

2011 Water Quality Management Plan Update

Twin Door Kewaunee B Basin, Wisconsin

December 2011

The Kewaunee River Watershed is located in Kewaunee County and the eastern edge of Brown County and is 91,009 acres in size. It contains 295 miles of streams and rivers and 7,313 acres of wetlands. The watershed is dominated by agriculture (75%) and is ranked high for nonpoint source issues affecting streams and groundwater.

Upper reaches of the watershed are dominated by forage fish because of low flows and warm water temperatures. Most of the remainder of the watershed supports warmwater sport fisheries, although several tributaries and one section of the Kewaunee River are designated as trout fisheries. All perennial streams within the watershed experience seasonal anadromous migrations of trout and salmon from Lake Michigan.

The Wisconsin Department of Natural Resources (WDNR) built and operates an egg collection facility for Lake Michigan trout and salmon on the lower portion of the Kewaunee River.

Water quality has been and still remains a major concern within the watershed. Based on watershed models, it is estimated that the Kewaunee River delivers 1,900 tons of sediment per year to Lake Michigan (WDNR 1995). Along with sediment, phosphorus, nitrogen and manure can be found in runoff reaching the Kewaunee River. It was estimated that between 1969 and 1978 the average phosphorus load of the river was 42,000 pounds per year with values ranging from 11,000 lbs/yr to 106,000 lbs/yr (WDNR 1984). Because of high levels of point and nonpoint source pollution, the Kewaunee River was designated as a Priority Watershed in 1982. When the Priority Watershed program ended on the Kewaunee River in 1992, 89 of 300 landowners had agreed to participate in the program. Although low in percentage, participation was average for Priority Watersheds begun in this time period. The effectiveness of phosphorus/sediment reduction practices in this project was never measured.



Map 1: Kewaunee River Watershed



Contents

Watershed Details. 1

- Population and Land Use 1
- Hydrology 2
- Ecological Landscapes 2
- Historical Note 3

Watershed Condition 3

- Priority Issues 3
- Water Quality Goals 3
- Overall Condition 4
- River and Stream Condition 4
- Lake Health 6
- Wetland Health 7
- Groundwater 7
- Point and Nonpoint Pollution 8
- Waters of Note 9
- Trout Waters 9
 - Outstanding and Exceptional Resource Waters 9
 - Impaired Waters. 10
- Fish Consumption. 10
- Aquatic Invasive Species 10
- Species of Special Concern 11
- State Natural and Wildlife Areas 11

Watershed Actions 12

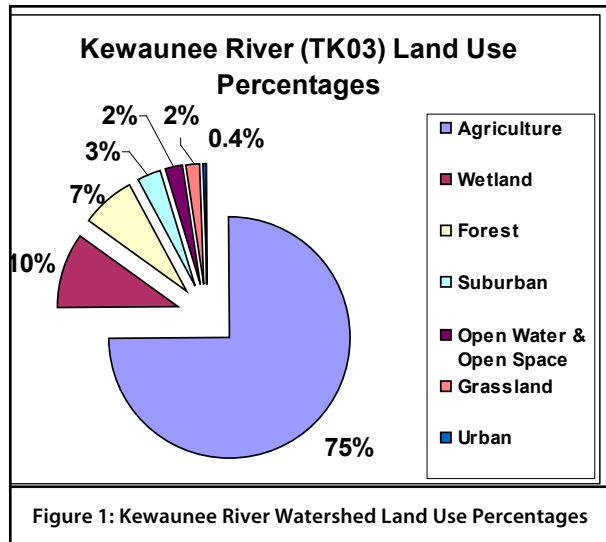
- Grants and Projects 12
- Monitoring 12
- Basin/Watershed Partners. 12
- Recommendations 13
- Contributors 13

Watershed Details

Population and Land Use

Agriculture is the most common land use in the watershed accounting for almost three-quarters of the total area. Ten percent of the watershed has been identified as wetlands, and forests cover another seven percent. Over three percent of the total area can be described as suburban environments. Open space and open water together with grasslands claim the last sizeable land use percentages for the Kewaunee River Watershed with two percent of the total area, each. Urban landscapes are even scarcer in the watershed with only two-fifths of one percent land cover.

Land Use	Acres	Percent of Area
Agriculture	67,910.49	74.62%
Wetland	9,321.68	10.24%
Forest	6,592.23	7.24%
Suburban	3,009.45	3.31%
Open Water & Open Space	2,228.62	2.45%
Grassland	1,487.38	1.63%
Urban	346.05	0.38%
Barren	113.20	0.12%



Hydrology

The historic removal of forests and wetlands from the landscape have resulted in a watershed that lacks adequate opportunities for infiltration and retention of precipitation and snow melt, resulting in flashy runoff which overwhelms existing stream channels and aquatic habitat. This excessive runoff also strips valuable sediments and nutrients from the terrestrial environment and delivers them to our streams and lakes where they result in degraded water quality and poor habitat. This degradation of aquatic resources leads to the extirpation of sensitive fish and aquatic invertebrates and makes the waters more susceptible to invasive species. Flashy runoff also limits the amount of water available to sustain adequate flows during drought. Restoration efforts should focus on increasing the overall percentage of forests and wetlands in this watershed to restore a more natural hydrologic regime and minimize the impacts of flashy runoff and an altered hydrologic regime.

