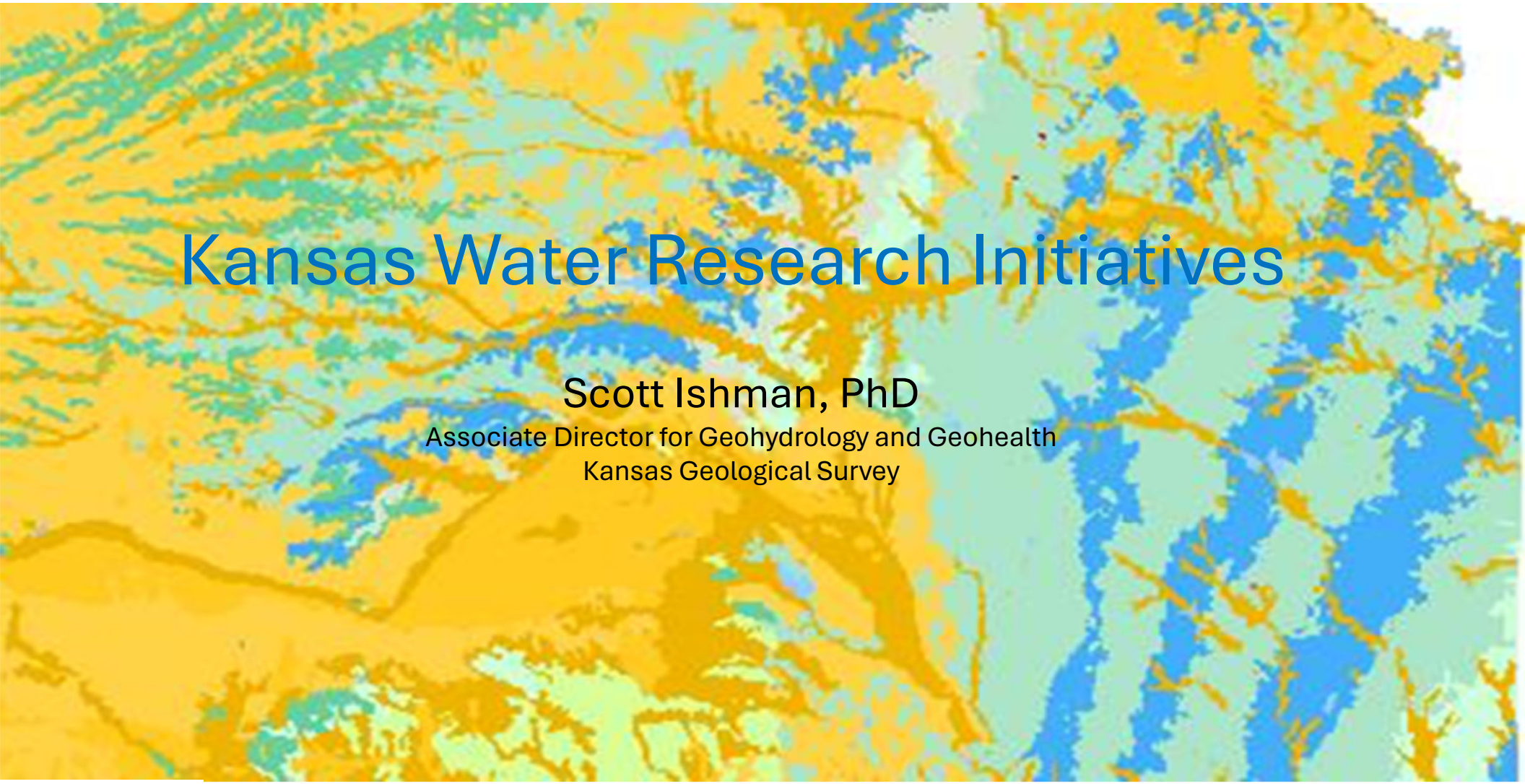


Kansas Water Research Initiatives

Scott Ishman, PhD
Associate Director for Geohydrology and Geohealth
Kansas Geological Survey

KU KANSAS GEOLOGICAL SURVEY
The University of Kansas

74th Annual Environmental Engineering Conference, April 17, 2024

Water Crisis

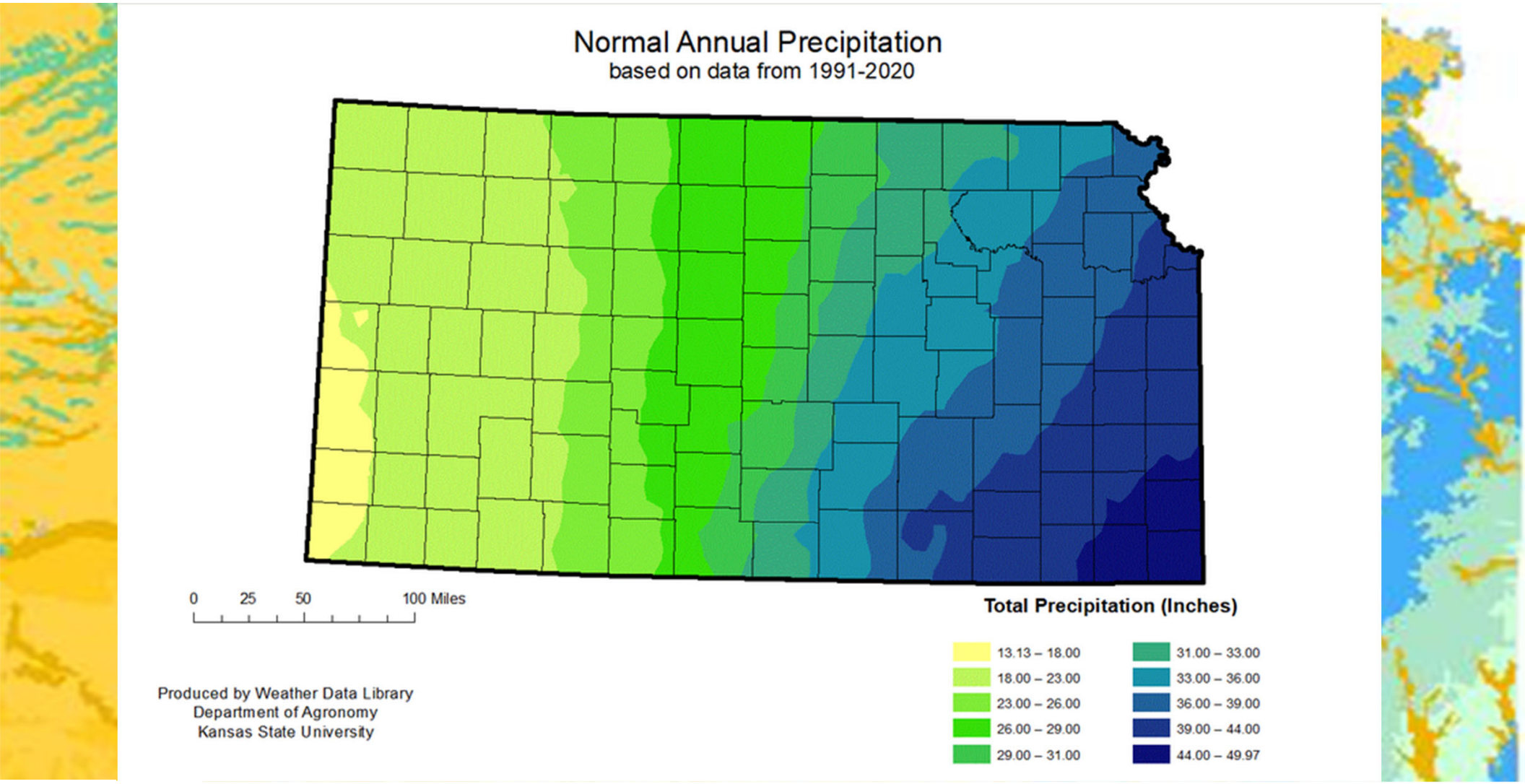
"As standards of living rise, consumption per capita tends to rise. The U.S. population has more than doubled since the beginning of the century, but our per capita water consumption has increased five to eight times."

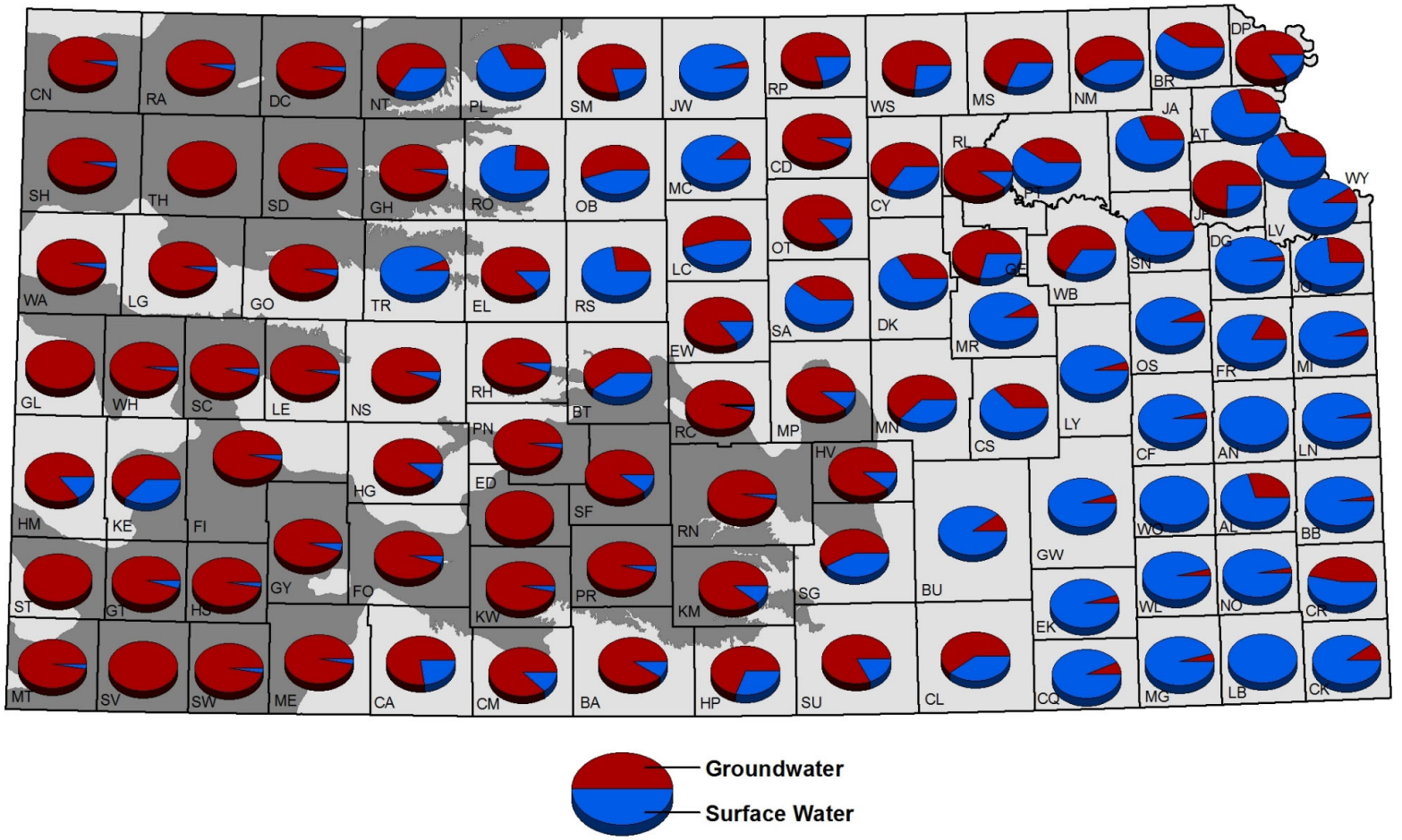
- Honorable Senator Paul Simon, 1998

Paul Simon, *Tapped Out: The coming world crisis in water and what we can do about it,* 1998 (New York: Welcome Rain, 1998)

Kansas Water Research Initiatives

- Water quantity
  - Too much water
  - Not enough water
- Water quality
- Surface water
- Groundwater


Normal Annual Precipitation
based on data from 1991-2020
0 25 50 100 Miles
Total Precipitation (Inches)
13.13 – 18.00
18.00 – 23.00
23.00 – 26.00
26.00 – 29.00
29.00 – 31.00
31.00 – 33.00
33.00 – 36.00
36.00 – 39.00
39.00 – 44.00
44.00 – 49.97
Produced by Weather Data Library
Department of Agronomy
Kansas State University


