# Kane and McHenry County

# Groundwater Supply & Demand

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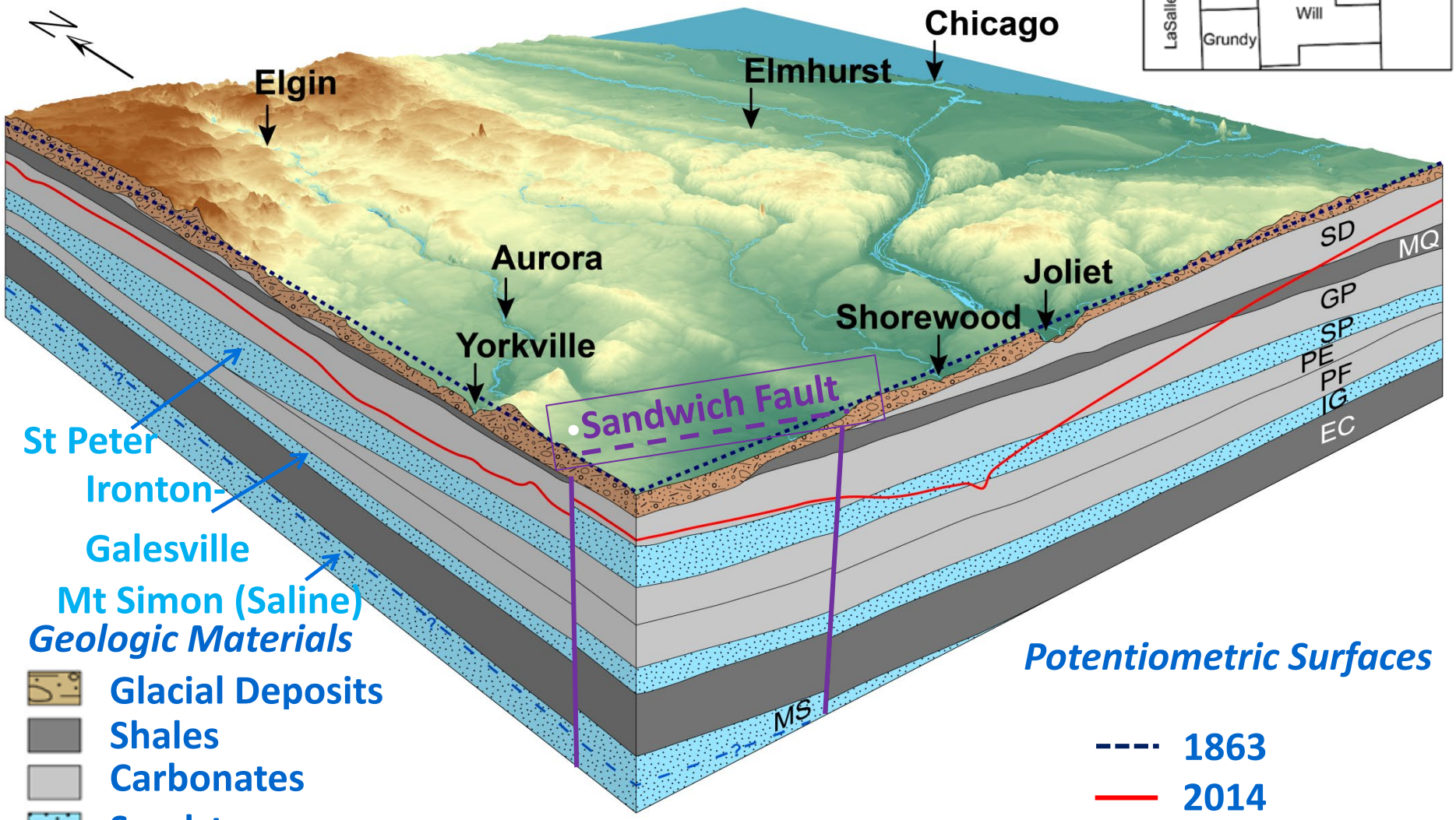
Tuesday, June 28, 2020

# Regional Bedrock Geology


*Geologic Materials*

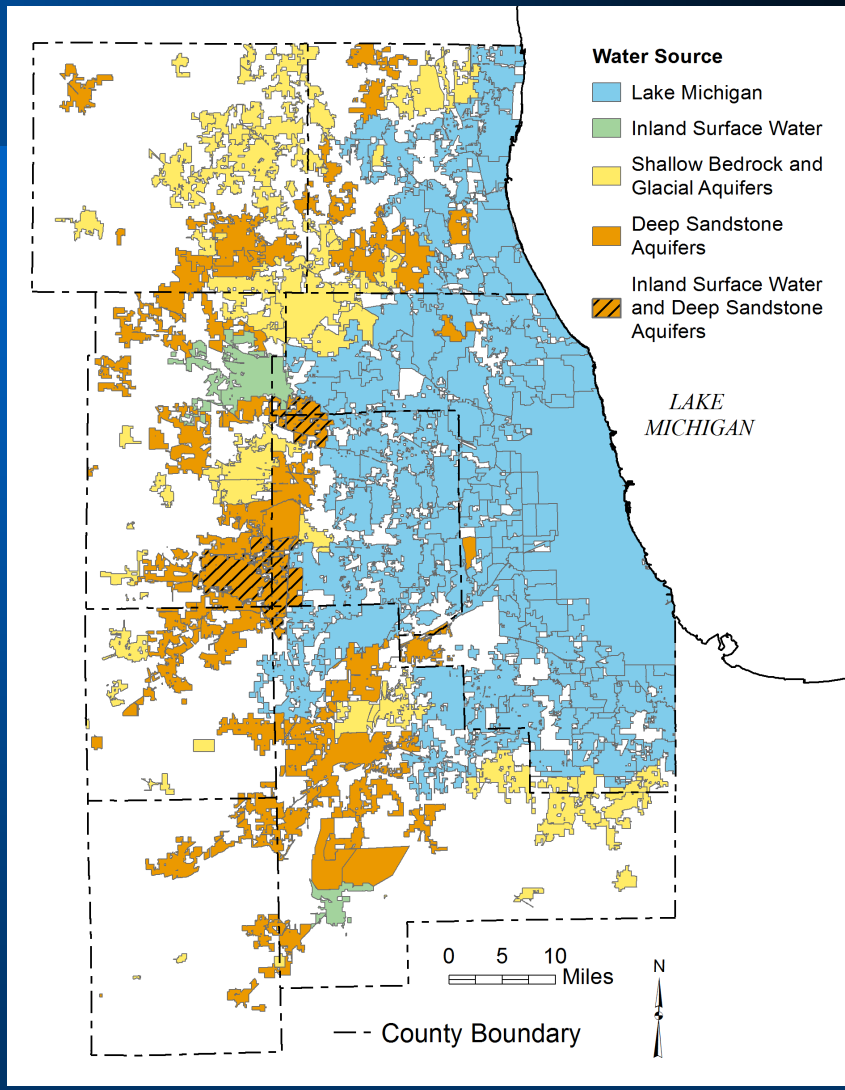
- Glacial Deposits
- Shales
- Carbonates
- Sandstones

*Potentiometric Surfaces*

- 1863
- 2014

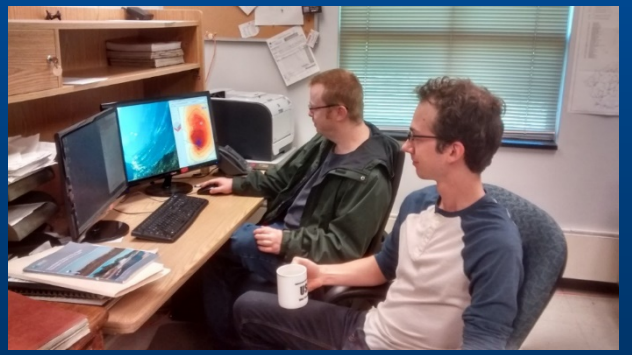
# Sources of Water in Northeastern Illinois

- Suburbs rely on the deep aquifers
- Water levels have declined for over a century
- Joliet switching off the sandstone in 2030; withdrawals still above sustainable supply

