

Water Use In Illinois and the Illinois Water Inventory Program

Illinois Soybean Association
December 18th, 2024

Steve Wilson
Illinois State Water Survey- Prairie Research Institute

Illinois Water Inventory Program Overview

- Initiated in 1978 – voluntary program to better understand where and how water is being used in the state.
- Amendment to Water Use Act of 1983
 - 2010- Mandatory for Public Water Suppliers and Self-Supplied Industry water users
 - 2015- Mandatory for Irrigation water users
- The collected data supports research projects, efforts to better understand water level changes due to pumpage and how they affect water wells, even changes in chemistry of groundwater.

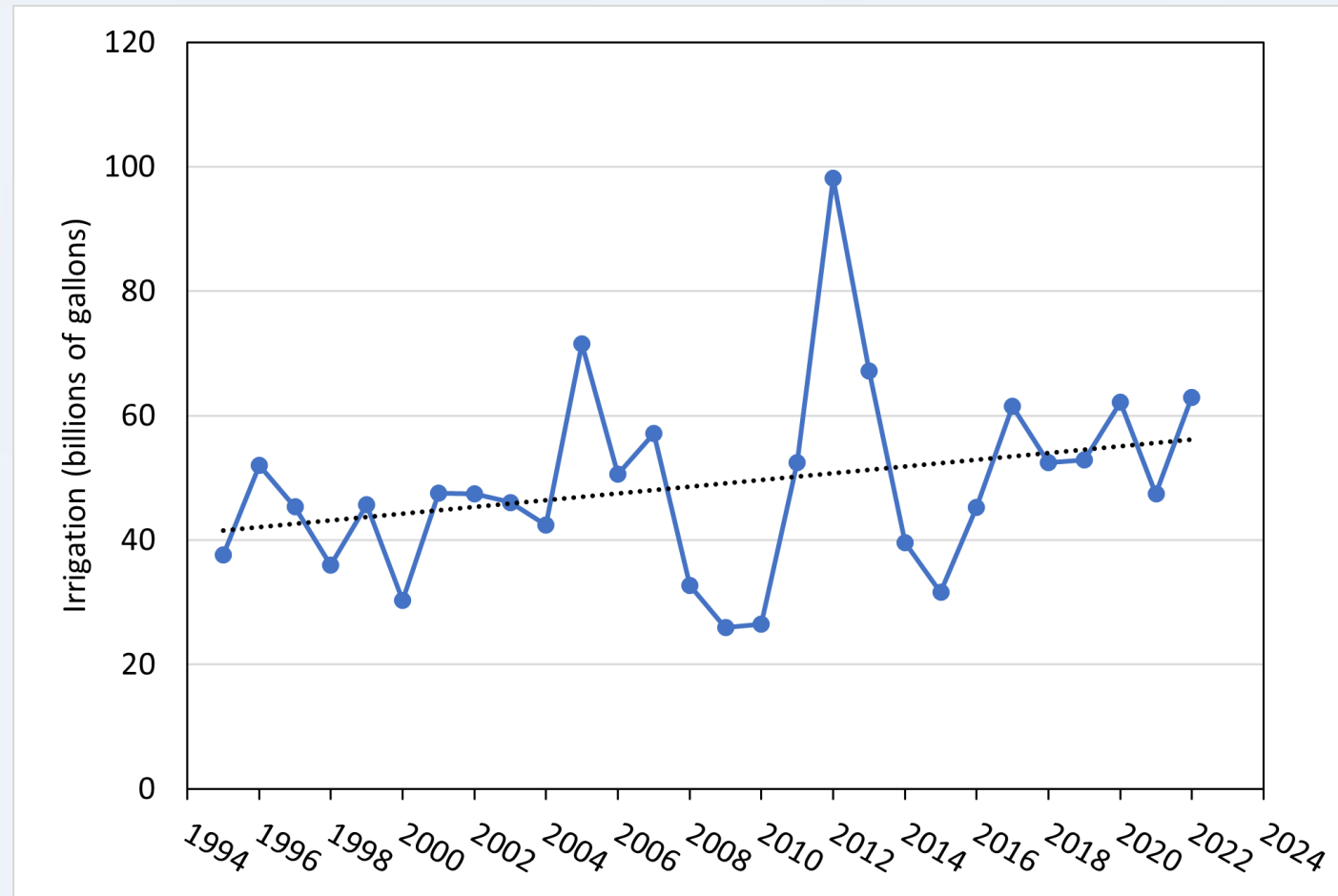
IWIP Overview – Facilities (high capacity pumpage)

- IWIP collects annual point source data from three sectors
 1. Public Water Supply
 - Provides water for human consumption to at least 15 service connections, or 25 people
 2. Self-Supplied Industrial-Commercial
 - *Wells/intakes which combined are rated to pump 100,000 gallons per day (70 gallons per minute)

IWIP Overview- Facilities cont.

3. Irrigation

- Focus on agricultural irrigation (golf courses and nursery are considered Industrial/Commercial)
- Became mandatory in 2015, but very low reporting since 2015, less than 20%
- Historically inconsistent reporting throughout the state.



Reported pumpage from the Imperial Valley Water Authority

Irrigation in Illinois

- About 7,500 center pivot irrigation systems in the state
- Most, but not all, are in areas with soils that have lower moisture holding capacity
- Concentrated in sandy areas of Illinois
- In some years, only most sandy areas need irrigation, if sufficient rainfall
- 38 inches in Illinois, 12-15 in Nebraska (96,000 pivots there)

Center Pivot Irrigation in Illinois 2012 and 2014 Illinois State Water Survey

Center Pivot Irrigated Field 2012
Center Pivot Irrigated Field between 2012 and 2014 Growing Seasons
Saturated Hydraulic Conductivity (>4 c/d-ft)

