WATER USE

WITHDRAWAL USE OF WATER IN 1969, IN MILLION GALLONS PER DAY

Use	Source and type of supply						Total
	Ground water			Surface water			
	Public supply		Private supply	Public supply		Private supply	
	Municipal	Other		Municipal	Other		
Domestic	0.7	<0.1	3.1	0.5	0	0	4.3
Industrial and commercial	.8	< .1	2.4	1.4	0	31.0	35.7
Irrigation	< .1	0	.8	0	0	.2	1.0
Stock	0	0	2.6	0	0	1.0	3.6
Other	.6	< .1	< .1	.8	0	0	1.5
Subtotal	2.1	.2	8.9	2.7	0	32.2	
Total	11.2			34.9			46.1

Nearly 17 billion gallons of water was withdrawn for use in the Menominee—Oconto—Peshtigo River basin in 1969. About 25 percent of this amount came from wells. The remainder came from streams, lakes, and reservoirs.

Of the surface water withdrawn in the basin, nearly 89 percent was for paper manufacturing. Most water withdrawn for use in paper manufacturing was returned to the streams.

The city of Marinette, the largest community in the basin, derives its public supply from Green Bay. This accounts for all of the public supply of surface water in the table above.

Ground water is the source for all other communities and most rural and small industrial supplies.

Public supply is that of municipalities, sanitary districts, and unincorporated communities. Under public supply, irrigation is largely for parks and golf courses. In the use column, "other" includes losses from the distribution system, street washing, water-main flushing, and use in public buildings. Private supply is all other use, including rural farm and nonfarm, industries, commerce, and irrigation of vegetables. Industrial water use is mainly for paper manufacturing and food processing.

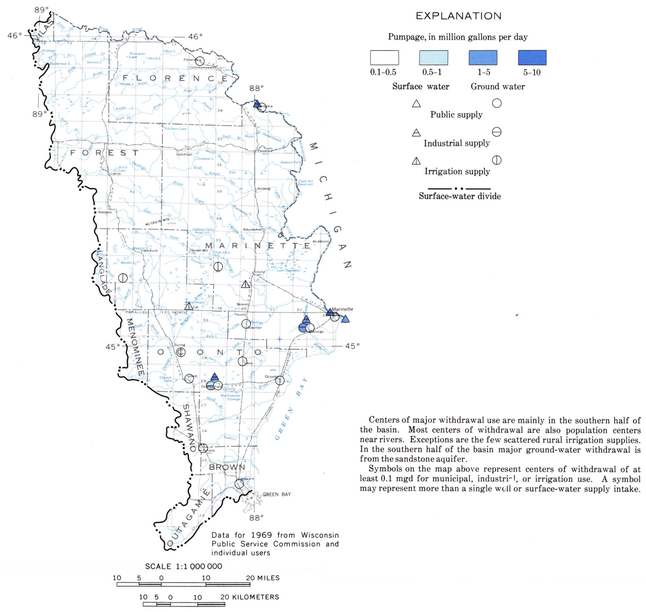
Withdrawal use of water in 1969 was equal to about 2 percent of the average streamflow leaving the basin. However, because most of the water is discharged into the nearest stream after use, it is available for reuse downstream. Therefore, data on withdrawals of surface water include an undetermined amount of reuse of the same water.

