

Flood and Drought compel rethinking: A Kansas Aqueduct and Energy Corridor

Mark Rude
Executive Director

Southwest Kansas Groundwater Management District No. 3



Floods

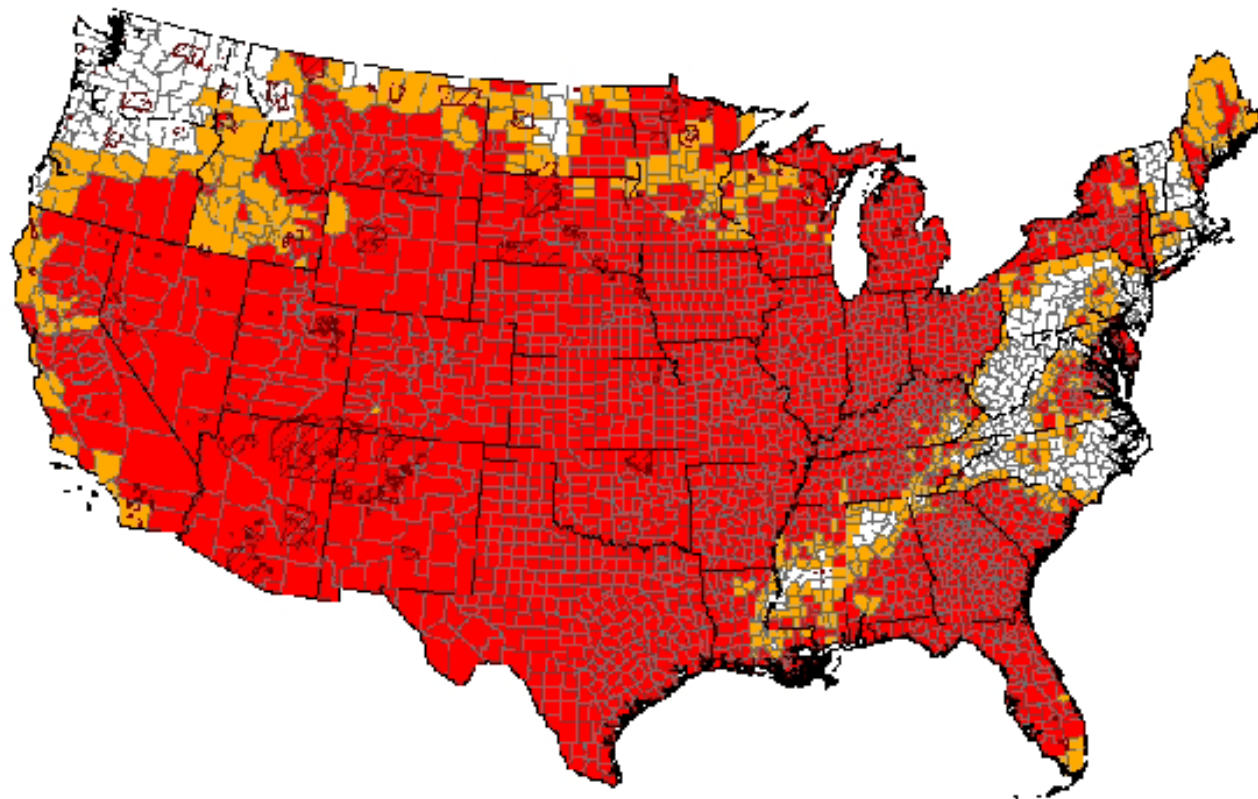
Regional Missouri River Flooding Information

- In **Doniphan County**, homes and businesses affected by flooding.
- In **Atchison County**, homes and businesses south of the city of Atchison impacted. Rail lines washed out along the river and agricultural land was affected by two levees that overtopped.
- In **Leavenworth County**, the levees overtopped, resulting in parks being under 10-12 feet of water.
- In **Wyandotte County**, flooding from three levees overtopping impacted the Lakeside Speedway and the Kansas City Police Department.
- (Photo of 2011 Missouri Flooding courtesy of Larry Geiger)






Secretarial Disaster Designations - CY 2012



Primary and Contiguous Counties Designated for 2012 Crop Disaster Losses



All Crop Disaster Incidents as of 12/19/2012

-  State Boundary
-  County Boundary
-  Tribal Lands

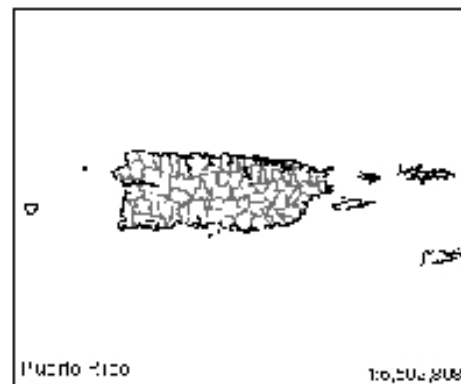
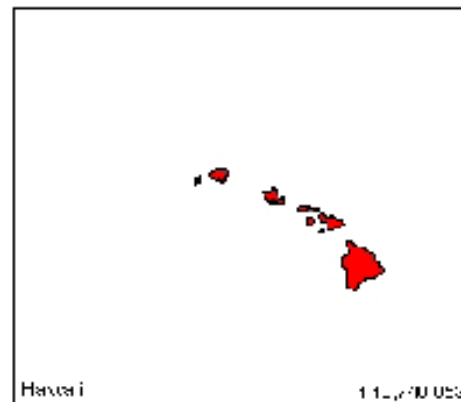
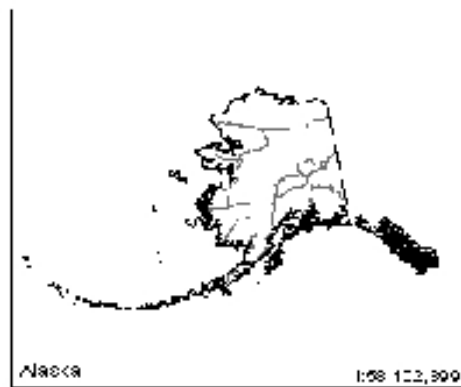
Total All Crop Approved Designations
December 19, 2012

-  Primary Counties: 2,307
-  Contiguous Counties: 43



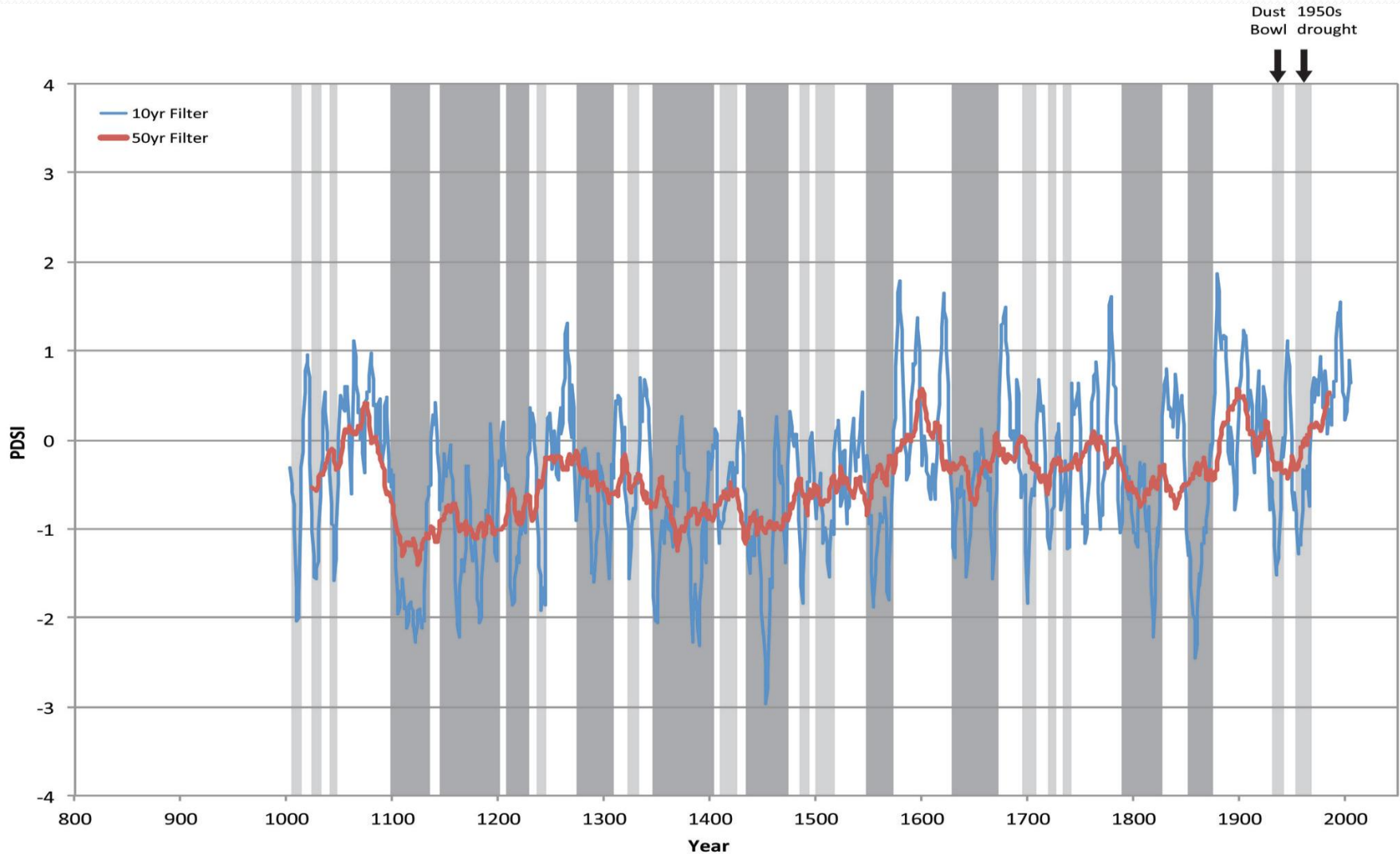
USDA Farm Service Agency
Production Emergencies and Compliance Division
Washington, D.C.
December 19, 2012

29,520,203

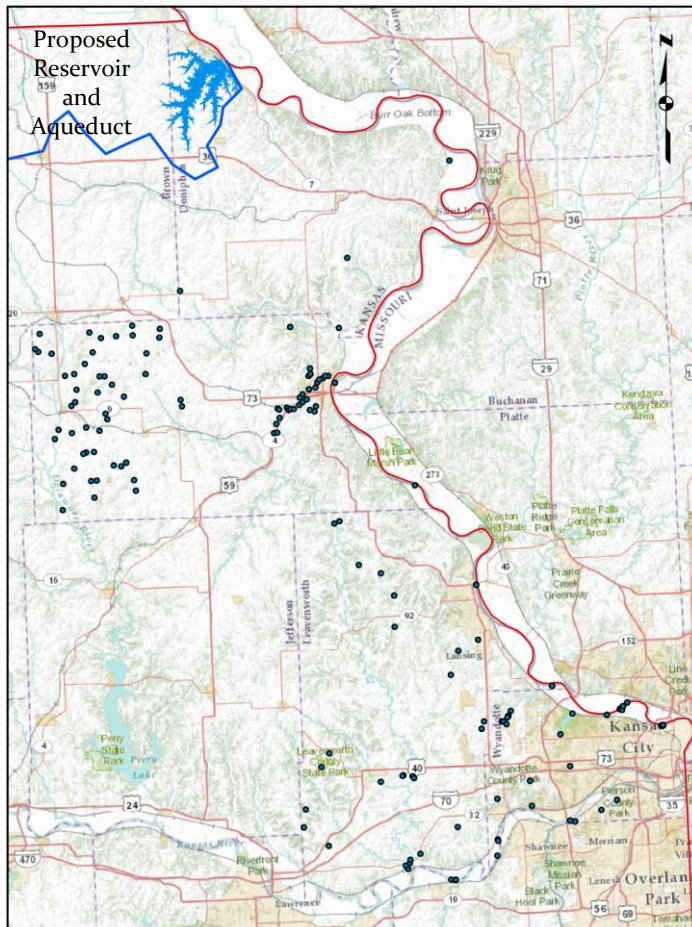


NE Kansas Climatic Variability

Anthony L. Layzell, KGS. PDSI = Palmer Drought Severity Index



The long term Missouri River water supply for Kansas is at risk.