Ecological Landscapes

The Kewaunee River Watershed is located within the Central Lake Michigan Coastal Ecological Landscape, which stretches from southern Door County west across Green Bay to the Wolf River drainage, then moves southward in a narrowing strip along the Lake Michigan shore to central Milwaukee County. Owing to the influence of Lake Michigan in the eastern part of this landscape, summers there are cooler, winters warmer, and precipitation levels greater than at locations farther inland. Dolomites and shales underlie the glacial deposits that blanket virtually all of the Central Lake Michigan Coastal Ecological Landscape. The dolomite Niagara Escarpment is the major bedrock feature, running across the entire landscape from northeast to southwest. A series of dolomite cliffs provide critical habitat for rare terrestrial snails, bats, and specialized plants. The primary glacial landforms are ground moraine, outwash, and lakeplain. The topography is generally rolling where the surface is underlain by ground moraine, variable over areas of outwash, and nearly level where lacustrine deposits are present. Important soils include clays, loams, sands, and gravels. Certain landforms, such as sand spits, clay bluffs, beach and dune complexes, and ridge and swale systems, are associated only with the shorelines of Lake Michigan and Green Bay.

Historically, most of this landscape was vegetated with mesic hardwood forest composed primarily of sugar maple, basswood, and beech. Hemlock and white pine were locally important, but hemlock was generally restricted to cool moist sites near Lake Michigan. Areas of poorly drained glacial lakeplain supported wet forests of tamarack, white cedar, black ash, red maple, and elm; while the Wolf and Embarrass rivers flowed through extensive floodplain forests of silver maple,

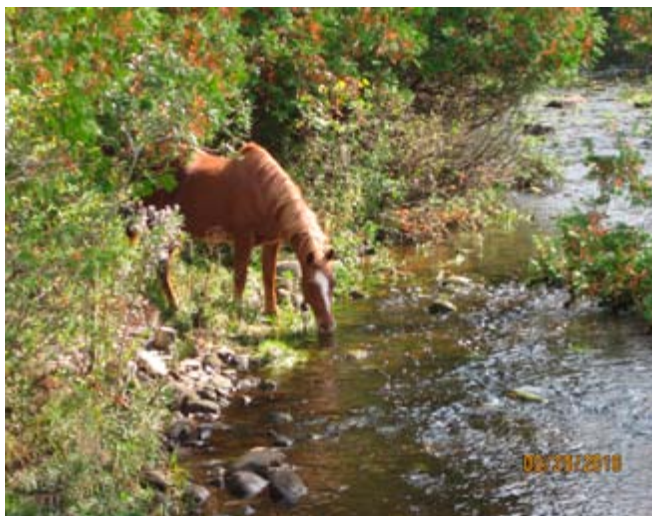


green ash, and swamp white oak. Emergent marshes and wet meadows were common in and adjacent to lower Green Bay; while Lake Michigan shoreline areas featured beaches, dunes, interdunal wetlands, marshes, and highly diverse ridge and swale vegetation. Small patches of prairie and oak savanna were present in the southwestern portion of this landscape.

Historical Note

The village of Luxemburg is located in the Kewaunee River Watershed. Luxemburg was settled in the 1850's by four families from the Grand Duchy of Luxembourg in Europe. A few years later more families arrived from Germany.

Originally, the idea of connecting the two cities of Sturgeon Bay and Green Bay by rail line came from Edward Decker. It was through his efforts that the Ahnapee & Western Railway Company, which runs through the Village of Luxemburg, bringing community growth and business opportunities, was formed. Subsequent to its retirement, the railroad bed is now home to the Ahnapee biking and hiking trail, a very popular and scenic tourist amenity.



Casco Creek near Crevice Road, Kewaunee County

The watershed is also home to the C. D. "Buzz" Besadny Fish and Wildlife Area, which was established in 1957 to manage fish and wildlife resources associated with the Kewaunee River and surrounding landscape. The property is located in eastern Kewaunee County and contains one of the largest wetland complexes bordering Lake Michigan as well as one of the largest remaining blocks of forest in the county.

Watershed Condition

Priority Issues

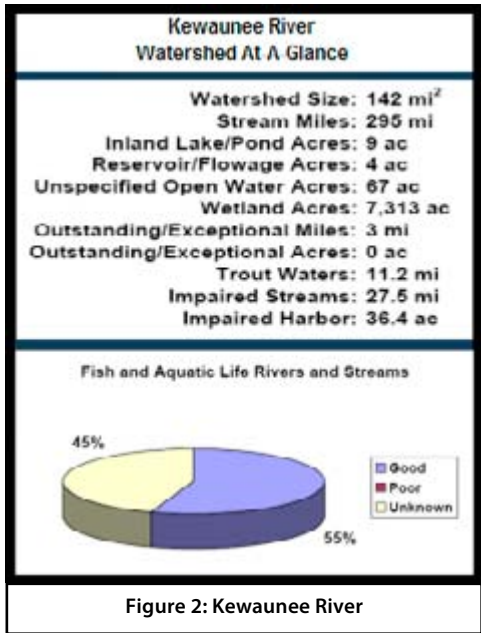
A priority issue for this watershed is agricultural runoff reaching surface waters and groundwater, and its impact on drinking water and surface water quality. Protecting groundwater in this area of fractured dolomite or karstic bedrock is important where agricultural land use and urban development can have potentially serious effects on water resources.

