

Rock River Coalition GFLOW Model

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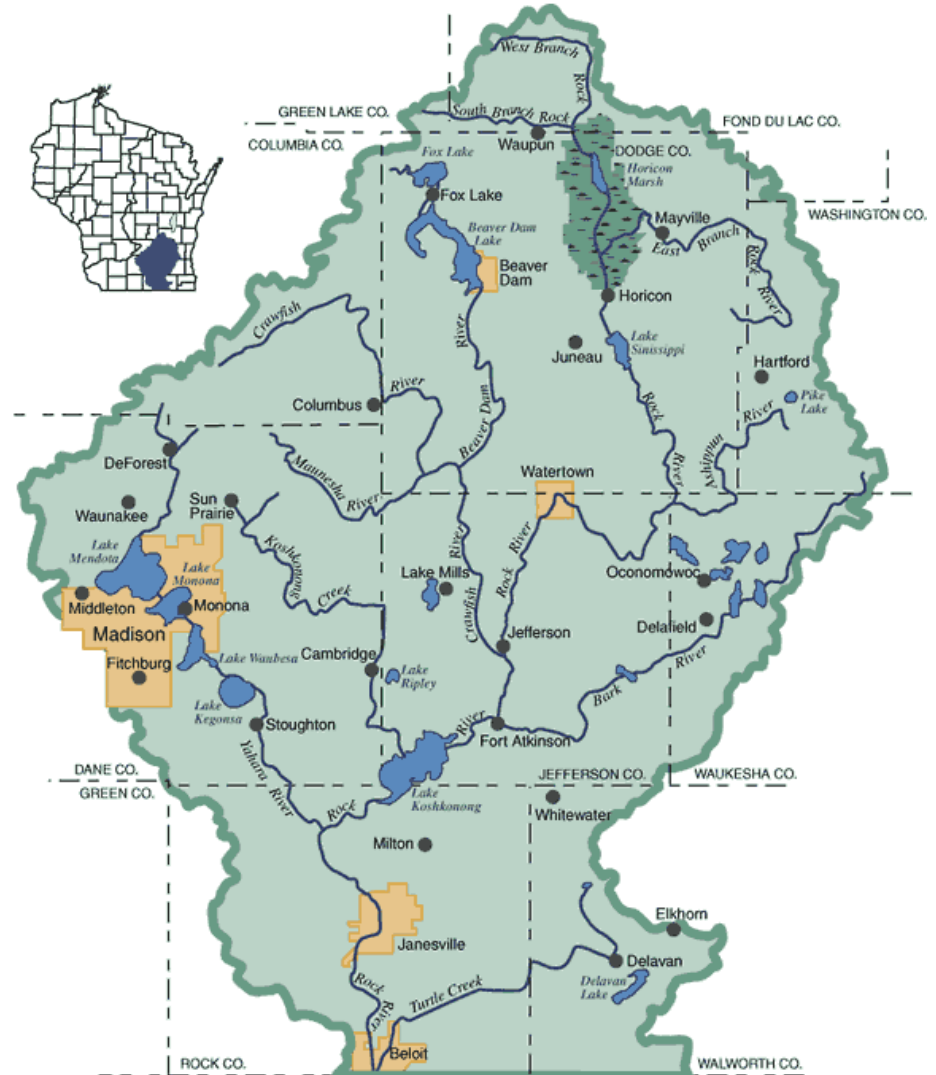
The Rock River Basin

