Wisconsin Watersheds

Bear Creek Watershed
Lower Wisconsin Basin

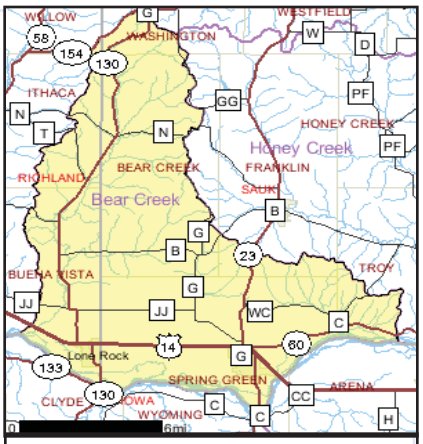
2010 Water Quality Management Plan Update

Lower Wisconsin Basin, Wisconsin

August, 2010

The Bear Creek watershed is one of 29 watersheds within the Lower Wisconsin Basin. The watershed is located in southwestern Sauk and southeastern Richland County, covering approximately 87,000 acres (Map 1).

Numerous rivers and streams cover 236 miles throughout the watershed. There are fewer streams in the southern portion of the watershed, though there are many sloughs and wetlands associated with the Wisconsin River floodplain. There are approximately 6,800 wetland acres in addition to roughly 219 total lake acres, primarily consisting of these oxbows and sloughs.



Map 1: Bear Creek Watershed

Plan Contents

Watershed Details

Population and Land Use

The dominant land uses in the watershed include agriculture and forest, encompassing 45% and 41% of the land area, respectively (Figure 1). The trends in agriculture toward fewer dairy farms with reduced need for alfalfa and pasture, means many of those acres are being replaced with corn and soybeans. In steeply sloping areas of the state, such as much of the Bear Creek Watershed, this inevitably means higher rates of runoff of soil and nutrients.

Significant upland acreage in this watershed was historically enrolled in the Conservation Reserve Program (CRP) beginning in the late 1980s and continuing through the 1990s. This program required taking cropland out of production and planting it to grasses. Many of these contracts have—and continue to—expire(d), meaning in transition they will become sources of sediment and nutrients again, particularly if they are used primarily for corn and soybean production, as is the case in much of Wisconsin.

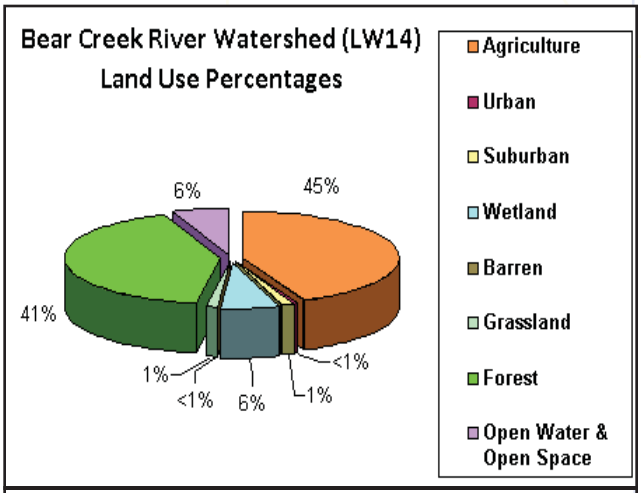
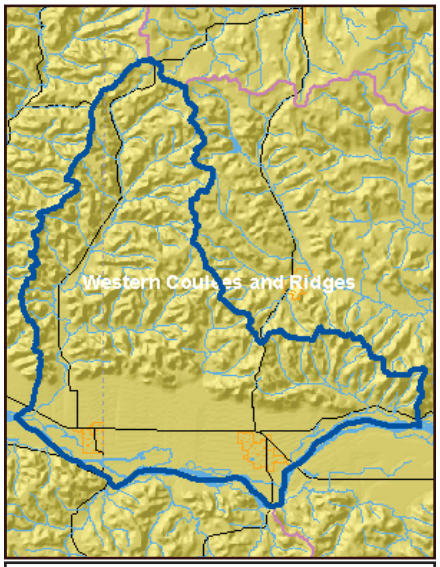


Figure 1. Land Use Bear Creek Watershed Percentages are rounded.

Ecological Landscapes

The Western Coulee and Ridges Ecological Landscape in southwestern and west central Wisconsin is characterized by its highly eroded, unglaciated, or driftless topography and relatively extensive forested landscape. Soils are silt loams (loess) and sandy loams over sandstone residuum over dolomite. Several large rivers including the Wisconsin, Mississippi, Chippewa, Kickapoo and Black flow through or border the Ecological Landscape (Map 2).

