

**Kansas Water Authority Meeting  
Conference Call / GoToMeeting  
9:00 a.m. – December 11, 2020  
Agenda**

<i>Time</i>	<i>Agenda Item</i>	<i>Presenter</i>	<i>KWA Advice</i>	<i>KWA Decision</i>	<i>Page No.</i>
9:00 am	<b>Call to Order/Roll Call</b>	Connie Owen	--	--	--
9:05 am	<b>Approval of Meeting Minutes</b>	Connie Owen			
	October 26, 2020 Meeting (Conference Call/GoToMeeting)			X	1
9:15 am	<b>KWA PWS Committee Update</b>	John Bailey			
	2021 Surplus Water Report	Nathan Westrup		X	
	Debt Refinancing Discussion	Nathan Westrup	X		
9:30 am	<b>Vision/Kansas Water Plan Update Status</b>	Cara Hendricks			3
	Conserving & Extending the High Plains Aquifer <i>DRAFT</i>	Armando Zarco Keadron Pearson	X		4
	Reducing our Vulnerability to Extreme Events <i>DRAFT</i>	Gary Koons Josh Olson	X		18
	Increasing Awareness of Kansas Water Resources <i>DRAFT</i>	Kirk Tjelmeland Angela Anderson	X		30
	Securing, Protecting and Restoring our Kansas Reservoirs <i>DRAFT</i>	Richard Rockel	X		39
10:50 am	<b>KWA Annual Report to the Governor and Legislature</b>	Matt Unruh/ Cara Hendricks		X	48
11:45 am	<b>Director's Report</b>	Cara Hendricks	X		
11:55 am	<b>New Business</b>				
12:00 pm	<b>Adjourn</b>				

Upcoming Kansas Water Authority Meetings: TBD

**Please join my meeting from your computer, tablet or smartphone.**

<https://global.gotomeeting.com/join/312356573>

**You can also dial in using your phone.**

United States: +1 (571) 317-3112

**Access Code: 312-356-573**

## Minutes

### KANSAS WATER AUTHORITY Topeka, Kansas

October 26, 2020

Conference Call

---

- CALL TO ORDER:** Chair Connie Owen called the **October 26, 2020**, Kansas Water Authority conference call to order at **10:02** a.m.
- MEMBERS PRESENT:** Connie Owen - Chair; Mike Armstrong, John Bailey, Randy Hayzlett, Alan King, Carolyn McGinn, Allen Roth, Allan Soetaert, Jean Steiner, David Stroberg
- MEMBERS ABSENT:** Lynn Goossen, Jeremiah Hobbs, Chris Ladwig
- EX-OFFICIO MEMBERS PRESENT:** Dan Devlin, Sara Baer, Leo Henning, Mike Beam, Andrew Lyon, Rolfe Mandel, Brad Loveless, Earl Lewis, Susan Duffy

**EX-OFFICIO MEMBERS ABSENT:** Kayla Savage, Chris Beightel

#### APPROVAL OF MINUTES:

**Motion No. 10-20-01** It was moved by Mike Armstrong and seconded by Allen Roth to approve the August 24, 2020 Minutes for the Regular Meeting of the Kansas Water Authority as presented. **Motion carried with no dissenting votes.** Information found in meeting materials.

#### KWA PWS Committee Update:

John Bailey gave an update

#### Legislative & Budget Update:

*KWA Presentation Legislative Budget Committee*

Mike Armstrong gave an update

#### KWA RAC Operations Committee:

*New RAC Membership*

**Motion No. 10-20-02** It was moved by Allan Soetaert and seconded by Jean Steiner that the KWA approve the membership category change for the Smoky Hill-Saline RAC. **Motion carried with no dissenting votes.** Information found in meeting materials.

#### KWA RAC Operations Committee:

*Missouri RAC Message*

**Motion No. 10-20-03** It was moved by Jean Steiner and seconded by Mike Armstrong that the KWA approve the recommended response to the Missouri RAC of The Kansas Water Office shall request information from KDHE, KDA-DWR, KDWPT and GMD #3 regarding the recent Proof of Concept (POC) project and share the findings of the project activities with the MO RAC and the Upper Ark RAC with additional comments of “and to include all appropriate RACs and the full Kansas Water

Authority”. **Motion carried with no dissenting votes.** Information found in meeting materials.

**Vision/Kansas Water Plan Update:**

*Upper Arkansas RAC Goals/Action Plans:*

**Brant Peterson** presented.

**Vision/Kansas Water Plan Update:**

*Cimarron RAC Goals/Action Plans*

**Armando Zarco** presented.

**Vision/Kansas Water Plan Update:**

*Red Hills RAC Goals/Action Plans*

**Mark Watts** presented.

**Vision/Kansas Water Plan Update:**

*Improving Our States Water Quality*

**Kirk Tjelmeland, Angela Anderson and Tom Stiles** presented.

**Vision/Kansas Water Plan Update:**

*Public Input and Comments on draft Kansas Water Plan*

**Matt Unruh** presented.

**Annual Report:**

**Matt Unruh** presented

**Director’s Report:**

**Earl Lewis** gave an update.

**ADJOURNMENT**

The KWA adjourned at 12:48 pm:

# MEMO



DATE: December 4, 2020  
TO: Kansas Water Authority  
FROM: Cara Hendricks  
RE: Kansas Water Plan Update

900 SW Jackson Suite 404  
Topeka, KS 66612  
Phone: (785) 296-3185  
Fax: (785) 296-0878  
www.kwo.org

---

At the October 26, 2020 Kansas Water Authority (KWA) meeting, the KWA was provided an update concerning the Kansas Water Plan (KWP). This update included a review of the updated goals and action plans for four of the 14 Regional Advisory Committees (RACs), as well as a review of the “Improving our State’s Water Quality” section.

Work has continued to complete additional KWP draft sections for review. The following draft sections will be presented at the December 11, 2020 KWA meeting:

- “Conserving & Extending the High Plains Aquifer” *DRAFT* section
- “Reducing our Vulnerability to Extreme Events” *DRAFT* section
- “Increasing Awareness of Kansas Water Resources” *DRAFT* section
- “Securing, Protecting and Restoring our Kansas Reservoirs” *DRAFT* section

Additional information on this process will continue to be shared with the full KWA at future meetings.

---

*This is for informational purposes only.  
No Kansas Water Authority action is necessary at this time.*

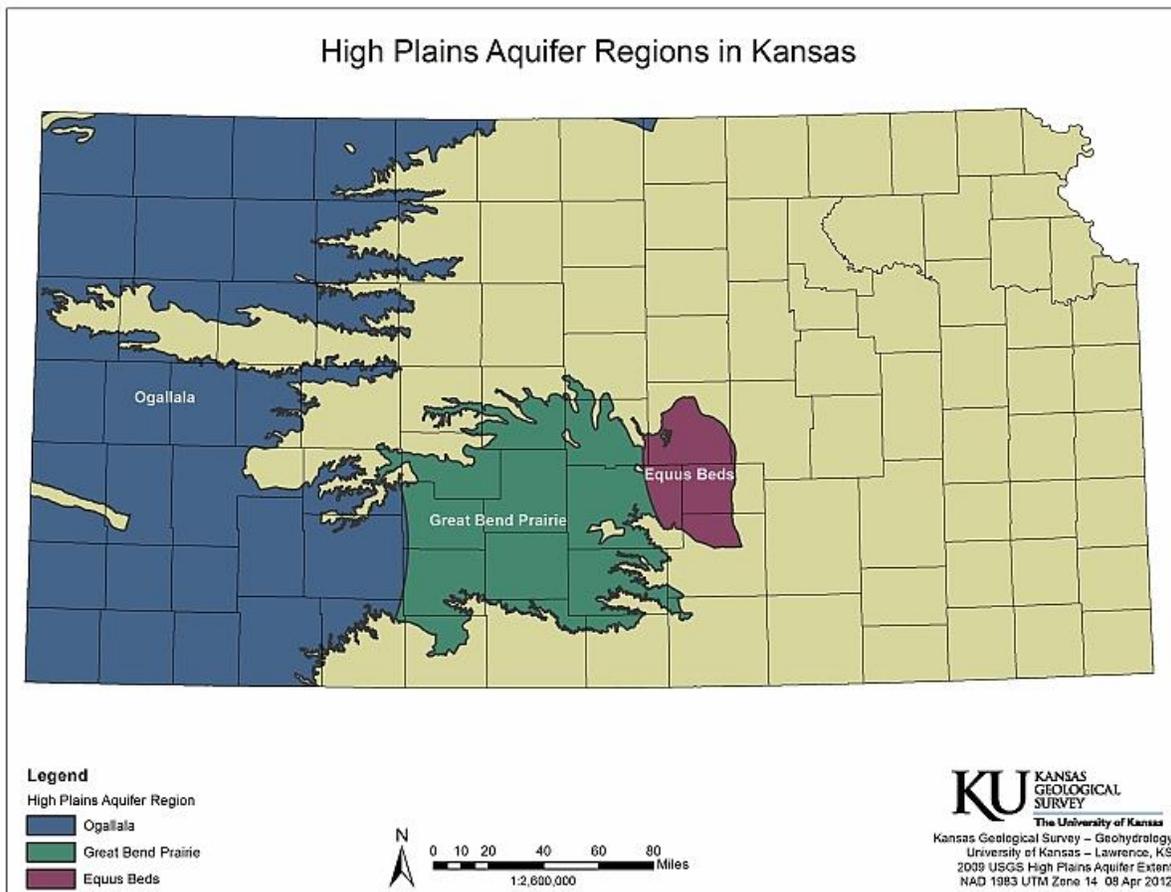
---



## Conserving & Extending the High Plains Aquifer

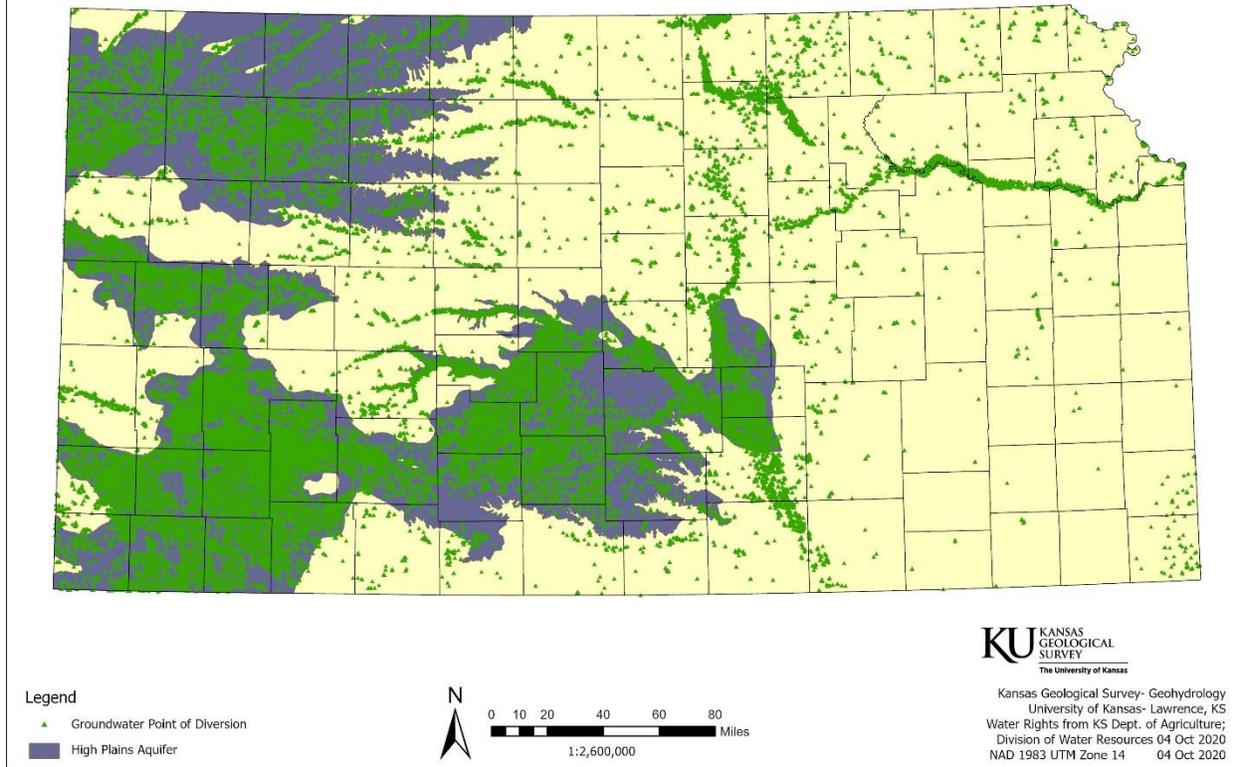
## **Background & Issue**

The High Plains Aquifer (HPA) is the largest, most economically important groundwater source in Kansas. It underlies western and south-central Kansas and is composed of several hydraulically connected aquifers. The Ogallala, which is the largest of these, occurs in the western third of Kansas, an area that is semi-arid with limited surface water. The eastern extension of the High Plains Aquifer is composed of younger sediments that make up the Great Bend Prairie and Equus Beds aquifers. Lying above the Ogallala Formation are Pleistocene and younger stream valley deposits that bear water; where these are connected to the underlying aquifer, they are considered part of the High Plains aquifer.