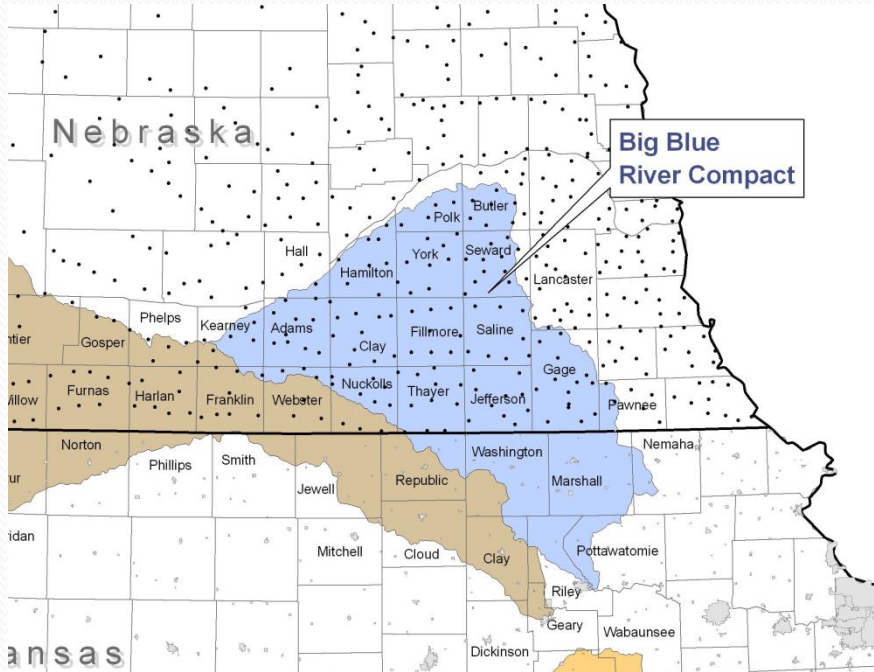


DWR Well locations

- Largest Kansas renewable surface water supply routinely passed downstream
- In relative terms, almost no appropriations have been requested and granted under Kansas Law
- Compact proceedings with other states could occur without warning, setting Kansas portion near zero.

Kansas Big Blue Compact allocation also sent to downstream states

- Big Blue basin is a key Kansas renewable water supply
- Big Blue Compact is federal Public Law 92-308 established in 1972
- 5.3 Kansas apportionment “...Kansas shall have free and unrestricted use of all waters of the Big Blue river basin flowing into Kansas...”
- In 2012 during severe drought: Part of Kansas Big Blue compact allocation in Tuttle Creek Reservoir was released by US Army Corps of Engineers for use in other states with no Kansas recourse or compensation.



The Business of Water

- It is commonly said, the problem of water is not one of physical shortage but, rather, one of governance.
- Governance is matching demand with supply, of ensuring that there is water at the right location, and the right time of year, and at a cost that people can afford and are willing to pay for.

Kansas Water Agencies with Water Governance Responsibilities

- Kansas Water Office/Water Authority
 - Kansas Water Plan and Surface Water Assurance.
- Department of Agriculture : Water Rights and Allocations
- Department of Health and Environment: Clean Water
- Groundwater Management Districts (GMDs)
- Water Distribution Districts:
 - Rural Water Supply Districts
 - Irrigation Districts
 - Public Wholesale Water Supply Districts (PWWSD)

A special state agency or public authority (like a PWWSD) is necessary for an Aqueduct project

Kansas Water Appropriation Act

- Water in the state is dedicated to the use of the people of the state
- Surface water and groundwater can be appropriated for beneficial use, by anyone, without waste or impairment to existing water rights
- Kansas is a “first in time, first in right” state
 - Date determines priority, not type of use
- Projects are proposed by filing an application for priority
 - subsequent approval may occur after all information needed for final review is provided.

The Business of Interstate Water

Only three ways to allocate interstate waters among states:

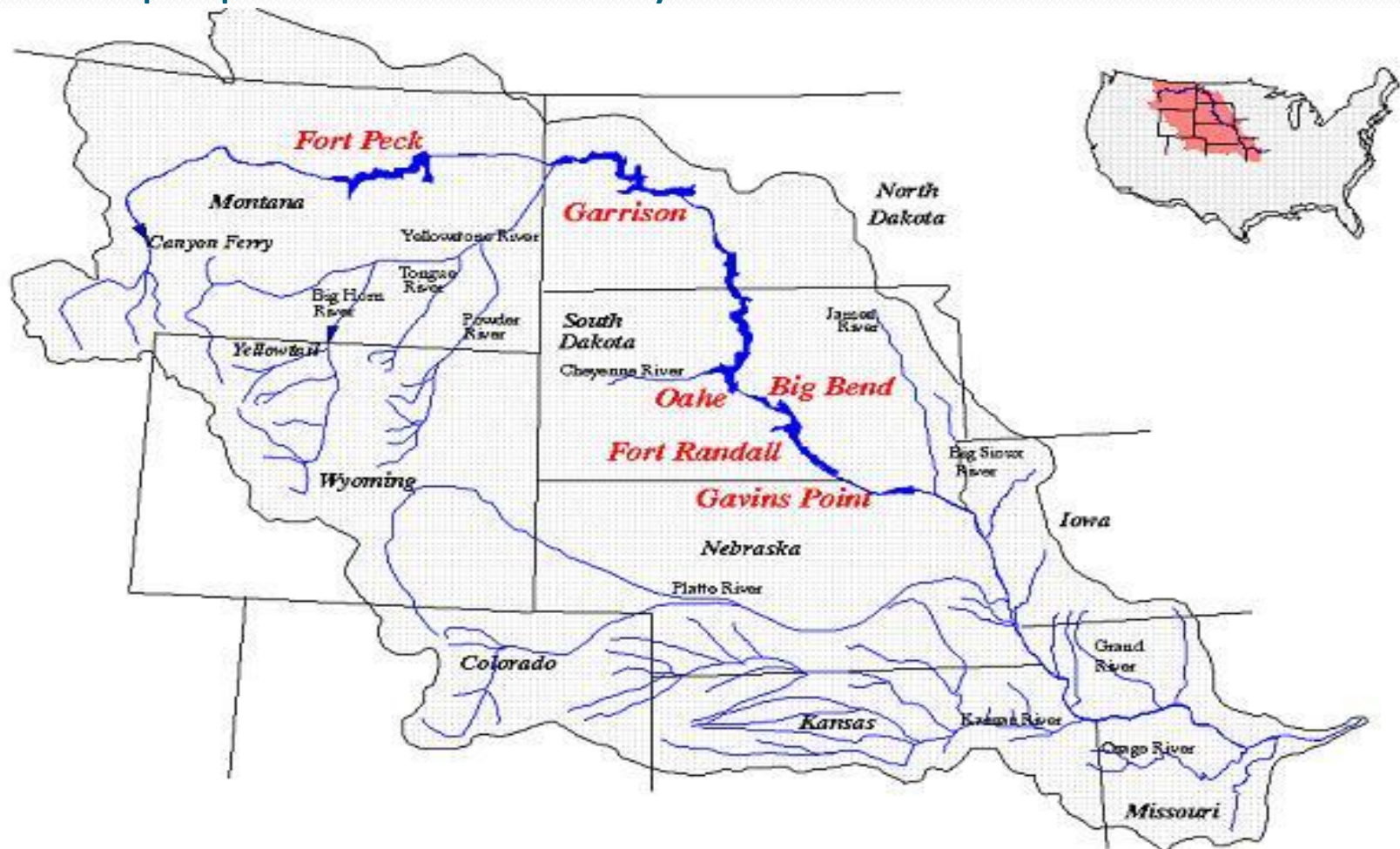
- States establish a compact agreement,
 - which is then ratified by congress
- Supreme Court equitably apportions the waters
 - Usually after requiring effort for compact agreement
- Congress Acts to apportion the waters

The Business of Kansas Interstate Water

- Interstate stream compacts governing Kansas apportionments are state law in each member state and are ratified by Congress as Federal Law.
 - Kansas-Nebraska-Colorado Republican River Compact, K.S.A. 82a-518
 - Kansas-Colorado Arkansas River Compact, K.S.A. 82a-520
 - Kansas-Oklahoma Arkansas River Compact, K.S.A. 82a-528
 - Kansas-Nebraska Big Blue River Compact, K.S.A. 82a-529
- **There is no compact agreement between states sharing the Missouri River**
http://www.ksda.gov/interstate_water_issues/?cid=431
- **There are significant Kansas River flows annually leaving Kansas**

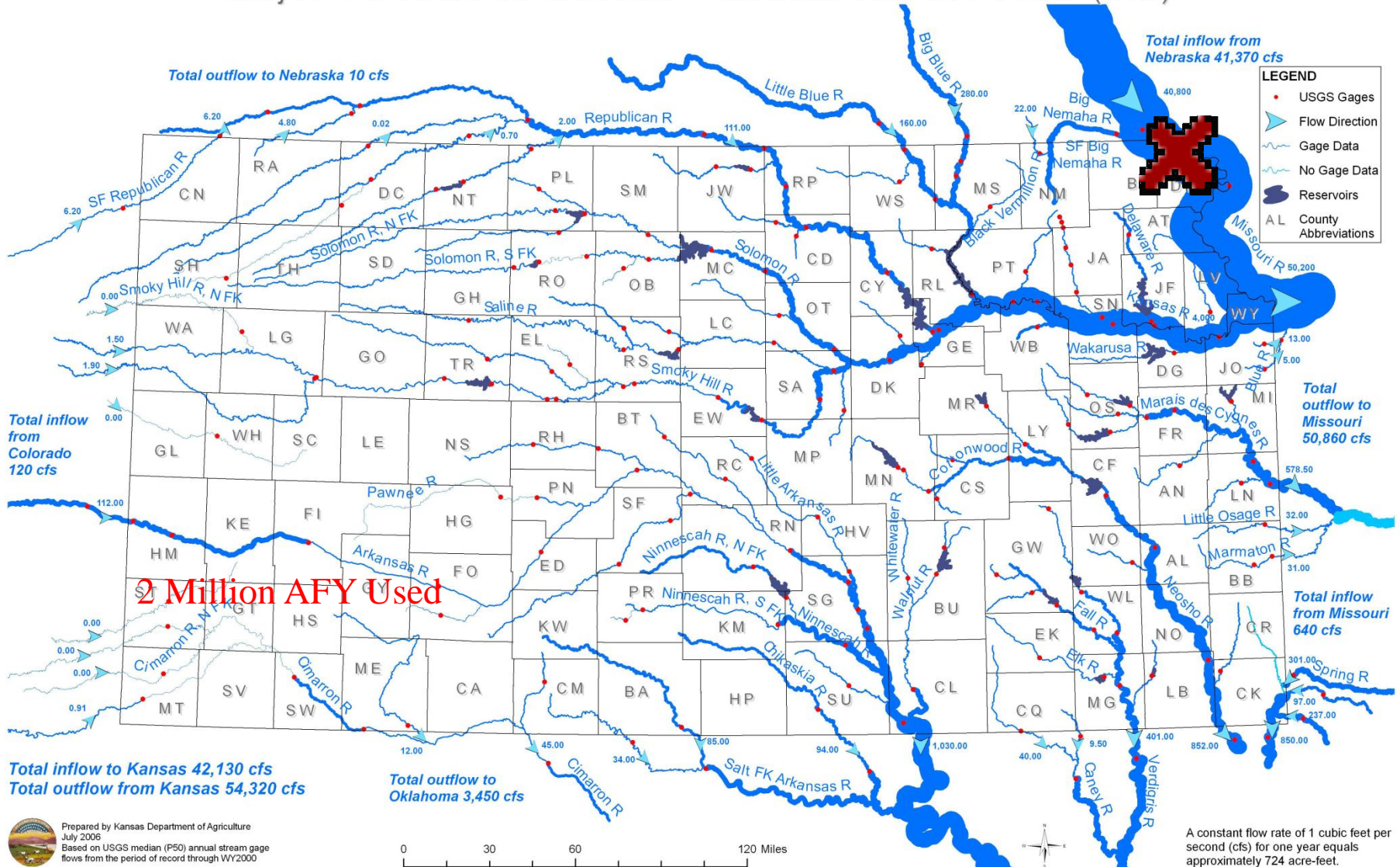
Missouri River basin

US Army Corp of Engineers controls reservoir projects for project purposes. No authority over state water allocations



29.5 Million AFY by White Cloud Kansas

Major Streams in Kansas - Median Annual Flow (cfs)