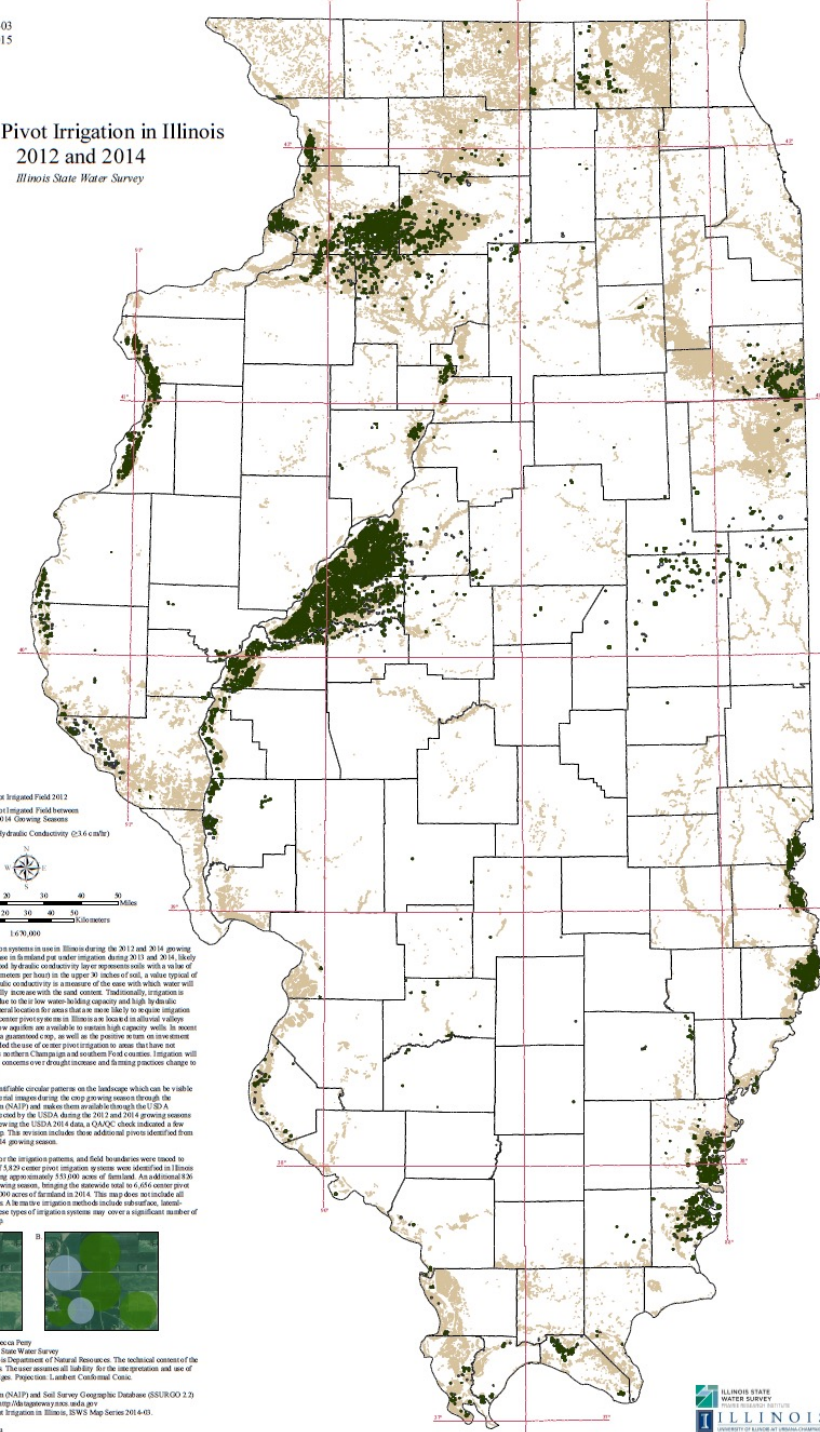
0 5 10 15 20 25 30 Miles
0 5 10 15 20 25 30 Kilometers
1:630,000

This map displays center pivot irrigation systems in use in Illinois during the 2012 and 2014 growing seasons. There was a significant increase in identified pivot irrigation systems during 2013 and 2014, likely due to the drought in 2012. The saturated hydraulic conductivity layer represents soils with a value of 2.00 millidarcies per second (0.4 centimeters per hour) or the upper 30 inches of soil, a value typical of sandy soils in Illinois. Saturated hydraulic conductivity is a measure of the ease with which water will move through a soil, and is related to porosity. Areas with the most porous, traditionally irrigated, soils are located in the northwestern part of the state due to their low water holding capacity and high hydraulic conductivity. This layer provides a general location for areas that are more likely to require irrigation for a successful crop. The majority of center pivot systems in Illinois are located in arid and semi-arid regions where soils are sandy and where shallow aquifers are available to sustain high capacity wells. In recent years, most crop contracts that require a guaranteed crop, as well as the positive return on investment for crop under irrigation, have expanded the use of center pivot irrigation to areas that have not historically required irrigation such as northern Champaign and southern Peoria counties. Irrigation will likely continue to expand in Illinois as concerns over drought increase and farming practices change to attain crop yield and economic goals.

A. Center pivot irrigation systems identify circular patterns on the landscape which can be visible in aerial images. The USDA collects aerial images during the crop growing season through the National Agricultural Imagery Program (NAIP) and makes them available through the USDA's Geospatial Data Gateway. Images collected by the USDA during the 2012 and 2014 growing seasons were used to develop this map. In reviewing the USDA 2014 data, a QA/QC check indicated a few pivots were omitted from the 2012 map. This revision includes these additional pivots identified from USDA images collected during the 2014 growing season.

