# KANSAS GEOLOGICAL SURVEY

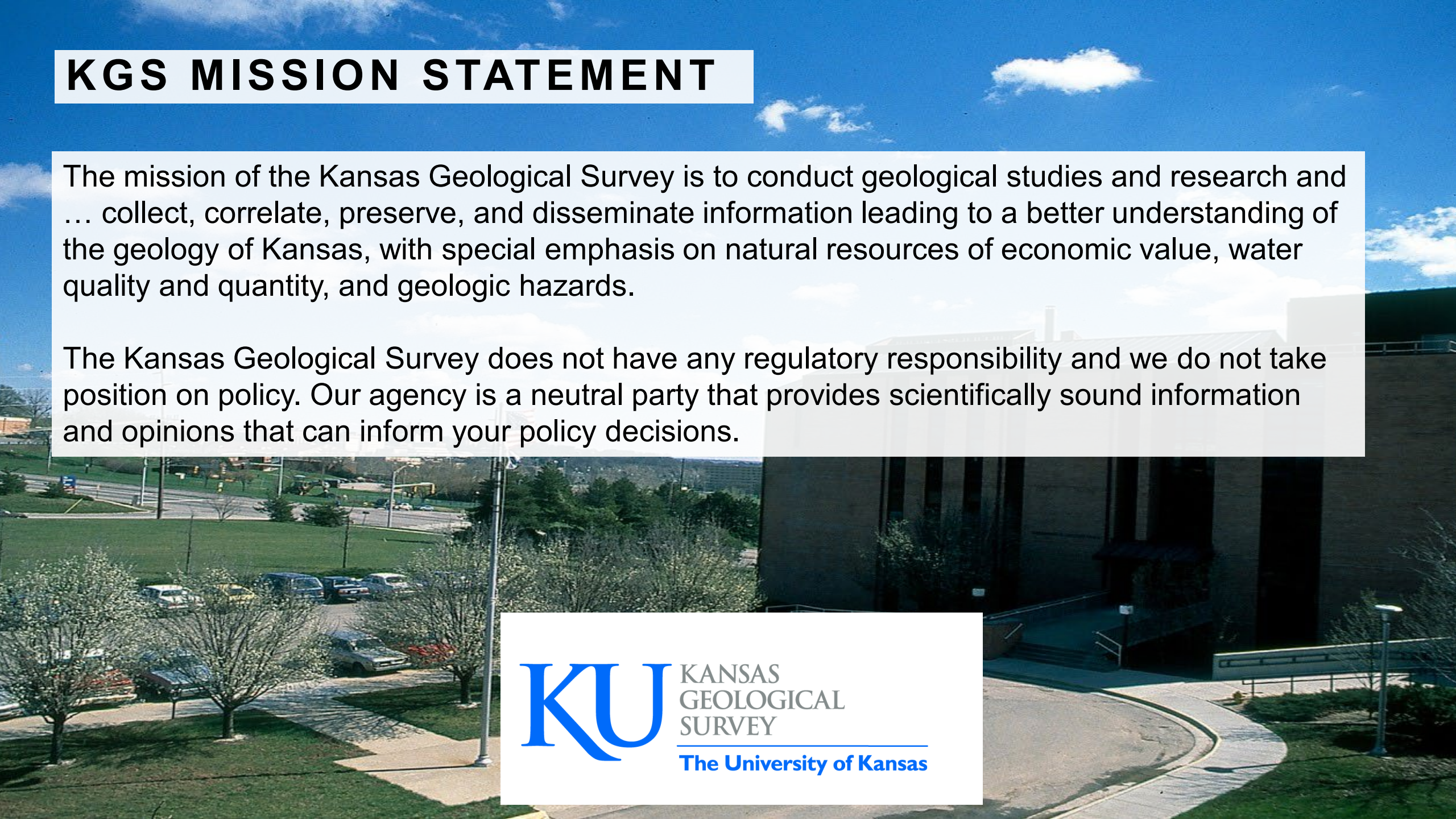
Presentation to the Kansas Water Committee on February 24, 2021.

*Dr. Rolfe Mandel, Director of the Kansas Geological Survey, State Geologist, and University Distinguished Professor*

# KGS MISSION STATEMENT

The mission of the Kansas Geological Survey is to conduct geological studies and research and … collect, correlate, preserve, and disseminate information leading to a better understanding of the geology of Kansas, with special emphasis on natural resources of economic value, water quality and quantity, and geologic hazards.

The Kansas Geological Survey does not have any regulatory responsibility and we do not take position on policy. Our agency is a neutral party that provides scientifically sound information and opinions that can inform your policy decisions.



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# KGS STRUCTURE

KGS is located in the west district of the University of Kansas.

- Energy Research
- Stratigraphic Research
- Exploration Services
- Geohydrology Research
- DASC & GIS
- Public Service & Outreach

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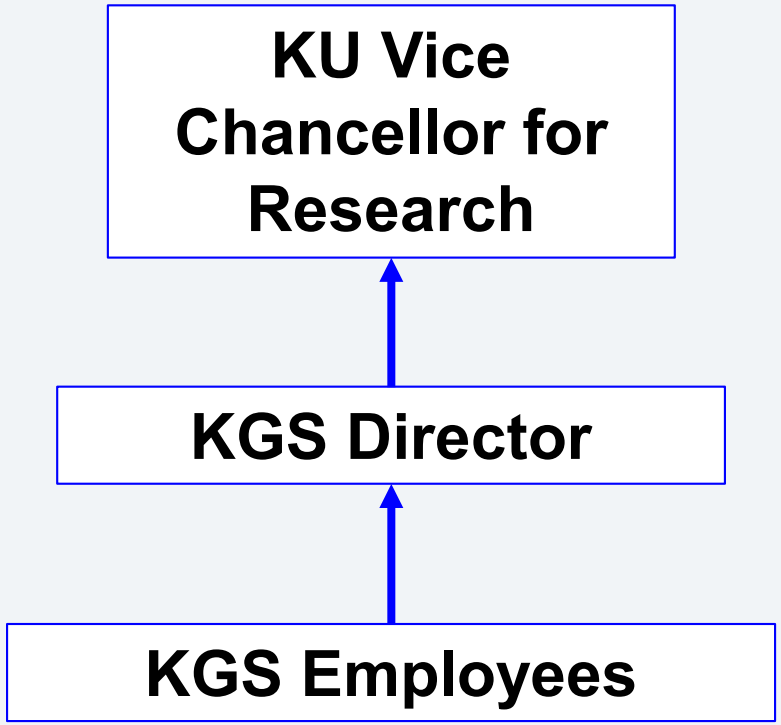
# REPORTING STRUCTURE

All KGS employees report to the KGS Director.

The KGS Director reports to the Vice Chancellor for Research at the University of Kansas and

| Role | Number |
|---|---|
| **Scientists** | 20 |
| **Researchers** | 13 |
| **Research Support Staff** | 29 |
| **Support Staff** | 21 |
| **Students** | 23 |
| **TOTAL** | **106** |

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# ADVISORY COUNCIL

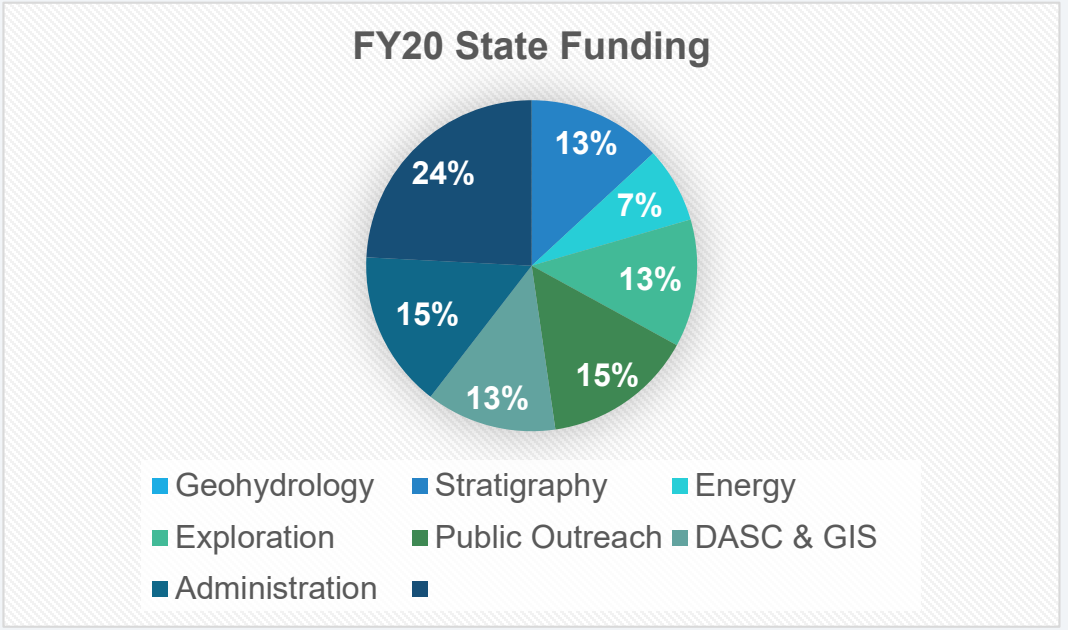
The KGS also has a 12-member advisory council to provide review and guidance.

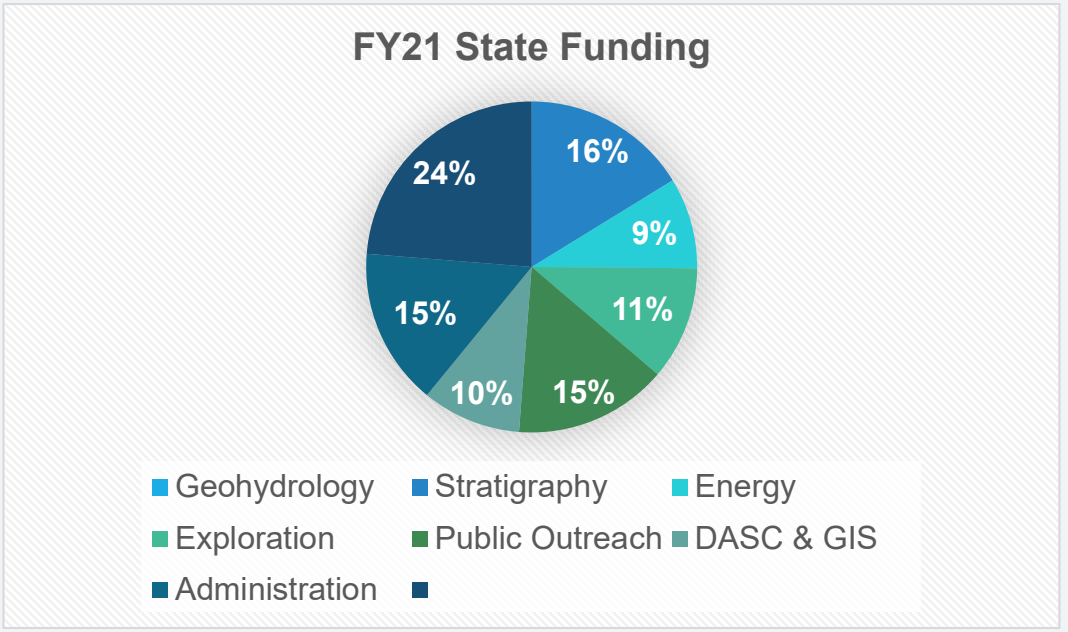
**KGS Advisory Council Members**

Tim Boese
David Heinemann
Beth Isern
Jason Probst
Dan Kerschen
Julie Westhoff
Tom Christy
Paul Simpson
Mike Ramsey
Patrick Parke
Tom Sloan
A. Scott Ritchie

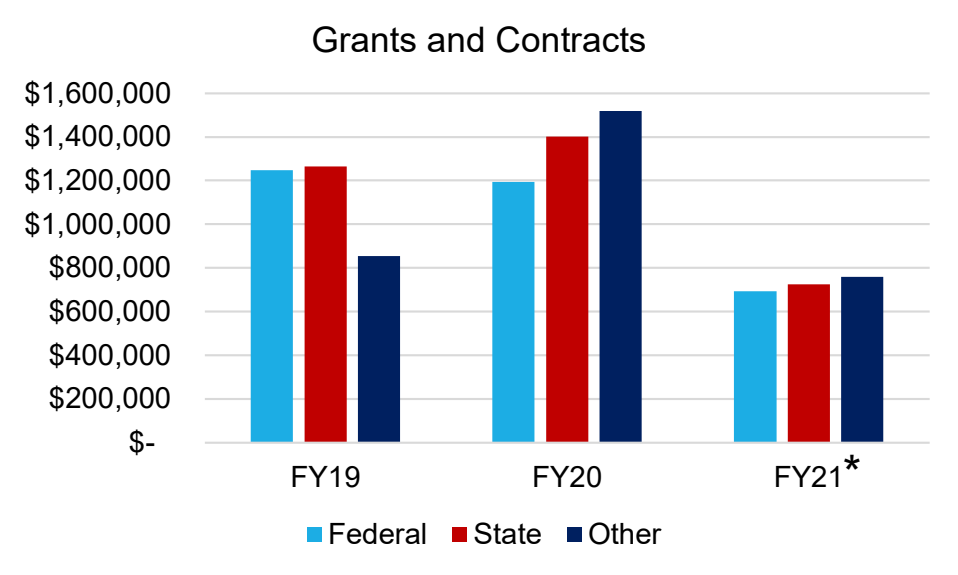
# BUDGET SUMMARY

| | Fiscal Year | |
|---|---|---|
| **CATEGORY** | 2020 | 2021 |
| Salaries | 4,934,153 | 5,094,500 |
| Other Operating Expenses | 1,310,395 | 1,142,299 |
| **TOTAL** | 6,244,548 | 6,236,799 |



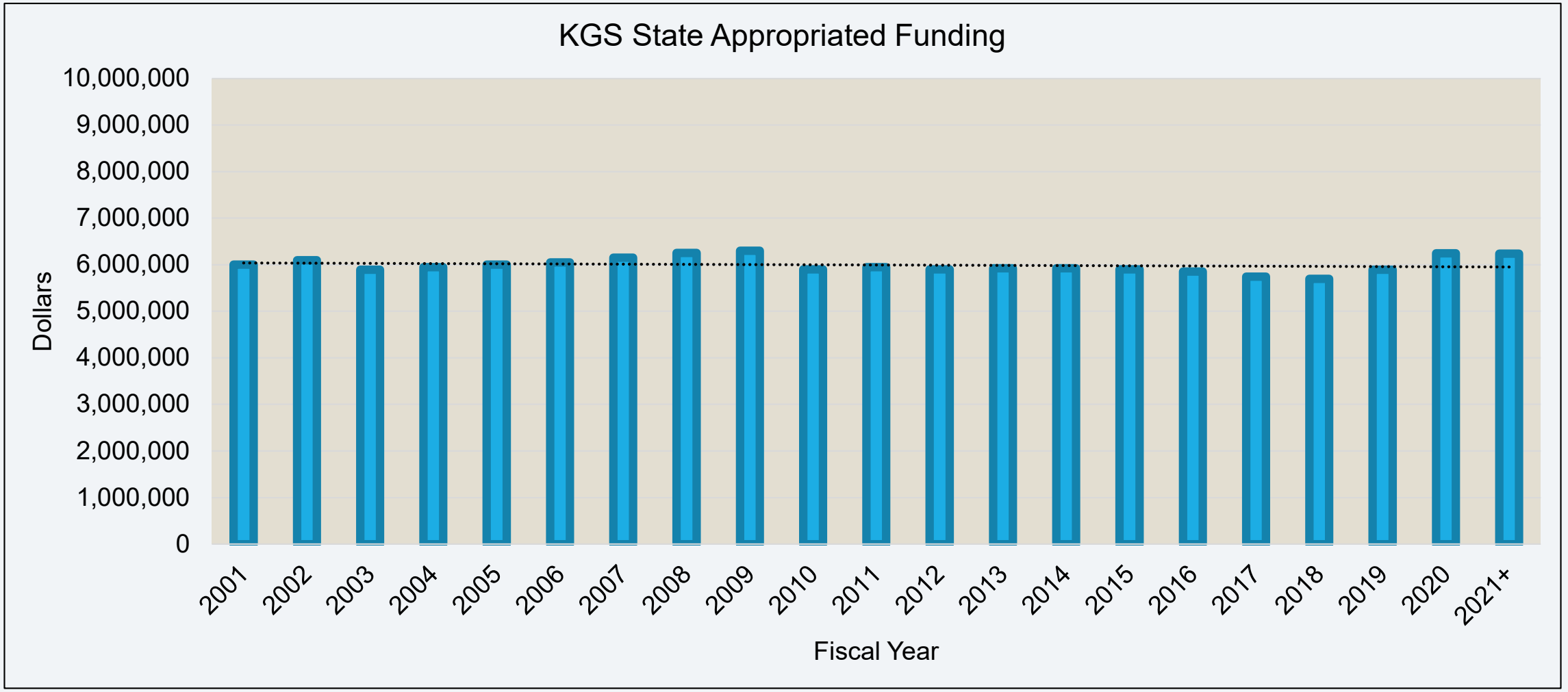
# GRANTS AND CONTRACTS



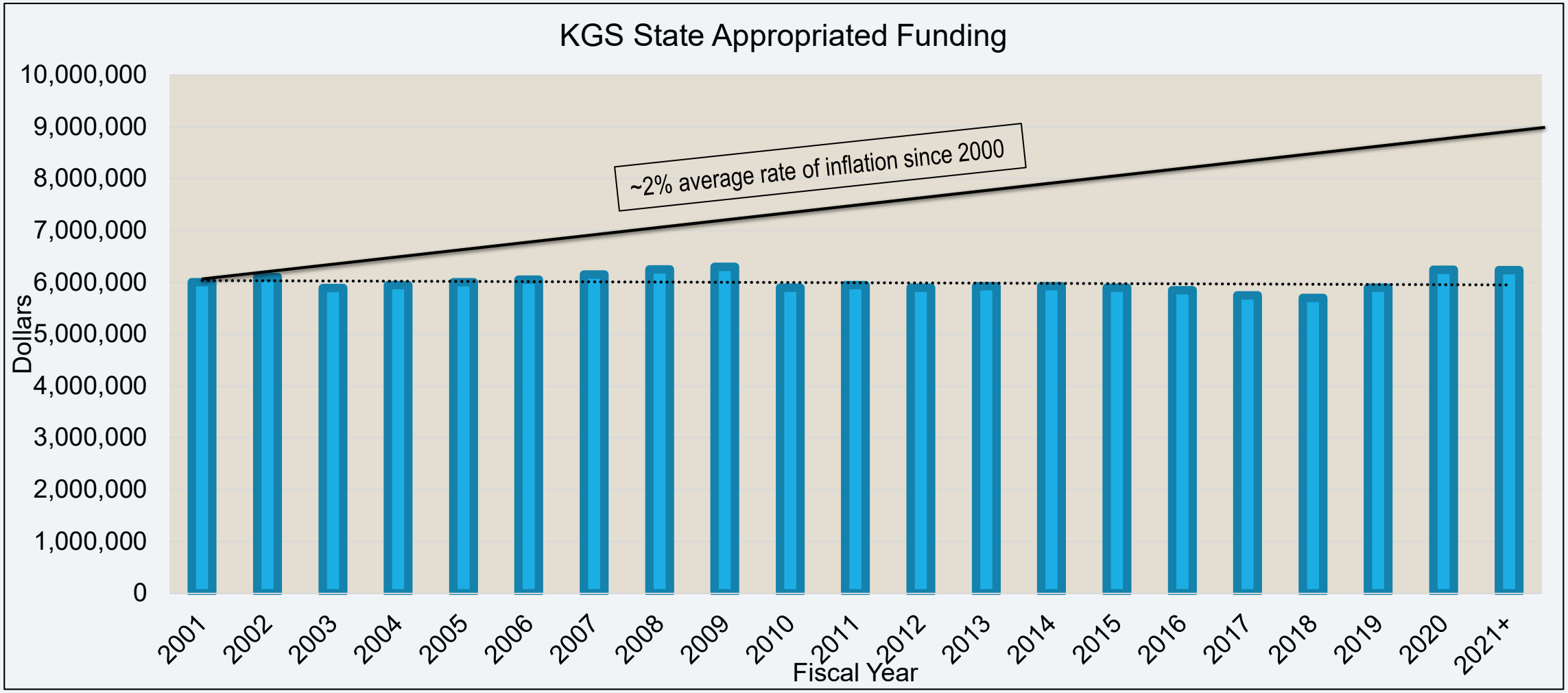

*FY21 values are to date

| FUNDING SOURCE | 2019 | 2020 | 2021 |
|---|---|---|---|
| **FEDERAL:** | | | |
| National Science Foundation | 27,030 | 54,935 | 38,266 |
| US Army Corp Of Engineers | 467,374 | 823,186 | 412,792 |
| US Department Of Energy | 523,554 | 67,509 | |
| US Geological Survey | 230,145 | 247,564 | 242,036 |
| FEDERAL TOTAL | 1,248,103 | 1,193,194 | 693,093 |
| **STATE:** | | | |
| Equus Beds Groundwater Management District #2 | 29,376 | 21,879 | |
| Groundwater Management District 4 | 540 | 4,337 | 54,797 |
| Kansas Corporation Commission | 169,304 | 172,685 | 40,679 |
| Kansas Department Of Agriculture | 41,057 | 63,222 | 45,775 |
| Kansas Department Of Health & Environmt | 8,259 | 40,955 | 48,348 |
| Kansas Department Of Revenue | 219,309 | 206,385 | 150,736 |
| Kansas Department Of Transportation | 329,986 | 255,082 | 71,807 |
| Kansas Division Of Emergency Managment | | 3,807 | 4,618 |
| Kansas Information Technology Office | 195,554 | 386,744 | 130,894 |
| Kansas Water Office | 224,899 | 230,139 | 164,763 |
| Kansas Water Resources Institute | 37,890 | 15,153 | 12,278 |
| Southwest Kansas Groundwater Management, District #3 | 9,005 | | |
| STATE TOTAL | 1,265,178 | 1,400,388 | 724,696 |
| **OTHER:** | | | |
| Foundation | 54,605 | 51,160 | 42,833 |
| Industry | 345,335 | 458,264 | 94,706 |
| Institution | 1,826 | 3,239 | 1,350 |
| Non-For-Profit | 367,246 | 745,128 | 440,025 |
| State Agencies (non Kansas) | | 40,467 | 42,215 |
| Universities | 85,762 | 196,054 | 138,383 |
| Foreign | | 24,244 | 0 |
| OTHER TOTAL | 854,774 | 1,518,556 | 759,513 |
| | | | |
| **TOTAL** | **3,368,054** | **4,112,138** | **2,177,302** |

