# Water Program Task Force

July 21, 2025

Kansas Department of Agriculture

KANSAS GEOLOGICAL SURVEY
The University of Kansas

# Outline

- KDA Division of Water Resources Mission and Role
- Distribution of Water Resources
- Uses of Water in Kansas and Aquifer Impacts
- Defining the Aquifer
- Addressing Groundwater Declines
- Future Risks and Uncertainties
- Water as an Economic Generator

# Kansas Department of Agriculture
# Division of Water Resources

# KDA–DWR Mission and Role

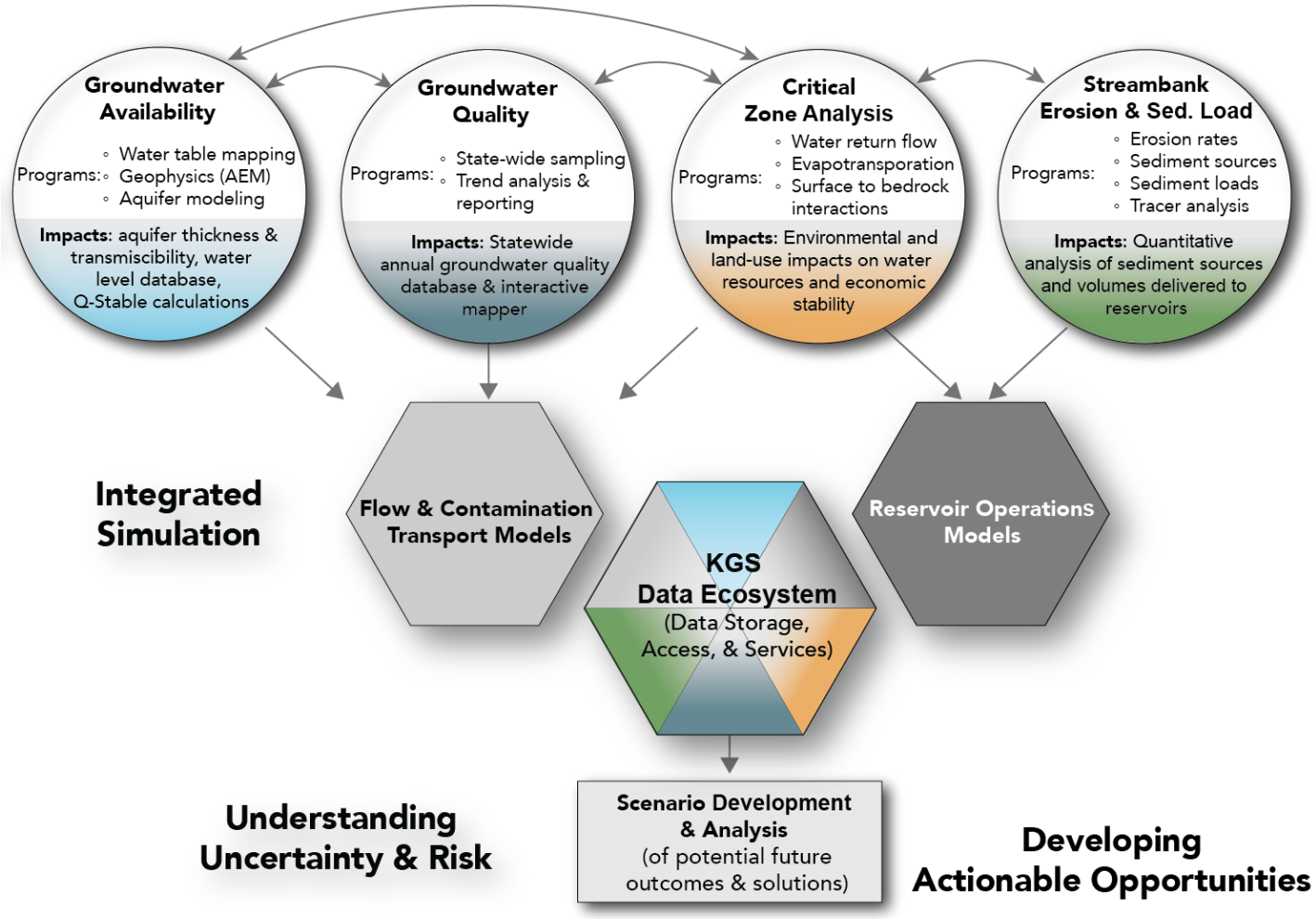
- Allocate and regulate the state's water resources, including the administration of water rights.
- Protect public safety and private property (dam safety, regulation of stream and floodplain projects).
- Ensure Kansas obtains its share of interstate supplies.

# Kansas Geological Survey Mission & Role

- Develop authoritative, impactful, and accessible scientific datasets related to Kansas' geological resources (particularly those of economic impact).

- Translate observations into objective, actionable insights and decision support systems in partnership with communities, farmers and ranchers, and industrial producers.

## KGS Water Programs



# Kansas Water Appropriation Act

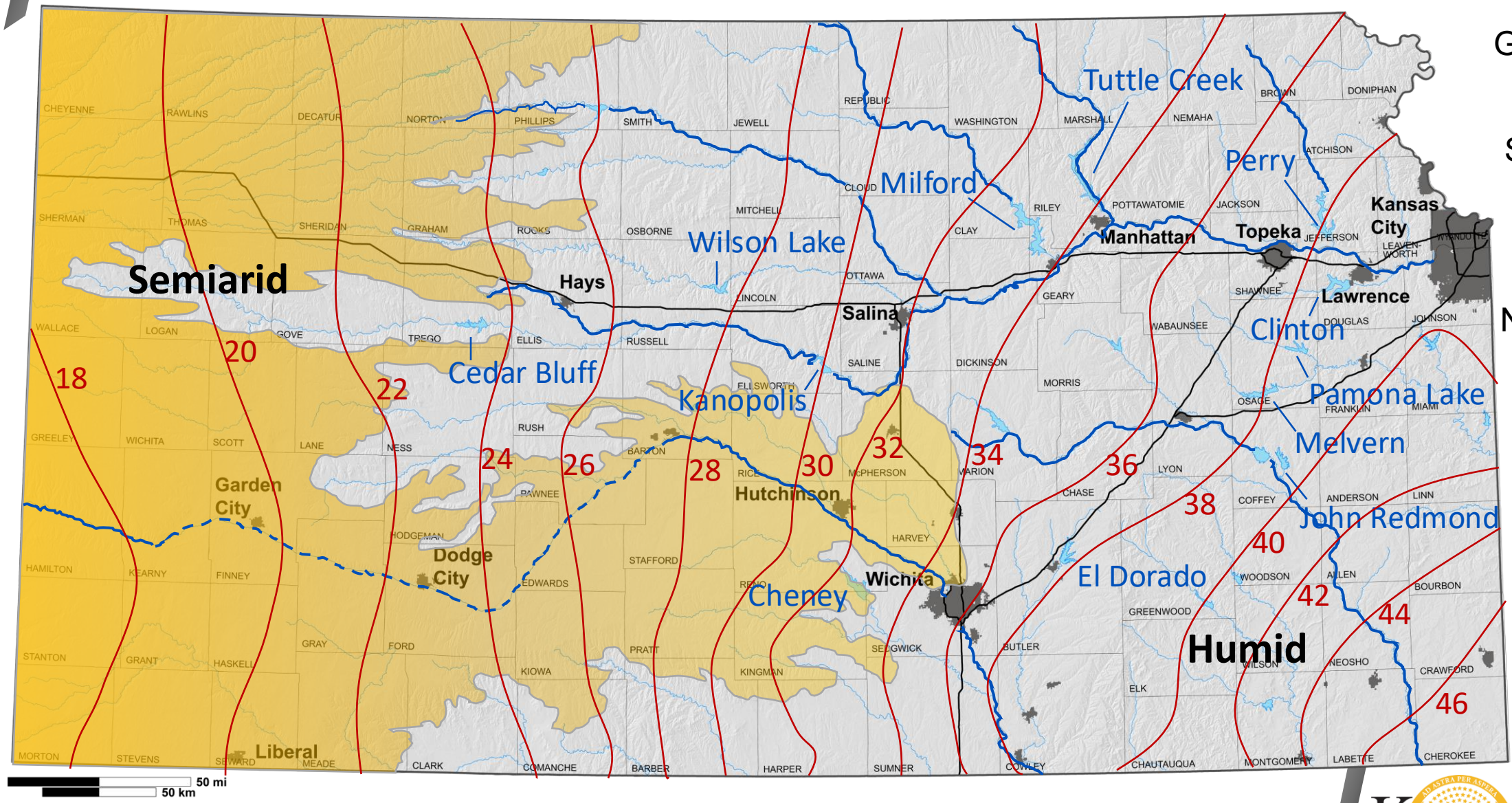
- "First in time, first in right" — prior appropriation doctrine.
- Governed by Kansas Water Appropriation Act (K.S.A. 82a – 701 et seq.).
- Water is publicly owned; beneficial use requires a permit from DWR.
- The main beneficial uses are irrigation, municipal, industrial, or stockwater.
- Allows chief engineer to oversee allocation of the state's water resources for beneficial use and regulate in times of shortage.

# How Water Rights Are Managed

- Each permit defines point of diversion, place and type of use, quantity, and priority date.
- New permits follow public notice and review process.
- Groundwater rights are subject to a safe yield analysis and surface water is subject to minimum desirable streamflow (MDS).
- Changes must not cause impairment to existing rights.
- Process guided by Kansas Water Appropriation Act provisions.

