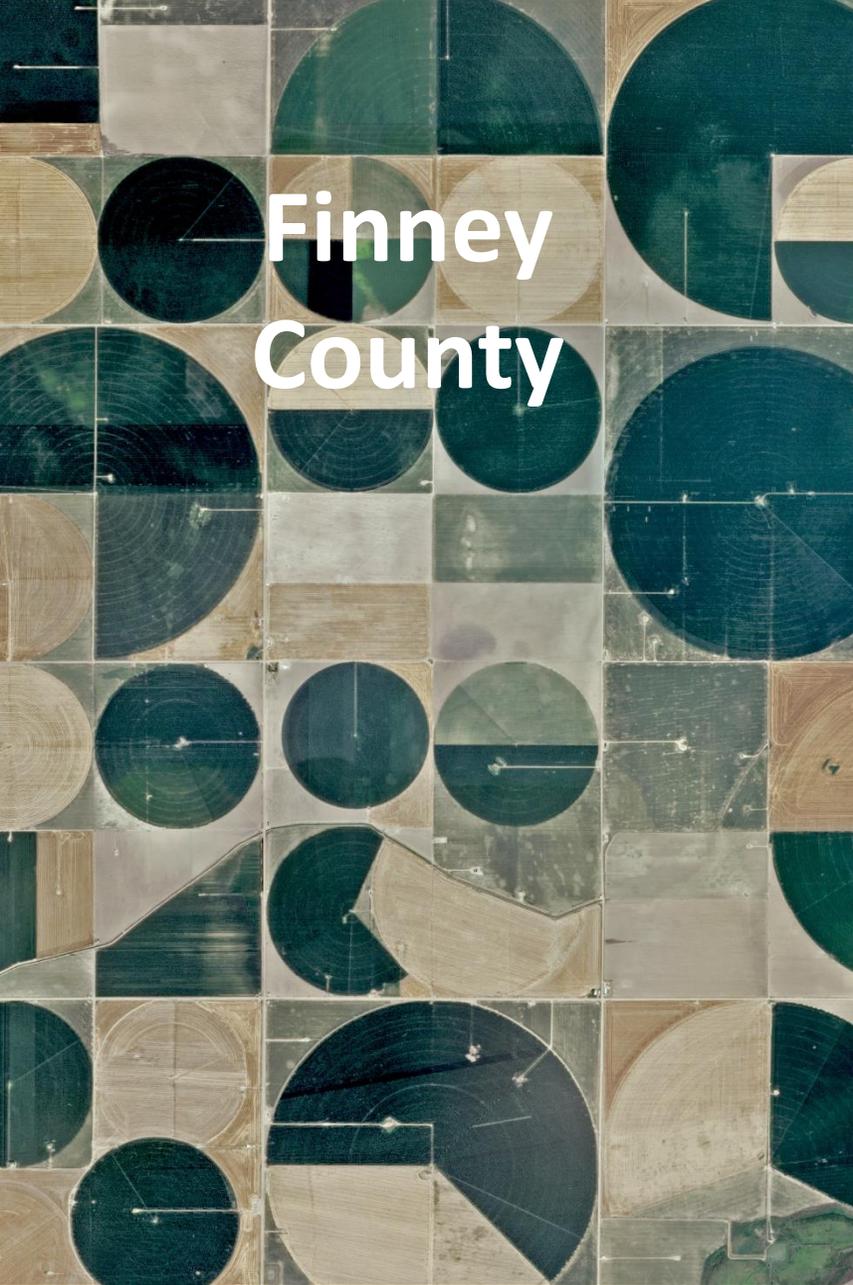




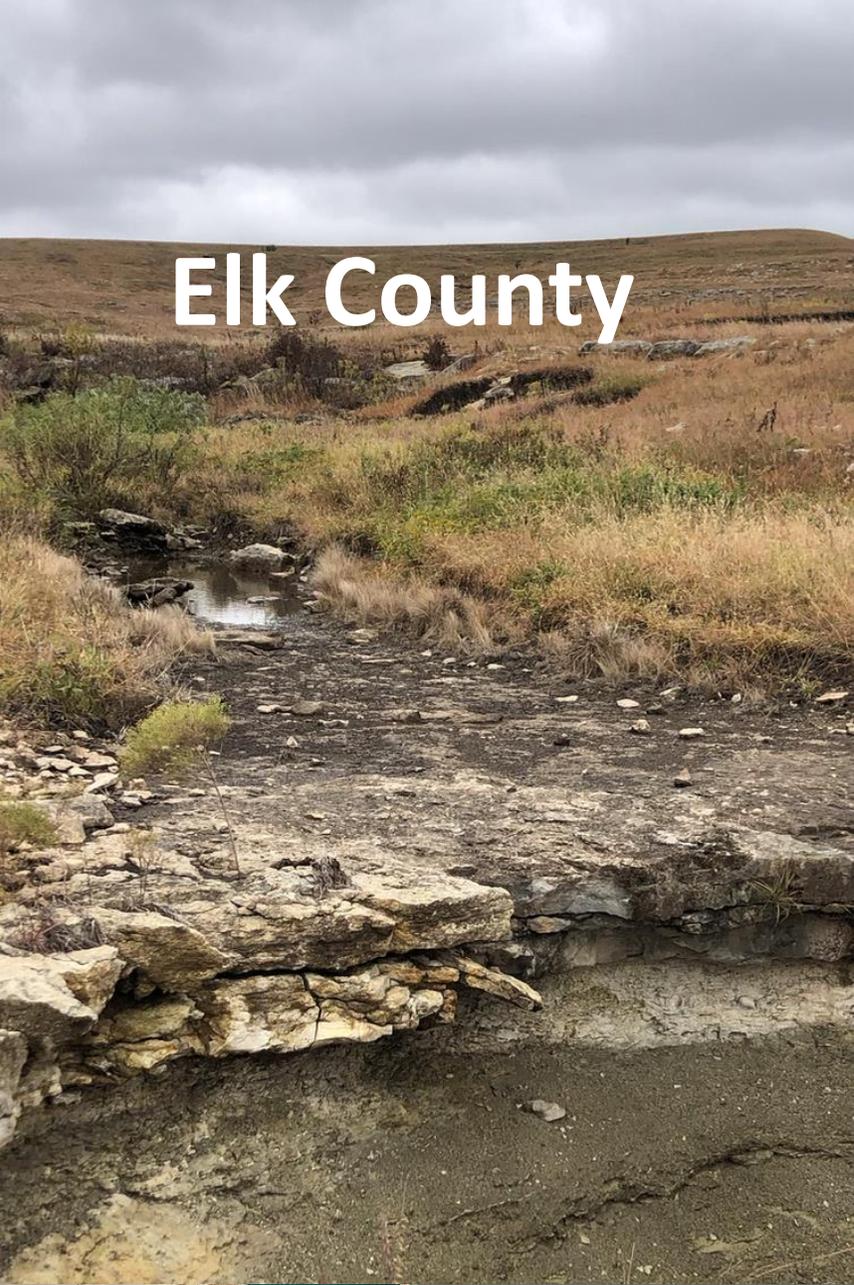
Kansas Biological Survey

House Committee on Water
February 8, 2021

MISSION: *To serve Kansas and the global environment through world-class research, education and outreach.*