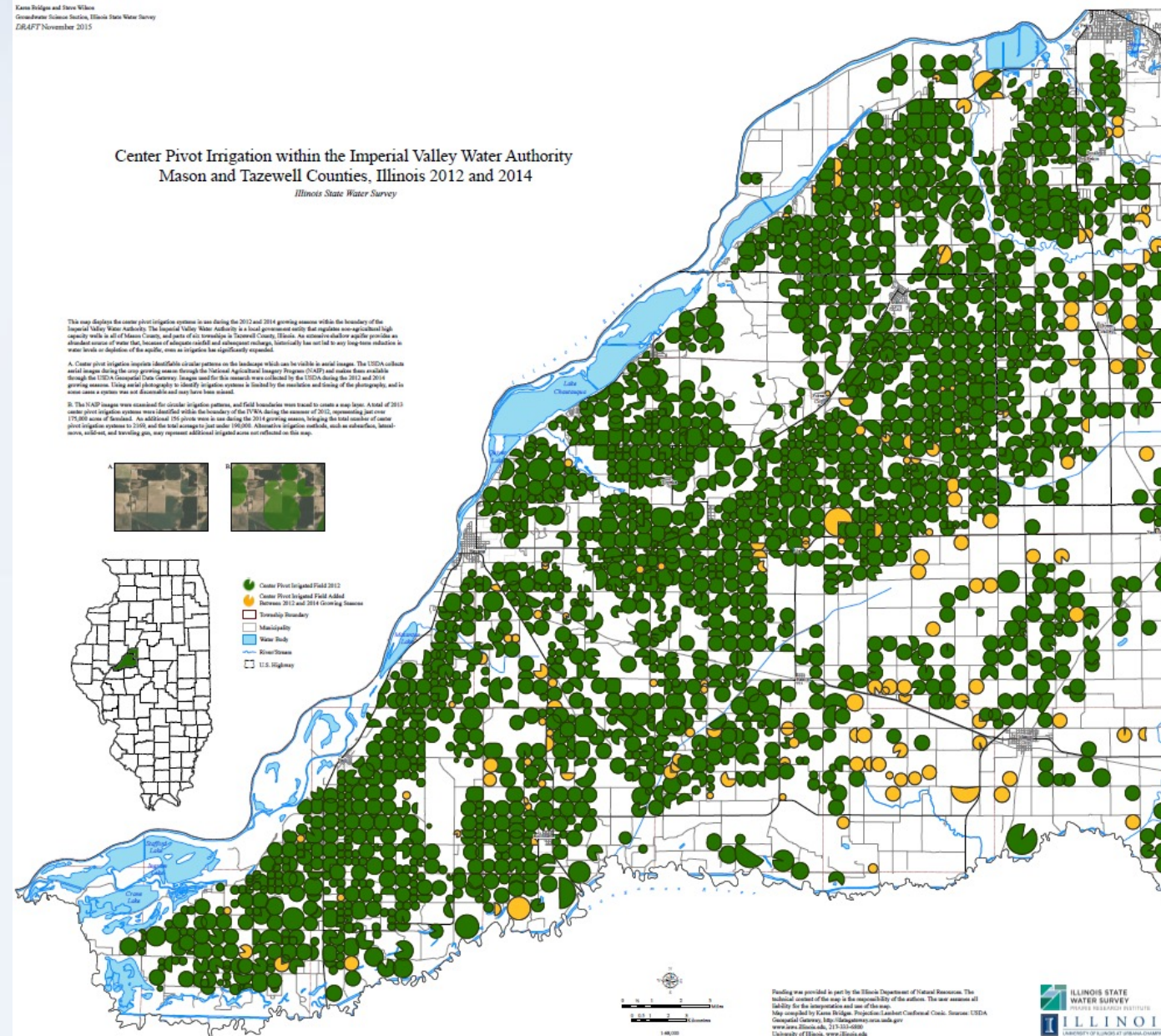
B. The NAIP images were examined for the irrigation patterns, and field boundaries were traced to create an ArcGIS map layer. A total of 5,820 center pivot irrigation systems were identified in Illinois during the summer of 2012, representing approximately 551,000 acres of farmland. An additional 930 pivots were in use during the 2014 growing season, bringing the statewide total to 6,750 center pivot systems, irrigating approximately 625,000 acres of farmland in 2014. This map does not include all forms of irrigation employed in Illinois. A major irrigation methods include subsurface, surface, wheel-irrigation, and flooding. These types of irrigation systems may cover a significant number of irrigated acres not reflected in this map.

Karen Bridges, Steve Wilson, and Robert Perry
Geospatial Science Section, Illinois State Water Survey
Funding was provided in part by Illinois Department of Natural Resources. The technical content of the map is the responsibility of the authors. The user assumes all liability for the interpretation and use of the map. Map compiled by Karen Bridges. Projection: Lambert Conformal Conic Spheroid.
National Agricultural Imagery Program (NAIP) and Soil Survey Geographic Database (SSURGO 2.2) from the USDA Geospatial Gateway. Map data and imagery from the USDA Geospatial Gateway. Bridges, et al., 2014. 2012 Center Pivot Irrigation in Illinois, ISWS Map Series 2014-03. www.illinois.edu, 21.11x34.800
University of Illinois, www.illinois.edu

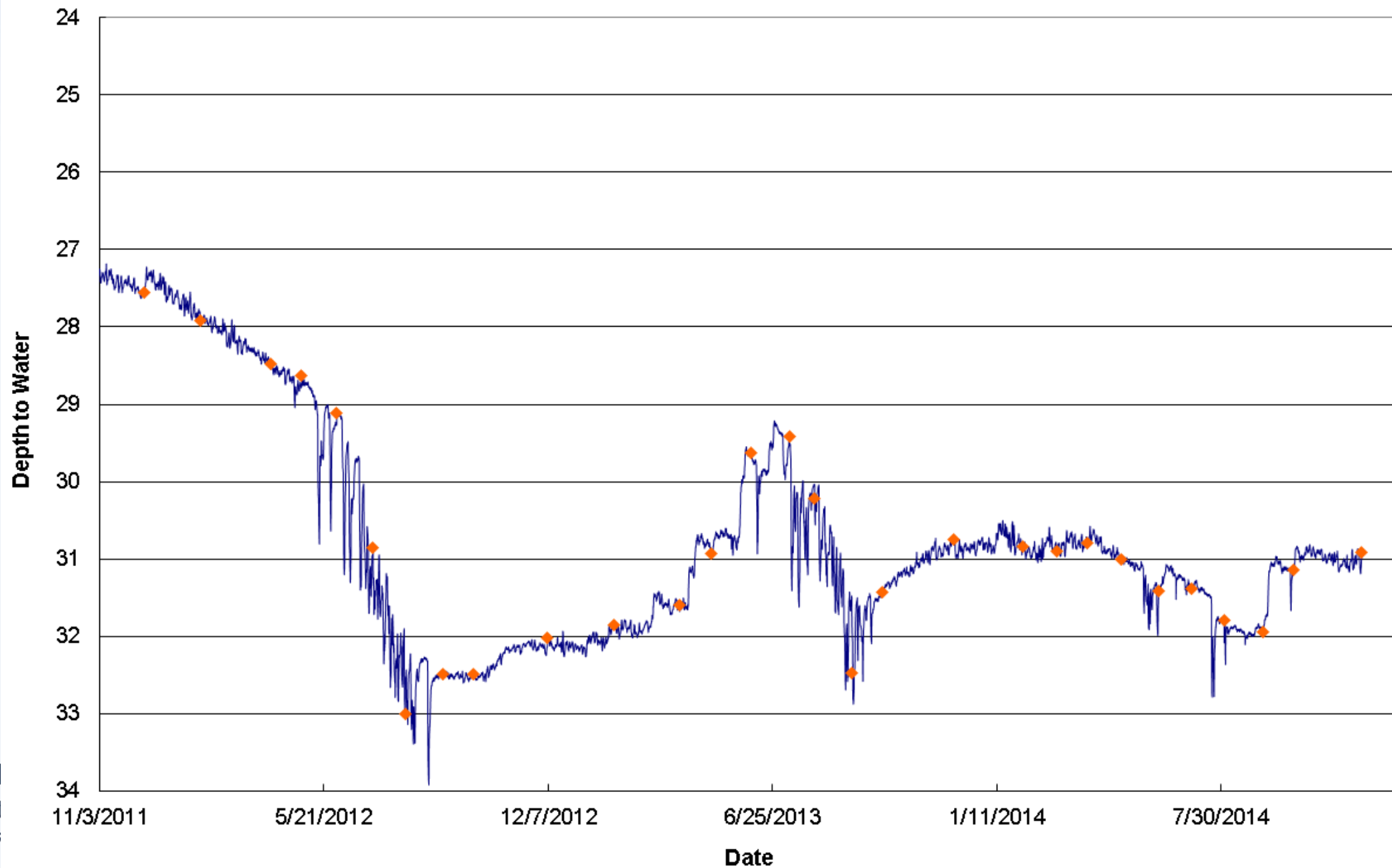


The Imperial Valley

- About 30% of the irrigated acres in the state are in Mason and Tazewell Counties
- Over 2,300 irrigation systems irrigating about 180,000 acres
- In 2012, pumped 98 billion gallons of water
- Average over 20 years is closer to 50 billion gallons.
- Part of the Mahomet Aquifer