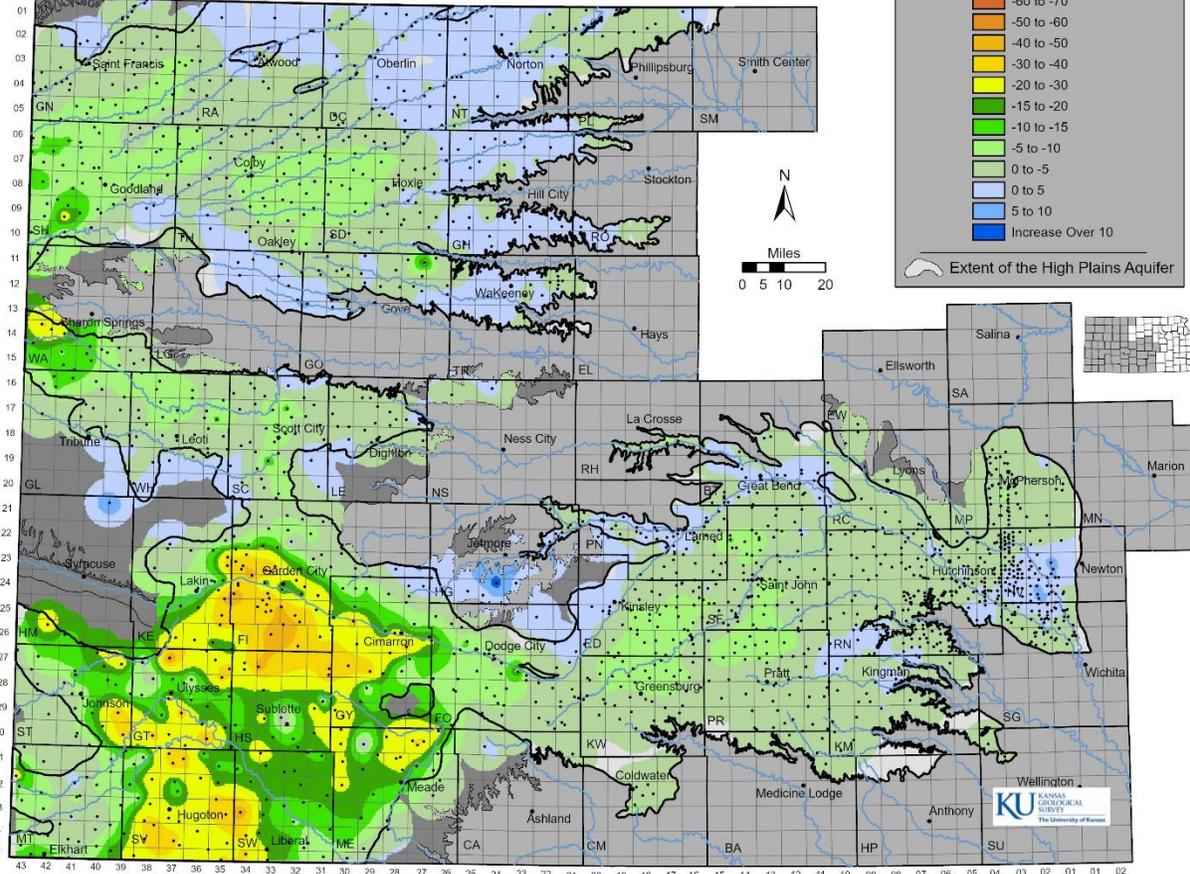
In western and south-central Kansas, groundwater has historically been the most reliable source of large volumes of water for irrigation, municipal, and industrial use. To date, there have been over 50,000 water rights approved in all of Kansas with a majority of those approved for groundwater use in the HPA.

## 2020 Active Points of Diversion - Groundwater



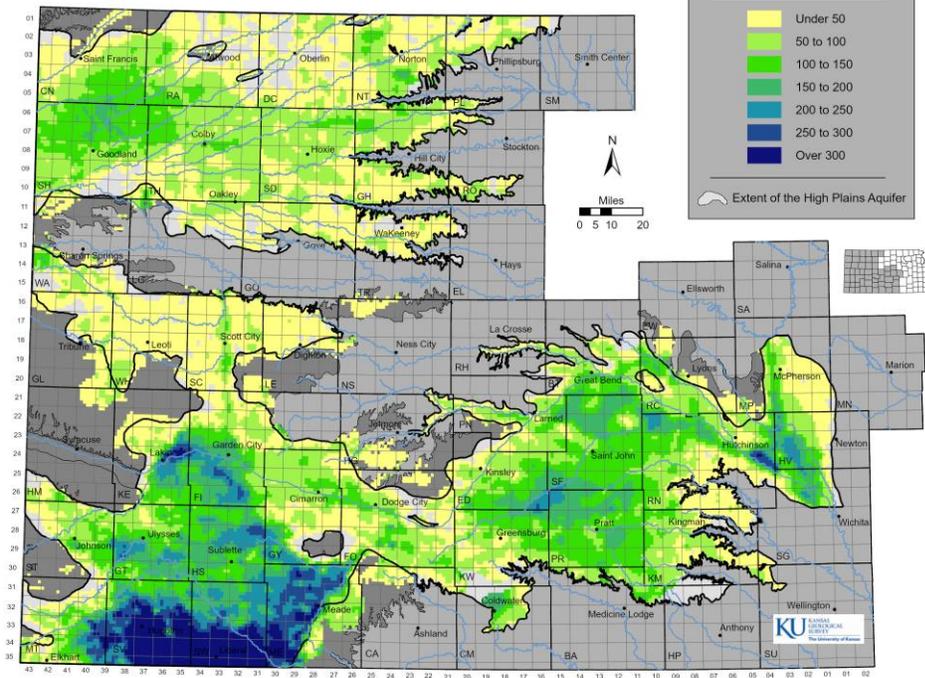
The total irrigated acres in the HPA are estimated to have been around 2.3 million acres in 2019. Corn has been the most commonly grown crop in recent years. Given that corn may need up to 2 acre-foot per acre per year, the HPA region may require up to 5.58 million acre-feet of water per year to grow corn and other crops. Although this total includes contribution from precipitation and some surface water, groundwater from the HPA will be a very significant contributor.

**Interpolated Water Level Change, Kansas High Plains Aquifer,  
Average 2009-2011 to Average 2018-2020**

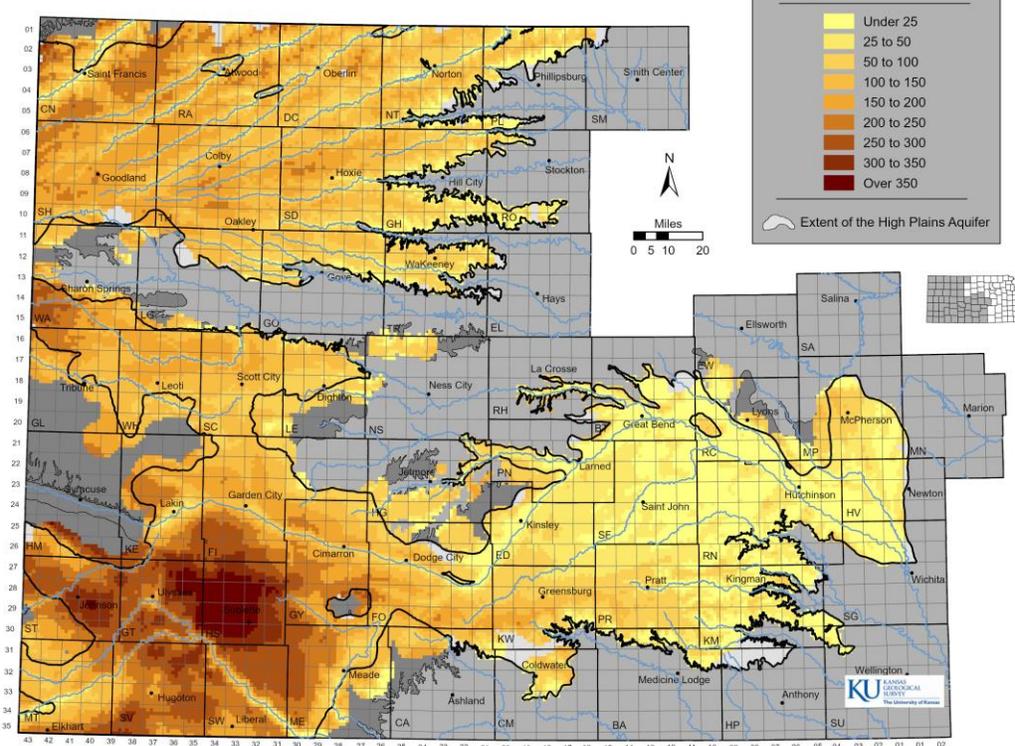


When pumping demands exceed the amount of water that recharges an aquifer, groundwater declines occur. In the Kansas HPA, the saturated thickness and rates of groundwater decline are highly variable. While some areas of the aquifer have effectively been depleted, other areas have substantial volumes of water still in storage. The Ogallala portion of the High Plains aquifer with its greater depths to water, lower precipitation, and lower recharge rates typically has higher groundwater declines relative to south-central Kansas. The rate of water-level decline typically ranges from only a few inches to several feet per year. During drought conditions, rates of decline can be as much as 15+ feet per year. Under current pumping demands, many areas of the aquifer have already experienced, or are projected within the next decade, significant reductions in well yields.

**Average 2018-2020 Saturated Thickness, Kansas High Plains Aquifer**



**Average 2018-2020 Depth to Water, Kansas High Plains Aquifer**



The HPA supports an extensive agricultural complex including irrigated crops, a large cattle and dairy industry, meat packing plants, and biofuel plants in Kansas. Research has shown that the value of water, as measured in revenue generated, continues to increase for irrigated crops with more efficient crop water management, higher yielding crops, and higher prices. A separate economic study completed in 2013 by the Kansas Department of Agriculture showed that the statewide revenue for irrigated and dryland corn was 513 million and 43 million dollars, respectively. Clearly, water resources are an important linchpin of the local and statewide economy. Thus, we should all strive to ensure that groundwater and surface water will be available for future generations of Kansans.

As the population continues to grow, there is a need for more crops, cattle, and energy. Each of these needs requires water for production. With the finite amount of water available in Kansas, we must strive to make every drop count and learn ways to make less water go further. The conservation efforts listed below are being utilized within the state to help conserve water and other resources. The state vision is to Conserve and Extend the High Plains aquifer for generations to come.

### **Management Approach**

The High Plains aquifer is essential to the economy and environment, as well as the well-being of our citizenry. A variety of local, state, and federal groups and agencies work together to help implement water conservation efforts within the region with the commitment to make every drop count. Local Groundwater Management Districts (GMDs), along with state and federal agencies like KWO, KDA-DWR, KDA-DOC, KDHE, KGS, K-State Research and Extension, USDA-NRCS, USDA-FSA, and Conservation District offices provide assistance to producers within the region through cost-share and incentives programs, conservation and environment programs, and education and outreach. New water appropriations are closed across most of the region by order of either the Chief Engineer or local GMDs, or are effectively closed through safe yield rules and regulations. Water rights owners adhere to a seniority system with “first in time, first in right” when it comes to water right disputes. It is through the willingness of water right owners in the region, who recognized the need for change, that so many of the conservation efforts being made have had positive impacts to the aquifer.

The Mission from the *Vision for the Future of Water Supply in Kansas*, “Provide Kansans with the framework, policy and tools, developed in concert with stakeholders, to manage, secure and protect a reliable, long-term statewide water supply while balancing conservation with economic growth”, describes the goal of the management approaches that are being implemented. The four guiding principles that helped to direct the development of the state Vision document are listed below. These principles will continue to guide the implementation and development of all future management approaches.

- Locally driven solutions have the highest opportunity for long term success. Therefore, the intentional focus of the action items presented in the Vision are to provide the necessary tools and support to allow for greater flexibility and management of water resources at the local level.

- Policies and programs should not unintentionally penalize those who have already demonstrated good stewardship with the state’s water resources.
- Voluntary, incentive and market-based water conservation and land management activities are the preferred tools for ensuring a reliable statewide water supply.
- Action is necessary now to ensure a reliable supply into the future.

The conservation efforts listed in the following table are some of the efforts currently being utilized within the state of Kansas to help conserve water and other resources.