Finney
County



Elk County



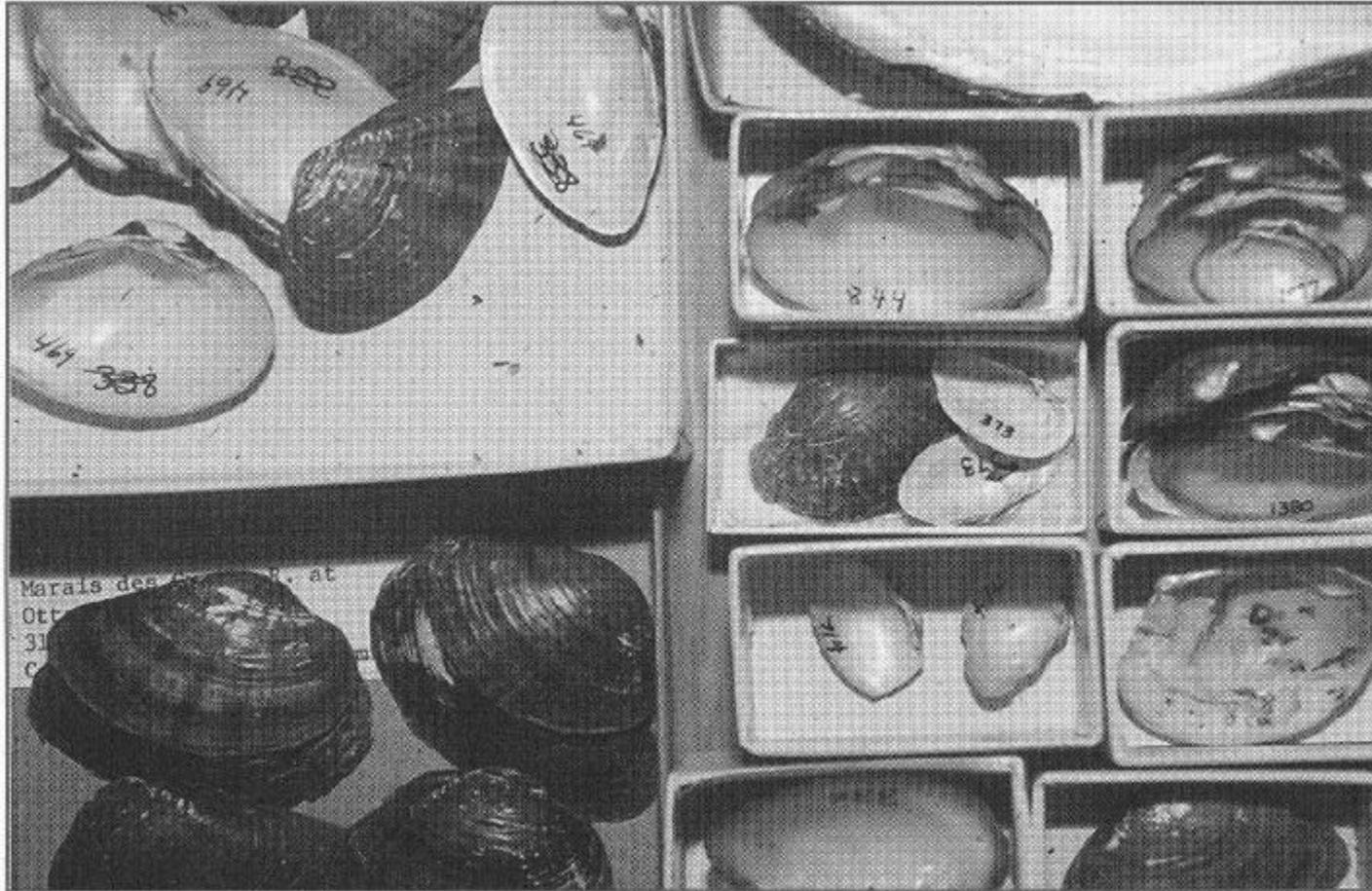
Jefferson
County

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5. Leave key takeaways



History



Craig Freeman

- Organized efforts to inventory the biota of Kansas began in the 1860s.
- The Kansas Biological Survey was formally established in 1911 by the KU Chancellor.
- In 1959, Kansas State House Bill No. 133 recognized the Kansas Biological Survey as a unit of state government.
- Non-regulatory state agency

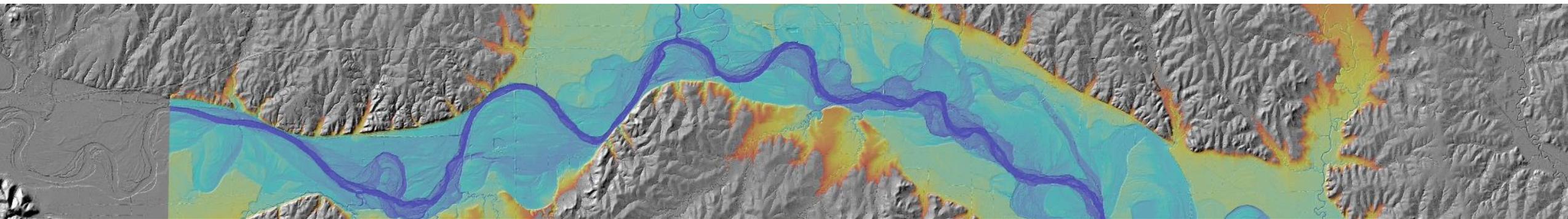
Statute 76-338

- ... survey the animals and plants, especially native animals and plants of economic and educational importance*
- ... publish reports*
- ... receive and administer lands needed by the state of Kansas for the study, preservation, or use of native animals and plant resources*
- ... accept grants, state moneys, or any gifts or donations*



Expansion of Scope

- In 1986, the Kansas Natural Heritage Inventory was established by the Kansas Legislature to identify ecologically important sites across the state, and became part of the Survey.
- In 1997, the Kansas Applied Remote Sensing (KARS) Program (established by NASA and the State in 1972 to conduct research on applications of satellite imagery technology) was folded into the Survey.
- In 1999, the 1947-established KU Field Station became administered by the Survey.
- Monarch Watch



Kansas Biological Survey Budget	FY 2019	FY 2020	FY 2021
Positions funded by KU	1,842,044	1,710,622	1,966,538
Other operating expenses	18,751	10,529	10,529
Total	1,860,795	1,721,151	1,977,067

Sponsored Project Expenditures*	FY 2019	FY 2020	FY 2021
Non-federal funds (e.g., grants and contracts from the State, foundations, not-for-profit organizations, industry, and other universities)	1,183,930	863,006	
Federal funds (external grants and contracts; e.g., NSF, USDA)	3,022,182	2,811,998	
Total	4,206,112	3,675,004	

*grants and contracts processed through KU Center for Research

Return on investment

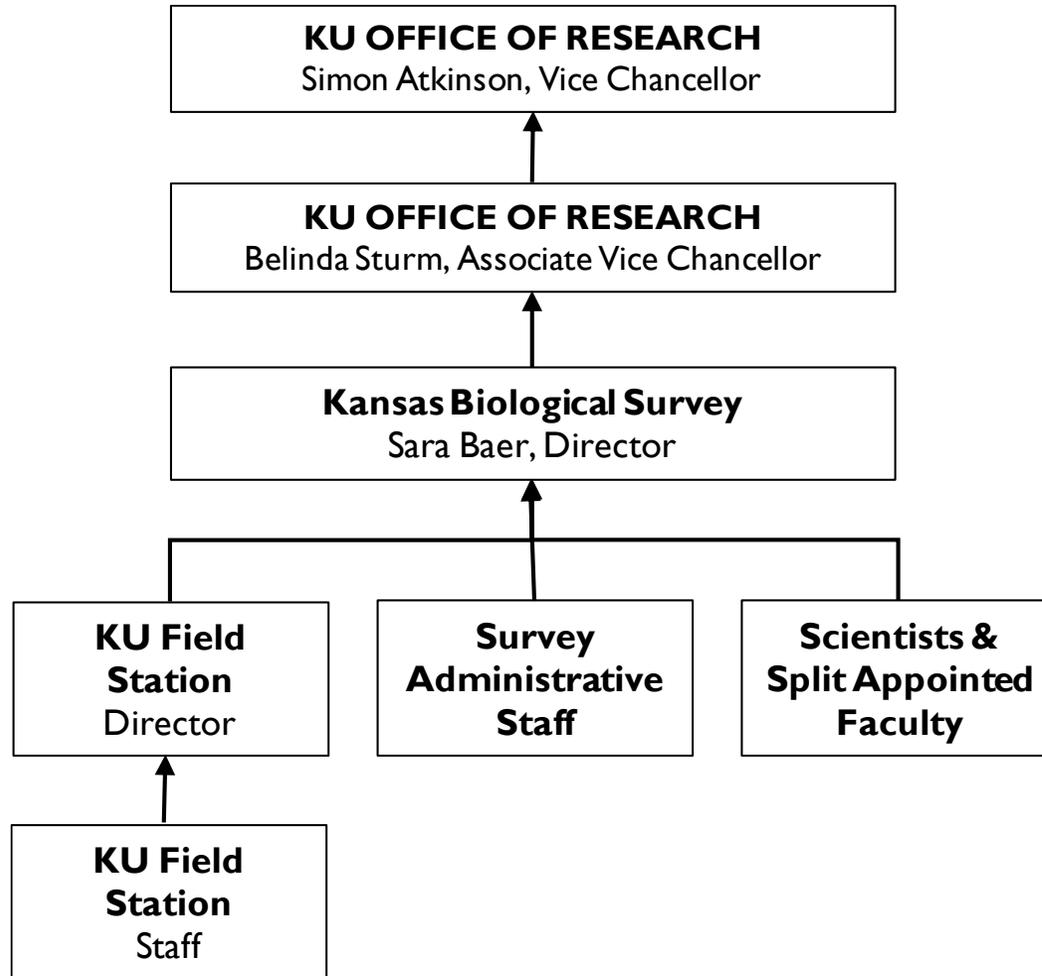
226%

214%

...because of sponsored projects



Reporting Structure



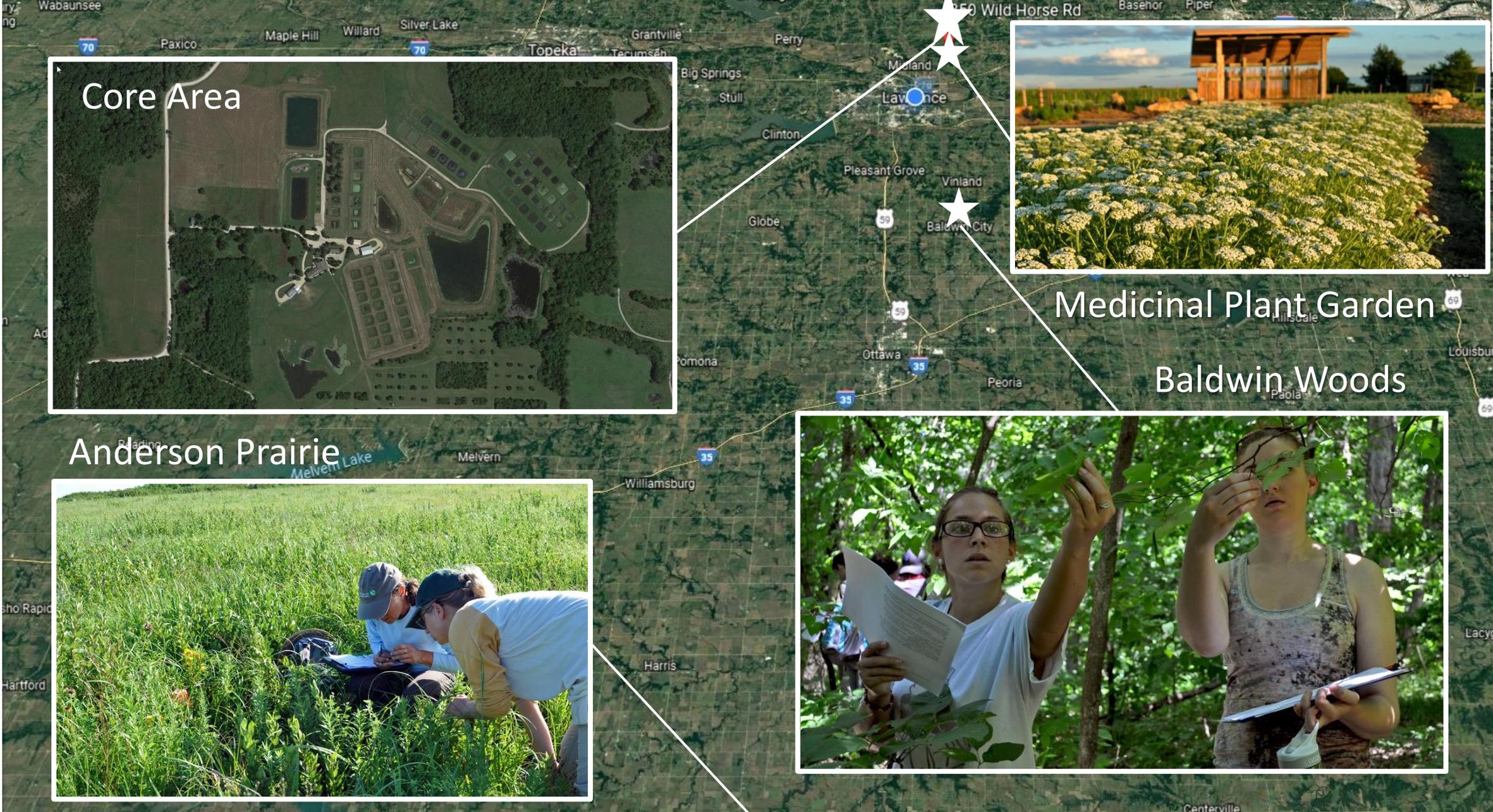
- Annual report published every year
- Quarterly review with director
- Annual review of director
- 5 year review of director
- 5 year review of research center

