

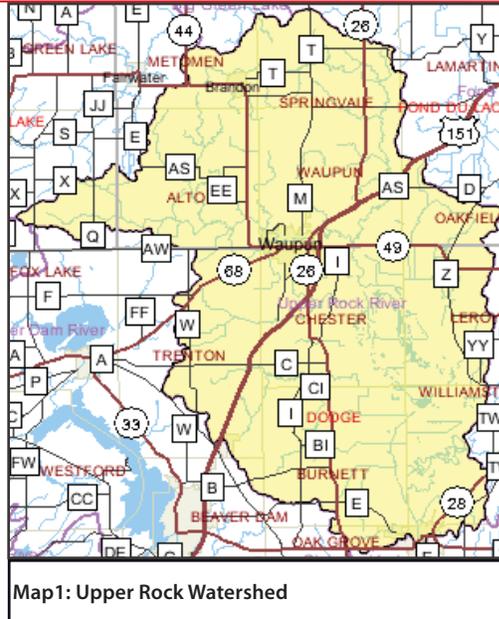
2010 Water Quality Management Plan Update

Upper Rock River Basin, Wisconsin

August, 2010

The Upper Rock watershed is divided roughly in half by a county boundary; the northern portion of the watershed is in Fond du Lac County and the southern portion is in Dodge County. A very small portion of the watershed lies in Green Lake County (Map 1).

The major landscape feature of the watershed is the 31,904 acre Horicon Marsh. This vast cattail marsh is managed partially by the U.S. Fish & Wildlife Service as the Horicon National Wildlife Refuge and partially by the Wisconsin Department of Natural Resources as the Horicon Marsh State Wildlife Area.



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Watershed Details

Population and Land Use

The watershed encompasses approximately 259 square miles and includes 335 total stream miles, 1,629 total lake acres, and 34,062 total wetland acres. Agriculture activities and wetlands dominate the landscape in the watershed, with open water/open space and suburban development occurring as minor features (Table 1).

Table 1: Land Use, Upper Rock Watershed

Land Use	Total Acres	Percent of Watershed
Agriculture	108,455	65.8
Urban	1,135	0.7
Suburban	4,099	2.5
Wetland	34,062	20.7
Barren	133	0.1
Grassland	1,199	0.7
Forest	5,358	3.3
Open Water	6,595	4.0
Open Space	3,831	2.3
Total	164,866	100%

Hydrology

In addition to Horicon Marsh, the dominant water features of the watershed include the West Branch of the Rock River and the South Branch of the Rock River. A number of small creeks, drainage ditches, and small ponds comprise the remainder of the water features.

Ecological Landscapes

The Southeast Glacial Plains Ecological Landscape makes up the bulk of the non-coastal land area in southeast Wisconsin. This Ecological Landscape is made up of glacial till plains and moraines. Most of this Ecological Landscape is composed of glacial materials deposited during the Wisconsin Ice Age, but the southwest portion consists of older, pre-Wisconsin till with a more dissected topography. Soils are lime-rich tills overlain in most areas by a silt-loam loess cap. Agricultural and residential interests throughout the landscape have significantly altered the historical vegetation. Most of the rare natural communities that remain are associated with large moraines or in areas where the Niagara Escarpment occurs close to the surface.

Historically, vegetation in the Southeast Glacial Plains consisted of a mix of prairie, oak forests and savanna, and maple-basswood forests. Wet-mesic prairies, southern sedge meadows, emergent marshes, and calcareous fens were found in lower portions of the Landscape. End moraines and drumlins supported savannas and forests. Agricultural and urban land use practices have drastically changed the land cover of the Southeast Glacial Plains since Euro-American settlement. The current vegetation is primarily agricultural cropland. Remaining forests occupy only about 10% of the land area and consist of maple-basswood, lowland hardwoods, and oak. No large mesic forests exist today except on the Kettle Interlobate Moraine which has topography too rugged for agriculture. Some existing forest patches that were formerly savannas have succeeded to hardwood forest due to fire suppression.

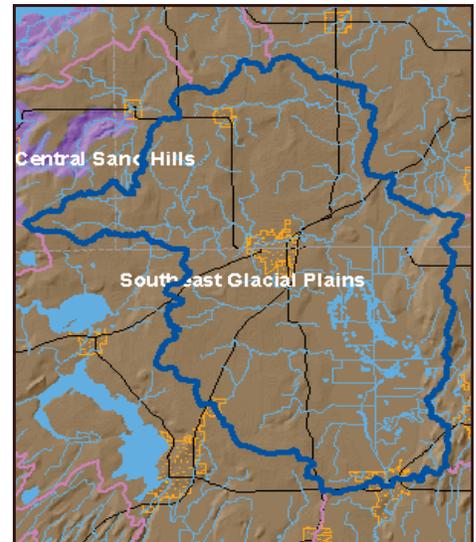
Historical Note

The Village of Waupun, in the Rock River Valley, was founded in 1839 by Seymour Wilcox. Waupun was settled by a mix of Irish, English, Scottish, German, Norwegian and Dutch settlers.