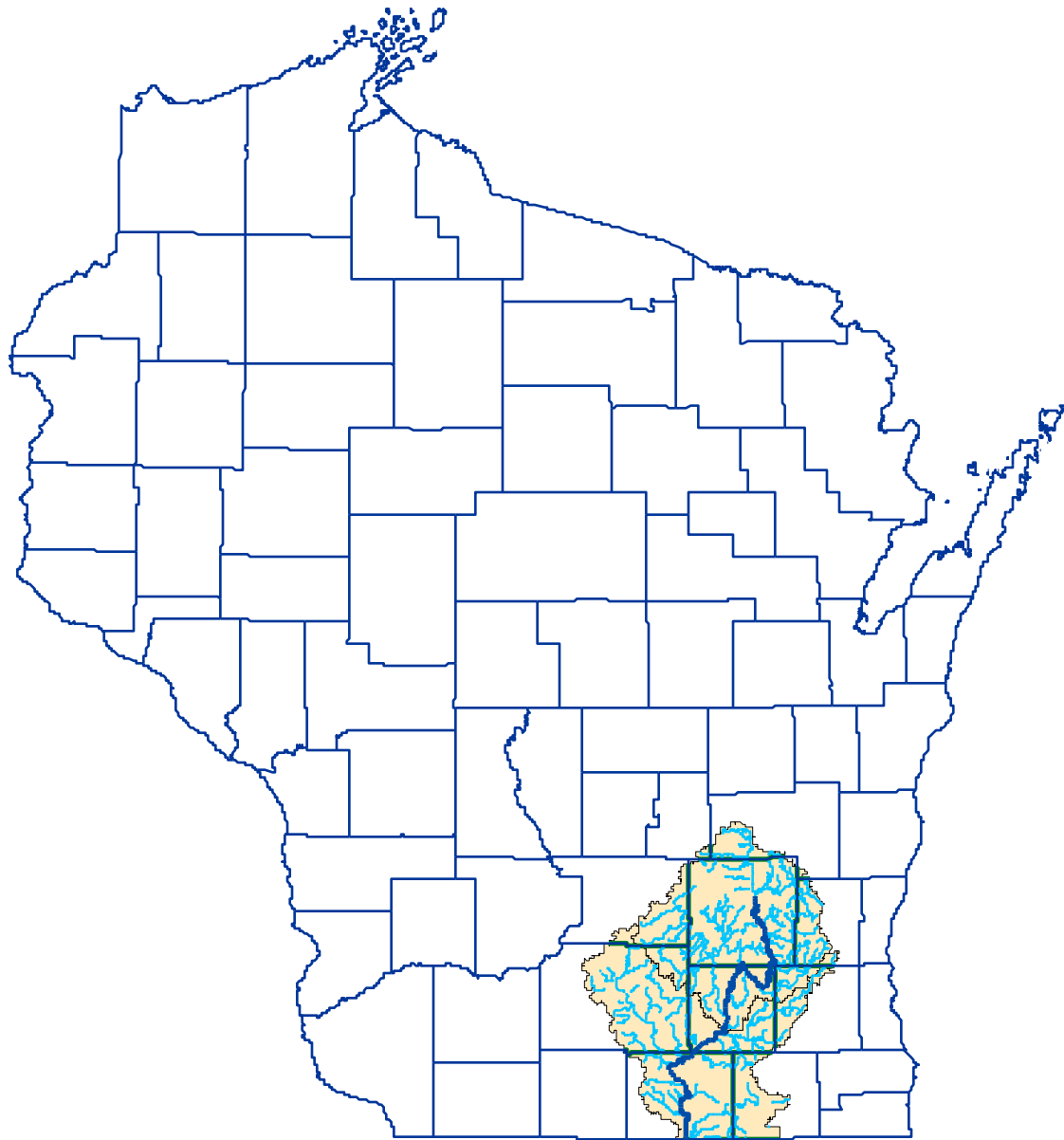
443 lakes and
impoundments

3,900 river miles

3,700 square mile
watershed

750,000 population





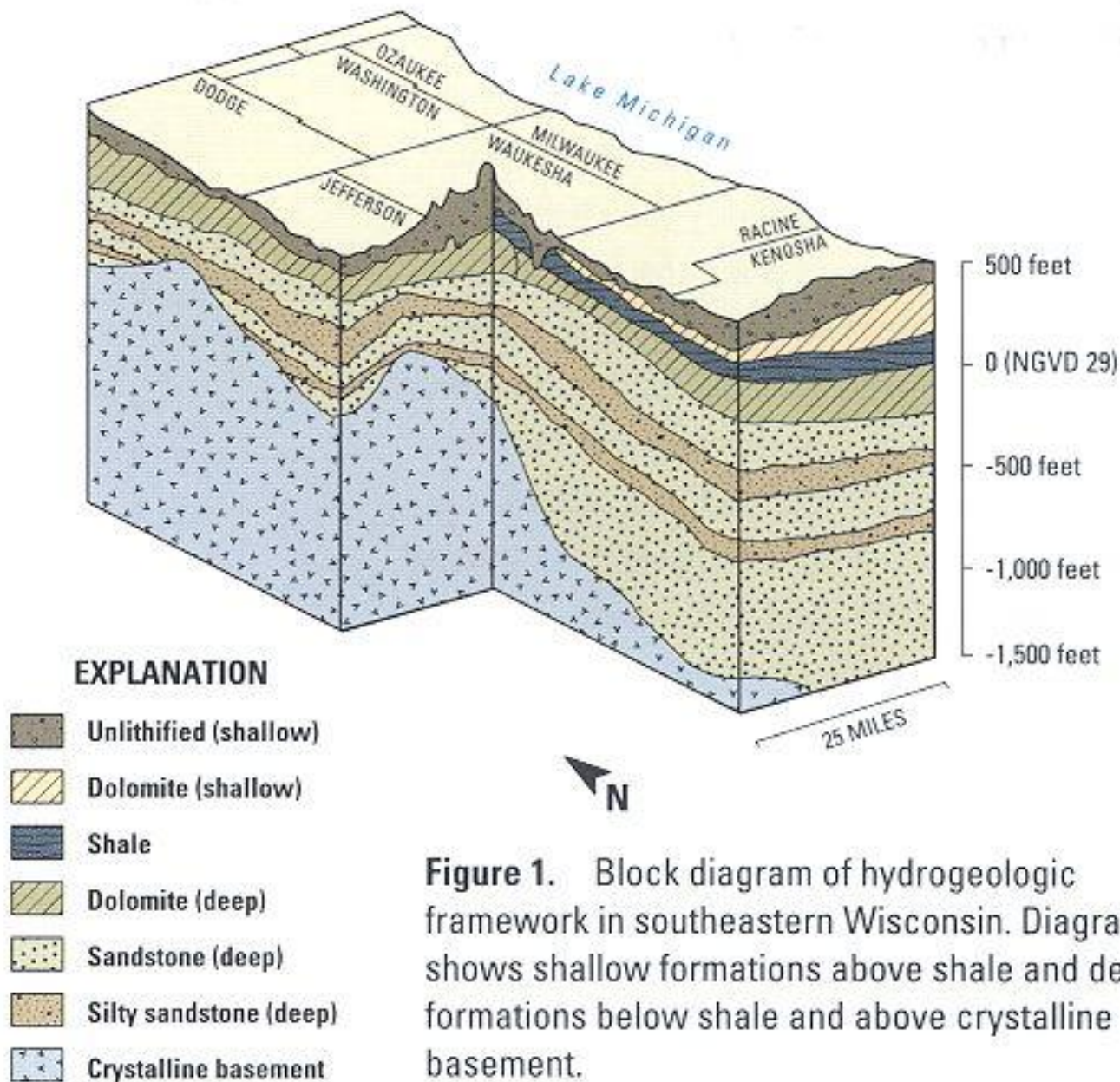
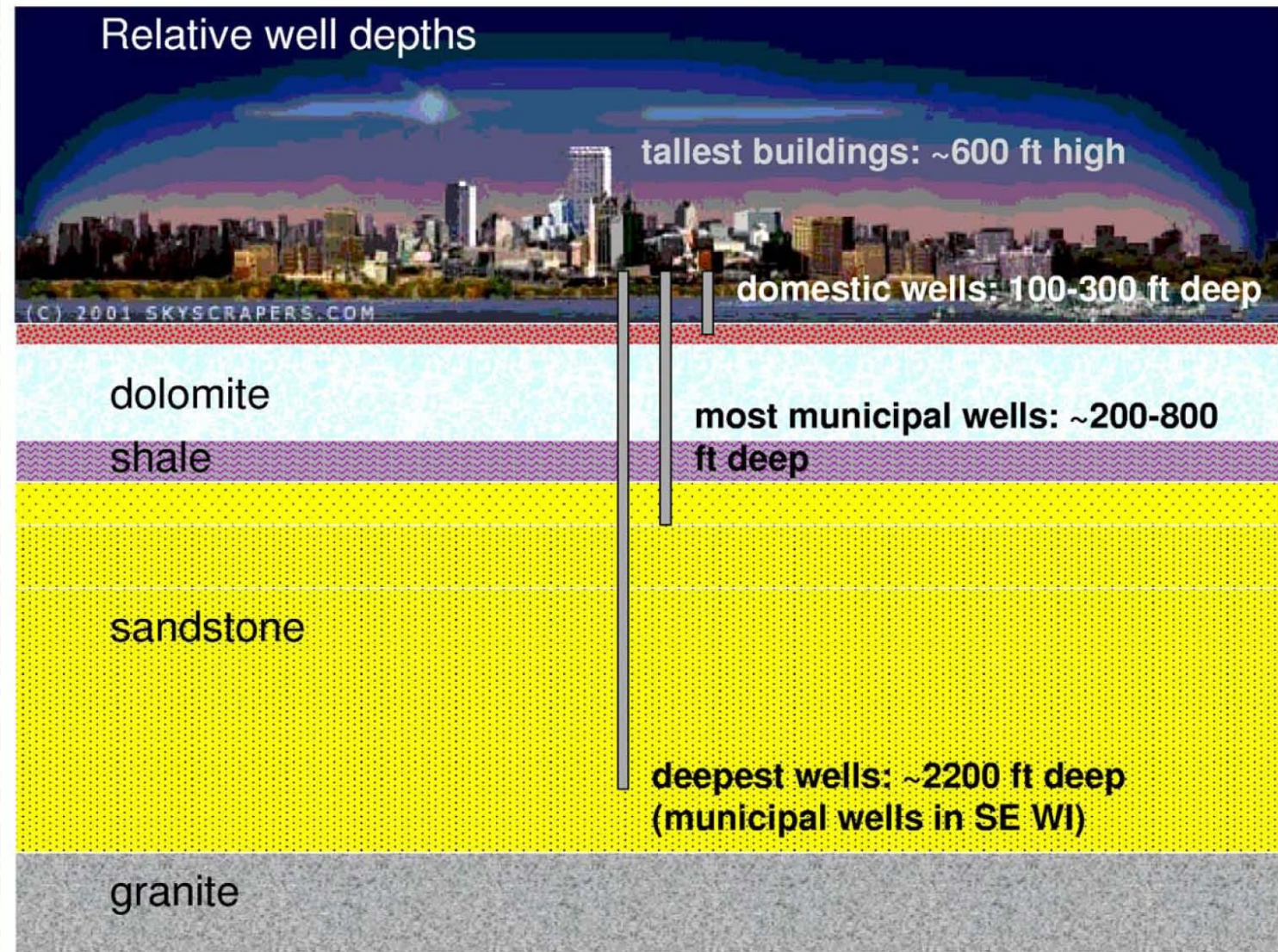
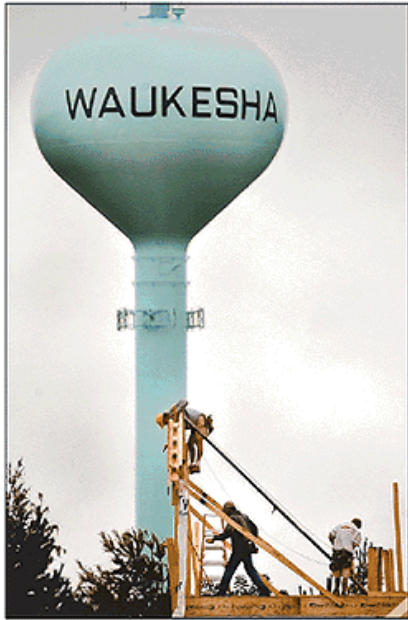


Figure 1. Block diagram of hydrogeologic framework in southeastern Wisconsin. Diagram shows shallow formations above shale and deep formations below shale and above crystalline basement.

Well construction in SE Wisconsin





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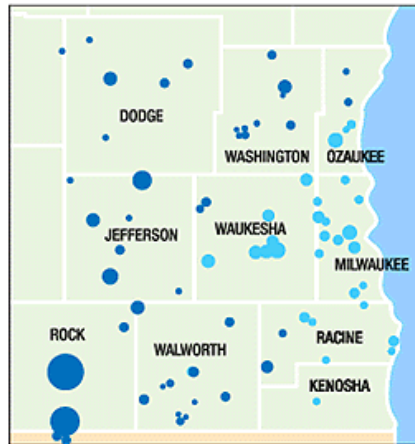
Unable to tap water from Lake Michigan, most Waukesha county residents are dependent on groundwater, as provided by the city.