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 pre-settlement wildfires were suppressed.



Map 2. Ecological Landscapes

Current vegetation is a mix of forest (40%), 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 pre-settlement 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.

The Bear Creek Watershed has a variety of good quality habitats and rare plant communities that are listed on the state's (Natural Heritage Inventory) NHI, kept by the Bureau of Endangered Resources. These communities include: cedar grove, dry cliff, dry prairie, moist cliff, oak barrens, oak openings, pine barrens, sand barrens, sand prairie, southern dry-mesic forest, southern mesic forest, alder thicket, emergent aquatic, floodplain forest, oxbow lake, shrub-carr, southern sedge meadow and springs and spring runs.

Hydrologic Features

Groundwater and surface water resources in the watershed are completely interconnected. Small streams originate from springs and groundwater seepage. These tributary streams combine to form larger streams and so on. During dry periods, most of these tributary streams continue flowing as "baseflow". This phenomenon is the reason most of our cold-water trout streams exist. The oxbow lakes and sloughs in the Wisconsin River floodplain are also an expression of groundwater elevation, indicating where the intersection of the land surface and the water table occurs. These vital surface waters are completely dependent on groundwater for their existence.

Streams dominate within this ecological landscape, though there are natural floodplain sloughs, oxbows, and a few impoundments in this watershed. Levels of stream and groundwater pollution are worse than average, according to Wisconsin DNR watershed rankings.

The primary geologic feature in the southern portion of the watershed is the Wisconsin River floodplain terrace. This is a broad plain of sand and gravel deposited by streams of meltwater from receding glaciers during the last glaciation. Streams flowing into the terraces, such as Big Hollow Creek, often disappear into the coarse sand and gravel prior to reaching the Wisconsin River. This phenomenon occurs at different locations along the Lower Wisconsin River valley.

Sauk Slough, Photo by Dave Marshall

Historical Note

The Village of Lone Rock is located within the Bear Creek watershed in Richland County. Lone Rock is so named because, at one time, a massive piece of sandstone stood a short distance from the north bank of the Wisconsin River. The rock became a landmark for early river raftsmen. Over time the rock was cut and used for basements and foundations in the village. What is left of the rock is located west of Highway 130 across from Brace Park.

The community was founded in 1856 and during the Civil War, the 6th Wisconsin Battery was organized by Henry Dillon of Lone Rock, who was afterwards elected as captain. Most of the recruits came from Richland County, though there were some from adjoining counties. It was the first battery to receive its full quota of men and should have been numbered the 1st instead of the 6th. The Battery left Lone Rock on September 30th, 1861, going to Camp Utley at Racine where it remained until March 1862, when it was sent south, taking part in many fierce battles, including Vicksburg, Jackson, Corinth and Mission Ridge. Today a bronze monument in Battery Park commemorates these men and their sacrifices.

This monument was erected in the memory of the 6th Wisconsin Battery Light Artillery in 1884. Photo by Bruce Laine.

Watershed Condition

Watershed Priorities

- Identify, restore and preserve high quality fisheries in the watershed.
- Protect riverine habitat especially in sloughs and backwaters of the Wisconsin River.
- Protect ORW/ ERW waters and trout waters.
- Restore stream habitat, hydrology and morphology throughout the watershed to recover from damage incurred in the 2008 flooding events.
- Conduct monitoring to sufficiently understand and abate water quality standards impairments in the watershed.
- Set priorities for Little Bear Creek restoration work to eventually remove the water from the impaired waters list.

Watershed Goals

- Protect high quality cold, warm and cool water streams and improve conditions in those not meeting designated uses
- Restore and protect sloughs, backwaters, and tribuary streams to the Wisconsin River.
- Create/ build upon cooperative partnerships and projects to improve the condition of Little Bear and Bear Creek.
- Fund cooperative projects for stream restoration including buffers, hydrology and stream morphology.

Overall Condition

While not all waterbodies in the Bear Creek watershed have been assessed, the overall general condition of the watershed is good. Landscape conditions and land use patterns and watershed conditions in this watershed are inextricably linked. Overall there is great variability in topography, from the steep, hilly land in the north, to the relatively flat Wisconsin River terrace in the south. In the hilly portion of the watershed, forest is by far the dominant land use, which puts a premium on the remaining land for its agricultural use. As is typical of the Driftless area of Wisconsin, ridge tops and valley bottoms are the only areas not too steep to farm. Consequently, farming or pasturing occurs right to the edge of the stream on many farms, with little or no buffer between fields and the streambank.

