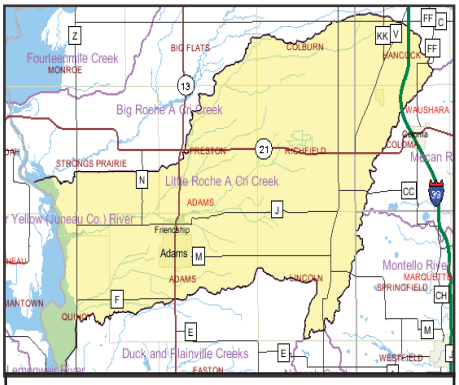
Little Roche-a-Cri Watershed

2010 Water Quality Management Plan Update

Central Wisconsin River Basin, Wisconsin

August 2010

The Little Roche-a-Cri, a 196 mi² watershed, is located in the southern part of the Central Wisconsin River Basin in Adams, Waushara and Marquette Counties (Map 1). The Basin contains numerous rock outcroppings and beautiful flowages and is characterized by agricultural activities throughout the basin, with intensive row cropping and vegetable production taking place in the central sands region.



Map 1: Little Roche-a-Cri Watershed

The last glaciers to shape Wisconsin only reached part of the basin, consequently affecting the Little Roche-a-Cri Watershed topography. The glaciers created a network of warm and cold water streams, fed by surface and groundwater sources, that all connect to the Wisconsin River. Over 108 stream miles, 168 lake acres and 18,000 wetland acres are located in the Little Roche-a-Cri Watershed.

Watershed Details

Population and Land Use

Land use characteristics have changed significantly since European Settlement in Wisconsin, as woodlands, wetlands and grasslands covered the entire watershed during the Presettlement Period (Figure 1). Figure 2 shows watershed land use data from the 2001 National Land Cover Inventory dataset, which illustrates the variety of land use types in the watershed. Today, agriculture and forest are the two dominant types, with wetlands and open space and open water, third and fourth respectively.

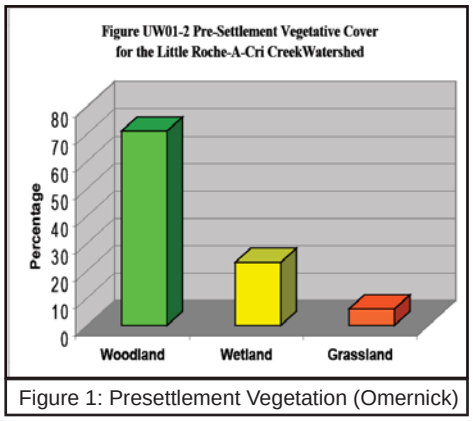


Figure 1: Presettlement Vegetation (Omernick)

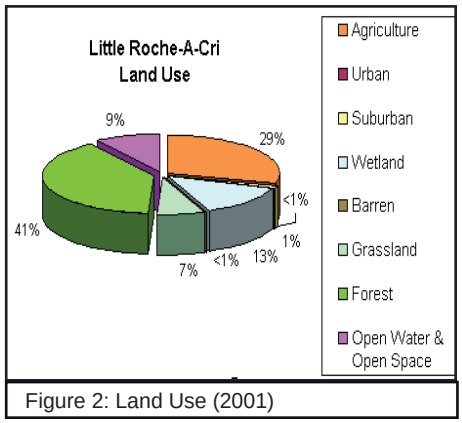
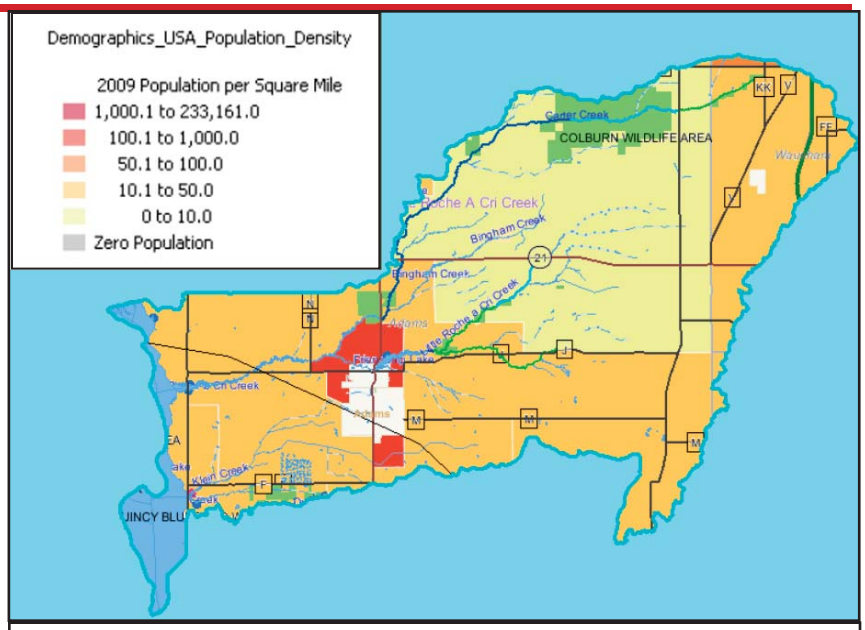