EXCESSIVE WATER WITHDRAWALS THREATENING GROUNDWATER SUPPLY

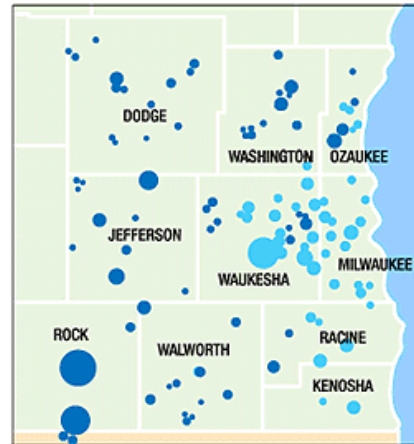
In the last 35 years, wells tapping into southeastern Wisconsin's groundwater have not only grown in number but have become more high-capacity, digging deeper into underground aquifers. In areas with a natural concentration of toxic contaminants – such as radium, arsenic, lead, fluoride and iron – constant drilling and pumping may intensify the contamination.

WELLS ARE GROWING IN NUMBER AND REACHING DEEPER

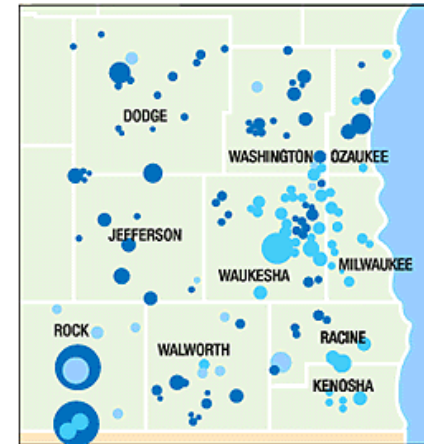
1965



1985



2000



Dots indicating location of wells in the 10 counties are sized according to pumping rate.

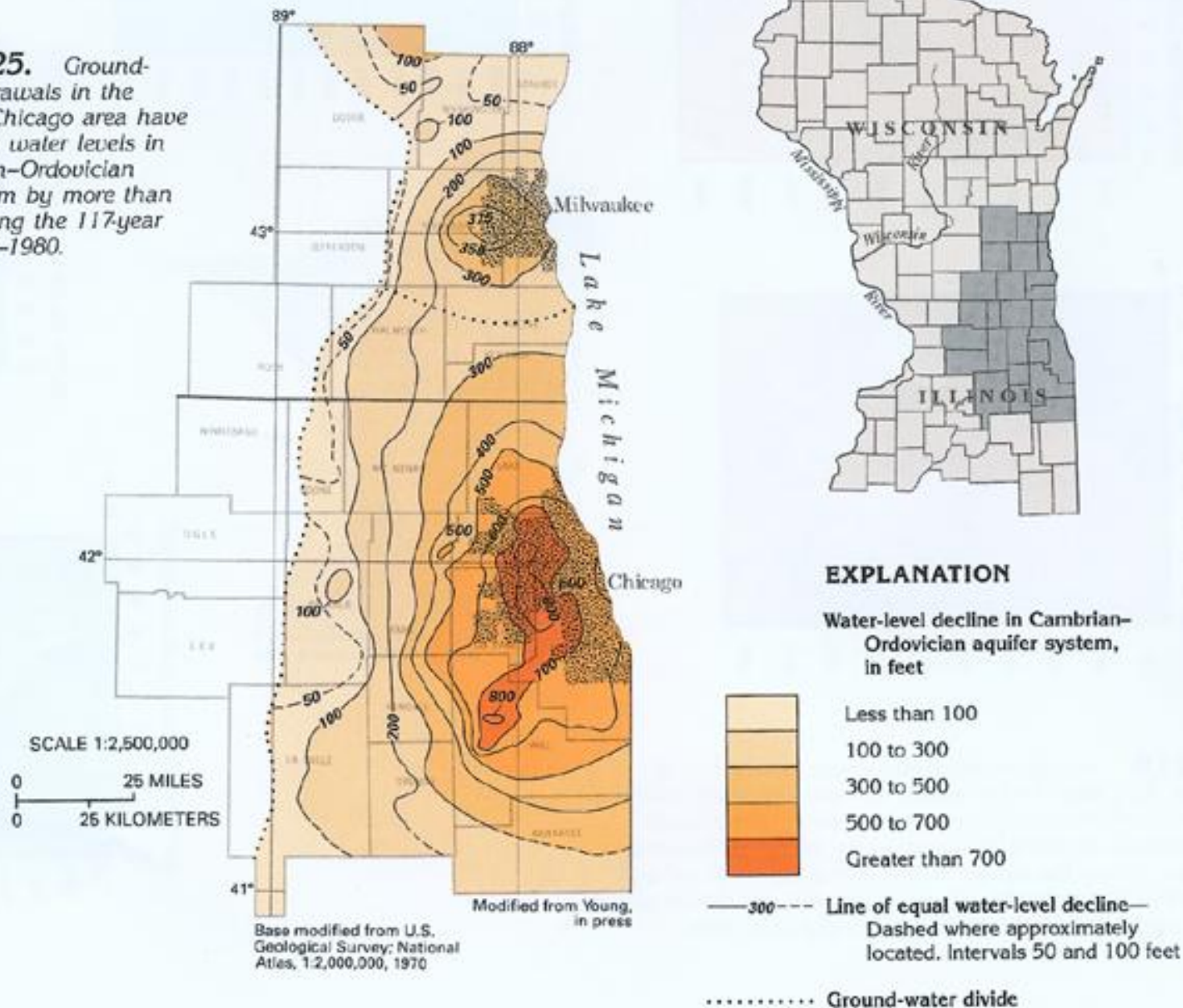
- DEEP WELL
- SHALLOW WELL

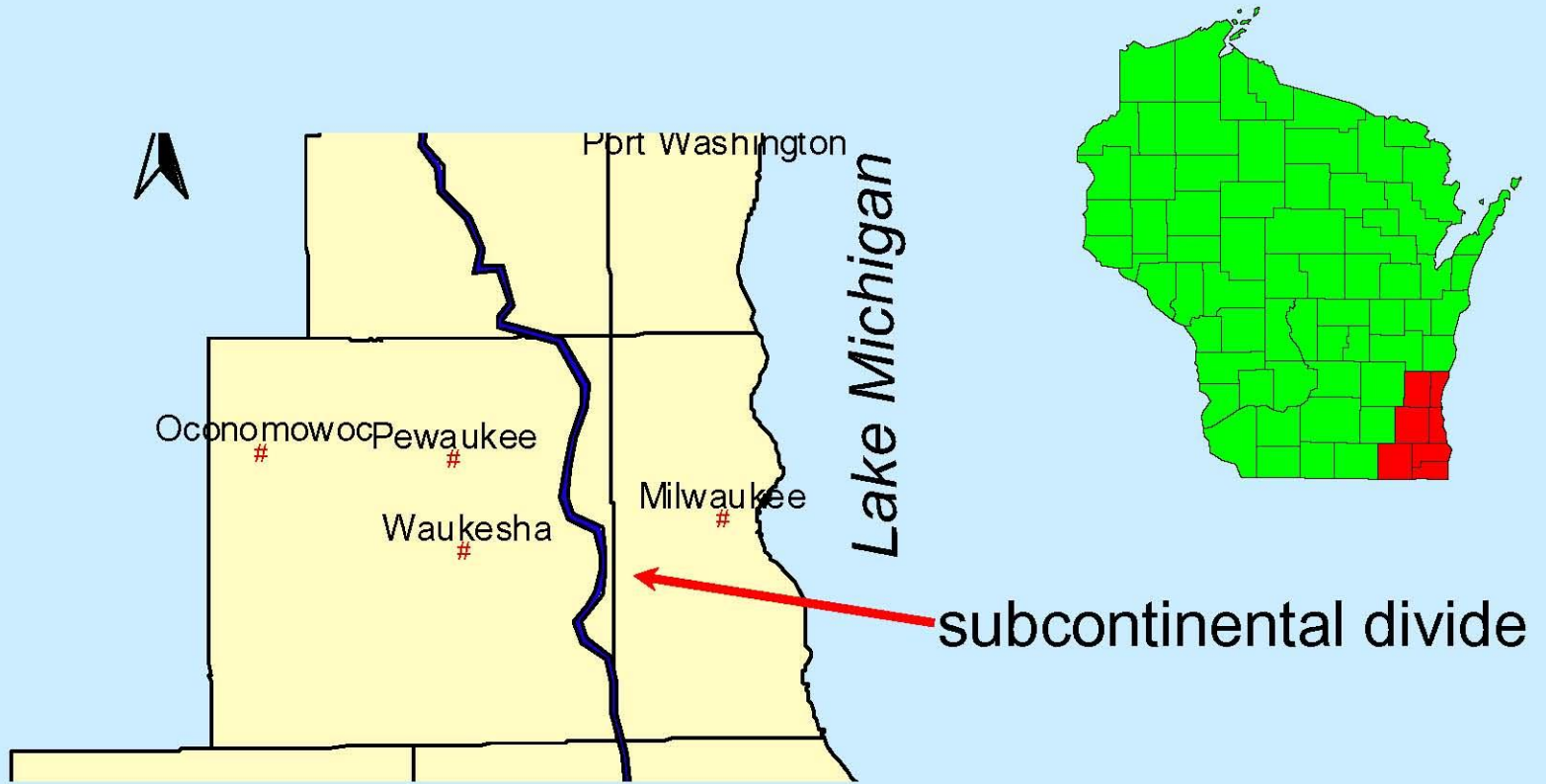
Above dots represent a pumping rate of about 750,000 gallons per day.