# KGS 20 YEAR APPROPRIATED FUNDING HISTORY



# KGS 20 YEAR APPROPRIATED FUNDING HISTORY



# GEOPHYSICS AND EXPLORATION SERVICES

- Develops and uses near-surface imaging and characterization to locate underground anomalies, such as voids, tunnels, and abandoned mines;
- Image rock layers to study groundwater flow and map geologic structures;
- Appraise subsurface hazards;
- Monitor earthquake activity across the state.

# SEISMIC RESEARCH AND APPLICATIONS

## Reflection Program

- Worlds leaders since 1980 in shallow high resolution seismic reflection method development and application
- Hazard evaluations, examples
  - I-70 sinkhole
  - US-50 bypass around Hutchinson
  - Abandoned coal mines Scammon BNSF railroad
  - Abandoned saltwater disposal wells (Macksville, Punkin Center, Leesburg, etc)
  - Lyon's salt mine collapse
  - Hutchinson gas explosion


## Surface Wave Program

- Developed method in 1999 that has been Globally accepted as standard for estimating shallow rock properties (shear velocity, rock stiffness) for engineering and groundwater applications
- Risk reduction and mitigation or hazard evaluations, examples
  - Olathe groundwater contamination
  - Galena lead/zinc mine collapse and town stability
  - Treece and US 69 Highway stability risk
  - Hutchinson legacy salt jugs roof stability and collapse

**Outside (non-State) funding to support development and application over last 20 years exceeds $20M.**

# ANNUAL WATER LEVEL MEASUREMENT PROGRAM

KGS took over for the USGS in 1997. Prior to 1997, USGS measurement crews spent 2 to 3 months measuring 559 wells using paper maps and counting miles.

**The program in 1997:**

KGS responsible for 559 wells in 16 counties

DWR responsible for 823 wells in 33 counties

KGS started using digital maps and handheld GPS for guidance and supported DWR efforts

13 days, 6 people to complete KGS portion

**The program today:**

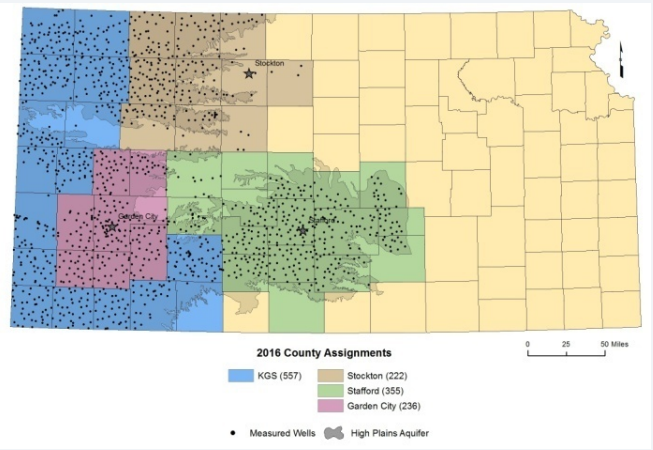
KGS responsible for 581 wells in 17 counties

DWR responsible for 838 wells in 32 counties

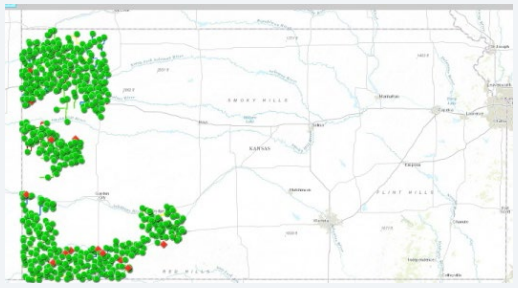
KGS developed paperless, digital acquisition system w/ real time navigation, well histories, and data uploads to KGS server w/ time and location stamps and saved on mobile phones

**3 days, 8 people** to complete KGS portion


1997

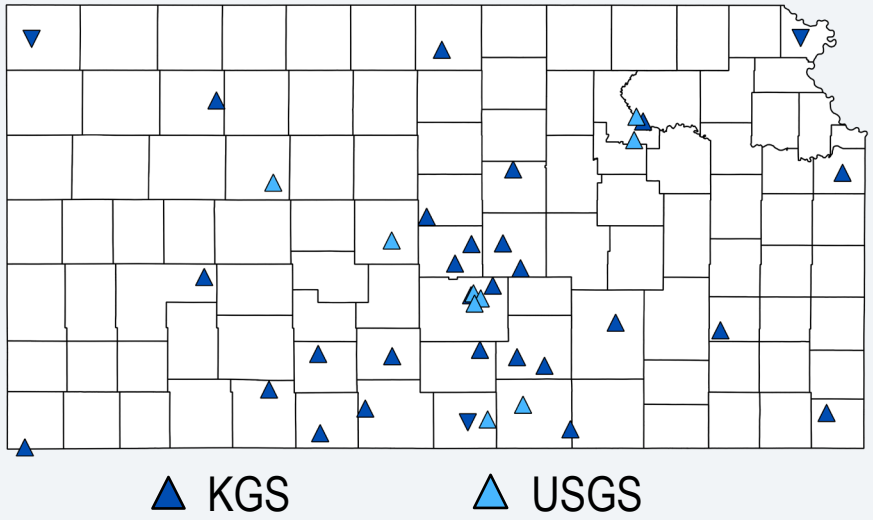


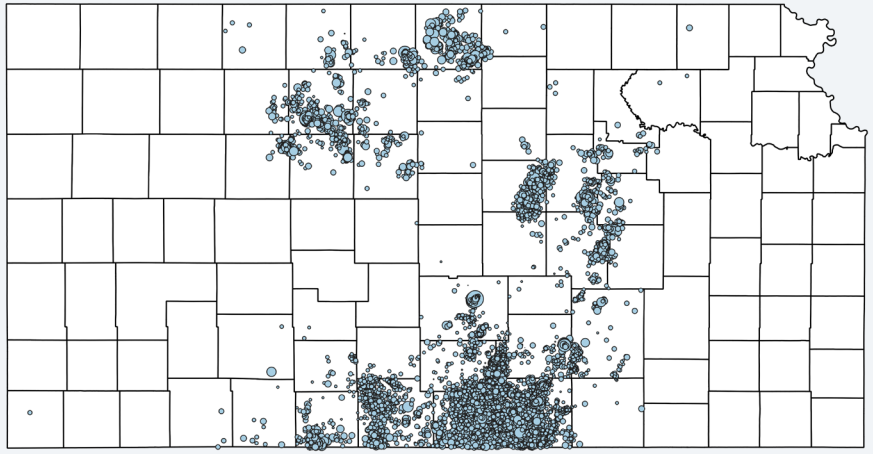

2021



# KANSAS EARTHQUAKE NETWORK

- Development of modern network began in 2014.
- Current network includes 30 stations focused on State priority areas and regional surveillance



16,967 earthquakes located by KGS since beginning of 2015

# FORENSIC/ARCHAEOLOGY GEOPHYSICS

**Crime scene investigations**

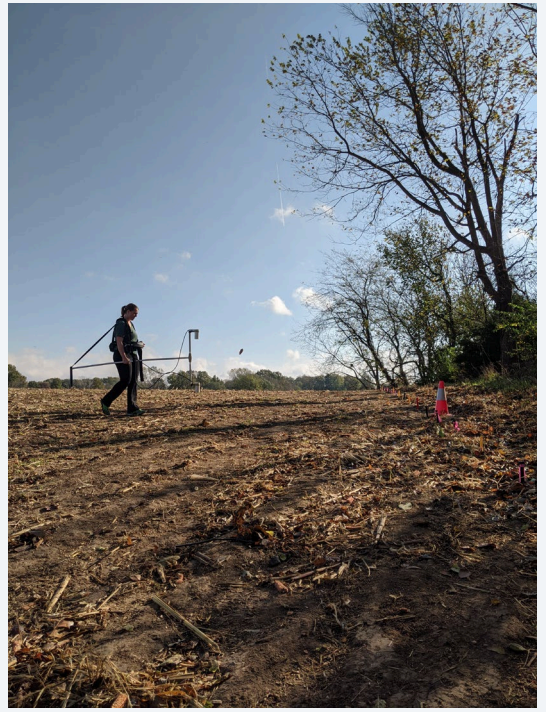
- KBI investigation in Shawnee County
- KCK police investigation of cold case
- Council Grove police investigation of cold case

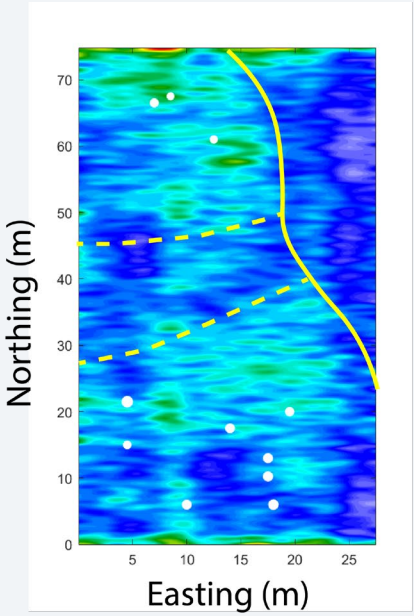
**Grave delineation**

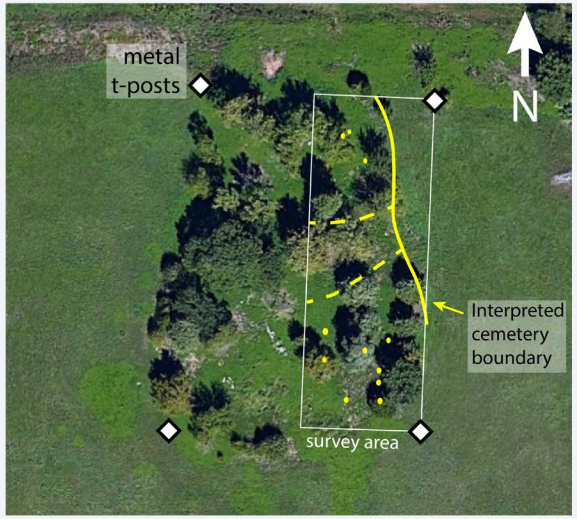
- pre-1900 cemeteries
- Douglas County
- Leavenworth County

**Historically significant sites**

- Civil War
- Native Kansan dwellings






# MINERAL INVESTIGATIONS

**Volcanic intrusive mineral deposits (magnesium-mica)**

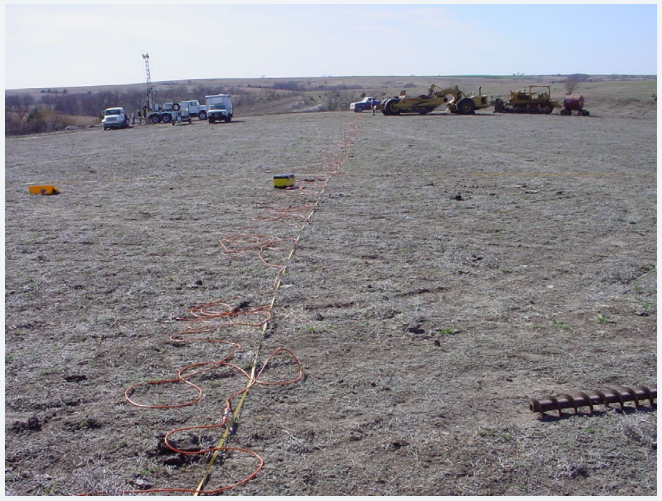
Developed methods to delineate highly variable ore bodies

**Limestone/Aggregate deposits**

Improving resource management and classification, Bonner Springs, Independence

**Volcanic Ash**

Develop geophysical method for volumetric evaluations, Jewell County

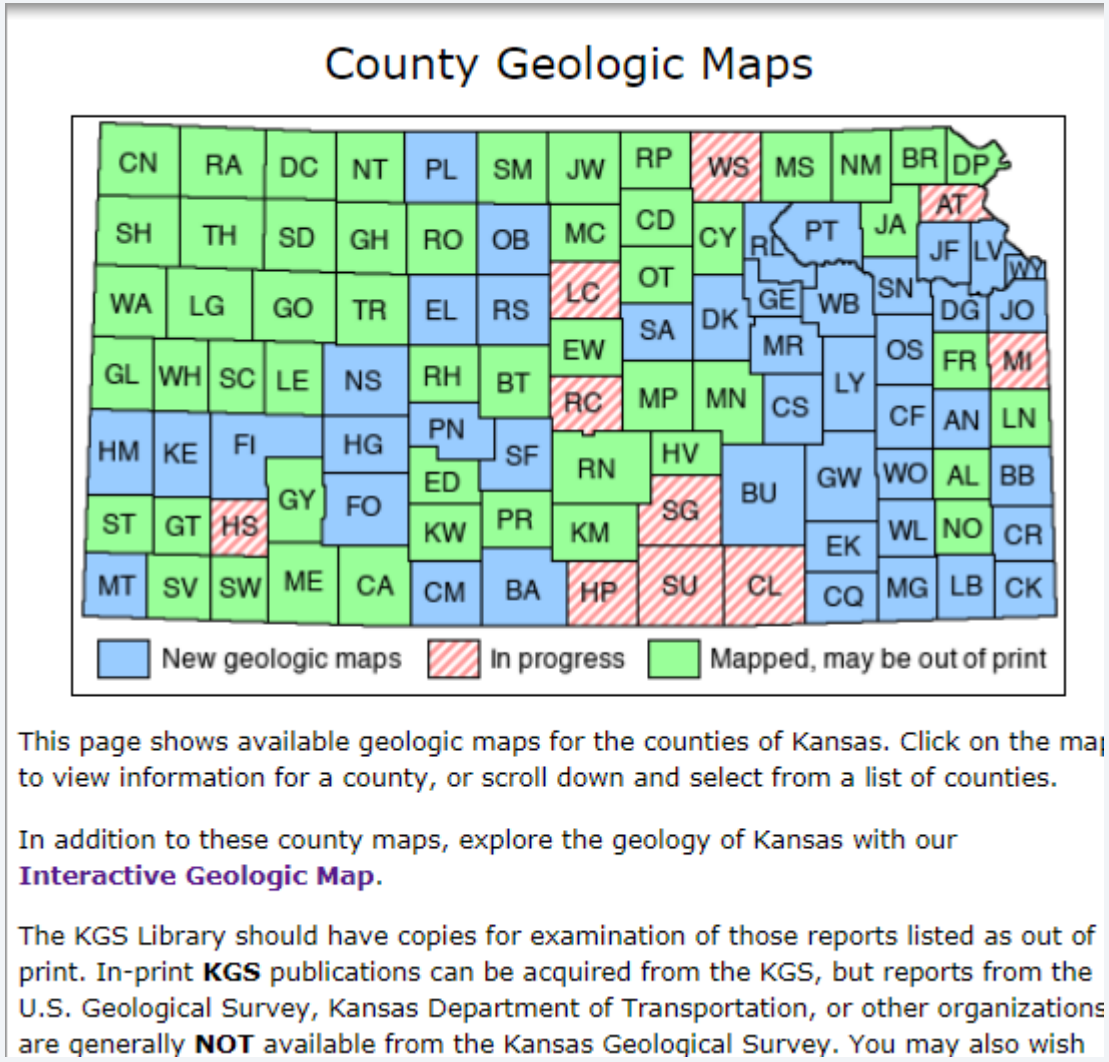


# STRATIGRAPHY

Stratigraphic research projects are focused on geologic mapping, as well as quantitative characterization and dating of sedimentary deposits.

- Geologic Mapping
- Streambank Erosion Study

# KGS PARTICIPATION IN THE USGS STATEMAP PROGRAM




Many county maps are from the 1960's or earlier, are out of print or not in an easily accessible digital formats.

While the rocks don't change significantly in human timespans, our scientific tools and ability to investigate and understand the geology of Kansas does improve.

Geologic maps convey this new and more accurate information to stakeholder agencies and industries, scientific colleagues, and the general public.