CN
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CY
RL
JA
AT
WY
WA
LG
GO
TR
EL
RS
LC
OT
SN
DG
LV
WB
SA
DK
MR
OS
FR
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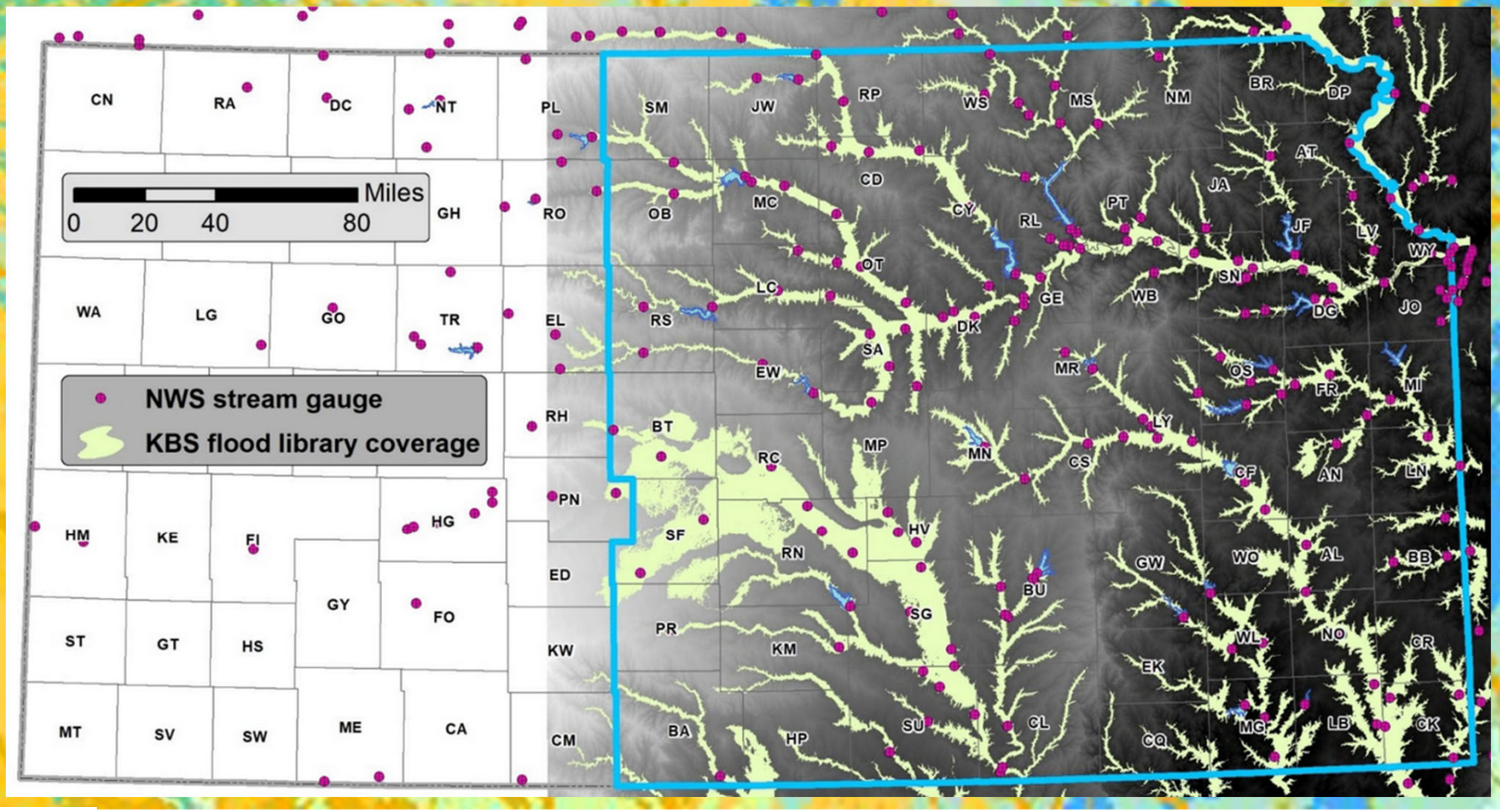
KM
SG
BU
EK
WL
NO
CR
MT
SV
SW
ME
CA
CM
BA
HP
SU
CL
CQ
MG
LB
CK
Groundwater
Surface Water

Flood Mapping - Kansas Inundation Library Coverage



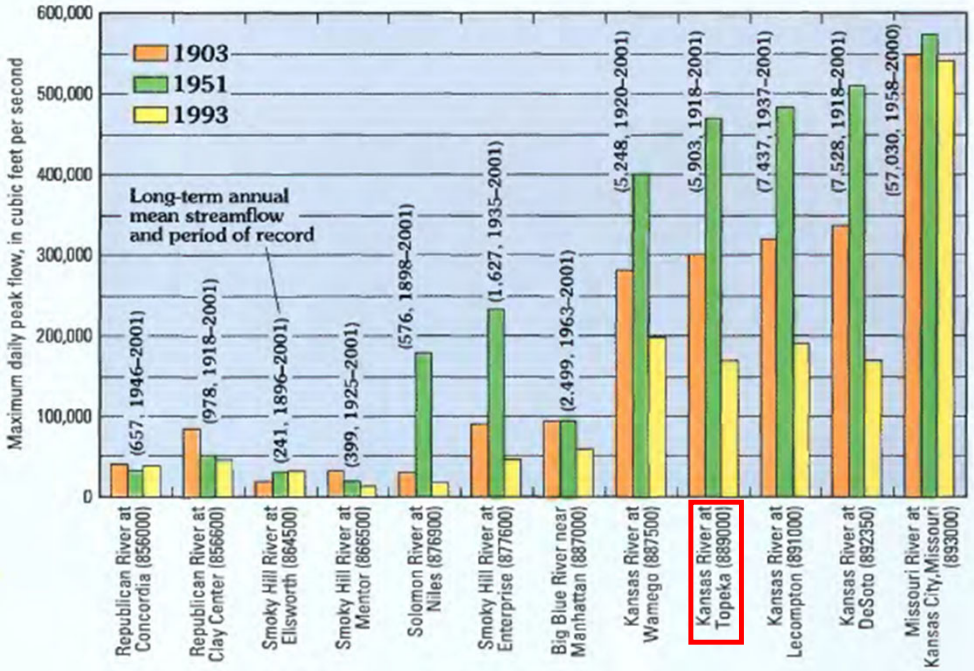


Figure 3. Comparison of maximum daily annual peak flows for 1903, 1951, and 1993 at selected U.S. Geological Survey streamflow-gaging stations. Location of stations shown in figures 1 and 2.

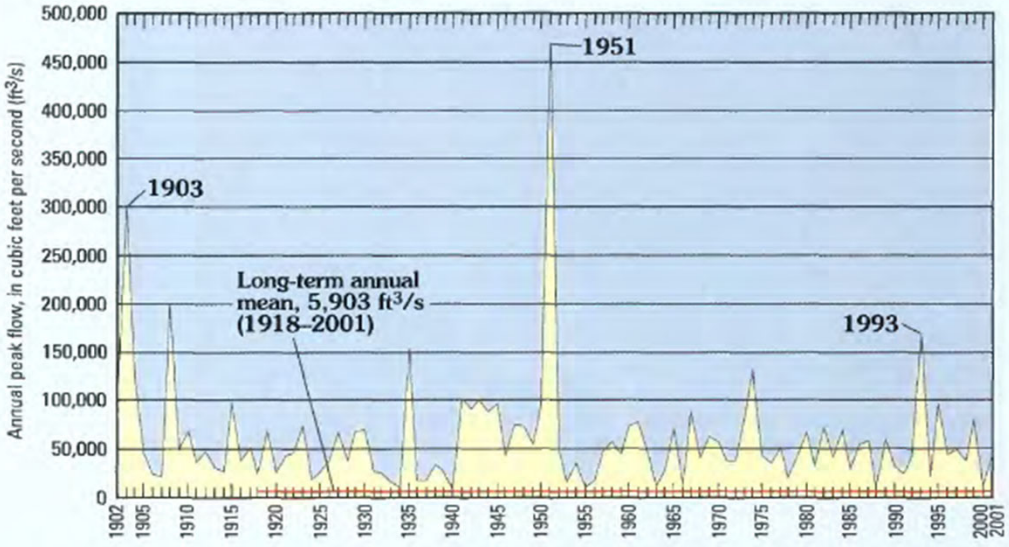
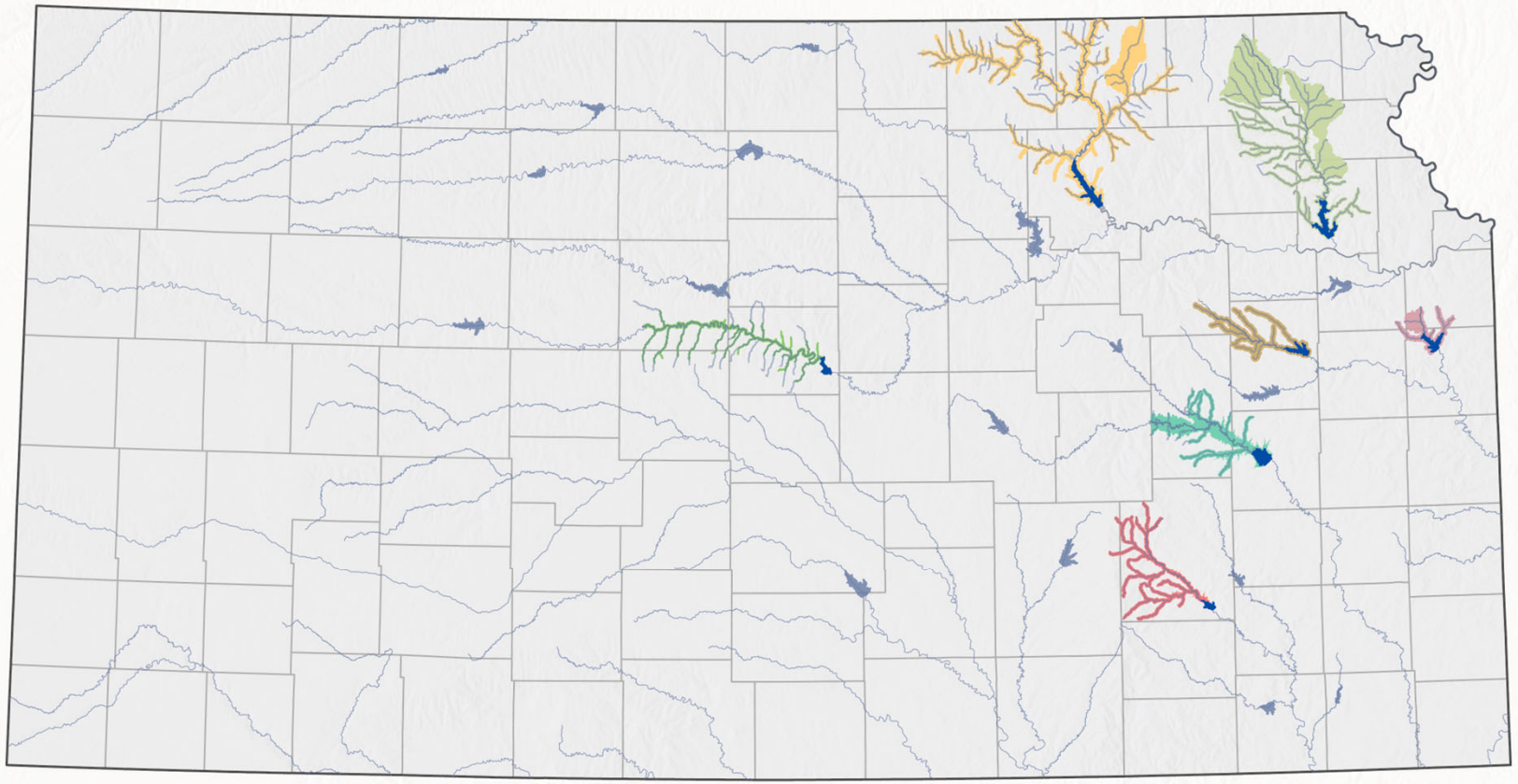


Figure 4. Annual peak flows for Kansas River at Topeka (station 06889000, fig. 1) and long-term annual mean streamflow, 1918–2001.

