIVE HUC-10 SUBWATERSHEDS (LC 25)



DISCLAIMER: The information shown on this map has been obtained from various sources and are of varying age, reliability, and resolution. This map is not intended to be used for navigation. This map is not an authoritative source of information about legal land ownership or public access. No

26.5 miles of Otter Creek make up the only trout water in the watershed. Otter Creek is also the only designated ANRSI water in the watershed due to the existence of endangered, threatened or other animal or plant species of concern.

The Otter Creek watershed boundary was newly created for the purpose of improved hydrologic distinction. Otter Creek was removed from the Lowes and Rock Creek watershed because it drains to the Eau Claire River, while the streams in the Lowes and Rock Creek watershed drain directly to the Chippewa River. No large lakes exist in this watershed and no permitted dischargers are located here.

IMPAIRED WATERS

Otter Creek - 26.53 miles (Impaired)
Otter Creek is a Coldwater, Cool-Cold Headwater, Cool-Cold Mainstem, Cool-Warm Mainstem that is currently impaired and 303d listed due to one or more pollutants and associated quality impacts. In 2012, Otter Creek was reclassified from a Class III to a Class II brown trout water for its entire length.

Otter Creek was placed on the impaired waters list for total phosphorus in 2012. The 2016 assessments showed continued impairment by phosphorus; total phosphorus sample data overwhelmingly exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the “poor” condition category).

Watershed Plans & Studies

There are no recent watershed plans or studies to reference for this HUC 10.

Other Watershed Projects & Activities

While there are no watershed-level plans or projects in the Otter Creek Watershed, the urban northern portion of the watershed, in particular, are impacted by plans and policies not found in many areas of the watershed, including stormwater management regulations and the Eau Claire/Chippewa Falls Urban Sewer Service Area Plan discussed previously in this report. The Eau Claire Waterways Plan contemplates additional open space acquisition along Otter Creek, but a trail is not proposed due to the many existing private lots along the Creek. The Waterways Plan also includes many excellent policies and recommended BMPs to protect water quality along Otter Creek and within this basin.

APPENDIX D: SUMMARY OF RECENT POLLUTANT LOADING ESTIMATES

APPENDIX D.
SUMMARY OF RECENT POLLUTANT LOADING ESTIMATES

A number of phosphorus and sedimentation studies have been previously prepared within the Eau Claire River Watershed. The more recent studies with potential watershed-wide implications are discussed here; this is not intended to be a comprehensive literature review. Additional subwatershed studies, stream assessments, and plans are noted in the HUC-10 summaries in Appendix C.

Coon Fork Flowage SWAT Analysis (2002), Panuska Study (1997)
Prepared by WDNR, this used the Soil and Water Assessment Tool (SWAT) model to predict flow, sediment, and phosphorus loads for the Coon Fork Flowage (Lake). Some highlights from this report include:

- Only about 17% of the watershed was considered agriculture, with most of the remainder in forest and wetlands. Two subwatersheds comprised 37% of the area, but delivered 88% of the total phosphorus loading.
- Significant reductions in phosphorus loading can be obtained through reduction of phosphorus in feed. Comparable reductions in loading can be obtained with improved nutrient management techniques and improved tillage practices. A combination of current tillage practices, scheduled manure applications with incorporation, and reduced dietary phosphorus showed the greatest reduction in total phosphorus export.
- Reductions in nutrients take place with little or no change in sediment loading at the watershed outlet.

A 1997 study performed by John Panuska using the ACOE FLUX Model for tributary flow and loading and the ACOE BATHTUB Model for reservoir trophic response found that:

- The retention time of the reservoir is 7 to 13 days, which is less than the 14 day retention time needed for a chlorophyll response to phosphorus. The reservoir is not considered phosphorus sensitive under low and normal flow conditions based upon the 1997 data.
- Coon Fork Lake is rated as eutrophic with 62 for total phosphorus, 57 for chlorophyll 'a', and 61 for Secchi disk using the Wisconsin Trophic State Index.
- If phosphorus can be reduced by 25%, the number of blooms would be cut in half. But, if phosphorus loads increased to 125%, the algae blooms would increase during the growing season by 9%, compared to current conditions.

The study also recommended additional flow monitoring to quantify the low flow rate and to continue water quality monitoring to establish a historical record

Phosphorus Loading Model for Lake Eau Claire and Lake Altoona (2009)
This report prepared by the Center for Watershed Science and Education at the University of Wisconsin-Stevens Point used the Soil & Water Assessment Tool (SWAT) model to simulate how land management, non-point nutrient runoff, and agricultural changes influence phosphorus-loading within the Eau Claire River Watershed. Available data and previous monitoring studies were used to calibrate the model, including:

- USGS, USACE, and WDNR stream discharge monitoring locations from previous studies as shown on Figure 52.
- Measured monthly sediment and phosphorus export for four subwatersheds: Coon Fork Lake (1997 WDNR Study), Mead Lake (2005 U.S. Army Corps of Engineers Assessment), Muskrat Creek (1999 USACOE Lake Eau Claire Assessment), and North Fork of Eau Claire River (1986-2003 USGS

APPENDIX D.
SUMMARY OF RECENT POLLUTANT LOADING ESTIMATES

discharge gauge station).

- Point-source discharges from wastewater treatment plants at Boyd, Stanley, Thorp, Augusta, Fairchild, and Fall Creek. At the time, the average daily phosphorus loading from all of these facilities combined was approximately 15.5 pounds per day.
- the model recognized that Lake Eau Claire has been shown to be a source of phosphorus through release from the sediments and the model did not try to mimic this release beyond a negative sedimentation during the summer months (-10m/d).

The calibrated model estimated an average phosphorus loading to Lake Eau Claire of approximately 88,000 pounds with 33,000 pounds during the summer (May-Sept) months. Lake Altoona had an annual phosphorus loading of 136,000 pounds with a summer loading of 53,000 pounds. Approximately two-thirds of this annual phosphorus load was attributed to agricultural land management. Similar to how the agricultural land is distributed, the largest phosphorus yields originated from the agriculturally dominated northern and southern parts of the watershed.

The SWAT simulated suspended sediment delivery in the Eau Claire River watershed was approximately 4,150 metric tons per year with fairly large variations month to month depending on precipitation. The simulated sediment loss was attributed almost entirely (>95%) to agricultural land, with relatively high soil loss during periods with little cover crop. The highest subwatershed sediment loading is predicted to come from those subwatersheds with a large percentage of row crop agriculture and more erosive soils.

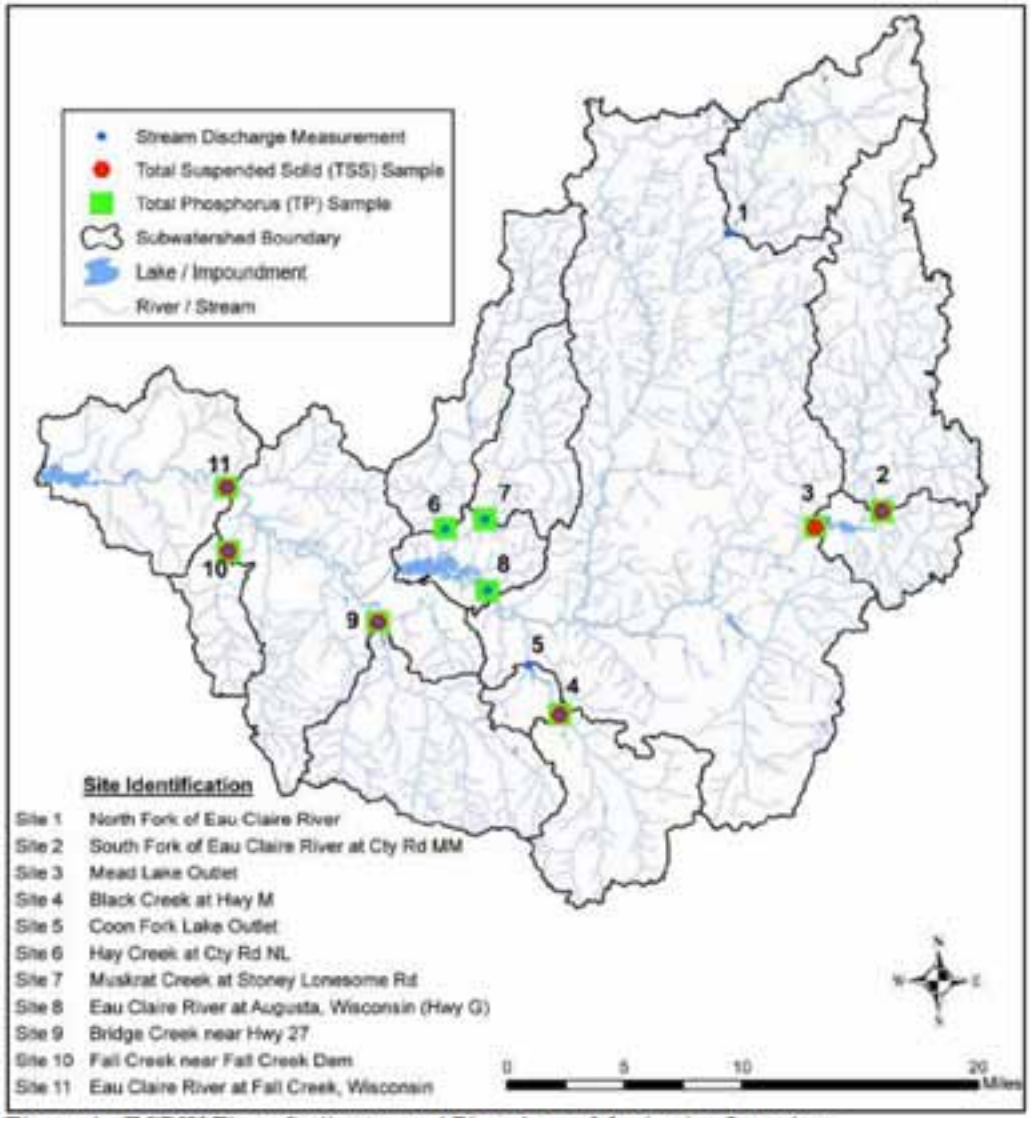


Figure 52: *ECRW Flow, Sediment, and Phosphorus Monitoring Locations*

APPENDIX D.
SUMMARY OF RECENT POLLUTANT LOADING ESTIMATES

Lake Eau Claire Management Plan (2012)
This plan references various studies and states that:

- Lake Eau Claire is seriously eutrophic for much of the warmer months of the year. Not surprisingly the prevailing conditions during these months result in high levels of planktonic biomass with nearly 90% being blue-green algae during the months from April to October in 1999.
- Roughly 50% of phosphorus within Lake Eau Claire comes from internal loading during the summer. A significant reduction of this level of internal load could improve the eutrophic conditions that develop during the summer months. Since most of this internal P arises because anoxic conditions that develop in the western basin of the lake, the efforts concentrated on lowering P levels in the western 200 acres of the lake.
- Much of what is believed to be sediment filling is the result of shoreline erosion and slumping of steep sand drop-offs along the shorelines and islands that were created in the 1950's excavation project. Today the primary threats to the lake come from the 5 small tributary streams along the north shoreline. In these cases, the problem can be dealt with by installing sand traps that are cleaned out regularly.

The plan includes recommended alternatives for addressing the above.

Lake Altoona Sedimentation Study Project Report (2015)
This report prepared by G.O. Environmental Services (GOES) includes an extensive review of previous studies (Finley 1975, Ayres 1979, WCWRPC 1988, Simons et al., 1988) characterizing the sediment transport and deposition on the Lower Eau Claire River and at Lake Altoona. This report provides the following insights:

- Past studies and reports leads one to believe that the infilling of Lake Altoona with sediment is inevitable and will largely take place in the next 50 years, unless massive and continuous dredging is undertaken. To keep the lake's sediment problem in check, these studies quantified that 111,000 cubic yards or possibly more needed to be removed annually. The Finley report also concluded from sediment size distribution and an evaluation of upstream sediment sources that 21,000 yd3 of the 111,000 yd3 was deposited in the east end of the lake in the delta region and the remaining 90,000 yd3 was deposited in the rest of the lake.
- There are significant differences in total annual bank erosion estimates--namely 56,027 yd3 for Finley, 122,000 yd3 for Ayres, and 20,743 yd3 for GOES. The Finley and Ayres differences are perplexing since they are from the same time period of 1938 to 1975. The GOES erosion values for 1999-2013 included more new erosion sites, but the amount of erosion for common sites in all there sites was substantially less.
- The landscape has changed dramatically in the last 160 years, which has significant impacts on riverine sediment transport. In the case of the lower Eau Claire River, most of the wash load sediment (finer sediment) comes from upland sources associated with human activities. The 1988 Simons et al report estimated the annual wash load supplied to Lake Altoona as 88,454 and 70,854 cubic yards/year as bulked sediment. The amount of agricultural acreage in the watershed has decreased since 1988.

The recommendations from this study included:

- Use of LIDAR Data to Determine Erosion Hot-Spots and Historical Trends

- Regular Scheduling of Lake Bathymetric Maps
- Establish River Stage Continuous Monitoring Site and Calibrate for Discharge Rate (Flow)
- Determine River Transported Sediment Type and Size Distribution
- Establish Relationship for Stream Discharge Rate vs. Sediment Transport Rates to Predict Lake Sediment Loading
- Coring to Characterize Lake Sediment
- Subsurface Profiling of River Channel
- Create Accurate Elevation Map of River Bed, Backwater, and Potential Aggregation Sites
- Identify Best Locations for Upstream Sediment Traps and Catchment Basins
- Identify and Design Re-connectivity and Improved Habitat Projects

Phosphorus and Sediment Total Maximum Daily Load (TMDL) for Mead Lake (2008)

Though this TMDL is for Mead Lake and its subwatershed, it is worth including here since it is the only approved TMDL within the Eau Claire River Watershed, and its water quality challenges are not unique. The Mead Lake TMDL was established in 2008 due to sediment and phosphorus, which are leading to impairments of degraded habitat, pH criteria exceedances, and excess algal growth in summer that result in limited body contact recreational use.

Sediment and phosphorus enters Mead Lake via the South Fork Eau Claire River from nonpoint sources of pollution. Phosphorus is bound to the sediment particles, and once in the system, sediment has the capacity to transfer phosphorus to the lake bottom. Mead Lake's shallow depth, phosphorus-laden sediments, and excessive water column phosphorus levels cause the lake to experience severe algal blooms during the "growing" season (May-October).

