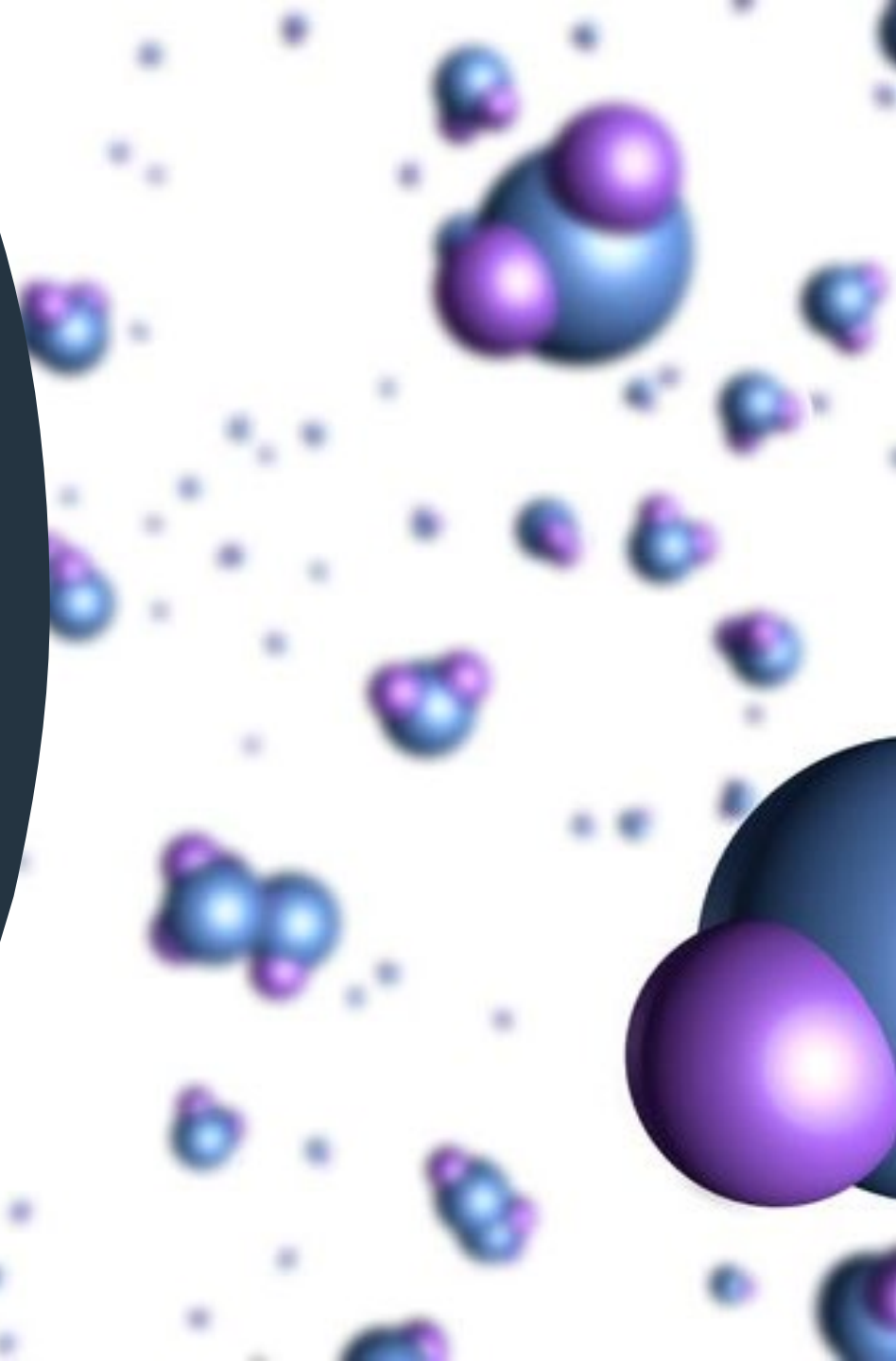


Sustainable Supply and Demand Discussion

Daniel Abrams

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

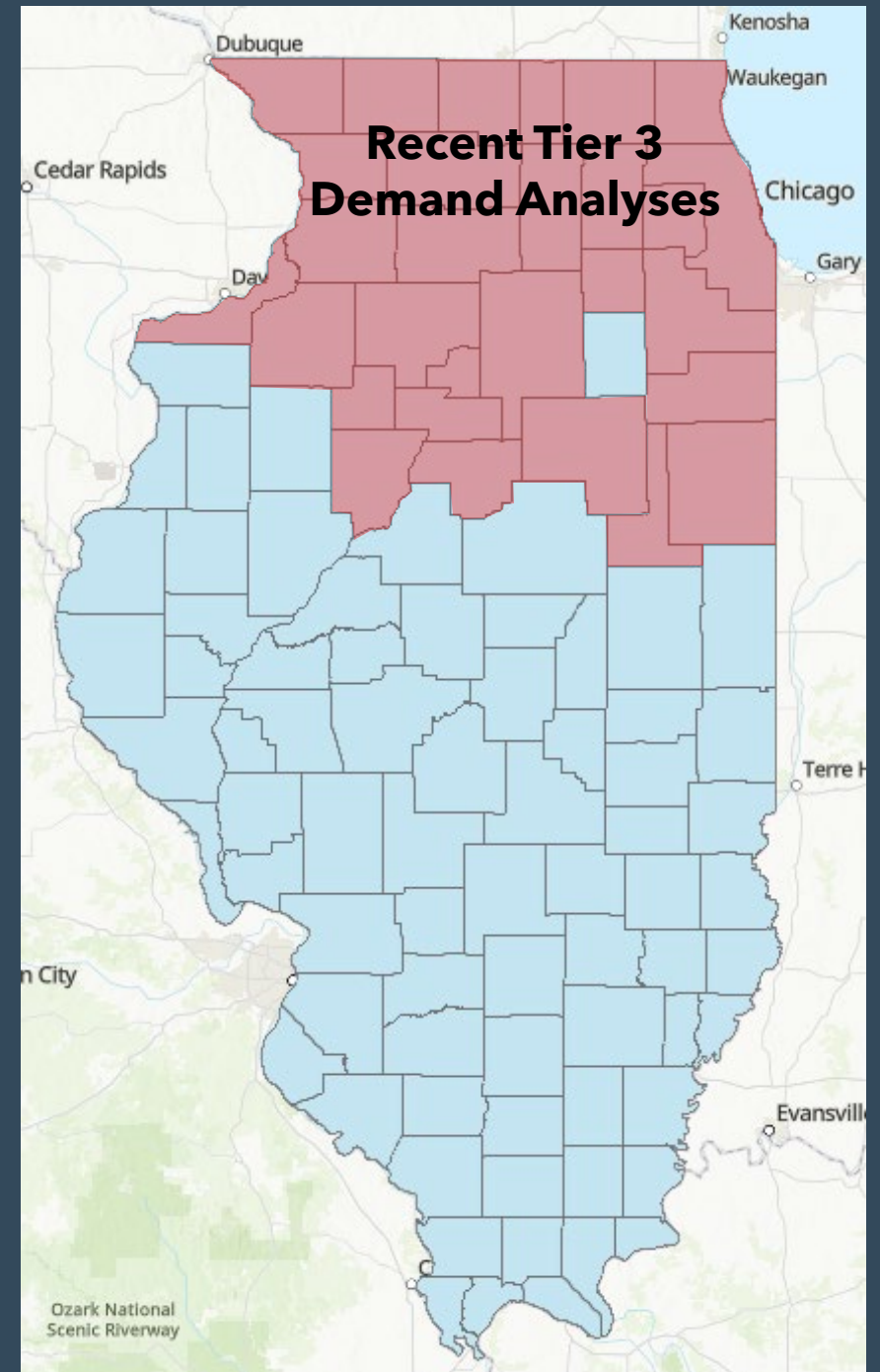
Values obtained from the statewide groundwater flow model

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?*

Illinois Natural History Survey | Illinois State Archaeological Survey | Illinois State Geological Survey | Illinois State Water Survey | Illinois Sustainable Technology Center

ILLINOIS

Illinois State Water Survey
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Groundwater Science

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Service Programs

- [Irrigation Reporting Information](#)
- [Water Resource Investigations for Kane County, Illinois](#)
- [How to Fill Out Your Water Inventory Form](#)
- [Features of the Wells and Intakes Listing](#)
- [How to Fill Out the Water Use Part of the Inventory Form](#)
- [Frequently Asked Questions](#)
- [Explanation of Terms on Your Water Inventory Form](#)
- [Detailed Explanation of Well Treatment, Water Levels, Conservation, and Discharge](#)
- [IWIP Data Use](#)

Illinois Water Inventory Program

ILLINOIS WATER INVENTORY PROGRAM COVID-19 UPDATE

The Illinois Water Inventory Program is still operational.

Although University offices are closed due to the Governor's shelter-in-place order, the Illinois Water Inventory Program team is still available to answer calls and emails to support 2020 water use reporting.

The Online Reporting Tool is operational, and IWIP is accepting 2020 water use reporting, as well as any other outstanding years' reports.

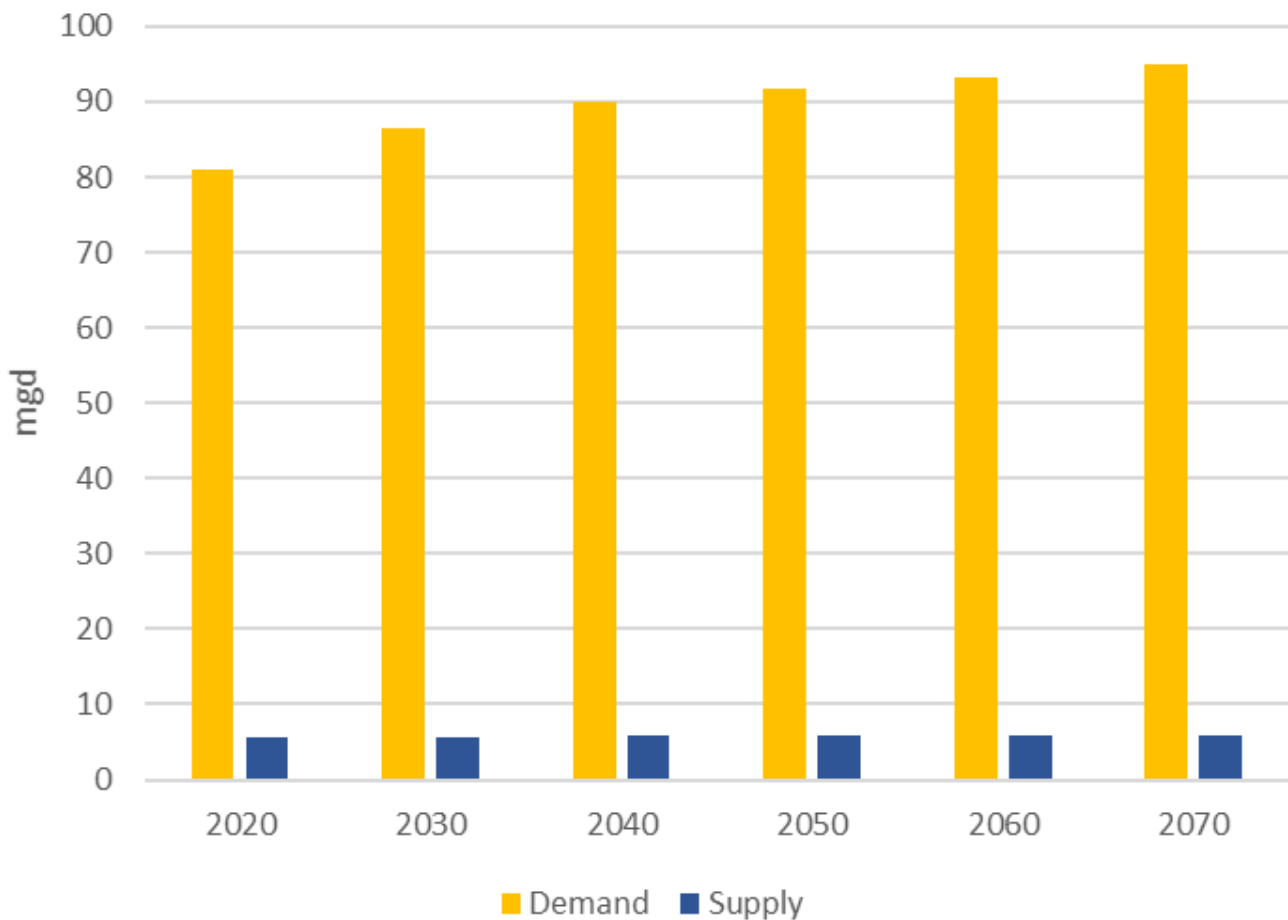
To report your 2020 or other outstanding years' reports via the Online Reporting Tool please see the links on this page listed below under the Online Reporting section.

Please note that mail services to our offices are suspended. Consequently, some normal IWIP functions will be delayed, such as mailing of notification postcards. IWIP staff will be sending reminder emails instead and will follow-up with facility contacts by phone to remind them to submit annual water use reports. If you mail your IWIP response, we recommend that you also call or email to let IWIP staff know you have submitted your response.

We acknowledge that some of you may be experiencing additional workload and changes in your own business practices, so please let us know if you need more time to report or extra assistance in generating your annual water user report. Be assured we are available to help, and please contact us with any questions you may have.

