Current Kansas Water Issues:
Seeking solutions to our water resource challenges

Kansas Society of Professional Engineers
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Kansas Department of Agriculture
Outline

• Overview of DWR and related water agency responsibilities

• Water appropriation issues:
  • Brief water right 101
  • Hays change applications and proposed water transfer
  • Wichita’s requested changes to its Aquifer Storage and Recovery (ASR) Project
  • The Ogallala challenge: current directions to extend its life and benefits (LEMAs, WCAs, etc.)
  • Quivira National Wildlife Refuge impairment

• Water structures: recent dam failure and breach
Water Agencies and Coordination

1. **State natural resources agencies:**
   - KS Dept of Agriculture with:
     - Division of Water Resources (DWR)
     - Division of Conservation (funding water projects)
   - Kansas Water Authority/Office (state water plan and fund; management of state-owned storage in federal reservoirs)
   - KS Dept of Health and Environment – water quality

2. **Local**: Groundwater Management Districts (GMDs), watershed districts, and more

3. **Federal agencies**: U.S. Geological Survey, Corps of Engineers, Bureau of Reclamation, more

3. **Coordination through**: State water planning process (KWA)
DWR’s major responsibilities:

- Allocate and regulate the State’s water resources in light of:
  - increasing needs / declining resources
  - increasing conflicts; complex and time-consuming water administration
- Protect public safety and private property (dam/levee safety; regulation of stream and floodplain projects)
- Insure Kansas obtains its share of interstate supplies
- Other services: water right and water use data, flood mapping and insurance, much more
Kansas Interstate Water Compacts:

- Republican River Compact: 1942
- Big Blue River Compact: 1971
- Kansas-Colorado Arkansas River Compact: 1949
- Kansas-Okahoma Arkansas River Compact: 1966
About DWR’s organization

• Part of Kansas Department of Agriculture
• Responsibilities under 30 separate statutes
• Three Programs
  • Water Appropriation (water rights, water administration)
  • Water Structures (dam safety, stream permits, floodplain regulation, flood insurance)
  • Water Management Services (interstate compacts, data analysis, more)
• Moved to Manhattan, summer 2014
• Approx. 50 Headquarters Staff/ 30 Field Office Staff
• Significant body of regulations, esp. under Kansas Water Appropriation Act and Stream Obstruction Act
Kansas Water Appropriation Act (KWAA), 1945

• “All water within the state of Kansas is hereby dedicated to the use of the people of the state, subject to the control and regulation of the state in the manner herein prescribed.”

• Based on prior appropriation (first in time, first in right)

• Groundwater and surface water in single priority system

• Charges chief engineer to oversee:
  • Allocation of water supply, allowing for orderly development of the state’s water resources
  • Regulation of in times of shortage.
Kansas Water Appropriations Act’s fundamental charge to the Chief Engineer

- K.S.A. 82a-706: *The Chief Engineer shall enforce and administer the laws of this state pertaining to the beneficial use of water and shall control, conserve, regulate, allot and aid in the distribution of the water resources of the state for the benefits and beneficial uses of all its inhabitants in accordance with the rights of priority of appropriation.*
- Develop rules and regulations to effectuate the law
- Make decisions on new applications and changes of water rights (Use made of water, point of diversion and place of use)
- Require water use reporting, meters
- Regulate unlawful use
- Administer water rights in times of insufficient supply
- Protect storage releases
Key water descriptor: variability
NUMBER AND NET AUTHORIZED QUANTITY OF WATER RIGHTS

YEAR

NUMBER WITH PRIORITY DATES IN YEAR

QUANTITY (AF)

ACCUMULATED NUMBER APPROVED

ACCUMULATED NET AF AUTHORIZED
2017 Reported Water Use for Kansas Counties

Use Made of Water
- Yellow: Industrial
- Red: Municipal
- Teal: Irrigation
- Green: Recreation
- Dark Blue: Stock

Seward: 147,344 AF
Reno: 79,785 AF
Wabaunsee: 4,772 AF

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.

Uses of water for artificial recharge, contamination remediation, dewatering, domestic, fire protection, hydraulic dredging, thermal exchange and water power use are not shown on the charts.

Kansas Department of Agriculture
Division of Water Resources
October 8, 2018
The current situation, challenges

• Other that the Ogallala-High Plains system, most of state managed well under KWAA based on principals of priority in surface water systems augmented by storage and safe yield in groundwater system.

