East Twin River Watershed

A clean water guide for people living and working in the watersheds of Krok, Tisch Mills, Jambo, and Johnson Creeks, the East Twin River, and small streams along Lake Michigan

East Twin River

Green frog

Yellow lady slipper

Photos (from left): Debbie Beyer, Jeffrey J. Strobel and Thomas Meyer

Explore & Restore

Wisconsin Coastal Management Program · NOAA · Wisconsin Maritime Museum at Manitowoc · Lakeshore Natural Resource Partnership · Woodland Dunes Nature Center & Preserve · UW Extension · Wisconsin Dept. of Natural Resources

What do you value about your river or stream?

Krok, Tisch Mills, Jambo and Johnson Creeks are the major tributaries of the East Twin River. Along with their tributaries and small streams along Lake Michigan, they are part of the East Twin River watershed. You may see one of these rivers or streams every day, but you may not stop to really think about it. As you peer out your window or step outside, what do you see? Is the river or stream scenic, or unsightly? What do you hear? What do you smell? Does the river or stream add to or decrease the economic value of your property? Have you thought about how these waters connect you to the rest of the world?

Jeffrey J. Strobel

Yellow-headed blackbirds nest in some of the restored wetlands in the East Twin River watershed.

The East Twin River watershed is in the Great Lakes basin

Rivers, creeks and streams in the East Twin River watershed provide water to the Great Lakes. The Great Lakes have played a major role in the history of the United States and Canada and are immensely important today for food, drinking water, transportation, industry, recreation, and energy production.

The Great Lakes make-up the largest system of fresh surface water on earth and contain about 18% of the total world supply. The Great Lakes basin, the land area that drains into the Great Lakes, is home to more than 10% of the United States population and 25% of Canada's population. The Great Lakes basin harbors some of the world's greatest industrial capacity and almost 25% of agricultural production in Canada and 7% of production in the United States.

Read on to learn more about the East Twin River watershed. Take time to explore and restore this amazing water resource!

About this brochure: *This brochure is part of the 2009 "Explore and Restore" river education project. "Explore and Restore" is a collaborative effort of Woodland Dunes Nature Center, Wisconsin Maritime Museum, the Lakeshore Natural Resource Partnership, and the UW-Extension Basin Education Initiative and supported with funding from Wisconsin Coastal Management Program and through a 2008-09 Wisconsin Department of Natural Resources river protection grant. Through this partnership, programs and educational brochures are offered to citizens regarding four watersheds (East Twin River, West Twin River, Manitowoc River and Silver Creek) that are especially in need of restoration action from citizens.*

The East Twin River watershed supplies water to Lake Michigan

Rivers, creeks and streams in the East Twin River watershed flow into Lake Michigan - one of the greatest of Great Lakes! By volume, Lake Michigan is the second largest Great Lake and the fifth largest freshwater lake in the world! It is 307 miles long and 118 miles wide, with an average depth of 279 feet.

Lake Michigan is where 43% of all Great Lakes fishing happens; it cradles the world's largest collection of freshwater sand dunes and recreational beaches; and it supplies drinking water for 11 million people, including those living in Green Bay, Two Rivers and Manitowoc. But Lake Michigan and the Great Lakes system have limits. They are showing serious signs of stress from more than 100 years of intense human activity.

Lake Michigan retains water for about 99 years before it cycles out to Lake Huron. Polluted water entering Lake Michigan almost 100 years ago is still affecting the lake now. The quality of water entering Lake Michigan today impacts how you, your grandchildren and even your great-great grandchildren will be able to use and enjoy the lake.

Water quality in rivers, creeks and streams the East Twin River watershed contributes directly to the health of Lake Michigan. Activities that support healthy rivers support healthy Great Lakes.

Source: The Great Lakes – An Environmental Atlas and Resource Book. U.S. Environmental Protection Agency (EPA) and the Government of Canada, 1995; and the Lake Michigan Lakewide Area Management Plan (LaMP). Michigan Department of Environmental Quality and U.S. EPA, 2007.

Great Lakes Basin

East Twin River Watershed

U.S. Army Corp. of Engineers – Detroit District, and NASA Geospacial Interoperability Office, Jet Propulsion Laboratory

Debbie Beyer

Healthy rivers support healthy Great Lakes for our children and grandchildren to use and enjoy.