Additional issues for this watershed include invasion by non-native invasive species, the presence of dams and other fish passage barriers, loss of forests and wetlands and the need for riparian vegetation buffers, runoff from urban areas, and the lack of water quality and biological assessment data.

Water Quality Goals

Water quality goals for the watershed include:

- Minimizing agricultural runoff from rural areas
- Minimizing urban stormwater runoff
- Protecting groundwater resources
- Restoring key wetlands and forestlands for water quality improvement and protection
- Establishing riparian buffers to protect water quality
- Monitoring and controlling non-native invasive species
- Minimizing fish passage barriers
- Obtaining water quality and biological monitoring data to adequately assess water resource conditions



- Increasing citizens' watershed awareness, understanding and stewardship activities

Overall Condition

All of Rogers Creek (0.8 miles) and the lower 0.4 miles of Casco Creek are considered Exceptional Resource Waters. About two miles of the lower reaches of Little Scarboro Creek are considered Outstanding Resource Waters. Kewaunee River, Harbor, and Marsh suffer from chronic aquatic toxicity from unspecified metals. Fish tissue from these waters has also been found to be contaminated by PCBs. Little Scarboro Creek, Casco Creek, and Rogers Creek contain a total of four miles of Class I trout streams, and over four miles of Class II trout streams can be found along segments of Scarboro Creek and Casco Creek. Numerous Aquatic Invasive Species have been documented in Lake Michigan and rusty crayfish have been discovered along sections of Casco Creek, Kewaunee River, Scarboro Creek, and School Creek.

River and Stream Condition

According to the WDNR's Register of Waterbodies (ROW) database, there are over 294 miles of streams and rivers in the Kewaunee River Watershed; 97 miles of these waters have been entered into the WDNR's assessment database. Of these 97 miles, over half (55%) are meeting Fish and Aquatic Life uses and are specified as in "good" condition. The condition of the remaining stream miles is not known or documented.

Additional uses for which the waters are evaluated include Fish Consumption, General Uses, Public Health and Welfare, and Recreation. As Table 2 shows, these uses have not been directly assessed for the watershed. However, a general fish consumption advisory for potential presence of mercury is in place for all waters of the state. The distinction between supporting and full supporting is made based on the biological condition values for the water (excellent versus good, fair or suspected poor).

Table 2: Designated Use Support Summary for Kewaunee River Watershed Rivers and Streams (miles)

Use	Supporting	Fully Supporting	Not Supporting	Not Assessed	Total Size
Fish Consumption				96.55	96.55
Fish and Aquatic Life	50.98	2.49		43.08	96.55
General				96.55	96.55
Public Health and Welfare				96.55	96.55
Recreation				96.55	96.55

Kewaunee River

The Kewaunee River is a large, low gradient stream with a 46-year average flow of 81.1 cubic feet per second (cfs) (USGS, 2010). The Kewaunee River generally has fair to good water quality. Its major tributaries include Casco, School, Scarboro, and Little Scarboro creeks. The watershed is predominantly agricultural (75%). The mainstem of the river and many of its tributaries are receiving sediment and nutrient enrichment from agricultural runoff. Watershed soils are high in fine clays, which are easily suspended in water. Erosion in the watershed delivers these soil particles (and nutrients and herbicides that readily attach to sediments) to the river and to Lake Michigan.

Most of the Kewaunee River supports a warmwater sport fishery and has seasonal runs of salmon and trout from Lake Michigan. WDNR operates a trout and salmon egg-taking facility (C.D. "Buzz" Besadny Anadromous Fisheries Facility, BAFF) with a lowhead dam on the river. Eggs are harvested from spawning females to support Wisconsin's fish propagation efforts. NR 26, Wis. Adm. Code, classifies the river stretch from County Highway F upstream to 500 feet past the return pipe of the facility as a fish refuge. The lower river has extensive wetlands, which serve as nursery grounds for the 28 species of fish supported by the river. Two and a half miles of the river, between the mouth of Casco Creek downstream to County Trunk C, are Class II brown trout waters. Sandy soils in this portion of the watershed are important in maintaining base flows to trout waters and in providing gravel substrate for spawning.

In the upper watershed above County Road K, the Kewaunee River supports only forage fish and is likely fully supporting its potential use. Water quality in this segment is fair, with low flows and high water temperatures limiting the

fishery. The City of Kewaunee has a wastewater treatment plant that discharges to the Kewaunee River.

Because of high levels of point and nonpoint source pollution, the Kewaunee River was designated as a Priority Watershed in 1982. When the Priority Watershed program ended on the Kewaunee River in 1992, 89 of 300 landowners had agreed to participate in the program. Although low in percentage, participation was average for Priority Watersheds begun in this time period. The effectiveness of phosphorus/sediment reduction practices in this project was never measured.