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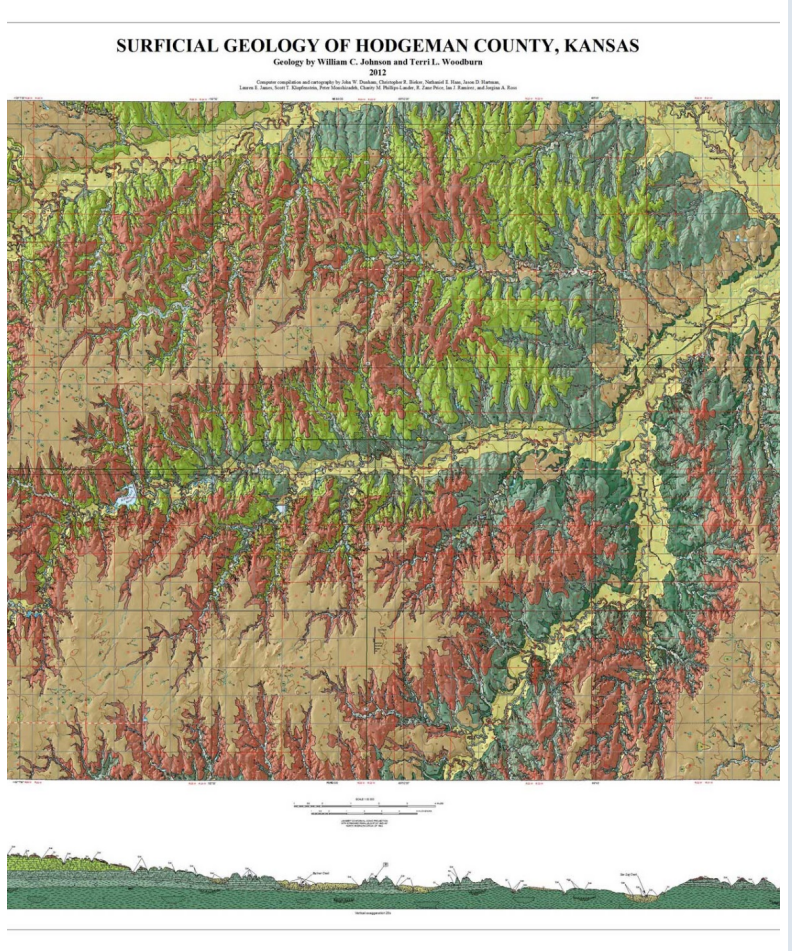
# NATIONAL COOPERATIVE GEOLOGIC MAPPING PROGRAM (NCGMP)

- STATEMAP is a competitive matching-funds grant program available to State surveys to support geologic mapping.
- Primary objective is to establish the geologic framework of areas determined to be vital to the economic, social, or scientific welfare of individual States.
- Kansas mapping priorities are guided by the KGS Advisory Committee.
- **Criteria for county selection in Kansas vary, though priority issues have focused on water resources, the ever-increasing demand for construction aggregate throughout the state; and recent public concern over induced seismicity related to petroleum production in south-central Kansas and Oklahoma.**

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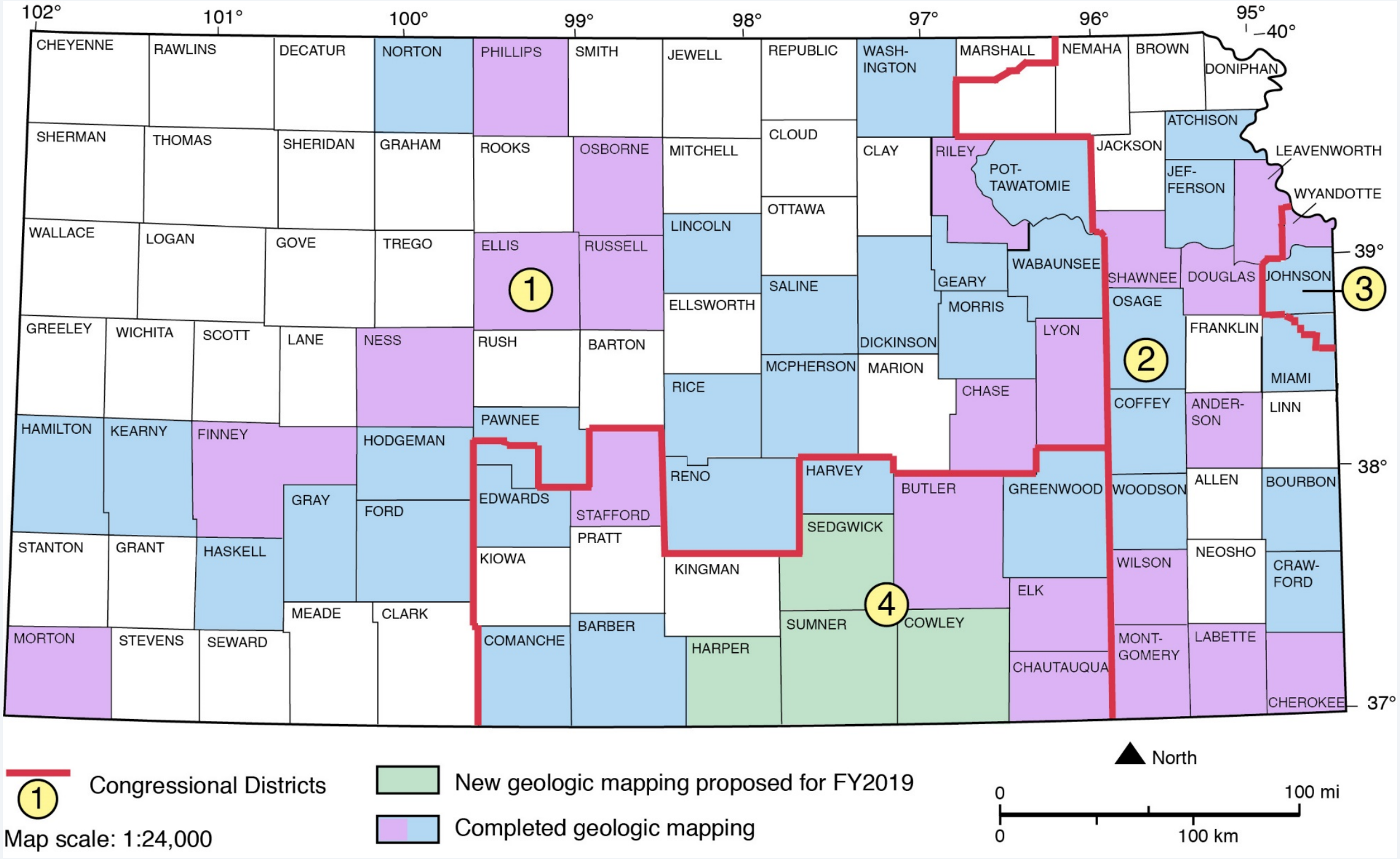
102°
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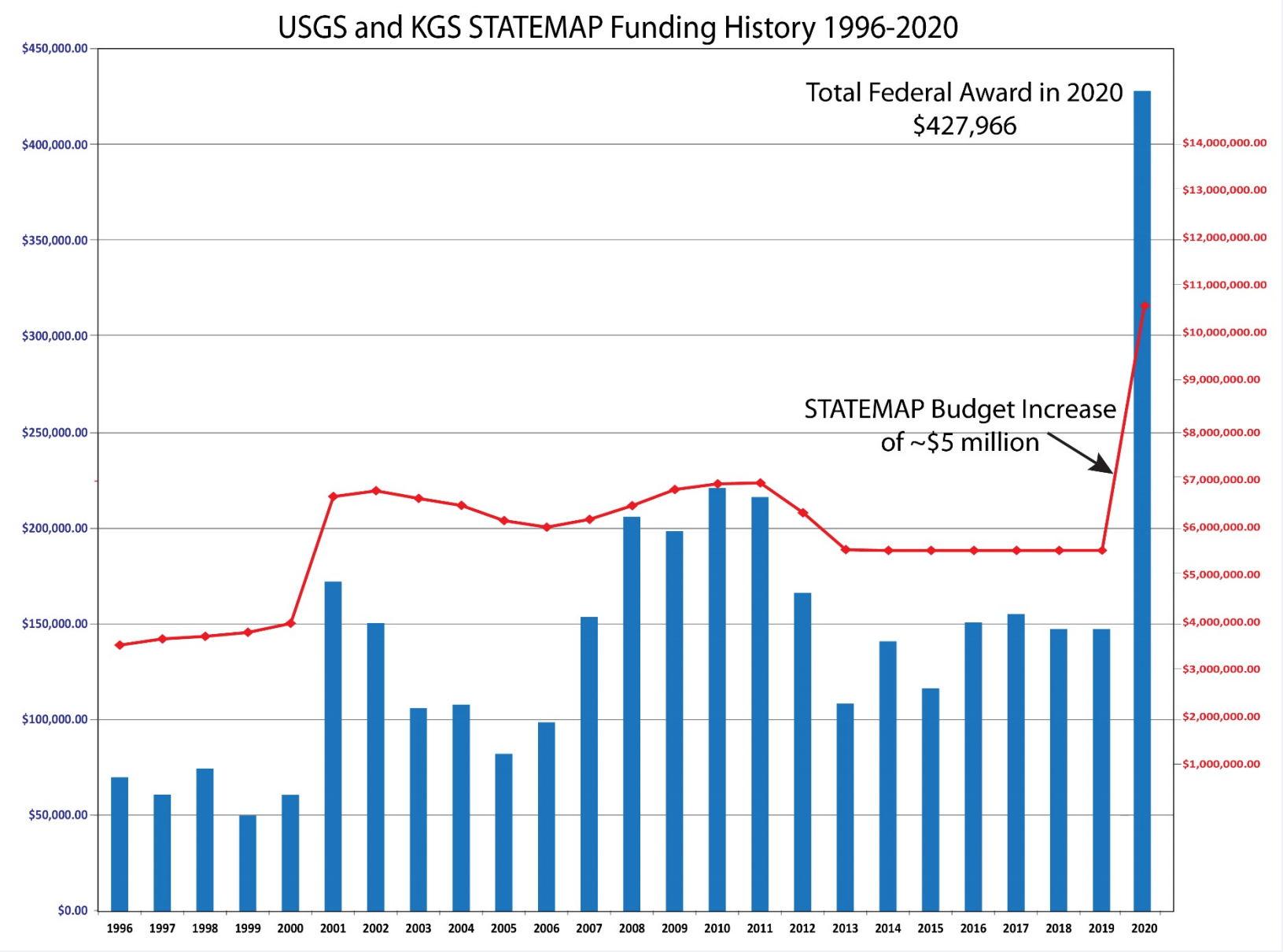
CHEYENNE
RAWLINS
DECATUR
NORTON
PHILLIPS
SMITH
JEWELL
REPUBLIC
WASH-INGTON
MARSHALL
NEMAHA
BROWN
DONIPHAN
SHERMAN
THOMAS
SHERIDAN
GRAHAM
ROOKS
OSBORNE
MITCHELL
CLOUD
CLAY
RILEY
POT-TAWATOMIE
JACKSON
ATCHISON
LEAVENWORTH
JEF-FERSON
WYANDOTTE
WALLACE
LOGAN
GOVE
TREGO
ELLIS
RUSSELL
LINCOLN
OTTAWA
GEARY
WABAUNSEE
SHAWNEE
DOUGLAS
JOHNSON
SALINE
MORRIS
OSAGE
GREELEY
WICHITA
SCOTT
LANE
NESS
RUSH
BARTON
ELLSWORTH
DICKINSON
LYON
FRANKLIN
MCPHERSON
MARION
MIAMI
RICE
CHASE
COFFEY
ANDER-SON
LINN
HAMILTON
KEARNY
FINNEY
HODGEMAN
PAWNEE
RENO
HARVEY
BUTLER
GREENWOOD
WOODSON
ALLEN
BOURBON
GRAY
EDWARDS
STAFFORD
SEDGWICK
FORD
PRATT
STANTON
GRANT
HASKELL
KIOWA
KINGMAN
WILSON
NEOSHO
CRAW-FORD
ELK
MEADE
CLARK
BARBER
SUMNER
COWLEY
MONT-GOMERY
LABETTE
MORTON
STEVENS
SEWARD
COMANCHE
HARPER
CHAUTAUQUA
CHEROKEE
1
2
3
4
Congressional Districts
Map scale: 1:24,000
New geologic mapping proposed for FY2019
Completed geologic mapping
North
0
100 mi
0
100 km




2020 budget increase is to support new digital mapping activities, such as converting older maps and adoption of new mapping standards not already covered in the STATEMAP program.

- Budget increase of $5 million is expected to continue

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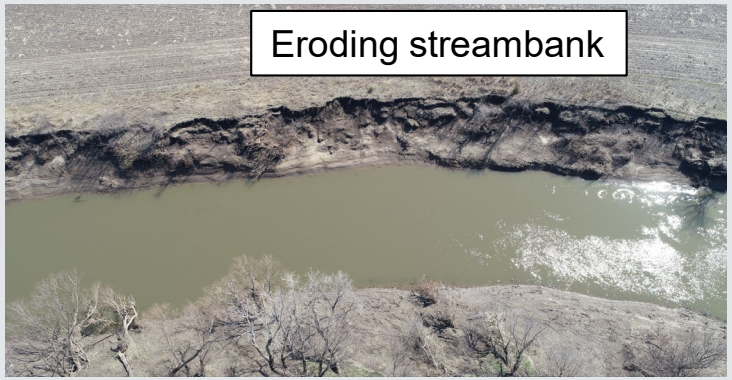
# Assessing the Effectiveness of Streambank Stabilization Projects

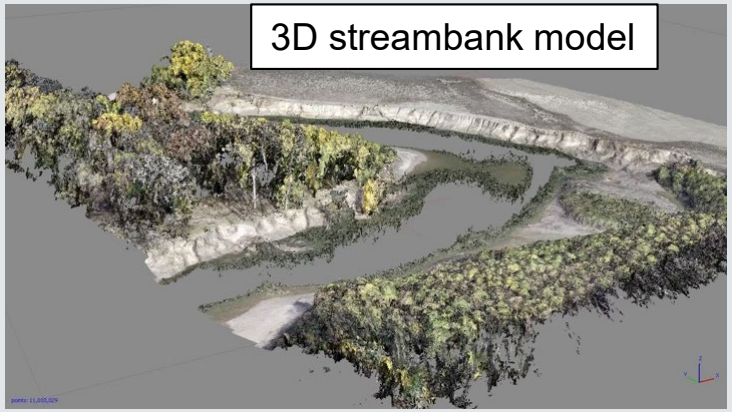
Streambank erosion is a significant cause of reservoir sedimentation in Kansas. To combat this problem over 250 streambank stabilization (SBS) projects have been completed along rivers draining into major federal reservoirs.

**The effectiveness of SBS needs to be studied to determine (1) whether it resolves the underlying causes of streambank erosion, a stream out of equilibrium, and does not shift erosion upstream or downstream of the SBS site, and (2) whether SBS accomplishes the goal of reducing total sediment loads entering Kansas reservoirs.**

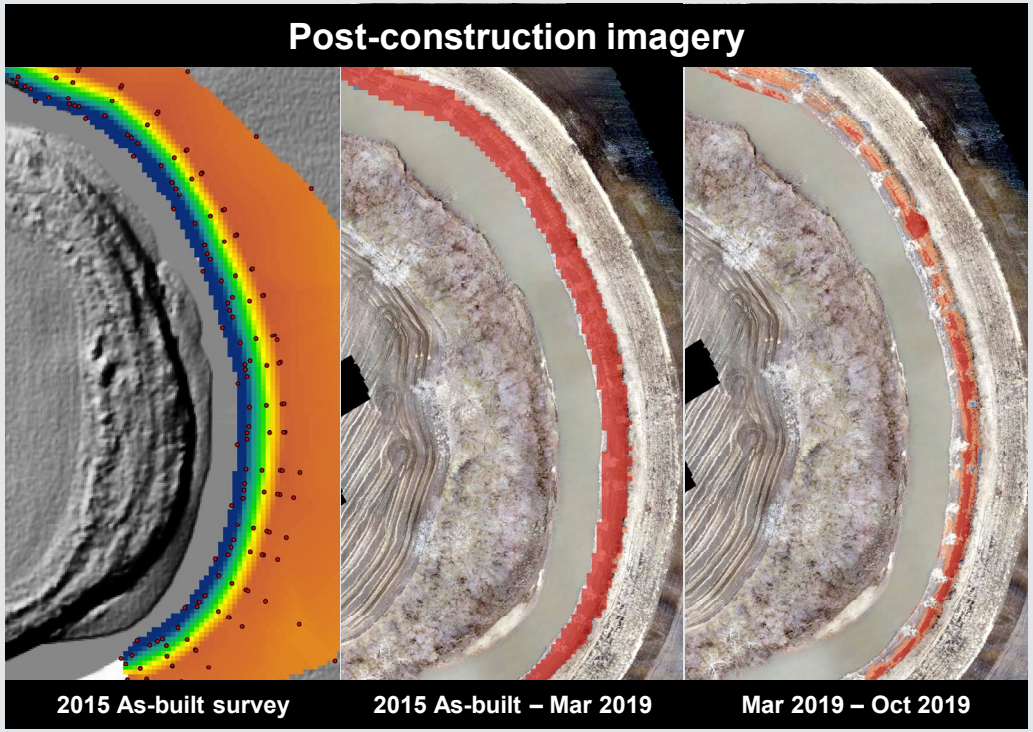
Drone survey



Eroding streambank



3D streambank model




Funding:
State of Kansas/Kansas Water Office ($300,000)
USGS/KWRI (Federal $30,000; cost share $60,387)

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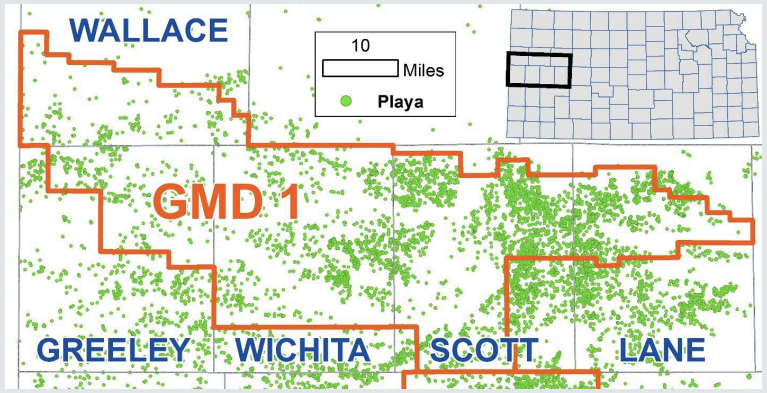
# Playas in Western KS: Recharge to the High Plains aquifer and Economics of Cropping

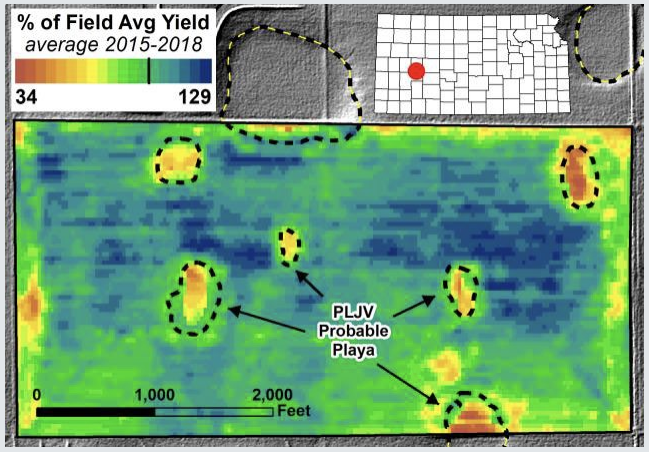
Playas of the High Plains provide critical ecosystem services (e.g., wildlife habitat, supporting regional biodiversity, and contributing recharge to the High Plains aquifer). Yet, more than 80% of the over 22,000 playas in Western Kansas are completely farmed over and have lost substantial ecological functionality with unquantified effects on recharge.

**This project seeks to explore the interactions between agriculture and playas by determining the degree to which different physical factors control recharge rates through playas, and how playas influence producer economic outcomes**.

Demonstrating that degraded playas reduce recharge and/or that farmed playas have reduced economic value compared to non-playa farmland could enhance landowner buy-in for playa preservation and existing programs for playa restoration and protection.




