

# Water Use for Irrigation in Michigan, 2001

Each year, water-use data for Michigan are compiled or estimated by the Michigan Department of Environmental Quality (MDEQ), working in cooperation with the U. S. Geological Survey (USGS). The resulting information provides a category-by-category profile of over 4,200 facilities throughout the State. The data are reported in the Michigan Water Use Reporting Program, which provides needed information for water-resources planning and enhances public understanding of the value of sustaining water resources within the Great Lakes Basin. The primary goal of the program is to inventory, analyze, and report baseline data for major water uses.

Irrigation — divided into two primary types: agricultural and golf course — is one of Michigan’s major water-use sectors for which data are compiled or estimated. Agricultural and golf-course irrigation are seasonal, generally occurring from May thru September, with withdrawal rates reaching their peaks in July and August. Because Michigan’s temperate climate does not always provide adequate rainfall during the summer, irrigation is often necessary to relieve, balance, or eliminate moisture stress and create optimal growing conditions for crops and golf-course grasses.

The heaviest irrigation in Michigan is in the southwest, where soil texture is generally coarser than it is in other irrigated parts of the State (fig. 1). Sources of water for irrigation include ground water, inland lakes and streams, and the Great Lakes and their connecting waters (fig. 2). The major source of withdrawals in 2001 was ground water, which accounted for 64 percent of the total; about 34 percent of total irrigation withdrawals were from inland lakes and streams; and only 2 percent were from the Great Lakes and connecting waters.

Irrigation accounted for 2.3 percent of Michigan’s total water withdrawals in 2001. This relatively small percentage is due to the high volume of water withdrawn by other sectors, particularly thermoelectric powerplant cooling, which accounts for 81 percent. Irrigation water withdrawals, although a small percentage of the total withdrawals, are seasonal and have a high consumptive water-use rate. Withdrawals are highest during the summer when stream, lake, and ground-water levels typically are lowest. Because withdrawals for irrigation are from surface water or from ground water that may supply water to a surface-water body, water-resources managers need to consider water-supply issues for effective water-resources planning.

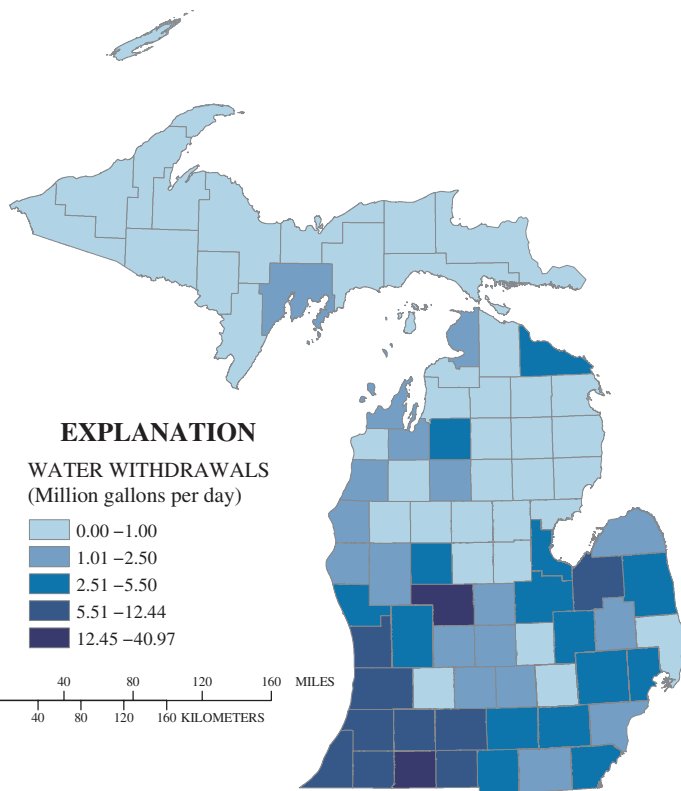


Figure 1. Total irrigation withdrawals for Michigan, by county, 2001.