In 1851, Waupun was chosen as the site for a state penitentiary because of the great abundance of limestone and the close proximity to the proposed Rock River Valley Railroad. Seymour Wilcox donated 20 acres of land to the state for the construction of the prison that opened its doors in 1852. The original cell hall had 288 cells and was built using convict labor at a cost of \$325 a cell. This magnificent structure is located in the heart of the city with all of the original building in use today.

The railroad reached Waupun in the mid-1800s. As a result of the railroad's arrival, Waupun became a prosperous hub of commerce and industry. The man who made the most significant impact on industry in Waupun was Clarence Addison Shaler. Shaler was an educated farmer who turned into an industrial mogul. With his innovations, foresight and leadership, Shaler brought economic progress to the city. Umbrellas, vulcanizers, golf clubs and rivets were all a part of his manufacturing successes. Today, National Rivet stands in downtown Waupun, a tribute to Shaler and his contribution to Waupun's industrial success, along with the original 1904 Carnegie Library.

National Rivet started as a manufacturer of fastening components for brake linings in the 1920s. As a supplier of aluminum aircraft rivets during World War II, the company really "took off". Once we demonstrated our quality capabilities and production capacity, virtually all of the aircraft rivets for the American war effort came through National Rivet's Waupun, Wisconsin facilities, where we are still located today. During the War, National Rivet earned an "E Flag", which is a production efficiency award from the Army and Navy.



Map 2 Ecological Landscapes of the Upper Rock Watershed

Watershed Condition

Priority Issues

Issues of concern in the watershed focus on sediment and nutrient (nitrogen and phosphorus) delivery to waterbodies resulting in poor water quality and protection and restoration of wetlands throughout the watershed.

Water Quality Goals

- Create and implement Rock River Recovery Plan in the Upper Rock Basin for specific streams and wetlands where phosphorous and sediment reduction goals are established through Total Maximum Daily Load (TMDL) development.
- Identify, protect, and restore critical wetland areas to provide ecosystem stability including pollutant attenuation, critical habitat and other important functional values.

Overall Condition

The Upper Rock Watershed includes a globally unique resource - the Horicon Marsh and its associated waters. This ecological feature is a critical resource for short-term restoration and long-term protection as it hosts thousands of migratory birds, a diverse array of amphibians, and critical habitat for some of the state's most common lake species. Reducing agricultural impairments associated with the marsh and its tributaries is imperative for regional resource protection and maintenance.

Point and Nonpoint Sources

Both urban and rural development affect the quality of water resources in this basin. This area is the subject of monitoring, modeling and evaluation to address the known sources of pollution. Sediment and nutrient delivery to waterbodies is the primary concern; sources include, but are not limited to, agricultural land uses. Table 2 lists agricultural statistics for the Fond du Lac and Dodge County portions of the watershed.

Table 2: Agricultural Statistics for Watershed Counties

County	Average Soil Loss (tons/acre/year)	Percent of cropland acres eroding above	Percent of cropped fields maintaining residue levels above 30%
Fond du Lac County	1.4	24	32
Dodge County	3.0	21	27

Municipalities in the watershed include the City of Waupun, the Village of Brandon, and portions of the City of Horicon and the Village of Kekoskee. The wastewater treatment facilities from Waupun and Brandon, the sanitary districts of Burnett and Kekoskee, Saputo Cheese, and National Rivet & Manufacturing all discharge into the watershed (Table 3).

Table 3: Point Source Facilities in the Watershed

Facility Name	Permit Number	Design Flow (MGD)	Receiving Waterbody	Comments
Brandon WWTP	0023442-07	784 million gallons per day	Tributary to Gallagher Marsh then to South Branch of Rock River	Facility is in substantial compliance
Burnett Sanitary District	0031551-06	0375 million gallons per day	Spring Brook Creek then to Horicon Marsh	Facility is in substantial compliance
Waupun WWTP	0022772-08	1.8 million gallons per day	South Branch of Rock River	Facility is in substantial compliance
Leroy/Kekoskee Wastewater Commission	0035548-05	.058 million gallons per day	East Branch of Rock River	Facility is in substantial compliance
National Rivet & Manufacturing	0001996-07	NA	South Branch of Rock River via storm sewer	Facility is in substantial compliance
Saputo Cheese	0002003-06	NA	Alto Ditch to South Branch Rock River	Facility is in substantial compliance

River and Stream Condition

The major rivers in the watershed are the West Branch Rock River and the South Branch Rock River. A number of small tributaries, both named and unnamed, also populate the watershed. Water quality data has been collected primarily on the two major rivers in the watershed; limited data exists for the smaller tributaries. A table of all major rivers and streams can be found in Table 5 of this report.