COMMUNITY WATER USE IN 1969

Community	County	Population (1960)	Average daily pumpage (mgd)	Maximum daily pumpage (mgd)	Use				Aquifer or surface-water source
					Domestic (mgy)	Industrial and commercial (mgy)	Public (mgy)	Other (mgy)	
Coleman	Marinette	718	0.143	0.528	8.34	38.27	3.49	2.10	Sandstone
Commonwealth	Florence	140	.007	.045	1.41	.90	.00	.20	Crystalline
Florence	Florence	675	.108	.172	10.84	7.02	1.65	20.02	Sand and gravel
Gillett	Oconto	1,374	.155	.690	13.65	31.82	3.23	7.89	Sand and gravel
Goodman	Marinette	600	.089	.294	4.03	17.12	1.96	9.30	Sand and gravel
Howard	Brown	3,485	.233	.576	49.39	17.72	4.39	13.46	Sandstone
Laona Sanitary District	Forest	950	.045	.150	12.00	2.43	1.80	.20	Sand and gravel
Lena	Oconto	506	.154	.217	6.88	37.51	3.52	8.30	Sandstone
Marinette	Marinette	13,329	2.720	3.244	192.02	525.31	36.61	238.24	Green Bay
Niagara	Marinette	2,089	.336	.580	36.31	15.60	11.28	59.71	Sand and gravel
Oconto	Oconto	4,805	.292	.639	47.02	33.70	9.02	16.83	Sandstone
Oconto Falls	Oconto	2,331	.211	.376	31.33	30.88	5.01	9.71	Sandstone
Peshtigo	Marinette	2,504	.226	.623	39.90	16.19	3.90	22.45	Sandstone
Pound	Marinette	273	.026	.088	2.86	1.05	.44	5.01	Sandstone
Pulaski	Brown	1,540	.137	.239	21.02	20.22	7.50	1.18	Sandstone
Suring	Oconto	513	.029	.216	5.47	3.14	1.66	.42	Sand and gravel
Wausaukee	Marinette	608	.046	.100	6.91	4.78	1.79	3.22	Sand and gravel
Total		36,440	4.957		489.38	803.66	97.25	418.24	

Pumpage and use data from Wisconsin Public Service Commission

Of the 17 community water supplies in the basin, all but one are from ground water. Nine communities obtain water from bedrock: eight are from deep wells in the sandstone aquifer, and one is from a shallow well in the crystalline aquifer. Seven communities obtain water from the sand and gravel aquifer.

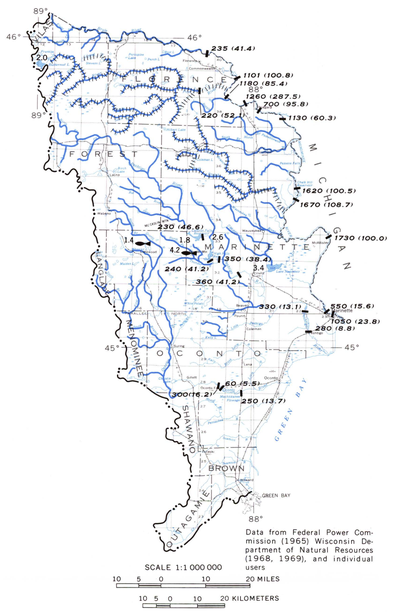


Data for 1969 from Wisconsin Public Service Commission and individual users

WITHDRAWAL USE

Centers of major withdrawal use are mainly in the southern half of the basin. Most centers of withdrawal are also population centers near rivers. Exceptions are the few scattered rural irrigation supplies. In the southern half of the basin major ground-water withdrawal is from the sandstone aquifer.

Symbols on the map above represent centers of withdrawal of at least 0.1 mgd for municipal, industrial, or irrigation use. A symbol may represent more than a single well or surface-water supply intake.



Data from Federal Power Commission (1965) Wisconsin Department of Natural Resources (1968, 1969), and individual users

NONWITHDRAWAL USE

Major nonwithdrawal uses of water in the basin are for power generation, fish and wildlife habitat, fish hatcheries, and recreation. Dams for hydroelectric power generation are located on major rivers where river gradients are steep. The power plants of 21 dams in the basin generate about 1,300 megawatt hours daily, passing an average of 17,030 cfs (5,400 billion gallons per year) through their turbines. This is about four times the average runoff (including streamflow originating in Michigan) from the basin. This use is not consumptive, and the water discharged at a power plant may be used at another plant downstream.