Casco Creek

Casco Creek is a small, clear, spring-fed stream that flows 10 miles to the Kewaunee River. Its habitat and fishery varies considerably over its length. The 1.4-mile-long segment between the Village of Casco and the Kewaunee River has a steep gradient (30 feet per mile), gravel substrate, wooded and well-shaded banks. The 0.4-mile segment near the creek's mouth is a Class I brook trout stream and classified as Exceptional Resource Waters; the remaining mile is a Class II brook trout stream. Natural reproduction of Lake Michigan steelhead has been documented throughout these stream stretches. Public access is limited to one road crossing on this reach. The Village of Casco has a wastewater treatment plant that discharges to Casco Creek.

A dam in Casco forms the Casco Millpond. The pond is 1.3 acres, no deeper than five feet, and does not support a healthy sport fishery due to natural limitations. There is no public access and the pond is not considered to be a significant fishery resource. The seven-mile stretch above the millpond has a moderate gradient (10 feet per mile) and often flows through wetlands. Some warmwater fishes have been found in the lower two-thirds of this segment. These species include northern pike, rock bass, and black bullhead. However, the fish community is mainly comprised of forage species, particularly near the headwaters. Public access is limited to road crossings.

Water quality conditions are good in Casco Creek, but heavy siltation from nonpoint sources of water pollution has been noted in many areas. A survey in 2000 on Casco Creek at Rockledge Road showed a poor IBI value. Gamefish surveys in 2010 indicate good rainbow trout and rock bass reproduction.

Little Scarboro Creek

Little Scarboro Creek is a cold water, high gradient stream that originates in the Lipsky Swamp and flows 2.7 miles to the Kewaunee River. The East Branch also is a high gradient, coldwater stream that originates in the swamp and enters Little Scarboro Creek near its mouth. Little Scarboro Creek is one of the most productive Class I brook trout streams in northeastern Wisconsin. It is one of a few Lake Michigan tributary in Wisconsin with consistent natural reproduction of coho salmon and rainbow trout. The lower 1.7 miles is classified as Outstanding Resource Waters. Public access is excellent, with 432 acres of the Little Scarboro State Public Fishing Area bordering the 1.4 miles of the creek.

Scarboro Creek

Scarboro Creek is a clear stream that flows 15 miles from its headwaters in Brown County to its confluence with the Kewaunee River. The stream gradient is about 10 feet per mile until the creek flows into the Kewaunee Valley, where the gradient increases to 30 feet per mile.

The lower three miles are Class II brown trout waters. The three miles above Valley Road supports a fish community in transition, with some warmwater species present but forage species dominant. Above Hill Road, the stream narrows and supports mainly forage fishes. Most of the stream in Brown County is intermittent.

Rogers Creek

Roger's Creek, south of Casco, is a small, clear, spring-fed tributary to the Kewaunee River. The entire length (0.8 miles) is considered a Class I brook trout stream and Exceptional Resource Waters. No public access is available.

Luxemburg Creek

Luxemburg Creek is a three-mile long, moderate to high gradient (18-62 feet per mile) stream tributary to the Kewaunee River. The creek has poor base flow and is limited to supporting forage fishes throughout most of its length. The stream is heavily channelized along State Highway 54.

School Creek

School Creek has only 5.6 miles of perennial flow, yet drains a watershed area 25 square miles and 14 miles long. Fish populations in this stream are limited by flow.

Lake Health

The WDNR's ROW database shows that there are nine acres of lakes and ponds, over four acres of reservoirs and flow-ages, and another 67 acres of unspecified open water in the Kewaunee River Watershed. A total of 19 lake acres has been entered into the state's assessment database. Of these 19 acres, six acres are indicated as supporting Fish and Aquatic Life uses as shown in Table 3. The remaining lake acres within the watershed have not been assessed for Fish and Aquatic Life use support.

Use	Fully Supporting	Not Supporting	Not Assessed	Total Size
Fish Consumption			19.47	19.47
Fish and Aquatic Life	6		13.47	19.47
General			19.47	19.47
Public Health and Welfare			19.47	19.47
Recreation			19.47	19.47

Casco Millpond

Casco Millpond is a small shallow impoundment, whose level is maintained by a low head structure. Frontage is primarily industrial and the pond receives discharge from a cheese factory nearby. Forage fishes constitute the population. Public access is not available. The pond is high in total alkalinity presumably due to agricultural runoff. There are no adjoining wetlands. Winterkill may be an added problem (Source: 1966, Surface Water Resources of Kewaunee County Casco Millpond T24N, R24E, Section 17 Surface Acres = 1.3, S.D.F. 1.16, Maximum Depth = 5 feet).

Hallada Lake

Hallada Lake is a three-acre seepage lake with a maximum depth of 15 feet. Hallada Lake is a landlocked kettle lake with high aesthetic value, but it is unable to support fish over winter. The water is brown and a shallow thermocline develops in summer. Public access is not available (Source: 1966, Surface Water Resources of Kewaunee County Hallada Lake, T23N, R23E, Section 30 Surface Acres = 3.2, S.D.F. = 1.20, Maximum Depth = 15 feet).

