

# Water Demand vs. Water Availability: Revisiting Sustainable Yield in Northeast Illinois



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**Daniel Abrams**  
**George Roadcap**

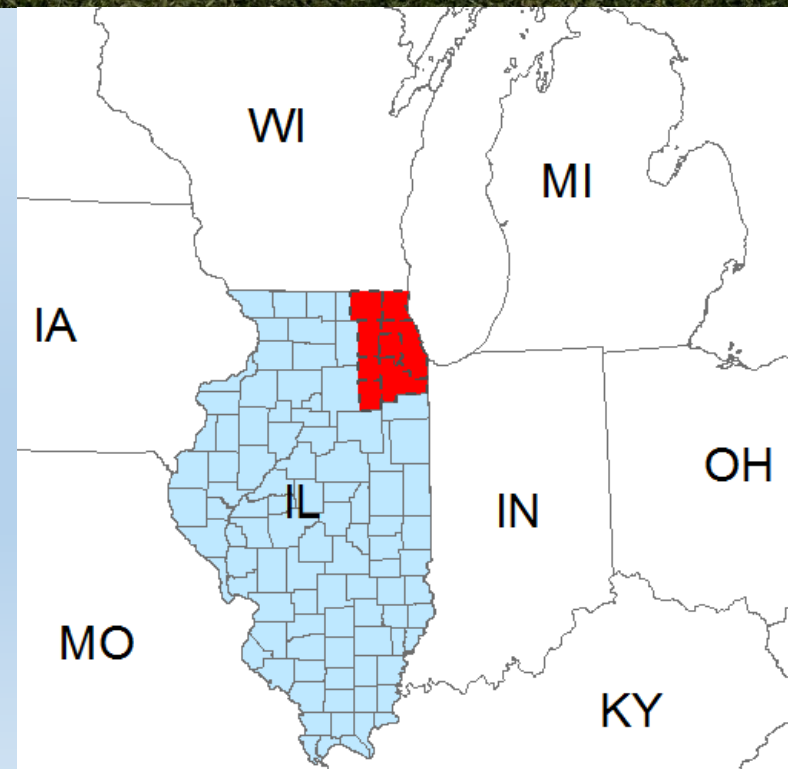
NWPA TAC Meeting  
July 25, 2017



ILLINOIS STATE  
WATER SURVEY  
PRAIRIE RESEARCH INSTITUTE



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UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN



# Application of head-specified model

Input - Water level measurements

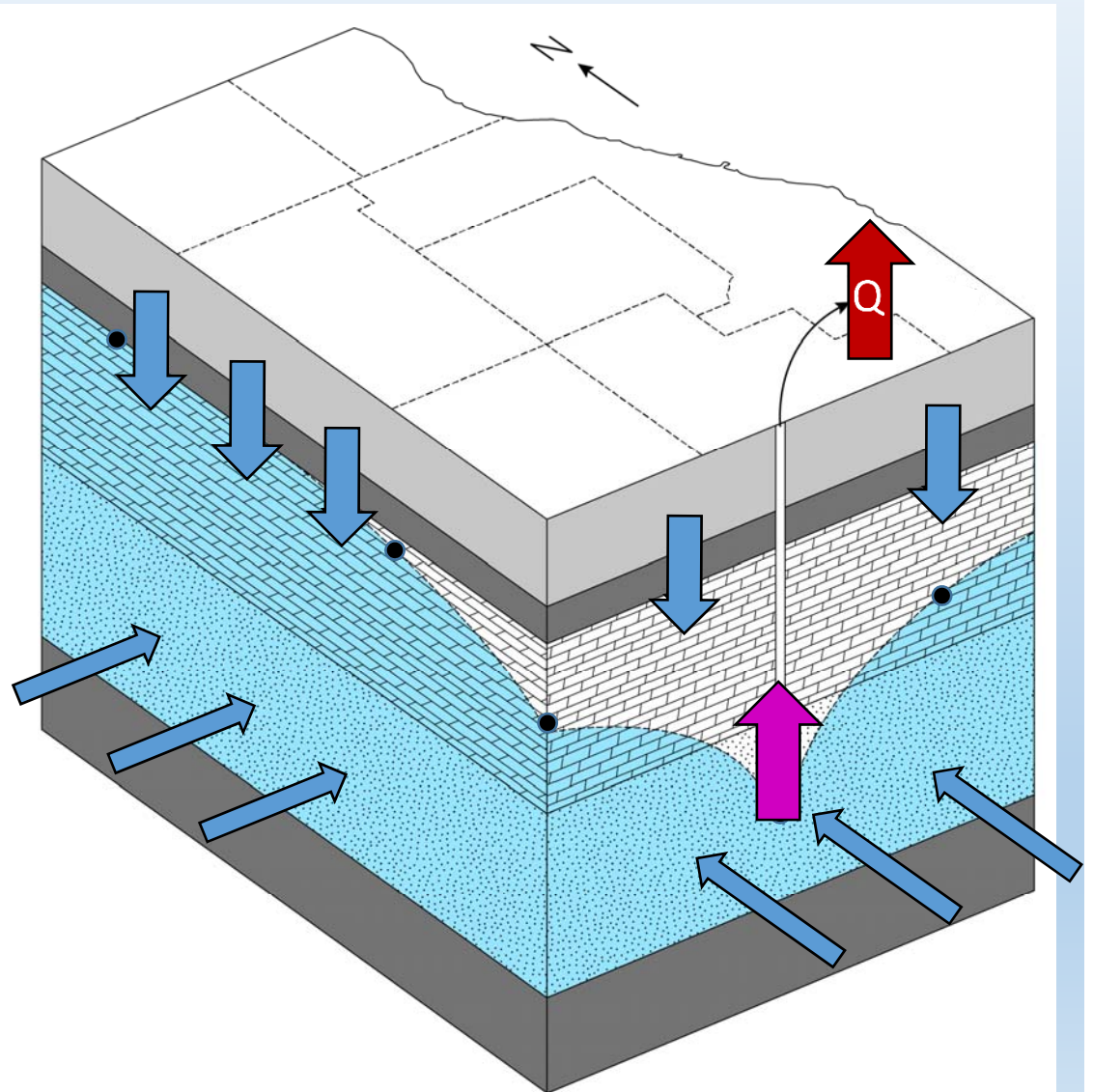
Output - Flow rates

Calibrate to **pumping rate**

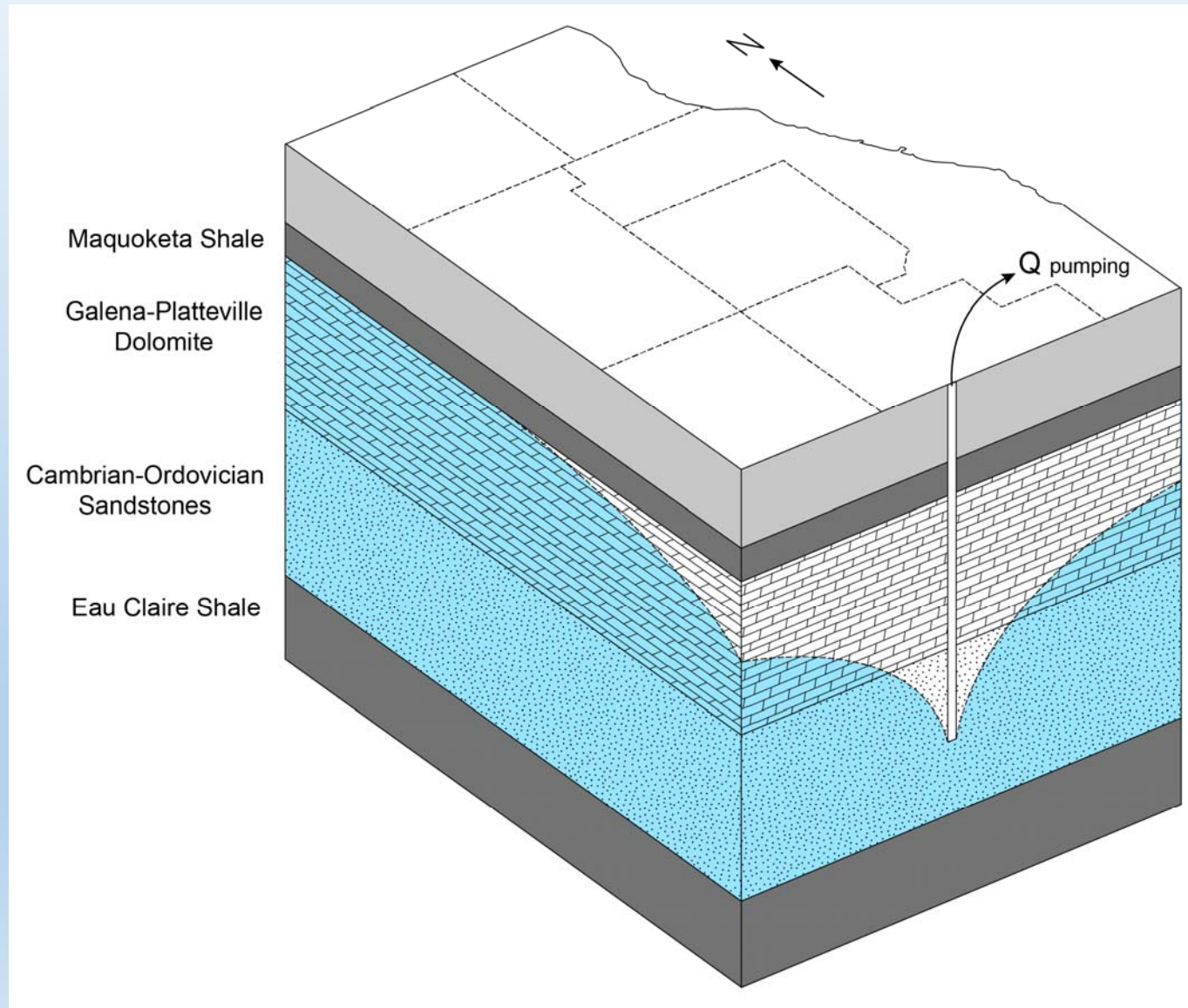
If **all sources of water** are properly conceptualized, **flow rate** will match **pumping rate**

If there are additional sources of water not being modeled, **flow rate** will show a deficit compared to **pumping**

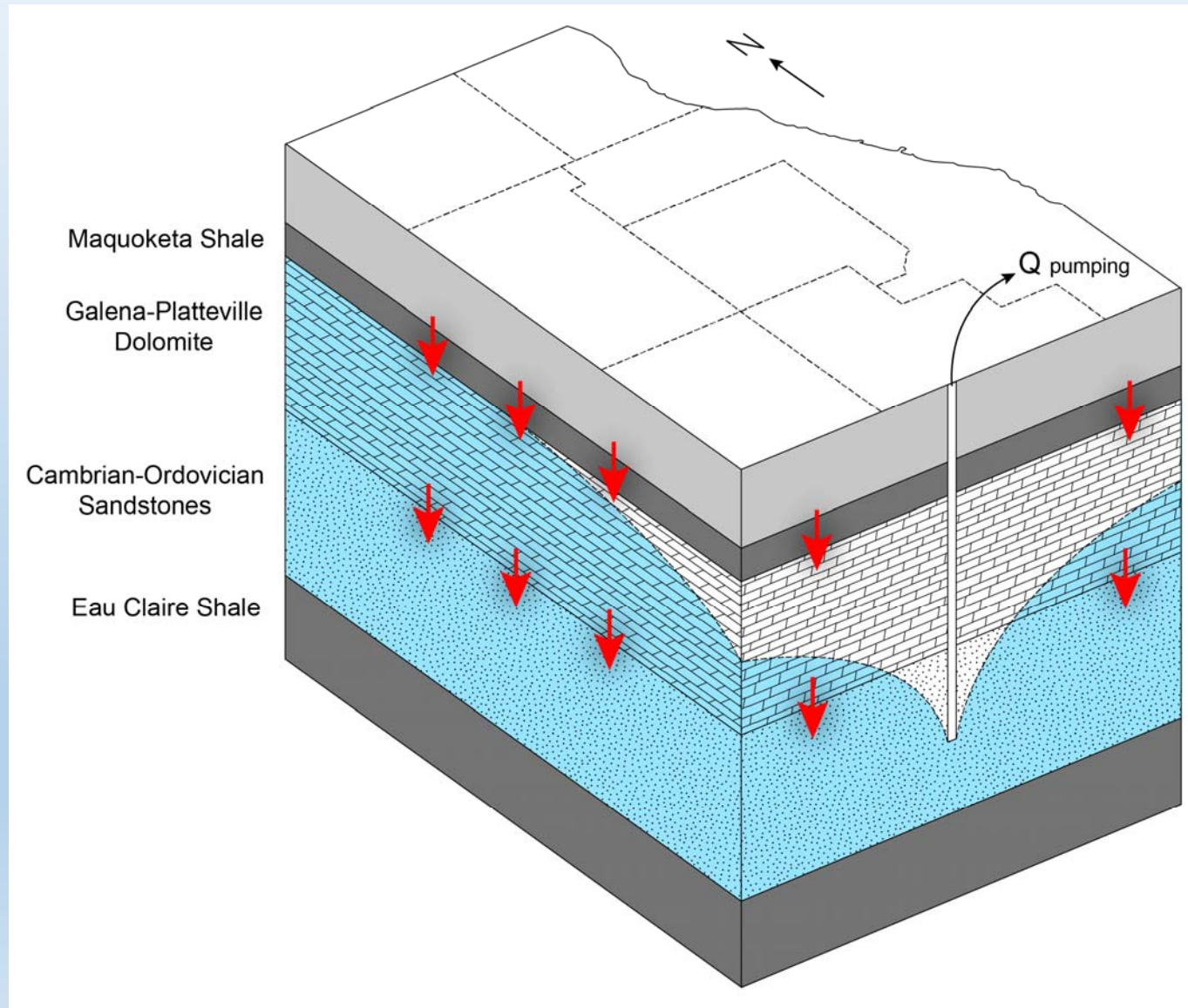
Excess **flow** compared to **pumping** indicates unallocated pumping or too much recharge



