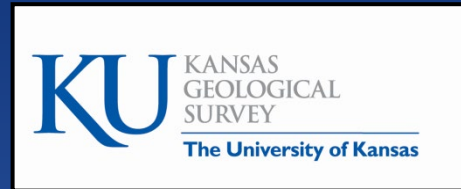


# Groundwater Resources in Kansas

House Water Committee  
January 19, 2023



Kansas Geological Survey  
University of Kansas

# Kansas Geological Survey

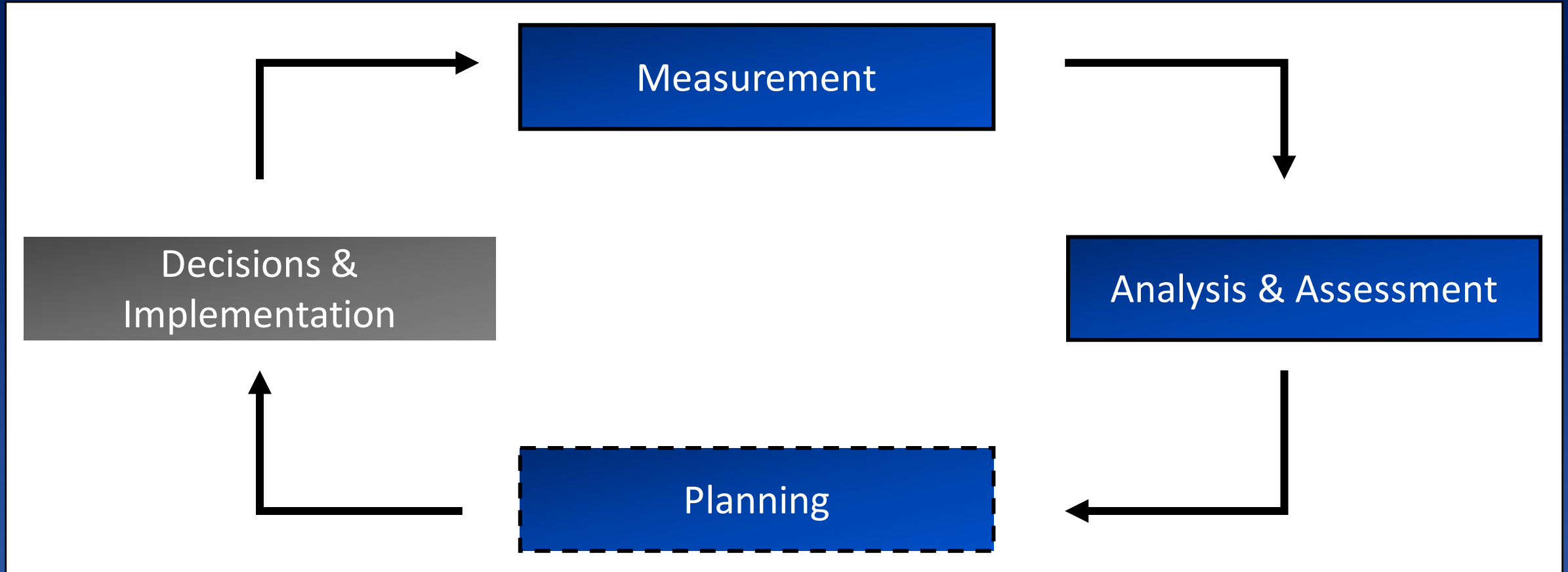


State Agency

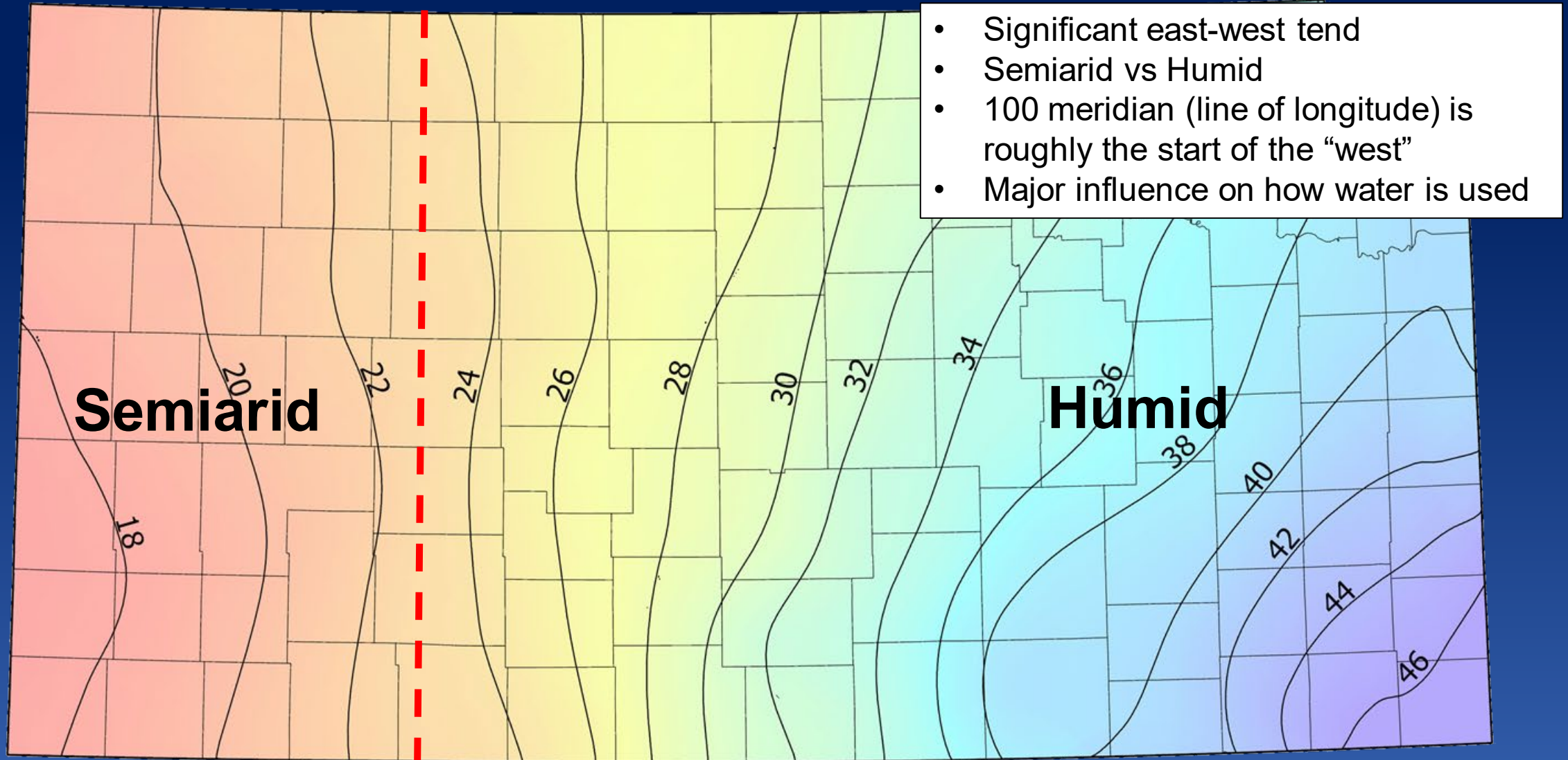


Research Institution under the  
University of Kansas

# KGS work is integral in 3 out of 4 resource management steps

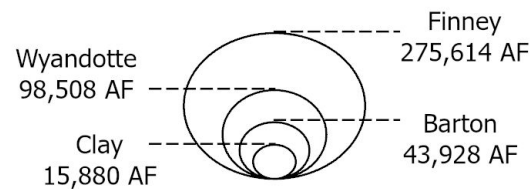
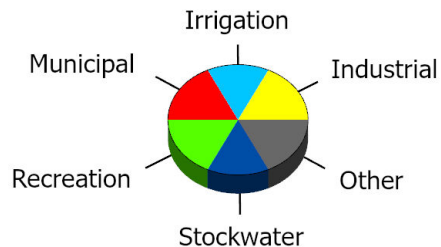
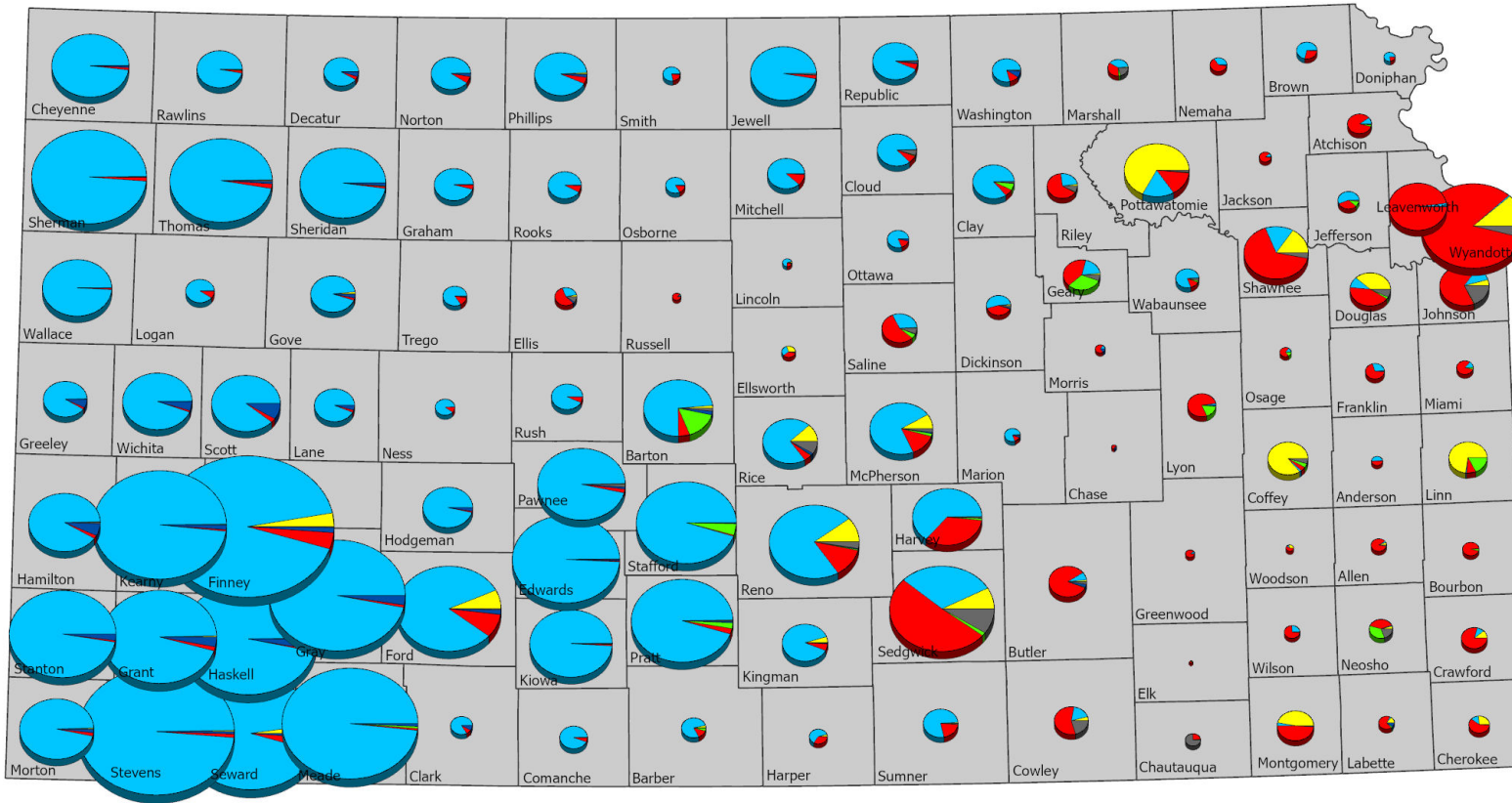