Agriculture is the primary land disturbing activity, as well as the biggest source of nutrients, both land applied and concentrated on livestock farms. Water quality is reflective of this dominant land use, since it accounts for the largest sources of runoff from cropland, pasture and barnyards.

Like many of southern Wisconsin's watersheds, Bear Creek suffered extensive flooding of geologic proportion in the mid-1990's to the late 2000's, with the worst damage occurring in 2008. Resource professionals from the Land Conservation Departments of Sauk and Richland Counties report newly formed and greatly enlarged gullies throughout the watershed, particularly in the steep, wooded slopes. Thousands of tons of sediment were transported during these events and deposited in the valley bottoms, adding to the previous deposition occurring since the land was first put under plow in the mid-nineteenth century. This sediment severely limits streams' potential to support fish and other aquatic life.

Little Bear Creek, 2010. Photo by Jean Unmuth. This photo of the stream shows obvious erosion along the stream banks.

Fish Consumption

A fish advisory for the Wisconsin River is in place for elevated levels of Polychlorinated Biphenyls from the Prarie du Sac Dam down to the Mississippi River. This advisory is specific to the water, above and beyond the state's general advice. The Department's information on PCB advisories is located below:

- http://dnr.wi.gov/fish/consumption/FishAdvPCBs2010lo.pdf

Point and Nonpoint Sources

The Lone Rock Wastewater Treatment Plant (WWTP) discharges treated wastewater directly into groundwater. The Spring Green Wastewater Treatment Plant discharges to the Wisconsin River. Two industrial facilities, the Hanor Company's Crouch Farm and Pecks Feed & Grain, also discharge into groundwater in the watershed. Municipal wells serving the communities of Lone Rock and Spring Green draw from both the shallow sand and gravel and deep sandstone aquifers.

River and Stream Condition

In fulfilling a goal to protect, maintain, and improve surface waters, the Wisconsin Department of Natural Resources (WDNR) must classify the state's waters based on their natural capacity to support a specific type (subcategory) of aquatic community. For example, a cold water community is a subcategory that indicates a stream supports trout and other aquatic life that can only be found in cold water streams, while a warm water sport fishery would contain fish like large-mouth bass that grow best at warmer temperatures. Biologists collect information on a stream or lake, evaluate the data, and then rate the condition or how well a water body is faring. Designated uses are those uses specified by water quality standards for each water body, whether or not that designated use is currently being met. Existing uses are those uses of a stream or lake that are either being met or have been recognized as having the potential to meet a specific use based on information that stream biologists collect. A list of water bodies with their associated condition, designated uses, and existing use are located in the appendix.

Bear Creek, 2010. Photo by Jean Unmuth.

Bear Creek

Bear Creek begins in Sauk County and flows for nearly 27 miles before entering the Wisconsin River, approximately 1.7 miles west of Lone Rock, in Richland County. It is currently classified by statute as a cold water stream in the upper reaches and as a warm water sport fishery in the lower 8.2 mile reach near the mouth. Six major tributary streams and many small tributaries flow into Bear Creek (Appendix A). The major named streams are Croal Creek, Four Springs Hollow Creek, Little Bear Creek, Marble Creek,

McCarville Creek, Pumpkin Hollow Creek and Wilson Creek.

The WDNR recently assessed Bear Creek at three stations spaced across the lower eight miles of the stream, where it is classified as a warm water sport fishery (WWSF). Aquatic insect surveys, fish surveys, water quality, and stream habitat information was collected during 2008 and 2009. In general stream health was rated as good, except for a site at State Highway 130 where stream health was poor likely due to intensively grazed banks and barnyards close to the stream.

There were 16 different fish species found in the surveys, but no game fish other than brown trout were found, even in the WWSF stream segment. Upstream of State Highway 130 to the headwaters, Bear Creek is classified as, and supports a cold water (CW) class II trout fishery. Yet, based on extensive fish and aquatic insect surveys done in this segment in 2001, the stream condition was rated as fair. Many of the unnamed tributary streams in the Bear Creek watershed have not been assigned a stream classification or been assessed to determine if they are meeting the designated use. Streams remain un-assessed either due to lack of access to the stream or due to the lack of resources and time to survey all streams in the watershed.