What threatens the health of rivers and streams in the East Twin River watershed?

The greatest threats to rivers, creeks and streams in the East Twin River watershed and thus, also to Lake Michigan and the rest of the Great Lakes, include polluted runoff, industrial waste, habitat loss and fragmentation, and invasion by alien species.

Industrial waste

Under federal policy, the lower stretch of the East Twin River, from Lake Michigan to the Mishicot dam is classified as "impaired water." This means that due to pollutants, the lower East Twin River is not meeting its potential for supporting activities such as fishing and swimming. Although the East Twin River and many of its tributaries are impacted by pollution – especially runoff in rural areas, it is contamination from PCBs in the lower stretch of the East Twin River that puts it on the list of Wisconsin's impaired waters.

PCBs are present in the sediment of the East Twin River and in Lake Michigan. Manufacturing PCBs was banned in the U.S. in 1977, but PCBs still persist in air, water and soil. The presence of PCBs restricts the amount of fish that is safe to eat from the lower East Twin River. Remember to check and follow fish consumption guidelines found on the Wisconsin Department of Natural Resources website at: *http://dnr.wi.gov/fish/consumption/*

Runoff from agricultural and urban areas

Agriculture makes up 68% of the land use in the East Twin River watershed. Polluted runoff from agricultural lands may contain fertilizers, pesticides, herbicides, manure, land-spread industrial waste, and sediment from soil erosion. Scientists estimate that agricultural lands in this watershed contribute 5,313 tons of sediment from soil erosion - equivalent to 253 dump-truck loads, and 18 tons of phosphorus to Lake Michigan each year.

(Source: U.S.G.S. 1996 Water Resources Investigations Report #96-4092)

Sediment enters Lake Michigan at Two Rivers.

City of Two Rivers

In urban and residential areas, soil erosion at construction sites and chemicals that run off pavement and lawns, or are poured into storm sewers, can be toxic to fish and other aquatic organisms. Small amounts of pollutants can have big impacts. Just one quart of motor oil poured down a storm drain can create a 2-acre oil slick, harming fish, waterfowl and other aquatic organisms. Remember that what goes into storm sewers flows untreated directly into lakes, rivers and streams.

Loss of forests and wetlands

Prior to European settlement, the East Twin River watershed was covered with forests and wetlands that provided rich wildlife habitat and protected soil and water resources. Forests held the soil in place during rainstorms and spring thaws, keeping soil from eroding into streams. Forests also shaded rivers and streams, keeping their waters cool.

Biologists estimate that at least 50% of historic wetlands have been lost in this region. Historically, wetlands large and small dotted the watershed, absorbing floodwaters and releasing them slowly into surrounding rivers, lakes, streams and groundwater. Wetlands and their flood-control benefits are greatly diminished today. Flash floods are becoming the norm when rainstorms rage or snow thaws.

Dams

The Mishicot dam is the only major dam on the East Twin River, defining the upper river and lower river. Dams and other barriers, like improperly installed culverts, slow or stop the flow of water, allowing it to warm and promoting algae growth.

Dams and other barriers confine fish and other aquatic organisms to limited stretches of river or stream and may keep them from spawning areas, winter or summer habitat, or Lake Michigan. Loss of access to critical habitat can reduce or eliminate populations of northern pike, smallmouth bass, or other fish that depend on flowing waters.

If you own woodland or wetland, learn more and do what you can to care for it and protect it – you have something special that is important to the water quality above and below ground.

Forests help keep river water cool.

Wetlands absorb flood waters.

Photos (from left): Debbie Beyer and Woodland Dunes Nature Center

What goes into storm sewers is untreated – it flows directly into lakes, rivers and streams.

Debbie Beyer

Invasion by alien species

Carp and rusty crayfish are the only aquatic invasive species known to be present in waters throughout the entire watershed. Other aliens like zebra mussels, sea lamprey and round goby coming from Lake Michigan have been limited to the lower East Twin River by the Mishicot dam. These aliens replace native species like emerald shiners, sculpin, and northern clearwater crayfish.

Purple loosestrife, Eurasian water milfoil, phragmites, bush honeysuckle and buckthorn are alien plants in the watershed that displace native plants that provide valuable food and cover for fish and wildlife.