# Distribution of Water Resources

# Kansas Water Resources

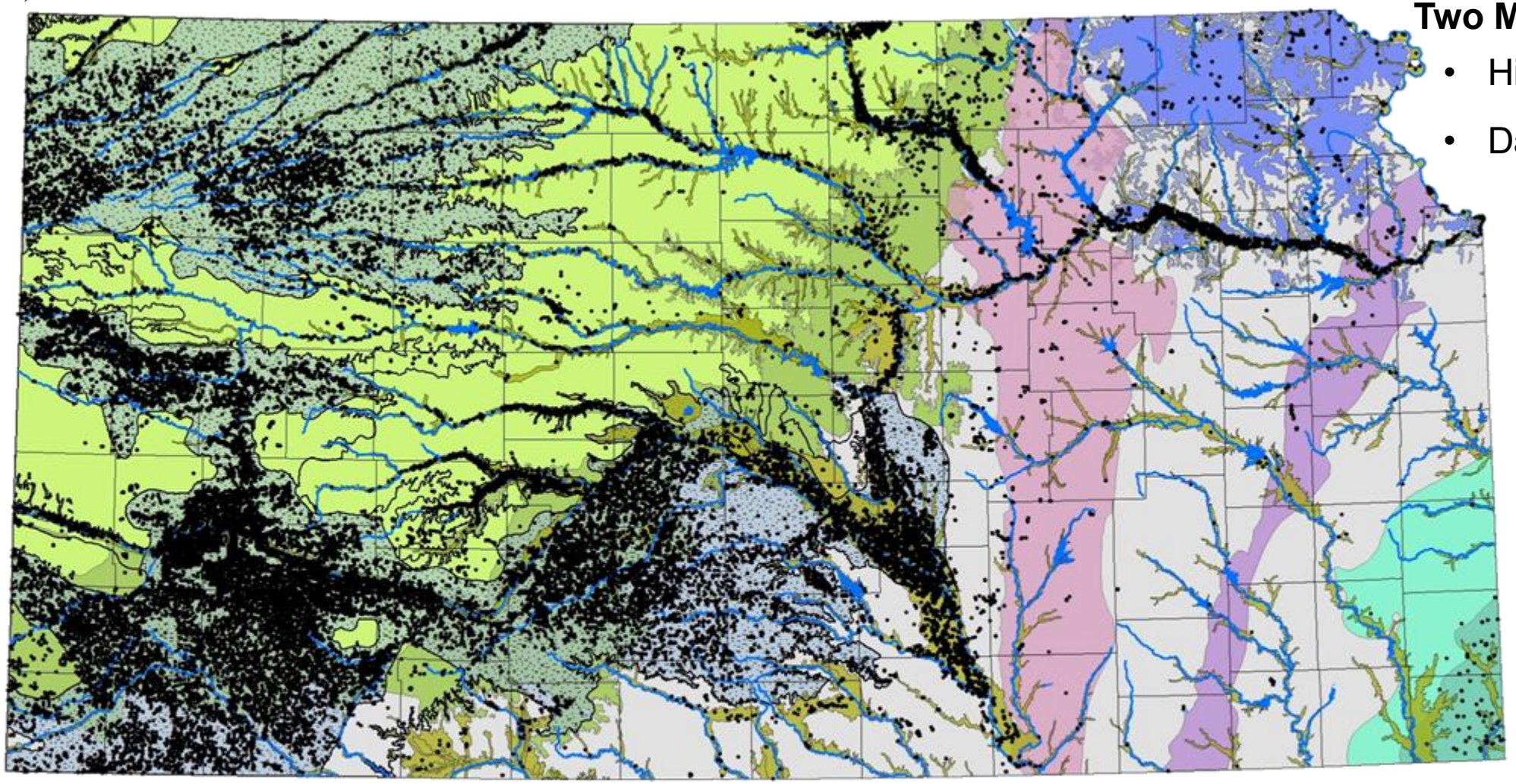





Kansas Department of Agriculture

KANSAS GEOLOGICAL SURVEY
The University of Kansas

# Major and Minor Aquifers in Kansas



**Two Major Aquifers**

- High Plains Aquifer (~85%)
- Dakota Aquifer (~15%)

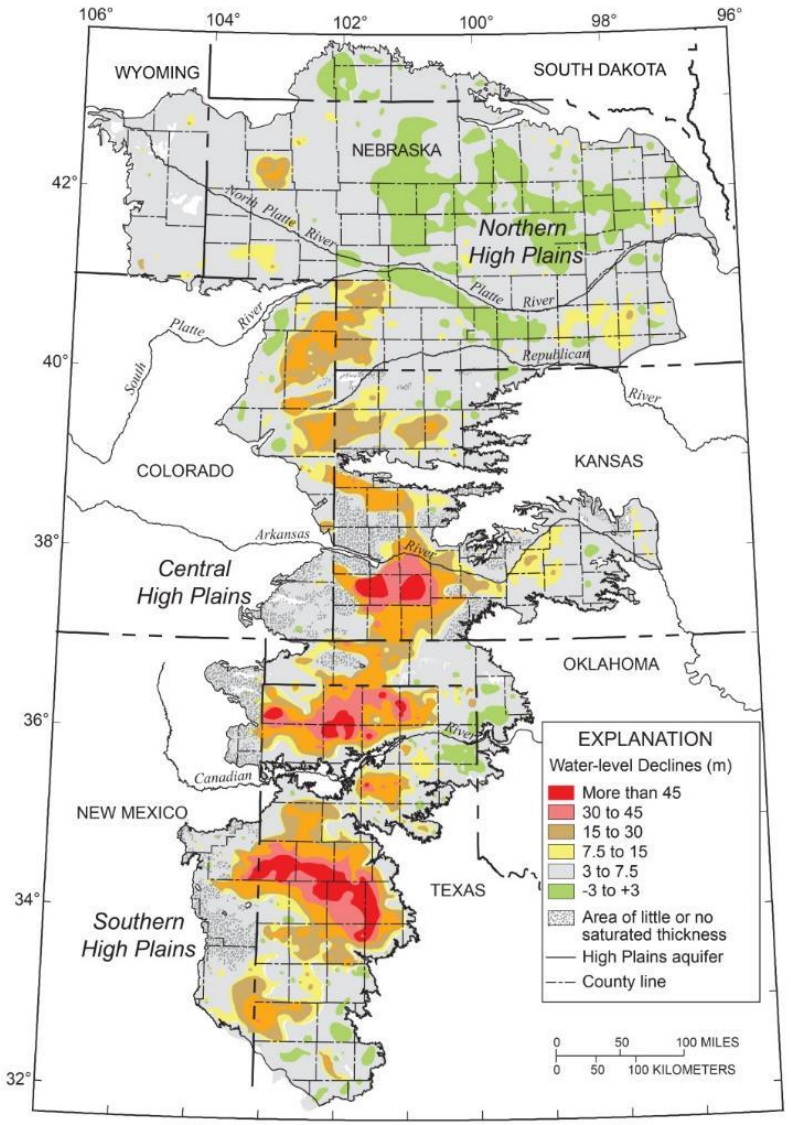
High Plains Aquifer (Saturated Extent)
Dakota Aquifer (Unconfined)
Dakota Aquifer (Confined)
Flint Hills Aquifer
Glacial Drift Aquifers
Douglas Aquifer
Alluvial Aquifers
Ozark Aquifer (freshwater)
Ozark Aquifer (usable water)

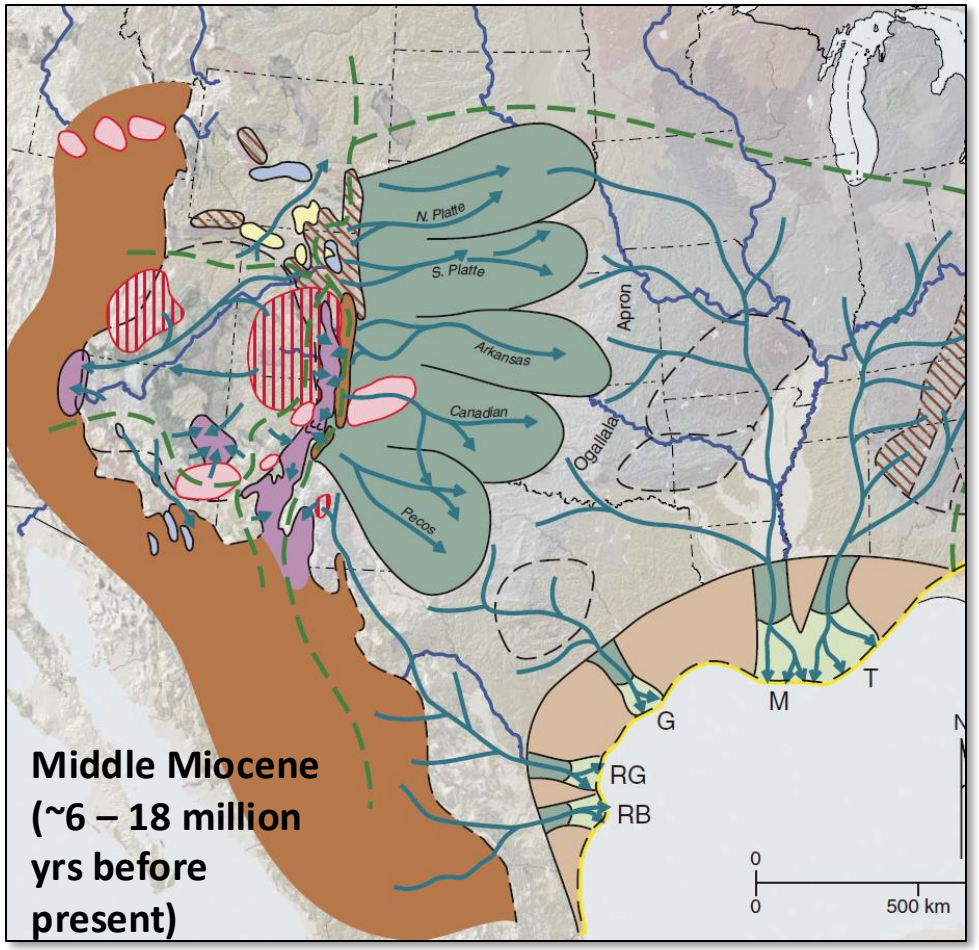
KU Kansas Geological Survey The University of Kansas

Kansas Department of Agriculture

Kansas Geological Survey The University of Kansas

# The Ogallala Formation




## Lithologies

- Sediments shed eastward off the Rocky Mountains
- Extremely heterogeneous
- Interbedded sandstone, mudstone, conglomerates, and their uncemented equivalents; eolian silt and clay; and local lenses of volcanic ash and lacustrine limestones