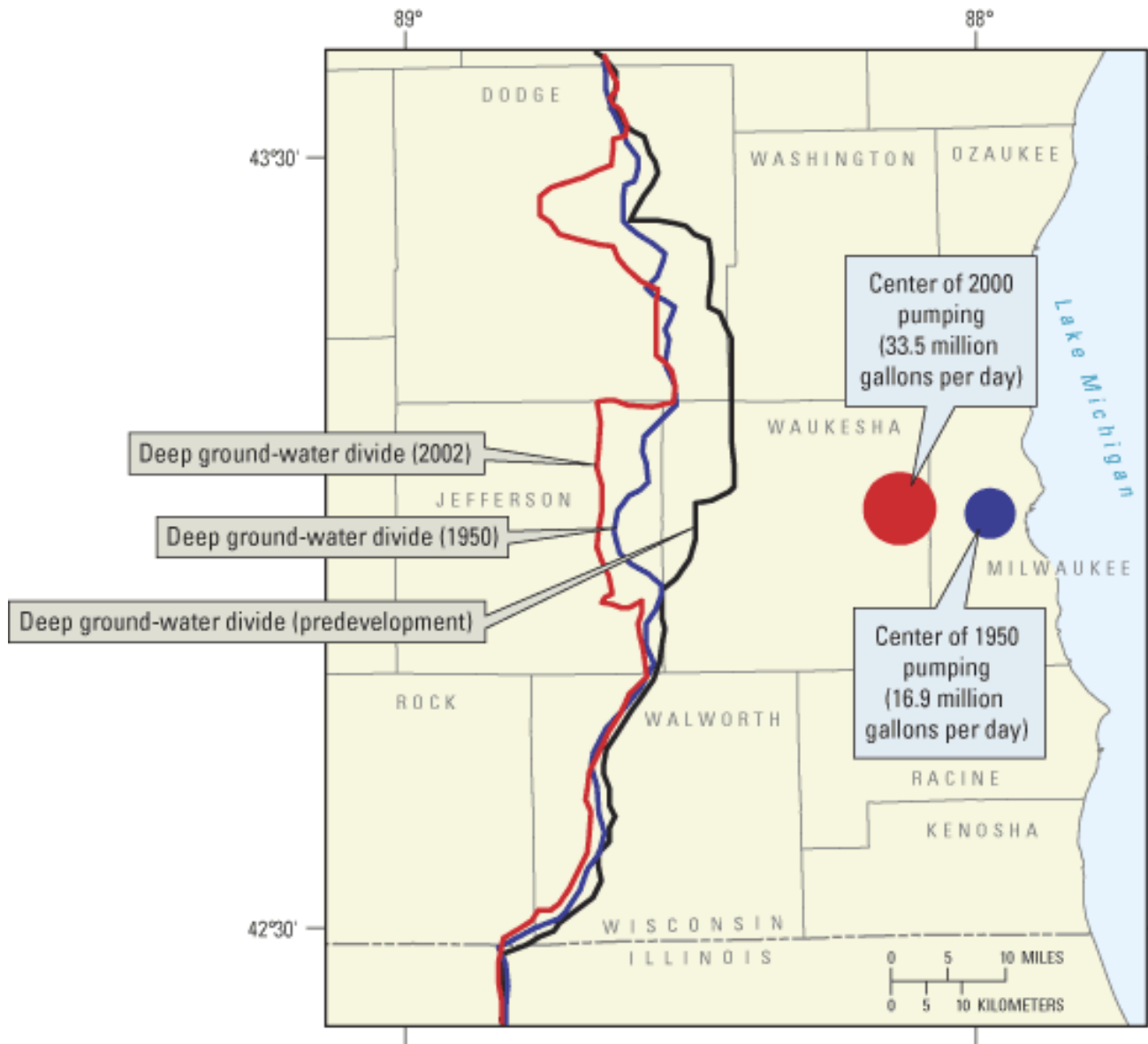
Source: Southeastern Wisconsin Regional Planning Commission

DAVID ARBANAS, ALFRED ELICIERTO/Journal Sentinel

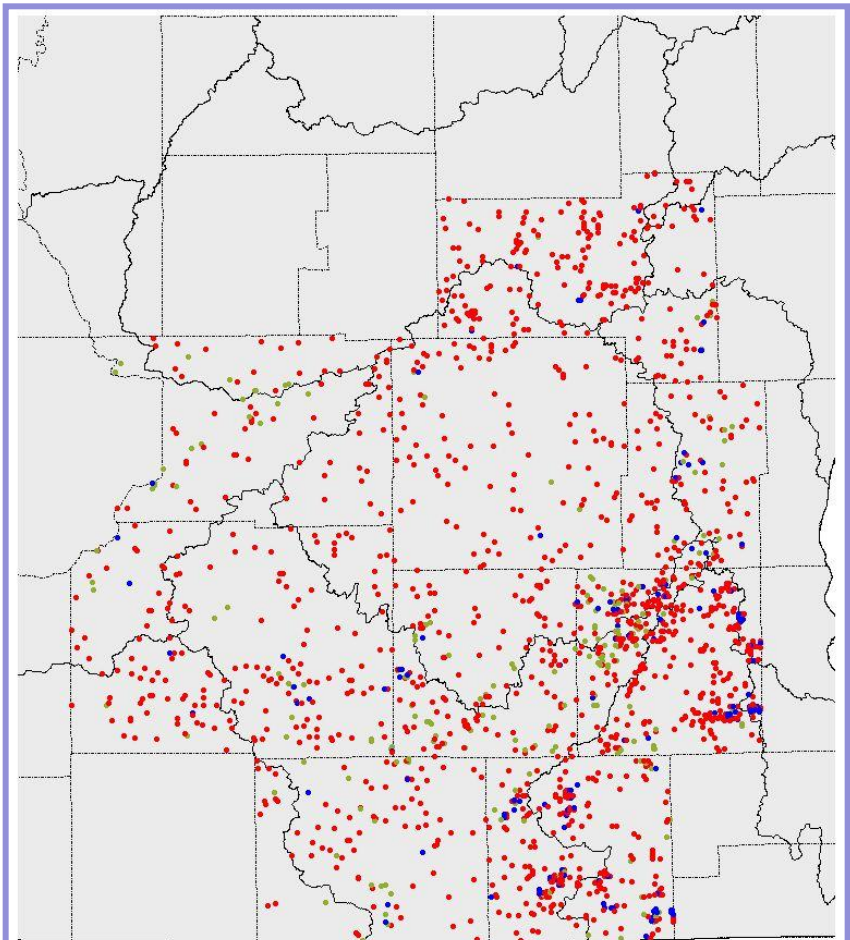
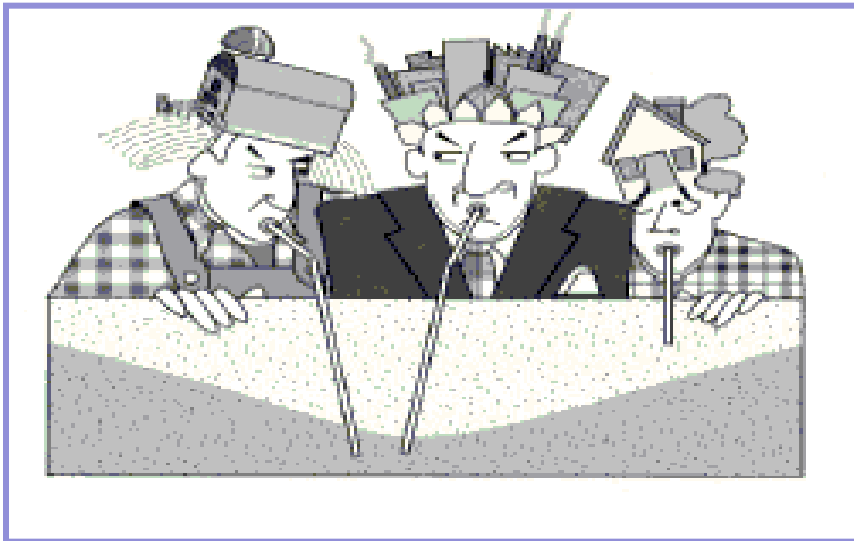
Figure 125. Ground-water withdrawals in the Milwaukee–Chicago area have drawn down water levels in the Cambrian–Ordovician aquifer system by more than 800 feet during the 117-year period, 1864–1980.