Stump Pond

Stump Pond is six acres in size with a maximum depth of three feet. It is a seepage lake with no developed public access. Stump Pond is a small marshy-shored, stump-filled pond, which is landlocked and may fluctuate considerably in size. Winterkill obviously occurs annually. Its prime attributes are the shore birds which are common here, and waterfowl which nest here. A county trunk highway borders the pond; however, public access may not be possible (Source: 1966, Surface Water Resources of Kewaunee County Stump Pond, T23N, R24E, Sections 13, 24 Surface Acres = 5.7, S.D.F. = 1.49, Maximum Depth = 3 feet).

Wetland Health

Wetland Status:

The Kewaunee River Watershed, located in Kewaunee County and the western edge of Brown County, is 90,956 acres in size. An estimated seven percent of the current land uses in the watershed are wetlands. Currently, only 64% of the original wetlands in the watershed are estimated to exist. Of these wetlands, the majority include forested wetlands (72%), scrub (14%), and emergent wetlands (12%), which include marshes and wet meadows.

Wetland Condition:

Little is known about the condition of the remaining wetlands but estimates of reed canary grass (RCG) 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 17% of the existing emergent wetlands and 1% of



Figure 3: Forested Wetlands (Photo courtesy of WDNR)

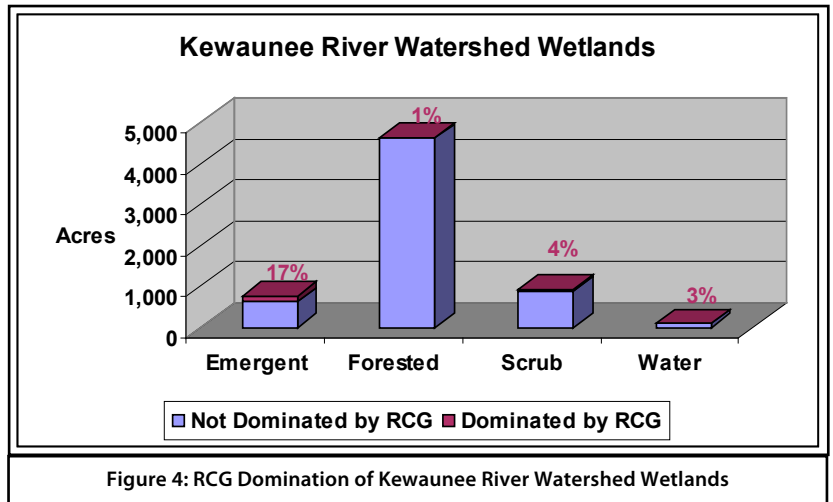


Figure 4: RCG Domination of Kewaunee River Watershed Wetlands

the remaining forested wetlands. Reed canary grass domination inhibits successful establishment of native wetland species.

Wetland Restorability:

Of the 3,623 acres of estimated lost wetlands in the watershed, approximately 94% are considered potentially restorable based on modeled data, including soil types, land use and land cover (Chris Smith, DNR, 2009).

Groundwater

Kewaunee County has an abundant supply of groundwater for domestic, municipal, and industrial uses. Groundwater is water which occupies pores, cavities, or crevices in glacial deposits or bedrock. The depth at which these empty spaces become saturated with water varies geographically. The depth to the water table varies throughout the county from less than 10 feet to over 30 feet. Groundwater supplies in the county are derived from three sources. These sources include the unconsolidated surficial materials deposited by glacial ice, the Silurian dolomite aquifer, and the St. Peter and Cambrian sandstone aquifer.

If Kewaunee County's abundant supply of groundwater is to remain an asset, development and land use practices must be managed in a way that protects the quality of this resource.

Kewaunee County lies in an area of the state classified as having shallow "karst" topography. This type of topography is characterized by shallow soil depth (five feet or less) to the underlying Niagara Dolomite (limestone) bedrock. In most landscapes, rivers flow across the surface of the land. However, in karst landscapes, rainwater and snowmelt readily flows downward through joints in permeable limestone rocks and invisibly attacks them over time through a solution process called "carbonation". Carbon dioxide from the atmosphere and soil combines with falling rain and snowmelt to form a weak carbonic acid that dissolves calcium carbonate, the main component of limestone. In carboniferous limestone, this process enlarges vertical and horizontal joints and creates complex underground channels. These channels provide easy conduits for transporting unfiltered groundwater contaminants, such as sediment, chlorides, nitrates, bacteria, and other microorganisms to local drinking water aquifers (Kewaunee County Land & Water Resource Management Plan Executive Summary, 2010 - 2019).

The following groundwater information for Kewaunee County is from Protecting Wisconsin's Groundwater through Comprehensive Planning website (<http://wi.water.usgs.gov/gwcomp/>).

No municipal water systems located within the Kewaunee River Watershed have developed a wellhead protection plan thus far. Kewaunee County and Brown County (into which part of the watershed extends), however, have both adopted animal waste management ordinances.

From 1979 to 2005 (historic data), total water use in Kewaunee County fluctuated from about 2.7 million gallons per day to 5.0 million gallons per day. The fluctuations in total water use over this period are due to fluctuations of usage in all categories, with an increase in aquaculture in 2005. The proportion of county water use supplied by groundwater has been consistently above 96% during the period 1979 to 2005.