Modified from McGuire, 2014, Water Level Changes in HPA

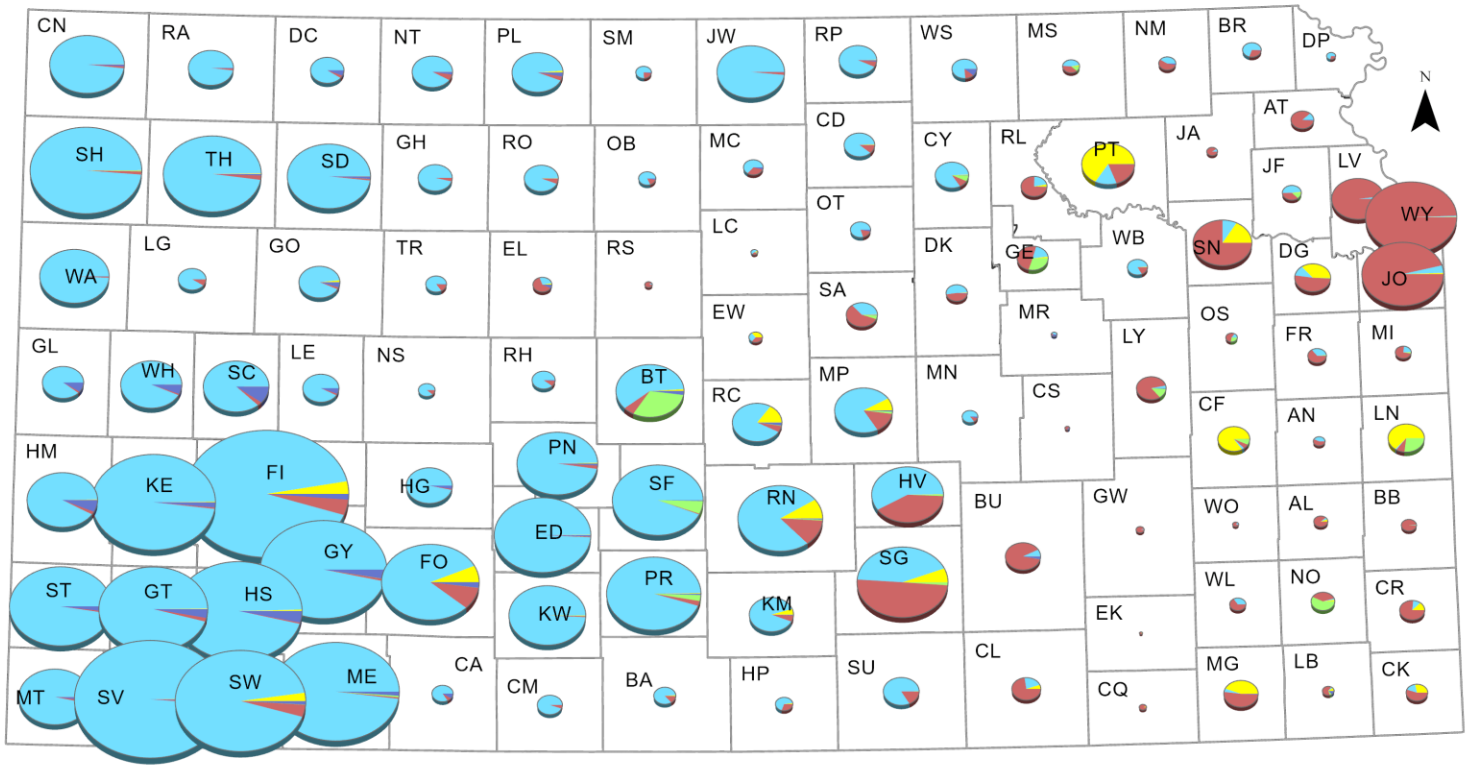
# Uses of Water in Kansas and Aquifer Impacts

# Water Use in Kansas

KANSAS GEOLOGICAL SURVEY
The University of Kansas

Kansas Department of Agriculture

## 2024 Reported Water Use for Kansas Counties




**Use Made of Water**

- Industrial
- Irrigation
- Stockwater
- Municipal
- Recreation

Finney (FI): 258,158 AF

Thomas (TM): 111,927 AF

Comanche (CM): 6,562 AF

Features on this map represent conditions as of the date of the map and are subject to change. The user is referred to specific policies, regulations and/or orders of the Chief Engineer.

Uses of water for artificial recharge, contamination remediation, dewatering, domestic, fire protection, hydraulic dredging, sediment storage, thermal exchange and water power are not shown on the charts.

0 25 50 75 Miles

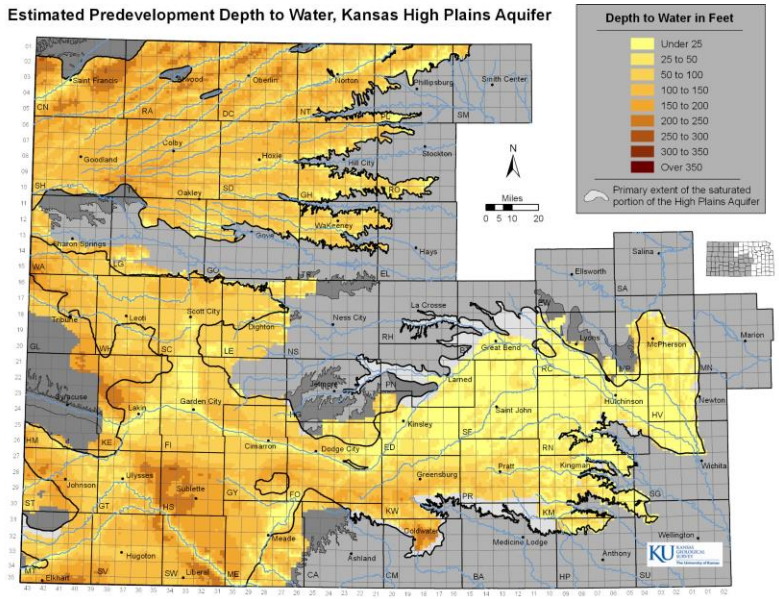
Kansas Department of Agriculture
Division of Water Resources
June 23, 2025

# Understanding the Aquifer In Context

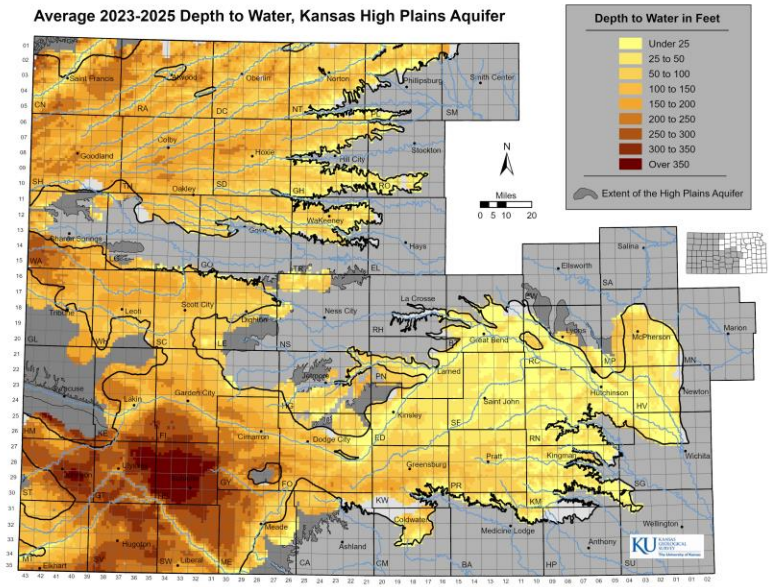
KANSAS GEOLOGICAL SURVEY
The University of Kansas

Kansas Department of Agriculture

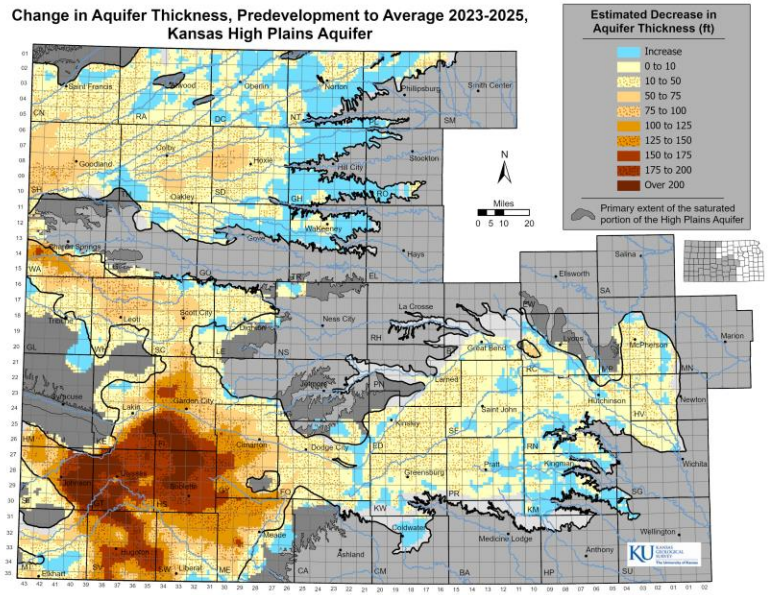
Estimated Predevelopment Depth to Water, Kansas High Plains Aquifer