<b>Regional Conservation Efforts</b>		
<b>Cost-Share &amp; Incentives</b>	Water Transition Assistance Program (WTAP)	A program offered by KDA-DOC that pays water right owners in targeted areas that are closed to new water rights appropriations, to permanently dismiss all or a portion of their active water right(s). ( <a href="#">Click here for more information</a> )
	Conservation Reserve Enhancement Program (CREP) – Kansas Upper Arkansas River	USDA-FSA offers a program to producers in the Upper Arkansas River counties in Kansas that pays irrigators to permanently transition acreage out of irrigated production and into grasslands or other conservation practices. ( <a href="#">Click here for more information</a> )
	Water Banking	A market-based program currently in south central Kansas that provides water conservation measures and allows the movement of water right allocations to areas of need within the same sub-basin, through long term leases of water rights. ( <a href="#">Click here for more information</a> )
	Irrigation Technology Initiative	KDA-DOC offers cost-share funds to assist landowners with irrigation efficiency technology. This initiative is designed to promote irrigation efficiency and water conservation by providing cost-share assistance to landowners for automated soil moisture probes. ( <a href="#">Click here for more information</a> )
	Environmental Quality Incentives Program (EQIP)	USDA-NRCS program that provides financial and technical assistance to producers to implement water conservation practices. ( <a href="#">Click here for more information</a> )
<b>Conservation &amp; Environment</b>	Regional Advisory Group (RAC)	Regional planning committees were established by KWA to focus on priority goals for the region and develop an action plan to help address water concerns and other issues within their region. ( <a href="#">Click here for more information</a> )
	Local Enhanced Management Area (LEMA)	A program that allows a Groundwater Management District (GMD) to take action to conserve water usage in portions or all of their district. If recommended by the

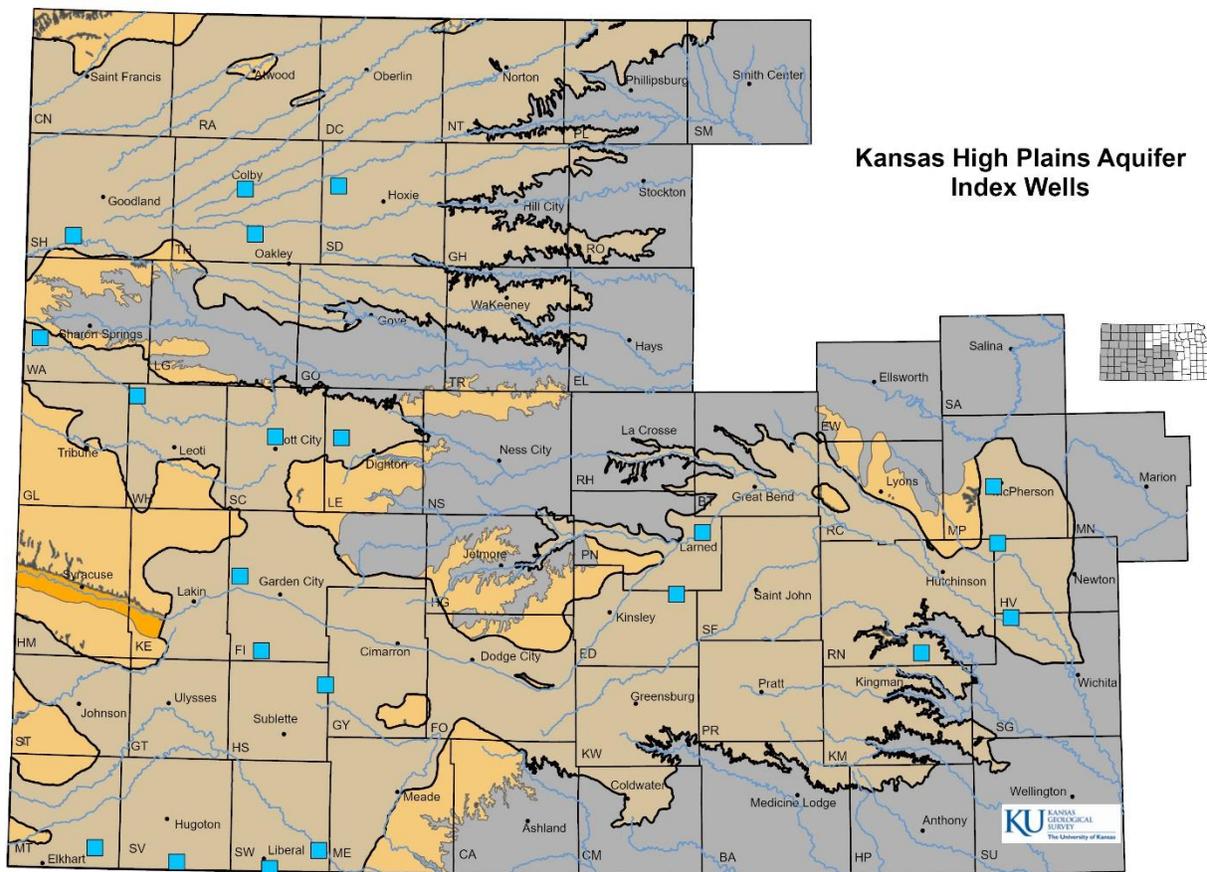
		GMD and ordered by the Chief Engineer, the conservation measures temporarily override the appropriated water rights in the region. A LEMA has the potential to be highly effective due to local commitments and changes in farming practices. ( <a href="#">Click here for more information</a> )
	Water Conservation Areas (WCA)	A program offered by KDA-DWR that allows individual farms the flexibility of their water right(s) on their land for a limited time period, as long as they officially agree to reduce water use during that period. ( <a href="#">Click here for more information</a> )
<b>Education &amp; Outreach</b>	K-State Research and Extension	Offers information and guidance through their Mobile Irrigation Lab, KanSched, and Crop Water Allocator that help producers make the most efficient, economic use of their crop water. Also are looking into more water tolerant crops and are experimenting with multiple crop varieties in order to learn what works best in different climates and if any new crop variety can be obtained for further water conservation. ( <a href="#">Click here for more information</a> )
	Water Technology Farms	Kansas Water Office (KWO) offers producers free enrollment into the program to help demonstrate and educate other producers on the benefits of utilizing new irrigation technologies, practices, and services. ( <a href="#">Click here for more information</a> )
	HPA Index Well Network	A Kansas Geological Survey (KGS) program that is focused on developing an improved understanding of aquifer dynamics at scales appropriate for management. The program has a monitoring network of 25+ wells with much of the data being presented in real-time on the KGS website to allow Kansans to understand conditions in the HPA in their area. An additional goal is to directly examine issues and areas of particular interest to the GMDs and KDA-DWR. ( <a href="#">Click here for more information</a> )

### Measuring Success

Much of the Ogallala portion of the High Plains aquifer has been heavily depleted since predevelopment. Projections in some areas, such as portions of Haskell County, show no more than 20 years of available water remaining if pumping continues at current rates. Other areas in west central Kansas have already reached the point of no return where many acres of once irrigated land has now been converted to dryland crops or cattle grazing. Some small areas in southwestern Kansas show more than 100 years of available water remaining but this is far from the rule in most of the HPA in western Kansas.

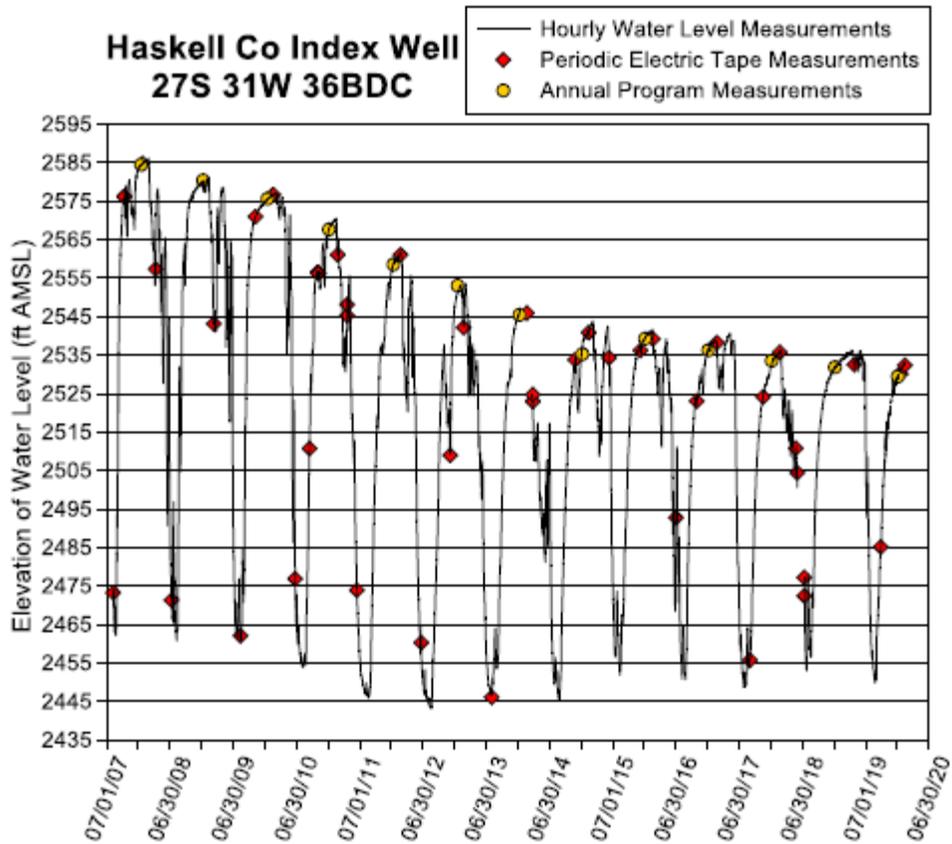
Although there are economic advantages to conserving water for future use, as well as consideration of future generations' needs, many producers still use their water rights to maximize the current benefit. Yet recent studies have shown that the same amount of yield or more can be accomplished with less water if new farming practices are introduced.

The KGS currently has over 25 "Index Wells" that have been installed in the High Plains aquifer region that are continuously recording water levels every hour. The first three sites were drilled in 2007 and are located in Haskell (GMD3), Scott (GMD1), and southern Thomas (GMD4) counties. Below you will see three graphs. These graphs show changes in the water table for all three well since they were installed.



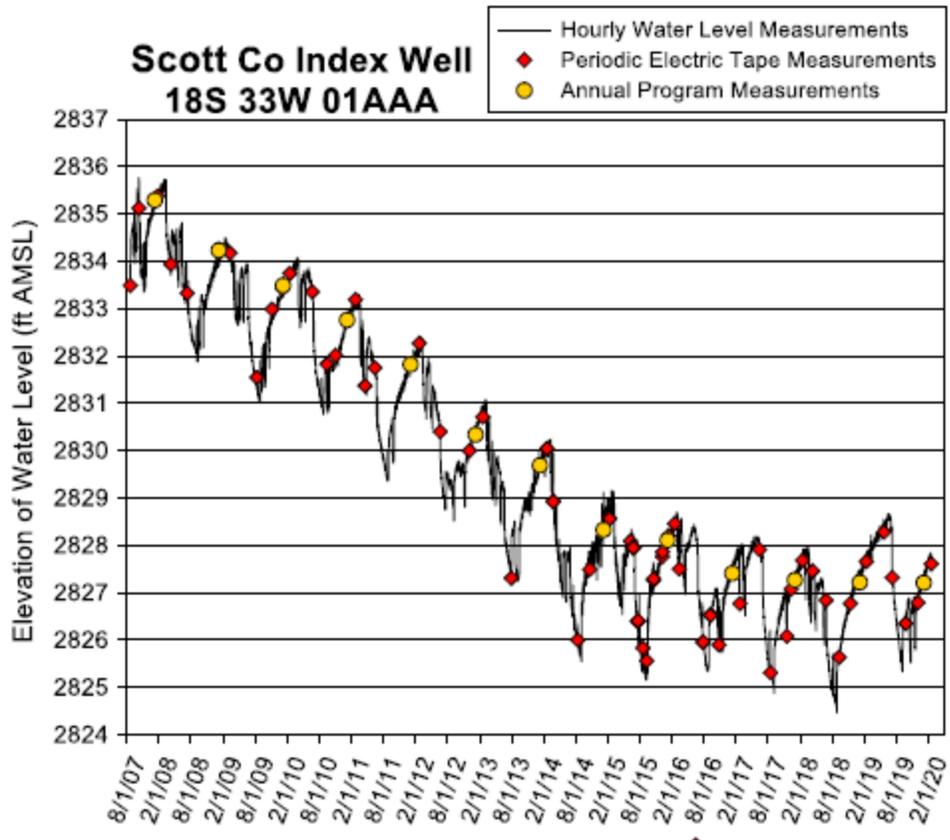
*Haskell County KGS Index well*

**Hydrograph- Annual Average Depth to Water Below Land Surface**



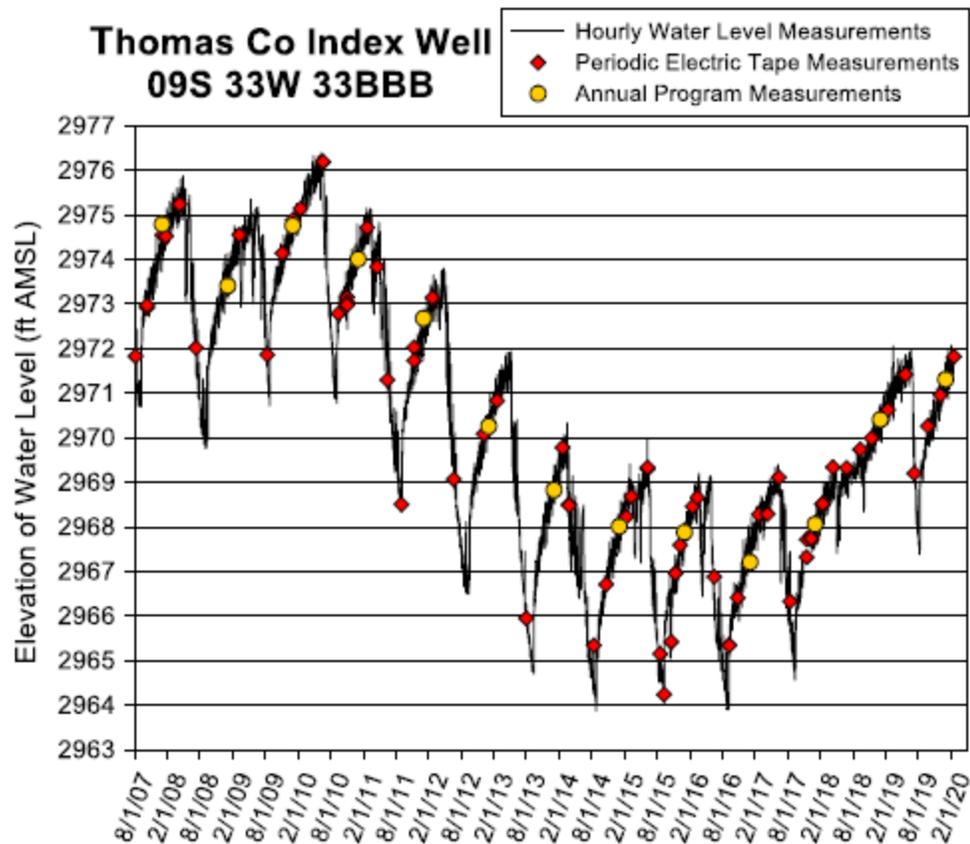
*Scott County KGS Index well*

**Hydrograph- Annual Average Depth to Water Below Land Surface**



*Thomas County KGS index well*

**Hydrograph- Annual Average Depth to Water Below Land Surface**



As can be seen in the graphs, water levels can vary substantially in a single year in response to irrigation-based pumping during the growing season and climatic conditions. In recent years, the overall rate of decline has improved as much of the HPA region has seen above average precipitation rates and resulting lesser pumping demands. When favorable and timely rains do not occur, groundwater withdrawals increase and water levels typically fall.