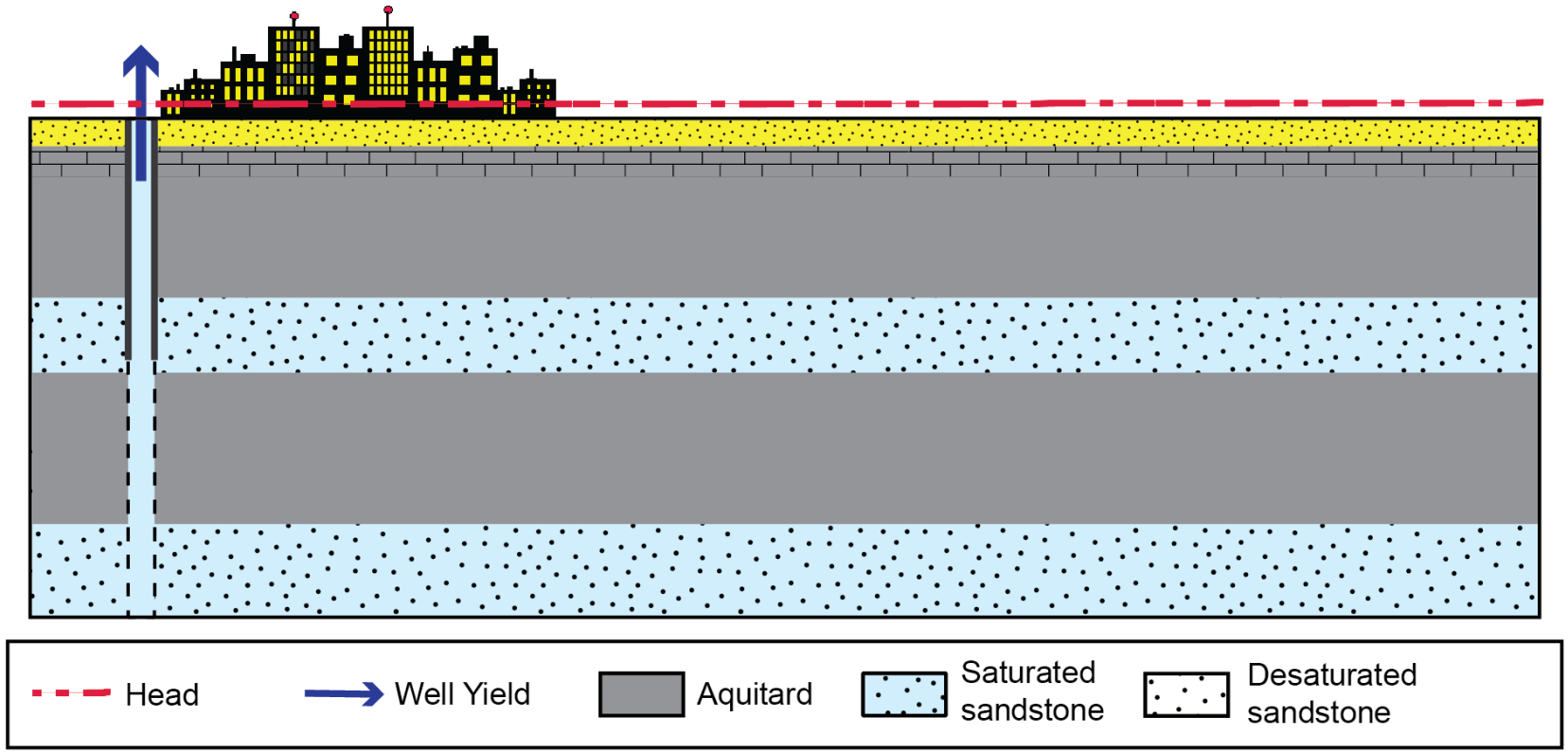


# The ISWS has a number of ways to understand how the aquifer responds to demands.

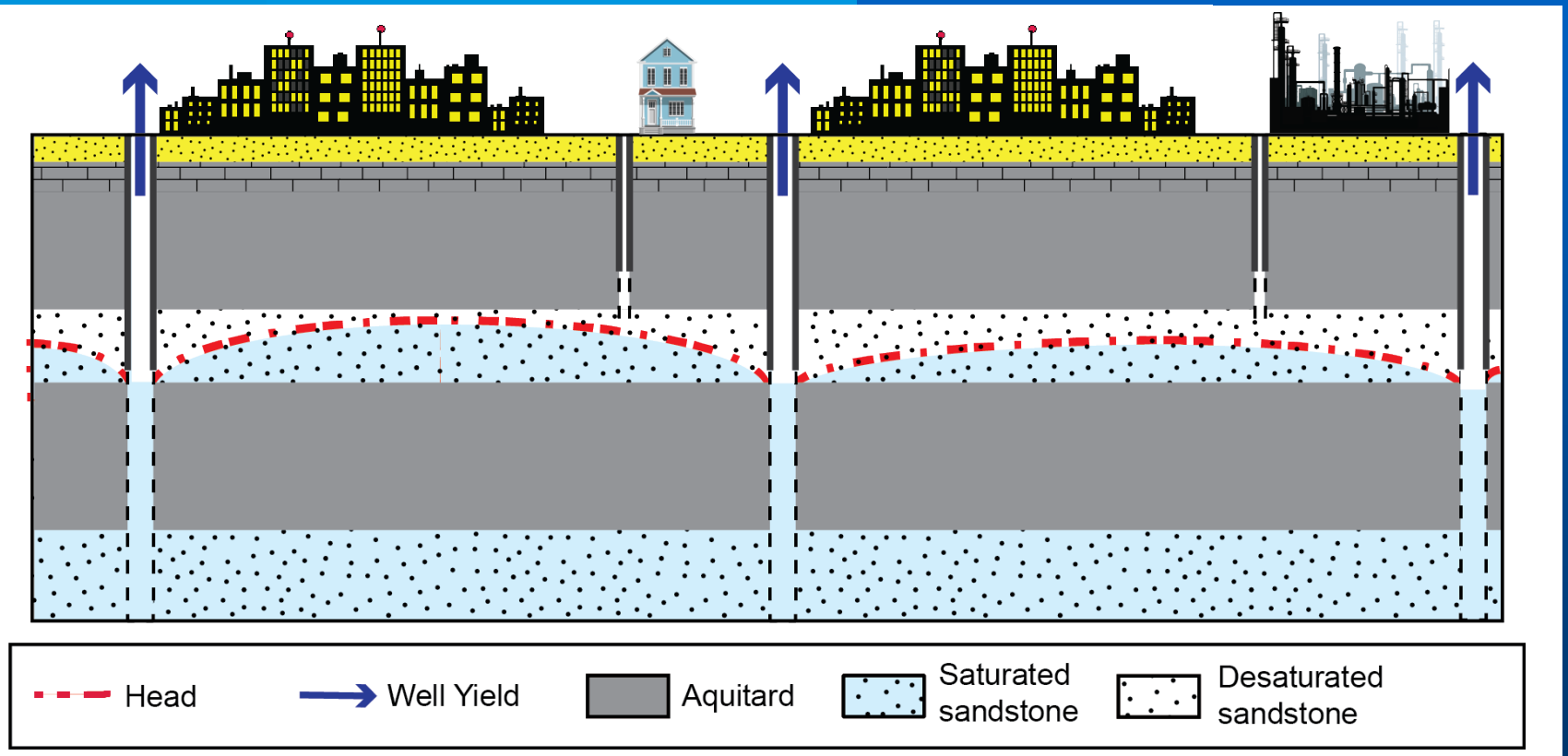
- Water Level Measurements
- Groundwater Flow Model
- Stakeholder Engagement



# Water Levels in the early 1900s



# Modern Day: Upper Aquifer Dewatered



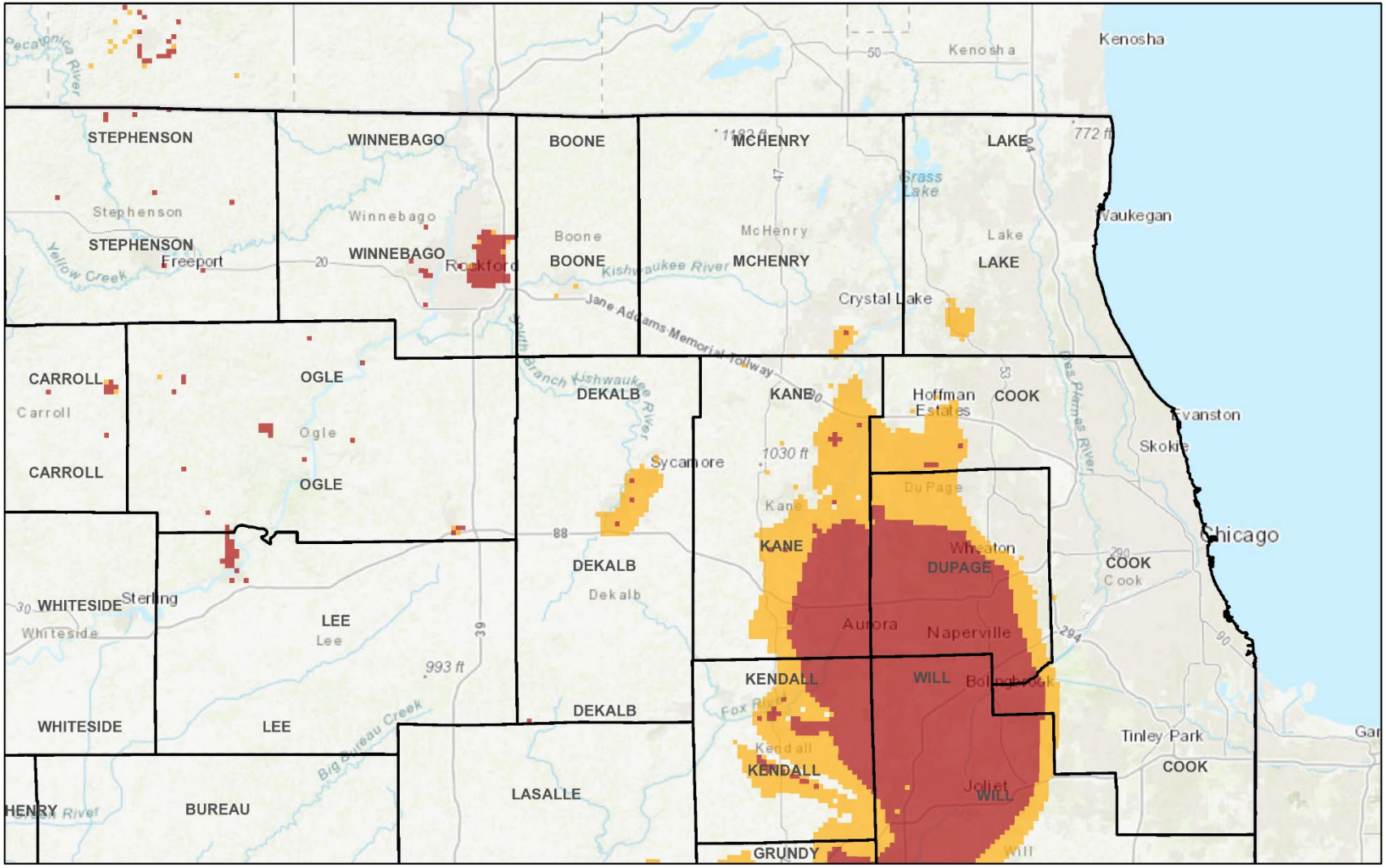
# St. Peter Risk Zones (Old Analysis):

- Head is less than 200 ft above the top of the St. Peter

And

- Head is less than 50% of predevelopment head above the top of the St. Peter

# •St. Peter Risk




7/23/2018, 6:18:50 PM

Counties

Future

St. Peter Sandstone Risk Area

Current

1:1,155,581

0 5 10 20 mi

0 10 20 40 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri

Web AppBuilder for ArcGIS

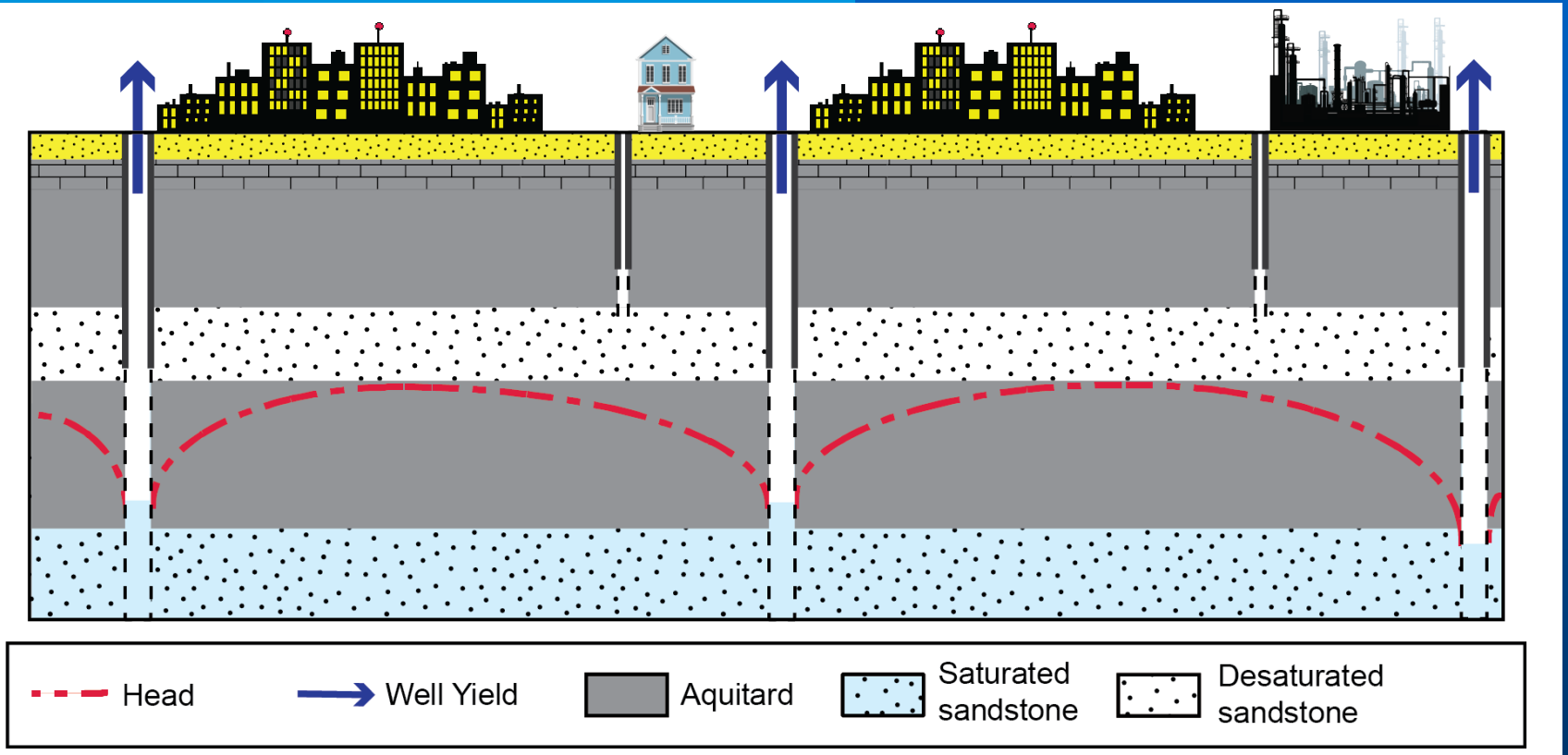
Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS | ISWS, ISGS |