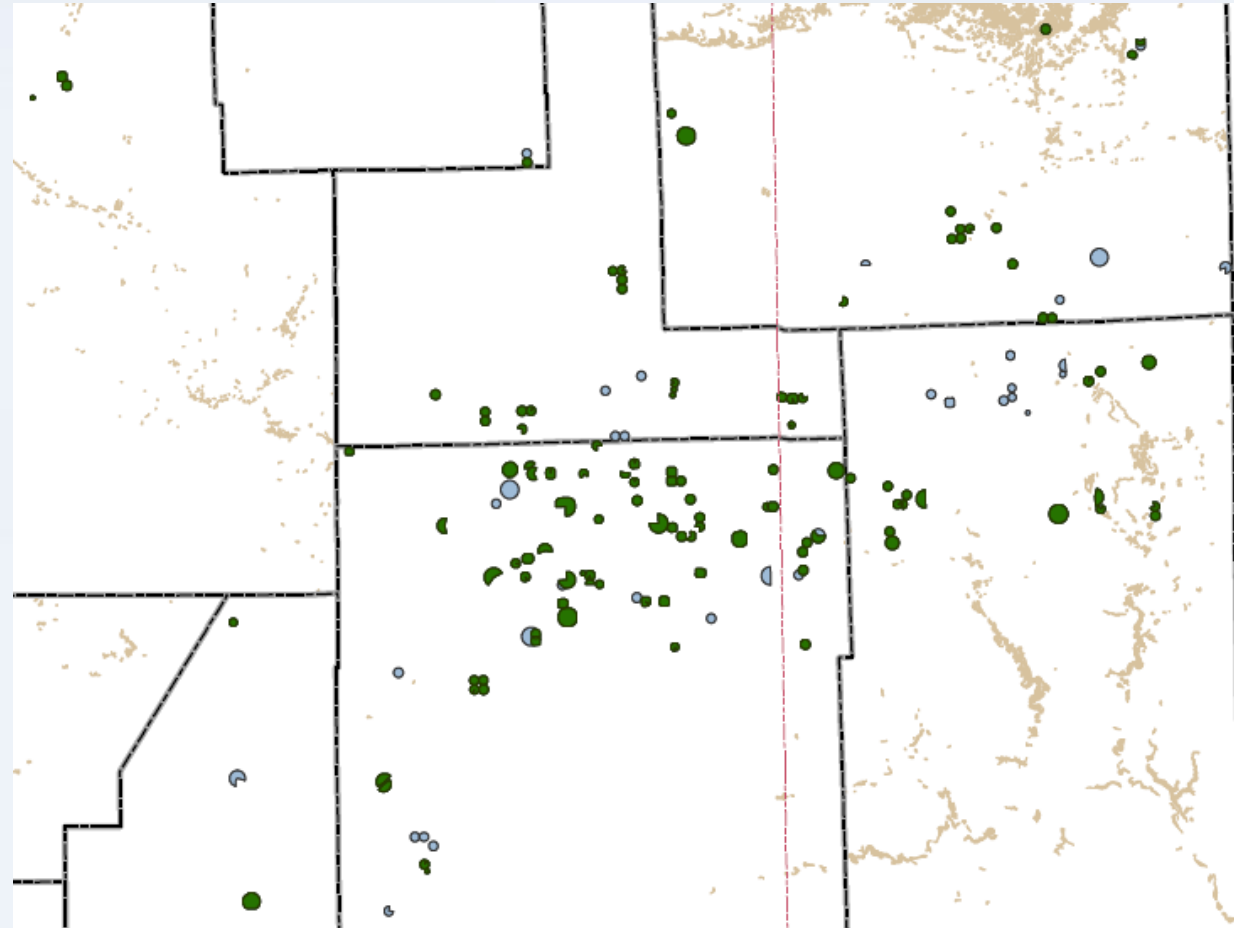


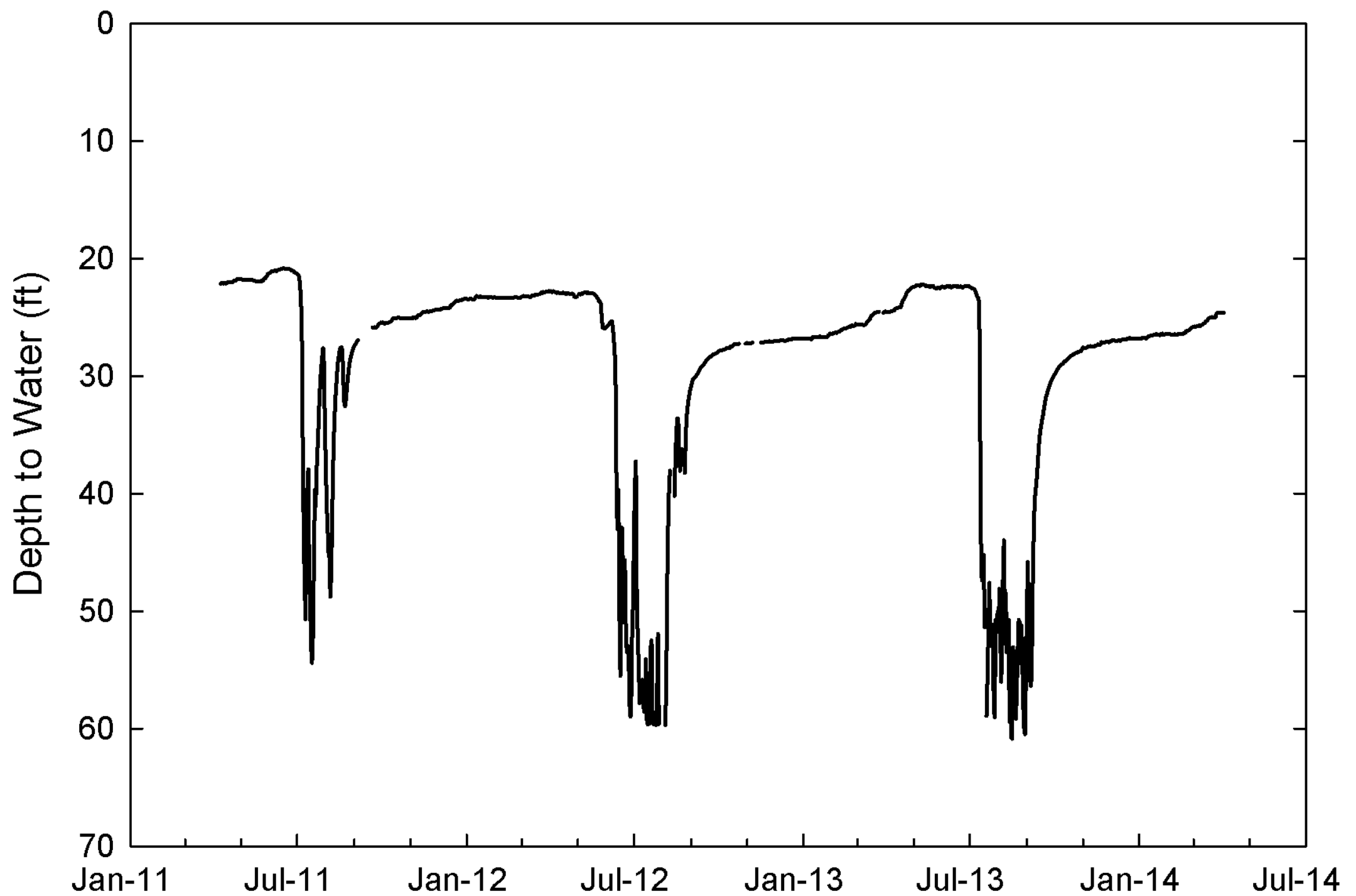
Depth to Water at San Jose (MTOW-10)