In addition to the index well program, the KGS and KDA-DWR measure roughly 1,400 wells across the High Plains aquifer each winter to monitor regional changes in the groundwater supply. The data collected can be accessed through the KGS WIZARD Water Well Levels Database ([click here for more information](#)) available on the KGS website.

Precipitation-based aquifer recharge is highly variable across Kansas. It can be influenced by a variety of factors including depth to water, intensity of water inflow, and total precipitation and rate, temperatures, soil types, and regular land use. Research is also being conducted to show if there is potentially a recharge source from the 20,000 plus playa lakes in central and western Kansas. While recharging the ground can be helpful, it may take years to decades or even longer for a drop of water to travel from the surface to the water table depending on the location, depth, and material in the subsurface. The best method to keep groundwater available longer is to pump less.

Groundwater water rights in Kansas allow for specific annual authorized quantities and uses that can be pumped year to year. Stakeholders have incentives to use all they are entitled to from a common pool, to reap short term benefits, when the negatives (water declines) are spread across many users. However, common pool resources have been successfully managed by and for those that rely on it, particularly with a locally developed plan that has clearly defined goals, rules, and regulatory oversight; an example of this is the Local Enhanced Management Area (LEMA) program.

The first approved LEMA in the state of Kansas is the SD-6 LEMA in Sheridan County. This ongoing LEMA has a water conservation goal of a 20% reduction in groundwater pumping, and that goal was exceeded in the first five year cycle. LEMA participants renewed the program for another 5-year cycle in 2018. As a result of the success of the SD-6 LEMA, GMD#4 initiated a district-wide LEMA in 2018 and LEMAs are being considered by at least one other GMD in western Kansas.

Then Governor Brownback signed a bill in April of 2015 that allowed for the establishment of Water Conservation Areas (WCAs). WCAs are a simple, streamlined, and flexible tool that allows any water right owner or group of owners the opportunity to develop a management plan to reduce withdrawals in an effort to extend the usable life of the aquifer in their area. To date, 53 WCA plans have been approved in the High Plains Aquifer region with a total of over 86,000 irrigated acres.

As of 2020, there are 17 farms enrolled in the Water Technology Farm program. This program is for the demonstration of technologies, such as soil moisture probes, mobile drip irrigation (MDI), sub-surface drip irrigation (SDI), more efficient nozzle packages, variable rate pivot systems, observational index wells, farm weather stations, direct crop sensing probes, dairy ice sweepers & water reuse systems, and services, such as aerial imagery, soil sampling and mapping, soil health analysis, water tracking, cover crops, and no-till farming practices. With growing interest each year, more and more producers are realizing the impact that water smart technology can have on their operations and the water-saving benefits for future generations.

Recent studies show that by using less water and introducing new farming practices, the same amount of yield or more can be produced. Thus, bringing to mind the concept of “less water use with a greater economic return”, encouraging producers in the region to consider adopting new tools and practices.

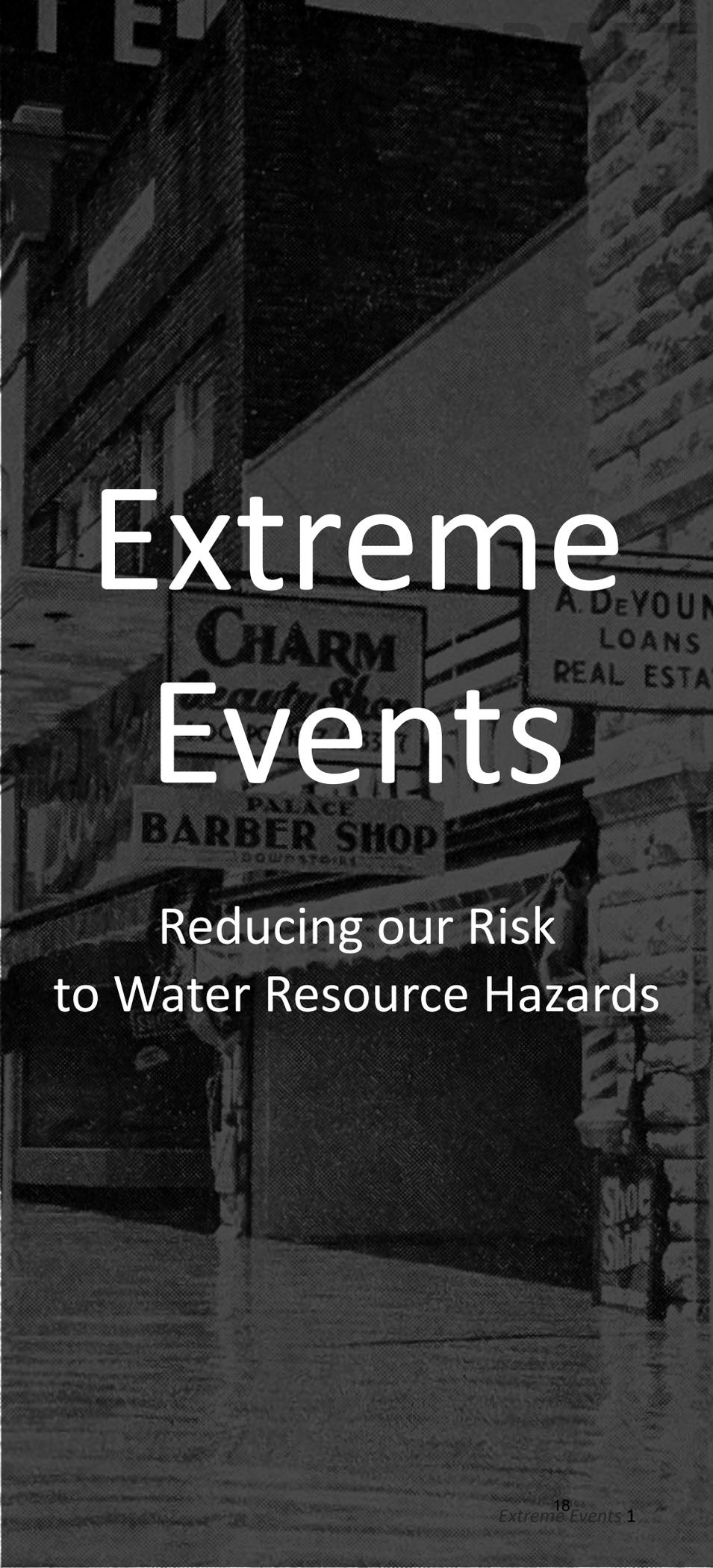
Helping to educate and change the mindset of Kansans in the High Plains aquifer region is crucial in helping to conserve water. Seeing the numbers and results of efforts being made proves that these methods work. It is all about making every drop count.

### **Recommended Actions and Strategies**

Throughout the course of a calendar year, the Kansas Water Authority and Regional Advisory Committees meet regularly to address resource concerns and future agendas. Starting in the fall of 2019, the KWO held regional meetings with local stakeholders to discuss concerns in their areas and recommendations on steps to resolve such issues. Based on stakeholder feedback, it is

suggested to take these steps to help conserve and extend the High Plains Aquifer in the Kansas. These steps can help make a difference now but may also make an impact for generations to come.

- Improve coordination on water related issues with the state's primary water related agencies through the creation of the Governor's Water Resources Subcabinet at the Executive level with additional regular agency collaboration to implement joint activities
- Policy or Program Recommendations
  - Increased incentives for water conservation program
  - Continue to support the KGS Index Well Program
  - Provide more support to DWR for Compliance and Enforcement
  - Increase support and promotion of Local Enhanced Management Areas (LEMAs)
    - Provide greater support to local entities in LEMA development and management
    - Target water conservation incentives, including existing cost share program and new incentives, to established LEMAs to support implementation of lower water consumption actions
- Implementation Actions
  - Sharing Information
  - Developing a curriculum to be taught in schools
- Data, Research, and Studies
  - Increased support for Water Technology Farms
  - Research on drought tolerant and low water crops
  - Providing to the public more reports that include studies that demonstrate the benefits of pumping less water
- Funding and Resource Needs
  - Make the State Water Funding a priority
  - Coordinate with the Kansas Department of Commerce and the Marketing Division of the Kansas Department of Agriculture to consider incentives to recruit businesses and focus economic development on businesses that value water conservation, use water efficient technologies and reduce the removal of water from the state
    - Encourage value added processing within Kansas by providing financial or water right credit incentives to dairies and feedlots



# Extreme Events

Reducing our Risk to Water Resource Hazards

## Background & Issue

Extreme weather events impact Kansas regularly. Severe flooding occurred in Kansas in 1935, 1951, 1965, 1973, 1976, 1981, 1983, 2007, 2011 and again in 2019. Kansas has also repeatedly experienced droughts, with most aware of the “dirty thirties” and the 1950s drought, and while these events have typically been used as standards for severe droughts in Kansas in the past hundred years, paleoclimate proxy evidence indicates droughts in Kansas of even greater severity and duration over the past thousand years. The state’s diverse climate and propensity for both extremely wet and dry conditions creates unique challenges. In some years, both flooding and drought can occur simultaneously, as they did in 2011 when above-average snowpack melt and precipitation impacted the Missouri River system and caused northeast Kansas to flood while much of the state was in a moderate to exceptional drought.

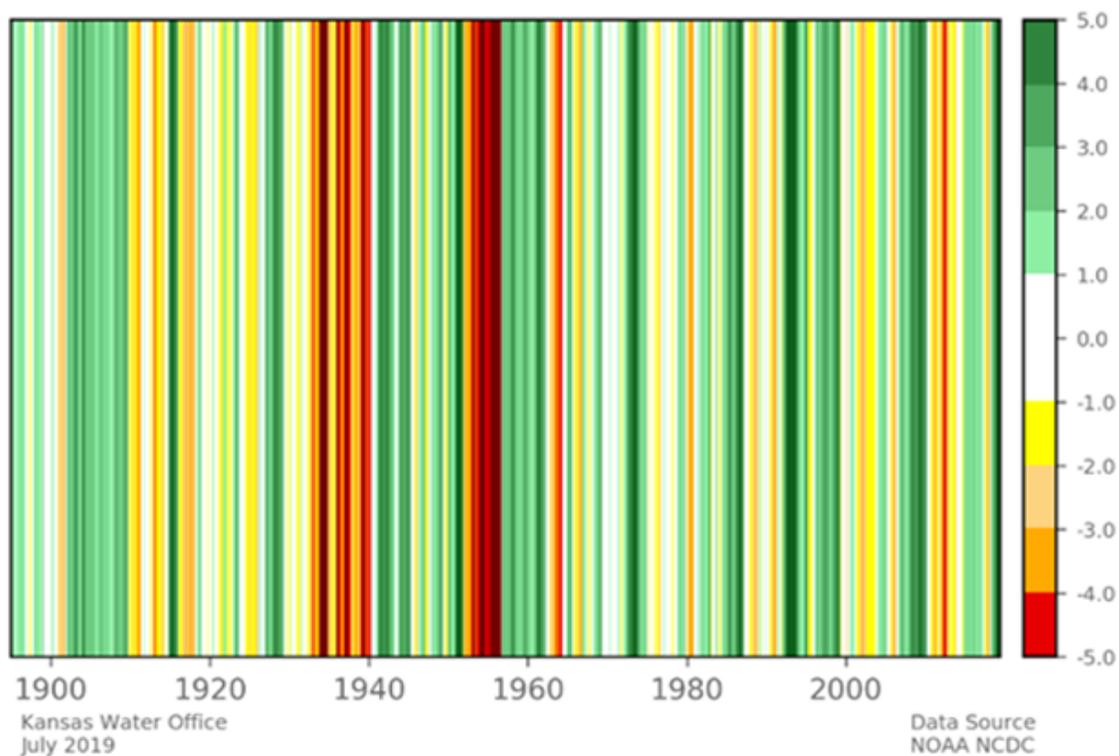


Figure 1. Historical Kansas Palmer Drought Severity Index (PDSI) values.

PDSI utilizes precipitation, temperature, and available water content data to estimate relative dryness. Classifications typically range from extremely wet (PDSI > 4.0) to extreme drought (PDSI < -4.0). Historical PDSI data illustrates the year-to-year variability of water resources in Kansas, as well as the severity of extreme events like the 1930s and 1950s droughts.