• Good water use data; building robust groundwater model to guide water management decisions

• Continued development of our water laws; additional tools to address challenges

• Some water resource challenges:
  • Ogallala-High Plains aquifer management – increasing conflicts with water level declines
  • Reservoir sedimentation
Hays/Russell Water Right Changes - Overview

• Decades search for source of water to grow
• Purchased the R9 Ranch near Kinsley as their long-term solution.
Hays/Russell Pending Changes Applications and Proposed Water Transfer

- Proposal to change 7,647 acre-feet (AF) from irrigation use on the R9 Ranch to municipal use for Hays/Russell
- Two approvals required:
  1) contingent approval from KDA-DWR to change applications (completed March 2019)
  2) approval of the proposed water transfer via the Water Transfer Act process
- Terms of contingent change approvals, March 2019:
  - Annual limitation 6,756 AF/year and
  - 10-year limitation of 48,000 AF (an average of 4,800 AF/year).
  - Many more (70 page “Master Order”)
- Recently filed judicial review of change approval is pending, principally challenging Chief Engineer’s determination of long-term allowable use.
- The Water Transfer proceeding will be delayed until judicial review is resolved.
Wichita’s requested changes to its Aquifer Storage and Recovery Project
Wichita ASR Background

- Wichita’s ASR was approved in phases: Phase I in 2005 (Burrton plume focus) and Phase II in 2009 & 2010.

- 1) The City is requested that the bottoms of the basin storage area (BSA) be lowered.
   - This change is driven by the City re-purposing its ASR project to be a source of water during a protracted (1%) drought.
   - The current bottoms prevents the City from accessing some credits during drought.
   - The requested bottoms range between 72 - 86% full in the various index cells.

- 2) The City is requesting a new way to generate recharge credits with the aquifer full.
   - Over the last two decades, the City’s has moved 400,000 AF of its use from the Equus Beds Aquifer to Cheney Reservoir, contributing to the recovery of the aquifer to near-full conditions, making it difficult for the City to build the credits it needs in a protracted drought.
Wichita ASR: What are the proposed “Aquifer Maintenance Credits” (AMCs)

• The City is proposing AMCs to allow them to build ASR credits while keeping the Equus Beds Aquifer full.

• AMCs would allow the City to obtain recharge credits for:
  • water diverted and treated via its ASR infrastructure (diversion of Little Arkansas River flows)
  • when such water cannot be injected into the ground as the aquifer is near full and
  • when such water is taken to the City in lieu of Equus Beds water.
  • Additional terms and conditions proposed to protect the public interest and prevent impairment. Are they sufficient?

• A public hearing will be held in Sept, principally for the formal parties.

• For more information: http://agriculture.ks.gov/WichitaASR
The Ogallala challenge:
Percent Change in Saturated Thickness of O-HP Aquifer

Notes:

• Despite significant declines, significant use continues and the water resource is critical to today and tomorrow’s economy.

• While south-central Kansas is experiencing less declines in groundwater levels, ground use is reducing streamflows.
Legislative acts to encourage groundwater conservation

• 1972: GMD Act allow for the creation of GMDs to lead in local water conservation efforts

• 1978: GMD Act amended to allow for Intensive Groundwater Use Control Areas (IGUCAs).

• 2012: Local Enhanced Management Areas (LEMA’s) allowed

• 2012: Eliminating abandonment of groundwater rights in closed areas

• 2015: Water Conservation Areas (WCA’s) allowed

• 2015: Requirement for chief engineer to give due consideration of past voluntary conservation in all conservation programs
Kansas Groundwater Management Districts

GMD accomplishments:

• Closed districts to new appropriations, regulations related to change applications, metering, groundwater models, studies, incentive-based programs, more

• But little action to address over-appropriation in Ogallala (until 2012)
Intensive Groundwater Use Control Areas (IGUCAs), 1978

• Water management tool that works in conjunction with the Kansas Water Appropriation Act
• Allows for more flexible solutions, taking into account the area and aquifer
• Provides alternatives to strict administration of water rights by priority
• Formal public hearings are held
• Decision by chief engineer based on hearing record
Intensive Groundwater Use Control Areas

