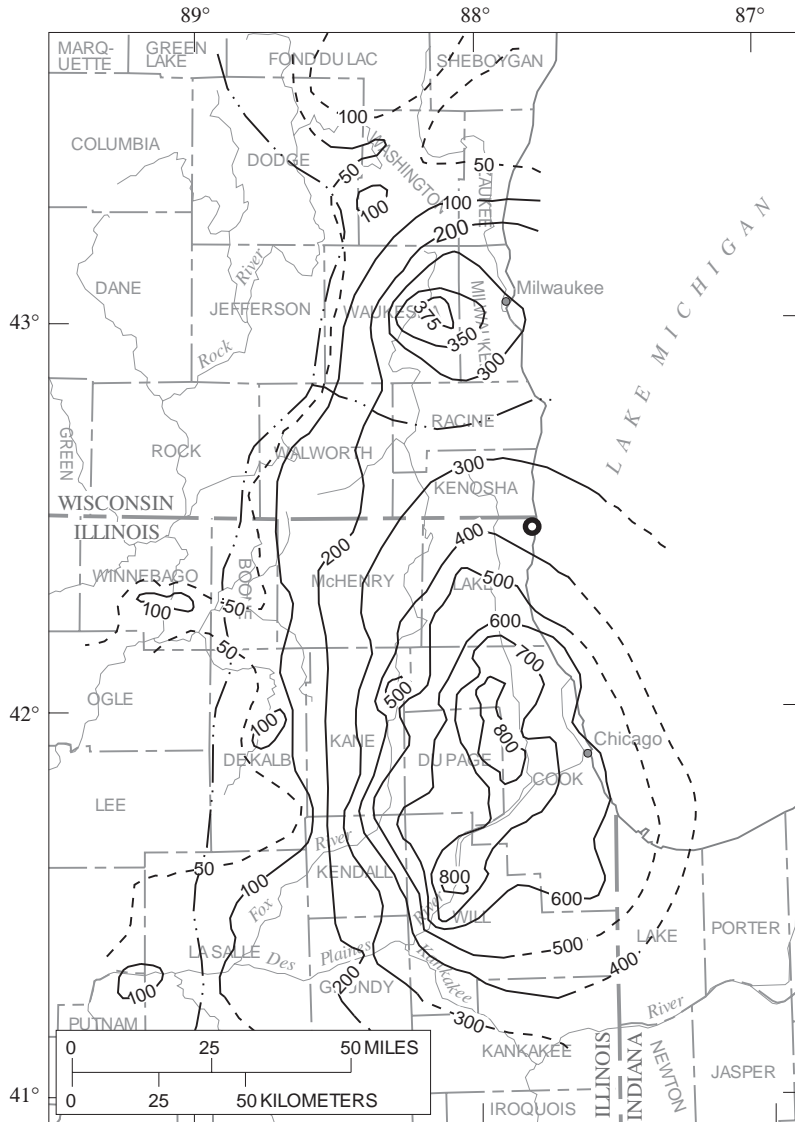


## Introduction

Abundant water resources have been an important part of the economic development of the Chicago area (fig. 1) for more than a century. The city of Chicago, Ill., and other

lakefront towns have used Lake Michigan as a water supply. Where water from Lake Michigan was not available or a need for supplemental water supplies was present, deep wells (generally greater than 700 feet) provided a clean, reliable, and abundant water supply

from the Cambrian-Ordovician aquifer. Public water suppliers withdraw the most ground water in the eight-county Chicago area (Cook, Du Page, Grundy, Kane, Kendall, Lake, McHenry, and Will Counties) (fig. 2). This report describes a reversal in the trend of declining ground-water levels in the Cambrian-Ordovician aquifer in the Chicago area as public water suppliers have converted from the withdrawal of ground water from wells to the withdrawal of surface water from Lake Michigan.

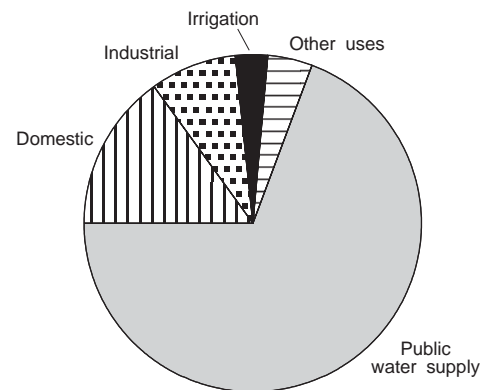


Base from U.S. Geological Survey  
1:2,000,000 Digital Data  
Albers Equal-area Conic Projection  
Standard parallels 33° and 45°, central meridian -89°

### EXPLANATION

- 700 — — LINE OF EQUAL WATER-LEVEL DECLINE, 1864-1980 — Dashed where approximate. Interval, in feet, is variable
- · — MAJOR GROUND-WATER DIVIDE
- U. S. GEOLOGICAL SURVEY OBSERVATION WELL

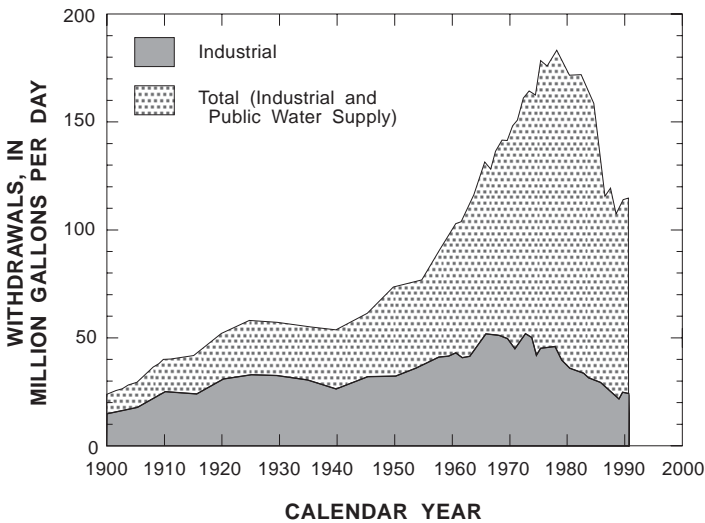
**Figure 1.** Water-level decline in the Cambrian-Ordovician aquifer, Chicago and Milwaukee areas, 1864-1980. (Modified from Young, 1992)