Field investigation of infiltration, recharge, and sedimentation will be conducted in playas (~10-15) across Kansas Groundwater Management District #1 (GMD1)




Preliminary data suggest correspondence between potential playas and areas of sub-average crop yield

Funding:
Environmental Protection Agency
(Federal $269,879
Cost share $90,156)

Project started
October 2020

Collaborators:
Kansas Biological Survey

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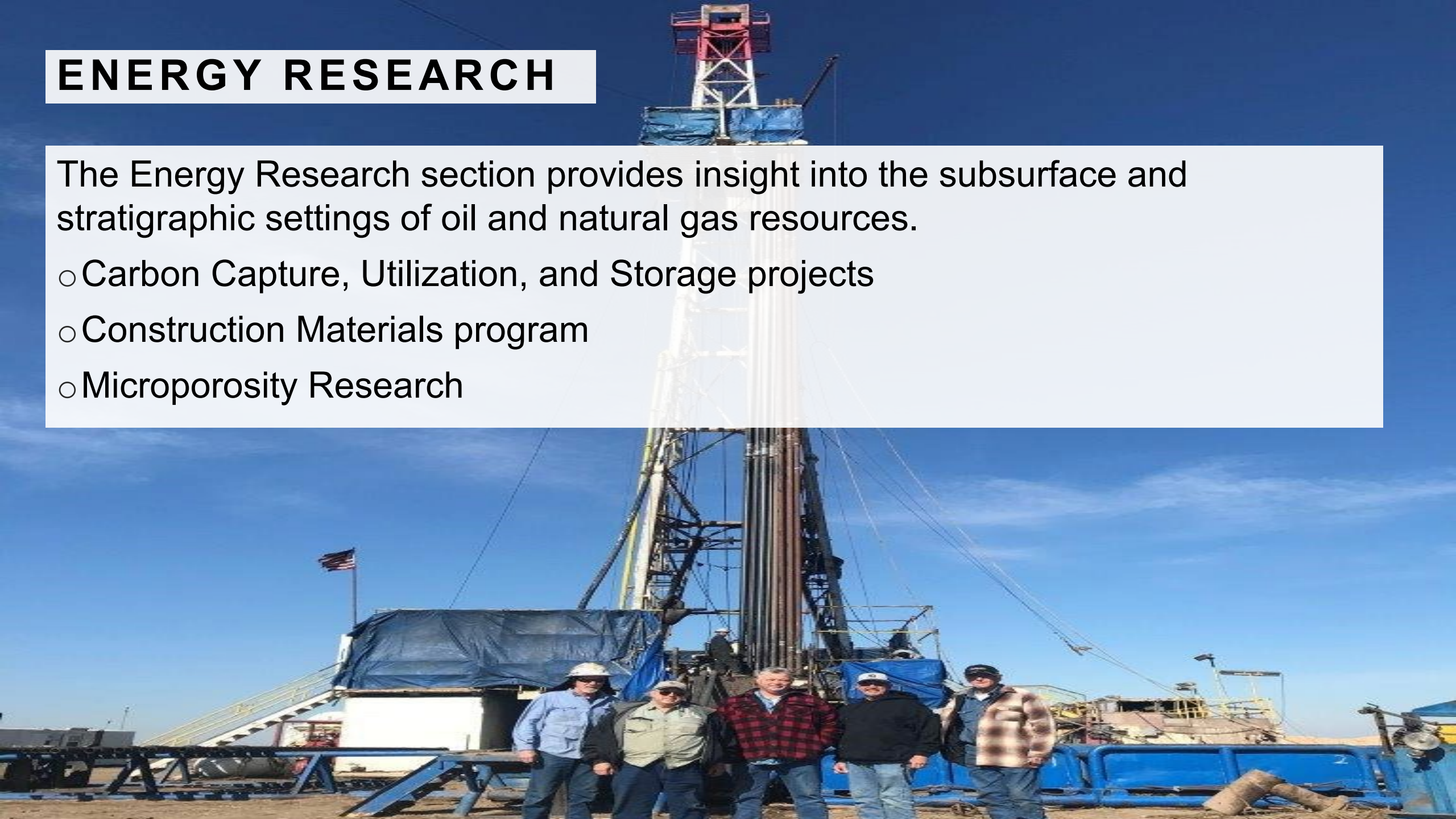
# ENERGY RESEARCH

The Energy Research section provides insight into the subsurface and stratigraphic settings of oil and natural gas resources.

- Carbon Capture, Utilization, and Storage projects
- Construction Materials program
- Microporosity Research



# CARBON CAPTURE, UTILIZATION, AND STORAGE (CCUS) PROJECTS

Patterson KGS 5-25 Rig

- The KGS is helping to create a coalition of industry and regulatory agencies to assess the economic and environmental playing field for commercial carbon capture, utilization, and storage (CCUS) implementation in Kansas.
- Since 2009, the KGS has received nearly $25 million from DOE to study CO2 sequestration in southern and central Kansas.
- The CCUS projects are largely funded by the U.S. Department of Energy and carried out with industry and academic partners, including Berexco, LLC, Linde, Battelle, Energy and Environmental Center, Occidental Petroleum, and many others.

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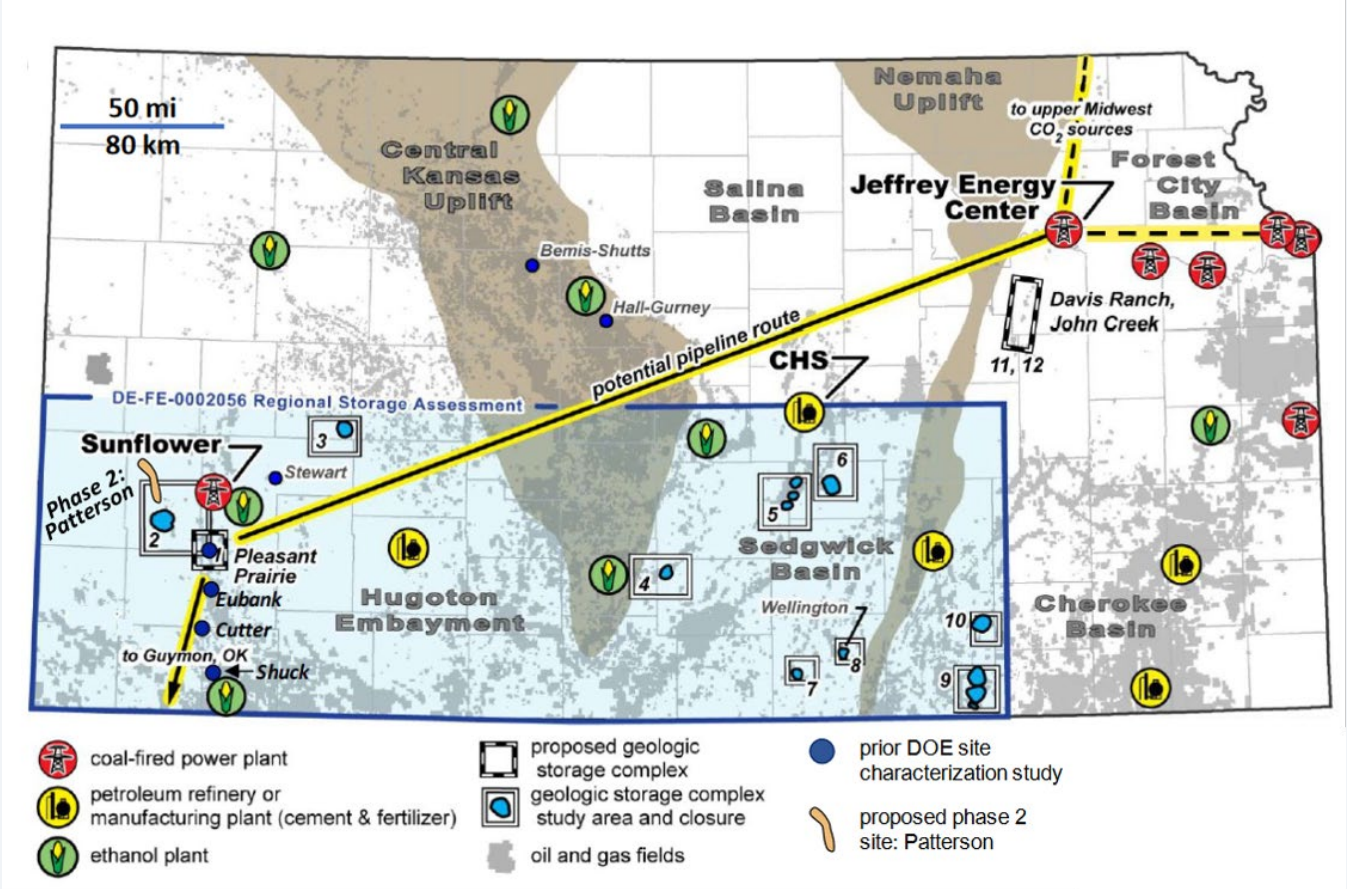
# ECONOMICS OF CCUS

Interest in capturing and storing carbon emissions was regenerated in 2018 when the Internal Revenue Service updated a tax incentive, known as 45Q, for companies willing to capture and store CO2. Oil and gas production, ethanol, electrical-power generation, pipeline, agriculture, and other industries are eligible.

- 45Q tax credits make CCUS projects economically feasible.
- Kansas operators are well-positioned because KS oil fields have already been delineated and it is within the pathway of a possible large-scale CO2 pipeline system.



# ECONOMICS OF CCUS

The Osage, Viola, and Arbuckle Groups are the key targets for CO2 storage in western Kansas.

**To support this initiative, the KGS has:**

- Successfully injected CO2 for Enhanced Oil Recovery in two fields.
- Amassed large quantities of seismic data, drilling data and rock cuttings, and drill cores.
- Created the CCUS Task Force, which is a coalition of industry and regulatory agencies to assess the economic and environmental playing field for commercial carbon capture, utilization, and storage (CCUS) implementation in Kansas, as well as drafting legislation to reform CCUS regulations in Kansas.

KGS Scientists providing testimony for the Senate Utilities committee in 2020

Drill cores from the KGS 5-25 Rig

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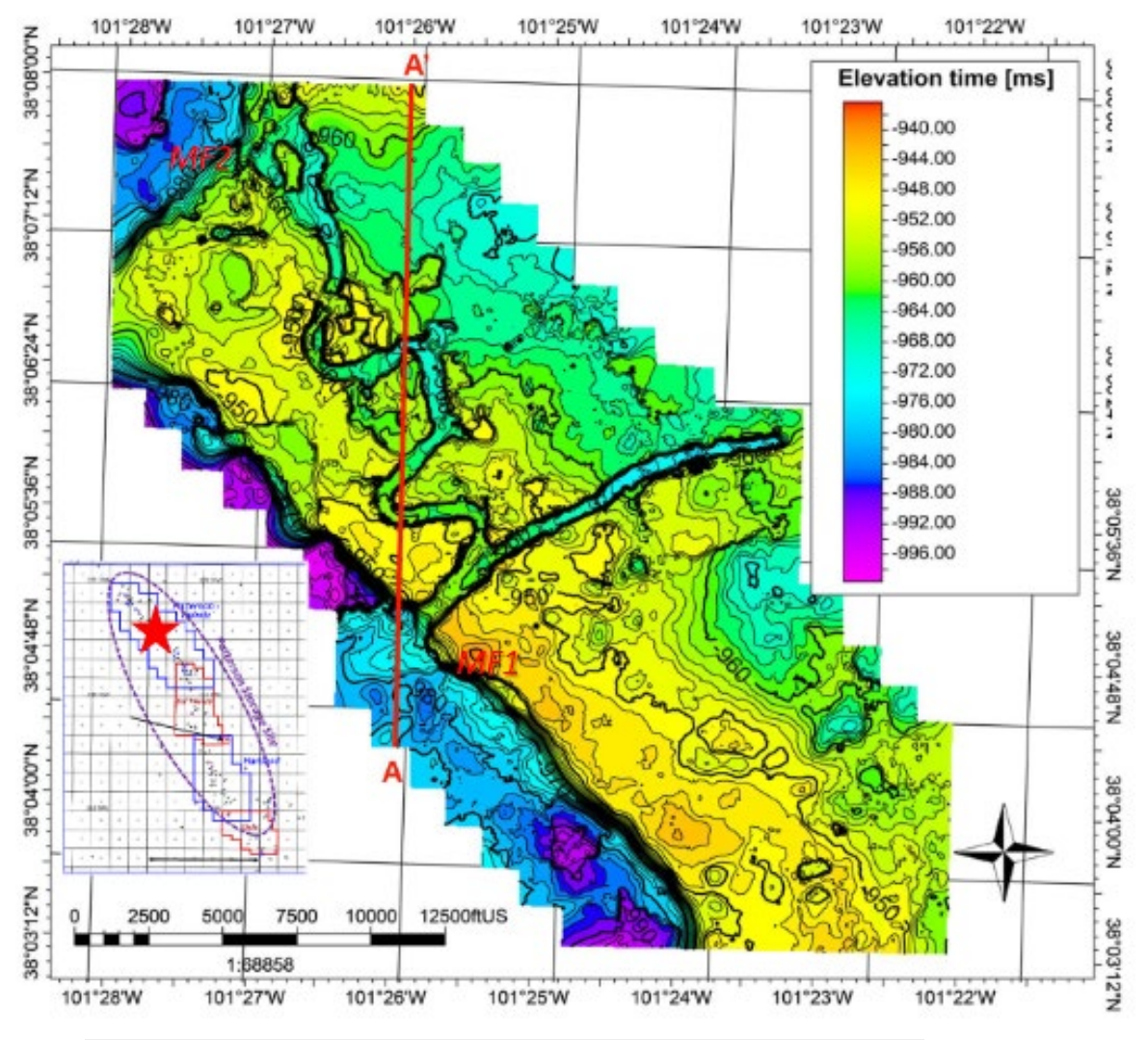
# CARBONSAFE PROGRAM

Energy Research is finalizing multi-year projects to develop the science behind and investigate the use of anthropogenic CO2 for both enhanced oil recovery in favorable oilfields and safe storage of CO2 in closed geologic structures.

The CarbonSAFE project is targeting potential geologic CO2 storage sites in southwest Kansas and Nebraska.




Seismic data collected in the CarbonSAFE project

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# KGS AND CUSP


The Carbon Utilization and Storage Partnership, or CUSP, is led by the Petroleum Recovery Research Center (PRRC) at the New Mexico Institute of Mining and Technology, which was awarded $6.24 million by the U.S. Department of Energy (DOE) for the project.

This project's initiative is to share data and advance research on the process of carbon capture and storage

The KGS will receive about $310,000 of that and could get additional funding for database development and other purposes as the project progresses through 2024.

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# CONSTRUCTION MATERIALS RESEARCH

**Research Driver**

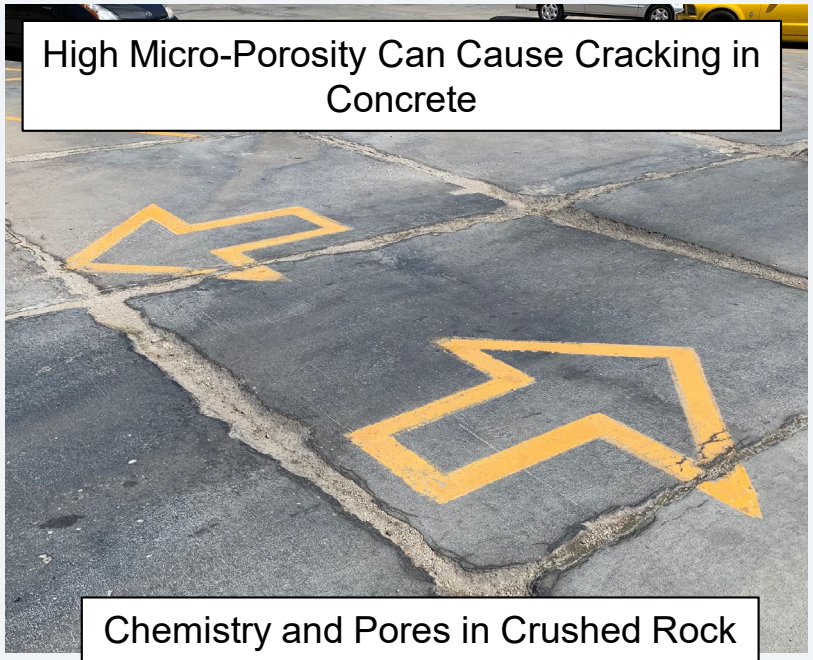
- Sand, gravel and crushed rock are used in significant quantities in construction of roads, bridges, and buildings in urban and rural areas
- Some materials are better than others
- Kansas **imports** crushed rock due to low availability of local sources

**Activities**

- Adding quarry and mine locations to KGS online maps
- Adding chemistry and engineering properties of Kansas materials to KGS online maps
- Studying micro-porosity in limestone with 2-year, $200k US National Science Foundation grant
- Studying what sizes and shapes of sand make the best concrete (2 year, $350k project with Iowa DOT) using advanced technology
- Studying how chemistry of rocks affects quality of construction materials with new technology with KDOT

**Impact on Kansas Economy**

- Will help roads last longer
- Possibly will enable roads to need less salt, which will mean less salt into surface water
- Support Kansas quarries/mines by reducing need to import crushed rock



High Micro-Porosity Can Cause Cracking in Concrete

Chemistry and Pores in Crushed Rock Affect Quality

# CRITICAL MINERALS RESEARCH

## Research Driver

- Critical minerals are used in 21st century technology (electronics, batteries, cell phones, wind turbines, solar panels)
- US relies on foreign sources for most critical minerals, notable China and Russia
- Helium is a critical mineral that Kansas leads production for in US, but it is dwindling
- Critical mineral mine being developed just across border in Nebraska (Elk Creek Niobium Deposit )

## Activities at KGS

- Producing report on helium sources in Kansas
- Inventorying KGS reports on Critical Minerals with USGS grant ($30k, 1 year)
- Applied for $1 million in funding from US Department of Energy to study Critical Minerals in coal (including formulating economic development plans)
- Applied for $1.5 million from US National Science Foundation for chemical analysis equipment to assay rock samples for critical minerals

## Impact on Kansas Economy

- New helium sources would contribute to Kansas Oil & Gas Industry
- New mining operations would contribute to Kansas Mining Industry

FEDERAL REGISTER
The Daily Journal of the United States Government

Notice

**Final List of Critical Minerals 2018**

A Notice by the Interior Department on 05/18/2018

**SUMMARY:**

The United States is heavily reliant on imports of certain mineral commodities that are vital to the Nation's security and economic prosperity. This dependency of the United States on foreign sources creates a strategic vulnerability for both its economy and military to adverse foreign government action, natural disaster, and other events that can disrupt supply of these key minerals. Pursuant to Executive Order 13817 of December 20, 2017, "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals," the Secretary of the Interior on February 16, 2018, presented a draft list of 35 mineral commodities deemed critical under the definition provided in the Executive Order. After considering the 453 public comments received, the Department of the Interior believes that the methodology used to draft the list remains valid and hereby finalizes the draft list of 35 critical minerals. The final list includes: Aluminum (bauxite), antimony, arsenic, barite, beryllium, bismuth, cesium, chromium, cobalt, fluorspar, gallium, germanium, graphite (natural), hafnium, helium, indium, lithium, magnesium, manganese, niobium, platinum group metals, potash, the rare earth elements group, rhenium, rubidium, scandium, strontium, tantalum, tellurium, tin, titanium, tungsten, uranium, vanadium, and zirconium. This list of critical minerals, while "final," is not a permanent list, but will be dynamic and updated periodically to reflect current data on supply, demand, and concentration of production, as well as current policy priorities. This final list will serve as the Department of Commerce's initial focus as it develops its report to comply with Section 4 of Executive Order 13817.