Private Wells

Ninety-six percent of 126 private well samples collected in Kewaunee County from 1990 through 2006 met the health-based drinking water limit for nitrate-nitrogen (newer data may be available and will be updated as staff resources can accommodate this work).

Land use affects nitrate concentrations in groundwater. An analysis of over 35,000 Wisconsin drinking water samples found that drinking water from private wells was three times more likely to be unsafe to drink due to high nitrate in agricultural areas than in forested areas. High nitrate levels were also more common in sandy areas where the soil is more permeable. In Wisconsin's groundwater, 80% of nitrate inputs originate from manure spreading, agricultural fertilizers, and legume cropping systems. The areas of fractured dolomite or karstic bedrock in the Kewaunee River Watershed are especially susceptible to groundwater contamination from both rural and urban influences. These geologically sensitive areas have high bedrock and thin soils that have limited ability to filter surface water contaminants prior to water entering drinking water aquifers.

A 2002 study estimated that 33% of private drinking water wells in the region of Wisconsin that includes Kewaunee County contained a detectable level of an herbicide or herbicide metabolite. Pesticides occur in groundwater more commonly in agricultural regions, but can occur anywhere pesticides are stored or applied. There are no atrazine prohibition areas in Kewaunee County. All 31 private well samples collected in Kewaunee County met the health standard for arsenic.

Potential Sources of Contamination

There are concentrated animal feeding operations (CAFOs) in the Kewaunee River Watershed spread among the communities of Casco, Kewaunee, Luxemburg, West Kewaunee, and New Franken. The Kewaunee County SW Balefill and Compost Site in West Kewaunee is the only licensed landfill in the watershed. No Superfund sites are located within the watershed.

WDNR's Remediation and Redevelopment (RR) Program oversees the investigation and cleanup of environmental contamination and the redevelopment of contaminated properties. The RR Program provides information about contaminated properties and other activities related to the investigation and cleanup of contaminated soil or groundwater in Wisconsin through its Bureau for Remediation and Redevelopment Tracking System (BRRTS) database (WDNR 2010e).

Point and Nonpoint Pollution

The Kewaunee River Watershed is ranked as a high priority overall for nonpoint source (NPS) pollution and is similarly ranked for groundwater and stream NPS pollution. Lakes within the watershed, however, are not yet ranked for NPS pollution.

Runoff Events

Runoff events occur regularly within the Kewaunee River Watershed. This is a significant issue since these runoff events degrade water quality, cause abundant algae growth, and degrade the fishery.

Waters of Note

Trout Waters

Class I trout streams are high quality trout waters that have sufficient natural reproduction to sustain populations of wild trout, at or near carry capacity. Consequently, streams in this category require no stocking of hatchery trout. These streams or stream sections are often small and may contain small or slow-growing trout, especially in the headwaters. Class II trout streams may have some natural reproduction, but not enough to utilize available food and space. Therefore, stocking may be required to maintain a desirable sport fishery. These streams have good survival and carryover of

adult trout, often producing some fish larger than average size (<http://dnr.wi.gov/fish/species/trout/streamclassification.html>).

Little Scarboro Creek, Casco Creek, and Rogers Creek contain a total of four miles of Class I trout streams, and over four miles of Class II trout streams can be found along segments of Scarboro Creek and Casco Creek. The table below indicates where these trout waters are located along the streams, starting from the mouth at mile zero.

WADRS ID	Official Waterbody Name	Local Waterbody Name	WBIC	Start Mile	End Mile	Trout Class	Trout ID
10178	Casco Creek	Casco Creek	91600	0	0.47	CLASS I	11
18064	Casco Creek	Casco Creek	91600	0.48	1.87	CLASS II	1517
10170	Kewaunee River	Kewaunee River	90700	13.51	16.36	CLASS II	1515
10171	Little Scarboro Creek	Little Scarboro Creek	90800	0	1.69	CLASS I	9
1523091	Little Scarboro Creek	Little Scarboro Creek	90800	1.69	2.73	CLASS I	9
10207	Rogers Creek	Roger's Creek	91500	0	0.8	CLASS I	10
18062	Scarboro Creek	Scarboro Creek	91000	0	3	CLASS II	1516

Outstanding and Exceptional Resource Waters

Wisconsin has designated many of the state's highest quality waters as Outstanding Resource Waters (ORWs) or Exceptional Resource Waters (ERWs). 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 of Wisconsin 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 "antidegradation" policy that is designed to prevent any lowering of water quality, especially in those waters having significant ecological or cultural value.

Outstanding Resource Waters (ORWs) typically do not have any point sources discharging pollutants directly to the water (for instance, no industrial sources or municipal sewage treatment plants), though they may receive runoff from nonpoint sources. New discharges may be permitted only if their effluent quality is equal to or better than the background water quality of that waterway at all times. No increases of pollutant levels are allowed. If a waterbody has existing point sources at the time of designation, it is more likely to be designated as an Exceptional Resource Water (ERW). Like ORWs, 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 (<http://dnr.wi.gov/topic/surfacewater/orwerw.html>).

All of Rogers Creek (0.8 miles) and the lower 0.4 miles of Casco Creek are considered Exceptional Resource Waters. About two miles of Outstanding Resource Waters can be found in the lower reaches of Little Scarboro Creek.

