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

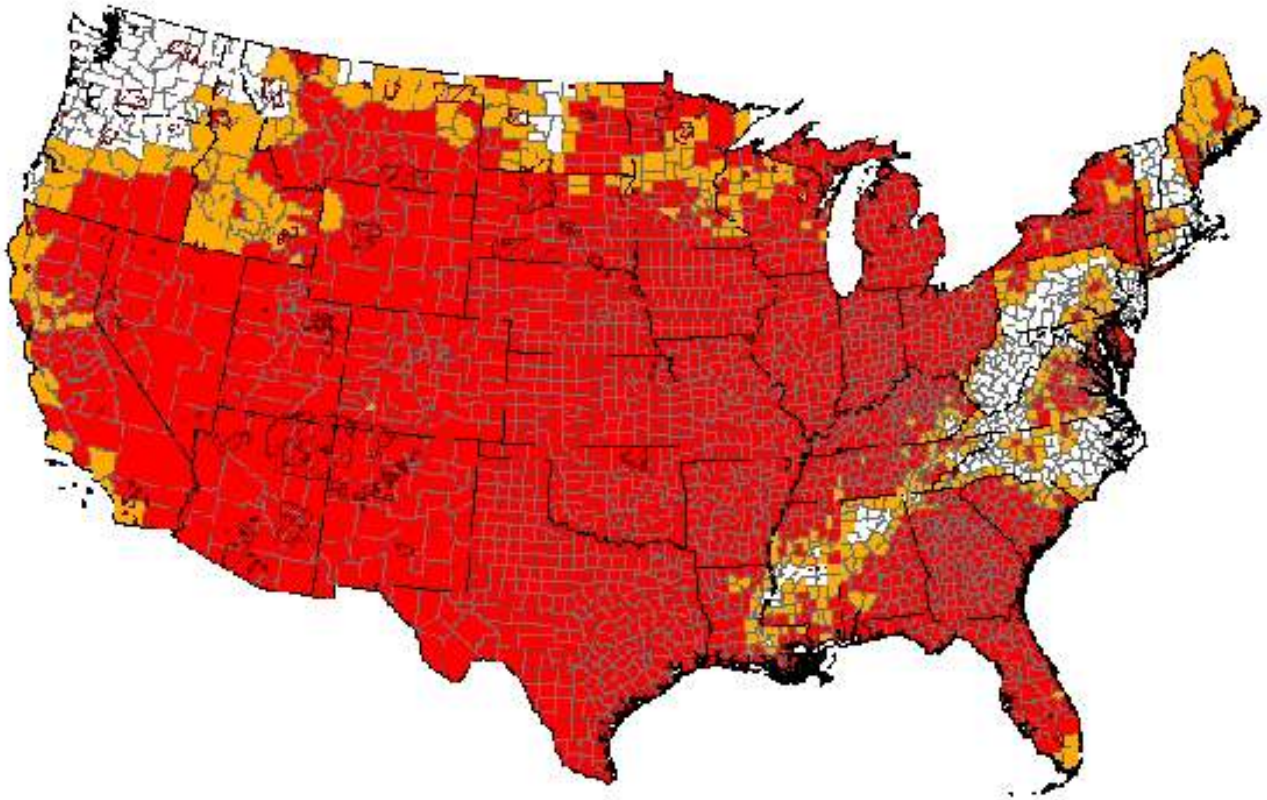
Mark Rude
Executive Director
Southwest Kansas Groundwater Management District No. 3

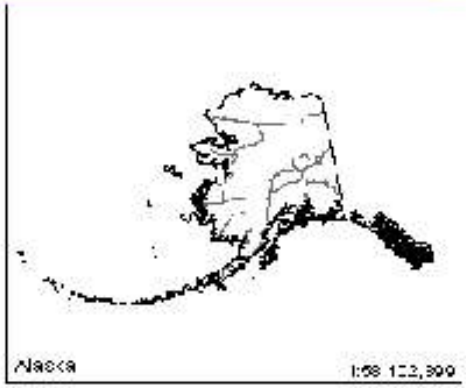
Floods

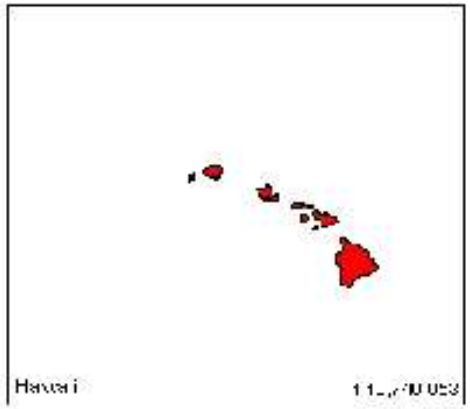
- In **Doniphan County**, homes and businesses affected by flooding.
- In **Atchison County**, homes and businesses south of the city of Atchison impacted. Rail lines washed out along the river and agricultural land was affected by two levees that overtopped.
- In **Leavenworth County**, the levees overtopped, 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)

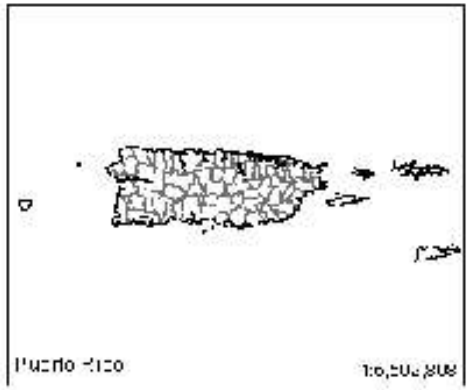
Secretarial Disaster Designations - CY 2012

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_

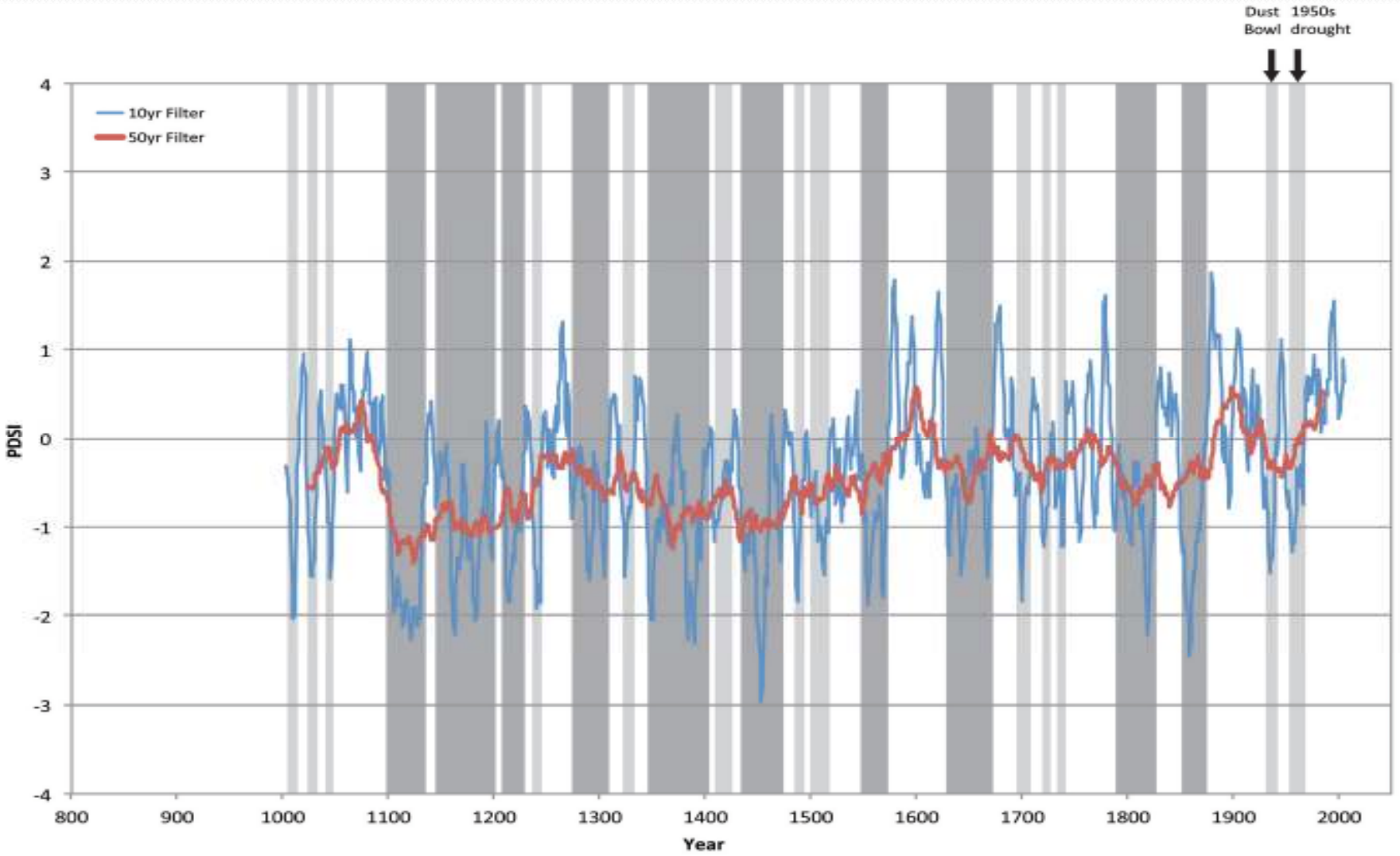
23,520,203

USDA FSA

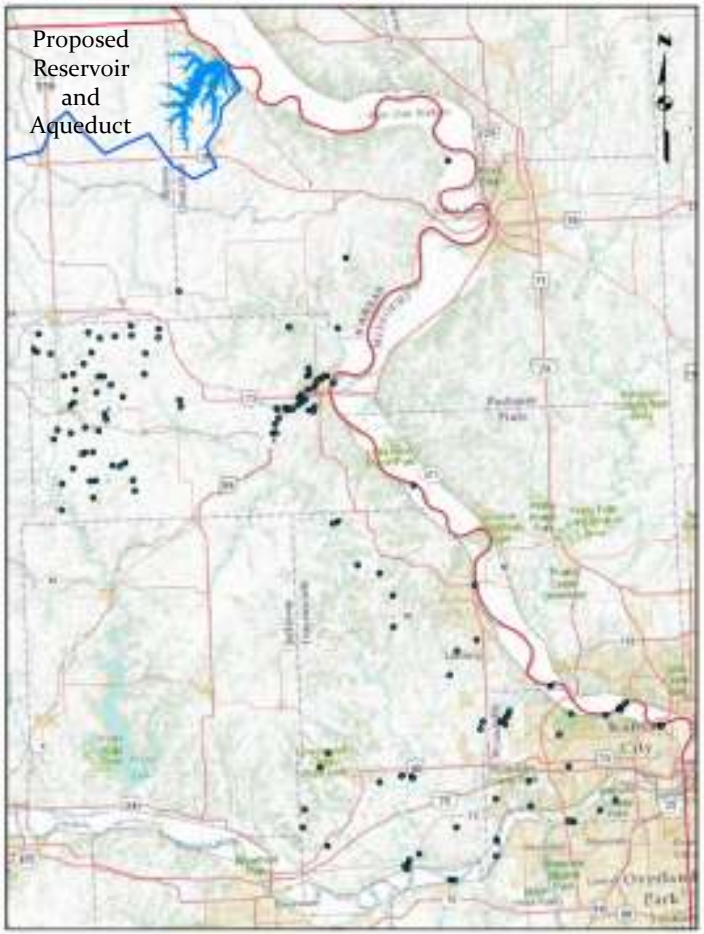
USDA Farm Service Agency
Production, Emergencies and Compliance Division
Washington, D.C.
December 19, 2012

NE Kansas Climatic Variability

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



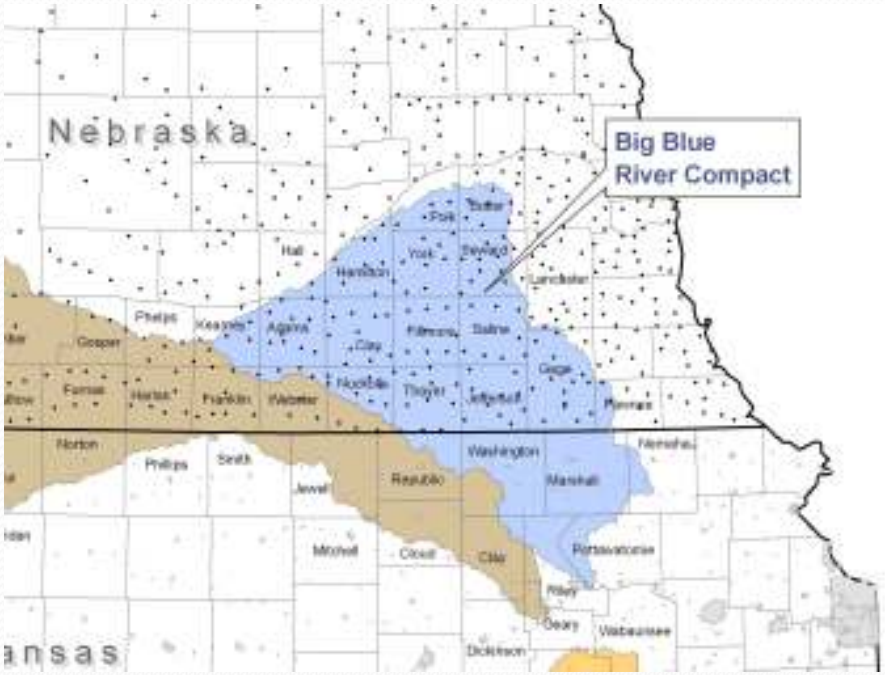
The long term Missouri River water supply for Kansas is at risk.