# 1991-2020 Normal Precipitation and Climate Zones



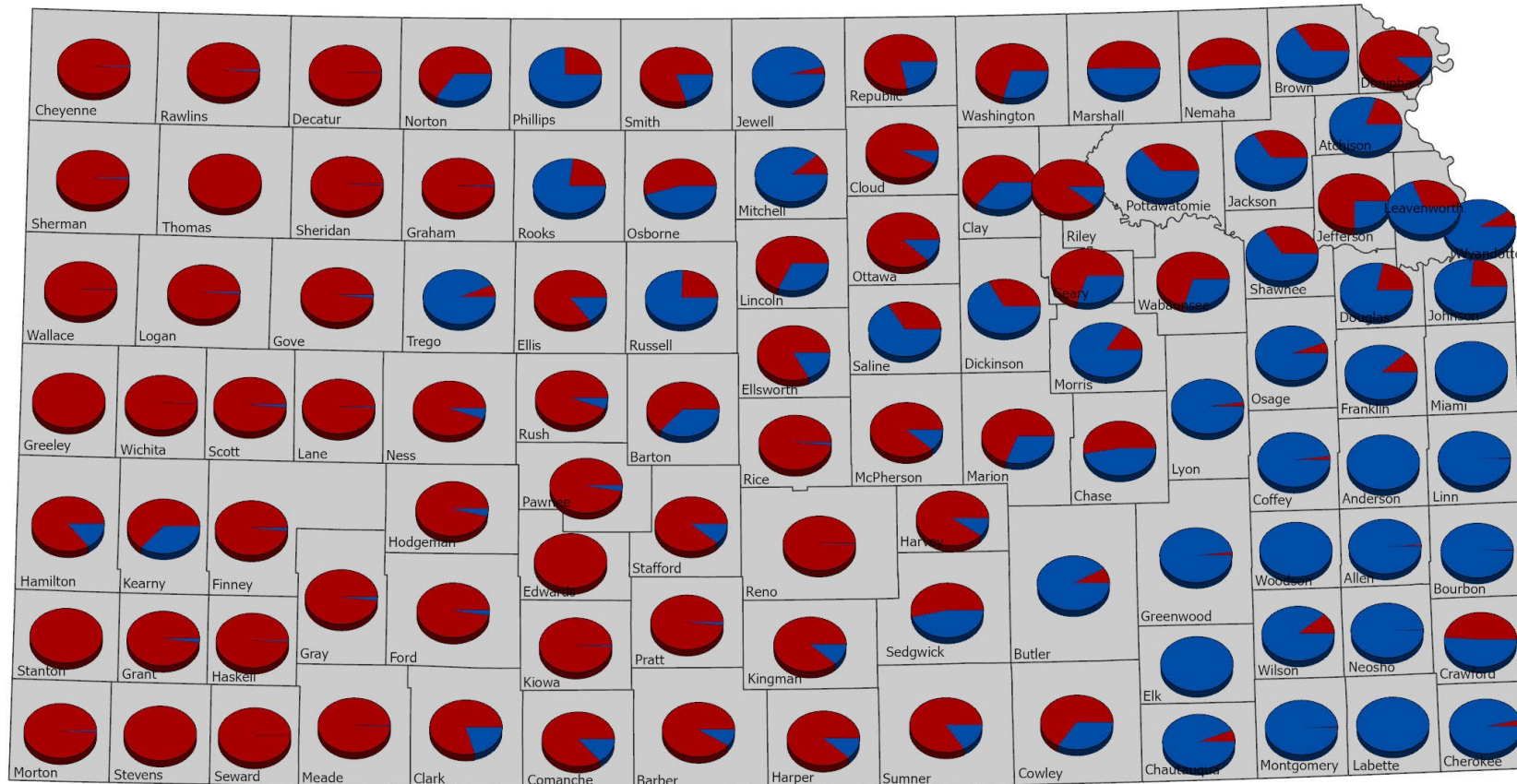
Source- Kansas State University Weather Data Library

# Average Reported Use Made of Water, 2012 to 2021

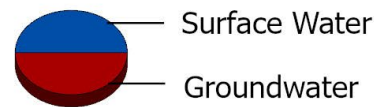


\*Excludes Bowersock Mill and Power Company (Other) in Douglas County

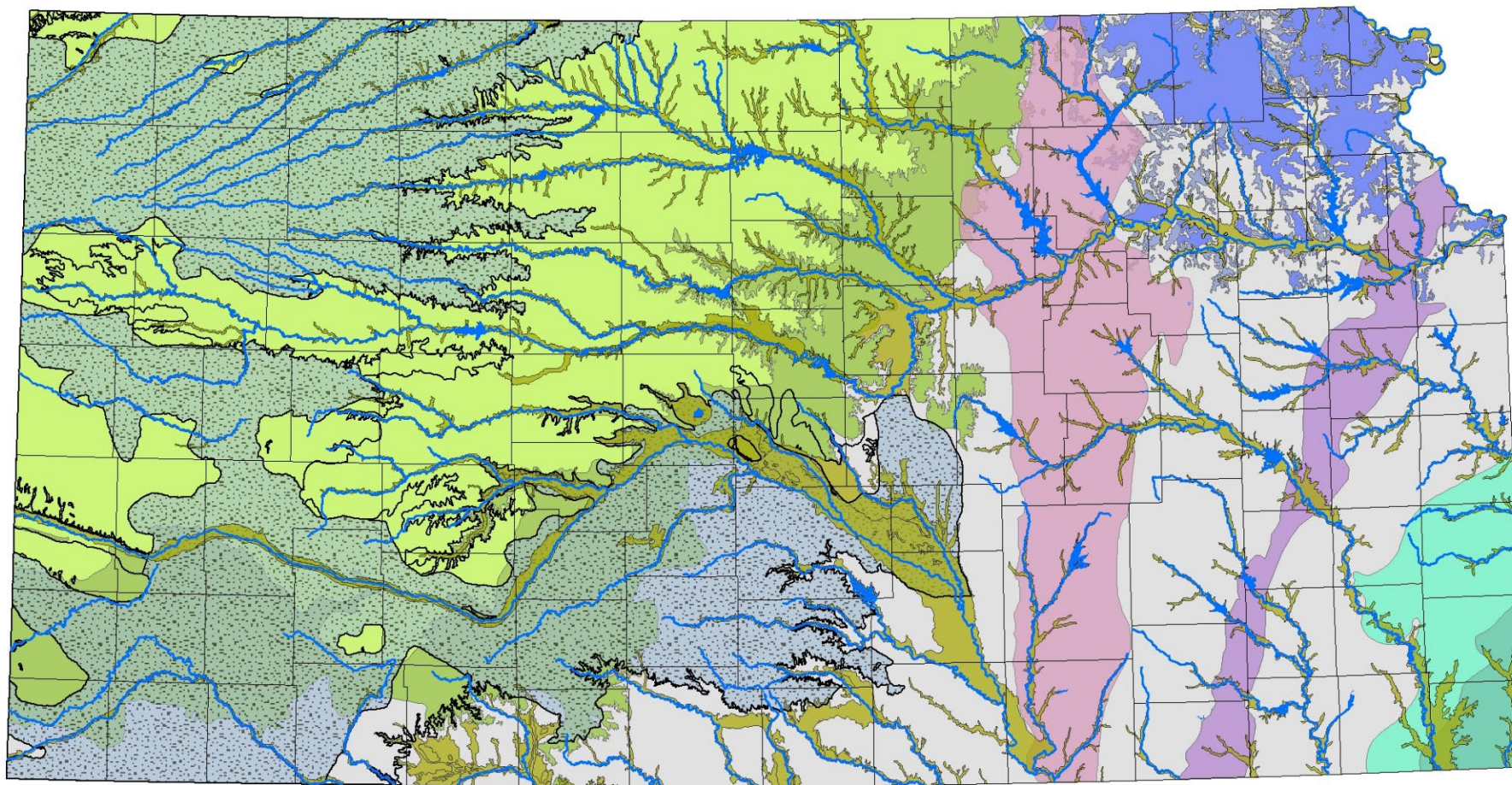
- Eastern Kansas typically municipal and industrial uses
- Irrigation dominates western and south-central Kansas
- Stockwater uses, although smaller, are found in greater concentrations in southwest Kansas
- Driven by precipitation, climate, and water availability



- **Eastern Kansas typically surface water**
- **Western and south-central Kansas typically groundwater**