Climatologists have warned that Kansas is facing a warming trend in our future, causing a potential increase in the frequency, duration, and intensity of extreme events. Recent decades support this trend, with temperature increases particularly notable in the spring, which affects the planting of crops. The Fourth National Climate Assessment, 2018, projects that current temperatures will increase in the Southern Great Plains by 4.4 to 8.4 degrees Fahrenheit by 2100. Even small increases in average temperatures raise the risk of heat waves, wildfires, and droughts, as well as higher surface water evaporation and more turbulent atmospheric conditions leading to severe weather.

Future predictions for average annual precipitation are somewhat uncertain, with projections indicating a slight increase in winter precipitation and decrease in summer precipitation. However, the anticipated increase in the frequency and intensity of extreme precipitation events could result in decreased soil moisture, as soil would have less time to absorb the precipitation and longer periods between precipitation events to dry out. Such conditions would have a direct, negative impact on agriculture and put a greater strain on flood management infrastructure.

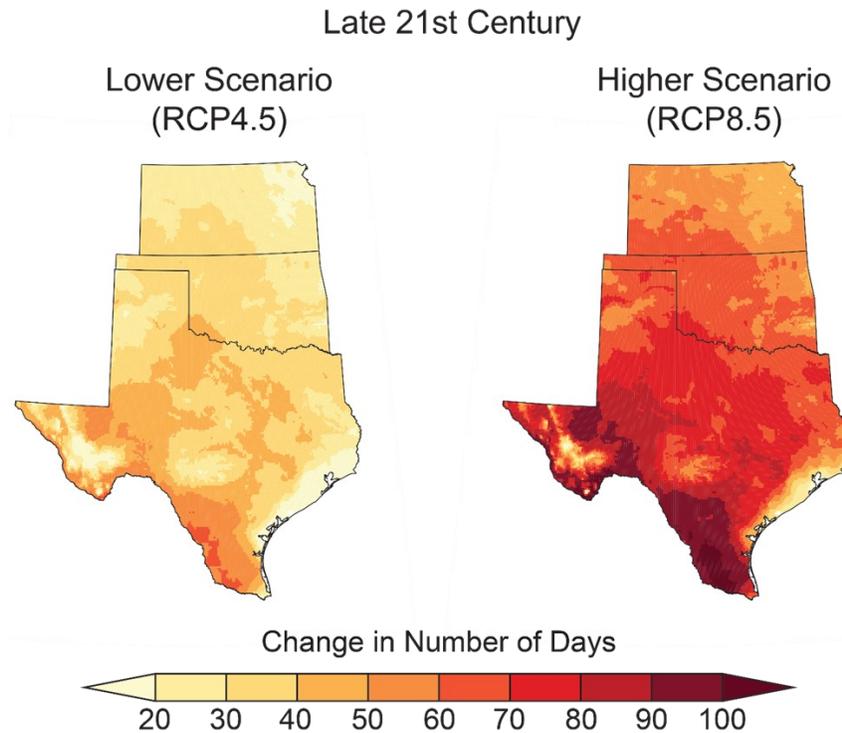


Figure 2. Projected increase in number of days above 100°F throughout the Southern Great Plains. (from Kloesel et al., 2018)

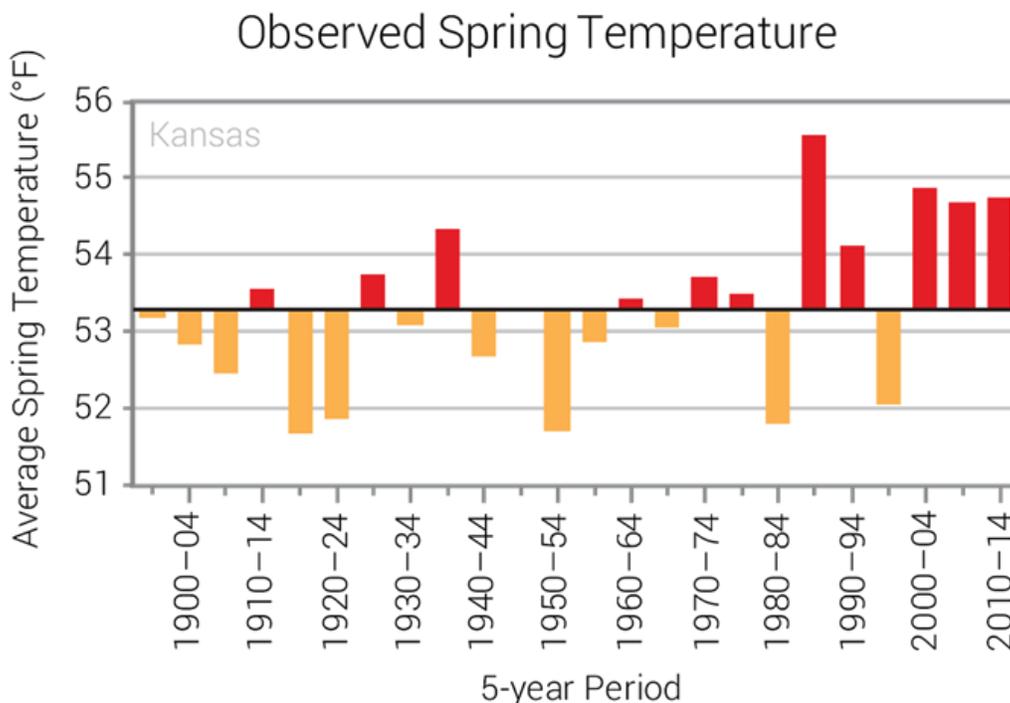


Figure 3. Warming trends in Kansas have been particularly noticeable in the spring in recent decades. (from Frankson et al., 2017)

The precipitation figure below illustrates the inherent variability and climatic challenges in our state. What has historically allowed the State of Kansas to grow and prosper is the utilization of water resources to combat extreme events. In western Kansas, groundwater resources play a critical role. In eastern Kansas, surface water resources have a more significant impact. However, these vital resources have a threshold. Extreme events (flood and drought) can propel us closer to that threshold.

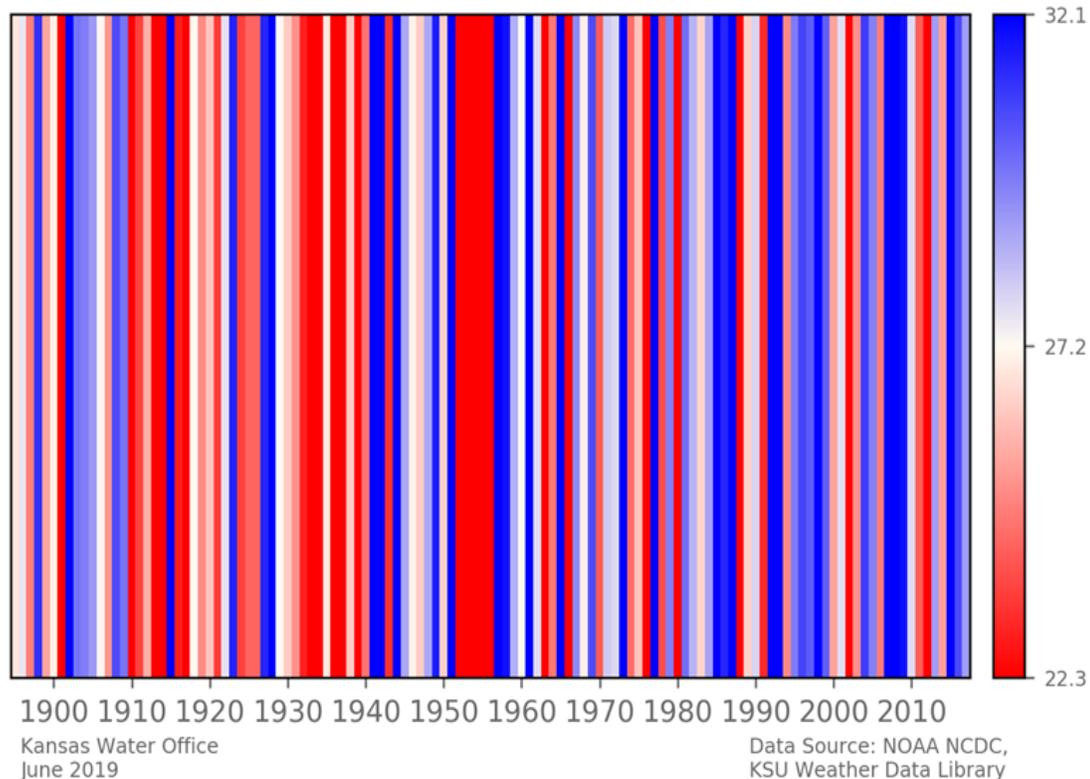


Figure 4. Statewide annual precipitation, inches (1895-2017).

Blue stripes indicate years with above average precipitation ( $>27.2''$ ) and red stripes indicate years with below average precipitation ( $<27.2''$ ). The variation in color patterns demonstrates the diverse range of water resource conditions, both in duration and frequency of wet and dry conditions, that Kansas experiences.

### Flooding in Kansas

Flooding usually occurs quickly when precipitation exceeds infiltration and then exceeds channel capacity. Preparations to warn of flooding, protect infrastructure, and keep sediment and nutrients from entering water bodies can decrease adverse effects and duration of any impacts. Intense precipitation events also increase the presence of sediment, nutrients, and various pollution loads in streams, which end up in reservoirs that store flood waters. Once sediment enters a reservoir during a flood event, it is deposited on the lake bed, decreasing the available storage space needed to withstand future floods and droughts. Much of the state's lost storage in reservoirs can be attributed to inflows of sediment during flood control operations. Local and regional water utility infrastructure can also be at risk, threatening the delivery of safe drinking water to users.

In 2019, saturated conditions in the Great Plains early in the year were amplified by the wettest spring on record and additional summer rains. Thanks to the state's system of federal reservoirs, levees and watershed dams, we were able to concentrate most flood damage to our reservoirs and riparian corridors. This localized damage, however, came at a cost to the State. Significant water storage space was lost in our reservoirs due to the substantial sediment and debris inflows. Our low-lying riparian areas, often accompanied by productive farm ground, public infrastructure, and other assets, endured long periods of inundation and the erosive forces of flood waters.

During the 2019 flood disaster, the Kansas Department of Agriculture's Division of Water Resources (DWR) reported only 10.0% of homes within Kansas' mapped floodplains were carrying flood insurance through the National Flood Insurance Program (NFIP). They also reported that the 287 NFIP claims made in Kansas during that time totaled \$3.78 million. Floodplain maps provide guidance for local land use planning. However, other considerations often take precedence when development occurs in floodplains. Mapping these flood prone areas is an ongoing effort that requires in-depth analysis of floodplain characteristics, fluvial morphology, and planning for increased flood magnitudes. Ultimately, the effectiveness of real-time hydrology information is reliant on our ability to share the information with multiple user groups.



Figure 5. Flooding in Elmdale, KS.  
Photo taken May 8, 2019 by Chase County Emergency  
Management Director Scott Wiltse.

Additionally, the State oversees the permitting, construction, and inspection of our smaller watershed reservoirs. As these structures age, they become less functional and a potential breach danger to downstream residents if not properly maintained. Water utilities tend to be vulnerable to flood events due to their proximity to surface water resources. Water treatment intakes may be compromised by a blockage or loss of power. Wastewater systems can be overwhelmed by stormwater entering municipal sewer systems and may also be over-topped by adjacent floodwater. The development of vulnerability assessments and emergency plans is key to minimizing these disruptions of safe water to Kansans. Managing a flood event requires well-developed procedures for communication between forecasting agencies, emergency responders, government officials, utility providers, and the general public. Real-time information on weather, stream flow, reservoir storage, levee integrity and others are used to inform the State's emergency operations. The Kansas Division of Emergency Management (KDEM) provides guidance for hazard response in the 2017 Kansas Response Plan and information on mitigation in the 2018 State Hazard Mitigation Plan.

## Drought in Kansas

Each year, drought costs the United States an average of \$8-9 billion, as estimated by the USGS. Kansas is one of the many states with a history of significant impacts from drought. In recent years, drought-related losses in Kansas have been particularly significant in agriculture. In 2017, Kansas ranked 2<sup>nd</sup> in the country for total crop acres. The total value of agricultural products sold in 2017 was \$18.8 billion according to the USDA's National Agricultural Statistics Service. In 2011, however, the Kansas Department of Agriculture estimated that drought caused roughly \$1.8 billion in crop losses in Kansas including the price farmers would have received for the lost production and nearly \$366 million in drought-related herd liquidation from overfilled cattle livestock auction houses. Even more destructive, the 2012 drought caused more than \$3 billion in drought-related crop losses in Kansas. Additionally, more than \$1.3 billion in crop insurance indemnity payments for failed commodities were paid to Kansans in 2012 according to the U.S. Department of Agriculture's Risk Management Agency. More recently, though less severe, the 2018 drought resulted in a drought declaration for the majority of the state with losses throughout the Great Plains and Southwest regions of the country estimated by the NOAA National Centers for Environmental Information (NCEI) at approximately \$3.1 billion.