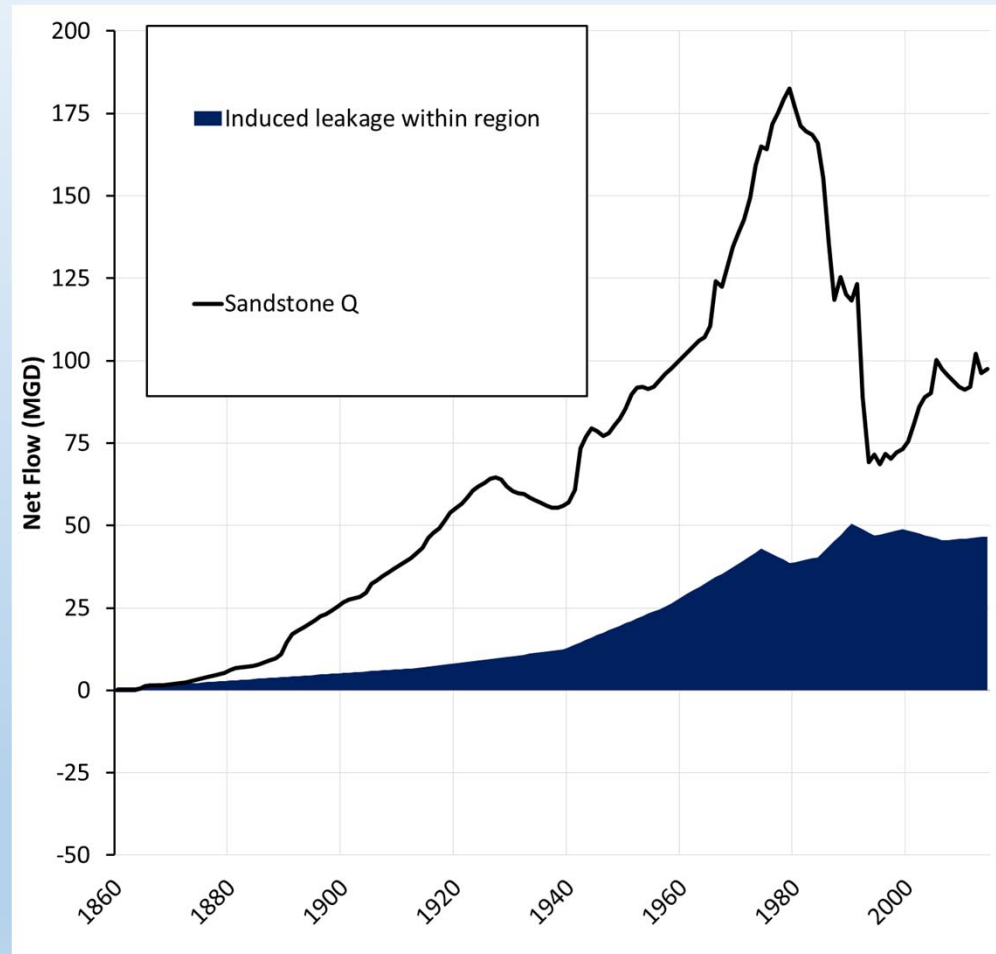
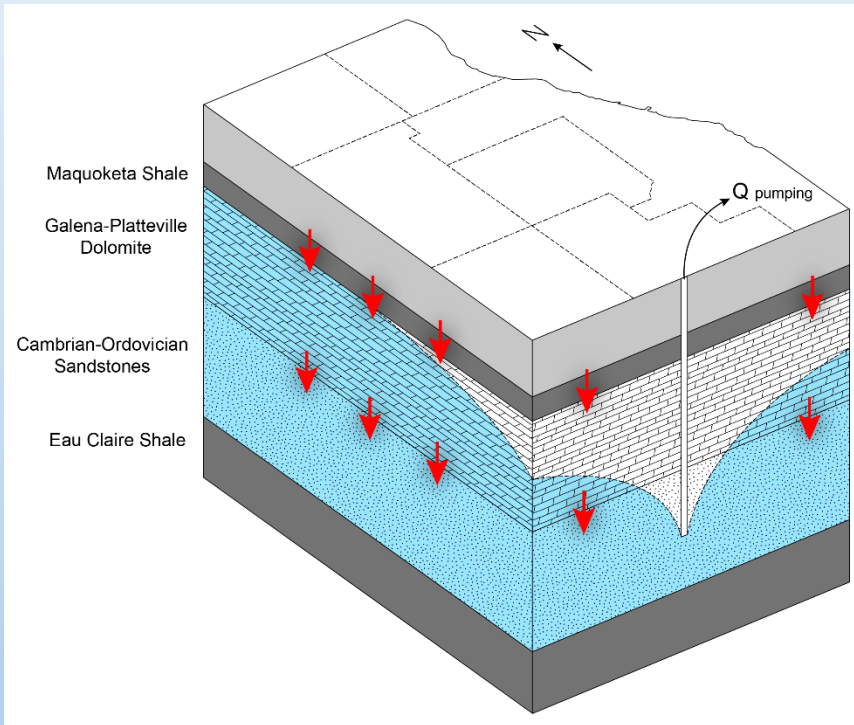
# Estimated sources of water in NE Illinois



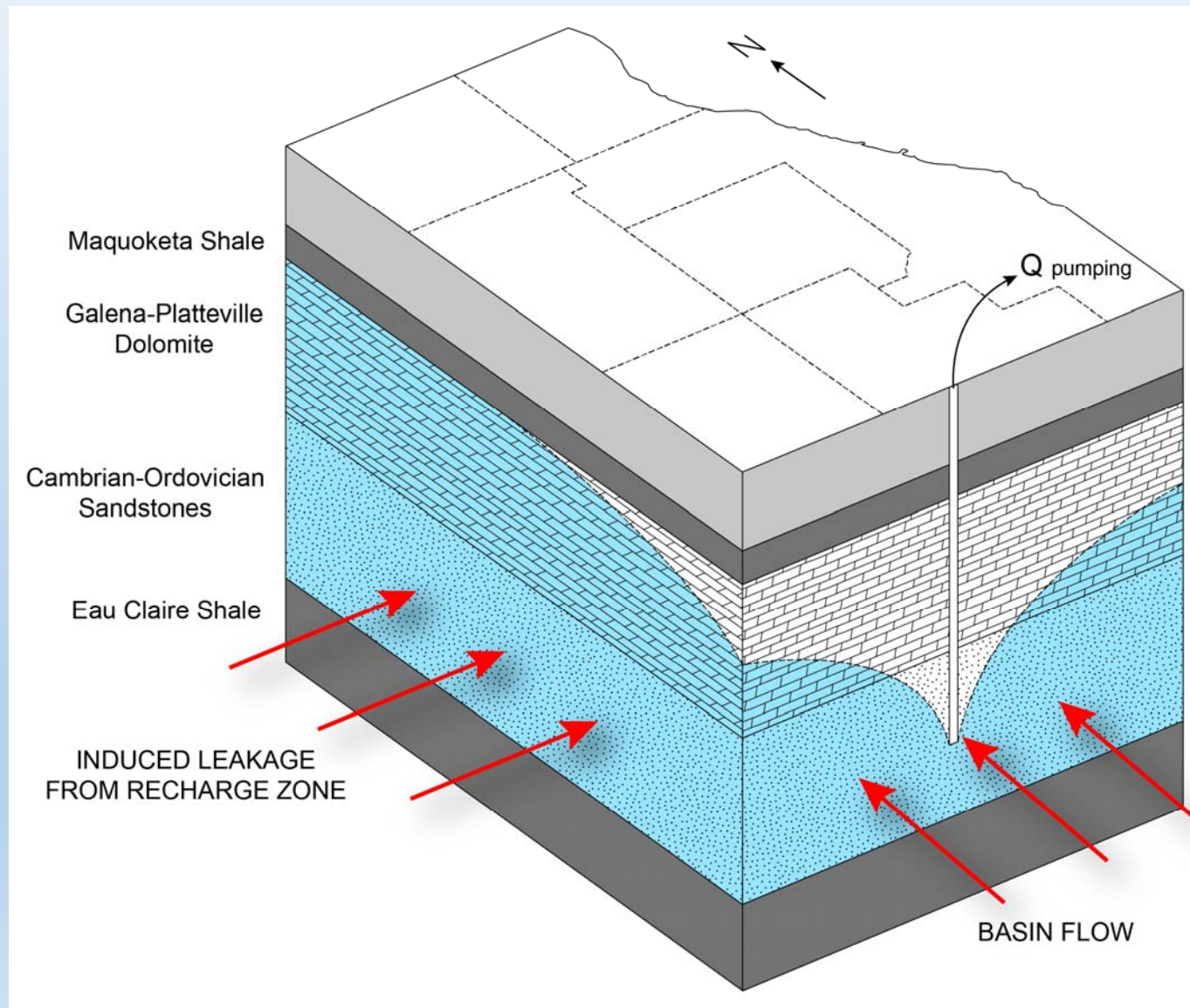
# Vertical infiltration into sandstone (natural)



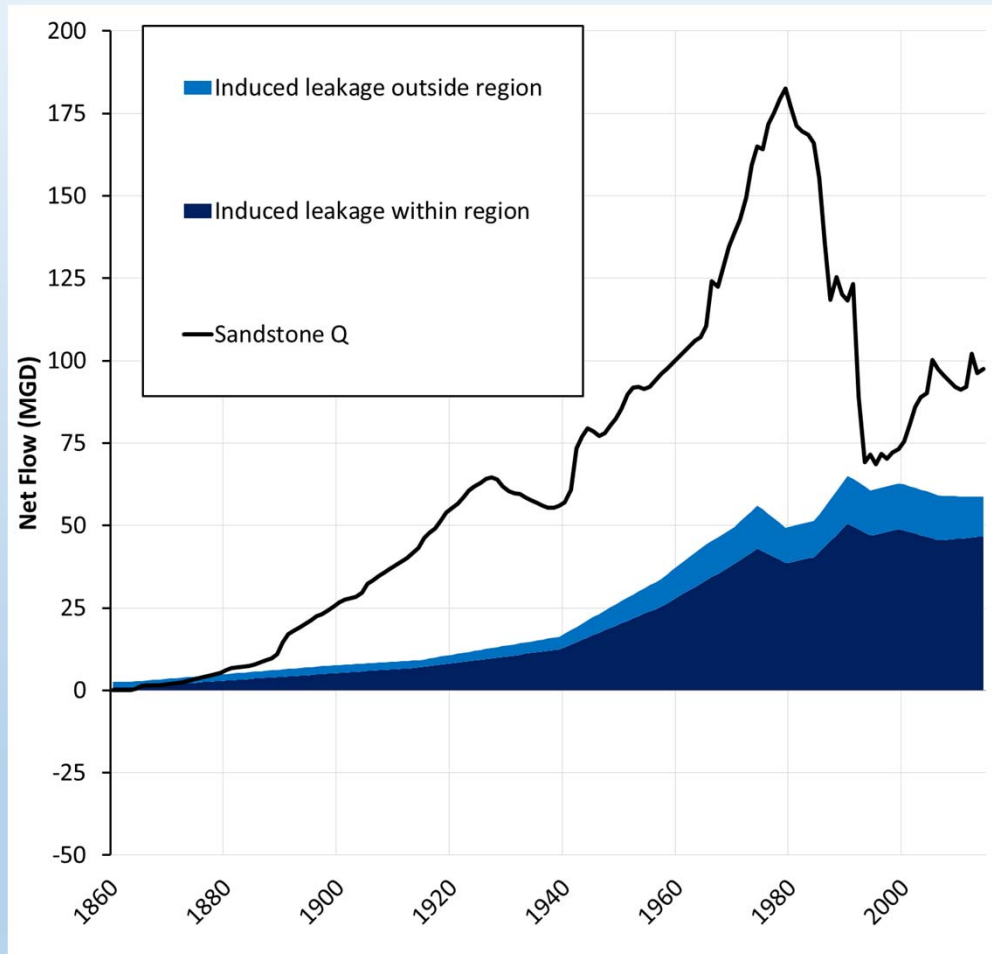
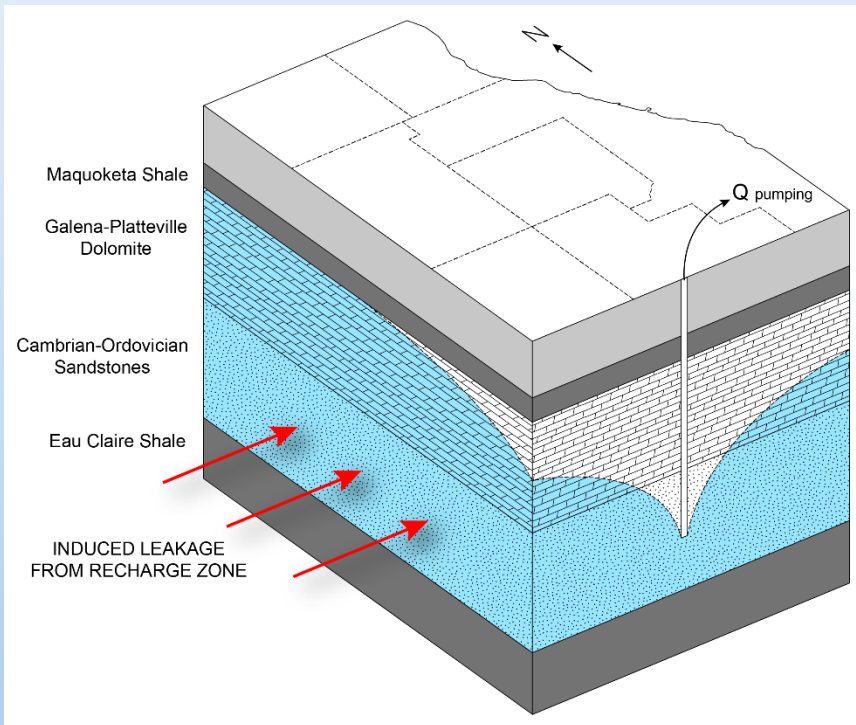
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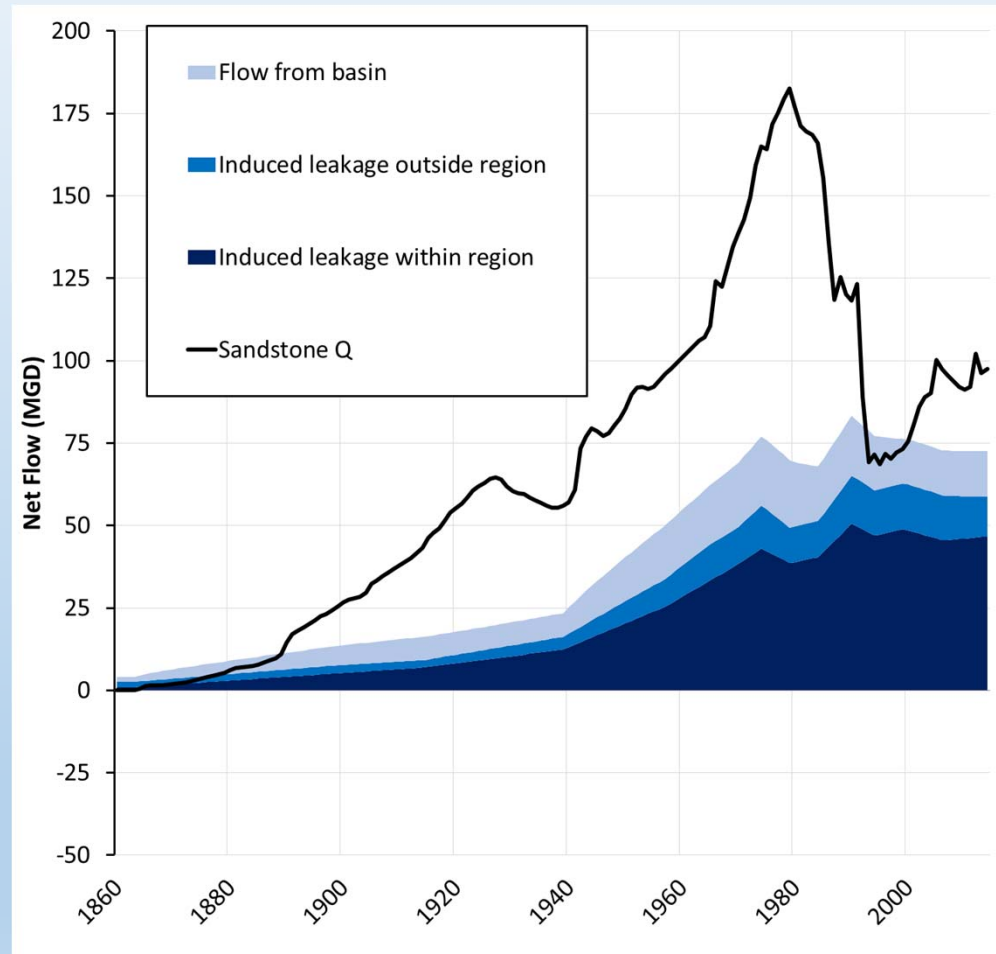
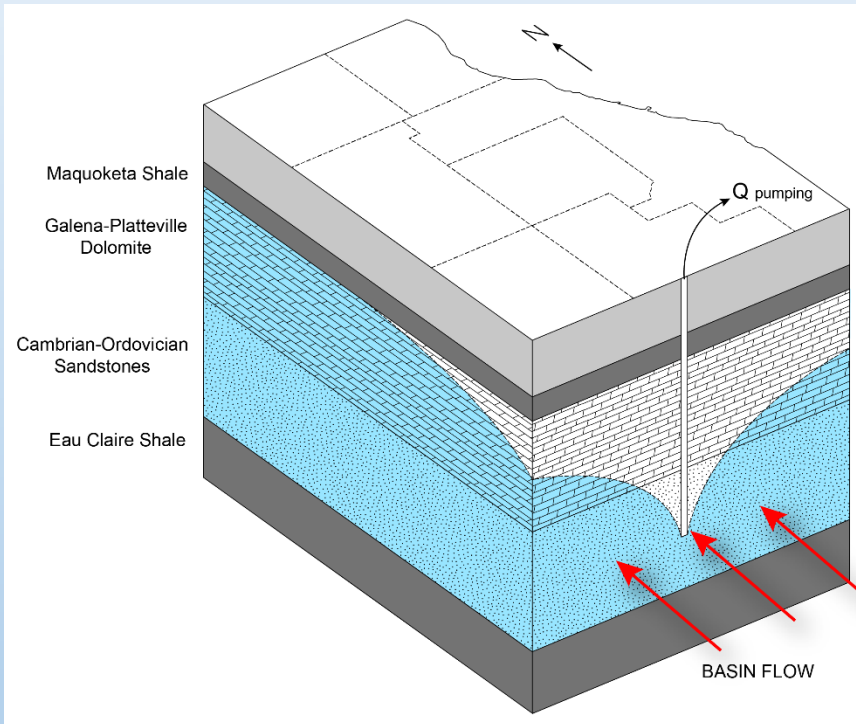
# Flow from outside region