## Water Withdrawals for Agricultural Irrigation, 2001

Although precipitation in Michigan is often adequate for crop nourishment during the growing season, farmers use irrigation as a supplement for greater control of water application and to ensure adequate moisture during critical crop-development periods. Agricultural water use in the State changes from year to year on the basis of several factors, including

- water-resource availability
- soil moisture
- crop type
- variations in weather
- irrigation-system development and operational costs

To estimate annual water withdrawals for agricultural irrigation, Michigan State University (MSU), working with the Michigan Departments of Environmental Quality (MDEQ) and Agriculture (MDA), developed a model to calculate agricultural irrigation crop-water demand statewide (Andresen and others, 2000, unpublished report). Federal Agricultural Census data for farmers irrigating 14 or more acres were combined with Next Generation Weather Radar (NEXRAD) weather data, soils data, and other information to generate crop-specific estimates. Farms with less than 14 irrigated acres were not included in the initial model analysis during 1997–2001, because they represented less than 3 percent of the total irrigated acreage in the State. The remaining irrigated acreage was included for 1,712 reporting farms.

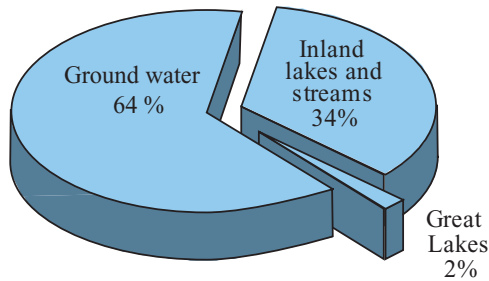


Figure 2. Sources of water for irrigation withdrawals in Michigan, 2001.

According to 2001 model estimates, agricultural water withdrawals totaled 206.96 million gallons per day (Mgal/day) throughout the State (figs. 3 and 4) and accounted for 85 percent of the total water withdrawals for irrigation in Michigan. The majority of withdrawals (65 percent) were from ground water, followed by 31 percent from inland lakes and streams, and less than 4 percent from the Great Lakes and their connecting waters. St. Joseph County, in southwestern Michigan, accounted for the largest water withdrawals and had 94,908 of the total 384,828 irrigated acres in Michigan. Eleven counties reported no farms irrigating 14 or more acres, and data could not be disclosed for another 18 counties because of census requirements that protect individual farm data. The St. Joseph Basin (HUC 04050001)<sup>a</sup> had the largest reported withdrawals for agricultural irrigation, with 80.31 Mgal/day withdrawn by 574 farms irrigating 184,225 acres in 2001. The basin with the smallest reported withdrawals was the Little Calumet-Galien Basin (HUC 04040001), with four farms using 0.07 Mgal/day.

<sup>a</sup>HUC (Hydrologic Unit Code) denotes the geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated on the State Hydrologic Unit Maps produced by the USGS.

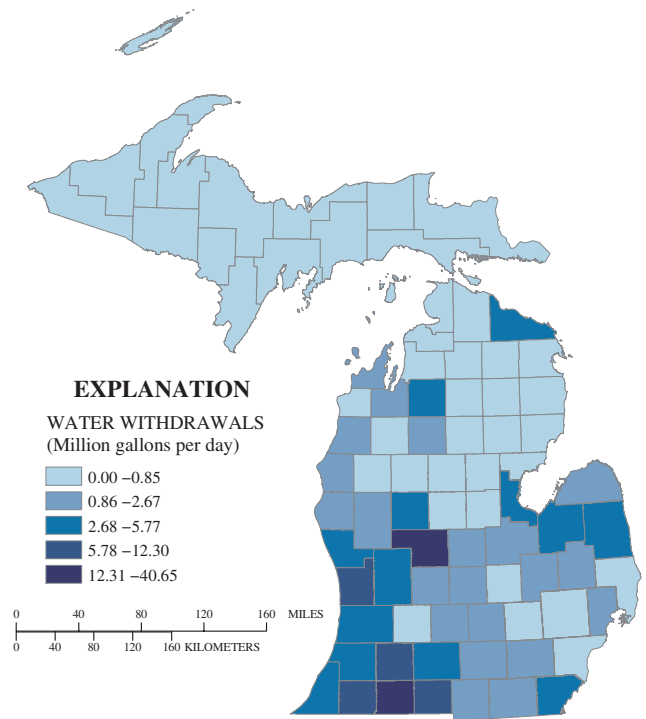


Figure 3. Agricultural irrigation for Michigan, by county, 2001.