In October 1997, a project was initiated by a local group to monitor sediment and phosphorous loading to Horicon Marsh. A DNR lake planning grant was obtained, and the U.S. Geological Survey (USGS) was hired to do the project. A continuous flow monitoring station was installed on the West Branch Rock River, on Hwy 49, prior to the West Branch entering Horicon Marsh but after the South Branch and West Branch combine. Stations were also installed on the East Branch Rock River prior to it entering the state end of Horicon Marsh and in the City of Horicon as the Rock River leaves Horicon marsh. In addition to continuous flow monitoring, an automatic sampler was installed at each station. The samplers were to monitor base flow conditions and storm/runoff events. Data was collected for two years and then analyzed and published by USGS.

Since that 1997-99 project, the US Fish & Wildlife Service (USFWS) initiated a watershed project to get best management practices, buffer strips and other practices installed and implemented on lands within the watershed. In 2006, USFWS secured funding to hire a retired Natural Resources Conservation Service (NRCS) District Conservationist through the Fond du Lac County Land & Water Conservation Dept. The employee was able to successfully work with the area land-owners to identify critical source areas, improve relationships with farmers, increase awareness of available programs and get practices implemented. Additional funding was obtained to continue the work through 2009 and is ongoing at this time.

Since initiation of the project, 726 tracts of land have been evaluated, which included contacts with 316 individuals. More than 16 miles of buffers have been installed and more than 47, 200 acres now have a conservation or nutrient management plan in place.

In addition to the watershed work, Administrative Code NR 217 was implemented which requires point source dischargers meet a 1 mg/l phosphorous discharge limit. This resulted in large decreases of phosphorous to the West and South branches of the Rock River.

In 2009, USFWS received a challenge cost share fund for another two-year monitoring project. Other partners for this project included USGS, DNR, Rock River Coalition, and Friends of the Horicon Marsh National Wildlife Refuge and the City of Horicon. A DNR river protection grant was obtained along with matching funds from USGS. The monitoring project began in October 2009 as a follow up to the monitoring project in 1997. The current monitoring is being conducted to assess the effectiveness of the point source reductions as well as the previous watershed work. Preliminary data suggests that the phosphorous reductions to the West and South branches of the Rock River have been substantial with base flow concentrations being reduced tenfold.

West Branch Rock River

The West Branch of the Rock River (Map 3) has its headwaters east of the Village of Brandon. It flows east and then south through mainly agricultural land. This area contains many drained wetlands, so there is likely a relatively high input of groundwater from drain tile.

Willow and Ladoga Creeks flow into the river from the west as the river flows south. There are no Surface Water Integrated Monitoring System (SWIMS) monitoring stations in this stretch; therefore, there is no water quality data available until the river intersects Highway 151 in the Town of Waupun (T-14-N; R-15-E, Sect 24, SWIMS station # 143258). Data from this station is limited legacy data from the winter of 1975-76. The next SWIMS station is approximately 500 feet south on Guenther Road (SWIMS station # 203105). There is an extensive amount of water quality data for this station dating from late 1997-2000.

The next SWIMS station is approximately two miles downstream at Oak Center Road. SWIMS lists four stations for this crossing. Two of the stations (203126 and 100000) have no data available in SWIMS. Station # 203129 has very limited

water quality data but two Hilsenhoff Biotic Index (HBI) surveys have been conducted showing a HBI of 6.56 (fairly poor) in 2000 and 5.54 (fair) in 2008. In 2000, fish and habitat surveys were conducted at Oak Center Road (station 10008399) showing an Index of Biotic Integrity (IBI) of 15 (very poor) and a Qualitative Habitat Rating of 40 (fair). The next monitoring downstream is approximately 1 mile south of the junction with the South Branch Rock River. The entire west Branch Rock River has been listed as an impaired water due to sedimentation, habitat degradation and excessive nutrients. Although the river has never been formally classified, it is a default warm water sport fishery, which would likely be the correct classification.