Kansas Reservoir Protection Initiative Priority Implementation Areas



Remaining Storage within Kansas Reservoirs

The vertical height of each bar represents total storage capacity. The blue indicates the 2021 capacity of each reservoir. The brown indicates the volume of sediment in each reservoir.

Tuttle Creek Lake
52.8% Remaining capacity
47.2% Capacity lost to sediment

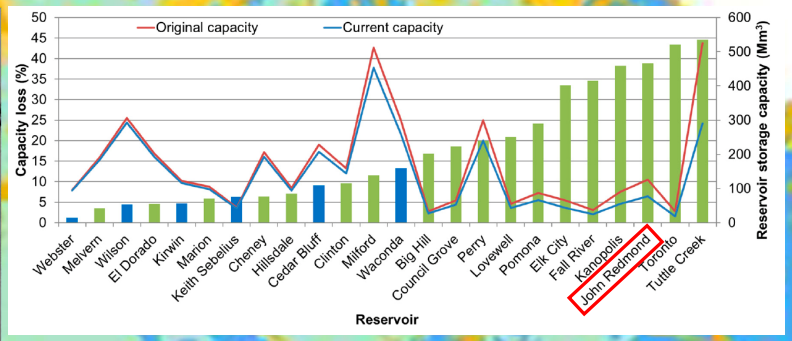
Keith Sebelius Lake
Webster Reservoir
Kirwin Reservoir
Lovewell Reservoir
Waconda Lake
Cedar Bluff Reservoir
Wilson Lake
Kanopolis Lake
Cheney Reservoir
Milford Lake
Tuttle Creek Lake
Perry Lake
Clinton Lake
Council Grove Lake
Hillsdale Lake
Pomona Lake
Melvern Lake
Marion Reservoir
John Redmond Reservoir
El Dorado Lake
Toronto Lake
Fall River Lake
Elk City Lake
Big Hill Lake

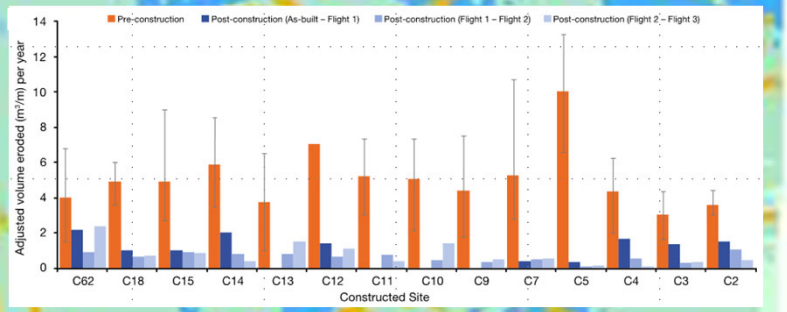
Legend
- Remaining Capacity
- Volume of Sediment in 2021

Kansas Water Office

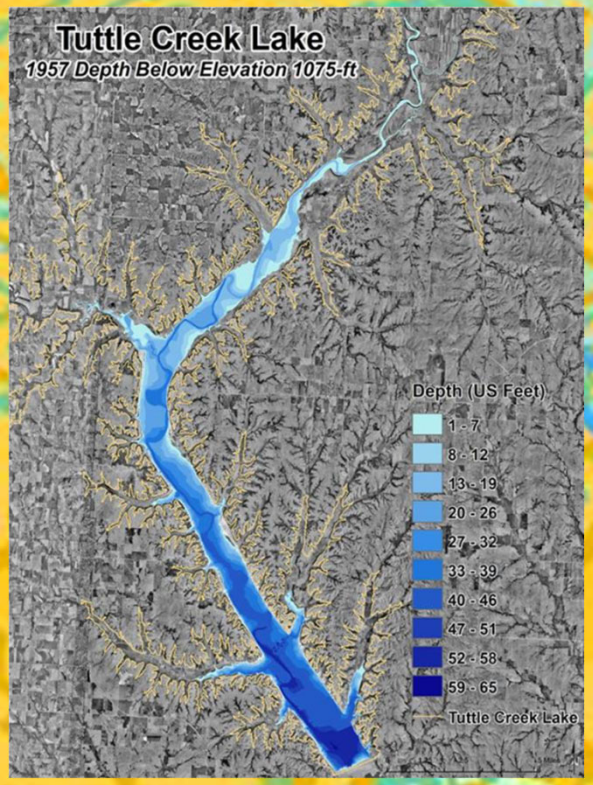
KU Kansas Geological Survey, The University of Kansas