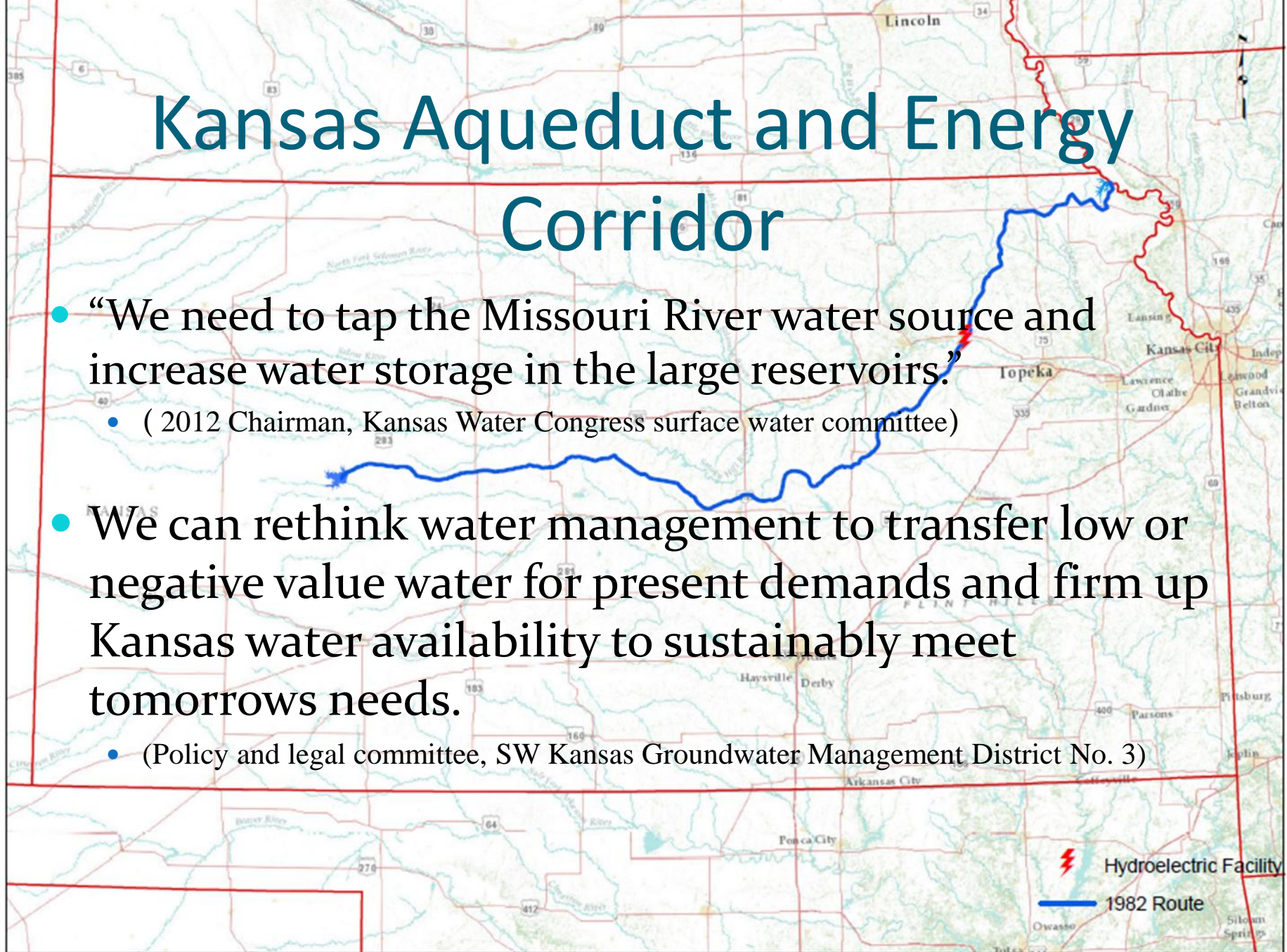


Prepared by Kansas Department of Agriculture
 July 2006
 Based on USGS median (P50) annual stream gage
 flows from the period of record through WY2000

A constant flow rate of 1 cubic feet per
 second (cfs) for one year equals
 approximately 724 acre-feet.

Kansas Aqueduct and Energy Corridor

- “We need to tap the Missouri River water source and increase water storage in the large reservoirs.”
 - (2012 Chairman, Kansas Water Congress surface water committee)
- We can rethink water management to transfer low or negative value water for present demands and firm up Kansas water availability to sustainably meet tomorrows needs.
 - (Policy and legal committee, SW Kansas Groundwater Management District No. 3)



A topographic map of the High Plains region in Kansas. The map shows the Ogallala Aquifer as a blue-shaded area. A red line indicates the proposed water transfer route from the east to the High Plains. Major cities like Lincoln, Olathe, and Overland Park are visible. The title "35 Years Ago" is overlaid on the map.

35 Years Ago

- 1976 Public Law for the High Plains Study (HPS)
 - Section 193 of the 1976 Water Resource Development Act (Public Law 94-587) authorizes and directs the Secretary of Commerce to study the depletion of water resources of the Ogallala Aquifer and to develop plans to increase water supplies in the area.
- Resulting 1982 HPS Report to the Secretary of Commerce.
- Five progressive aquifer management elements evaluated:
 - Kansas has implemented all but the fifth element; a major water transfer.
- The U.S. Army Corp of Engineers was directed by Congress to examine the engineering feasibility of transferring water from the east to the High Plains.
- The Kansas Water Transfer south route was found engineering feasible and the least expensive route identified.

Kansas Participated in HPS Kansas Law Review

LEGAL CONSTRAINTS ON DIVERTING WATER FROM EASTERN KANSAS TO WESTERN KANSAS*

*John C. Peck***

- “Since the Missouri River is a gaining stream, and since there has been major flooding of the Missouri River in the past, the taking of water during peak flow periods from the Missouri River might well be viewed by Missouri and points downstream as a positive, rather than a negative, development.” (30 U. Kan. L. Rev. 1981-1982, pg. 195)

* The research forming the basis for this Article was conducted under Contract No. EDA-78-2550 from the Economic Development Administration of the United States Department of Commerce. The views expressed are those of the author.

** Associate Professor of Law. B.S. 1968, Kansas State; J.D. 1974, Kansas. The author acknowledges the valuable research assistance of Michael Ramsey, Class of 1980, University of Kansas School of Law.

Kansas Participated in HPS Kansas Law Review

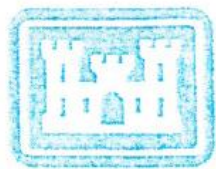
LEGAL CONSTRAINTS ON DIVERTING WATER FROM EASTERN KANSAS TO WESTERN KANSAS*

*John C. Peck***

- “A compact between Kansas and Missouri for allocation of the water of the Missouri River would involve some method of providing Kansas with the amount of water needed to ship west while preserving certain minimum flows for Missouri and other downstream states.” (30 U. Kan. L. Rev. 1981-1982, pg. 195)

* The research forming the basis for this Article was conducted under Contract No. EDA-78-2550 from the Economic Development Administration of the United States Department of Commerce. The views expressed are those of the author.

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US Army Corps
of Engineers
Kansas City District

Six-State High Plains Ogallala Aquifer Regional Resources Study

Water Transfer Element

Water Transfer From Missouri River To Western Kansas

September 1982

Appendix B

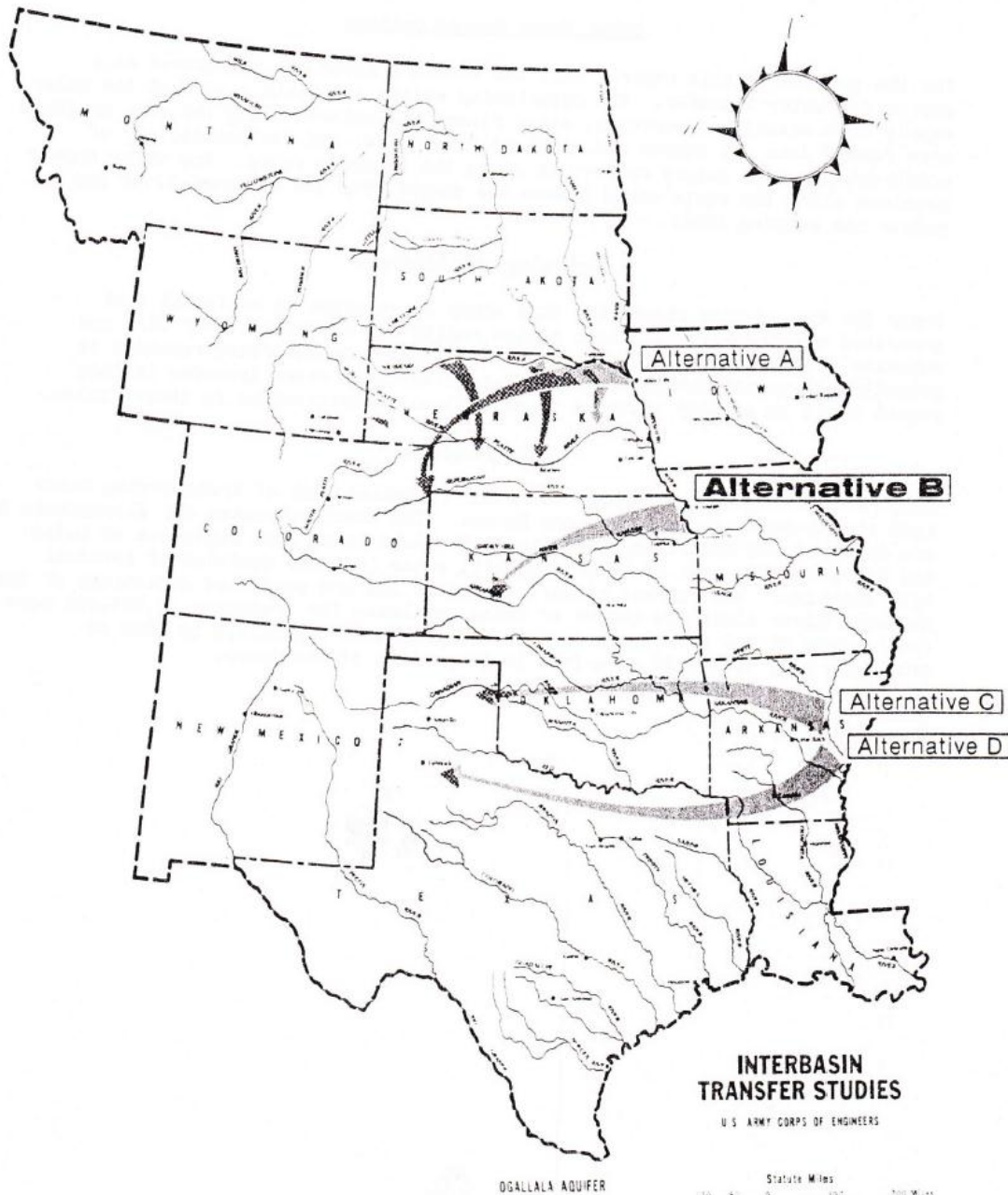
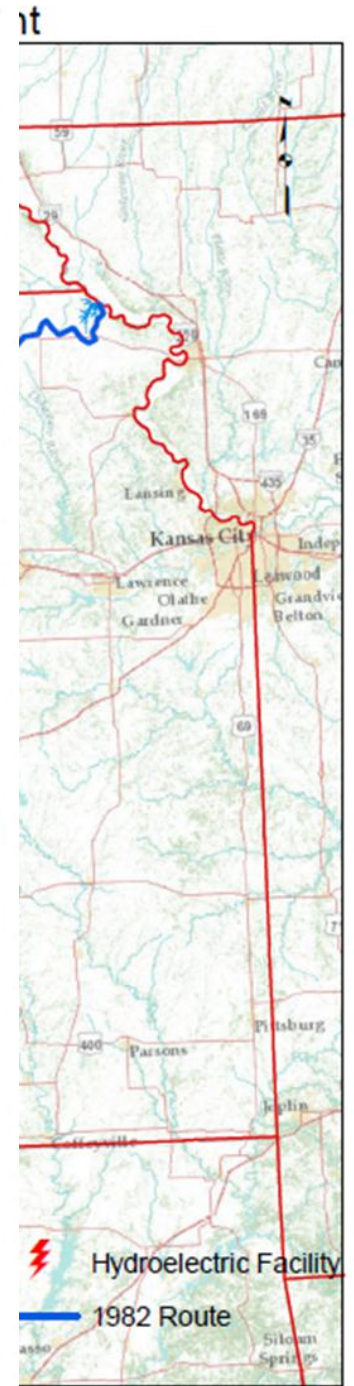