# Flow from outside region (recharge)

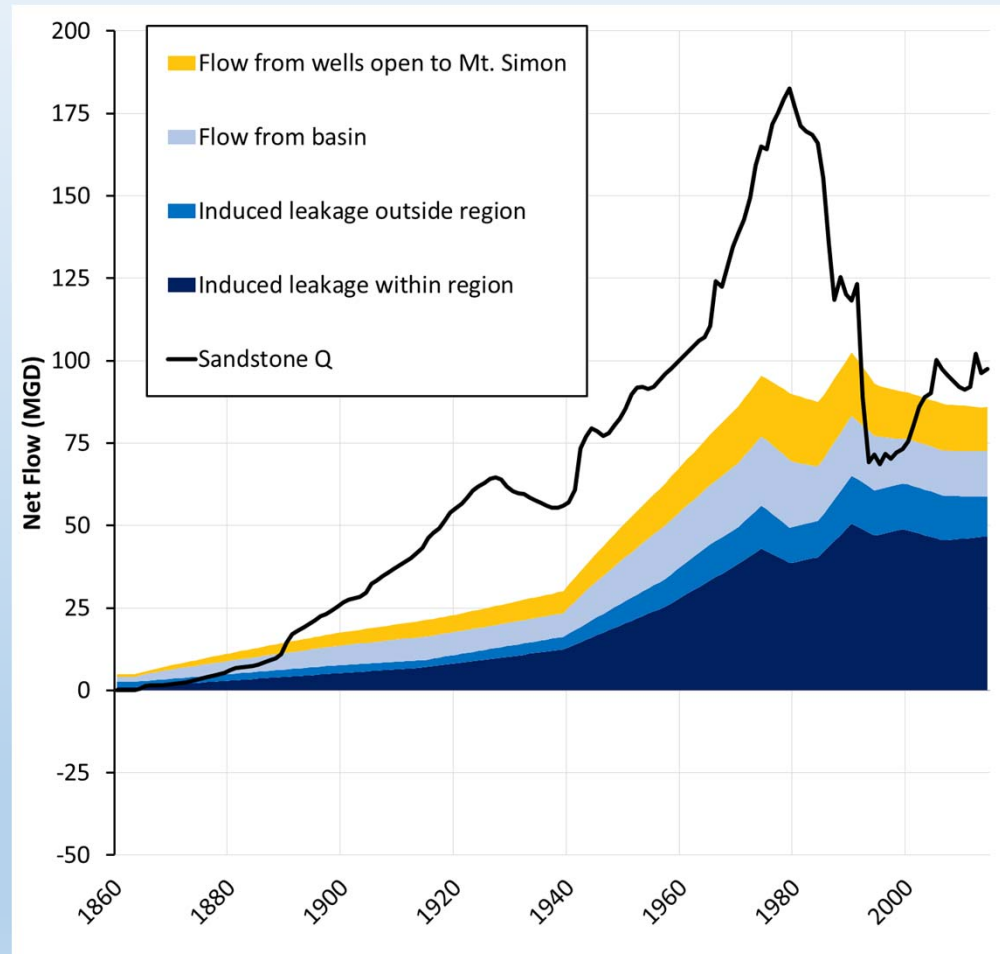
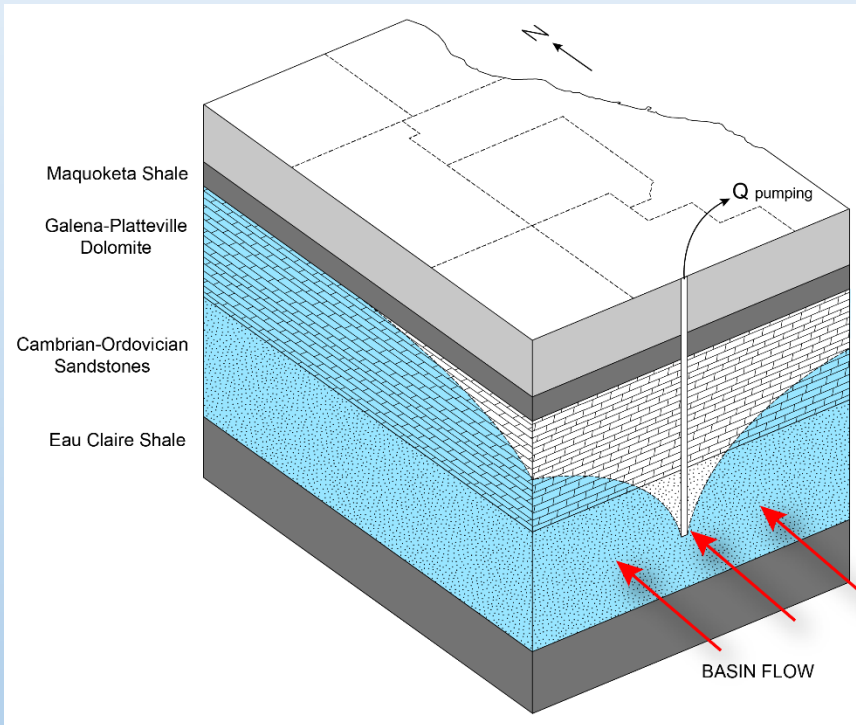