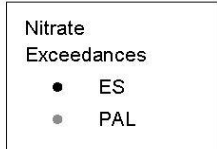
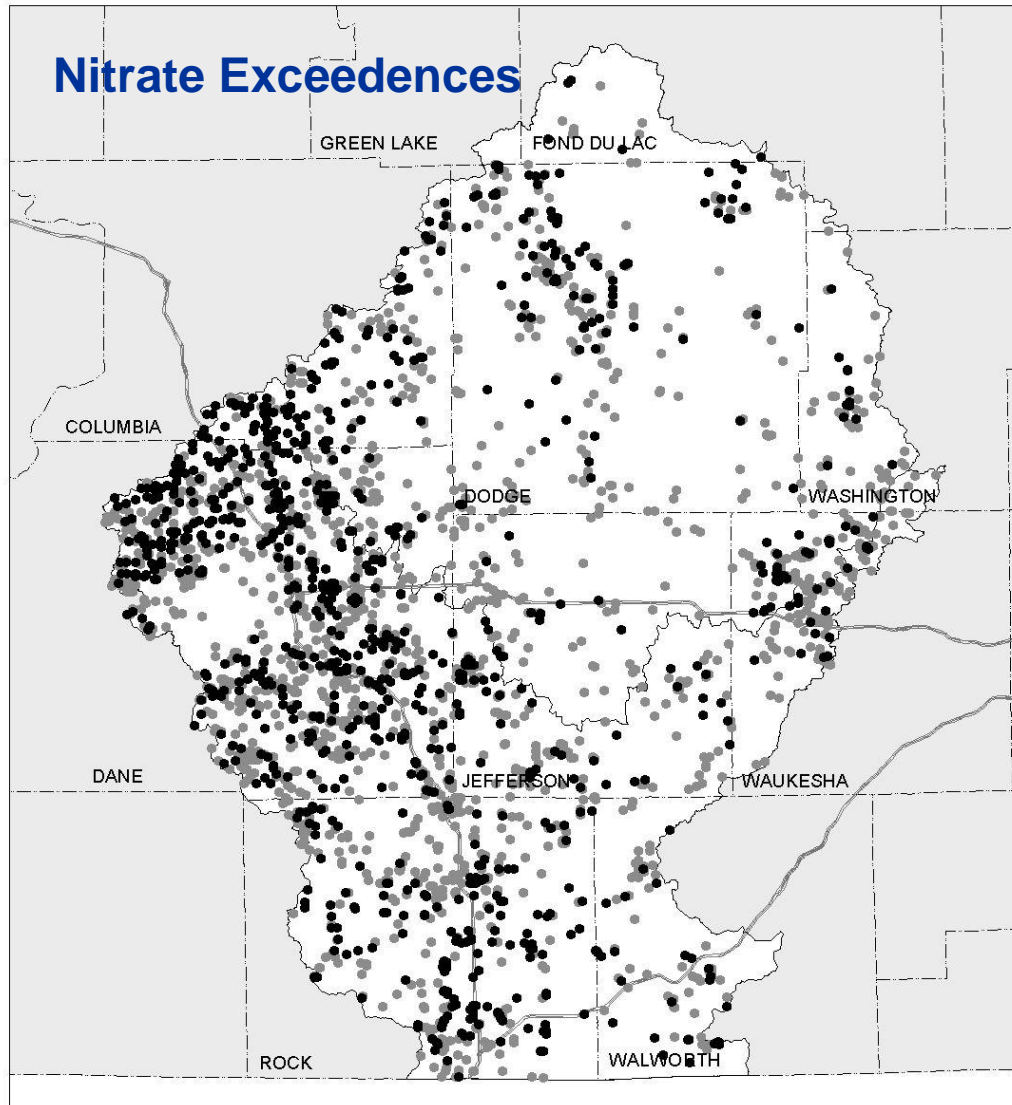
People's wells began drying up



- 2+ wells
- drilled
- point

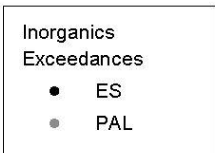
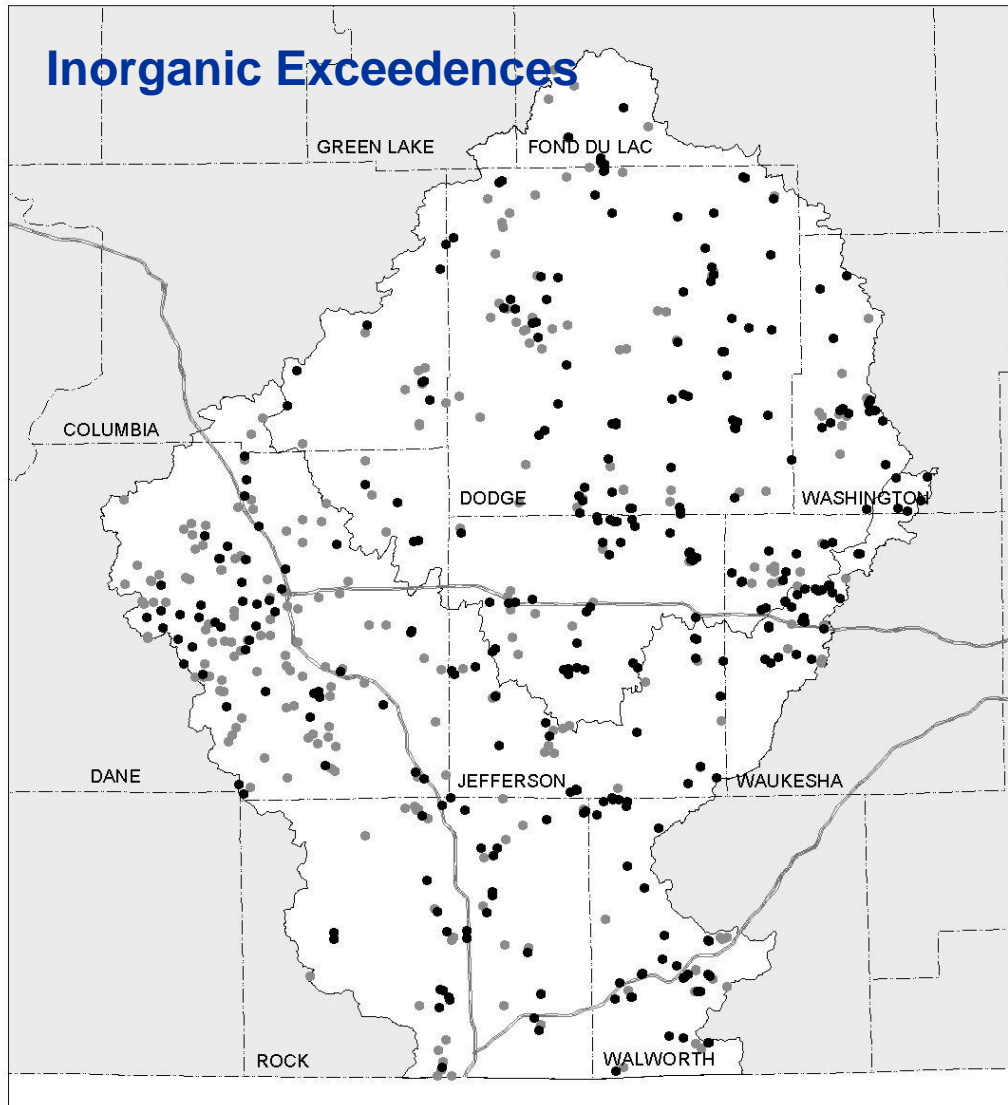
New wells installed due to old well drying up