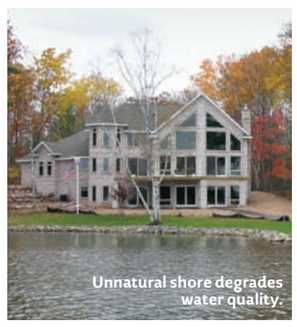
Take action on land to protect and restore your water

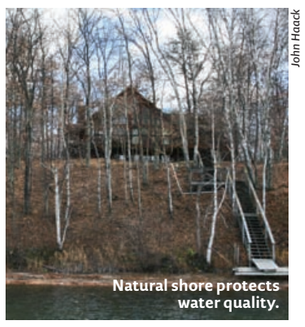
Volunteer...

- Observe and record changes in a portion of the East Twin River or a tributary.
- Label "Dump No Waste – Drains to River" on city storm drains
- Restore habitat and beauty to a portion of degraded riverbank by replacing invasive plants with native trees, shrubs, wildflowers and grasses. *(You will need to follow county ordinances and may need a shoreline permit.)*
- Report pollution runoff to the Wisconsin DNR Spill Hotline 1-800-943-0003 *(24 hrs/day)* or your county conservation office.

Kris Stepenuck

Volunteer stream monitoring


Unnatural shore degrades water quality.


John Haack

Natural shore protects water quality.

At home...

- Use lawn care practices that minimize the use of chemicals, especially phosphorus.
- Use lawn care practices that minimize runoff and maximize rainfall and snowmelt infiltration into the soil.
- Maintain or establish a buffer of natural vegetation, rather than mowed lawn, along the riverbank.
- Have your septic system inspected and pumped every three years by a certified septic installer to be sure it functions properly.
- Properly dispose of household hazardous waste *(paint, drained oil, old herbicides, cleaning solutions, etc.)*. Watch for annual *"Clean Sweep"* announcements.

On your farm...

- Reduce erosion with crop rotations, conservation tillage, no-till planting, cover crops and grassed waterways.
- Establish wooded or grass buffers along all shorelands.
- Develop and follow a nutrient management plan to optimize yields and lower the phosphorus content in your soil to 25-40ppm.
- Incorporate manure into the soil immediately upon application.
- Avoid applying manure during frozen or snow-covered conditions.
- Do not apply manure or agricultural chemicals near ditches, lakes, rivers, streams, sinkholes, bedrock fractures and wells.
- Build berms to divert water away from sinkholes, bedrock fractures and wells.
- Restore wetlands and woodlands.

Lynn Betts, USDA-NRCS

Rural stream buffer

Wisconsin Maritime Museum

Storm drain stenciling

In town...

- Avoid dropping or pouring anything into storm drains.
- Encourage city officials to create stormwater management ordinances, programs and incentives.
- Encourage city, county and state officials to press for clean-up of contaminated sediments in the East Twin River.

FOR MORE INFORMATION

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

General information
7 am-10pm, 7 days per week:
1-888-936-7463

Spill Hotline
24 hours/day, 7 days/week:
1-800-943-0003

www.dnr.state.wi.us/

Keywords: *Wisconsin waters, rivers, Great Lakes, beach health, impaired waters, fish consumption advisories, runoff, forests, wetlands, dams, aquatic invasive species, natural areas, fish*

COUNTY CONSERVATION DEPARTMENTS

Kewaunee County: 920-845-1360 x3 **www.kewauneeco.org/**
Manitowoc County: 920-683-4183 **www.manitowoc.wi.us/**

Soil erosion control and water protection information, technical assistance and cost sharing opportunities for farmers, landowners, and home owners with private wells.

UNIVERSITY OF WISCONSIN – EXTENSION COUNTY OFFICES
www.uwex.edu/ces/

Kewaunee County: 920-388-7141
Manitowoc County: 920-683-4169

Information on drinking water and private wells, water resources, forestry, and earth-friendly yard care. Information aand training for farmers, crop advisors and manure haulers.

WOODLAND DUNES NATURE CENTER 920-793-4007

Focus on East Twin and West Twin Rivers
www.woodlanddunes.com/

WISCONSIN MARITIME MUSEUM 920-684-0218 X 115

Focus on Manitowoc River and Silver Creek
www.wisconsinmaritime.org/

Volunteer opportunities and educational programs.