- **McPherson County**, 1979, closed area, required meters
- **Pawnee Valley**, 1980, set safe yield criteria
- **Burrton**, 1982, water quality concern; criteria for review
- **Lower Smoky Hill River**, 1983, closed area, 15 inch allocation
- **Upper Smoky Hill River**, 1984, closed area
- **Arkansas River Valley**, 1984, closed area, restrict moves
- **Hays and Immediate Area**, 1985, restrict lawn watering by domestic wells
- **Walnut Creek**, 1990, 5-year allocations: senior set at 12-14 inches; junior set at 5.25-6.25 inches, flexibility to move allocations.
Northwest Kansas GMD 4 seeks Enhanced Management

• “Sheridan 6” High Priority Area wanted to cut use by 20%, but not via priority administration, (2010-11)
• NW Kansas GMD No. 4 Board discusses and rejects IGUCA option
• Manager outlines new approach requiring new legislation
• Results in LEMA statute, 2012
• Sheridan 6 LEMA designated for 2013-17 and 2018-22, with the **goal of 20% reduction in use**
Local Enhanced Management Areas (LEMA), 2012

• Like IGUCAs, requires demonstrated groundwater problem
• Similar tools as IGUCAs.
• Like IGUCAs, due process required via hearings (as adjusting water rights)
• LEMA Plan to include conservation measures to address specific water resource problems.
• Hearings before the Chief Engineer to adopt, reject or return plan to the GMD
• Chief Engineer decision: is it consistent with state law; does it address the problem appropriately?
Sheridan 6 LEMA: Significantly reduced groundwater use

- Blue = reported use
- Orange = estimated use based on climate factors (2000-12)
- Actual use 2013-17 was 32% less than predicted by climate.
- 5-year values:
  - Historic average 149,100 AF
  - 2013-17 actual use 89,700 AF
  - 2013-17 savings 59,100 AF or 39%
GMD#4 District Wide LEMA

- GMD 4 determined rate of decline by township
- Sets 5-year allocations in inches/acre based principally on NIR for corn
  - Highest decline areas (red): 13-14 inches
  - Second highest decline (yellow): 15-16 inches
  - Purple township, 18 inches
  - Blue/Green: no restrictions
- No additional flexibilities, encourages WCAs
GMD 4 District-wide LEMA, Process

• Plan developed by GMD 4, working with members over 2015-17
• Initial hearing held August 23, 2017; positive decision, LEMA needed
• Second hearing held November 14, 2017
  • a group of intervenors granted expanded “due process”
  • Significant public comment received
• On February 23, 2018, order of decision issued, returning it to District with recommended changes to improve plans administration.
• GMD 4 accepted the recommended changes.
• On April 13, 2018, the Order of Designation issued.
• Currently under judicial review
2015 Legislation: Water Conservation Areas (WCAs)

K.S.A. 82a-745. Water conservation areas; establishment procedures; duties of chief engineer; notice; orders; consent agreement; review.

(a) Any water right owner or a group of water right owners in a designated area may enter into a consent agreement and order with the chief engineer to establish a water conservation area. The water right owner or group of water right owners shall submit a management plan to the chief engineer.

- A Water Conservation Area (WCA) is a designated area with an approved management plan developed by a water right owner(s) with the consent of the chief engineer to reduce water withdrawals while maintaining economic value via water right flexibility.

- **Flexibilities** can include multi-year allocations, exceeding annual authorized quantities, allowing for new uses of the water, when no impairment.

- **No hearings**; streamlined process

- WCAs do not make a permanent change in the water right
WCA’s totals

- **Current status:**
  - 22 plans approved as well as 25 Wichita County WCA consent agreements
  - 43,492 acres enrolled
  - 7,073 acre-feet of annual water savings

- Several significant WCA plans are under development
- LEMA likely best alternative for large areas but significant WCAs can benefit these local areas

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*WCA allocation held to historical average giving due consideration of past conservation per K.S.A. 82a-745.*
Quivira National Wildlife Refuge impairment

Figure 2 - Rattlesnake Creek Basin map of water rights
GMD 5:
Extensive area of sandy soils, shallow water tables

Pre-development condition: recharge destined to streams

Groundwater pumping intercepts water, deduces (depletes) streamflows
Historic depletions to Rattlesnake streamflows due to junior groundwater pumping. Model shows continuing to increase.
Impairment quantity by year from final impairment report, 1974-2007

![Bar chart showing impairment quantity by year from 1974 to 2007.](image-url)
Seeking a remedy for the impairment

• Augmentation can be part of the remedy. It must be developed by the basin, led by GMD5.