Today

- **Designated research center** at KU.
 - Interdisciplinary and multi-institutional research on plants, animals, microbes, ecosystems, nutrients, soil carbon, and water resources.
- **Employs** 70-100 researchers annually: faculty/scientists, staff, technicians and students.
 - Faculty members teach classes at KU and mentor emerging scientists at all levels.
 - Most employees are supported by funding coming from outside the State.
- Growing involvement in **public outreach and service** activities at local, state, regional, and national levels.
- Increasing **infrastructure for research** on campus and at the KU Field Station made possible by external funding from the National Science Foundation (NSF).

ARMITAGE EDUCATION CENTER
RESEARCH AND OPERATIONS

THE UNIVERSITY OF KANSAS
FIELD **KU** STATION



Core Area

Medicinal Plant Garden

Baldwin Woods

Anderson Prairie









KU Field Station Core Research Area

350 Wild Horse Rd

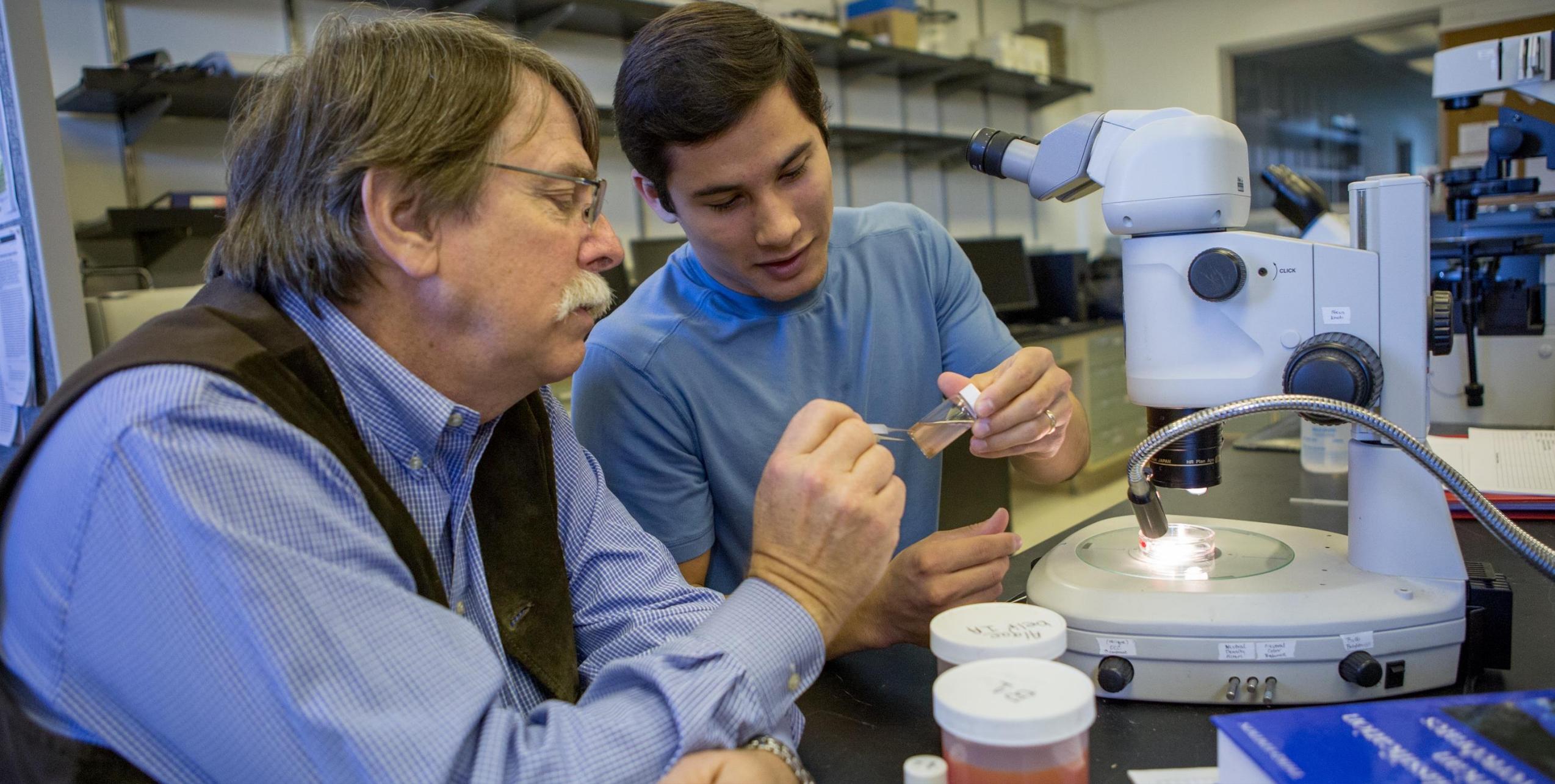










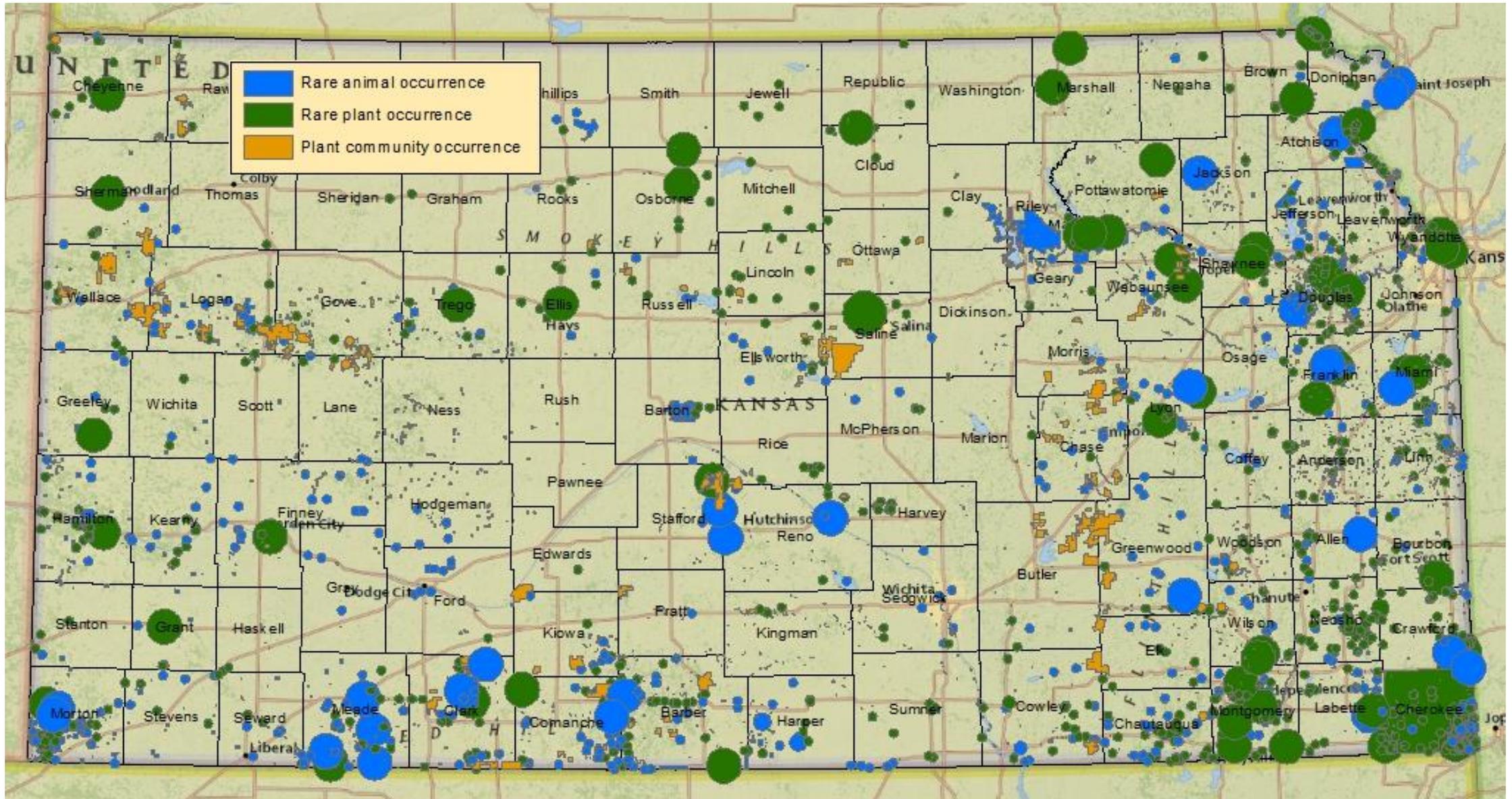




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Data Sources

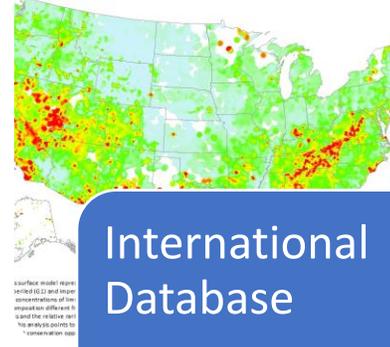
- KDWPT
- KDHE
- KBS
- researchers
- museums