DWR Well locations

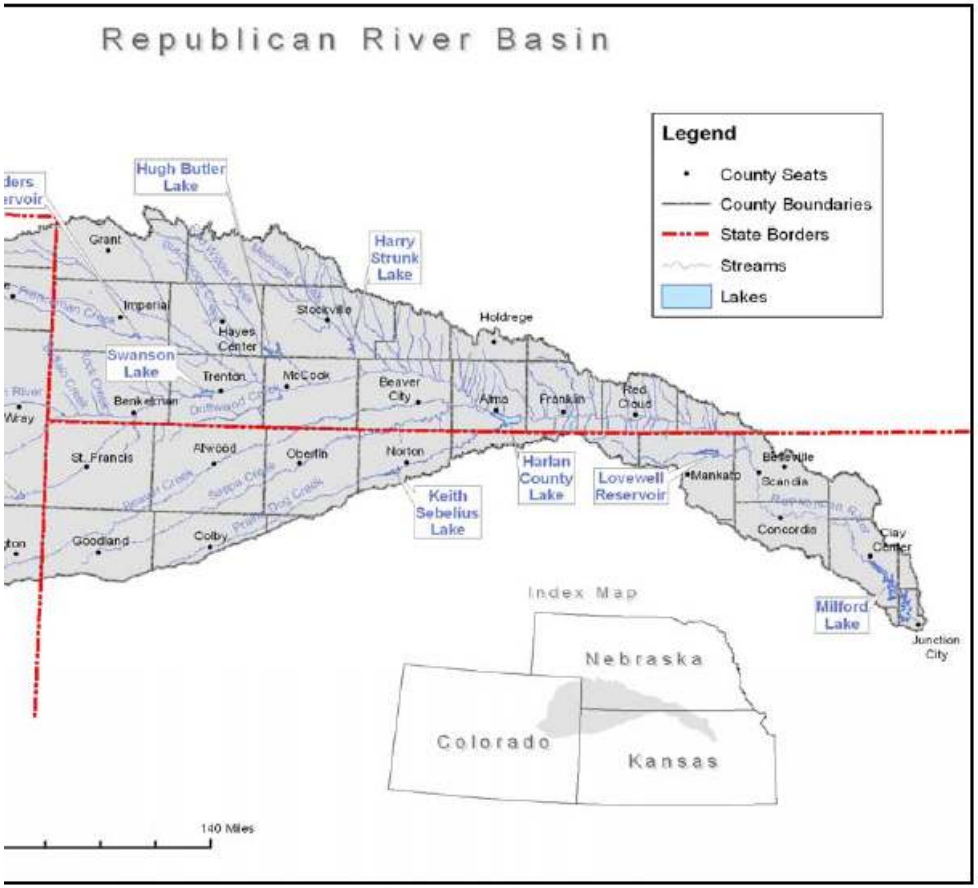
- Largest Kansas renewable surface water supply routinely passed downstream
- In relative terms, almost no appropriations have been requested and granted under Kansas Law
- No Compact exists, but compact proceedings with other states could occur without warning, setting Kansas portion near zero.

KS Big Blue Compact portion sent to other states, violating compact



- 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 agreement, recourse or compensation, violating the compact purposes.

KS Republican River portion sent to other states, violating compact



- Republican River Compact is federal Public Law (PL No. 696, 77th Congress, Chapter 545, 2nd Session) established in 1942.
- Article II: "… Beneficial consumptive use is the basis and principle upon which the allocations of water hereinafter made are predicated."
- Article II: "The term "Beneficial Consumptive Use" is herein defined to be that use by which the water supply of the Basin is consumed through the activities of man, …"
- Article IV: "…allocated for beneficial consumptive use in Kansas, annually, …"
- In 2012 during severe drought: Part of Kansas compact allocation in Milford Reservoir was released by US Army Corps of Engineers for use in other states with no Kansas agreement, recourse or compensation, violating the compact purpose of beneficial consumptive use in Kansas.

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.

- Water assurance promotes jobs and economic growth.

Kansas Water Agencies with Water Governance Responsibilities

- Kansas Water Office/Water Authority
  - Kansas Water Plan and Surface Water Assurance.
- Department of Agriculture : Water Rights & Interstate Compacts
- 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:

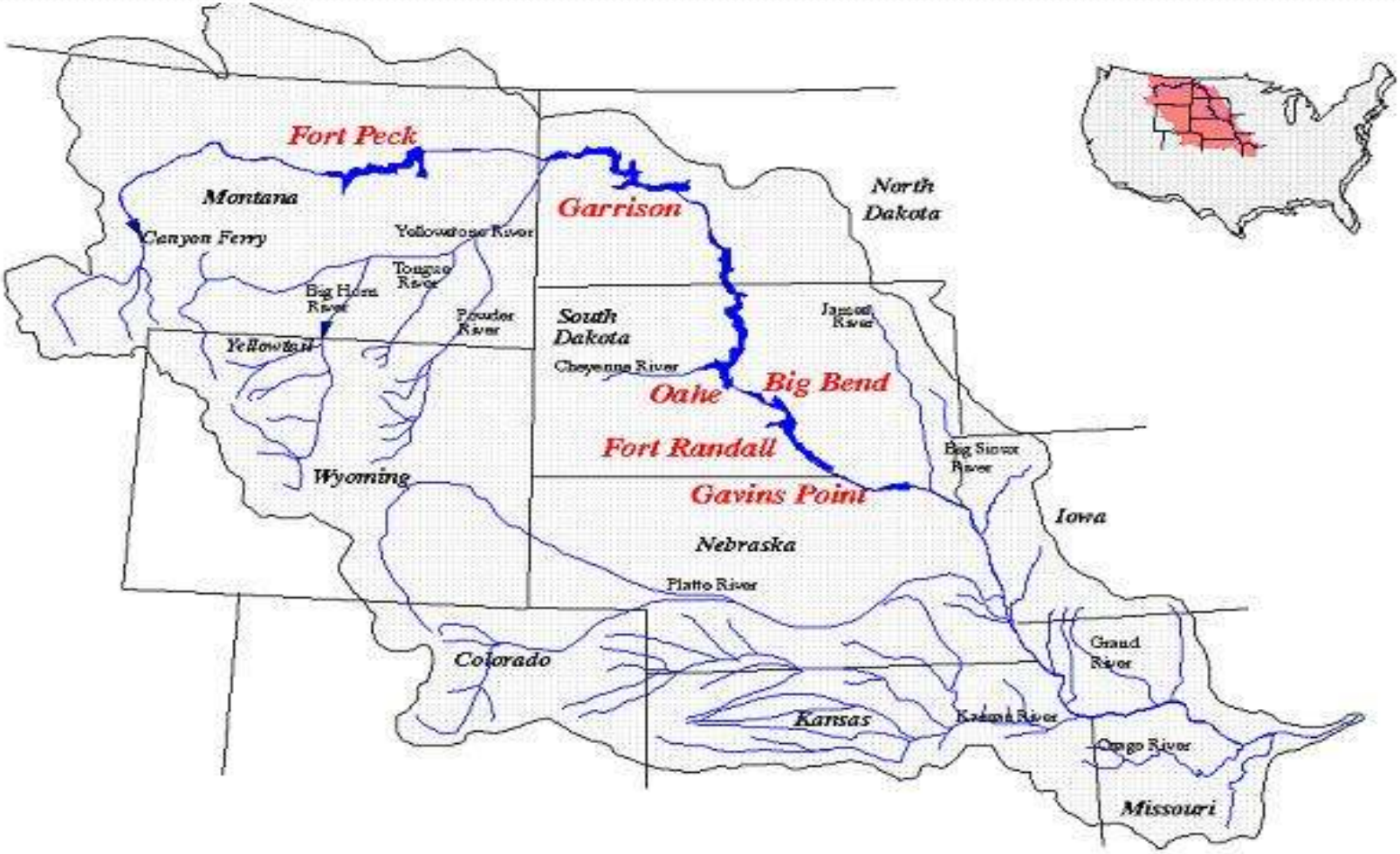
- States establish a compact agreement,
  - which is then ratified by congress
- Supreme Court equitably apportions the waters
  - Usually after requiring effort for compact agreement
- Congress Acts to apportion the waters

The Business of Kansas Interstate Water

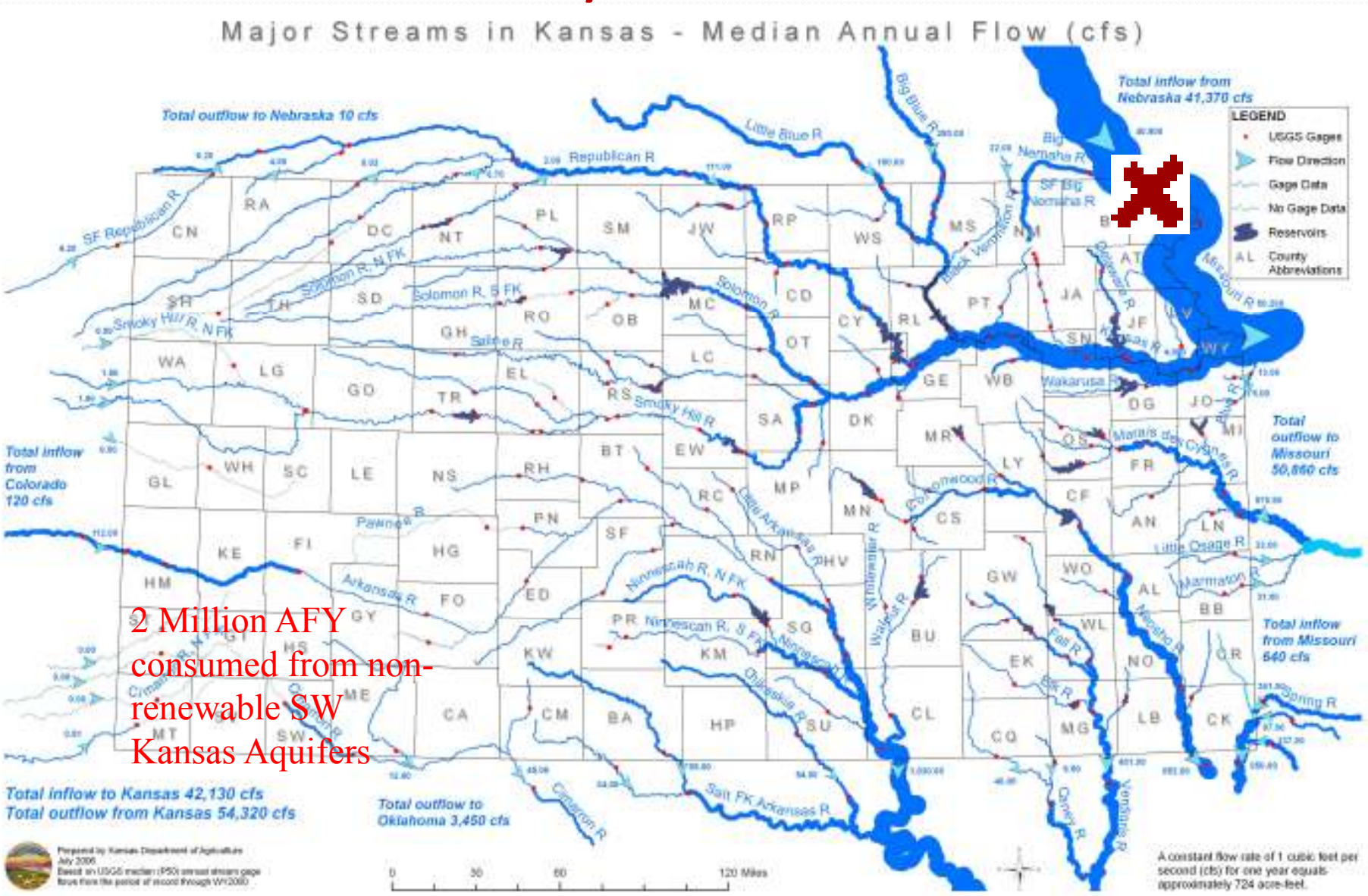
- Interstate stream compacts governing Kansas apportionments are state law in each member state and are ratified by Congress as Federal Law.
  - Kansas-Nebraska-Colorado Republican River Compact, K.S.A. 82a-518
  - Kansas-Colorado Arkansas River Compact, K.S.A. 82a-520
  - Kansas-Oklahoma Arkansas River 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 Corps of Engineers controls reservoir projects. No Corps authority over state water rights or compact allocation purposes