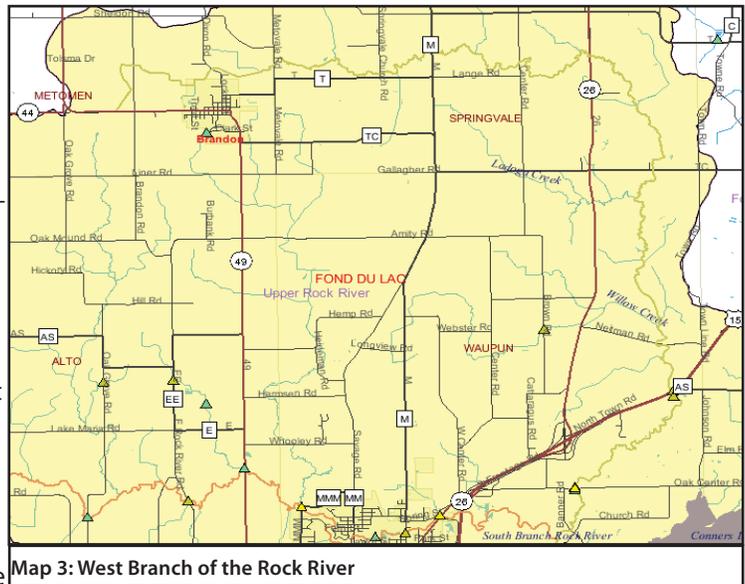
South Branch Rock River

The South Branch of the Rock River (Map 4) is approximately 23 miles long, with its headwaters in the far eastern portion of Green Lake County. The river flows east through Dodge County and combines with the West Branch Rock River approximately two miles east of the City of Waupun. As the River flows through the City of Waupun, there is a small dam that creates a five-acre mill pond. The entire South Branch Rock River is also on the Impaired Waters list. It is listed as impaired for habitat and sediment, although there are also excessive nutrients as identified in recent monitoring. Although only the lower three miles of the river are formally classified as warm water sport fishery, there is potential in the upper reaches to also have a sport fishery.

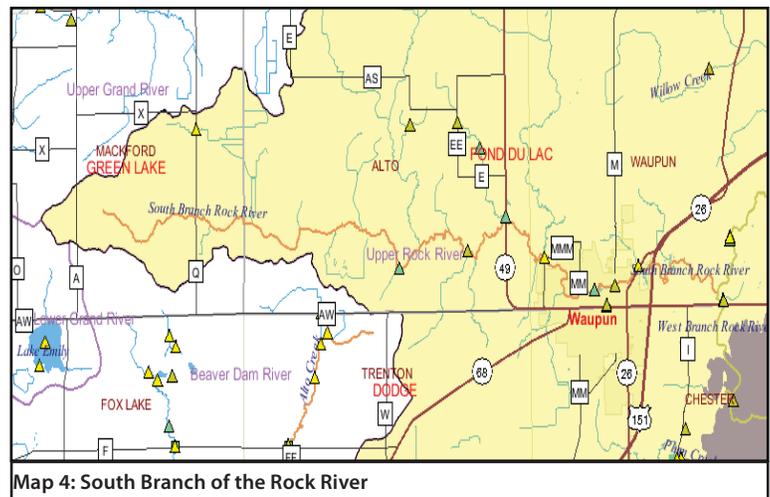
There are 19 monitoring stations on the river and its tributaries, up to its confluence with the West Branch. There is one large point source discharger in the upper reaches above the City of Waupun. Saputo Dairy (formerly Alto Dairy) discharged excessive amounts of phosphorous into the system. With the adoption of Administrative Code NR 217, these levels have dropped significantly, however this is still a significant source of phosphorous. In addition, much of the watershed is agriculture allowing for excessive sedimentation. There are also a significant amount of drained wetlands, leading to inputs of groundwater from drain tile, which can be high in nitrogen. Available HBI data is highly variable ranging from good to poor.

There are several tributaries, such as Alto Creek, which do flow into the river. Alto Creek (WBIC 870500) is listed as an unnamed creek in the watershed. These tributaries show extensive ditching and straightening. In addition to increased sedimentation and high nitrogen levels, the City of Waupun discharges wastewater effluent into the river adding more phosphorous to the system.

Just east of Waupun, the South Branch and West Branch combine. There are two SWIMS stations listed just north of Highway 49 (SWIMS #203131 and #143263). Most of the data collected, from several studies, have been reported under #203131. Although the data is not in SWIMS, there was a USGS monitoring station at this site from October 1997 – 1999 as was mentioned before. The study showed excessive levels of phosphorous and suspended solids. There was more macroinvertebrate collection done in 2002 and in 2008. The 2002 study showed an HBI of 5.2 (good). The 2008 study showed a decrease in quality with an index of 5.9 (fair). Data from station #143263 was acquired from a macroinvertebrate study conducted in 1998, resulting in a HBI of 5.423 (good).