Kansas Natural Heritage Inventory

- quality control
- data integration with GIS interface

NatureServe Rarity-Weighted Richness Model of Critically Imperiled and Imperiled Species in the United States

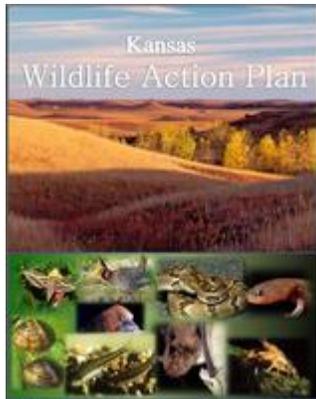


International Database

- NatureServe

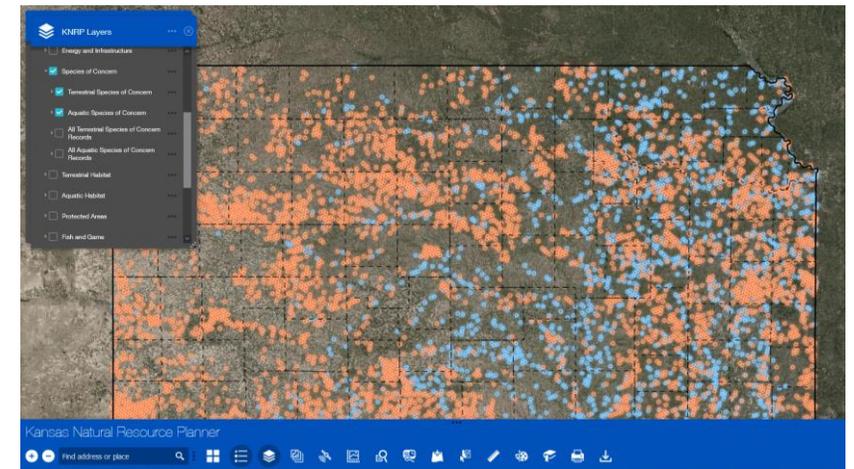
Uses

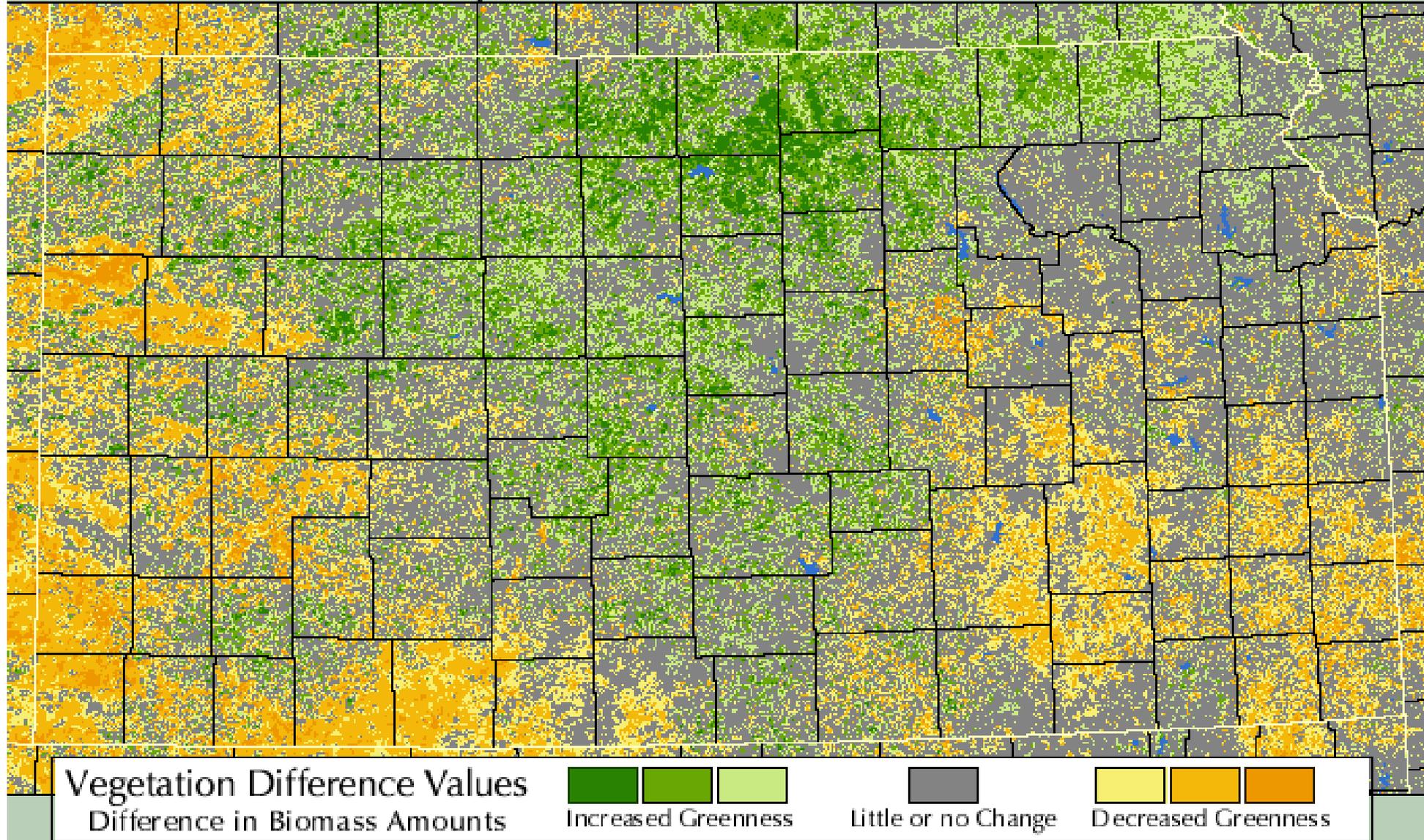
- assessment
- planning



Statewide Applications

- Natural Resource Planner
- Crucial Habitat Assessment Tool
- State Wildlife Action Plan





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Past Work

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ATLAS OF KANSAS LAKES

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Maps of watersheds and land cover	32
Summary statistics	232

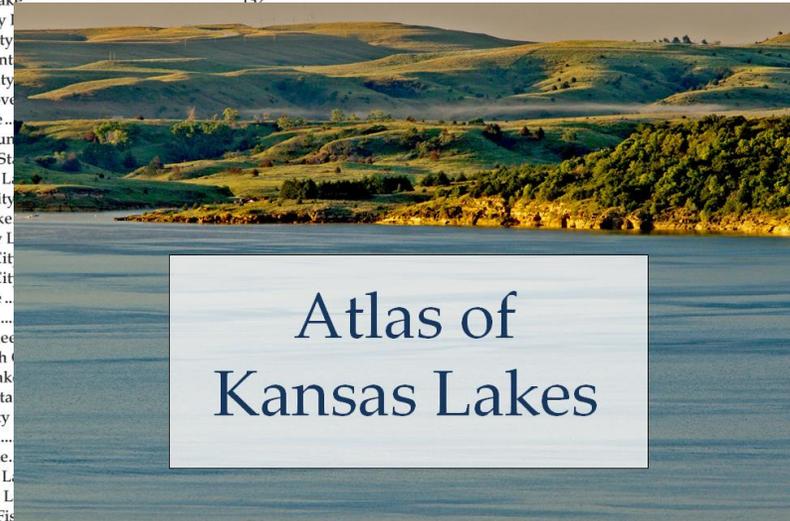
Federal reservoirs

Big Hill Lake	36
Cheney Reservoir	40
Clinton Lake	44
Council Grove Reservoir.....	48
El Dorado Lake.....	52
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Fall River Lake.....	60
Hillsdale Lake.....	64
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Kanopolis Lake.....	72
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Lovell Reservoir.....	80
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Melvern Lake.....	88
Milford Lake	92
Perry Lake	96
Pomona Lake	100
Toronto Lake.....	104
Tuttle Creek Lake	108
Webster Reservoir	112
Wilson Lake	116