The basin contains part of the largest and most important complex of trout streams in the State (Threinen and Poff, 1963, p. 63). Most trout streams are located in the northern two-thirds of the basin where sand and gravel occurs in end moraine and outwash areas, and where most base flows are at least 0.30 cfs per square mile (sheet 3). In these areas streams are continuously fed by ground water in sufficient quantity and of sufficiently low temperature for trout propagation.

Two trout hatcheries in the basin use a total of 5.6 mgd of continuous cold surface-water throughflow. This use does not consume water.

Water-related recreation in the basin is centered on 1,200 miles of streams and 500 lakes. Most of the lakes are small and are in the northern two-thirds of the basin. There are 65 square miles of natural lakes and 10 square miles of reservoir lakes. Lakes and impoundments greater than 1,000 acres in area are shown on the map above. Fishing, boating, swimming, and sailing are popular on the inland lakes and on the 50 miles of shoreline along Green Bay.

Two minor river systems in the basin have been declared "wild" by the State of Wisconsin. These are the Pine River in Florence and Forest Counties, and the Pike River in Marinette County. They are shown on the map above. These recreational streams are in largely unpopulated forested areas where base flows are relatively high and sediment yields are low. The natural beauty and conditions of these streams will be protected by State regulation and control of streambank and near-streambank development.

DISTRIBUTION OF USE

SUMMARY

Large amounts of good quality water are available in the Menominee–Oconto–Peshtigo River basin. The quantity of surface water withdrawal use in the basin is three times that of ground water. Ninety-three percent of the surface water used in the basin is for industrial purposes. Nonwithdrawal uses of surface water are for power generation, recreation, and wildlife habitat. Ground water is used for most community, rural, and industrial supplies.

Ground water, which is more widespread than surface water, is available from sand and gravel deposits and sedimentary bedrock. Domestic and stock supplies are available everywhere in the basin.

The sandstone and sand and gravel aquifers commonly yield more than 500 gpm to wells.

Most areas in the basin have adequate supplies of ground or surface water available for future growth and development.

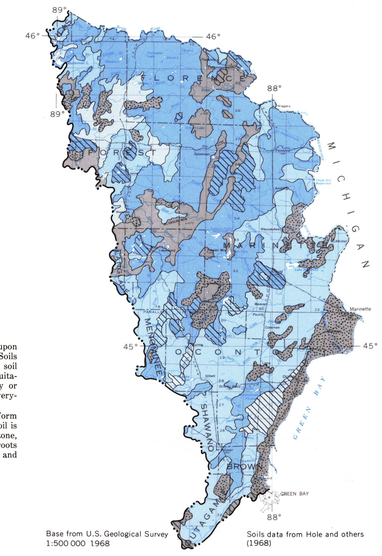
Water problems are minor and are related primarily to water quality. Both ground and surface water have high natural hardness; high iron content is a local problem in ground water. Reaches of some streams are polluted by industrial or municipal wastes. Saline water occurs in the sandstone aquifer near Marinette and locally in the crystalline aquifer.