The Aldo Leopold chapter of Trout Unlimited recently helped broker the sale of a public access easement to DNR on private land north of the current DNR fishery area. On this property, a design for nearly 1 mile of streambank protection and in-stream habitat has been designed by staff from the Sauk County Land Conservation Department. Currently, volunteers from TU are working to obtain funding for this important project that could become a catalyst for more work on private land.

Little Bear Creek
Little Bear Creek is a spring fed 8.0 mile long tributary of Bear Creek. In 2007 and 2008, three different stream stations were monitored by the WDNR. Fish, aquatic insects, water quality, and stream habitat information was collected. Results indicated the stream's condition was poor to very poor, except for the uppermost reach near the headwaters which was rated good.

During the summer of 2007, stream temperatures were continuously monitored at all three segments. In July and August, 11% of 17 mean daily samples collected exceeded 73 degrees F (22.7 C), above the acceptable temperature of 65 degrees F (18.3 degrees C), the optimal temperature for growth of brown trout. Phosphorus samples, collected over a 6 month period in 2008 by the United States Geological Survey (USGS), exceeded 0.075 mg/l (75 ug/l) in 5 of 6 samples.

This level is at the upper threshold for phosphorus water quality criteria currently listed under the rule revision being proposed for small streams. The proposed criteria are intended to prevent in-stream algae and other plant growth to the extent that it is detrimental to fish and aquatic life.

Little Bear Creek, 2010. Photo by Jean Unmuth, WDNR.

Stream channelization and ditched wetlands have increased siltation in the lower stream reaches where low stream gradient allows silt to settle out, rather than flush through the system. The stream has good permanent flow from large springs in the upper stream segment. Much of the riparian stream corridor is either cropped or pastured. There are several dairy operations along the stream, causing pasturing in some wetland areas along the stream corridor. One of the larger dairy operations along the stream had a manure pit overflow into wetlands adjacent to the stream, but that operation was abandoned in late 2009. Non-point source pollution from agricultural sources has likely increased phosphorus, reduced water clarity in some stream segments, and increased water temperature.

Bank and stream habitat information was collected at three stations along the stream. Results indicated that fish habitat was rated fair in the ditched segment, where the stream is wide and shallow with few natural meanders. While there are some stream segments that are deep enough to support cold water game fish, sand and sediment overlays much of the gravel and cobble so that it reduces the available fish spawning habitat. The stream appears to have a lack of rock riffles used for fish spawning and fish food or aquatic insect production. It also lacks the deeper pools

necessary for fish resting and over-wintering. In the lower stream reaches, where the channel appears not to have been ditched, there are natural meanders and deeper pools, but banks are steep and in some areas eroded. In addition, some wetlands have been drained by ditching, which also increases transportation of sediment and nutrients like nitrogen and phosphorus from agricultural lands.

The Wisconsin River

The Lower Wisconsin River flows for approximately 19 miles through the Bear Creek watershed and is classified as a warm water sport fishery. The entire Lower Wisconsin River is identified as impaired on the federal Impaired Waters list, due to contaminated fish tissues from Mercury and Polychlorinated biphenyls (PCBs).

A Long-term Trend (LTT) water quality-monitoring site was established at Muscoda to help assess general water quality conditions/trends and long-term water quality changes. The data helps the state develop water quality-based effluent limits for point-source dischargers and water quality standards. Recent fish surveys from the Lower Wisconsin River indicate that the river has a highly diverse fishery. However, there was an abundant amount of silt and nutrients due to high nonpoint source runoff from agricultural land. Excessive growths of filamentous algae are the result of excessive nutrients from surface water runoff and from upstream impoundments like Lake Wisconsin.

Lake Health

* also includes ponds, oxbows and sloughs.

There are ten named lakes, ponds, river oxbows or sloughs and approximately 24 unnamed lakes, ponds or sloughs totaling approximately 216 acres in the watershed. Nearly all are located in the floodplain of the Wisconsin River within the Bear Creek watershed. All named lakes have been assessed in the last 5 years through DNR River Planning Grants supported by Sauk County and Sauk Prairie River PAL, a non-profit organization. Information was collected to assess water chemistry, water quality, qualitative habitat, fishes and aquatic plants. Details summarizing the findings of individual floodplain lakes, sloughs, or oxbows can be found in the final Planning Grant reports.