Irrigation in the Champaign Area

- About 20,000 irrigated acres in region
- 100+ irrigation systems
- Pumping from the Mahomet Aquifer





Name : MTOW-10
ISWS P# : 360676

Network :
IMPERIAL VALLEY
Local Aquifer Name :
MAHOMET
Aquifer Type :
UNCONFINED
Aquifer Class :
QUATERNARY SAND AND GRAVEL

Location [Lat, Long] : [40.311972, -89.604726]
Land Surface Elevation : 560.74 feet above MSL
Well Depth : 56 feet below LS
Measurement Frequency : CONTINUOUS
Period of Record :
[1995-03-01 00:00] - [2024-12-18 07:00]

Last water level : Not Available

Download Data :
[\[JSON \]](#) | [\[CSV \]](#)



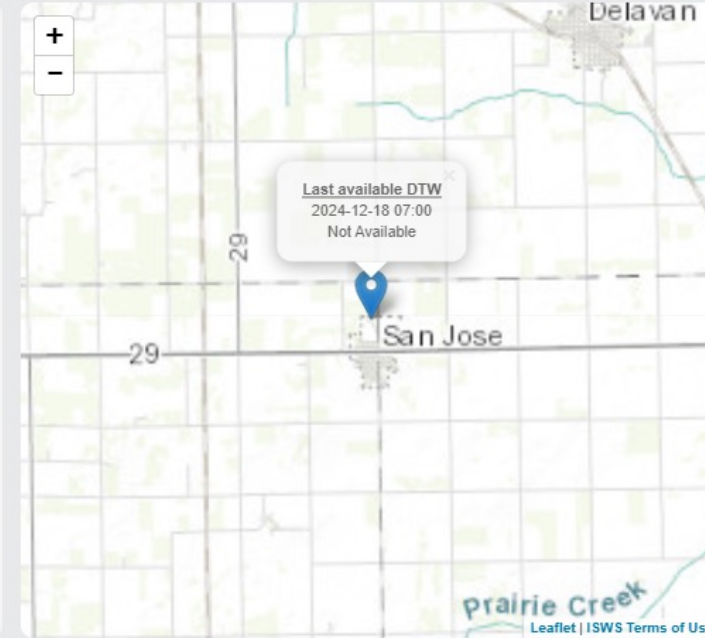
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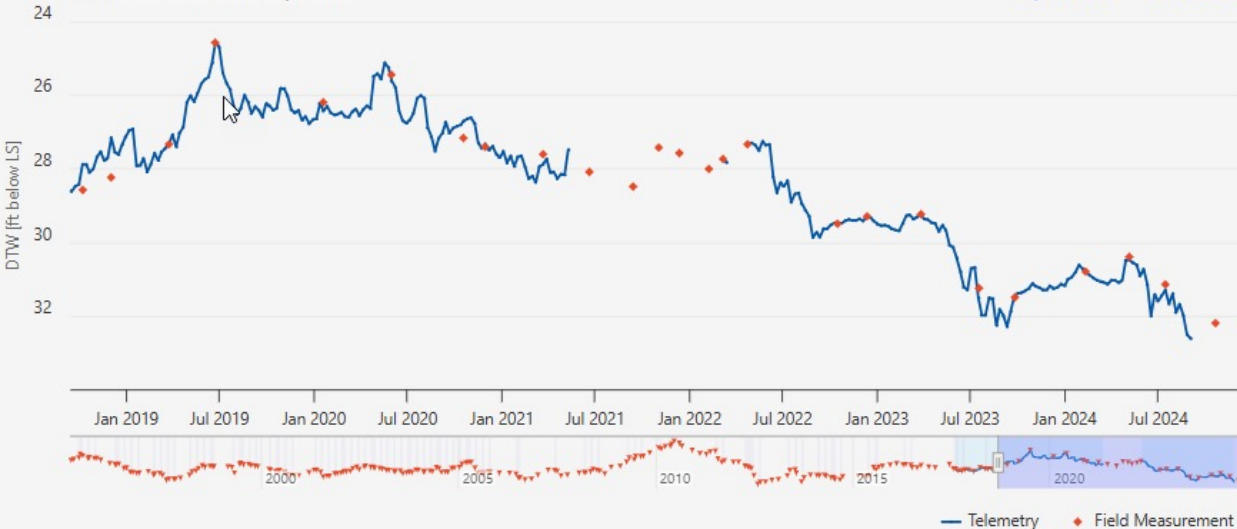