WATER AVAILABILITY AND SUITABILITY FOR VARIOUS USES

Use and considerations \ Source	SURFACE WATER						GROUND WATER		
	Menominee River	Oconto River	Peshtigo River	Smaller streams	Large lakes (including Green Bay) and reservoirs	Small lakes and wetlands	Sand and gravel aquifer	Bedrock: Sandstone and Galena-Platteville aquifers	Bedrock: Crystalline aquifer
Community and industrial supply Quantity—100,000 gallons per day (About 1000 population or a small industry) Quality—Meet drinking water standards of U.S. Public Health Service (1962). Special industrial requirements may exist (Federal Water Pollution Control Administration, 1968)	Adequate flow Less mineralized than ground water Little pollution Treatment required for domestic use	Adequate flow Less mineralized than ground water Some pollution in lower reaches Treatment required for domestic use Colored water	Adequate flow Less mineralized than ground water Little pollution Treatment required for domestic use	Less mineralized than ground water Very little pollution Flow is variable Treatment required for domestic use May require storage Colored water	Less mineralized than ground water Adequate quantity Treatment required for domestic use	Quantity variable seasonally Ease of pollution Treatment required for domestic use Colored water	Adequate quality Adequate well yields usually available Commonly high in iron Near-surface deposits may become polluted Limited to northern two-thirds of basin	Adequate quality Not easily polluted Adequate well yields May require deep wells Quality poor in Marinette area Limited areal extent	Quality may be poor Well yields not adequate
Rural domestic, livestock, or resort supply Quantity—5 gallons per minute Quality—Meet drinking water standards of U.S. Public Health Service (1962)	Adequate flow Treatment required for domestic use Available only to riparian lands Ease of pollution	Adequate flow Treatment required for domestic use Available only to riparian lands Ease of pollution Colored water	Adequate flow Treatment required for domestic use Available only to riparian lands Ease of pollution	Adequate flow Treatment required for domestic use Available only to riparian lands Ease of pollution Colored water	Adequate quantity Adequate quality Treatment required for domestic use Limited to lakeshore owners	Treatment required for domestic use Quantity may vary seasonally Ease of pollution Colored water Limited to lakeshore or wetland owners	Adequate quality Adequate well yields Commonly high in iron Near-surface deposits may become polluted Limited to northern two-thirds of basin	Adequate quality Not easily polluted Adequate well yields May require deep wells Limited aerial extent	Quality may be poor Well yields are small May require deep wells
Irrigation supply Quantity—1 cubic foot per second or 450 gallons per minute per 40 to 60 acres	Adequate flow Available only to riparian lands	Adequate flow Available only to riparian lands	Adequate flow Available only to riparian lands	Adequate flow Available only to riparian lands	Adequate quantity Limited to lakeshore owners	Quantity variable seasonally Limited to lakeshore and wetland owners Many small lakes in hilly areas not suited for irrigation	Adequate well yields Limited to northern two-thirds of basin	Adequate well yields May require deep wells Limited aerial extent	Well yields not adequate
Recreation supply Water free from pollution, excessive weed growth, or odor Adequate access Availability of recreation sites Adequate depth for water sports Attractive physical setting	Little pollution Access at many sites Adequate depth Many scenic sites in upstream areas Dams may restrict passage of boats and canoes	Access at many sites Many scenic sites in upstream areas Dams may restrict passage of boats and canoes Pollution may limit swimming in downstream reaches	Little pollution Access at many sites Many scenic sites in upstream areas Dams may restrict passage of boats and canoes	Little pollution Access at many sites Many scenic sites Many campgrounds Depth and flow seasonally variable	Little pollution Access at many sites Adequate depth Many campgrounds	Little pollution Some campgrounds Adequate access Depth variable seasonally Ease of pollution	EXPLANATION Adequate flow / Available only to riparian lands Advantage / Disadvantage Overall evaluation for use based on considerations indicated Good / Fair / Poor		
Fish and wildlife habitat Adequate depth and quality for game fish Adequate cover for wildlife provided in or around: Wetlands—by lakes or potholes surrounded by marsh areas Streams—by woods or marshes along banks	Little pollution Adequate depth Streambank cover is variable Dams may restrict fish migration	Good cover along banks in upstream reaches Adequate depth Some pollution in lower reaches Dams may restrict fish migration	Good cover along banks in upstream reaches Adequate depth Little pollution Dams may restrict fish migration	Little pollution Adequate cover Adequate quality Depth is variable	Little pollution Adequate depth Adequate cover Adequate quality	Little pollution Adequate cover Adequate quality Depth is variable Ease of pollution			

This table lists advantages and limitations of various sources without regard for legal limitations. Water withdrawals from streams, lakes, and high- capacity (over 100,000 gpd) wells require permits from the Wisconsin Department of Natural Resources

IRRIGATION



Base from U.S. Geological Survey
1:500 000 1968

Soils data from Hole and others (1968)

SCALE 1:1 000 000
10 5 0 10 20 MILES
10 5 0 10 20 KILOMETERS

The suitability of soils for irrigation differs greatly, depending upon topography, soil permeability, and the depth to the water table. Soils in this basin are grouped above according to topography and soil parent material (F. D. Hole, written commun., 1967). The soil suitability shown above does not take into account water availability or soil fertility. However, water for irrigation is available nearly everywhere in the basin.