Figure 2: Land Use (2001)

Contents

Map 3 shows a generalized breakdown of population density in the region as characterized by national census data, with 10 to 50 persons per square mile the most common density in the region and a slight increase of 50 to 100 persons per mile in the southern portion of the basin, near the Village of Adams.



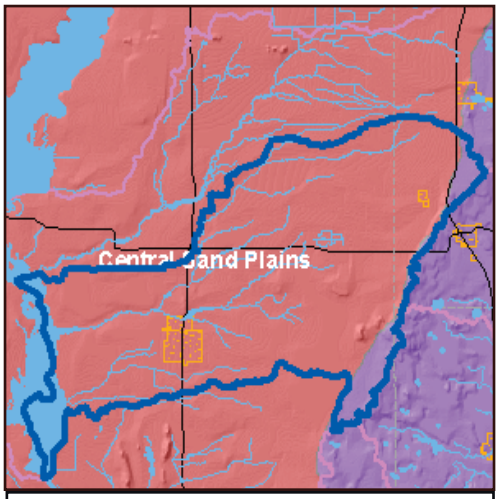
Map 3: Population Density

Hydrology

The central sands region is characterized by flat topography and flat watertable with highly permeable soils, which are predominantly sand and gravel. This results in rapid movement of groundwater to surface water and visa versa, resulting in many groundwater fed-streams and rapid groundwater recharge. These same characteristics have led to intensive irrigated agricultural use, depleting groundwater and affecting surface waters. These hydrologic characteristics go hand-in-hand with contamination of groundwater from fertilizers and pesticides.

Ecological Landscapes

The Little Roche-a-Cri Creek Watershed is located primarily in the Central Sand Plains Ecological Landscape which is located in central Wisconsin (Map 4). This landscape occurs on a flat, sandy glacial lake plain, and supports agriculture, forestry, recreation, and wildlife management. The Ecological Landscape formed in and around what was once Glacial Lake Wisconsin, which contained glacial meltwater extending over 1.1 million acres at its highest stage. Soils are primarily sandy outwash deposits, some with silt-loam loess caps. Sandstone bluffs or buttes -- carved by rapid drainage of the glacial lake, or by wave action when they existed as islands in the lake -- are distinctive features of this landscape.



Map 4: Ecological Landscapes

Prior to European settlement, 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 Ecological Landscape. An area of more mesic forest with white pine and hemlock was found in the northwest portion, including a significant pinery in eastern Jackson County. Today, nearly half of the Ecological Landscape is nonforested and is used as agriculture and grassland. Most of the historic wetlands were drained early in the 1900s, and the land is now used for vegetable cropping. The forested portion is mostly oak-dominated, followed by aspen and pines, with a portion maple-basswood and lowland hardwoods.

Watershed History Note:

The Village of Coloma is located within the Little Roche-a-Cri Creek Watershed in Waushara County. Coloma's lollipop shaped water tower constructed in early 1940 was one of the first of its kind ever built. It was filled on July 2, 1940 with 57,000 gallons, the capacity of the sphere and pedestal. Coloma attained a bit of fame in the World Book Encyclopedia, beginning with the 1962 edition that reads: Chicago Bridge & Iron Co. A 77-foot high watersphere stores water for the Village of Coloma, WI. It has a 40,000 gallon water capacity.

