WISCONSIN POLICY FORUM

AS OTHER STATES GO DRY, WISCONSIN'S WATER USE PLUMMETS

As western states struggle with empty reservoirs and limits on growth imposed by water shortages, Wisconsin seemingly swims in an abundance of fresh water with municipal water supplies facing little threat even during summer droughts. One reason in addition to our environment is that over the past generation, the state's water utility customers have been steadily purchasing fewer gallons, which has helped to conserve this vital resource but also put pressure on utilities to raise their rates.

The volume of water sold by Wisconsin's water utilities has fallen to near its lowest level per person in at least a generation and likely much longer than that, state data show.

These 574 Wisconsin utilities sell more than 138 billion gallons of water annually for use in homes, businesses, factories, and, to a small extent, irrigation. Since 1997, the earliest available year in our data, statewide total water sales have fallen by 18%, or 30.4 billion gallons, about the same amount of water that is held in Lake Monona in Madison.

The record low for water usage was 134.6 billion gallons in 2019, but 2022 was not far behind, at 138.4 billion, down from a high of 175 billion in 1998. On a per capita basis, the drop is even more pronounced at 28.5%, from just over 33,400 gallons per person in 1998 to a near record low of 23,300 in 2022 (see Figure 1).

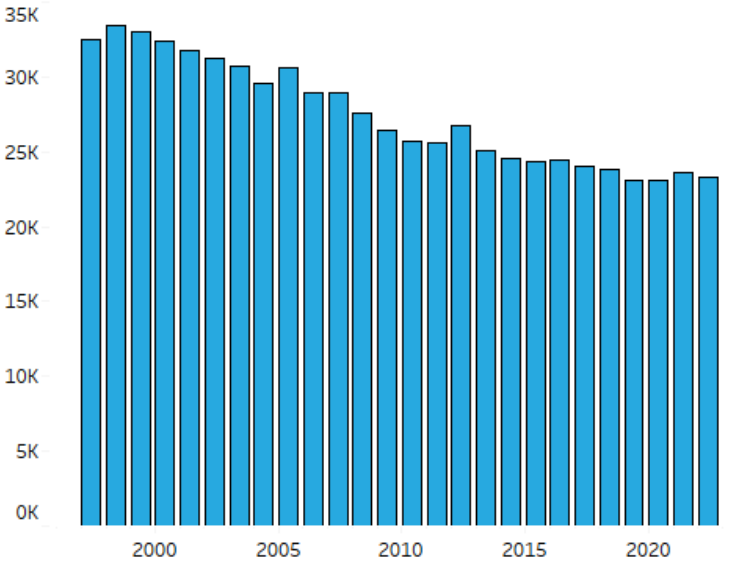
Though Wisconsin has plentiful water resources, reduced consumption has positive benefits, including opportunities to serve new homes and factories more cheaply, lower energy use by water utilities to pump and treat water, less stress on sewer systems and sewage treatment plants, and fewer disruptions to aquatic ecosystems.

Also, as the climate warms and drought becomes more likely across the country and here in Wisconsin, stable access to clean water could make the state more attractive to residents and businesses. Looking at these data can help policymakers monitor and tout this advantage, plus they provide some insight into other trends such as the trajectory of manufacturing in the state and the impact of COVID-19 on people's daily habits.

Using data from the Wisconsin Public Service Commission that were in turn compiled from annual reports submitted by water utilities across the state, we provide a picture of who is using the state's water resources, why water use has declined by so much in recent years, and the implications of that change. We excluded data from Superior Water, Light and Power, the only investor-owned water utility in the state, as data from their annual reports differs significantly from the other water utilities.

Fig. 1: Water Sales Per Capita Down by One-Third Since 1997

Statewide water utility sales per capita in thousands of gallons, 1997-2022



Source: Wisconsin Public Service Commission

One important caveat is that our data include only the gallons sold by water utilities, not total withdrawals of groundwater or water from lakes and rivers by other entities. That means that while our figures provide a good sense of water use by business and residential customers who represent the vast majority of the statewide users, the data exclude the biggest uses of water such as power generation and agricultural irrigation that account for a greater share of the overall use of this resource in the state. To examine those trends, we also analyze data from the Department of Natural Resources (DNR), which tracks water withdrawals from all sources.