### U.S. Drought Monitor Kansas

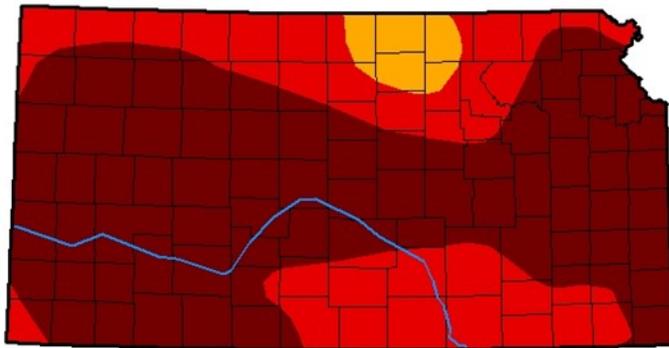
**August 21, 2012**

(Released Thursday, Aug. 23, 2012)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	0.00	100.00	100.00	100.00	96.43	66.93
<b>Last Week</b> 08-14-2012	0.00	100.00	100.00	100.00	89.84	63.30
<b>3 Months Ago</b> 05-22-2012	15.30	84.70	13.27	2.36	0.03	0.00
<b>Start of Calendar Year</b> 01-03-2012	42.48	57.52	47.15	23.20	12.79	0.22
<b>Start of Water Year</b> 09-27-2011	16.39	83.61	66.03	48.78	28.54	17.63
<b>One Year Ago</b> 08-23-2011	28.77	71.23	62.24	49.07	23.54	14.55



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Michael Brewer  
NCEI/NOAA



<http://droughtmonitor.unl.edu/>

Figure 6. Kansas Drought Monitor, August 21, 2012.

Extreme to exceptional drought conditions throughout the majority of Kansas resulted in significant economic losses in 2012, particularly in agriculture.

Adapting to changing conditions and minimizing harm from severe droughts is vital for Kansas agriculture. The use of cover crops can help reduce vulnerability to drought by increasing soil pore space, which increases infiltration, reduces evaporation, keeps soils cooler, and positively impacts yields during drought. Additionally, no-till or strip-till farming practices, along with drought tolerant crops and decision-support tools such as irrigation scheduling and crop water allocation planning can help manage risk. Many federal and state lakes provide an alternate water supply for livestock during droughts. Whatever measures are taken, maximizing conservation practices and efficient water use during a drought is critical.

Clearly, even a single year of extreme drought can result in severe agricultural impacts. Drought impacts, however, are not limited to agriculture. Intense flash droughts can rapidly impact water supplies. With approximately two-thirds of the Kansas population relying on surface water for municipal and industrial needs, depletion of these resources creates a significant strain on communities and businesses. The Kansas Water Office recommends that water system operators monitor, plan, and coordinate to minimize drought impacts.

### **Municipal Water Conservation Plans:**

Having a state-approved water conservation plan, through the Kansas Water Office, is a public water system's first line of defense against drought. Technical assistance for developing a plan is available through the Kansas Water Office upon request. While there is no overall requirement, a public-water supplier may be required to develop a water conservation plan as a condition of a water right, involvement in a program or as a condition of a grant. Many Suppliers recognize the value of water conservation for their community and voluntarily develop a water conservation plan. The Kansas Rural Water Association provides free technical assistance for developing municipal water conservation plans through the State Water Plan fund.

### **Public Water Supply Emergency Response Plans (ERPs):**

KDHE requires the development of these plans to address all threats to a public water supply and steps to restore the safe delivery of water following a natural or man-made disaster. Drought plans are currently not a requirement, but a suggested action plan of the ERP.

For communities using a common source of supply, drought plans should be consistent in use restrictions to minimize political issues of fairness and equity. Alternate supplies also need to be developed for Public Water Supply (PWS) systems vulnerable to drought.

Ultimately, drought mitigation planning is needed by all sectors that use water. Additional storage of water in reservoirs or aquifers would give Kansans greater ability to manage for potential changes in precipitation timing, duration, and frequency, such as extended dry spells. This can be accomplished through conservation practices to extend and conserve groundwater resources, building or purchasing additional storage, or the recovery of existing surface storage lost to sedimentation. All potential options for drought mitigation should be pursued to protect Kansans and the future economic health of the State.

## Management Approach

Kansas relies heavily on access to surface and subsurface water resources for everyday use. When managing through extreme events, these storage resources play a critical public safety role in fighting drought or holding back flood water.

### Partnership with our Federal Reservoirs

The United States Army Corps of Engineers (USACE) and the United States Bureau of Reclamation (USBR) operate the State's federal reservoirs primarily for flood control. During a flood event, reservoir operations by these federal agencies are designed to minimize flood damage to entire basins across multiple states.

All 24 federal reservoirs also provide critical water supply during times of drought. The majority of water supply in USBR reservoirs is used to meet irrigation demands, generally in western and central Kansas. USACE reservoirs are predominantly in the East and are primarily used to satisfy municipal and industrial needs. These are operated cooperatively between the USACE and the Kansas Water Office. During drought, the majority of flow in a river is actively managed with prescribed releases from USACE reservoirs, often providing the majority of water to your tap.

### Supplementing Surface Water Supply

Natural Stream Flow



Released Storage



Normal Conditions



Drought Conditions

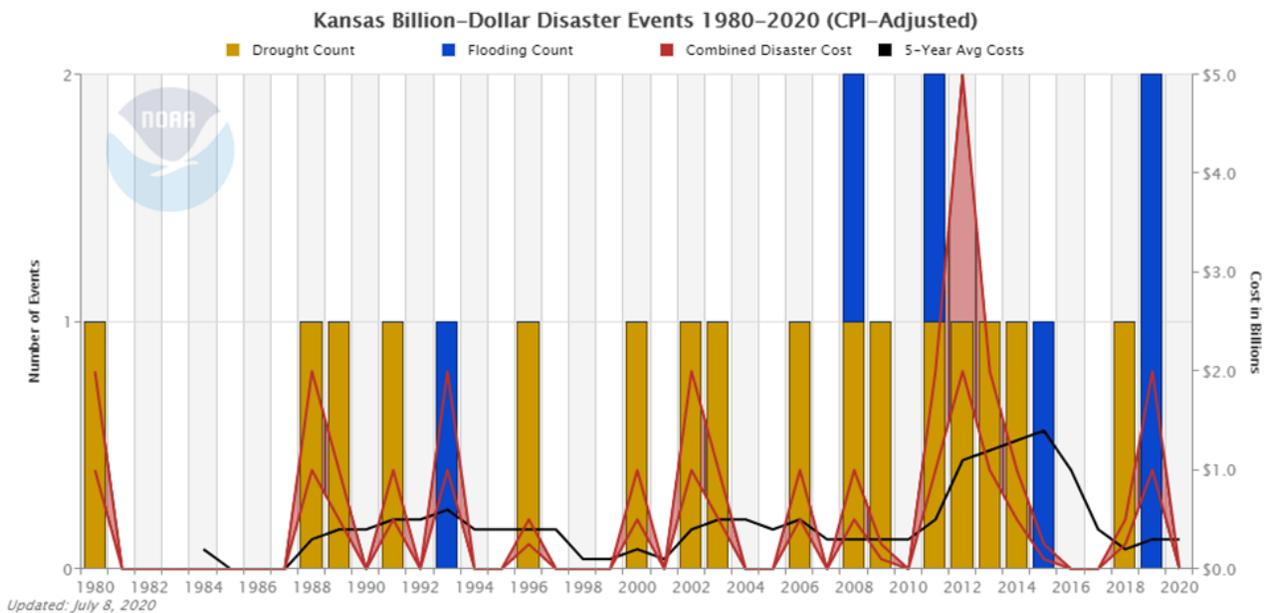
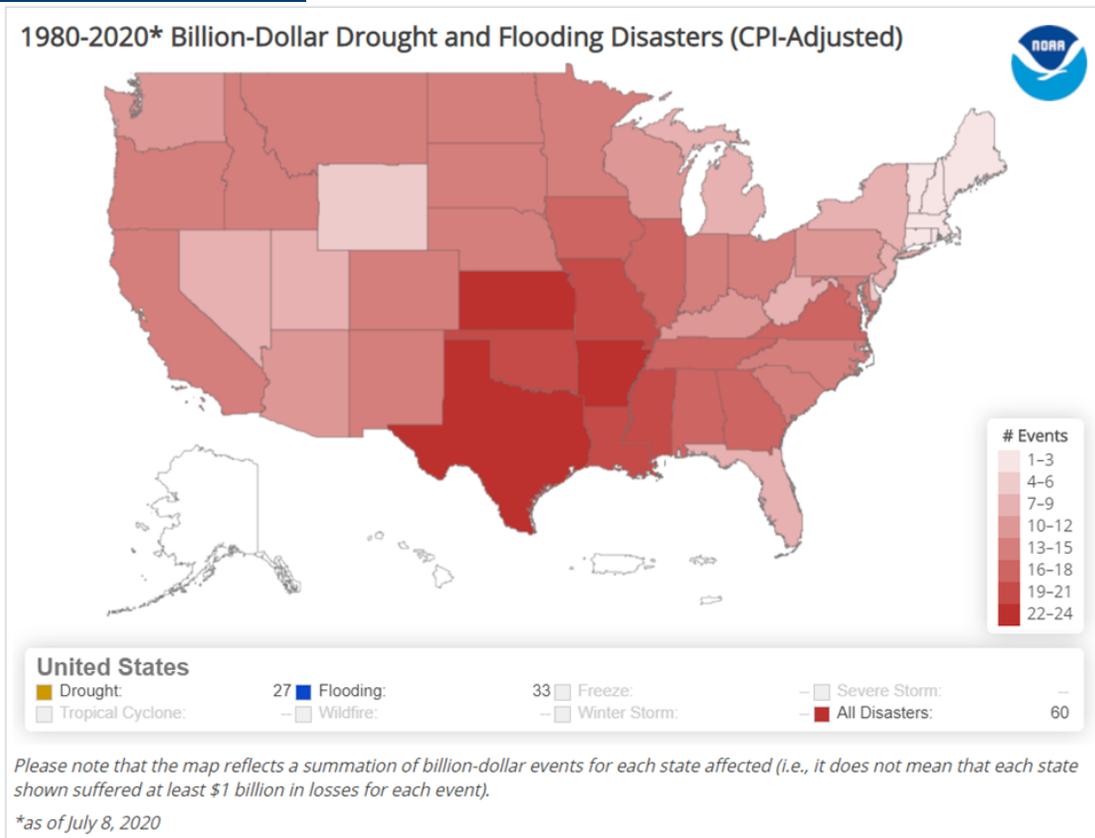
### Managing Drought

In addition to the management of reservoir storage, the State utilizes stream gages to monitor water supply. The use of Kansas water resources in times of shortage is guided by the Kansas Water Appropriation Act and the State Water Plan Storage Act. The State also maintains a Drought Response Team that is charged with monitoring conditions, coordinating resources, and supplying the Governor's Office with updates or recommendations to deploy additional resources as needed.

### Assessment, Prevention, and Recovery

The State of Kansas has developed programs within multiple agencies tasked with floodplain management and mapping, non-federal dam safety, flood control lake development, disaster response planning, hazard mitigation, and others. Additionally, the State engages with many federal agencies that supply information on weather forecasts, river conditions, damage estimates, and disaster relief for qualified applicants.

## Measuring Success



In Kansas, our best measure for extreme event resiliency is economic impact. A high economic impact from flooding or drought would suggest a vulnerability or inability to withstand such an event. From 1980 to 2019, 6 Flooding and 16 Drought billion-dollar disaster events affected Kansas (CPI-adjusted). Weather and climate disaster statistics are collected and distributed by NOAA’s National Centers for Environmental Information. Assessment data are provided by a number of sources including insurance companies and State and Federal agencies.

## Recommended Actions

In response to the increasing frequency of natural disasters across the country, federal assistance programs are shifting focus to projects that reduce or eliminate the risk of repetitive damage. The National Institute of Building Sciences has found that the economic benefits of hazard mitigation significantly outweigh the costs by as much as 6:1 when using traditional cost-benefit analysis. Typically, federal programs require a portion of State or local cost share. This effort to spend federal dollars more efficiently has created a competitive environment among states to put forth well-informed and partially funded mitigation projects. These projects require stakeholder engagement, planning, engineering, and capital. It is critical that the State of Kansas engage in this process if we wish to join our neighboring states and minimize extreme event impacts in the future.

Recommended Actions and Strategies - Flood	
<b>Policy or Program Recommendations</b>	
<ul style="list-style-type: none"> <li>• Improve collaboration between state, federal, and public stakeholders and encourage pooling of resources to enhance flood planning and response.</li> <li>• Pursue better coordination of data sharing and public information.</li> </ul>	
<b>Implementation Actions</b>	
<ul style="list-style-type: none"> <li>• Assemble a group of subject experts to identify the areas of greatest need and opportunity, improve flood planning and response, and determine the best path forward.</li> <li>• Compile critical flood information currently spread across several agencies into a single, publicly-accessible location with a user-friendly interface.</li> <li>• Continue the development of real-time flood inundation mapping in Kansas.</li> <li>• Work with state and federal agencies and emergency managers to develop a methodology for assessing damages to stakeholders from floods in a timely manner.</li> <li>• Develop flexible reservoir management strategies that provide the ability for precautionary drawdowns if there are indications of coming flood conditions.</li> <li>• Promote the use of dry dams and flood easements to temporarily hold flood water behind roadways or other opportunistic land features.</li> </ul>	
<b>Data, Research, and Studies</b>	
<ul style="list-style-type: none"> <li>• Work with state and federal partners to identify existing data gaps, including needs for additional gages within the monitoring network to improve river forecasting.</li> <li>• Continue the development of advanced, all-encompassing flow modeling for future flood planning, and identify basins lacking the data necessary to support more sophisticated modeling methods.</li> <li>• Evaluate current climate trends and projections for extreme event frequency, size, and duration in Kansas to update flood planning based on such statistics as appropriate.</li> <li>• Improve forecasting to predict extreme conditions and pursue flexible reservoir management strategies that maximize the benefit of such information.</li> </ul>	
<b>Funding and Resource Needs</b>	
<ul style="list-style-type: none"> <li>• Shift focus from reactionary to preventative, emphasizing mitigation efforts that reduce or eliminate the risk of repetitive flood damage, to be more competitive for funding from federal assistance programs.</li> <li>• Determine existing infrastructure needs to repair damage from past floods and prevent additional losses from occurring in the future.</li> </ul>	

## Recommended Actions and Strategies - Drought

### Policy or Program Recommendations

- Prioritize the conservation and maintenance of existing water storage, both surface water and groundwater, to ensure sufficient supply under future drought conditions.
- Ensure sufficient staff and in-state expertise to optimize drought planning strategies.
- Develop and promote new drought mitigation tactics for water managers to utilize through an updated water conservation planning document.