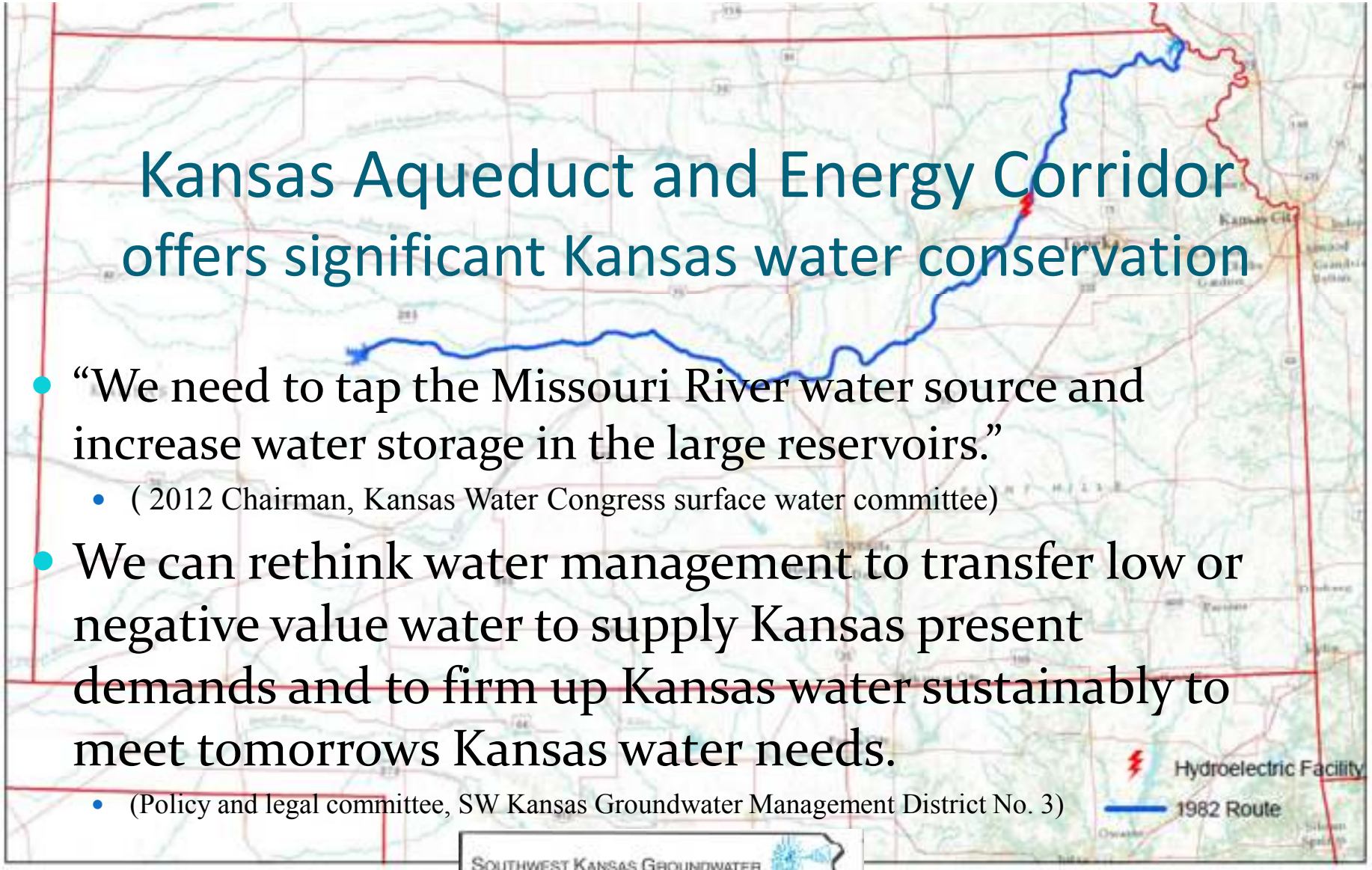


29.5 Million AFY by White Cloud Kansas



Kansas Aqueduct and Energy Corridor offers significant Kansas water conservation

- "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 to supply Kansas present demands and to firm up Kansas water sustainably to meet tomorrows Kansas water needs.
  - (Policy and legal committee, SW Kansas Groundwater Management District No. 3)



SOUTHWEST KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 3
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mrude@gmd3.org • www.gmd3.org

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 impacts of 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 Six-State 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 Six-State 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