If you have any questions about IWIP, about 2019 water use reporting, or about ISWS operations, we encourage you to send us an email at [ISWS-](mailto:ISWS-@prairie.edu)

DuPage County



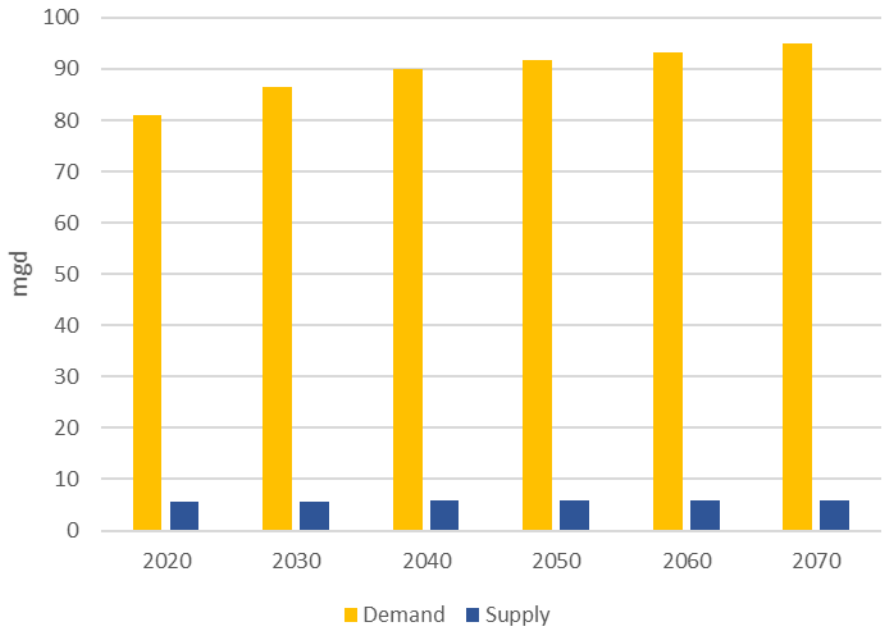
DuPage County

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

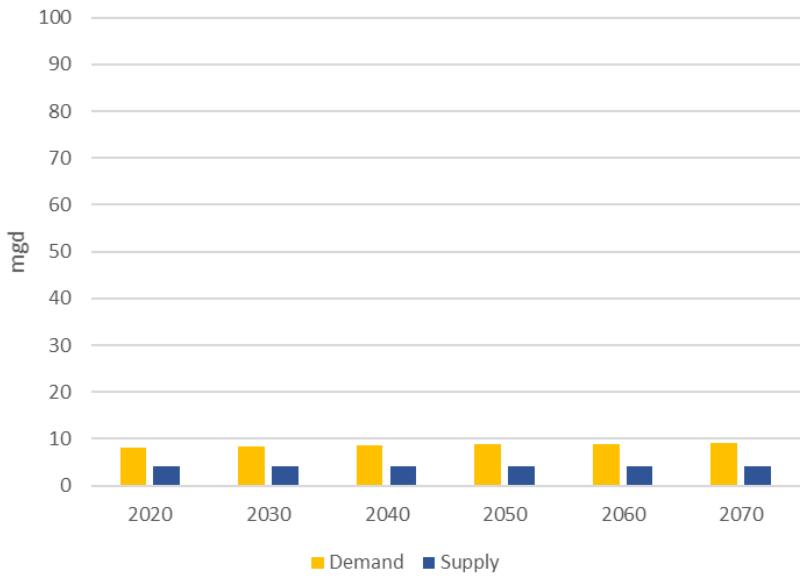
Example 1

Only sources within the county are considered for the sustainable supply

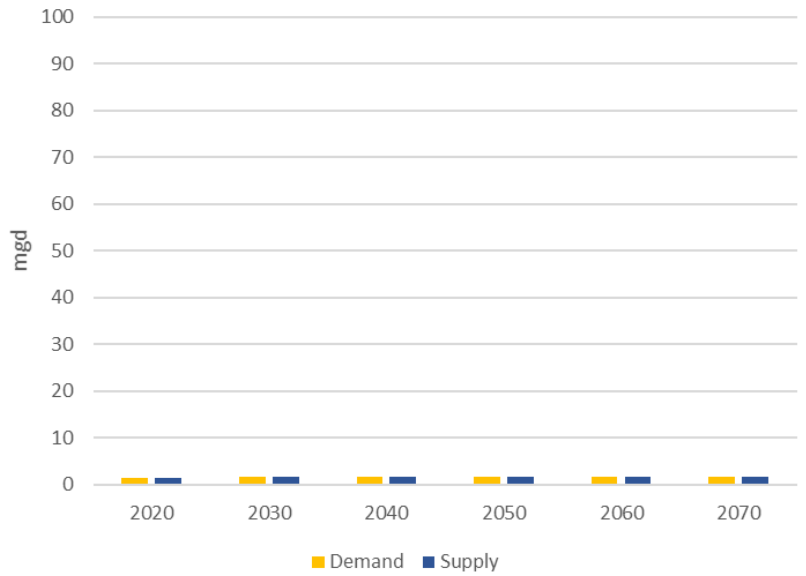
DuPage County



DuPage County (GW)

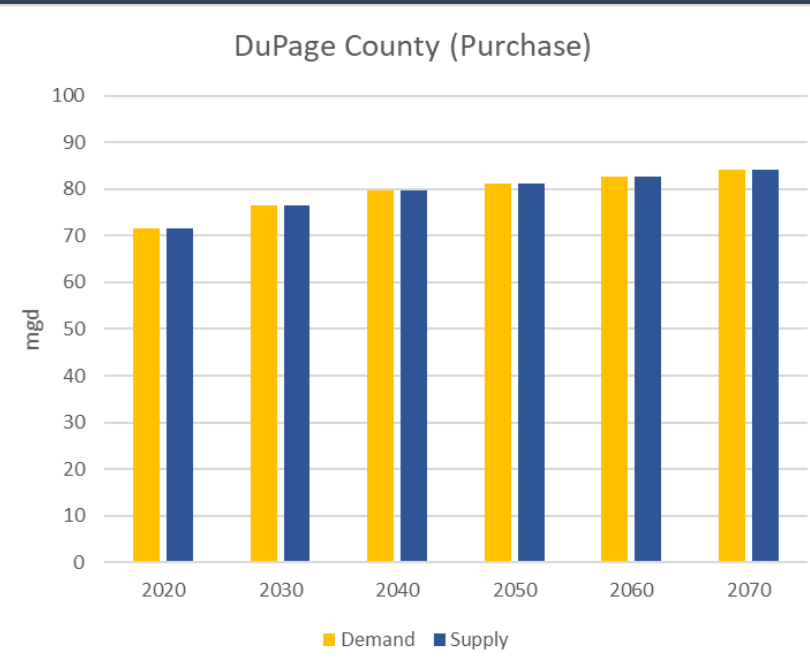
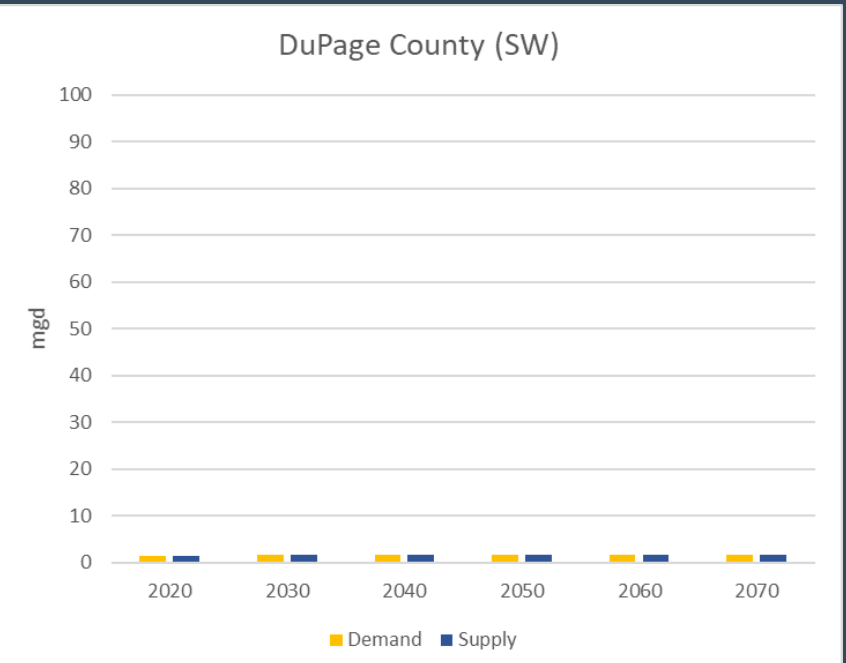
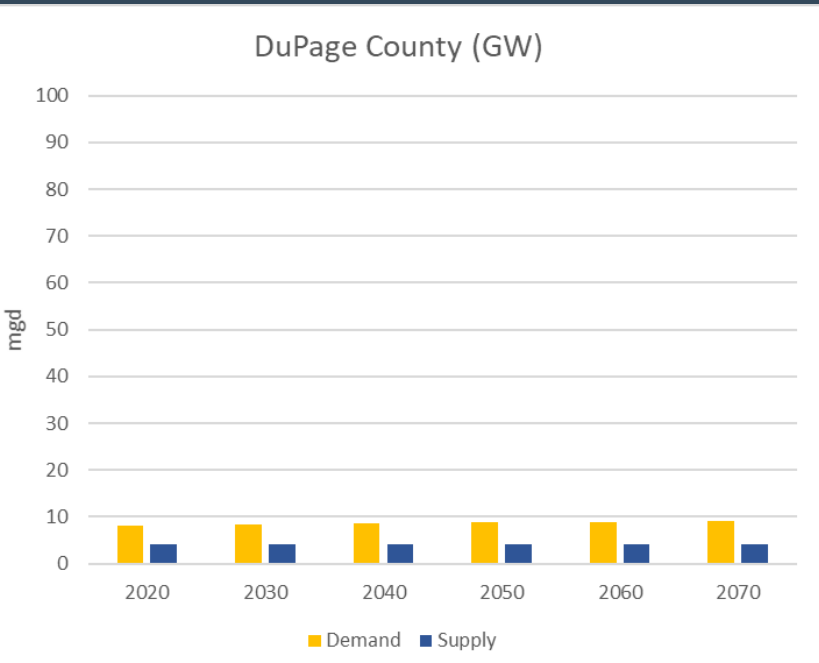
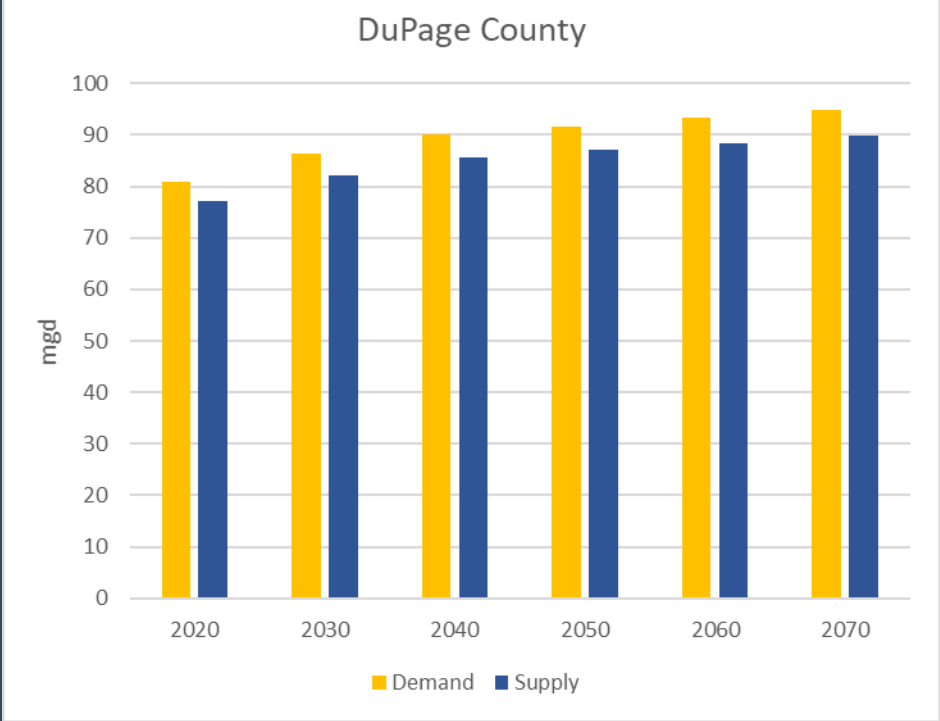


DuPage County (SW)