### Implementation Actions

- Develop sediment management plans for water supply reservoirs, emphasizing sustainability and the preservation of existing storage.
- Develop flexible reservoir management strategies that provide the ability to eliminate drawdowns and increase water storage if there are indications of coming drought conditions.
- Utilize BMPs and conservation practices, such as cover crops, no-till or strip-till, drought-tolerant crops, irrigation scheduling and crop water allocation planning to prepare for and reduce negative impacts from drought.
- Make drought plans a mandatory component of emergency plans.
- Ensure all communities and rural water districts have updated water conservation and drought management plans.
- Educate landowners on the importance of groundwater conservation, the need for sustainable practices, and encourage participation in existing programs.

### Data, Research, and Studies

- Investigate and pursue innovative sediment management technologies, such as Water Injection Dredging (WID) and hydrosuction, to preserve reservoir storage.
- Improve forecasting to predict extreme conditions and pursue flexible reservoir management strategies that maximize the benefit of such information.
- Develop advanced models that incorporate climate variability modeling into the water supply model to optimize drought planning strategies.

### Funding and Resource Needs

- Work with federal partners to maximize matching funds and prioritize funding for the development of sediment management plans and sediment management pilot projects.
- Expand in-state expertise related to drought forecasting, modeling, and planning and secure sufficient funding to address any staffing needs that are identified.
- Provide funding necessary to assist and incentivize landowner participation in groundwater conservation programs.

Actions should consider both short and long-term economic and environmental impacts to communities, agriculture producers, the energy sector, transportation infrastructure, and our recreation facilities. Ultimately, reducing vulnerability to extreme events in Kansas is best accomplished by acknowledging the risks and mitigating likely impacts from flooding or drought. This requires plans and actions that will assure the safety of our citizens and clean water delivery to Kansans.

## References

- Layzell, Anthony L., and Catherine S. Evans. *Kansas droughts: Climatic trends over 1,000 years*. Kansas Geological Survey, Geology Extension, University of Kansas, <http://www.kgs.ku.edu/Publications/PIC/PIC35r.pdf>. 2013.
- NOAA National Centers for Environmental Information, State of the Climate: Drought for June 2011, published online July 2011, retrieved on October 22, 2020 from <https://www.ncdc.noaa.gov/sotc/drought/201106>.
- Kloesel, K., B. Bartush, J. Banner, D. Brown, J. Lemery, X. Lin, C. Loeffler, G. McManus, E. Mullens, J. Nielsen-Gammon, M. Shafer, C. Sorensen, S. Sperry, D. Wildcat, and J. Ziolkowska, 2018: Southern Great Plains. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 987–1035. doi: 10.7930/NCA4.2018.CH23. <https://nca2018.globalchange.gov/chapter/23/>.
- Frankson, R., K. Kunkel, L. Stevens, D. Easterling, X. Lin, and M. Shulski, 2017: Kansas State Climate Summary. *NOAA Technical Report NESDIS 149-KS*, 4 pp. <https://statesummaries.ncics.org/chapter/ks/>
- Painter, C “Kansas Drought.” *USGS*, [https://www.usgs.gov/centers/kswsc/science/kansas-drought?qt-science\\_center\\_objects=0](https://www.usgs.gov/centers/kswsc/science/kansas-drought?qt-science_center_objects=0).
- United States Department of Agriculture. “National Agricultural Statistics Service.” <https://www.nass.usda.gov/index.php>.
- Bickel, Amy. “End of Dry Conditions on Horizon for Some in Kansas.” *The Topeka Capital-Journal*, 12 Apr. 2013, [www.cjonline.com/article/20130412/NEWS/304129818](http://www.cjonline.com/article/20130412/NEWS/304129818).
- NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2020). <https://www.ncdc.noaa.gov/billions/>, DOI: [10.25921/stkw-7w73](https://doi.org/10.25921/stkw-7w73)

# Kansas Water Plan Guiding Principles and Priorities

## Increasing Awareness of Kansas Water Resources

### Background & Issue

As the *Long-Term Vision for the Future of Water Supply in Kansas* was being developed and more than 600 public input meetings were held across Kansas, one message heard repeatedly was the need for increased education and outreach for Kansans of all ages on water resources issues within the state. While there are many existing water-related educational programs available for both youth and adults, it was noted through these public input meetings that a central message and coordinated educational resources were lacking to help better connect users to their water resources. Many of the Action Items in the *Long-Term Vision for the Future of Water Supply in Kansas*, as well as some goals developed by Regional Goal Leadership Teams, highlight the need for additional development of a state-wide water message and “one-stop-shop” for information and learning resources. To meet this goal, an inter-agency and inter-organizational coordinating team was formed in 2015. This team met throughout 2016 and hosted a series of outreach meetings to solicit input into the development of statewide education and public outreach materials as well as develop tangible action plans aimed at strengthening Kansans’ knowledge and awareness of water and water-related issues. From those meetings a Vision Education Public Outreach Supplement Section to the Vision was created and now serves as the foundation for the *Kansas Water Plan* Guiding Principle and Priority of Increasing Awareness of Kansas Water Resources.



- Additional information to help build the case?



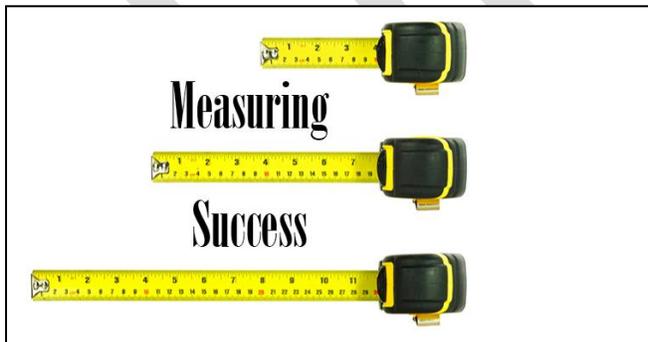
### Management Approach

The following are overarching principles which directed the development of the Vision Education Public Outreach Supplement Section to the Vision. These overarching principles will continue to serve as precepts for Increasing Awareness of Kansas Water Resources within the *Kansas Water Plan*.

- No actions are intended to displace current water education programs. Instead, the initiatives for Increasing Awareness of Kansas Water Resources are designed to promote such programs and to encourage the development of complementary programs. **Include recognition of other programs utilized for overall education efforts here**
- The initiatives and concepts described for Increasing Awareness of Kansas Water Resources are strategic in nature and, as such, do not describe the details of the implementation of the initiatives. The initiative implementation plans will be developed following the approval of the initiatives. Any local, regional or state agency, educational institution, non-government organization, private company or individual stakeholders interested in water education programs are invited and encouraged to provide input and feedback regarding the implementation plans and to participate in these initiatives.
- All of the initiatives for Increasing Awareness of Kansas Water Resources will be unified through a social marketing campaign and the Kansas Runs on Water website.
- All strategies and action items for Increasing Awareness of Kansas Water Resources exist under the larger umbrella of the *Kansas Water Plan*, and will support its mission to provide Kansans with the framework, policy and tools to manage, secure and protect a reliable, long-term statewide water supply. A reliable water supply is dependent upon both sufficient quantity and quality.

### Measuring Success

As previously noted, actions identified for Increasing Awareness of Kansas Water Resources are not intended to displace any current water education programs in Kansas. This collaborative represents an opportunity to build upon and maximize the many successful education organizations and activities currently in place in Kansas. Just a few of these successes include: youth conservation poster and essay contests hosted through the County Conservation Districts, local community water festivals, Kansas Association of Conservation and Environmental Education (KACEE) Project WET, as well as the Awesome Aqua magazine and natural resource educator’s guides developed through Kansas Foundation for Agriculture in the Classroom.



While we have many successes to celebrate related to water resource education in Kansas, gaps still exist and opportunities remain to strengthen Kansans’ knowledge and awareness of water and water-related issues. Filling the gaps and success in the end will require everyone on all levels working together

with a common goal of conserving and protecting our water resources for the next generation. Potential metrics which could be utilized to measure success towards Increasing Awareness of Kansas Water Resources include but are not limited to:

- *Develop and conduct statewide awareness assessment to establish baseline knowledge of Kansans' understanding and comprehension of water issues*
  - *Any information from partners which could be highlighted to help establish current baseline?*
- *Conduct mid-campaign survey to assess effectiveness of plan, comparing results with initial findings of baseline survey*
- *Assess the success of outreach campaign efforts through a post-campaign survey*
- *Establish baseline knowledge of youth in Kansas on water-related issues through a review of marketing research data on youth education*
  - *Any information from partners which could be highlighted to help establish current baseline?*
- *Conduct follow up surveys to assess changes in youth awareness and knowledge in water-related conditions and issues*
- *Evaluate increased participation over time in education and outreach-related efforts*
- *Development and implementation of Kansas water-related educational resources/curriculum*
  - *Information from partners on current educational programs/resources provided*

*Partner feedback regarding desired written order of bullet points above would be appreciated.*

### **Recommended Actions and Strategies**

#### **Policy/Program Recommendations:**

1. Appoint an advisory group in conjunction with KSDE guidance to develop a multi-phased educational proposal for target audiences of K-12, community leaders and media to promote local conservation decisions. Existing educational efforts, programs and activities should be incorporated as appropriate. Ideas to be considered by the advisory group include:
  - *Implement community facilitation programs, with partners like K-State Research and Extension (KSRE), to develop ownership for local conservation districts*
  - *Design and implement a statewide curriculum for K-12 on water conservation, building on current resources and knowledge such as Project WET and integrate water conservation into science curriculum, by working with partners such as the Kansas Association of Conservation and Environmental Education (KACEE) and the Kansas Department of Education*
  - *Develop additional activities within youth and adult organizations such as 4-H and the K-State Research and Extension (KSRE) system to educate others and promote youth activities related to water conservation*
2. Create a long-term commitment to water conservation education by designating responsibility for water conservation public information and outreach within agencies of the Water Resources Subcabinet.
  - *Develop continual media plans and message maps related to water conservation and the importance of local engagement to be implemented by multiple partners through all aspects of traditional paid, earned and social media*
3. Enhance educational programming specifically for state legislators as well as other state officials, Congressional delegation and local policy makers.
4. Utilize agricultural education and 4-H to encourage young people to develop agricultural programs using water efficient technologies and less water intensive crops or crop varieties through recognition and incentive programs.
5. Develop models for the inclusion of water conservation into the agricultural education curriculum, including classroom, supervised agricultural experience and FFA activities.

6. Encourage the development of community college, technical programs and university programs to prepare the future workforce to work in irrigation efficiency technologies and with necessary expertise in less water intensive crops and crop varieties.

Implementation Actions:

**Strategy 1: Develop and enhance a statewide marketing campaign to include brand recognition within Kansas households.**

Action 1: In collaboration with a marketing firm, develop a media plan and campaign message maps to improve knowledge and awareness of water resources as well as promote local citizen knowledge and engagement in water conservation.

Short Term Action Steps:

- *Develop a portfolio of water resource education messages*
- *Showcase campaign through a concerted outreach launch event including social media, print coverage and television broadcasting*
- *Make modifications and improvements to media plan and message maps as necessary*

Mid Term Action Steps:

- *Conduct a mid-campaign survey to assess effectiveness of media plan, comparing results with initial findings of a baseline survey*
- *Assess the success of the campaign through a post-campaign survey and adapt accordingly annually*
- *Continue to develop and incorporate digital strategies for end user interaction as identified by a marketing firm*



**Strategy 2: Establish a brand recognizable centralized website.**

Short Term Actions:

Action 1: Create an online “one-stop shop” of vetted and approved statewide water-related resources and information for all Kansans including federal, state and other public

officials.

- *Finalize development and promotion of the centralized website*
- *Create a clearinghouse for resource libraries on the website. Information to be included, but not limited to the following: curriculum resources, vetted resources for K-12 for utilization in classrooms, scientific research-based resources, economic indicator models, and water-related workshop resources as well as a list of experts and researchers who can provide information on water-related issues*

Action 2: Continue adding to centralized website utilizing materials and resources collected in Phase I, and promote website throughout the state.

- *Enhance centralized website by adding interactive user engagement opportunities such as online information requests and downloadable curriculum*
- *Maintain and add to resource library, keeping materials current and relevant*
- *Continue to assess the usefulness of the “one-stop shop” website*

**Strategy 3: Increase awareness and knowledge of Kansas youth on water-related issues through K-12 education and beyond-the-classroom opportunities.**

Short Term Actions:

Action 1: Establish baseline knowledge of youth in Kansas on water-related issues through a review of marketing research data on youth education.