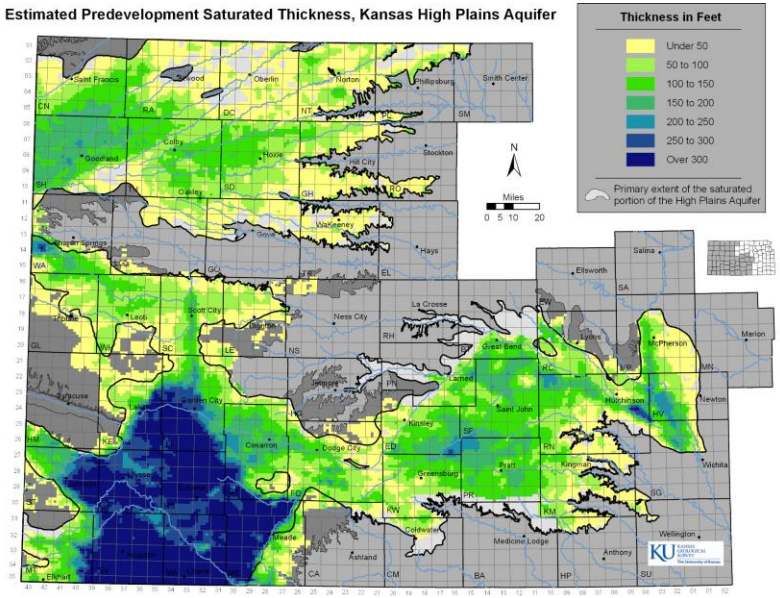

Average 2023-2025 Depth to Water, Kansas High Plains Aquifer



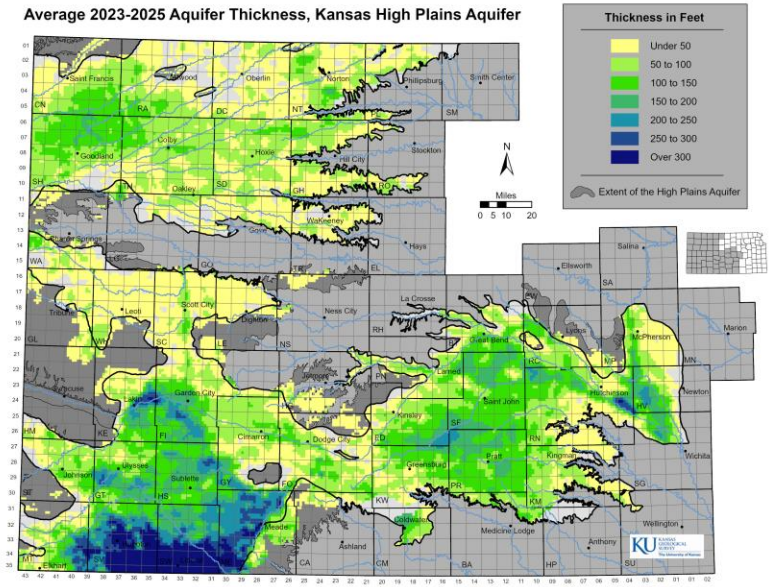

Change in Aquifer Thickness, Predevelopment to Average 2023-2025, Kansas High Plains Aquifer



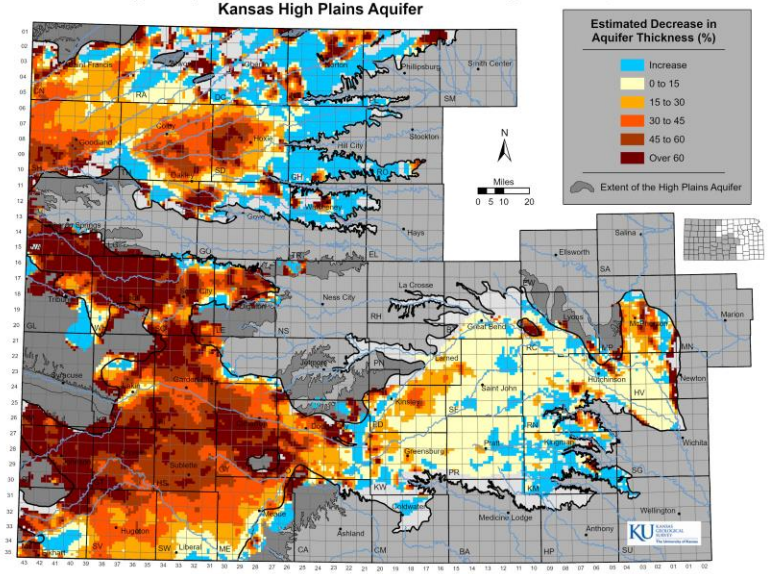

Estimated Predevelopment Saturated Thickness, Kansas High Plains Aquifer




Average 2023-2025 Aquifer Thickness, Kansas High Plains Aquifer




Percent Change in Aquifer Thickness, Predevelopment to Average 2023-2025, Kansas High Plains Aquifer



# Defining the Aquifer

# Water Level Measurement Program

**Program Facts**

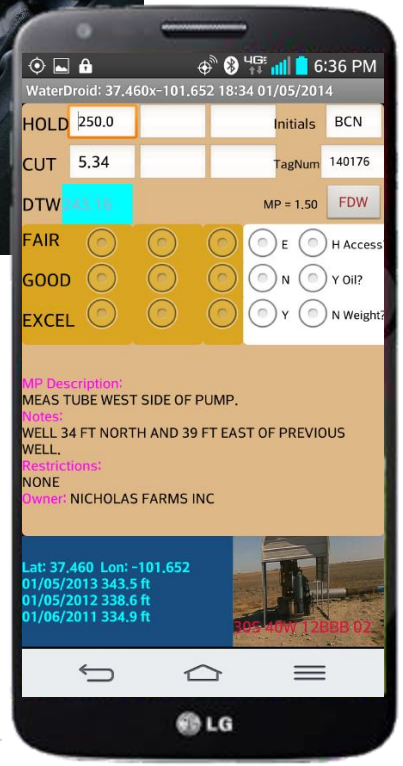
- KGS – DWR Cooperative Effort
- Total Wells Measured Yearly ~1,400

**KGS 2025 Campaign (Jan. 2025)**

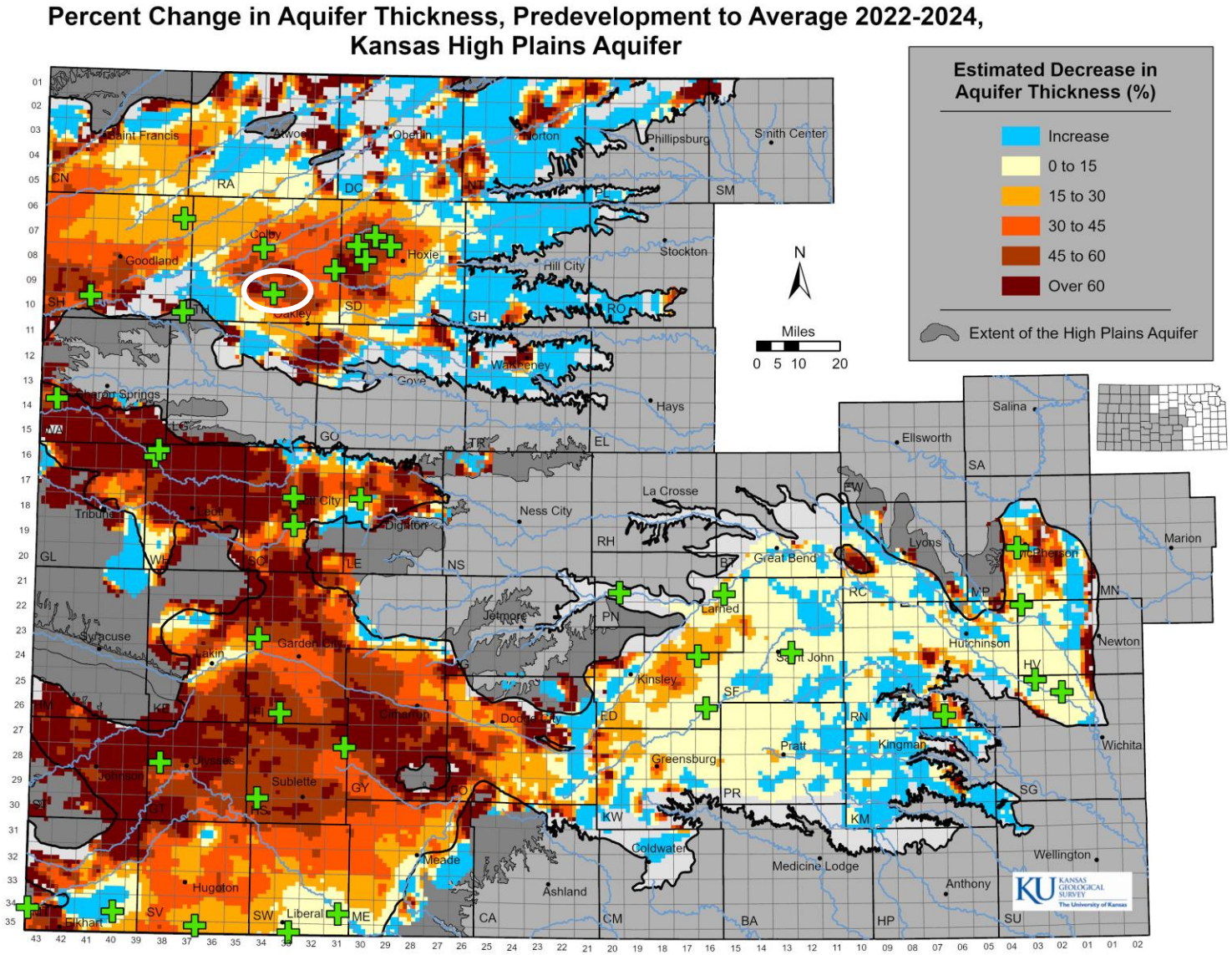
- Total wells – 616
- Avg. well depth – 162.4 ft
- Deepest well – 458 ft
- Cumul. ft. measured ~97,464 (18.5 mi)
- Total miles traveled (w. of Oakley) – 11,629 mi
- Average Daily Surface Temperature 10°F