# Flow from outside region (basin)

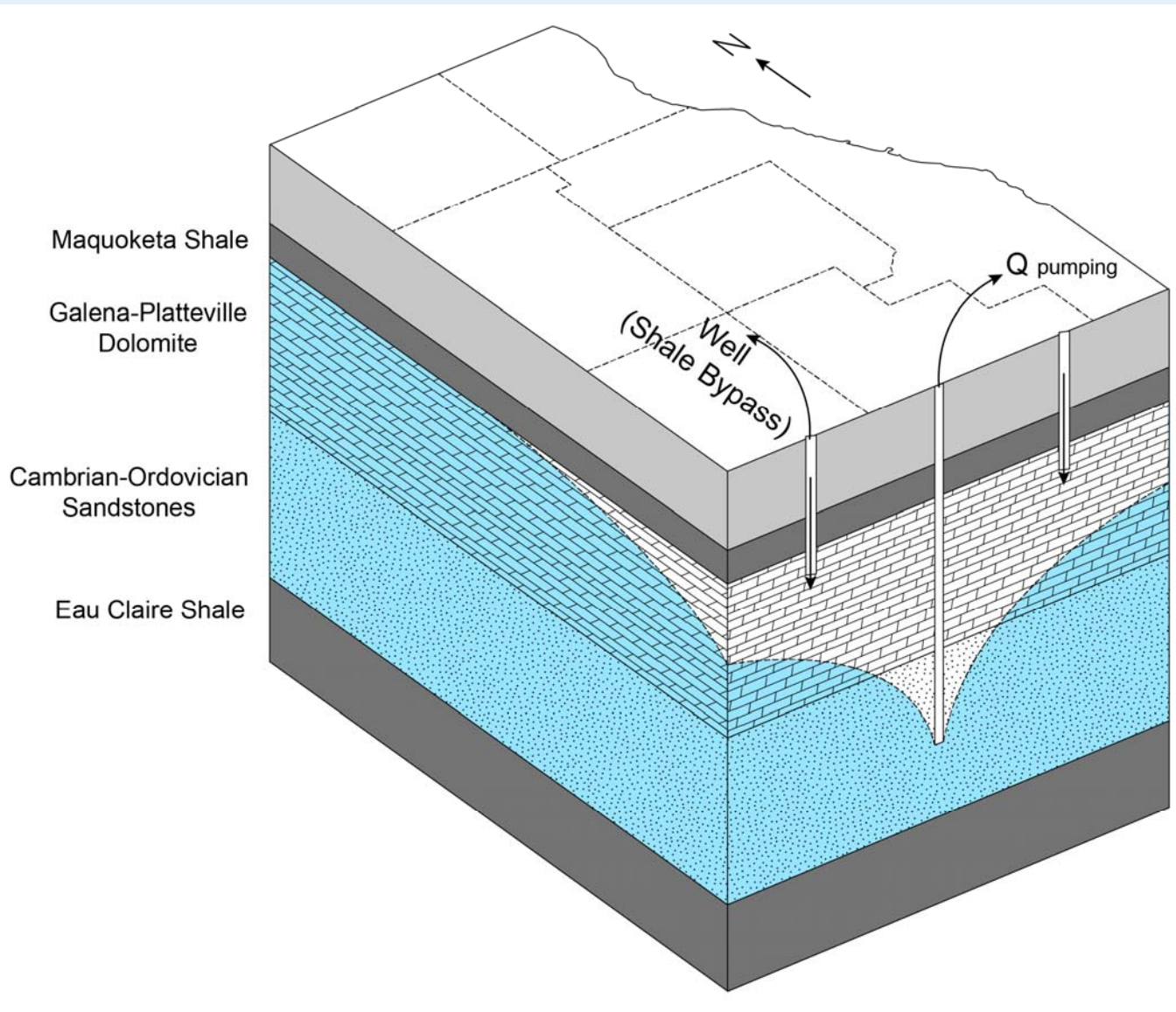




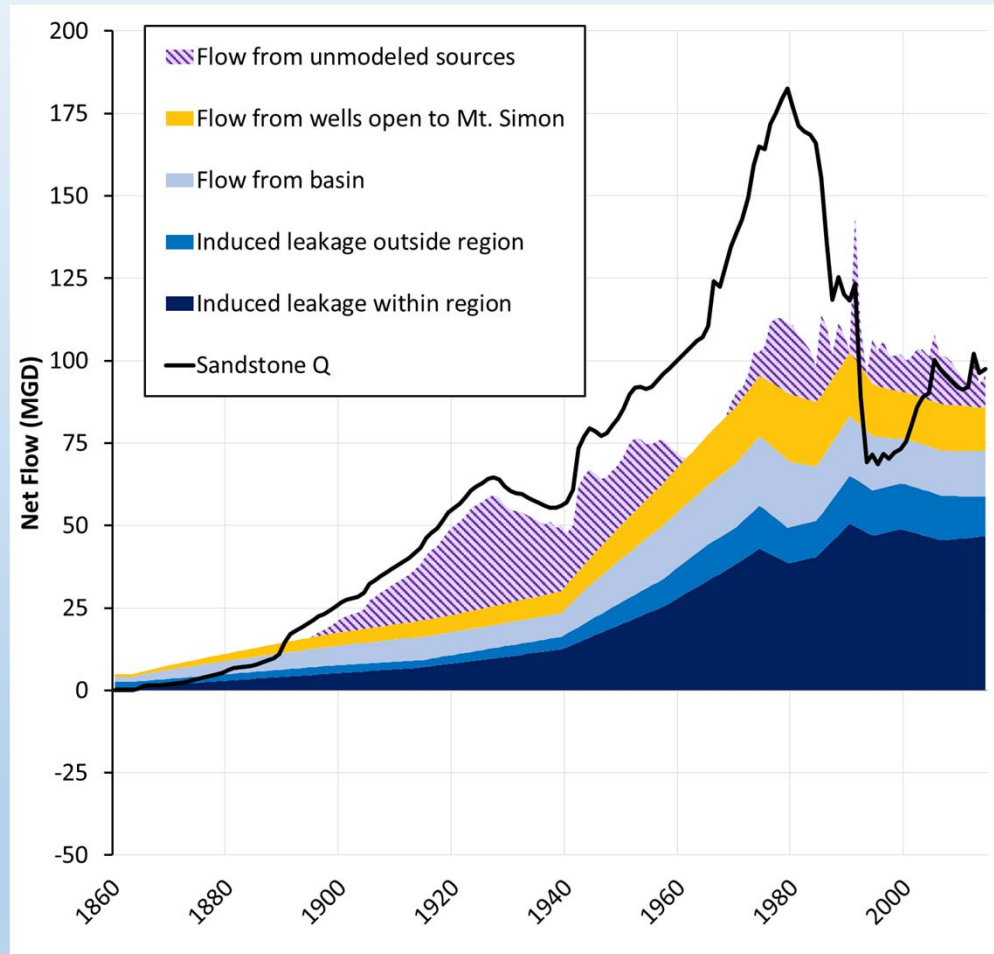
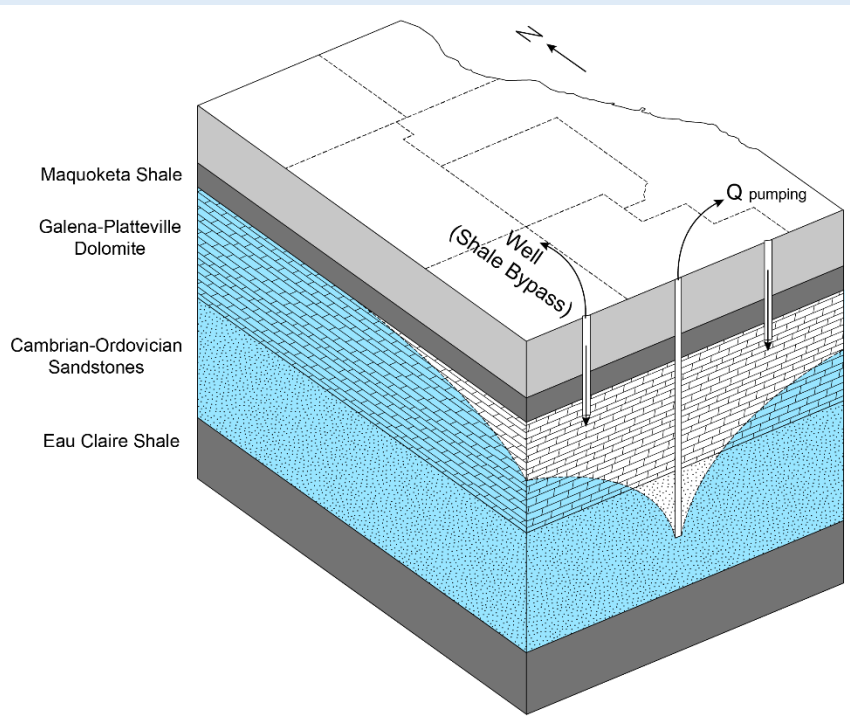
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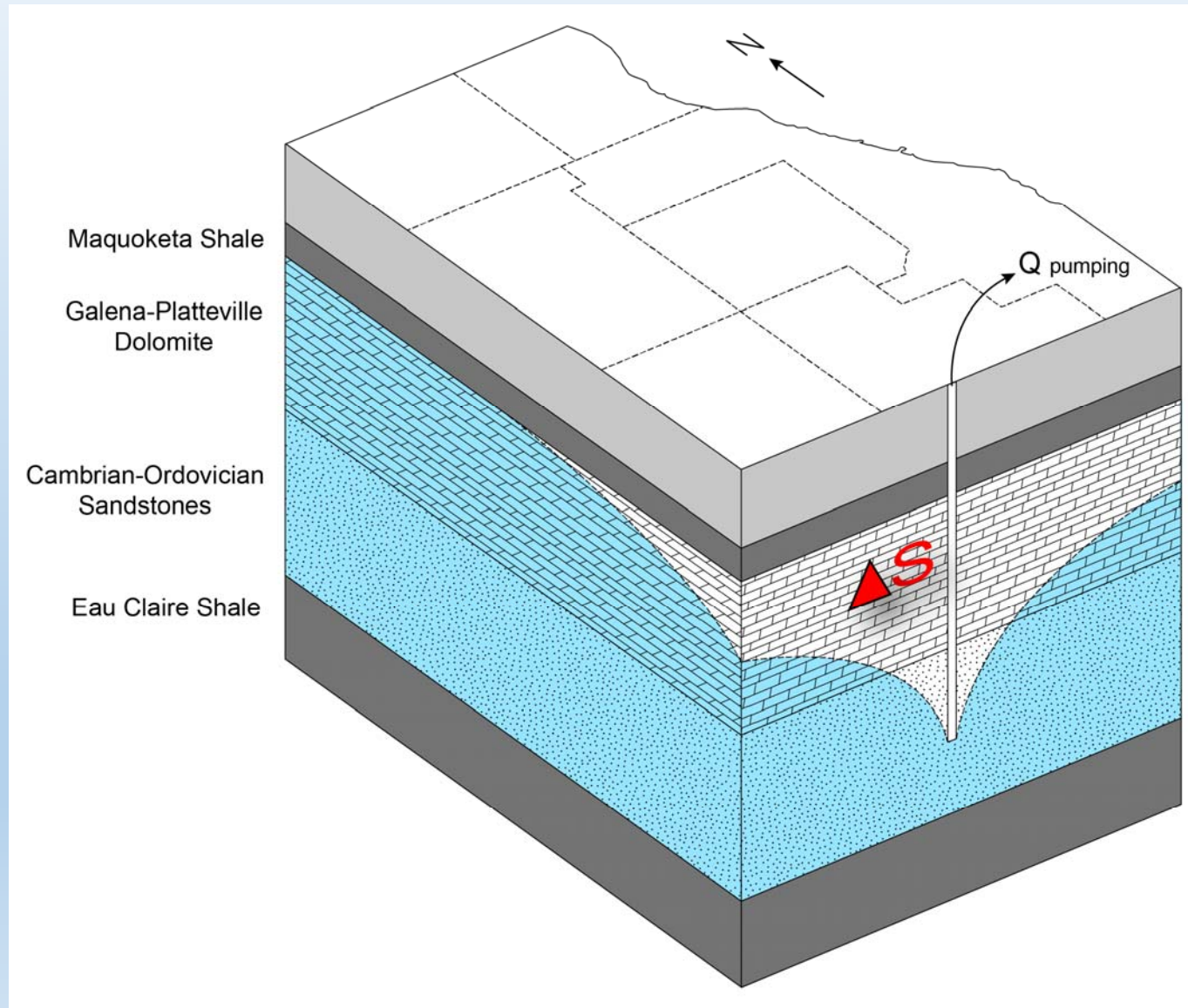
# Vertical infiltration into sandstone (anthropogenic)



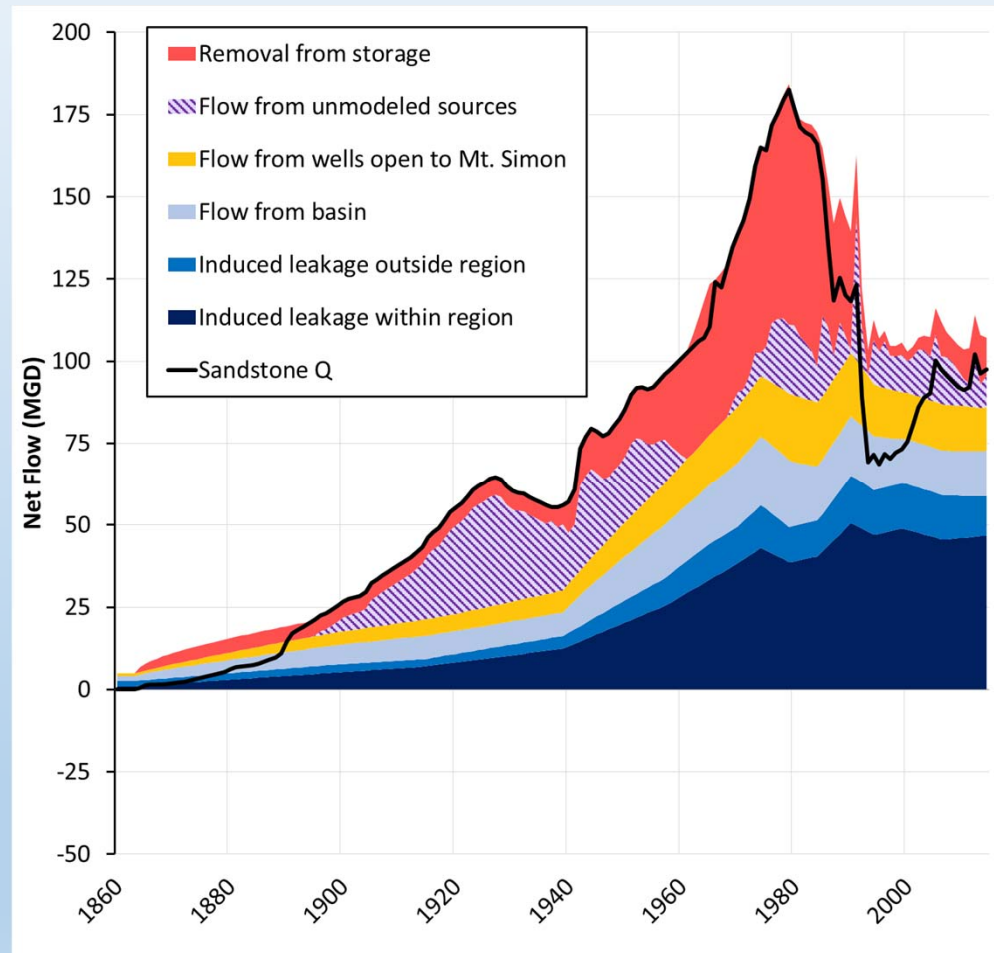
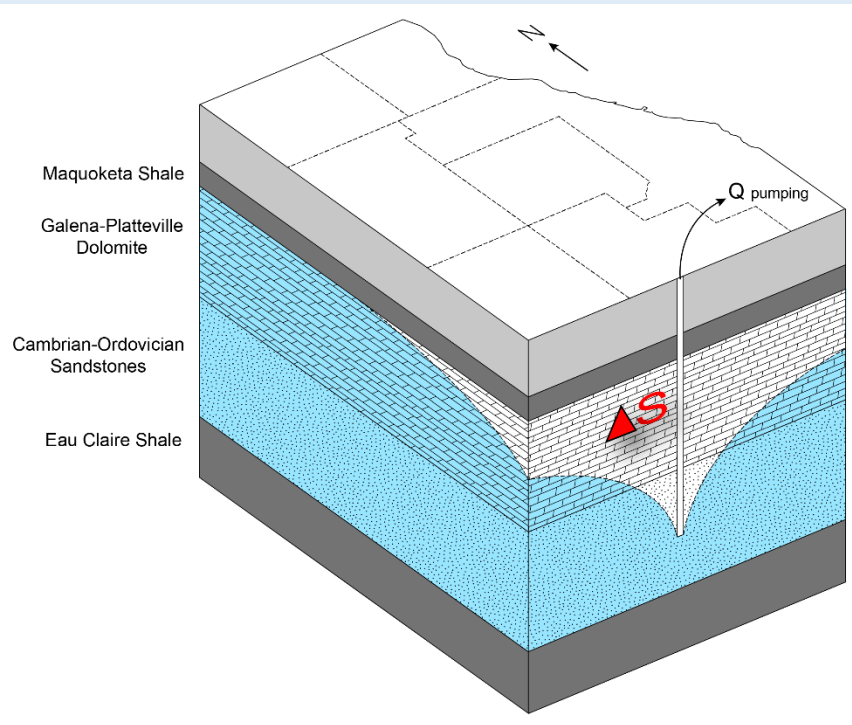
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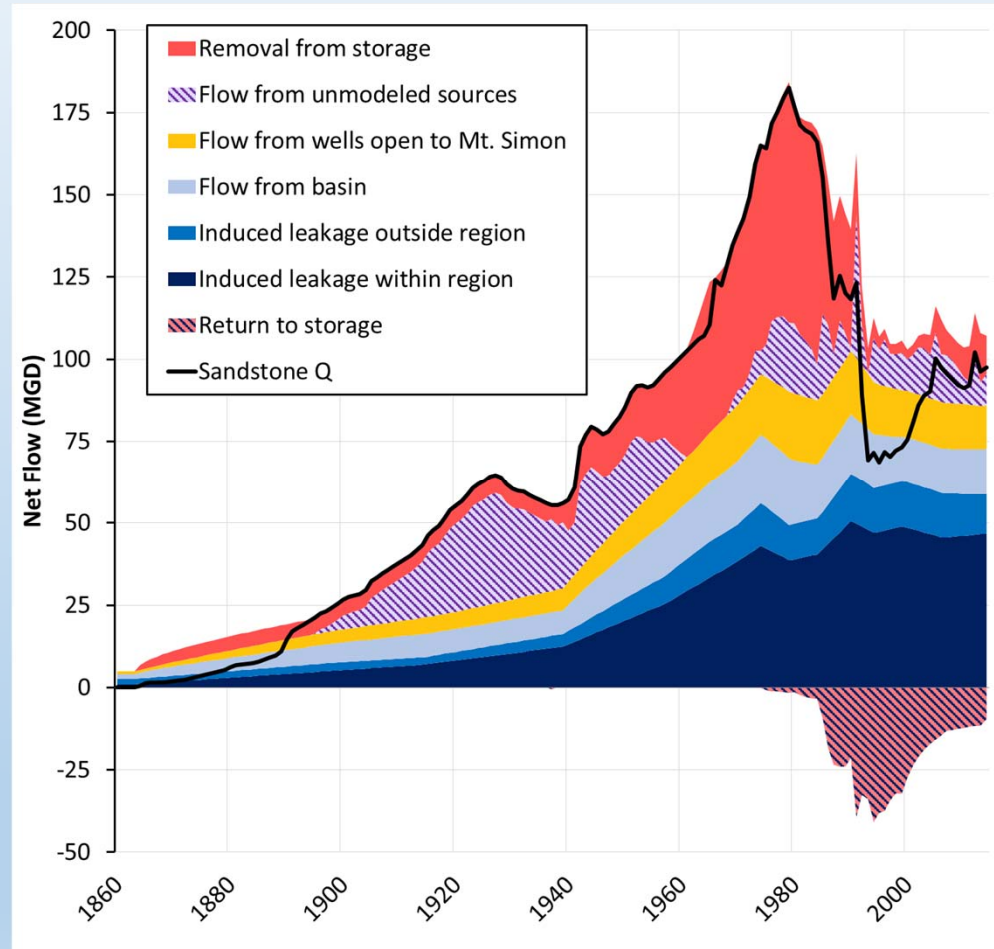
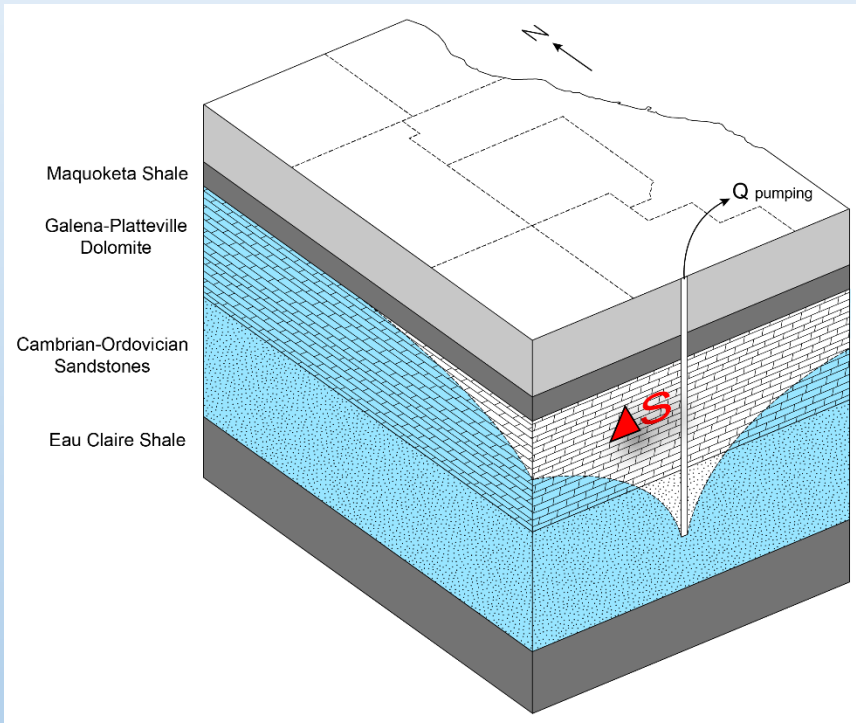
# Removal of water from storage