Figure 1. VICINITY MAP



The point at White Cloud, Kansas



High Plains Study, water transfer element, 1982

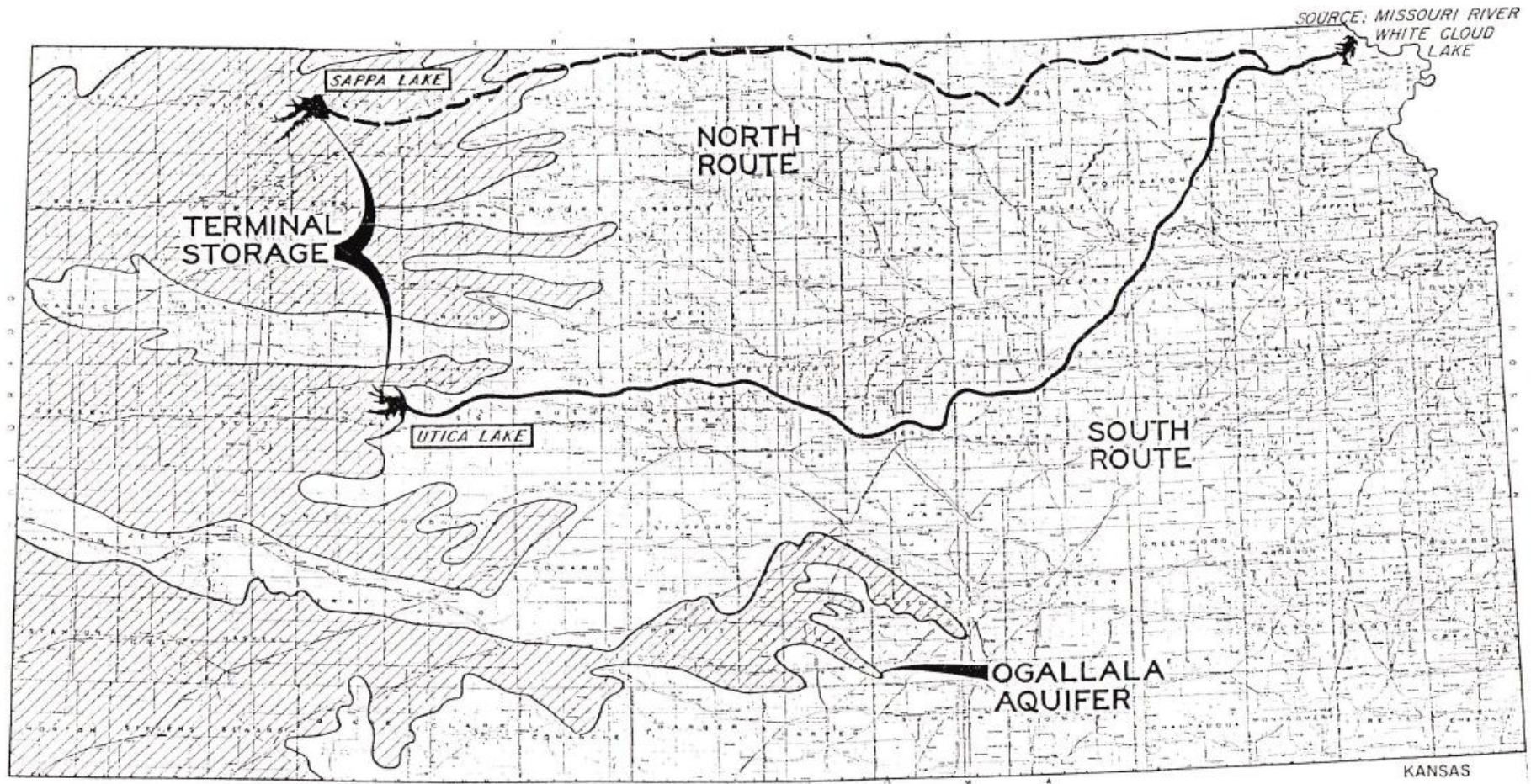
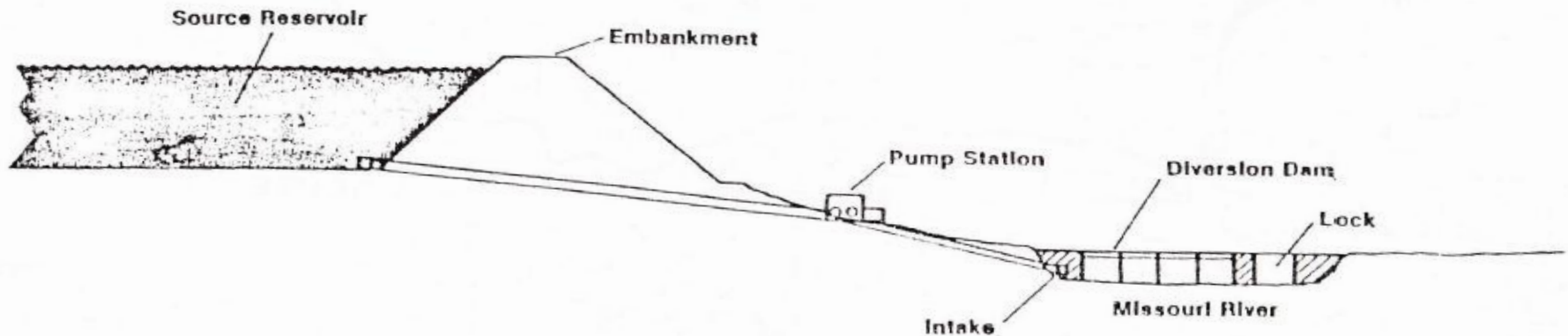


Figure 2
LAYOUT OF TRANSFER ROUTE
ALTERNATIVE B—HIGH PLAINS STUDY

1982 study: Envisioned a river dam and lock, pump intakes and source reservoir

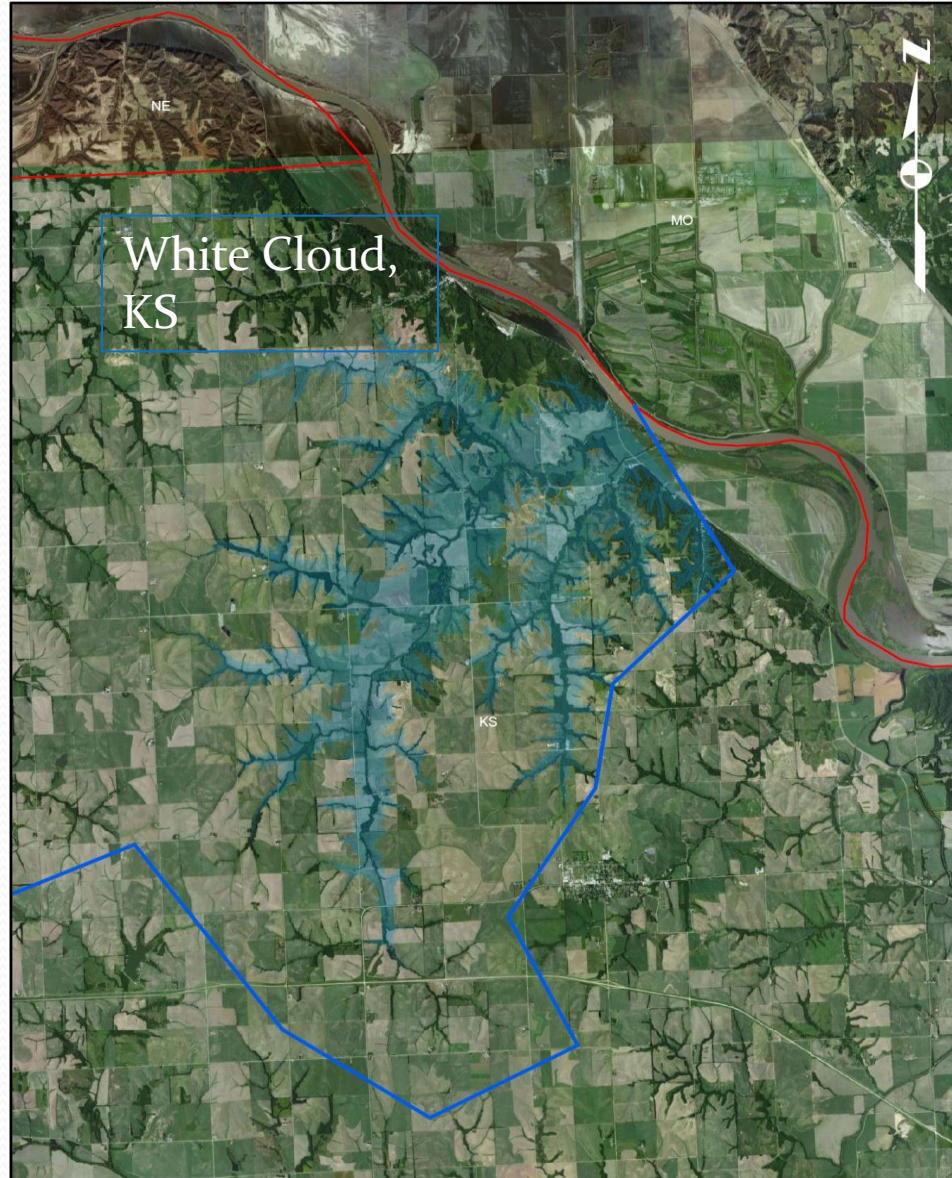


Source Features

Less river intrusive diversions: a number of collector wells



A Source Reservoir may be optional if collector wells are used.



Water would move 5' per second,
dropping $\frac{1}{2}$ foot per mile west.