Nitrate Exceedances



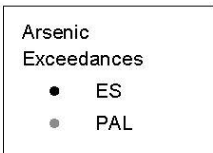
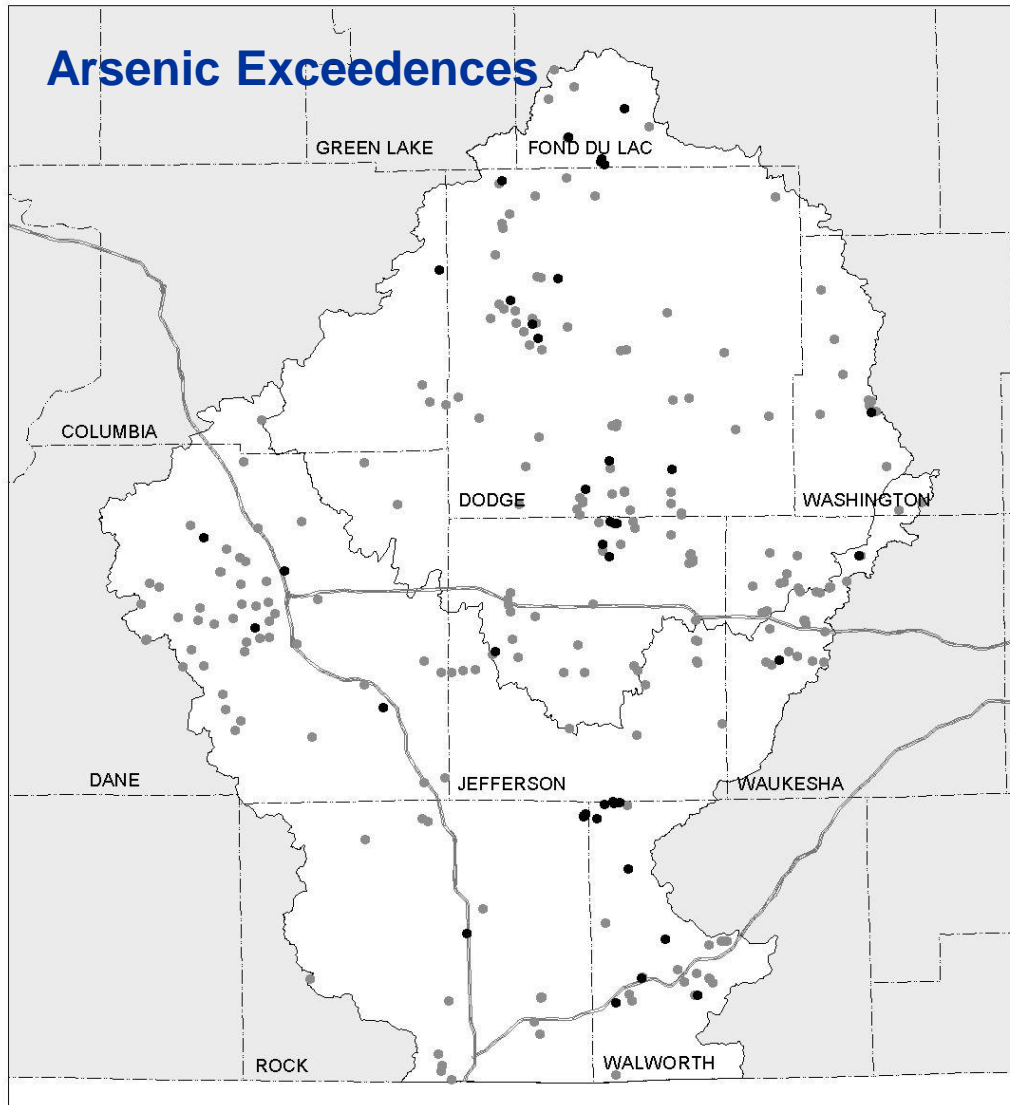
Source: DNR GRN

