# Sustainable Supply and Demand Discussion

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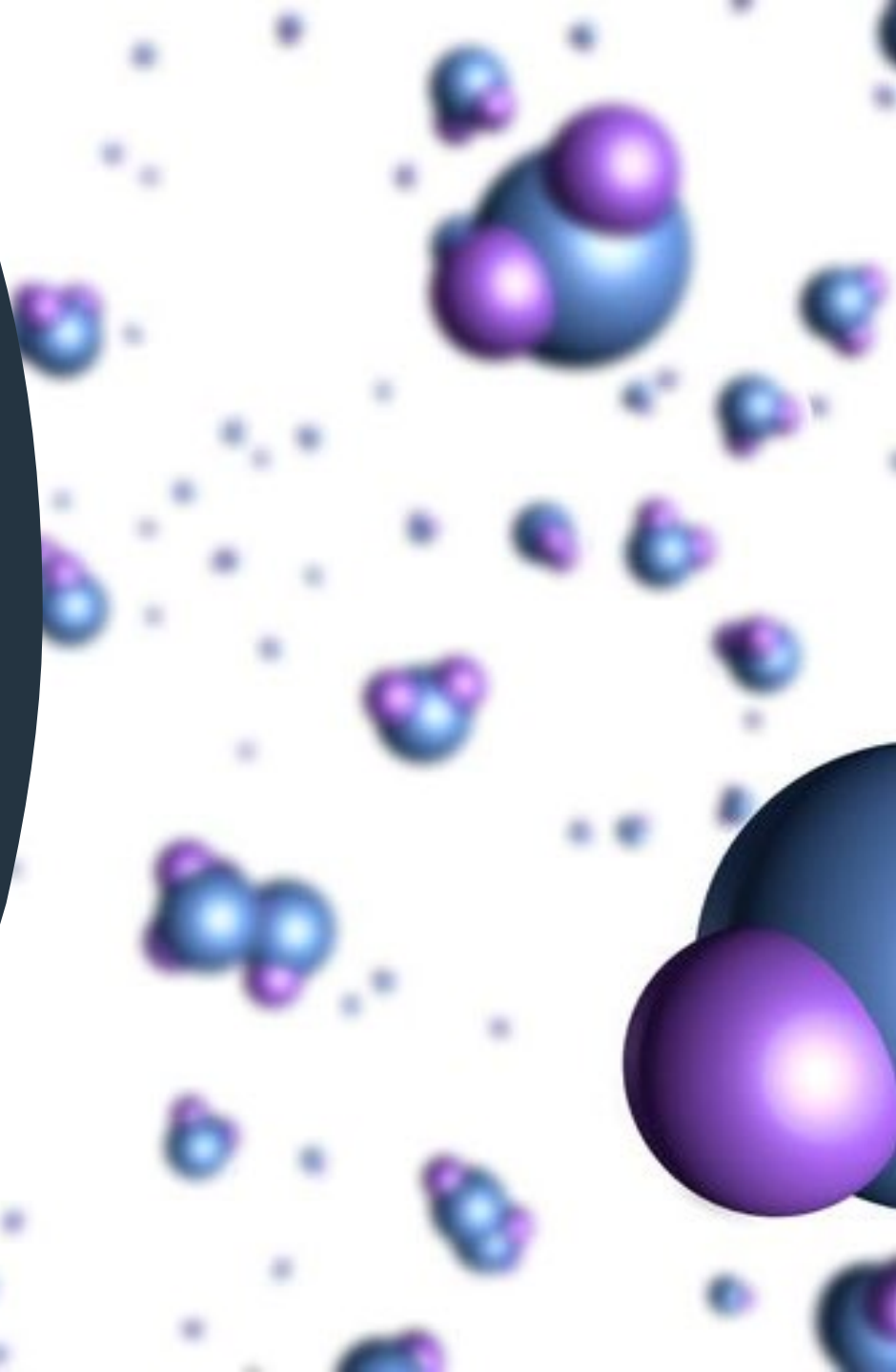
4/27/2021



# Goal of Today

1. Provide an overview of methods to determine demand
2. Provide an overview of methods to determine supply for shallow aquifers, sandstone aquifers, and rivers
3. Solicit feedback on approaches and needed improvements

**Today's focus is demands and the shallow aquifer**

**We can discuss sandstone demands and river demands in a future meeting.**

# Three links (public access will be deactivated after the meeting)

1. Supply/Demand by Sector
    A. https://prairie-research.maps.arcgis.com/apps/dashboards/ba5c68d378bd4df2912f5f3edd432498
2. Supply/Demand by Use
    A. https://prairie-research.maps.arcgis.com/apps/dashboards/ca5c04b13ef444e99d4cc6854dc21bee
3. Sandstone Supply/Demand
    A. https://storymaps.arcgis.com/stories/5975fc471be742b39ab7413939b69c24

# A Note on Tiers

**Tier 1 Demand Scenario**

Assumes current water use (gallons per capita per day) is applied to projected population

**Tier 1 Supply Analyses**

Values obtained from the statewide groundwater flow model

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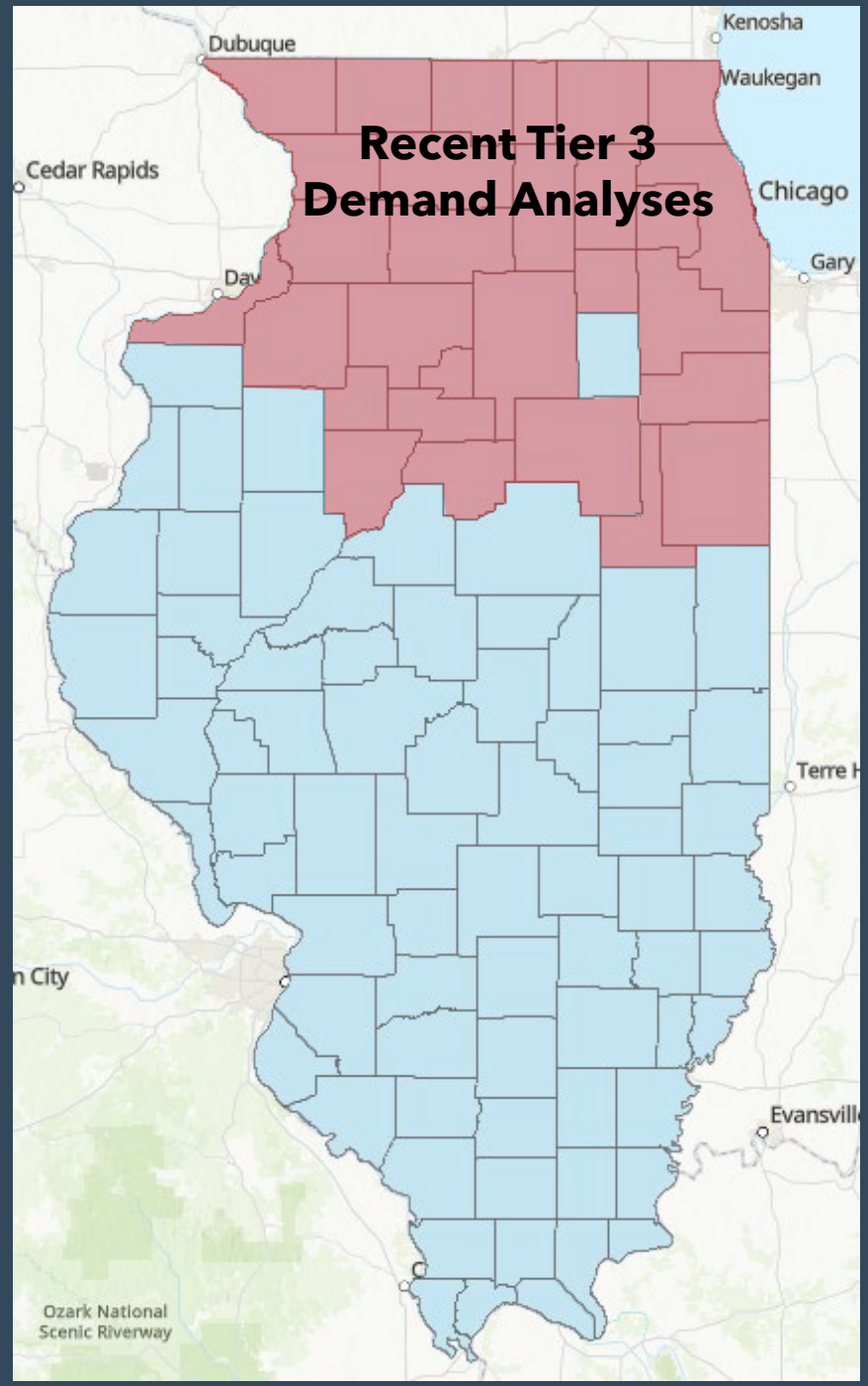
All analyses shown today are Tier 1, except for sandstone which has been investigated in detail. This means that analyses use the same simple algorithms applied throughout the state.

# Higher Tier Analyses

Where applicable, higher tier analyses will be utilized in the public facing form of this document.

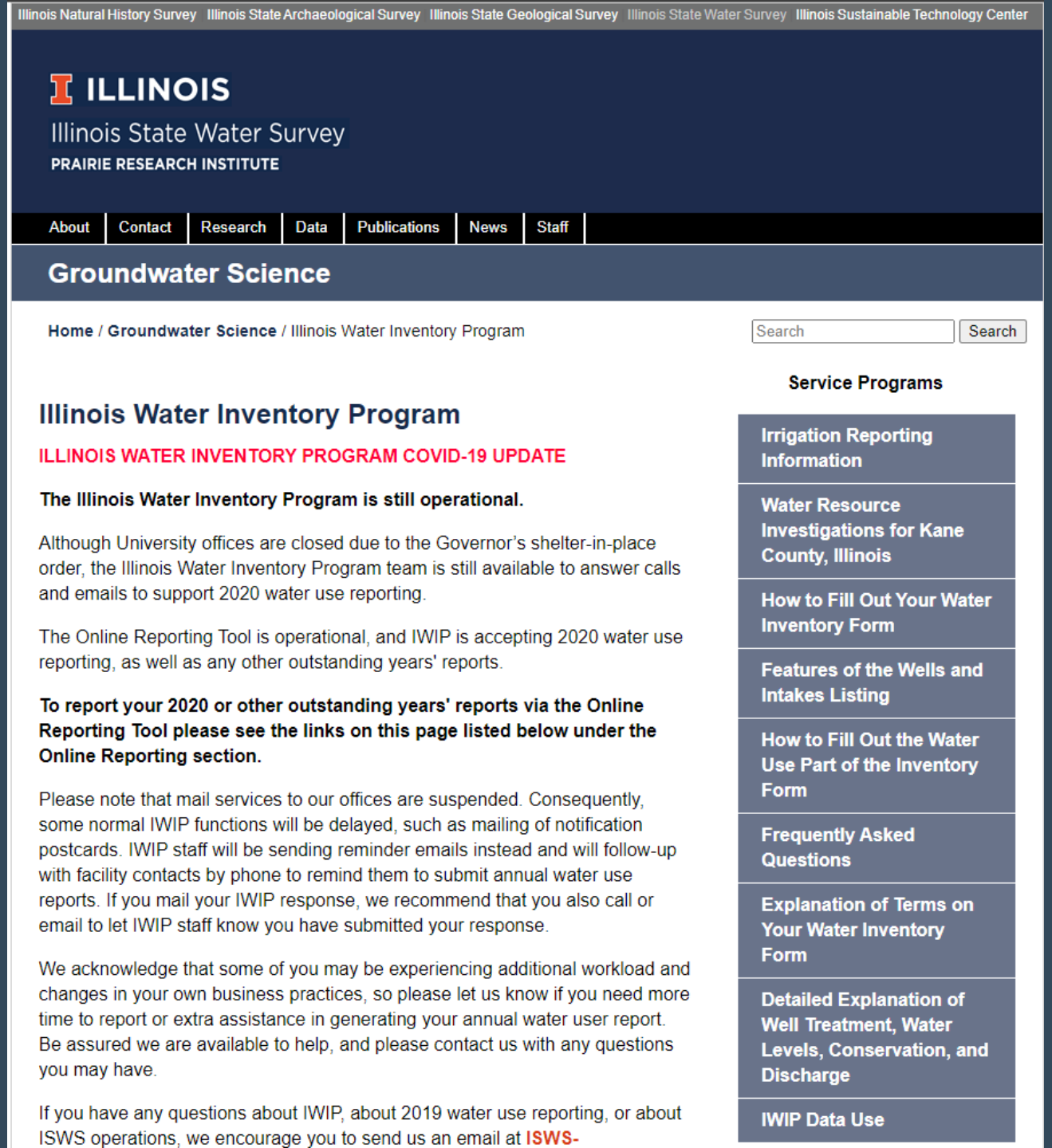
- For demands, this includes CMAP's regional demand forecasts and local information received by communities.
- For supply, this includes local modeling, such as the Kane and McHenry County models.