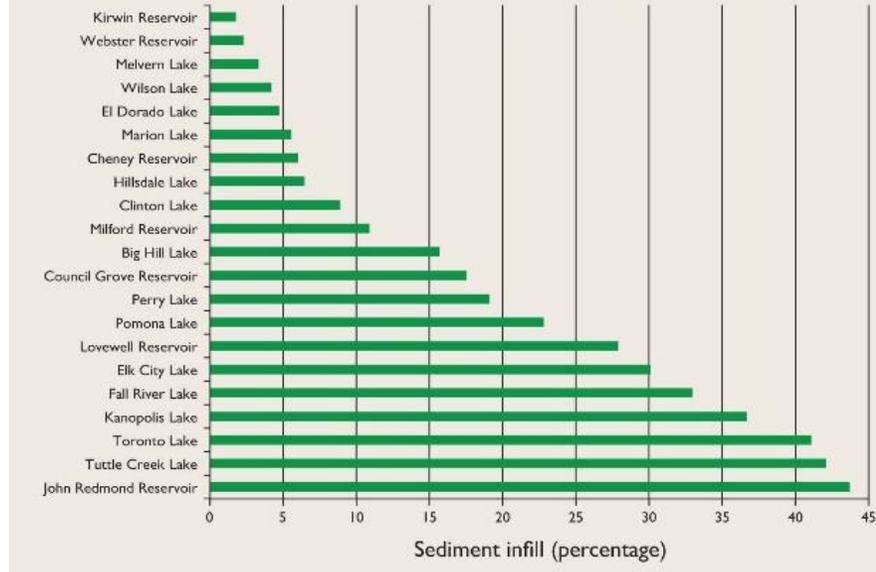
State and local reservoirs

Alma City Lake.....	122
Atchison County Lake	124

Augusta City Lake	126
Augusta-Santa Fe Lake.....	128
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Boy Scout Lake	132
Cedar Valley Lake	
Centralia City Lake	
Chanute-Santa Fe Lake	
Chase County Lake	
Council Grove Reservoir	
Crystal Lake	
Douglas County Lake	
Elk County State Lake	
Eureka City Lake	
Fort Scott City Lake	
Gardner Lake	
Garnett City Lake	
Herington City Lake	
Herington City Lake	
Kahola Lake	
Lake Afton	
Lake Shawnee	
Leavenworth City Lake	
Lone Star Lake	
Louisburg State Lake	
Madison City Lake	
Miola Lake	
Mission Lake	
Moline City Lake	
Mound City Lake	
Nebo State Fish Lake	



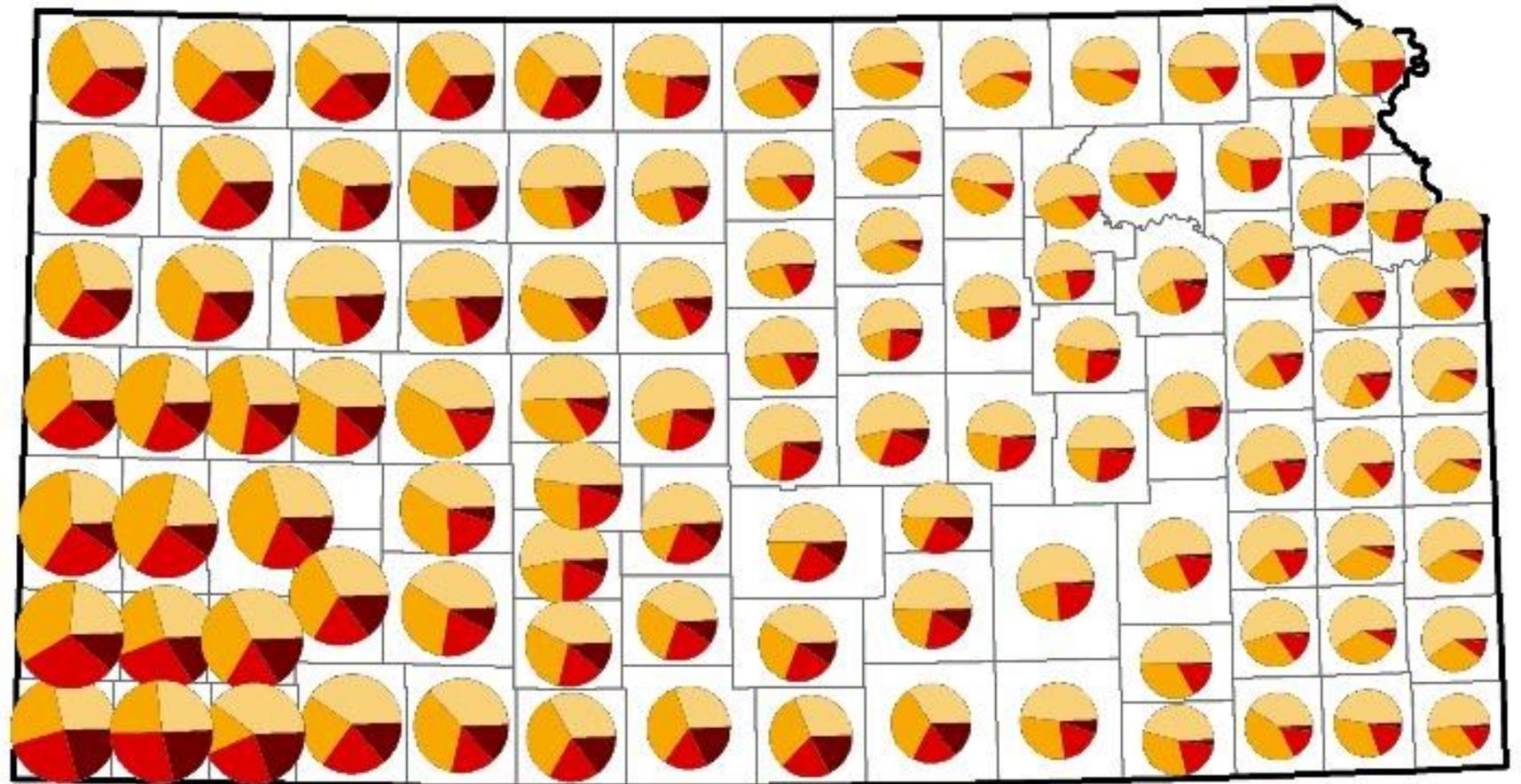
Atlas of
Kansas Lakes



Western Kansas

World of water deficit.

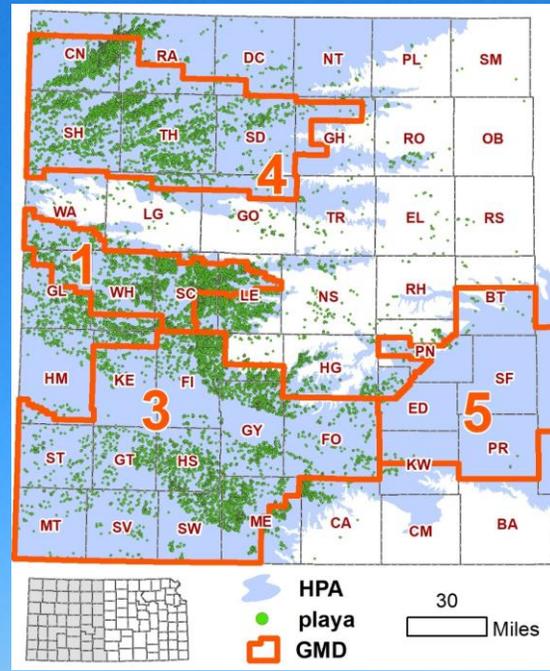
How can we sustain groundwater for future generations?



**Time in Drought
2000-2020**

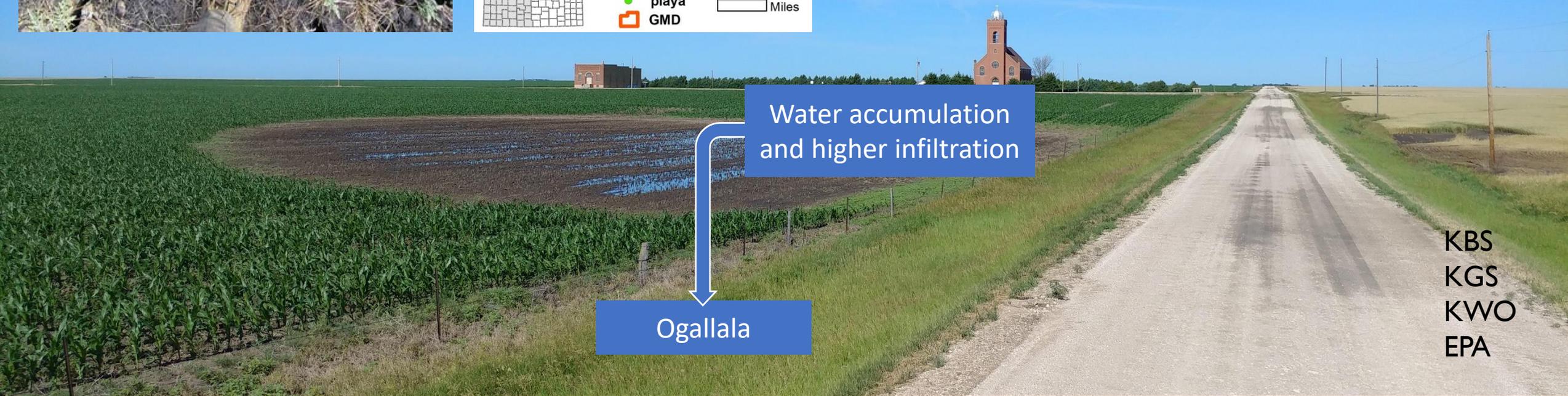
min: 20%
max: 57%





Small rainwater-fed wetlands: playas

- 22,000 playas mapped
- 84% of playas are cropped
- marginal farmland
- inconvenient to crop around