# Reality

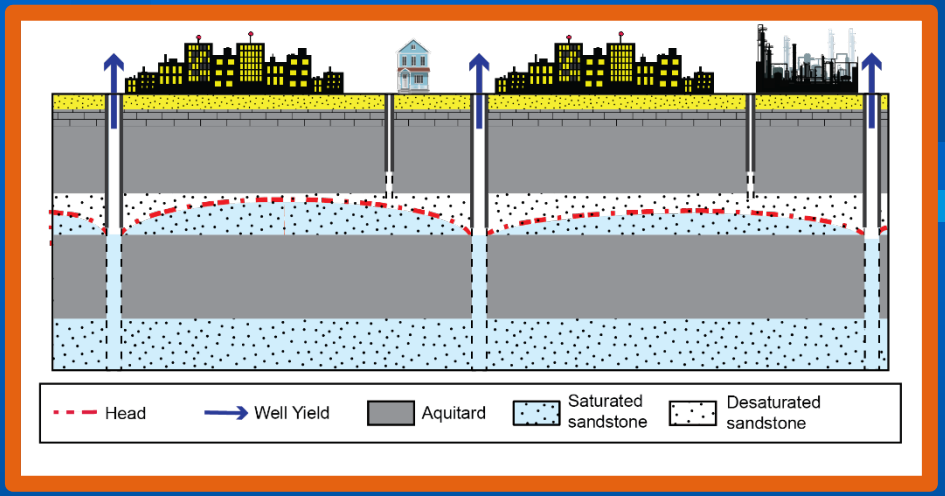
- Most high capacity wells are open to the Ironton-Galesville and have cased off the St. Peter
- There isn't a motivation to keep the St. Peter saturated

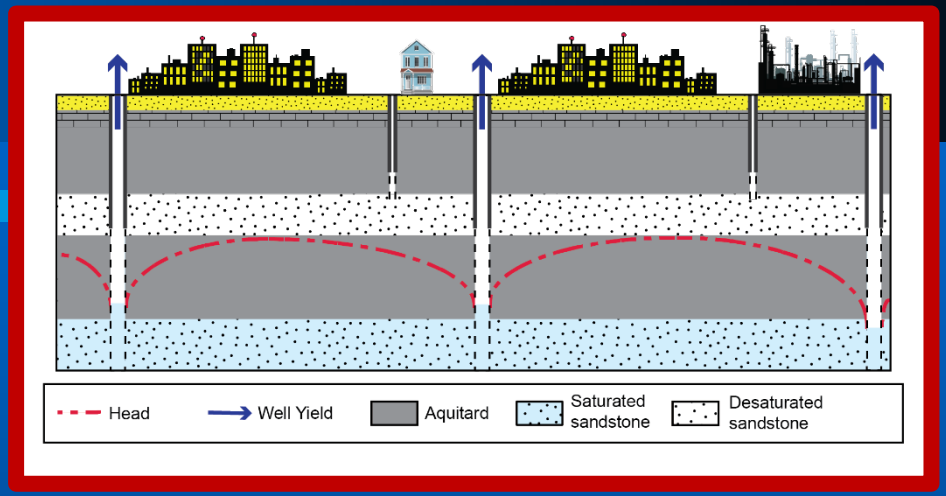
New analyses focus on the risk to the Ironton-Galesville

# Before 2050: Reaching the pumping limit



# Ironton-Galesville Risk Zones (New):

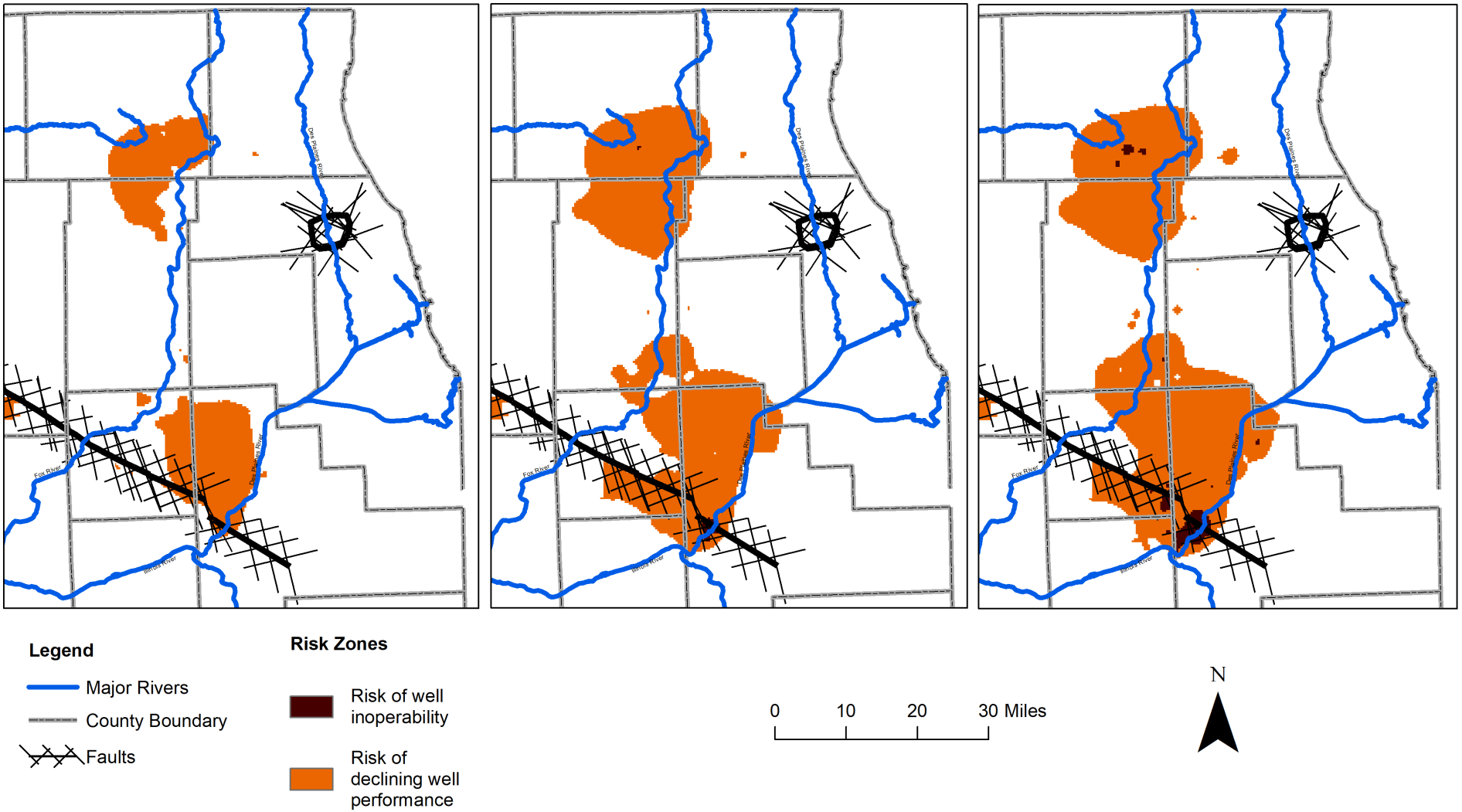


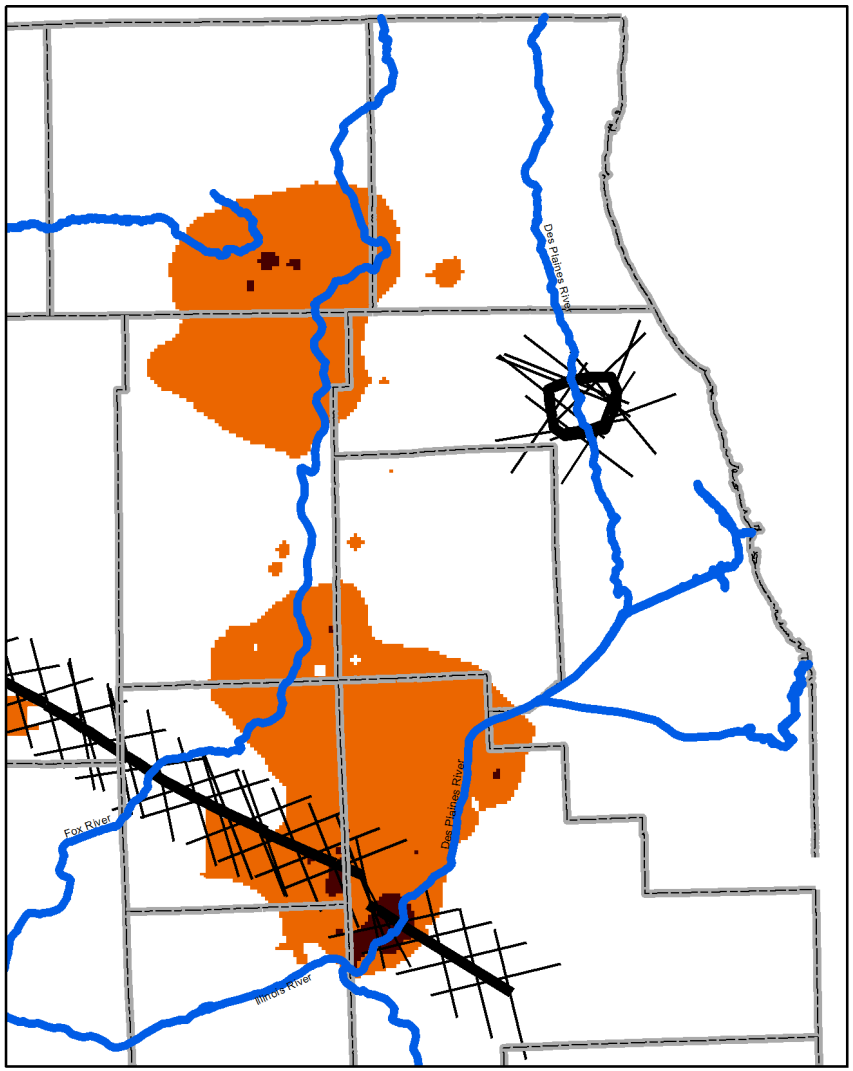

| Orange Risk Zone: Current Conditions |
|---|
| Risk of dry wells (domestic and industrial) |
| Lost well performance |
| Potential for pumping sand |
| Community well interference |
| Wells at-risk of large new water user |
| Increased well maintenance |
| Increased cost of lifting water |

| Red Risk Zone |
|---|
| All of the risks associated with the orange zone are magnified in the red zone, plus |
| Severe risk of well inoperability |
| Reaching a limit that a pump can be dropped |
| UNCHARTED TERRITORY and UNANTICIPATED COMPLICATIONS |

# Current Risk: Joliet leaving the aquifer in 2030



# What is going on in McHenry County?




- The same metric for Joliet is used for McHenry County
  - Risks are at severe risk when heads are within 400 ft of the top of the Ironton-Galesville due to severe drawdown in many wells
- Is this a fair assumption?