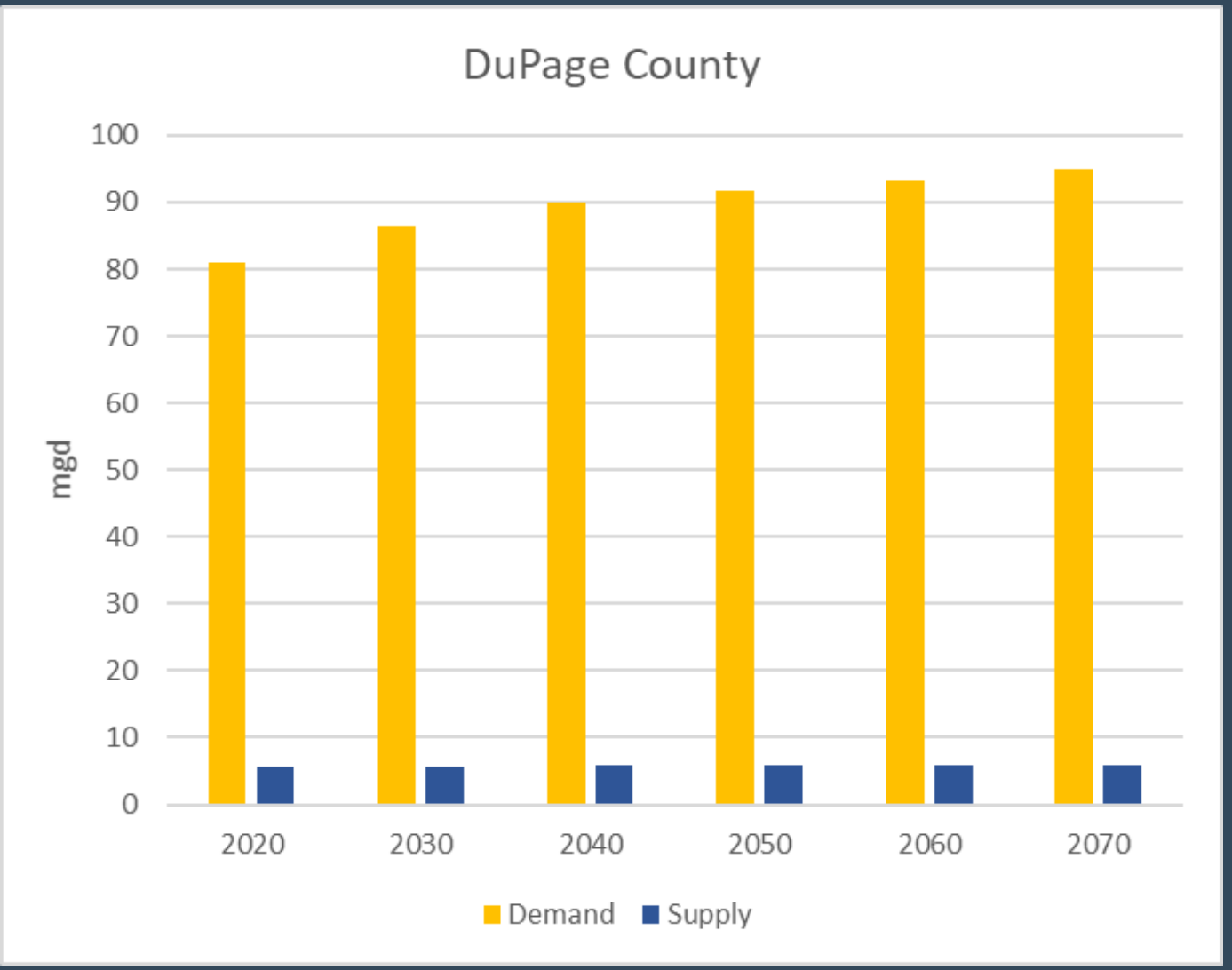


# Demand - IWIP

1. IWIP is used to determine demands at a “facility” level and then summed to county totals

2. Question: *What is the demand that we should consider within a county to compare with sustainable supply?*



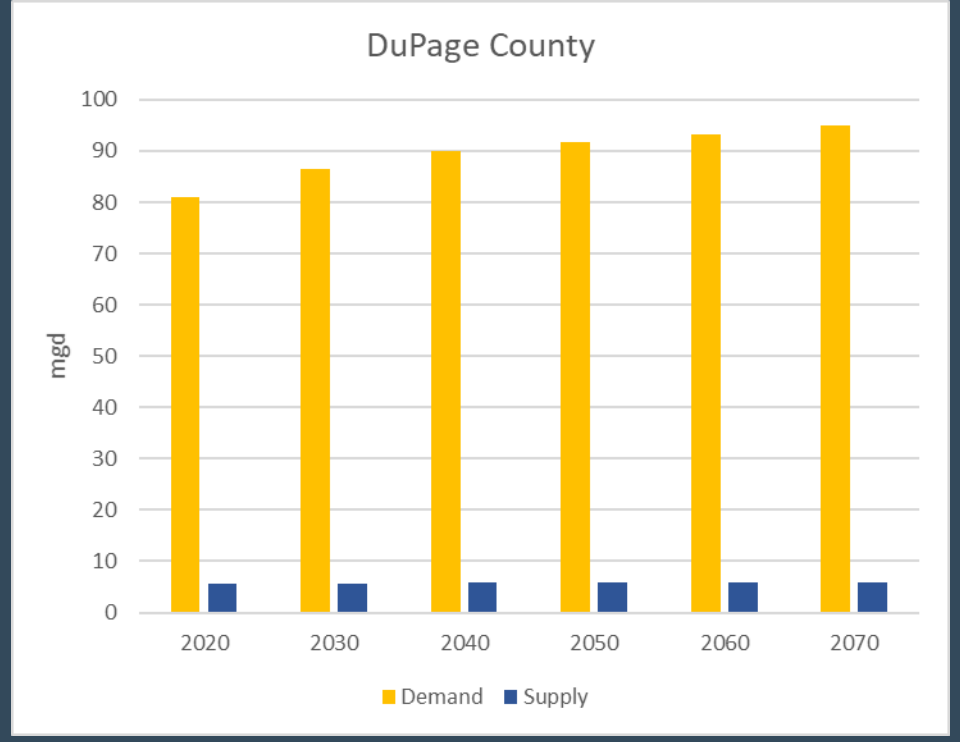


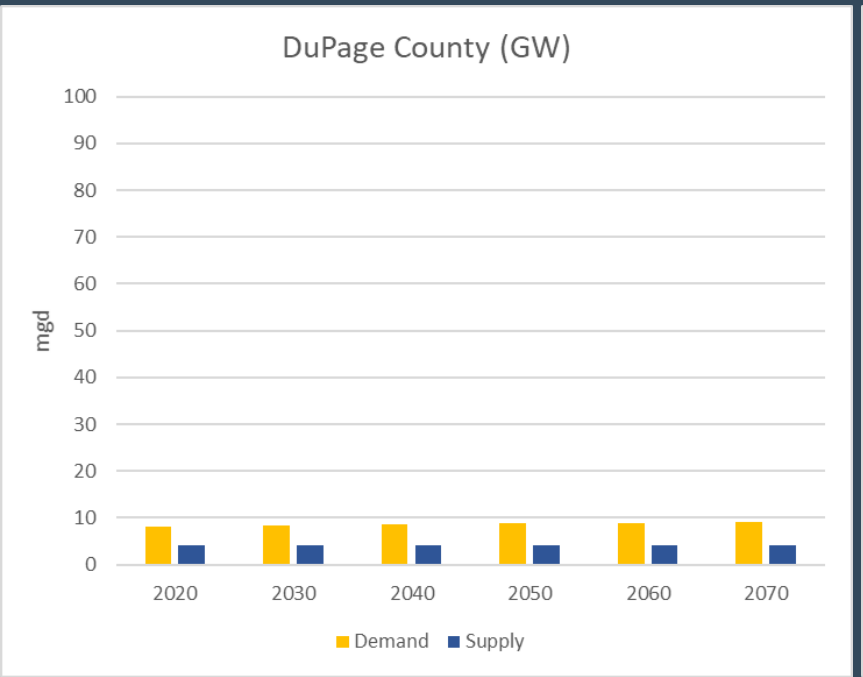

# DuPage County

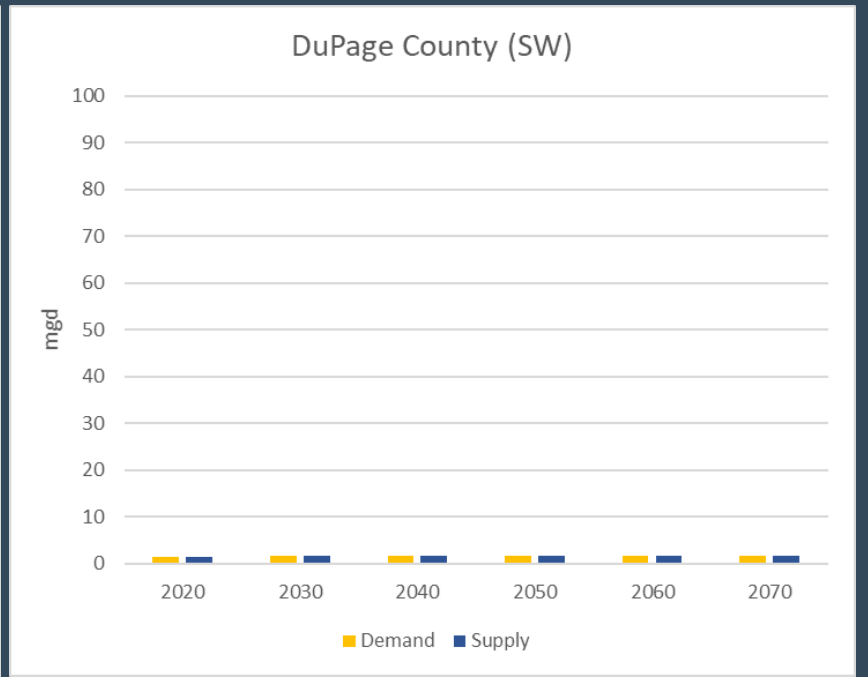
DuPage County does not have a sustainable supply from groundwater or surface water within the county boundary

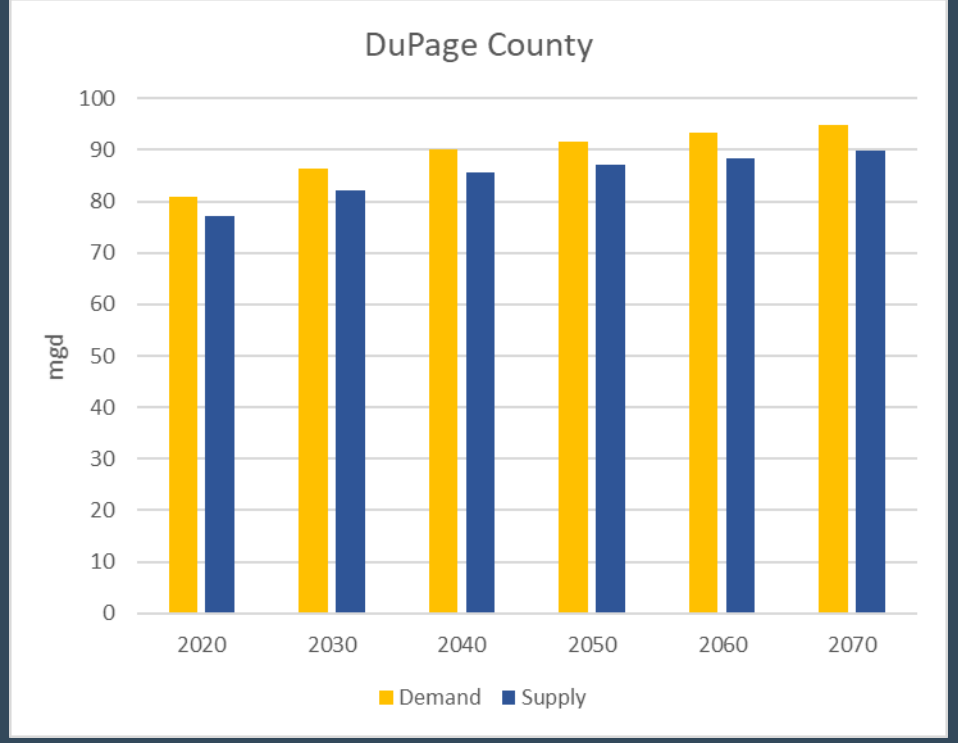
# Example 1

Only sources within the county are considered for the sustainable supply



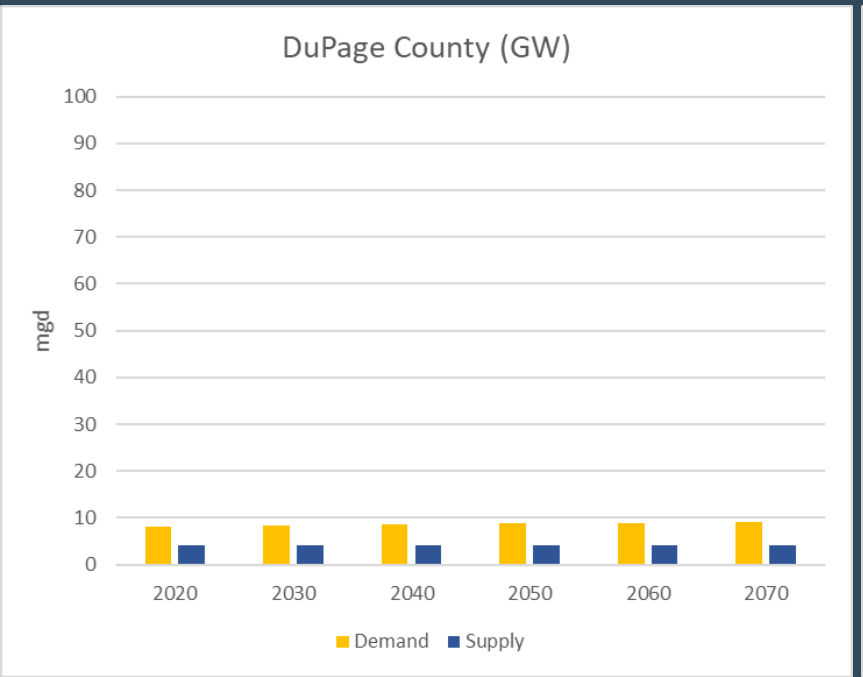



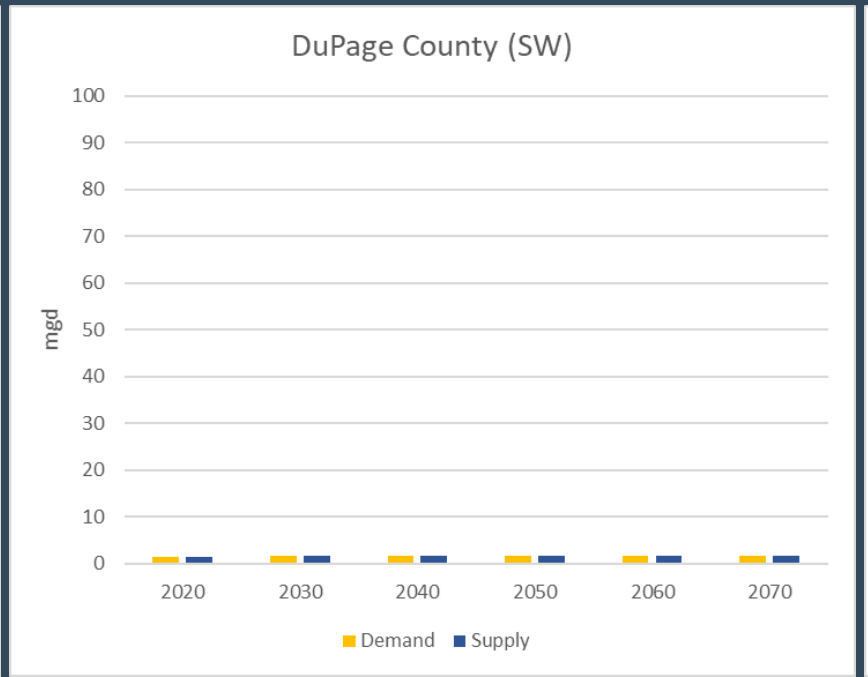



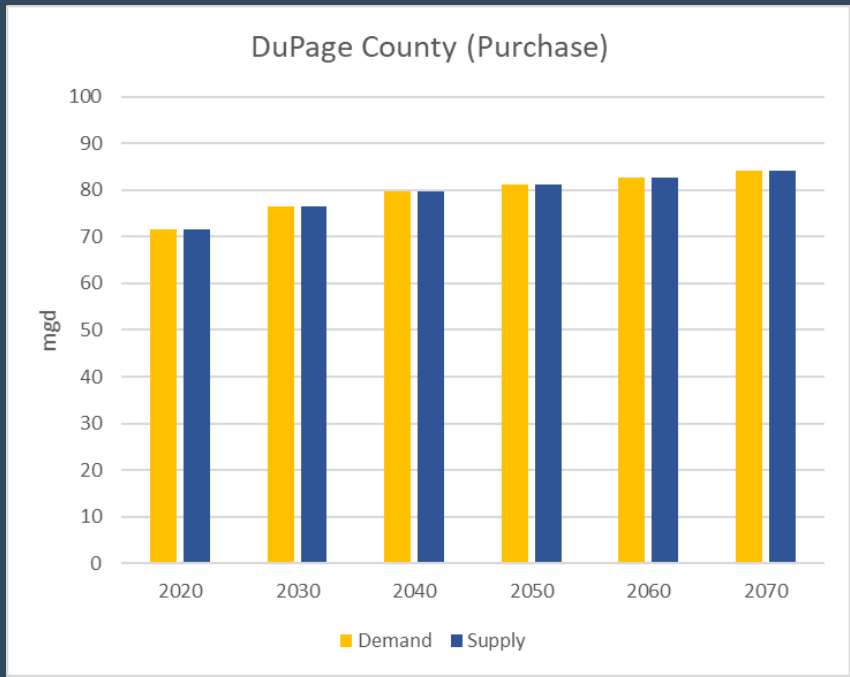



# Example 2

DuPage County does not have a sustainable supply from groundwater or surface water within the county boundary