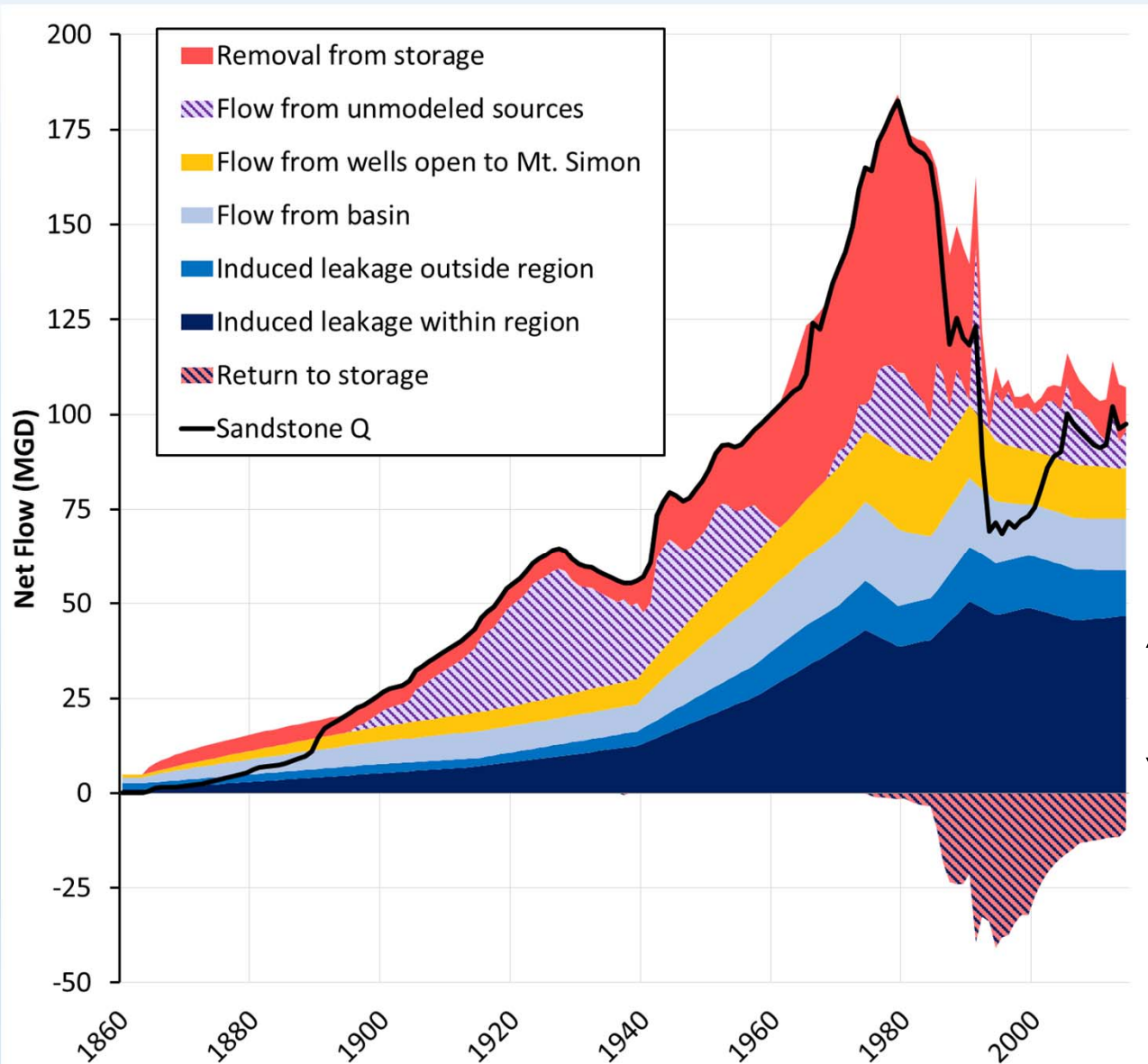
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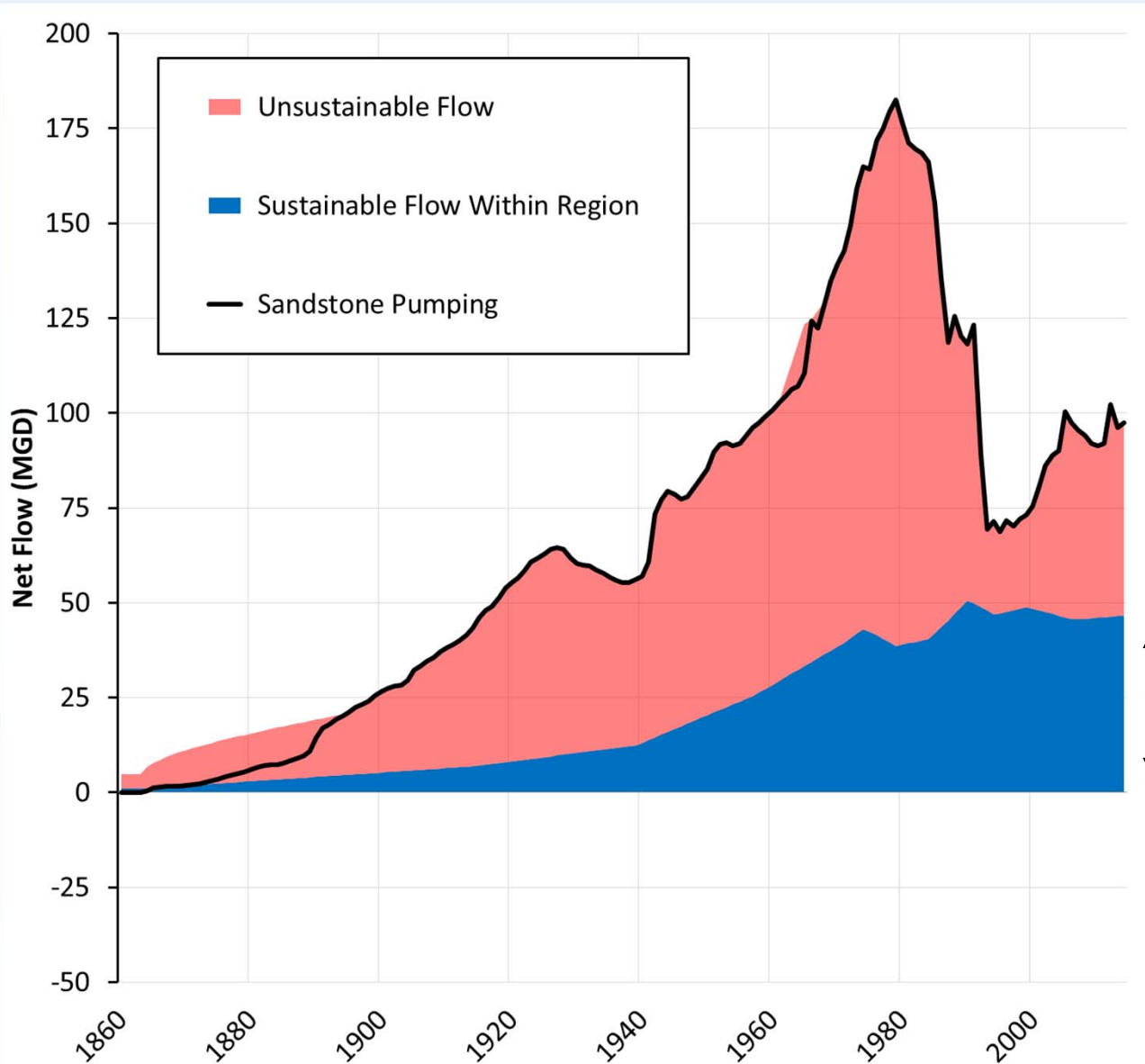


# What is sustainable?



Arguably, considering only induced leakage within Northeast Illinois provides the greatest water security for the region