SUBSTANTIAL DECLINE IN WATER SALES

Digging deeper into customer types provides a picture of where water use has fallen most dramatically over the past quarter century. As shown in Figure 2, residential purchases declined by 10.5 billion gallons, or 16%, between 1997 and 2022. The total decline understates the increased efficiency in water use, as Wisconsin experienced population growth over the same time period. Residential purchases actually declined 27% on a per capita basis, from nearly 13,000 gallons per person in 1997 to just over 9,300 last year.

The long-term declines in residential use can be attributed, at least in part, to water conservation legislation at the federal level and other efforts to require and encourage the installation of low-flow showerheads, toilets, and appliances. Other contributing factors may have included more aggressive efforts by citizens to fix leaks and to engage in water-conscious behavior, such as reduced watering of plants and lawns, in light of the positive impact of reduced water use on the environment and family budgets, especially as water rates rise.

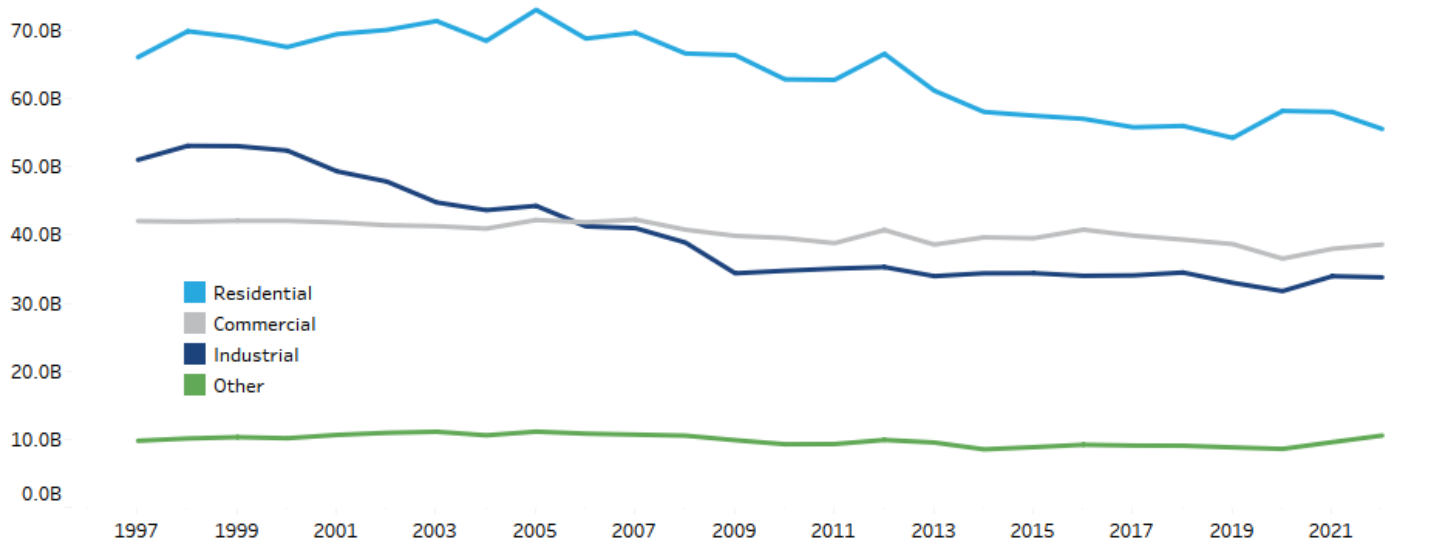
Annual residential water use can still rise and fall depending on factors such as heat waves or droughts that lead to greater watering of plants and lawns. The figure also shows the impact of stay-at-home orders, virtual work, and higher unemployment at the height of the pandemic. Those developments kept more people at home, causing a 7.3% increase in residential water use in 2020, which then held steady through 2021 and tapered off in 2022.

Commercial water use has also dropped, falling by 3.4 billion gallons over the 25-year period, or 8.2%. That was a smaller decline than that of either residential or industrial customers but was still notable.

Commercial use includes restaurants, retail locations and other businesses, and in many cases multi-family residences like apartments and duplexes. Just as homeowners' efforts to reduce water use have made an impact, similar actions by businesses and apartment dwellers likely have resulted in declining water purchases.

Figure 2: Gallons of Water Sold by Water Utilities Have Fallen Dramatically

Billions of gallons of water sold by water utilities by customer type (excluding gallons meant for resale), 1997-2022



Source: Wisconsin Public Service Commission annual Reports. Note: Multi-family residential sales were generally included in the commercial category until 2013. We include those customers in commercial customers for the entire time period for ease of comparison.