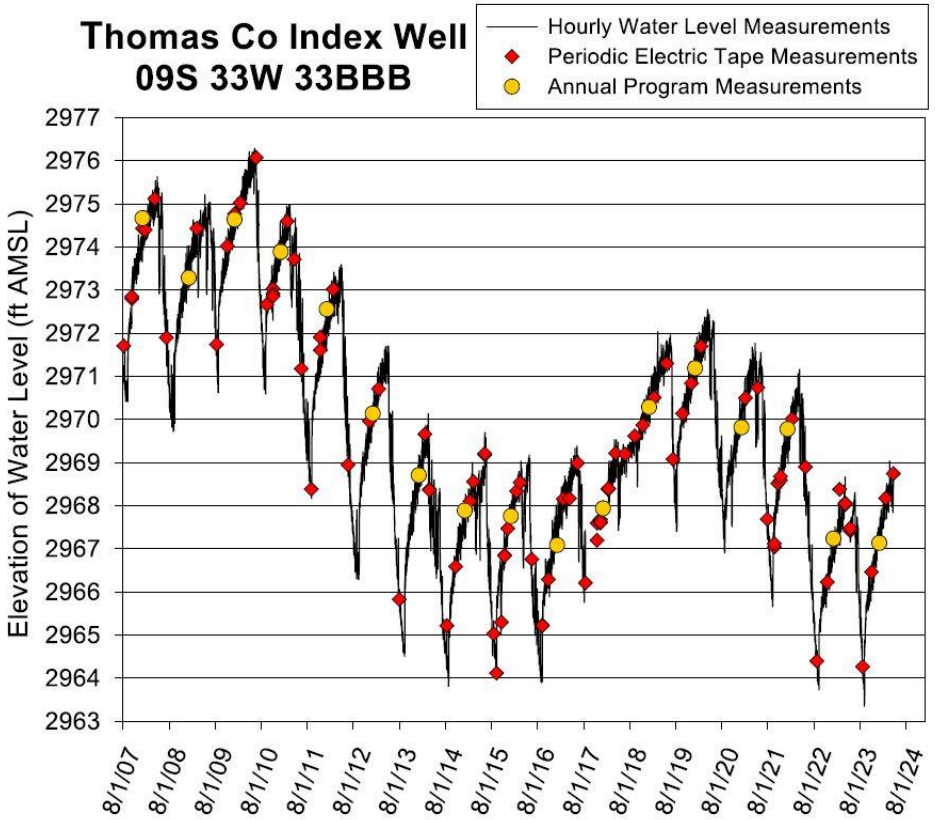
# Subsurface Calibration is Key



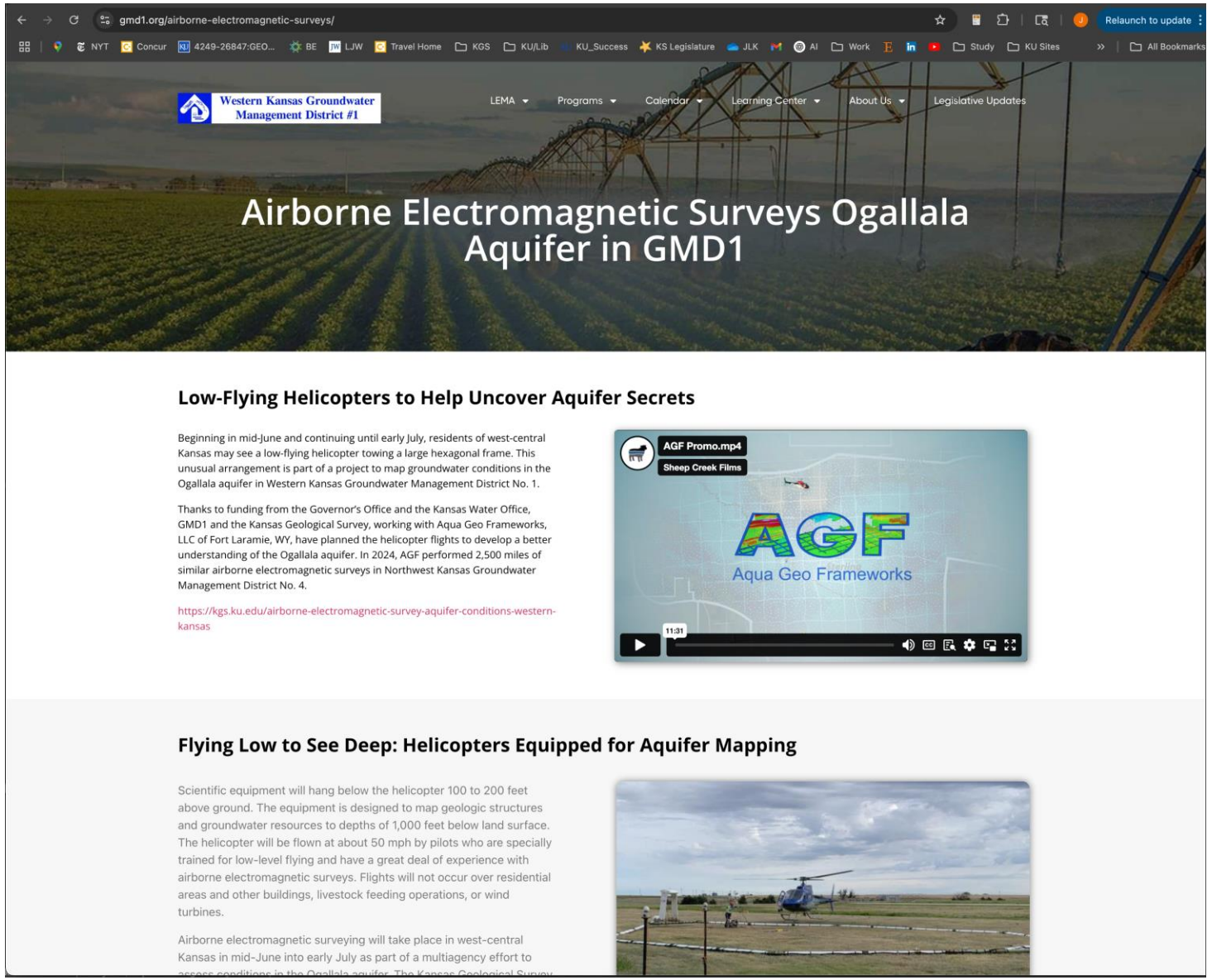

## Subsurface Calibration

- Index Wells
- Test hole logs
- Oil & gas well logs

Hydrograph: water elevation measurements



# Airborne Electromagnetic (AEM) Survey




from GMD#1 website: https://www.gmd1.org/airborne-electromagnetic-surveys/

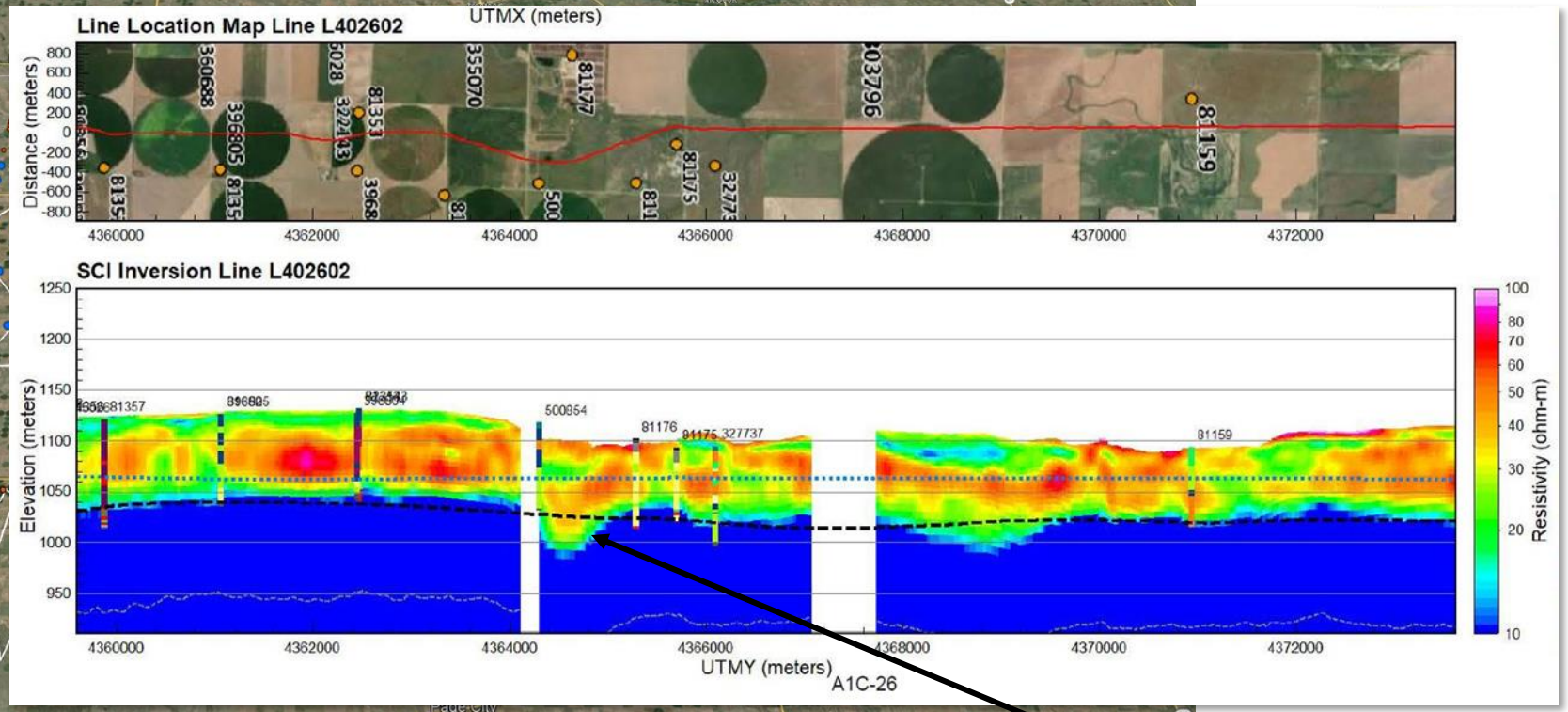


Kansas Department of Agriculture

KANSAS GEOLOGICAL SURVEY
The University of Kansas

# AEM Flight Lines in GMD4 – 2,486 miles

May 28 – June 16, 2024




Bedrock low
(thickened aquifer)