Most waterbodies are presently supporting their designated use of fish and aquatic life, with the exception of Blue Hole Slough. Blue Hole is less than one acre in size, and is very shallow with oxygen levels during some periods of the year that are too low to support fish. Yet, it is still important to other aquatic organisms like amphibians, waterfowl and aquatic insects. The remaining waters are not only meeting their designated use, but were found to be capable of supporting warm water fishes, including state endangered, threatened or special concern species. In general, these waterbodies are in good to excellent condition, having good water clarity and quality, and contain an abundance of high quality aquatic plants and fishes not found elsewhere in the watershed. There are several sloughs with poor water clarity, elevated nutrient levels, excessive algae blooms, and high nitrates.

Norton Slough, 2010. Photo by Dave Marshall

Hutter, Jones and Norton sloughs were identified as either having high nutrients or excess algae growth. Some are very close to agricultural fields where manure and other nutrients are applied to crops grown. These nutrients are either reaching the sloughs through runoff or discharge of nutrient-laden groundwater. For example, Baakens Pond and Hill Slough have high nitrate levels.

These sloughs should be more closely monitored to help determine the cause of nutrient loads, excessive filamentous algae growth, and levels of nitrates. Ponds and lakes with outlet control structures (dams with tin whistle structures) should have the tin whistles modified to draw water midway off the bottom of the water column, to reduce nutrient inputs to downstream waters during draw downs.

Lakes, sloughs and oxbows associated with the Wisconsin River should be given additional protection by classifying them as Outstanding Resource Waters. Designating Sensitive Areas along the shorelines of developed and potentially developable shorelines would also provide additional protection. The DNR, Sauk County Land Conservation Department, and NRCS could work with local landowners to reduce nutrients and nitrates in groundwater and agricultural runoff. Nutrients could be reduced by implementing best management practices that will reduce runoff and nitrate leaching to groundwater. On agricultural lands, vegetated buffers and filter strips could also be implemented through the CREP program. Additionally, landowners can develop and improve wildlife habitat on agricultural lands through the WHIP program to protect, restore, develop or even enhance declining or important aquatic wildlife species' habitats. Additional protection to upland groundwater sources would benefit sloughs, lakes and oxbows. This could be accomplished by expanding buffer zones to protect groundwater and reduce pollutants in storm water runoff.

Wetland Health

The Bear Creek watershed encompasses 87,386 acres, and only 7% of the total watershed acreage is currently wetlands. Estimated wetland acres is based on the Wisconsin Wetland Inventory and the hydric (wet) soils mapping. The majority of wetlands in the watershed are forested wetlands (63%) and emergent wetlands (30%) which include marshes and wet meadows (Table 1).

Table 1. Wetland Community Types

Wetland Plant Community Types	Acres	% of Wetland
Shallow Open Water	27.8	0%
Aquatic Bed	10.8	0%
Emergent (Marshes and Meadows)	1888.9	30%
Shrub	373.3	6%
Forested	4006.9	63%
Other	52.3	1%
Total	6360.0	100%

Twenty-two (22) percent of the original pre-settlement wetlands in the Bear Creek watershed are estimated to have been lost to filling, ditching or draining (Chart 2). A significant amount of the remaining wetlands are of low quality, due to alteration by ditching, tiling or other manipulation that has changed the hydrology or mix of plant species.

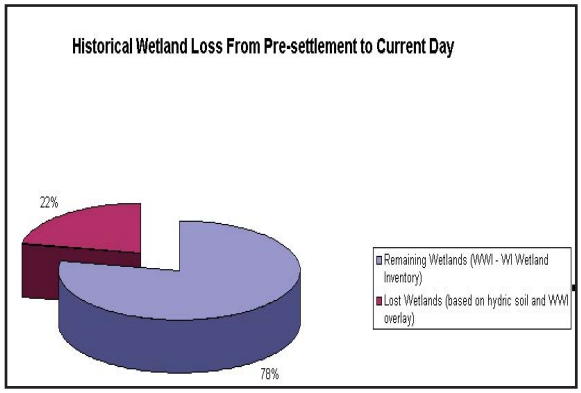


Chart 2. Wetlands Lost, WDNR

Wetlands provide critical animal or wildlife habitat. They also function as sponges for flood storage and act as a filter for nutrients and pollutants in urban and rural runoff. Wetlands slow the release of water during storms and provide much needed moisture during low water periods. or dry spells.