Priority Issues

- Protecting the quantity and quality of groundwater in the watershed;
- Maintaining high quality naturally reproducing trout streams;
- Continued work to preserve baseflow in the area's cold-water fed trout streams;
- Identifying, tracking and reducing the spread of Aquatic Invasive Species and Terrestrial Exotics;
- Through Administrative Rule, establish a Public Interest Flow at Friendship Dam, to balance lake level and downstream water quality interests.

Water Quality Goals

- Conducting comprehensive stream surveys on impaired or potentially impaired streams;
- Installation of in-stream habitat where habitat is a limiting factor for biological condition;
- Continued gathering of continuous water temperature data on streams where temperature may be a limiting factor for biological response;
- Wetland restorations for those lost and potentially restorable wetland areas;
- Ongoing evaluation of groundwater quality and quantity as land uses continue to change and if/when development occurs, including baseflow monitoring in local streams to track impacts from groundwater withdrawls.

Overall Condition

Overall, the Little Roche-a-Cri Watershed has fairly healthy surface water quality. Multiple Exceptional Resource Waters and Trout Class II and III streams are located in the area. However, groundwater quantity and quality pose specific challenges, as high nitrogen levels in the shallow aquifer may result in nitrate contamination of these regionally baseflow-fed cold water streams. Historic wetland losses and placement of tiles and/or ditches for agricultural purposes have also altered the regional hydrology, which affects water quality and the downstream aquatic systems.

Point and Nonpoint Sources

Adams Wastewater Treatment Plant

The Adams wastewater treatment plant is designed to discharge 436,000 gallons of water aday to the Little Roche-a-Cri Creek. The facility's oxidation ditches, built in the year 2000, are designed to function until the year 2020. The annual average design biological oxygen demand (BOD) is 800 pounds a day. The plant is designed to serve a population of 4202 people. Currently, the plant serves about 2600 people. In 2009 the plant's annual average influent flow was 208,000 gallons a day adn the annual influent BOD was 601 pounds per day.

Grande Cheese Company Food Ingredients Division

This facility, in Friendship, produces powders and liquids for food products. The facility generates wastewater from cleaning equipment, boiler blowdown, noncontact cooling, and separating processes. The wastewater is segregated into high, medium, and low strength flows. About 35,000 gallon per day of high strength wastewater (whey solids, and food ingredient residuals, boiler blowdown, and some rinse water) is landspread on approved sites. Medium strength wastewater (process and cleaning operations waters, non-contact cooling water, reverse osmosis retentate and cooling tower blowdown) is discharged to a constructed ridge and furrow system at a rate of about 50,000 gallons per day. Low strength wastewater (noncontact cooling waters and reverse osmosis permeate) is discharged to the Little Roche-a-Cri Creek at a rate of about 50,0000 gallons per day.

Based on the 2001 National Land Cover Inventory, agriculture comprises 30% of the watershed's land uses. In 2000-02, the Little Roche-a-Cri Watershed was evaluated for nonpoint source runoff problems for streams, lakes and groundwater and was ranked as a "medium priority" for lakes and streams and a "high" priority for groundwater. These rankings reflect the groundwater summary described below.

Rivers and Streams

Bingham Creek
Bingham Creek is classified as a forage fishery. A cranberry marsh lies near Bingham Creek below Unnamed Lake (T18N, R6E, Sec.21). Biotic index sampling in 1979 indicated very good and excellent water quality. However, this data is quite old and the stream should be resampled as resources allow.

Carter Creek
Carter Creek is classified as a warm water sport fishery and a Class I, II, III trout fishery, depending on its stream segment. Roche-A-Cri State Park, Carter Creek Fishery Area and Colburn Public Hunting Grounds are in the vicinity of, or adjacent to, the creek. Beaver and beaver dams have cause severe problems, especially in the Colburn Public Hunting Grounds (Ironside, 2001). In-stream cover is poor and the reproduction potential is limited due to lack of spawning areas. Rough fish have access from the Wisconsin River via Little Roche-A-Cri Creek.