WADRS ID	Official Waterbody Name	Local Waterbody Name	WBIC	ORW/ERW	ORW/ERW ID	Start Mile	End Mile	Code Reference
10171	Little Scarboro Creek	Little Scarboro Creek	90800	ORW	1668	0	1.69	102.10(1)(d)13
10178	Casco Creek	Casco Creek	91600	ERW	1670	0	0.47	102.11(1)(a)
10207	Rogers Creek	Roger's Creek	91500	ERW	1669	0	0.8	102.11(1)(a)

Impaired Waters

The entire stretch of the Kewaunee River is listed as impaired from polychlorinated biphenyls (PCBs), which are a class of compounds used in a wide variety of manufacturing processes and in transformers. The use of PCBs in new applications is no longer possible, but historical discharges or dumping of PCBs throughout the U.S. has resulted in contamination of river bottoms where PCBs attach to sediment or soil and is redistributed when the sediment is disrupted or disturbed. Organic contaminants are bioaccumulating substances, which means that they are stored in the fat of animals, such as fish, and transferred to predators, such as humans. The Kewaunee Harbor and Kewaunee River and Marsh are all also listed on the 303(d) list for arsenic.



Fish Consumption

Wisconsin's fish consumption advisory is based on the work of public health, water quality, and fisheries experts from eight Great Lakes states. Based on the best available scientific evidence, these scientists determined how much fish is safe to eat over a lifetime based on the amount of contaminants found in the fish and how those contaminants affect human health. Advisories are based on concentrations of the following contaminants along with angler habits, fishing regulations, and other factors.

Kewaunee River and Lake Michigan have had a specific fish consumption advisories in effect for polychlorinated biphenyls (PCBs) since 2009.

Studies indicate the people exposed to PCBs are at greater risk for a variety of health problems. Infants and children of women who have eaten a lot of contaminated fish may have lower birth weights and be delayed in physical development and learning. PCBs may affect reproductive function and the immune system and are also associated with cancer risk. Once eaten, PCBs are stored in body fat for many years. Each time you ingest PCBs the total amount of PCB in your body increases (Lowndes & Helmuth. Proposed Guidance For the Classification, Assessment, & Management of Wisconsin Surface Waters, March 12, 2007).

Aquatic Invasive Species

It is important to keep in mind that many invasive species of fish have become naturalized in Lake Michigan and are now a critical part of the forage base. As this watershed discharges into Lake Michigan, there are constant influxes of invasives species from the Great Lakes.

Table 6: Kewaunee River Watershed Aquatic Invasive Species

Database Key	Waterbody Name	Bio. Common Name	Status	Subtype	Start Date	WBIC
1404	Lake Michigan	Eurasian Water-milfoil	Verified and Vouchered	Mainbody	07/01/1978	20
29305528	Lake Michigan	Fishhook Waterflea	Verified and Vouchered	-	07/01/2000	20
29304803	Lake Michigan	Rainbow Smelt	Verified and Vouchered	-	12/31/1923	20
29304802	Lake Michigan	Round Goby	Verified and Vouchered	-	-	20
22707869	Lake Michigan	Spiny Waterflea	Verified and Vouchered	-	12/31/1986	20
34951437	Lake Michigan	Viral Hemorrhagic Septicemia	Verified and Vouchered	-	-	20
31	Lake Michigan	Zebra Mussel	Verified and Vouchered	Interstate	01/01/1991	20
22570633	Casco Creek	Rusty Crayfish	Verified and Vouchered	-	-	91600
22570767	Kewaunee River	Rusty Crayfish	Verified and Vouchered	-	-	90700
22571173	Scarboro Creek	Rusty Crayfish	Verified and Vouchered	-	-	91000
22571174	School Creek	Rusty Crayfish	Verified and Vouchered	-	-	92200

Species of Special Concern

The following table contains federally-listed Threatened, Endangered, Proposed, and Candidate species found in Brown and Kewaunee counties, in which the Kewaunee River Watershed is located. A full list of special concern plants and animals for this watershed can be found on the state’s Natural Heritage Inventory (NHI).

Species	Status	Habitat	Taxa
Hine’s emerald dragonfly (<i>Somatochlora hineana</i>)	Endangered	Streams and associated wetlands overlying dolomite bedrock	Insect
Dwarf lake iris (<i>Iris lacustris</i>)	Threatened	Partially shaded sandy-gravelly soils on lakeshores	Plant

State Natural and Wildlife Areas

C. D. (Buzz) Besadny Fish and Wildlife Area

The C. D. “Buzz” Besadny Fish and Wildlife Area was established in 1957 to manage fish and wildlife resources associated with the Kewaunee River and surrounding landscape. C. D. (Buzz) Besadny Fish and Wildlife Area is a 2,632-acre property, located in west of Kewaunee, contains one of the largest wetland complexes bordering Lake Michigan as well as one of the largest remaining blocks of forest in the county. The property is comprised mostly of forest, wetlands, river (warm water), stream (cold water), and grasslands. Ahnapee State Trail runs through the property.