The TMDL was based on a two year study (2002-2003) of water quality in Mead Lake and the South Fork Eau Claire River conducted by the U.S. Army Corps of Engineers (USACE 2005). The study focused on external non-point loading (suspended sediments and nutrients from the South Fork Eau Claire River), internal P fluxes from lake sediments, and in-lake water quality. The study included continuous flow monitoring and bi-weekly and storm event water quality sampling of the South Fork Eau Claire River. Samples were analyzed for total suspended solids, total nitrogen, total phosphorus, and soluble reactive phosphorus. The USACE study found that:

- The seasonal (May-September) baseline modeled seasonal phosphorus load to Mead Lake was 5,500 pounds. The annual phosphorus load to Mead Lake was 13,230 pounds.
- The seasonal (May – September) baseline modeled seasonal suspended sediment load to Mead Lake was 333 tons. The annual sediment load was estimated at 1,180 tons.
- On average, 83% of the phosphorus (P) load originated from direct drainage and tributaries to Mead Lake. Tributary P loading accounted for 87% and 78% of the measured P load in 2002 and 2003, respectively. In contrast, internal P loading from sediment accounted for about 12% and 21%, respectively, of the 2002 and 2003 measured P inputs (or about 17% on average).
- Mean total P concentrations of the South Fork Eau Claire River ranged between 0.115 and 0.123 mg/L and accounted for 54% of the total P load to Mead Lake. Laboratory-derived internal P loading rates from sediments were very high under

anoxic conditions (range = 16 to 38 mg m-2 d-1) suggesting the potential for substantial P flux from bottom sediments. Total P concentrations in the bottom waters increased markedly in 2003 in conjunction with a higher residence time, anoxia in the hypolimnion and reduced flushing rates, compared to 2002 which was a wetter year. Summer chlorophyll concentrations averaged 51 µg/L and 76 µg/L in 2002 and 2003, respectively (USACE 2005).

- Exceedances of the state water quality criteria for pH occurred on 16 of 39 (40%) of the sampling events considering all locations and sampling dates. These pH exceedances (>9) generally correspond to chlorophyll levels greater than 70 µg/L.
- Sediments deposited in Mead Lake contribute P to the water column via recycling under anoxia or high pH conditions (both which exist in Mead Lake during summer). Laboratory derived internal P loading rates were very high under anoxic conditions (16-38 mg m-2 d-1) suggesting a high potential for P flux from bottom sediments (USACE 2005).

The TMDL established a summer epilimnetic mean phosphorus goal of 93 ug/L (parts per billion), which reflected achievable P load reductions in the watershed based on feasible restoration scenarios using the SWAT model, consensus of a local stakeholder group, and best professional judgment of WDNR staff. This site-specific target represents an approximate 24% decrease in mean growing season P and a 34% decrease in mean chlorophyll levels. The phosphorus goal also corresponds to a 29 percent reduction in the amount of time the lake experiences summer algal bloom conditions in excess of 30 µg/L chlorophyll. To meet the 93 ug/L goal, the following load reductions would be required:

- 30% P load reduction goal for nonpoint sources during the May-September period and a 35% annual P load reduction goal for nonpoint sources. A basin-wide phosphorus reduction goal of 30% results in a seasonal (May – September) nonpoint source load allocation of 3,850 pounds and a daily load allocation of 25 pounds.
- The sediment loading capacity was primarily based upon the amount of sediment reduction needed to achieve the phosphorus goal. A sediment loading reduction goal of 30% results in a seasonal load allocation of 233 tons and an annual load allocation of 826 tons.

The Mead Lake 93ug/L total phosphorus goal was set prior to the State's adoption of the 2010 Phosphorus Rule that established a significantly lower P goal of 40 ug/L for lakes like Mead. The TMDL for Mead Lake will need to be updated to address the new State standard and additional reductions and best practices may be necessary.

APPENDIX E: EXAMPLE SOIL HEALTH & WATER QUALITY BEST MANAGEMENT PRACTICES

APPENDIX E.
EXAMPLE SOIL HEALTH & WATER QUALITY BEST MANAGEMENT PRACTICES

Unless otherwise noted, the following water quality and soil health best management practices (BMPs) and definitions are taken from the EPA document entitled *BMP DESCRIPTIONS FOR STEPL AND REGION 5 Model.*

PRIMARY BMPs USED IN THE EAU CLAIRE RIVER WATERSHED STEPL MODEL

The following BMPs were used in the STEPL modelling discussed in Section IV.C. of this Watershed Strategy in order to help guide the development of the interim, 10-year goals (indicators) in Section VIII. These BMPs were selected for inclusion in the model based on: (i) frequency of current use; (ii) strong likelihood of future adoption; (iv) potential to significantly address phosphorus and/or sedimentation loading; and (iv) sufficient data on which to base existing and future adoption estimates. As discussed in Section VIII, it is important to remember that some of these BMPs are more efficient at reducing phosphorus and sediment loading than others. Understanding these efficiencies can be important when determining what BMPs should be prioritized in the action plan.

Contour Farming
Contour farming includes tillage, planting, and other farming operations performed with the rows on or along the contour of the field slope. It helps to reduce sheet and rill erosion and the resulting transport of sediment and other waterborne contaminants.

Diversion
Diversion is the redirection of a storm drain line or outfall channel so that it can temporarily discharge into a sediment trapping device. Its purpose is to prevent sediment laden water from entering a watercourse, or public or private property through a storm drain system, or to temporarily provide underground conveyance of sediment laden water to a sediment trapping device. A diversion channel is constructed across a slope and has supporting earthen ridge on the lower side. Diversion is often associated with agricultural cropland, but can be used in other settings as well.

Filter Strip
A filter strip is a strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and wastewater before they reach water bodies or water sources, including wells.

Grassed Waterway
A grassed waterway is a natural or constructed channel that is shaped or graded and planted with suitable vegetation for the stable conveyance of runoff without causing erosion of the channel. For purposes of the Eau Claire River Watershed STEPL model, filter strips and grassed waterways were considered a single, combined BMP, most frequently associated with agricultural cropland, but can be used in other settings as well.

Reduced Tillage Systems
Reduced tillage refers to any system that is less intensive and aggressive than conventional tillage. The number of operations is decreased compared to conventional tillage, or a tillage implement that requires less energy per unit area is used to replace an implement typically used in conventional tillage system. The term is sometimes used to imply conservation tillage; however, for a system to be considered a conservation tillage system, 30 percent of the soil surface must be covered with residue after planting. For

purposes of the Eau Claire River Watershed STEPL model, “no till” systems were included in current and future reduced tillage acreage estimates.

Stream Channel Stabilization
Stream channel stabilization means stabilizing the channel of a stream with suitable structures to prevent erosion or siltation of the channel. A channel is considered stable if, the channel bottom remains essentially at the same elevation over long periods of time. Stream channel stabilization methods include modifying the channel capacity, channel armoring, providing channel crossings for livestock, and seeding (vegetating or planting the channel to prevent erosion).

Figure 53: *Riprap bank armoring for channel stabilization, Little Miami River, Ohio.*

Streambank Protection
Streambank protection methods are essentially the same as stream channel stabilization methods and help to prevent streambank erosion. They include modifying the channel capacity, channel armoring, providing channel crossings for livestock, and seeding (vegetating or planting the channel to prevent erosion).

Streambank Fencing
Fencing is used to restrict livestock access to streambanks because animal traffic erodes streambanks, increases sediment load, and contributes animal waste in and near the stream, impairing water quality. For purposes of the Eau Claire River Watershed STEPL model, stream channel stabilization, streambank protection, and streambank fencing were combined under a single BMP titled “Streambank Stabilization and Fencing.”

Nutrient Management Planning (NMPs)
NMPs are a farm-based strategy for obtaining the maximum return from on- and off-farm fertilizer resources in a manner that protects the quality of nearby water resources. It is a way for farmers to ensure that their crops get the right source of nutrients at the right rate, time, and place to match crop needs and minimize nutrient losses from fields. Nutrient management planning is based on soil type and slope, crop rotations and residual nutrients, and takes both manure and commercial fertilizers into account. NMPs were a locally added BMP not included on the EPA list.

Pastureland – Managed Rotational w/ Livestock Exclusion (Prescribed Grazing)
Prescribed grazing is the controlled harvest of vegetation with grazing or browsing animals, managed with the intent to maintain or improve water quality and quantity. For example, on grazed forest, native pasture, or rangeland, grazing is limited so that the grazing animals will consume no more than 50 percent (by weight) of the annual growth of high or medium preferred grazing species.

Forest Dry Seeding (Road Dry Seeding and Hydraulic Seeding)
Two basic methods for spreading seed are dry seeding and hydraulic seeding. Dry seeding is a method the U.S. Forest Service uses to revegetate inactive roads to provide long-term erosion control. In dry seeding, seeds are broadcast or planted without mixing them with water or other liquid. Dry seeding and fertilizing along roads are usually done with cyclone-type rotary seeders. In hydraulic seeding (hydroseeding), a wet slurry of seed, mulch, and fertilizer is typically applied from a pump truck or portable trailer to steep slopes or areas where erosion rates are high.

Pastured Forest
Forest acreage in which cattle are fenced out. See Pastureland.

Replacing Failing Septic Systems
Phosphorus tends to bind to soil particles and does not easily move through the soil column to reach groundwater, unlike nitrogen which readily passes through soil. Human sewage entering septic systems contains phosphorus. In properly operating septic systems in good soils, phosphorus tends to remain in the soil adjacent to the septic system. However, as septic systems age the binding capacity of the soil can be saturated, particularly in sandy soils. Failing systems can include septic systems that are blocked or improperly connected, drainfields that are ponding, and systems that have been compromised by tree roots, erosion, etc. Failing systems can also include older conventional systems constructed in areas where non-traditional systems (e.g., mound systems) would be required today. Under these conditions, phosphorus can begin to move off the site in groundwater or overland. In addition, failing septic systems often discharge wastewater to the surface and create an additional opportunity for phosphorus to leave the site. A study in Minnesota has estimated the phosphorus delivery from riparian septic systems at 0.32 kg/capita/yr for failing (surfacing) systems and 0.16 kg/capita/yr for other systems (Barr Engineering 2004). A study by WI DATCP estimates the percentage of failing septic systems in WI at 20% (Wisconsin Department of Commerce, 1998). Replacing failing septic systems were a locally added BMP not included on the EPA list.

OTHER POTENTIAL BMPS

The following are additional example BMPs that were not explicitly included in the Eau Claire River Watershed Strategy STEPL modelling at this time, but some may be included as part of or overlap a previous BMP. The additional BMPs in this section could provide water quality benefits if implemented.

Animal Trails and Walkways
Animal trails and walkways (Figure 54) are facilities designed to allow livestock or wildlife to move through difficult or ecologically sensitive terrain. They are intended to reduce erosion by providing or improving animals' access to forage, water, or shelter; improving grazing efficiency and distribution; and diverting travel away from ecologically sensitive or erosive sites.

Animal Waste Management Systems
Animal waste management systems comprise a variety of best management practices (BMPs) or combination of BMPs used at concentrated animal feeding operations (CAFOs) and farms to manage animal waste and related animal by-products. These systems include engineered facilities and management practices for the efficient collection, proper storage, necessary treatment,

Figure 54: *Animal trails and walkways (USDA, Natural Resources Conservation Service).*

transportation, and distribution of waste. The BMPs are designed to reduce the discharge of nitrogen, phosphorus, pathogens, organic matter, heavy metals (such as zinc, copper, and occasionally arsenic, which are present in many animal rations), and odors. Example facilities and management methods are holding ponds, waste treatment ponds, composting, and manure management and land application.

Bioretention Facility
A bioretention facility or bioretention area consists of both a shallow depression or basin with a flow-regulating structure to control flow and a floor covered with specially engineered soil and plants to promote biological degradation of pollutants.

Concrete Grid Pavement
Concrete grid pavement (Figure 55) is a pavement surface that consists of strong structural materials having regularly interspersed void areas filled with pervious materials like sod, gravel or sand. The pervious materials enhance rainfall infiltration, reducing runoff.

Figure 55: *Example of a concrete grid pavement used in an overflow parking area (ODNR 1992).*

Conservation Cover
Conservation cover is the practice of establishing and maintaining perennial vegetative cover to protect soil and water resources on land that has been retired from agricultural production. It reduces

soil erosion and sedimentation, improves water quality, and creates or enhances wildlife habitat.

Conservation Crop Rotation
Conservation crop rotation is the practice of growing different crops on the same piece of land in a planned sequence. This sequence might involve growing high-residue-producing crops such as corn or wheat in rotation with low-residue-producing crops such as vegetables or soybeans. The rotation might also involve growing forage crops in rotation with various field crops. Crop rotation can help reduce soil erosion and break insect, disease, and weed cycles.

Cover and Green Manure
Cover and green manure refers to a crop of close growing legumes or small grain grown primarily for seasonal protection and soil improvement. The crop is usually grown for one year or less, except where permanent cover is need as in orchards. The crop controls erosion during periods when the major crops do not furnish adequate cover; and it adds organic material when it is plowed into the soil.

Critical Area Planting
Critical area planting is the planting of grasses, legumes, or other vegetation to stabilize slopes in small, severely eroding areas. The permanent vegetation stabilizes areas such as gullies, over-grazed hillsides and terraced backslopes. Although the primary goal is erosion control, the vegetation can also provide nesting cover for birds and small animals.

Dry Detention Basin
A dry detention basin is a storm water retention basin that remains dry except for short periods following large rainstorms or snowmelt events. Its main benefit is its moderating influence on peak flows, helping to control streambank erosion.

Extended Wet Detention Basin
An extended wet detention basin is a detention basin designed to increase the length of time that storm water is retained. This type of basin is typically configured in sections with a shallow forebay and a deeper permanent pool of water. The permanent pool of water provides a storage volume for pollutants to settle out. During large storm events, storm water temporarily fills the additional storage volume and is slowly released over a number of hours, reducing peak flow rates. Detention basins are often heavily vegetated so the vegetation can filter pollutants.

Grade Stabilization Structure
A grade stabilization structure is designed to reduce channel grade (steepness) in natural or constructed watercourses to prevent erosion of a channel that results from excessive grade in the channel bed (Figure 56). This practice allows the designer to adjust the channel grade to fit soil conditions.

Grass Swale
Grass swales (Figure 57) are elongated depressions in the land surface that are at least seasonally wet, usually heavily vegetated, and normally without flowing water. Swales direct storm water flows into primary drainage channels and allow some of the storm water to infiltrate into the ground surface. Swales are vegetated with erosion resistant, and flood tolerant grasses. Sometimes check dams are strategically placed in swales to moderate flow, and an engineered soil mixture might underlie swales.