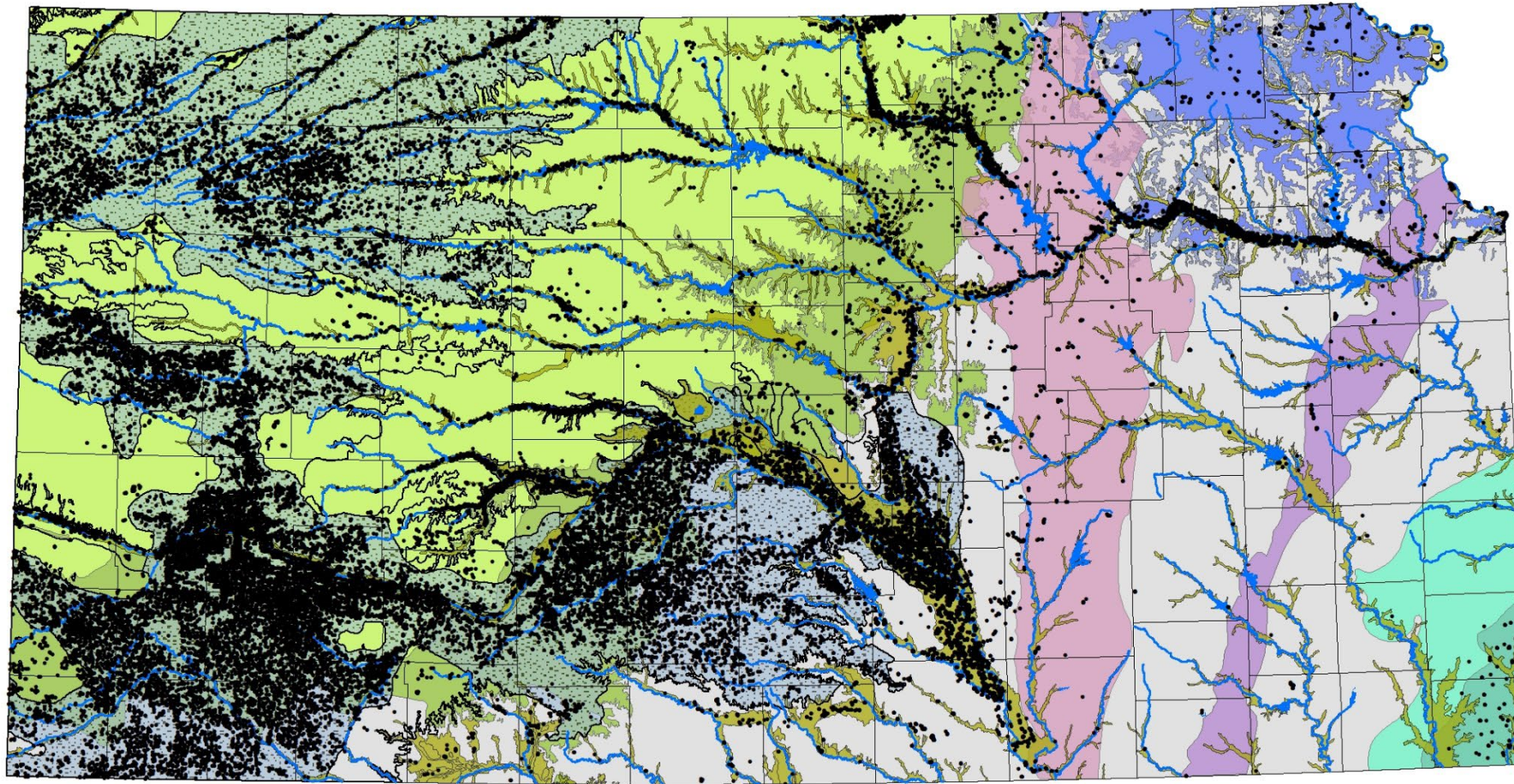


# Aquifers in Kansas



- Major and minor aquifer systems in the state
- Each system is unique in composition and water accessibility, availability, and quality

# Aquifers in Kansas and Groundwater-Based Water Rights

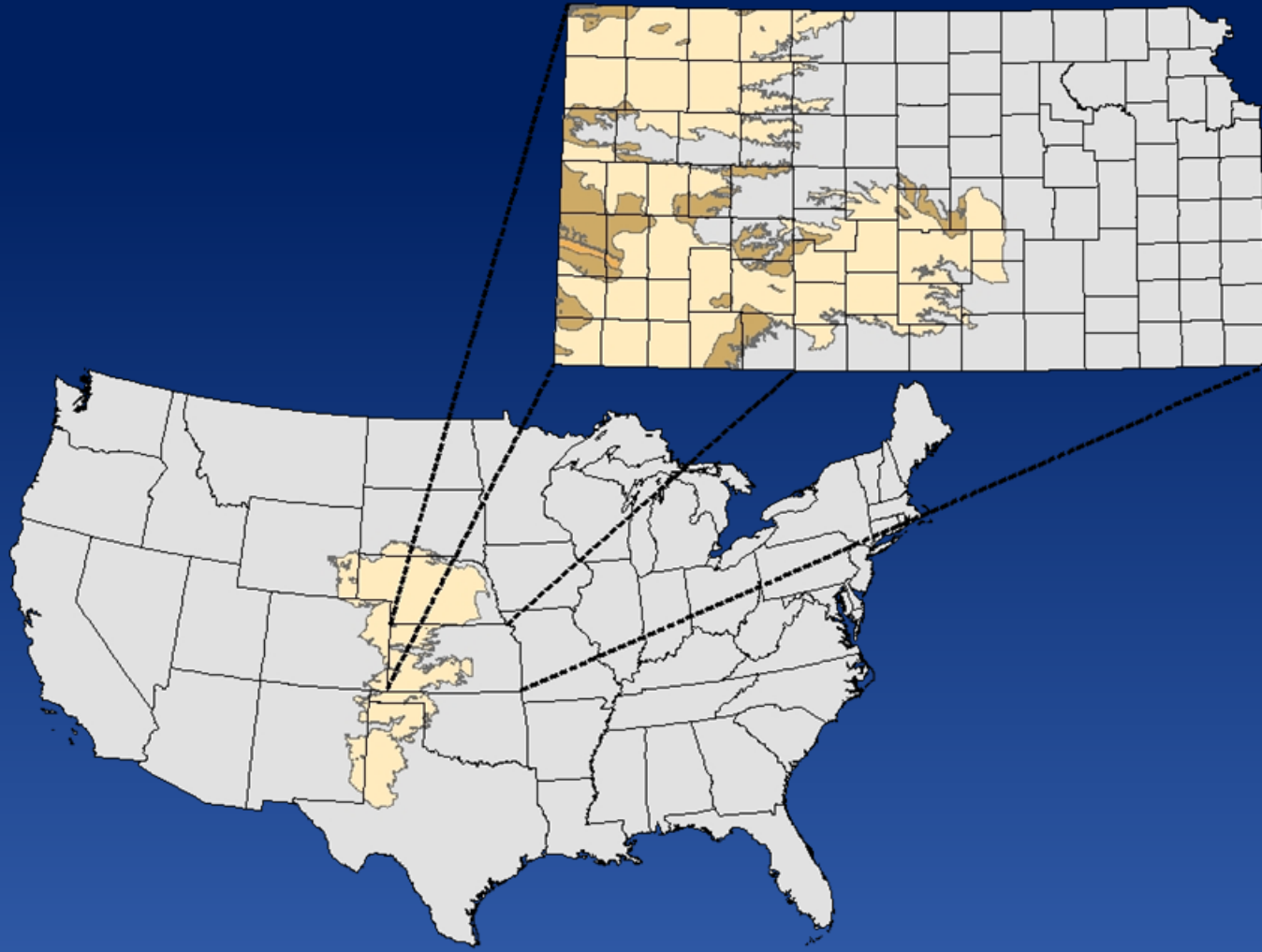


- |  |                        |                              |
|--|------------------------|------------------------------|
| High Plains Aquifer (Saturated Extent) | Flint Hills Aquifer    | Alluvial Aquifers            |
| Dakota Aquifer (Unconfined)            | Glacial Drift Aquifers | Ozark Aquifer (freshwater)   |
| Dakota Aquifer (Confined)              | Douglas Aquifer        | Ozark Aquifer (usable water) |

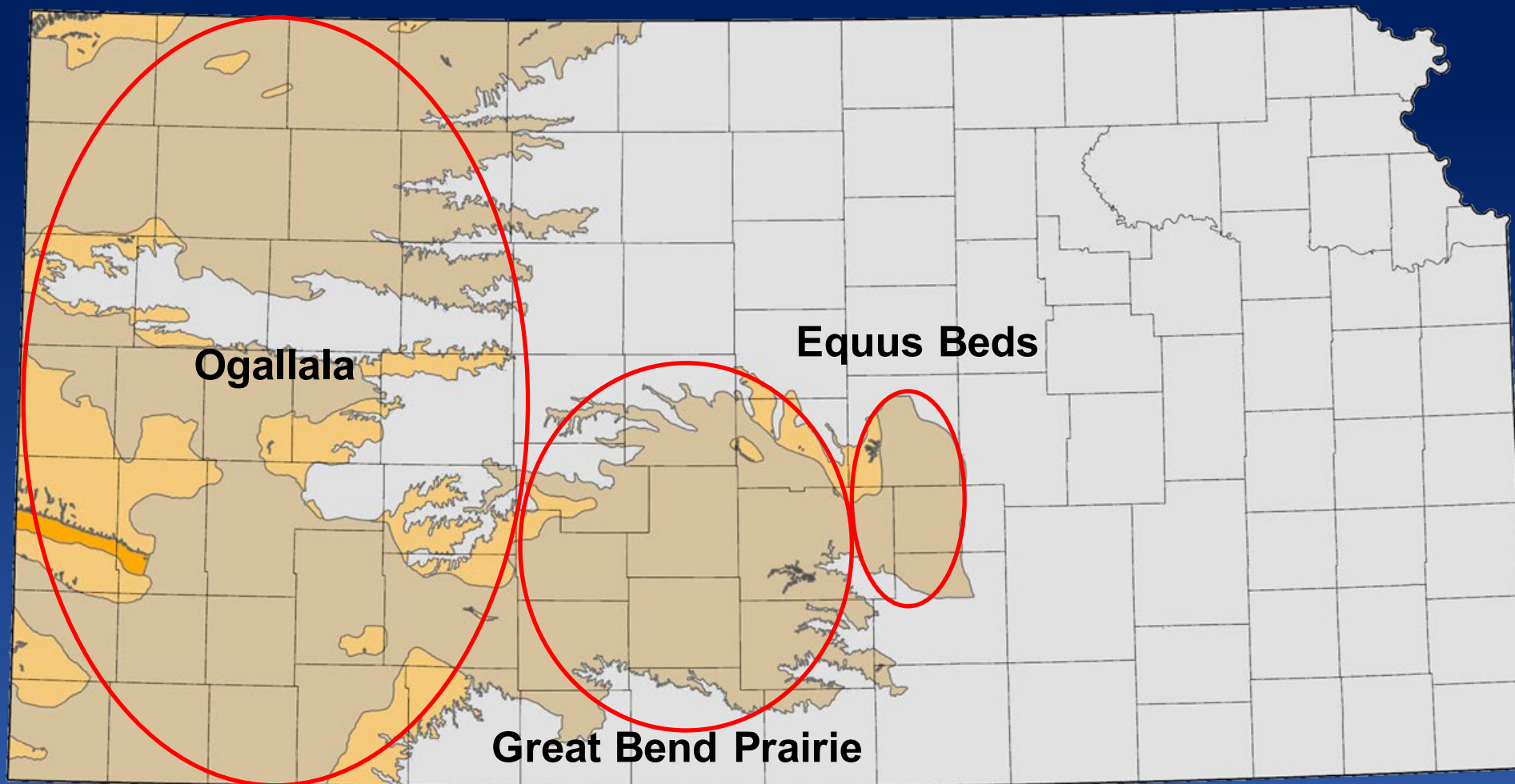


- Groundwater-based water right development
- Typically represents larger capacity wells and does not include domestic uses
- Good indicator of where usable water is and is not