Biotic index sampling in 1979 indicated good and very good water quality. The town of Colburn is located in the upper watershed where wind erosion occurs (Adams County, 1987). This data may be of limited use due to changes in the watershed over 30 years. Nutrients and pesticides may be entering the creek (Schultz, 1989).

Fordham Creek
Fordham Creek is recognized as the finest Class I trout stream in Adams County, supporting strong naturally reproducing populations of brook, brown and rainbow trout (Ironside). Siltation and sedimentation are existing problems throughout the stream resulting in the loss of spawning substrate for fish as well as the loss of very valuable pool cover. A trout habitat improvement project was performed in the summer of 2001. The project included brushing the streambank, installing brush bundles to narrow the stream channel, and installing overhead cover and mid-channel cover. Future work on the Fordham could include installing sediment traps to collect shifting sediment and installing overhead cover and mid-channel cover (Spaeth, 2002).

The towns of Richfield and Lincoln are located within the upper portion of the Fordham Creek Watershed. This is a wind erosion control priority area where sediment could enter the surface water. Nutrient and pesticide loading may also be impacting water quality (Schultz, 1989).

Little Roche-A-Cri Creek
Little Roche-a-Cri Creek is classified as warm water sport fishery and a Class I, II, III trout fishery, depending on its stream segment. Habitat improvement efforts including overhead cover, mid-channel cover, the creation of pool cover, as well as bank stabilization may expand the potential of the Class II portion of Little Roche-A-Cri Creek (River Mile 13.7 - 22.0).

Biotic index sampling in the spring and fall of 1979 indicated very good and good water quality. The upper portions of Little Roche-A-Cri Creek lie in the town of Richfield. This is a wind erosion control priority area. Ditches in the watershed lead to nutrient and pesticide loading. The city of Adams WWTP discharges effluent to Little Roche-A-Cri Creek.

Lake Health

Adams County has a successful Citizen Monitoring program established for lakes. Adams County is encouraged to seek grant opportunities to continue their Citizen Lake Monitoring work.

Friendship Lake, located in Adams County, is a 115-acre impoundment of the Little Roche-a-Cri Creek with a maximum depth of 16 feet. The lake's fishery consists mainly of warm water fish species including large mouth bass and panfish. The stream flowing into the lake is classified as a Class I fishery. Brown trout have been known to reside in the lake once fall turn over has occurred. During the summer, increased plant densities have become a problem resulting in low dissolved oxygen levels and stagnate backwaters. The lake association, in conjunction with the DNR, has created a lake management plan and established self-help monitoring to reduce aquatic plant populations and other possible problems.

At the present time there are no operating level established at Friendship Dam, only a normal water level reference of 937.49 LBM evaluation. The minimum interest flow established below the dam is based on standard 25% of normal flow, but has not been specifically established for the stream, nor are there any measurable references. At the request of the

Friendship Lake Association, the WDNR will include a project in the next bi-annual work plan to establish a low water operating level, or a set of conditions for low water level operation. To assure protection of the waterway, the WDNR will establish a pubic interest flow below the dam with visual reference for public interest level.

Wetland Health

Wetland Status

The Little Roche-a-Cri Watershed is situated in the southern part of the Central Wisconsin Basin in Adams, Waushara and Marquette Counties. The area is characterized by agricultural activities throughout the basin, with intensive row cropping taking place in the central sands region. An estimated 12% of the current land area in the watershed is wetland. About 77% of the original wetlands in the watershed are estimated to exist (Figure 3). Of these wetlands, the majority include forested wetlands (42%), shrub wetlands (24%), and emergent wetlands (24%), which include marshes and wet meadows.