The fishery portion of the project consists of the Kewaunee River, a warm water stream, and Little Scarboro Creek, a cold water stream. The Kewaunee River has native populations of smallmouth bass and northern pike. It also receives seasonal migration of trout and salmon from Lake Michigan. Recreational fishing is very popular during these seasonal runs. The Little Scarboro, a tributary of the Kewaunee River, is a Class I brook trout stream with a self-sustaining fishery.

The wildlife portion of the project is managed for a whole host of species. The area provides habitat particularly for songbirds, waterfowl, water birds, and upland game. It supports a diversity of birdlife due to its proximity to Lake Michigan, the varied habitats present. This area is also migration corridor for many raptors and other birds. Portions of the property receive annual pheasant stocks for hunting opportunity. Forest are primarily lowland, consisting of cedar and bottomland hardwood species.

Watershed Actions

Grants and Projects

NPS Grant Targeted Runoff - Rural Construction 2005

Construction and installation of barnyard and manure storage best management practices (BMPs) on a family farm.

Lake Protection Grant

Kewaunee County Lakes Protection Ordinance Project: Kewaunee County conducted a county-wide inventory, analysis and classification of its surface water resources with the intent to develop a comprehensive land use and resource protection plan. This grant aided in the development of plans that pertains to the Krohn, Three Mile Creek, East and West Alaska lakes and watersheds and addressed ordinance concerns specific to the needs of those lake resources.

Monitoring

Baseline and Trends Monitoring

- River Monitoring to comply with Clean Water Act implementation - water quality standards: use designations, criterion, permit issuance and compliance, assessments and impaired waters management.
- Fisheries projects include a wide variety of “baseline” monitoring and targeted fieldwork to gain specific knowledge related to Wisconsin’s fish communities.
- In close cooperation with UW Extension and Wisconsin Sea Grant, education efforts



Besadny Wildlife Area, WDNR

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.

Basin/Watershed Partners

1. The Lakeshore Natural Resource Partnership, Inc. (LNRP)

The LNRP is a very active non-profit organization whose mission is to support community-based conservation and stewardship in one of the most unique and inspiring areas of Wisconsin – The Lakeshore Region. Members of the LNRP include Individuals, organizations, and businesses who believe in a healthy environment, a sustainable economy, people joining forces to help solve local, and regional natural resource issues. LNRP supports community efforts and creative regional collaborations for conservation and stewardship, by involving all stakeholders in constructive dialog, raising awareness, and carrying out meaningful actions.

2. The Kewaunee County Land and Water Conservation Department (LWCD)

The Kewaunee County LWCD has completed a Land & Water Resource Management Plan for Kewaunee County for the years 2010 through 2019 to meet the minimum requirements of the water resource management planning program. The goal of the program is to foster and support a locally led process that improves decision-making, streamlines administrative and delivery mechanisms, and better utilizes local, state, and federal funds to protect Wisconsin's land and water resources.

3. Groundwater Guardians of Kewaunee County

The Groundwater Foundation provides motivational and inspirational education and community-based action programs that creatively involve individuals, communities, public and private entities in groundwater conservation and protection. In 2010, the Groundwater Guardians of Kewaunee County assisted with the Kewaunee County LWCD's well testing program. Team members worked with private well owners on proper well water sampling and the importance of regular private well testing. Over 30 wells were tested. The Groundwater Guardians also assisted with the fifth annual Kewaunee County Groundwater Festival. Nearly 200 fifth grade students, teachers, and volunteers from throughout the county participated in the festival and learned about Wisconsin's groundwater resources through hands-on activities. In addition, the group hosted a nitrate testing booth at the Kewaunee County Fair. Ten people had their water tested for nitrates while another 50 came to the booth for more information during the fair.

4. Kewaunee Cares

Kewaunee Cares is a group of citizens advocating responsible environmental stewardship. Their mission is to advocate stewardship of the land, air and water to provide a thriving environment, economy, and community in Kewaunee County, Wisconsin.

Recommendations

1. Minimize agricultural runoff from rural areas:
 - Provide funding needed for implementation of agricultural management programs
 - Work with agricultural producers to implement best management practices such as restricting livestock access to streams, installing stream buffer strips, planting cover crops etc.
 - Provide funding for manure storage
 - Address the barnyard runoff, especially at operations within close proximity to streams
2. Minimize urban storm water runoff: work with the City of Kewaunee and the towns of Luxemburg and Casco to implement storm water best management plans.
3. Restore key wetlands and forests in the watershed.
4. Restore riparian corridors and stream buffers.
5. Design water quality monitoring strategies to determine current water quality conditions throughout the watershed.
6. Increase citizens' watershed awareness, understanding and stewardship.
7. Monitor and control non-native invasive species.
8. Protect Groundwater resources.

Contributors

- Mary Gansberg, Water Resources Management Specialist; Kelley O'Connor, Wastewater Supervisor; Steve Hogler, Fisheries Biologist, NER.
- Jordan Emerson, Lisa Helmuth, Matt Rehwald, Chris Smith, and Fran Keally, Watershed Management, Madison, WI

Keewaunee River Harbor





Casco Creek at Rockledge



Kewaunee River, Upstream of Hwy 42



Keewaunee River CTH C



Keewaunee River and Harbor 001

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

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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.

Kewaunee River Watershed