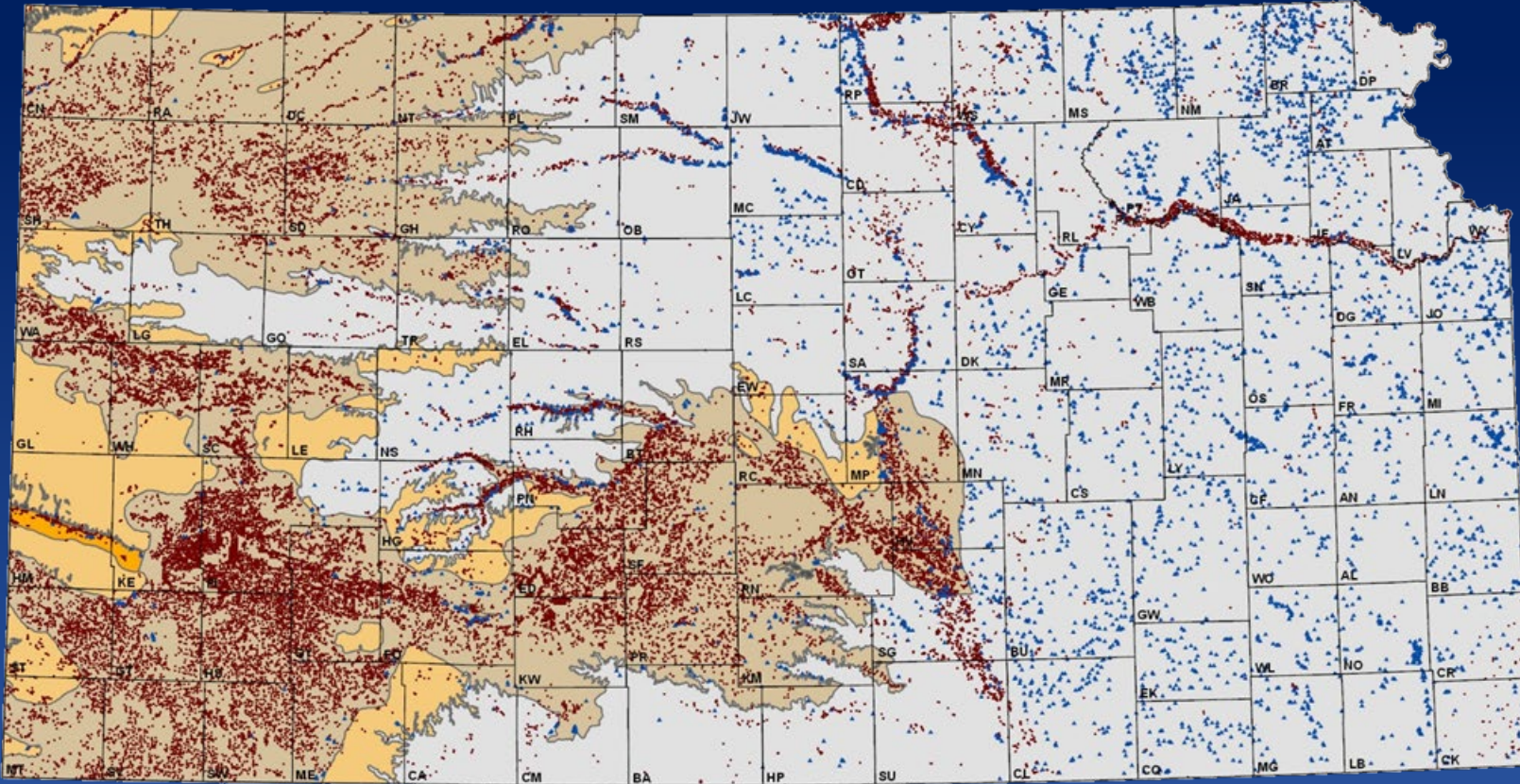
# The High Plains Aquifer



# The High Plains Aquifer in Kansas



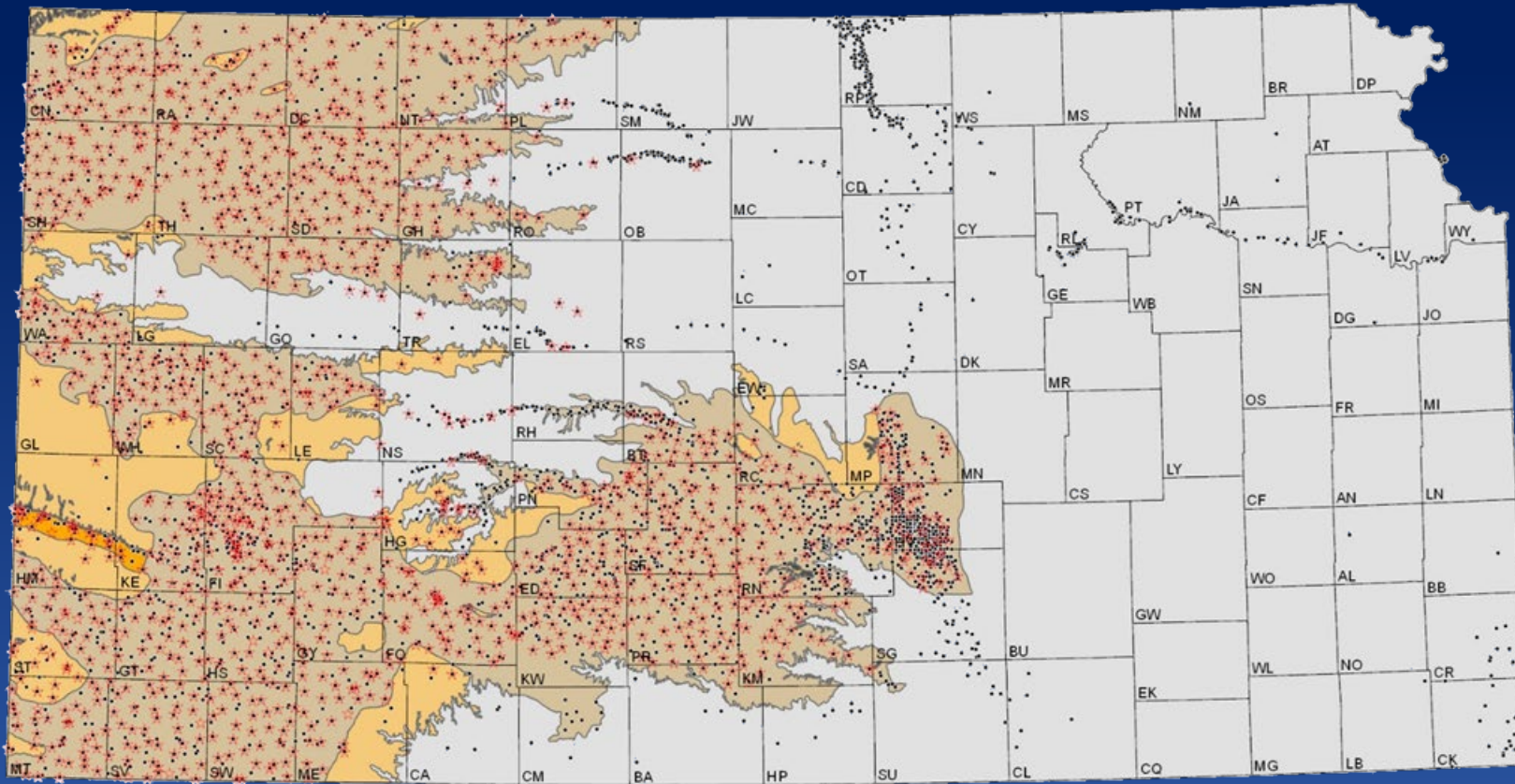
# Water Right Development in Kansas



- Water usage is highly regulated
- Much of the water development in the High Plains aquifer was in place by the 1980s
- Each year, ~90% of water used is from groundwater, from that, ~80 to 85% is for irrigation
- Over 95% of the wells in the Kansas High Plains aquifer have a flow meter