• To slow further streamflow declines, DWR maintains a modest reduction (approx. 15%) in junior groundwater pumping is an essential part of the long-term remedy, in addition to augmentation.

• KDA-DWR and GMD5 worked together to develop a LEMA that addresses the impairment. However, discussions have stalled as GMD insists that the impairment can and should be resolved by augmentation only.

• KDA-DWR is assessing how to proceed: initiate IGUCA proceedings, water right administration, and more.

• For more information: [http://agriculture.ks.gov/Quivira](http://agriculture.ks.gov/Quivira)
Failure and breach of Nemaha-Brown Watershed Joint District No. 7
GS DD Site 31-13

May-June 2019
Dam characteristics

- Built 1992
- Height: 38 feet
- 145 acre-feet at normal pool
- 506 acre-feet at the emergency spillway
- Location, just south of Sabetha
- Significant hazard due to wastewater treatment plant immediately below.
Tuesday, May 28

On-going piping failure along the principal spillway evidenced

Reservoir approx. at emergency spillway elevation
Wednesday, May 29
Failure progressing
Failure progress, Wed, May 29(day 2)

Drone video
https://youtu.be/hm_R9ENLuAA
The failure progressed slower than expected. We monitored the rest of the week and weekend.

By Monday morning, June 3, the water level had dropped several feet but still above the principal spillway. With potential for additional rains and downstream concerns, DWR issues emergency breach order.
Contractor begins by widening flow path through the dam (before increasing releases)
Opening up entry channel
Begin lowering reservoir (gradually, over 8 hours)
Video of breach operation:

https://youtu.be/sLHw3jxhrC0
Breach just below PS;
Breach wave showed up at Muscotah gage (30 miles downstream) on the morning of June 4

Hydrograph at Delaware River near Muscotah
For more information

http://www.agriculture.ks.gov/dwr

To subscribe to updates:
agriculture.ks.gov/dwr-updates
Questions
Western Kansas GMD No 1, Remaining Saturated Thickness
Wichita County WCA proposal development

• 23 feet of average remaining saturated thickness, well rates dropping, less than 25 years of remaining life.

• Unique, county-wide WCA developed that producers can enroll in

• Extensive process to develop proposal, driven by a local committee, initiated August 2016

• Plan approved March 2017
Wichita County WCA

- Four 7-year milestones beginning in 2017 and ending in 2045. Conservation factor from recent historic use, beginning at 29% and increasing to 50% by the last 7-year planning period
- Can use their allotment on any authorized land.
- Current status:
  - 25 consent agreements approved
  - 2,807 acre-feet of annual water savings (first 7 years; greater in subsequent periods)
  - 13,453 acres enrolled (almost 20% of irrigated acres in county)
- While a good start toward the goal of doubling the life of the aquifer, the WC committee is asking GMD to develop Wichita County LEMA, which is on-going
Kansas surface water supplies
State Water Plan Storage Act authorizes state-controlled storage in federal reservoirs

Source: Kansas Water Plan, 2009
In Kansas, the High Plains Aquifer is made up of several smaller sub-regional aquifers - the Ogallala, Great Bend Prairie and Equus Beds. On a national scale, many people and publications will refer to the High Plains aquifer as the Ogallala. In Kansas, we make a distinction.

The Great Bend Prairie and Equus Beds aquifers are generally closer to the land surface (not as deep) and are more responsive to recharge. They are managed as sustainable systems. The Ogallala is generally deeper with less annual precipitation and has little natural recharge. Recharge estimates are in the 0.5 to 1 inch range annually.
Percent Change in Saturated Thickness of High Plains Aquifer in Kansas

Estimated Decrease in Saturated Thickness (%)

- Increase 0 - 15
- Increase 15 - 30
- Increase 30 - 45
- Increase 45 - 60
- Increase Greater than 60

Extant of the saturated portion of the aquifer
Major streams

10 Miles
Kansas Groundwater Management Districts (GMDs)
Groundwater Management District Act

• Allows local people to “determine destiny” – within state laws and policies

• GMDs must adopt a Management Program, subject to Chief Engineer’s approval.