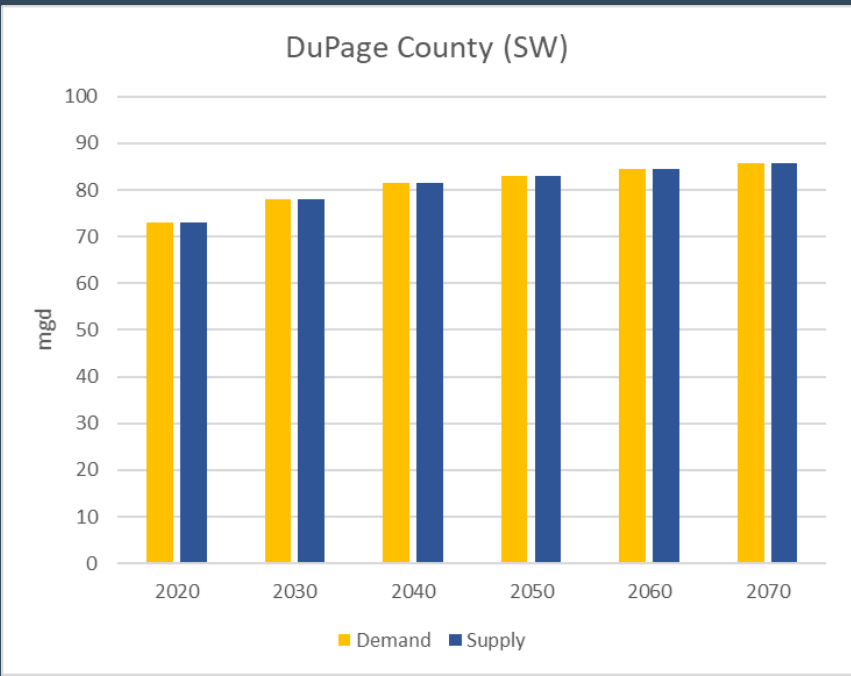
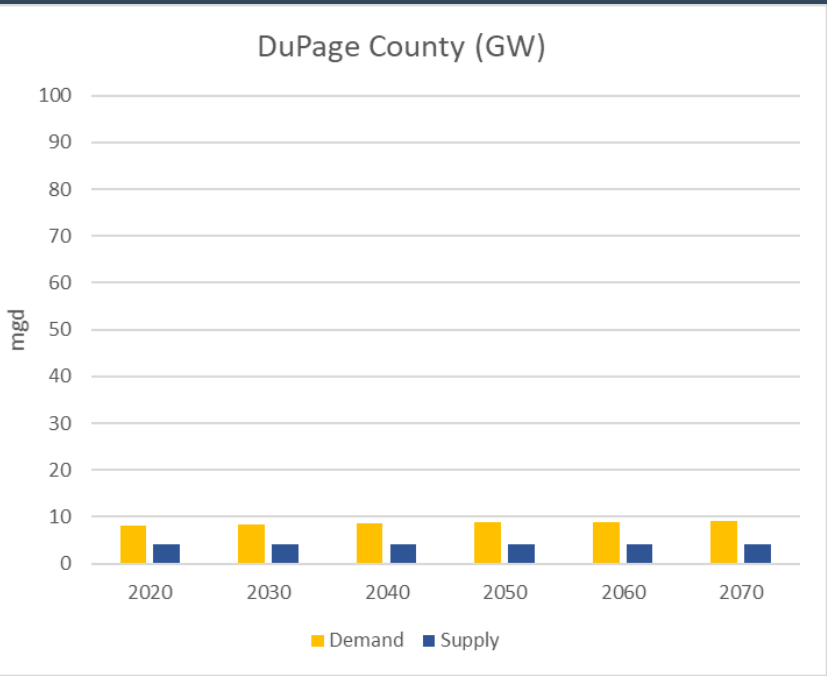
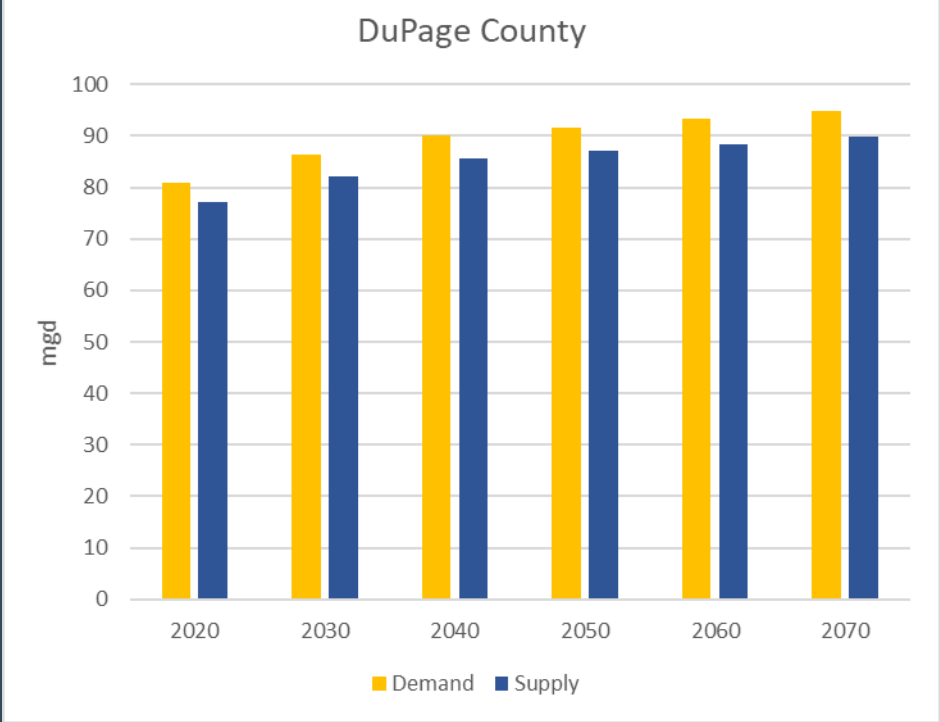
Example 2

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



Example 3

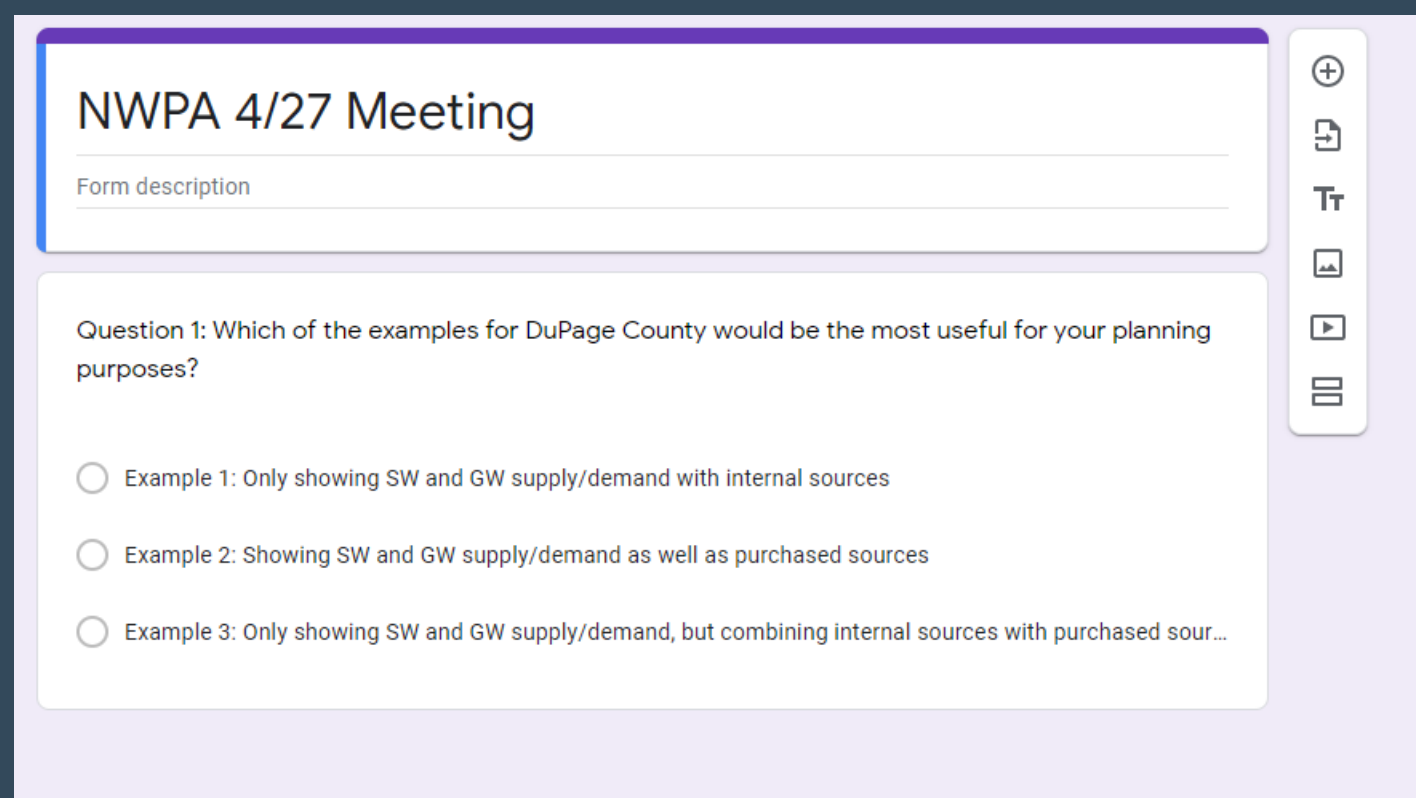
Purchases are not shown, only GW and SW regardless of the county of origin



Question 1

Let's jump to a poll question 1:

<https://forms.gle/oqZ5wYECV8htd1JE8>



NWPA 4/27 Meeting

Form description

Question 1: Which of the examples for DuPage County would be the most useful for your planning purposes?

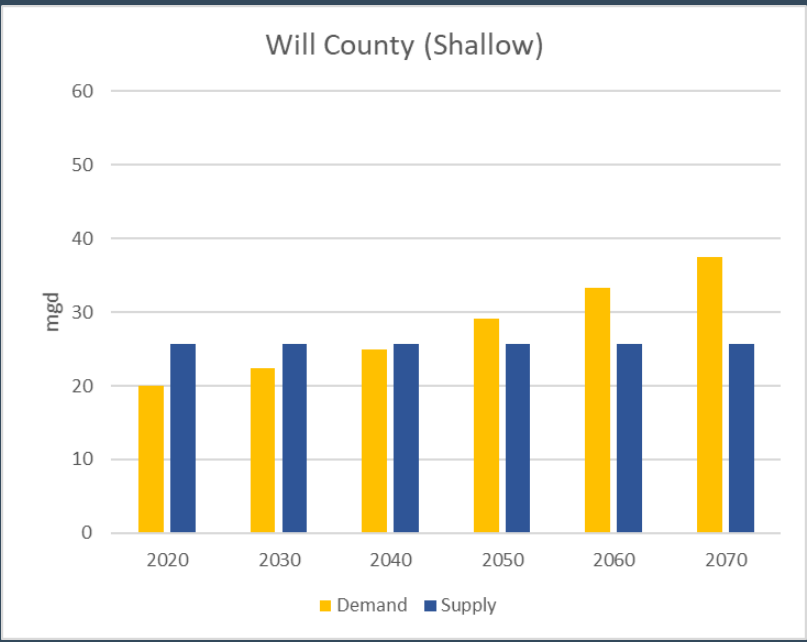
- Example 1: Only showing SW and GW supply/demand with internal sources
- Example 2: Showing SW and GW supply/demand as well as purchased sources
- Example 3: Only showing SW and GW supply/demand, but combining internal sources with purchased sour...

Another observation from Will County

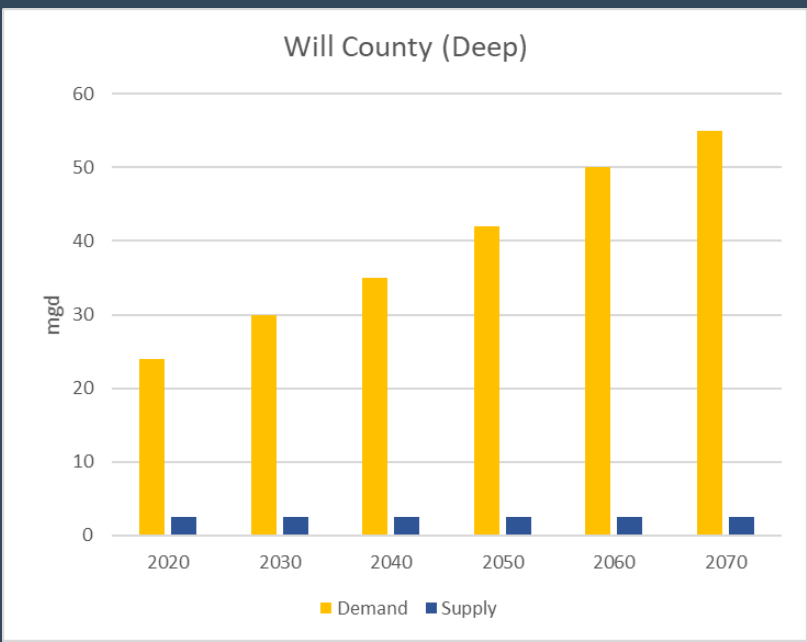
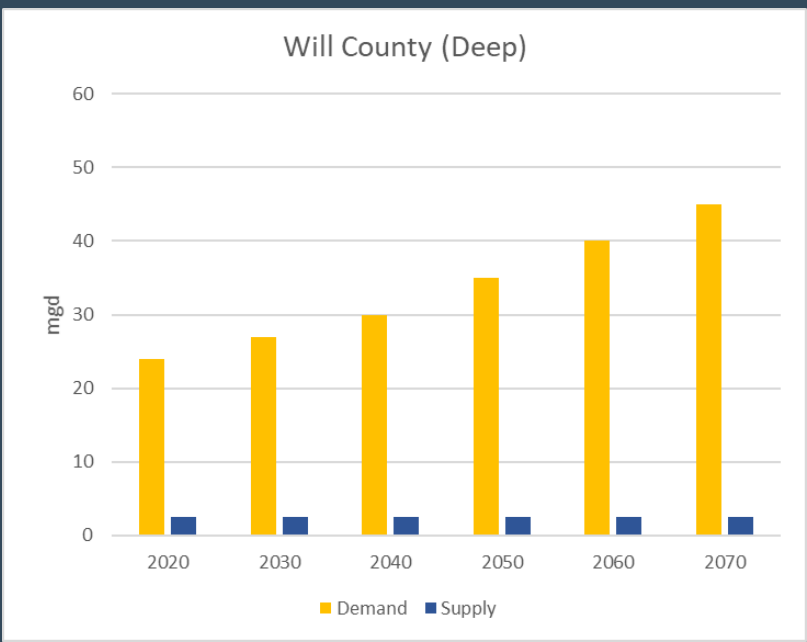
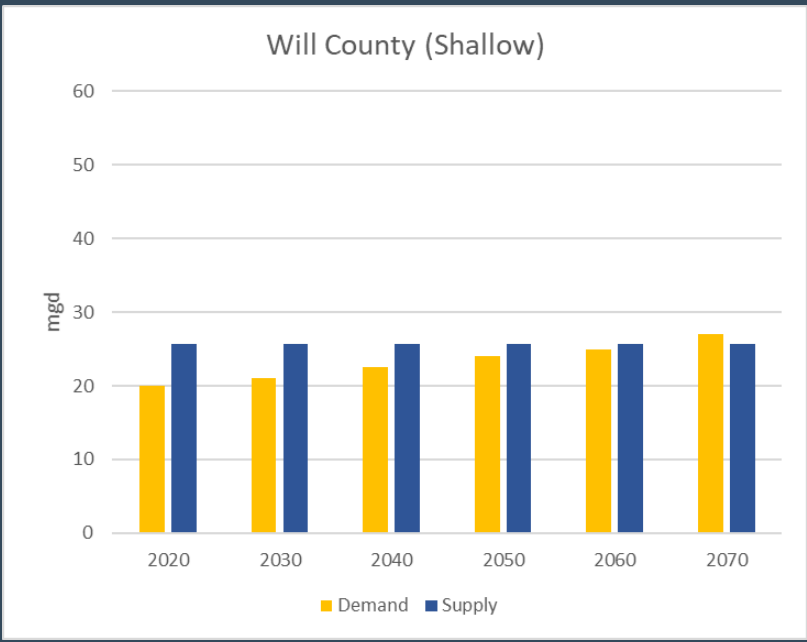
Due to rising chloride and concerns over emerging contaminants, many communities had plans to transition off their shallow wells