Of all the categories, industrial usage has declined the most over the years, dropping by more than 17.2 billion gallons, or 34%. In fact, whereas industrial customers purchased 11 billion gallons more per year than commercial water customers in the late 1990s and early 2000s, they now trail commercial purchasers. The decline in industrial water purchases, however, is a more complicated story than one of simple advancements in water conservation.

DECLINE IN INDUSTRIAL WATER USE IS TIED TO ECONOMIC CHANGES

Like other utility customers, industrial plants have grown more efficient over the decades in their use of water. Yet the use of this resource in manufacturing was also heavily affected by a decline in overall industrial activity, especially in water-intensive activities such as papermaking and, at least in some communities, food production.

Plant closures have meant that some communities have seen industrial water use fall by massive amounts. Figure 3 shows the 10 communities with the biggest declines in industrial water sales since 1997, by volume and percentage.

For example, the small former village of Brokaw lost a major paper plant in 2011, resulting in layoffs of workers and ultimately the disincorporation of the village. Given the loss of all its industrial purchases, overall water sales by the village utility dropped by 92% between 2005 and 2006 and in 2019 the utility was completely shut down, with the remaining customers switching to the village of Maine utility.

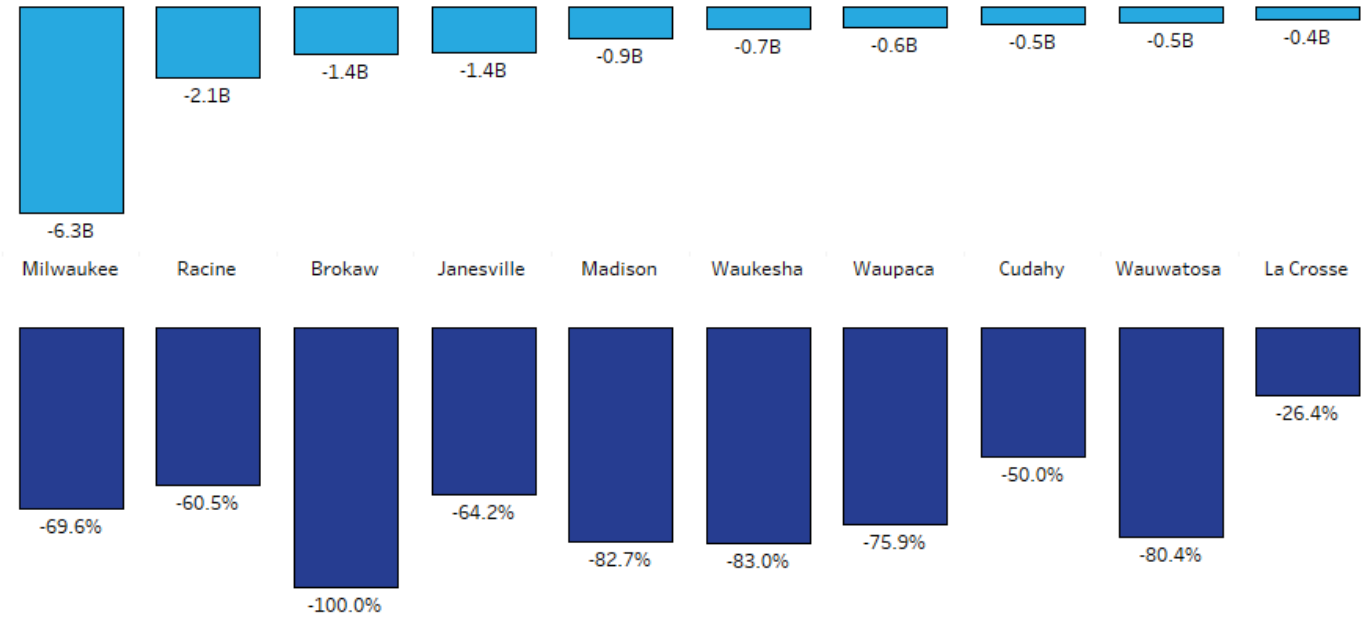
Madison also lost major industrial customers over the time period in question including two dairies, the Sara Lee Bakery, and the Oscar Mayer headquarters and manufacturing plant, the city's single largest purchaser. Those setbacks reduced the amount of water sold by the utility to industrial customers by 83%.