Appendix B

September 1982

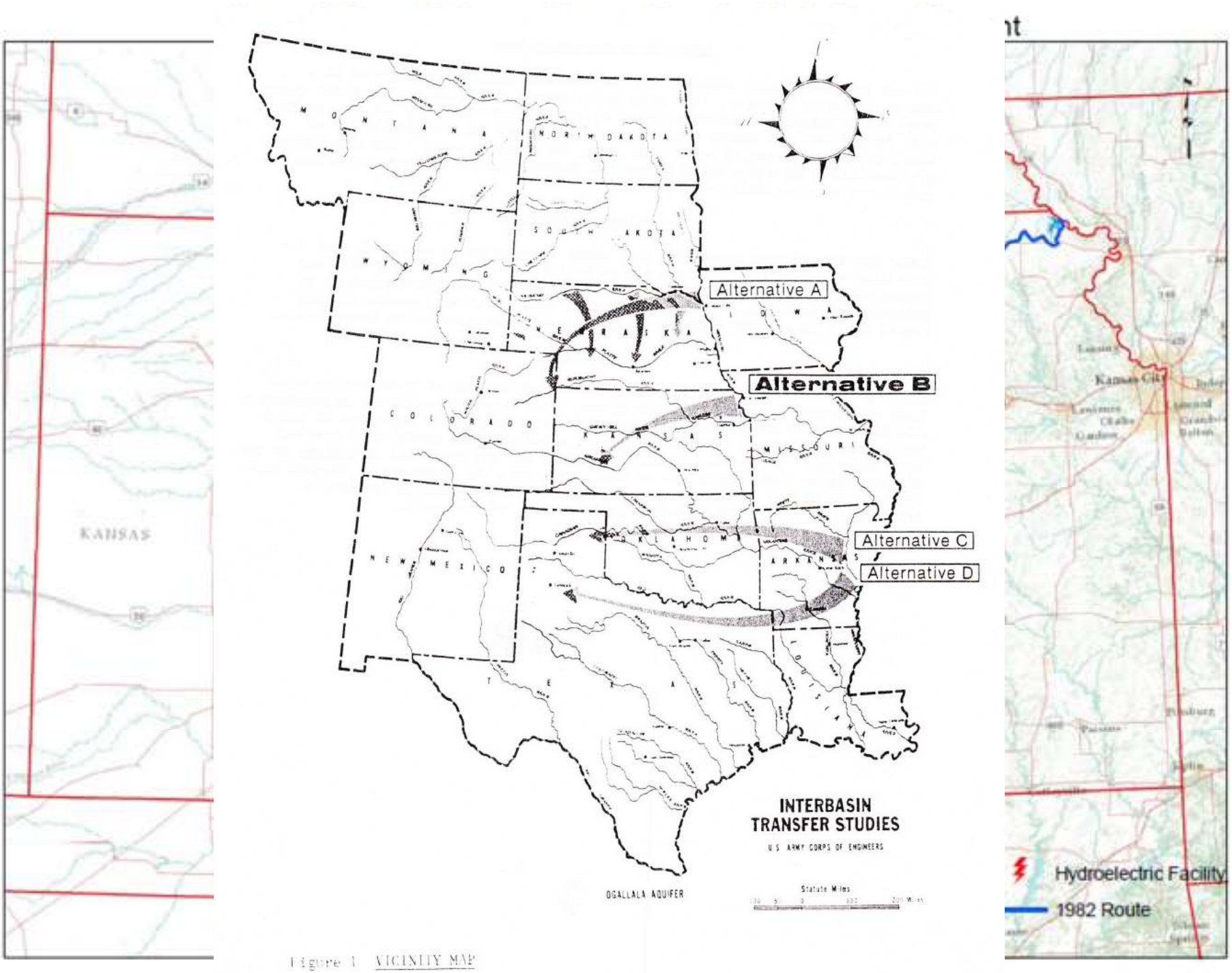


Figure 1 VICINITY MAP

The point at White Cloud, Kansas

High Plains Study, water transfer element, 1982

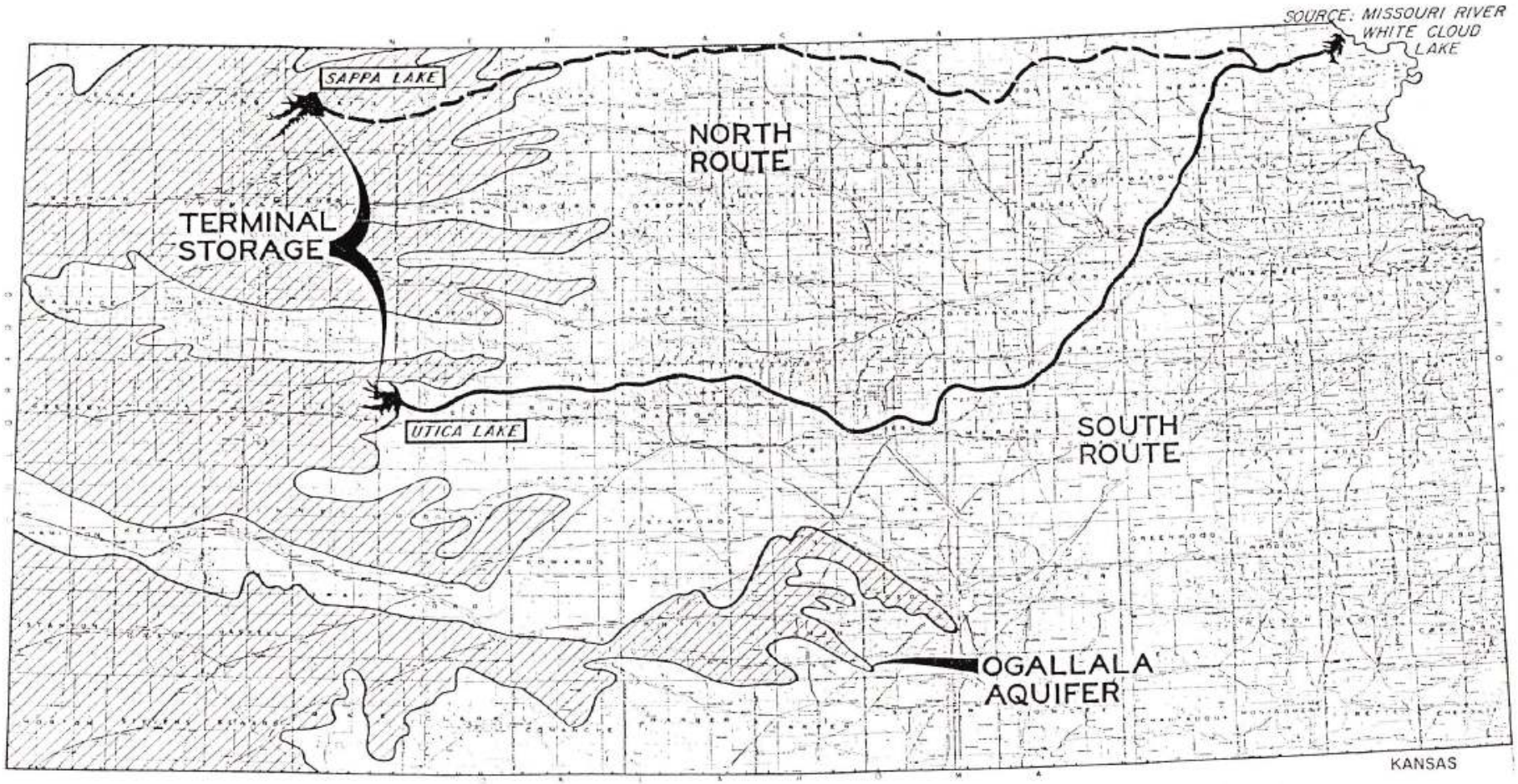
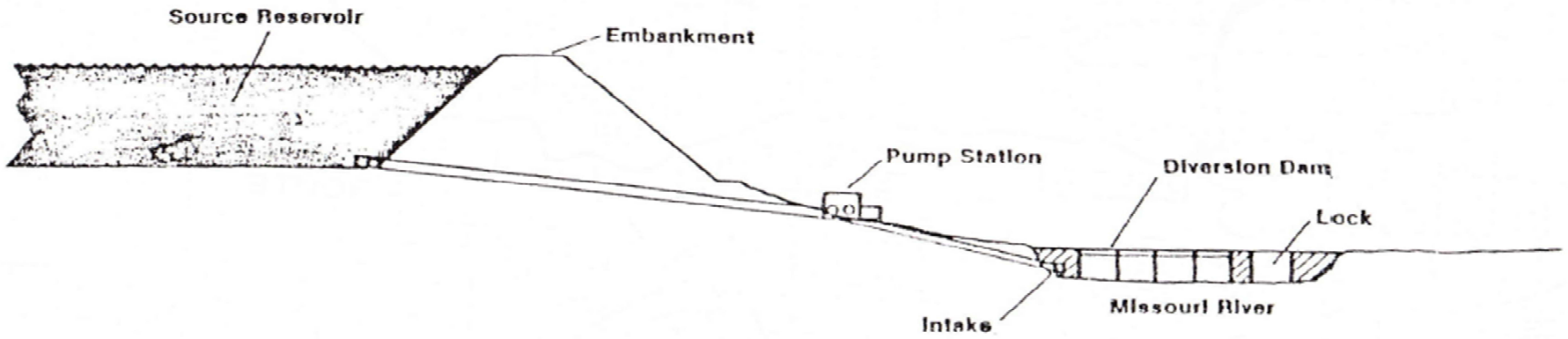


Figure 2
LAYOUT OF TRANSFER ROUTE
ALTERNATIVE B—HIGH PLAINS STUDY

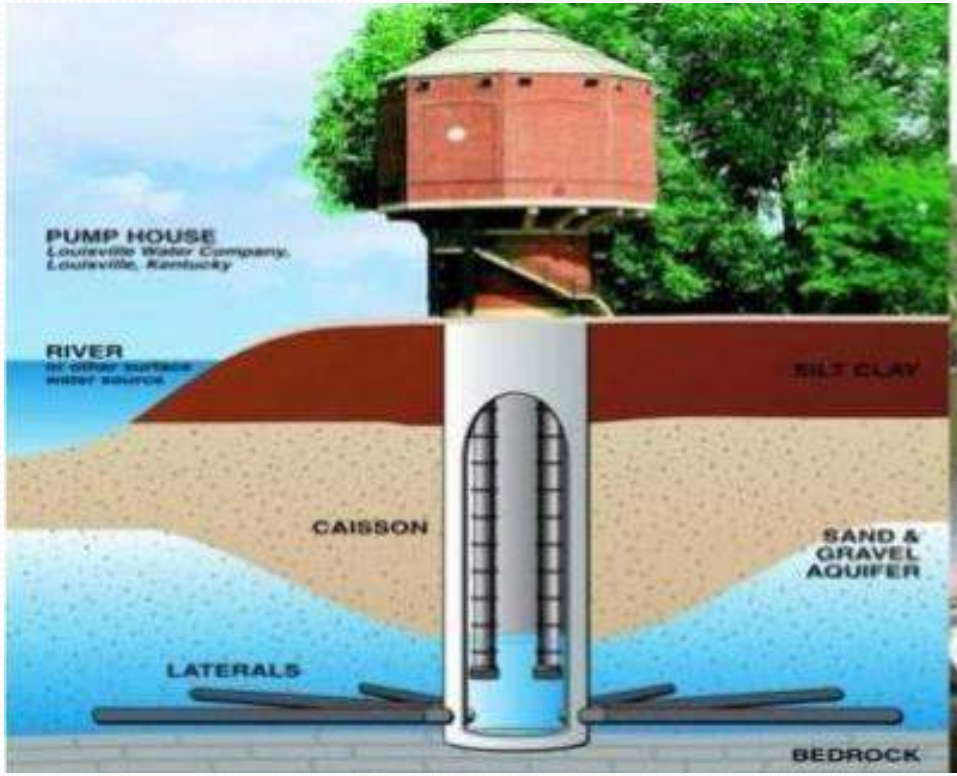
B-16

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



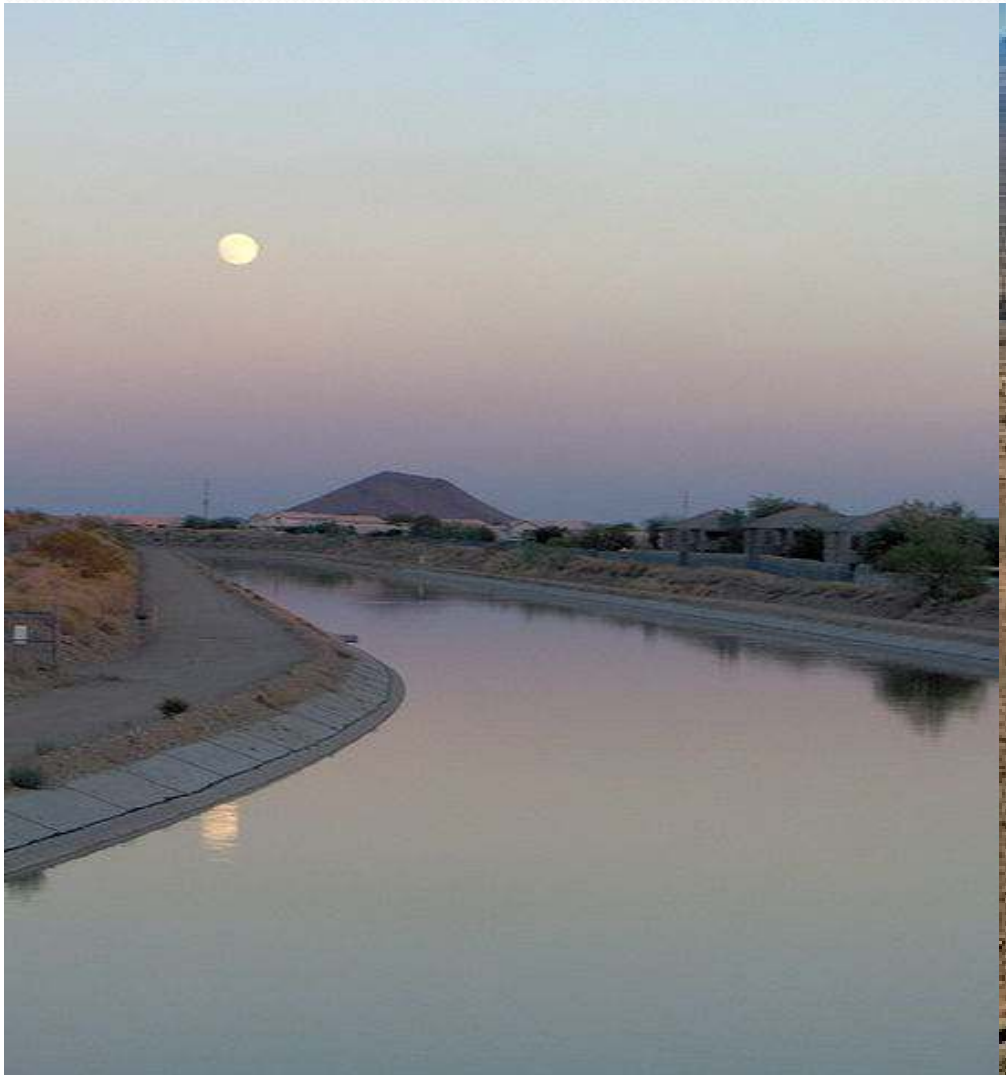
Source Features

Less river intrusive diversions: a number of collector wells



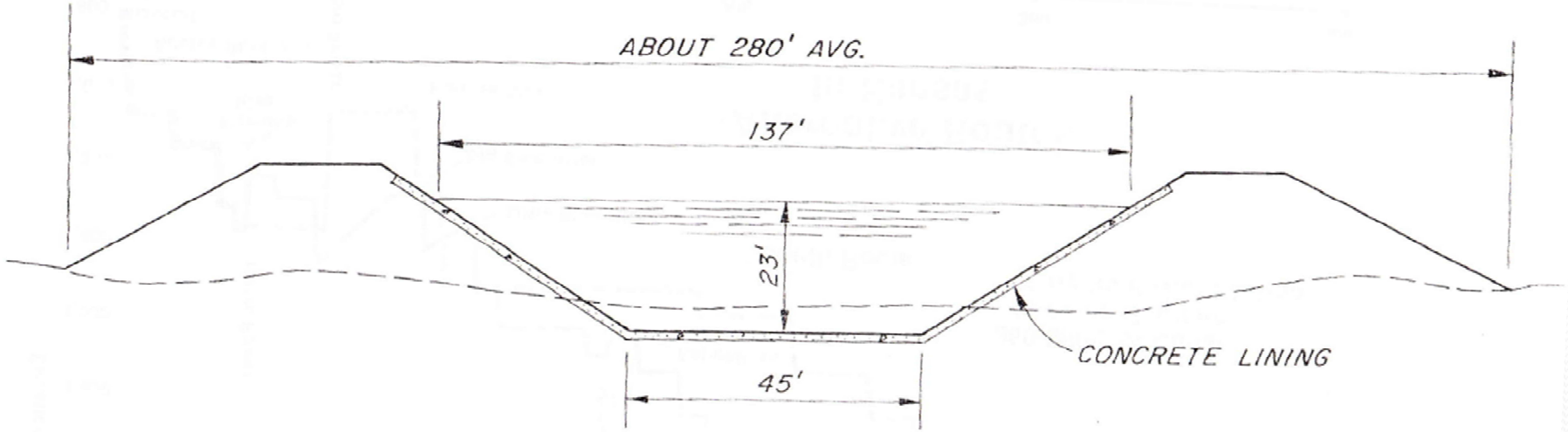
A Source Reservoir may be optional if riverbank collector wells are used.

Water would move 5’ per second, dropping ½ foot per mile west between lift stations.