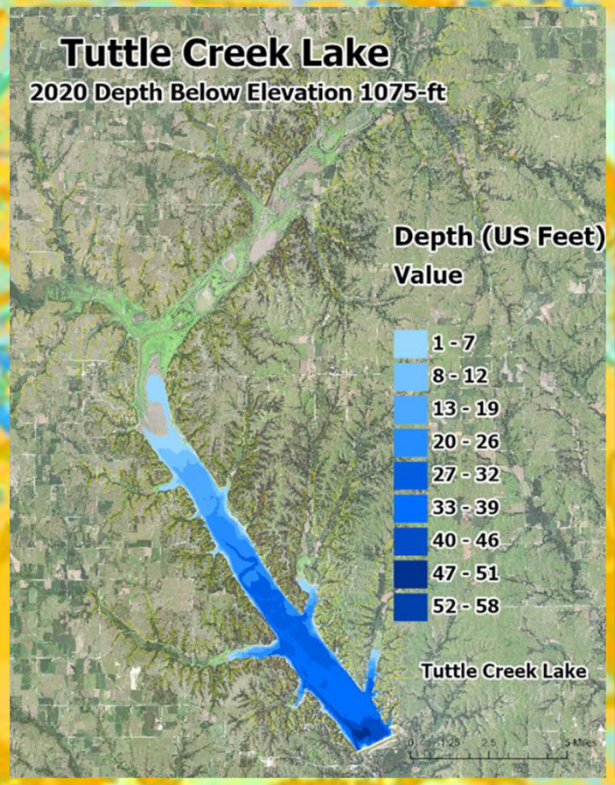
Streambank Erosion

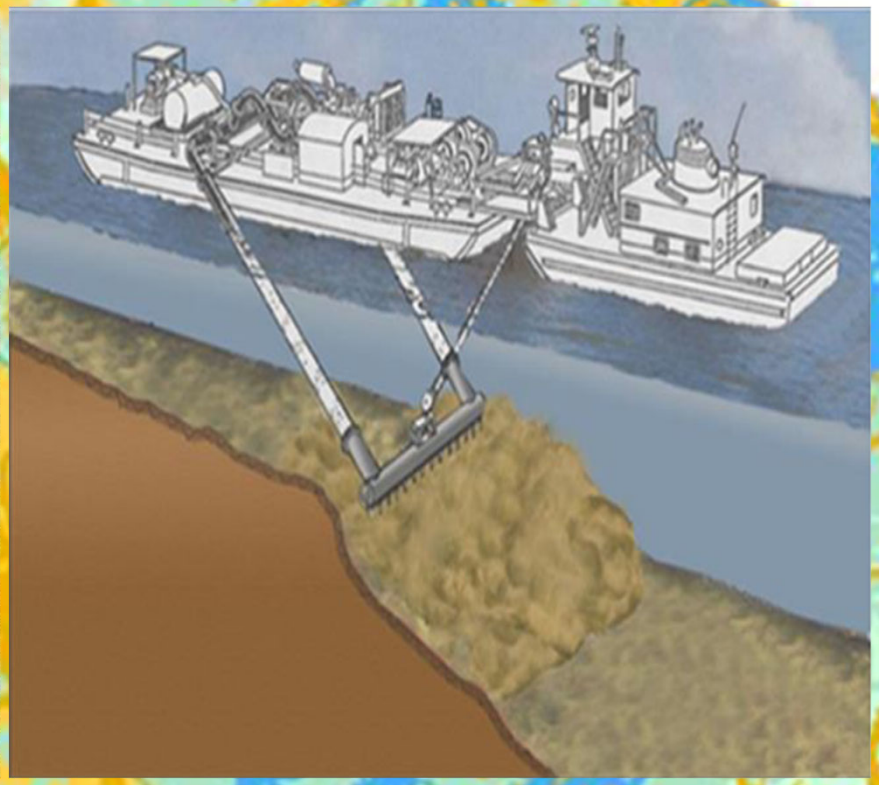




Water Injection Dredging Study

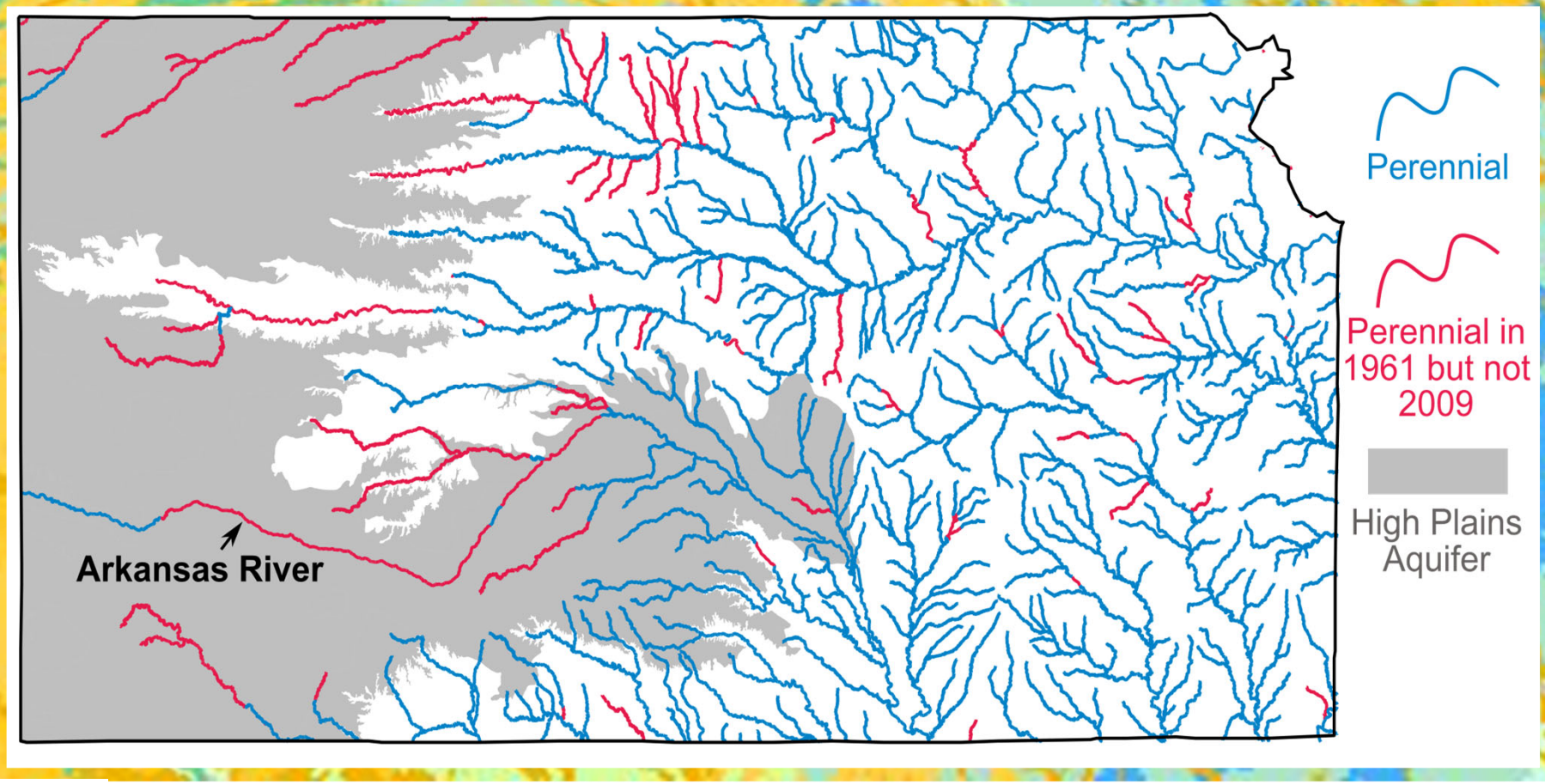




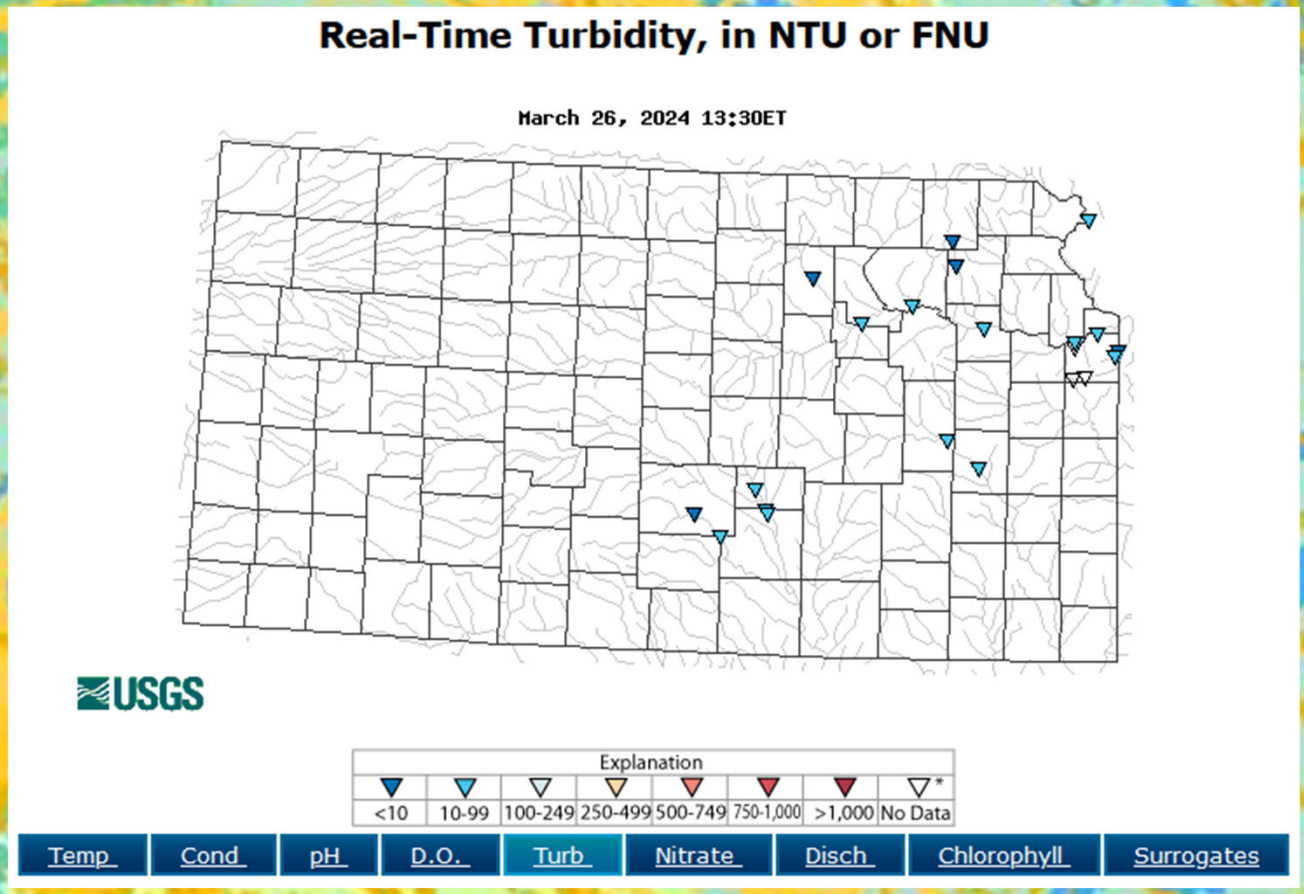


Stream-Aquifer Interaction

Widespread transitions from perennial to intermittent streams

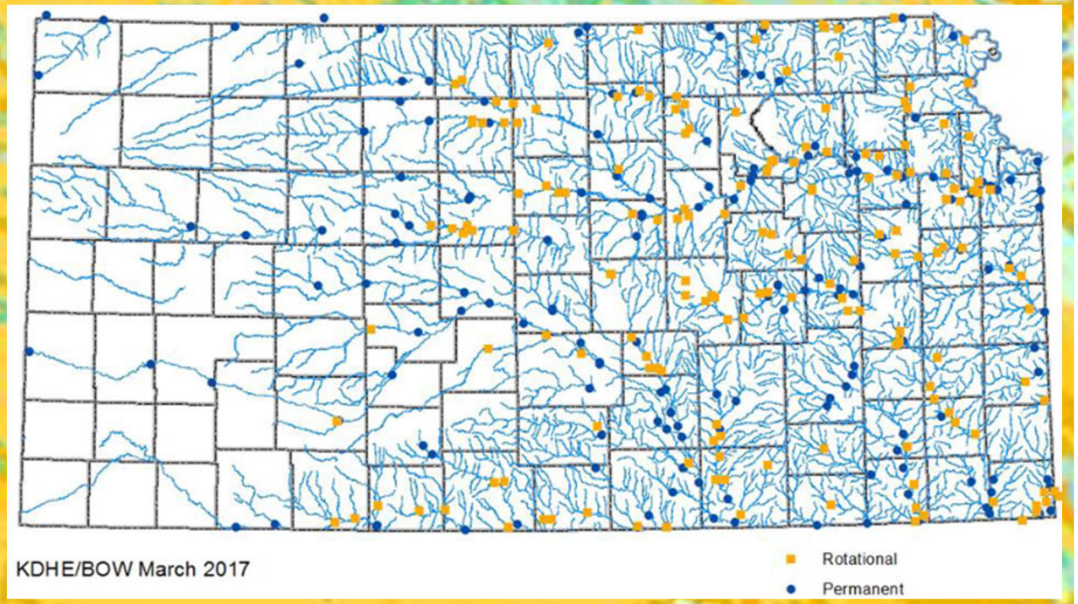


USGS Surface Water Quality Monitoring

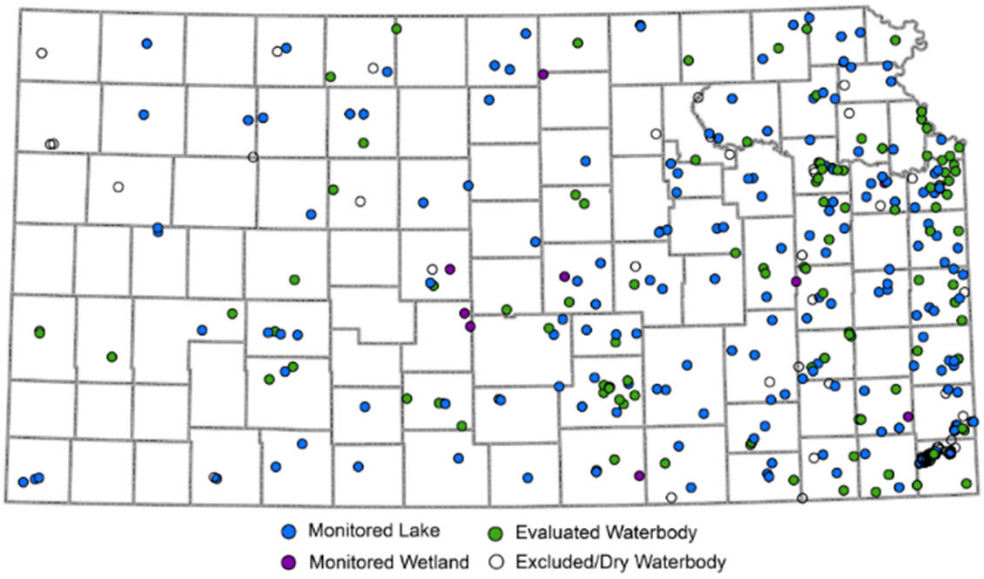


KDHE Surface Water Quality Monitoring

Permanent and Rotational Stream Chemistry Monitoring Stations

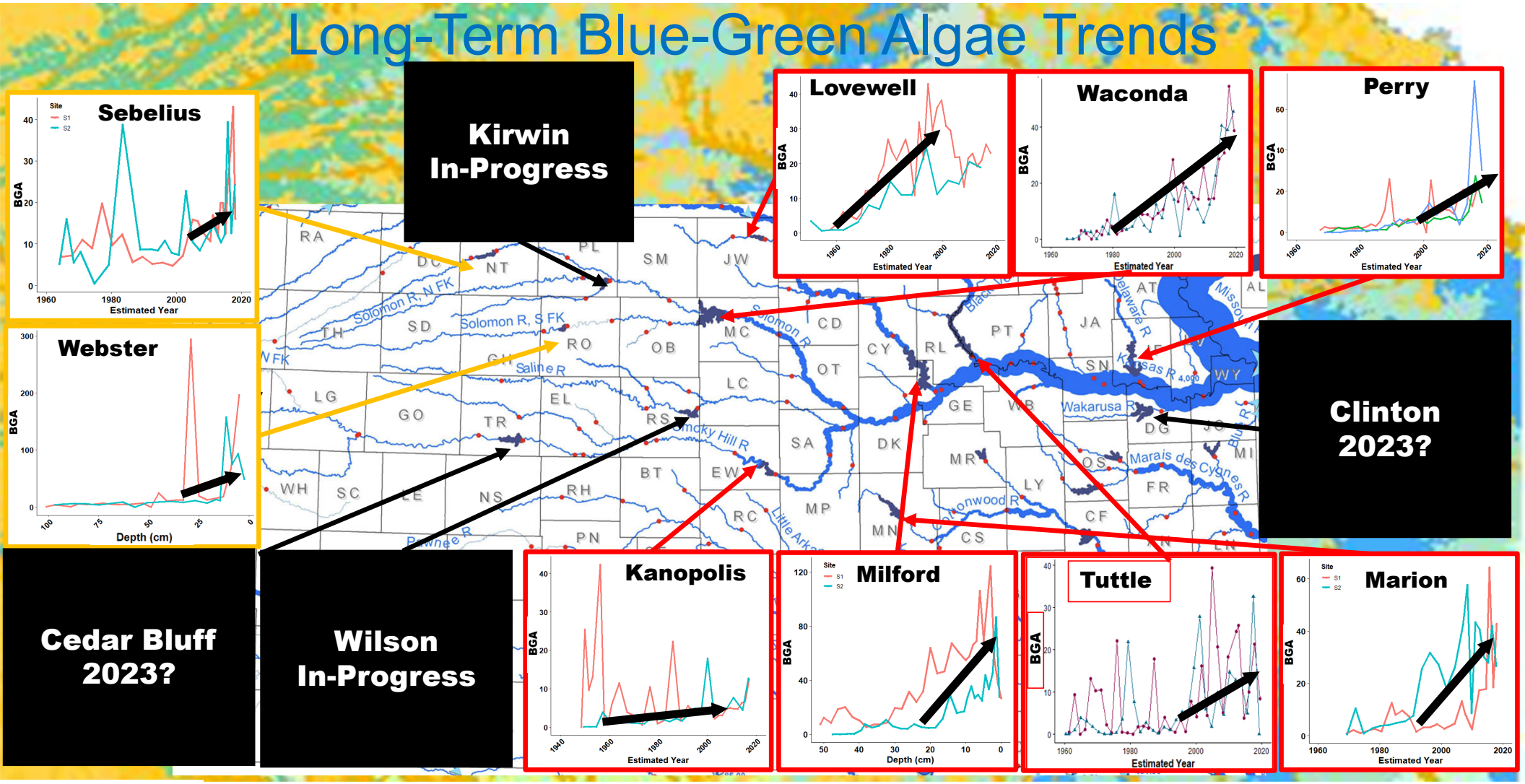


Lake and Wetland Monitoring Program



Harmful Algal Blooms

Long-Term Blue-Green Algae Trends



(Slide compliments of Ted Harris, KBS)