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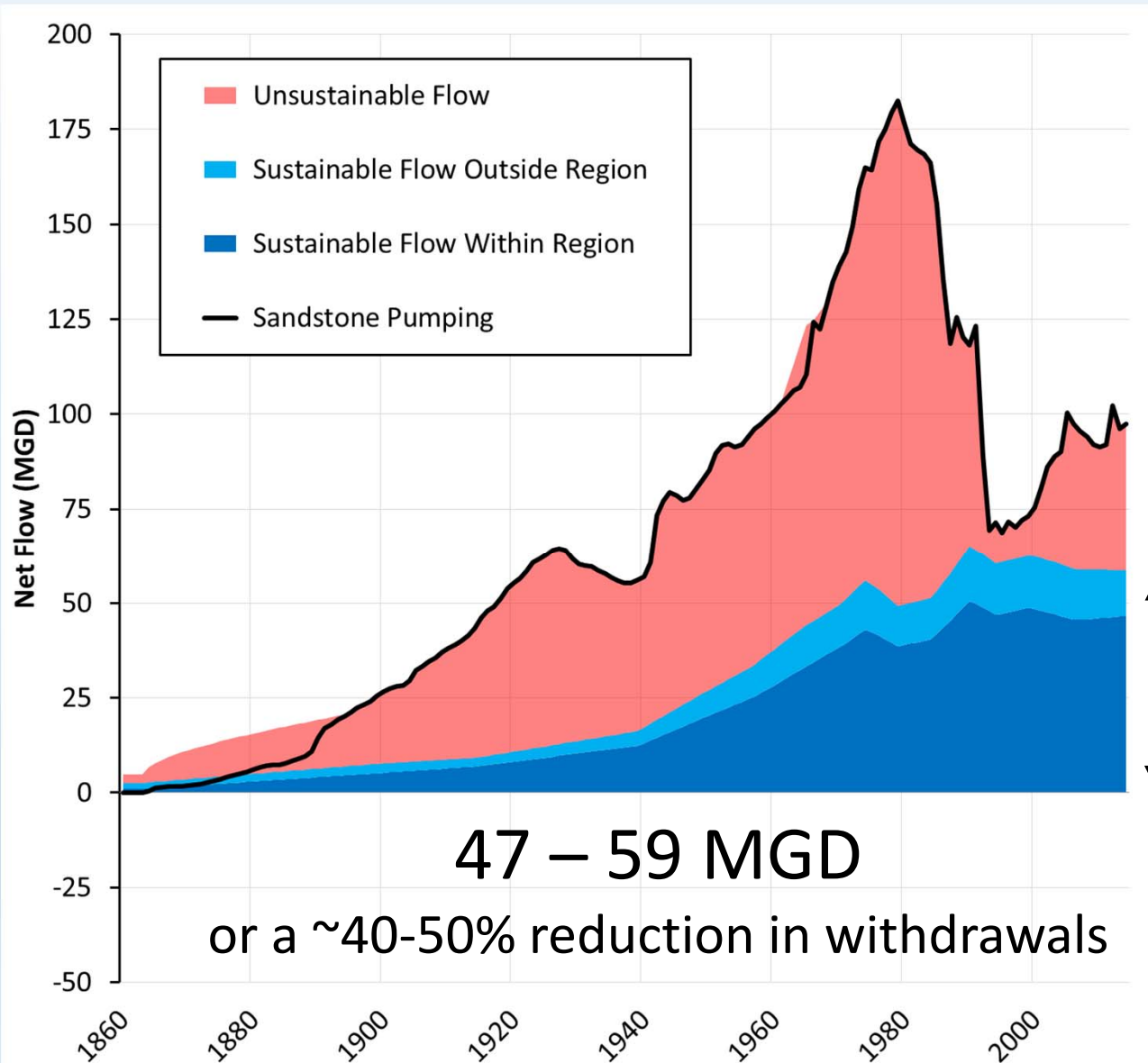


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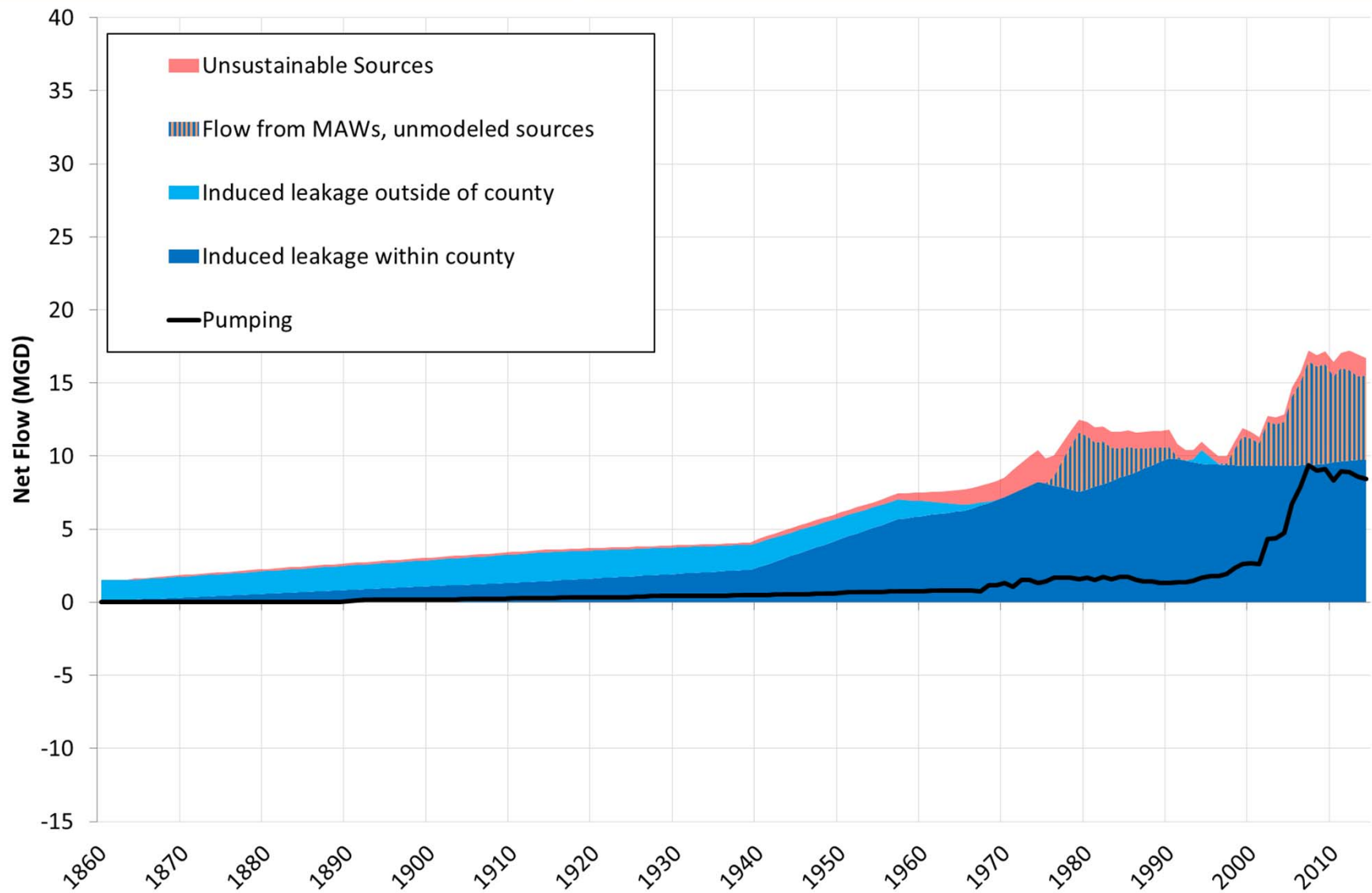


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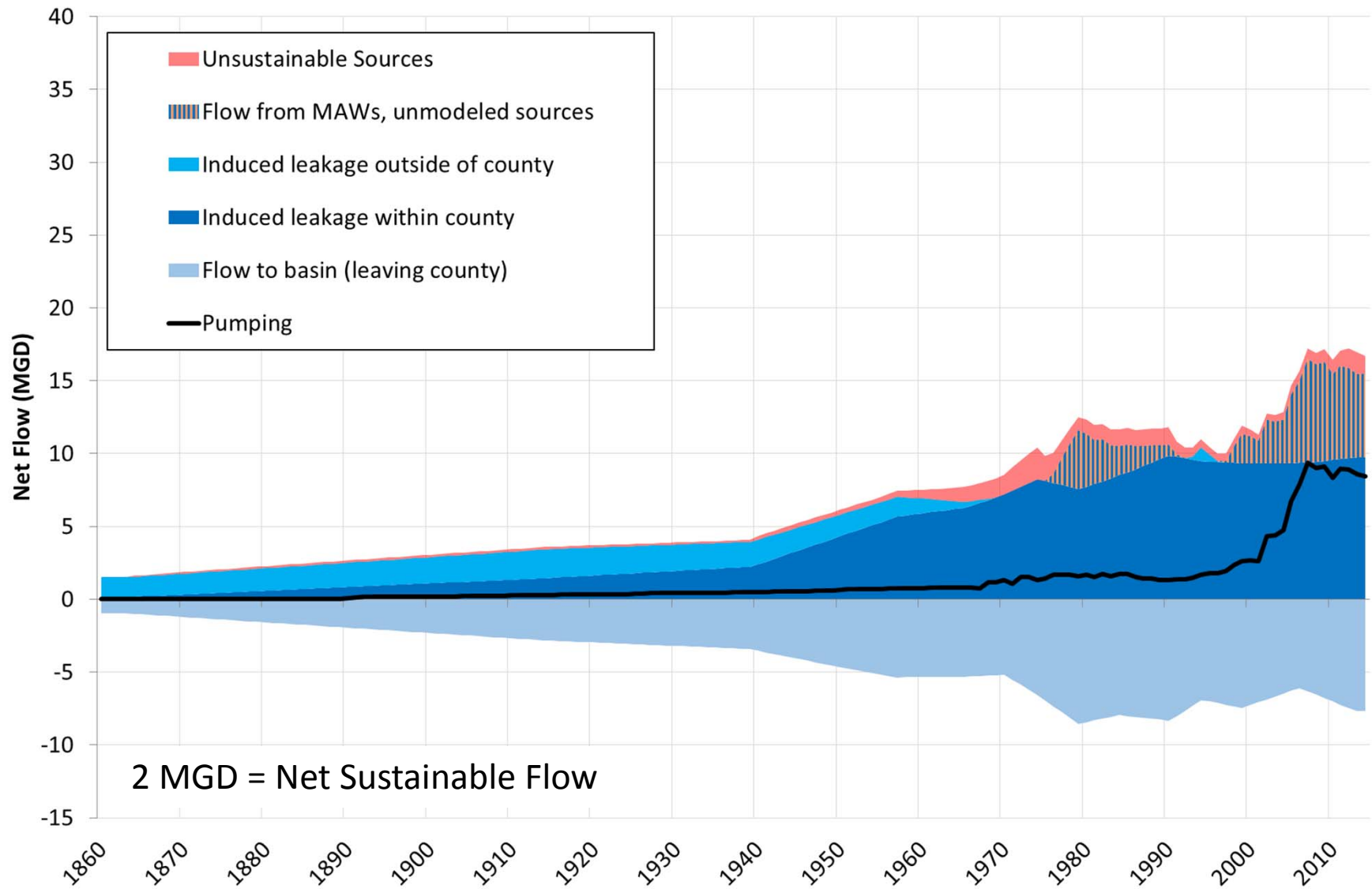
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However, traditional estimates of sustainable yield have included flow from recharge outside NE Illinois