Kansas water lifted west with 16 pump stations



Canal size or capacity may depend on the final project elements

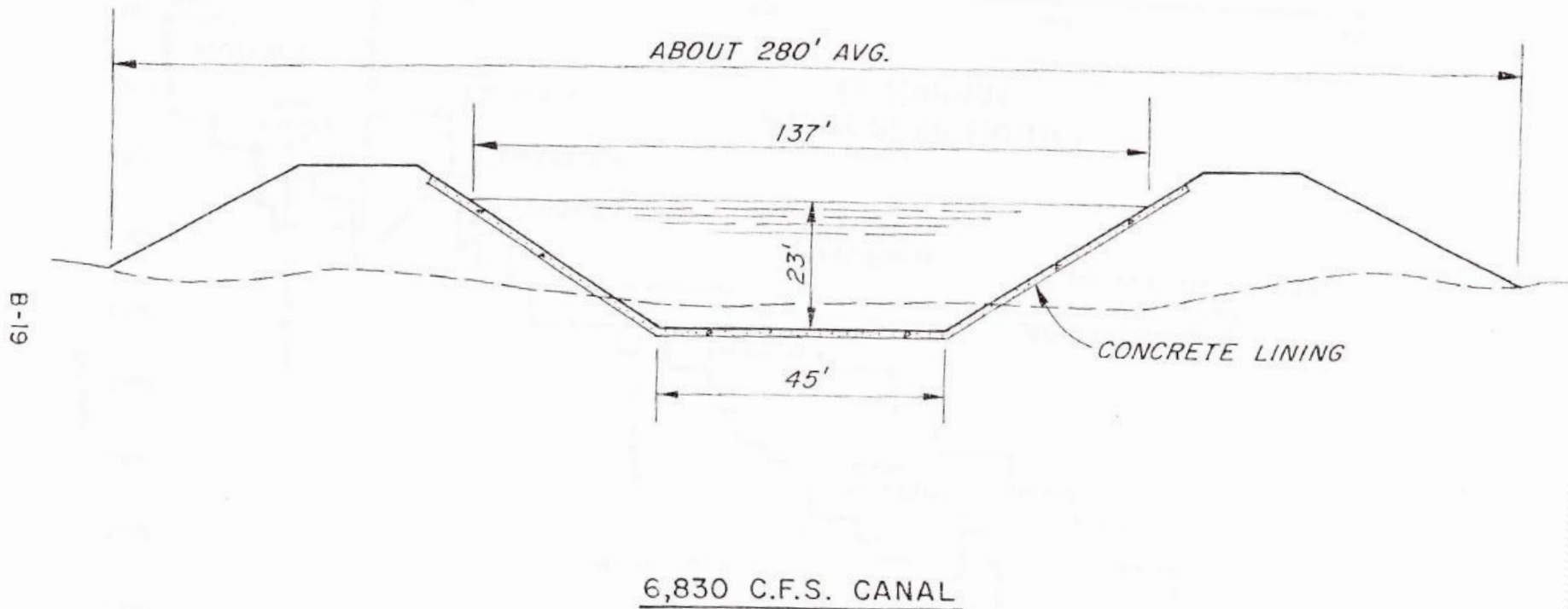
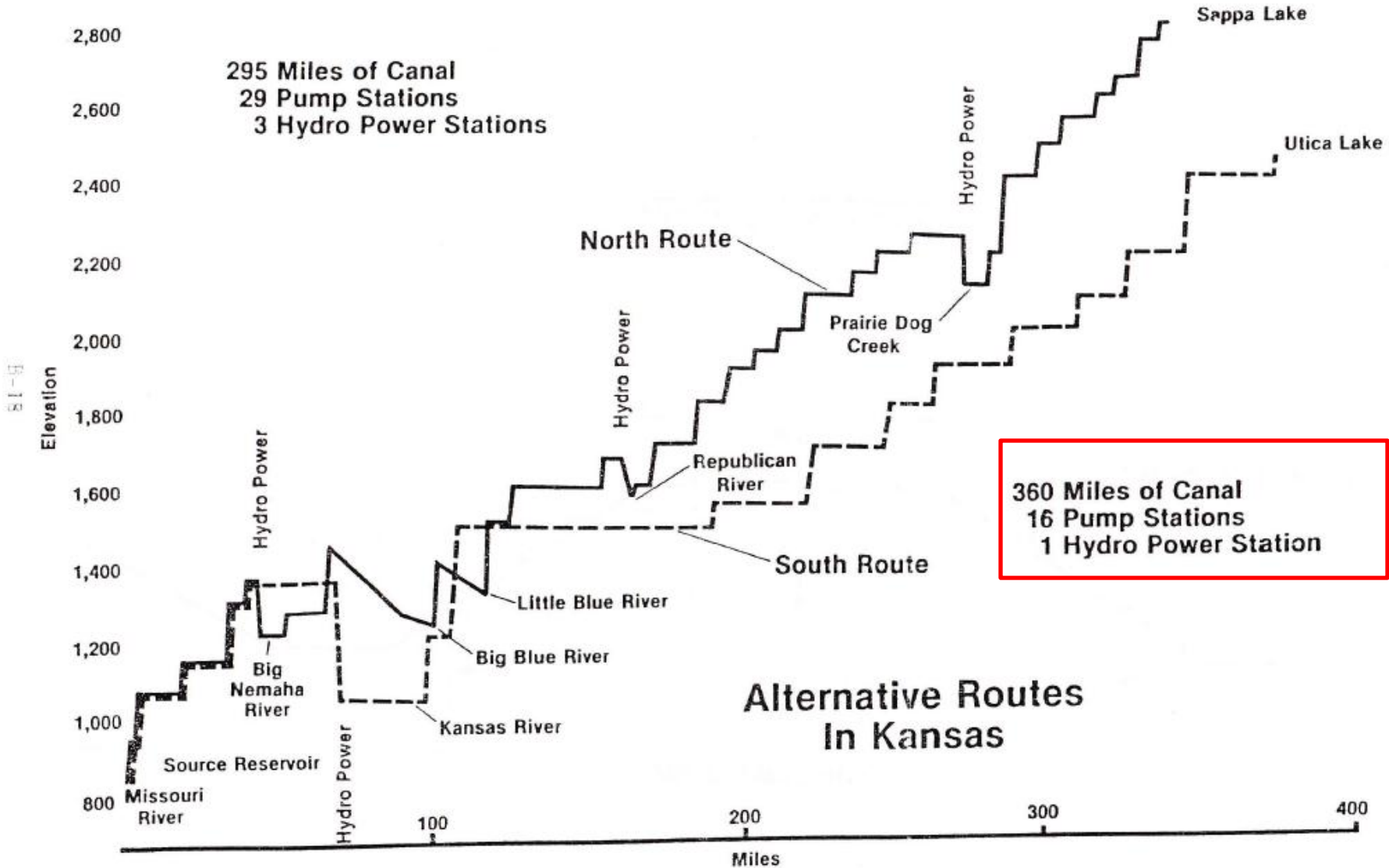
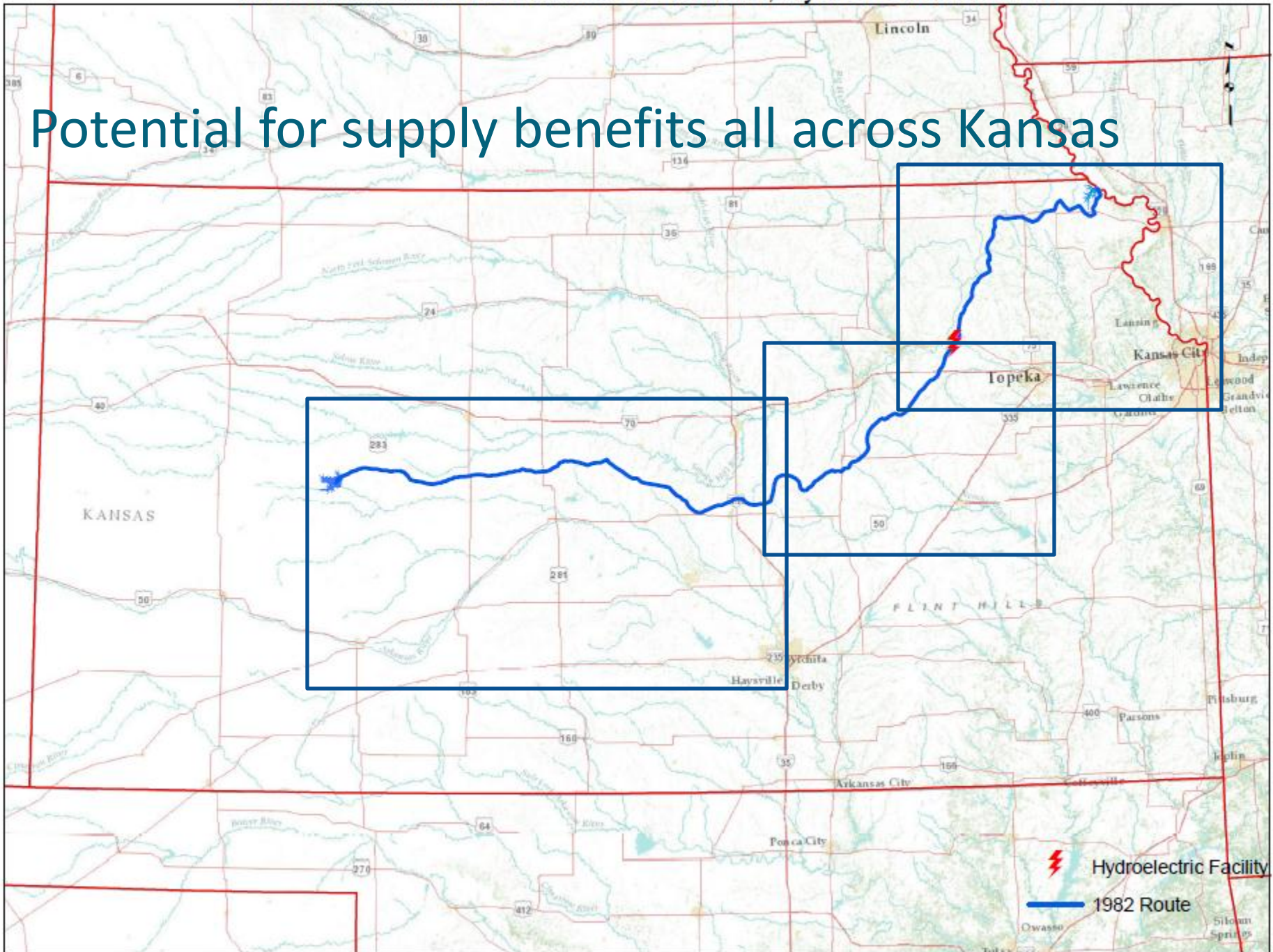


FIGURE 5 - TYPICAL CANAL DESIGN

Kansas South Route preferred



Potential for supply benefits all across Kansas



Ridgeline water supply assurance





Base flow
stream
augmentation

Council Grove Res.,
Neosho River
System,

Marion
Reservoir.

John Redmond
Res. & Water
Assurance

Hydroelectric Facility
1982 Route

Ridgeline water supply opportunity

Cedar Bluff Res.

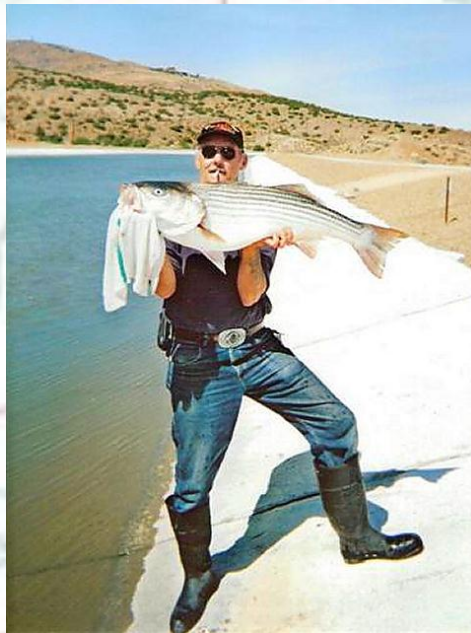
Wind farm energy storage

Kanopolis Res. and City of Salina

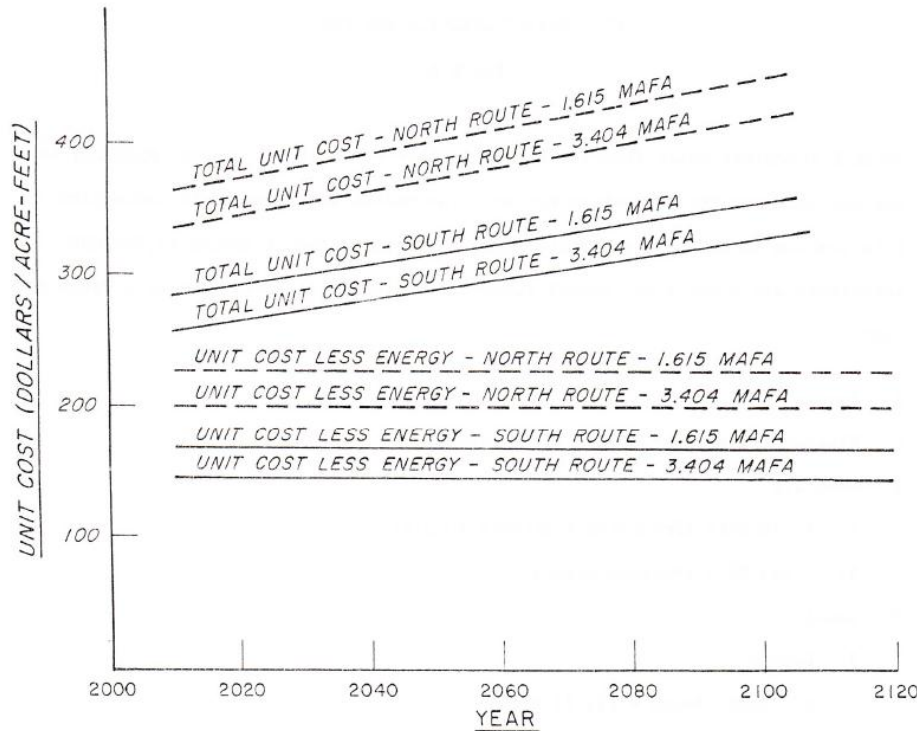
Cheyenne Bottoms and Wet Walnut

GMD2 and Wichita Aquifer Storage and Recovery

700,000 AF Lake with added ditches and pipelines to fields



Costs estimated in 1978 dollars 2013 dollars? Bond rates?