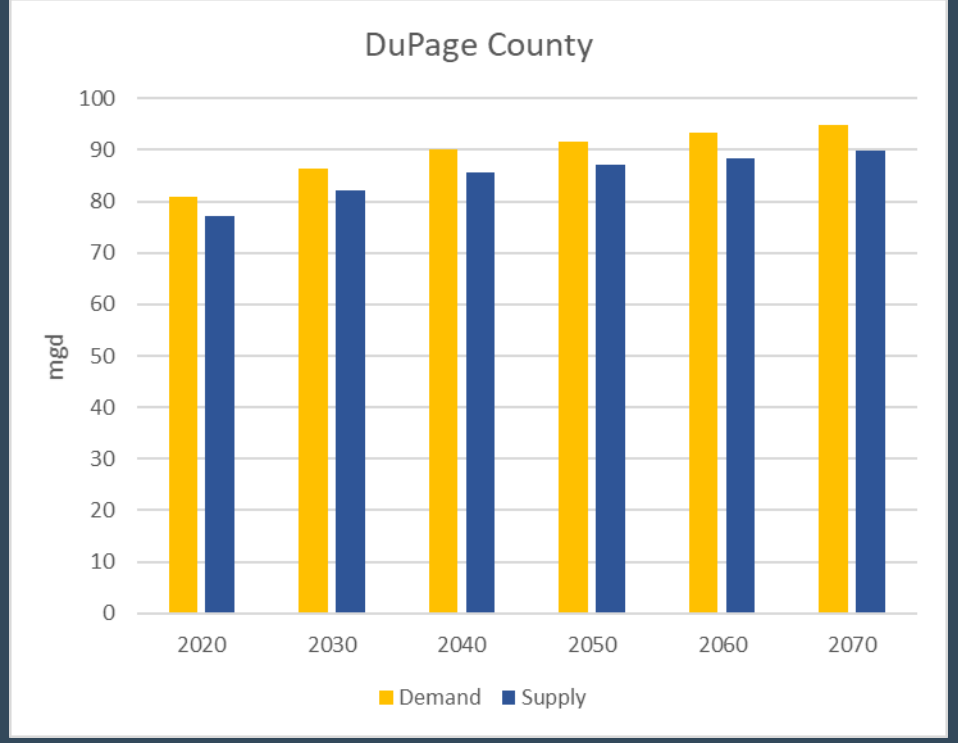


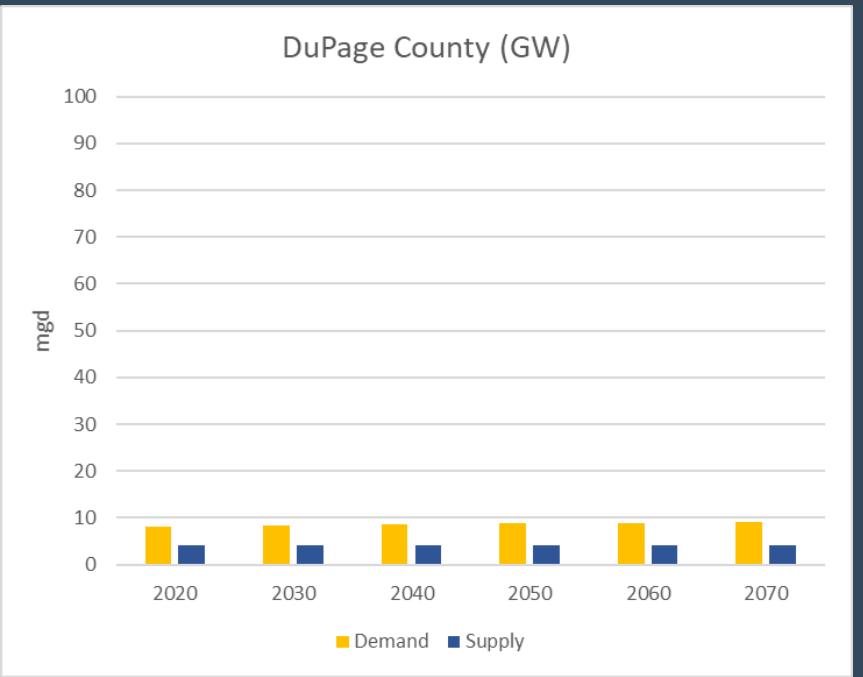



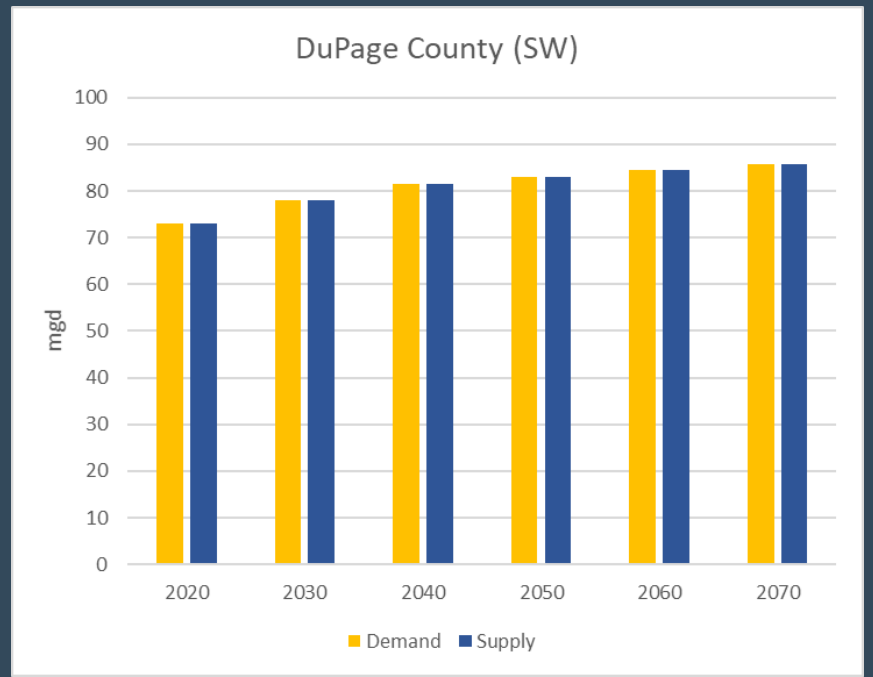



# Example 3

Purchases are not shown, only GW and SW regardless of the county of origin



# Question 1

Let’s jump to a poll question 1:

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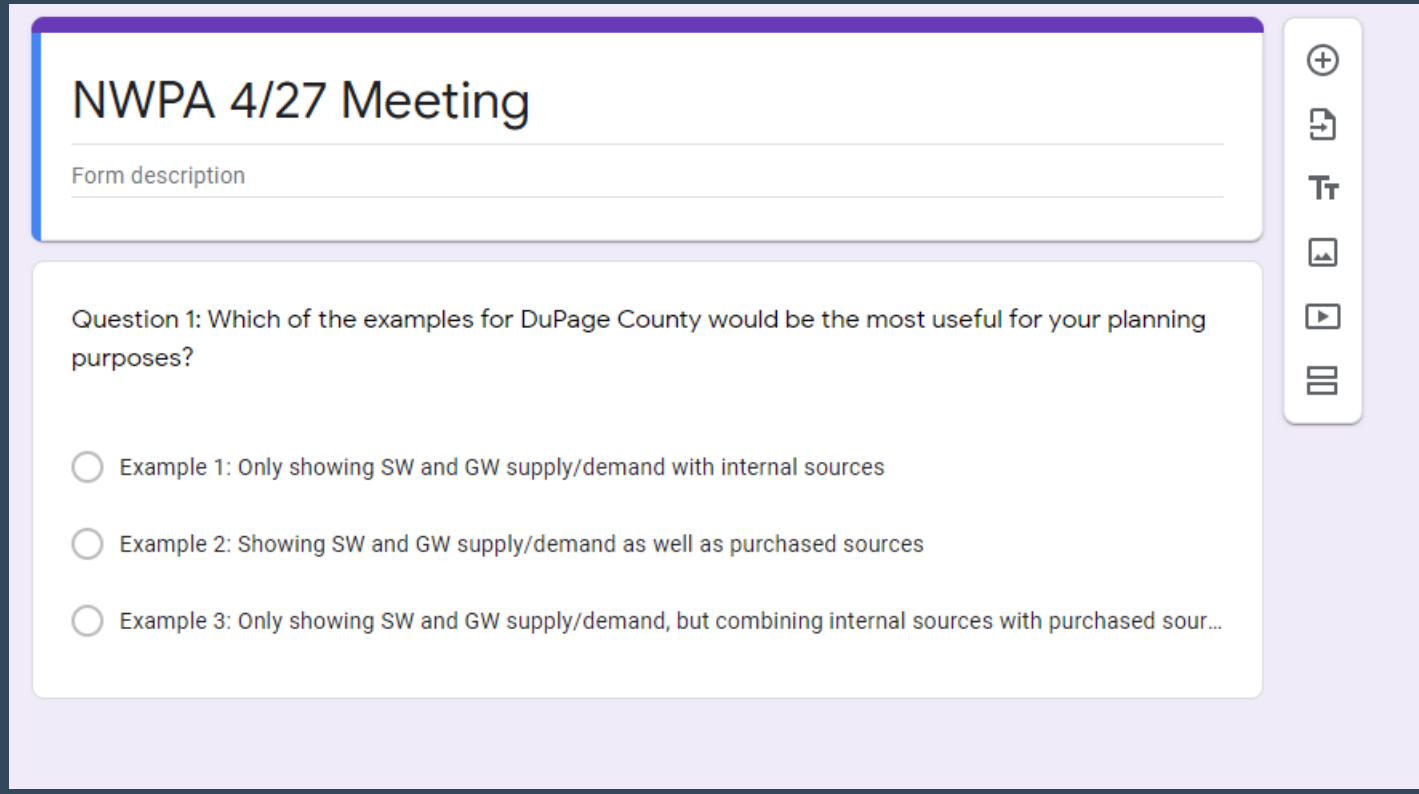
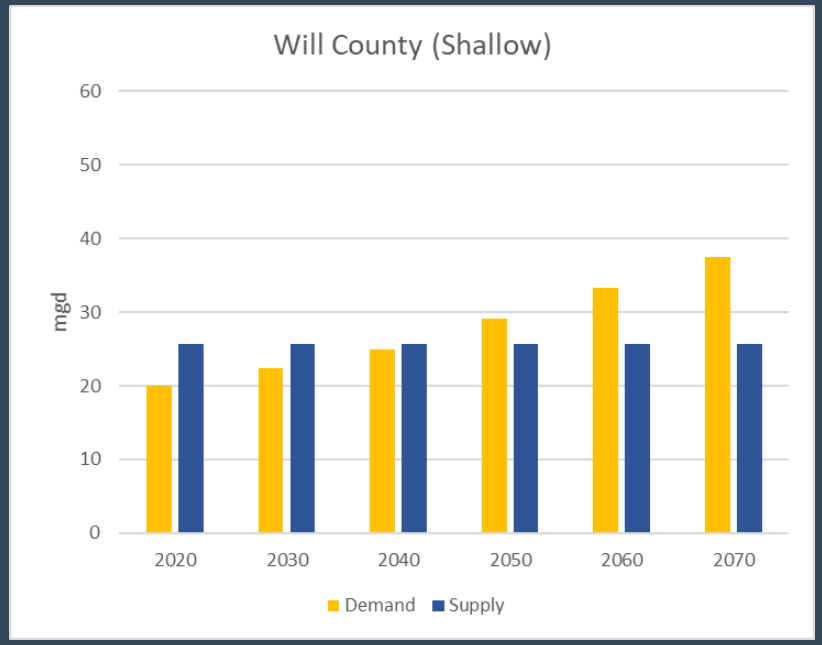


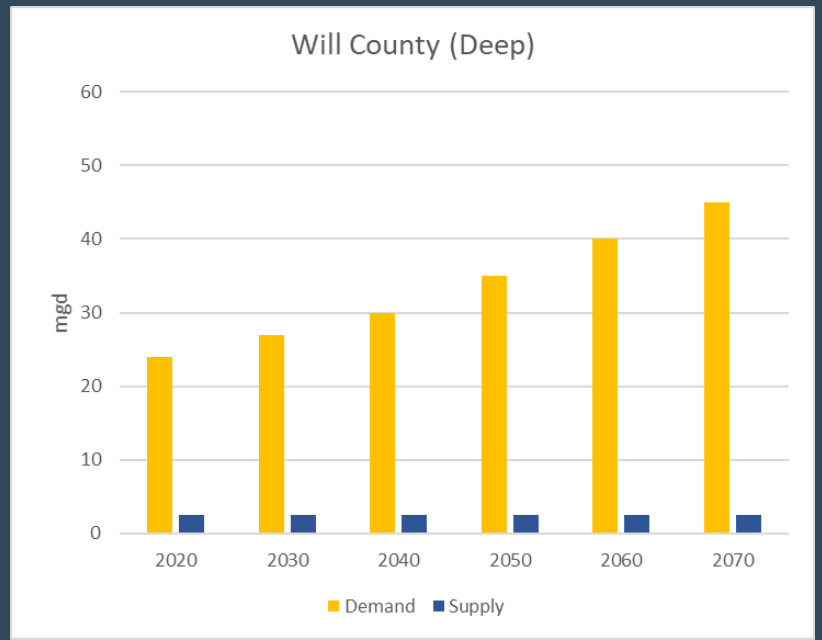
# Another observation from Will County

Due to rising chloride and concerns over emerging contaminants, many communities had plans to transition off their shallow wells