APPENDIX E.
EXAMPLE SOIL HEALTH & WATER QUALITY BEST MANAGEMENT PRACTICES

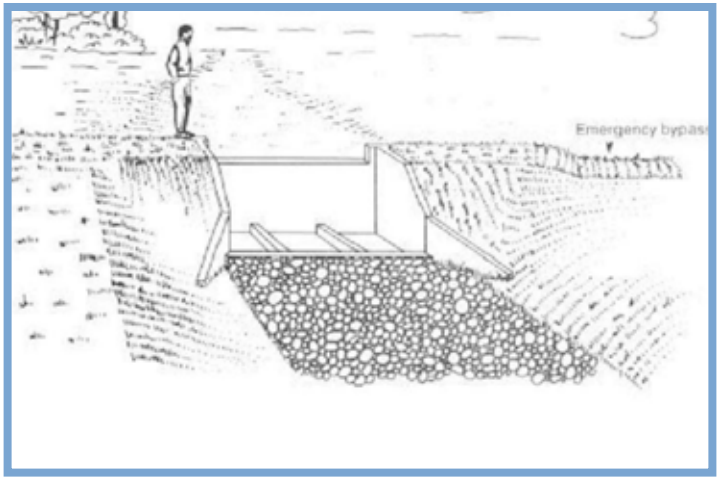


Figure 56: *A reinforced concrete drop spillway for grade stabilization with emergency bypass and downstream protection (Mississippi State University Department of Agricultural and Biological Engineering).*

Figure 57: *A grass swale.*

Hydromulch
Hydromulch is a mixture of fiber mulch, grass seed, fertilizer, or other agriculture approved additives (including a tactifier or bonding agent such as guar gum) and water. This mix is placed in a machine to form a homogeneous slurry. The slurry is sprayed under pressure to achieve a uniform application over the soil. Hydromulching is a term used to describe the process of applying hydromulch.

Infiltration Basin
An infiltration basin is a facility constructed in highly permeable soil that provides temporary storage of runoff during rain events. Over a period of several hours or days, the basin allows the water to discharge primarily by infiltration through the surrounding soil. It might have an outlet for overflow discharge to surface water.

Infiltration Devices
Infiltration devices capture a portion of runoff, and retain it onsite, allowing it to infiltrate into the soil. If properly sited, designed, constructed, and regularly maintained, these devices can be very effective in reducing peak discharge rates and storm water volumes and removing pollutants from the first flush of runoff. Infiltration trenches, infiltration basins, dry wells, leaching catch basins, porous pavement/blocks, and infiltration islands within parking areas are examples of infiltration devices.

Infiltration Trench
An infiltration trench is basically an excavated ditch that has been lined with filter fabric and backfilled with stone to form an underground basin. Runoff is diverted into the trench through a grass area or pretreatment device. It then exfiltrates into the soil to provide groundwater recharge or enters a perforated pipe underdrain through which it is routed to an outflow facility.

Infiltration trenches can handle only small amounts of runoff and are often used in conjunction with other BMPs.

Oil/Grit Separator
An oil/grit separator (Figure 58) consists of a series of three or four concrete chambers connected to a storm drain system. Runoff passes through the chambers, settling sediment and particulate matter, screening debris, and separating free surface oils from storm water runoff before the water passes to a storm drain. An oil/grit separator is used primarily to treat water to remove contaminants from small areas where activities contribute large loads of grease, oil, mud, sand, and trash to storm water runoff. Such areas include automotive work areas, loading areas, gas stations, parking areas, and roads, which have a heavy amount of motor vehicle traffic.

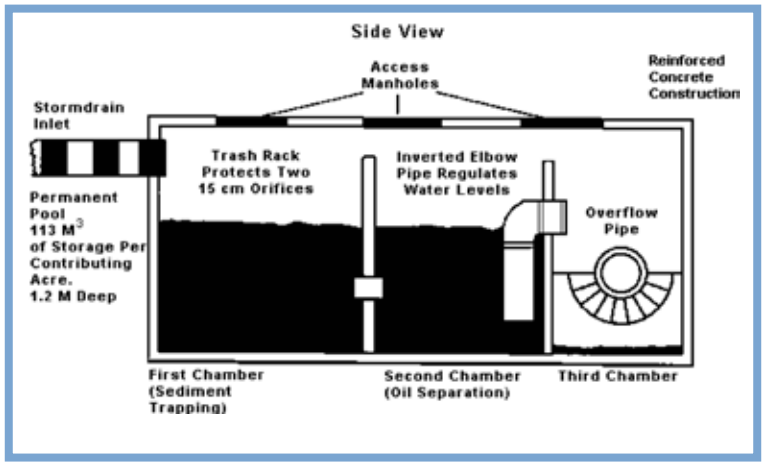


Figure 58: *Schematic of an oil/grit separator (Mississippi State University Center for Sustainable Design).*

Porous Pavement
An alternative to conventional asphalt, porous pavements uses a variety of porous media, often supported by a structural matrix, concrete grid, or modular pavement. The media allow water to percolate though the pavement to a subbase for gradual infiltration into the underlying soil.

Residue Management, Mulch Tilling
Mulch tilling (Figure 59) is the practice of tilling crop residue from the previous harvest into the soil as mulch by using non-inversion tillage methods such as chiseling and disk harrowing to partially incorporate organic material left on the soil surface.

Figure 59: *Residue management, mulch till (USDA, Natural Resources Conservation Service).*

Road Grass and Legume Seeding
Grass and legume seeding is a form of revegetation of bare soils used to prevent erosion. Native plants, domesticated native plants, and introduced agronomic species are all useful for rehabilitation and revegetation.

Road Hydromulch (Hydromulch)
Hydraulic mulching is a process by which wood fiber mulch, processed grass, hay or straw mulch is applied with a tacking agent in a slurry with water to provide temporary stabilization of bare slopes or other bare areas. This mulching method provides uniform, economical slope protection. It may be combined with hydroseeding as a revegetation method.

Road Straw Mulch
Straw mulch is applied on slopes to hold the soil and prevent loss of grass seed. Straw mulch provides erosion control and moisture conservation, and it prevents soil crusting.

Road Tree Planting
Tree planting is used for erosion control on permanently closed or decommissioned forest roads to return the site to forest and timber production. Where necessary, compacted or rock-surfaced roads are loosened to reduce surface runoff and promote seedling survival.

Runoff Management System
A runoff management system controls excess runoff caused by construction operations at development sites, changes in land use, or other land disturbances. A settling basin (see Settling Basin) is a type of runoff management system.

Sand Filter
Sand filters (Figure 60) are self-contained, compartmented treatment systems designed to catch runoff from highly impervious areas with relatively high total suspended solids, heavy metal, and hydrocarbon loadings, such as roads, driveways, drive-up lanes, parking lots, and urban areas. The compartments consist of a forebay that removes trash, debris, and coarse sediment, and a sand bed that allows solids settling and uses filtering and adsorption processes to reduce pollutant concentrations in storm water. The sand filter compartments are usually constructed of concrete, and they may be set above or below ground.

Sand Filter/Infiltration Basin
Sand filters (see Sand Filters) are often coupled with infiltration basins (see Infiltration Basin). The sand filter (Figure 60) provides pretreatment of the runoff to reduce pollutant concentrations before the runoff passes into the infiltration basin, where it is allowed to infiltrate into the ground and recharge groundwater.

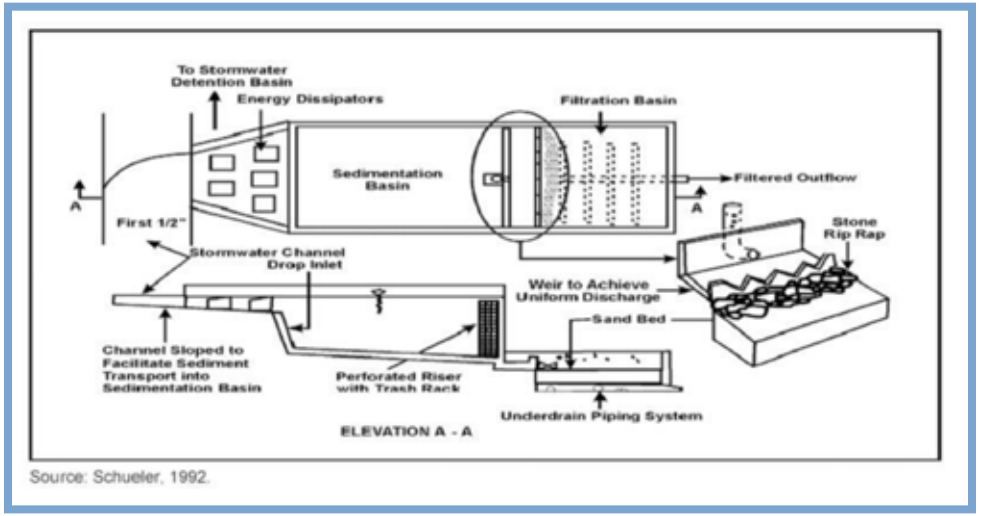


Figure 60: *Schematic of an oil/grit separator (Mississippi State University Center for Sustainable Design).*

Settling Basin
A settling basin is a temporary basin with a controlled storm water release structure that releases flow at a very slow velocity, allowing the solids to settle out. Settling basins are used to collect and

store sediment from sites cleared or graded during construction or for extended periods of time before permanent vegetation is established or structures are built. They are intended to help prevent the release of silt-laden runoff.

Soil Stabilization Measures (Forests Site Preparation)
The following measures can be used to stabilize soils for forest site preparation and road construction:

Measure	Description
Hydromulch	Mix of cellulose fiber and water sprayed on slope
Straw	Straw hand-placed evenly on slope
Crimping	Rolling the placed straw with a sheepfoot roller
Seeding	Spreading grasses, alfalfa, or other legumes using a hand spreader or water mix
Fertilizer	Application of nitrogen, phosphorus, and potassium by hand spreader or water mix
Transplanting	Hand transplantation of locally grown plant species
Net	Jute netting hand-placed on slope and pinned in place

Solids Separation Basin
A solids separation basin is a basin used for gravity settling of solids from liquid manure. A typical design for a solids separation basin is a 2- to 3-foot deep basin with concrete floor and walls and a porous dam or perforated pipe outlet that allows access by a front-end loader to remove solids every 1 to 2 months. Alternative earthen settling basins that allow for 6 to 12 months' storage of solids are also common. The basin contents should be thoroughly agitated and removed for land spreading by either a liquid manure spreader or slurry irrigation.

Solids Separation Basin/Infiltration Bed
See separate entries for Solids Separation Basin and Infiltration Bed.

Straw Crimping
Straw crimping is the practice of using a crimping disc, such as a sheepfoot roller, to place straw mulch on the ground. Crimping anchors the straw to the ground to hold it in place more securely.

Strip Cropping
Strip cropping (Figure 61) is a technique in which alternate strips of different crops are planted in the same field. Contour strip cropping, field strip cropping, and buffer strip cropping are the three main types of strip cropping. Strip cropping is used to control both wind and water erosion. If the strips are planted along the contour of the land surface, water erosion can be minimized. In dry regions, if the strips are planted crosswise to the contour, wind erosion is also minimized.

Figure 61: *Field strip cropping (Purdue University).*

APPENDIX E.
EXAMPLE SOIL HEALTH & WATER QUALITY BEST MANAGEMENT PRACTICES

Strip Cropping, Buffer
Buffer strip cropping can be employed by using strips of grass or legume crops laid out between contour strips of crops in irregular rotations. These strips may be even or irregular in width or placed on critical slope areas of the field.

Strip Cropping, Contour
In contour strip cropping, the crop strips follow the contours of the land. Both the crop stripping and the tillage are held closely to the contour of the field.

Strip Cropping, Field
In field strip cropping, strips of a uniform width are placed across the general slope of the land. With adequately grassed waterways, the strips may be used where topography is too irregular to make contour stripping practical.

Terrace
Terraces are constructed benches on slopes, which consist of level field or paddy areas held in place by embankments of soil or rock. Terraces enable water to be stored temporarily on slopes to allow sediment deposition and water infiltration; reduce slope length, erosion, and soil particle content in runoff water; improve water quality; retain runoff for moisture conservation; prevent gully development; and reduce flooding.

There are three types of terraces: bench terraces, contour terraces, and parallel terraces. Bench terraces are the type that most often comes to mind when the word terrace is used, and they are employed most often in mountain regions around the world.

Vegetated Filter Strip
See Filter Strip.

Waste Management Systems
See Animal Waste Management Systems.

Waste Storage Facility
A waste storage facility is an impoundment made by constructing an embankment or excavating a pit or dugout, or by fabricating a structure.

Water and Sediment Control Basin
A water and sediment control basin (Figure 62) is an earthen embankment or combination ridge and channel constructed across a slope and minor watercourse to form a sediment trap and water detention basin. Water collected in the basin is slowly released through an outlet structure.

Figure 62: *Water and sediment control basin (USDA Natural Resources Conservation Service).*

Weekly Street Sweeping
Weekly street sweeping is performed to remove contaminants, sediment, and debris from roadways before they have a chance to wash away in storm water runoff.

APPENDIX E.
EXAMPLE SOIL HEALTH & WATER QUALITY BEST MANAGEMENT PRACTICES

Wet Pond
A wet pond is a constructed basin that has a permanent pool of water throughout the year (or at least throughout the wet season). The primary removal mechanism is settling while the storm water runoff resides in the pool. Nutrient uptake also occurs through biological activity in the pond. Wet ponds are among the most cost-effective and widely used storm water treatment practices. Although there are several different versions of the wet pond design, the most common is the extended detention wet pond (see Extended Wet Detention Basin).

Wetland Detention
Wetland detention uses a detention basin planted with wetland vegetation. The wetland vegetation improves the quality of storm water released from the basin more effectively than dry detention and typical wet detention because the wetland vegetation reduces nutrients like nitrate nitrogen and phosphorus by as much as 90 percent, and settling and mechanical filtration by wetland plants also reduce suspended solids and turbidity.

Water Quality Inlets (Inlet Devices)
Inlet devices are various types of inserts placed in water intakes to trap pollutants and floating trash. Some inlet devices, such as silt fences, culvert inlet sediment traps, and oil-skimming booms, are intended for temporary use to prevent sediment from entering storm drainage systems prior to permanent stabilization of a disturbed area, such as during construction. Other inlet devices, such as strainer baskets, are installed in storm water inlets permanently. The baskets sometimes incorporate an oil-skimming boom to collect hydrocarbons. These baskets must be cleaned out and the oil-absorbent material replaced periodically.

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APPENDIX F: EAU CLAIRE RIVER WATERSHED SOCIAL SCIENCE ASSESSMENT

University of Wisconsin-Stevens Point
College of Natural Resources

Eau Claire River Watershed
Social Science Assessment

FINAL REPORT: JUNE 2016

SURVEY INVITATION LETTER

We're asking for your help! A group of citizens in your community -- the Eau Claire River Watershed Coalition -- is working to build a partnership to face local water quality challenges. This survey, which we expect should take about 20 minutes to complete, is an important step to help this group understand the priorities of those who know the land: agricultural producers and landowners in the Fall Creek, Bear Grass Creek, Wolf River, and Headwaters of the North Fork areas of your watershed. The survey is being conducted by the UW-Extension Center for Land Use Education at UW-Stevens Point that is assisting the watershed coalition with this important step -- **so please contribute to this effort by completing the survey and returning it in enclosed postage paid envelope!**

Here are a few important notes about this study:

- Remember all results will be kept confidential; we're just looking for your important perspective about how to better manage the Eau Claire River and the surrounding watershed.
- All responses will be treated as anonymous and records used to contact respondents containing identifying information will be destroyed prior to the research team reviewing data.
- Please skip any questions that make you feel uncomfortable or that you don't know how to answer.
- We do not anticipate any potential for risk or harm due to participation in this study; however, if you have any complaints about your treatment as a participant in this study please contact Dr. Debbie Pelron, IRB Chair at (715) 346-3953, e-mail at dpelron@uwsp.edu, or mail at University of Wisconsin-Stevens Point, Science Building D240, Stevens Point Wisconsin 54481

While your participation is voluntary your input can help bring local voices into these important efforts to benefit the Eau Claire River! If you have any questions or comments about this project you may contact me using the information provided below.