Join your neighbors in the East Twin River watershed to explore and restore clean water to YOUR river and to YOUR Great Lake!

Explore the East Twin River Watershed

Local waters, global connections

The East Twin River and its tributaries like Krok, Tisch Mills, Jambo, and Johnson Creeks, drain lands in Kewaunee and Manitowoc counties. Their water flows into Lake Michigan via the East Twin River. Additionally, there are numerous small, seasonal streams along Lake Michigan that flow directly into the lake. Large or small, these waters are all within the Lake Michigan watershed and contribute to the health of the Great Lakes–St. Lawrence River system. This water eventually finds its way to the Atlantic Ocean!

Debbie Beyer
Jambo Creek

Map prepared by Manitowoc County Soil and Water Conservation Department

Two sources of river water

Most rivers, creeks and streams in the East Twin River watershed are fed by a mix of groundwater and surface runoff. During dry periods when river levels are low, water you see remaining in rivers and streams is groundwater. Groundwater is rain or snowmelt that soaks into the ground and is stored between soil particles. It slowly seeps into lakes, rivers, and streams.

Rain and snowmelt that does not soak into the ground, but quickly runs off the surface of the land also contributes to water levels. Surface runoff results in increased water depths and river flows after rainstorms and winter or spring thaws. Both sources can deliver pollutants to lakes, rivers and streams.

Nature in the watershed

The East Twin watershed, especially the Lake Michigan shoreline, is like a living natural history museum to the nature enthusiast. Rare coastal wetlands, sand dunes, sand beaches, and a buried forest are found along this stretch of Lake Michigan and harken back thousands of years to the Ice Age. Many species of rare plants and animals are found here.

Boating, canoeing and kayaking

Motorboats can be used on the East Twin River in and near the City of Two Rivers. The watershed's most reliable canoeing and kayaking opportunity is the lower 9-mile stretch on the East Twin River, from Mishicot Village Park to Paddlers Park in Two Rivers. Depending on river flow, this surprisingly scenic trip can take from 3-6 hours. Upstream from Mishicot, the East Twin River and its tributaries get shallow, but many stretches can be canoed or kayaked during wet seasons.

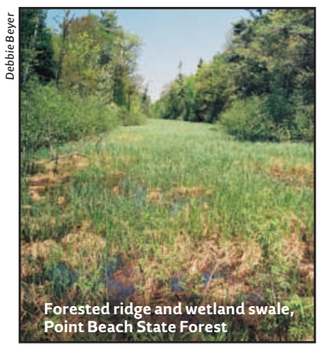
What is your watershed address?

The watershed, the landscape that drains into the East Twin River system and the adjacent Lake Michigan shore, covers 158 square miles or 101,196 acres. Check the map to see where you live or work. If your address was based on watersheds, rather than city and state, what would it be?

Answer: (Your river or stream), East Twin River, Lake Michigan, Great Lakes and St. Lawrence River system, Atlantic Ocean.

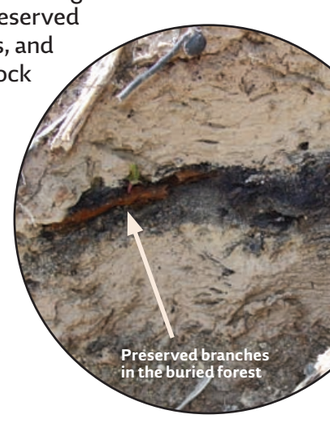
Inland and coastal wetlands

Coastal wetlands are different from inland wetlands because of their interaction and history with Lake Michigan. They are important spawning habitat for fish, stopovers and staging grounds for migratory and breeding birds, and critical habitat for rare plants and animals. Forested ridges and swales, Great Lakes dunes, and interdunal wetlands are found in two designated state natural areas within Point Beach State Forest, just north of Two Rivers. Conservation efforts have especially focused on restoring wetlands in the East Twin River watershed because of their importance to migrating birds and water quality.