Wetlands lying along Bear and Little Bear Creek that have been ditched, drained or tiled should be restored. Of the 1,784 acres of lost wetlands, 99% have the potential to be restored (not lost to urban development). Drain tiles could be removed, ditches plugged, and wetland vegetation restored. This would reduce runoff from agricultural fields, development, and roadways; reduce sediment and nutrients transported to streams; reduce flooding in the watershed and improve water quality for fish and other aquatic organisms. The Wetlands Reserve (WRP) and Environmental Quality Incentives Program (WRP) is a voluntary program designed to help restore and protect wetlands on private property, and is available to landowners having wetlands converted to agriculture. Another program available to landowners is the US Fish & Wildlife Service's Partners for Fish and Wildlife. A landowner near the confluence of Bear and McCarville Creeks is planning a seven acre restoration in summer, 2010 using this program.

Little documentation of the condition of the remaining wetlands exists, 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 reed canary grass dominates 85% of emergent (marshes and meadows) wetlands and 10% of forested wetlands. Reed canary grass domination inhibits successful establishment of native wetland species and does little to provide a diverse food base or nesting habitat for wildlife.

Groundwater Resources

Groundwater is abundant in the watershed. Farmers using center pivot irrigation in agricultural fields, in the lower portion of the watershed, take advantage of this abundant groundwater and the shallow depth aquifer on the Wisconsin River sand and gravel terrace. The water table in the shallow aquifer experiences large fluctuations in response to climate and weather patterns. Unusually heavy precipitation in 1993, and again in 2008, caused the water table to rise above the ground's surface. Extensive damage to crops, residences and other property was caused by this 'groundwater flooding.'

Lakes, streams and wetlands in the watershed are not only dependent on groundwater quantity for healthy aquatic life, but also groundwater quality. Elevated levels (well beyond the EPA drinking water standard) of nitrates have been found in private wells in the watershed, in the floodplain terrace of the Wisconsin River. A portion of the watershed, also within the floodplain terrace, has been designated an Atrazine Prohibition Area. Elevated levels of atrazine, a herbicide used on corn, have also been found in some private wells, though continued testing indicates those levels may be declining. Sandy soils in the Wisconsin River terraces are highly permeable, which allows contaminants to reach groundwater in some locations. Since groundwater is constantly moving toward streams, lakes and wetlands, the presence, or overuse, of contaminants is a cause of concern in the watershed.

Waters of Note

Despite increases in pollutant from flooding and other factors, there still remain several spectacular resources in the Bear Creek Watershed. The following 9 waters (two stetches of the Wisconsin River) are designated as Exceptional Resource Waters. These special resources are identified as such to protect their quality now and into the future.

Outstanding and Exceptional Waters

Waters designated as ORW or ERW are surface waters which provide outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities. ORW and ERW status identifies waters that the State has determined warrant additional protection from the effects of pollution. These designations are intended to meet federal Clean Water Act obligations requiring Wisconsin to adopt an "anti-degradation" policy that is designed to prevent any lowering of water quality, especially for waters having significant ecological or cultural value. If a waterbody has existing point sources of pollution at the time of designation, it is more likely to be designated as an ERW. Like ORWs, effluent dischargers to ERW waters are required to maintain background water quality levels; however, exceptions can be made for certain situations when an increase of pollutant loading to an ERW is warranted because human health would otherwise be compromised.

The Bear Creek Watershed has four streams and many lakes, sloughs and oxbow ponds associated with the Wisconsin River designated as Exceptional Resource Waters (ERW). Not all Wisconsin River floodplain lakes (see appendix) are shown as ERW in the DNR Surface Water Data Viewer mapping system. But because they are part of the Wisconsin River floodplain, all floodplain lakes, sloughs and oxbows along the Wisconsin River are, by definition, ERW waters. There are no designated Outstanding Resource Waters (ORW) in the watershed.

Table 2. ORW/ERW Waters

Local Waterbody Name	ORW/ERW	Start Mile	End Mile
Biser Creek	ERW	0	3.86
Cynthia Slough	ERW		
Hutter Slough	ERW		
Jones Slough	ERW		
Long Lake	ERW		
Marble Creek	ERW	0	3.51
Creek 28-11 T10N R3E	ERW	0	0.49
Creek 28-11 T10N R3E	ERW	0	0.93
Wisconsin River	ERW	57.66	90.94
Wisconsin River	ERW	27.67	57.66

Trout Waters

Five different streams and stream segments in Bear Creek Watershed are considered trout waters by NR 102, Wisconsin Administrative Code, and the state Fisheries Classification NR 1 rules. There are 3.86 miles of Class 1 high quality trout waters having sufficient natural fish reproduction to sustain populations of wild trout, and the remaining 18.29 miles are class II waters having some natural fish reproduction, but may require fish stocking to maintain a desirable sport fishery. Table 3 shows these waters location, classification, and length.