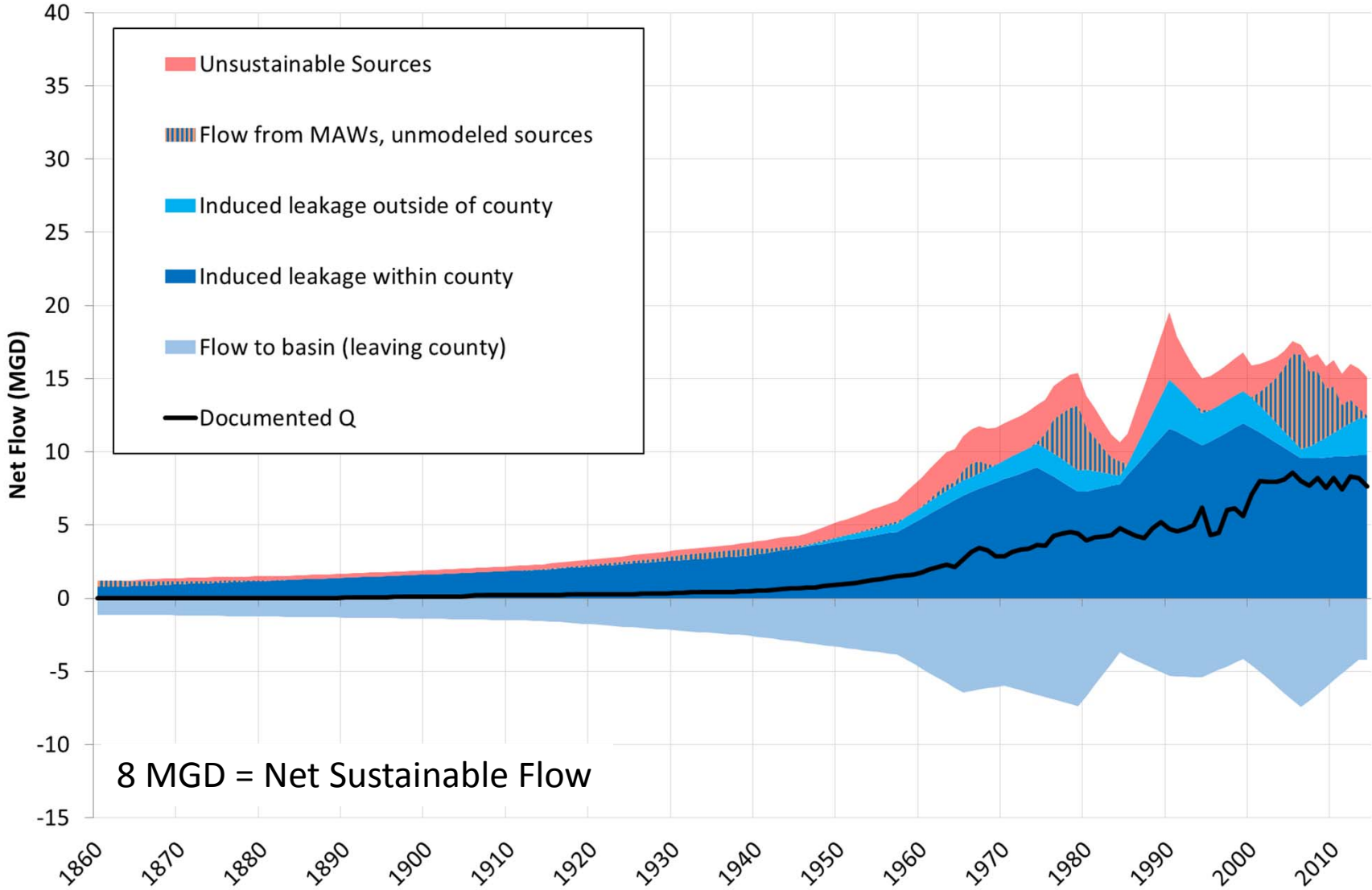
# Kendall County



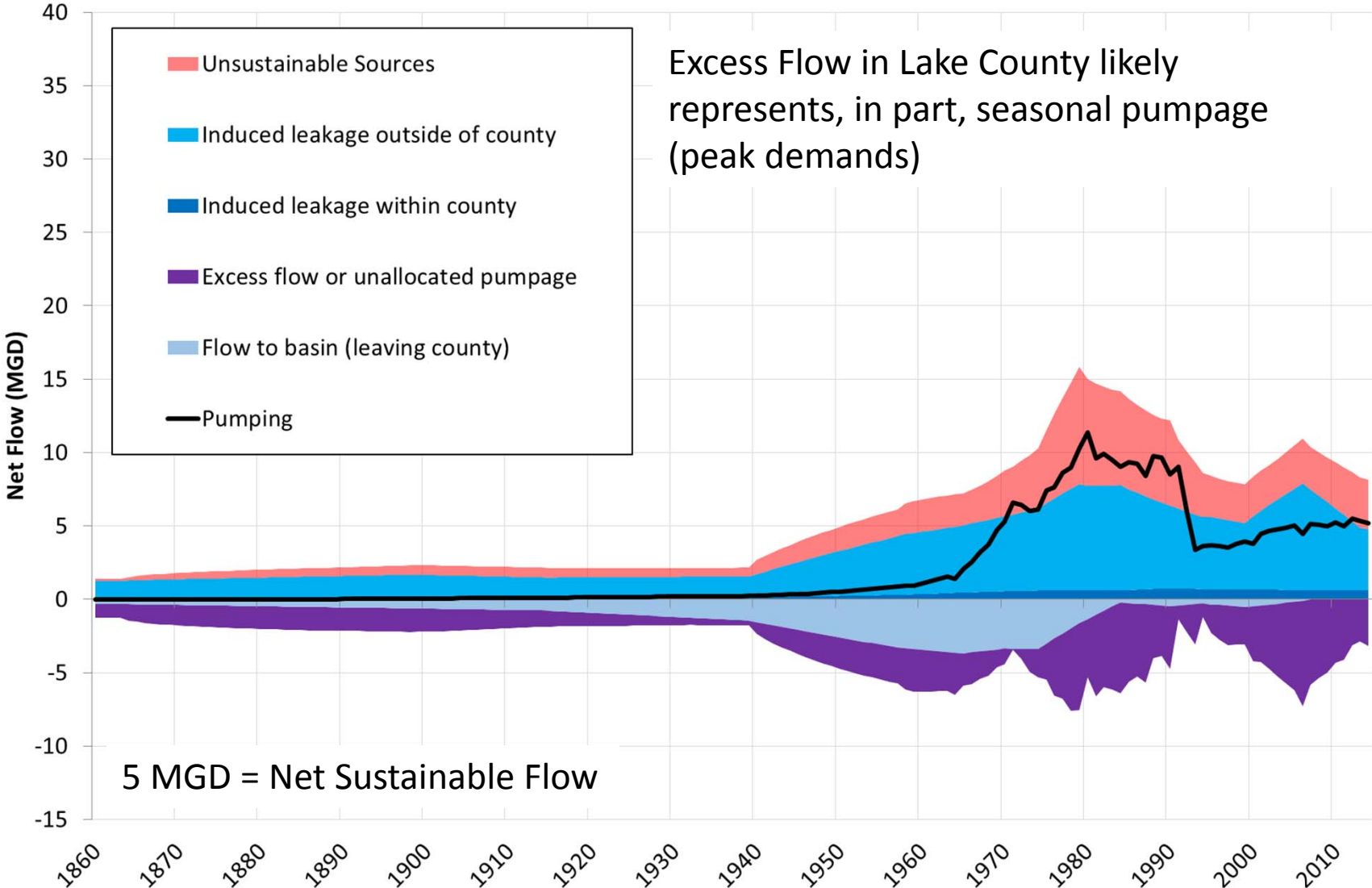
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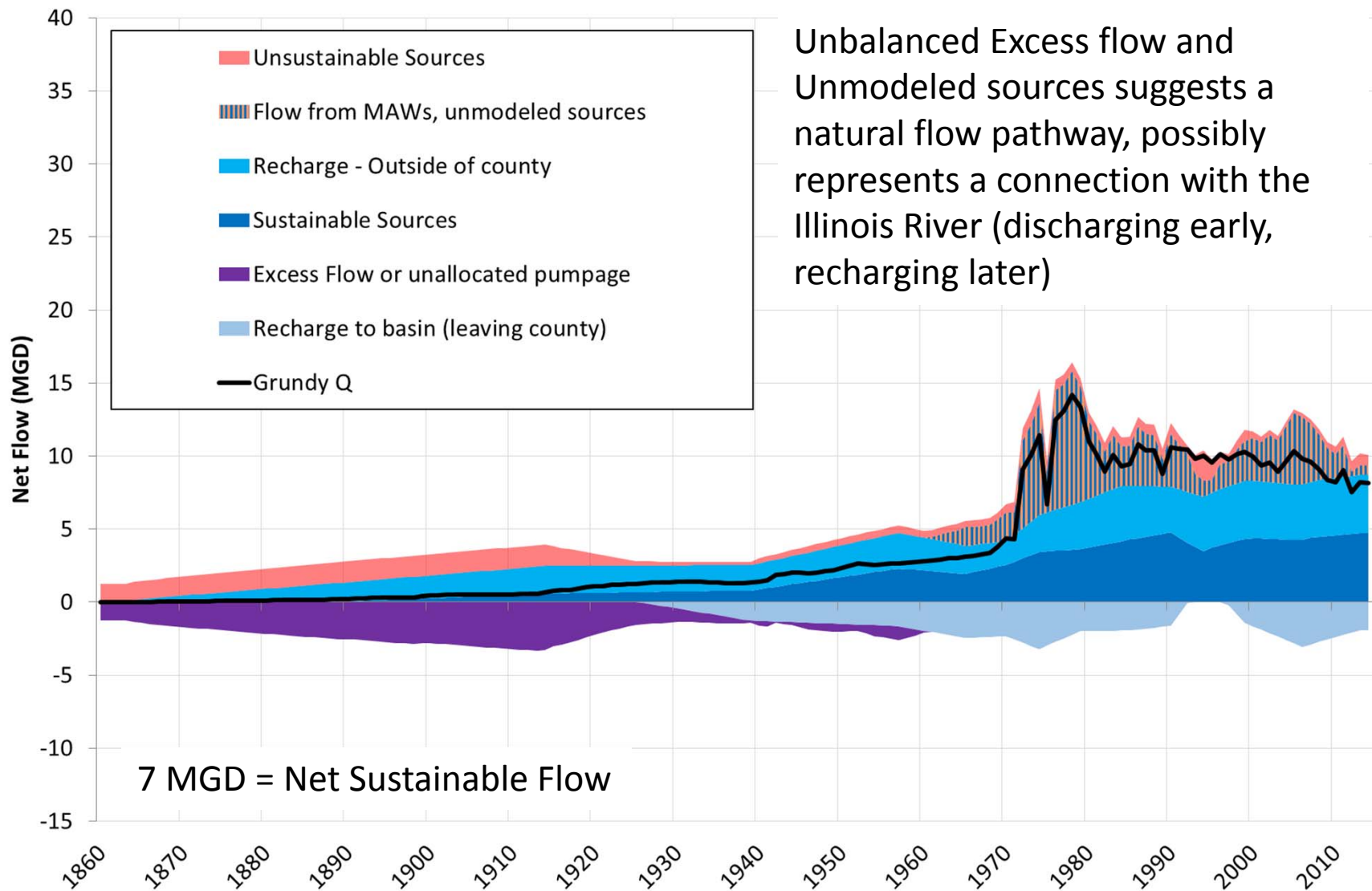
# McHenry County