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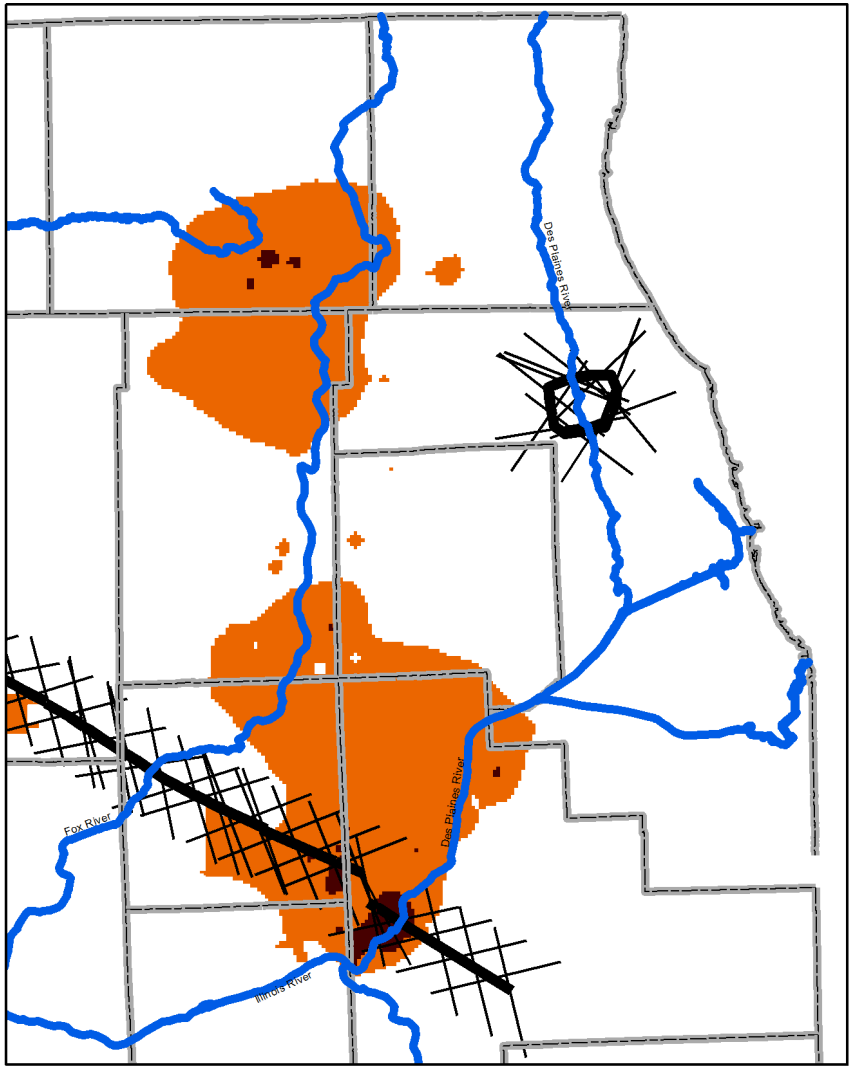


Depths to the IG are similar

- In Joliet, the Ironton-Galesville is ~1200 ft below land surface
- In Huntley, the Ironton-Galesville is ~1100 ft below land surface

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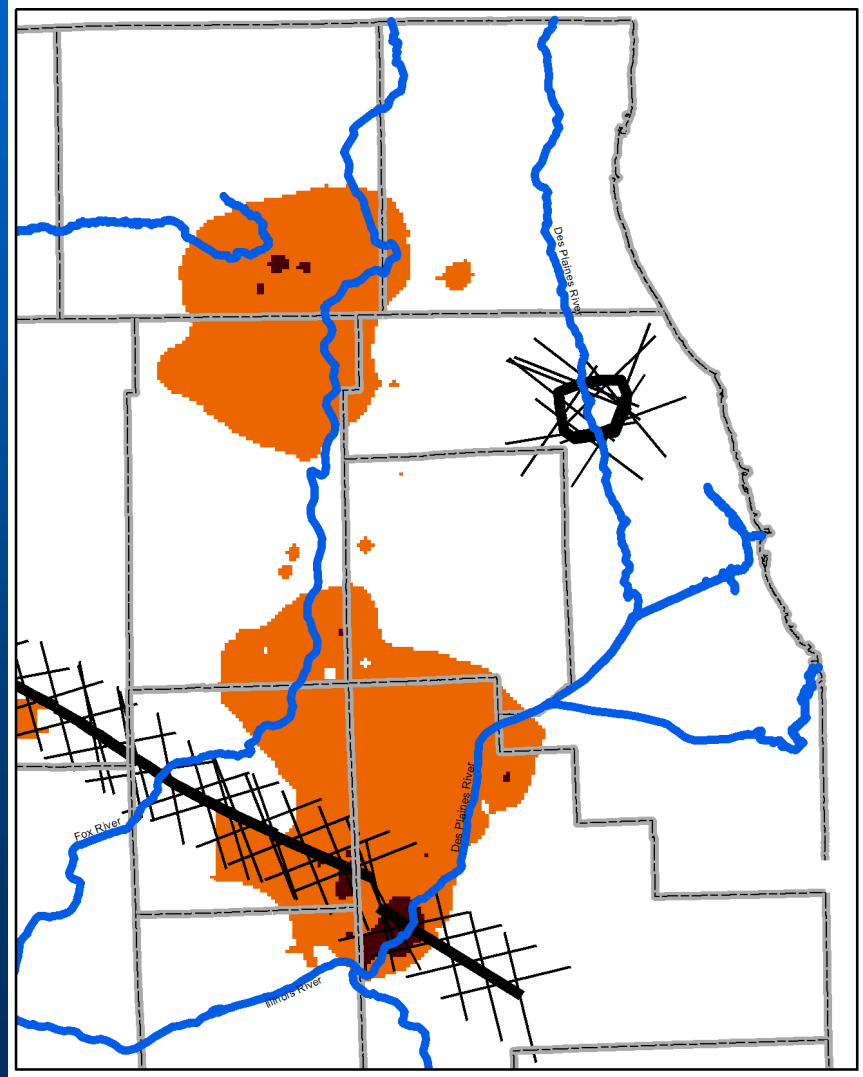
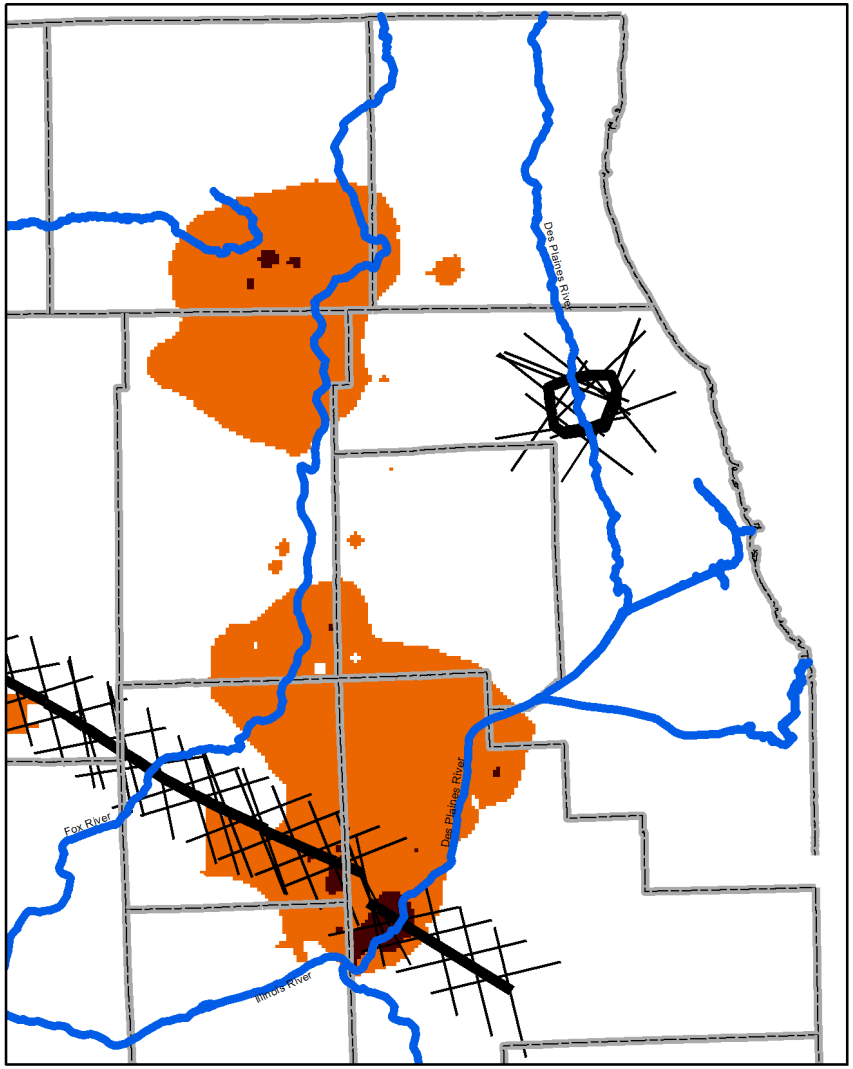



Casings are similar:

- The most at-risk areas are often in new development with wells only open to the Ironton-Galesville
- True in western Will County and in southeastern McHenry County

# What is going on in McHenry County?




- In Will County, most wells have 200-400 ft of drawdown, with specific capacities generally ranging from 1-5 gpm/ft
- There are some indications that specific capacity decreases through time, either due to well age, lost transmissivity, or well bore mineral accumulation