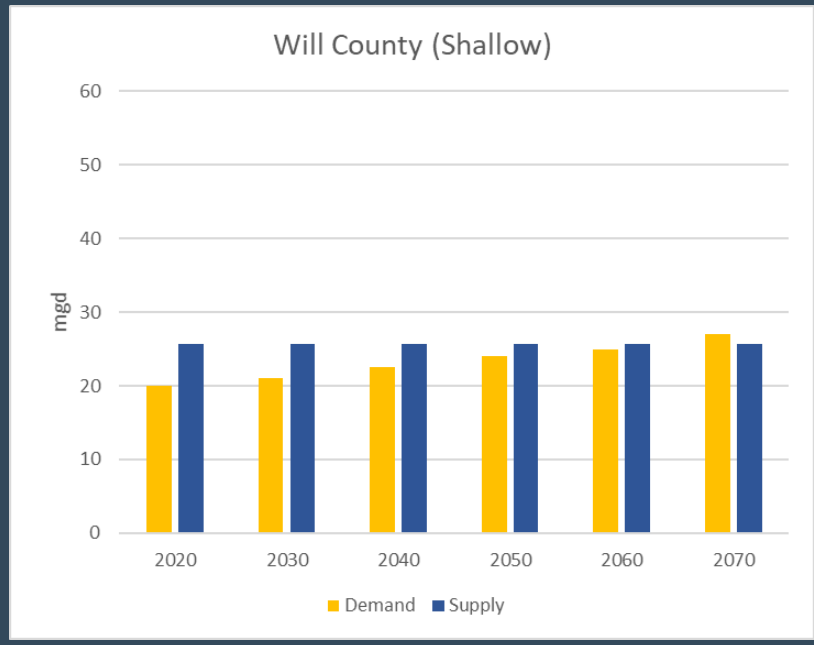
**Hypothetical example using Tier 1 analyses**

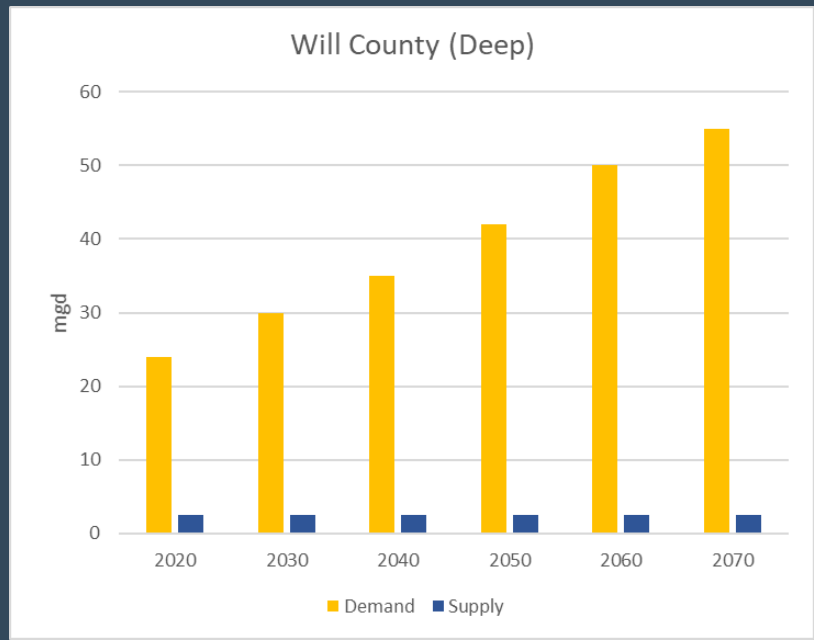
## Original




## Shifting Usage



# Question 2

Let’s jump to a poll question 2:

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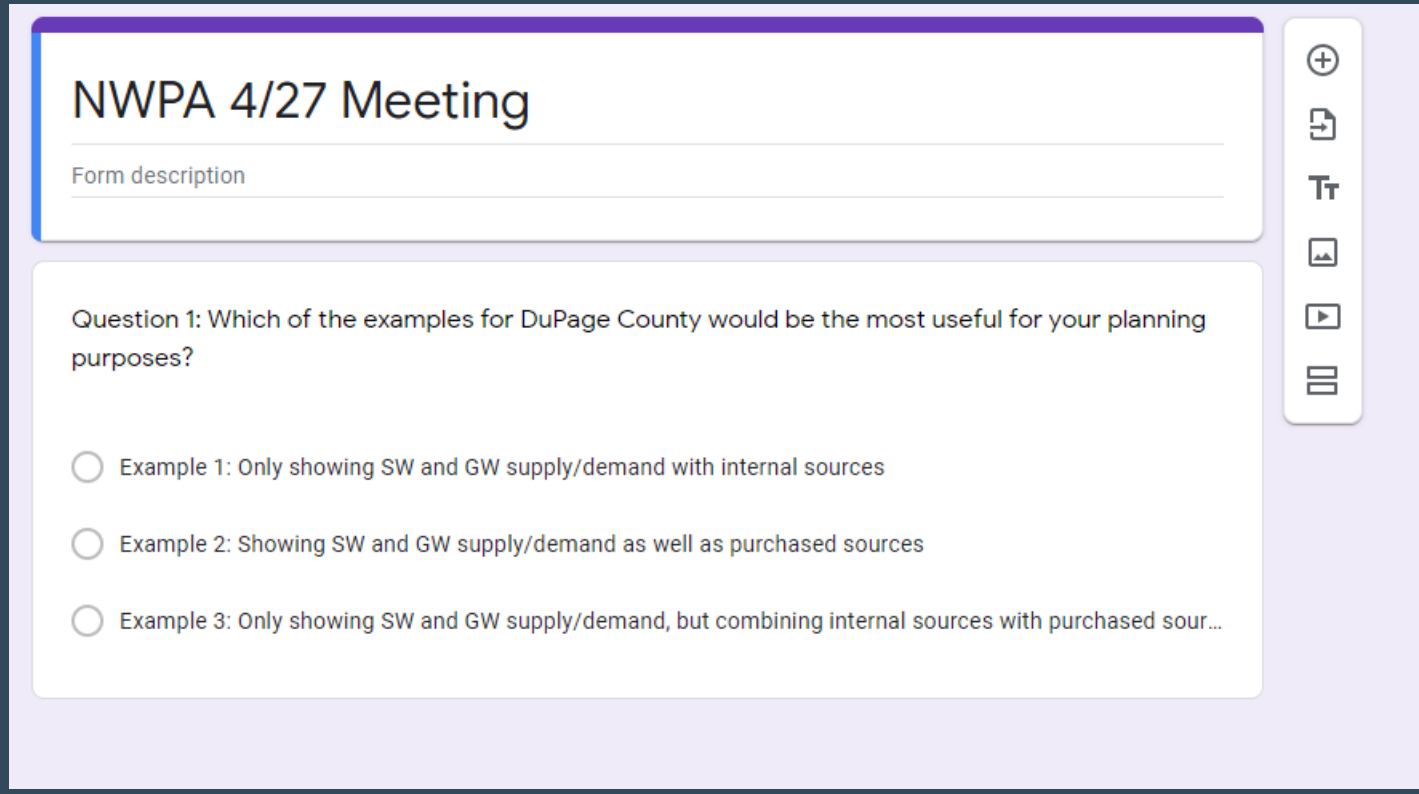


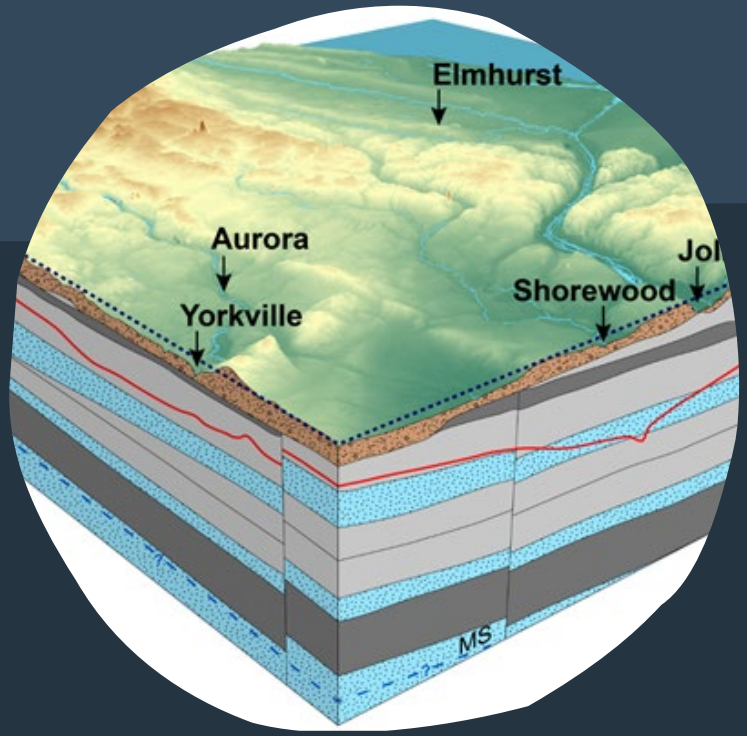
# Overview of supply methodologies

1. Provide an overview of methods to determine demand
2. Provide an overview of methods to determine supply for shallow aquifers, sandstone aquifers, and rivers
3. Solicit feedback on approaches and needed improvements

# Overview of supply methodologies

**Shallow Aquifer**

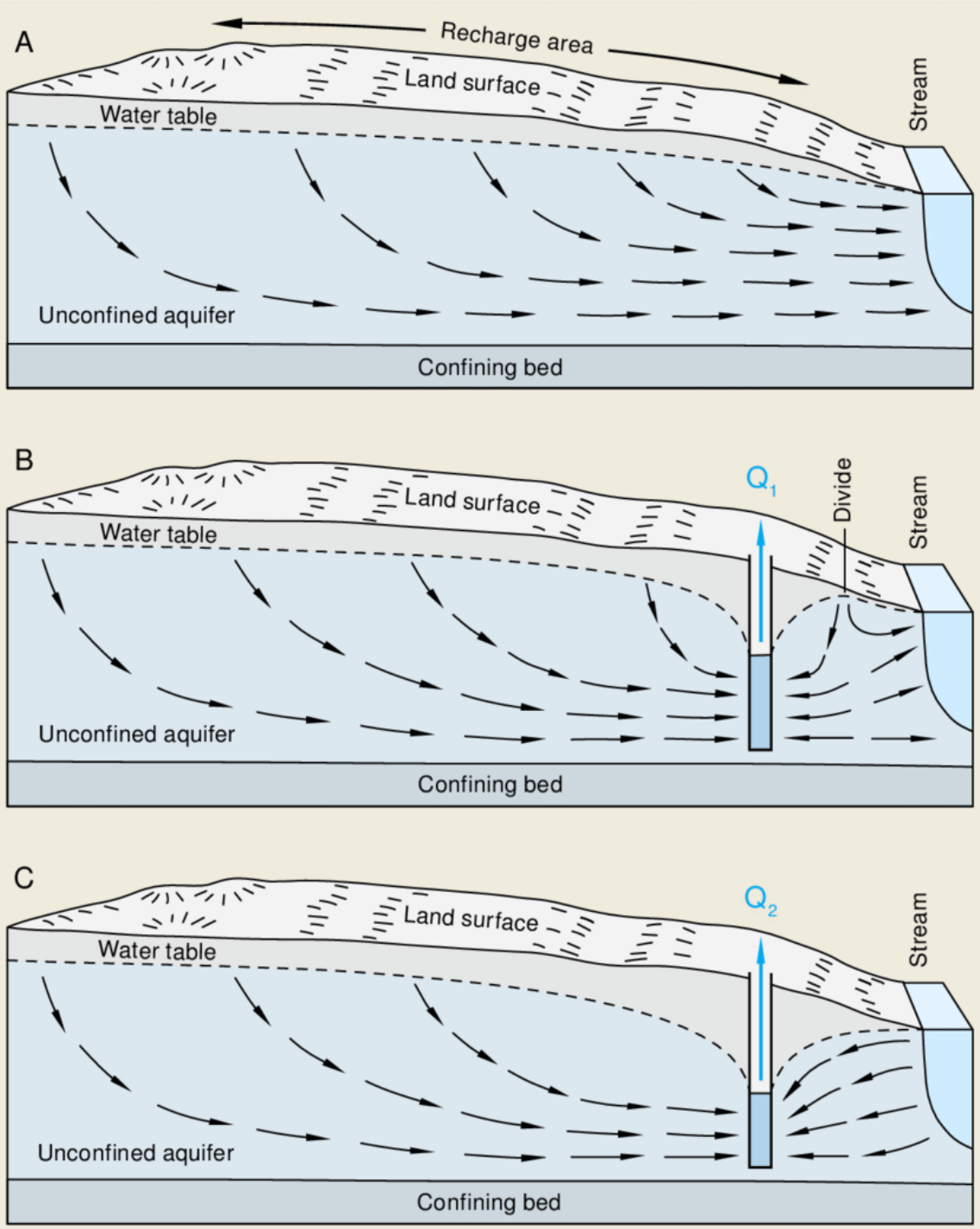
**Deep Sandstone**




**Fox River**

# How do we calculate shallow supply?

1. Pumping that could result in a 10% reduction in natural groundwater discharge to a stream (averaged over a county)
2. For the Tier 1 analysis, this is assumed to be total pumping equal to 10% of the predevelopment flow