Aqueduct water lifted west with 16 pump stations, and gravity flow between stations

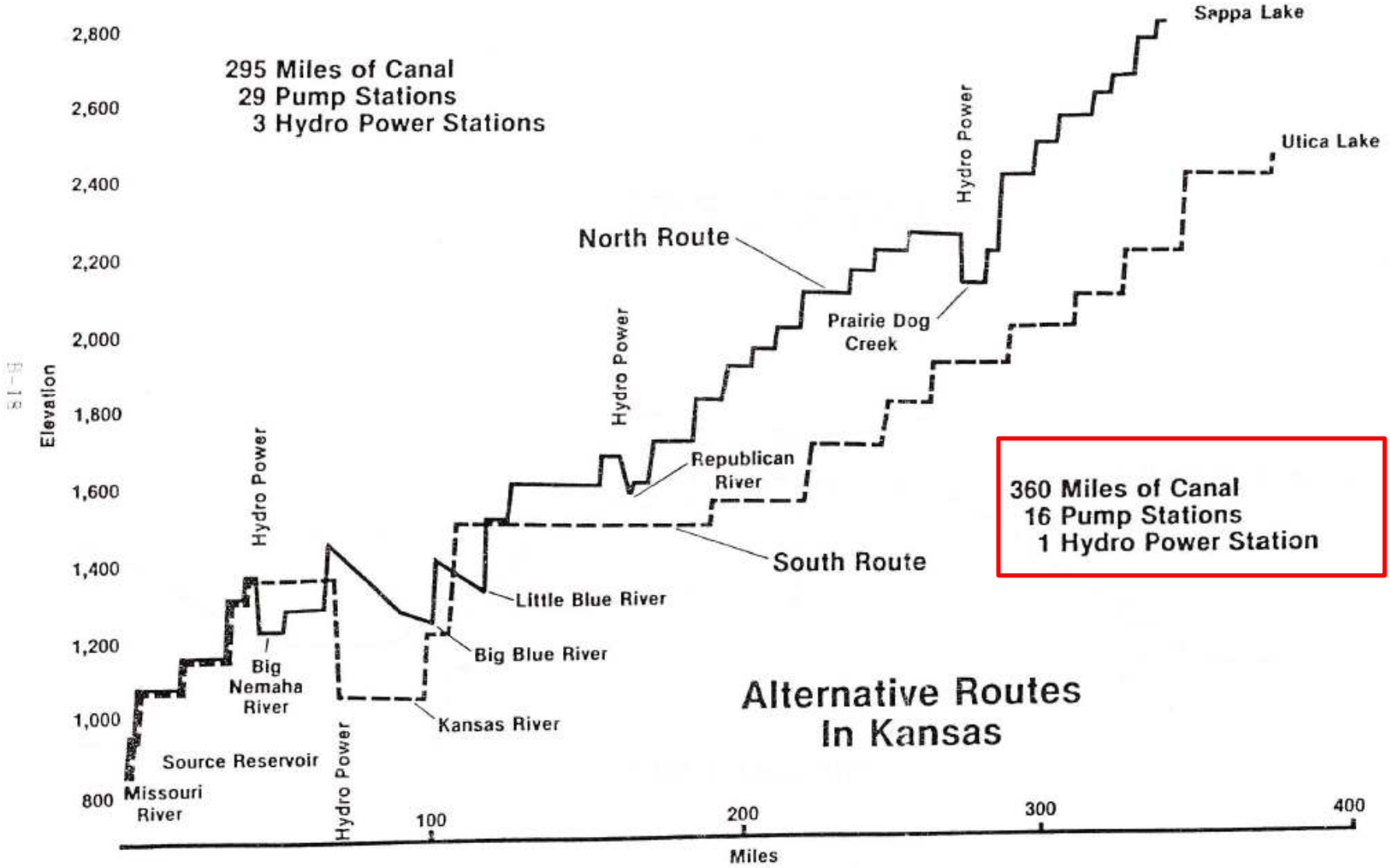
Canal size or capacity may depend on the final project elements

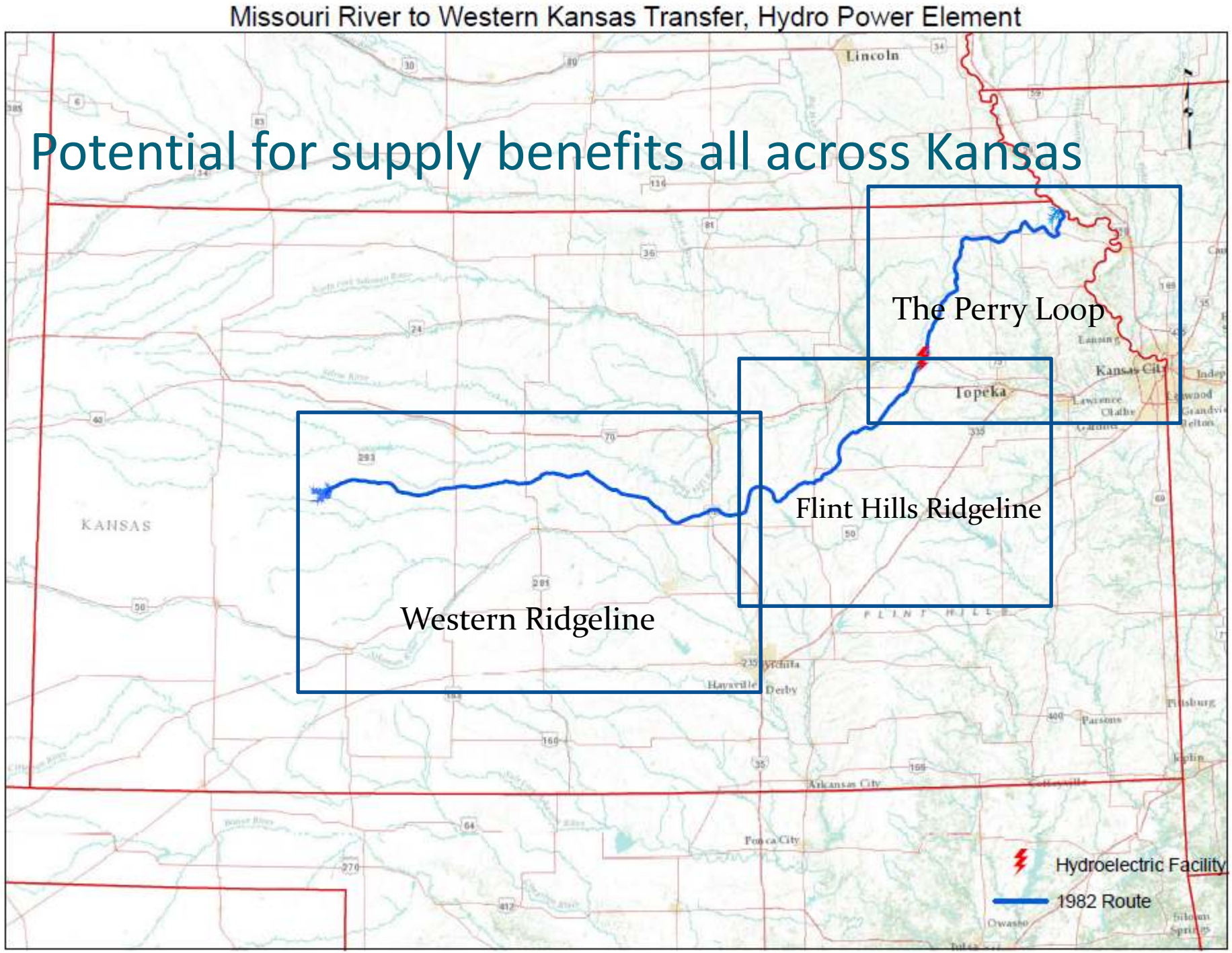


B-19

FIGURE 5 - TYPICAL CANAL DESIGN

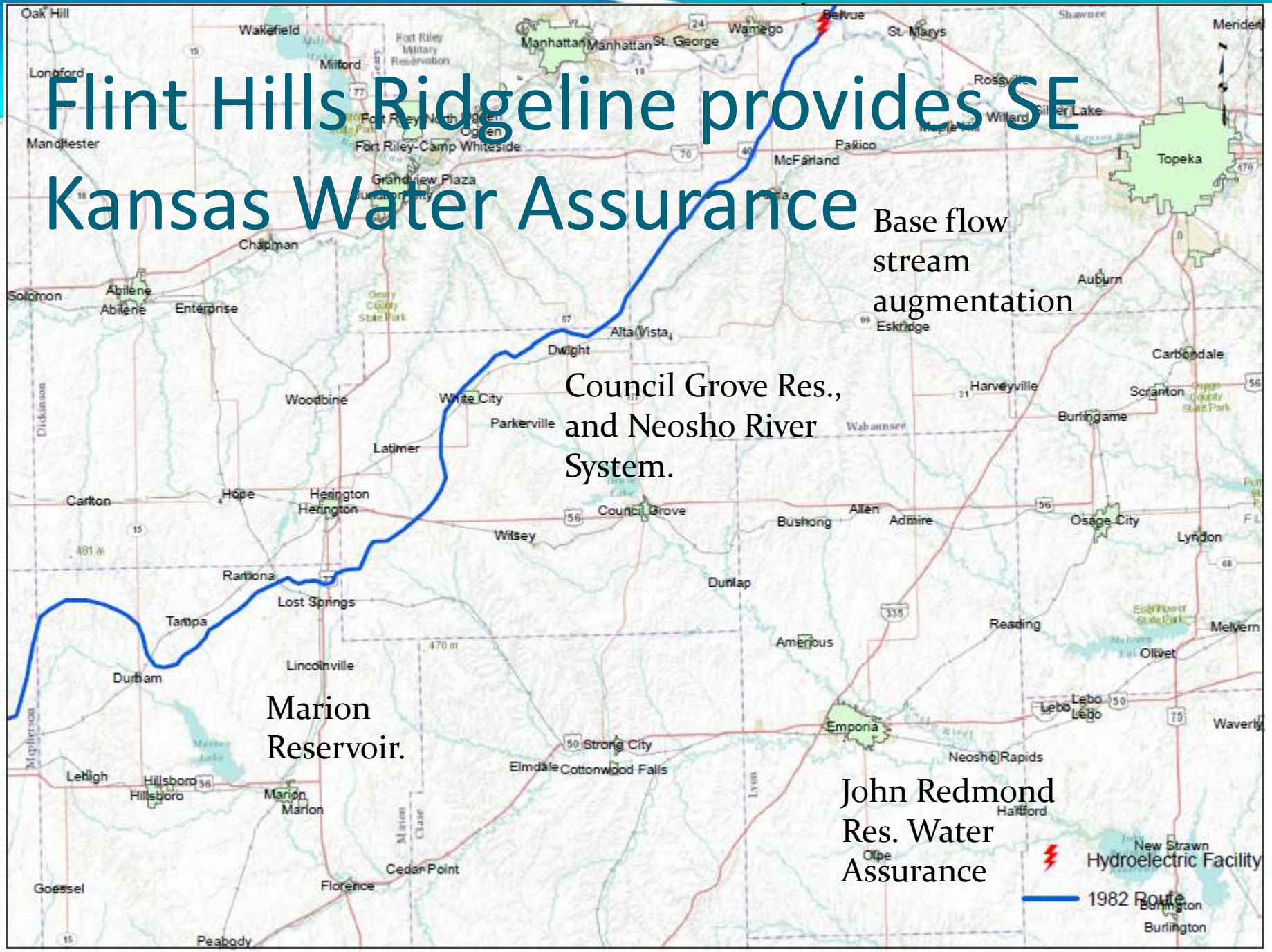
Kansas South Route preferred




Missouri River to Western Kansas Transfer, Hydro Power Element
Potential for supply benefits all across Kansas
The Perry Loop
Flint Hills Ridgeline
Western Ridgeline
Lincoln
Topeka
Kansas City
KANSAS
Hydroelectric Facility
1982 Route

The Perry Loop, formed by the Missouri River – Aqueduct – Kansas River, around Perry Reservoir, provides water assurance to a large Kansas population

Flint Hills Ridgeline provides SE Kansas Water Assurance



Western Ridgeline Water Supply Assurance

Cedar Bluff Res.