Debbie Beyer
Forested ridge and wetland swale, Point Beach State Forest

Two Creeks Buried Forest

This state natural area is north of Two Creeks on HWY 42. It is owned by the WDNR and is a unit of the Ice Age National Scientific Reserve. Below the ground surface are layers of soil that contain preserved logs, branches, stumps, needles, and cones of spruce, pine and hemlock trees radio-carbon dated to 11,850 before present. When Lake Michigan water levels were higher, water action exposed these Ice Age relics along the bluff face, making them easy to find. Today if you are lucky, you may find a small area of exposed soil and preserved trees. Removing any material is strictly prohibited.


Preserved branches in the buried forest

Debbie Beyer

Sand beaches

Lake Michigan harbors the world's largest collection of freshwater sand dunes and recreational beaches in the world. Explore and enjoy six miles of uninterrupted sand beach at Point Beach State Forest.

Remnant forests

The rivers, creeks and streams in the East Twin River watershed meander their way to Lake Michigan through lands that were once forested with eastern white cedar, hemlock, beech, sugar maple and white pine. Visit Point Beach State Forest and reflect on the ways forests protect rivers, streams and the Lake Michigan shore. If there is woodland on your property, learn more and do what you can to protect it!

Debbie Beyer
Mature white cedar trees shade the East Twin

People and the river

Imagine the rich natural resources that drew people to settle this region. The area now known as Two Rivers, was the site of native villages and camps where people found an abundance of fish, game, water, wood and other resources for daily living. In 1795, French-Canadian Jacques Vieux established a trading post near present-day Mishicot to obtain furs harvested by native people.

Debbie Beyer

In 1844, Daniel Smith was attracted to the timber here. He built a sawmill and founded a town. He named the town "Mishicot," after his local Potawatomi friend, Chief Mishicott.

Throughout the mid-1800s, French-Canadians settled along the mouth of the East Twin River to raise their families and start commercial fishing businesses. It was during this period that people also began to settle the region for farming.

The East Twin River has been important in Great Lakes transportation. It has provided a Lake Michigan port at Two Rivers, and has been the home of shipbuilders and shipping companies, fishing fleets and manufacturers.

What drew your family to this area?

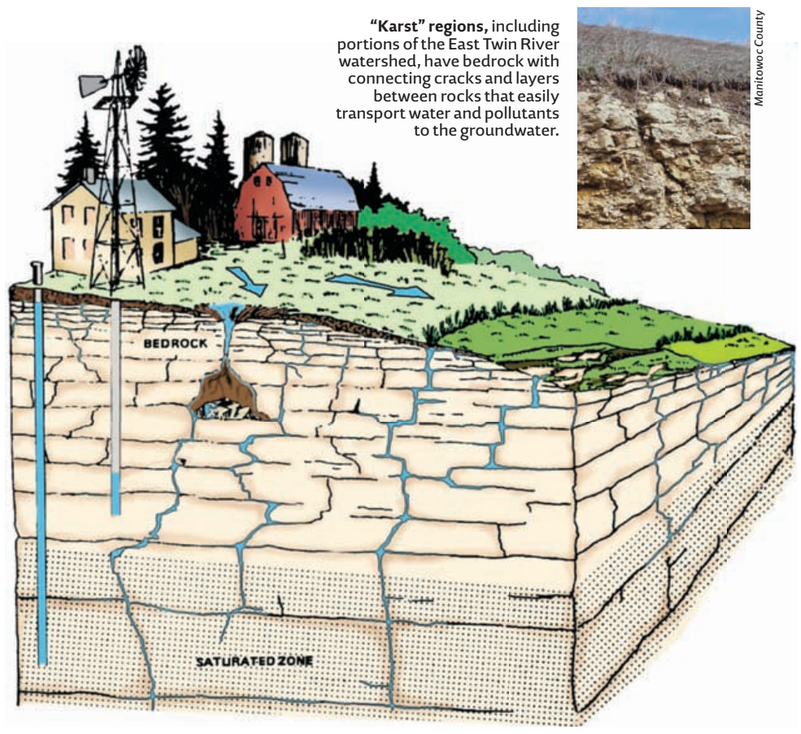
Wisconsin Maritime Museum
Logs floating to sawmills in Two Ri

Protect the Water You Drink!