Under good conditions the topography is level to allow uniform distribution of water and to prevent excessive water runoff, the soil is permeable so that water can infiltrate and percolate to the root zone, and the depth to the water table is 4 feet or more so that plant roots remain in the zone of aerated soil for proper utilization of oxygen and nutrients.

EXPLANATION

Soil suitability			Parent material
Uplands	Plains	Wetlands	
Good only on level upland areas of limited extent	Good: The soil is level and permeable; and the water table is deeper than 4 feet below land surface.		Sandy outwash and some organic materials.
	Good soils mixed with many wetlands that have good suitability where drained.		Sandy outwash, sandy and silty lake deposits, and some organic materials.
Good on level areas that are mixed with few wetlands needing drainage.			Sandy outwash, sandy till, and some organic materials.
Fair: The soil is level to undulating; at least moderately permeable; and the water table varies from 1 to 4 feet below land surface.	Fair: Clayey soils mixed with sands of variable drainage conditions.		Sandy till, sandy and silty lake deposits, and some organic materials.
Poor: Soil permeability is low, or terrain is irregular, or water table is within a foot of land surface.	Poor: Soil permeability is low and special management is required	Poor: Water table is within a foot of land surface. Some wetland soils have good suitability where drained.	Sand and gravel, sandy and silty lake deposits, sandy and clayey till, lake clay, and some organic materials.

Surface-water divide

SOIL SUITABILITY FOR IRRIGATION

SOURCES OF ADDITIONAL INFORMATION

Information source	Geology	Soils	Topography and drainage	Land use	Water budget	Ground water–surface water relationship	Surface water	Surface-water quality	Pollution	Ground water	Ground-water quality	Water use	Recreation and fish and wildlife
Enviromental Protection Agency. (Formerly Federal Water Pollution Control Administration), Water Quality Office, 33 East Congress Parkway, Chicago, Ill. 60605								■	■				
Northeastern Wisconsin Regional Planning Commission, 2111 North Richmond St., Appleton, Wis. 54911				■				■				■	■
U.S. Corps of Engineers, Chicago District, 219 South Dearborn St., Chicago, Ill., 60603			■				■						
U.S. Department of Agriculture, Soil Conservation Service, 4601 Hammersley Rd., Box 4248, Madison, Wis. 53711		■	■	■			■					■	
U.S. Department of the Interior, Bureau of Outdoor Recreation, 3853 Research Park Dr., Ann Arbor, Mich. 48104													■
U.S. Department of the Interior, Bureau of Commercial Fisheries 3853 Research Park Dr., Ann Arbor. Mich., 48104									■				
U.S. Forest Service 633 West Wisconsin Ave., Milwaukee, Wis. 53203				■									■
U.S. Geological Survey, Water Resources Division, 1815 University Ave., Madison, Wis. 53706	■		■		■	■	■	■		■	■	■	
Wisconsin Department of Natural Resources 4610 University Ave., Box 450, Madison, Wis. 53701				■				■	■	■	■	■	■
Wisconsin Geological and Natural History Survey, 1815 University Ave., Madison, Wis. 53706	■	■	■		■						■	■	
Wisconsin Public Service Commission, 432 Hill Farms State Office Building, Madison, Wis. 53702												■	
Wisconsin-Michigan Power Company, 807 South Oneida St., Appleton, Wis. 54911				■	■	■	■		■			■	■

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Base from U.S. Geological Survey
1:500 000, 1968

WATER RESOURCES OF WISCONSIN—MENOMINEE–OCONTO–PESHTIGO RIVER BASIN

By
E. L. Oakes and L. J. Hamilton

1973