City of Hays

Wind farm energy storage

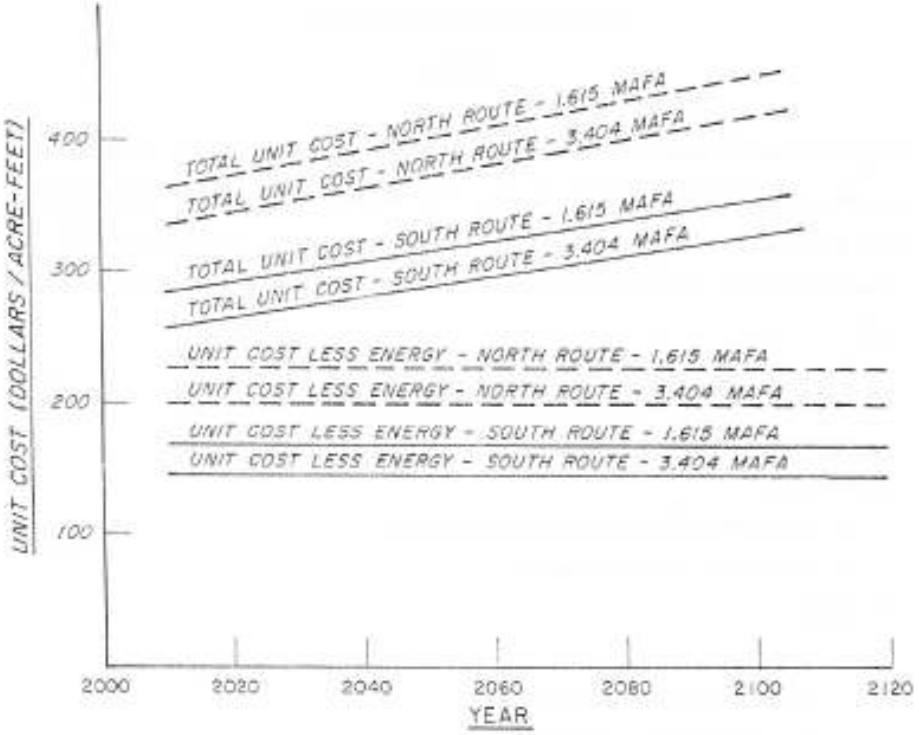
Kanopolis Res. and City of Salina

Cheyenne Bottoms and Wet Walnut Creek

Wichita area, ASR

700,000 AF Lake with added ditches and pipelines to replace reliance on non-renewable groundwater

Costs estimated in 1978 dollars 2013 dollars? Bond rates?



NOTE:
COSTS REFLECT 15-YEAR CONSTRUCTION PERIOD.

ANNUAL COSTS WITH PROJECTED ENERGY COSTS

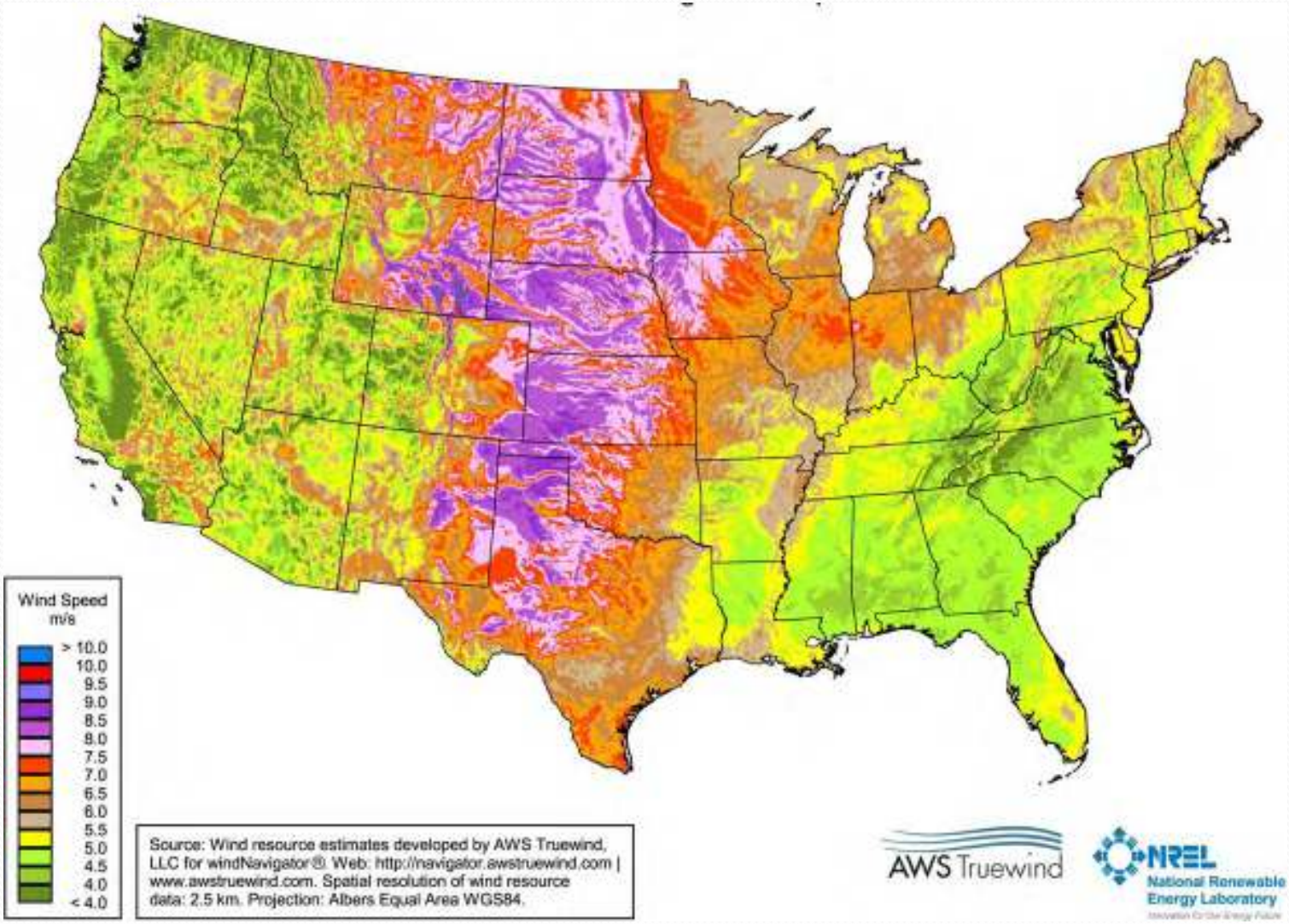
KANSAS CITY DISTRICT - CORPS OF ENGINEERS

FIGURE 8

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

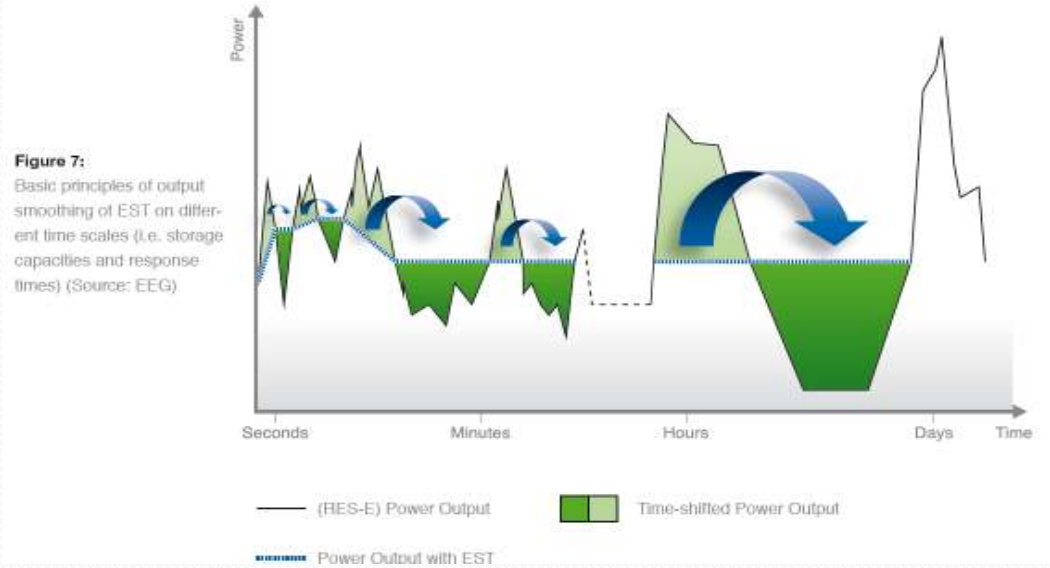


Figure 7:
Basic principles of output smoothing of EST on different time scales (i.e. storage capacities and response times) (Source: EEG)

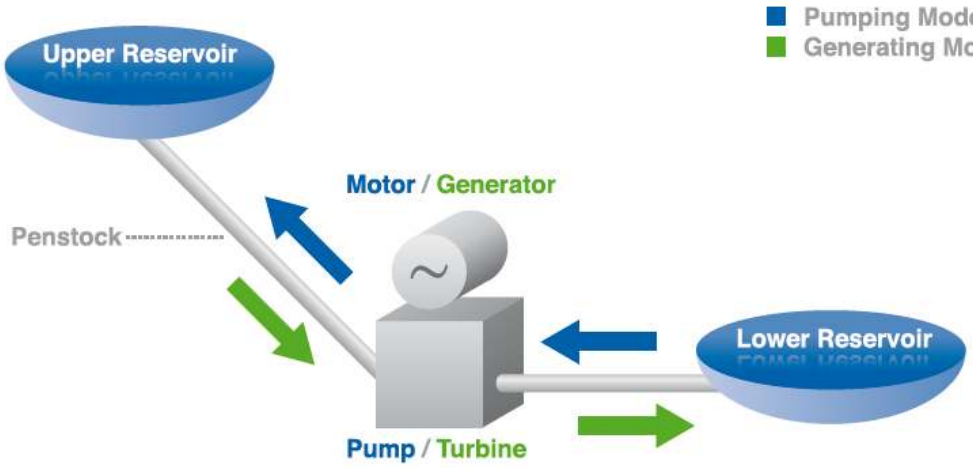


Figure 1:
Schematic diagram of a closed-loop PHES (Source: EEG)

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.
    - **<u>Priority of filing is considered critical</u>** 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 for best Kansas management of beneficial consumptive use, including during flood and drought. ("Every Drop Matters." KS Water Authority Chair)
  - Example: Big Blue and Republic River Compact allocations controlled by Army Corps of Engineers in Tuttle Creek and Milford Reservoir operations: releasing Kansas water they 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 Kansas water use restrictions.

Recommendation 4:

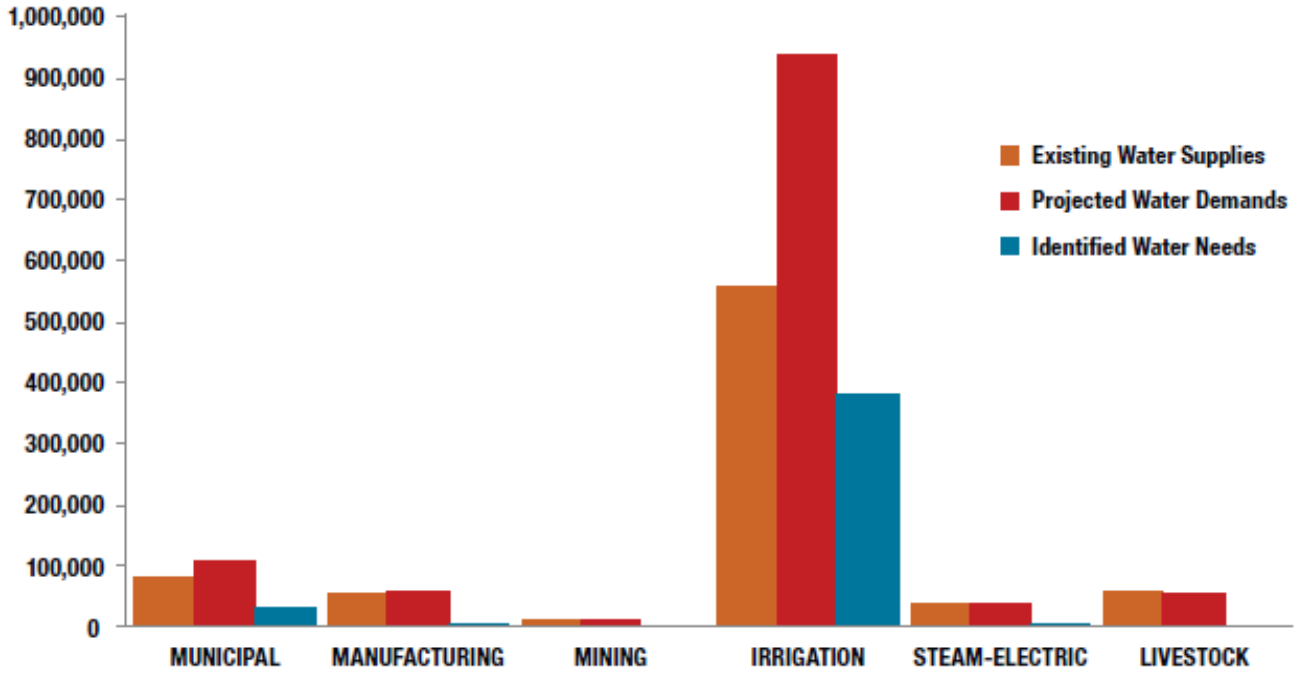
- Place a priority on restoring the Kansas Interstate Litigation Account funding to protect Kansas interstate water supplies.
  - Funds placed into the Interstate Litigation Account should occur even if expenditure authority is not authorized, indicating a Kansas commitment to protecting Kansas Water.