If you own property with a private well in this watershed, learn more about groundwater threats and protecting your well water. Sinkholes and cracks in the limestone bedrock may be direct conduits for pollutants to travel from the land surface to ground-water – the water you drink. Work with your neighbors to minimize impacts on your drinking water. Your health and that of your neighbors depends on it!

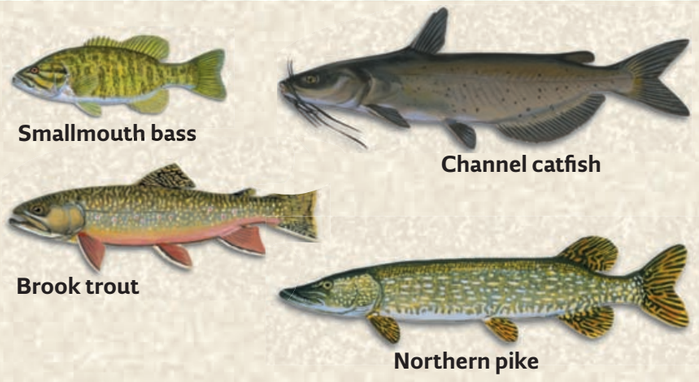
Manitowoc County

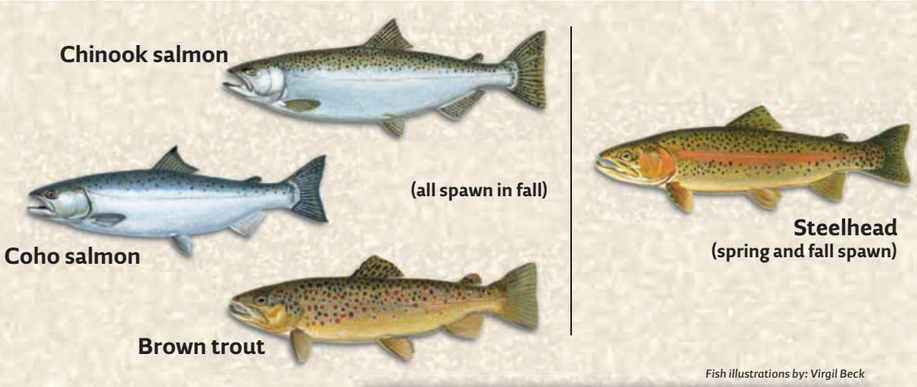
"Karst" regions, including portions of the East Twin River watershed, have bedrock with connecting cracks and layers between rocks that easily transport water and pollutants to the groundwater.



The "fish story"

Fishing can improve in this watershed by protecting and restoring good water quality – cool, clean water with high levels of dissolved oxygen, and restoring habitat and deep pools for adult northern pike, smallmouth bass and trout. Actions to improve fishing are those that reduce runoff and soil erosion from the land and improve habitat along and in the river. Most of the rivers, creeks, and streams in this watershed support a diverse array of fish, mussels and snails that can live in warm water. Northern pike, smallmouth bass and channel catfish are frequently caught.





Fish illustrations by: Virgil Beck

Trout need cool, clear water. They thrive in some areas of the watershed and struggle in others. In its Kewaunee County headwaters, 7.6 miles of the East Twin River are designated class I and class II trout waters. The brook and brown trout population in Tisch Mills Creek has increased in recent years, likely due to improved water quality. The population in the East Twin River appears to be stable, but brown trout have declined in Krok Creek, likely due to habitat loss. In spring and fall, salmon and trout from Lake Michigan run upstream as far as the Mishicot dam, providing exciting fish viewing and angling opportunities.

Remember to check and follow consumption guidelines found on the DNR website:
http://dnr.wi.gov/fish/consumption

Brochure development led by Debbie Beyer, UW-Extension Basin Education Initiative. Reviewed by Steve Hogler & Mary Gansberg, Wisconsin Department of Natural Resources; Kelly Eskew, Woodland Dunes Nature Center; Jim Kettler, Lakeshore Natural Resource Partnership, Inc.; Wendy Lutzke, Wisconsin Maritime Museum; Patrick Robinson, UW-Extension; Manitowoc County Soil & Water Conservation Department; and Dale Robertson, United States Geological Survey. Graphic design by Amy Torrey & Jeffrey J. Strobel, UW-Extension Environmental Resources Center