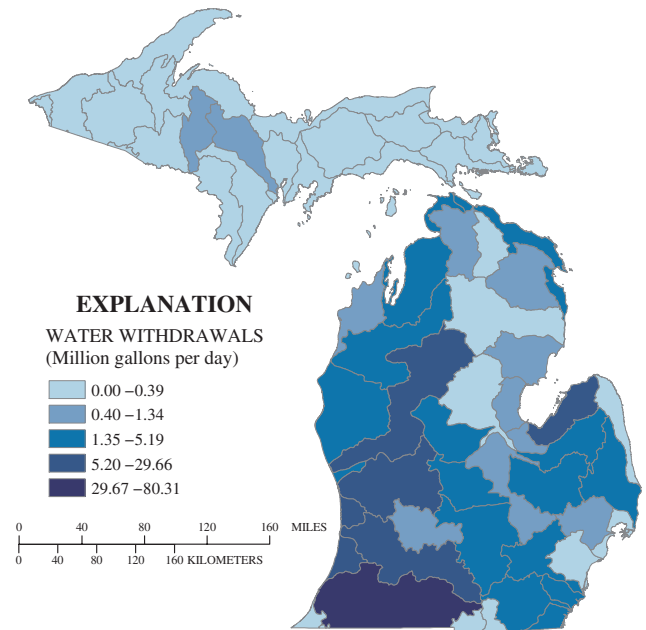


Figure 4. Agricultural irrigation for Michigan, by hydrologic basin, 2001.

## Water Withdrawals for Golf-Course Irrigation, 2001

Michigan ranks third in the Nation in the number of golf courses. Most golf courses irrigate some combination of greens, tees, and fairways. Healthy turf grass is necessary for a successful golf course, and supplemental irrigation is an essential factor in overall turf-grass maintenance, particularly for the higher water requirements of greens. The amount of water withdrawn for golf-course irrigation depends on several factors, including

- water-resource availability
- course design and acreage
- grass and soil types
- irrigation-system development and operational costs

The Great Lakes Charter and Michigan's water-use reporting law require all golf courses with the capacity to withdraw 100,000 gallons a day during any 30-day period to report water withdrawals on an annual basis. This includes 622 golf courses, or about 65 percent of the total in the State. Many of these are in southeastern Michigan. Golf courses that do not report their withdrawals either irrigate below the reporting threshold or are supplied by public water systems.

In 2001, water withdrawals for golf-course irrigation accounted for 36.27 Mgal/day throughout the State (figs. 5 and 6), about 15 percent of the water withdrawals for irrigation in Michigan. The majority of withdrawals (57 percent) were from ground water, followed by 41 percent from inland lakes and streams and 2 percent from the Great Lakes and their connecting waters. Oakland County had both the greatest number of golf courses (63) and the largest withdrawal rates (4.55 Mgal/day). Withdrawals from the Kalamazoo Basin (HUC 04090003) were the largest withdrawals for any basin, 3.53 Mgal/day used to irrigate 47 golf courses. The Tahquamenon Basin (HUC 04020202) ranked lowest in withdrawals for 2001, with one reporting golf course using 0.01 Mgal/day.

As is the case for agricultural irrigation, water withdrawals for golf-course irrigation represent a very small percentage of Michigan's total water withdrawals (0.34 percent in 2001). However, water withdrawals for golf-course irrigation can have substantial impact because they occur during the summer, when stream and lake levels generally are lower than at other times of the year.