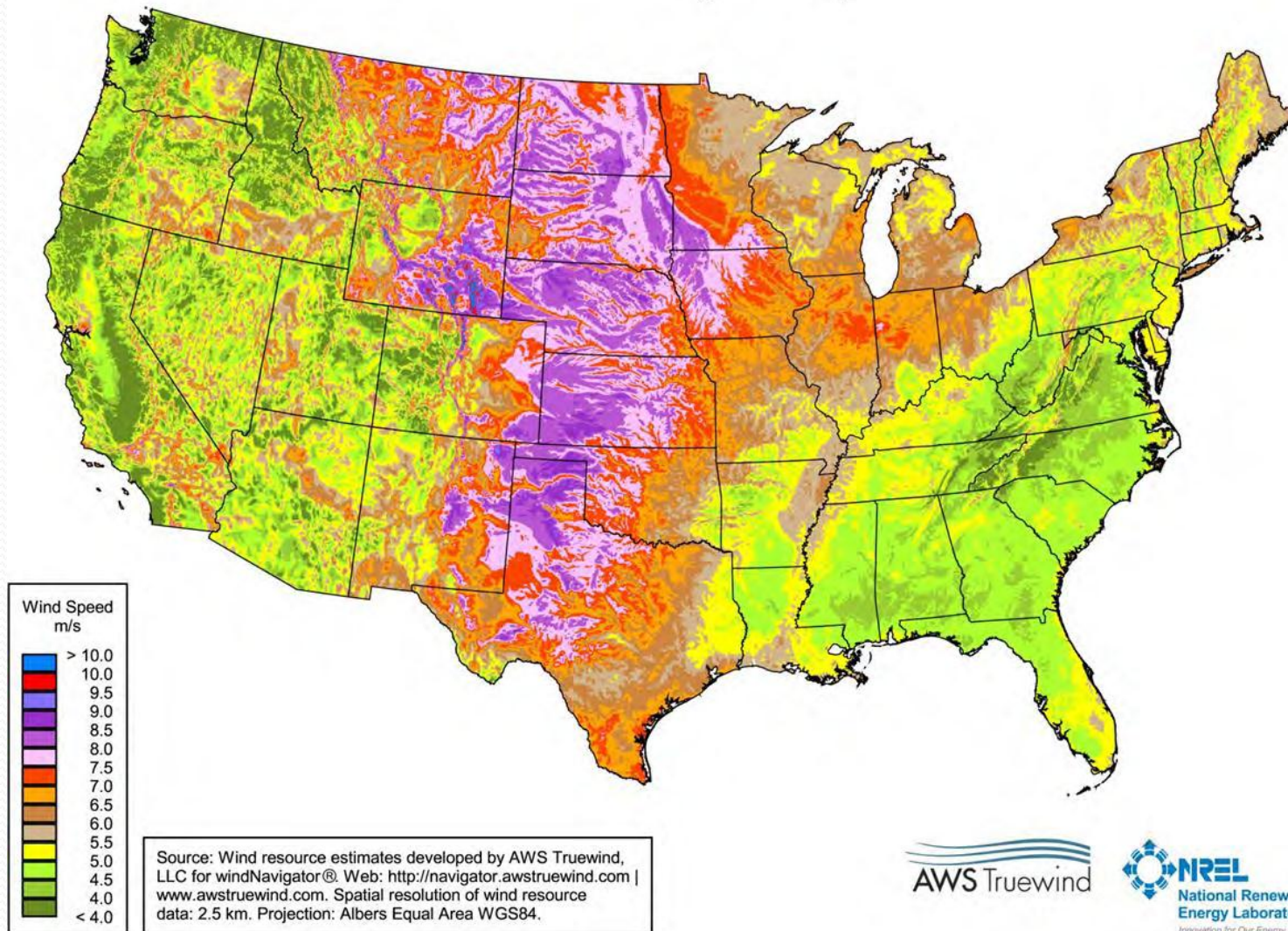
NOTE:
COSTS REFLECT 15-YEAR
CONSTRUCTION PERIOD.

ANNUAL COSTS WITH PROJECTED ENERGY COSTS
KANSAS CITY DISTRICT - CORPS OF ENGINEERS

The water management benefits of delivery to aquifer areas and to recharge include:

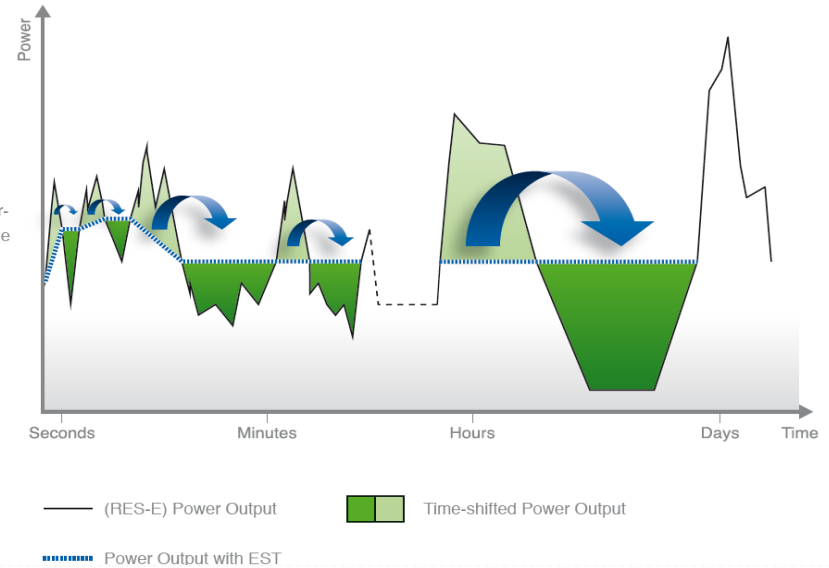
- Aquifer areas with KAEC water provide surety of supply, with the most efficient recharge being to establish groundwater as a secondary supply;
- Firms Kansas water supply by providing a "reserve" of water that can be recovered during prolonged drought or during interruption in the water delivery of a Kansas Aqueduct and Energy Corridor (KAEC);
- Encourages the use of renewable water supplies instead of continued over-reliance on finite groundwater supplies;
- Mitigates impacts of groundwater overdraft including increased power costs for pumping water from greater depths;
- Improves the quality of recharged surface water by filtration through underlying sediments in a process known as soil aquifer treatment.

Ridgeline aqueduct provides potential for Wind Electrical Energy Storage



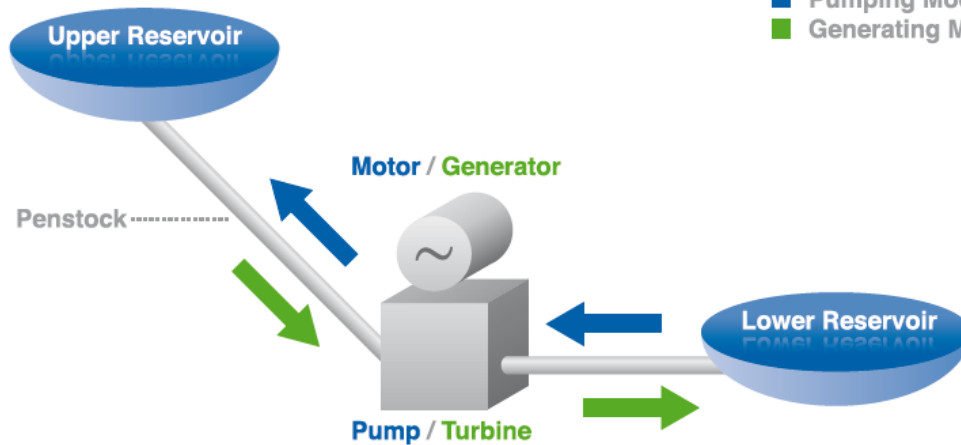
Pumped Hydro-Electric Storage

Figure 7:
Basic principles of output smoothing of EST on different time scales (i.e. storage capacities and response times) (Source: EEG)



- Pumping Mode
- Generating Mode

Figure 1:
Schematic diagram of a closed-loop PHES (Source: EEG)



Recommendation 1:

- Support the filing of applications to establish added Kansas appropriation of Missouri River water:
 - by GMD3, or other appropriate Kansas agency, using the 1982 Transfer Study for project DNA, and
 - waive or delay the statutory filing fees until project applications can be considered in final form.
- **Priority of filing is considered critical** for Kansas Missouri River interests while Kansas develops and evaluates the many needs, interests and project elements for aqueduct feasibility.

Recommendation 2:

- Support a Kansas Water Plan update to include a Kansas Aqueduct and Energy Corridor evaluation for pertinent basins, including the Missouri River.
- State Water Plan basin team staff and other state and local resources can collaborate with project leaders and stakeholders to develop elements of a KAEC Project.

Recommendation 3:

- Encourage a review of Kansas intrastate and interstate allocations to quantify all water uses and needs for best Kansas management goals, including during flood and drought. (“Every Drop Matters.” KWA Chair)
 - Example: Big Blue Compact allocations are controlled by Army Corps of Engineers Tuttle Creek Reservoir operations: releasing water targeted for use in other states without a Kansas agreement and without compensation to Kansas.
 - Water dedicated to Kansans and yet leaving the state may be cause for review of use restrictions.

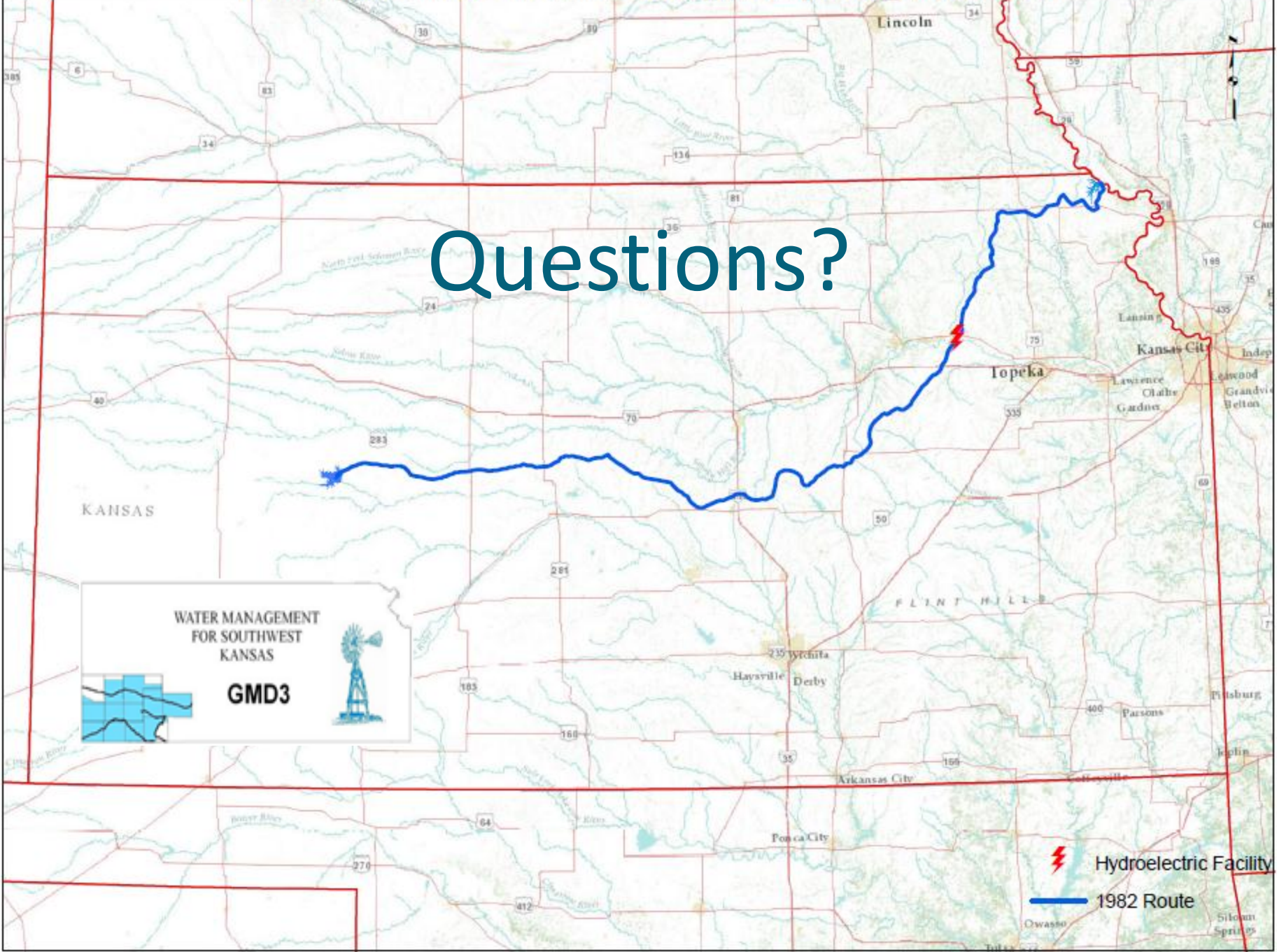
Recommendation 4:

- Place a priority on restoring the Kansas Interstate Litigation Account funding to detour compact violations of Kansas interstate water supply.
- Interstate Account funding should occur even if expenditure authority is not included.