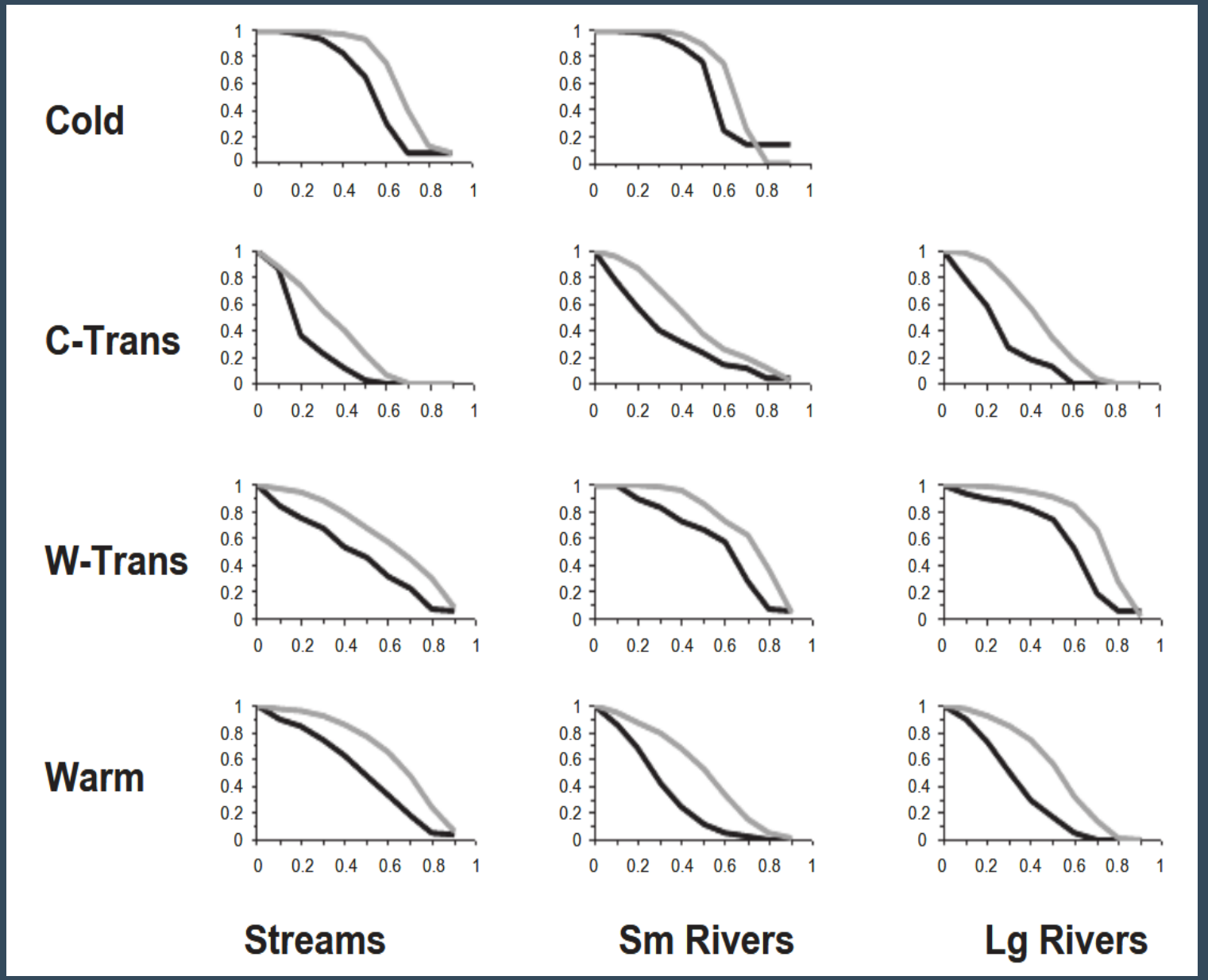



Reid et al. 2009. Catalogue of conceptual models for groundwater–stream interaction in eastern Australia

# Why 10%?

Zorn et al (2012) remains the most relevant study I have found looking at the impact of reduced natural groundwater discharge on fish communities.

10% is a conservative estimate without additional studies, but a reasonable case could be made for 20%.



# Question 3

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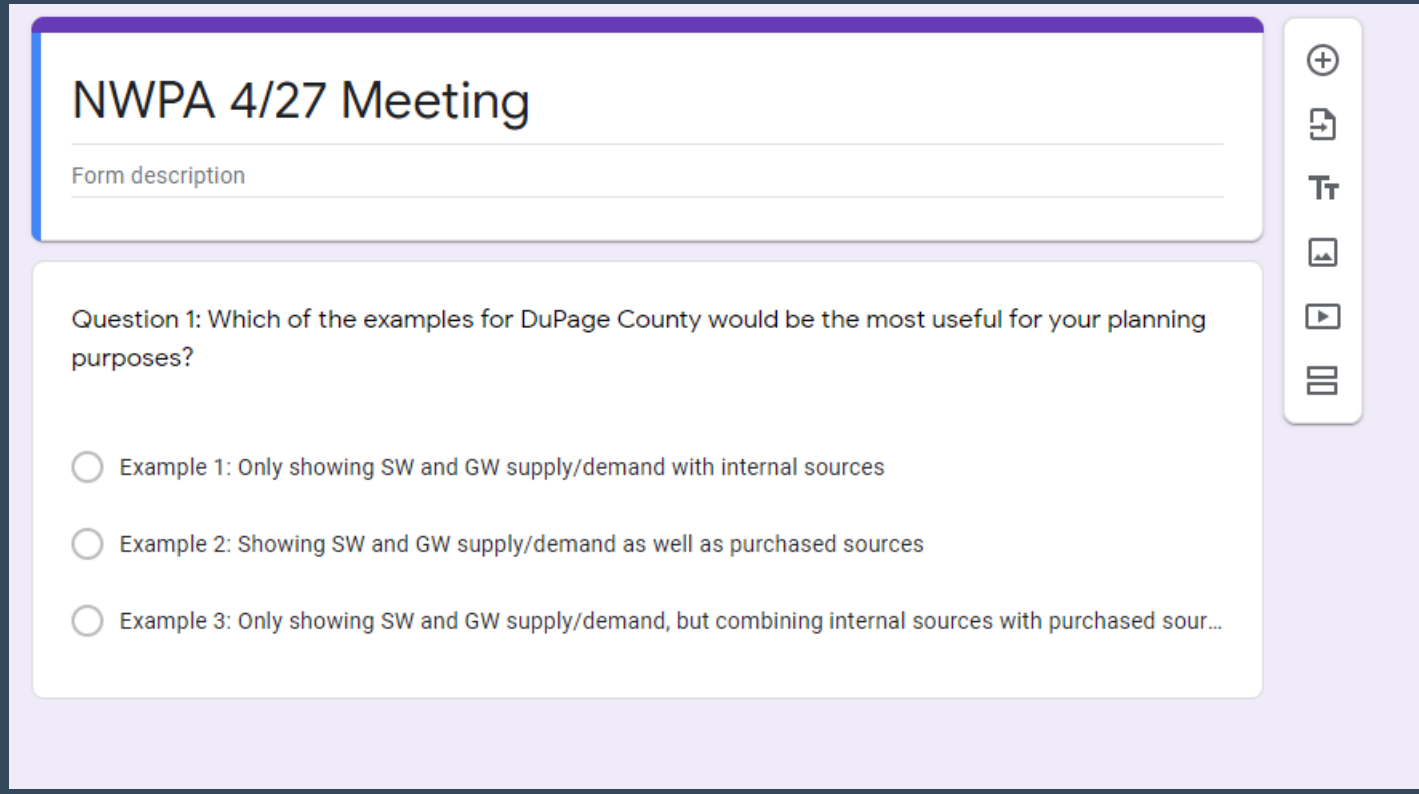
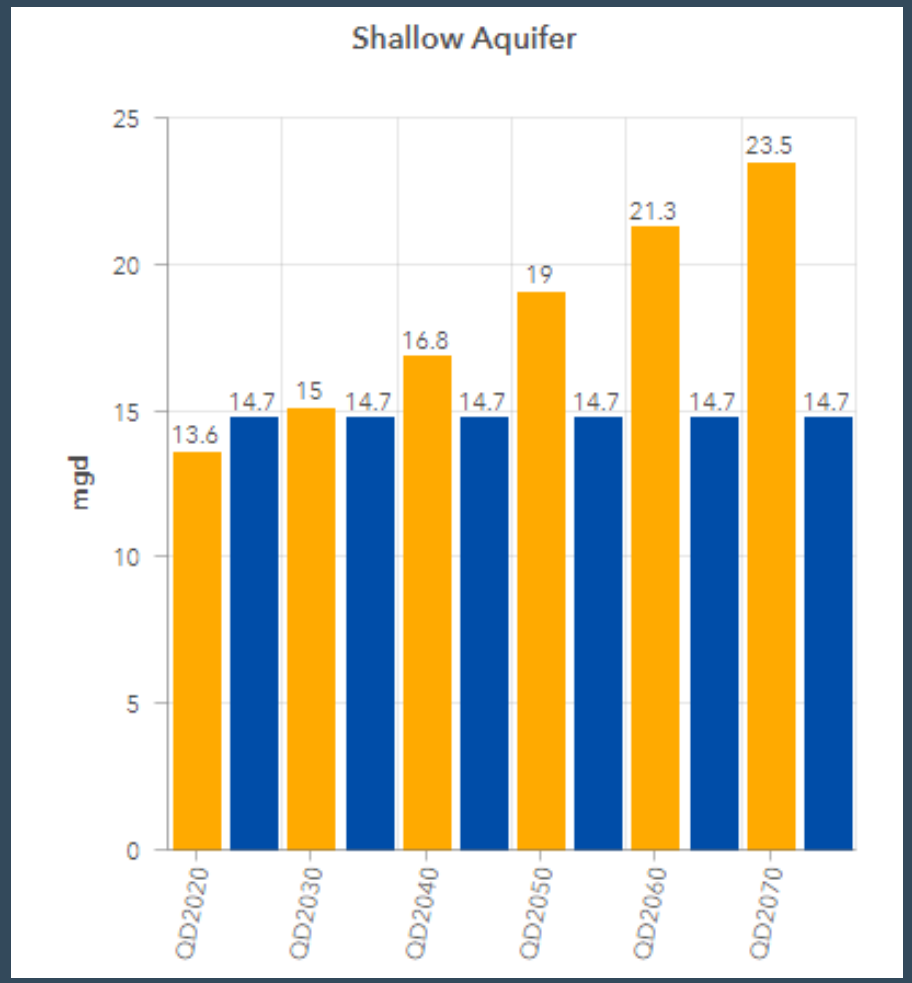
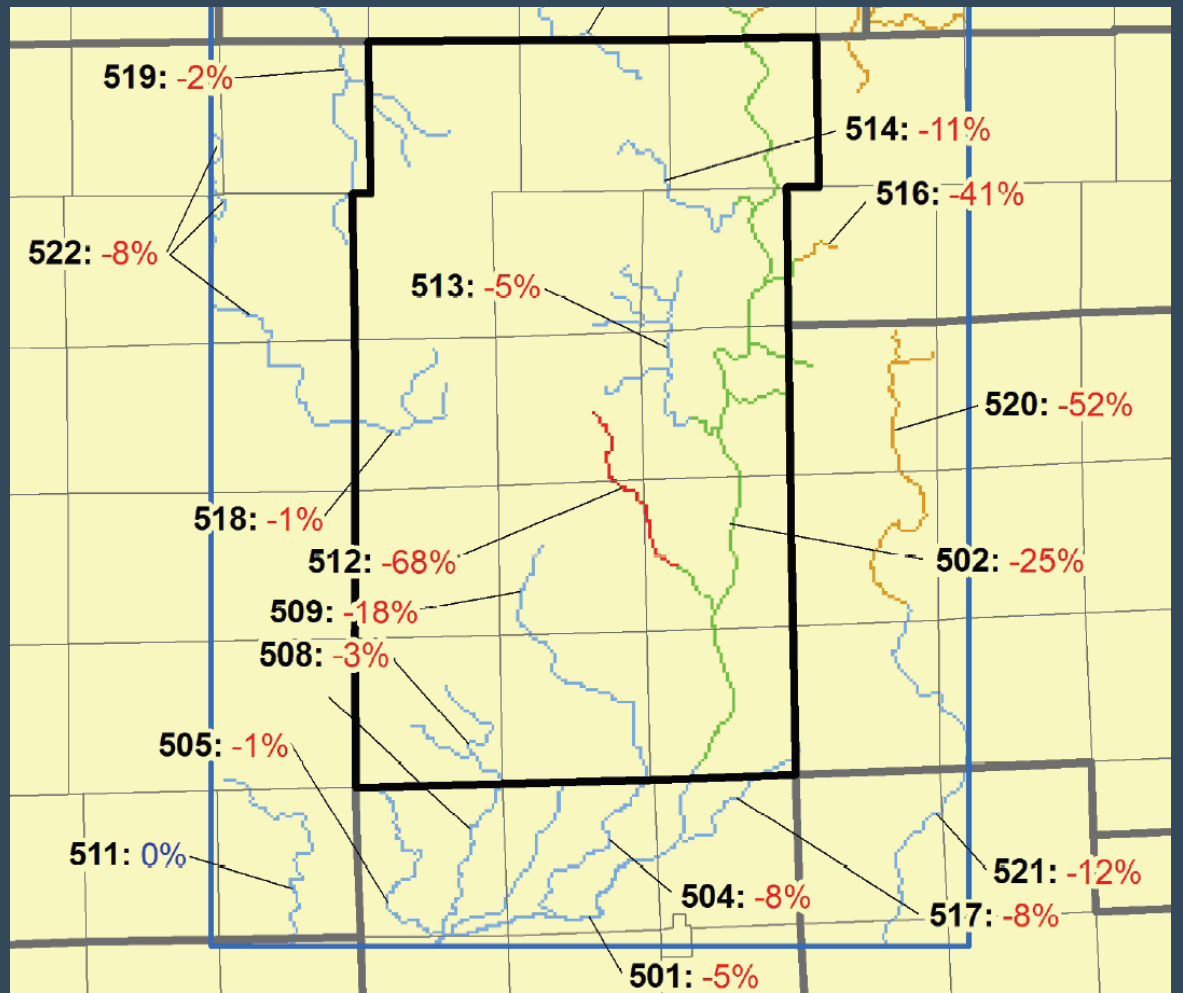