Inorganic Exceedances

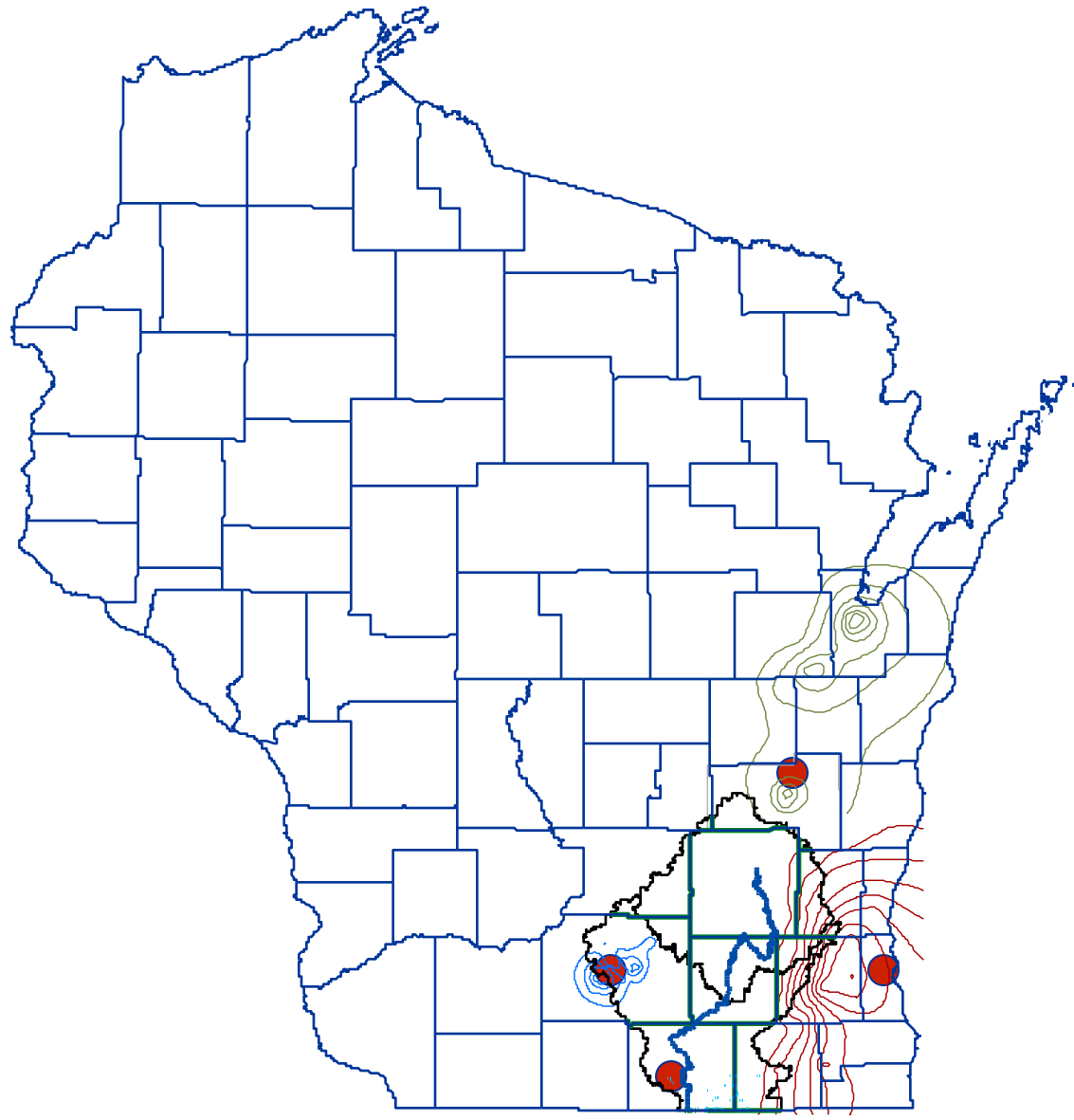


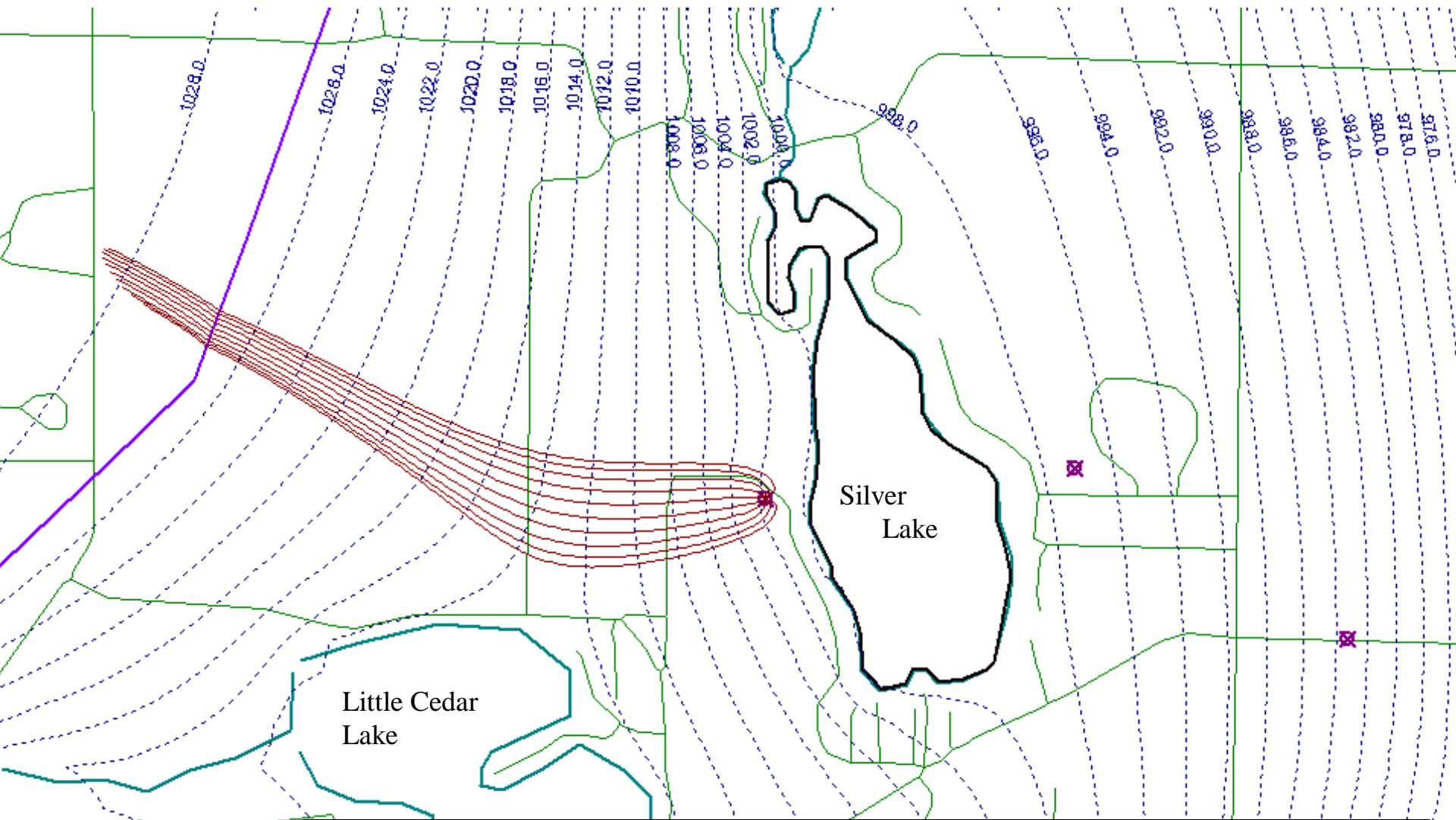
Source: DNR GRN

Arsenic Exceedances



Source: DNR GRN





Model simulation of a single well pumping at 75 gpm

Simulated stage of Silver Lake lowered by 0.013 feet

Simulated flow from Silver Lake to Silver Creek reduced by 0.14 cubic feet per second

Goals of Model

- Describe hydrogeologic setting of Rock River Basin
- Create steady-state, one layer, analytical model of regional groundwater system that depicts interactions with surface water

Prepared in cooperation with the Rock River Coalition

Simulation of the Regional Ground-Water-Flow System and Ground-Water/Surface-Water Interaction in the Rock River Basin, Wisconsin



Scientific Investigations Report 2009–5094

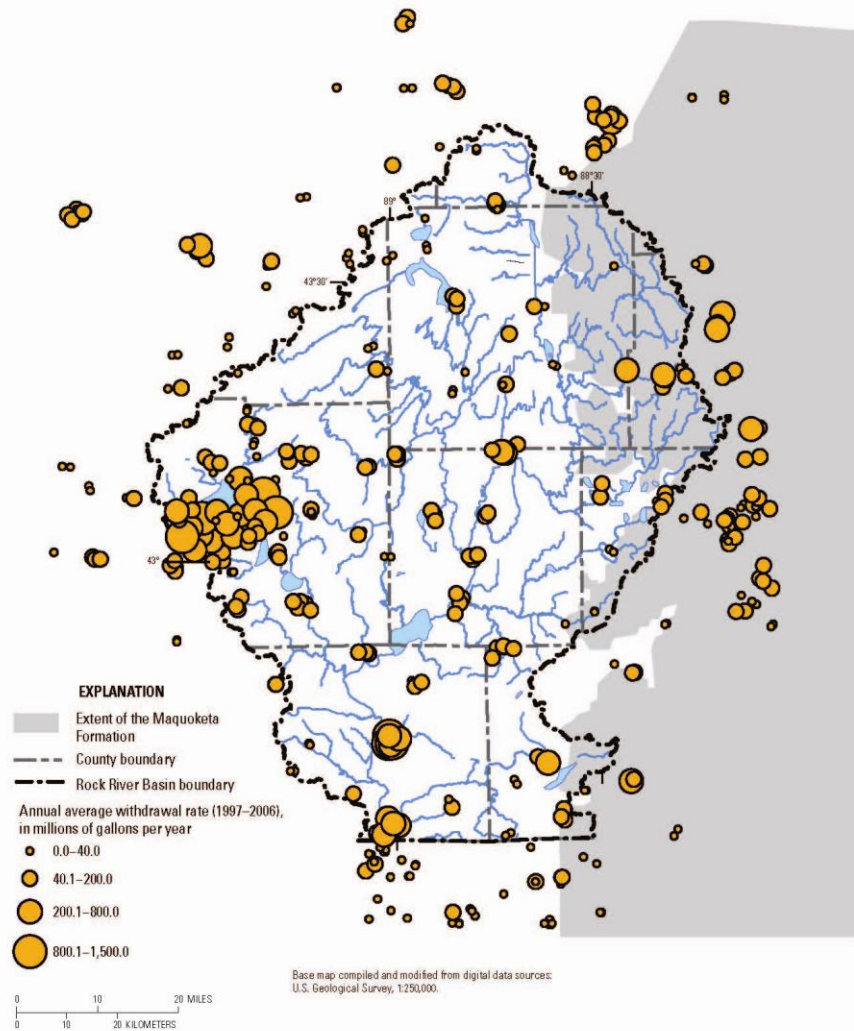


Figure 9. Ground-water withdrawal from public-supply wells in the GFLOW model of the Rock River Basin. Only wells that withdraw water from aquifers above the Maquoketa Formation are included in the GFLOW model where the Maquoketa Formation is present.