Thank you for your time and we're looking forward to hearing from you!

Dr. Aaron Thompson, Assistant Professor
E-mail: aaron.thompson@uwsp.edu Phone: 715.346.2278

UW Extension
University of Wisconsin-Extension

Eau Claire River Watershed Social Science Assessment: Understanding factors influencing landowner participation in agricultural conservation practices in the Eau Claire River watershed

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Acknowledgements

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I would also like to thank many individuals who were involved in the development of the Eau Claire River Farmer Survey. Thank you to Becky Wadleigh who managed the data collection process as part of her graduate studies at UW-Stevens Point. Additionally the support of Chris Straight, Kelly Jacobs, Buzz Sorge, and input from members of the Eau Claire River Watershed Coalition was greatly appreciated. Finally, the purpose of this research effort is to help stakeholders in the Eau Claire River watershed share their voice and opinions to inform the watershed planning process – this work is not possible without those individuals who took the time to complete the survey and a big thank you is well deserved for the agricultural landowners and producers who contributed their time to share their views!

Suggested Citation

Thompson, Aaron (2015). Eau Claire River Farmer Survey: Eau Claire River Watershed Social Science Assessment: Understanding factors influencing landowner participation in agricultural conservation practices in the Eau Claire River watershed. Retrieved from the University of Wisconsin-Stevens Point, UWEX Center for Land Use Education website: http:www.uwsp.edu/cnr/landcenter/

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Table of Contents

Introduction

This report summarizes the results of a confidential survey of agricultural landowners designed to support the development of a watershed management plan for the Eau Claire River Watershed in West-Central Wisconsin. A social science assessment is used to better understand the stakeholders responsible for and impacted by the decisions that will be made as part of this planning process. The study objectives work to provide leaders with a clear picture of the priorities of stakeholders, an understanding of factors influencing behaviors related to water quality, and information on factors that influence engagement in efforts to preserve or enhance the watershed.

Study Objectives: Identify the major attitudinal, economic, and community factors influencing *agricultural landowners'* conservation behaviors within the Eau Claire River watershed.

Method: Targeted Surveys

The 8-page survey was administered using a 5-contact process, adapted from Dillman's Tailored Design Method (2000), from February to April 2016 to a sample of 310 agricultural landowners in Eau Claire, Taylor, Chippewa, and Clark Counties in Wisconsin. All participants' data was collected in a manner to allow respondents to remain anonymous and recruitment information asked that only individuals over 18 years of age participate. Due to the large geographic size of the watershed and availability of funding to support the survey it was determined to focus on four sub-watersheds, listed below, that were identified for participant recruitment based on a high percentage of agricultural land cover and representation of multiple counties (including headwater streams).

The selection process identified respondents using a multi-step spatial analysis process conducted using ESRI ArcGIS (Version 10.3.1). To select participants both the NASS 2014 Cropland Data Layer and the Wisconsin Statewide Parcel layer were used as source information. The specific steps included:

- **Step 1:** Cropland Data Layer was reclassified to identify agricultural lands (including crops and grass / pasture). The data was then queried to identify agricultural land uses greater than 60 acres within each of the subwatersheds.
- **Step 2:** The Wisconsin Statewide Parcel layer (containing ownership records) was clipped to each subwatershed and then dissolved to identify parcels sharing a common owner.
- **Step 3:** The results of steps 1 and 2 were then overlaid (using select by location) to identify parcels that contain a portion of the >60 acre areas of contiguous agricultural land cover.
- **Step 4:** The parcel layer was then screened to remove ownership holdings smaller than 60 acres in total size. The final selection layer thus represents individuals who own 60 or more acres within the subwatershed that is associated with a contiguous block of agricultural land greater than or equal to 60 acres in size.

Method: Response Rate

The **overall response rate for the survey was 44.5 percent**, based on a total of 130 returned surveys and the removal of 18 bad addresses from the original list of 310 addresses (n=292). The specific response rates for each of the selected subwatersheds are listed below:

- Bear Grass Creek (n=88); Response Rate = 51.1%
- Fall Creek (n=65); Response Rate = 44.6%
- Wolf River (n=97); Response Rate = 41.2%
- Headwaters North Fork of the Eau Claire (n=42); Response Rate = 31.0%

Sample and Non-Response Considerations

The question of whether or not these results are representative of all agricultural landowners within the four selected subwatersheds is an important consideration. As with all scientific data collection it is important to evaluate the data to determine the best way to utilize the results and reveal any possible limitations. For this study we attempted a complete census of large landowners (those owning more than 60 acres with additional land use qualifications to ensure that this land is in agricultural production) within four subwatersheds. However, what about those landowners that didn't respond to the survey request – does their non-response limit the utility of the data (or create what is known as non-response bias)?

Ensuring that non-response bias didn't limit the dataset was addressed at various stages of the research design and implementation, including:

- Eliminating participant selection bias -- the mailing list was generated from a complete parcel data layer ensuring that no landowners within the selection criteria were excluded from the opportunity to participate.
- Eliminating interviewer bias – the survey cover letter / booklet cover clearly outlined that the data would be treated as anonymous, including the destruction of mailing addresses prior to examining results.
- Ensuring representativeness of the data -- Following data collection key demographic variables collected from the survey were evaluated against the NASS Census of Agriculture to determine if key characteristics of the survey sample are different than the overall population of agricultural landowners.

These approaches are typical of social science data collection and while in some cases, usually when response rates are less than 30 percent, it is necessary (although expensive) to follow up with those who didn't respond to determine if there is a something unique about these individuals. However, remember that they have were already contacted a minimum of 5 times during the study and have chosen to not contribute to the study.

While it is important to acknowledge that the potential exists that there may be more to learn about those who didn't respond, based on the results in the table below it is likely that non-response is more uniformly distributed and based on individual availability or interest. In general the differences that are observed between the 2016 Eau Claire River Farmer Survey (this study) and the broader National Agricultural Statistical Service's Census of Agriculture appear to be related to the how respondents were selected for participation in the survey. Specifically, here are the observed differences between survey respondents and all agricultural landowners in the counties:

- **Age:** Survey respondents were slightly older than all landowners within these counties.
- **Average Farm Size:** Survey respondents own more acreage on average than all landowners.
- **Primary Occupation:** For most of the subwatersheds survey respondents were slightly more likely report that their primary occupation is off-farm, such as those who are landlords only or described their operation as a hobby farm.
- **Farm Sales:** A greater percentage of survey respondents reported farm sales greater than $100,000.

All of these characteristics are likely at least in part due to the survey selection criteria that eliminated farms smaller than 60 acres, which has the effect of focusing our results on those who are more established (older individuals) with more acreage in production that would result in greater farm sales.

	Age >55 years	Primary Occupation: Non-Farm	Avg. Farm Size (acres)	Farm Sales > $100,000
2016 Eau Claire River Farmer Survey	**59.2%**	**40.7%** landlord & hobby	**229**	**42.6%**
a. Bear Grass Creek – Eau Claire County	63.4%	53.3% landlord & hobby	244	37.8%
b. Bear Grass Creek – Eau Claire County	57.7%	41.4% landlord & hobby	182	31.6%
c. Wolf River – Chippewa County / Clark County	45.9%	25.0% landlord & hobby	216	63.2%
d. Headwaters North Fork – Clark / Taylor County	76.9%	38.5% landlord & hobby	312	16.6%
2012 NASS Census of Agriculture				
a. Eau Claire County	54.7%	35.6%	155	15.2%
b. Chippewa County	48.5%	34.5%	219	24.6%
c. Clark County	44.3%	22.3%	198	38.2%
d. Taylor County	52.8%	24.4%	224	26.1%

Project Timetable

The survey changed significantly from the original proposal that sought to conduct a pilot study to assess opportunities and barriers to engaging the agricultural community in a dialogue about the health of the river.

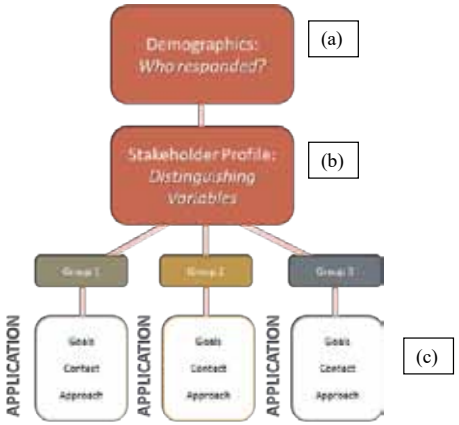
- In June 2015, the Eau Claire River Watershed Coalition met to discuss the social science assessment and determined that there was a need to expand the geographic scope and increase the number of farmers surveyed. This was a change in direction for what had originally been scoped as a pilot survey that would inform future data collection from other sources.
- In September 2015, WDNR representatives approved the request by Eau Claire County staff to extend the timeline for additional funding, including an additional $2,000 to expand the social science assessment.
- February 2016, UWSP contract for survey work finalized.
- March to April 2016, the Center for Land Use Education conducted a 5-contact survey process to inform landowners of the opportunity to contribute and solicit their response on the questionnaire.
- April to May 2016, finalized data collection and conducted analysis of survey results that will be used to inform implementation of the watershed plan moving forward.
- May 2016, draft report sent out for internal team review and recommendations.
- June 2nd 2016, final report submitted.

Agricultural Landowner Survey

The purpose of the farmer survey is to develop a stakeholder profile of agricultural landowners within the Eau Claire River watershed. This work is guided by Study Objective A, which is to "Identify the major attitudinal, economic, and community factors agricultural landowners' conservation behaviors within the Eau Claire River watershed."

Social Science Assessment

A social science assessment is simply another tool that can be used to understand (a) demographic characteristics of a key stakeholder audience, (b) develop a stakeholder profile to identify different groups based on attitudes toward key 'distinguishing' variables to better understand where agricultural landowners agree and where they don't, and (c) develop strategies to apply this information to support implementation of the watershed plan by meeting landowners where they're at, which includes understanding influences of conservation practice adoption (goals), who they wish to work with and who they don't (contact), and how they'd like to be included in decisions (approach).



(a) Demographics: Who responded?

To understand what we can learn from the survey of agricultural landowners we begin by discussing the characteristics of those who responded to the survey. The following demographic information does not in and of itself provide conclusions about how to engage agricultural landowners in watershed planning; rather it assists in understanding who voluntarily contributed to the watershed planning process by participating in the Farmer Survey.

Eau Claire River Watershed Coalition (ECRWC) Support

The survey began with a series of questions designed to understand overall awareness of agricultural landowners about the efforts of the Eau Claire River Watershed Coalition (ECRWC) to improve conditions within the watershed. The purpose of these questions is two-fold as an assessment, but also to provide a level of transparency regarding the purpose of the survey – to inform community actions intended to engage farmers and landowners in efforts to improve water quality. As shown in Figure 1 it is clear that few survey respondents are familiar with the efforts of the ECRWC, as results indicate that nearly 85 percent of agricultural landowners within the study don't know what this group does. Additionally, overall support for ECRWC's initial mission was slightly positive with the average response being +1.3 on a scale from -3 (strongly disagree) to +3 (strongly agree).

FIGURE 1: ECRWC Awareness

Eau Claire River Watershed Coalition: Farmer Support & Awareness

Agreement with Mission Statement

The Eau Claire River Watershed Coalition is *an effort to begin a community conversation with "anyone who values good, clean water and believes that our Watershed's lakes, rivers, and streams are important." Special efforts are being made to get area farmers involved and determine how best to represent the interests of all stakeholders in efforts to address water quality challenges facing this watershed.*

Average Respondent: Agrees, Score +1.3
(strongly agree = +3; strongly disagree = -3)

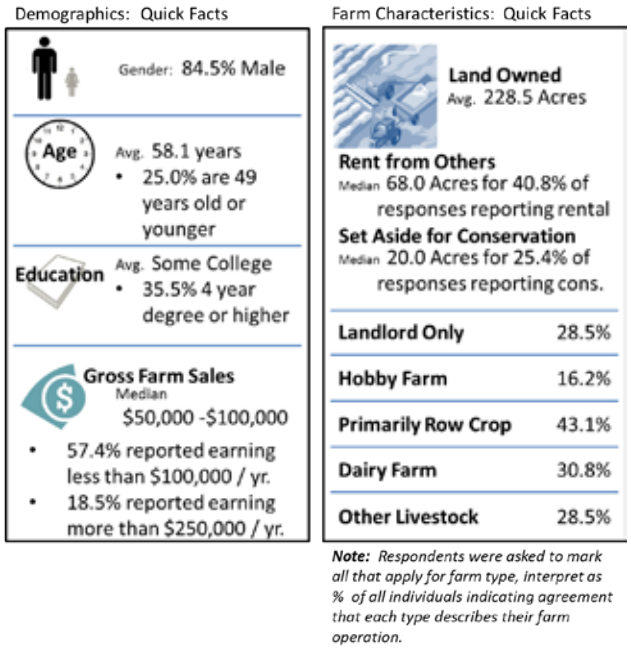
Awareness of Eau Claire River Watershed Coalition	
Never heard of them	37.0%
Heard of them, but don't know what they do	47.9%
Heard of them and know what they do	12.6%
Current member of Eau Claire River Watershed Coalition	2.5%

Note on the ECRWC mission statement: The ECRWC first met in early 2015 as a steering committee to guide the development of a plan for the Eau Claire River Watershed, though it was expected that ECRWC would continue to grow and be active as a community-led group after the plan's completion. At the time of this social science assessment, ECRWC did not have a formal mission statement and had not determined its long-term role. As the plan progressed, ECRWC has increasing emphasized in importance of soil health, education, and civic governance, which is not clearly reflected in the initial mission statement tested in the survey.

Demographics & Farm Characteristics

Figure 2 below provides a complete summary of demographic and farm characteristic information collected from agricultural landowners. Of particular interest in the demographic results is that the majority of surveys were completed by male members of the household (no restrictions were placed on participation as we simply asked the person responsible for land management decisions complete the questionnaire). Additionally, we see that the average age is 58.1 years, which is consistent with trends nationally for agricultural landowners.