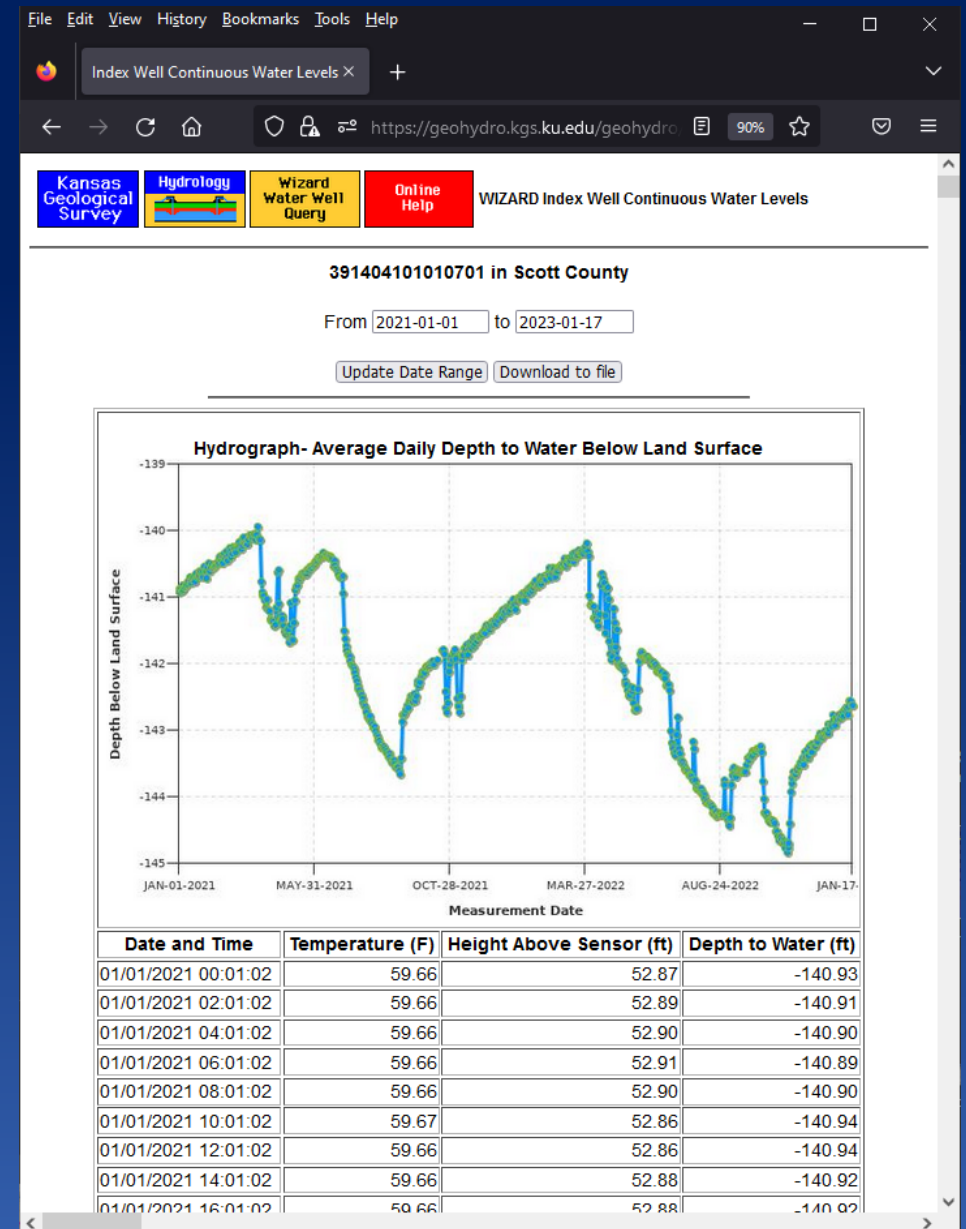


# Measured Wells in Kansas

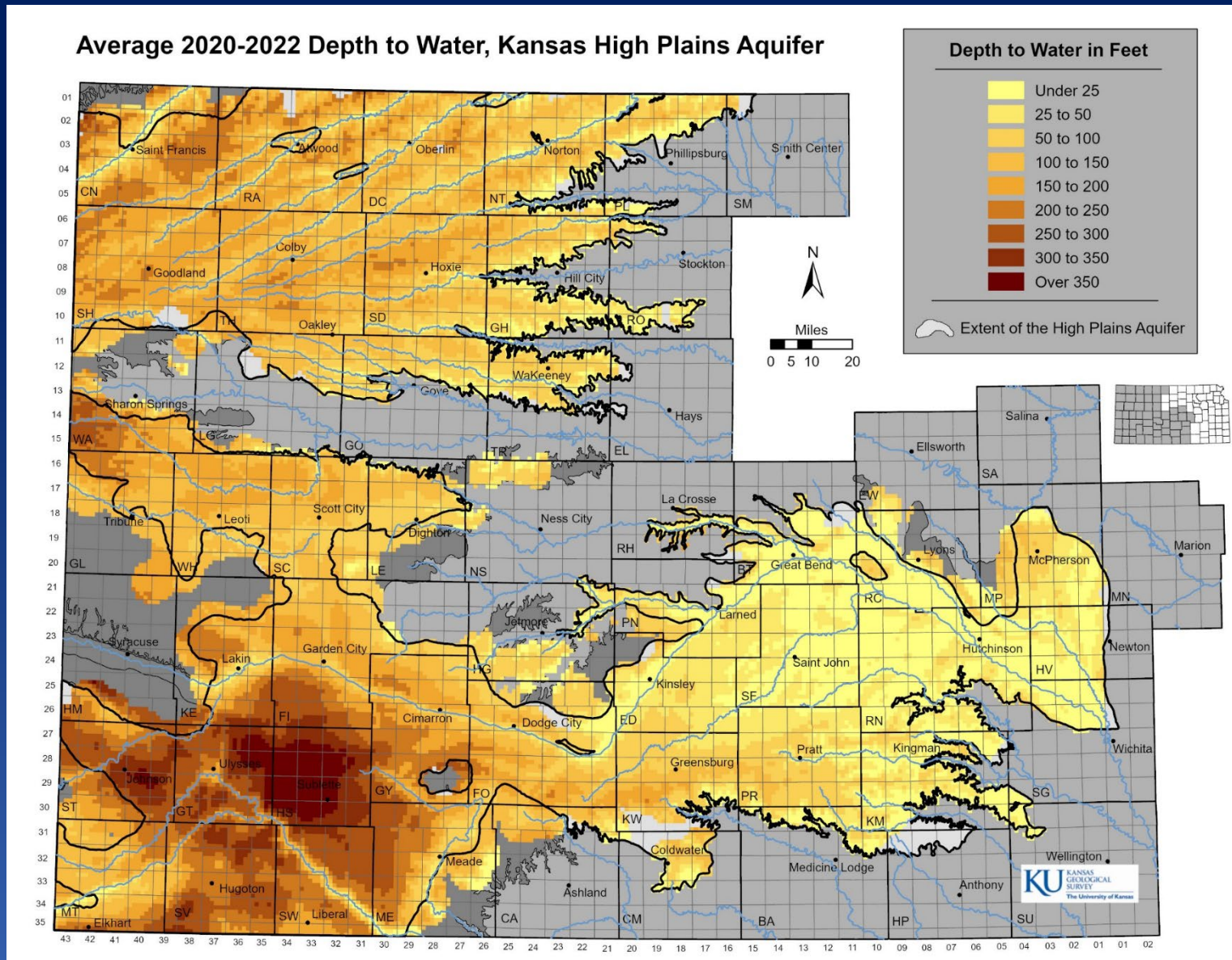


- Depth-to-water measurements
- Wells measured by GMDs 2 and 5, KDA-DWR, USGS, and the KGS
- Cooperative Water Level Network
  - Focused on High Plains aquifer
  - Annual measurements by the KGS and KDA-DWR
  - Regional aquifer characterizations





# Depth to Water, Kansas High Plains Aquifer

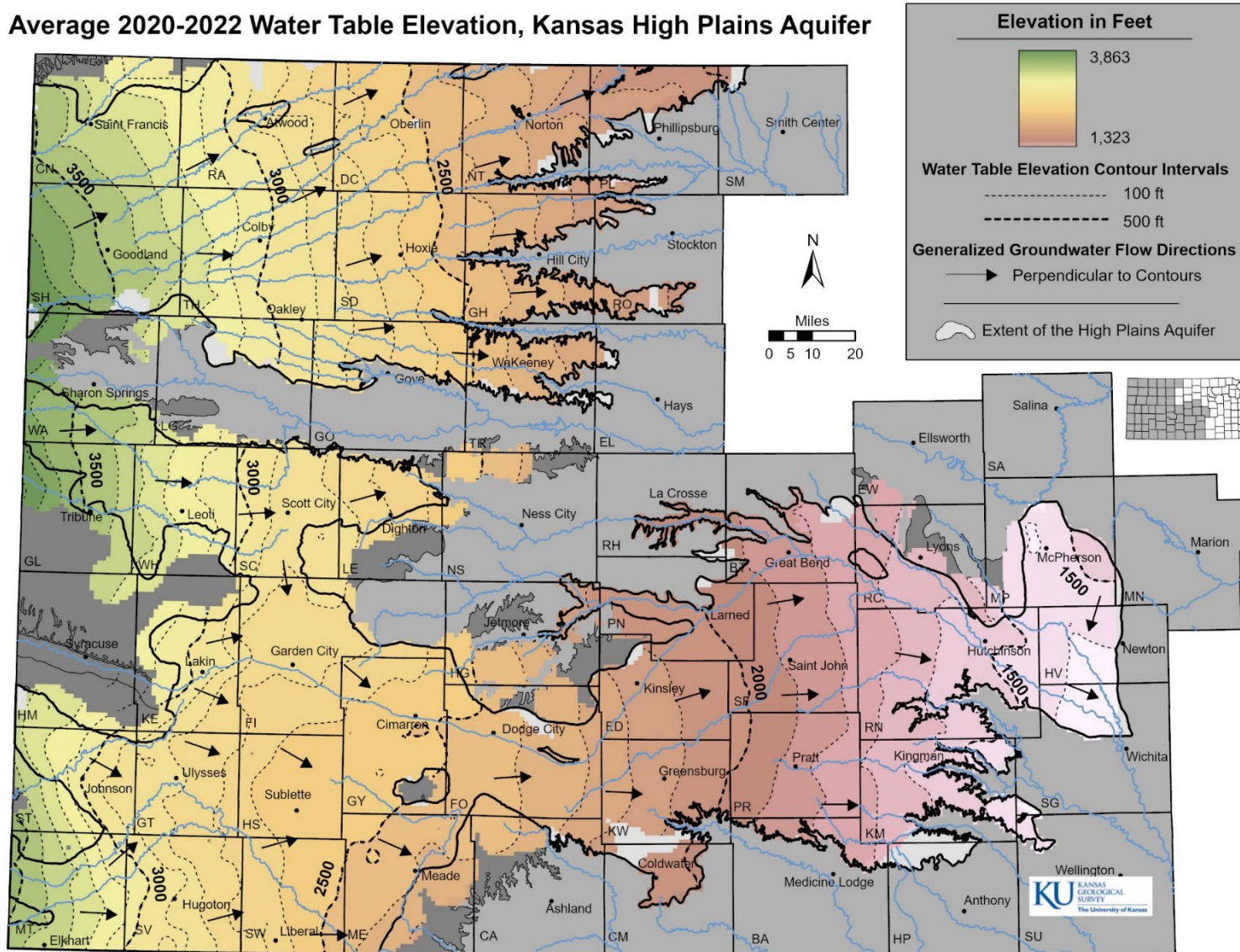


Depth to water ranges from:

- At or near the land surface
- Over 450 ft (Haskell County)