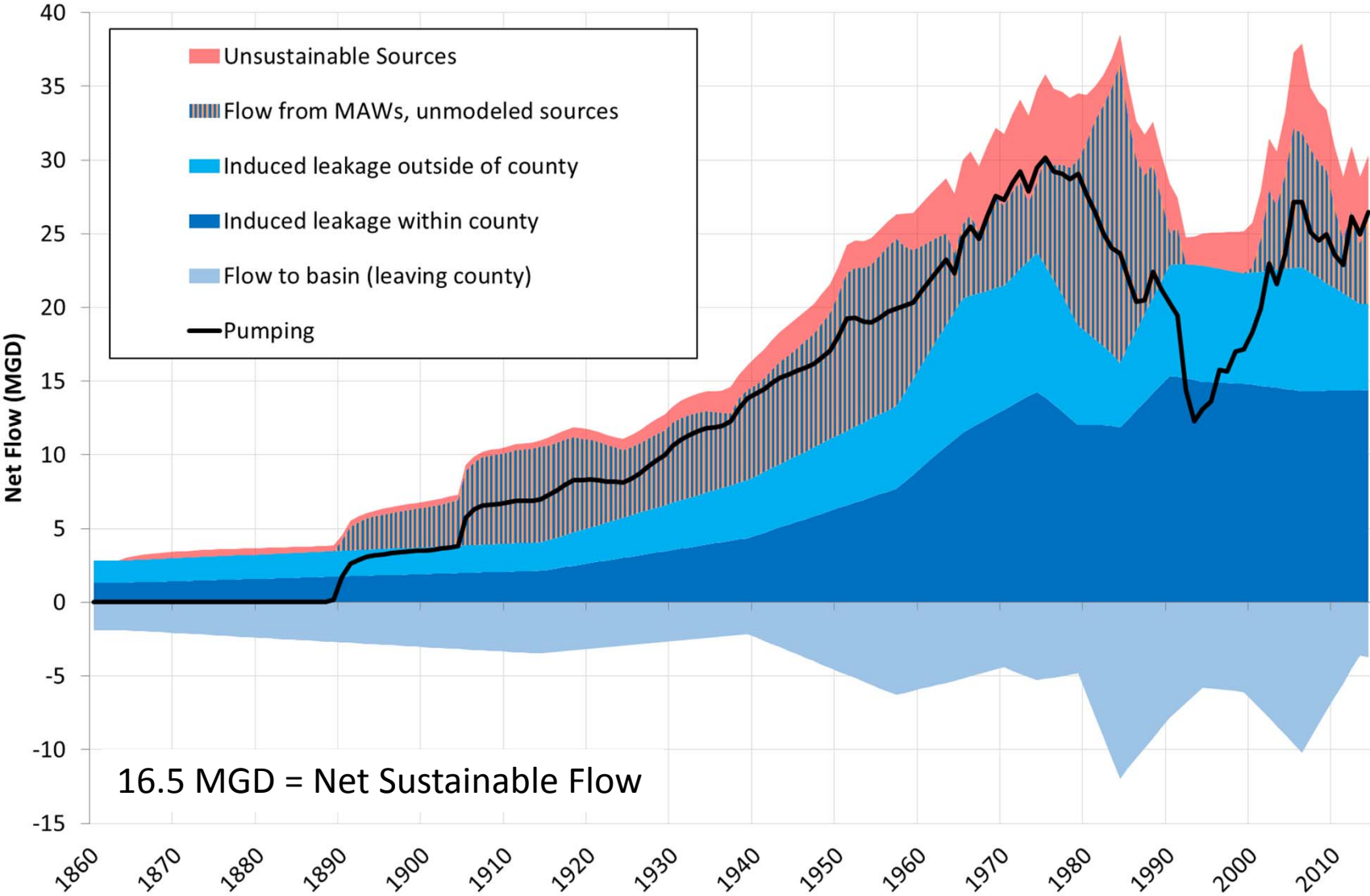
# Lake County



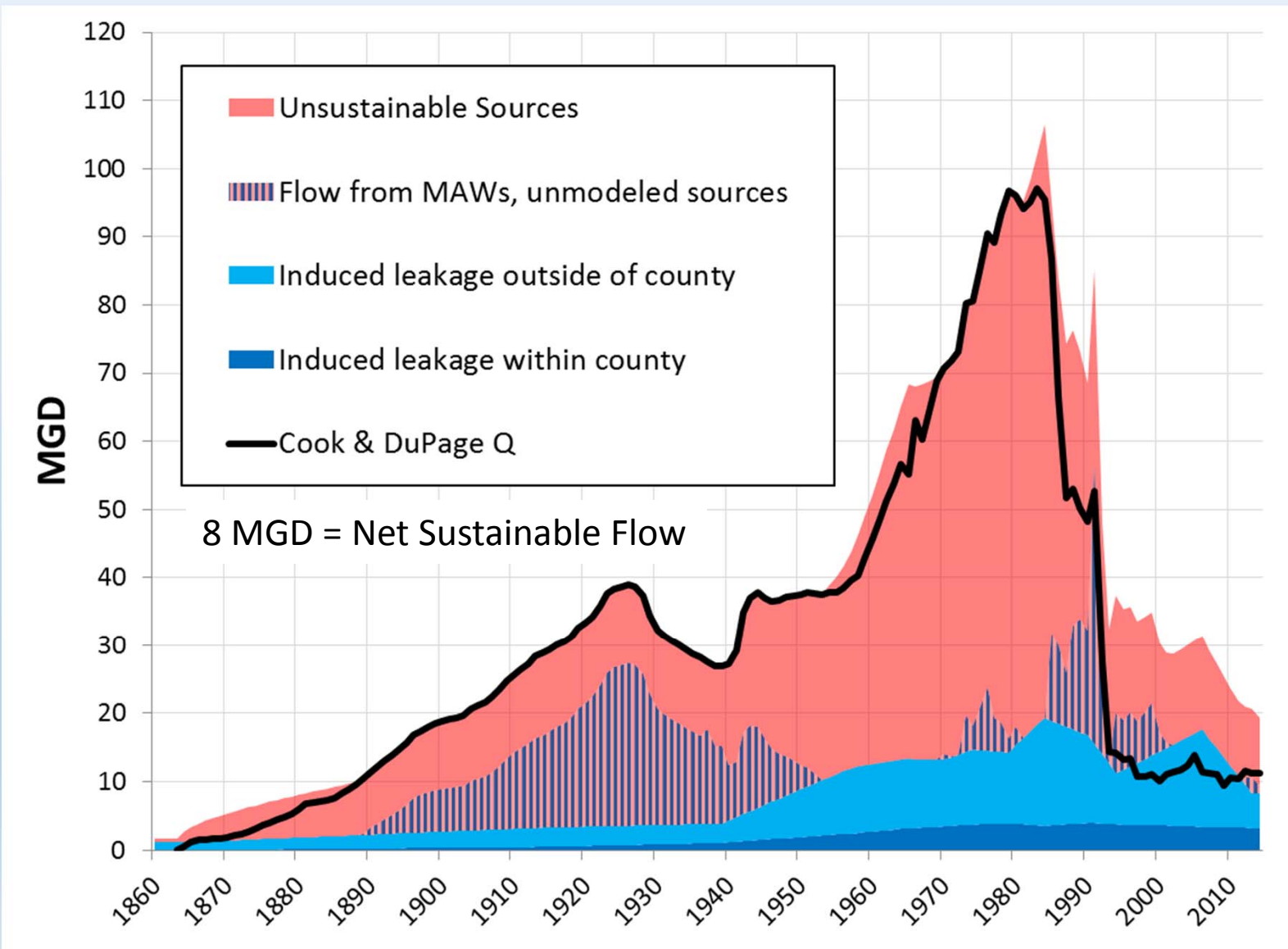
# Grundy County



# Kane County

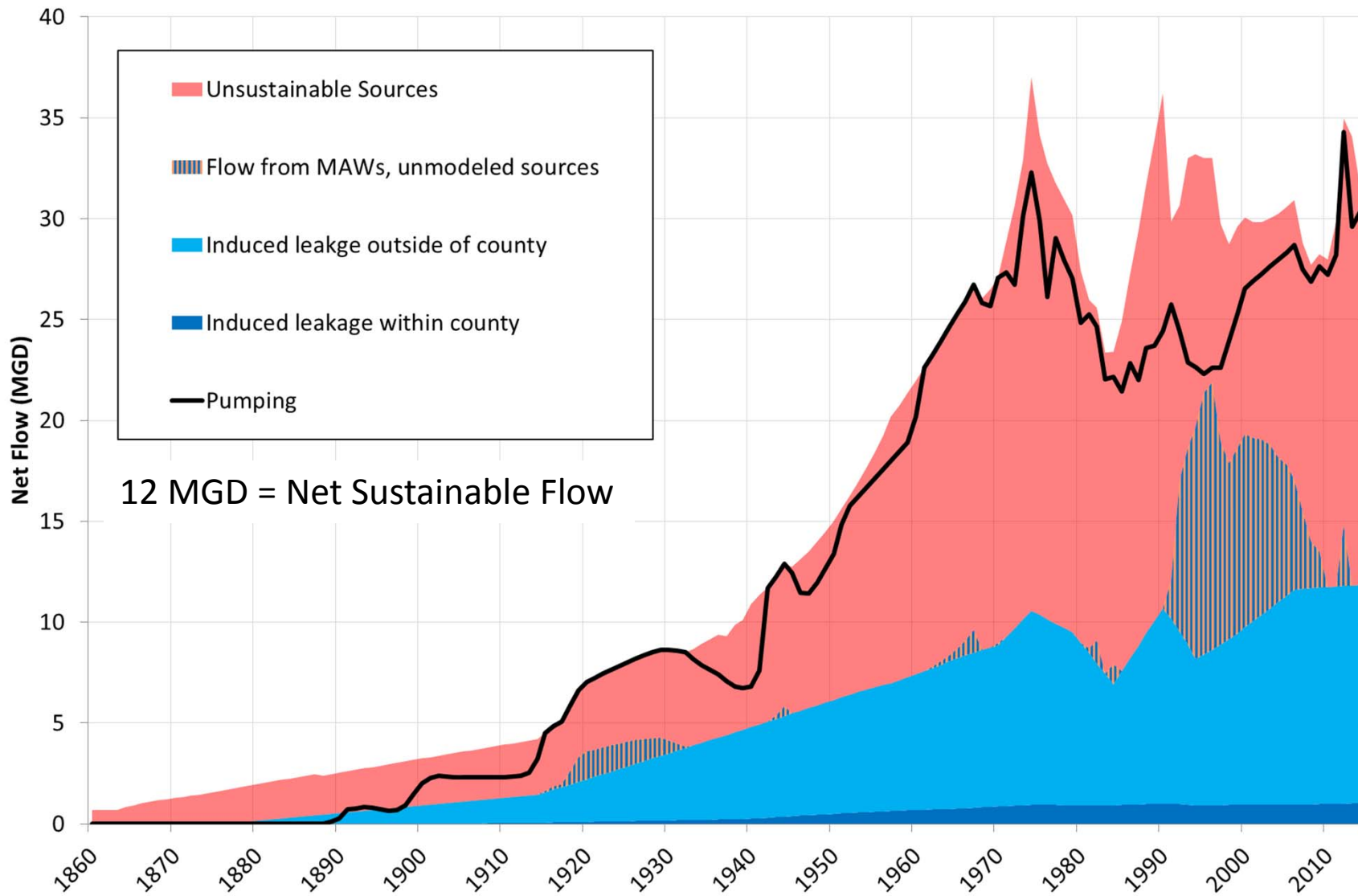


# Cook and DuPage Counties

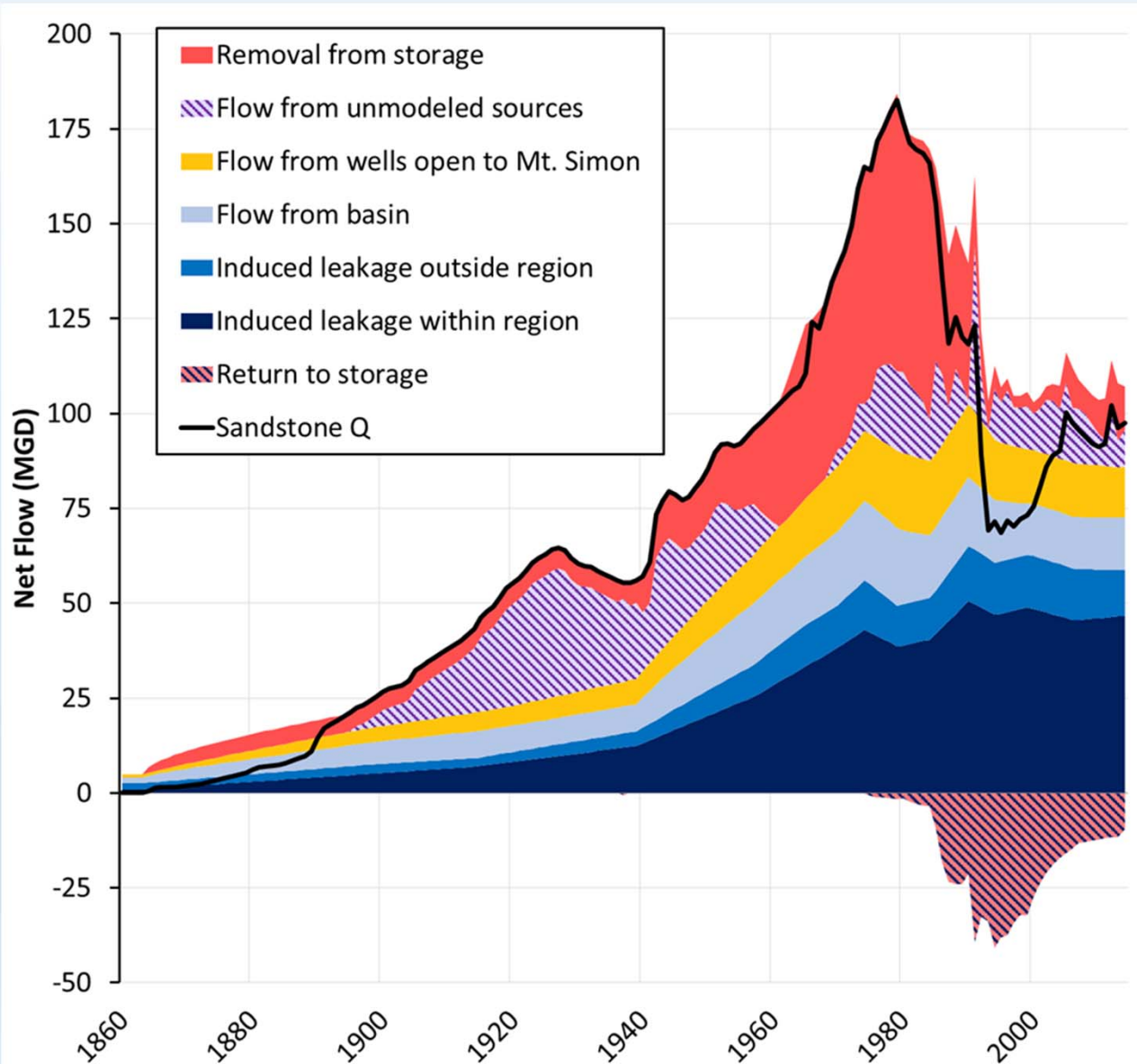




# Will County



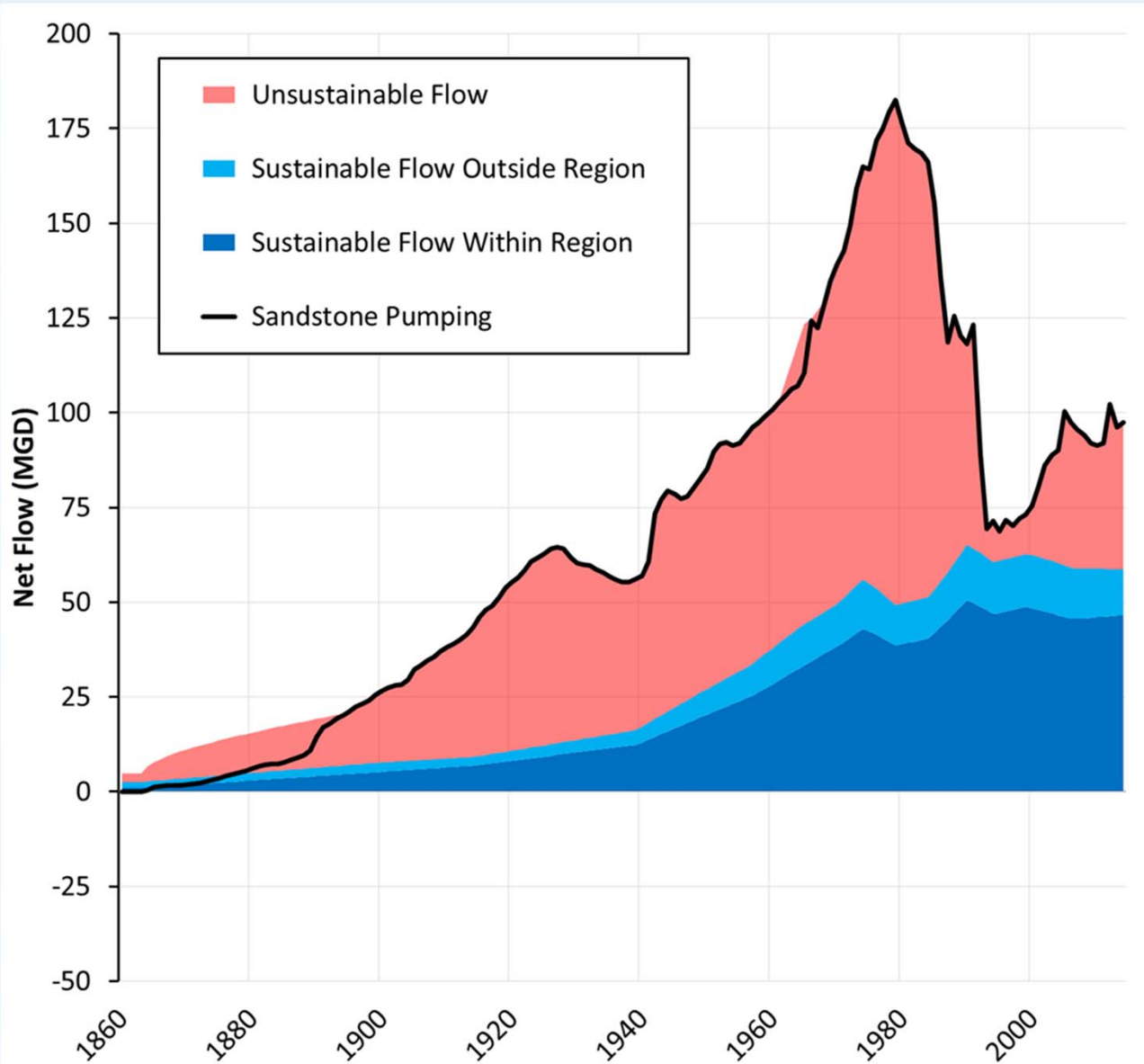
# What is sustainable?



Basin flow is unavoidable, so may be included in the short-term target, but it's best to minimize water from this source to avoid increasing salinity

Similarly, Mt. Simon should not be counted on as a source of water in most areas, as considerable uncertainty exists for the long-term water quality in these wells, especially as demands increase

# Other considerations



This approach does not consider reductions in natural groundwater discharge (yet), which would limit the amount of water available in recharge areas

Likely not a significant amount outside of northeast Illinois, but may be locally important in some streams and rivers

# “Safe Yield” vs Sustainable Yield

- New research using a Texas aquifer, calculates a safe yield from trends in either water levels or changes in storage
- Provides an estimate for the quantity of water capable of being withdrawn without increasing drawdown or removing water from storage
  - Includes the entire current flow budget irrespective of source, including leaky shallow MAWs, Mt. Simon, etc.
- Contrasted with sustainable yield, which also aims for an acceptable quality of water in addition to minimizing drawdown by limiting water from undesirable sources
- Synonymous in areas where water is primarily sourced from natural recharge

## MGD Withdrawals

County	Safe Yield	Sustainable Yield	Current Demands
Cook and DuPage	35	8	11
Grundy	7	7	8
Kane	19	16.5	26.5
Kendall	7.5	2	8.5
Lake	7	5	5
McHenry	8	8	8
Will	17.5	12	30
<b>Total</b>	<b>101</b>	<b>58.5</b>	<b>97</b>

**Yellow** = Current demands exceed both safe yield and sustainable yield

**Red** = Current demands exceed either safe yield or sustainable yield by at least 10 MGD

Note safe yield and sustainable yield are similar in most counties, except where undesirable water sources make up a considerable portion of the inflow