Madison's many other residential and commercial customers helped the water utility absorb the industrial losses, but they are still notable, especially when combined with efficiency gains by other users. Local officials noted in 2020 that water use by utility customers had fallen to its lowest level since the 1960s despite the fact that Madison's population was roughly twice as large as 60 years earlier. In their 2020 statement, utility officials said that shift meant the underground aquifer supplying the city's water was no longer dropping and was actually beginning to recharge.

Industrial users across the state also have become much more efficient in water use. The total value of manufacturing output in Wisconsin has increased even as industrial water purchases have declined. In 2005, there was approximately $1.17 of GDP generated per

Figure 3: Industrial Water Sales Fell Dramatically in Many Communities Over the Past Generation

Change in gallons sold (at top) and percent change (at bottom) by water utility, 1997-2022



Source: Wisconsin Public Service Comissioin

one gallon of water purchased by industrial users in Wisconsin. By 2022, output had jumped to nearly $1.68 per gallon, a 44% increase. Some of this trend may reflect industries actually using less water, while in other cases it may be due to a shift away from more water-intensive industries such as paper-making and toward less intensive ones and a shift away from aging and inefficient plants, which are more likely to close.

The gains in efficiency and loss of industrial customers have left many Wisconsin water utilities with considerable excess capacity. That could make Wisconsin a more attractive location for companies considering where to site water-intensive factories such as microchip plants. Notably, water shortages in other states have threatened existing plans for such development, while existing water capacity in nearby Racine was cited as a factor that helped the village of Mount Pleasant to land a Foxconn manufacturing plant.

IMPACT ON WATER SALES AND PRICES

Water utilities are subject to cost pressures such as inflation, expanding service areas, and pollution controls. As a result, total revenue from water sales, a good proxy for service costs, has increased from $322.8 million in 1997 to $790.7 million last year. That works out to an average increase of about 3.6% per year, or 1.2% per year when adjusted for inflation.

Water rates, however, have risen much faster. Utility revenue per 1,000 gallons sold has increased from $1.91 per 1,000 gallons in 1997 to $5.71 in 2022. That's an average increase of 4.5% per year, or 2.0% per year after adjusting for inflation.

These price increases have the effect of further incentivizing water conservation by users. This reduction in consumption has largely positive impacts as we have noted, but it can make it more difficult for utilities to cover their operating costs or finance major capital improvements such as the replacement of lead lateral lines that run from the main water lines to homes.

After subtracting a fire protection fee, Wisconsin's statewide average water rates in 2020, adjusted to 2023 dollars, were $58.80 for residential customers using 5,000 gallons a month. That was somewhat higher than other Midwestern states like Iowa ($56.00) and Northeast Illinois ($57.81) but much lower than water-starved states like California ($94.49 for 5,000 gallons). As conservation efforts continue, it's likely these rates will rise further.

WATER UTILITIES ONLY PART OF THE TOTAL

While Wisconsin utilities sold more than 135 billion gallons in 2021, that represents only 11% of the 1.77 trillion gallons withdrawn that year, according to a DNR report on statewide water withdrawals. Overall withdrawals in 2021 were 6% lower than the annual average since 2012, and nearly 400 billion gallons less than the amount withdrawn in 2011. The drop was driven by a decrease in withdrawals by power plants.

These plants are by far the biggest water users, accounting for 73% of total withdrawals. Power plants need huge amounts of water to generate electricity, because they burn fuel to heat water and create steam to drive turbine generators, and also use water to cool equipment. Much of the water is returned to the source, helping to mitigate its environmental impact. The returning water, however, can be warmer than when it was withdrawn, which can impact aquatic life.

Excluding cranberry production, agriculture accounts for 4% of the state's total annual water use, while cranberry production alone accounts for another 3%. In some places in the state, such as the Central Sands region, researchers have raised concerns about these agricultural withdrawals in particular. Paper manufacturers, using their own sources such as diversions of surface water, account for another 5% and the remaining 4% is withdrawn by miscellaneous users.

CONCLUSION

Water sales by public utilities have fallen substantially, the result of a changing manufacturing landscape and ongoing efforts to conserve water. Curbing water use has a positive impact, as each gallon we pump and treat increases energy use and puts pressure on our groundwater, lakes, and rivers. Reductions can also save money for businesses and families.

As water sales fall, however, the cost of producing each gallon goes up, along with the rates charged to businesses and residential customers. This trend will likely drive new efficiencies and further reduce usage, even as the state's population grows. Going forward, the shift could offer Wisconsin an opportunity both to conserve this key resource and add to the state's manufacturing base.