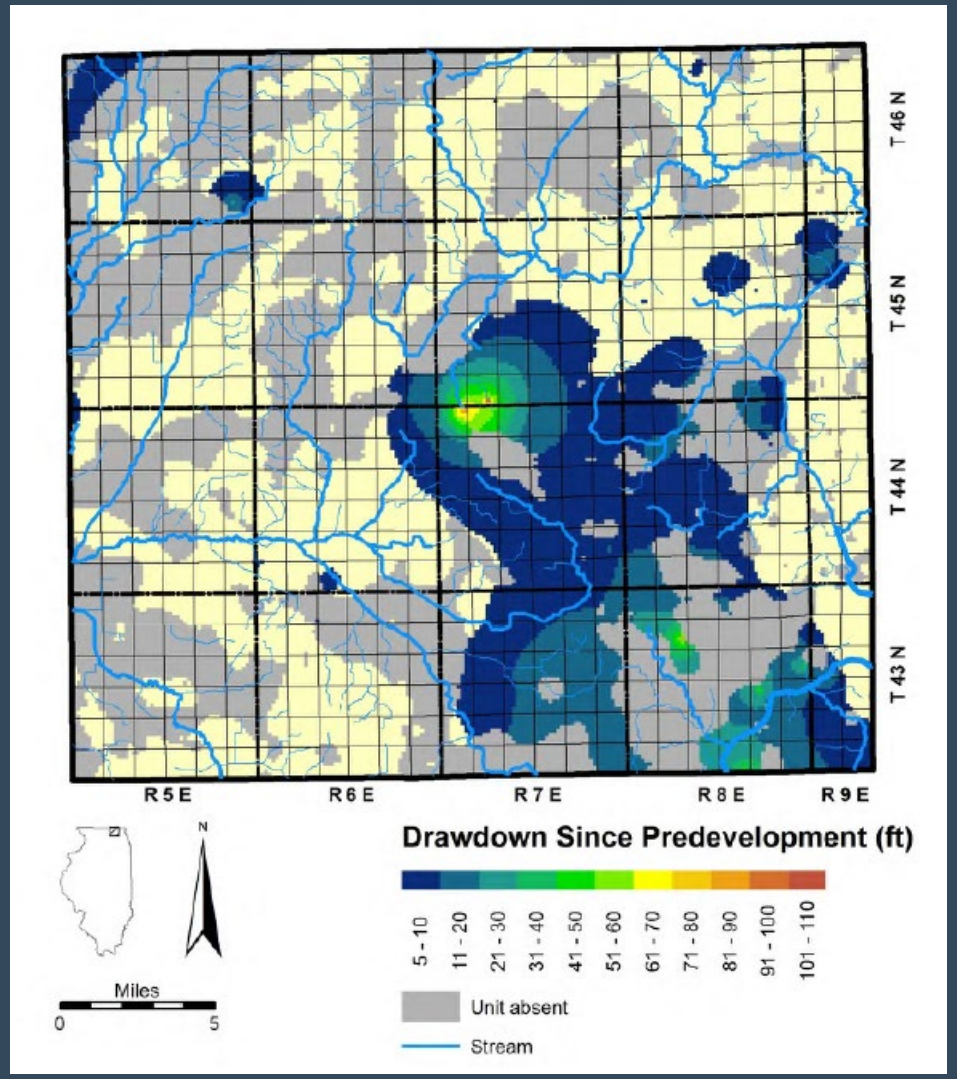
# Keep in mind that a 10% reduction on average is not ubiquitously spread through the county



# Other shallow considerations?

1. **Withdrawals resulting in drawdown**
2. Water quality issues (i.e. chloride)
3. Increasing recharge



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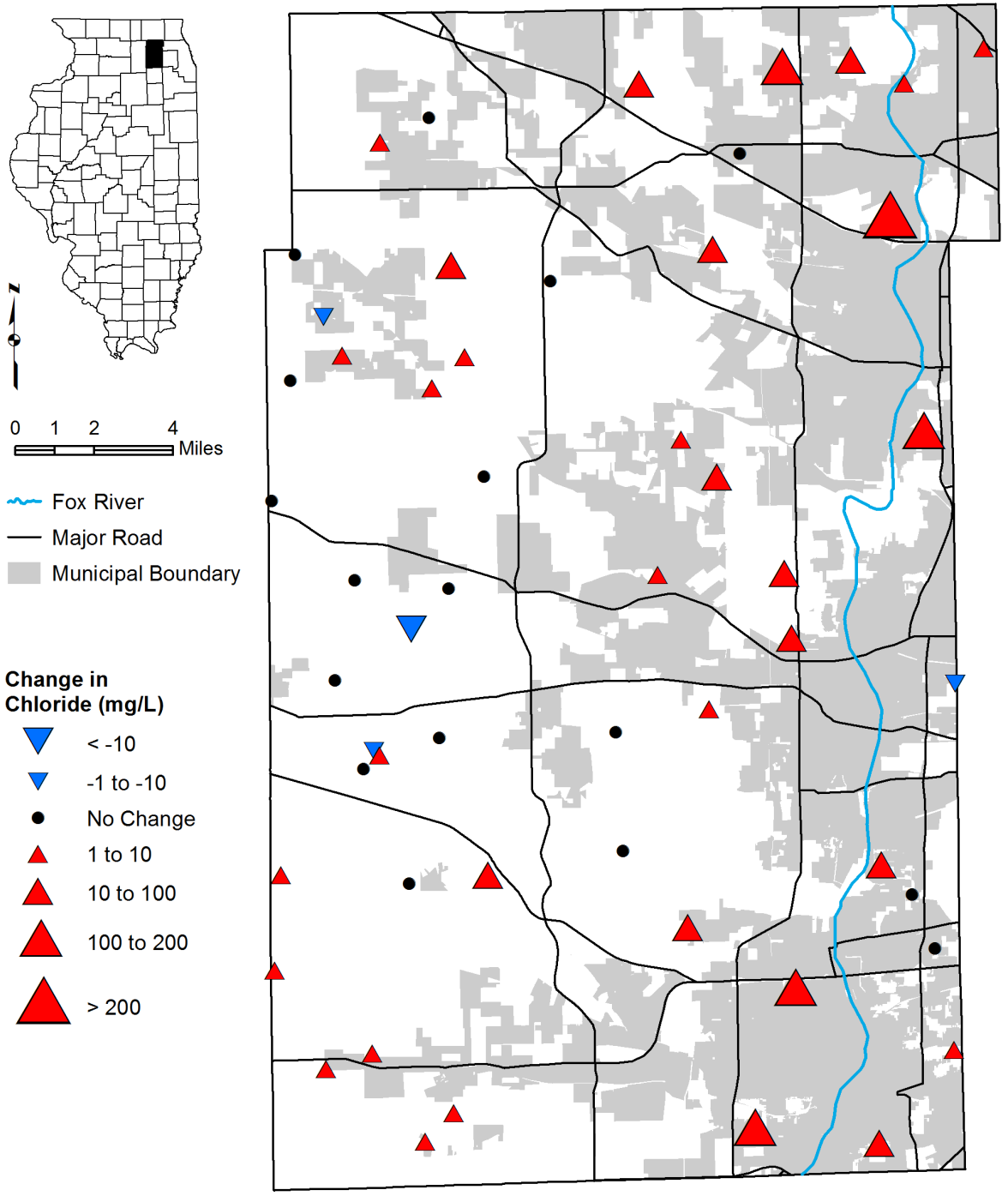
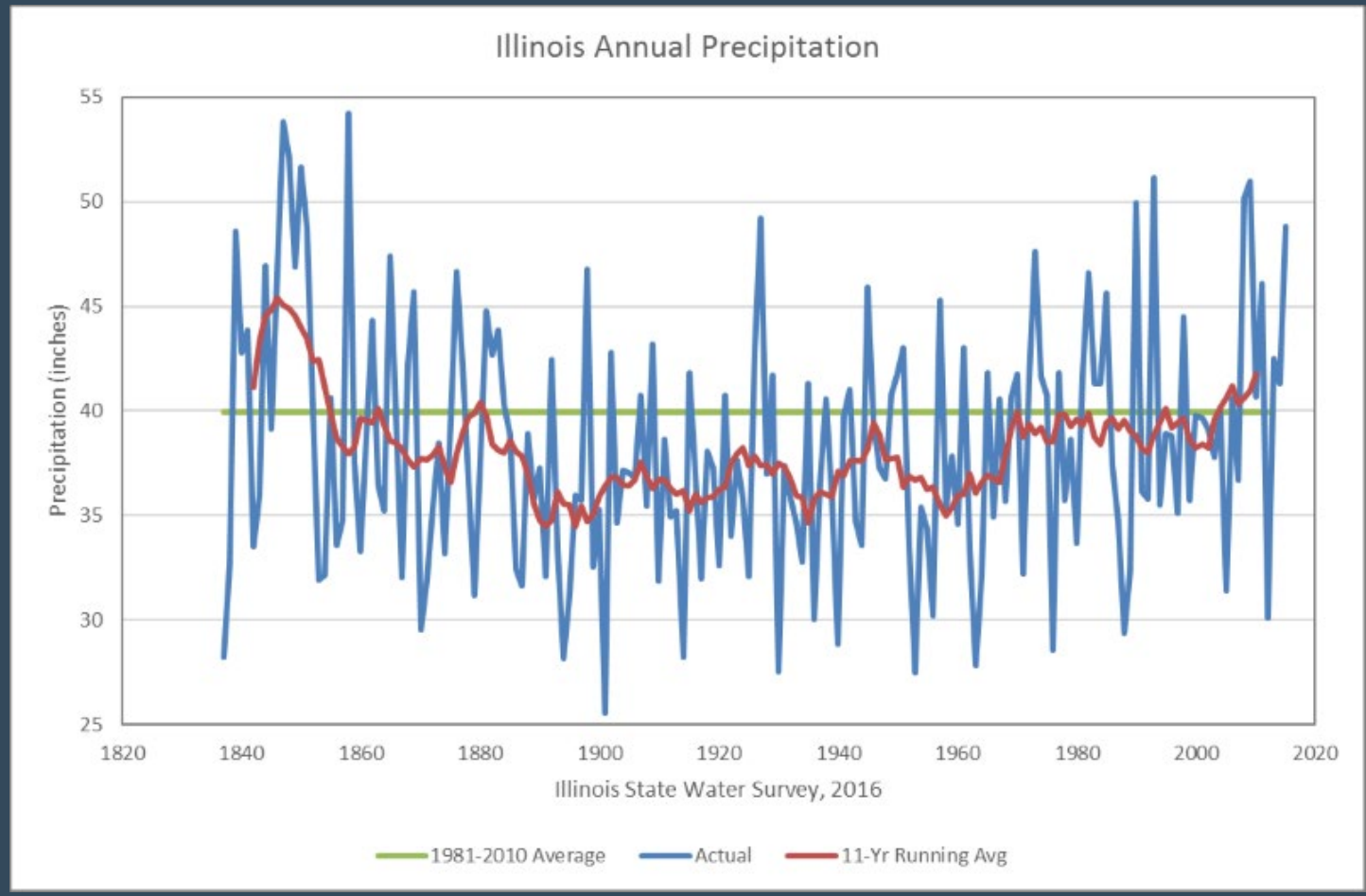


# Other shallow considerations?

1. Withdrawals resulting in drawdown
2. Water quality issues (i.e. chloride)
3. **Increasing recharge/river elevations**




https://stateclimatologist.web.illinois.edu/climate-of-illinois/climate-change-in-illinois/

# Question 4

Let’s jump to a poll question 4:

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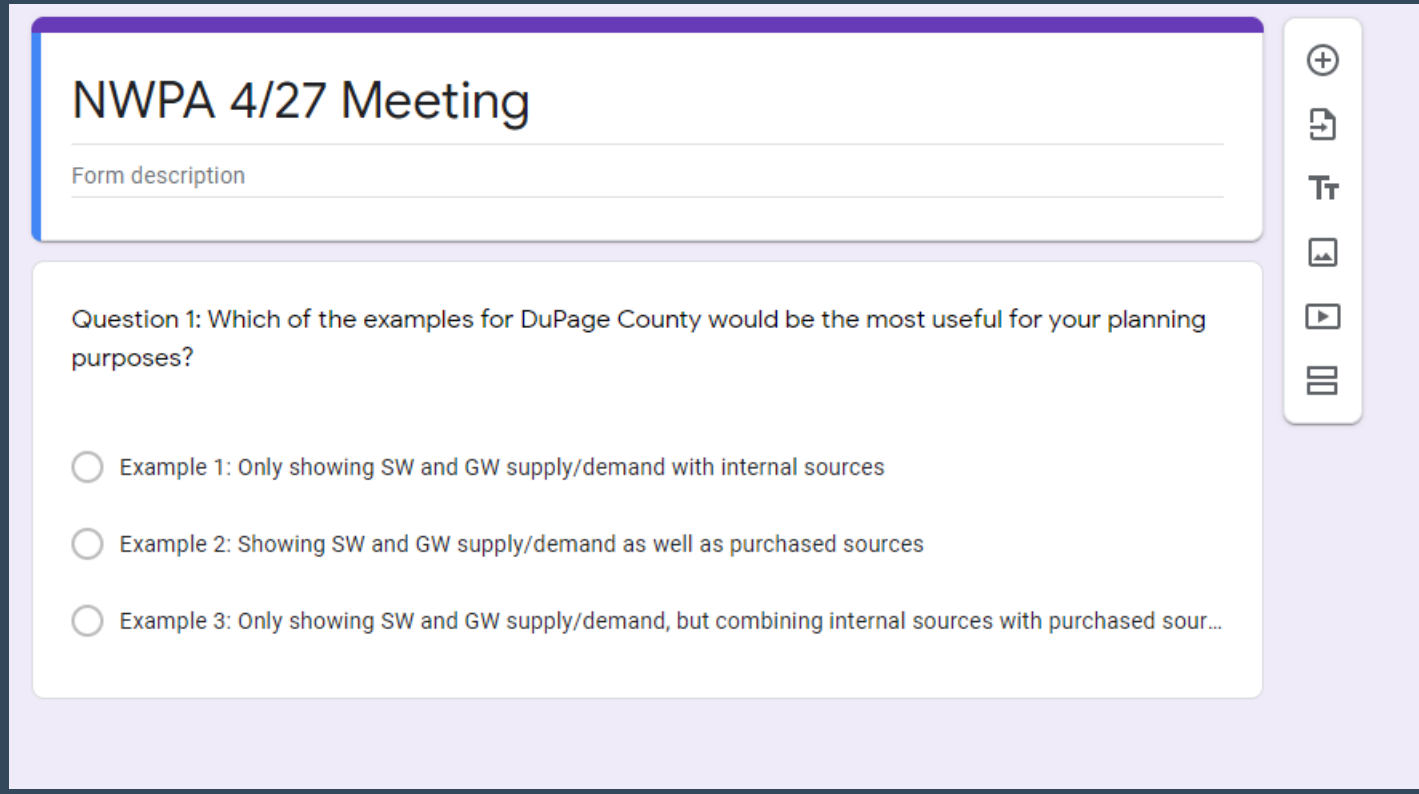
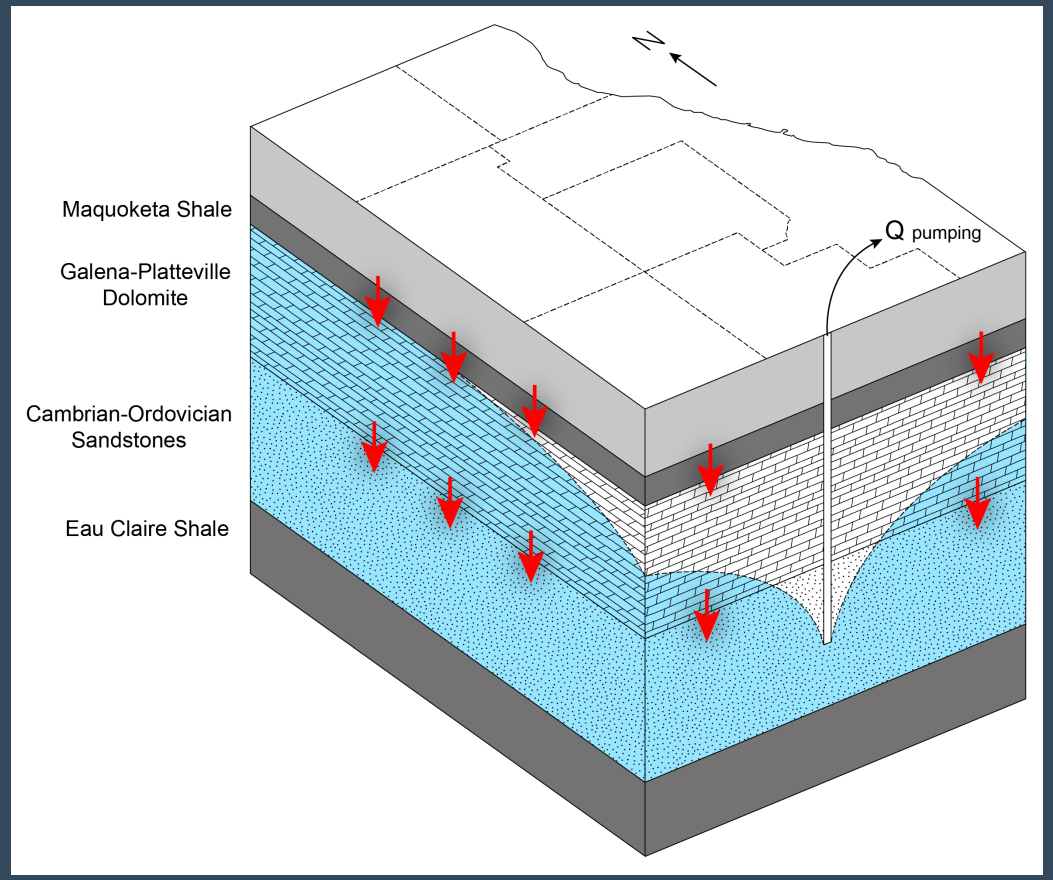
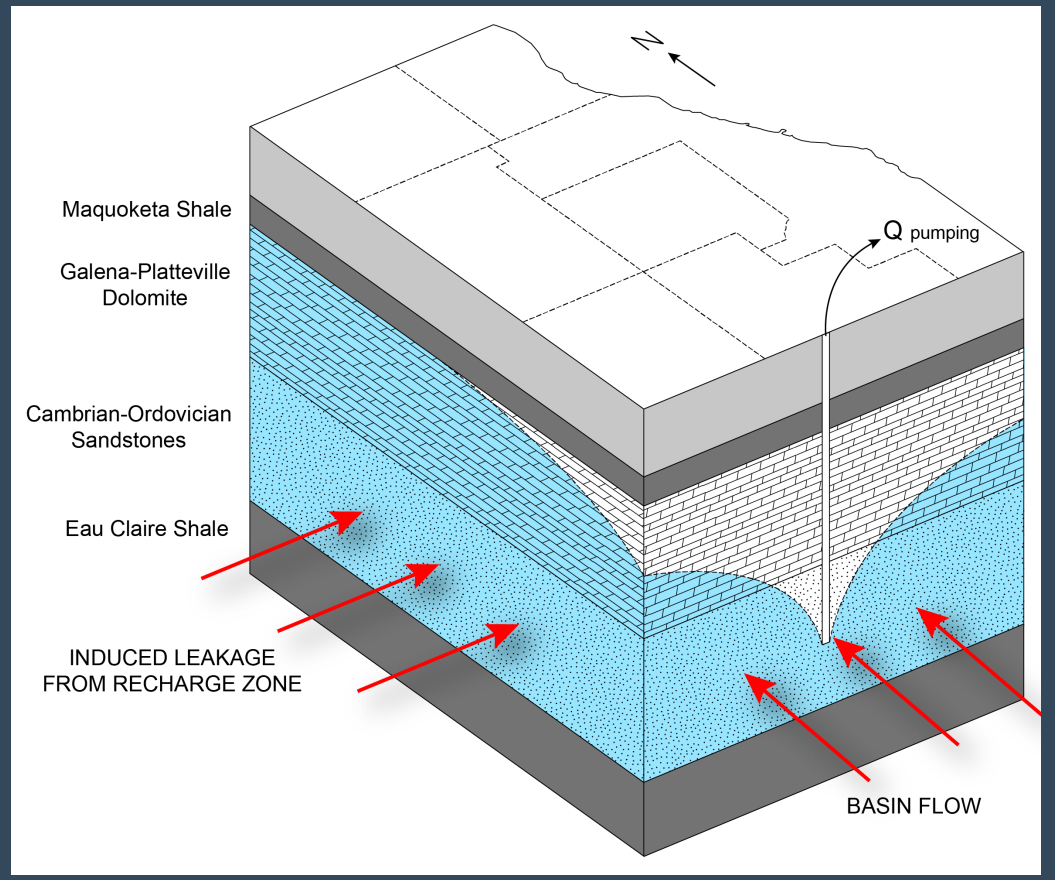


# Sandstone sustainability



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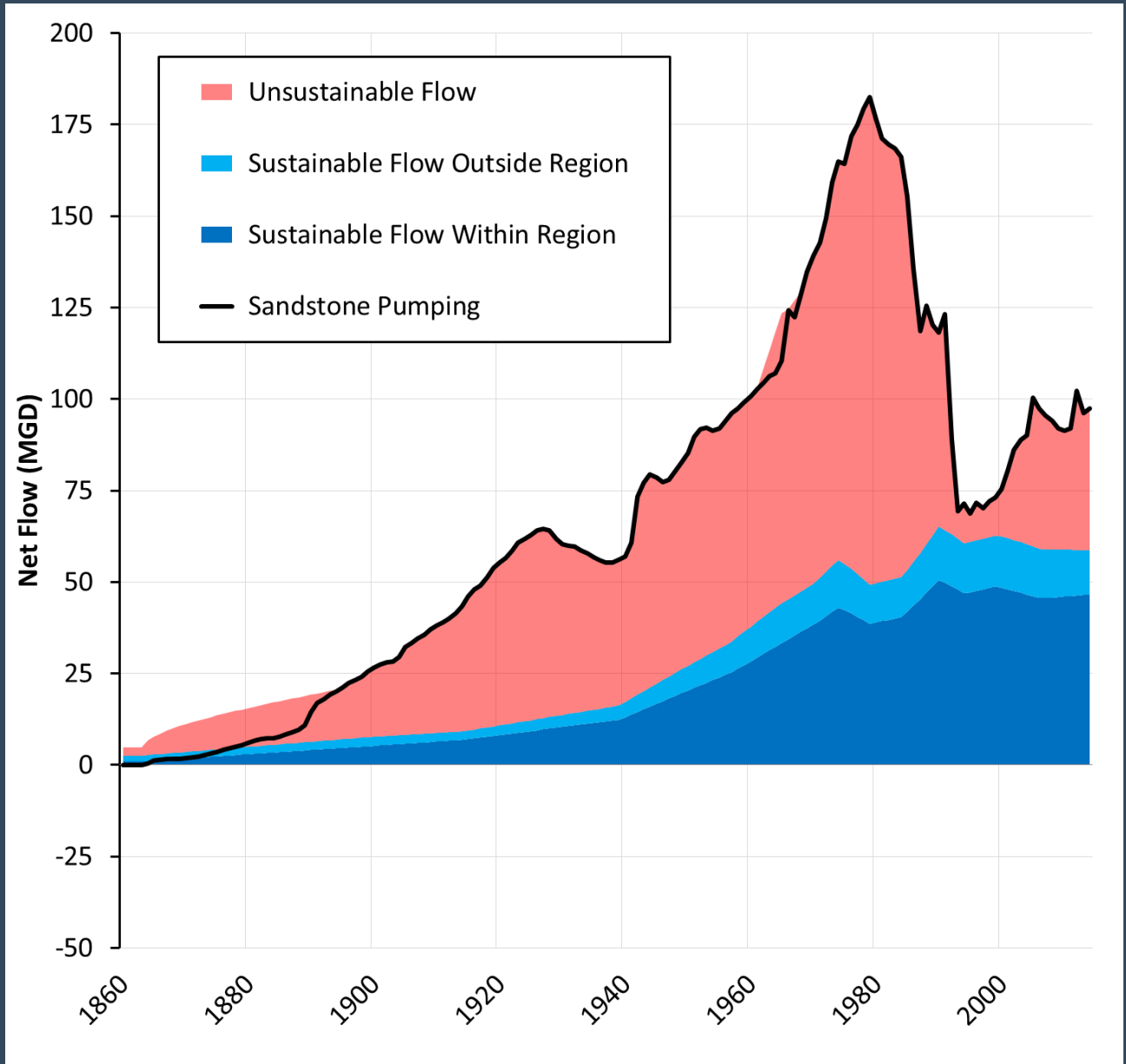
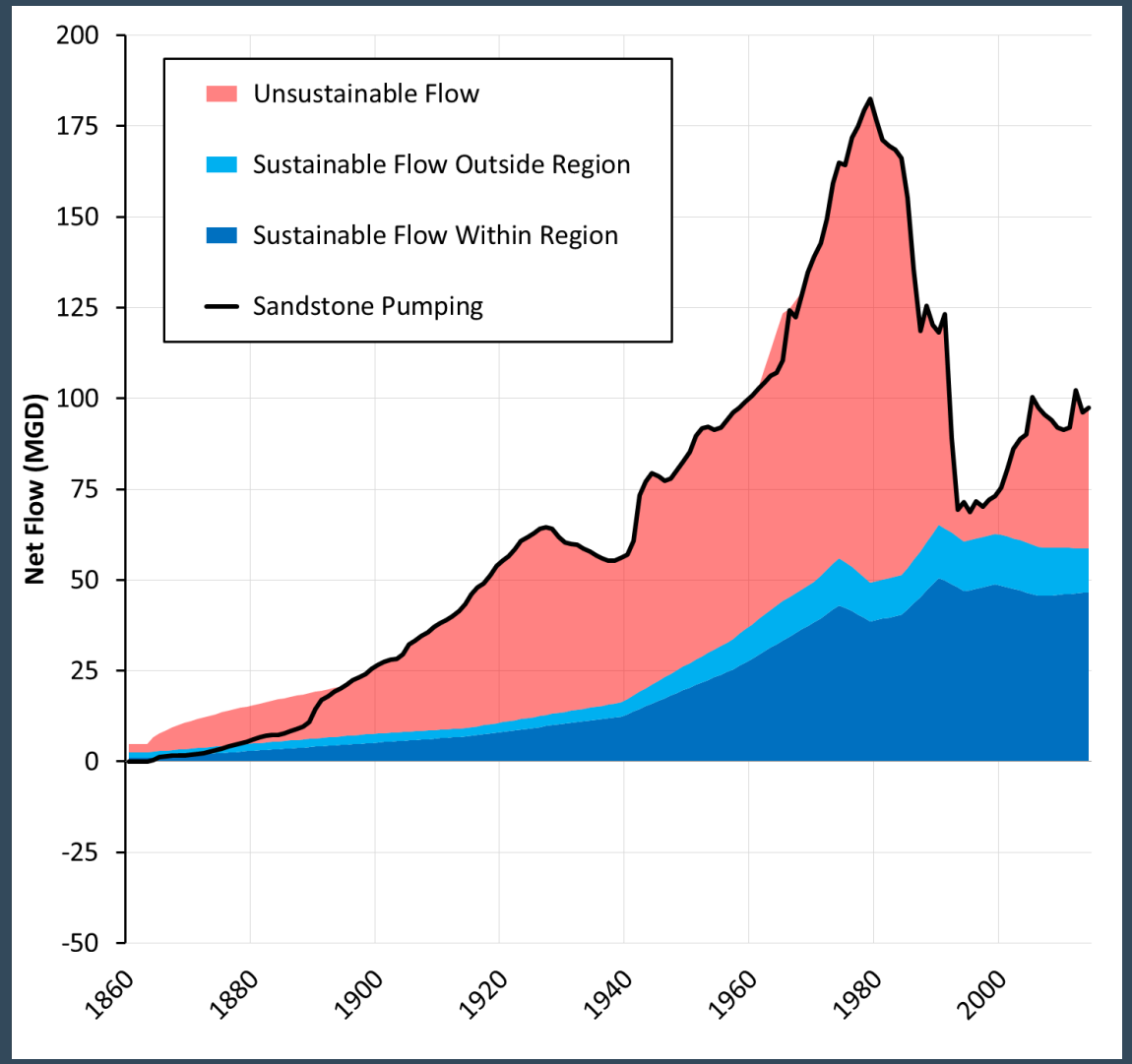



All other sources are taking water from elsewhere or coming from a source that is either of poor water quality or not readily recharged

Arguably, only induced leakage within Northeast Illinois can be considered a sustainable source of water