Kansas Department of Agriculture

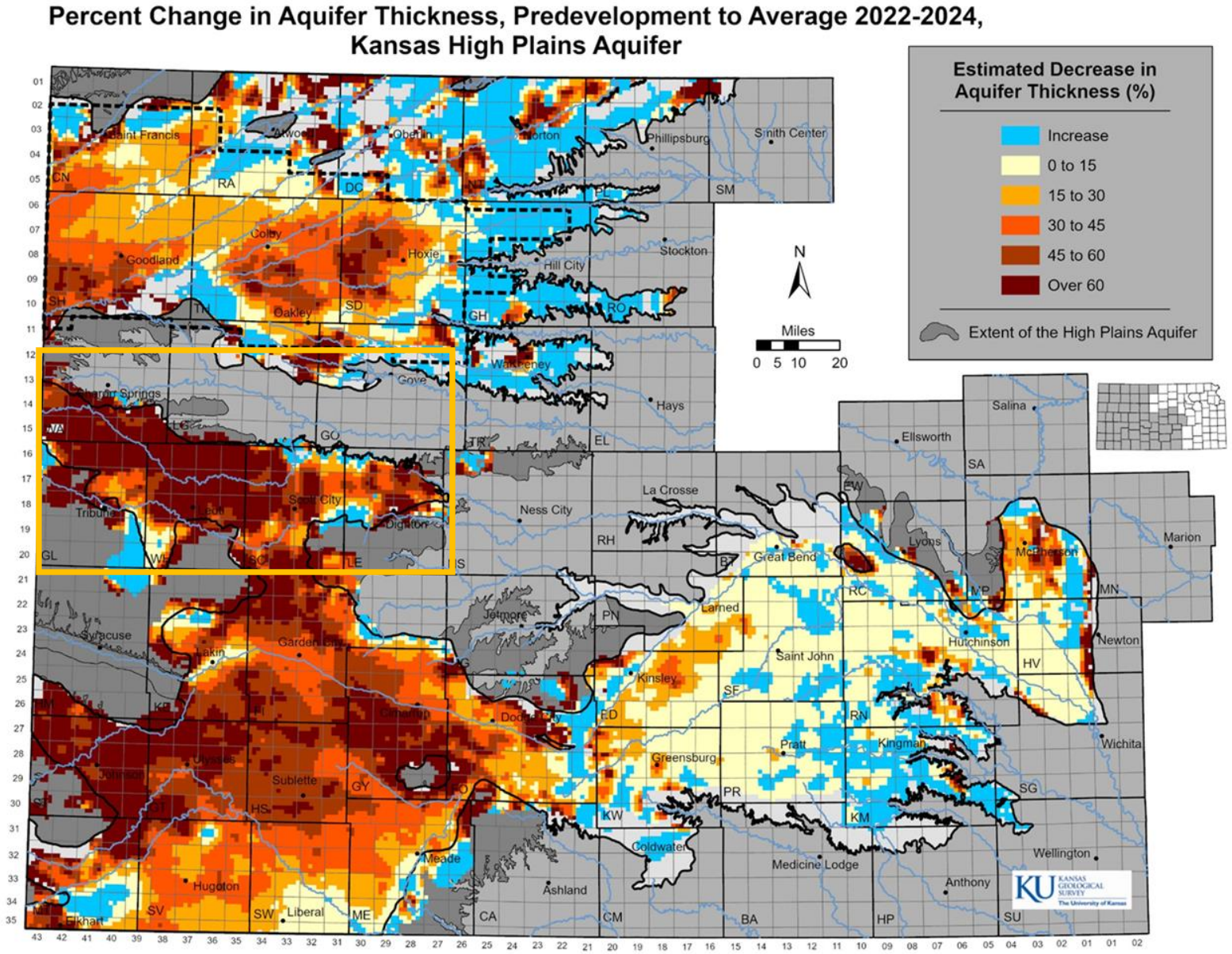
KANSAS GEOLOGICAL SURVEY
The University of Kansas

# Future Plans & Community Engagement

GMD4
2024

GMD1
2025

GMD3
2026




## Community Engagement

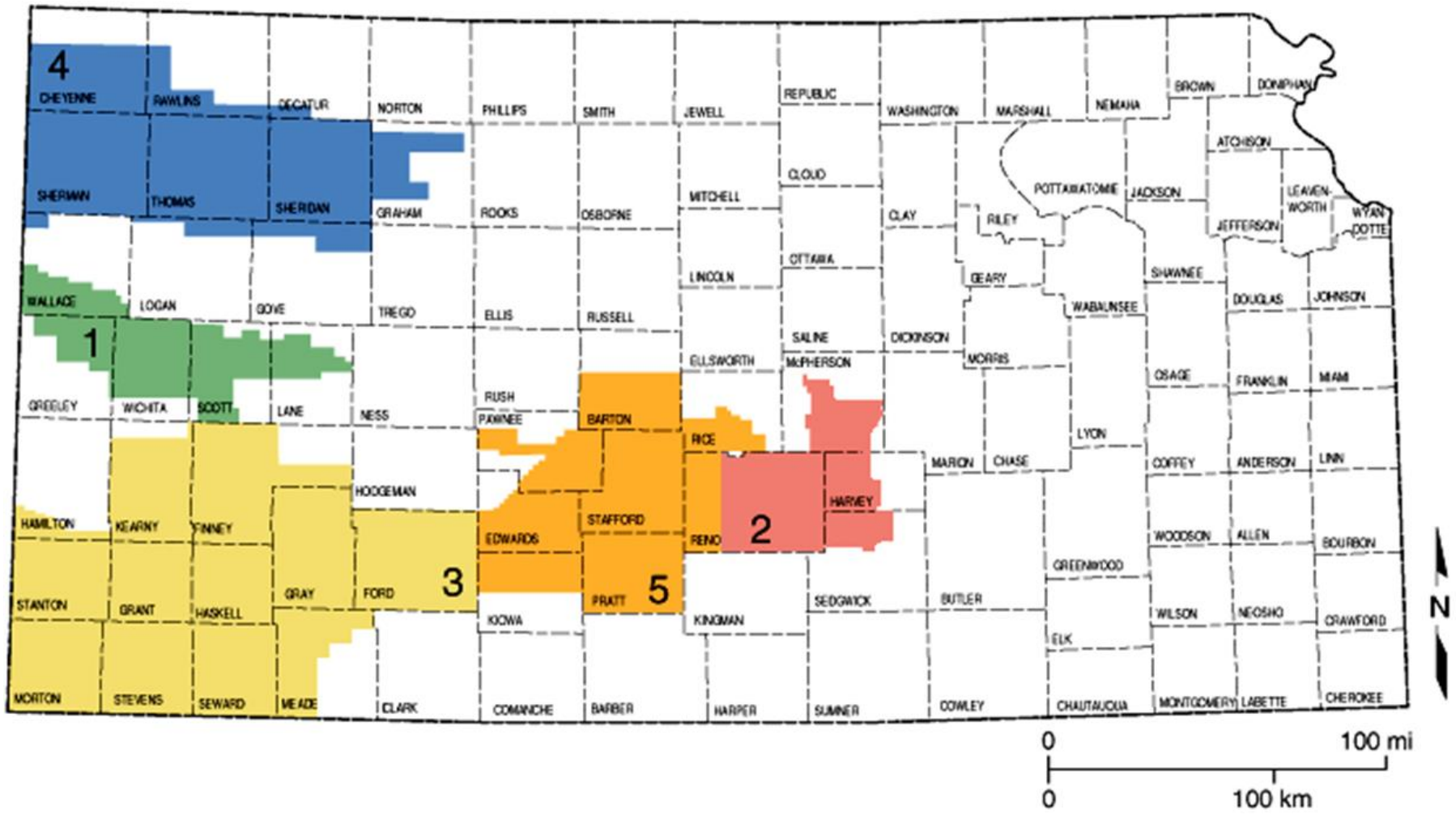
- Has been vital & overwhelmingly positive
- Townhall meetings in GMD4
- Post cards to residents
- Press engagement
- Program info on GMD website
- Engagement during flight operations

Kansas Department of Agriculture

Kansas Geological Survey
The University of Kansas

# Addressing Groundwater Declines

# Groundwater Management Districts

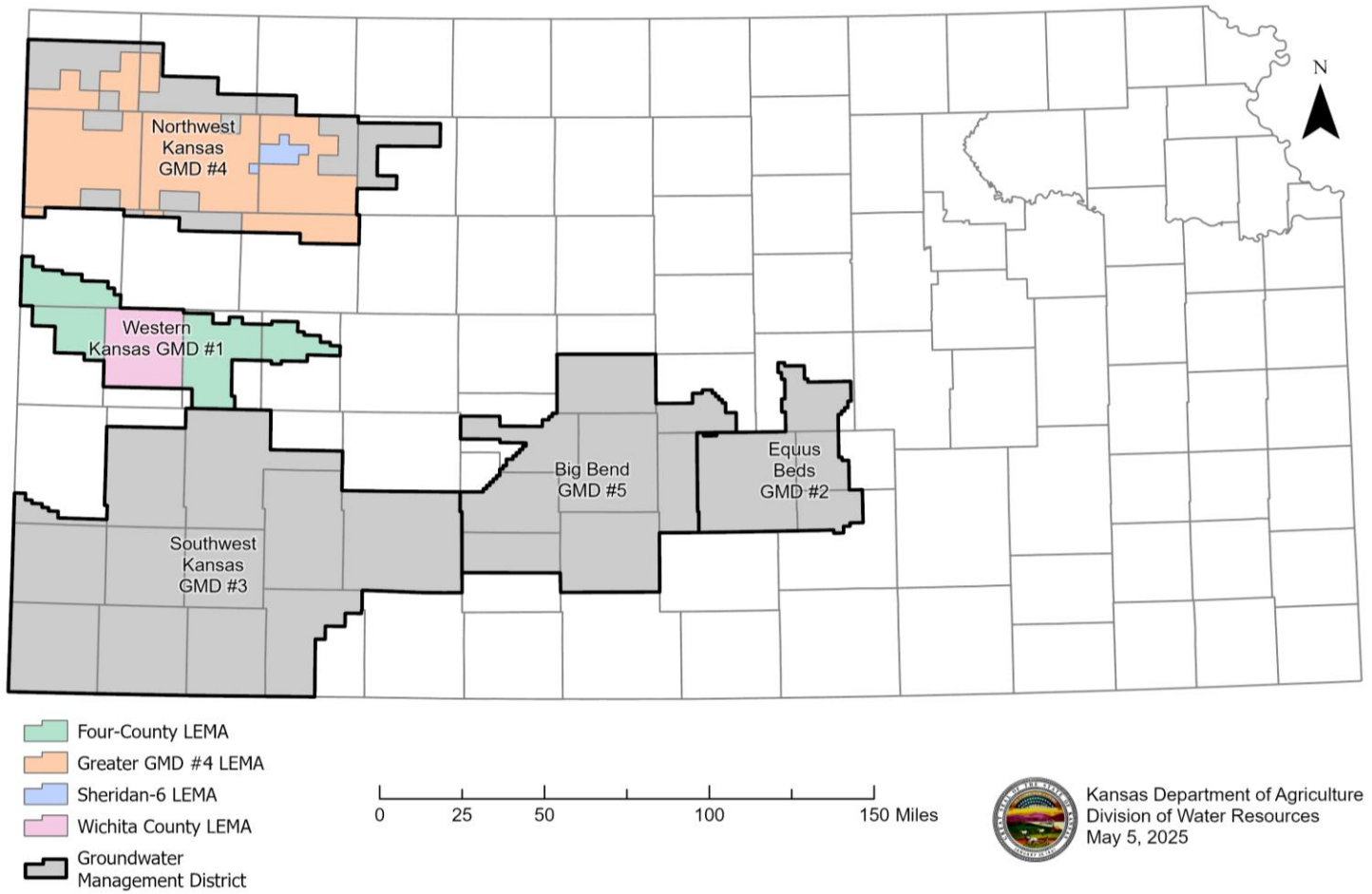



- 1972: GMD Act: GMDs to lead local conservation efforts
- 1978: GMD Act amended to allow for Intensive Groundwater Use Control Areas (IGUCAs)
- 2012: Local Enhanced Management Areas (LEMAs)
- 2015: Water Conservation Areas (WCAs)

# Local Enhanced Management Areas (LEMAs)

- Results from the two NW Kansas LEMAs show that producers continue to conserve more than originally targeted.