Other reference slides

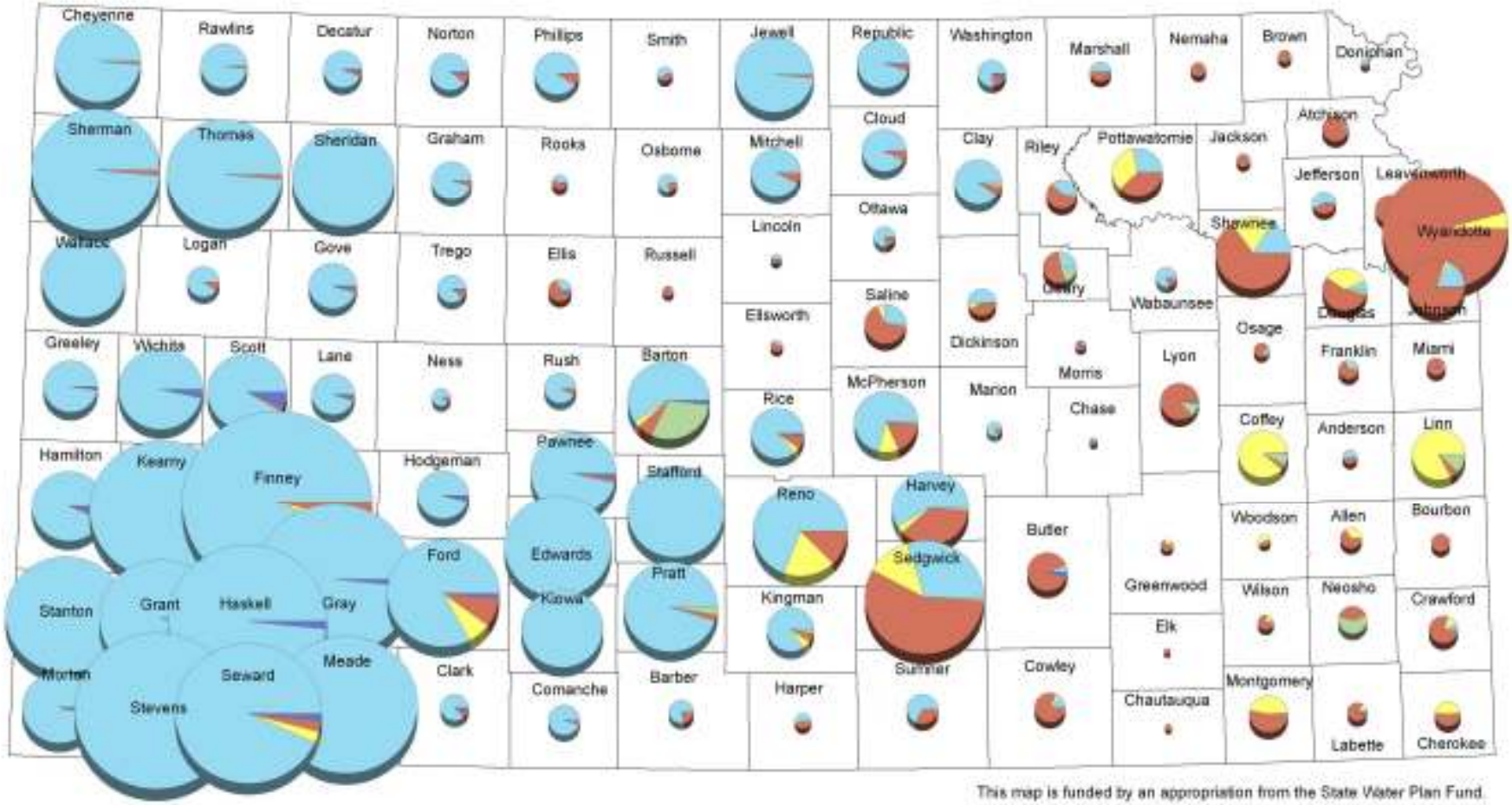
Future Need vs. Supply gap

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

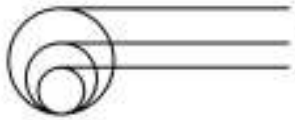


This map is funded by an appropriation from the State Water Plan Fund.

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 policies, 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.