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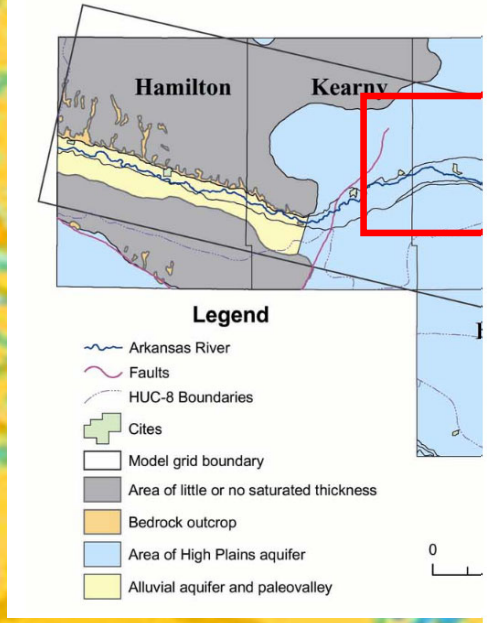
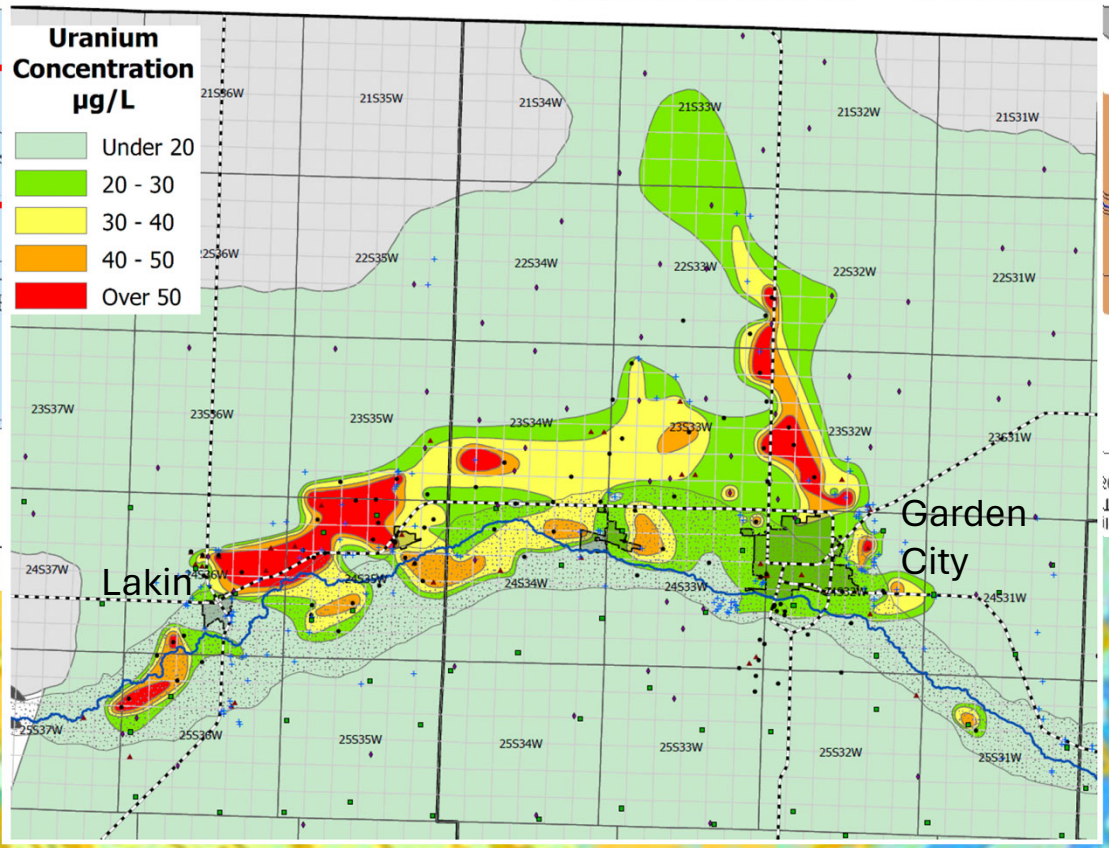
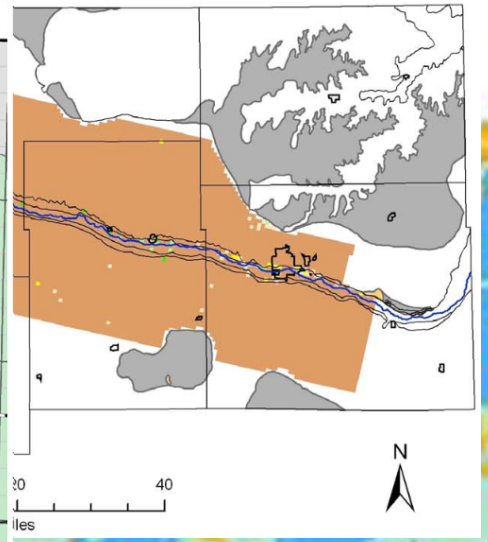
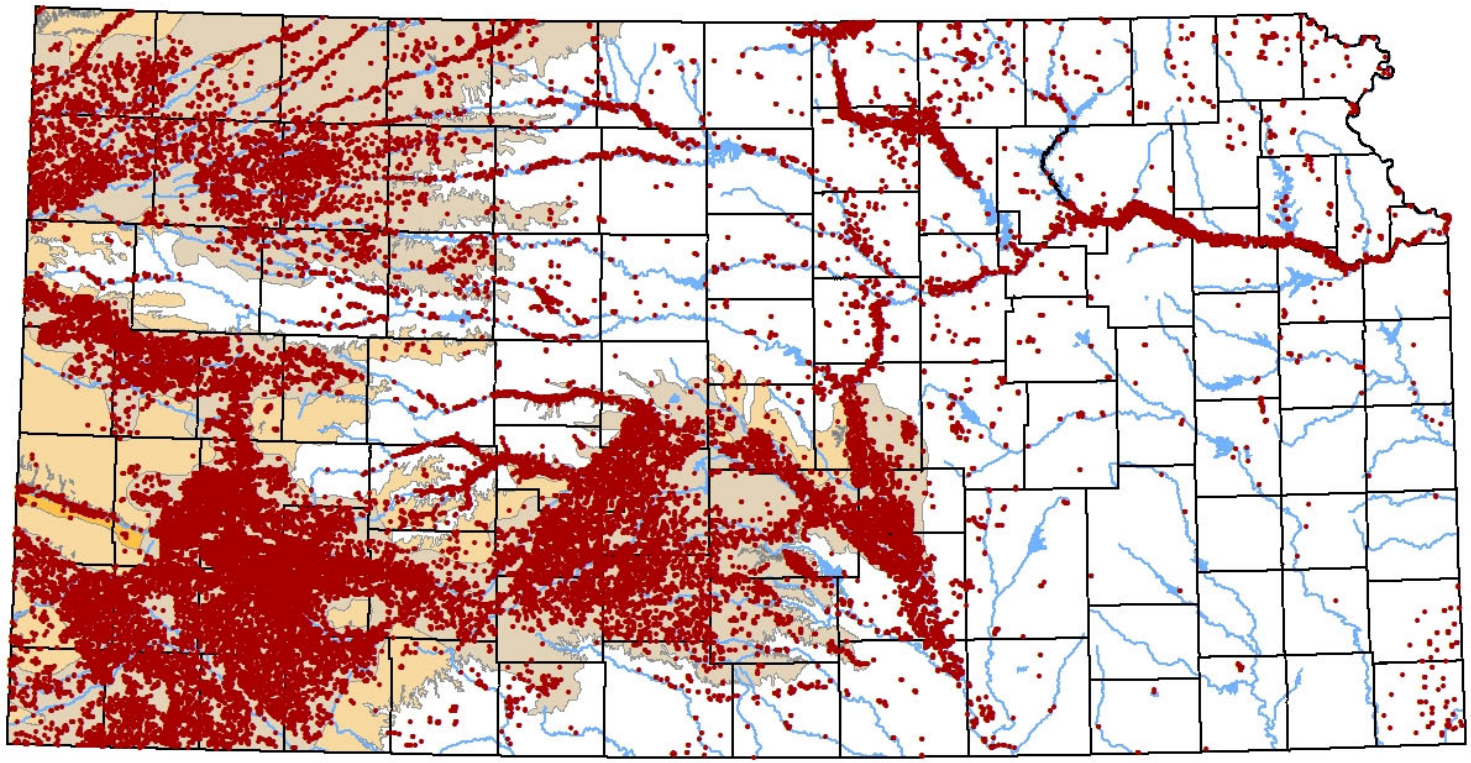
Upper Arkansas River