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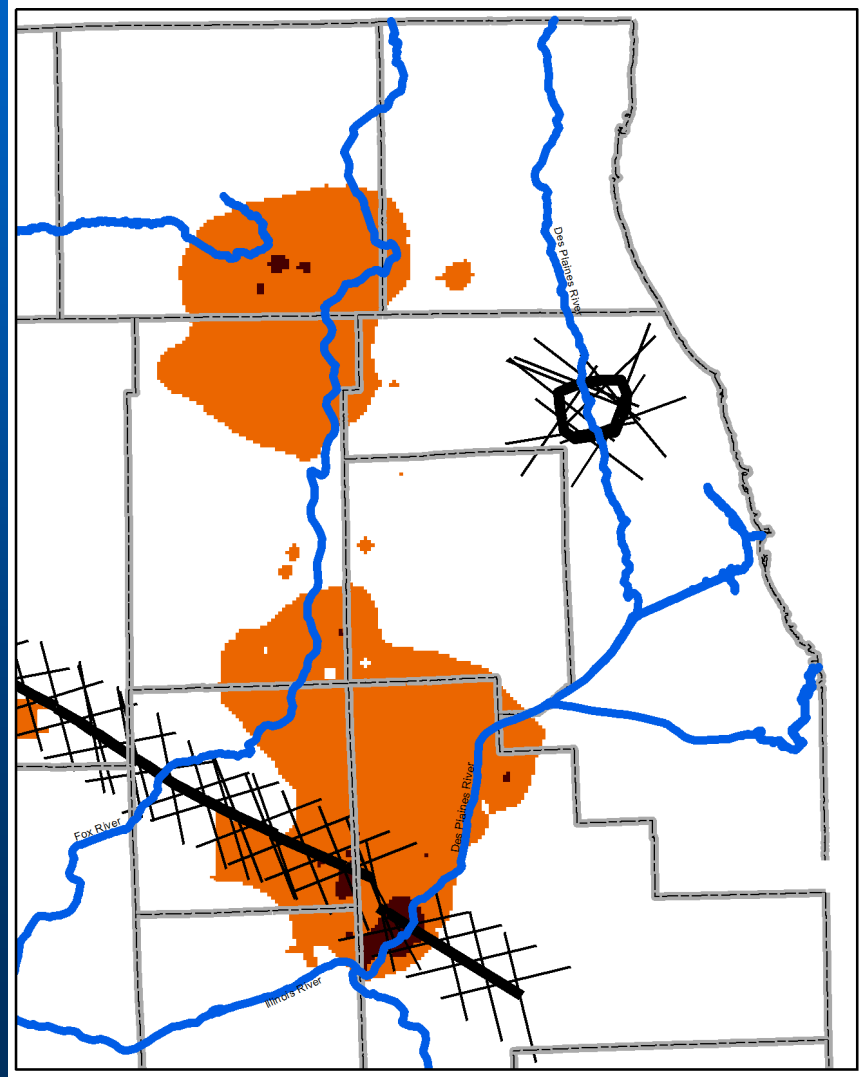
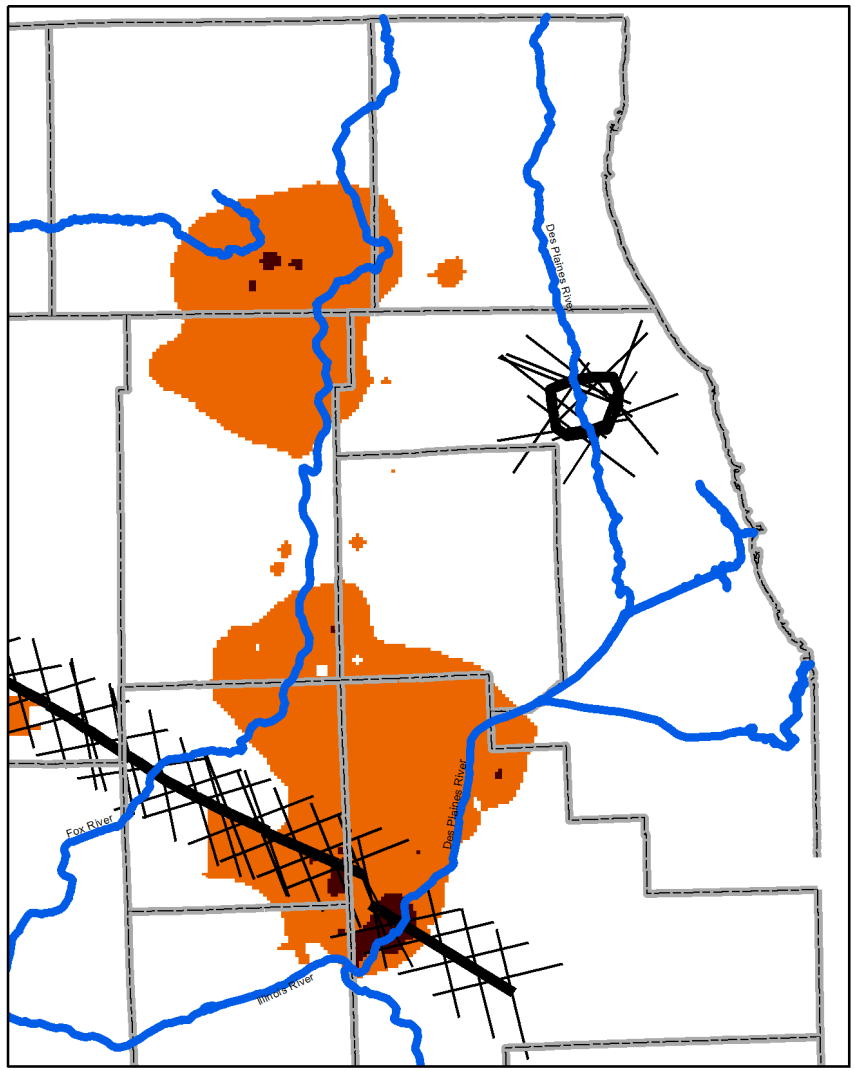



- In McHenry County, there are some similar observations. The following drawdown was observed in the ISGS database of newly drilled wells:
  - 359 ft
  - 285 ft (SC = 4.4)
  - 202 ft

# What has not happened: Local vetting of pumpage




- Future pumping is currently a combination of CMAP's regional demands and locally defined demands
- Local vetting can uncover additional considerations:
  - Planned industrial growth (unsimulated)
  - Water conservation efforts
  - **Plans to shift sources from shallow to deep aquifers**

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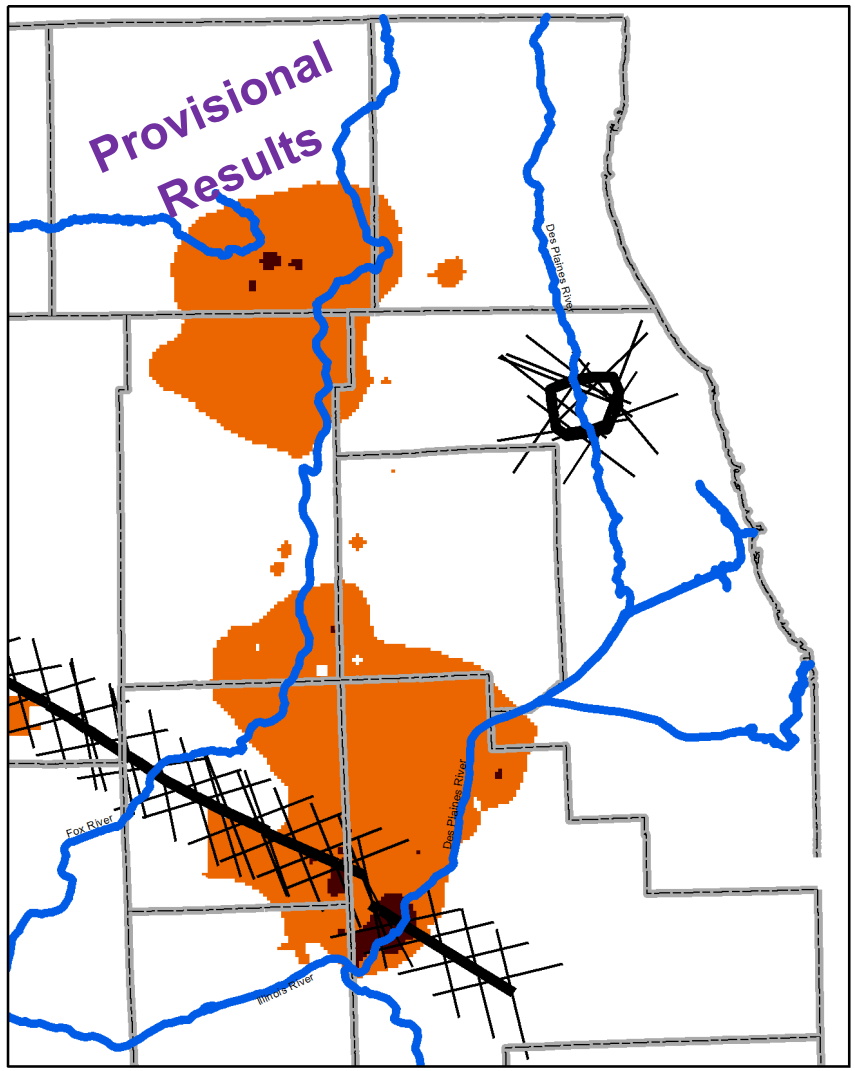


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  - Planned industrial growth (unsimulated)
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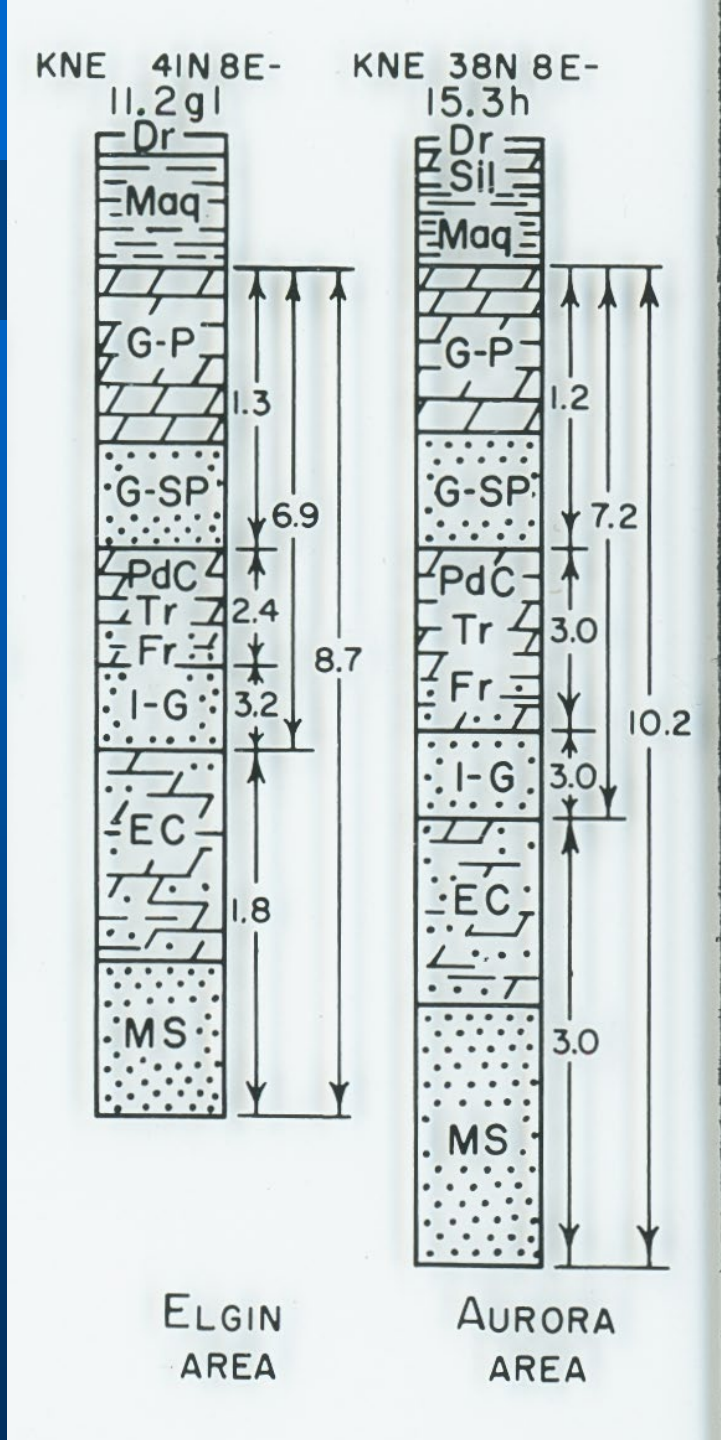
# Take Home

- We have learned a lot from the Will County project, and some of the metrics that are used to assign risk have changed
- It is not yet clear that the same metrics are appropriate in the NWPA region
- As part of our ongoing discussion on calculating sandstone supply, the calculation of risk needs to remain an important component

# Specific Capacity

- Recent findings in Will County indicate that overlying units may be important sources of water
- Older studies indicate that the overlying units could even be as important as the sandstone
- This is potentially problematic because the point at which drawdown in the aquifer removes water may not be as deep as we assume with current risk maps



# Supply and Demand – TX model

https://2017.texasstatewaterplan.org/region/G 90%

Please visit the 2017 State Water Plan homepage to view the published plan at: http://www.twdb.texas.gov/waterplanning/swp/2017/index.asp.