Hypothetical example using Tier 1 analyses

Original



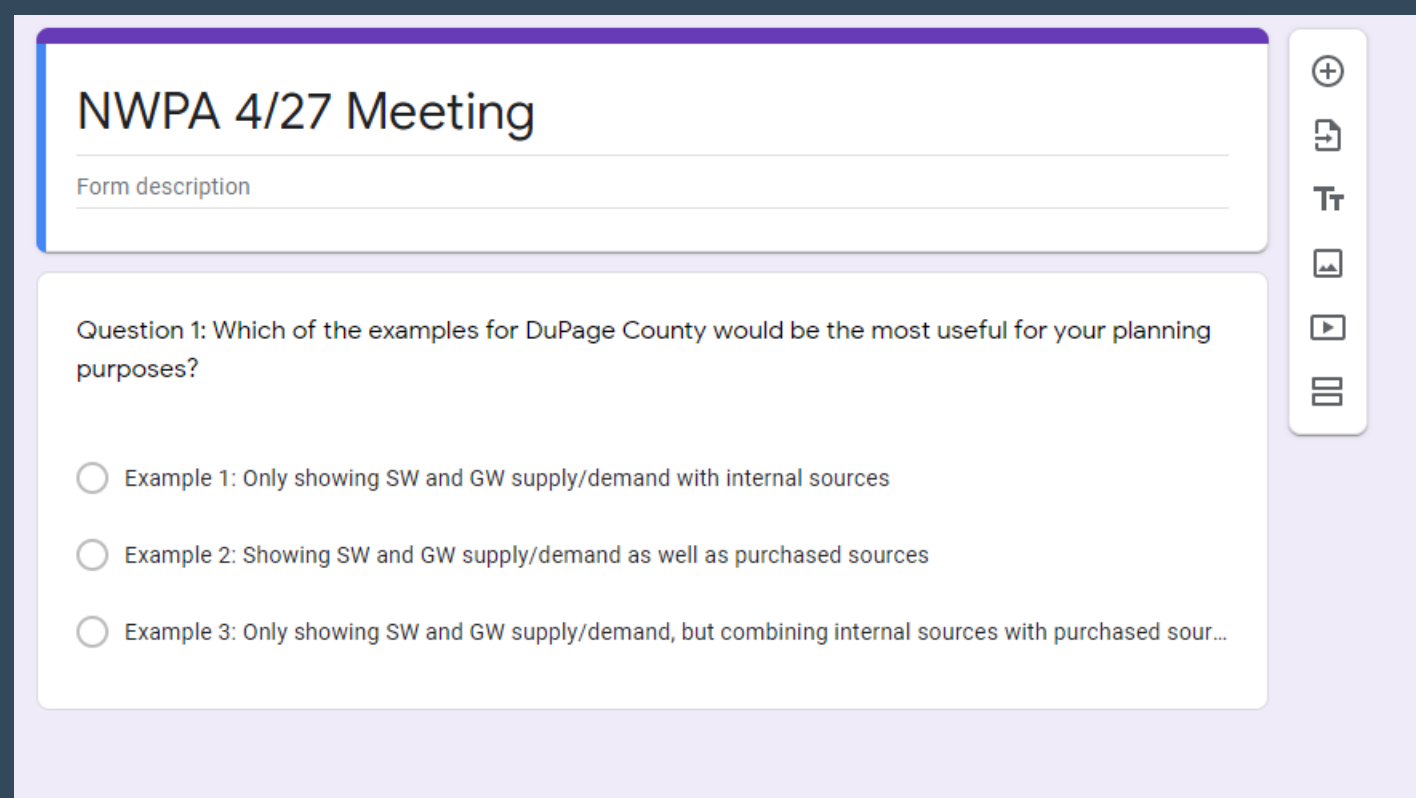
Shifting Usage



Question 2

Let's jump to a poll question 2:

<https://forms.gle/oqZ5wYECV8htd1JE8>



NWPA 4/27 Meeting

Form description

Question 1: Which of the examples for DuPage County would be the most useful for your planning purposes?

- Example 1: Only showing SW and GW supply/demand with internal sources
- Example 2: Showing SW and GW supply/demand as well as purchased sources
- Example 3: Only showing SW and GW supply/demand, but combining internal sources with purchased sour...

Overview of supply methodologies

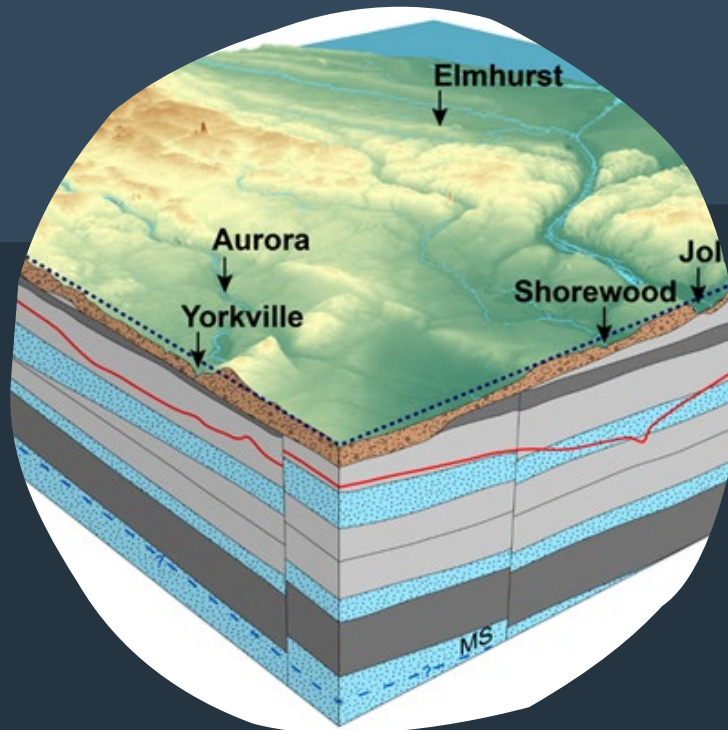
1. Provide an overview of methods to determine demand
2. Provide an overview of methods to determine supply for shallow aquifers, sandstone aquifers, and rivers
3. Solicit feedback on approaches and needed improvements

Overview of supply methodologies

Shallow Aquifer



Deep Sandstone

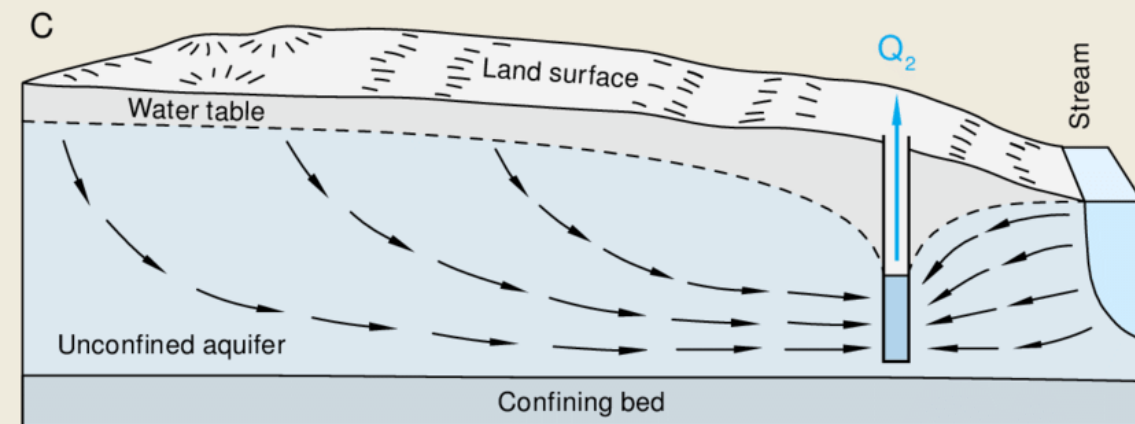
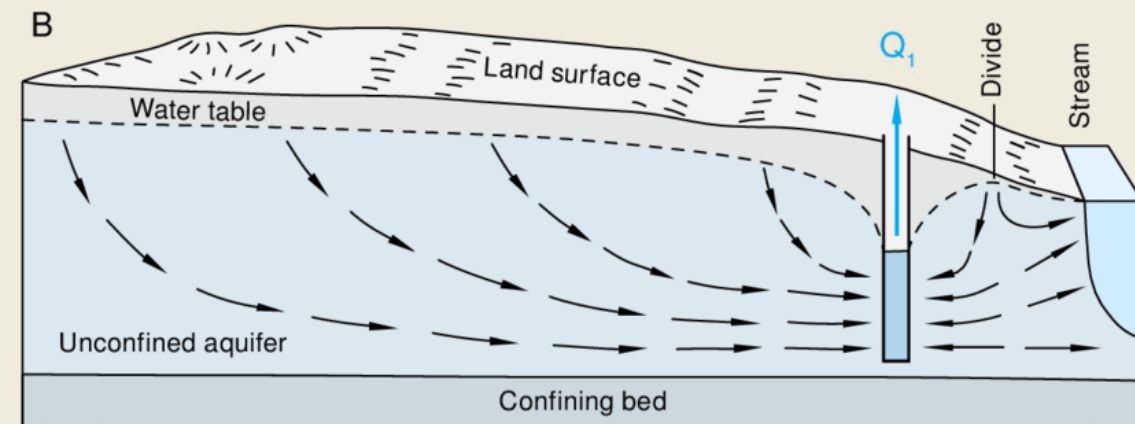
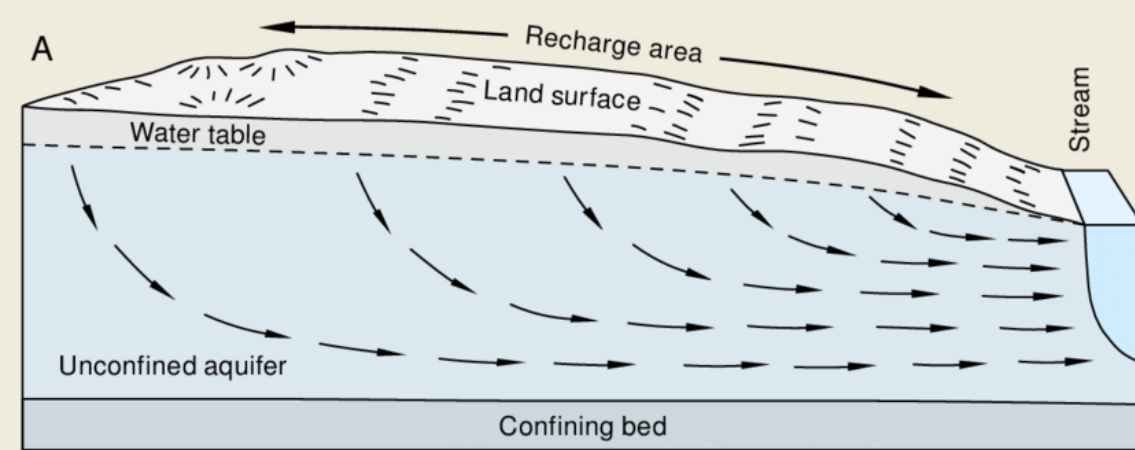


Fox River



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

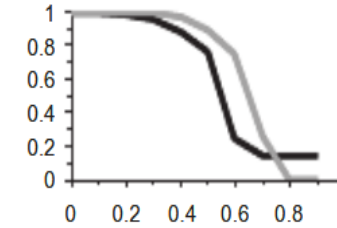
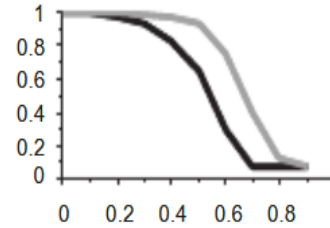


Why 10%?

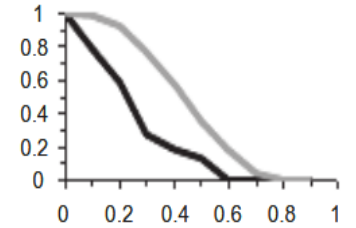
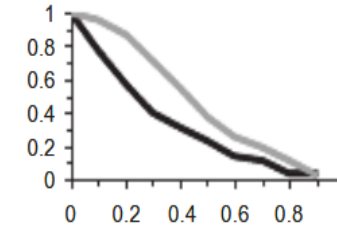
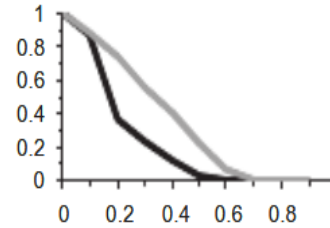
Zorn et al (2012) remains the most relevant study I have found looking at the impact of reduced natural groundwater discharge on fish communities.