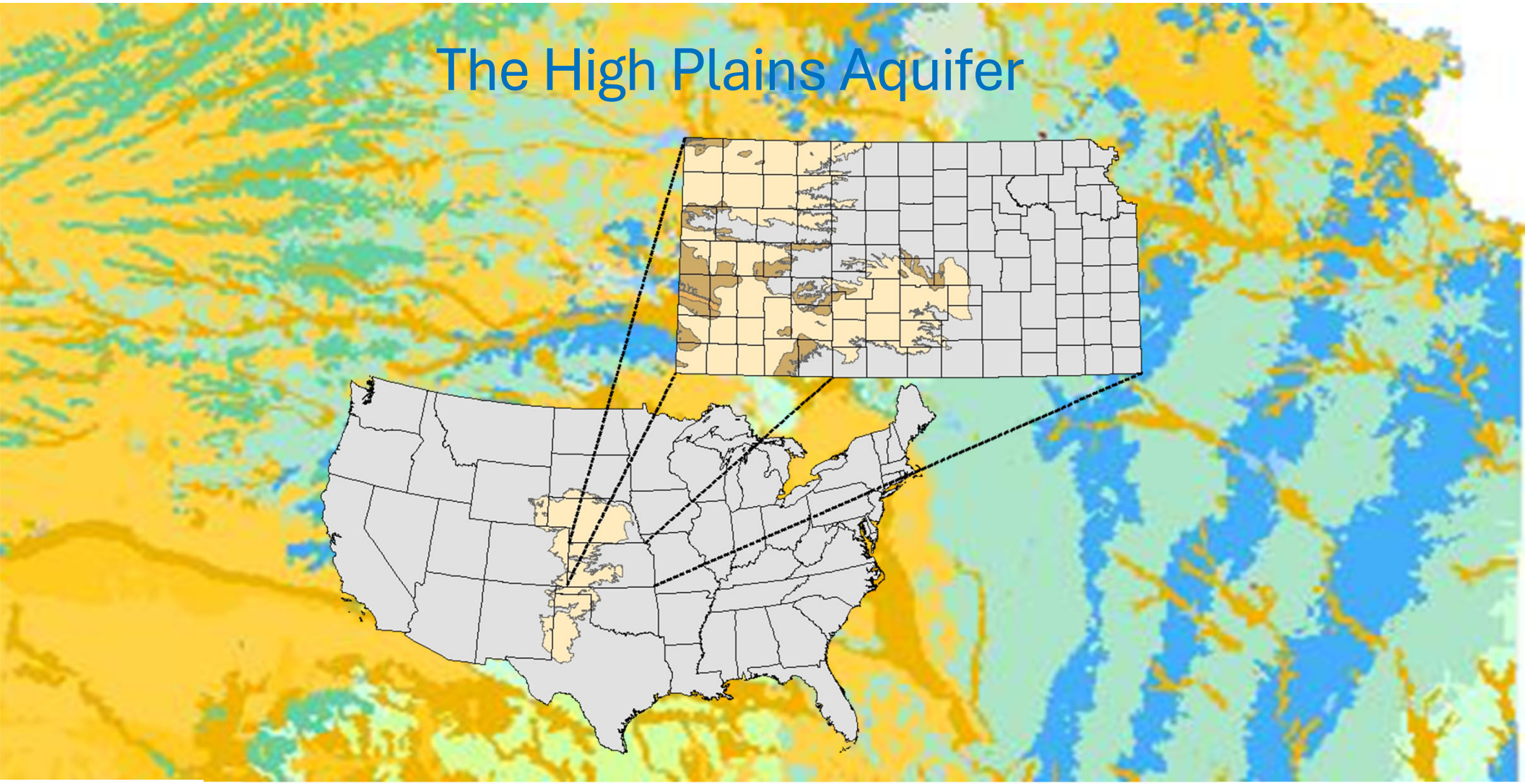


Active Water Rights - Groundwater

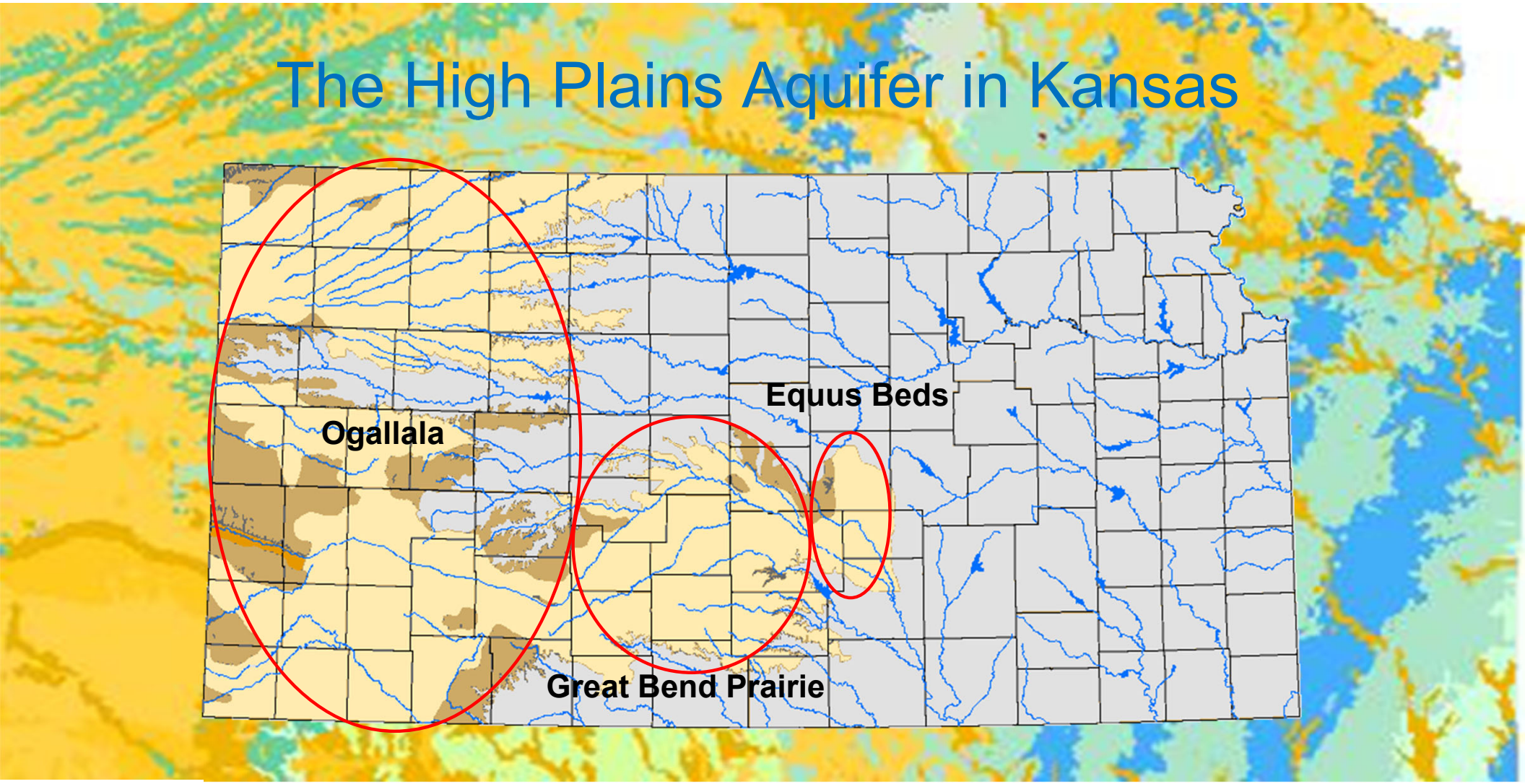


The distribution of wells with water rights for groundwater reveals the major aquifers in Kansas.