Map 3: West Branch of the Rock River



Map 4: South Branch of the Rock River

Willow and Ladoga Creeks

Willow and Ladoga Creeks are the two main tributaries to the West Branch Rock River. Willow Creek has some limited data in SWIMS and showed a HBI of 7 (fairly poor). There are no SWIMS stations for Ladoga Creek. Both water bodies are low flow narrow streams in highly agricultural areas.

Plum Creek

Plum Creek is a small narrow stream approximately 14 miles in length. There are several SWIMS monitoring stations, three active and one inactive. The site on Highway 26 was monitored in 2009 (site #10030029). Fish data, HBI data and habitat were all evaluated, although the data is currently not available in SWIMS. There is also another station on County Road I, east of Highway 26 (site #10017218), that was monitored for fish, HBI and habitat. The site had an HBI of 6.3 (fair). There is currently another site on the Wild Goose trail that is being monitored by USFWS for suspended solids, total phosphorous and total dissolved phosphorous.

Mill Creek

There is limited data available for Mill Creek. The Creek is approximate 13 miles in length with one monitoring station. The monitoring is being done by USFWS on the Wild Goose trail as it enters Horicon Marsh for several chemical parameters.

Spring Brook Creek (WBIC 872400) is another small creek entering Horicon Marsh on the southern end.. It is a small second order stream, approximately eight miles in length. The Burnett Sanitary District discharges wastewater effluent to this creek. There are two SWIMS stations listed and some fisheries data.

Mieske Ditch

Mieske Ditch (WBIC 872200) is another creek, low flow narrow stream, entering Horicon Marsh on the southern end. Several SWIMS monitoring stations are listed here due to a 2004 manure spill in the creek. Consequently, monitoring for manure was conducted in 2006.

Lake Health

There are 1,629 lake surface acres in the watershed. A majority of these lakes are very shallow and are either small impoundments of the various streams in the watershed or man-made ponds.

Wetland Health

Wetland Status

The Upper Rock River watershed currently contains 34,062 acres of wetlands. Majority of this acreage is contained in the Horicon Marsh, although there are numerous wetland complexes throughout the watershed. Despite the watershed being 22% wetland today, significant acreage has been lost due to conversion to agricultural land (Figure 1). Recent analysis of soil conditions suggest that, historically, the watershed contained 53,452 acres of wetland, which translates to a loss of 32% of the historic wetland acreage. Analysis also suggests that 90% of these “lost” wetlands are potentially restorable. The remaining wetland acres are often impacted due to excessive sediment and nutrient inputs.

Horicon Marsh

Horicon Marsh consists of both the Horicon National Wildlife Refuge (HNWR), which is administered by the U.S. Fish and Wildlife Service, and the Horicon Marsh State Wildlife Area (HMWA), which is administered by the Wisconsin Department of Natural Resources. The HNWR covers 20,976 acres in the northern 2/3 of the marsh and the HMWA covers 10,928 acres in the southern 1/3 of the marsh, for a combined total of 31,904 acres. The size of the marsh makes it one of the largest freshwater wetlands in the United States. There are 216 species of birds which use Horicon Marsh as well as 32 other bird species which have been reported in the marsh (USFWS, 1994). There is also a wide variety of fish, aquatic animals and mammals which utilize the marsh. Due to the extremely large size of the marsh, as well as other factors such as the diversity of flora and fauna and the large populations of waterfowl it supports, Horicon Marsh has been designated as a “Wetland of International Importance”. This recognition affirms the high natural resource value of Horicon Marsh not only for Wisconsin, but nationally and internationally as well.

Horicon Marsh is located entirely within the boundaries of the Upper Rock River Watershed (UR12). The main tributary to the HMWA is the East Branch Rock River which originates in the East Branch Rock River Watershed (UR13), located directly east of the marsh. Sources of water to the HNWR are the West and South Branches of the Rock River, which are contained in the Upper Rock River watershed (UR12). The primary land use in both watersheds is intensive agriculture. There are three smaller-sized municipalities in the immediate vicinity of the marsh; Horicon, Mayville and Waupun. There are also numerous smaller communities in the area surrounding the marsh.

Horicon Marsh is used by the public for a wide variety of outdoor activities. Wisconsin DNR records show that the most popular activities on the marsh are waterfowl observation, canoeing, duck hunting, goose hunting, deer hunting (gun & bow), fishing, snowmobiling, hiking and dog training and dog trials. These activities combined represent approximately 106,000 visitor days of use of the marsh on the state portion alone. These facts illustrate both the economic and cultural importance of Horicon Marsh.