Recommendation 5:

- Consider funding for a practical update of the John Peck 1982 Law Review article of the Legal constraints of moving water across Kansas, based on the proposed KAEC project.

Questions?





KANSAS

WATER MANAGEMENT
FOR SOUTHWEST
KANSAS

GMD3



 Hydroelectric Facility

 1982 Route

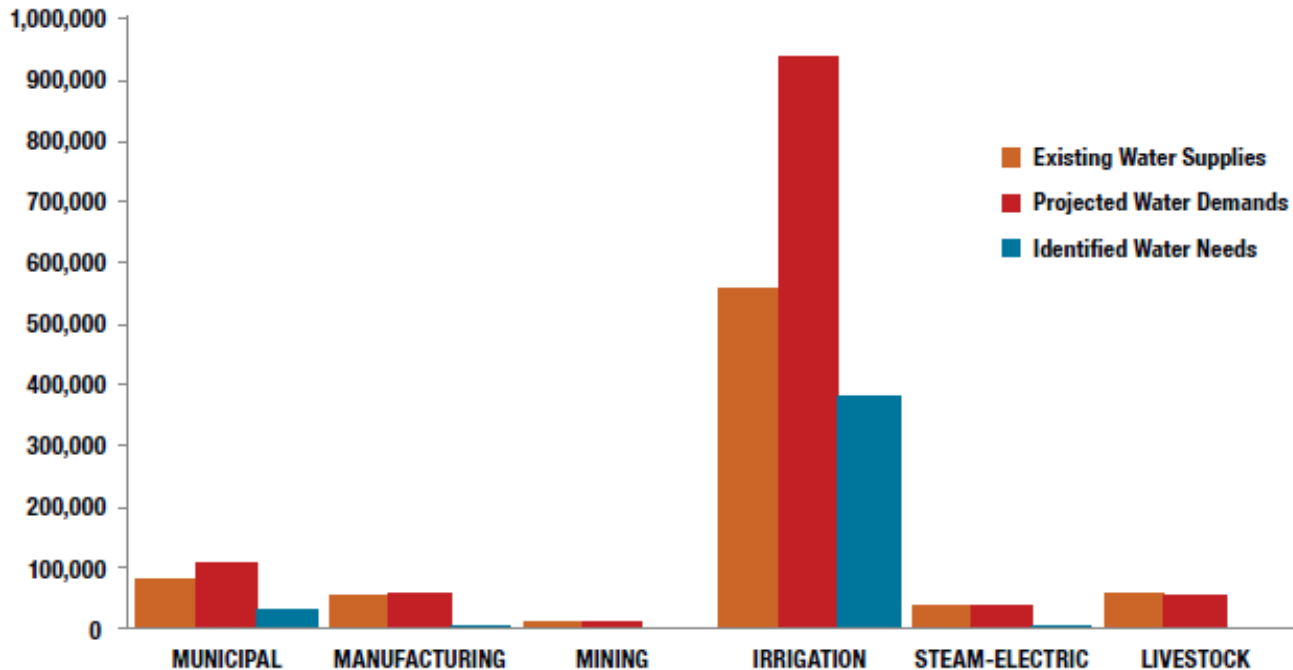


Other reference slides

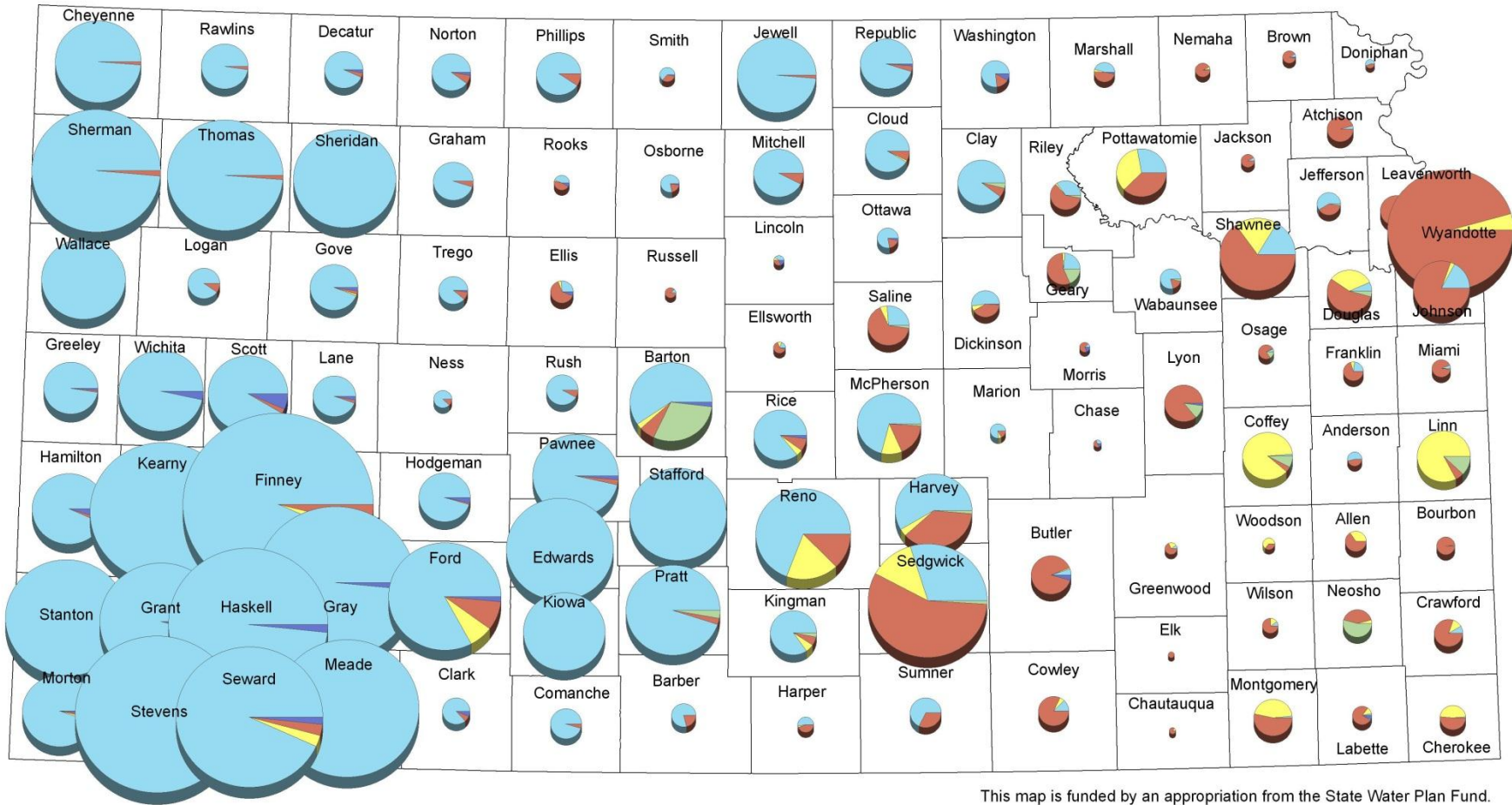
Future Need vs. Supply gap

A similar region overlying the Ogallala aquifer

FIGURE A.2. 2060 PANHANDLE REGION EXISTING SUPPLIES, PROJECTED DEMANDS, AND IDENTIFIED WATER NEEDS BY WATER USE CATEGORY (ACRE-FEET PER YEAR).



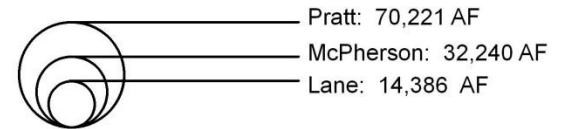
2007 Reported Water Use, by Type of Use for Kansas Counties



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

Percentages of 1.5% or less do not show up in the pie charts.

This map is intended for planning purposes only.



Use Made of Water

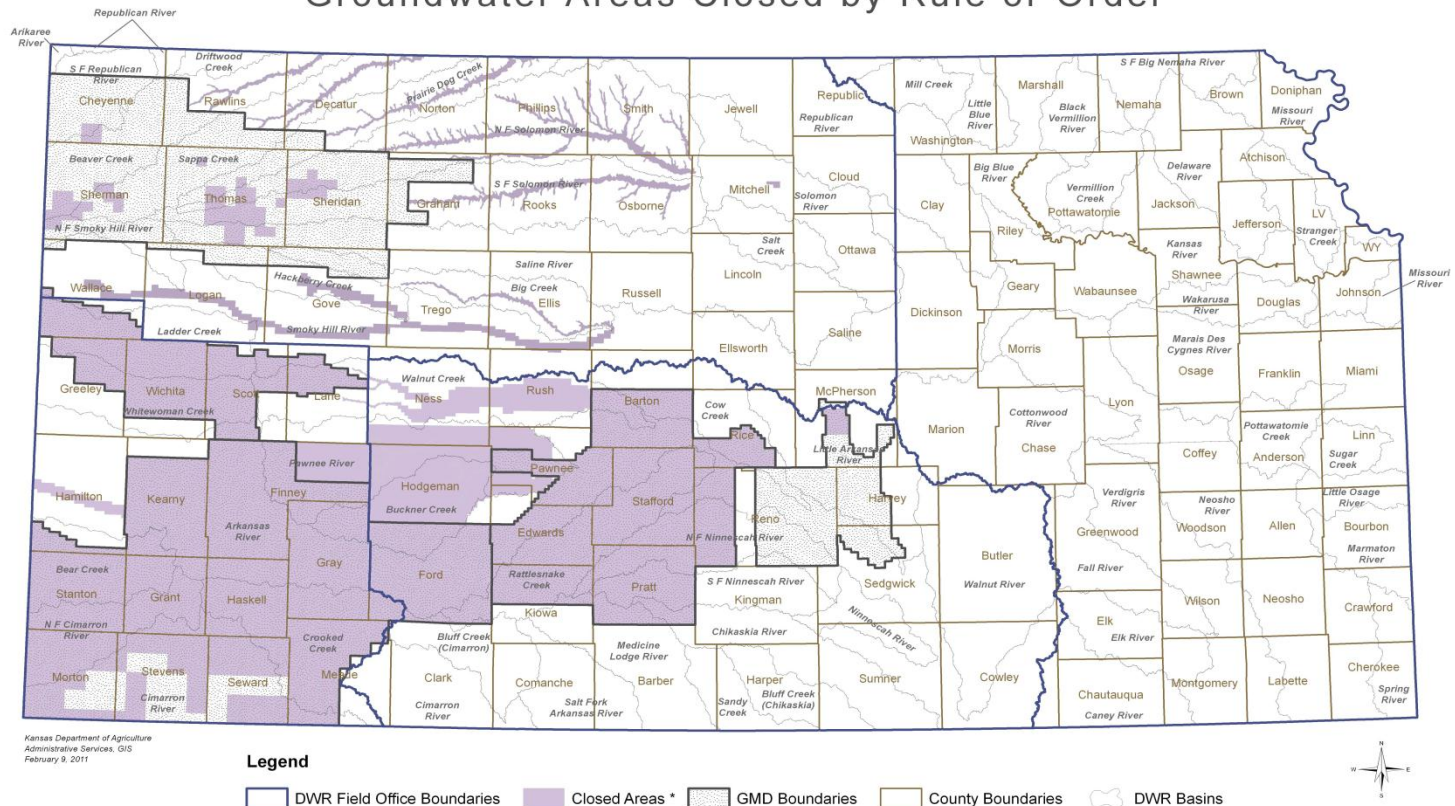


Kansas Department of Agriculture
Division of Water Resources
Water Use Unit
March 3, 2009



Five Kansas Groundwater Management Districts

Groundwater Areas Closed by Rule or Order



* Western Kansas Groundwater Management District No. 1 has requested rules and regulations to close the Ogallala and Niobrara formations within the district to new appropriation of water. A moratorium is in place while the rules and regulations are in the process of being adopted.