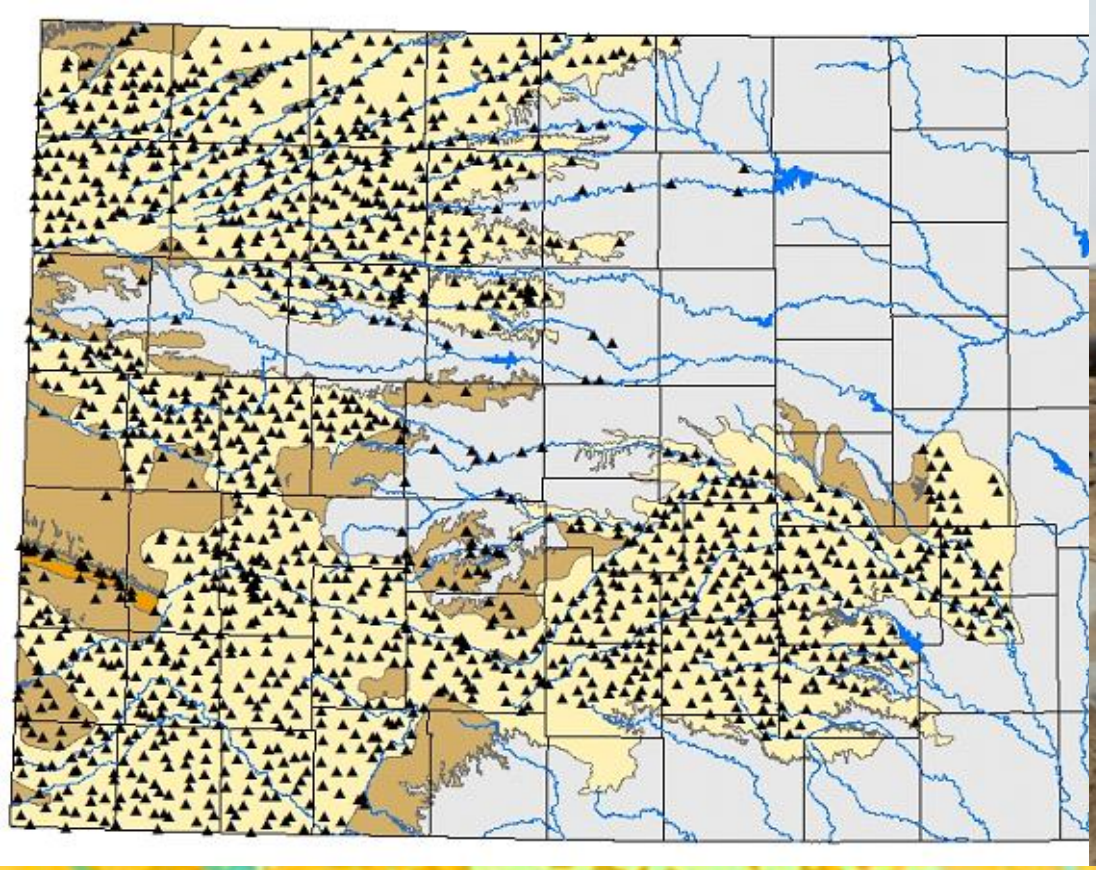
The High Plains Aquifer



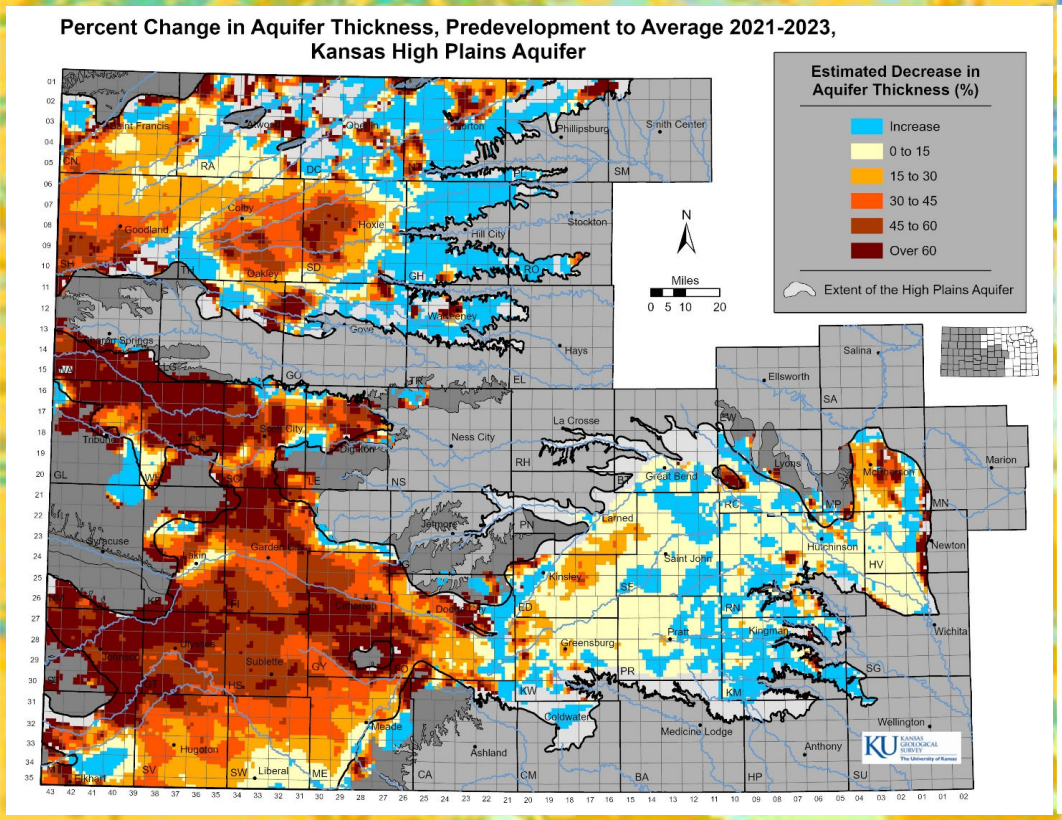
The High Plains Aquifer in Kansas

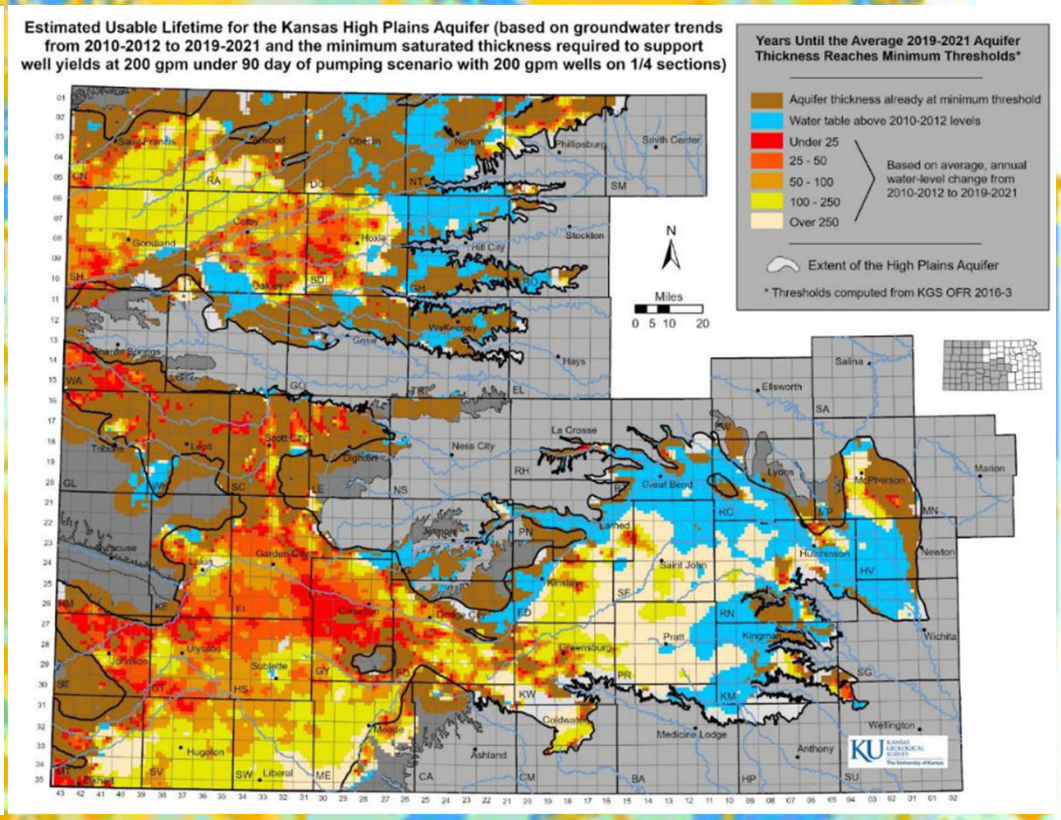


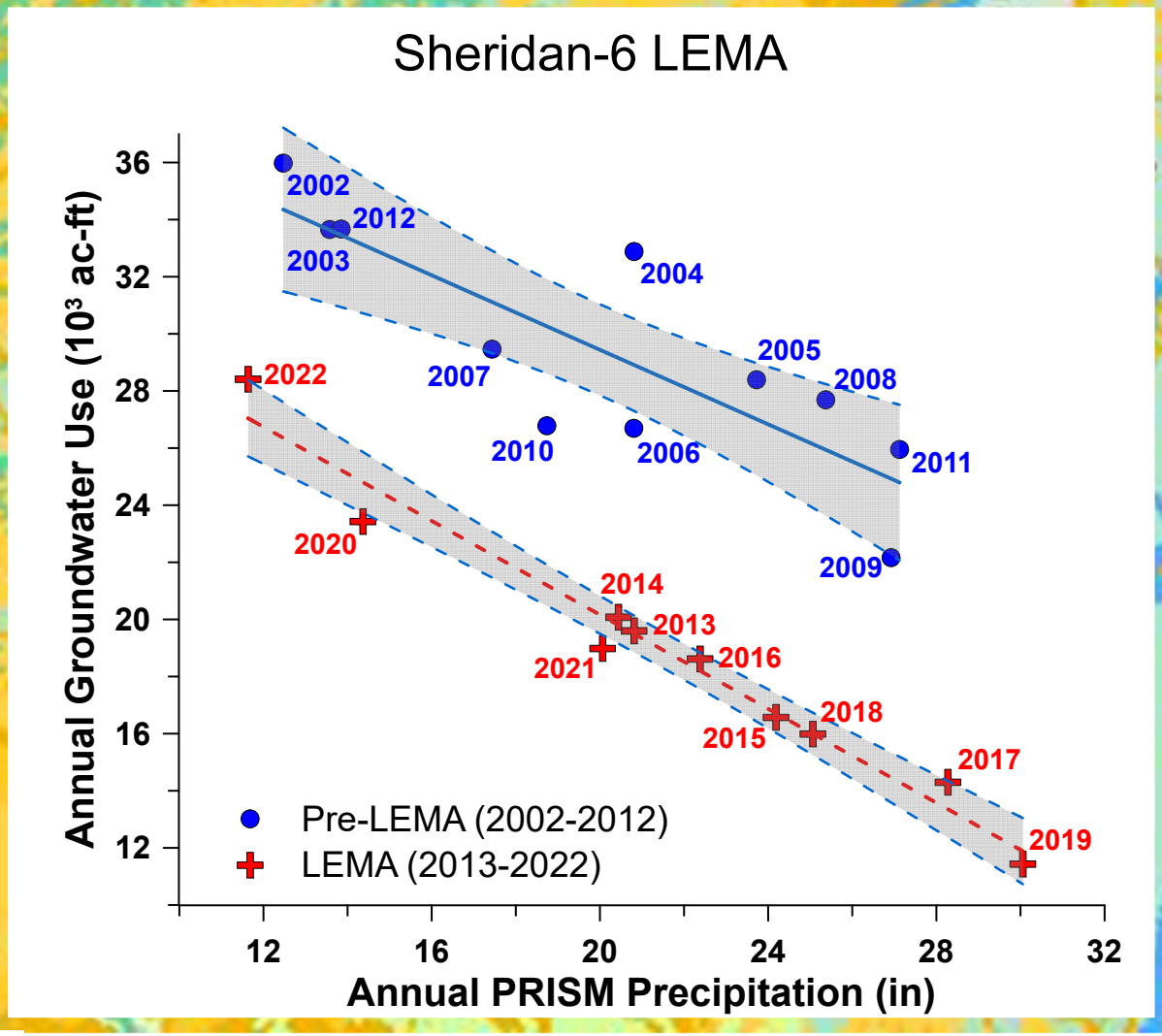
High Plains Aquifer Water Level Monitoring



What is the future of the Ogallala aquifer in western Kansas?







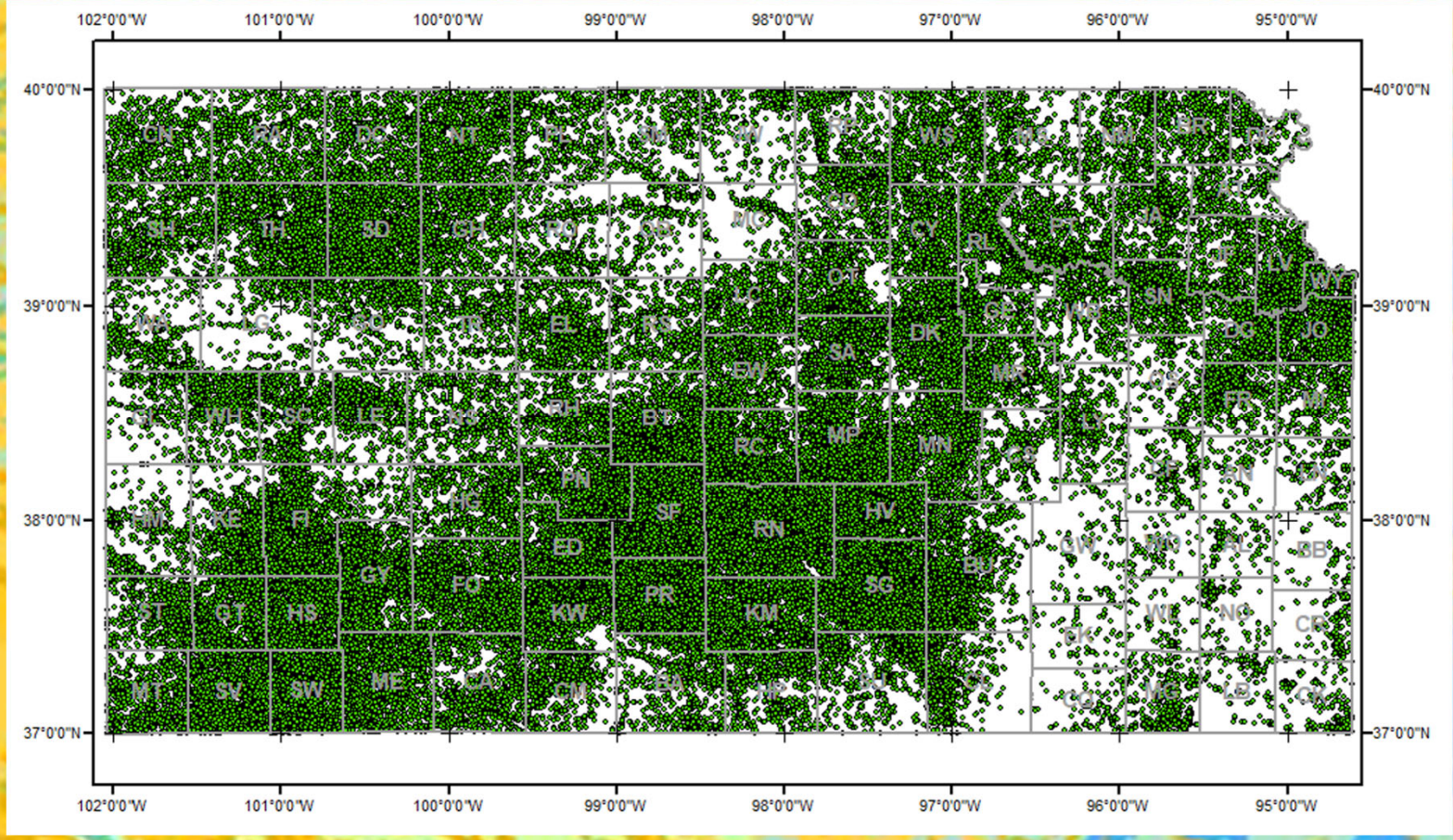
199 pumping wells

Q-Stable

≈ 31% reduction in pumping for similar climatic conditions.

95% confidence intervals

Completed Water Wells – 1975 to Present



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Kansas Groundwater Quality

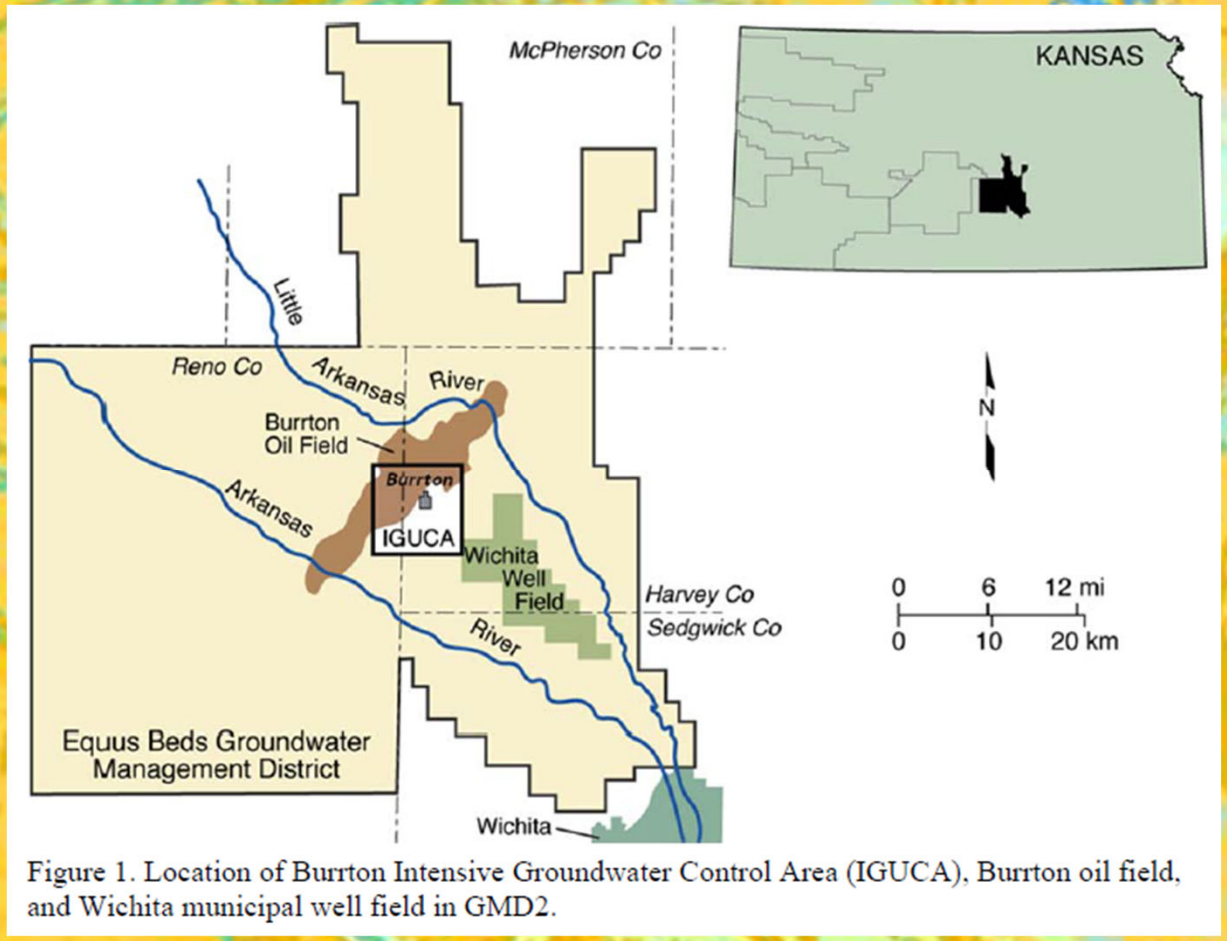
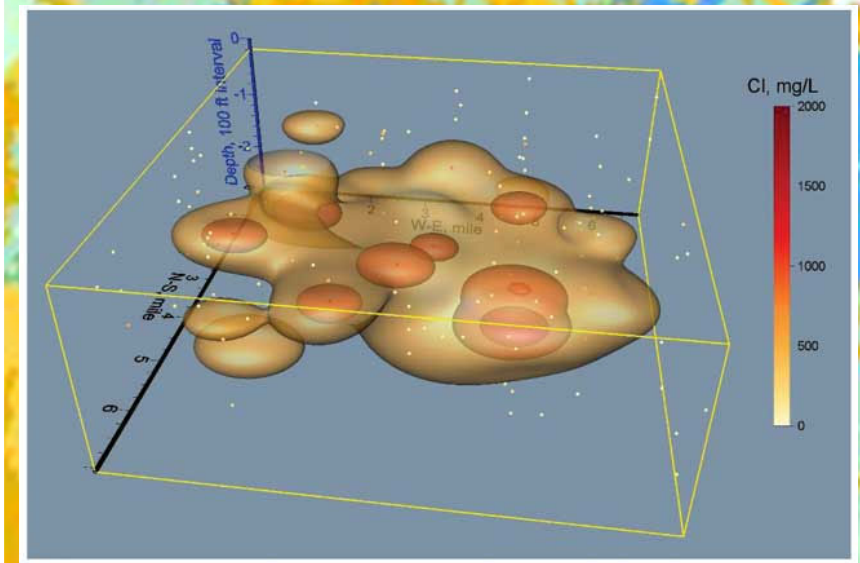
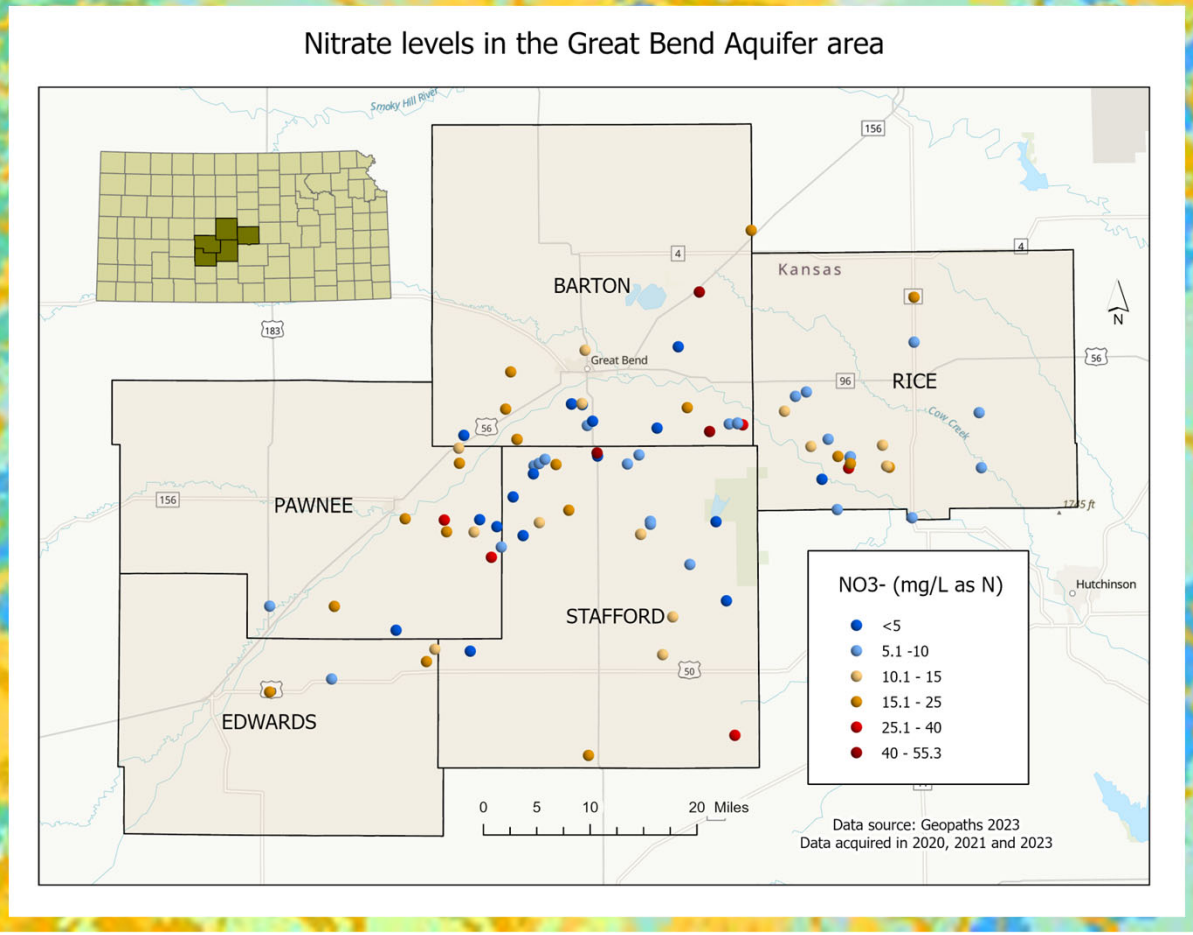