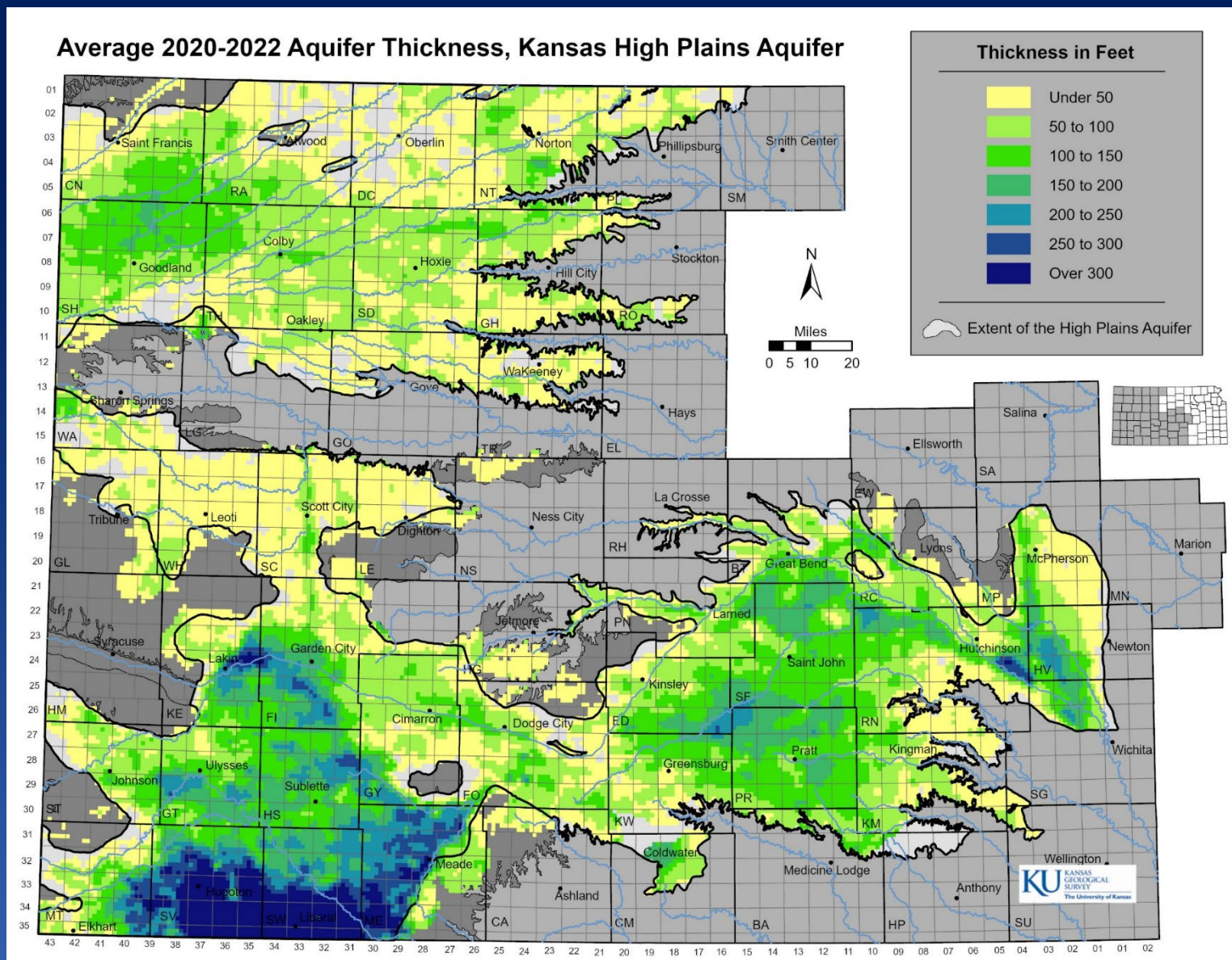
# Water Table Elevation, Kansas High Plains Aquifer

Average 2020-2022 Water Table Elevation, Kansas High Plains Aquifer

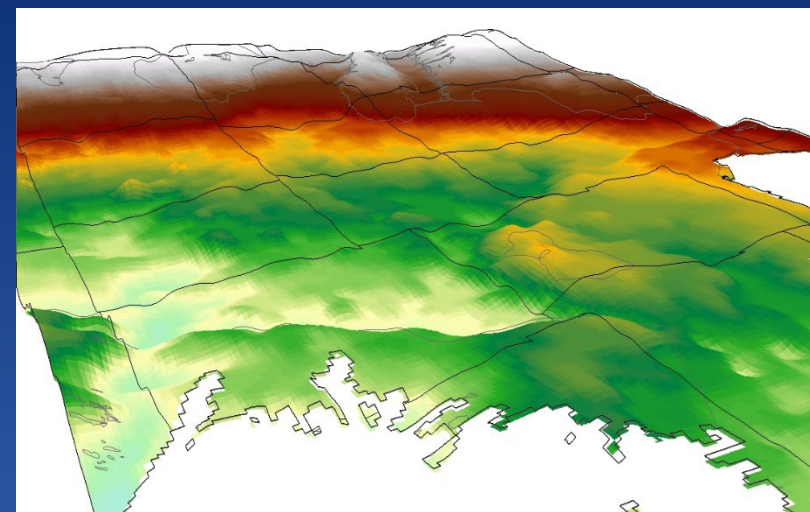


- Generally follows land surface
- Flow paths are generally west to east with some local variations
- Non-pumping, linear flow velocities
  - Range from 1 ft per 1 to 4 days
  - 10 to 20 years to go a mile

# Aquifer Thickness, Kansas High Plains Aquifer



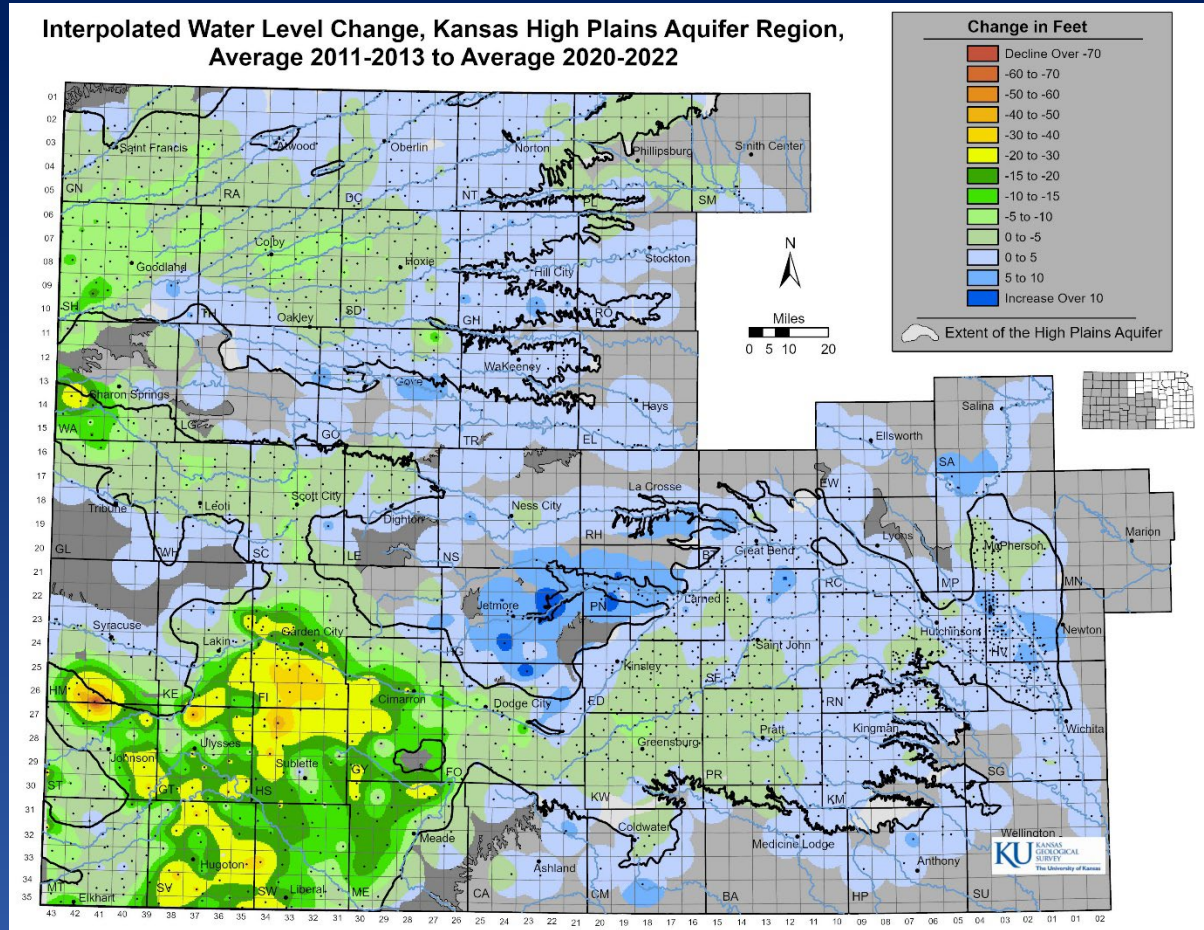
- Ranges from 0 to 500 ft (Seward County).
- Variability driven by bedrock surface.