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

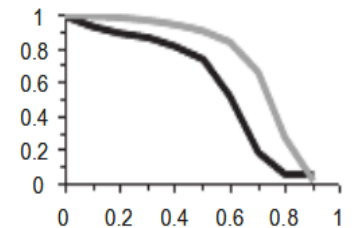
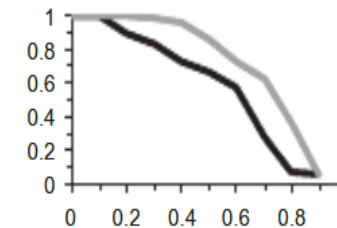
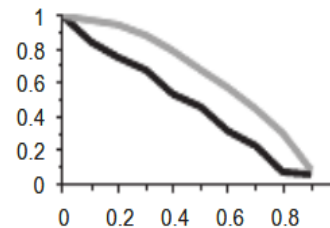
Cold



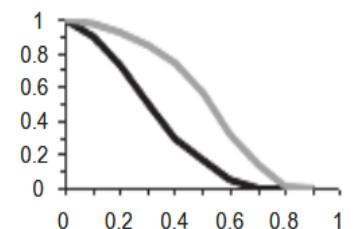
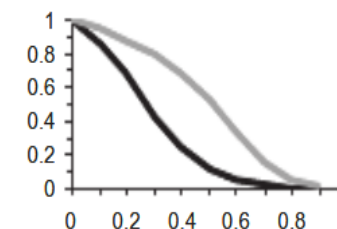
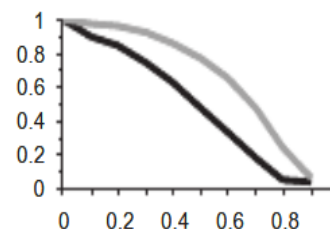
C-Trans



W-Trans



Warm



Streams

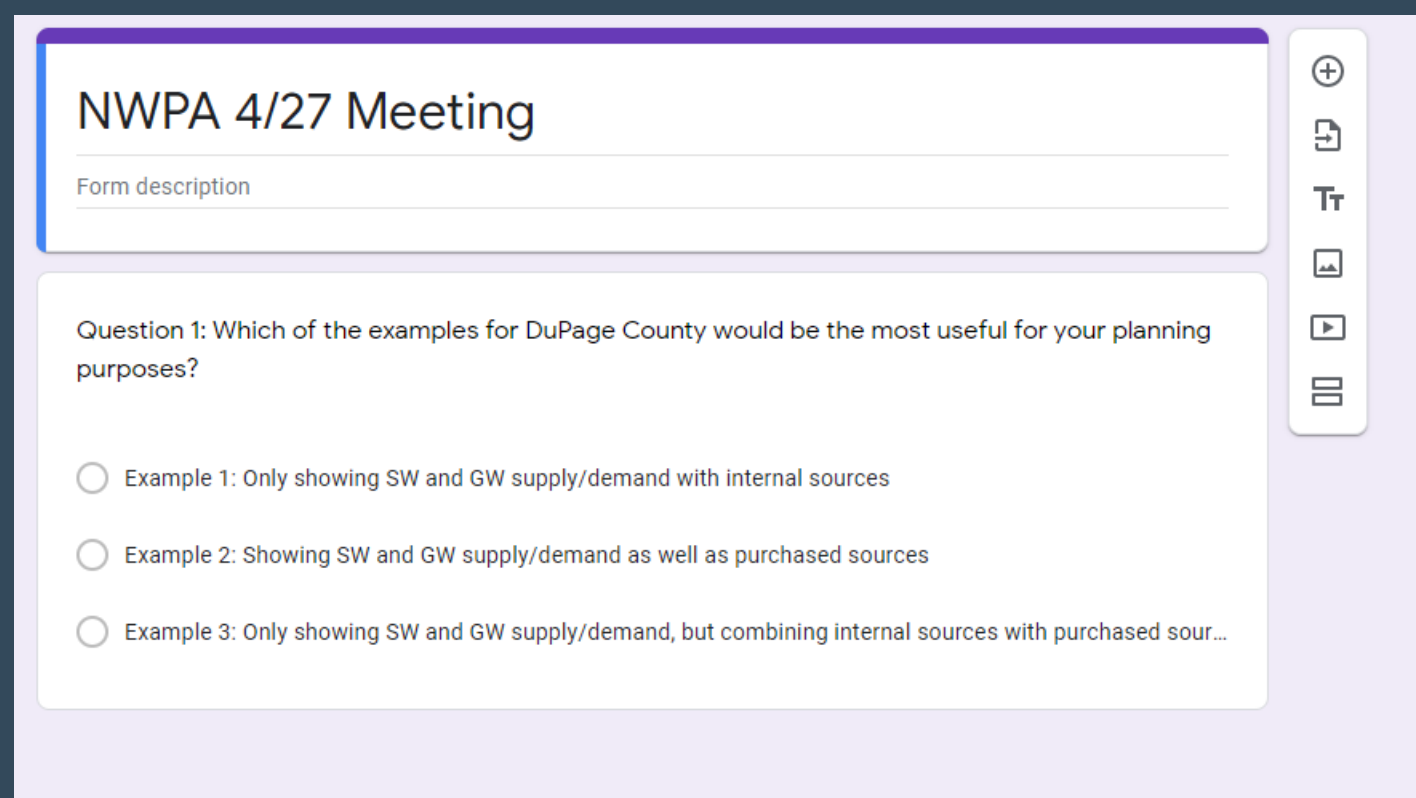
Sm Rivers

Lg Rivers

Question 3

Let's jump to a poll question 3:

<https://forms.gle/oqZ5wYECV8htd1JE8>

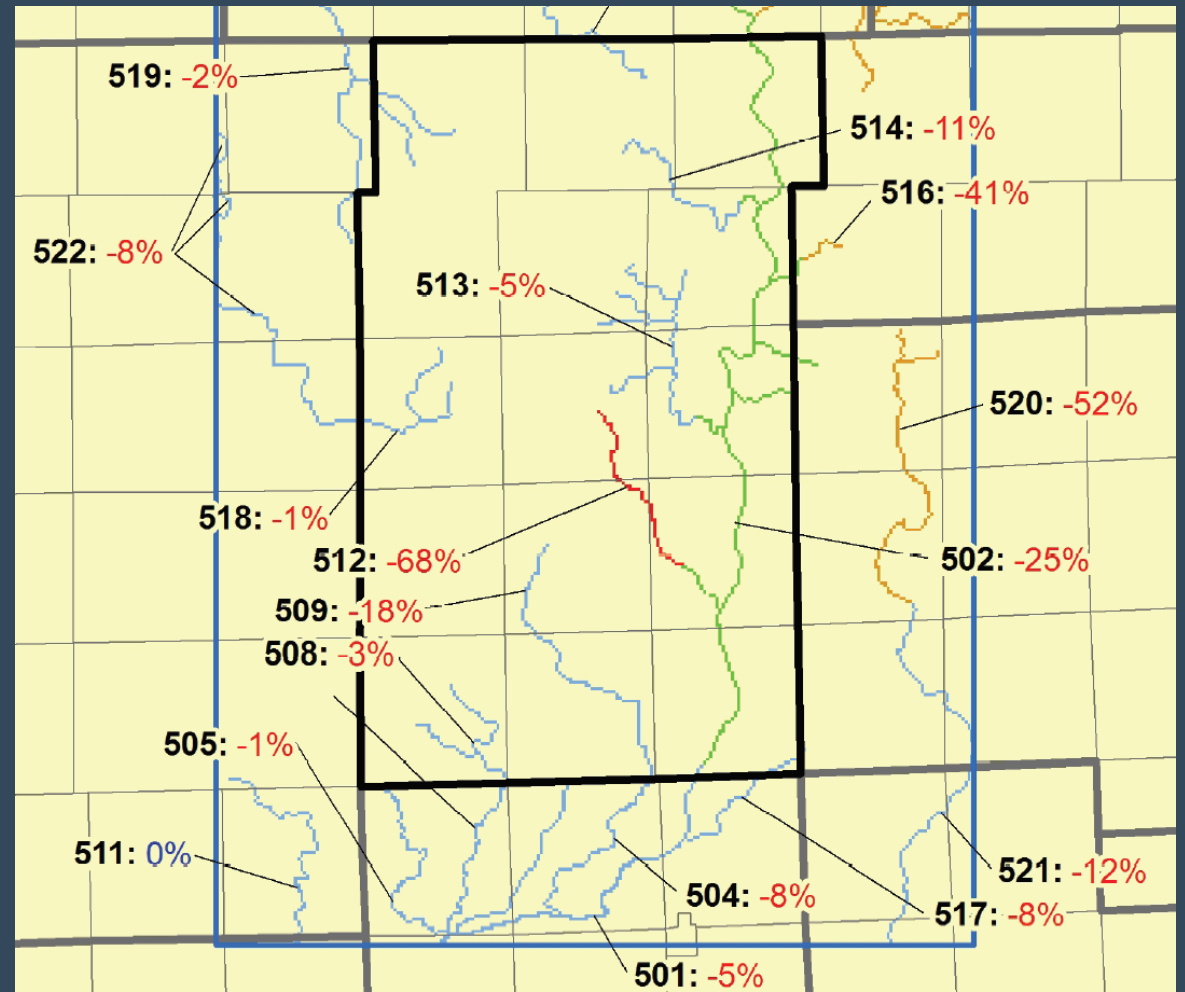
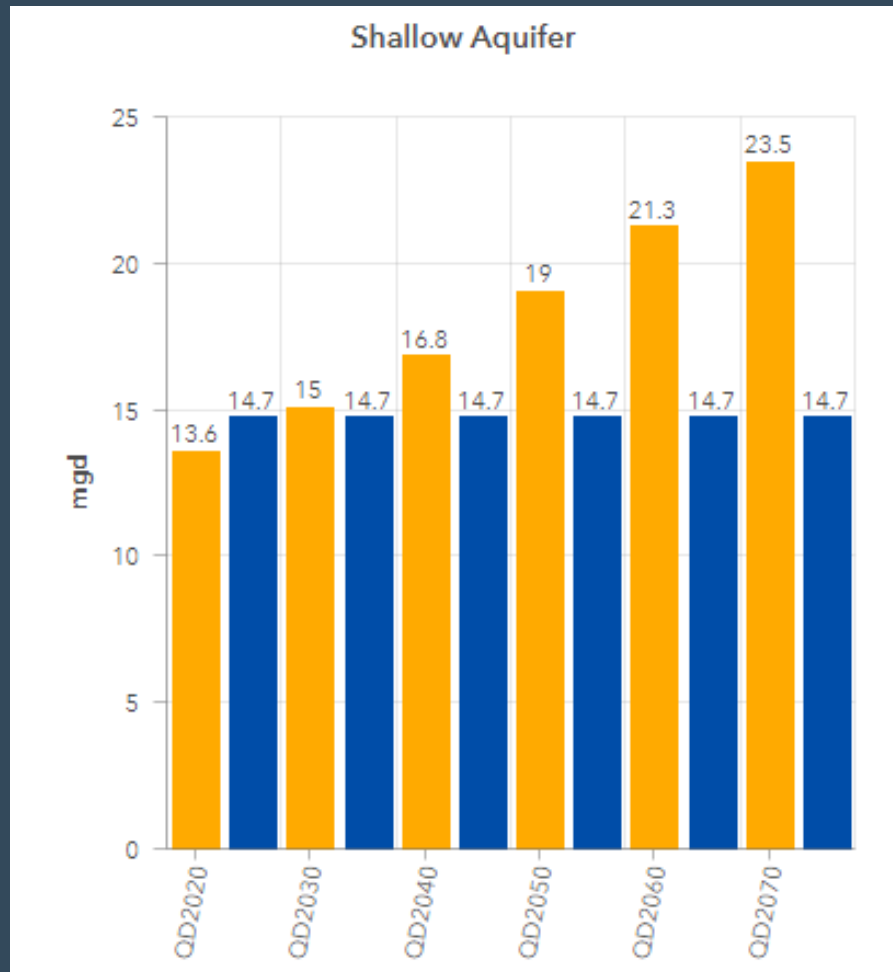


The screenshot shows a Google Forms interface. At the top, the title 'NWPA 4/27 Meeting' is displayed in a large, bold font. Below the title is a section for 'Form description'. The main content area contains a poll question: 'Question 1: Which of the examples for DuPage County would be the most useful for your planning purposes?'. There are three radio button options listed below the question:

- Example 1: Only showing SW and GW supply/demand with internal sources
- Example 2: Showing SW and GW supply/demand as well as purchased sources
- Example 3: Only showing SW and GW supply/demand, but combining internal sources with purchased sour...

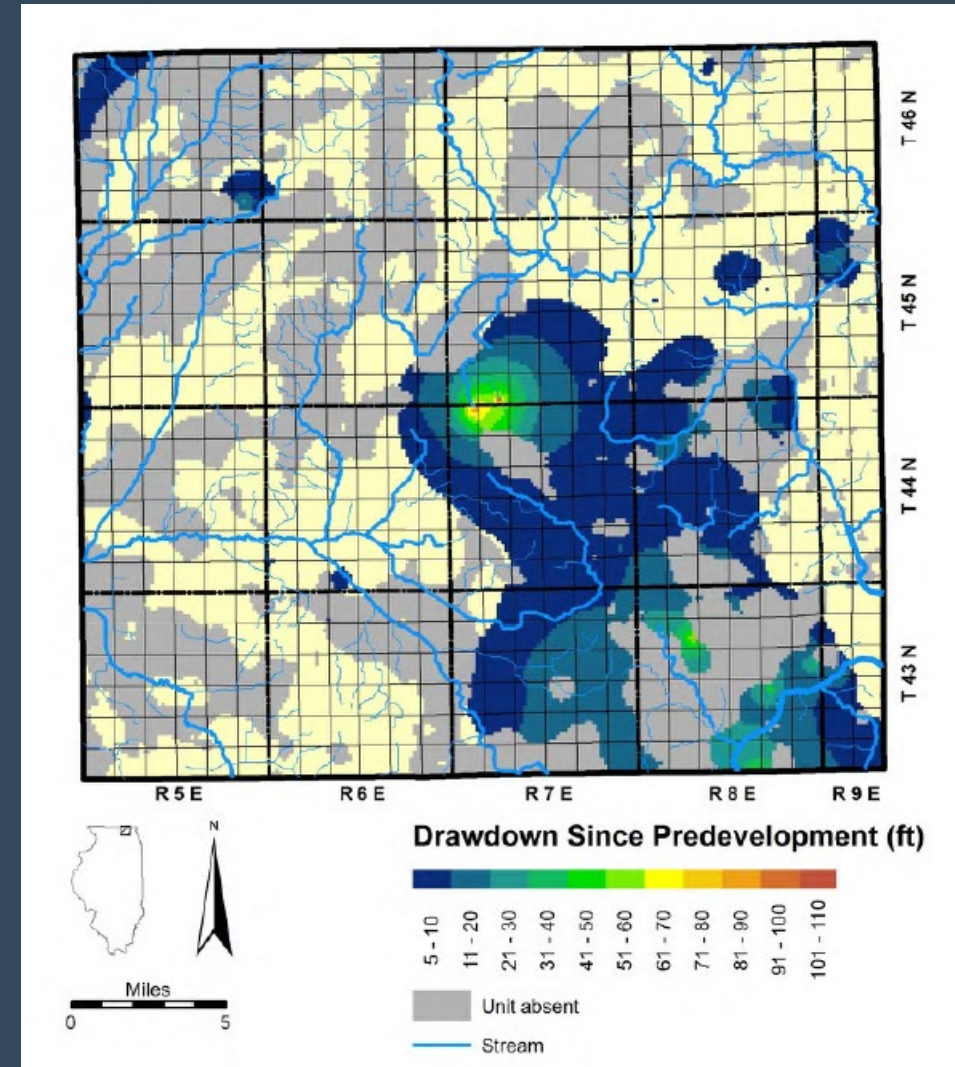
On the right side of the form, there is a vertical toolbar with icons for adding, deleting, duplicating, and other editing functions.