2017 **Texas State Water Plan** *by the* Texas Water Development Board

ABOUT

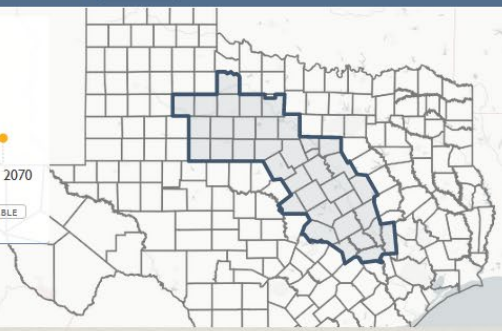
View data for Planning Region | Select Region | GO

## Planning Region G

*Regional Water Planning Area in Texas*

Population


SHOW DATA TABLE



The Brazos G Regional Water Planning Area includes all or parts of 37 counties. Over 90 percent of the region lies within the Brazos River Basin, with the Brazos River being the region's primary source of water. The largest economic sectors in the region are service, manufacturing, and retail trade. Major cities in the region include Abilene, Bryan, College Station, Killeen, Round Rock, Temple, and Waco. The full 2016 Brazos (G) Regional Water Plan can be found on the TWDB Web site at http://www.twdb.texas.gov/waterplanning/rwp/plans/2016/#region-g. A summary of the 2016 [Brazos G] Regional Water Plan can be found at http://www.twdb.texas.gov/waterplanning/swp/2017/doc/2016_RegionalSummary_G.pdf.

PLANNING REGION G

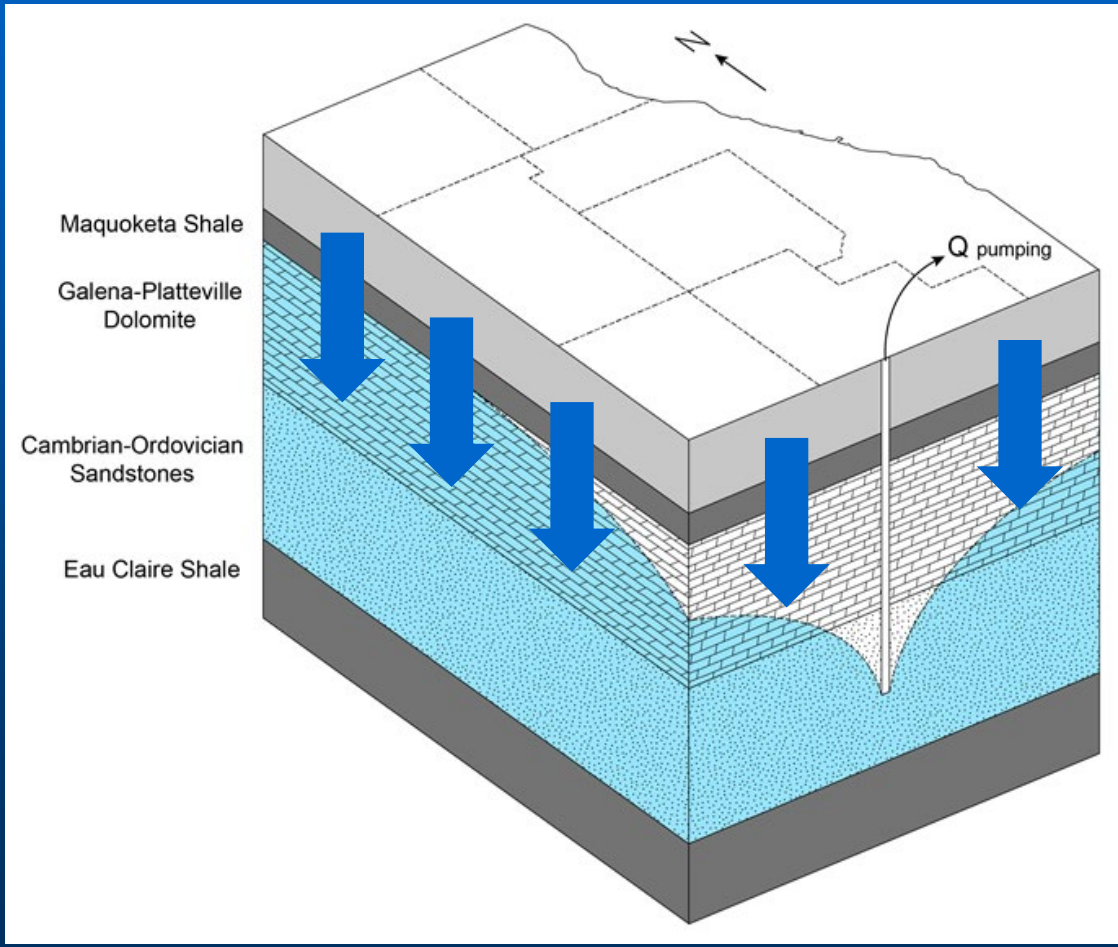
**Totals by Decade** (acre-feet/year)

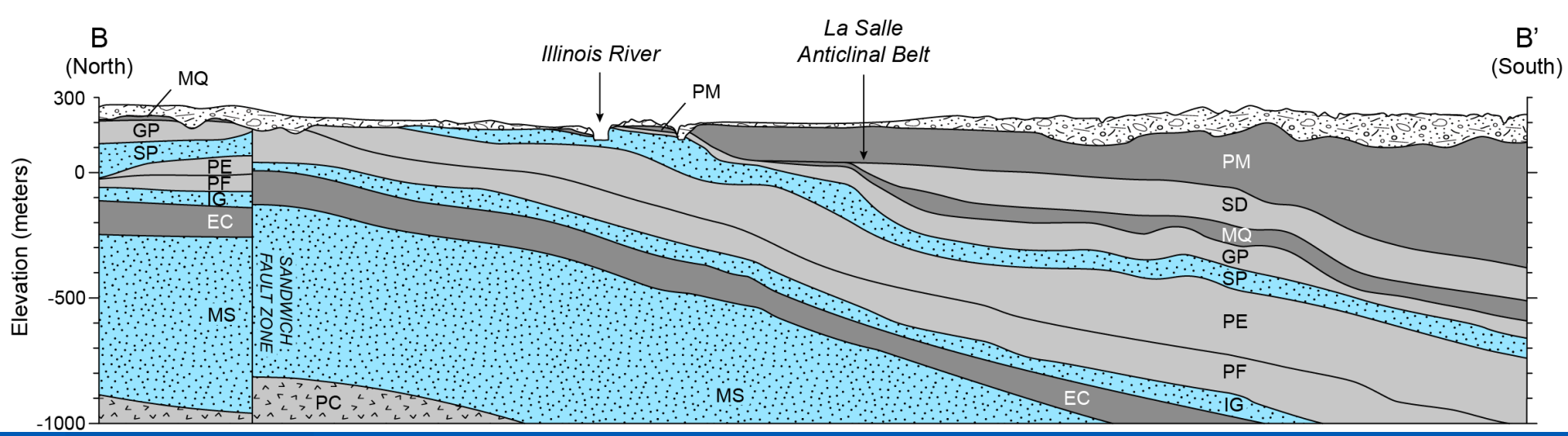

| | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 |
|---|---|---|---|---|---|---|
| Demands | 1,067,568 | 1,152,415 | 1,214,621 | 1,303,205 | 1,387,178 | 1,478,295 |
| Existing Supplies | 1,107,143 | 1,102,353 | 1,092,801 | 1,086,807 | 1,087,674 | 1,081,797 |
| Needs (Potential Shortages) | 235,276 | 290,688 | 344,001 | 419,231 | 485,803 | 565,566 |
| Strategy Supplies | 384,109 | 435,763 | 479,530 | 542,144 | 588,998 | 648,399 |

# DEEP SANDSTONE AQUIFER SUPPLY

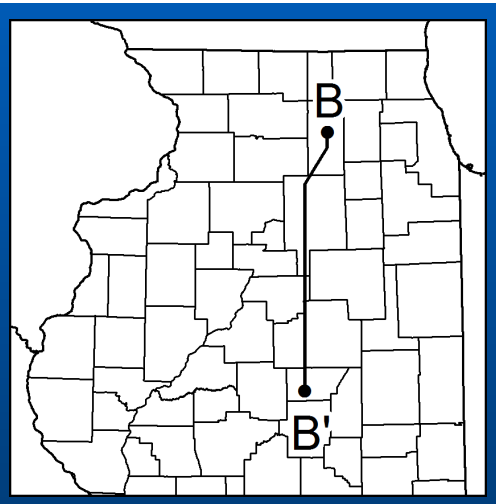
# Sandstone Supply Values

- Available sandstone aquifer supply estimated by artificially lowering water levels in the model to lowest safe level
- Simulates increased demands
- With lower water levels, deep aquifer recharge only limited by leakage across overlying layers, representing the available supply
- Like shallow aquifers, this value is capped at 10% of groundwater discharge to streams and rivers to limit impacts