Despite the fact that Horicon Marsh has been recognized as a "Wetland of International Importance," several severe problems continue to threaten many of the important resources of the marsh. The most severe problem is siltation, due to soil erosion from the surrounding watersheds. Other major problems in the marsh are rough fish infestation (mainly carp), invasive species infestation, and the loss of wildlife habitat.

Siltation is a severe water quality problem affecting Horicon Marsh, as determined by the water quality monitoring conducted by the Rock River Partnership in 1998 and 1999. Historic DNR documents have stated that heavy silt loads, particularly from the East Branch Rock River, contribute to the much shallower waters in many of the marsh's bays and channels. The largest source of sediment to the marsh is soil erosion from agricultural lands. Farming practices such as wetland drainage, fall plowing, farming too close to streambanks, farming on steep slopes, livestock grazing, and streambank erosion all contribute to the marsh's siltation problems. Fish and wildlife habitat and recreational use are greatly affected by this problem (USFWS, 1994).

The high inflow of nutrients (phosphorus and nitrogen) into Horicon Marsh from surrounding farm fields where manure and other fertilizer is spread, as well as runoff from barnyards and feedlots, is also a serious problem. The high phosphorus levels increase cattail expansion, closing off prime wildlife habitats. An increase in these nutrients can result in excessive algae and aquatic plant growth which can lead to serious dissolved oxygen problems and may cause fish kills, especially in the winter months. Past water quality monitoring in the marsh has detected levels of pesticides and inorganic fertilizers in the marsh, neither of which have known effects on the marsh ecosystem.

A severe overabundance of carp in the marsh has contributed to decreased water quality. Carp are able to tolerate poor water quality conditions, as compared to more desirable fish. The feeding habits of carp increase turbidity of the water, uproot vegetation and compete with more valuable fish and wildlife species for prey. The poor water quality and shallow depth of the marsh makes it difficult to maintain a game fish population, and thus control the carp population. In 1970, a basin wide project to eradicate carp from the Rock River was initiated. The basin headwaters, downstream to Watertown, were treated with fish toxicants to remove the fish population and then restocked with game fish. This project was unsuccessful in eradicating carp and was discontinued after 1976. In the winter of 1999, a drawdown of the marsh was conducted and chemical poisoning of the carp population was completed. The marsh was refilled in the spring of 2000 but the carp population rebounded quickly.

Land use practices around Horicon Marsh are slowly degrading the quality of this valuable natural resource. Nonpoint source pollution needs to be addressed in a comprehensive and holistic manner if the problems of the marsh are going to be



Photo: Horicon Marsh, Hagerty, USFWS

resolved. One of the most important projects currently underway is the gathering of quantifiable data on sediment and phosphorus loadings to the marsh from streams in the Upper Rock River Watershed and from the East Branch Rock River Watershed.

The state portion of the marsh is more affected by water quality problems than the federal portion because the state portion is primarily a single impoundment. However, a new impoundment in the state acreage, the Bachhuber Flowage, became an operational in 2001. The federal portion of the marsh is a series of impoundments, allowing for better management (Volkert, 1994). For more detailed descriptions of the history, management and resources of the Horicon Marsh, see "Horicon Marsh Wildlife Area Master Plan Concept Element" (WDNR, 1983) or "Horicon Marsh, Wisconsin, A Wetland of International Importance" (WDNR, 1992).

Groundwater

There is no new information reported on groundwater in this watershed.

Waters of Note:

Outstanding and Exceptional Resource Waters

There are no ORW/ERW waters in this watershed.

Trout Waters

There are no trout waters in this watershed.

Impaired Waters

Two rivers in the watershed are on Wisconsin's impaired waters list as required by section 303(d) of the federal Clean Water Act (Table 4). Those two are the South Branch Rock River and the West Branch Rock River. Both rivers suffer from degraded habitat, and the South Branch Rock River also has low levels of dissolved oxygen. Listing is due to non-point sources of pollution in the West Branch Rock River and a blend of point and non-point sources in the South Branch Rock River. The entire Rock River basin is in the TMDL development process.

Horicon Marsh is listed on the Impaired Waters List. It suffers from low dissolved oxygen levels and degraded habitat, resulting from elevated levels of total phosphorus and suspended sediment. The sources of these pollutants are from a mix and point and nonpoint sources.