## Water Withdrawals for Irrigation, 1997 — 2001

Water withdrawals for agricultural and golf-course irrigation varied greatly over 1997—2001 (fig. 7). Total withdrawals were highest in 1998 for both irrigation

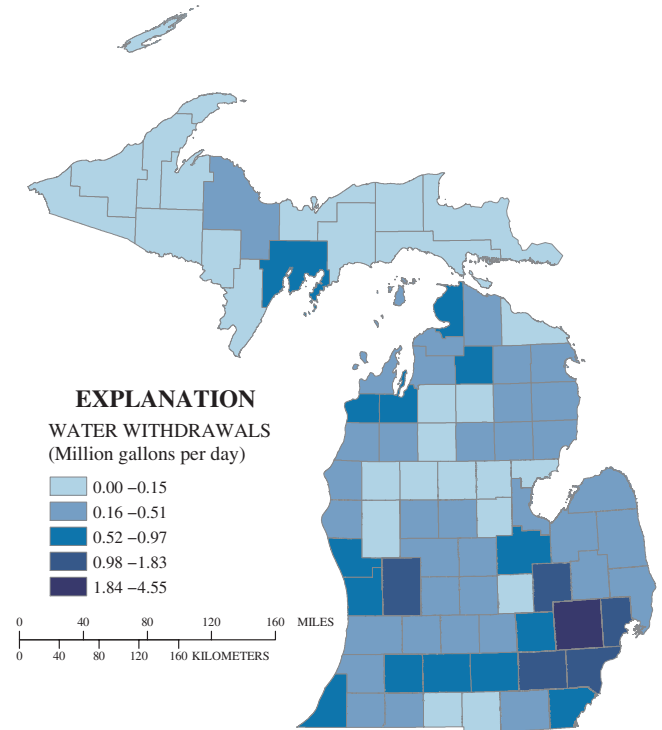


Figure 5. Golf-course irrigation for Michigan, by county, 2001.

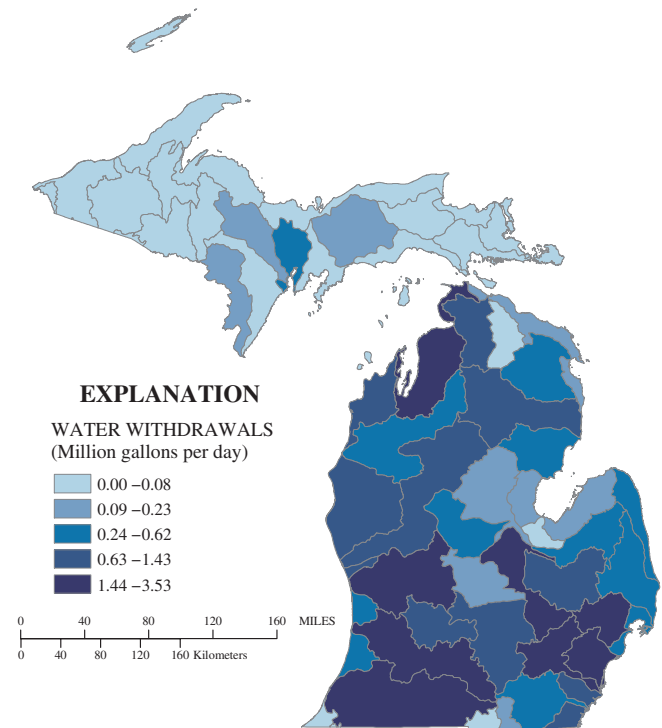


Figure 6. Golf-course irrigation for Michigan, by hydrologic basin, 2001.