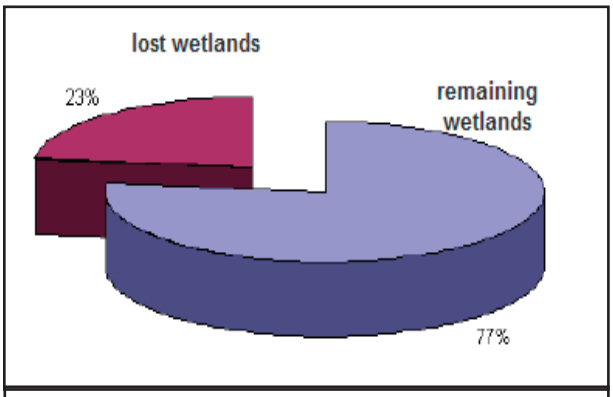


Figure 3: Percentage of Wetlands "Lost" versus "Remaining"

Wetland Condition

Little is known about the condition of the remaining wetlands but estimates of reed canary grass infestations, an opportunistic aquatic invasive wetland plant, into different wetland types has been estimated based on satellite imagery. This information shows that reed canary grass dominates 50% of the existing emergent wetlands and 26% of the remaining shrub wetlands. Reed canary grass domination inhibits successful establishment of native wetland species.

Wetland Restorability

Of the 4,506 acres of estimated lost wetlands in the watershed, approximately 93.6% are considered potentially restorable based on modeled data, including soil types, land use and land cover (Chris Smith, DNR, 2009).

Groundwater

The Little Roche-a-Cri Creek Watershed contains the City of Adams and the Village of Friendship. These two municipalities share the same water source. The City of Adams owns three wells, two that withdraw water from the sandstone aquifer and one that draws from the shallower sand and gravel aquifer. Adams, in turn, sells water to the Village of Friendship. The sandstone aquifer, which is protected by a clay overburden, was the traditional aquifer for these communities. The water is of very good quality with the exception of slightly elevated iron and manganese concentrations. Iron and manganese are naturally occurring elements that can cause aesthetic problems such as red, brown or black water, staining of fixtures and clothing, as well as imparting taste and odor to the water.

The City elected to tap the shallower sand and gravel aquifer in the area with their newer Well 4 to avoid problems from iron and manganese. Iron and manganese were successfully avoided, but the shallower sand and gravel aquifer is more susceptible to contamination from the surface. Even though a wellhead protection program was adopted for this well, volatile organic compounds, related to gasoline discharges, have been detected in this well. Concentrations of these compounds remain lower than the Safe Drinking Water Act Standards; therefore, the well remains in use and is monitored on an annual basis.

All three wells are very low in nitrates (less than 1.0 ppm), and fluoride is the only chemical added to the water to optimize the prevention of dental cavities. Chlorination facilities are available if the need for emergency disinfecting was to occur.

The University of Wisconsin Stevens Point Groundwater Task Force conducted well samples in every watershed in the Central Wisconsin Basin for nitrates and triazine. In the Little Roche-a-Cri Watershed, 277 wells were tested for traces

of nitrates. Of the 277 wells tested, 13.7 percent of them were over the allowable 10 parts per million for safe drinking water. Of the wells that are over 10 parts per million, 5.7 percent of those wells contained concentration greater than 20 parts per million. This exceeds the basin average by 3.2 percent and is the second highest percentage for concentrations greater than 20 parts per million or greater throughout the entire Central Wisconsin Basin.

Of the 29 wells tested for triazine in the Little Roche-a-Cri Watershed, 3.4 percent of those tested had concentrations over 1.1 parts per billion. None of the samples taken were over 3.0 parts per billion. Since triazine can not be used to set standards for drinking water limitations it is strongly recommended that if a test result comes back above 1 part per billion of triazine the well should be tested further for total concentrations of atrazine.

Little Roche-a-Cri Outstanding and Exceptional Resource Waters

Official Waterbody Name	WBIC	ORW/ERW	Start Mile	End Mile	Code Reference
Carter Creek	1351200	ERW	21.98	25.2	102.11(1)(a)
Fordham Creek	1352200	ERW	0	6.53	102.11(1)(a)
Little Roche A Cri Creek	1351100	ERW	13.01	17.46	102.11(1)(a)

Waters of Note

Outstanding and Exceptional Waters
There are three exceptional resource waters in the watershed. To the right is a list of these waters, showing the Carter Creek, Fordham Creek and Little Roche-a-Cri as designated Exceptional Resource Waters.