# Cross-sectional view



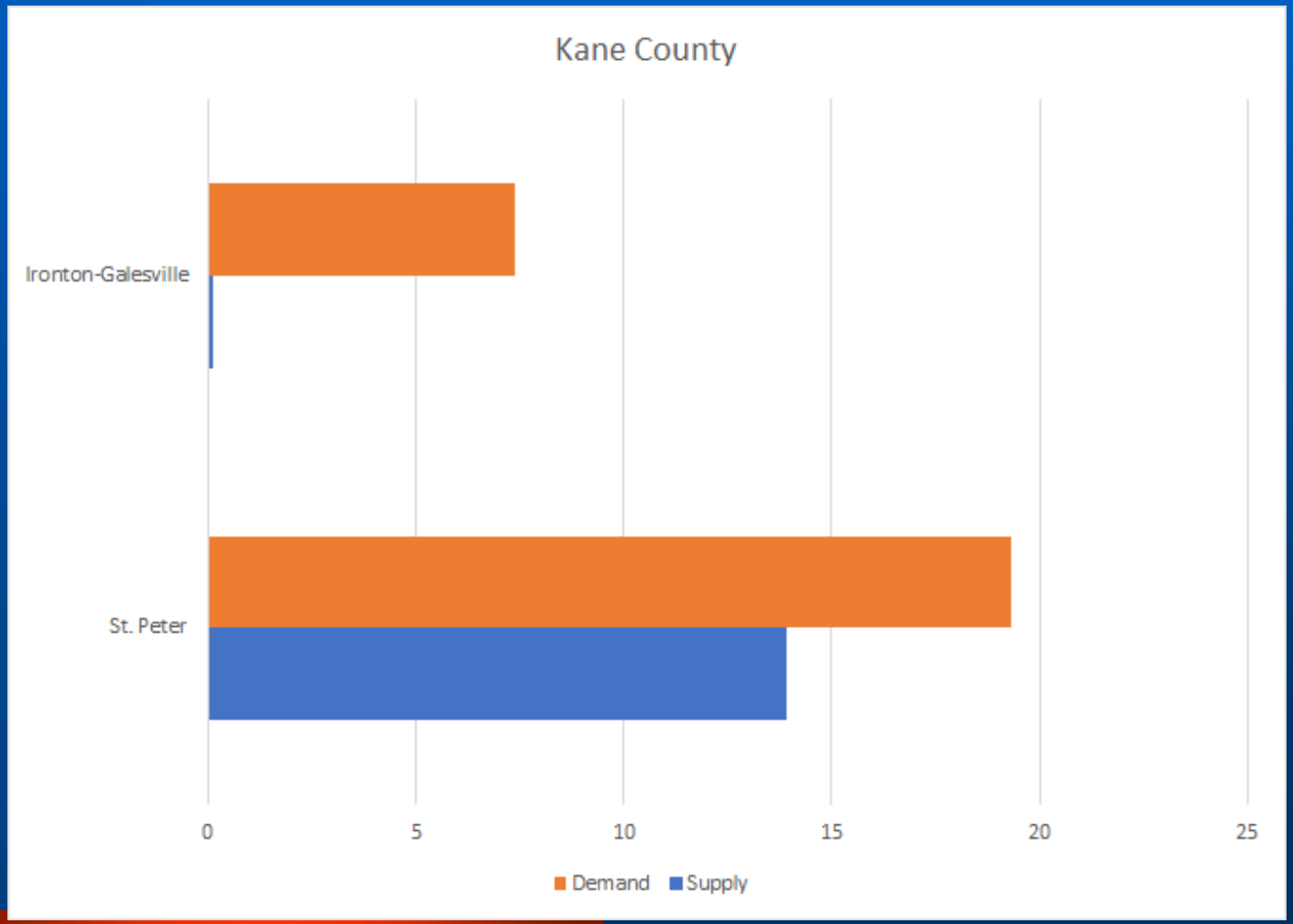

**Hydrostratigraphic Bedrock Units**

| | | |
|---|---|---|
| PM | Pennsylvanian-Mississippian | |
| SD | Silurian-Devonian | |
| MQ | Maquoketa | Ordovician |
| GP | Galena-Platteville | Ordovician |
| SP | St. Peter | Ordovician |
| PE | Prairie du Chien-Eminence | Ordovician |
| PF | Potosi-Franconia | Cambrian |
| IG | Ironton-Galesville | Cambrian |
| EC | Eau Claire | Cambrian |
| MS | Mt. Simon | Cambrian |
| PC | Precambrian | |

**Geologic Material**

- Glacial Deposits
- Shale
- Carbonate
- Sandstone
- Crystalline Bedrock

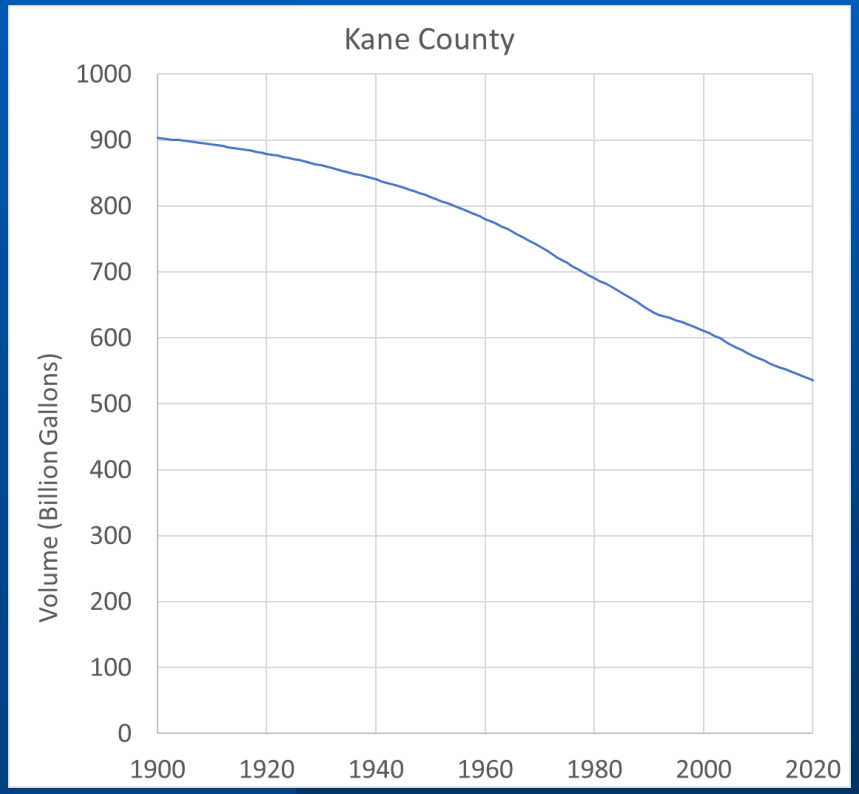
# St. Peter Supply and Demand

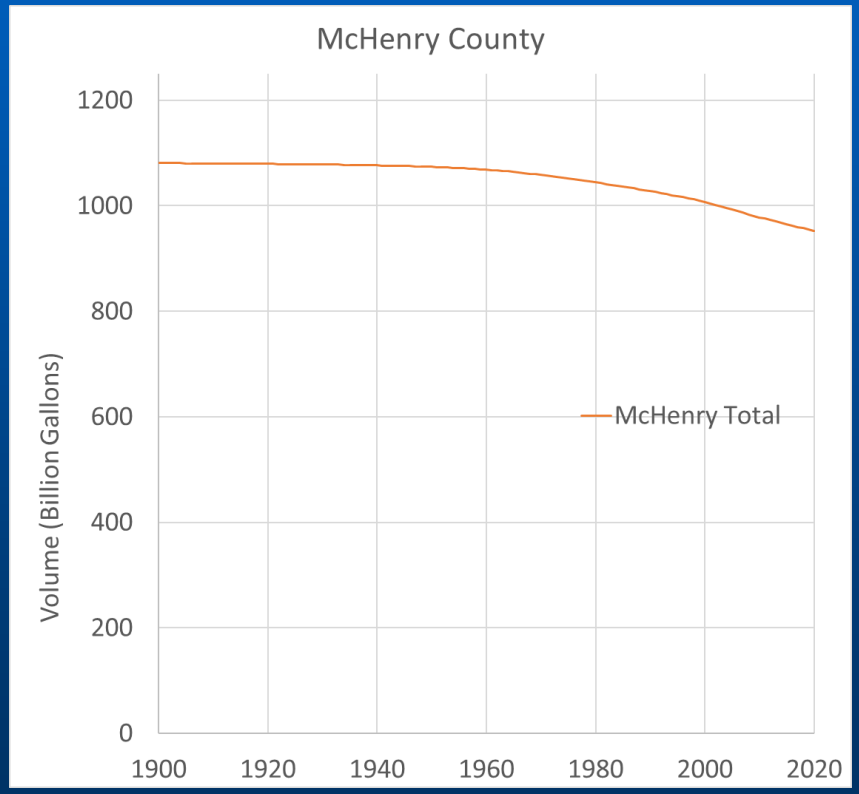


# Alternative Method

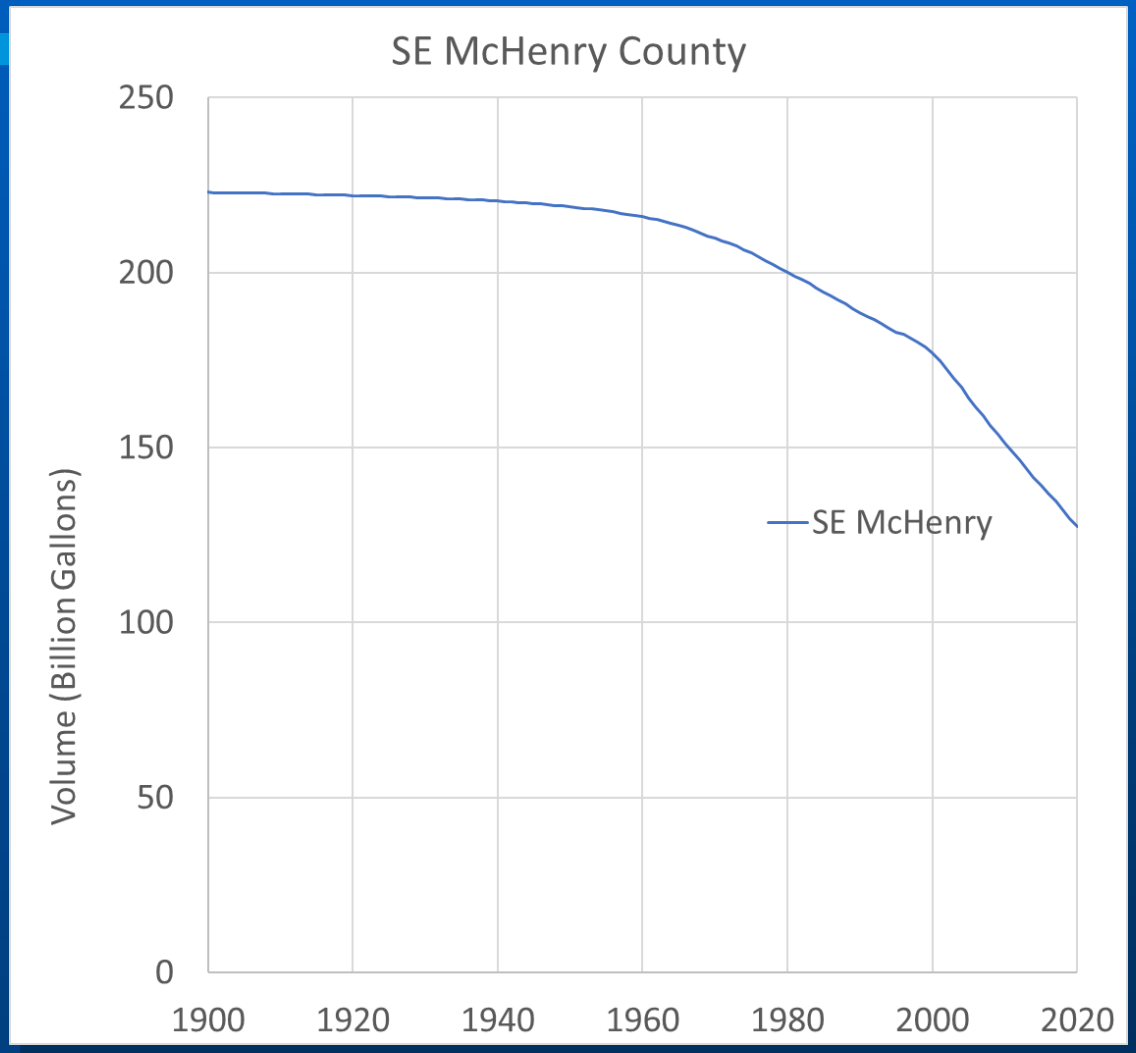
- Calculate the volume in the aquifer during predevelopment and removal of water from storage
- Multiple methods still being experimented with, but the next slides show the basic idea with some (very provisional) results