Groundwater Observations For: MTOW-10



Zoom 1w 1m 6m 1y All

Sep 14, 2018 → Dec 18, 2024

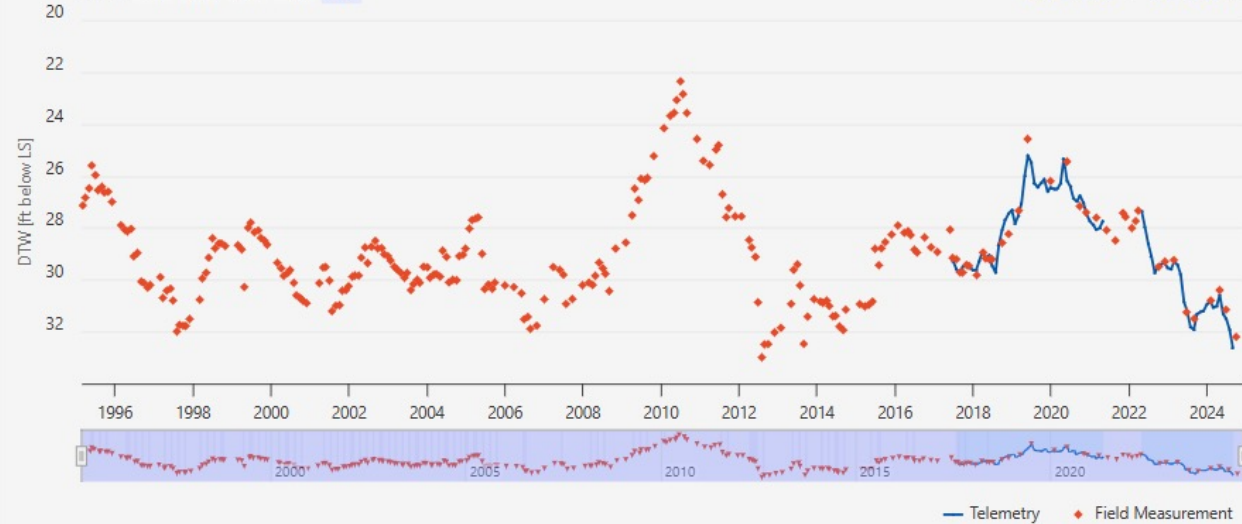


Groundwater Observations For: MTOW-10



Zoom 1w 1m 6m 1y All

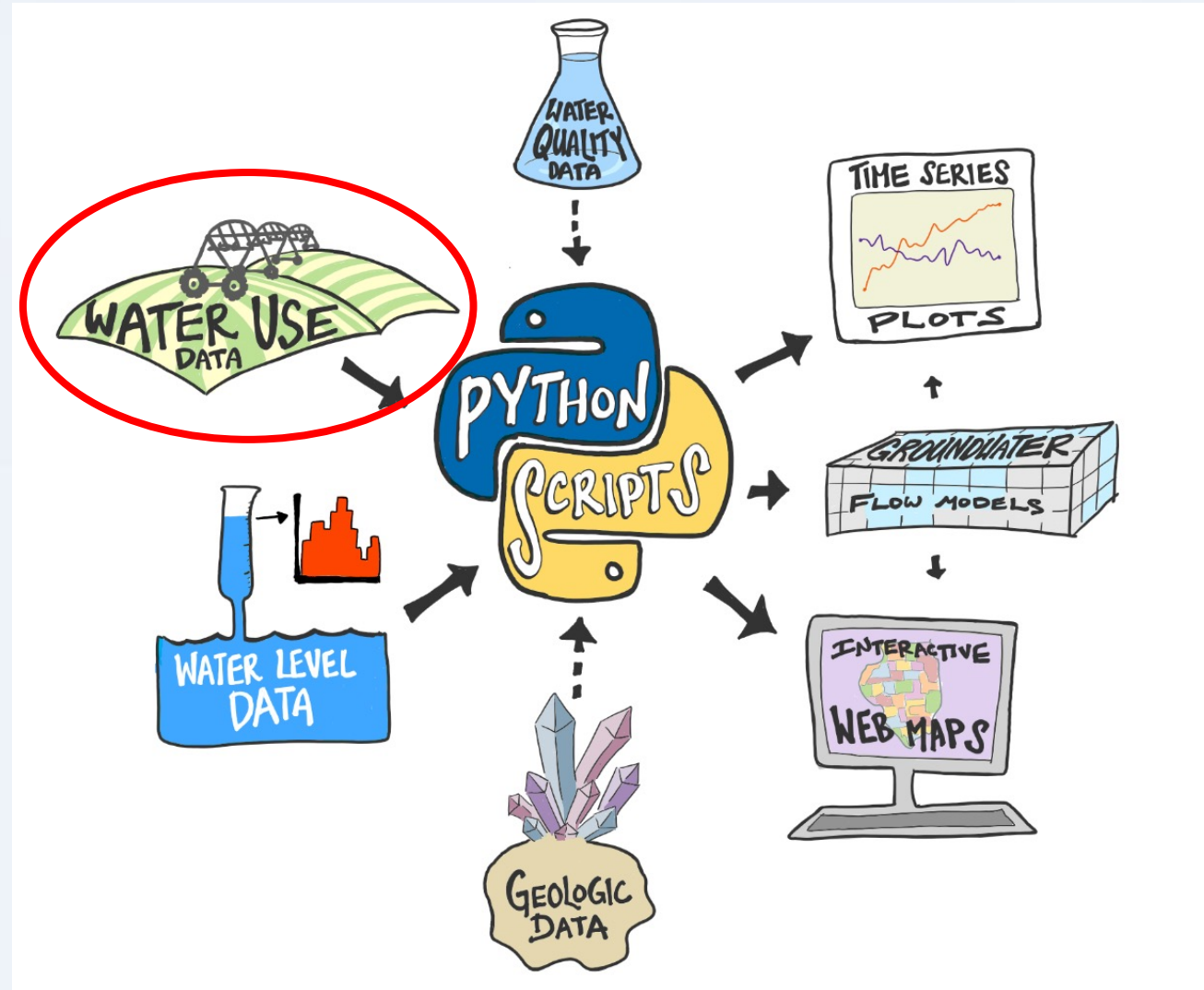
Mar 1, 1995 → Dec 18, 2024



— Telemetry ♦ Field Measurement

IWIP– Supports Our Science

- Relationships between pumpage, drawdown, water levels, and recharge
- Groundwater – Surface Water interactions – gaining and losing streams
- Changes over time, long term trends, where we should be paying attention
- Local well interference
- And many more – an aquifer doesn't care “why” there is pumpage, use needs to be tracked for all users.



Core of What We Do

- Groundwater flow modeling
- Illinois State Water Supply Planning
- Regional aquifer studies
- Municipal projects

All of these things are only as good as the data that goes into them. Water levels, aquifer properties, withdrawal and recharge are the basic information we use to understand our resources.