Table 4: Impaired Waters in the Upper Rock Watershed

Stream Name	Start Mile	End Mile	Pollutants	Impairments
Rock River	296.46	304.88	Total Phosphorus, Sediment/Total Suspended Solids	Degraded Habitat
Horicon Marsh		1000	Total Phosphorus, Sediment/Total Suspended Solids	Low DO, Degraded Habitat
West Branch Rock River	50	87.63	Total Phosphorus, Sediment/Total Suspended Solids	Degraded Habitat
East Branch Rock River	0	11.61	Total Phosphorus, Sediment/Total Suspended Solids	Low DO, Degraded Habitat
South Branch Rock River	0	3.58	Total Phosphorus, Sediment/Total Suspended Solids	Low DO, Degraded Habitat
South Branch Rock River	3.58	19.68	Total Phosphorus, Sediment/Total Suspended Solids	Low DO, Degraded Habitat

Watershed Actions

Projects and Grants

A number of grants have been secured over the years to fund projects within the watershed. These grants include:

- Nonpoint Source Grant to address agricultural discharges; Dodge County was awarded a grant in 2005.
- Nonpoint Source Grant to assist the City of Waupun in developing a stormwater utility. 2003.
- Nonpoint Source Grant to assist the City of Waupun in developing a stormwater management plan. 2002.
- Lake Grant to Waupun School District to assist in a sense of place project. 2004.
- Lake Grant to Dodge County to assist with waterway classification project. 2002.
- Lake Grant to Dodge County for a lake survey. 2001.
- Lake Grant to Green Lake County for an ordinance development project. 1995.
- River Grant to Rock River Headwaters, Inc. to fund organizational transition and outreach coordinator. 2000.

Monitoring

A number of projects have occurred in the Upper Rock River watershed throughout the years. These projects fall into the categories of aquatic invasive species monitoring, baseline stream monitoring, fisheries surveys, targeted monitoring projects, and watercraft inspections.

Recommendations

Wetland Recommendations

A number of recommendations specific to Horicon Marsh and surrounding wetlands have been identified and are listed here.

- Watershed Management (WT) staff, in cooperation with the U.S. Fish and Wildlife Service, should identify strategies to acquire or otherwise protect critical wetlands and other environmentally sensitive areas surrounding Horicon Marsh.
- WT staff should work with Dodge, Fond Du Lac and Washington counties to more aggressively educate citizens about and enforce existing shoreland/wetland protection zoning ordinances.
- WT staff, with the assistance of Wildlife Management and Dodge, Fond Du Lac and Washington County Land Conservation Departments, should continually monitor and better document sediment and phosphorous loading to Horicon Marsh from the Upper Rock River Watershed (UR12) and the East Branch Rock River Watershed (UR13) from smaller subwatersheds.
- WT staff should continue monitoring Horicon Marsh water quality.
- Continue work started in 2006 by the US Fish and Wildlife -- a watershed project to encourage more participation in best management practices in the West Branch and South Branch watersheds.
- Map potentially restoreable wetlands and work to implement Wetland Restoration Program to restore important wetlands with cooperative landowners.

River and Stream Specific Recommendations

- South Branch Rock River continues to show elevated levels of phosphorous at base flow levels. The river most likely needs reductions in phosphorus being discharged by Waupun wastewater treatment facility.
- Investigation of phosphorus sources to the South Branch Rock River, which has elevated phosphorus levels downstream of the City of Waupun.
- West Branch Rock River phosphorus and suspended solids levels should be better quantified above the confluence with South Branch Rock River to determine difference in contributions from each respective branches of the river.
- Phosphorus and suspended solid levels should be monitored in the tributaries of the West and South Rock River branches to determine the major contributing subwatersheds to assist in prioritizing best management practice installation effort.

Watershed Recommendations

- The City of Waupun should continue to implement the stormwater management plan that was developed to improve urban runoff. This should be done to improve water quality and reduce runoff quantity.
- The City of Waupun should consider acquisition of river corridor lands in the watershed using the state Urban Rivers and/or Streambank Protection funds under the state's Stewardship Program.

Watershed Management (WDNR) should:

- Evaluate the feasibility of removing the Waupun Millpond dam.
- Work with the U.S. Fish and Wildlife Service (USFWS), should identify and implement feasible strategies for acquiring or otherwise protecting critical wetlands and other environmentally sensitive areas, including conservation buffers on streams surrounding Horicon Marsh.
- Restrict future channelization of streams to reduce sediment and nutrient loading to Horicon Marsh.
- Assess the effect of polluted runoff on the W. Br. of the Rock River, the South Branch of the Rock River and their tributaries.
- Continue work on the Rock River Recovery TMDL Implementation Plan to restore the Upper Rock portions of this impaired basin.