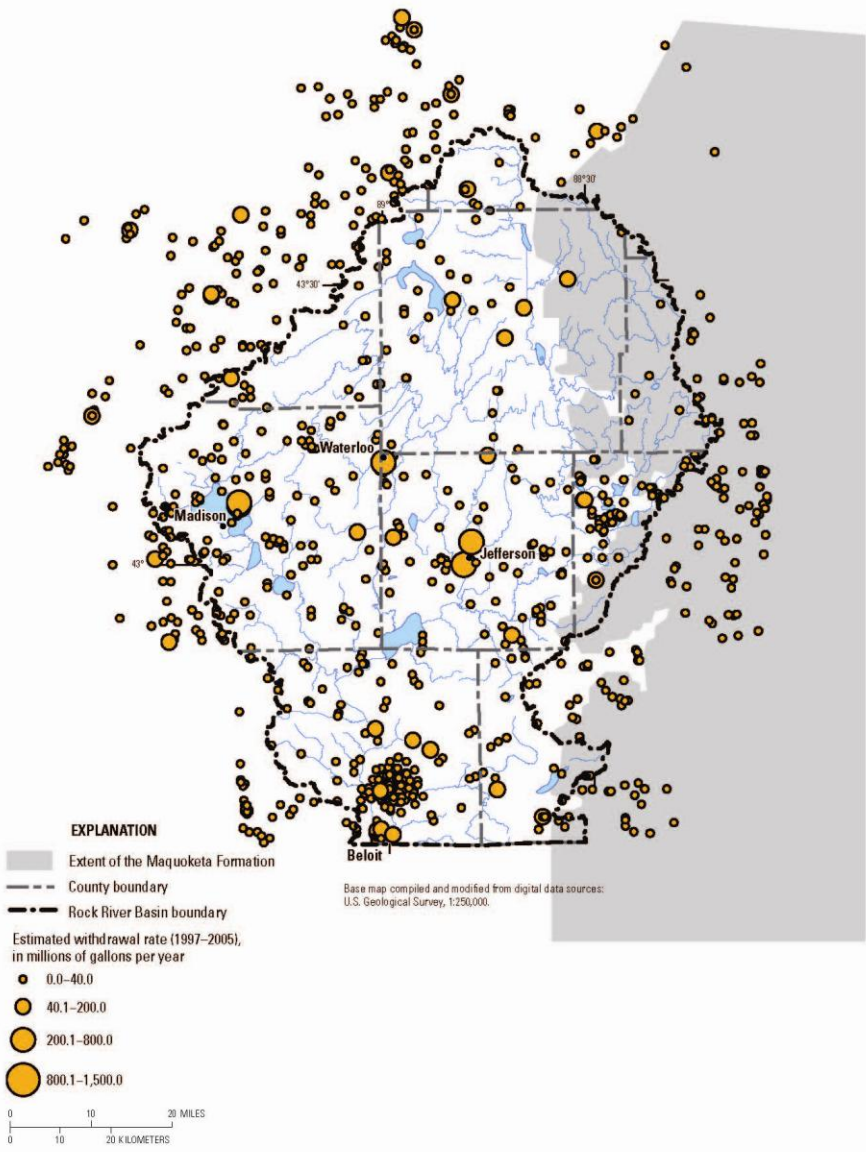


Figure 10. Ground-water withdrawal from agricultural, industrial, and commercial wells in the GFLOW model of the Rock River Basin. Only wells that withdraw water from aquifers above the Maquoketa Formation were included in the GFLOW model where the Maquoketa Formation is present. Estimated withdrawal rate based on historical rates or application (crop irrigation, manufacturing, etc.).

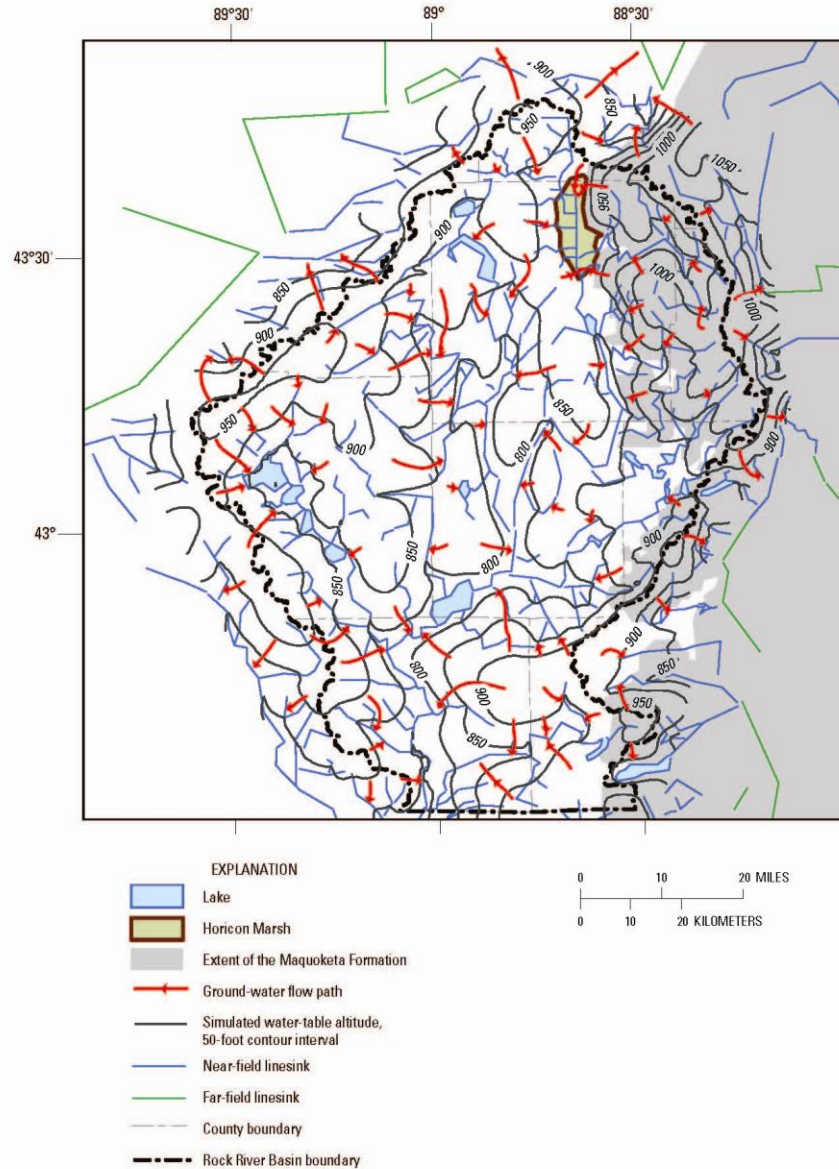
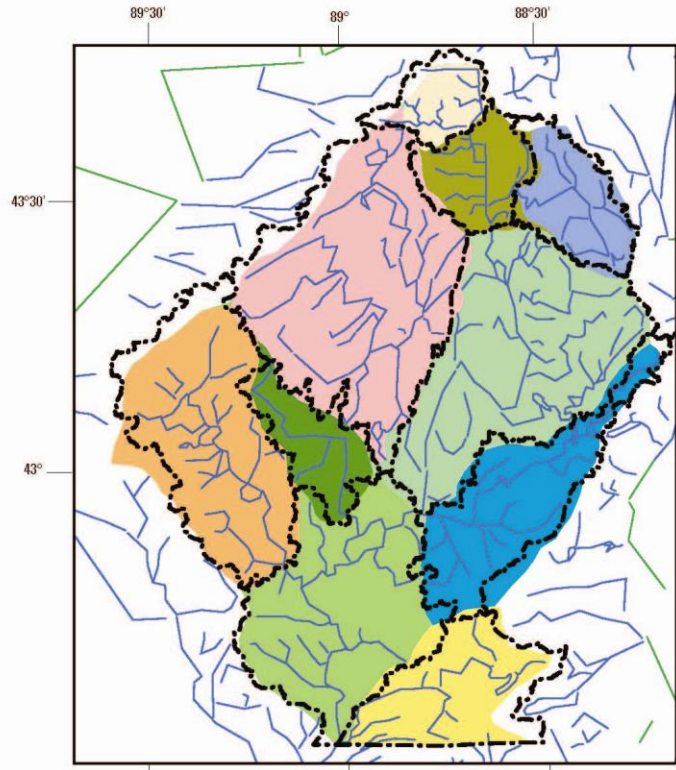


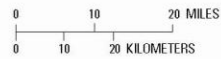
Figure 15. Simulated water-table altitude and ground-water flow directions from the GFLOW model in the Rock River Basin.



EXPLANATION

Ground-water basins for the:

- Rock River upstream from Beloit (excludes Turtle Creek)
- Turtle Creek at the Rock River
- Yahara River near Fulton
- Koshkonong Creek near Koshkonong Lake
- Bark River at the Rock River
- Crawfish River at Milford
- Rock River at Robert Street at Fort Atkinson
- Rock River near Horicon
- West Branch Rock River at State Highway 49 near Waupun
- East Branch Rock River near Mayville



- Tributary surface-water basin boundary
- Near-field linesink
- Far-field linesink

Figure 17. Simulated ground-water and mapped surface-water contributing areas for select tributaries to the Rock River.