Table 3. Trout Waters

Local Name	WBIC	Start Mile	End Mile	Class
Bear Creek	1234600	8.21	18.25	CLASS II
Bear Creek	1234600	18.25	26.78	CLASS II
Biser Creek	1236000	0	3.86	CLASS I
Mccarville Creek	1236100	3.1	4.74	CLASS II
Kroal Creek	1236200	0	3.82	CLASS II
Marble Creek	1235700	0	3.51	CLASS II
Mccarville Creek	1236100	0	3.1	CLASS II

Impaired Waters

The federal Clean Water Act (CWA) requires that states adopt water quality standards to protect waters from pollution. These standards set the water quality goals for a lake, river, or stream by stating the maximum amount of a pollutant that can be found in the water while still allowing for recreational use, and for aquatic organisms to thrive. The standards rely on criteria for a wide range of pollutants such as: phosphorus, sediment, bacteria, E.coli bacteria, PCBs, and mercury.

A water is polluted or "impaired" if it does not support full use by humans, wildlife, fish and other aquatic life and it is shown that one or more of the pollutant criteria are not met. Once waters are known to be impaired, the goals is to move them through a series of sequential steps, beginning with "impaired water listing" to "delisting" as a restored aquatic system.

The Lower Wisconsin River was placed on the impaired waters list in 1998 for the pollutant polychlorinated biphenyl (PCBs). While much work has been done to reduce PCBs through controlling industrial waste water, it can persist in stream sediments for many years. The bioaccumulation of PCBs in the aquatic food chain results in contaminated fish tissue. PCBs and mercury are the contaminants of greatest concern in fish, prompting safe eating guidelines for all waters in the state.

Little Bear Creek was monitored extensively from 2007-2009, and the segment from the mouth upstream to mile 6.77 has been proposed to be added to the impaired waters list in 2010. The pollutants responsible for this proposed listing are phosphorus, sediment and water temperature, and the impairments are degraded habitat and eutrophication. There are no lakes, ponds, sloughs or oxbows listed as impaired in the watershed.

Table 4. mpaired Waters and Recommended Waters for List

Name	Start Mile	End Mile	Pollutant	Impairment
Little Bear Creek **	0	6.77	Sediment/TSS Degraded Habitat Total Phosphorus	Elevated Water Temperature, Eutrophication
Wisconsin River	27.67	57.66	PCBs	Contaminated Fish Tissue (Fish Advice)
Wisconsin River	57.66	90.94	PCBs	Contaminated Fish Tissue (Fish Advice)

** 2010 Proposed for List

Monitoring

The following projects have been conducted in this watershed in the past few years.

Fisheries monitoring projects in the watershed include a wide variety of "baseline" monitoring and targeted fieldwork to gain specific knowledge related to Wisconsin's fish communities. This work has been conducted on Bakkens Pond, Bear Creek, Little Bear Creek, Long Lake, Marble Creek, Norton Slough, and Wilson Creek.

Aquatic Invasives (AIS) In close cooperation with UW Extension and Wisconsin Sea Grant, education efforts 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. Additional initiatives include monitoring and control programs.

Below Bakkens, Wisconsin River. Photo by Dave Marshall.

Little Bear Creek (1234700) 303(d) Evaluation
07/01/2007-08
Collected additional data for evaluating potential impairments and to determine if the stream has the potential to reach the attainable use listing of Cold water. Little Bear Creek is located in Sauk and Richland Counties.

Natural Community Stream Reference Sites 05/01/2008 Active
This study involves reference site selection and monitoring using the 2008 Streams Natural Communities dataset, which was 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.

Watershed Rotation Sites 06/03/2006 to present
Stream water quality monitoring, covering primarily biological, chemical, and habitat related parameters, was conducted to determine ambient conditions at "pour point" locations for each of state's 330 watersheds

Recommendations for Monitoring, Classification & Management

Monitoring

- Propose Bear Creek for TMDL monitoring.
- Monitor Biser Creek, Croal Creek, Four Springs Hollow Creek, Marble Creek, McCarville Creek and Pumpkin Hollow Creek to determine the stream condition.
- As resources become available, monitor tributary streams currently not classified and assigned a use designation.
- Continue long term trends water quality monitoring of the Wisconsin River at the Muscoda monitoring station.
- Monitor temperature to assess impacts of ponds in the headwaters of Little Bear Creek.
- Stream assessment monitoring for fish, aquatic insects and habitat should be completed on Croal Creek, Four Springs Hollow Creek, Pumpkin Hollow Creek, and an unnamed tributary stream to Marble Creek. This assessment would help determine whether they are meeting their cold water classification, and to rate the condition of each stream. Other unnamed and not classified streams may be assessed as time and resources allow.
- Monitor sloughs more closely to help determine cause of nutrient loads, excessive filamentous algae growth, and levels of nitrates.