FIGURE 2: Farmer Demographics for Eau Claire River Watershed

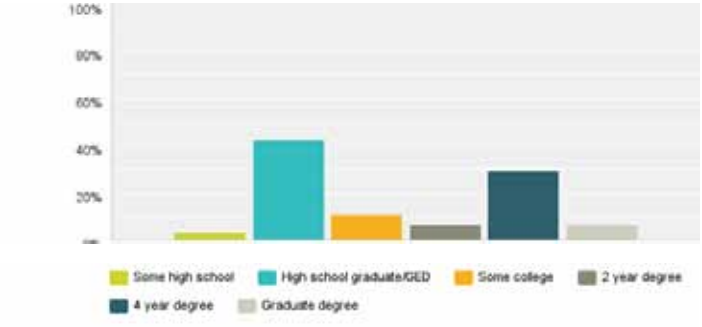


Note: *Respondents were asked to mark all that apply for farm type, interpret as % of all individuals indicating agreement that each type describes their farm operation.*

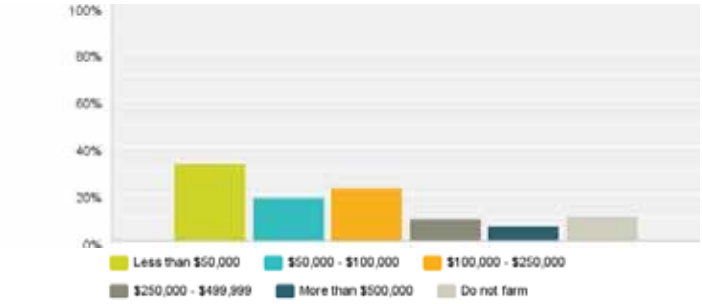
Highlights: Demographics

- Men represented 84.5% of respondents with an average age for all respondents of 58.1 years.

- The average respondent had some college education beyond high school, with 35.5% having a four year college degree or higher.

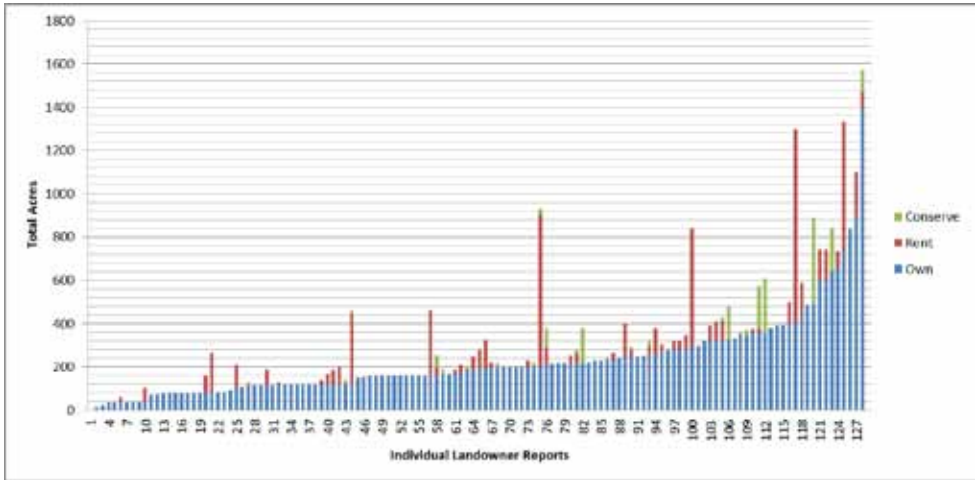


- Farm income breakdown – 57.4% of respondents earned $100,000 or less, while the rest reported earning more than this amount with 18.5% earning more than $250,000 per year.

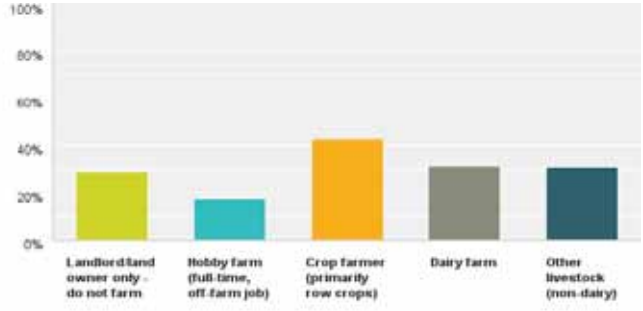


Highlights: Farm Characteristics

- Reports of Acreage Owned, Rented from Others, and Set aside for Conservation
  - The largest landholding reported (combining all 3 categories) was nearly 1600 acres total
  - Average acreage
    - Owned = 228.5 acres; (Median = 190.0 acres)
    - Rented from others = 122.2 acres; (Median = 68.0 acres)
    - Set aside for conservation = 58.4 acres; (Median = 20.0 acres)
  - Only 7 survey respondents indicated owning less than 60 total acres of land (used to create the original mailing list.)



- Farm Type breakdown showed that 55.7 percent of respondents self-identified as active farmers (crop, dairy, or other livestock), while 28.5 percent reported being non-farming households (landlord only).



- An ANOVA test, which is a type of statistical test that compares differences in mean values across groups was performed to determine if there is a significant difference in total acreage (a) owned, (b) rented, or (c) set aside for conservation between active farmers (row crop, dairy, or other livestock farms) and non-farming households (landlord only or hobby farms). As shown in the right hand column below only one statistically significant difference (<.05) was identified, which suggests that there is a real difference between active farmers (average = 262.3 acres) own more acreage than non-farming households (average = 139.6 acres). These results also demonstrate that there is no difference in the acreage rented or set aside for conservation between these groups.

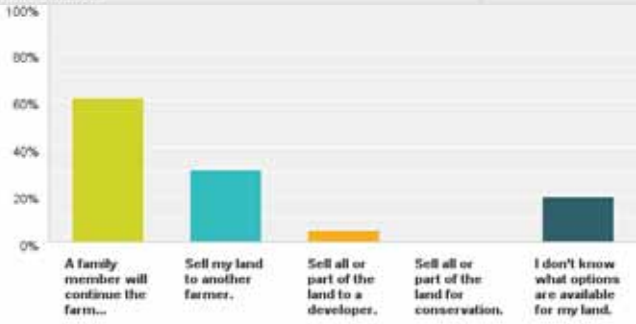
ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Own (Total)	Between Groups	381430.877	1	381430.877	11.442	.001
	Within Groups	4167052.824	125	33336.423		
	Total	4548483.701	126			
Rent From Others	Between Groups	23683.021	1	23683.021	.734	.396
	Within Groups	1645119.281	51	32257.241		
	Total	1668802.302	52			
Set aside for conservation	Between Groups	5484.587	1	5484.587	.651	.426
	Within Groups	261178.385	31	8425.109		
	Total	266662.972	32			

Future Plans: Land Management

As the average age of respondents (58.1) suggests many important questions are raised about the future of land management decisions. As you'll see in the next two questions (future plans and retirement plans) that among this group there is diversity of opinions about the future for their farms. However, it's clear that for landowners in this study area that they see their land remaining in agricultural production (more than 90 percent agreed that this is a likely possibility for their farm). It is also worth noting that an additional 19 percent of the total, meaning those not counted with other options, reported that they didn't know what options are available for their land.

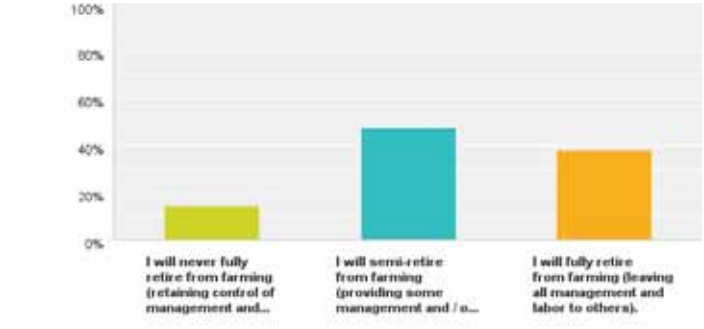
Answer Choices	Responses	
A family member will continue the farm operation.	61.16%	74
Sell my land to another farmer.	30.58%	37
Sell all or part of the land to a developer.	4.96%	6
Sell all or part of the land for conservation.	0.00%	0
I don't know what options are available for my land.	19.01%	23
Total Respondents: 121		



Future Plans: Retirement

Survey respondents were asked a series of questions developed by Arbuckle & Miller (2015) related to retirement plans. Based on these results we see that for a majority of respondents that they will never fully retire from involvement in farm management and / or providing labor.

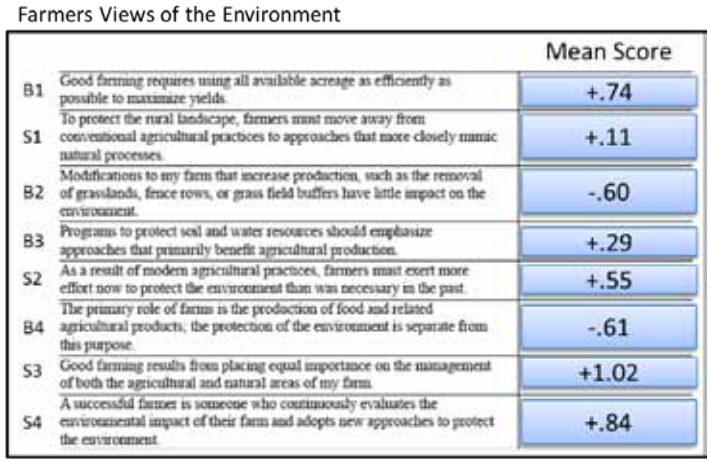
Answer Choices	Responses	
I will never fully retire from farming (retaining control of management and providing some labor).	14.66%	17
I will semi-retire from farming (providing some management and / or labor).	47.41%	55
I will fully retire from farming (leaving all management and labor to others).	37.93%	44
Total		116



(b) Stakeholder Profile: Distinguishing Variables

One of the primary reasons for conducting a sociological analysis of watershed stakeholders is that while there is a great deal of variation amongst the individuals who live, work, and play in the Eau Claire River watershed we also must begin to understand where stakeholders agree and disagree. In order to support this type of differentiation social science has developed methods for combining together survey responses to identify different 'groups' of stakeholders who share a key attitude or belief. Attitudinal differences among agricultural landowners were measured to distinguish responses based on two key distinguishing variables (also referred to as social constructs), including: 'environmental stewardship' views and 'farm as a business' views. This was accomplished by asking respondents to evaluated, based on their agreement or disagreement, a series of pre-tested survey statements shown below in Figure 3.

FIGURE 3: Farmer Views of the Environment Scales



While there is certainly value in examining how respondents viewed these individual items, the real strength of the research approach here is that it's intended to measure support for two underlying constructs using multiple items. Basically the idea is that by using repeated measures of a variable of interest, such as how an individual views the importance of environmental stewardship, we can evaluate the presence of competing beliefs about the farmers' role as a steward of the land against their views of the farm as a business. Think of this as asking a series of questions in slightly different ways in order to help us accurately measure how each individuals beliefs align (or don't) with others respondents. In this case you can see that the items are grouped on the left column into S-Stewardship or B-Business orientations. The FVE: Stewardship Scale has been described as measuring, "Farmers expressing a strong stewardship view identify their farming actions as having an impact on environmental quality, in essence seeing their farm as an important part of the larger rural environment. Following from this belief in the impact of farming on the environment, the stewardship view holds that farmers have an active role to play in protecting rural environmental quality" (Thompson, 2015). The second construct measured by the FVE: Farm as a Business Scale has been described as "This view places farm production and efficiency as the ultimate goal with an emphasis on maximizing yields. The scale items focus on the importance of technology in improving environmental quality and the view of the farm as a business that describes the belief that size and intensity of production are vital to the survival of the farm operation" (Thompson, 2015).

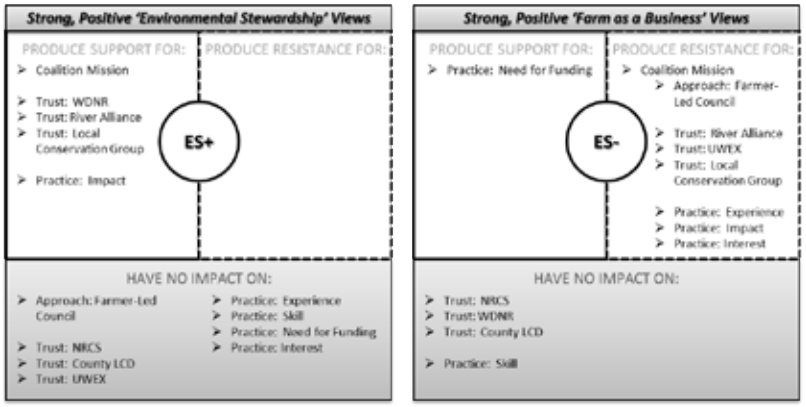
In this study the scales are composed of four items, whose scores are simply added together to create a total score for each respondent (meaning that there is a possible range of +8 for strongly agree to -8 for strongly disagree for each scale). A total of 118 respondents (or 91 percent) of the surveys returned had a complete response set for two scales that comprise the Farmers Views of the Environment measures. This type of slight reduction in responses, or missing data, is common and the result of instructions to only answer questions that they are comfortable providing a response to on the cover letter.

Farmers Views of the Environment: Influence

To assess the effectiveness of the FVE scales as distinguishing differences relevant to the watershed planning process a series of 15 regression models were run to examine the relative influence of strong, positive "Environmental Stewardship" and "Farm as a Business" attitudes toward variables measured within the survey.

The regression models targeted each of these separately measured variables from the survey as the dependent variable. The results, shown in Figure 4, reveal that positive support for the FVE Stewardship Scale predicts support for the ECRWC mission, trust in working with a number of project partners, and the perceived impact of implementing conservation practices. We see the reverse pattern for the FVE: Farm as a Business Scale, where positive support is associated with resistance for conservation approaches and for multiple project goals.

FIGURE 4: Regression Model Results



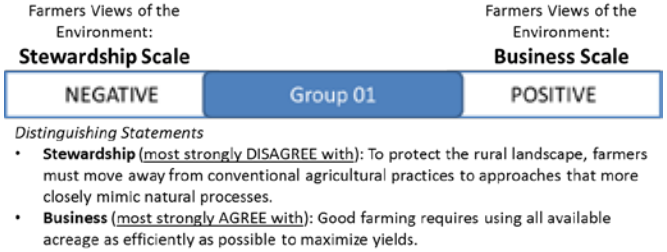
Farmers Views of the Environment: Differentiating Stakeholder Groups

Analysis of the responses to the FVE scales ('Environmental Stewardship' and 'Farm as a Business') resulted in the identification of 3 attitude groups, as described below:

Attitude Characteristics of Group 1 – Farm is a Business

What connects this group of individuals together (membership represents 24.1% of all survey responses) are strongly held views of the farm as a business. First and foremost this group clearly values agricultural production as a primary output from their land. This is clear with their most supported statement in the FVE: Business scale emphasizing efficiency and yield. These business values are at odds with the stewardship values held by members of Groups 2 and 3, as they disagree with statements that suggest that farmers must adapt or exert additional effort than was required in the past to protect the environment.

FIGURE 5: FVE-based Attitude Group 1



Distinguishing Statements

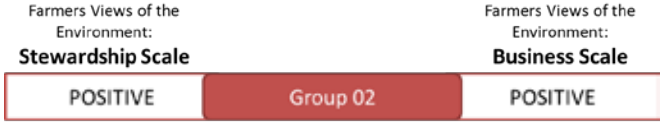
- **Stewardship** (most strongly DISAGREE with): To protect the rural landscape, farmers must move away from conventional agricultural practices to approaches that more closely mimic natural processes.
- **Business** (most strongly AGREE with): Good farming requires using all available acreage as efficiently as possible to maximize yields.