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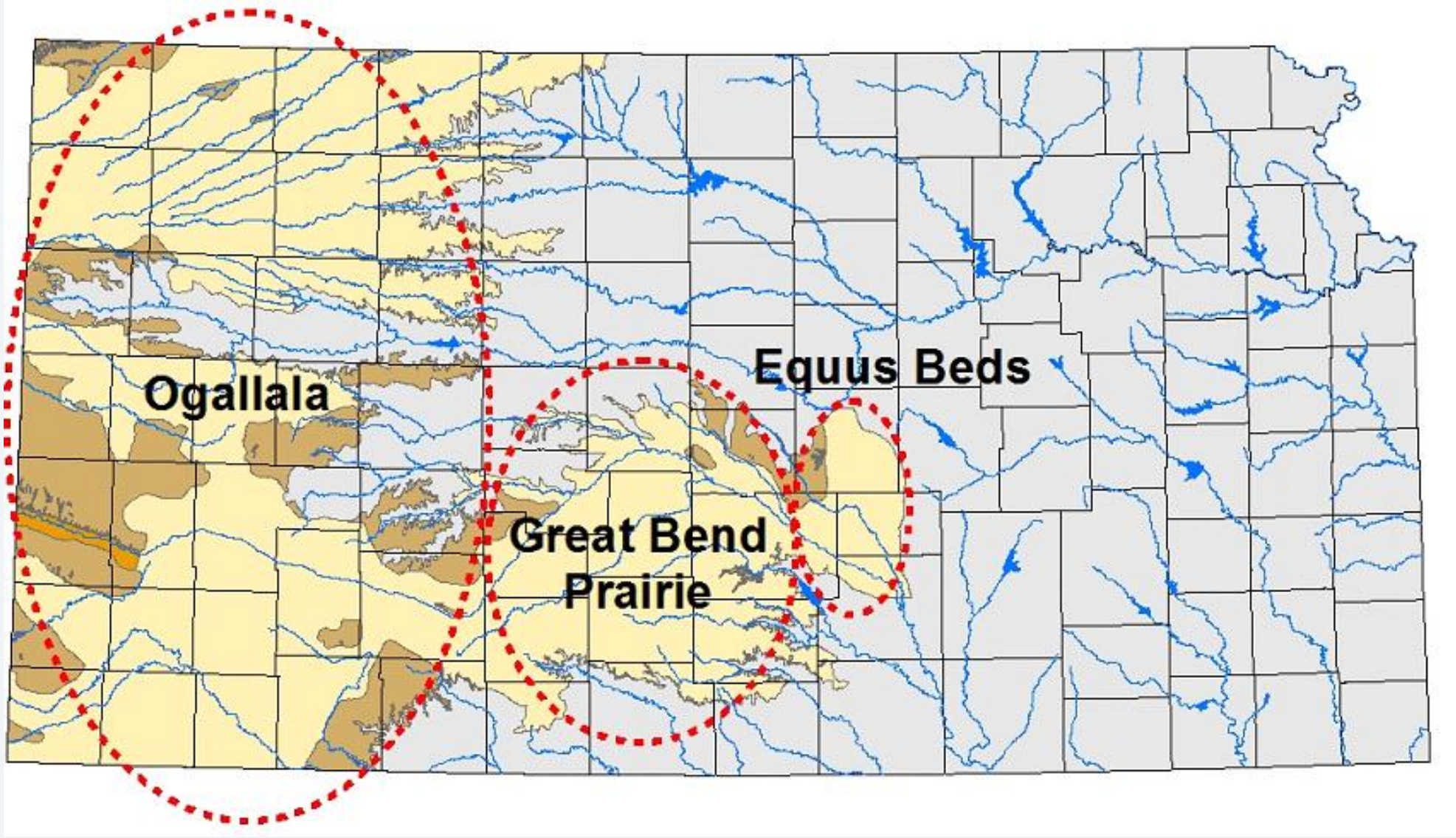
# GEOHYDROLOGY RESEARCH

- The KGS Geohydrology section investigates groundwater quantity and quality issues of significance to the State of Kansas, with an emphasis on the High Plains aquifer. The KGS has three major activities related to the High Plains aquifer and a major activity related to the Kansas River alluvial aquifer.

# THE HIGH PLAINS AQUIFER

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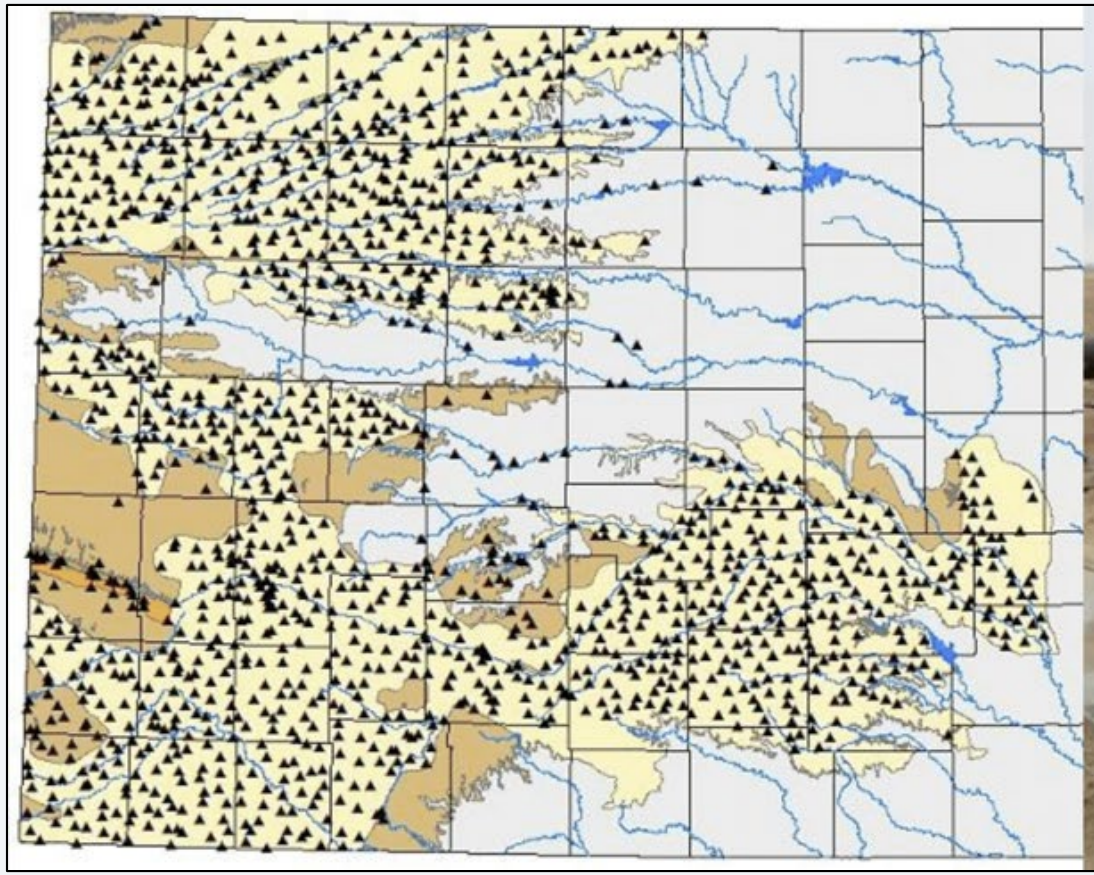
# ANNUAL WATER LEVEL MEASUREMENT PROGRAM

~1400 wells measured in High Plains Aquifer in 2021

http://www.kgs.ku.edu/HighPlains/HPA_Atlas/index.html



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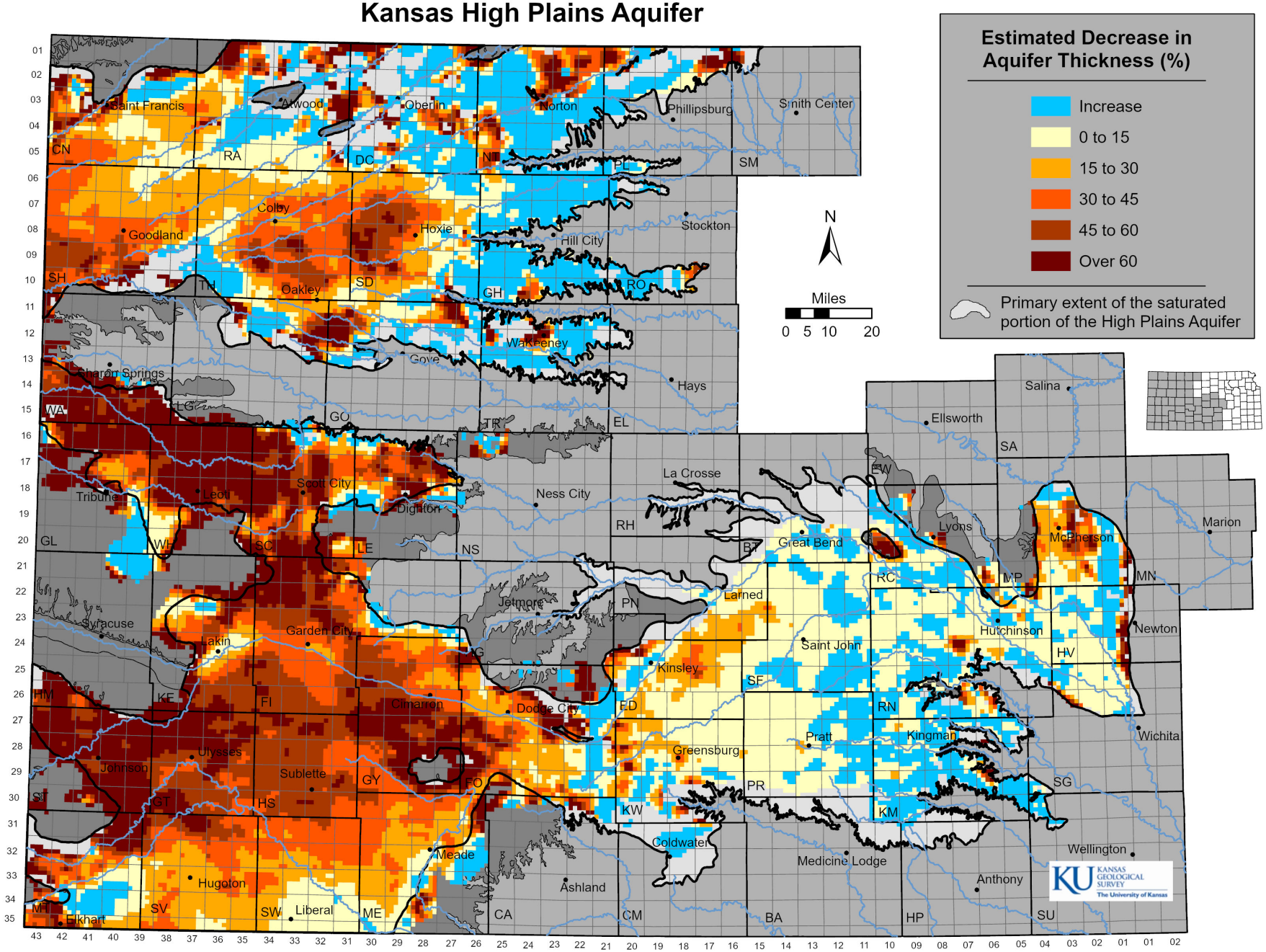
# Percent Change in Saturated Thickness, Predevelopment to Average 2018-2020, Kansas High Plains Aquifer

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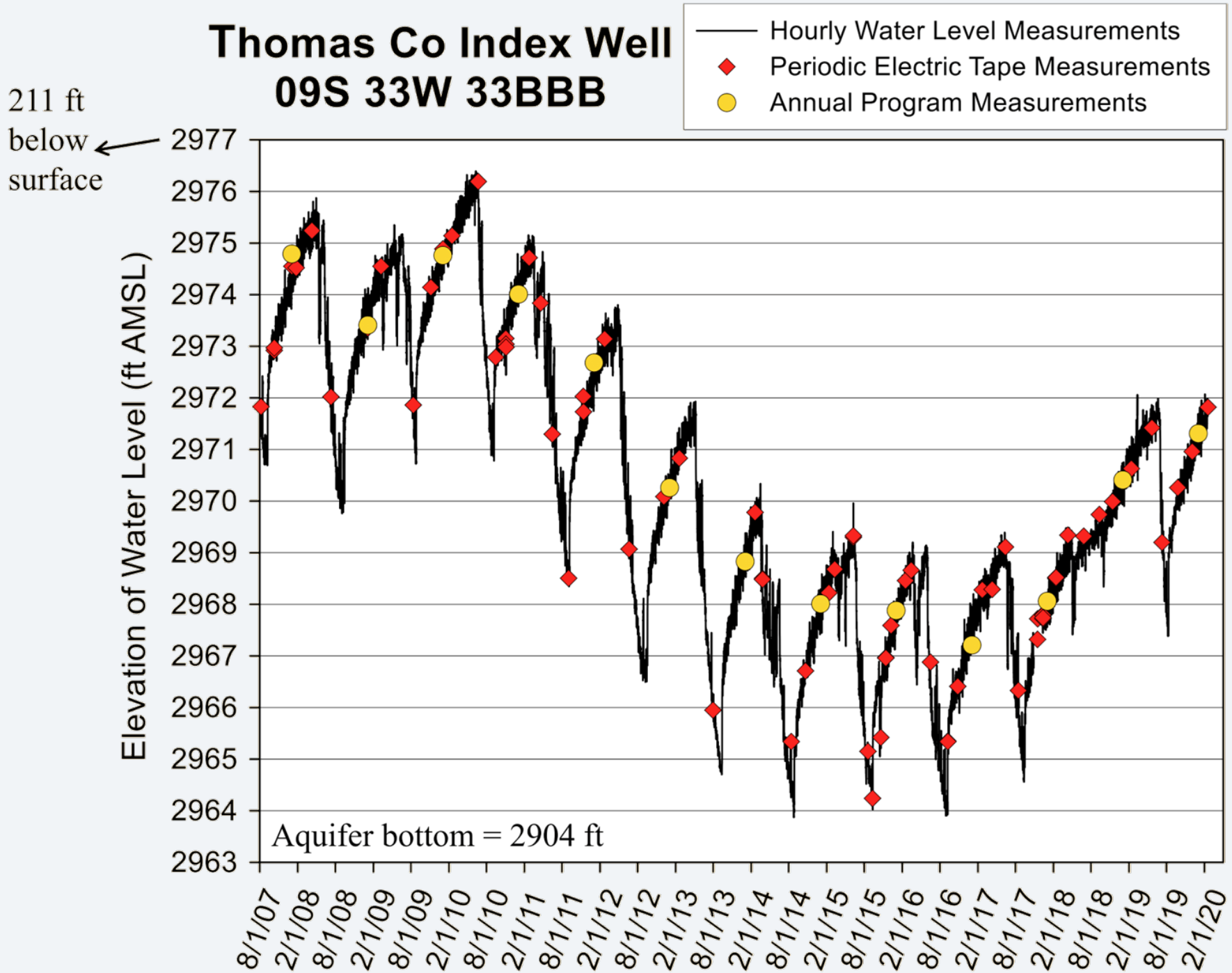


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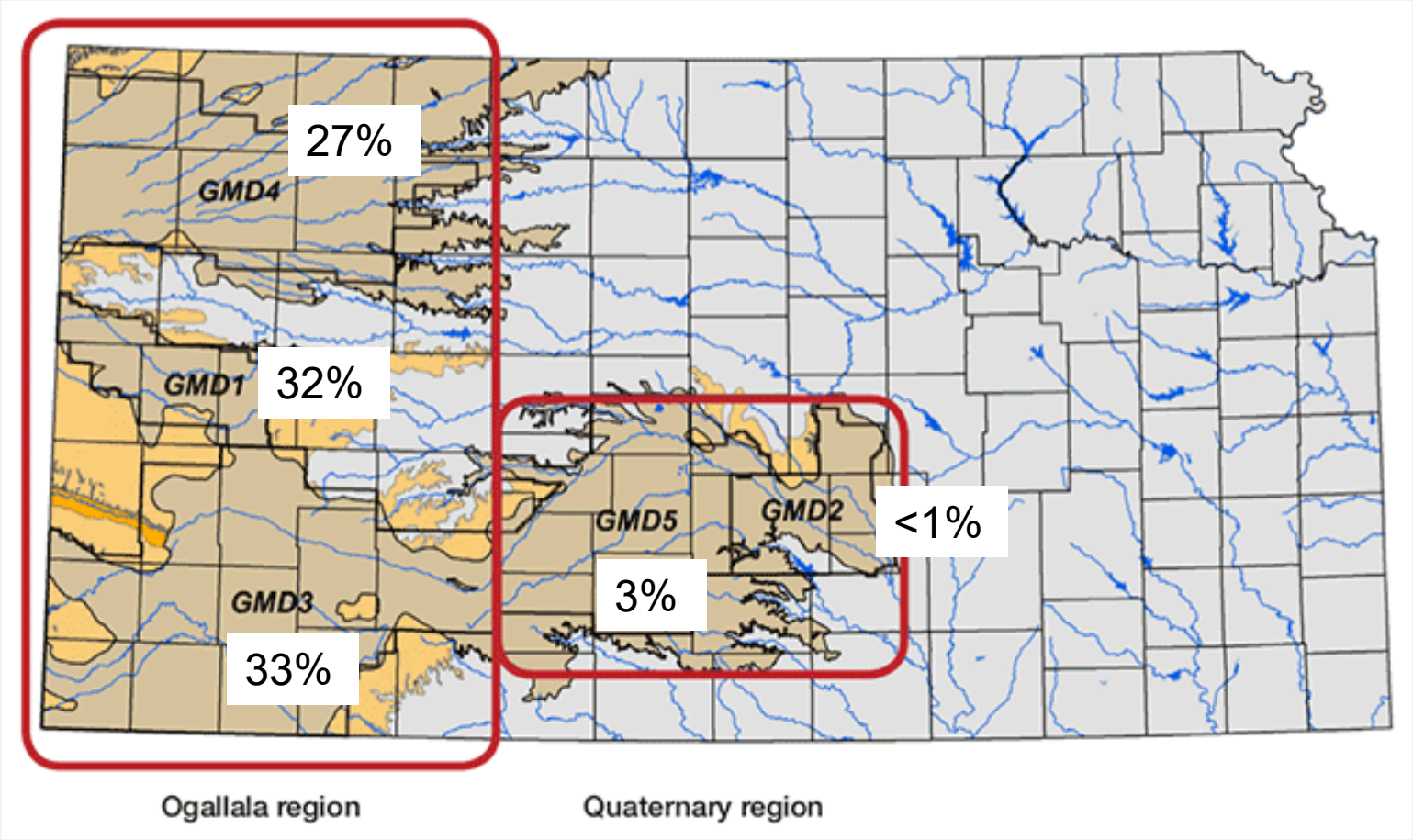
# PUMPING REDUCTIONS REQUIRED TO STABILIZE WATER LEVELS

*Reductions calculated with KGS Water Balance Method using annual pumping and water level data

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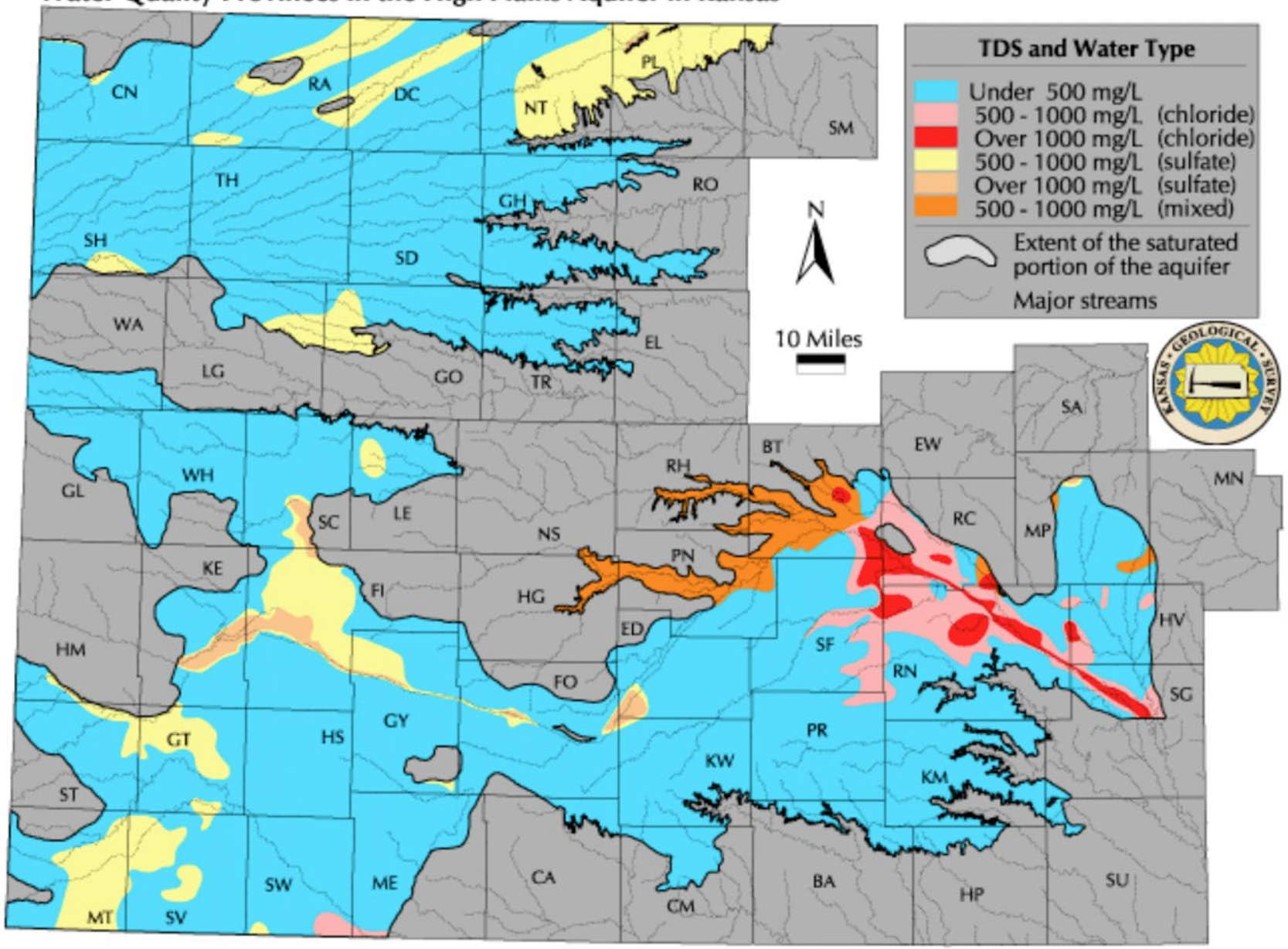
# Water Quality Provinces in the High Plains Aquifer in Kansas

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# Kansas High Plains Aquifer Atlas

This atlas has been created to serve as the primary gateway to the most recent graphical data available for the High Plains aquifer in Kansas. As newer/updated data become available, this atlas will be updated.