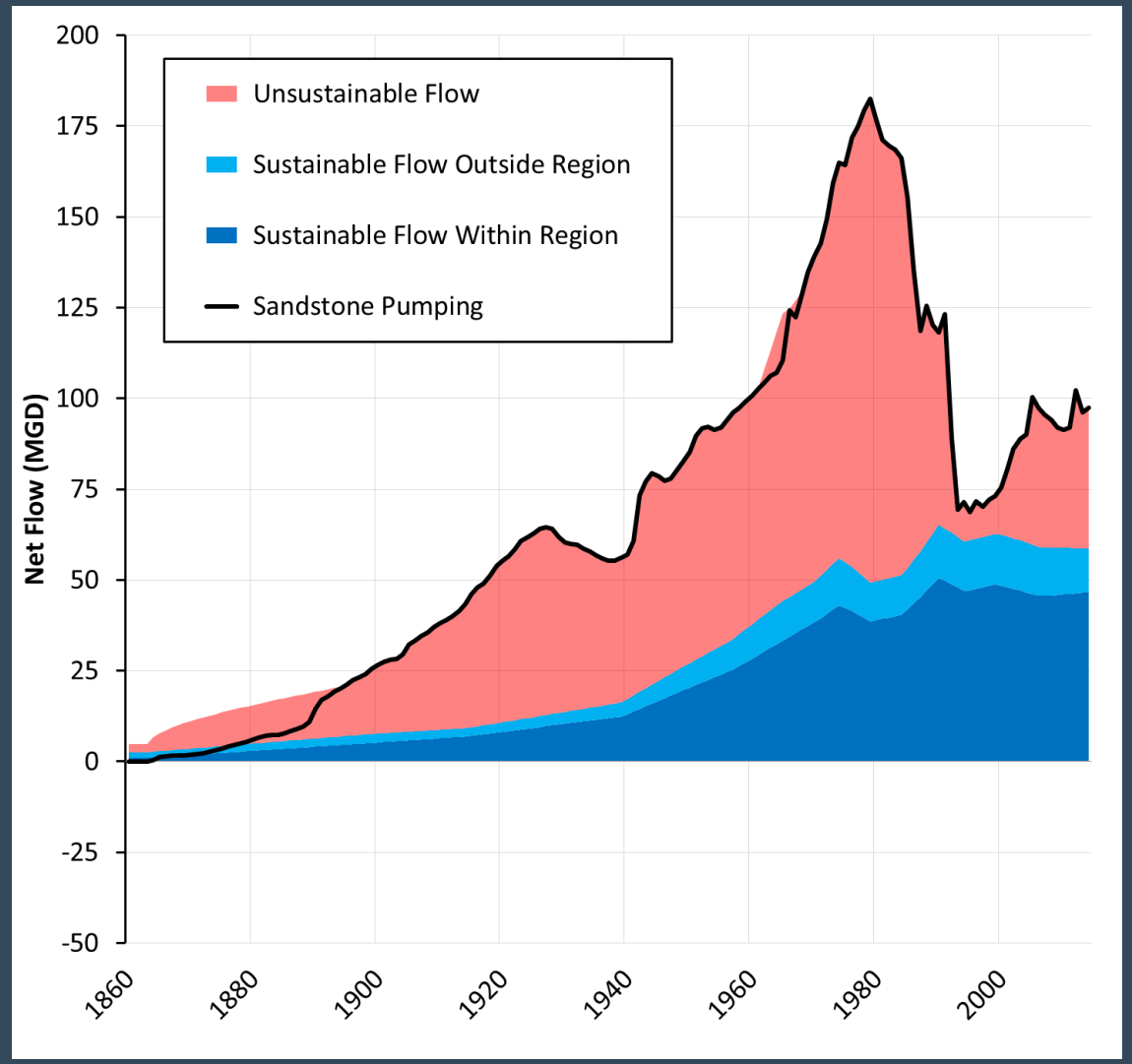
# Three metrics: Maximum Sustainable Leakage

a) Methodology: In the groundwater flow model, assign heads to 200 ft above the top of the Cambrian-Ordovician and calculate vertical leakage.
b) Benefit: Conservative approach-sustainability is determined only by water that enters within the county
c) Problem: Ignores the horizontal flow component, which is reality in northeastern Illinois and not going away



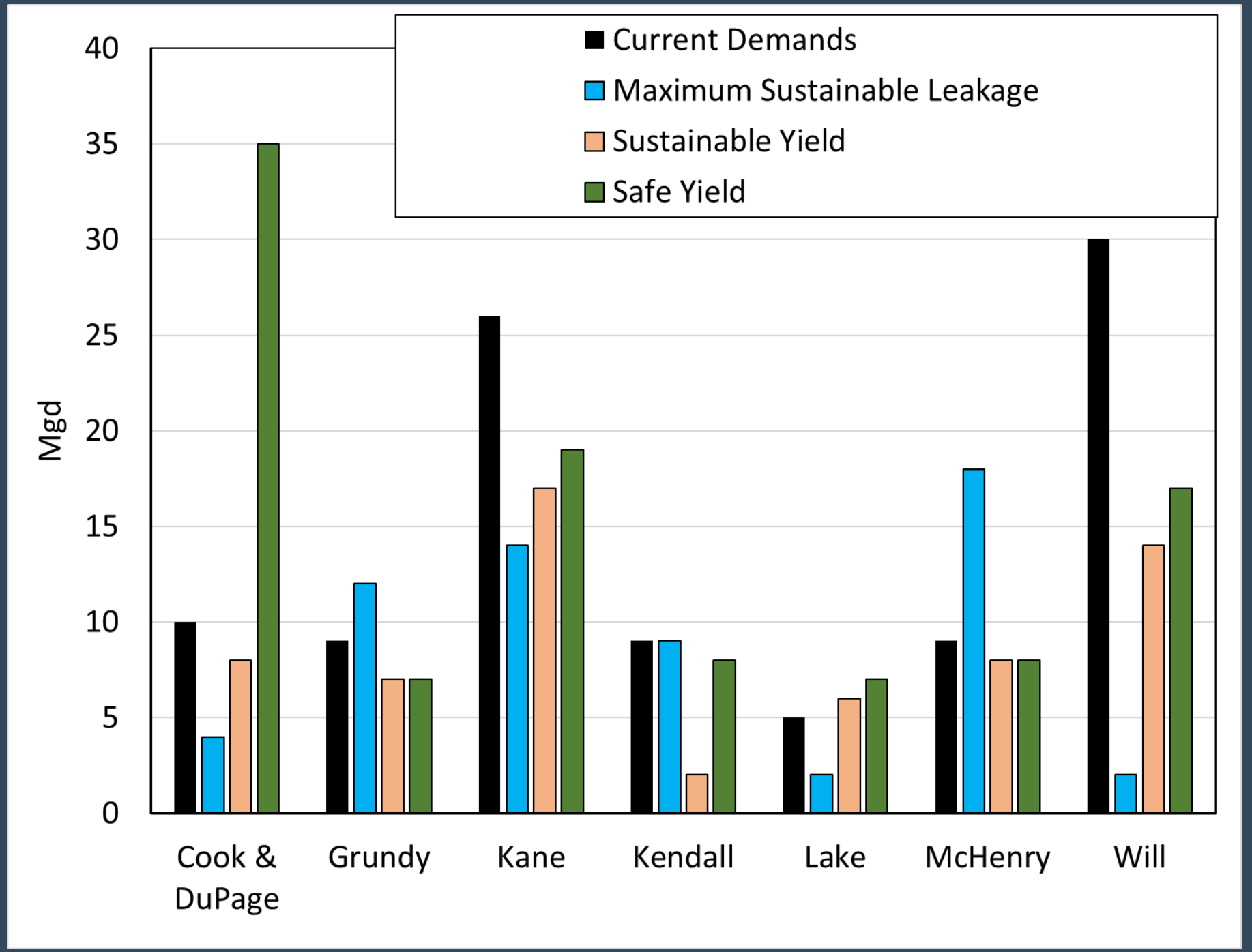
# Three metrics: Sustainable Yield

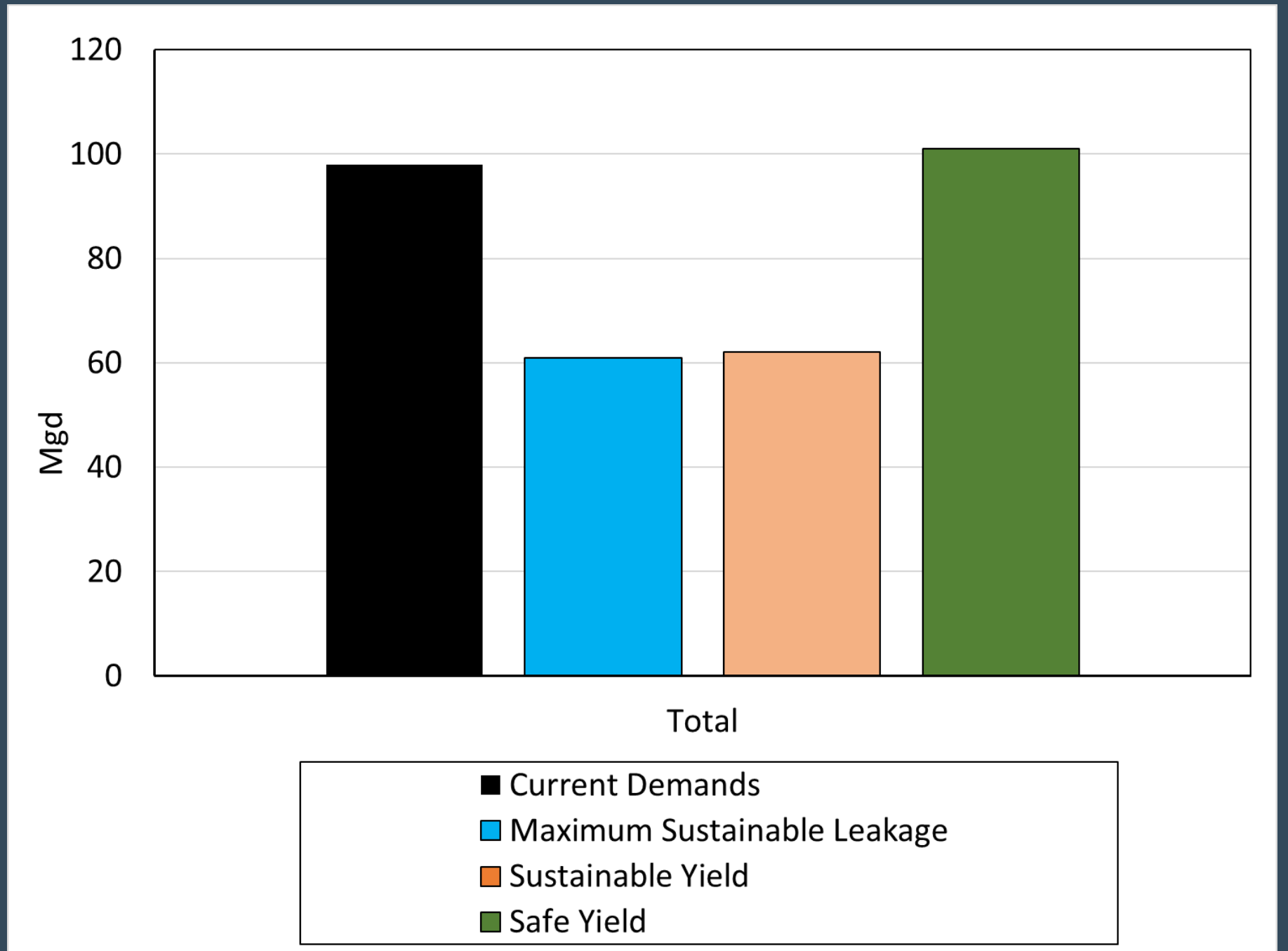
a) Methodology: Using current gradients, sum the vertical and horizontal inflow/outflow of the sandstone. Horizontal inflow is limited to water originating from natural recharge sources.
b) Benefit: Most grounded in reality (based off of current pumping conditions and gradients)
c) Problem: Reducing demands to this value will also reduce horizontal inflow (hence value does not truly represent a sustainable withdrawal rate)



# Three metrics: Safe Yield

a) Methodology: Assign to the model withdrawals such that there are no simulated changes in storage (thus stable water level conditions)
b) Benefit: Solution ensures that the optimized distribution of pumping will capture the safe yield
c) Problem: This approach assumes a pumpage distribution that does not match current demands. It also includes flow from the deep basin with undesirable water quality.


Current Demands
Maximum Sustainable Leakage
Sustainable Yield
Safe Yield
Mgd
40
35
30
25
20
15
10
5
0
Cook & DuPage
Grundy
Kane
Kendall
Lake
McHenry
Will


120
100
80
60
40
20
0
Mgd
Total
Current Demands
Maximum Sustainable Leakage
Sustainable Yield
Safe Yield

# Question 5

Let’s jump to a poll question 5:

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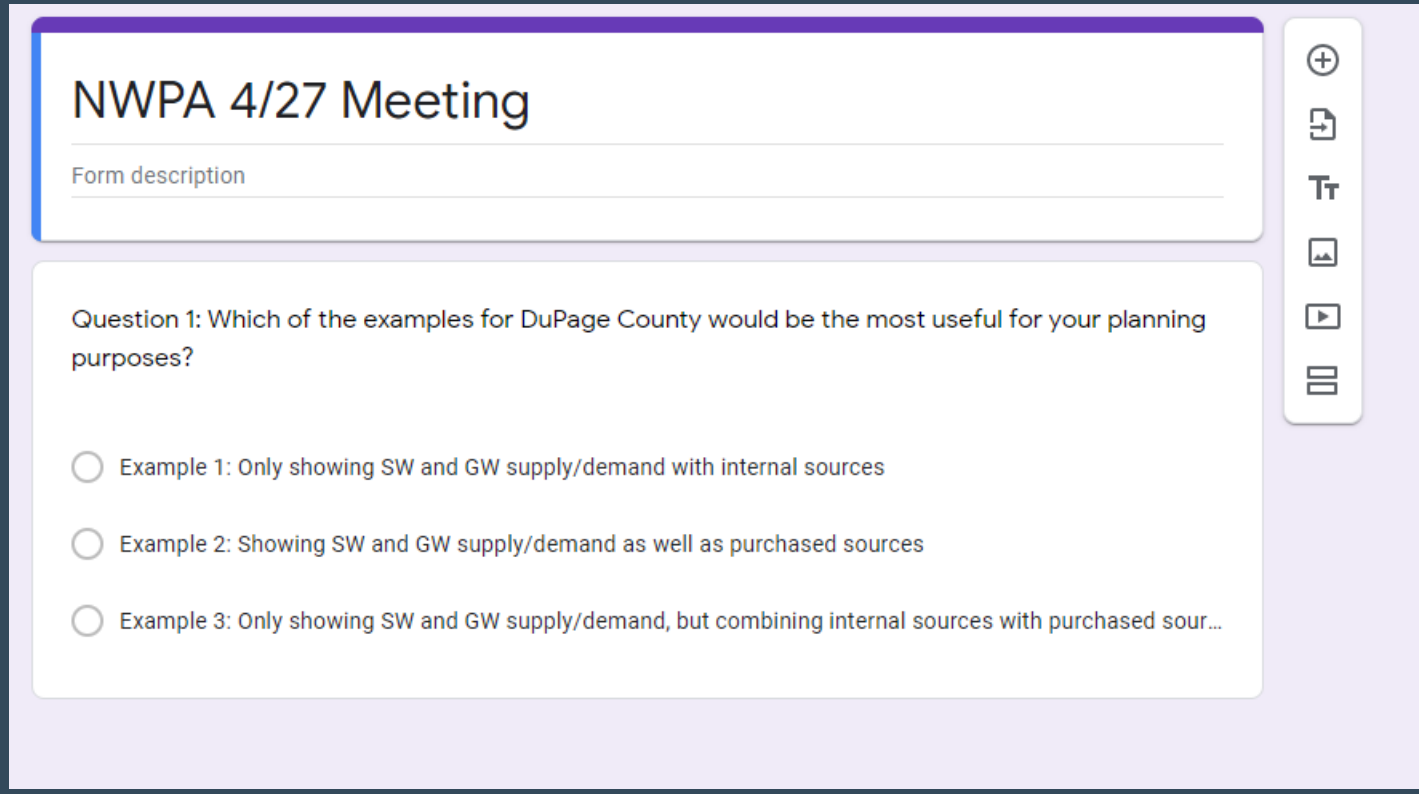

# Future discussion: Surface Water

- Current, we utilize available infrastructure as determined by maximum IWIP demands
- Seeking to calculate rivers as a true “sustainable supply”