• GMDs may recommend regulations and IGUCAs to the Chief Engineer (and now LEMAs)

• Permit approval/regulatory authority remains with Chief Engineer

• GMD accomplishments:
  • Closed Districts to new appropriations, metering, groundwater models and studies, more
  • But little action to address over-appropriation
Interpolated Water Level Change in the High Plains Aquifer from Average 1997-1999 to Average 2007-2009

Change in Feet
- Decline greater than -50
- -50 to -40
- -40 to -30
- -30 to -20
- -20 to -10
- -10 to -5
- -5 to 0
- 0 to 5
- Increase greater than 5

Extent of the Saturated Portion of the High Plains Aquifer
Groundwater impairment complaints / actions

• K.S.A. 82a-706b – “It shall be unlawful for any person to prevent, by diversion or otherwise, any waters of this state from moving to a person having a prior right to use the same…”

• With water level declines, increasing complaints between groundwater users

• Complex, time-consuming investigations
Management options in over-appropriated areas

• Intensive Groundwater Use Control Areas (1978):
  • Requires demonstrated problem: groundwater declines, dropping rates, etc.
  • Tools: allocations, rotation of use, etc., thus providing additional flexibilities to promote best use of more limited supply.
  • Requires due process via hearings; Chief engineer decision.
  • 8 IGUCAs in state; mostly alluvial systems. **None in Ogallala.**

• Local Enhanced Management Areas. (2012)
  • Chief Engineer decision: adopt, reject or return plan proposed by a GMD based on consistency with state law and appropriateness of solution.
  • 1 in place, working well; 2 add’l under active discussion.

• Water Conservation Areas (2015)
  • Consent agreement between water users and Chief Engineer.
  • 7 in place; many under discussion.
Interpolated 2015-2016 Water Level Change, Thomas and Sheridan Counties, Kansas
Cooperative Water Level Network
Kansas Geological Survey, KDA- Division of Water Resource
Provisional Results, Subject to Change

[Map showing water level changes with color coding and markers for water right and measured groundwater wells]
## Compact Enforcement History

<table>
<thead>
<tr>
<th>Year</th>
<th>Issue</th>
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<tbody>
<tr>
<td>1980s - 1990s</td>
<td>Nebraska begins to overuse its share. Kansas seeks to address concerns via the Compact Administration; then mediated settlement</td>
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<tr>
<td>1998</td>
<td>Kansas files suit in U.S. Supreme Court. Nebraska asserts that the Compact does not include groundwater.</td>
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<tr>
<td>2000-2003</td>
<td>Court rules that groundwater pumping impacts to streamflow must be accounted for; States negotiate comprehensive settlement. U.S. Supreme Court approves settlement</td>
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<tr>
<td>2010-2015</td>
<td>Second U.S. Supreme Court lawsuit following Nebraska’s violation of the Settlement. Court finds Nebraska in violation; orders damages. Allows Nebraska to determine how it will comply</td>
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<tr>
<td>2013-2015</td>
<td>Disputes over Nebraska and Colorado compliance plans.</td>
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Republican River Compact
Long-term agreements

• Resulting from 2 years of monthly meetings. Based on experience from 2 years under temporary agreements.

• Separate agreements, adopted by the RRCA, one on Colorado issues; a second on NE issues.

• Colorado – Agreement on additional actions to get to compliance on South Fork Republican River; augmentation credits for deliveries on the North Fork.

• Nebraska – Augmentation credits for water delivered to Harlan County for Kansas use. Working with irrigation districts and Bureau to implement MOA.
Kickapoo Water Right Settlement - Background

- The Kickapoo Tribe is a federally recognized Indian Tribe
- Under the *Winters* doctrine, the Tribe has a federal reserved water right with a priority date of October 24, 1832
- Tribe is seeking a more dependable long-term supply.
- Dispute with watershed district led to litigation.
Kickapoo settlement and water right quantification

• 30 sq miles. Tribe search for a more secure supply. Litigation

• Settlement/quantification of water right:
  • 4700 AF for direct use based on municipal build-out concept consistent with state rules.
  • MOA between Tribe and chief engineer
    • establishes procedures for communication, monitoring and protection of the Tribal Water Right,
  • annual reviews to insure it remains current, especially as the Tribe develops storage.
Program History

- City of Wichita
  Background Info
  - Largest city in KS
    Pop. 390,000
  - Largest water provider
    125 MGD max.
  - Two main water sources
    Cheney Reservoir
    Equus Beds Aquifer