- Meeting them where they're at requires (a preview of the stakeholder profile):
  - **Goals:** Acknowledging that they are generally not supportive of the mission or goals of the Eau Claire River Watershed Coalition is important. However, even with this they do agree that protecting soil health, promoting erosion control, and limiting phosphorus loading are important.
  - **Contact:** Understanding that they reported the lowest level of trust in all potential partners asked about in the survey. They are very distrustful of WDNR and Local Conservation Organizations, while being most willing to work with UWEX and County LCDs.
  - **Approach:** This group expressed strong concerns about funding availability and while more supportive of the use of a farmer-led council approach than Group 2 they also indicated that they were the most concerned about partnering with agencies whose land management goals may differ from their own.

Attitude Characteristics of Group 2 – Balancing Competing Demands

Acknowledging that the competing demands of both financial and environmental stewardship of their farms is a defining characteristic that describes individuals in this group (membership represents 45.5% of all survey responses). Their values are best described by their strong support of the statement below that stresses the importance managing both the agricultural and natural areas of a farm.

FIGURE 6: FVE-based Attitude Group 2



Distinguishing Statements

- **Stewardship** (most strongly AGREE with): Good farming results from placing equal importance on the management of both the agricultural and natural areas of my farm.
- **Business** (most strongly AGREE with): Good farming requires using all available acreage as efficiently as possible to maximize yields.

- Meeting them where they're at requires (a preview of the stakeholder profile):
  - **Goals:** This group supports the mission of the Eau Claire Watershed Coalition and expresses a higher level of interest in conservation practices than Group 1, although as a group they are still less interested than members of Group 3.
  - **Contact:** This group seeks input and is willing to work with a wider array of partners, but their preference is County Land Conservation or NRCS.
  - **Approach:** This group is the least likely to support a farmer-led council as a way to enhance efforts to address water quality issues. Like the other groups they see value in targeting community priorities and ensuring that all landowners have access to available funding for conservation.

Attitude Characteristics of Group 3 – Conservation Partners

The strong environmental stewardship values that are expressed by this group, along with their negative views of farming focused solely on business efficiency and yield, set this group apart from the rest. With membership representing 30.4% of survey respondents some might believe that this group is simply the "hobby farm" crowd – although clearly that is not the case here. This group expresses many of the characteristics of a strong conservation partner (willingness to engage, shared long-term goals, and a strong interest in practice expansion or adoption).

FIGURE 7: FVE-based Attitude Group 3

Distinguishing Statements

- **Stewardship** (most strongly AGREE with): Good farming results from placing equal importance on the management of both the agricultural and natural areas of my farm.
- **Business** (most strongly DISAGREE with): Modifications to my farm that increase production, such as the removal of grasslands, fence rows, or grass field buffers have little impact on the environment.

- Meeting them where they're at requires (a preview of the stakeholder profile):
  - **Goals:** They are the most supportive of the ECRWC's mission and while no difference was identified in current conservation practice experience, they did report significantly higher levels of land set aside for conservation on their farm. Their interest in conservation practice adoption or expansion is higher than members of Groups 1 or 2. Additionally, the management decision section of the survey indicated that they are less concerned about negative impacts on production or yield from changing land management to improve water quality on their farm.
  - **Contact:** They're willing to work with everyone – County Land Conservation and UWEX are at the top of their list.
  - **Approach:** This group is the most likely to support a farmer-led council as a way to enhance efforts to address water quality issues. And like the other groups they see value in targeting community priorities and ensuring that all landowners have access to available funding for conservation.

Stakeholder Groups: Geographic Distribution

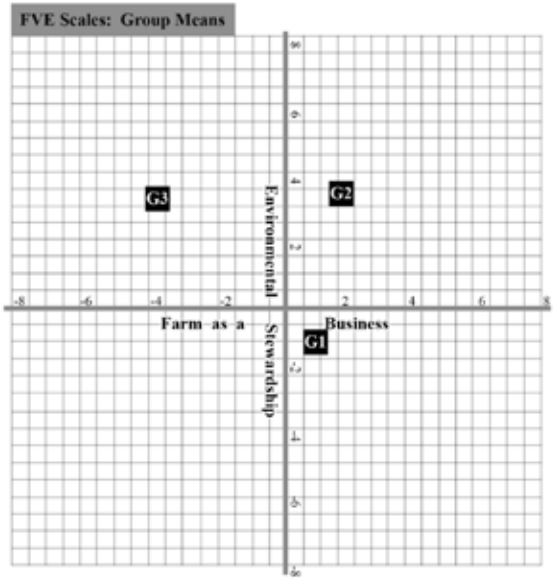
The stakeholder profile technique also allows us to evaluate variations between different geographic areas. For instance, what approach is more likely to work in one subwatershed as compared to another area within the basin. The following results (shown in Figure 8) reveal the geographic distribution for each of the attitude-derived stakeholder groups. There are many way to use this information, for example observing that for the Headwaters North Fork of the Eau Claire subwatershed had no reports of members of Group 1 would indicate the possibility that outreach emphasizing the environmental benefits of practices may have greater appeal than in watersheds where landowners prioritize the economic benefits of practices on their farm.

FIGURE 8: Distribution of Attitude-derived Stakeholder Groups

Differentiating Stakeholder Groups: Cluster Analysis Method

The three groups were identified using a 2-step cluster analysis technique that begins by sorting the individual responses to the FVE scales ('Environmental Stewardship' and 'Farm as a Business') in order to group together similar responses. This process uses a statistical analysis technique that continues until the number of representative groups is determined. The second step of the cluster analysis assigned each individual respondent, based on their responses to the attitude scales, to the group that best represents their pattern of responses (using a K-Mean Cluster technique). This analysis revealed that for agricultural landowners in the Eau Claire River watershed that there are 3 representative groups (meaning groups that share a common identity) based on responses to the FVE scales. The mean scores for each of these groups differs for the 'FVE Stewardship' scale and the 'FVE Farm as a Business' scale as shown in Figure 9.

FIGURE 9: FVE-based Groups



Similarities & Differences between Stakeholder Groups

There are similarities (areas where no significant difference is found in reported mean scores) and differences between members of these 3 distinct attitude groups. This section explores the demographics and farm characteristics of these groups before moving into a detailed explanation of the attitude characteristics held by each.

Demographics

- No significant differences identified between Attitude Groups for these demographic variables, including gender, age, education, or farm income.
- **Gender:** It is worth noting out of the 15 total responses from females (who based on survey instructions consider themselves responsible for land management decisions) that their membership is distributed as follows:
  - Group 1: 0 Females
  - Group 2: 10 Females (18.9% of total group membership)
  - Group 3: 5 Females (14.7% of total group membership)

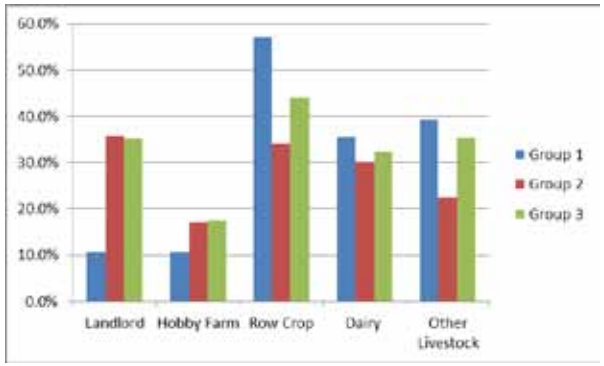
Farm Characteristics

Total acreage managed (owned or rented) by survey respondents exceeds 33,000 acres across the 4 subwatersheds included in this study. Here's a breakdown of the reported land managed by each of the attitude groups:

- **Acreage Owned:** No significant difference between attitude groups for total acreage owned. Below is a breakdown showing how much acreage was reported as owned by members of each group, along with average per farm for each group.
  - Group 1 total acreage owned: 7,483 acres *(median = 200.0 acres)*
  - Group 2 total acreage owned: 10,250 acres *(median = 160.0 acres)*
  - Group 3 total acreage owned: 9,371 *(median = 224.0 acres)*
- **Acreage Rented**: Significant differences included -- Group 1 rent more acreage than Group 3.
  - Group 1 total rental acreage: 2,911 acres *(median = 194.1 acres)*
  - Group 2 total rental acreage: 2,491 acres *(median = 131.1 acres)*
  - Group 3 total rental acreage: 861 *(median = 40.0 acres)*
- **Acreage Set Aside for Conservation:** Significant differences included – on average (although median scores suggest this is likely influenced by large conservation holdings on a smaller subset of farms) Group 3 sets more land aside for conservation than Groups 1 or 2, with more than 15% of the total land owned by these farmers set aside.
  - Group 1 total conservation acreage: 325 acres *(median = 20.0 acres)*
  - Group 2 total conservation acreage: 101 acres *(median = 14.4 acres)*
  - Group 3 total conservation acreage: 1,466 *(median = 20.0 acres)*

- **Farm Type:** As shown in the graph below (Figure 10) and based on the results of a difference of means test there are few notable differences between the type of production involvement and group membership. However, the results of the ANOVA test revealed that members of Group 1 are significantly less likely than the other groups to report being a 'landlord only'. Additionally, while Group 1 had the highest percentage reported for row crops, dairy, and other livestock no significant differences between groups were identified in the ANOVA tests.

FIGURE 10: FVE-based Groups by Farm Type



(c) Application: Farmer Survey Results

The following section builds upon the farmer groups identified from the FVE scales in order to understand key factors that influence whether these individuals will participate in efforts to enhance the Eau Claire River watershed. As presented here we've broken these results down for Groups 1, 2, and 3 to understand the following:

- Goals: What factors influence conservation practice adoption?
  - Section 1: Landscape Priorities
  - Section 2: Conservation Behaviors
  - Section 3: Factors Influencing Adoption
  - Section 4: Management Decisions

- Contact: Who do they trust / are willing to work with?

- Approaches: How would they like to be involved in decision making?
  - Section 1: Technical Assistance
  - Section 2: Governance & Decision-making
  - Section 3: Planning Scenarios

The following sections break down the survey results for each of these key aspects of watershed plan implementation. In addition, this data is used to support overall recommendations and strategies at the end of this report.

Analysis of Group Differences

Throughout the Application section of this report the analysis explores "Group Differences", which is reported identify similarities and differences between the attitude groups identified in the previous section. While it's easy enough to look the mean (or average) score for each group, this report goes one step further to evaluate whether or not these observed differences between means is statistically significant. In order to accomplish this an ANOVA (Analysis of Variance) Test is performed (with an acceptable p-value of .05) and the results are reported under the "Group Differences" headings throughout this section.

Goals: What factors influence conservation practice adoption?

This section covers the most intensly studied elements of this project, focusing on what we know (or don't) about factors that influence conservation practice adoption. Beginning with warm-up questions from the survey that assess broad priorities for the landscape we'll move through information about conservation practices that are applicable to different portions of the farm. Using this information a regression model then helps understand the relative importance of different factors (percieved impact of practices, current skill, available funding, and past experience).

Landscape Priorities

The survey began with a series of warm-up questions about goals for the watershed, which included the following:

CONSERVATION PRIORITIES

To begin we'd like to understand your priorities for the Eau Claire River Watershed. Please indicate whether you support each of the following goals by responding Yes or No.

YES ☐	NO ☐	Encouraging land management practices that promote good soil health.
YES ☐	NO ☐	Reducing soil erosion loading from both shoreline and upland sources.
YES ☐	NO ☐	Reducing phosphorus loading in the river in order to decrease the occurrence and intensity of blue-green algae blooms.

The result was that more than 93 percent of respondents agreed with all three of these questions. There is consensus that enhancing SOIL HEALTH, REDUCING SOIL EROSION AND preventing PHOSPHORUS LOADING in the river are clear goals for this landscape that are shared by nearly all agricultural landowners.

ECRWC Mission

A statistically significant difference was identified between Group 1 and Groups 2 and 3 related to support for the ECRWC mission statement. While no difference was seen for awareness (recall that it's extremely low for everyone) of this organization's efforts, this difference seems to reflect the support or lack thereof for environmental stewardship values that differentiates the attitude groups.

Eau Claire River Watershed Coalition

Agreement with Mission Statement

The Eau Claire River Watershed Coalition is *an effort to begin a community conversation with "anyone who values good, clean water and believes that our Watershed's lakes, rivers, and streams are important." Special efforts are being made to get area farmers involved and determine how best to represent the interests of all stakeholders in efforts to address water quality challenges facing this watershed.*

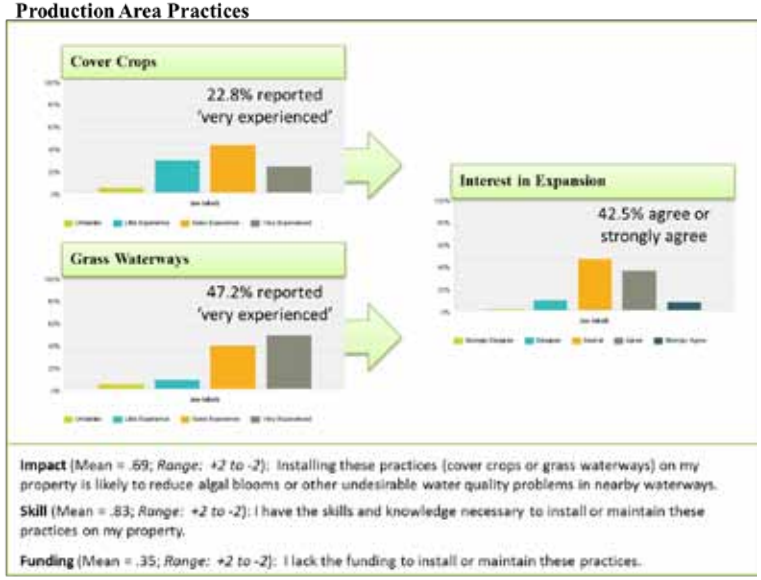
Group 01	Group 02	Group 03
Average = .22	Average = 1.38	Average = 1.96

Conservation Behaviors

A series of five distinct conservation practices were grouped together in the survey based on the area within the farm where they would be implemented (Intensive Use Area, Production Area, and Riparian Area). After assessing overall experience with each practice a series of questions were applied for all practices within the area as shown in Figure 11 below:

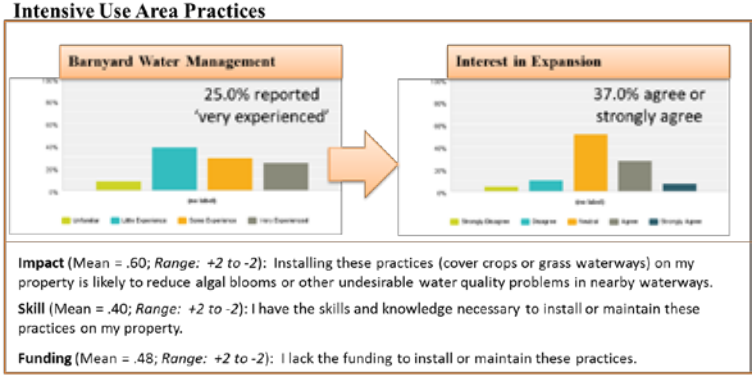
FIGURE 11: Conservation Practices

Production Area Practices



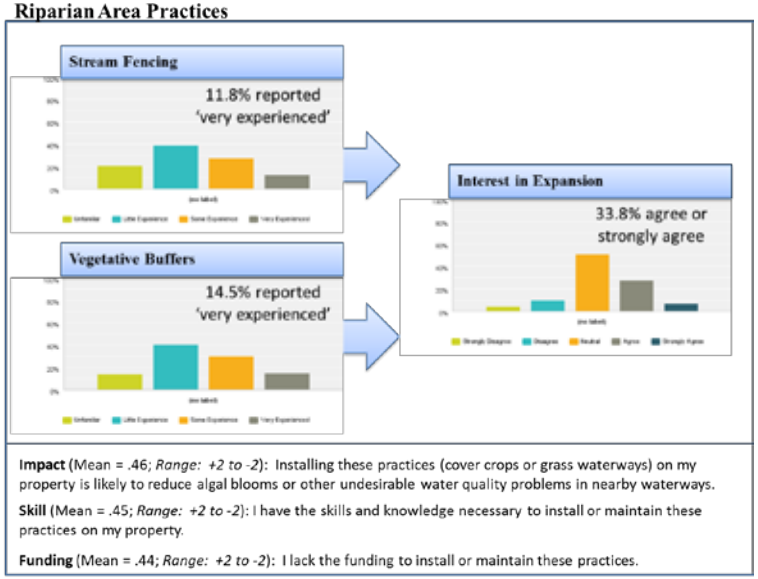
- How do **Production Area Practices** compare to Intensive Use and Riparian Areas?
  - **Experience:** By a large margin landowners indicated that they have the most experience (47.2% reported being very experienced) with Grass Waterways among practices from all 3 areas.
  - **Interest:** Overall interest in adoption or expansion of practices is highest from production area practices – with 42.5% of landowners indicating that they are interested in trying or expanding the use of these practices.
  - **Impact:** Similar to what we observe for all practice areas landowners slightly agree that installing these practices is likely to have positive water quality benefits.
  - **Skill:** While the mean score is only slightly positive at .83, this is much higher for Production Area practice than for Intensive Use or Riparian Areas.
  - **Funding:** The mean score is positive, but near neutral indicating that landowners are unsure whether or not they have the necessary funding for installation and maintenance of these practices – similar to both Intensive Use and Riparian Area practices.

Intensive Use Area Practices



- How do **Intensive Use Area Practices** compare to Production and Riparian Areas?
  - **Experience:** Nearly half of all respondents reported little or no experience with these practices, which is lower than Production Area and higher than Riparian Area practices.
  - **Interest:** Overall interest in adoption or expansion of practices is also high for Intensive Use Area practices – with 37.0% of landowners indicating that they are interested in trying or expanding the use of these practices.
  - **Impact:** Similar to what we observe for all practice areas landowners slightly agree that installing these practices is likely to have positive water quality benefits.
  - **Skill:** The mean score is only slightly positive at .40, which is lower than for Production and Riparian Area practices.
  - **Funding:** The mean score is positive, but near neutral indicating that respondents are unsure whether or not they have the necessary funding for installation and maintenance of these practices – similar to both Production and Riparian Area practices.

Riparian Area Practices



- How do **Riparian Area Practices** compare to Production and Intensive Use Areas?
  - **Experience:** Landowners reported the lowest levels of experience for Riparian Area practices, with less than 15 percent reporting that they were very experienced with stream fencing or vegetative buffers.
  - **Interest:** Similar to the Production and Intensive Use Area practices there are a lot of neutral responses, but only 33.8% of landowners indicated that they are interested in trying or expanding the use of Riparian Area practices – this is lower than for Production or Intensive Use Area practices.
  - **Impact:** Similar to what we observe for all practice areas landowners slightly agree that installing these practices is likely to have positive water quality benefits.
  - **Skill:** The mean score is only slightly positive at .45, which is lower than for Production and Riparian Area practices.
  - **Funding:** The mean score is positive, but near neutral indicating that respondents are unsure whether or not they have the necessary funding for installation and maintenance of these practices – similar to both Production and Intensive Use Area practices.

Practices Experience: Overall

- Cover Crops: 66.1% Some or Very Experienced (4.7% Unfamiliar)
- Grass Waterways: 87.4% Some or Very Experienced (4.7% Unfamiliar)
- Barnyard Water Management: 54.2% Some or Very Experienced (8.3% Unfamiliar)
- Stream Fencing: 40.0% Some or Very Experienced (20.9% Unfamiliar)
- Vegetative Buffers: 45.4% Some or Very Experienced (14.5% Unfamiliar)
- Differences

Practices Experience: Group Differences

- No significant differences between attitude groups for experience using the different practices.

Interest in Adoption / Expansion: Group Differences

- Production Areas: No significant difference between attitude groups.
  (*Mean scores:* Group 1 = .19, Group 2 = .32, Group3 = .62)
- Intensive Use Areas: No significant difference between attitude groups.
  (*Mean scores:* Group 1 = .19, Group 2 = .28, Group3 = .53)
- Production Areas: Significant difference between attitude group 1 and both Group 2 and Group 3 (Groups 2 and 3 are not significantly different).
  (*Mean scores:* Group 1 = -.29, Group 2 = .21, Group3 = .64)

Factors Influencing Adoption

Regression analysis can help understand the independent variables (or factors) that influence change in the dependent variable (such as a behavior of interest). For this survey the modelling effort focused on understanding the factors that influence the dependent variable: **Interest in trying out or expanding the use of practices on their farm** that was measured by adding up the individual responses to this question for each of the practice areas as shown in Figure 12 below.

FIGURE 12: Aggregate Interest in Practice Adoption

A similar approach was use for the independent variables that measured Impact, Skill, Funding, and Experience with these practices as factors that are anticipated to have an impact on interest in trying or expanding the use of these practices (or future adoption). The result was 4 independent variables, including:

- **Impact:** Production Area {Impact} + Intensive Use Area {Impact} + Riparian Area {Impact}
  - Installing these practices (combined measure for the practice area) on my property is likely to reduce algal blooms or other undesirable water quality problems in nearby waterways.
- **Skill:** Production Area {Skill} + Intensive Use Area {Skill} + Riparian Area {Skill}
  - I have the skills and knowledge necessary to install or maintain these practices on my property.
- **Funding:** Production Area {Funding} + Intensive Use Area {Funding} + Riparian Area {Funding}
  - I lack the funding to install or maintain these practices.
- **Experience:** Cover Crops {Experience} + Grass Waterway {Experience}+ Stream Fencing {Experience} + Vegetative Buffers {Experience}*
  - ***Note:** Due to missing data (non-response) Barnyard Water Management had to be excluded from this combined measure.*

Model Background: Development of the regression model began by examining the correlation matrix that provides a measure of the strength of relationships between variables, as shown in Figure 13.

Strong relationships

- Interest in practices is positively associated with perceived impact on water quality.
- Reported skill with practices is positively associated with overall practice experience.

Moderate relationships

- A strong business-focused view of the environment is negatively associated with Interest, Impact, and reported experience (it is also has a weak positive relationship with perception of not having enough access to funding for these practices).
- A strong stewardship-focused view of the environment is positively associated with perceived Impact on water quality from practice implementation.
- Overall experience with the practices is positively associated with perceived Impact on water quality from practice implementation, as well as expressed Interest in future adoption.

FIGURE 13: Strength of Relationship between Variables

Correlations

		Practice_Interest_3ItemSum	Practice_Impact_3ItemSum	Practice_Skill_3ItemSum	Practice_Funding_3ItemSum	Experience 4Item_Scale: Removed Barnyard managment due to missing data.
Practice_Interest_3ItemSum	Pearson Correlation	1	.605**	.254**	.054	.268**
	Sig. (2-tailed)		.000	.004	.555	.006
	N	125	124	125	123	105
Practice_Impact_3ItemSum	Pearson Correlation	.605**	1	.249**	.011	.342**
	Sig. (2-tailed)	.000		.006	.903	.000
	N	124	125	125	123	105
Practice_Skill_3ItemSum	Pearson Correlation	.254**	.246**	1	-.296**	.601**
	Sig. (2-tailed)	.004	.006		.001	.000
	N	125	125	126	124	106
Practice_Funding_3ItemSum	Pearson Correlation	.054	.011	-.296**	1	-.088
	Sig. (2-tailed)	.555	.903	.001		.373
	N	123	123	124	124	105
Experience 4Item_Scale: Removed Barnyard managment due to missing data.	Pearson Correlation	.268**	.342**	.601**	-.088	1
	Sig. (2-tailed)	.006	.000	.000	.373	
	N	105	105	106	105	106

**. Correlation is significant at the 0.01 level (2-tailed).

Model Results: The overall model performed well, explaining more than 38 percent of the total variance (R^2 = .384). For the data collected as part of the Eau Claire River Farmer Survey the results of the regression model indicate that only one factor influences landowner willingness to try or expand the use of conservation practices on their farm. While controlling for the influence of the other independent variables, the perception of the overall impact of practice adoption is the only significant factor that predicts higher levels of practice interest (as shown in Figure 14).

FIGURE 14: Regression Model (OLS)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.620[a]	.384	.360	1.72827

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.315	.498		-.632	.529
	Practice_Impact_3itemSum	.529	.078	.570	6.805	.000
	Practice_Skill_3itemSum	.132	.095	.143	1.384	.169
	Practice_Funding_3itemSum	.068	.063	.089	1.076	.285
	Experience 4item_Scale: Removed Barnyard management due to missing data.	-.005	.081	-.006	-.056	.955

a. Dependent Variable: Practice_Interest_3itemSum

The model demonstrates that for agricultural landowners in the Eau Claire River watershed whether or not they believe that *installing these practices on their property is likely to reduce algal blooms or other undesirable water quality problems in nearby waterways* is an extremely important part of their decision to adopt or expand the use of conservation practices.

Management Decisions

So what are the primary concerns of landowners when it comes to making decisions for their land? This final series of questions was designed to begin developing effective responses to these concerns, and serves to compliment the results of the modeling from the previous section.

Questions:

- **Impact:** Uncertainty about whether the money I invest will result in improvements in local water quality. (Mean score = .75)
- **Economic:** Concern that changing land management practices might reduce yields or overall farm productivity. (Mean score = .65)
- **Neighbors:** Concern that neighbors might not approve of the changes. (Mean score = -.41)
- **Trust:** Concern about working with agencies or groups whose views about land management methods may differ from my own. (Mean score = .54)
- **Paperwork:** The additional time spent doing paperwork isn't worth the cost share provided by organizations working to improve land management practices. (Mean score = .24)
- **Plan:** Not having a long term plan developed for my farm to ensure that changes to land management practices will produce the greatest benefit on my farm. (Mean score = .26)

FIGURE 15: Management Decisions & Barriers

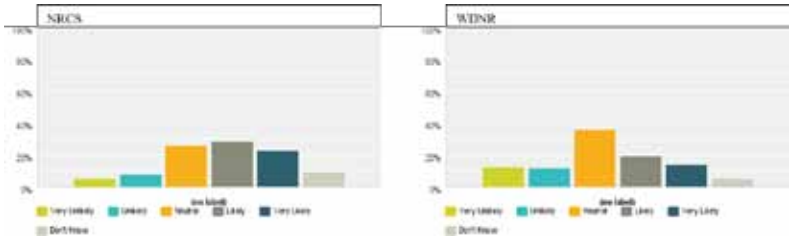
Group Differences:

- **Impact:** All 3 groups reported that they were somewhat concerned about whether the money they invest will result in improvements in water quality.
- **Economic:** Groups 1 and 2 reported a higher level of concern that changes might reduce yield or overall farm productivity than Group 3.
- **Neighbors:** None of the groups were very concerned (negative mean score) about whether or not neighbors will approve of their changes.
- **Trust:** All 3 groups are concerned about working with agencies whose views about land management differ from their own; however, Group 1 has a significantly higher level of concern than Group 2 or 3. Group 2's concern regarding agencies is also significantly higher than Group 3 with a stair step trend from Group 3 to 2 to 1.
- **Paperwork:** Group 1 is the most concerned about additional time spent doing paperwork followed by Group 2 who also raised this concern, while Group 3 is not concerned about this possibility.
- **Plan:** While not significant, Group 2 reported a higher level of concern about not having a long-term plan in place for their farm than Groups 1 or 3.

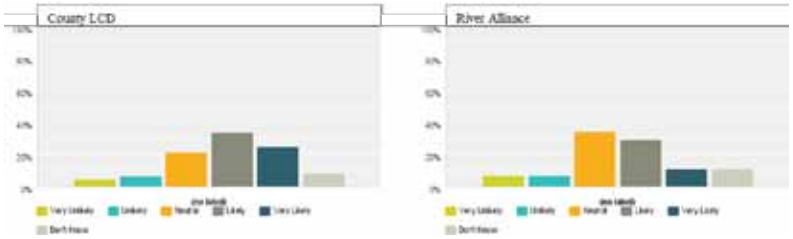
Contact: Who do they trust?

This series of questions is designed to help us understand how to most effectively communicate with farmers in the watershed by answering the question of who do they trust (or are willing to work with to address issues on their land).

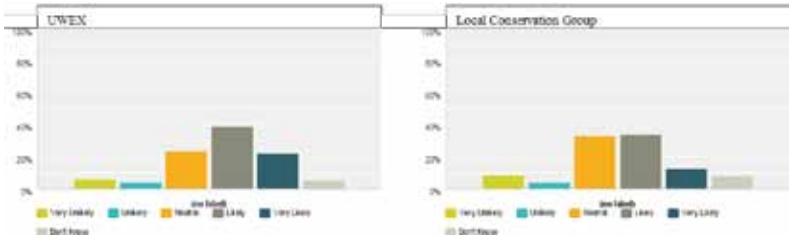
FIGURE 16: Trust (all respondents)



- **NRCS:** 56.7% of all respondents reported being likely or very likely to work with NRCS (14.4% are unlikely).
- **WDNR:** 30.8% of all respondents reported being likely or very likely to work with WDNR (26.7% are unlikely).



- **County LCD:** 64.3% of all respondents reported being likely or very likely to work with County LCD (12.5% are unlikely).
- **Wisconsin River Alliance:** 45.4% of all respondents reported being likely or very likely to work with River Alliance (16.4% are unlikely).



- **UWEX:** 64.1% of all respondents reported being likely or very likely to work with UWEX (11.1% are unlikely).
- **Local Conservation Group:** 50.0% of all respondents reported being likely or very likely to work with a local conservation group (14.0% are unlikely).

Group Differences: Group 1 is less likely to work with all groups than Group 2 who are less likely to work with all groups than Group 3.