Name : CHAM-12-02A
ISWS P# : 495463

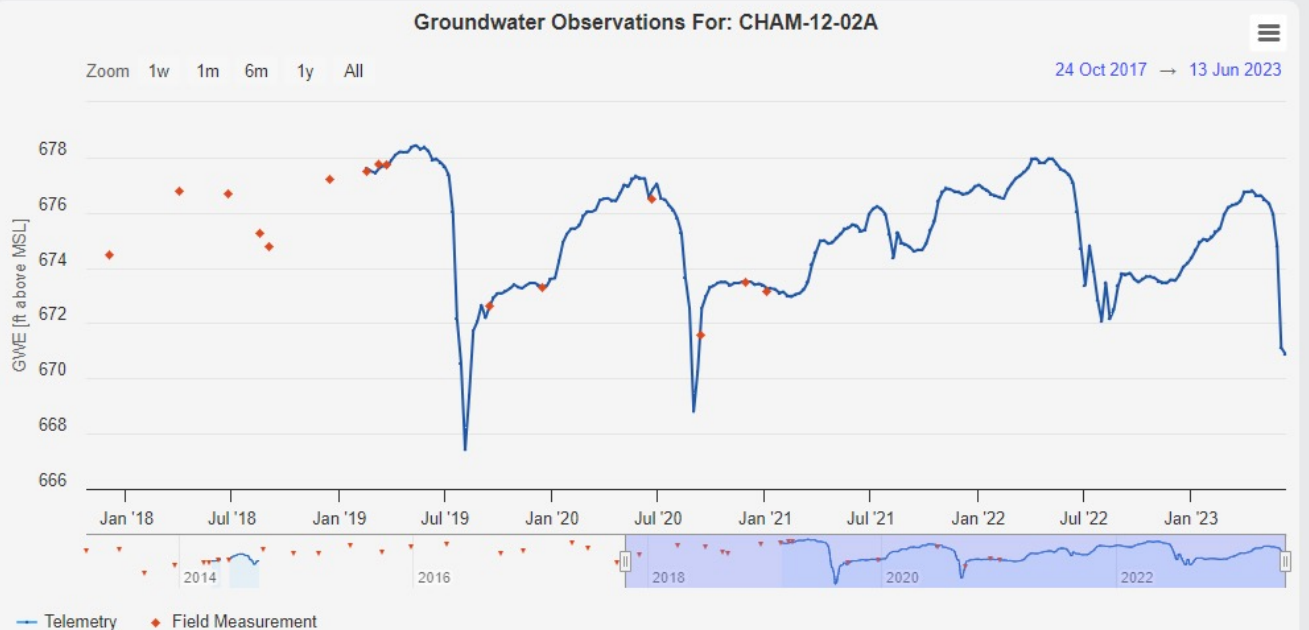
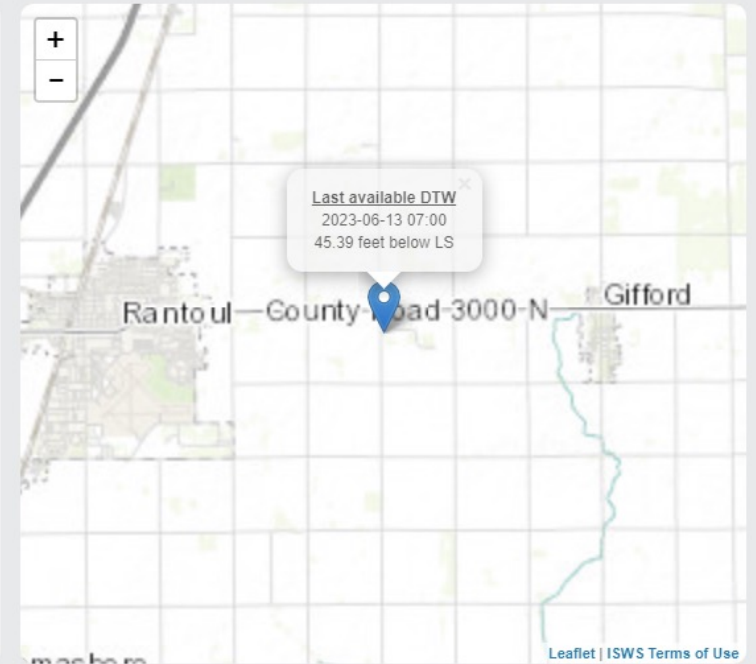
Network :
ILLINOIS AMERICAN CHAMPAIGN
Local Aquifer Name :
MAHOMET
Aquifer Type :
CONFINED
Aquifer Class :
QUATERNARY SAND AND GRAVEL

Location [Lat, Long] : [40.307832, -88.078057]
Land Surface Elevation : 715.88 feet above MSL
Well Depth : 280 feet below LS
Measurement Frequency : CONTINUOUS
Period of Record :
[2013-03-15 08:20] - [2023-06-13 07:00]

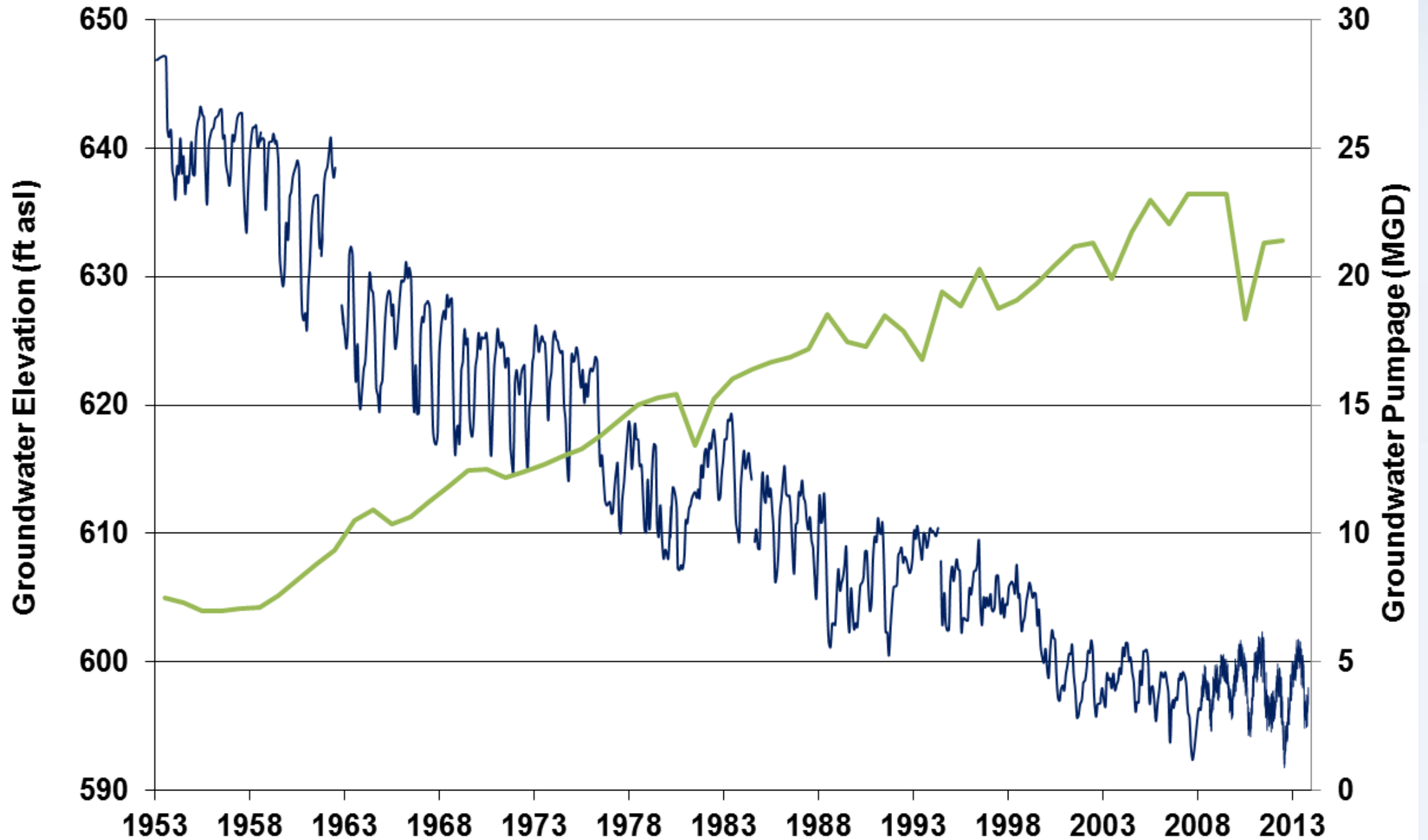
Last water level : 670.49 feet above MSL