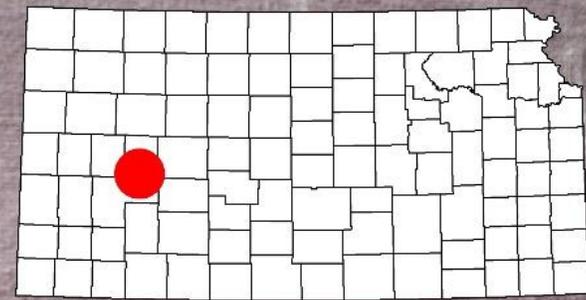


Water accumulation and higher infiltration

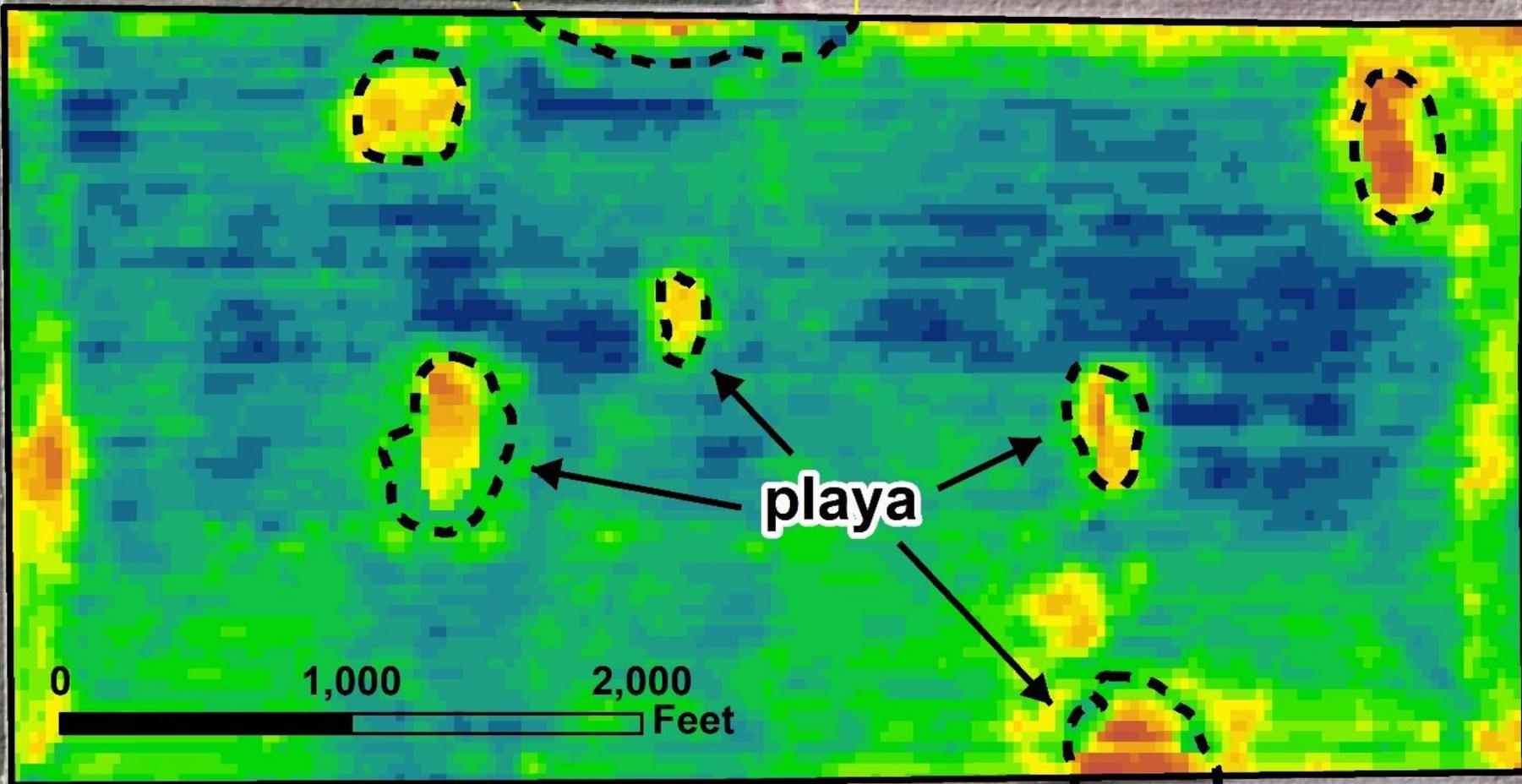
Ogallala

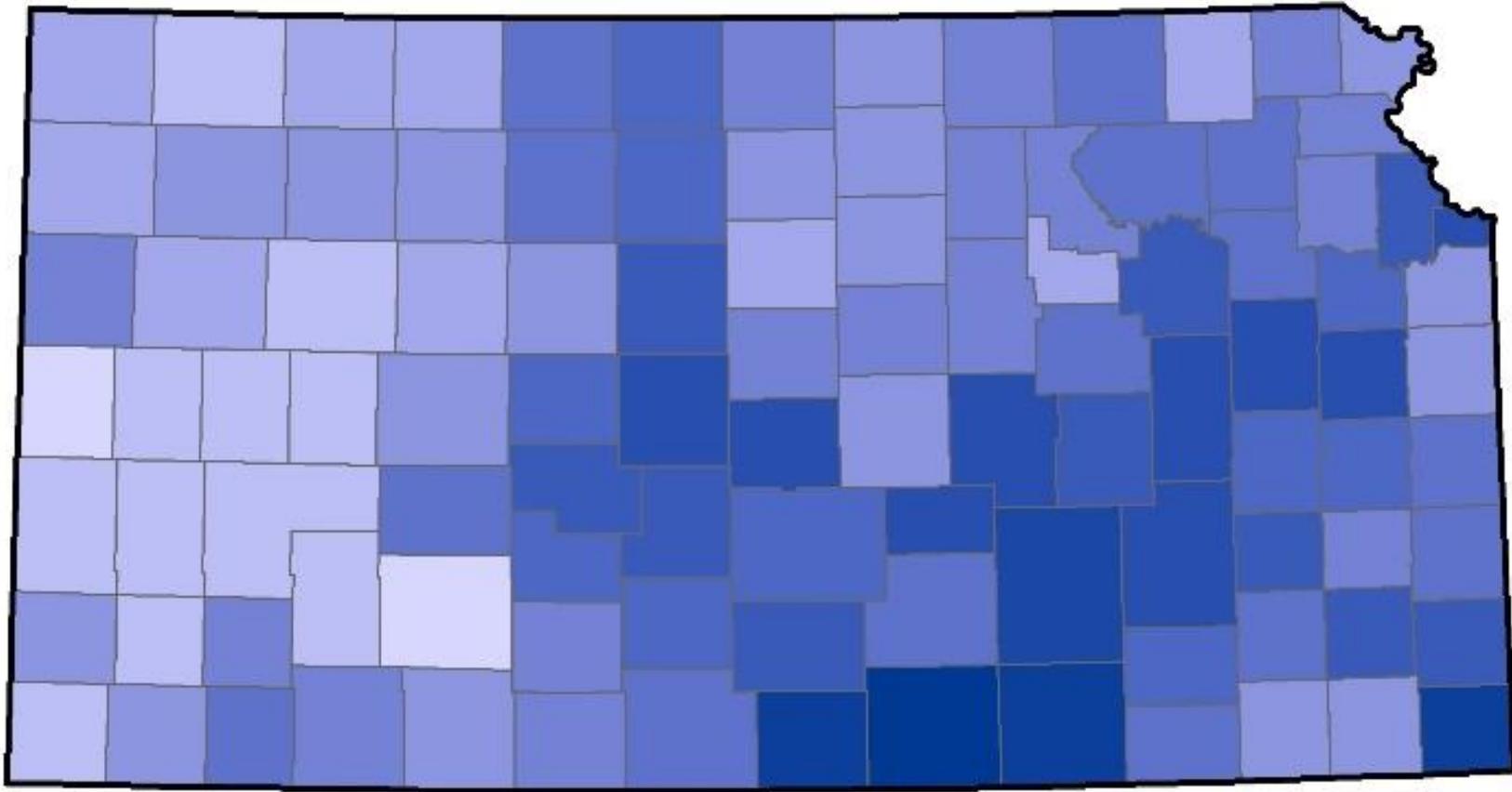
KBS
KGS
KWO
EPA

% of Field Avg Yield
average 2015-2018



KBS
KGS
KWO
EPA





**Floods
2000-2020**

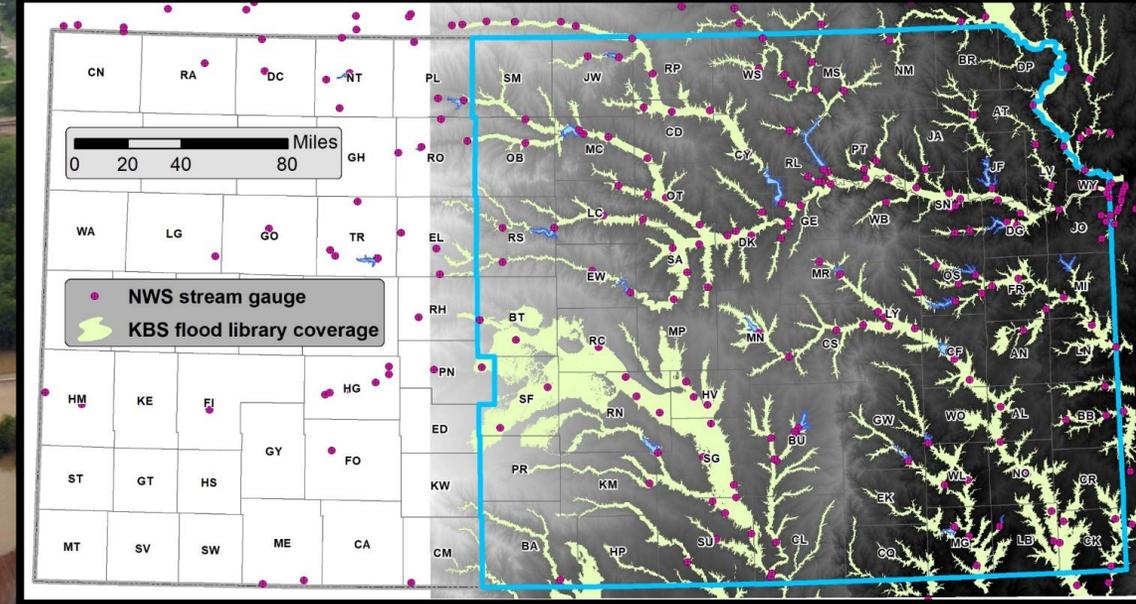
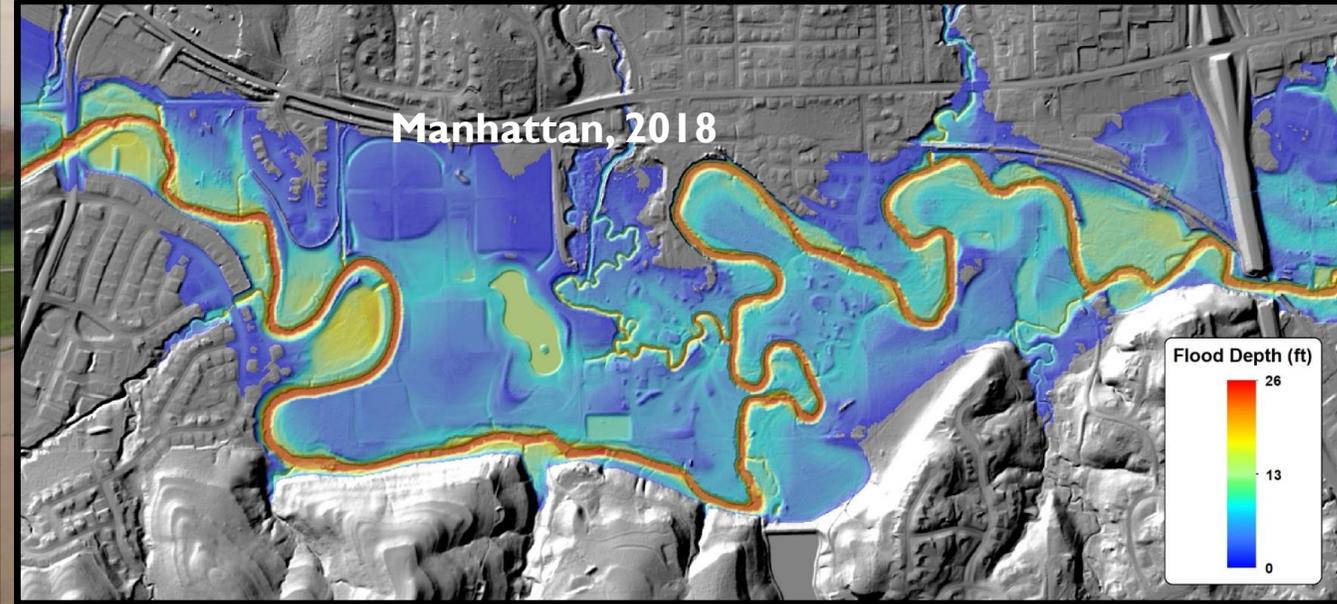


Eastern Kansas

**World of periodic deficit
and excess.**

*How can we be better prepared for
when extreme flooding strikes?*

Neosho River, 2007



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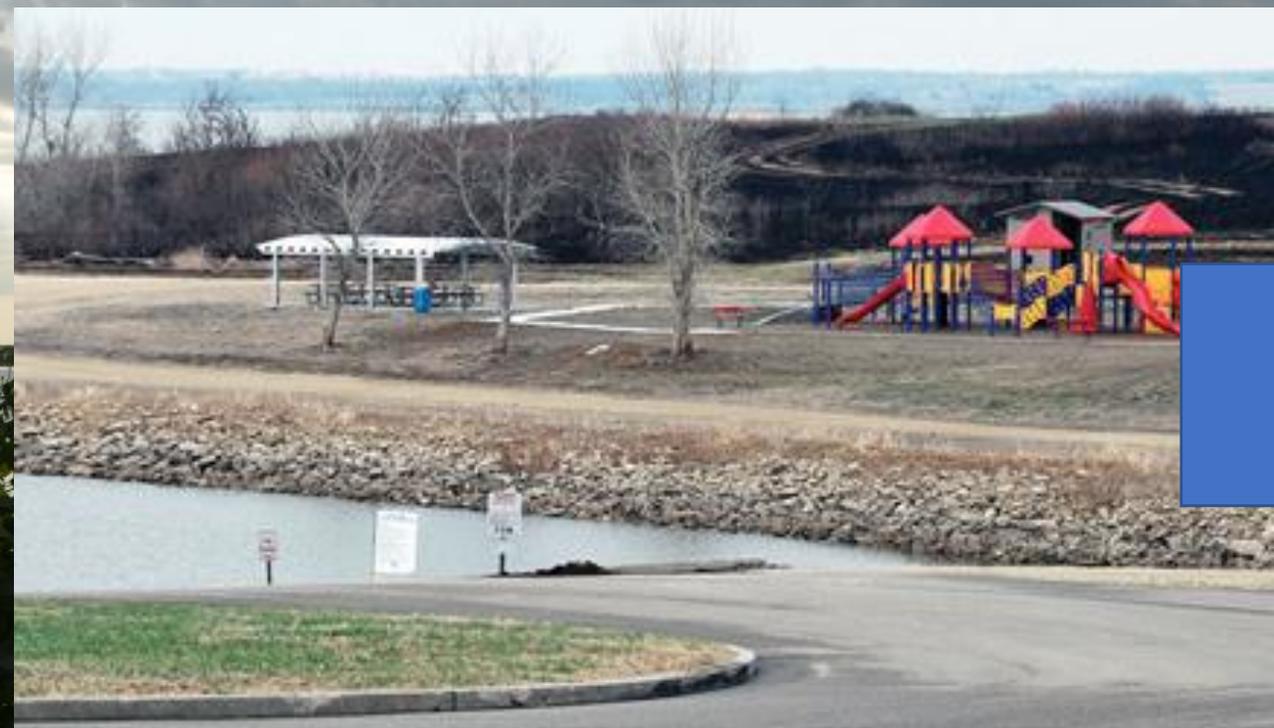