Classification

- Develop Fish Management Plan to improve Marble Creek from a Class II to a Class I trout stream.
- Biser Creek should be reclassified from a Class II to a Class I trout stream.
- Increase the trout stream mileage in the Sauk County portion of Bear Creek.
- Lakes, sloughs and oxbows associated with the Wisconsin River should be given additional protection by classifying them as Outstanding Resource Waters.

Management

- Stream restoration for Bear Creek and Little Bear Creek could be accomplished through many avenues, such as cooperative projects mentioned earlier involving the Aldo Leopold Chapter of Trout Unlimited, WDNR and Sauk County. is working with DNR fisheries staff and Sauk County.
- For similar projects, funding could be obtained from the Conservation Reserve Enhancement Program (CREP), Wildlife Habitat Incentive Program (WHIP), and State Targeted Runoff Management (TRM) grants.
- Reduce agricultural runoff and nutrient loads to Bear Creek, Biser Creek, Little Bear Creek, Marble Creek, McCarville Creek and Wilson Creek through use of Targeted Runoff Management (TRM) and other grants in cooperation with Sauk and Richland Counties.
- Continue the purchase of land or easements along Bear and Little Bear Creeks from willing sellers to support habitat improvement of the streams.
- Encourage projects that restore stream meandering of Little Bear Creek.
- Cooperate with Aldo Leopold and Ocooch Chapters of Trout Unlimited, Richland and Sauk County LCD and NRCS and other partners to improve fish and stream bank habitat in Bear and Little Bear Creeks and other tributaries through TRM, Stream Protection and TMDL Implementation grants.
- Ponds and lakes with outlet control structures should have the tin whistles modified to protect downstream water quality.

Wetlands-Specific Recommendations for Monitoring and Management

- Restore filled, ditched and drained wetlands along Bear Creek and its tributaries through WRP and EQIP programs offered by Richland and Sauk County NRCS and by other cost-sharing programs such as CREP, US Fish & Wildlife Service's Partners for Fish and Wildlife program and easements.
- Reduce reed canary infestations in wet meadows and forested wetlands using wetland restoration best management practices.

Lloyd Meng standing in Hill Slough, Wisconsin River, 2010. Photo by Dave Marshall.

Summary of Actions

Ongoing or Proposed Management Actions	Existing, Planned or Proposed	Type (Monitoring, Restoration, Protection, I & E)	Who/Agency	Water(s) this addresses	Watershed Priorities and Goals Supported	Existing or Proposed Timeframe
303 d list/TMDL	Planned	Restoration	DNR	L. Bear Creek	H	2010
Reduce nitrates	Proposed	Restoration	DNR, DATCP	Baakens Pond, Hill Slough	H	
Reduce nutrients	Proposed	Restoration	DNR, DATCP	Hutter, Jones, Norton Sloughs	H	
Reduce runoff, Improve stream habitat	Planned	Restoration	DNR, Trout Unlimited	Bear Creek	H	
These waters classified, and condition rated as unknown or fair to poor need to determine if meeting use designation	Proposed	Monitoring	DNR	Croal Cr., Unnamed tributary Marble Cr. (WBIC:5032821), Four Springs Hollow Cr., Pumpkin Hollow Cr.	H	2015
Long Term Trends Monitoring	Ongoing	Monitoring	DNR	Wisconsin River	H	2011
Maintain		Protection	DNR	Cruson Slough, Cynthia Slough, L. Bear miles 6.66-6.67, Long Lake, Smith Lake, Unnamed "Wagner" Pit, Unnamed "Ringlestetter Slough, Wilson Slough		
Identify as ERW in SWDV	Proposed	Protection	DNR	Baakens Pond, Blue Hole Slough, Cruson Slough, Hill Slough, Norton Slough, Smith Lake, Unnamed "Wagner" Pit, Unnamed Pond "Ringlestetter Slough", Wood Slough	L	
These waters not classified, no use designation is assigned at this time. Once assigned they should be monitored	Proposed	Monitoring	DNR	unnamed tributary streams (90 total) unnamed open water ponds/floodplain lakes (22)	L	

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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.

Bear Creek Watershed