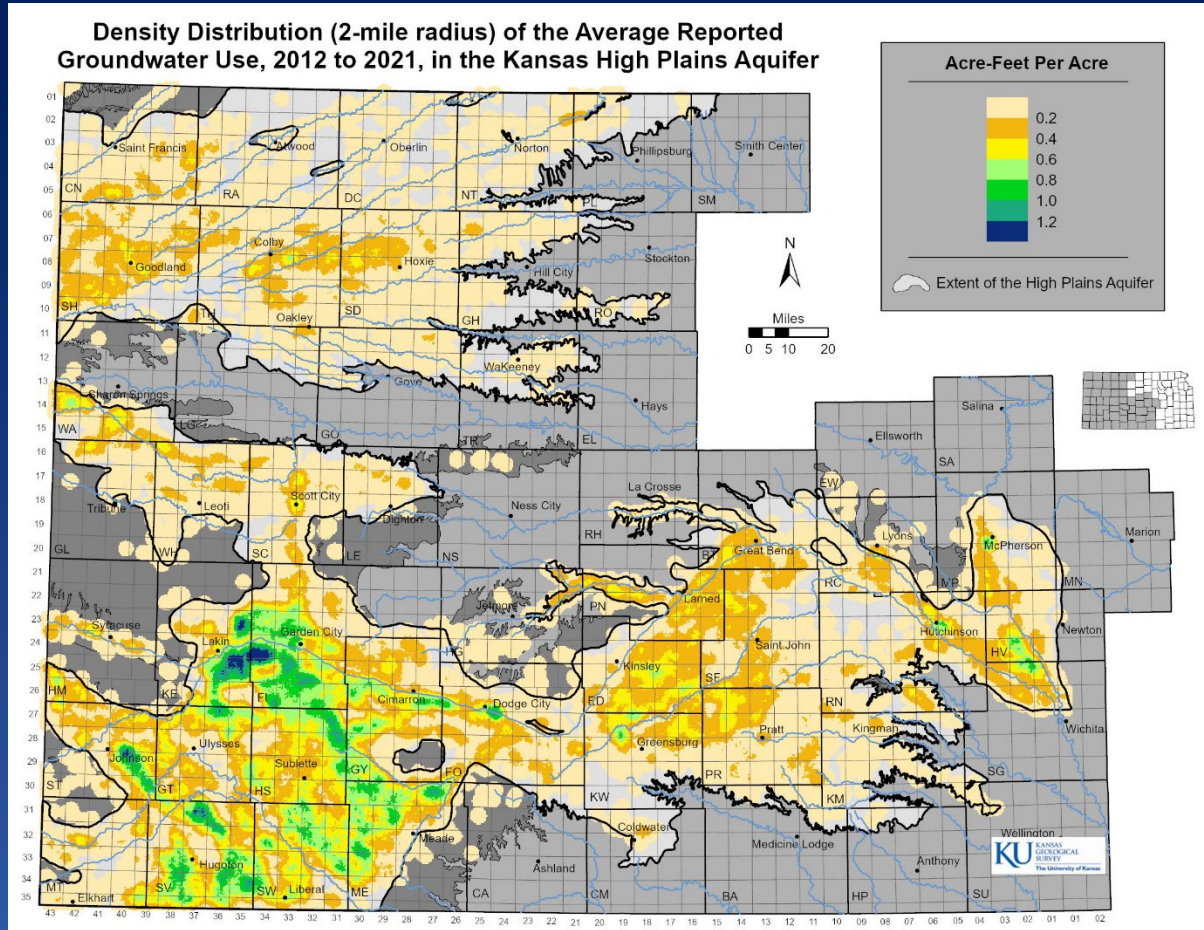


# Water-Level Change vs Reported Water Use

## Water-Level Change

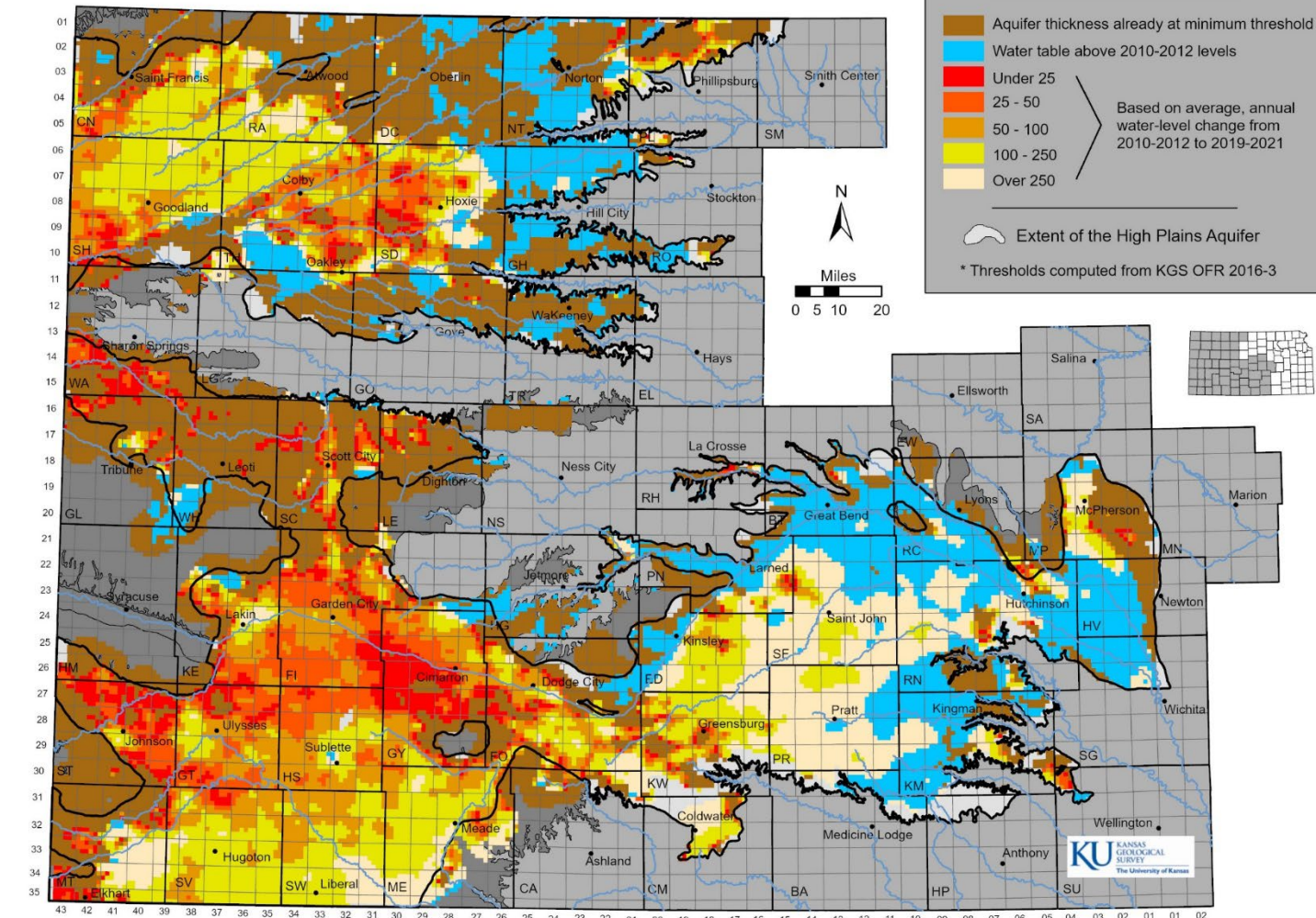


## Groundwater Use



# How long will the aquifer last?

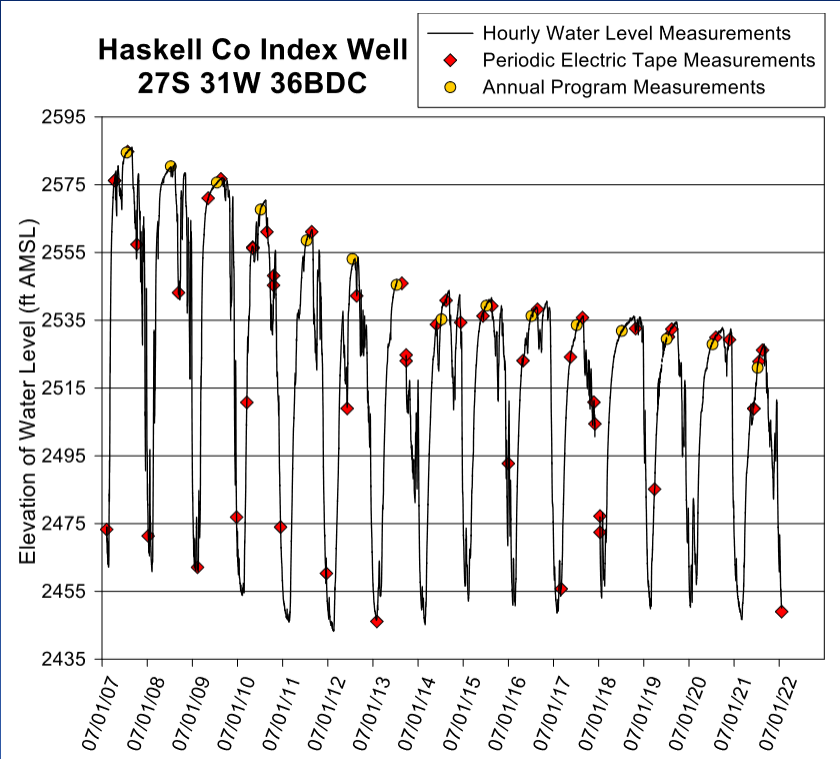
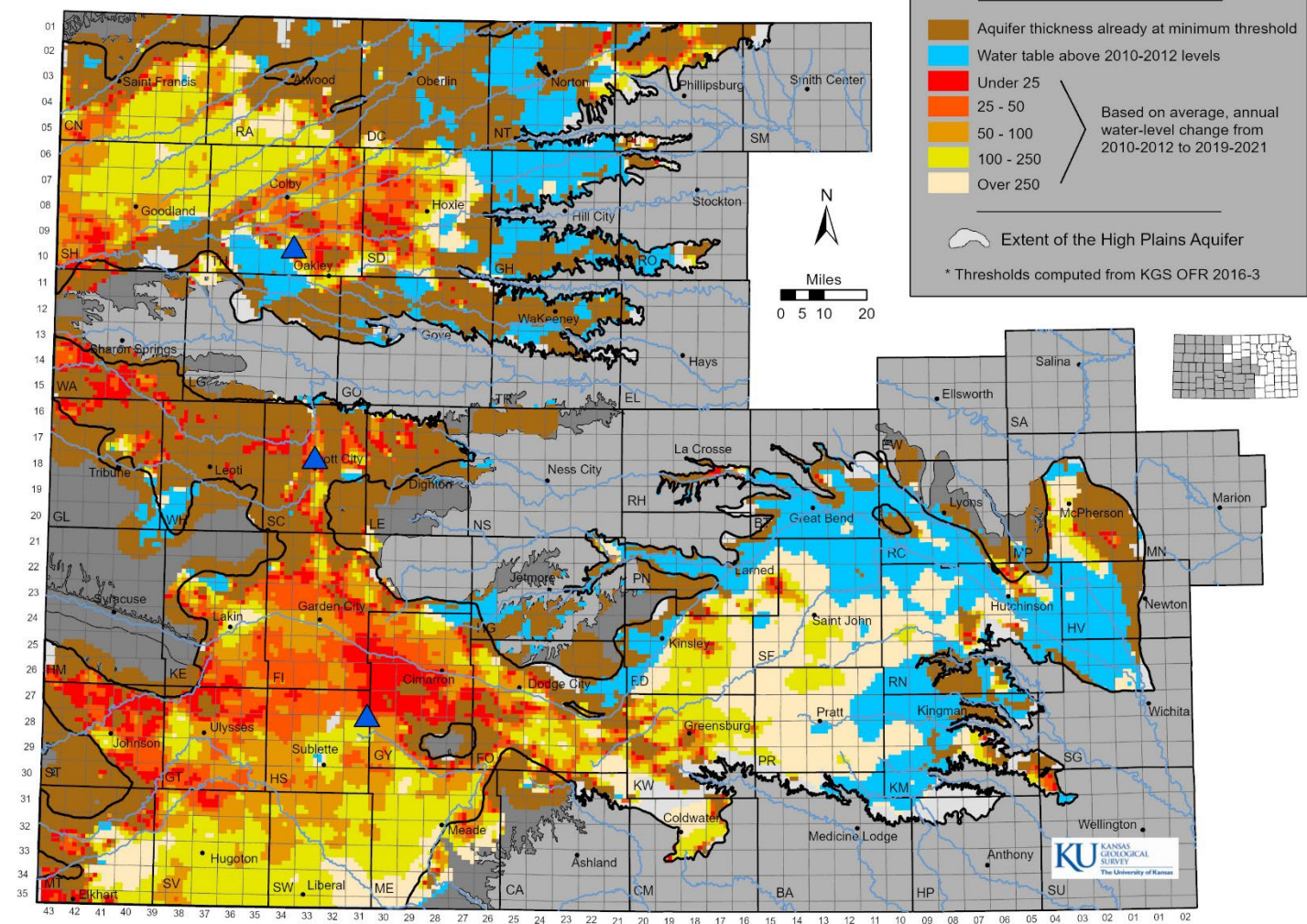
Estimated Usable Lifetime for the Kansas High Plains Aquifer (based on groundwater trends from 2010-2012 to 2019-2021 and the minimum saturated thickness required to support well yields at 200 gpm under 90 day of pumping scenario with 200 gpm wells on 1/4 sections)