Trout Waters
The same streams as listed above are also considered Official Trout Streams under the Water Divison's Fisheries Management Program. Class I streams are those that are soley naturally reproducing; Class II are streams that have some propagation but which also support natural reproduction; and Class III (the lower end of Carter Creek), are those streams that are supported soley by stocking. Evaluation of streams for trout reproduction occurs throughout the state on an ongoing basis as resources allow.

Little Roche-a-Cri Trout Waters

Official Waterbody Name	Waterbody ID Number	Start Mile	End Mile	Trout Class
Little Roche A Cri Creek	1351100	12.76	13.01	CLASS III
Little Roche A Cri Creek	1351100	13.01	17.46	CLASS I
Little Roche A Cri Creek	1351100	17.46	20.76	CLASS II
Carter Creek	1351200	3.47	17.62	CLASS III
Carter Creek	1351200	17.62	21.98	CLASS II
Carter Creek	1351200	21.98	25.2	CLASS I
Fordham Creek	1352200	0	6.53	CLASS I

Impaired Waters
Impaired waters in the watershed include the receiving waters connected with the area -- Castle Rock Lake on the Wisconsin River -- which is listed for dioxin in contaminated sediment and excess phosphorus in the water column causing eutrophication of the lake.

Watershed Actions

Watershed Grants and Projects

Lake Protection 09/01/2003 Complete - Adams County Lakes

Lakes Classification - Phase 1: Adams County initiated a Lakes Classification effort to assist in comprehensive plan development for communities surrounding its lakes with public access.

Phase 1 elements, funded with this grant, include:

1) delineation of surface watersheds and flow patterns,
2) delineation of ground watersheds,
3) identification and mapping of land uses,
4) inventory and mapping of shoreline erosion and development problems,

5) identification and mapping of sensitive/critical areas and natural heritage habitats,
6) verification of wetland delineations,
7) delineations of lake watersheds,
8) development of lake maps.

09/01/2004 Complete - Adams County Lakes
Lakes Classification Phase 2: Adams County continued its lake classification efforts through collecting and assessing chemical and biological data on all lakes within the county that provide public access points. Major project components included:

1) collection and assessment of chemical and biological data,
2) development of a "library" of information for public use,
3) development of management recommendations,
4) I&E for riparians and lake users.

09/01/2005 Complete - Adams County Lakes
Lakes Classification Phase 3: Adams County wrapped up its county-wide lake classification effort. Major project elements include:

1) completion of water sampling,
2) development of lakes classification report and individual lake summaries,
3) development of a powerpoint presentation,
4) four public meetings,
5) expansion of shoreline restoration packet.

Lake Protection Grant - Castle Rock Lake 09/01/2006 Complete
Adams County: Castle Rock Restoration: Adams County provided up to 75% of the cost of shoreland restoration practices to lake front property owners on Castle Rock Lake. Grant funds were distributed to fund removal of sea walls, minor bank re-shaping, placement of rip-rap, establishment of vegetative buffers and implementation of individual stormwater management plans. Special Conditions: 1) Space between rip-rap to be filled with soil and vegetated to facilitate successful access of turtle hatchlings to water. Lupine seed should be a wild variety that is compatible with Karner Blue butterflies, and 2) Permits will be secured by individual property owners prior to construction.

Small Scale Lake Planning Castle Rock Lake 10/01/2001 Complete
Adams County Shoreline Restoration Workshop For Professionals: The Adams County Land Conservation Department worked with local lake associations, UWEX and other interest groups to produce a workshop for local professionals. This workshop was designed to:

1) Establish an informed network of professionals who will be qualified to share information,
2) To educate others, and
3) Assist lakefront property owners with their lakeshore restoration efforts so that water quality of the major watersheds of Adams County will be protected and improved.

The Department of Natural Resources was provided with both a paper and electronic copy of the final report and results were disseminated to the public through local newspapers, radio stations and local newsletters.