Surface Waters of Kansas





In the last 20 years, a **blue green** problem started to emerge: harmful algal blooms.

“HABs”



Harmful Algal Blooms

NOT your average pond scum

This blue-green goo is disrupting our waters

Cause serious costs

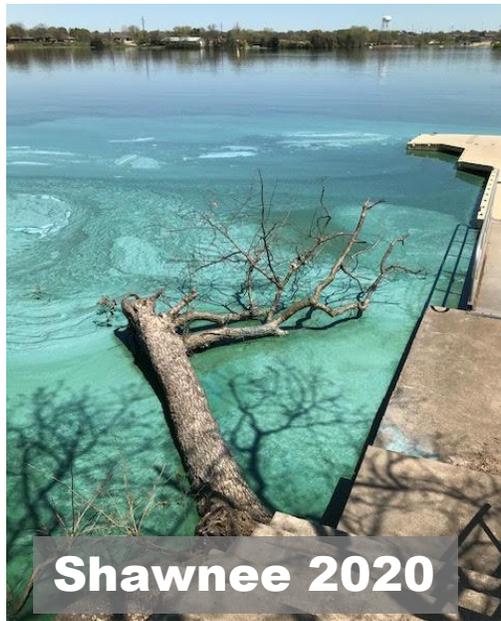
Harmful Algal Blooms in Kansas

- *Can* produce potent toxins
 - Blooms have poisoned dogs and cattle
- *Can* produce taste-and-odor compounds
 - HAB compounds increase drinking water cost by \$1000/day/treatment plant
- But not always
 - We don't know why.