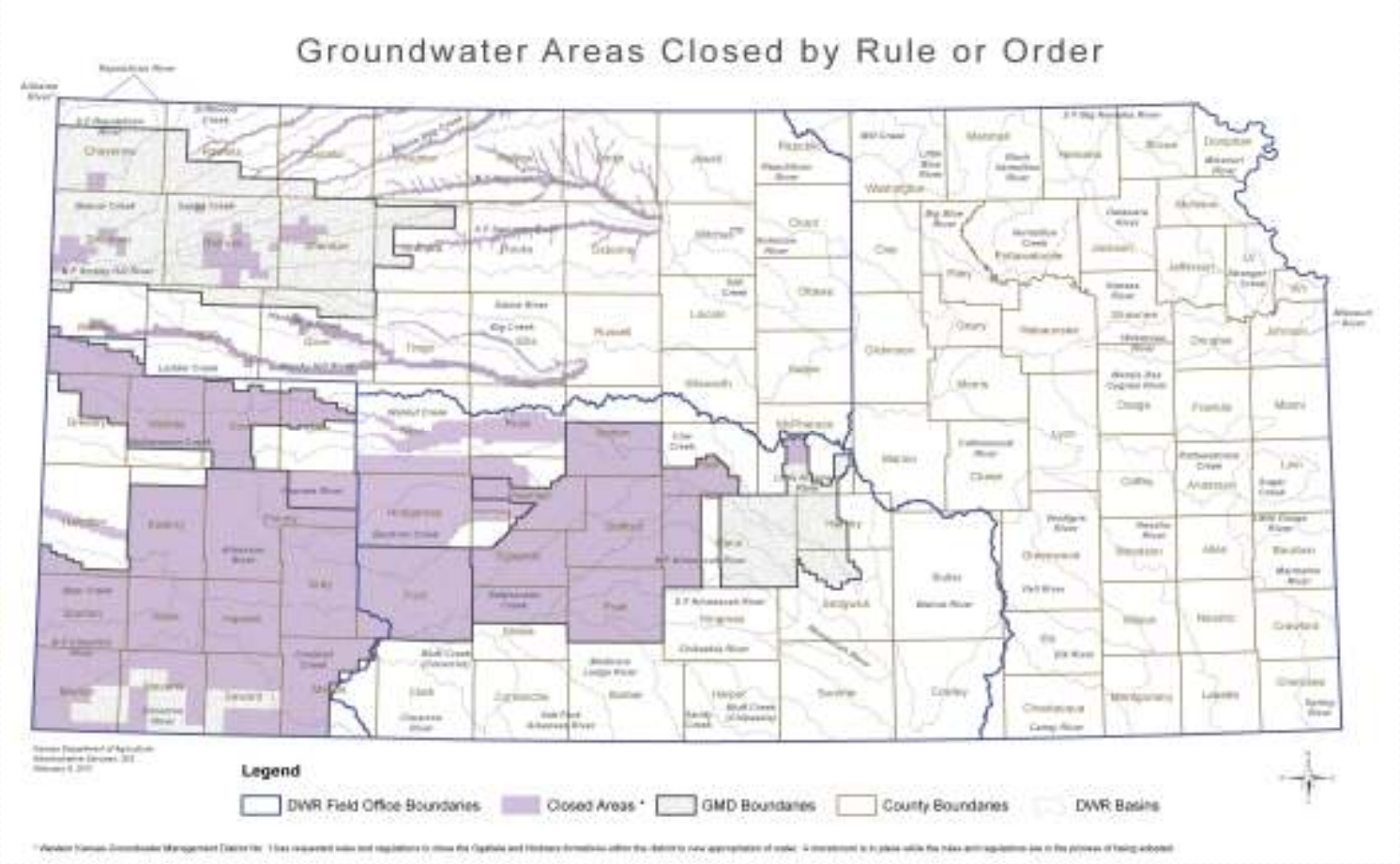


Use Made of Water

Irrigation
Municipal
Stockwater
Industrial
Recreation

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

Five Kansas Groundwater Management Districts



2011 Reported Water Use

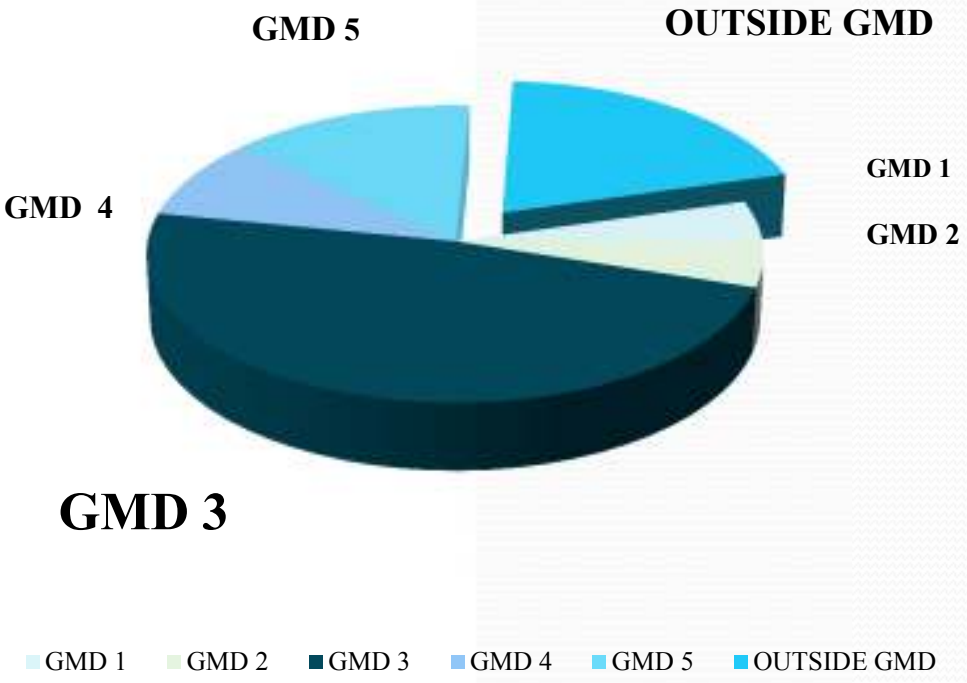
2011 Kansas

Total Water Diverted

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

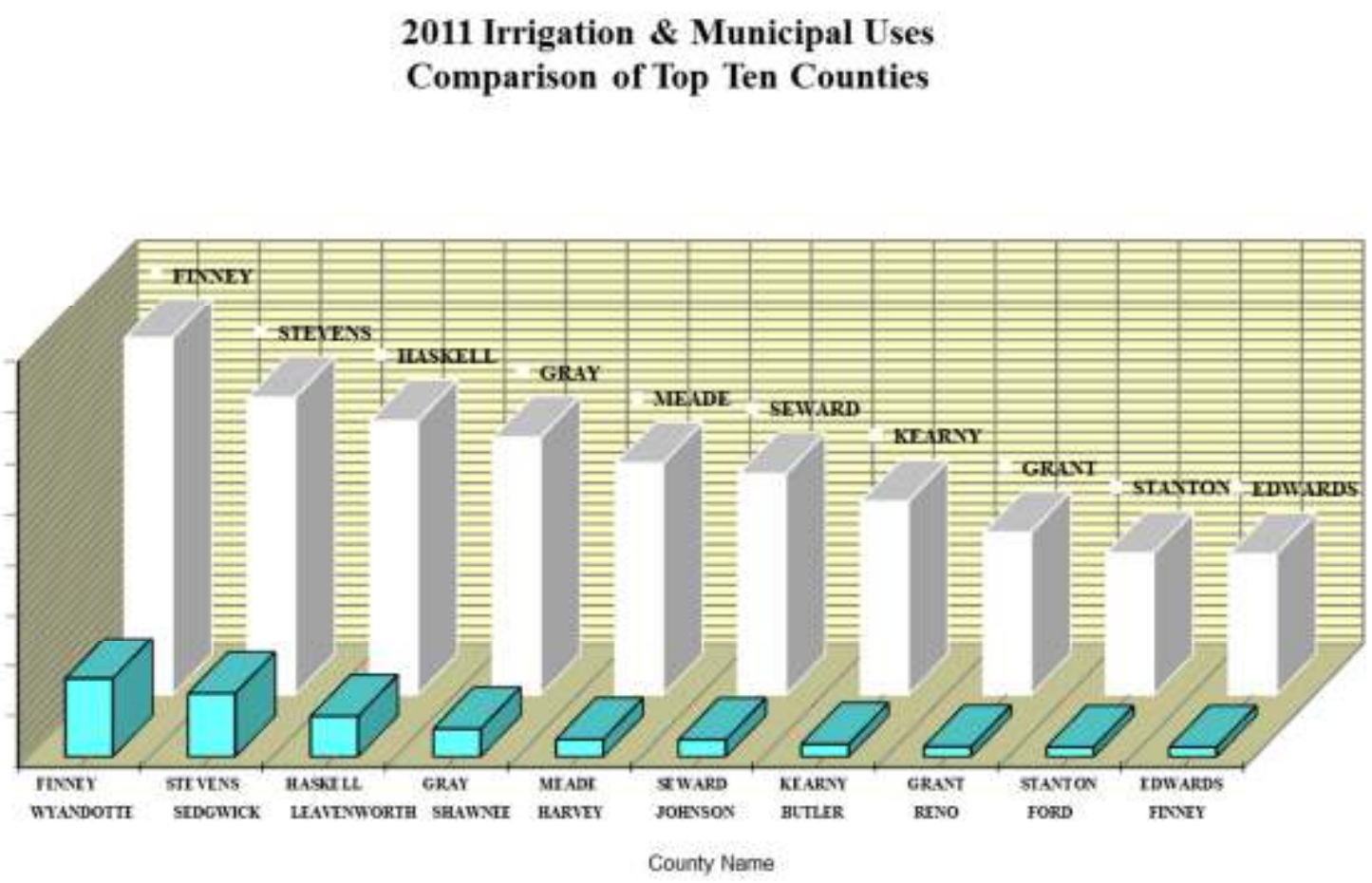
2011 Water Use by Groundwater Management District		
GMD 1	216,456	4.38%
GMD 2	246,978	5.00%
GMD 3	2,376,591	48.13%
GMD 4	434,545	8.80%
GMD 5	687,511	13.92%
OUTSIDE GMD	975,902	19.76%
Total	4,937,983	100.00%

2011 Total Water Diverted by Groundwater Management District



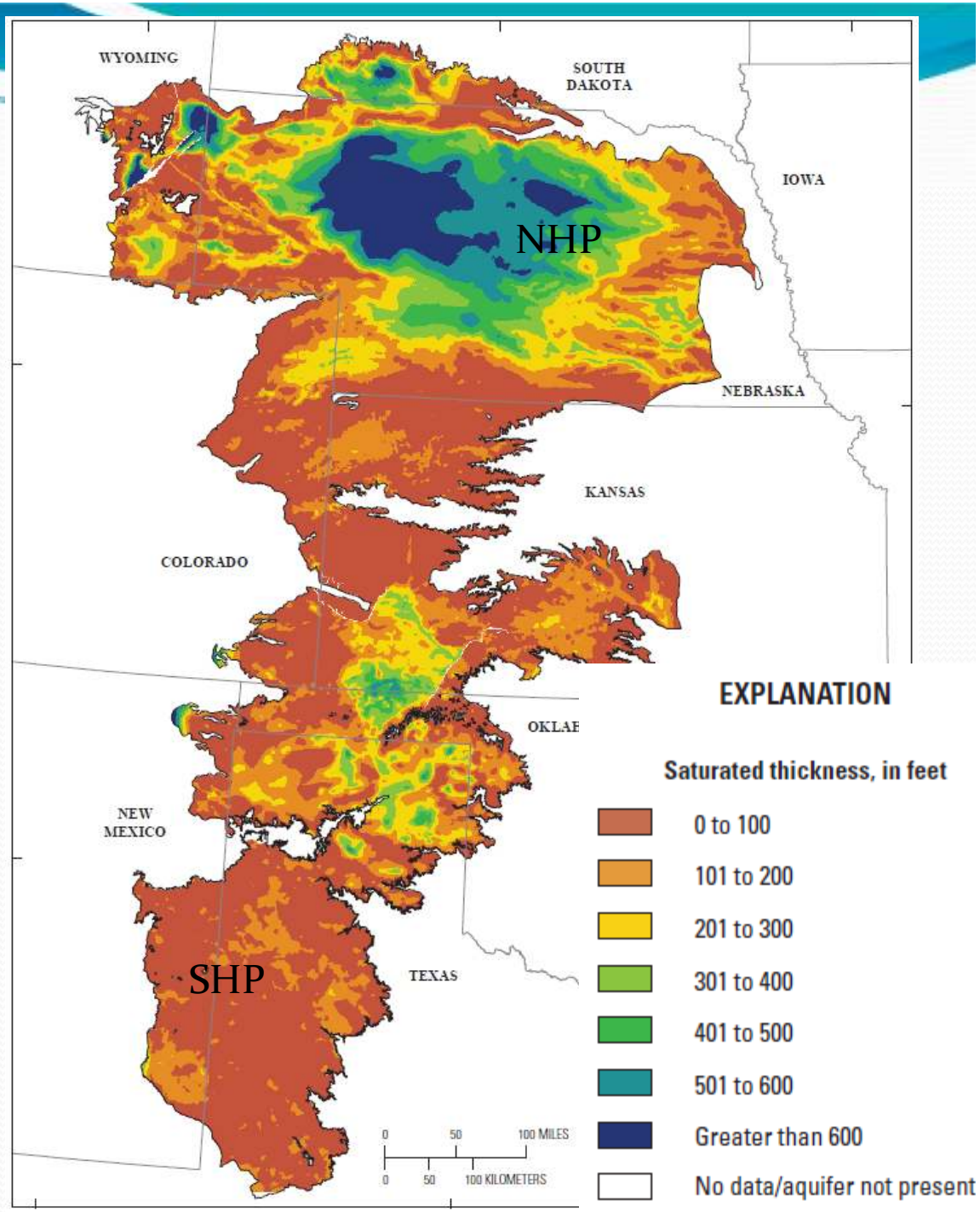
KANSAS
WATER USE UNIT

2011 Top Ten County water use



High Plains Aquifer Saturated Thickness in 2000

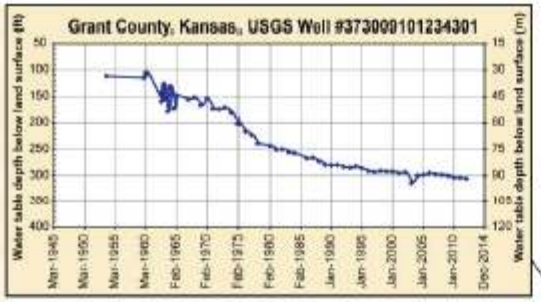
- NHP: large area with >500 ft; maximum of ~1,100
- SHP: mostly <100 ft

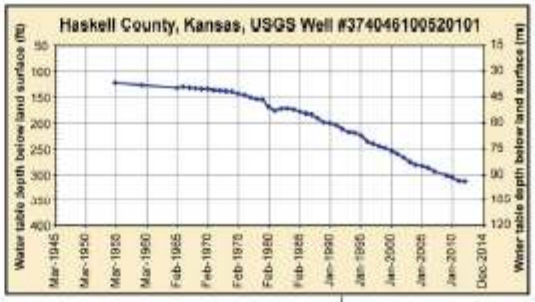


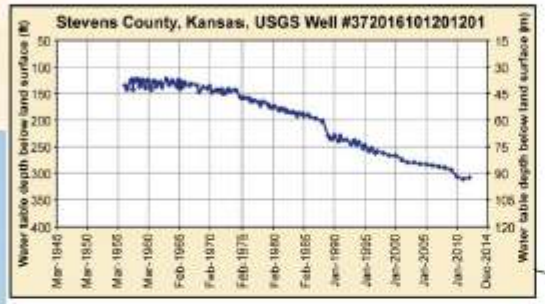
The water-level decline of the High Plains-Ogallala aquifer is the largest single water-management concern in the US

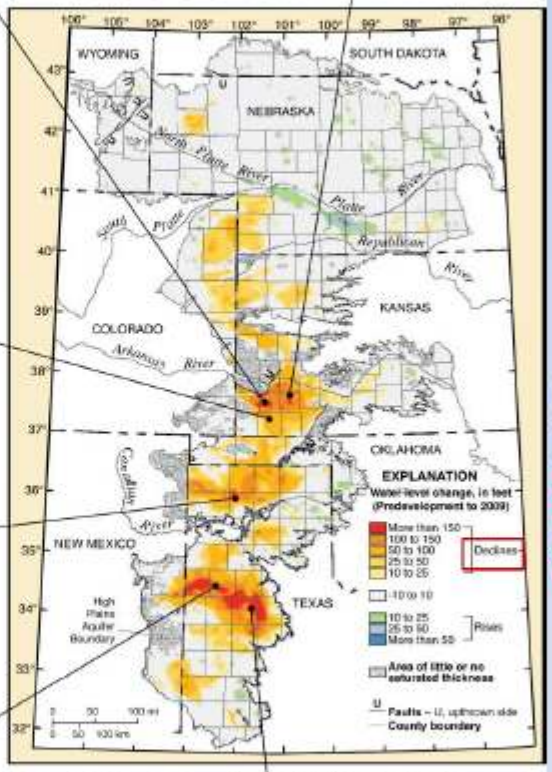
1945-2012 ground-water-level hydrograph declines

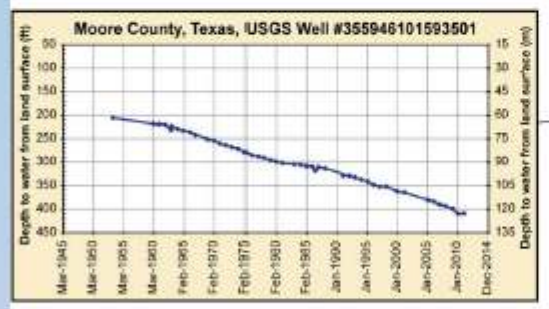
(*Modified from Sophocleous, 2010*)

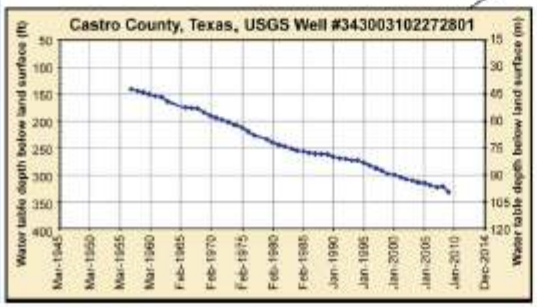


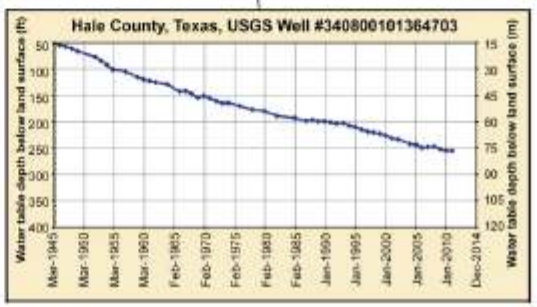












Groundwater-level changes: Predevelopment to 2009

(*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)