Monitoring Projects:

Fisheries Monitoring:
Fisheries montioring includes "baseline" monitoring and targeted fieldwork which was conducted to gain specific knowledge related to Wisconsin's fish communities. Bingham Creek, Carter Creek, Castle Rock Lake, Fordham Creek, Friendship Lake, Klein Creek, Little Roche-a-Cri Creek, Unnamed

Aquatic Invasives (AIS)
In close cooperation with UW Extension and Wisconsin Sea Grant, WDNR conducts and funds education efforts that focus on working with resource professionals and citizens statewide to teach boaters, anglers, and other water users how

to prevent transporting aquatic invasive species when moving their boats.

Citizen-Based Stream Monitoring
Citizen stream monitoring is conducted on two stream sites in the watershed .

Citizen Lake Monitoring Network
Area citizens have been conducting monitoring for a variety of purposes in the watershed, incuding: water quality, aquatic invasives, ice observations, and loon monitoring.

Natural Community Stream Reference Sites 05/01/2008 - Active
This study involves reference site selection and monitoring using the 2008 Streams Natural Communities dataset based on stream flow and temperature modeled by WDNR Integrated Science Services and USGS Region V States. This study evaluates highest quality streams representative of each of the eleven proposed natural communities. The purpose of the study is to provide the range of biological and ecological conditions for specific communities through determining the "potential biological use" of each and to gather information that will provide insight into the value of the 11 distinct natural communities for state assessment and water quality standards work.

West Central Region Clean Water Act Study 04/01/2007 - Complete
This was an intensive study of randomly identififfied samples statewide for Clean Water Act evaluation monitoring, including fisheries, habitat, chemistry and macroinvertebrates to study the general condition of Wisconsin's waters.

The Wisconsin River is listed as impaired for a Wis River TMDL Data Collection 04/08/2010 - Active
Wisconsin River and Impoundment Study to determine sources and

Recommendations:

Streams:
- WDNR should conduct wadable baseline monitoring on watershed streams and lakes.
- Evaluate Stream Baseflow Flow monitoring on Carter Creek (1351200).
- Conduct targeted monitoring on Little Roche-a-Cri Creek, including electrofishing for IBI determination, placement of temperature loggers and collection of macroinvertebrates.

Lakes:
- Citizen Lake Monitoring Network opportunities should be encouraged among watershed agencies and residents.
- WDNR should incorporate lake summaries from the Adams County project into its data systems.
- Through administrative rule, establish a Public Interest Flow at Friendship Dam to balance water level / lake level concerns and downstream water quality interests and help protect habitat below the dam.
- Adams County has a successful Citizen Monitoring program established. Adams County is encouraged to seek grant opportunities to continue their Citizen Lake Monitoring work

Wetlands:
- Identify specific wetlands in the watershed that can be restored; work with local governmental agencies to enhance restoration of wetlands infested with Reed Canary Grass.
- Work with county, state and federal partners to ensure protection of remaining wetlands within this relatively ecologically healthy watershed.

Watershed: Assess Watershed Condition
- Evaluate stations/data and river segments to determine if reduction of pollution from controllable factors is having an impact.

Contributors:

- Scott Watson, Basin Supervisor
- Scott Provost, Water Quality Biologist
- John Exo, UW-Extension Basin Educator
- Lisa Helmuth, Water Resources Management Specialist
- Amanda Lederer, Water Resources Management Specialist
- Mark Binder, GIS Analyst
- Additional Staff in the Central Wisconsin River Basin
- Comments by Chris Murphy, Adams County Conservationist

Wisconsin Department of Natural Resources
Box 7921, WT/3
Madison, WI 53707-7921
Equal Opportunity Employer

Americans with Disabilities Act Statement
This publication is available in alternative format (large print, Braille, audio tape. etc.) upon request. Please call (608) 267-7694 for more information.

Friendship Lake, Courtesy of the Adams County Land and Water Conservation Website.

DNR PUB WT- 936

UW Extension
Basin Education Initiative

Wisconsin DNR's mission involves preserving, protecting, and restoring natural resources. Watershed Planning provides a strategic review of water condition to enhance awareness, partnership outreach, and the quality of natural resource management.

Little Roche-a-Cri