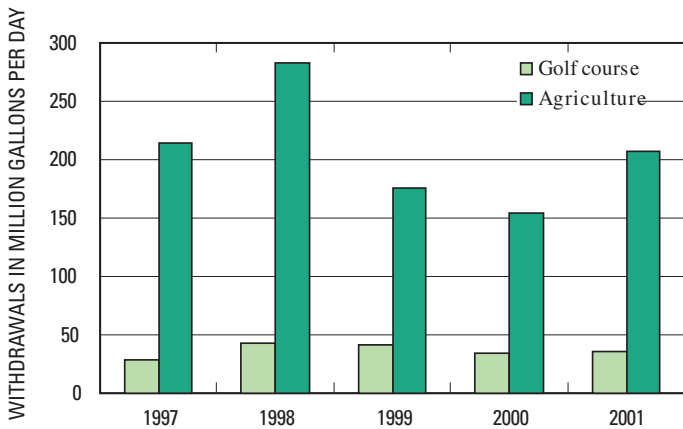


Figure 7. Total withdrawals for agricultural and golf-course irrigation for Michigan, 1997-2001.

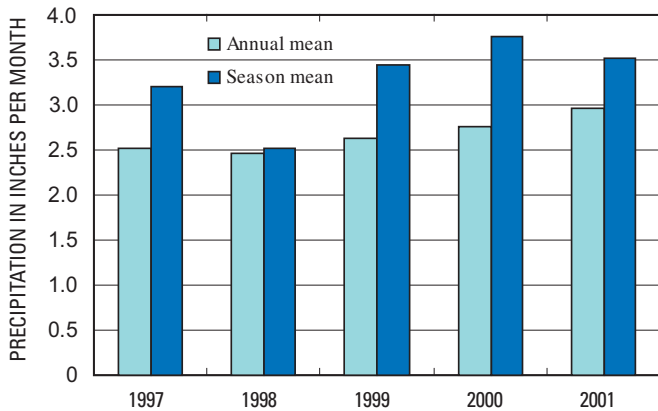


Figure 8. Average monthly precipitation for the growing season (May-September) and year for Michigan, 1997-2001. (National Climatic Data Center)

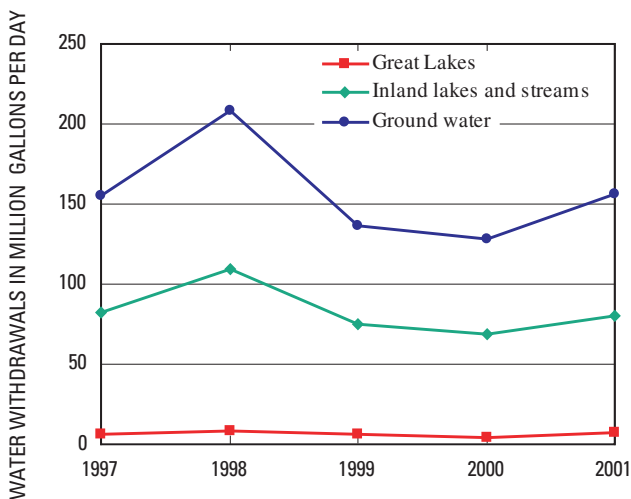


Figure 9. Source of water withdrawals for irrigation in Michigan, 1997-2001.

types, whereas withdrawals for golf-course irrigation were lowest in 1997 and withdrawals for agriculture were lowest in 2000. Demand for both agricultural and golf-course irrigation water depends in part on variations in weather, specifically between May to September (fig. 8). Because annual and growing season precipitation was lower for 1998, withdrawals for irrigation were larger.

Water sources for irrigation varied from 1997—2001 (fig. 9), with withdrawals from all sources highest in 1998 and lowest in 2000. The majority of withdrawals for golf-course and agricultural irrigation are from ground-water sources; however, withdrawal amounts from each source remained relatively consistent from year to year during 1997—2001.

## References Cited

Andresen, Jeff; Moen, Tom; Ritchie, Joe; Baer, Brian; Johnson, Jim; Savona, Chris; Swartz, Mark; and Van Til, Ron, 2000, Estimated Water Use for Agricultural Irrigation in Michigan: 1997-1999. MDEQ, MDA, and MSU (unpublished report).

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