Milford 2017



Shawnee 2020



Norton 2018



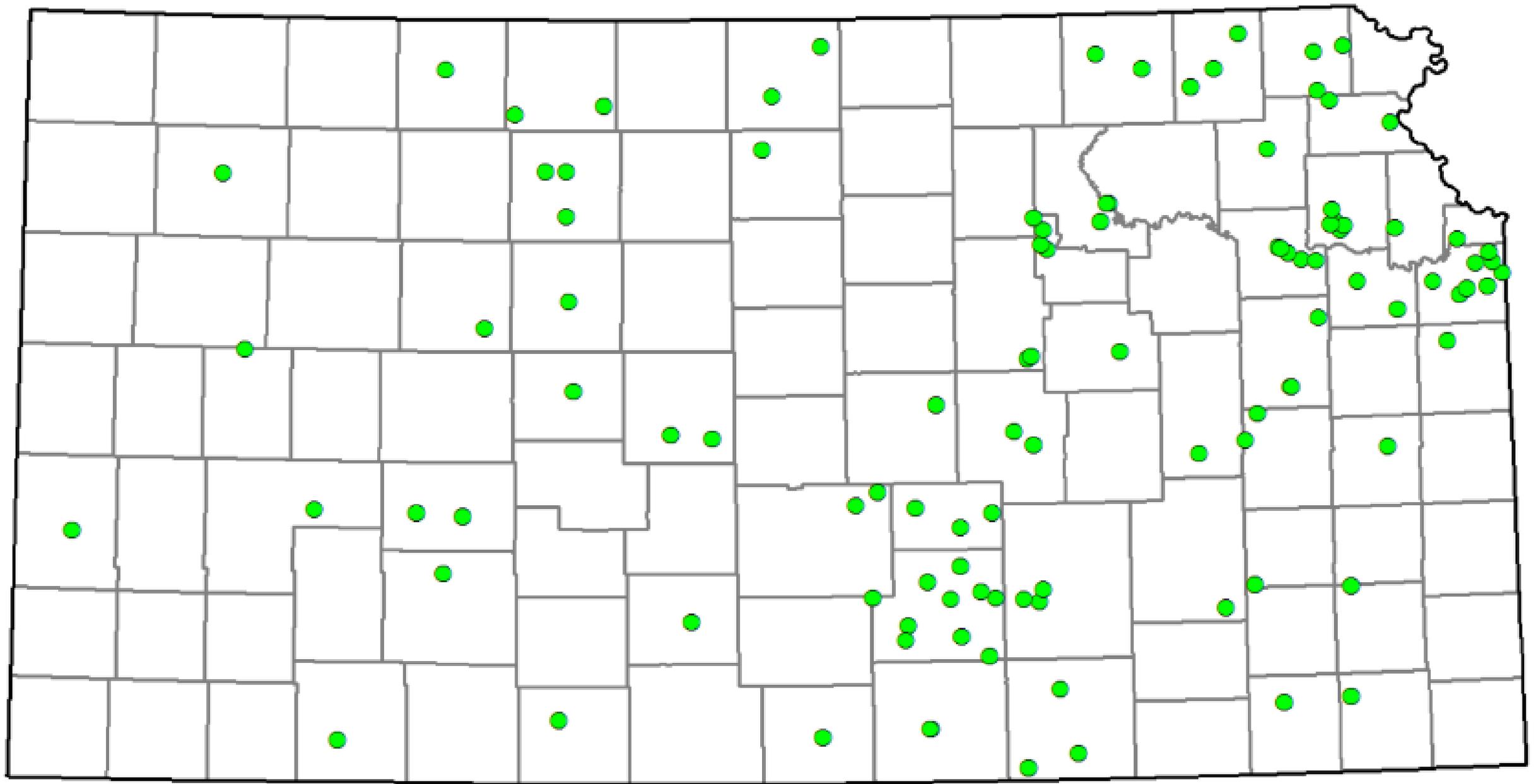
Webster 2019



Kanopolis 2020



Marion 2017



What conditions create HABs?

- Light



- Nutrients



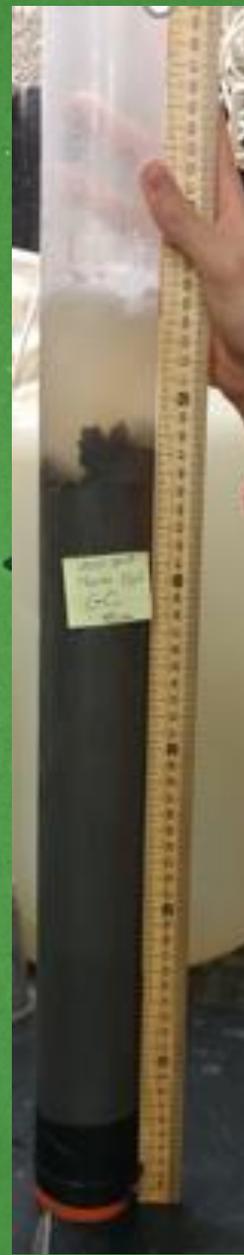
- Water





Where do we find the answers to
our HAB problem?

Sediment coring



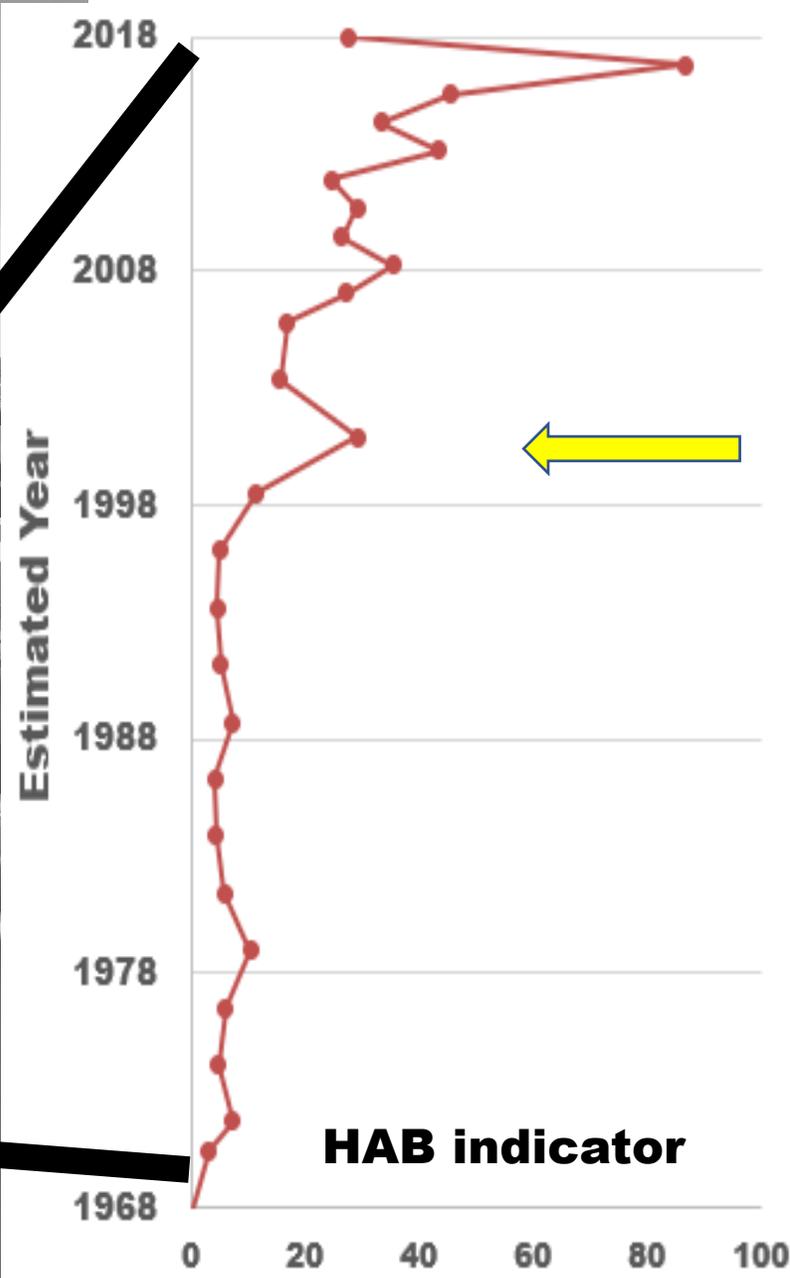
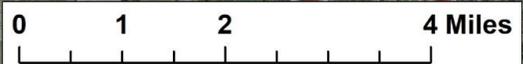
Milford

S2 +

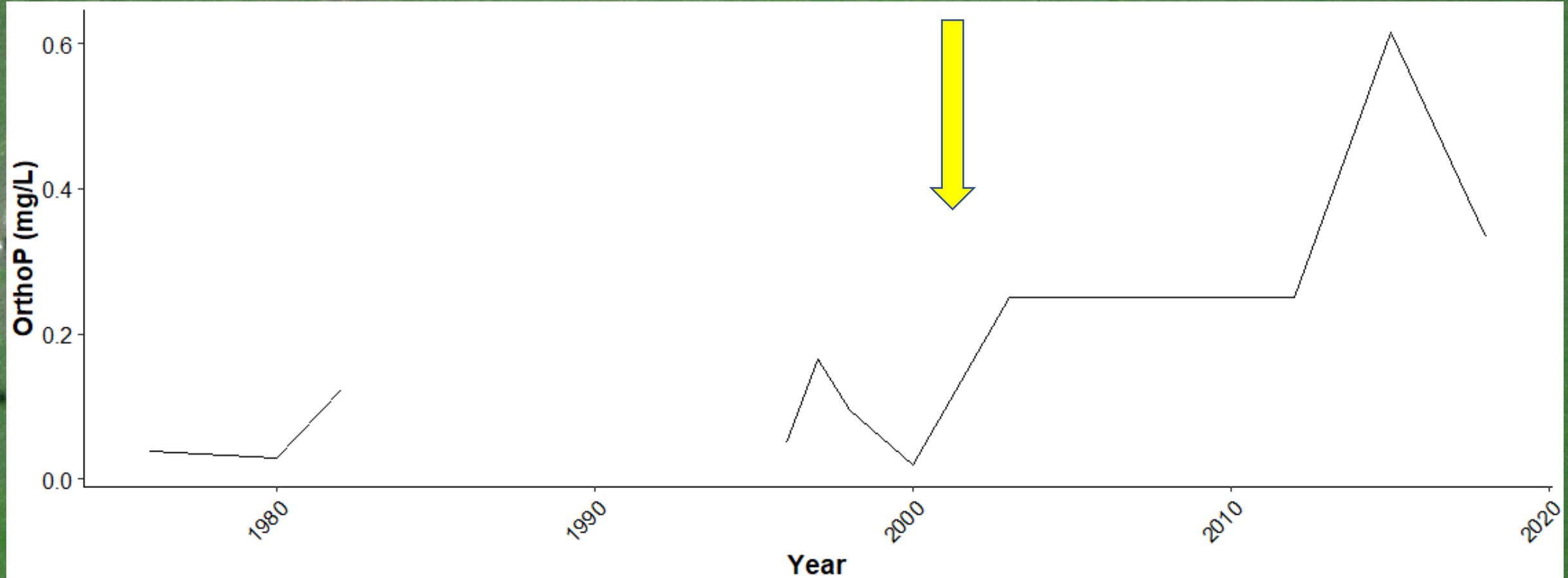
S1 +

Depth (ft)

- < 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65



Milford Water Quality Data: Nutrients



How do we stop HABs?

Limit nutrients... or limit light?



KDHE/CoL funded In-lake buoys: short-term forecasts



KWRI/KDHE/NSF funded experiments = Learn important factors + mitigation testing



KWO funded Cores + Data = Long-term forecasts



Takeaways

- The Biological Survey conducts a wide range of theoretical and applied research, much of which addresses water quality and quantity concerns in Kansas.
- Our State-supported efforts aim to map flood extent in real time to support emergency response and prevent human catastrophe, understand the role of playa wetlands in aquifer recharge and farmland productivity, and reveal causes and treatments of harmful algal blooms to improve the quality of water for human health, wildlife, and recreation.
- Continued support will be critical for the Survey to provide insight, information, and services facilitating cost-effective management of water resources in the State.