Download Data :

[\[JSON \]](#) | [\[CSV \]](#)



Groundwater Elevation at Petro North (1953-Present)



Significant Water Issues Have Be Addressed

- Chicago area municipalities and industries were mining the deep sandstone aquifers
- Started using Lake Michigan in 1980
- We were sued, pumpage was capped, now Joliet area is last major deep aquifer use.
- Water use has increased, our modeling indicates that Joliet and nearby industries will not be able to use the aquifer by 2030
- \$1 billion project

Water levels, aquifer properties, withdrawal and recharge are the basic information we use to understand our resources.

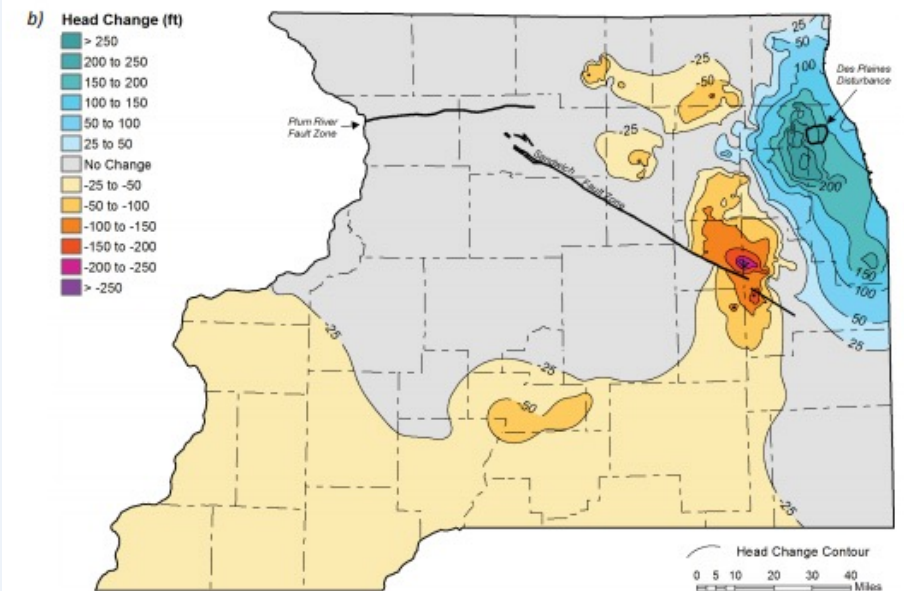
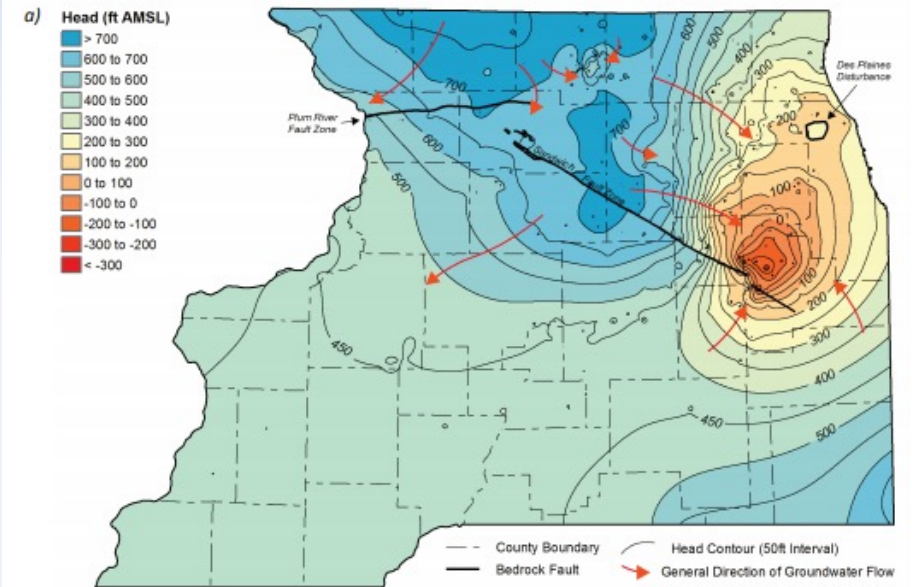


Figure 4. (a) Potentiometric surface for the Cambrian-Ordovician sandstones in 2014 in feet above mean seal level (ft AMSL) and (b) Head change in Cambrian-Ordovician sandstone wells between 1980 and 2014

If You Are New To The IWIP Program

- Contact us and we can help you get started and answer any questions you might have.
 - Complete the initial form that lists each well or intake. We will work with you to verify locations and well/intake information.
 - Then annually submit your water use by well, either if you have a meter on your system or by estimating based whether diesel or electric.
 - <https://www.isws.illinois.edu/environmental-public-health-information-and-data-services/illinois-water-inventory-program/>

Why Report Water Use

- It allows our scientists to better understand our water resources and be proactive in developing equitable solutions to water problems.
- We are not a regulatory agency, we are named in the act because of this existing program. We have privacy protections in place.
- Without the actual data, we will use our best scientific guess to assign pumpage to every high capacity well regardless.
- Individual data is protected, we only report data at the county, township and/or watershed level.
- It's really in every irrigators best interest to report.

ISWS - IWIP Program

Cora Wessman - IWIP Coordinator

cwessm3@illinois.edu

217-333-5838

Steve Wilson

sdwilson@illinois.edu

217-333-0956