FIGURE 17: Trust (group differences)

	NRCS	WDNR	County	Alliance	UWEX	Local
All	.60	.09	.74	.32	.68	.39
Group 1	.17	-.50	.25	-.42	.31	-.31
Group 2	.55	-.04	.73	.22	.48	.52
Group 3	.97	.73	1.06	1.00	1.21	.85
Mean scores ranging from +2 (Very likely) to -2 (Very unlikely)						

- **Group 1:** Most likely (in order) UWEX, County, NRCS / Least Likely (in order) WDNR, River Alliance, Local Conservation Group
- **Group 2:** Most likely (in order) County, NRCS, Local Conservation Group / Least Likely (in order) WDNR, UWEX, River Alliance
- **Group 3:** Most likely (in order) UWEX, County, River Alliance / Least Likely (in order) All scores close, minimal distinctions.

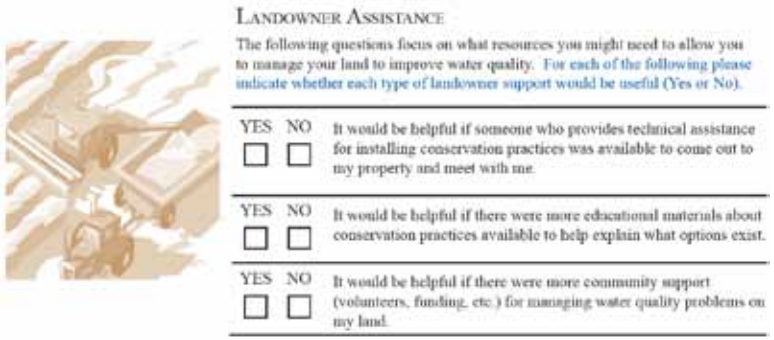
Approaches: Involvement in decision-making

The final section of the stakeholder profile focuses on how to engage landowners in conservation efforts in the Eau Claire River watershed. Specifically, the survey covered three relevant topics for implementation, including:

- Technical Assistance
- Governance & Decision-making (with an emphasis on Farmer-led Councils)
- Planning Scenario

Technical Assistance

As part of the introduction / warm-up questions respondents were asked about different types of conservation assistance that could be provided to landowners, the results indicate that:



LANDOWNER ASSISTANCE

The following questions focus on what resources you might need to allow you to manage your land to improve water quality. For each of the following please indicate whether each type of landowner support would be useful (Yes or No).

YES ☐ NO ☐ It would be helpful if someone who provides technical assistance for installing conservation practices was available to come out to my property and meet with me.

YES ☐ NO ☐ It would be helpful if there were more educational materials about conservation practices available to help explain what options exist.

YES ☐ NO ☐ It would be helpful if there were more community support (volunteers, funding, etc.) for managing water quality problems on my land.

- 50 percent of landowners would like someone with conservation expertise to come out and meet with them on their land to discuss installing conservation practices (that's more than 60 landowners in these 4 subwatersheds alone).

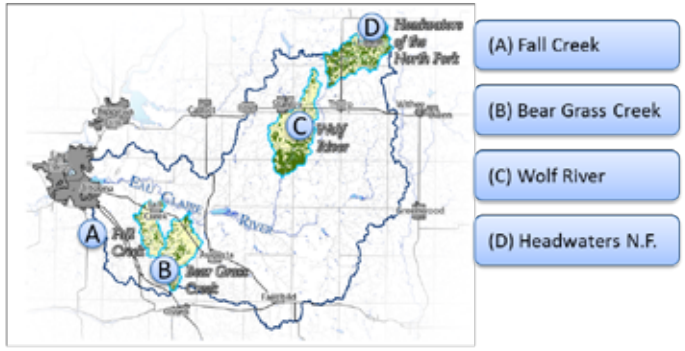
- 70 percent of landowners want additional educational materials that explain conservation options for their farm.

- More than half (52.5 percent) of landowners would like some form of community support to manage water quality issues on their land.

Governance & Decision-making

This section focused on asking stakeholders to evaluate farmer-led councils as a decision-making strategy for the Eau Claire River Watershed. They were presented with a description that highlighted that a farmer led council rely on the participation of interested landowners and parallels a farm advocacy group, the council of local farmers would work with interested landowners to get water quality projects completed on private properties, and this group would primarily consist of individual landowners with a vested interest in this landscape with support from individuals with technical expertise. They were then asked to rate their likelihood of participation, results are shown in Figure 18.

FIGURE 18: Views of Farmer-led Councils



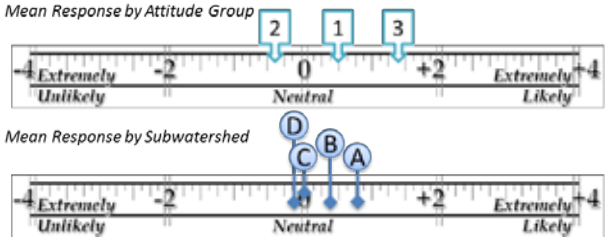
(A) Fall Creek

(B) Bear Grass Creek

(C) Wolf River

(D) Headwaters N.F.

How likely are you to participate in an effort that uses FARMER-LED COUNCILS for informing decision that impact how water quality is managed in the Eau Claire River Watershed?



Planning Scenario

This section of the survey challenged landowners to think through a hypothetical scenario designed to provide some generalized connections to the Eau Claire River watershed. As shown in Figure 19 below, they were then asked to evaluate problem solving approaches related to the scenario.

FIGURE 19: Problem Solving Approaches

Instructions: The following section contains a **scenario regarding a hypothetical community** and its attempt to address water quality issues in the rural landscape. Please read the following paragraphs and respond to the questions below.

Scenario: In Ashmore, many farmers knew that changes that had occurred over time to local agricultural practices were probably contributing to problems like the algae blooms, reduction in fish populations, and loss of water clarity in the local river. They also knew that while farming was not the sole cause of the river's poor health, money was now available to work with agricultural landowners to fund conservation practices that could provide significant improvements in the health of the river over the next decade.

QUESTION: How should Ashmore, or communities facing similar problems, use their limited resources for getting conservation practices installed on local farmland? Please rank the following options for how resources should be divided from (1) most desirable option to (5) least desirable option.

Median Ranking

(1) **Option 'B': Target community priorities, for example emphasizing restoration activities on land adjacent to or near the streams or rivers.**

(2) **Option 'C': Spread the resources so that all landowners who are interested receive some funding.**

(3) **Option 'D': Only work with those who are interested in addressing the problems on their land.**

(4) **Option 'A': First come, first served -- land owners who act quickly should receive the most benefit.**

(5) **Option 'E': Don't spend these resources on protecting the river, as this type of program will ultimately lead to higher taxes.**

Planning Scenario, Attitude Group Comparisons

The results show that Option 'B' (targeting community priorities) emerged as a top option for all 3 groups; however, landowners belonging to attitude Group 1 are significantly less supportive of this option than those in attitude Group 3. Additionally, Option 'C' (spread resources for all landowners) was ranked as a top selection for all 3 attitude groups. Option 'E' (don't spend these resources) was among the 2 least desirable options for all 3 groups; however, Group 1 is significantly more supportive of this option than Groups 2 or 3.

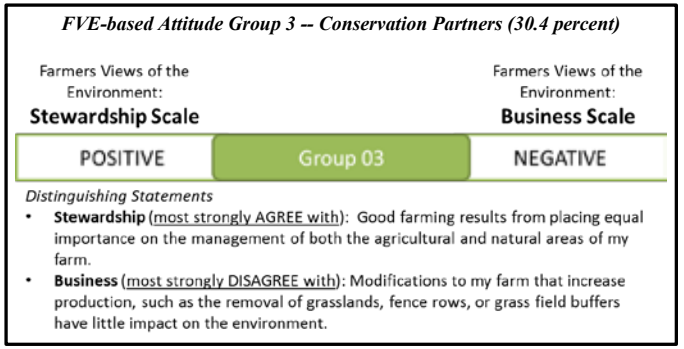
Working Together to Solve Water Quality Challenges

The survey responses and resulting stakeholder profiles have provided us with a significant amount of information about the agricultural landowners who live, work, and recreate in the Eau Claire River watershed. Shedding light on similarities and differences is important for efforts to address water quality challenges, so how can we use this information to inform future action? As an initial starting point this section highlights key findings from the survey that should guide future outreach efforts to agricultural landowners.

Key Finding #1

Need to respect the differences between the attitude-derived stakeholder groups -- discussed in detail on pages 21-23 of this report. Successful implementation of a watershed plan requires working with those landowners who either share the same long-term goals of cleaner water, or adapting the approach to find common ground with landowners whose values for the landscape differ from those of the watershed project. This research reveals that both approaches will be necessary to engage agricultural landowners in the Eau Claire River Watershed. Specifically, here are key questions related to engaging each of the stakeholder groups:

- **How do we identify and support landowners whose landscape goals are most similar to the long term outcomes that the watershed plan is trying to achieve?**
  - Group 3 emerged as strong conservation partners that are extremely supportive of the initial ECRWC mission statement and as a group expressed strong interest in increased conservation practice adoption on their farm.



- **How do we develop an inclusive strategy that reaches even those who may not strongly support the ECRWC's efforts?**
  - Group 1 is the biggest challenge as they don't share a strong connection to the goals of the watershed effort and are the least willing to work with potential partners.

FVE-based Attitude Group 1 – Farm is a Business (24.1 percent)

Farmers Views of the Environment: Stewardship Scale		Farmers Views of the Environment: Business Scale
NEGATIVE	Group 01	POSITIVE

Distinguishing Statements

- **Stewardship** (most strongly DISAGREE with): To protect the rural landscape, farmers must move away from conventional agricultural practices to approaches that more closely mimic natural processes.
- **Business** (most strongly AGREE with): Good farming requires using all available acreage as efficiently as possible to maximize yields.

  - A key to Group 1's involvement did emerge from the survey as results revealed consensus on important messages to engage all landowners. Nearly all landowners responded that they were supportive of efforts to enhance soil health, reduce soil erosion, and prevent phosphorus loading. These can serve as a baseline for all landowners, while more advanced strategies should target areas with a higher percentage of willing conservation partners.

There is consensus that enhancing SOIL HEALTH, REDUCING SOIL EROSION AND preventing PHOSPHORUS LOADING in the river are clear goals for this landscape

- **How does an implementation strategy for agricultural conservation practices differ when we acknowledge the competing demands on the landscape?**
  - Group 2 may be the most important of all of the stakeholder groups, as they represented a larger share of the total survey respondents and they share values with both of the other groups. Meaning that strategies designed to engage them are also more likely to also be acceptable to members of Group 1 or Group 3.
  - The survey revealed that Group 2:
    - prefers to work with County Land Conservation or NRCS.
    - is the least likely to support a farmer-led council as a problem solving approach for water quality efforts.
    - has a higher level of interest in conservation practices than Group 1, but not as high as Group 3.
  - The regression model results revealed that the perceived impact of installing a practice is important to all landowner's decision to adopt the practice. For Group 3 this may require identifying cost effective conservation strategies and generating data necessary to provide feedback on their effectiveness over time.

FVE-based Attitude Group 2 – Balancing Competing Demands (45.5 percent)

Farmers Views of the Environment: Stewardship Scale		Farmers Views of the Environment: Business Scale
POSITIVE	Group 02	POSITIVE

Distinguishing Statements

- **Stewardship** (most strongly AGREE with): Good farming results from placing equal importance on the management of both the agricultural and natural areas of my farm.
- **Business** (most strongly AGREE with): Good farming requires using all available acreage as efficiently as possible to maximize yields.

Key Finding #2

The results of several sections of this report (including the regression modeling examining factors that influence interest in conservation practice adoption) point to the same conclusions:

Whether or not landowners believe that a practice will help address water quality issues is a critical part of their decision to adopt!

Key Finding #3

With more than half of all respondents asking for someone to come out to their farm and discuss options for improving conservation / water quality protection it's clear that there is a need for more boots on the ground to support already existing efforts. In addition, 70 percent of landowners want additional educational materials that explain conservation options for their farm.

This demand for additional services may require the funding of new positions to work directly with landowners on conservation efforts. Based on overall levels of trust across the 3 attitude groups, these positions should be housed within or closely connected to County Land Conservation Departments in the watershed.

Key Finding #4

The planning scenario results (shown below) tell us a lot about where the agricultural community is at with regard to support for efforts to address water quality problems. Specifically, the rejection by all attitude groups of Option E (don't spend these resources on protecting the river) indicates that this work is valued by agricultural landowners within the watershed. However, it's more complex at the top of the list as the most desirable Option B (targeting priorities) and Option C (spreading resources around) may be at odds with one another.

Median Ranking

(1) **Option 'B': Target community priorities, for example emphasizing restoration activities on land adjacent to or near the streams or rivers.**

(2) **Option 'C': Spread the resources so that all landowners who are interested receive some funding.**

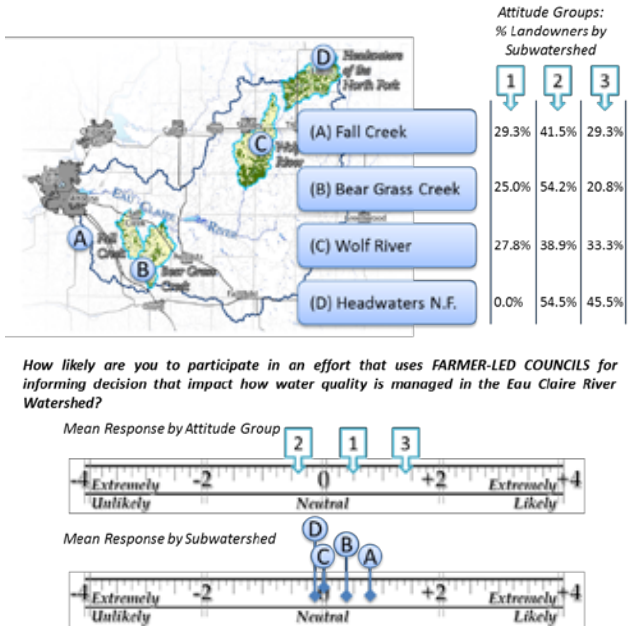
(3) **Option 'D': Only work with those who are interested in addressing the problems on their land.**

(4) **Option 'A': First come, first served -- land owners who act quickly should receive the most benefit.**

(5) **Option 'E': Don't spend these resources on protecting the river, as this type of program will ultimately lead to higher taxes.**

Key Finding #5

It is also important to note that the social data provides us with additional spatial information for targeting the correct message or outreach strategy to landowners. The table on the right side of the figure below shows the Group membership breakdown for each of the subwatersheds. In addition, it will be necessary to identify new approaches for landowner engagement in developing conservation strategies for the Eau Claire River watershed. However, the survey revealed some caution about pursuing farmer-led councils that have recently been promoted throughout Wisconsin. The analysis suggests that for the key Group 2 that they are the least likely (slightly negative) to participate in such a council. There is also variation by subwatershed with Fall Creek being the most likely and Headwaters North Fork of the Eau Claire being the least likely to engage in farmer-led councils.



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