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



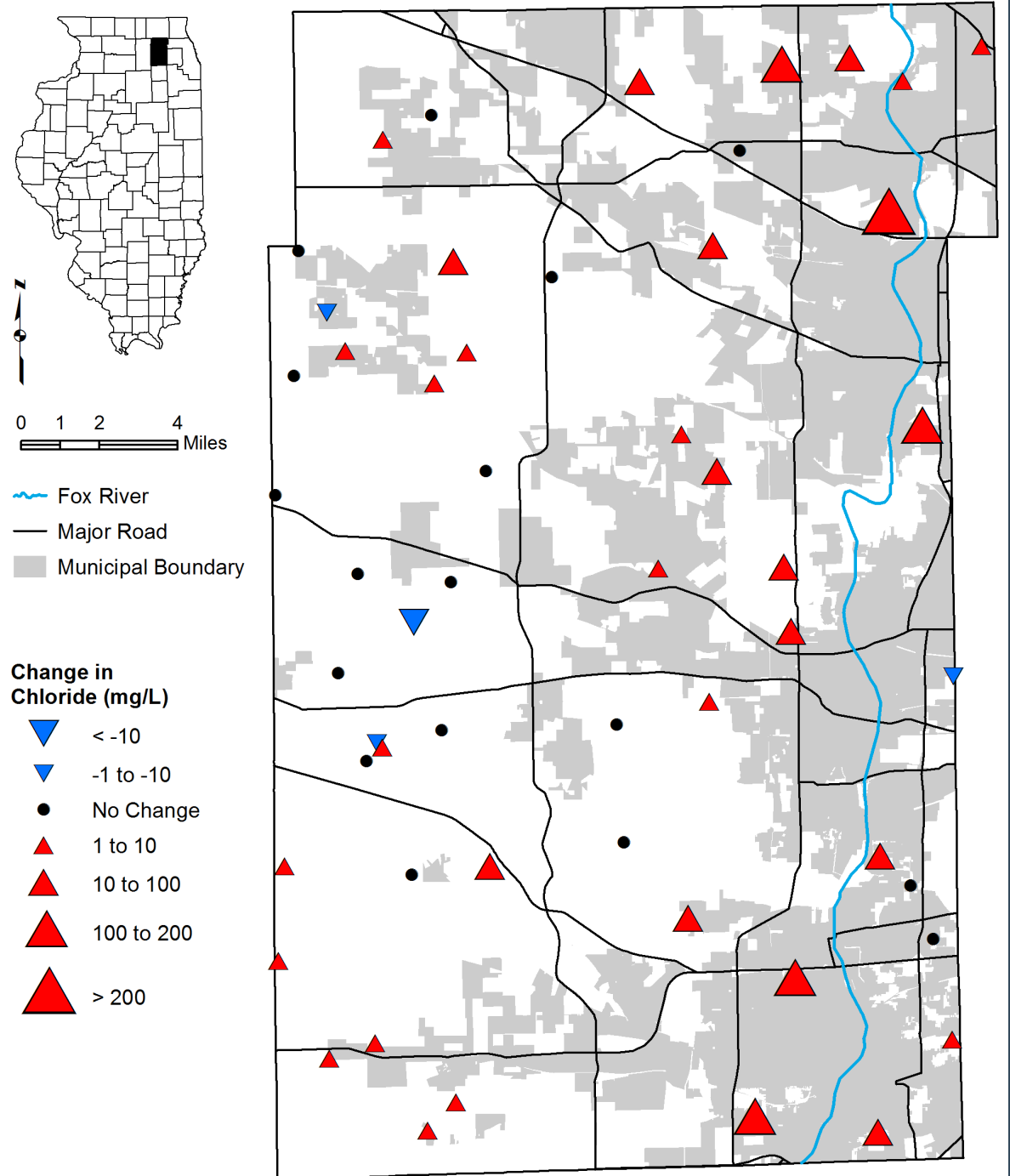
Other shallow considerations?

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



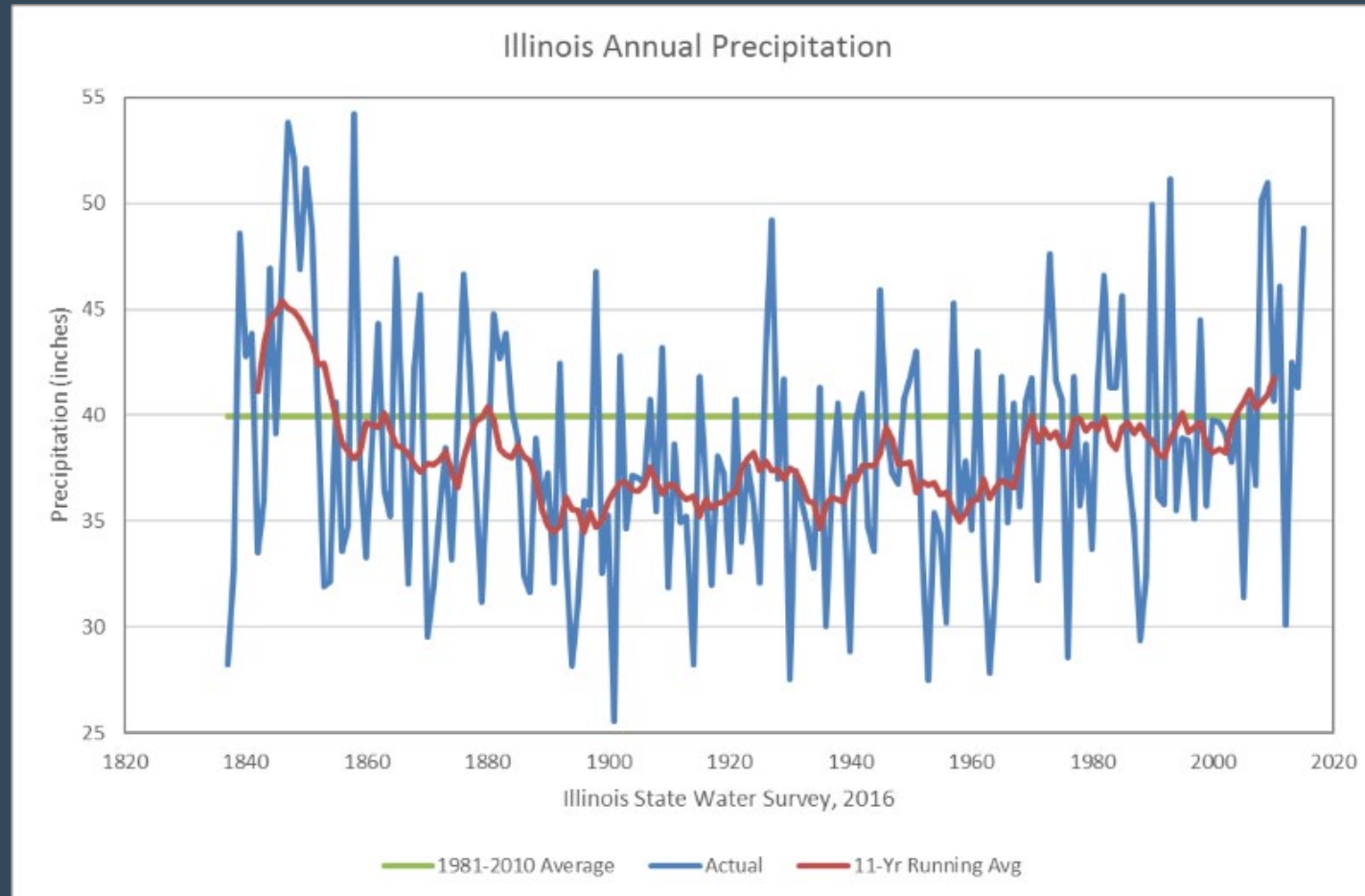
Other shallow considerations?

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



Other shallow considerations?

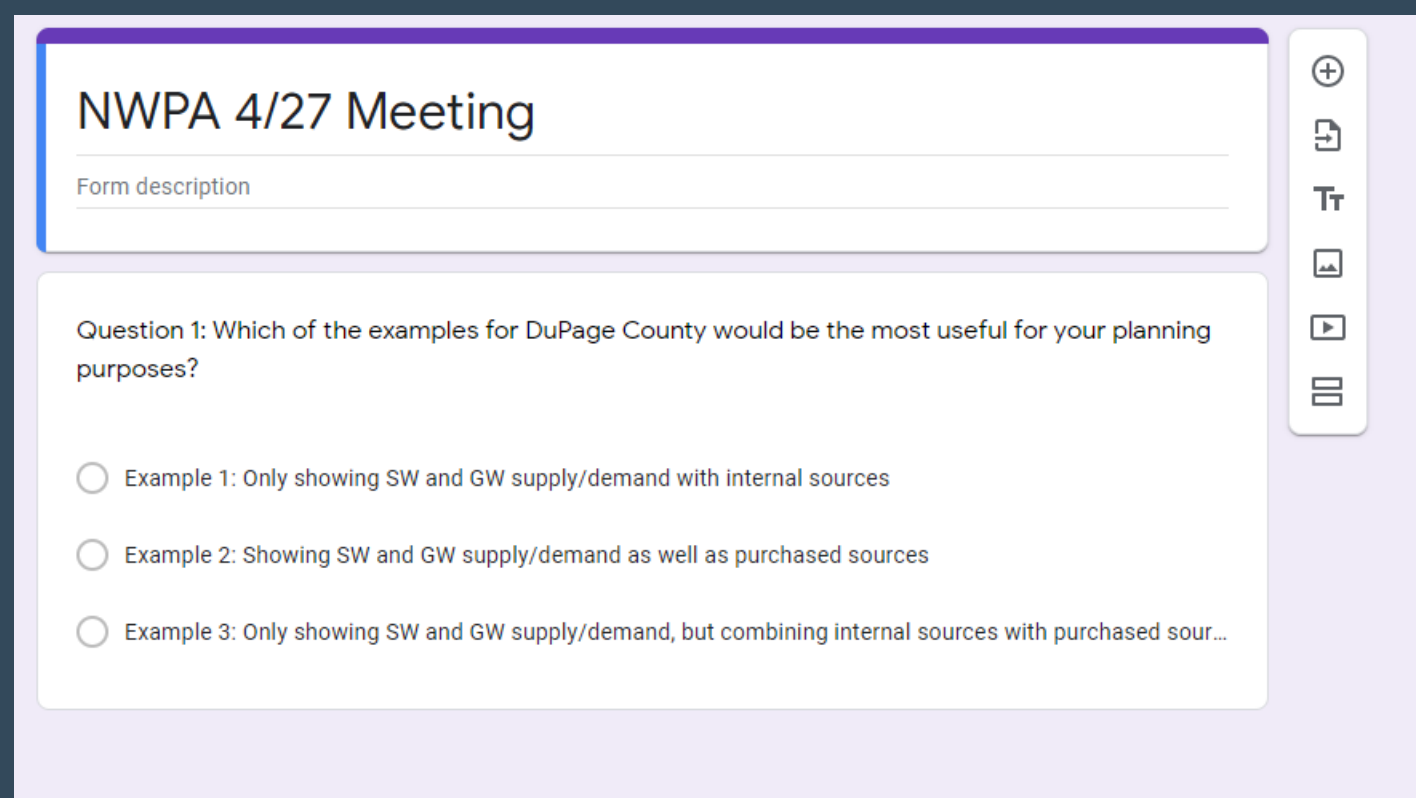
1. Withdrawals resulting in drawdown
2. Water quality issues (i.e. chloride)
3. Increasing recharge/river elevations



Question 4

Let's jump to a poll question 4:

<https://forms.gle/oqZ5wYECV8htd1JE8>

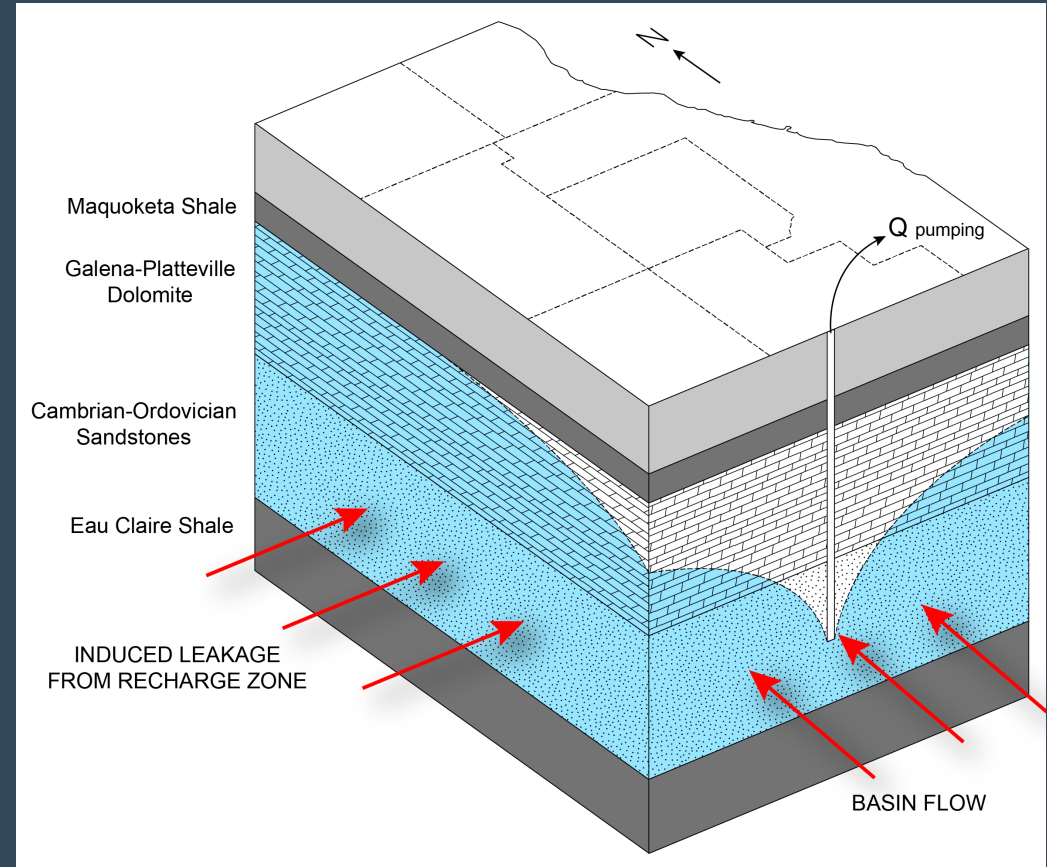
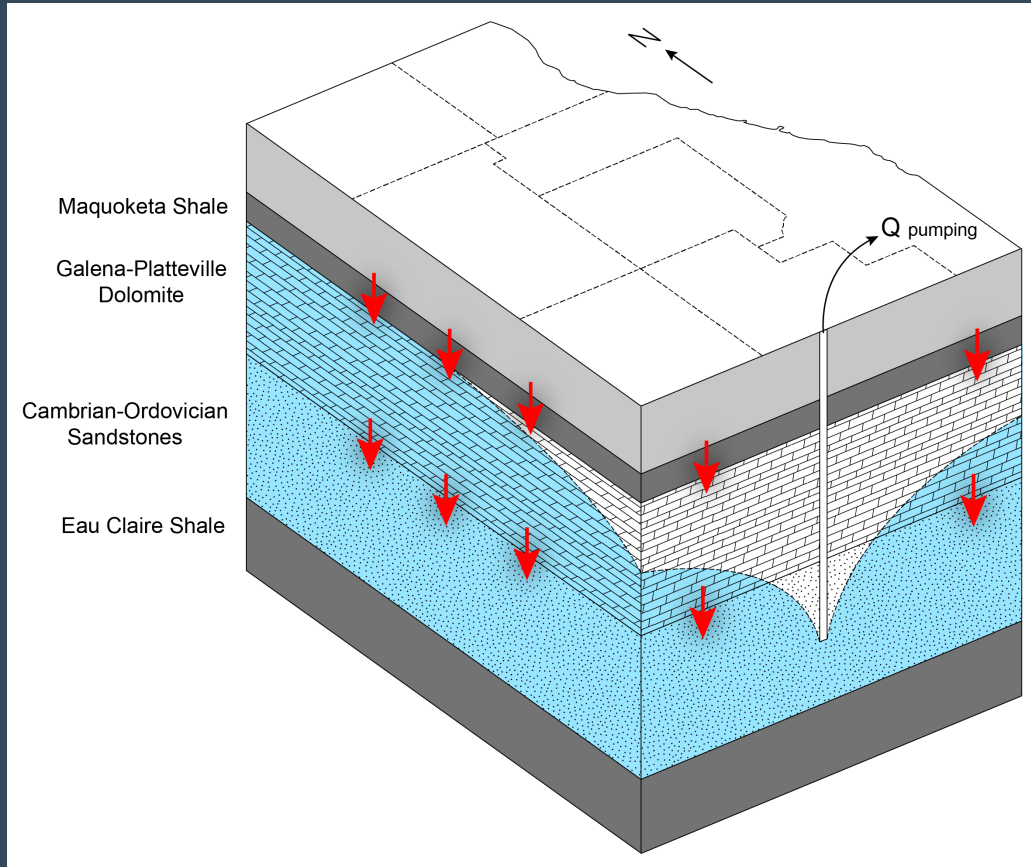


The screenshot shows a Google Forms interface. At the top, the form title is "NWPA 4/27 Meeting". Below the title is a section for "Form description". The main content of the form is a poll question: "Question 1: Which of the examples for DuPage County would be the most useful for your planning purposes?". There are three radio button options:

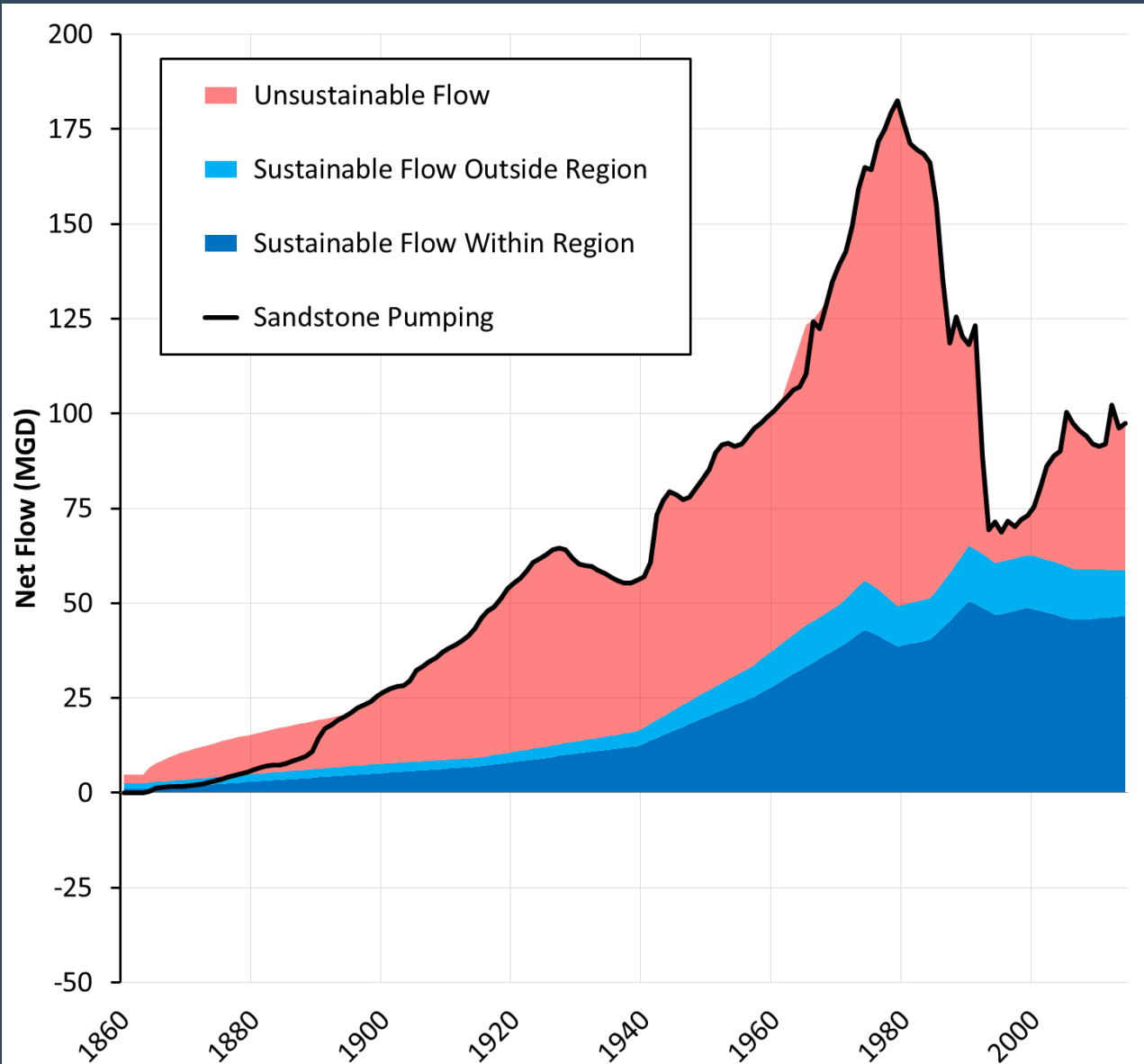
- Example 1: Only showing SW and GW supply/demand with internal sources
- Example 2: Showing SW and GW supply/demand as well as purchased sources
- Example 3: Only showing SW and GW supply/demand, but combining internal sources with purchased sour...

On the right side of the form, there is a vertical toolbar with icons for adding, deleting, moving, and other editing functions.

Sandstone sustainability



Sandstone sustainability



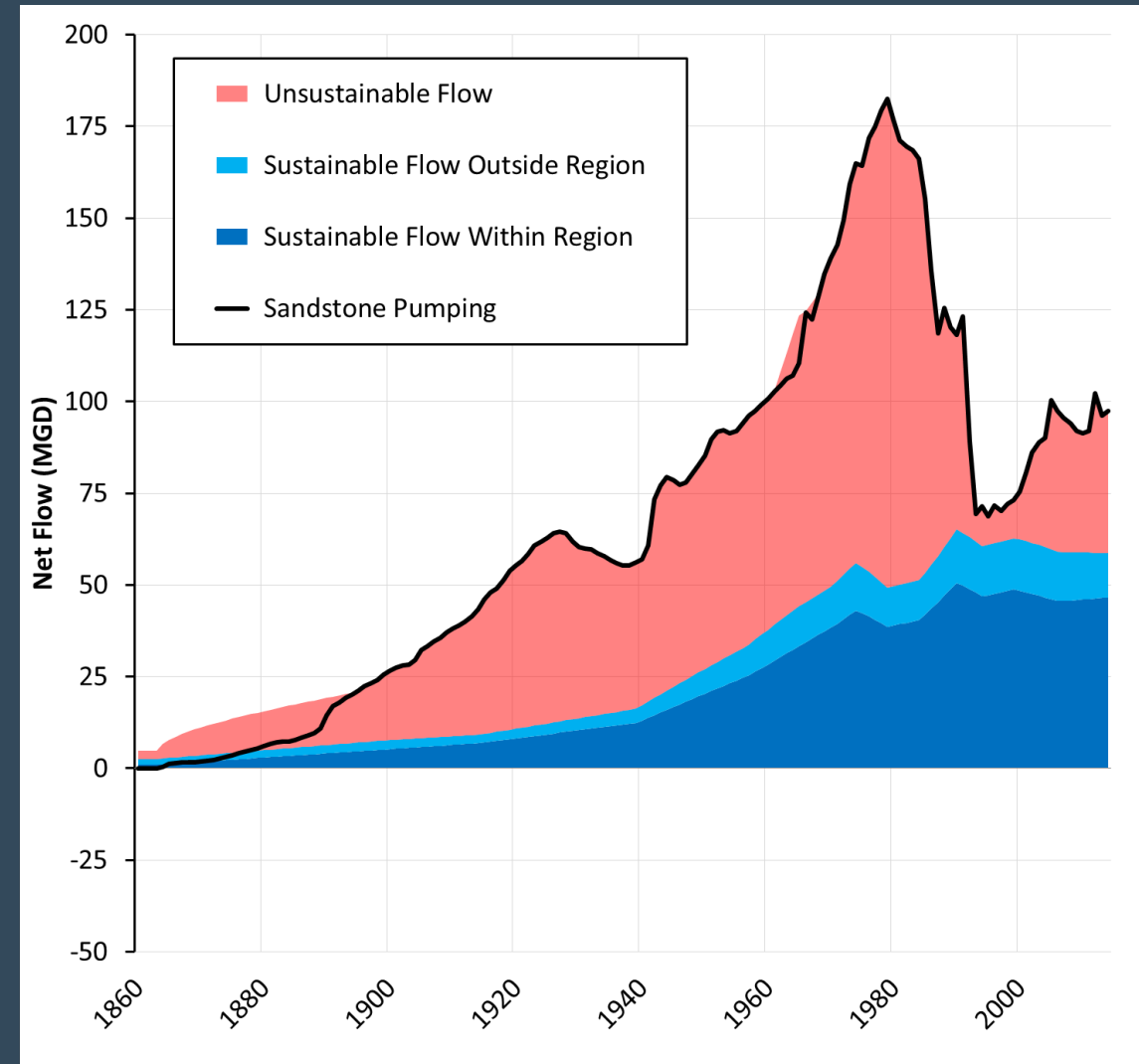
All other sources are taking water from elsewhere or coming from a source that is either of poor water quality or not readily recharged

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



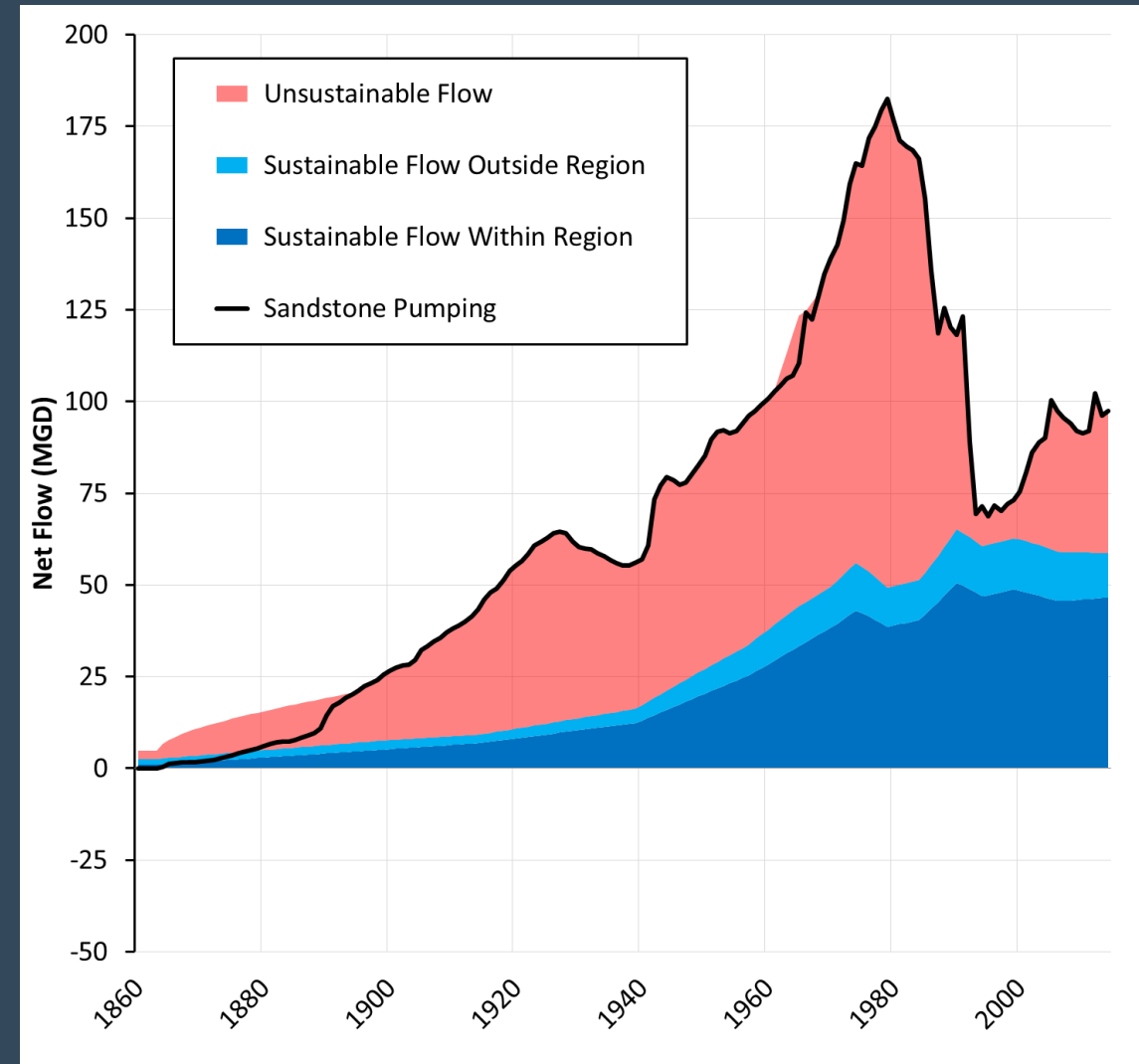
Three metrics: Maximum Sustainable Leakage