  In Sheridan County, users saved 24% versus pre-LEMA usage even during the recent drought period.



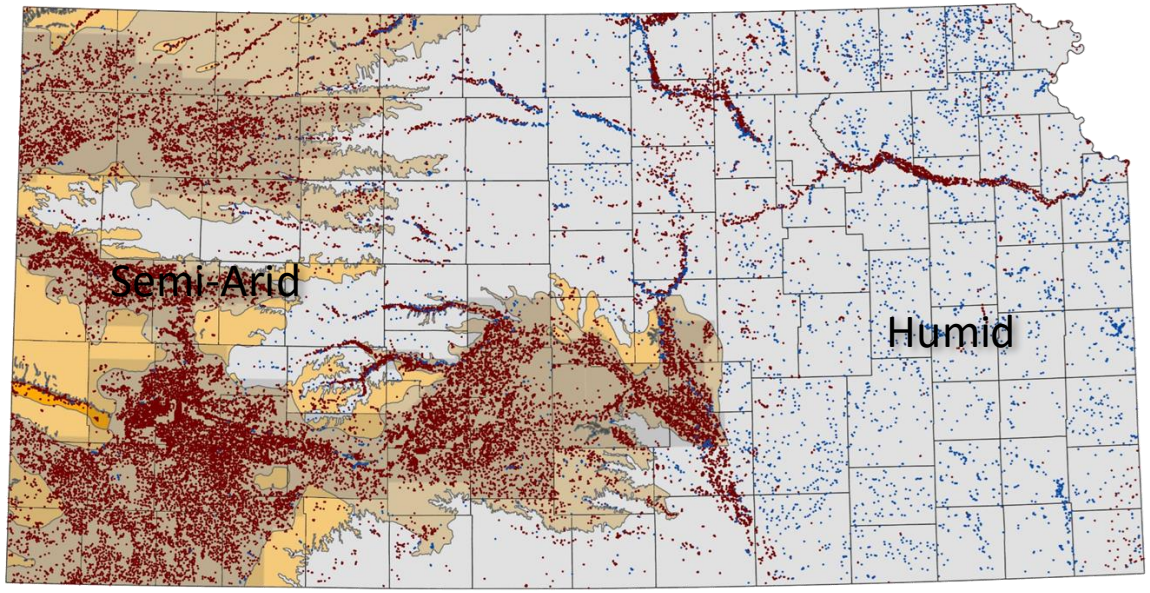
# Addressing Groundwater Declines

- K.S.A. 82a-1044 creates a process by which groundwater management districts (GMDs) will advance action related to water issues within their boundaries:
  - Identification of high priority areas of concern (GMDs)
  - Public education and outreach and development of an action plan to address the concern (GMDs)
  - Evaluation and approval of the action plan (Chief Engineer)
  - Implementation (GMDs and Chief Engineer)
- **The GMD board of directors is required to submit an action plan to reasonably address the identified concerns . . . to the chief engineer by July 1, 2026.**

# Future Risks and Uncertainties

# Future Risks

(+) More precipitation
(-) Drought impacts sources of supply
(-) Concentrated sources of water




(+) Longer-term water availability
(-) One main source of water
(-) Low recharge potential

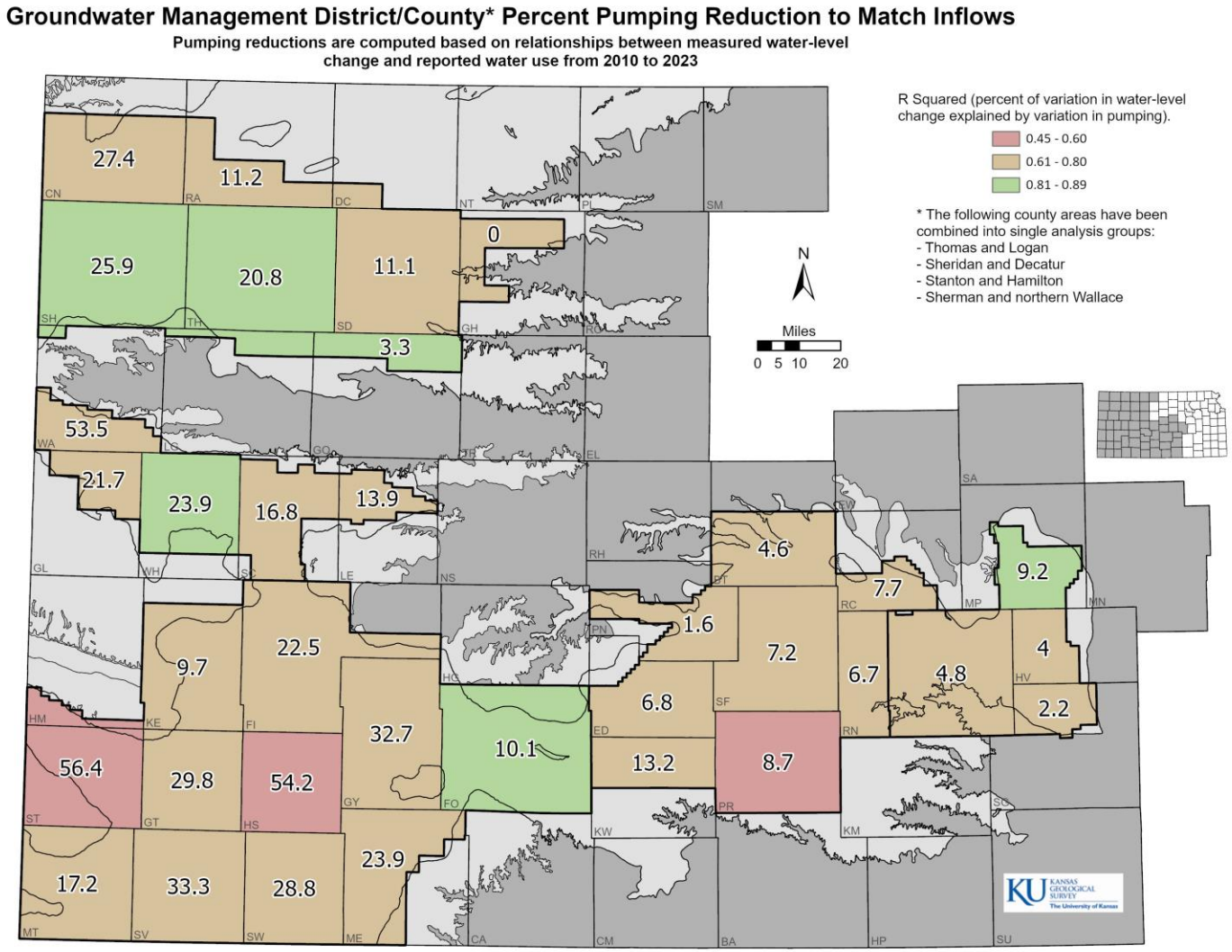
## Knowns

- We are pumping water much faster than the recharge rate
- Reservoirs, by their nature, fill up with sediment

## Uncertainties

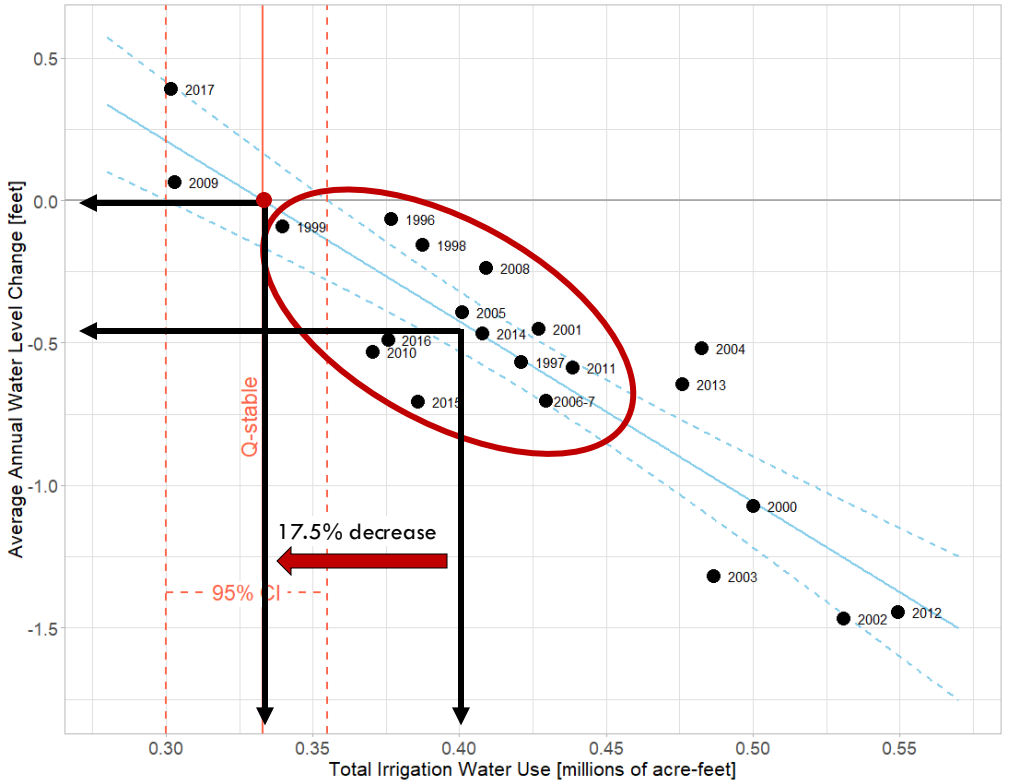
- Rainfall
- Temperature
- Evapotranspiration
- Population
- Industrial load

# How to Define Stable




It is important to note that these values change over time, and therefore plans should remain dynamic to address long term needs

- High-precision quantification allows area-specific planning!
- Each operator knows "their aquifer number"
- Irrigators & businesses can take action that is in their interest and the region's



# Water as an Economic Generator

# Top 5 Sectors of Kansas Agriculture

Kansas ranks 7th in Total Value of Agricultural Production by state.