**Introduction and Navigation**

Click here to view instructions for navigating this atlas.

3 images

**Aquifer Basics**

Basic information about the geology and hydrology of the High Plains aquifer.

18 images

**Water Levels**

View water levels from predevelopment to current.

9 images

**Water Rights and Water Use**

12 images

**Climate and Climate Trends**

18 images

**Land Cover and Irrigation**

5 images

**Index Well Program**

The Kansas Geological Survey has installed index wells, one in each of the three western Kansas Groundwater Management Districts, to continuously monitor water levels in the Ogallala-High Plains aquifer.

4 images

**Interactive Atlas**

Use our interactive atlas to view water levels, saturated thickness, and more.

http://www.kgs.ku.edu/HighPlains/HPA_Atlas/index.html

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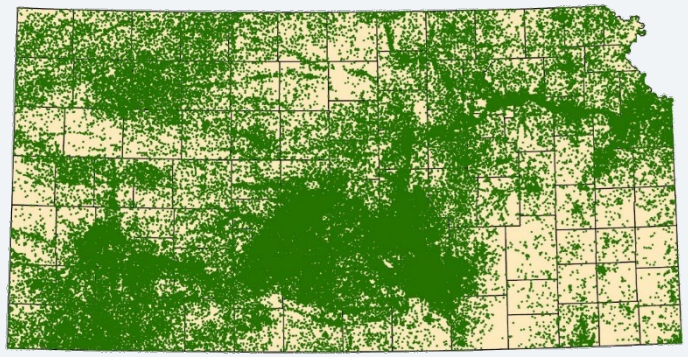
# KANSAS GROUNDWATER INVENTORIES

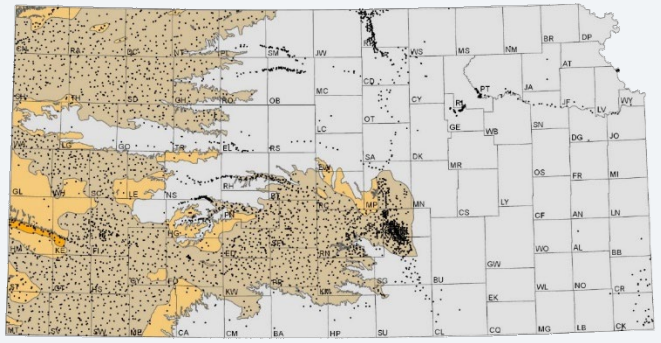
## WWC5

- Water Well Completion Records
- Kansas Department of Health and Environment
- WWC5 forms are required for any constructed, reconstructed, or plugged well in Kansas since 1975
- Well construction and lithology for all wells (monitoring, private, permitted, etc…)



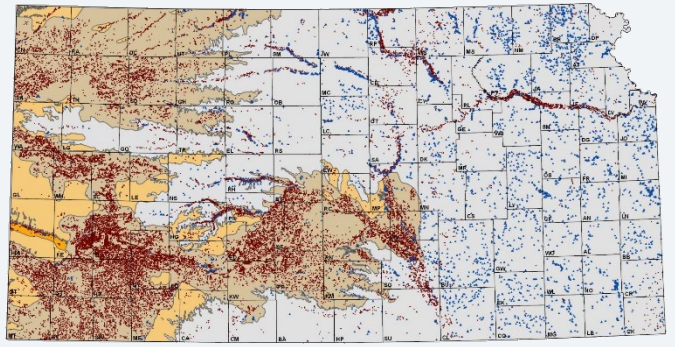
## WIZARD

- Water Information Storage and Retrieval Database
- Kansas Geological Survey
- State's largest repository of depth-to-water measurements
- Annual Cooperative Water-Level Network, GMDs 2 and 5, KDA-DWR, KGS, and USGS



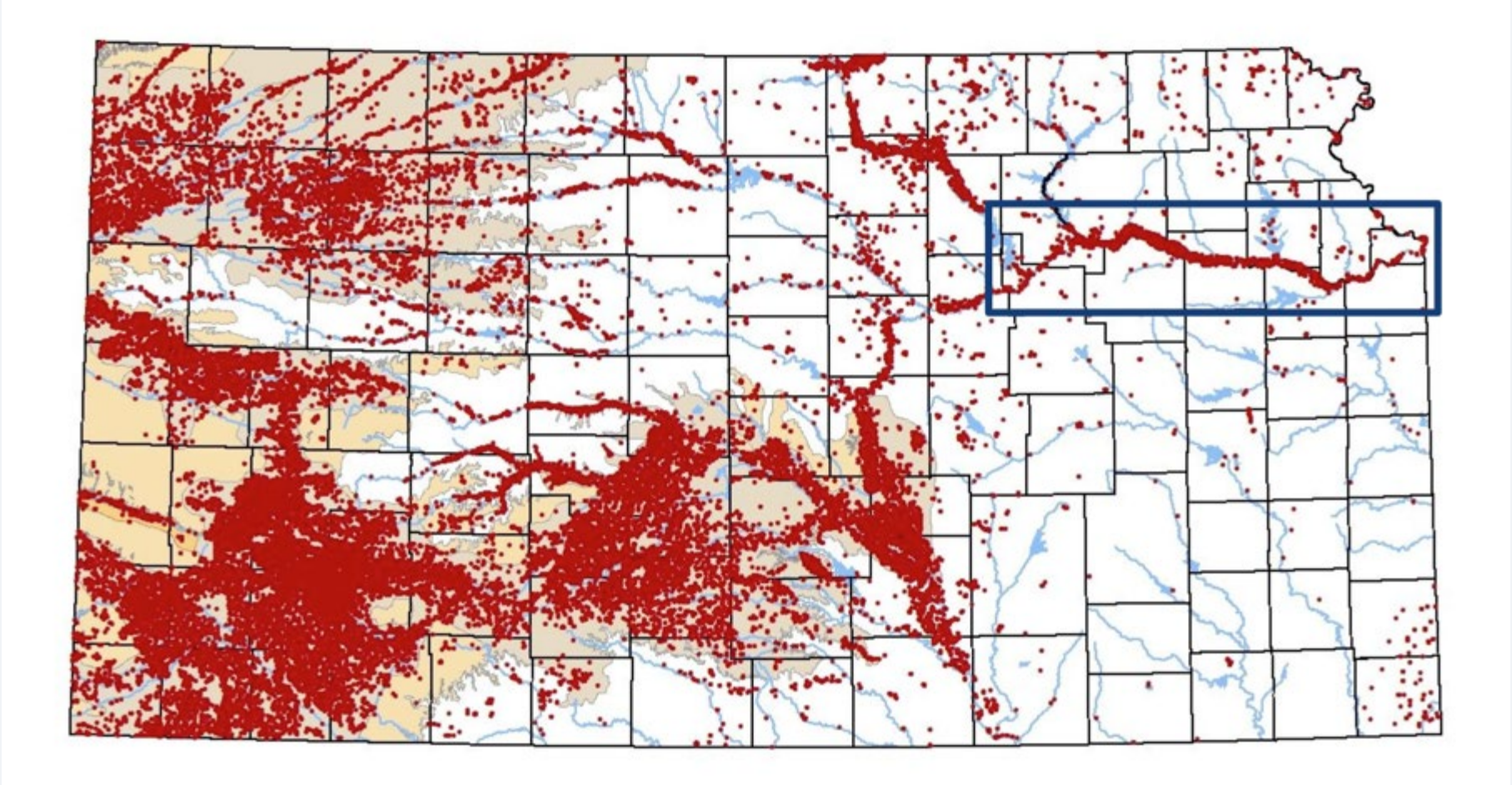
## WIMAS

- Water Information Management and Analysis System
- Kansas Department of Agriculture, Division of Water Resources
- Water Rights
  - Permits/Certificates to use water
  - Typically large uses
  - Diversions include both ground and surface water
  - Can be very complex



# KANSAS RIVER ALLUVIAL AQUIFER

How do the Kansas River Alluvial Aquifer and Kansas River Interact?



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# CURRENT STATUS

Network from west of Manhattan to the Kansas City metropolitan area (Lake Quivira).

- 11 wells with transducers recording water-level position every hour.
- Real-time data and interactive map on KGS website (www.kgs.ku.edu/Hydro/KansasRiver/index.html)

Shawnee County
Index Well 1 (SN01)


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# FUTURE PLANS

Installation of 5 more wells

- St. Marys, Lecompton, and transects
- Direct-push electrical conductivity transects
- Hydrostratigraphic analysis
- Hydrograph analysis


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# Kansas Geological Survey

**Kansas River Alluvial Aquifer Index Well Program:**
**2019 Annual Report**

**J. J. Butler, Jr., E. C. Reboulet, S. Knobbe, D. O. Whittemore,**
**B. B. Wilson, and G. C. Bohling**
**Kansas Geological Survey**
**University of Kansas**

**Kansas River Index Well Network – August 2020**

**Shawnee County Index Well 1**
**(SN01)**

**Kansas Geological Survey Open-File Report No. 2020-14**
**October 2020**

GEOHYDROLOGY

KU KANSAS GEOLOGICAL SURVEY

http://www.kgs.ku.edu/Publications/OFR/2020/OFR2020-14.pdf

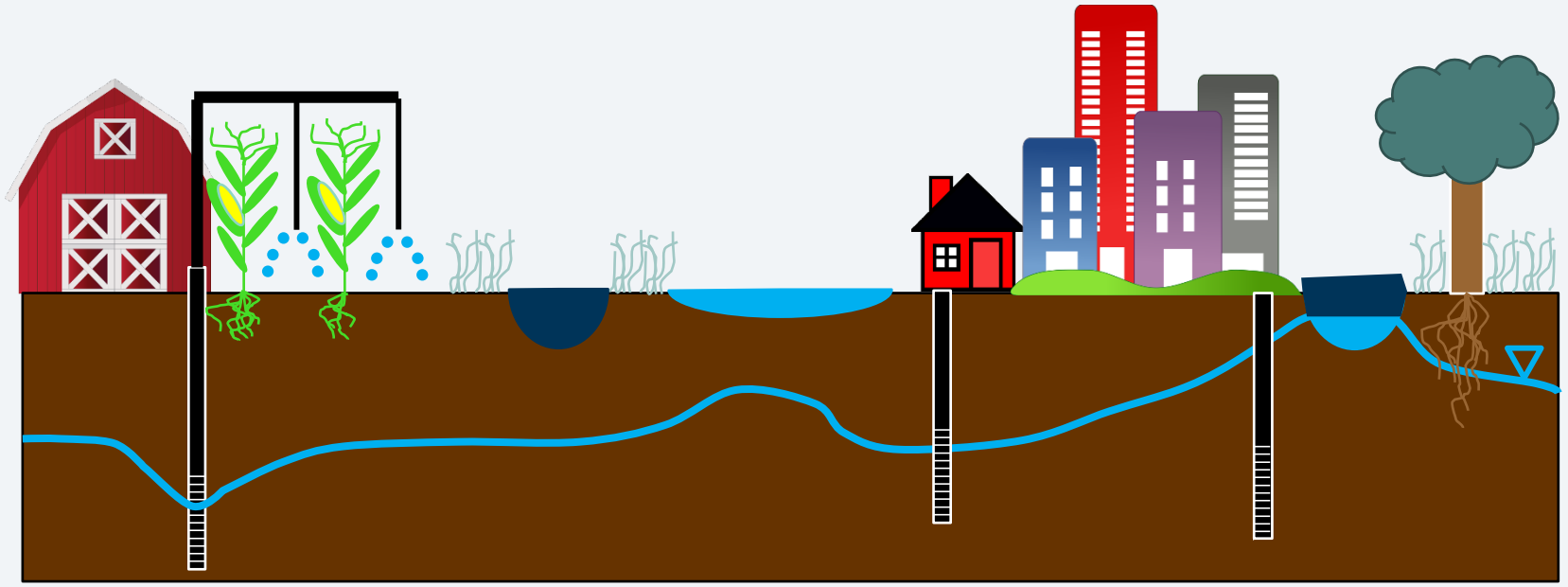
# WATER RESOURCES IN THE FUTURE

Other projects are working to understand how local, regional, and global change can and will affect the water resources of Kansas and the Great Plains region now and in the future.

Irrigator-driven water conservation

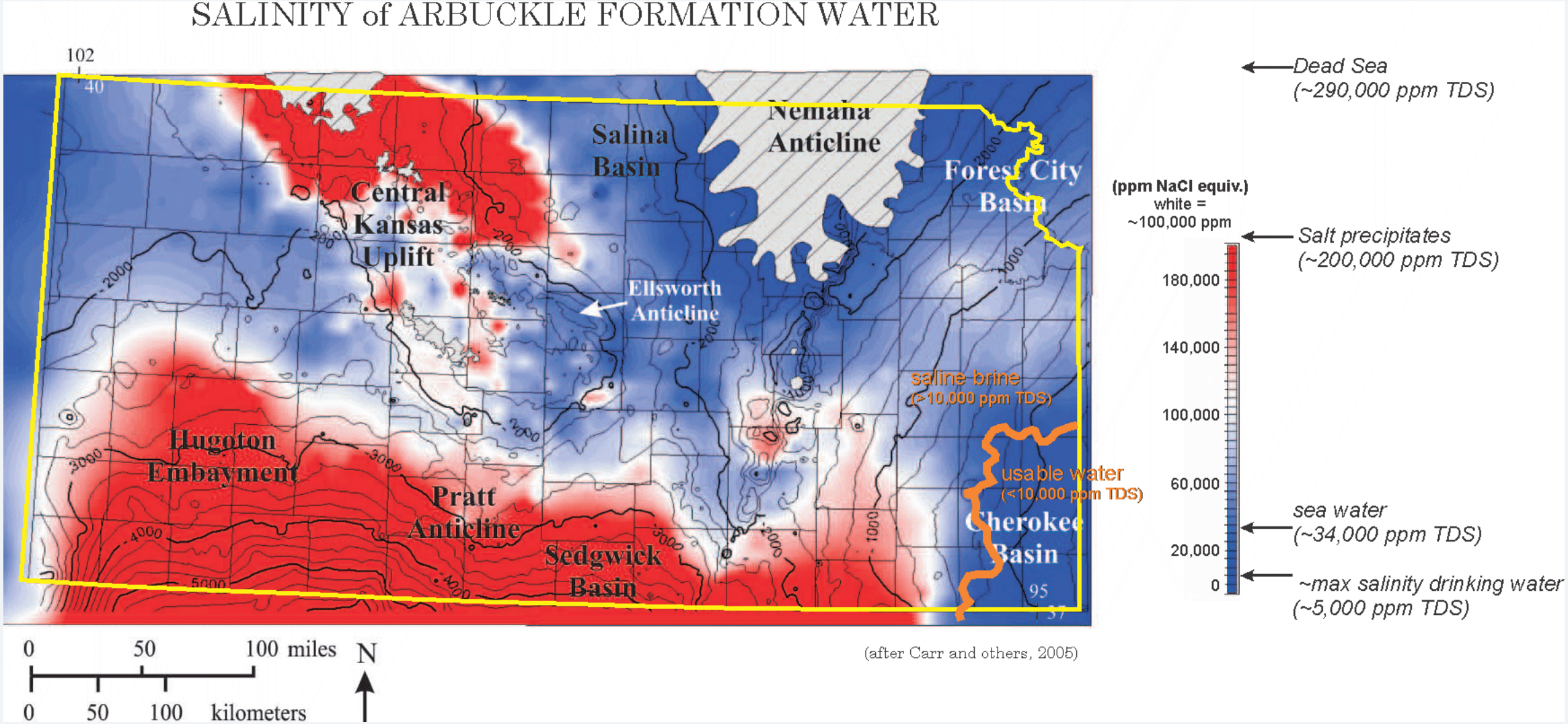
Ephemeral hydrology (playas, non-perennial streams)

Land use and stream-aquifer interactions

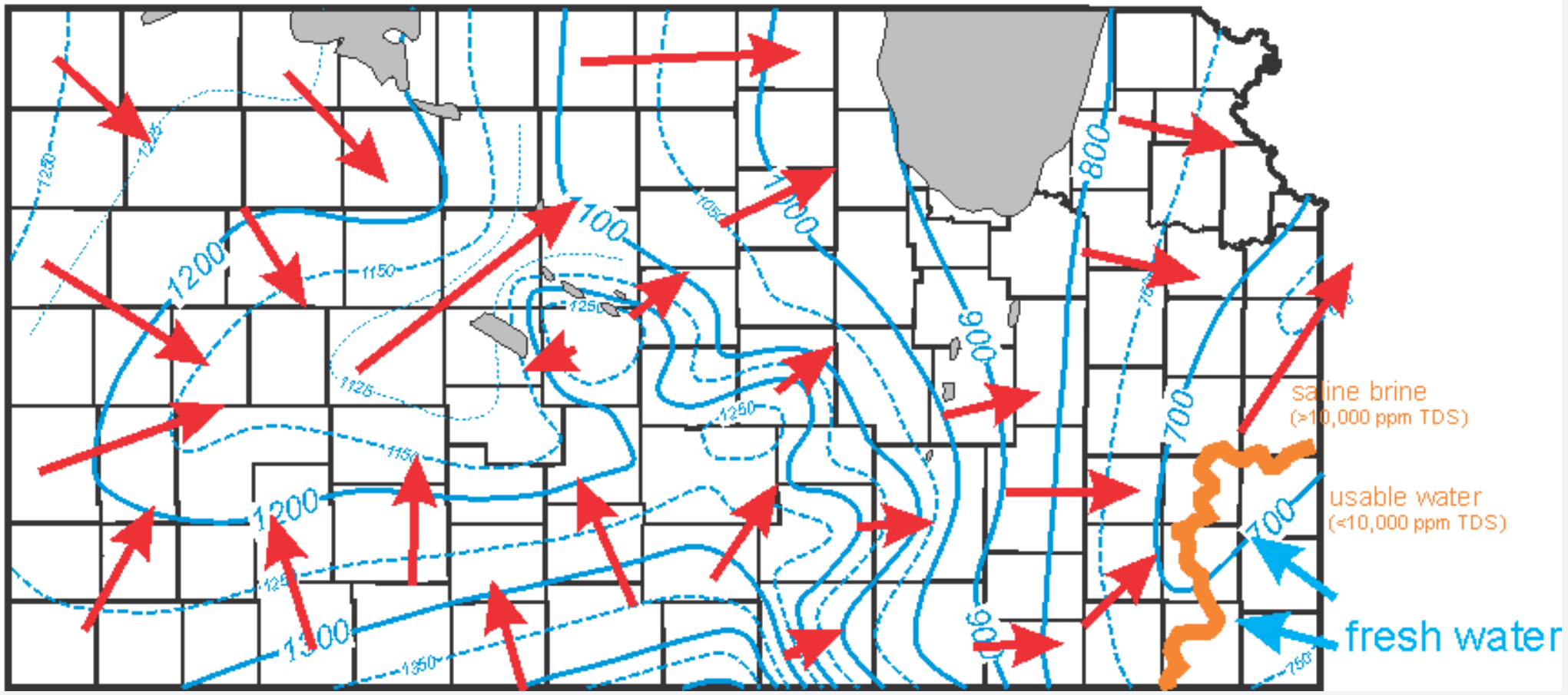


| Funding Agency | Amount | Project Focus (region) |
|---|---|---|
| Kansas Water Resources Institute | $40,000 | Groundwater recharge from intermittent streams (GMD5) |
| Kansas Water Office | $77,000 | Groundwater quality (Arkansas River Corridor) |
| U.S. Geological Survey | $163,530 | Pumping impacts on streamflow (High Plains Aquifer) |
| Environmental Protection Agency | $277,715 | Groundwater recharge from playas (GMD1) |
| National Science Foundation | $5,998,875 | Intermittent streams and water quality (Flint Hills) |