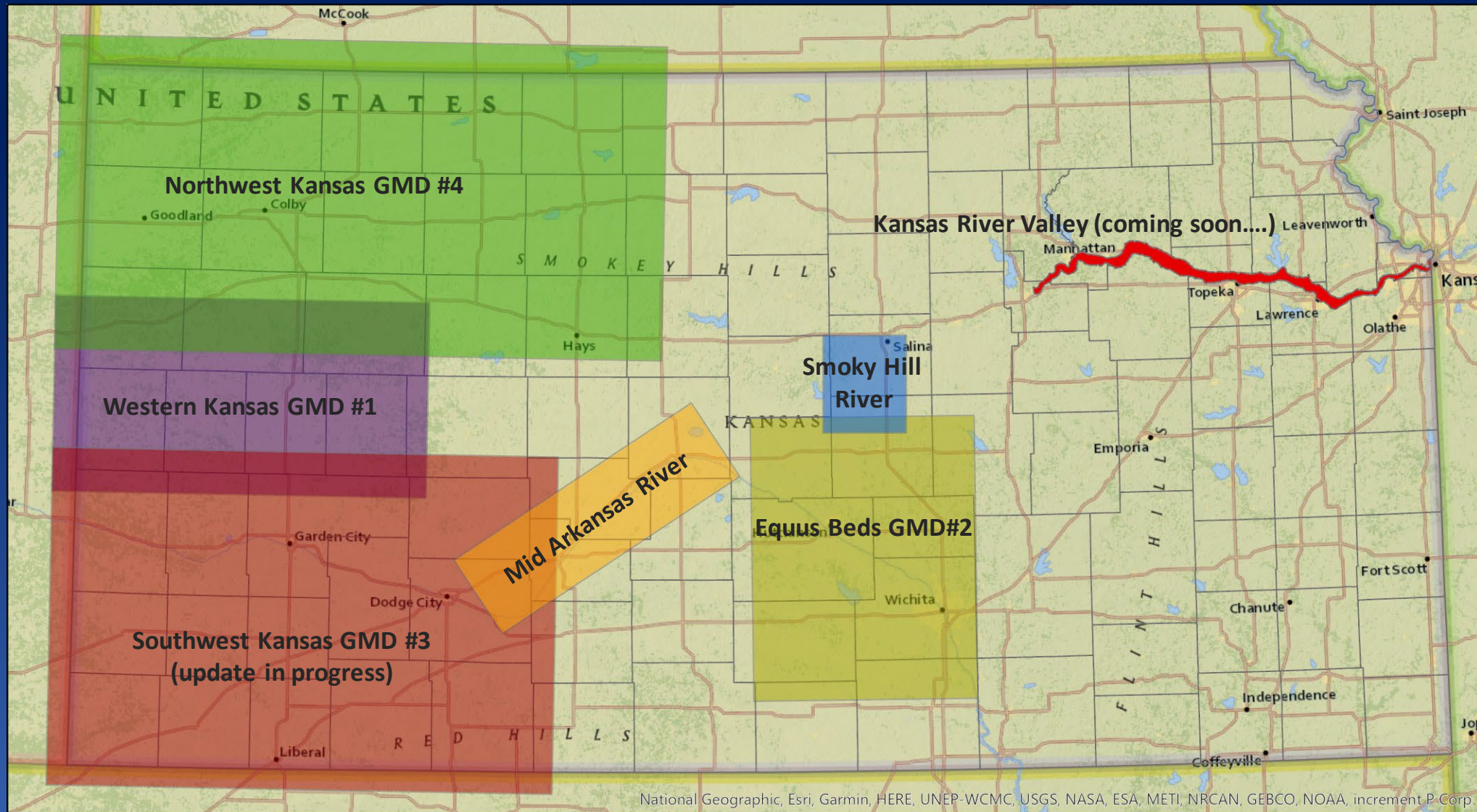
**Estimated Usable Lifetime = project water-level declines into the future until the saturated thickness of the aquifer is reduced to a point where well yields start to be impacted.**

# How long will the aquifer last?

Estimated Usable Lifetime for the Kansas High Plains Aquifer (based on groundwater trends from 2010-2012 to 2019-2021 and the minimum saturated thickness required to support well yields at 200 gpm under 90 day of pumping scenario with 200 gpm wells on 1/4 sections)



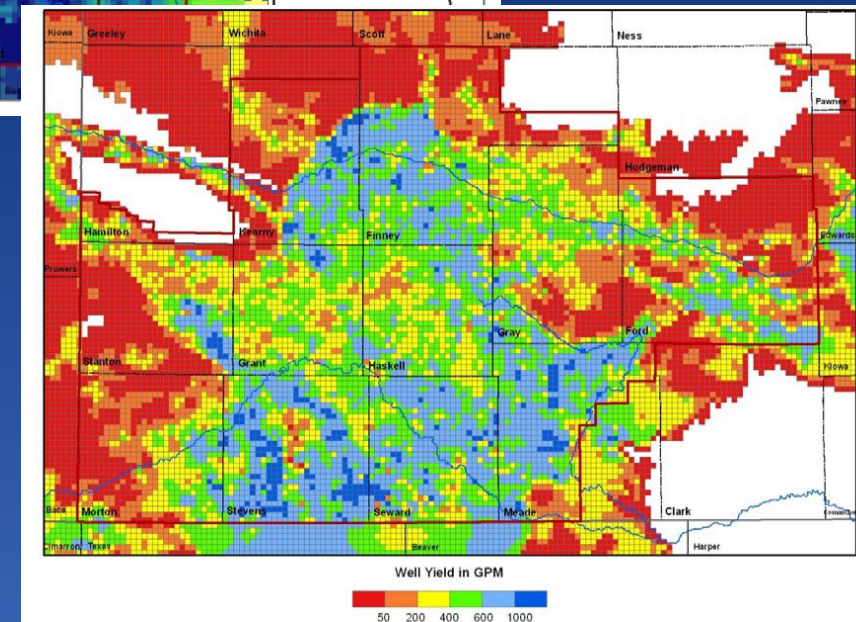
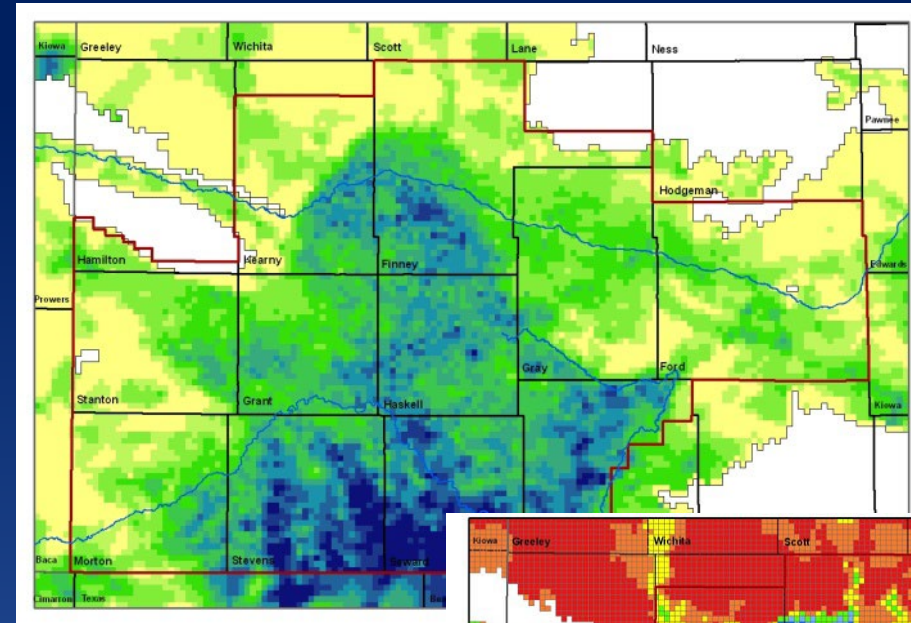
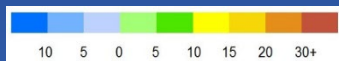
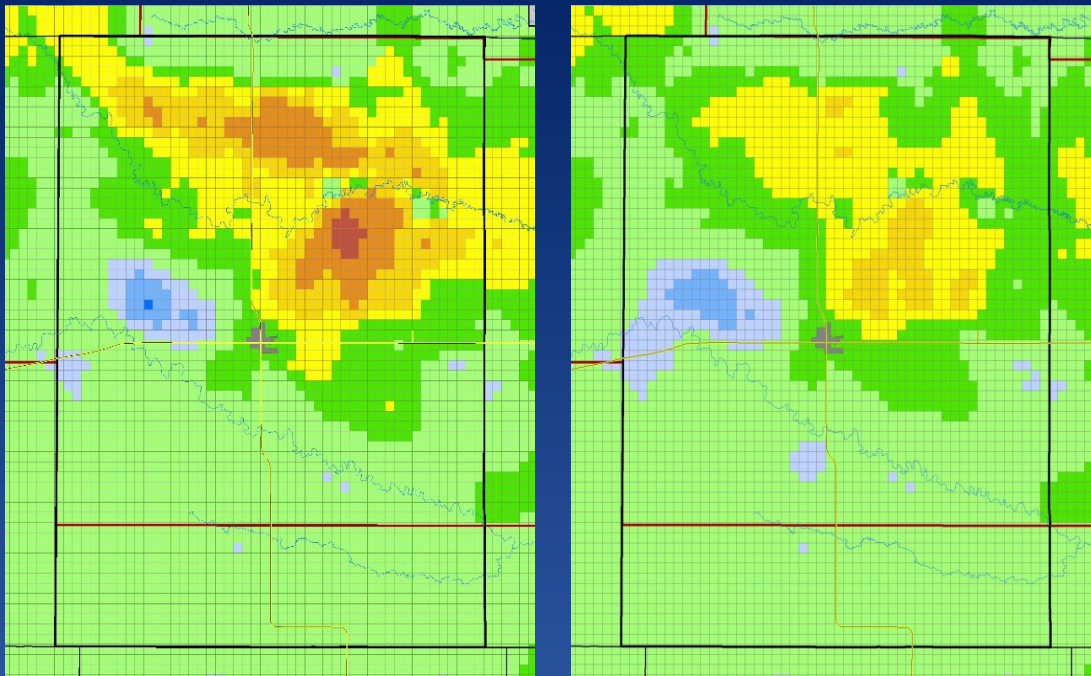
# Past and current KGS modeling activities in Kansas



# Example of model projections of aquifer changes

## Future storage and wells yields in SW Kansas

### Water-level changes in Wichita County



# Future aquifer lifetimes are dependent on many factors

Picture of a flow meter, Summer 2022

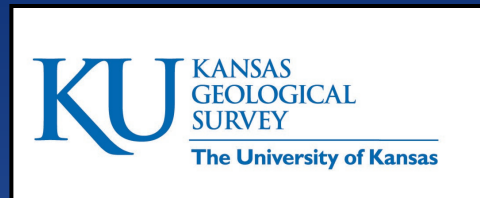
- Physical aquifer properties
- Economic drivers
- Water right / landowner management





# Questions????

**Kansas Geological Survey  
1930 Constant Ave  
Lawrence, KS 66047  
785-864-2118**



Visit our site at  
<http://www.kgs.ku.edu>