Watershed Management staff should work locally to:

- Encourage Dodge and Fond Du Lac counties to more aggressively enforce and educate residents concerning shoreland/wetland protection zoning ordinances.
- Encourage the villages and cities in the watershed to apply for funding through the TRM or Urban Nonpoint Pollution grant programs to develop stormwater management plans and install practices that control urban stormwater impacts.
- With county LCD, lake organizations, and conservation organizations to promote and install conservation buffers along all intermittent and perennial streams, wetlands, ponds, and lakes through easements, land acquisitions, and voluntary land owner cooperation.
- Work with public and private partnerships to install and restore wetlands in the watershed for water quality enhancement and to provide flood storage capacity in the watershed.
- Work with partners to assist in abandoning and removing dams and restoring the in-stream and near-shore areas as dams are removed.
- Encourage the use of milfoil weevils and limited use of selective herbicides to control the propagation and spread of Eurasian water milfoil.
- Encourage landowners to establish buffer zones along all waterways to retain their natural character. No structures or vegetation removal in the stream or buffer zone should be allowed other than to remove exotic plant species.
- Discourage landowners from removing all shoreline vegetation, with the exception of viewing/access areas.
- Encourage governments, non-profit conservation organizations and landowners to protect the remaining high quality natural areas in the watershed.
- Encourage the planting of permanent cover (like trees, shrubs, and grasses) on erodable lands.

Forestry Management (FM) staff should:

- Work with local partners to encourage the use of good forest stewardship to maintain healthy forests to help minimize the effects of high populations of insects.
- Work with private landowners and local governments to keep existing forests healthy by encouraging participation in government programs (like the Managed Forest Land and WI Forest Landowner Grant programs).
- Work with county and local governments to educate landowners and provide educational materials that discourage the developments in woodlots, or protect the woodlands during construction, and help maintain woodlots and work to connect the woodlots in watersheds and the Basin.
- Work with local partners to monitor insect populations in sensitive woodlands.

Wildlife Management staff should:

- Work with the US Fish and Wildlife to assess the impacts of poor water quality on the Horicon marsh system.

Table 5. Rivers and Streams of the Upper Rock River Watershed.

Name	Description	Fisheries	Notes
West Branch Rock River		This river is only partially supporting its potential as a warmwater sport fishery.	Observations and monitoring of the river reveal extensive sedimentation (WDNR, 1994). The West Branch is the principle source of runoff, nutrient and sediment loading to the Horicon National Wildlife Refuge (Rock River Partnership Monitoring Study, 1999). Baseline monitoring was conducted in 2000. Initial evaluation indicates the river is in fair condition.
South Branch Rock River		The lower 3 miles of this stream have been classified as WWSF and monitoring confirms this portion of the river does support a sport-fish community. Although the river has not been formally classified except for the lower 3 miles, sampling upstream indicates that water quality conditions support mainly tolerant forage fish (WDNR, 1994).	Factors which limit this stream from reaching full potential are cropland erosion, wetland loss, streambank and riparian zone erosion and livestock access to streambank
Alto Tributary	A small stream that feeds into the South Branch of the Rock River. It is a shallow, narrow stream with average depth less than 3 feet.	The industrial discharge has been improved so it is currently unknown how the fishery has responded as there has been no assessment recently.	Factors contributing to poor water quality in this stream were relatively high phosphorus loading from an industrial waste water plants, ditching, pasturing too close to the stream and cropland runoff.
Conners Ditch	A 4.75 mile stream flowing to the northeast corner of Horicon National Wildlife Refuge	No formal classification but likely only supporting limited forage fish.	No SWIMS station points located on this stream/ditch. Listed as intermittent
Libby Creek	A 2 mile small stream draining into northwest corner of Horicon Marsh National Wildlife Refuge	Limited forage fisheries or warm water forage fisheries	WBIC # 869600. No SWIMS station points. No available data.
Luebke Ditch	A 3 mile drainage ditch located in Horicon Marsh between Mill Creek and Springbrook Creek	No data available	A drainage ditch located entirely within Horicon Marsh state wildlife areas
Main Ditch	Listed as a 3 mile ditch on the north end of Horicon Marsh National Wildlife refuge	No data available	Main Ditch turns into West Branch after the 3 mile listing. WBIC #869100. One SWIMs station #143266 but no data available
Mieske Ditch	A 3 mile ditch flowing into South end of Horicon Marsh		Was impacted by a manure spill in 2004.
Mill Creek		Limited forage fisheries or warm water forage fisheries	
Plum Creek		Limited forage fisheries or warm water forage fisheries	
Spring Brook		Limited forage fisheries or warm water forage fisheries	
Townline Ditch	3 mile drainage ditch within Horicon Marsh		WBIC #868200
Ladoga Creek			

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Horicon Marsh, Wisconsin



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Basin Education Initiative

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Upper Rock Watershed