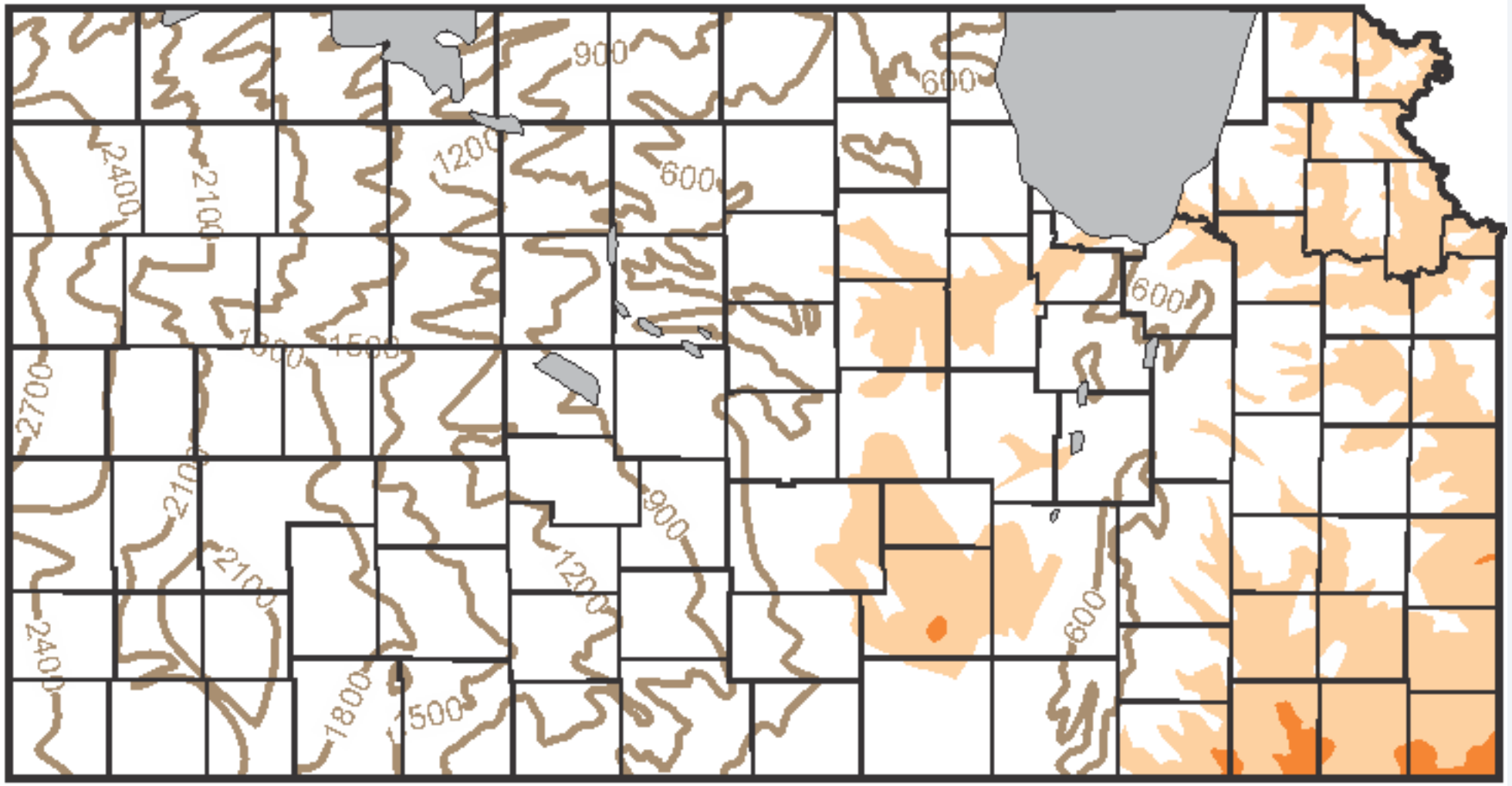
# SALINITY AND STRUCTURE OF THE ARBUCKLE



# ELEVATION of FLUID LEVELS in ARBUCKLE WELLS (adjusted to fresh-water density) defines direction of subterranean water flow



# DEPTH to WATER in ARBUCKLE WELLS




2400 depth to water in Arbuckle wells (no normalization for salinity)
contour interval 300 ft

<300 ft depth to water in Arbuckle wells (no normalization for salinity)

<100 ft depth to water in Arbuckle wells (no normalization for salinity)

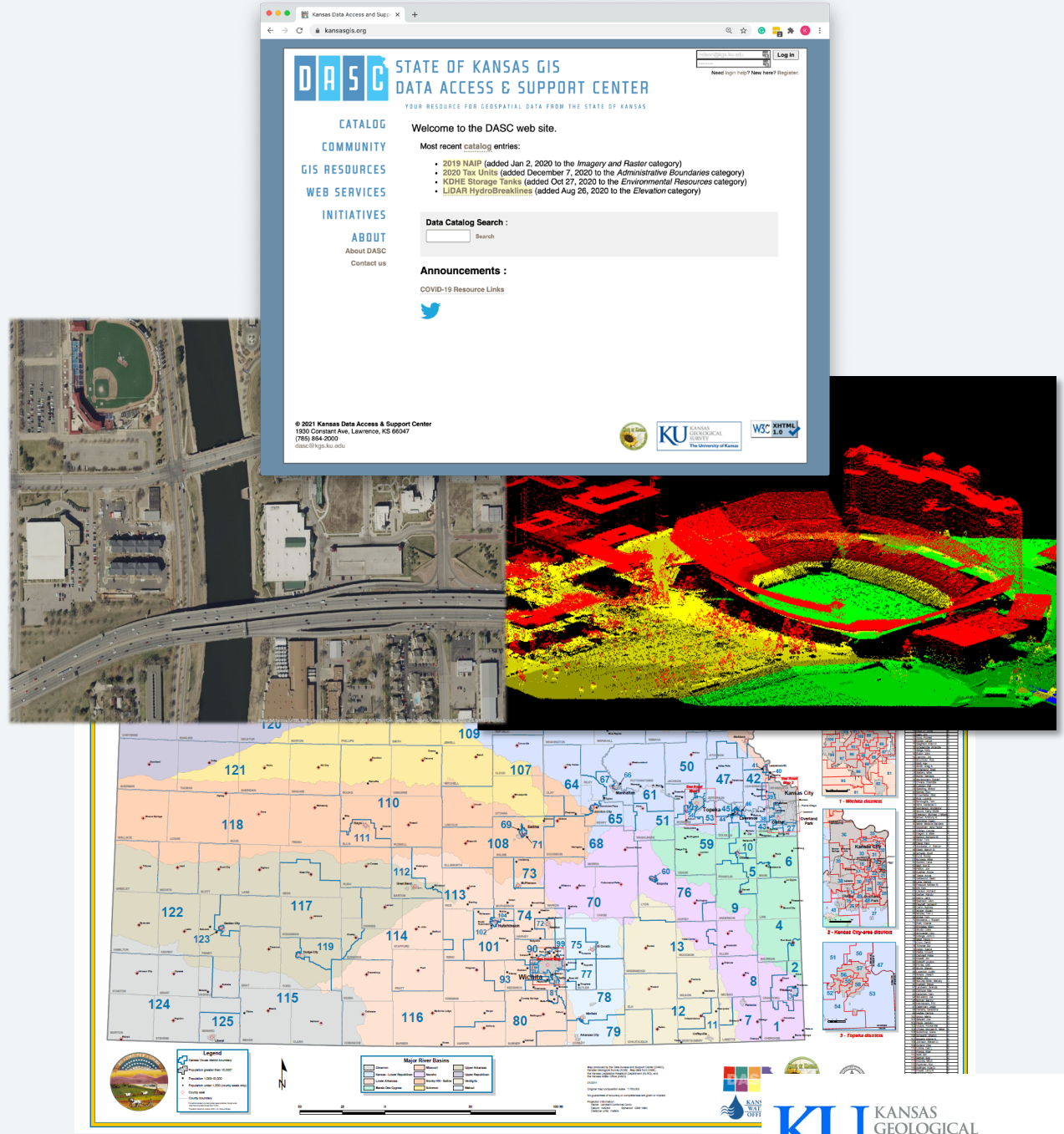
# DATA ACCESS SUPPORT CENTER (DASC)

DASC was established by the GIS Policy Board in 1991. It maintains a central repository of GIS databases of statewide & regional importance. DASC operates under contract with the Kansas Department of Administration's Office of Information Technology Services (OITS).

- $280,000/year for clearinghouse operations and Geographic Information Officer (GIO) services
- Fee-for-services provided to state agencies based on need and strategic performance

# DASC SERVICES

- Database archival and distribution
- Database development & integration
- GIS web application development and hosting
- Coordination & outreach to local, state, & federal government, and the private sector
- Coordinate & manage the state government Esri software Enterprise Agreement
- Geospatial metadata development assistance
- Cartographic development
- Promotion of the Kansas GIS Initiative
- Development and maintenance of the DASC web site – https://www.kansasgis.org

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# DASC PROJECTS & INITIATIVES

## Kansas Department of Agriculture

- Kansas Online Water Use Report application development & hosting
- Base Flood Elevation Portal application development & hosting

## Kansas 911 Coordinating Council

- Next Generation 911  GIS data QA, data aggregation, map service publication, portal development & maintenance, outreach & coordination, policy development

## Kansas Department of Revenue

- Open Records for Kansas Appraisers application development & hosting
- Statewide Tax Unit Database application development & hosting
- Streamlined Sales Tax Database & Web Service application development & hosting

## KDOT/Traffic Records Coordinating Council

- Crash location mapping
- 1Integrate Server hosting

## Kansas State Historical Society

- Historical Property Inventory application development & hosting
- Archeological Sites Inventory application development & hosting

## Kansas Department of Wildlife, Parks, & Tourism

- Fish & Wildlife Contracts and Reporting application hosting

## Kansas State Department of Education

- School Travel Audit Web Service development, maintenance & hosting

## Kansas Water Office

- Public Water Supply Mapping Portal application development & hosting

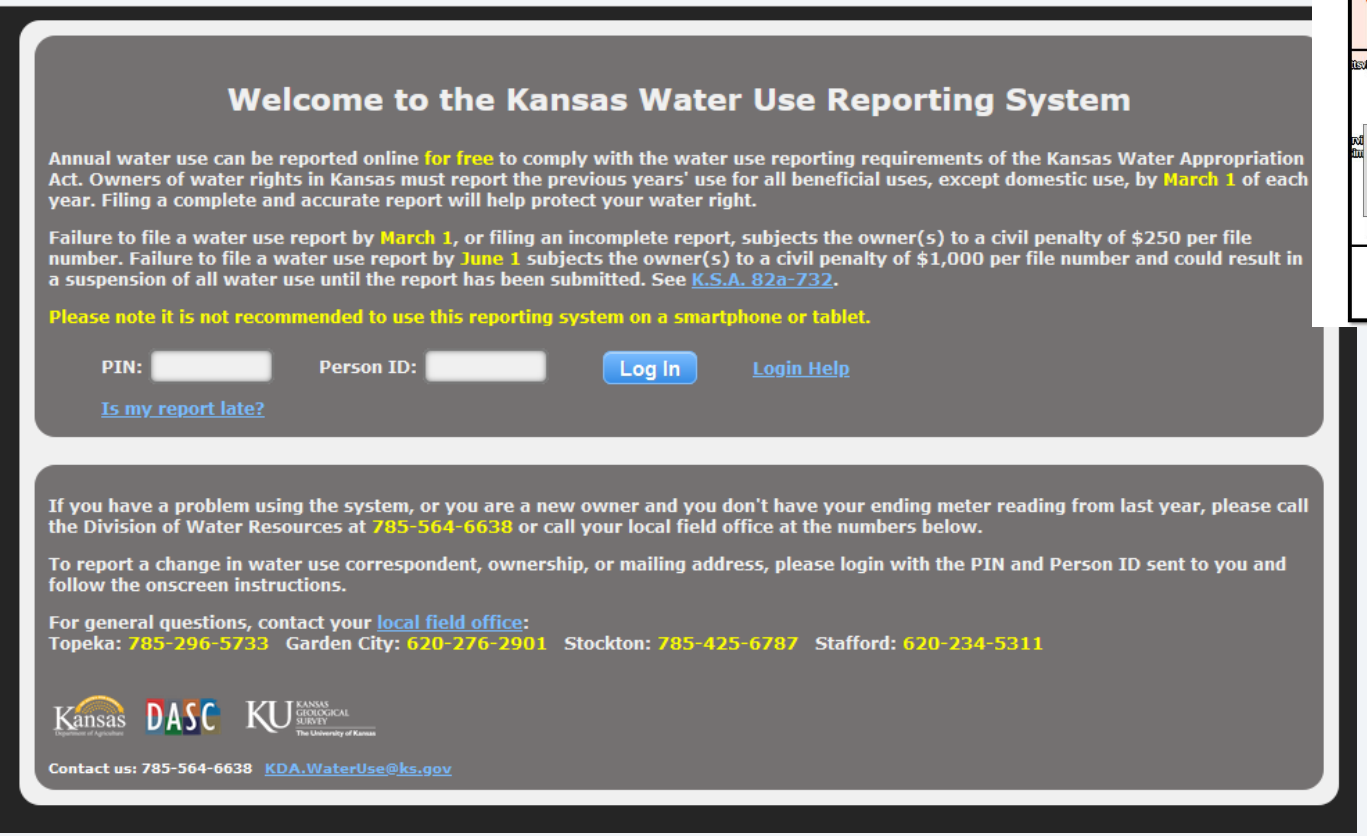
## Kansas Department of Health & Environment

- Data & map service hosting for public datasets

## Kansas Division of Emergency Management

- ArcGIS Server hosting
- Portal development

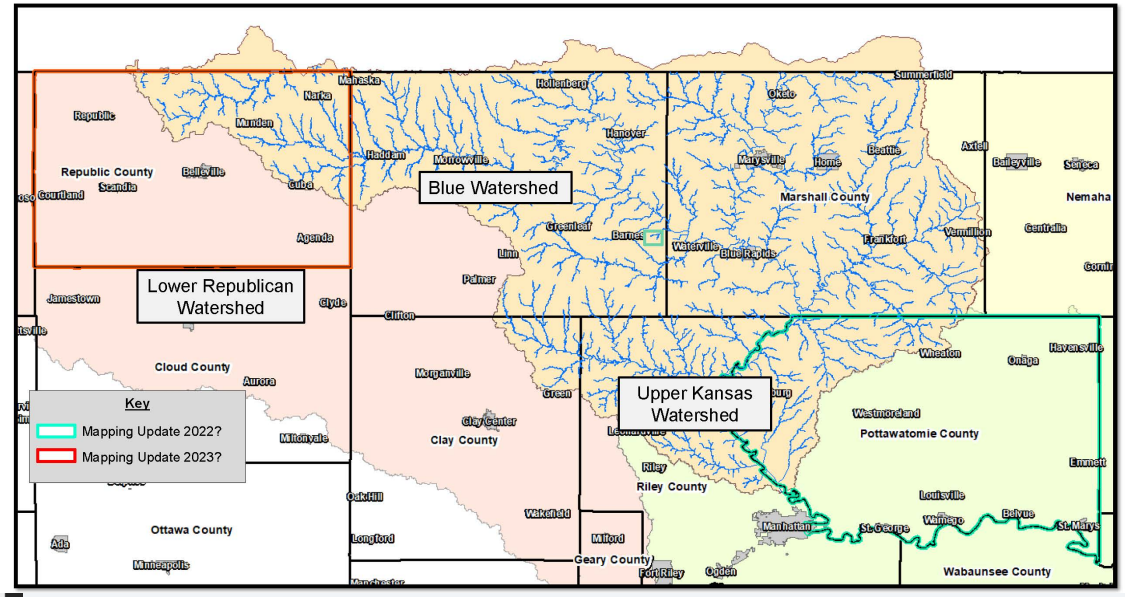
# KDA PROJECTS




Kansas Online Water Use Report

*During the 2019 reporting year, over 90% of all water use reports were filed online.*

**Blue Custom Watershed**




Base Flood Elevation Portal application development & hosting

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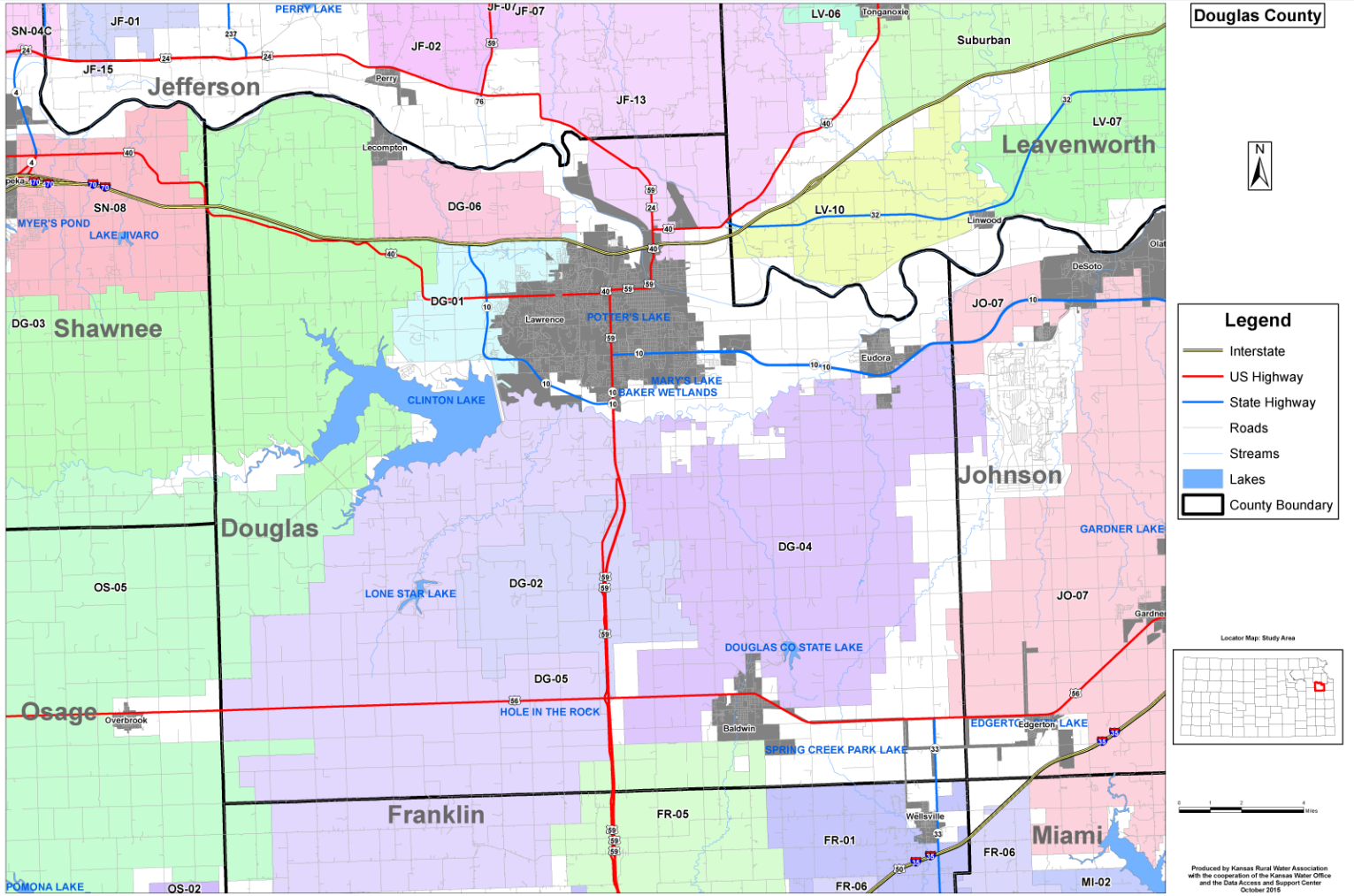
# KANSAS WATER OFFICE PROJECTS




## Public Water Supply Mapping Portal application development & hosting

- Officially launched in March 2019, the Portal provides a centralized place to maintain Rural Water District (RWD) contact information, communication tools, and conduct RWD boundary reviews.
- It also provides a standardized workflow for processing database updates. DASC continues to work with the KWO to promote the usage of the PWS Portal throughout the rural water districts community.