Beef cattle ranching & farming **$11.68 billion**

Animal, except for poultry, Slaughtering **$9 billion**

Grain farming **$6.82 billion**

Meat processed from carcasses **$4.79 billion**

Farm machinery and equipment manufacturing **$4.24 billion**

# Kansas' Rank in U.S. Agriculture

KANSAS GEOLOGICAL SURVEY
The University of Kansas

Kansas Department of Agriculture

| U.S. Rank | Commodity | Number | Unit | % of U.S. Total |
|---|---|---|---|---|
| 1 | Sorghum or Grain | 105,300,000 | bushels | 56.1 |
| 2 | Wheat, All | 244,200,000 | bushels | 14.8 |
| 2 | Cropland | 29,125,505 | acres | 7.3 |
| 2 | Principal Crops Planted | 24,101,000 | acres | 7.7 |
| 2 | Sorghum for Silage | 788,000 | tons | 13.9 |
| 3 | Cattle and Calves, All | 6,250,000 | head | 7.0 |
| 3 | Cattle on Feed | 2,480,000 | head | 17.5 |
| 3 | Grain Storage Capacity, Off Farm | 1,200,000,000 | bushels | 10.1 |
| 3 | Hay, All | 5,361,000 | tons | 4.8 |
| 3 | Land in Farms | 45,700,000 | acres | 5.1 |
| 3 | Principal Crops Harvested | 21,906,000 | acres | 7.7 |
| 3 | Red Meat Production, Commercial | 6,090,000,000 | pounds | 11.0 |
| 5 | Sunflower, Non-oil Type | 9,350,000 | pounds | 3.9 |
| 6 | Sunflower, All | 45,750,000 | pounds | 1.6 |
| 6 | Sunflower, Oil Type | 36,400,000 | pounds | 1.4 |

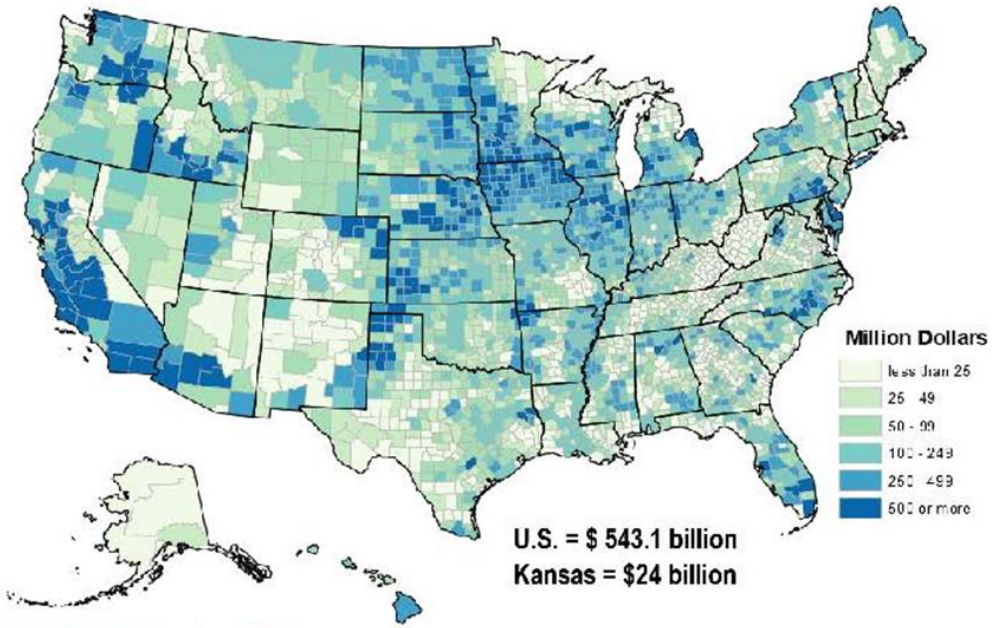
# Total Value of Agricultural Production

KANSAS GEOLOGICAL SURVEY
The University of Kansas

Kansas Department of Agriculture

## Total Value of Agricultural Production, 2022

By County



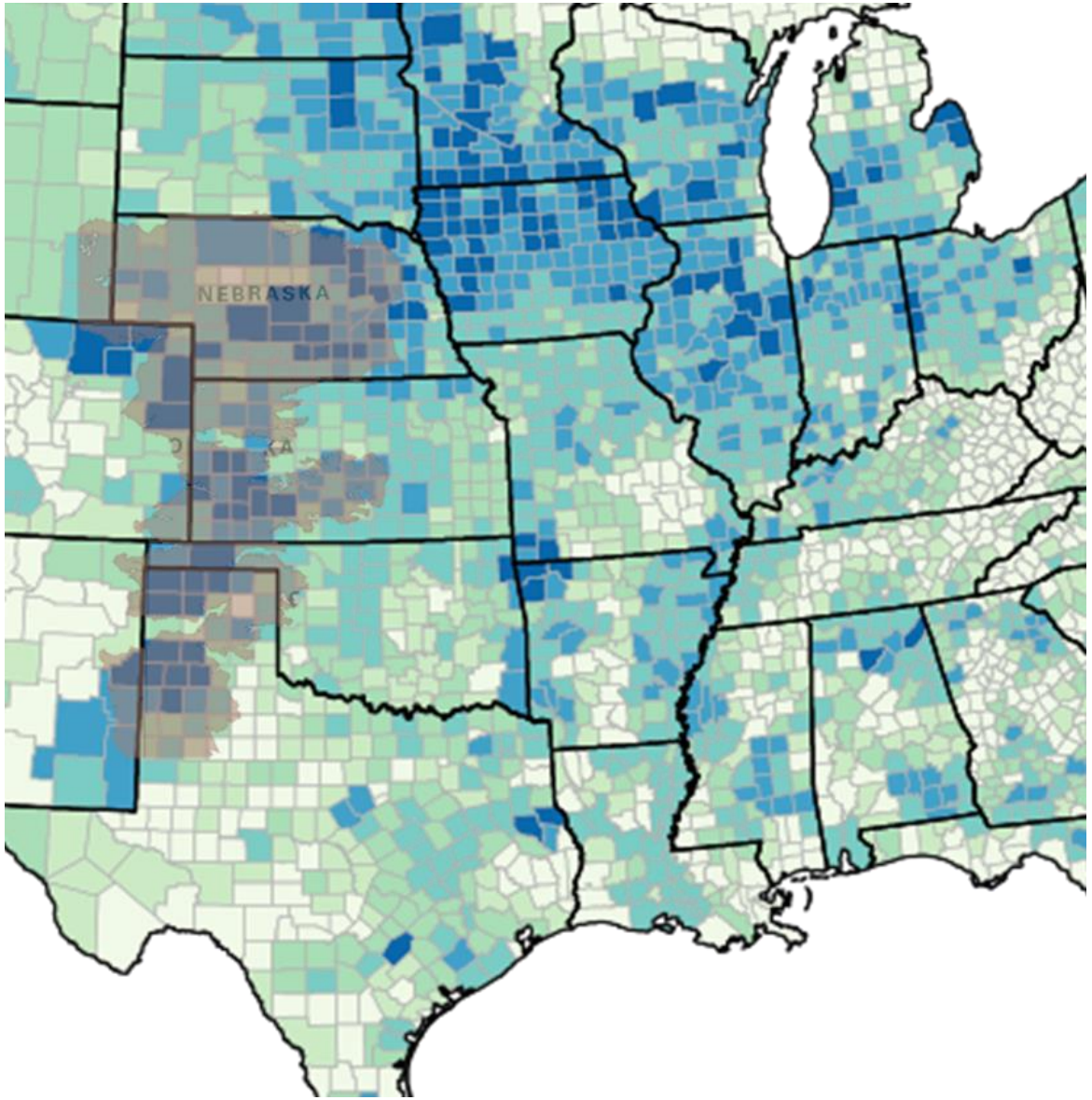

| Top Counties or Equivalents | TVP ($ millions) |
|---|---|
| Haskell | 1,636 |
| Scott | 1,405 |
| Gray | 1,272 |
| Finney | 1,122 |
| Grant | 1,053 |
| Ford | 668 |
| Wichita | 590 |
| Hamilton | 516 |
| Barton | 491 |
| Nemaha | 448 |

2022 CENSUS OF AGRICULTURE

USDA United States Department of Agriculture
National Agricultural Statistics Service

nass.usda.gov/AgCensus

# Water and Agriculture



# Economic Development

- Economic growth and industry are subject to water interdependencies, especially in water-short areas like western Kansas.



Water used to irrigate crops feeds cattle in Kansas feedyards



**24% of the nation's cattle** are fed in Kansas feedyards



Feedyards supply meat for production.



**Kansas produces 11% of the nation's** red meat

The Beef industry **employs about 19,000 Kansans** and has a direct **economic output of $12.7 billion**

# Questions?


**Earl Lewis**

KDA Chief Engineer

Earl.Lewis@ks.gov

**Kelsey Olson**

KDA Deputy Secretary

Kelsey.Olson@ks.gov

**Jay Kalbas**

KGS State Geologist

JayKalbas@ku.edu