# Kane and McHenry Counties



# Local areas can be different

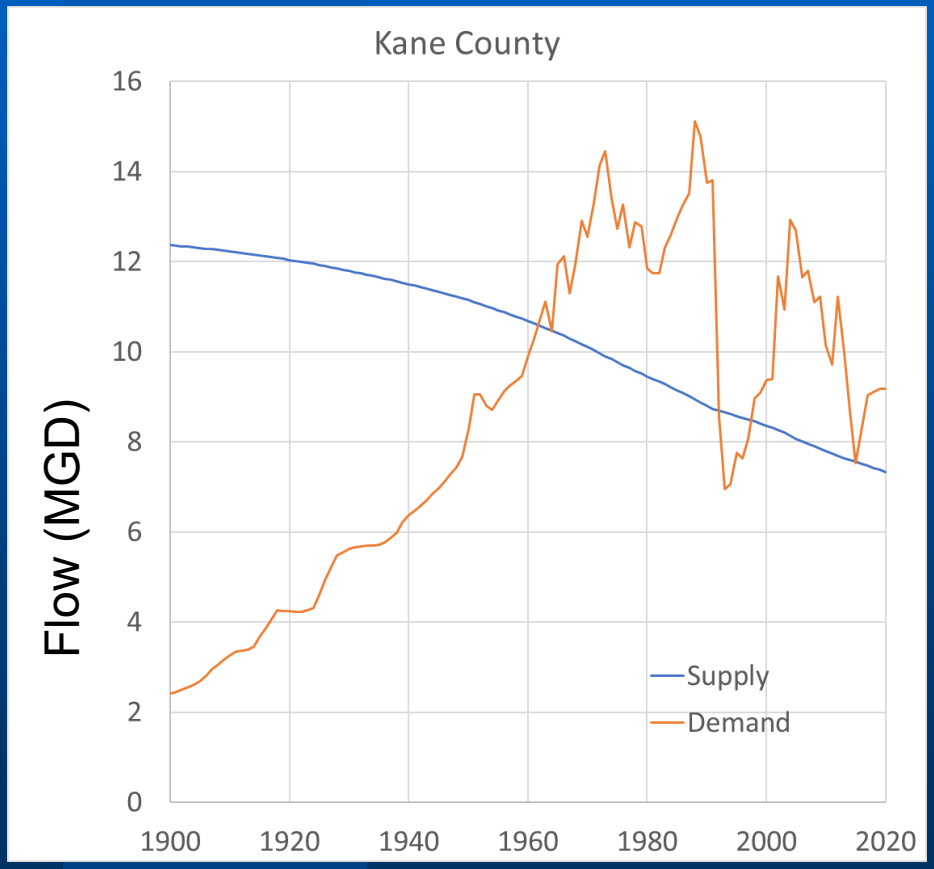


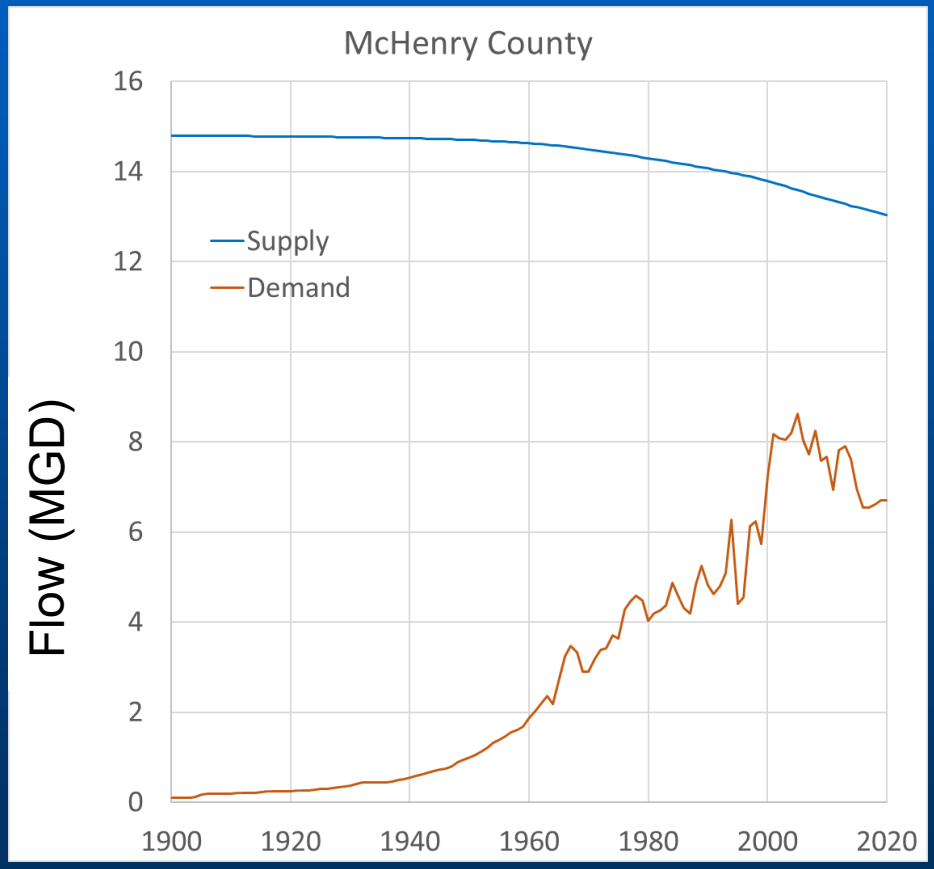
# Convert volume to rate

- Not sure how to do this
- Arbitrarily, I will assume that the water supply from storage should last 200 years into the future

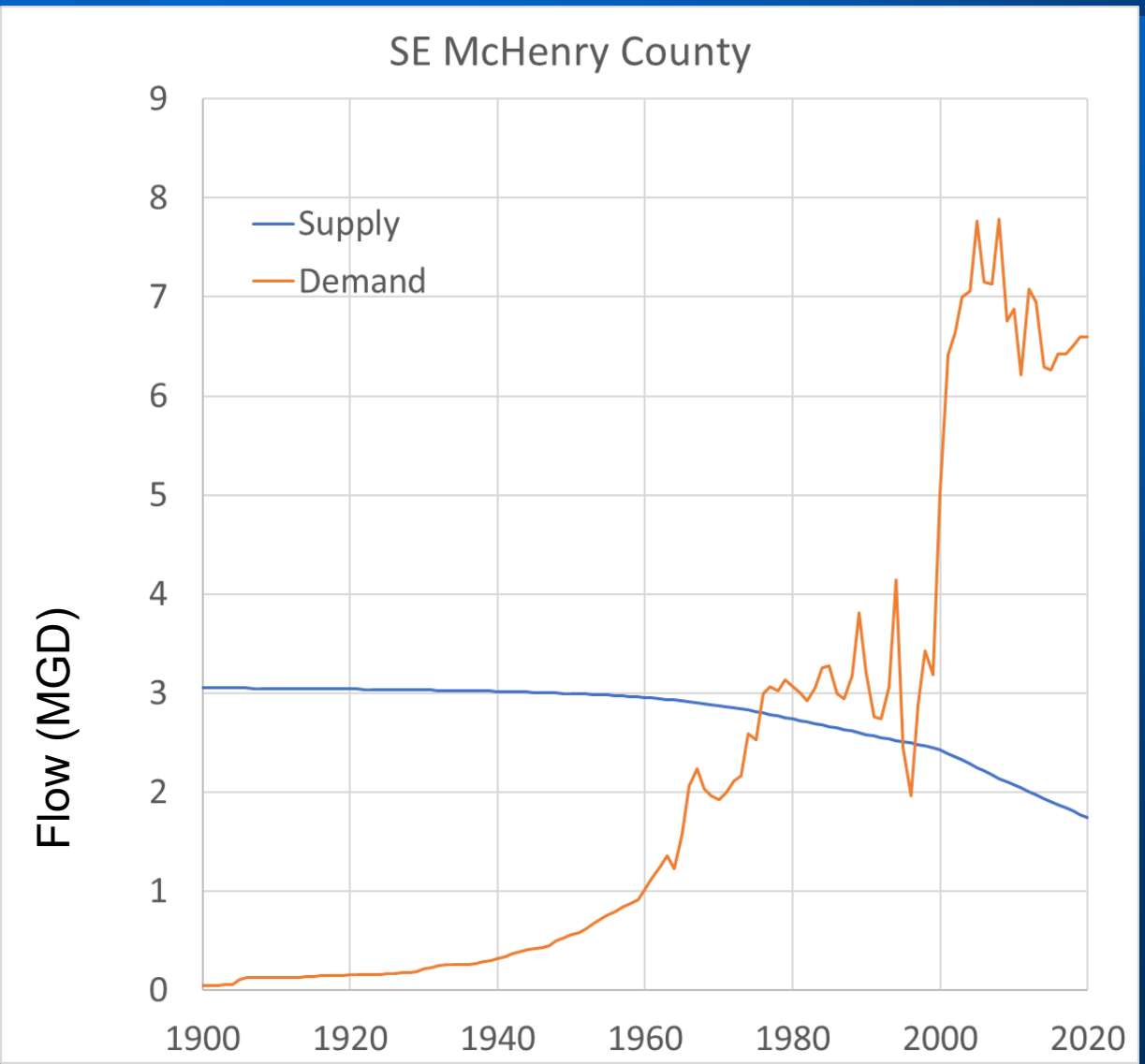
- I need regional stakeholder feedback on this one!

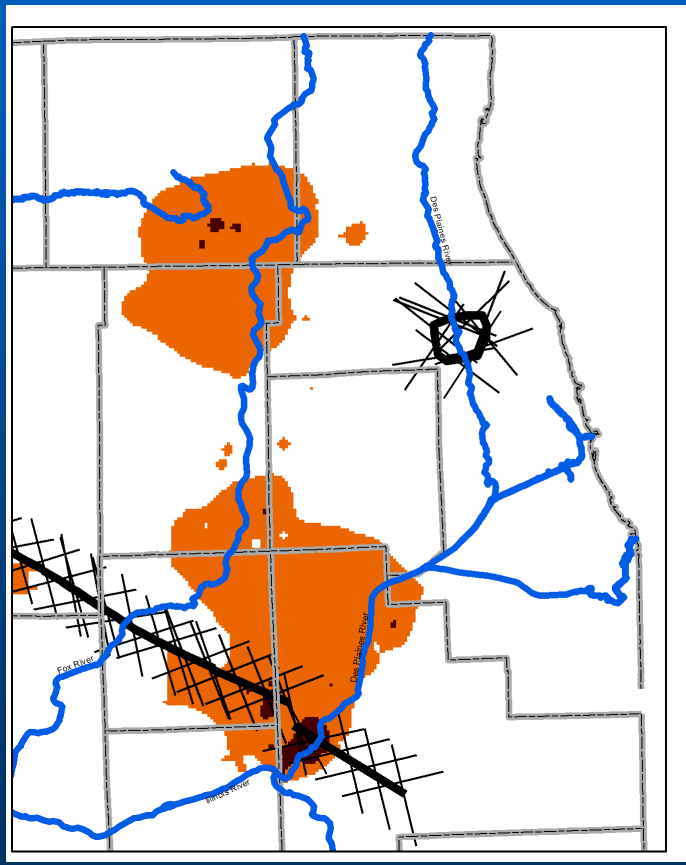
# County Scale Analyses: PROVISIONAL



# Local Scale Analyses: PROVISIONAL



# Specific question for the group

- How to convert volume to supply rate
  - This boils down to how long into the future planning for aquifer sustainability should take place. In my example, I selected 200 years

# Future work

- Explore storage estimates from predevelopment conditions
- Assess vertical leakage impacts
- Correlate to observed head declines
- Improve local estimates to complement county totals

# Future work

- Apply the same methodology to the shallow aquifers of the region (no examples today)
- In my next update, I will focus on the shallow aquifer examples for Kane, McHenry, and DeKalb Counties

# Thank you! Questions?

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