- 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



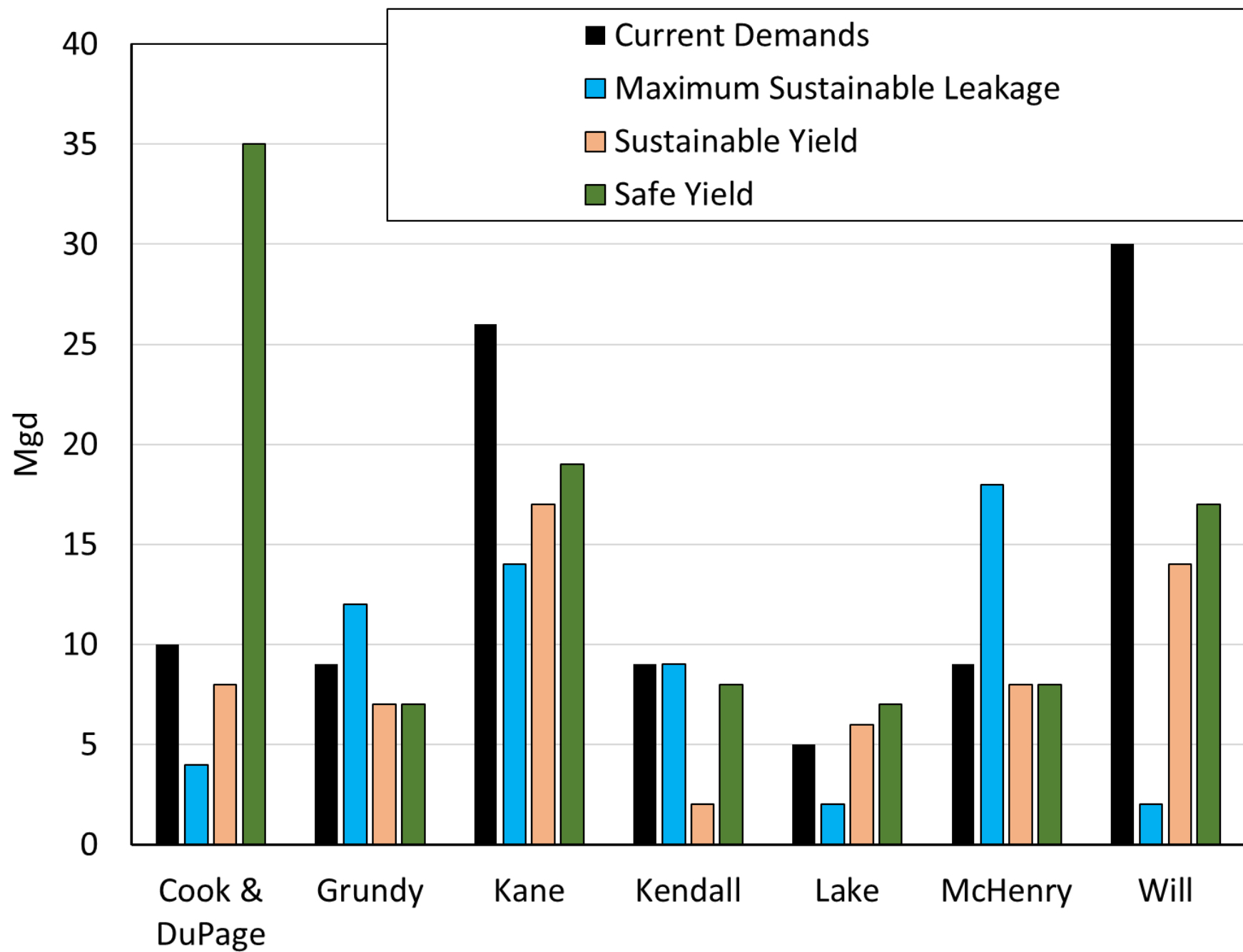
Three metrics: Sustainable Yield

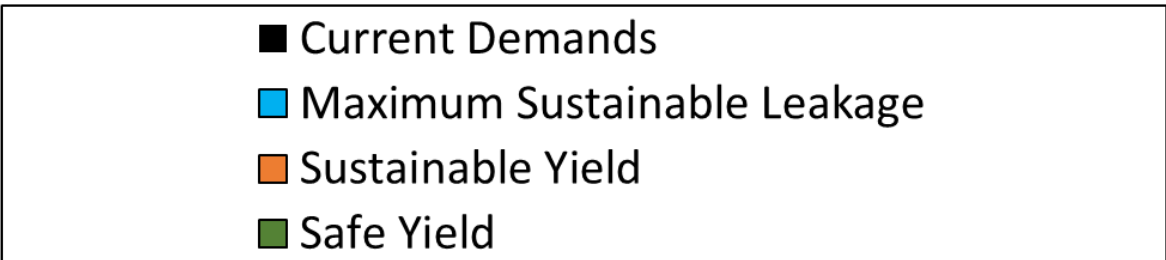
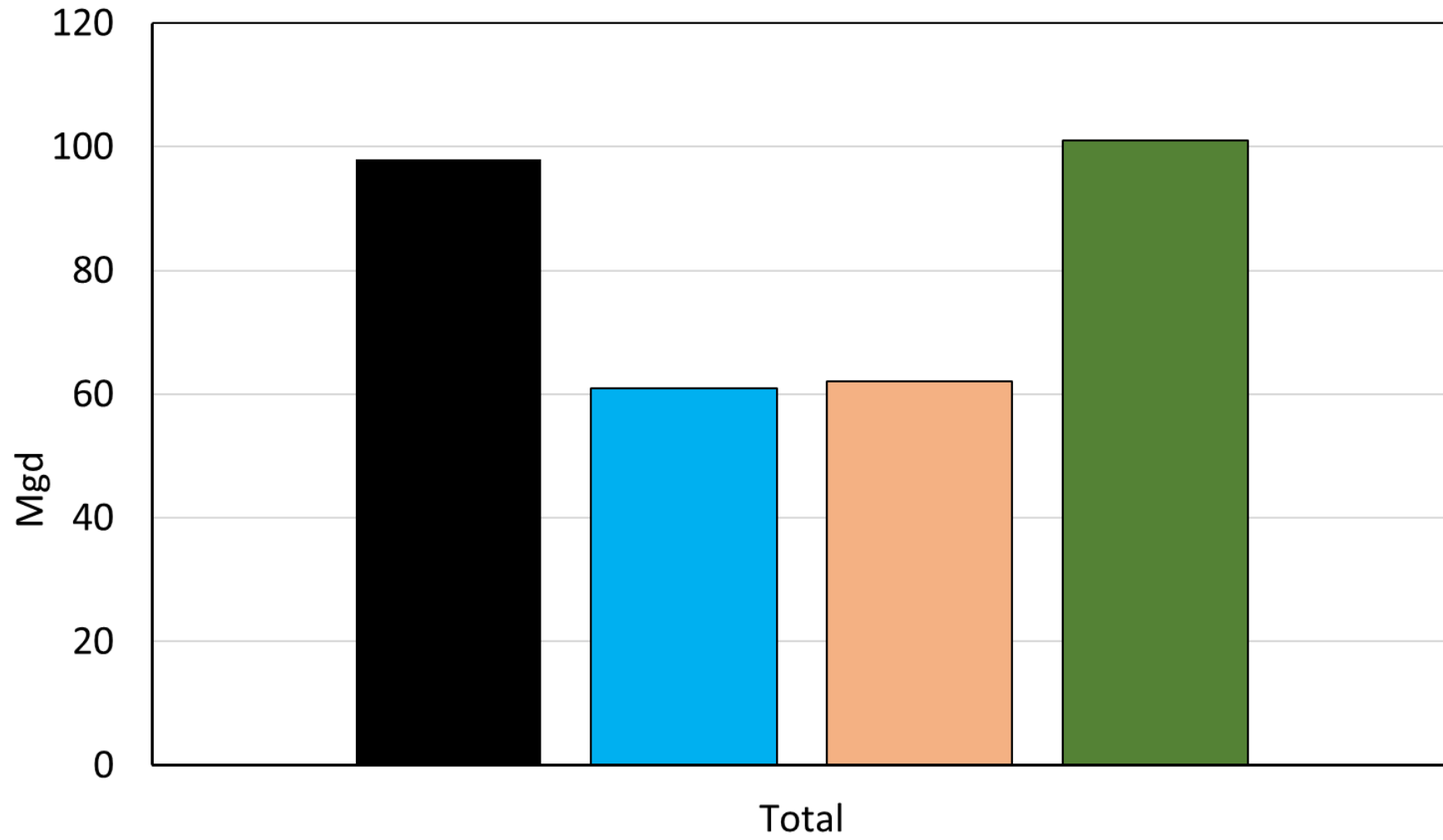
- a) Methodology: Using current gradients, sum the vertical and horizontal inflow/outflow of the sandstone. Horizontal inflow is limited to water originating from natural recharge sources.
- b) Benefit: Most grounded in reality (based off of current pumping conditions and gradients)
- c) Problem: Reducing 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.

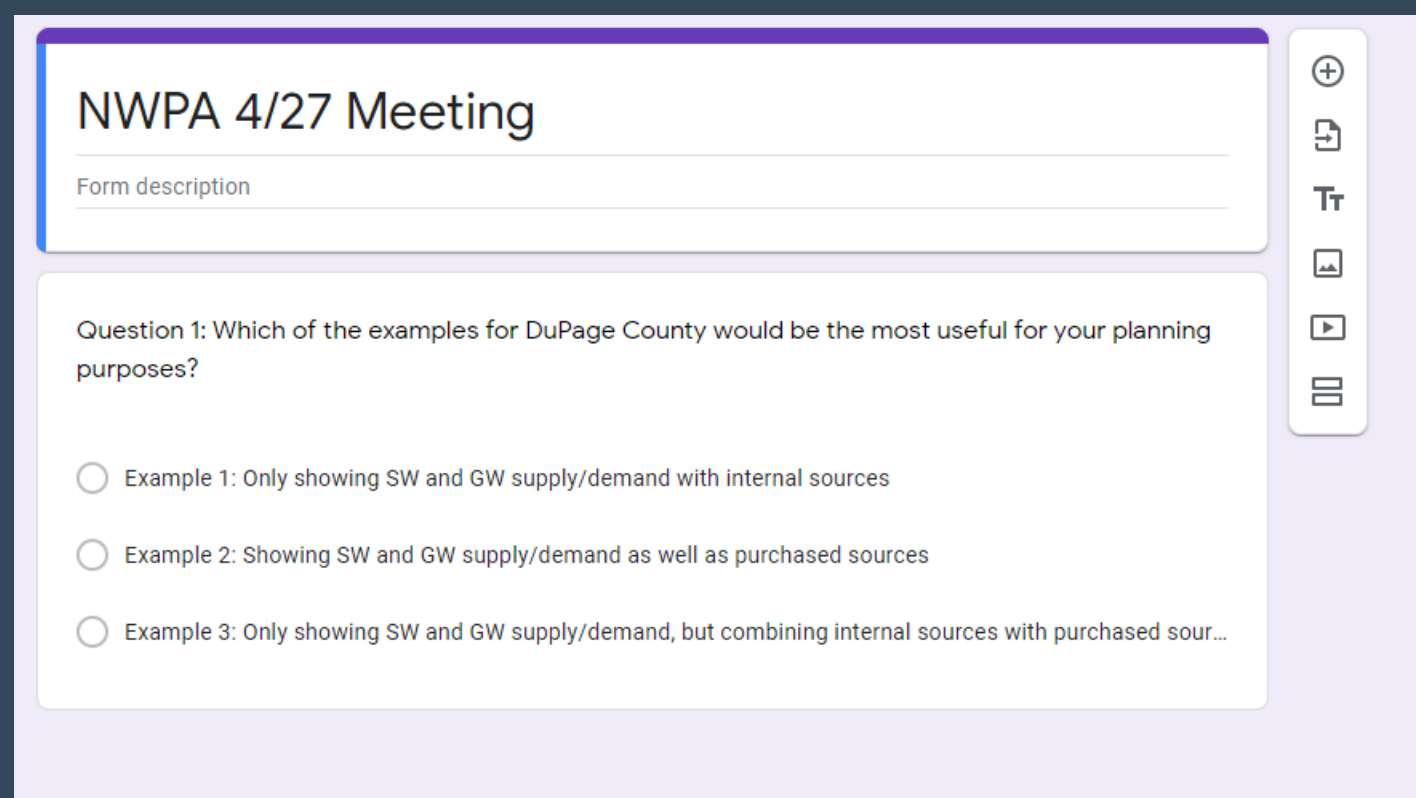




Question 5

Let's jump to a poll question 5:

<https://forms.gle/oqZ5wYECV8htd1JE8>



NWPA 4/27 Meeting

Form description

Question 1: Which of the examples for DuPage County would be the most useful for your planning purposes?

- Example 1: Only showing SW and GW supply/demand with internal sources
- Example 2: Showing SW and GW supply/demand as well as purchased sources
- Example 3: Only showing SW and GW supply/demand, but combining internal sources with purchased sour...

Future discussion: Surface Water

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