**Figure 2.** Withdrawals of ground water, by category, in the eight-county Chicago area, 1988.

## Historical Pumpage

The first documented deep well in the Chicago area was drilled in 1864 to a depth of 711 feet. It was an artesian well and flowed at a rate of about 400 gallons per minute. Drilling of deep wells continued throughout the area in the 1880's and 1890's, providing large amounts of water to public-supply systems and industries. Withdrawals of ground water from deep wells in Cook County accounted for more than 60 percent of the ground-water withdrawals in the Chicago area from 1861 to 1930. Since 1930, withdrawals in Cook County have declined relative to ground-water withdrawals from deep wells in the eight-county Chicago area. Withdrawals in Du Page, Kane, and Will Counties have increased such that these three counties accounted for almost 50 percent of the ground-water withdrawals from deep wells in the eight-county Chicago area in 1980. In 1980, about 180 million gallons per day were withdrawn from the Cambrian-Ordovician aquifer in the eight-county Chicago area (fig. 3).



**Figure 3.** Ground-water withdrawals from the Cambrian-Ordovician aquifer in the eight-county Chicago area, 1900-91. (From Visocky, 1993)

## Water-Level Declines

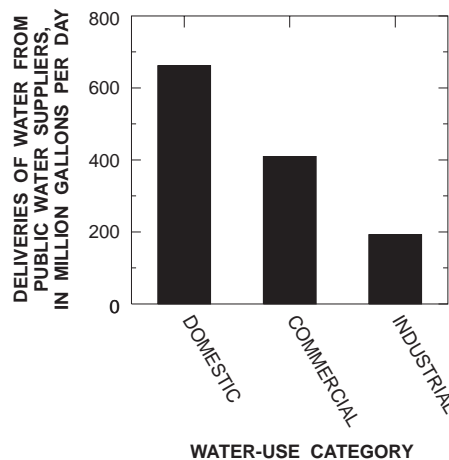
Many of the wells drilled during the late 1800's were open to aquifers under artesian conditions and were allowed to flow freely because the water supply from these wells was considered, at the time, to be inexhaustible. The excessive withdrawals from the free-flowing deep wells caused a widespread decline in water level in these wells; many of these wells no longer flowed by the early 1900's. The water-level declines from more than 100 years of ground-water withdrawals from the deep wells in the Chicago area have created a regional area of water-level decline (fig. 1). Only a low ground-water divide separates the areas of water-level decline in the Chicago and Milwaukee areas (fig. 1).

## Supreme Court Decree

The use of water by Illinois from Lake Michigan is a diversion and is authorized pursuant to a U.S. Supreme Court decree (*Wisconsin versus Illinois*, 449 U.S. 48 (1980)). The 1980 modification of the U.S. Supreme Court decree regulating the use of water from the Great Lakes in Illinois allows priority for new allocations of water from Lake Michigan to be given to domestic water users (*Wisconsin versus Illinois*, 449, U.S. 48 (1980)). This change was made with the intent of reducing withdrawals from the Cambrian-Ordovician aquifer.

The public water suppliers are being given the new allocations of water from Lake Michigan because most of the water delivered by public water suppliers in the eight-county area are to domestic users (fig. 4) and many public water suppliers have wells withdrawing water from the Cambrian-Ordovician aquifer. Costs of withdrawing ground water from the Cambrian-Ordovician aquifer have increased

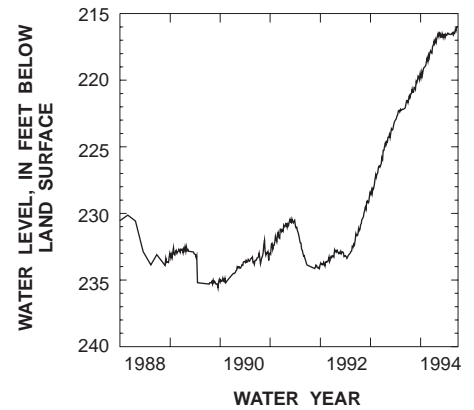
because of increases in power required to pump the water as water levels declined in the aquifer.



**Figure 4.** Deliveries of water from public water suppliers for categories of use in the eight-county Chicago area, 1988.

## Water-Level Recovery

The new allocations of water from Lake Michigan have been available to public water suppliers since 1980, although the conversion from ground-water supplies has been gradual (fig. 3). Many public water suppliers in northwestern Cook, Du Page, and eastern Lake Counties have converted from ground water to surface water from Lake Michigan. Ground-water levels in northwestern Cook County recovered about 250 feet from 1985 to 1991 (Visocky, 1993, fig. 9). The water-level hydrograph from a U.S. Geological Survey observation well (fig. 5) shows the recovery of the ground-water level from 1988 to 1994 (about 20 feet) as public water suppliers in eastern Lake County stopped withdrawing ground water.



**Figure 5.** Ground-water-level hydrograph from U.S. Geological Survey observation well at Zion, Lake County, Ill., 1988-94.

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## For More Information

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