2011 Reported Water Use

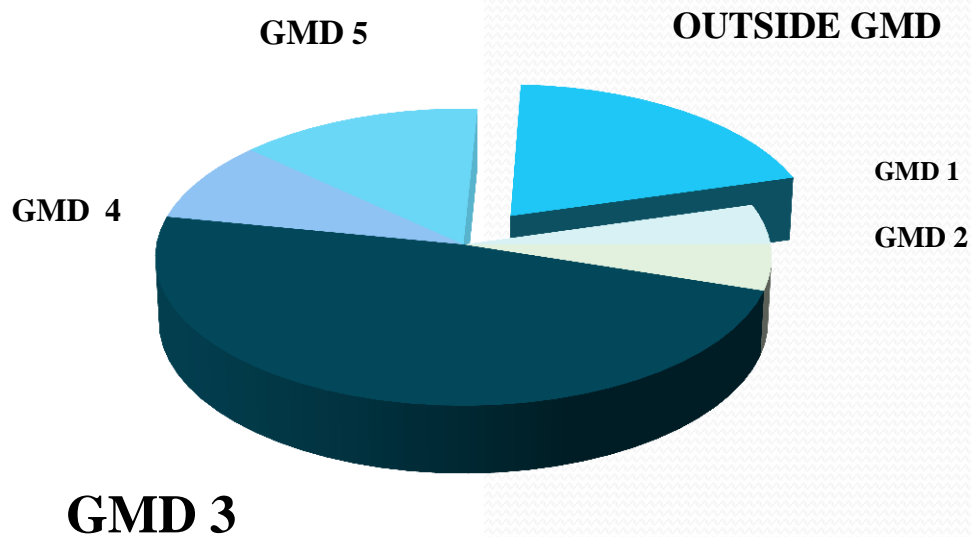
2011 Kansas

2011 Total Water Diverted by Groundwater Management District

Total Water Diverted

by Groundwater Management District
and outside GMD
All uses; all quantities in acre-feet

2011 Water Use by Groundwater Management District		
GMD 1	216,456	4.38%
GMD 2	246,978	5.00%
GMD 3	2,376,591	48.13%
GMD 4	434,545	8.80%
GMD 5	687,511	13.92%
OUTSIDE GMD	975,902	19.76%
Total	4,937,983	100.00%

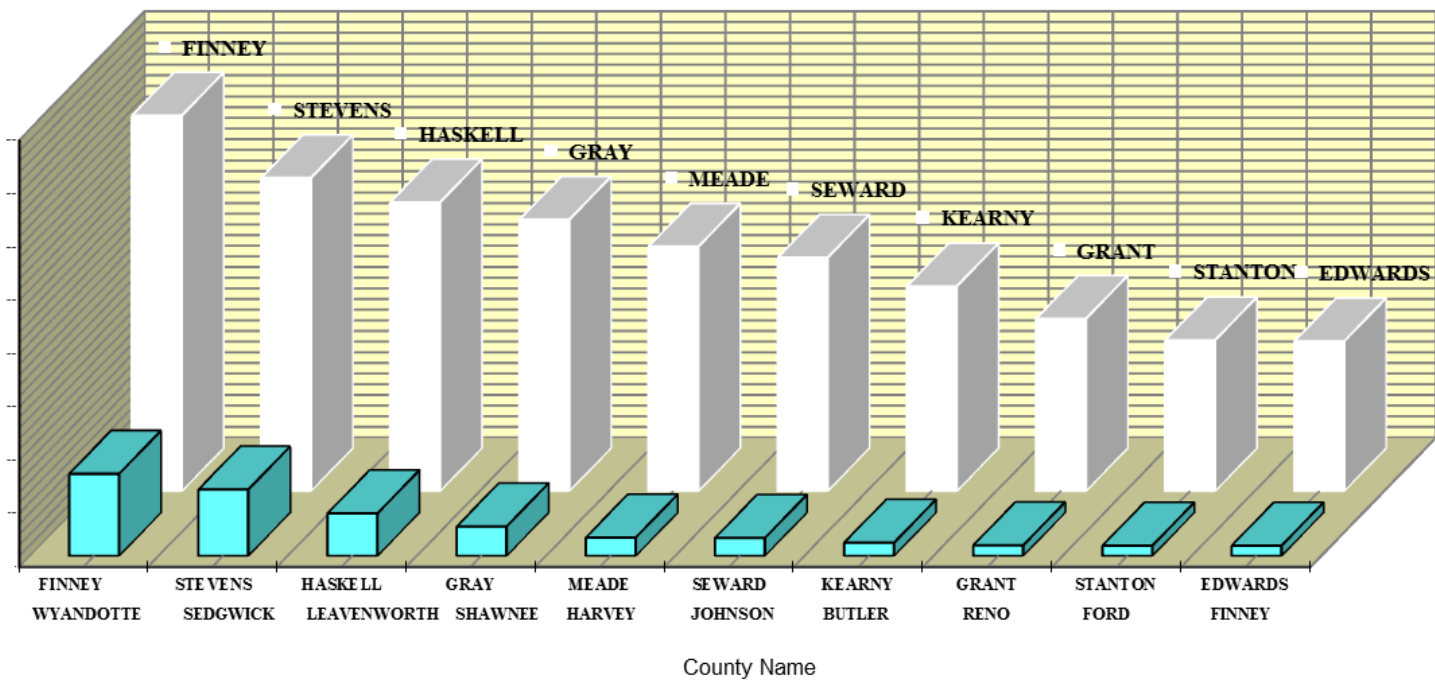


■ GMD 1
 ■ GMD 2
 ■ GMD 3
 ■ GMD 4
 ■ GMD 5
 ■ OUTSIDE GMD



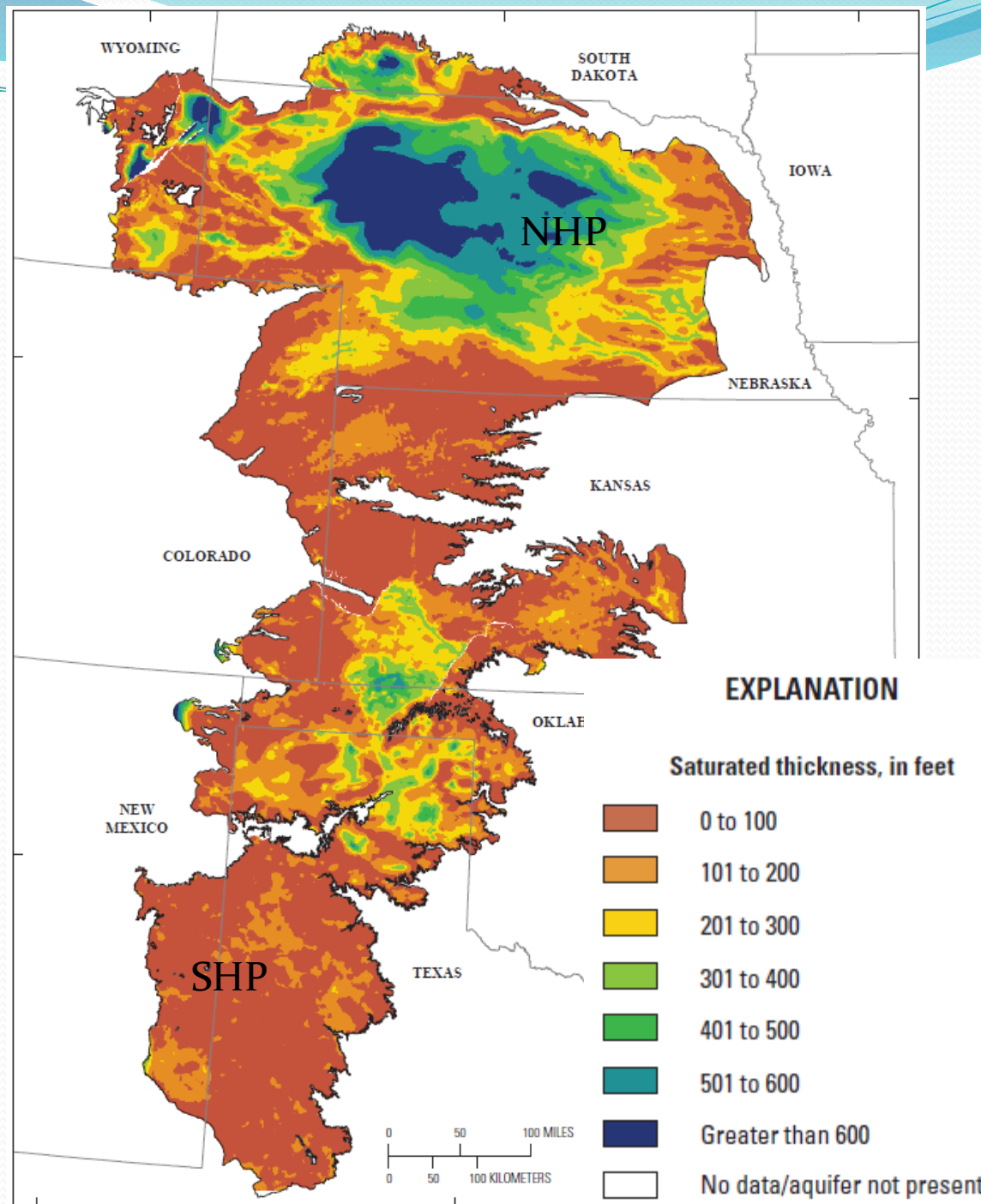
2011 Top Ten County water use

2011 Irrigation & Municipal Uses Comparison of Top Ten Counties



High Plains Aquifer Saturated Thickness in 2000

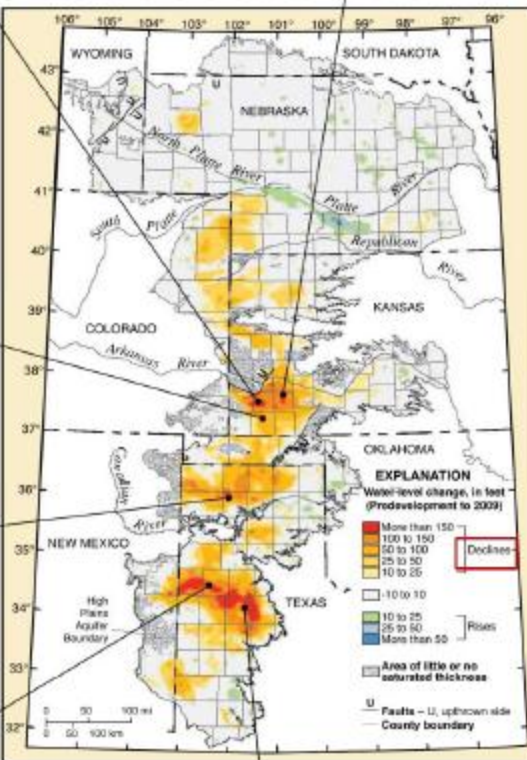
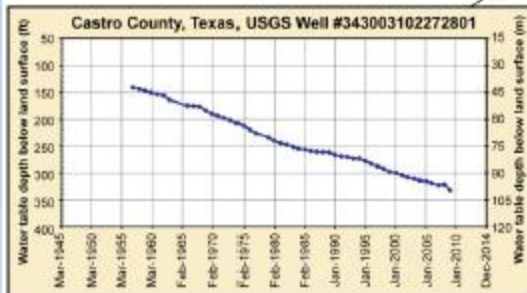
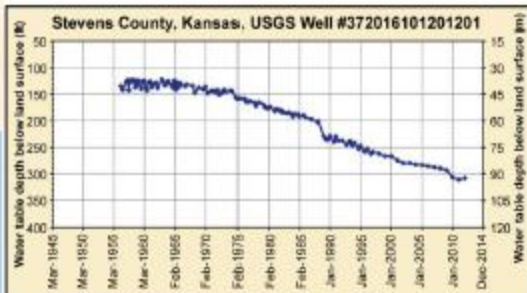
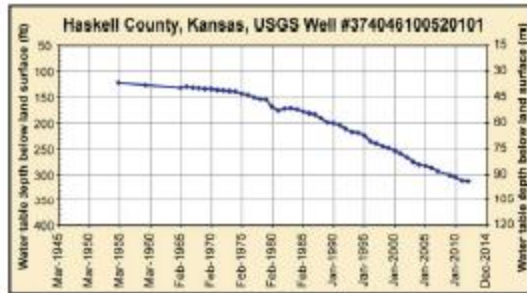
- NHP: large area with >500 ft; maximum of $\sim 1,100$
- SHP: mostly <100 ft



The water-level decline of the High Plains-Ogallala aquifer is the largest single water-management concern in the US

1945-2012 ground-water-level hydrograph declines

(Modified from Sophocleous, 2010)



Groundwater-level changes: Predevelopment to 2009

(McGuire, 2011)

Estimated Usable Lifetime for the High Plains Aquifer in Kansas
(Based on ground water trends from 1999 to 2009 and the minimum saturated thickness required to support well yields at 400 gpm under a scenario of 90 days of pumping with wells on 1/4 section)