Figure 1. Location of Burrton Intensive Groundwater Control Area (IGUCA), Burrton oil field, and Wichita municipal well field in GMD2.



3D view of the saline water plume in the Burrton Intensive Groundwater Control Area

Kansas Groundwater Geopaths Program



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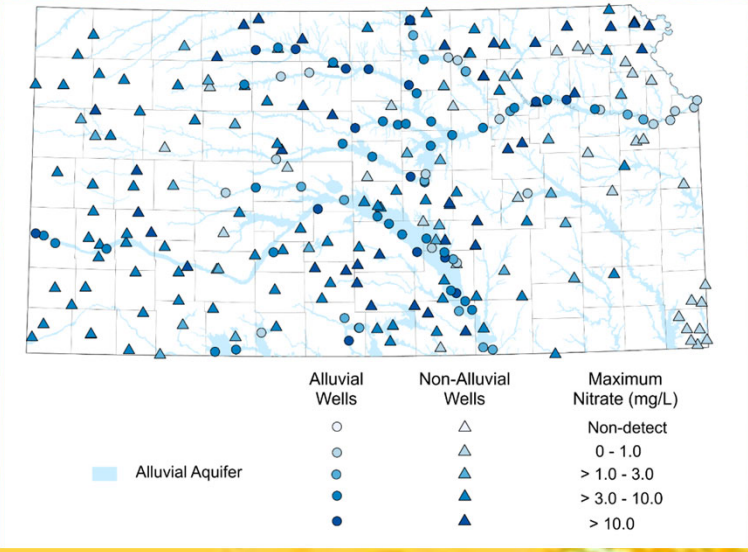
Kansas Groundwater Quality Monitoring Network

KDHE ambient monitoring program was discontinued in 2001.



Maximum detected nitrate concentrations from 103 alluvial and 238 non-alluvial wells sampling 1985-2001.

Currently no ambient monitoring for groundwater, leaving rural populations on domestic wells vulnerable to degraded water quality.

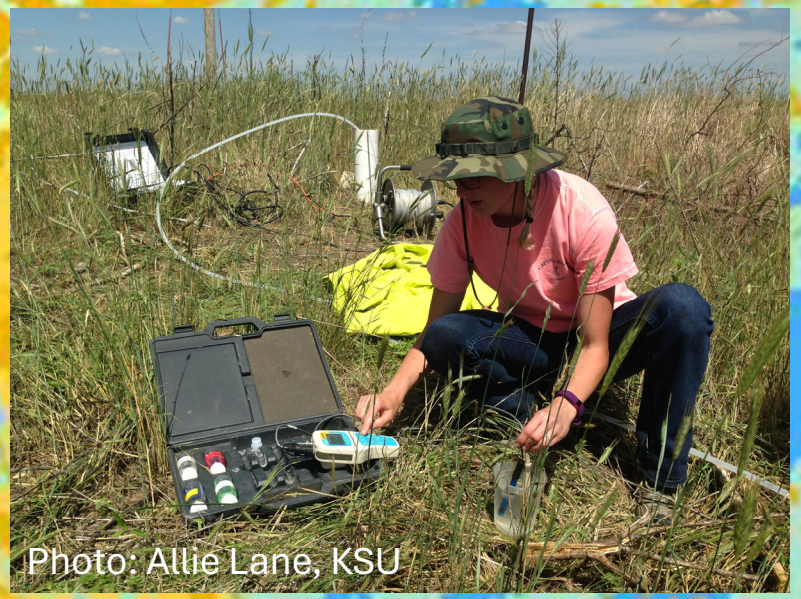


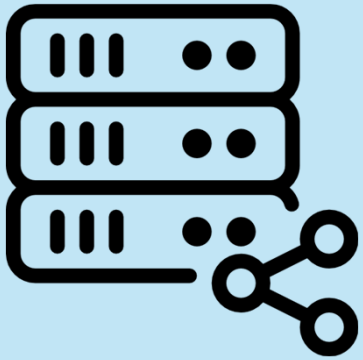
Photo: Allie Lane, KSU

KGS Groundwater Quality Monitoring Network

3 Components

Ambient monitoring

Data aggregation & integration



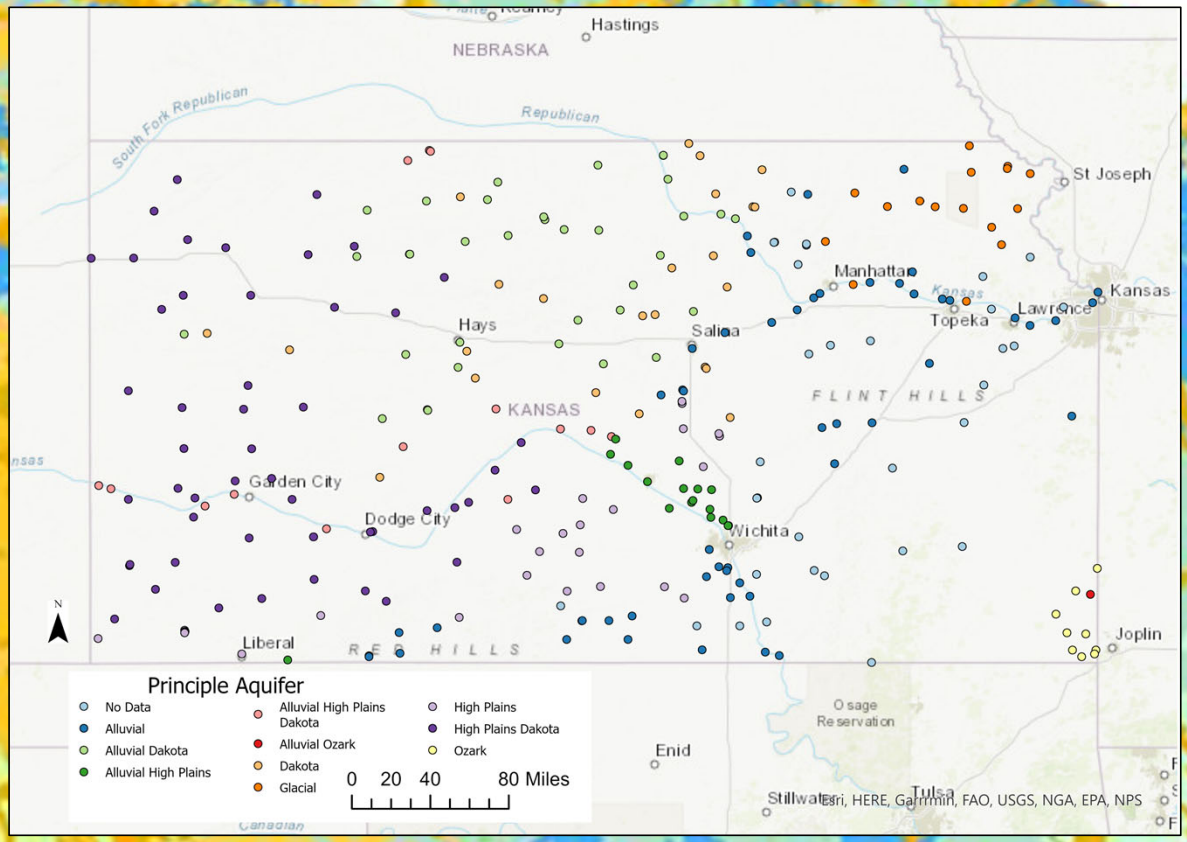
Public data access

Ambient Monitoring

~300 wells with sampling of 150 wells/year

Base set of analytes: nitrate, chloride, ammonium, cations/anions, TDS, arsenic, selenium, uranium

Flexible regional studies with capacity to add enhanced monitoring for specific solutes of concern at local/regional level



Water Infrastructure Grant Programs

Technical Assistance Grant Fund: provide funding for planning, engineering, managing, and other technical assistance to develop water infrastructure projects and to process grant and loan applications for such projects.

Water Projects Grant Fund: provide funding for construction, repair, maintenance, or replacement of water-related infrastructures and related construction costs; matching money for grant or loan applications for water-related infrastructure projects; and payment towards certain loan balances.

Water filtration system, Lakin, KS


Thank You
Questions?