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KOLAR

## Kansas On-Line Automated Reporting

Allows for the sharing of data between researchers and regulatory agencies. Also accelerates and simplifies the reporting process.

For use by:

- Oil & Gas Operators and Purchasers
- County Appraisers
- Water Well Contractors
- Injection Well Operators
- The Kansas Corporation Commission
- The Kansas Department of Revenue
- The Kansas Department of Health and Environment

**Recent Milestones**

As of October 1st, 2020:

- ✓ 13,336 WWC-5 forms submitted;
- ✓ 208 licensed water well contractors current in system;
- ✓ 1,612 Underground Injection Control (UIC) Class 1 facilities monthly monitoring reports into system;
- ✓ 109 plans, reports, and variance requests submitted for the Underground Hydrocarbon Storage (UHS) program.

# OUTREACH AND PUBLIC SERVICES

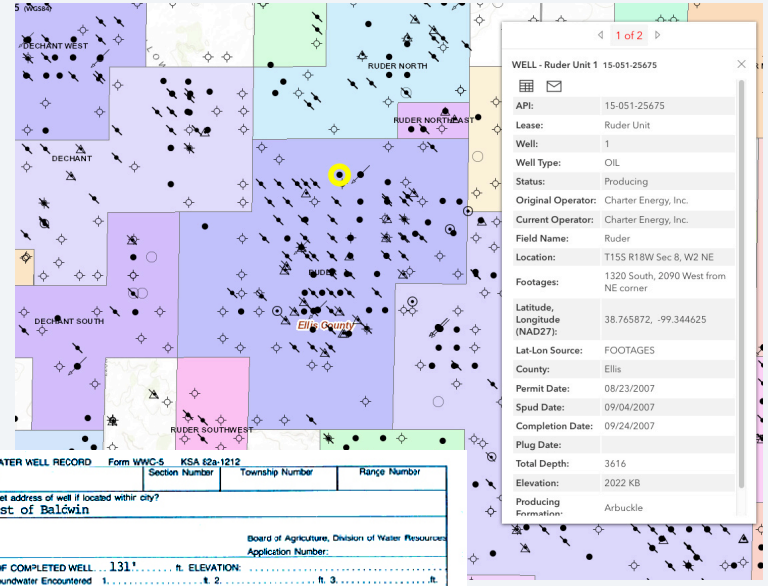
- Data Resources Library
- Kansas Geologic Sample Repository in Wichita
- Drill Core Library
- KGS Library and Archives

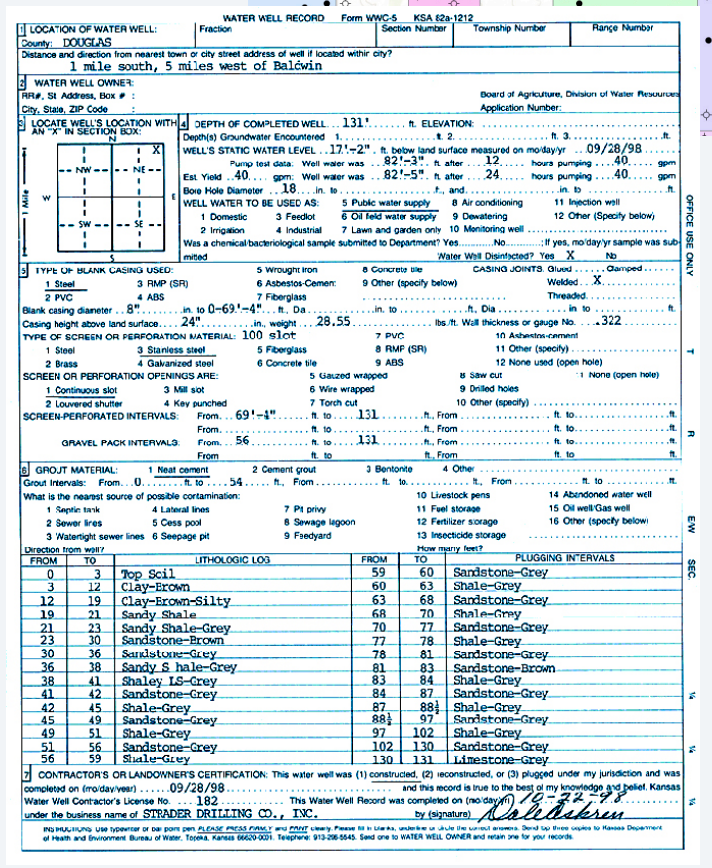
- Educational outreach such as field trips and community activities
- Editing, design, and publication production
- Publication sales

# DATA RESOURCES LIBRARY (DRL)

The DRL serves as the State of Kansas repository for historical aerial photographs and oil, gas, and water-well records. It houses geologic and production records for more than 450,000 oil and gas wells and 273,000 water wells.

- Receives financial support of $120,000 from the USGS's National Geological and Geophysical Data Preservation Program (NGGDPP). The support, which has been received since 2012, was increased by about 68% this year.
- The award will be used, for the first time, to inventory the state's critical minerals.



WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL: County: DOUGLAS — Fraction — Section Number — Township Number — Range Number

Distance and direction from nearest town or city street address of well if located within city?
1 mile south, 5 miles west of Baldwin

2 WATER WELL OWNER:
RR#, St. Address, Box # :
City, State, ZIP Code :
Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: NW NE SW SE

4 DEPTH OF COMPLETED WELL 131' ft. ELEVATION:
Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 17'-2" ft. below land surface measured on mo/day/yr 09/28/98
Pump test data: Well water was 82'-3" ft. after 12 hours pumping 40 gpm
Est. Yield 40 gpm: Well water was 82'-5" ft. after 24 hours pumping 40 gpm
Bore Hole Diameter 18 in. to ft., and in. to ft.
WELL WATER TO BE USED AS: 1 Domestic 3 Feedlot 5 Public water supply 8 Air conditioning 11 Injection well 2 Irrigation 4 Industrial 6 Oil field water supply 9 Dewatering 12 Other (Specify below) 7 Lawn and garden only 10 Monitoring well
Was a chemical/bacteriological sample submitted to Department? Yes No If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

5 TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued Clamped Welded X Threaded
Blank casing diameter 8" in. to 0-69'-4" ft., Dia. in. to ft., Dia. in. to ft.
Casing height above land surface 24" in., weight 28.55 lbs./ft. Wall thickness or gauge No. .322
TYPE OF SCREEN OR PERFORATION MATERIAL: 100 slot
1 Steel 3 Stainless steel 2 Brass 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) None (open hole)
SCREEN-PERFORATED INTERVALS: From 69'-4" ft. to 131 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 56 ft. to 131 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 0 ft. to 54 ft., From ft. to ft., From ft. to ft.
What is the nearest source of possible contamination:
1 Septic tank 2 Sewer lines 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? How many feet?

| FROM | TO | LITHOLOGIC LOG | FROM | TO | PLUGGING INTERVALS |
|---|---|---|---|---|---|
| 0 | 3 | Top Soil | 59 | 60 | Sandstone-Grey |
| 3 | 12 | Clay-Brown | 60 | 63 | Shale-Grey |
| 12 | 19 | Clay-Brown-Silty | 63 | 68 | Sandstone-Grey |
| 19 | 21 | Sandy Shale | 68 | 70 | Shale-Grey |
| 21 | 23 | Sandy Shale-Grey | 70 | 77 | Sandstone-Grey |
| 23 | 30 | Sandstone-Brown | 77 | 78 | Shale-Grey |
| 30 | 36 | Sandstone-Grey | 78 | 81 | Sandstone-Grey |
| 36 | 38 | Sandy S hale-Grey | 81 | 83 | Sandstone-Brown |
| 38 | 41 | Shaley LS-Grey | 83 | 84 | Shale-Grey |
| 41 | 42 | Sandstone-Grey | 84 | 87 | Sandstone-Grey |
| 42 | 45 | Shale-Grey | 87 | 88½ | Shale-Grey |
| 45 | 49 | Sandstone-Grey | 88½ | 97 | Sandstone-Grey |
| 49 | 51 | Shale-Grey | 97 | 102 | Shale-Grey |
| 51 | 56 | Sandstone-Grey | 102 | 130 | Sandstone-Grey |
| 56 | 59 | Shale-Grey | 130 | 131 | Limestone-Grey |

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 09/28/98 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 182 This Water Well Record was completed on (mo/day/yr) 10-22-98 under the business name of STRADER DRILLING CO., INC. by (signature) Dale Strader

OFFICE USE ONLY — T — R — EW — SEC — ¼ — ¼ — ¼

# KANSAS GEOLOGIC SAMPLE REPOSITORY

State repository for geologic samples of more than 149,000 oil, gas, and exploratory wells. Rock cuttings recovered from more than 145,000 wells and boreholes drilled up to 6,000 feet deep are preserved here.

Prior to 1938, there was no central repository for well cuttings.

In 1938, the first well sample repository was established in Wichita.

In the late 1950's, a series of fund drives provided for the construction of a larger facility in west Wichita.

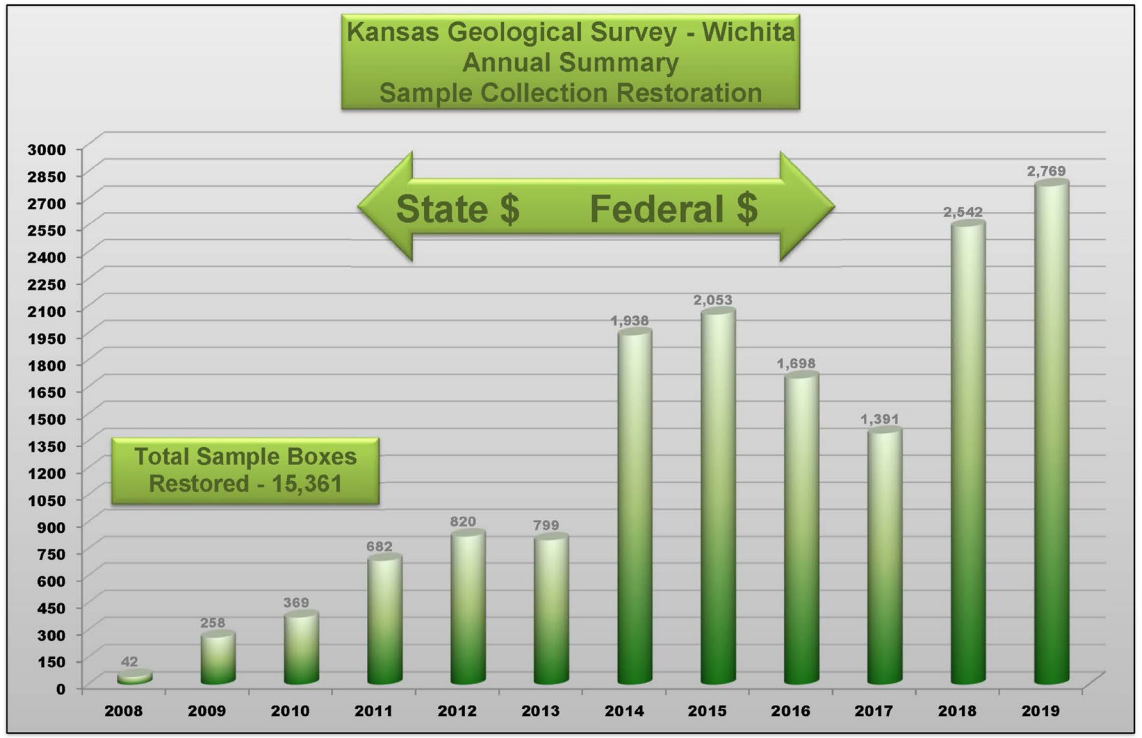
The KGS took over operations and administration in the 1980's.


- 23,500 ft² facility
- 1,500 ft² admin area
- 22,000 ft² repository
- 30% remaining storage
- KGS owns & operates

# KANSAS GEOLOGICAL SAMPLE REPOSITORY


Before

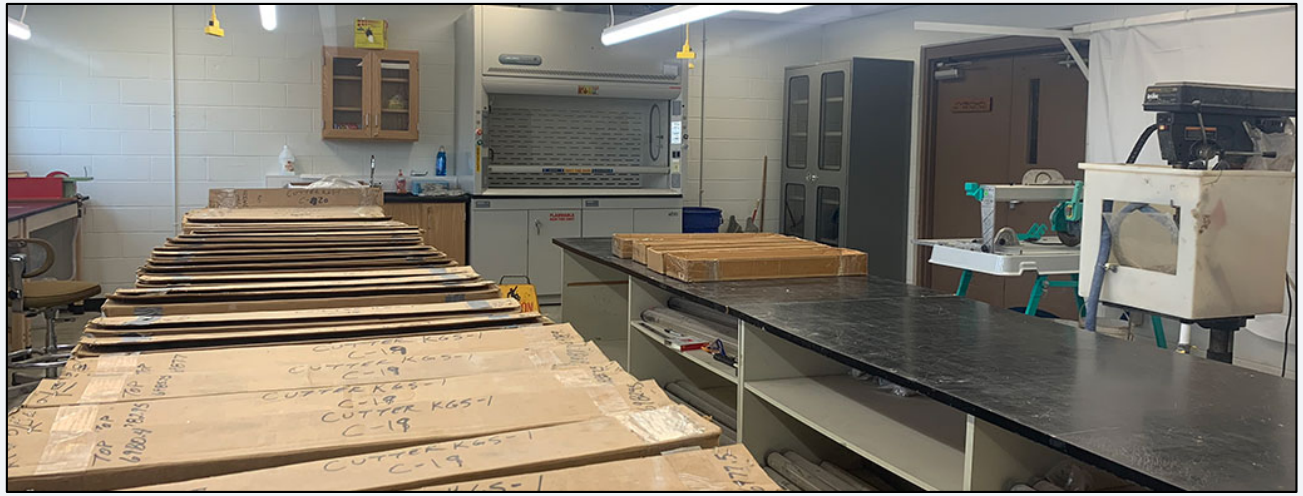
After




Restoration of rock sample boxes increased significantly after funding from the USGS NGGDPP program became available.

# KGS DRILL CORE LIBRARY - LAWRENCE

- The Lawrence Repository contains over 67,000 boxes
- Representing more than 5,500 drill holes



The Lynn Watney Kansas Core Analysis Laboratory

View Inside the Core Barn

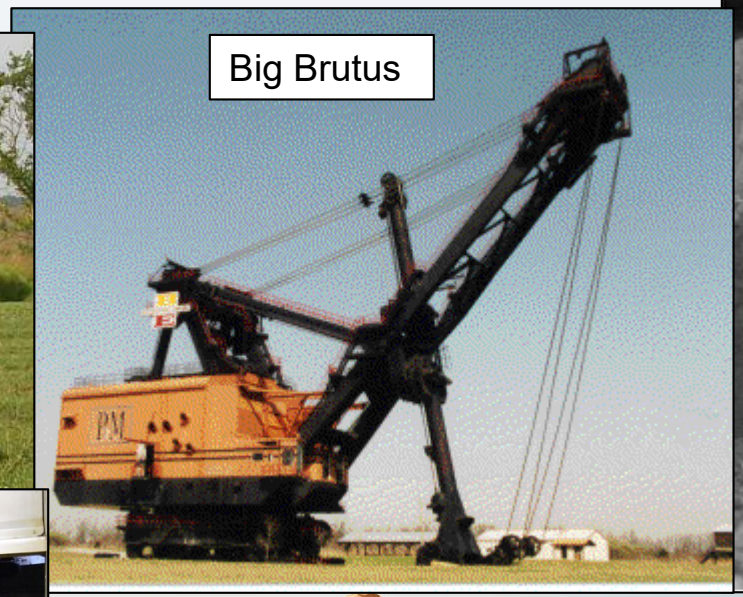
# ANNUAL FIELD CONFERENCE

The field conference, initiated in 1995, educates policy makers about natural resource issues in Kansas. This trip provides an opportunity to present policy makers with balanced, unbiased information about Kansas's natural resources.

# 2021 FIELD CONFERENCE

The 2021 KGS Field Conference will be held October 13-15 in SE Kansas! We will be exploring sites that highlight efforts to transform the state's natural resources in this region.

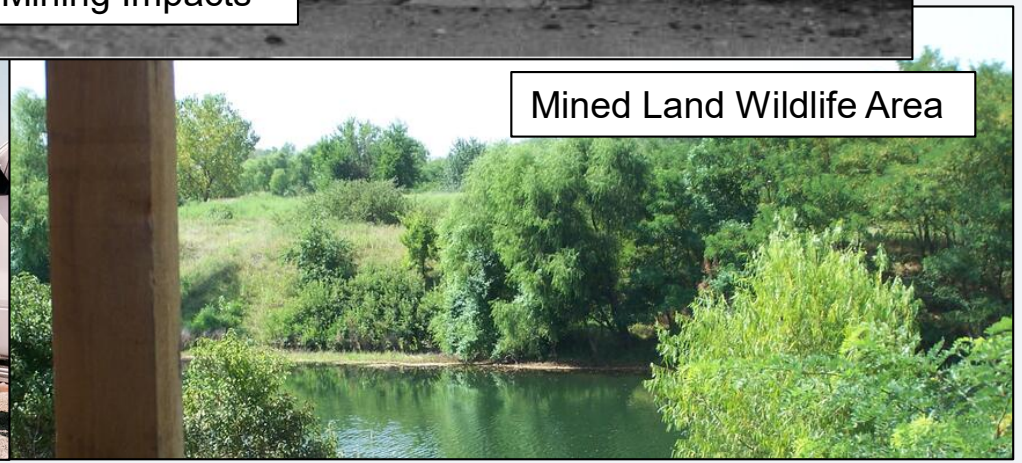

Mine Creek Battlefield


Big Brutus


Mining Impacts

Foster Dairy Farms


Treece, Kansas


Mined Land Wildlife Area