Action 2: Create opportunities to encourage collaboration between organizations currently involved in water education for youth:

- Hold Governor’s roundtable including the Kansas Commissioner of Education, the President and CEO of the Kansas Board of Regents, as well as leadership from organizations involved in water-related education for youth which establishes a commitment for integrating efforts in water education
- Hold a statewide Summit on Water Education for educators and educational organizations to share best practices, resources, curriculum and services tied to standards/science teaching and include professional learning
- Develop a collaborative plan for sharing water educational resources on an ongoing basis to be included on the website as well as through professional development programs

Action 3: Develop a grant program for new and existing water education organizations to provide professional development, curriculum and resources which build on statewide messaging efforts. This includes identification of existing programs which align with water education goals and establish cooperative agreements which foster collective action and develop a grant program for innovations and/or to fill existing identified gaps in programs or services.

Action 4: Collaborate with youth-related organization leadership on water-related educational opportunities and establish sessions and experiences focused on water.

**Strategy 3 (Continued): Increase awareness and knowledge of Kansas youth on water-related issues through K-12 education and beyond-the-classroom opportunities.**



Mid Term Actions:

Action 5: Launch, promote and award financial resources for statewide water education program.

Action 6: Provide information to K-12 educators about available resources that correlate with educational standards.

Action 7: Provide information to beyond the classroom education organizations on water education curriculum, tools and resources.

Action 8: Provide recognition and awards to youth on water-related projects, offered through schools, clubs and organizations.

Action 9: Increase opportunities for professional development for educators on water-related curriculum to strategically emphasize information and education regarding the importance of water and water conservation practices. Some opportunities may be made possible through the grant program noted within Short Term Action Items.

Action 10: Conduct surveys to assess changes in youth awareness and knowledge in water-related conditions and issues.

*Long Term Actions: Issues for future consideration for this specific strategy to be highlighted here. Partner feedback requested.*

***Strategy 4: Provide opportunities for Kansans of all ages to increase their awareness of local water issues***

**Short Term Actions:**

Action 1: Establish and hire Community Outreach Specialist position(s). The ideal candidate(s) will possess a water conservation background coupled with strong community discussion, education and facilitation skills.

Action 2: Expand current collaboration efforts between university water researchers and water agencies to include higher education institutions in Kansas. Discussions would include state and regional water priorities, current and potential water research projects, as well as additional opportunities to collaborate.

Action 3: Work with developers of centralized website to create links to existing economic indicator resources. Site should provide continual evaluation of the economic impacts of reduced water use based on decision support resources.

***Strategy 4 (Continued): Provide opportunities for Kansans of all ages to increase their awareness of local water issues***

Action 4: Establish the “Top 3” water quality and quantity-related conservation measures for each Regional Planning Area for household, agriculture and industrial/municipal water use. These should be developed by the Regional Advisory Committees using existing data and displayed on the central website.



Mid Term Actions:

Action 5: Utilize the statewide media plan and message maps to promote local engagement in water resource management.

Action 6: Enhance working relationships between local and state entities for collaboration on water strategies. This should consist of a unified message disseminated throughout the state by local entities.

Action 7: Coordinate workshops for local decision makers on water initiatives throughout the state.

Action 8: Develop a grant program to support Regional Advisory Committees and other organizations that are working with communities to raise awareness about water issues, recognize successes and engage citizens in water conservation initiatives.

Action 9: Establish region-specific, targeted improvements for household, agricultural and industrial/municipal water quality and quantity-related conservation. These measures will be shared through the Community Outreach Specialist(s), workshops and educational events.

***Strategy 5: Develop partnerships between industry, community, and educational institutions that will promote and train for water-related careers.***

Short Term Actions:

Action 1: Begin evaluation of higher education institutions current academic offerings and identify water-related courses and curricula.



Action 2: Coordinate regional/topical workshops to facilitate development of partnerships between higher education and business and industry. Partnerships will analyze existing academic degree programs leading to water-related careers.

Action 3: Develop workshops and professional development opportunities for multiple water-related career paths.

Action 4: Develop a grant-sponsored internship/mentorship program in water-related careers, sponsored across water agencies.

***Strategy 5 (Continued): Develop partnerships between industry, community, and educational institutions that will promote and train for water-related careers.***

Mid Term Action Items:

Action 5: Seek opportunities to promote existing water-related degree programs at Regents institutions. In addition, based on evaluations of all academic offerings, apply for United States Department of Agriculture, National Institute of Food and Agriculture funding through programs such as: Higher Education Challenge Grants and Secondary Education, Two-Year Postsecondary Education, and Agriculture in the K-12 Classroom (SPECA) Challenge Grants.

Action 6: Collaborate with higher education institutions to fill any gaps in the water-related academic career tracks that were identified during Phase I.

Action 7: Initiate and evaluate internship/mentorship grant program.

Long Term Actions:

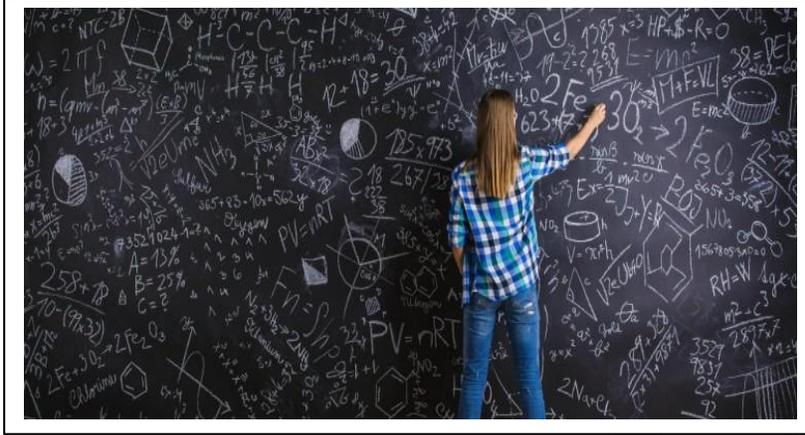
Action 8: Evaluate and increase enrollment and business participation in the internship/mentorship program.

Action 9: Complete and evaluate U.S. Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA) funded grant projects.

**Data, Research and Studies:** As noted previously within this Guiding Principles section of the *Kansas Water Plan*, research and data analysis to characterize current baseline knowledge and

understanding of Kansas water resource issues for all ages to provide a mechanism for evaluation of the overall success of implementation efforts to increase awareness of Kansas water resources. Data, research and studies which would support this evaluation include:

- *Partner feedback regarding data, research and studies to consider for inclusion*



**Funding and Resource Needs:**

Financial resources needed to fully implement the recommended strategies and actions for Increasing Awareness of Kansas Water Resources could be in excess of \$1,000,000 per year depending on the extent to which a full education and

outreach campaign is implemented. These financial resources would be utilized for items such as: media buying, social media management, campaign ad development, video development, website maintenance, educational resource development, professional development, and support/evaluation on delivery of educational programs. There are just a few examples for implementation of the recommended actions and strategies previously noted. Development of public-private partnerships to allow for the full execution of these actions and strategies will be vital to the overall success of these efforts.

# Securing, Protecting, and Restoring our Kansas Reservoirs

## Background & Issue

Surface water reservoirs serve to protect the public interest and facilitate multiple diverse beneficial uses within the state of Kansas. The future of Kansas reservoirs will impact all water user groups, as they act as water supply for the agricultural, domestic, industrial, municipal, and recreational water user groups.

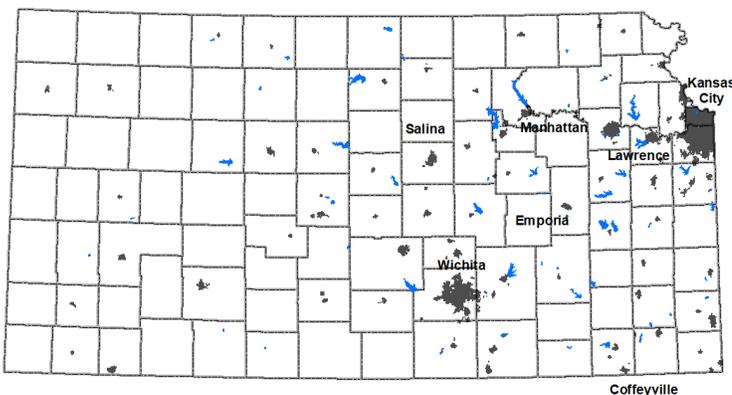
As a source of municipal water supply, over two thirds of the state’s population are served from municipal water diversions downstream of reservoirs, dependent on Kansas reservoirs to maintain streamflow for diversions, maintaining sufficient water quality for human uses, and providing drought resiliency.

For many rural communities, the water supply supported by reservoir releases is the only source of water through periods of prolonged drought. Loss of future reservoir water supply will inhibit rural revitalization efforts and be a regressive expense burden for lower income Kansans, as water suppliers incur elevated costs for water sourcing.

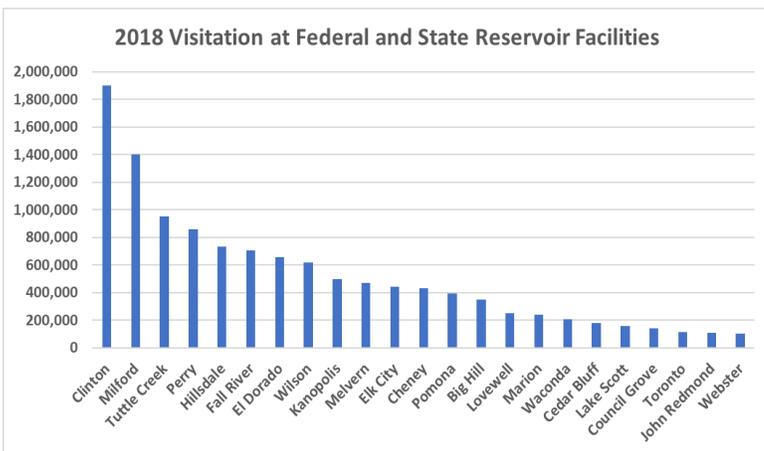
Reservoirs in the state support the water supply needs of a substantial amount of industry and commerce within the state, with a large amount of the state’s industrial production being supplied by municipalities, rural water districts, or direct intakes of surface water. Reservoirs supply water to electrical generating facilities, aeronautical production, refinery operations, cement production, and a growing amount of irrigated agricultural acres, all of which require reliable quantity and quality of water supply to continue providing their economic benefits to the state.

Recreation is a growing economic role of reservoirs, with several million visitors annually participating in on water and on shore activities, providing millions of dollars in economic benefits from visitor expenditures within the state. With more cities looking to develop riverfront recreational areas, maintaining reservoir water supply will allow for sufficient stream flow for recreational activities.

Kansas cities and large reservoirs



Above: Reservoirs over 500 surface acres indicated in blue and cities with populations over 2,500 in black. Many rural communities and areas in the eastern half of the state receive water supply from rural water districts that are supplied from reservoirs and can distribute costs.



The reservoirs serve to reduce the impacts of the variable Kansas climate, reducing the impacts of flooding events, that in the recent past would cause widespread damage to agricultural production, loss of homes, livelihoods, and human life. At times, the reservoirs serve as the sole source of water supply through prolonged drought for many Kansans, by using storage to support instream uses and maintaining an adequate flow of water to user's intakes. See the section on Reducing our Vulnerability to Extreme Events for more information on the impacts of climate variability in Kansas.

There are several varied issues impacting the future of the Kansas reservoirs:

1. Storage capacity is continually being lost to sedimentation in reservoirs. Land within the watersheds of reservoirs are losing soil, soil which is then transported to the reservoirs through varied climatic events. Soil is trapped in the reservoirs which reduces water supply available for future economic growth, future populations, and water supply needs through extreme climate events. Reduced reservoir water storage capacity leads to increased risk of loss for all water user groups dependent on reservoir water supply, flood protection, and water quality support.
2. The state's growing unfunded liability and inability to financially support its current contractual obligations for the operation of existing reservoir water supplies, which suppresses the ability to develop and plan for an adequate water supply for future Kansans. Lack of commitment to manage current financial obligations will inhibit the ability to plan and respond to future water supply challenges across the state, with a significant proportion of the state water plan funding coming from user fees that are supported by reservoir water supply. This will leave the state unable to adequately fund the development, protection, and control of water resources necessary to support anticipated water uses as stated in K.S.A. 82a-928.
3. The increase in the number of reservoirs experiencing Harmful Algal Bloom events, as well as an increase in event frequency within reservoirs as they continue to accumulate nutrients from natural and agricultural practices within their drainage basins, increasing the cost of living for Kansans downstream, reducing economic benefits, and impacting recreational interests. Impacting rural revitalization efforts in communities supplied by reservoir water supply.

### **Management Approach**

Without intervention, the current course will lead to the state being unable to satisfy its statutory obligations to the people of the state. Specifically, not having developed or secured control of sufficient supplies of water to meet the future needs of the people of the state.

As the source of municipal and industrial water for more than two-thirds of the state's population, supporting widespread irrigation use below their dams, and supporting water quality in streams and rivers during periods of low flow. Reservoirs in Kansas play a key role in water security and drought resiliency planning, both by providing sufficient quantity of water to meet demands and being a source of water to maintain water quality to drinking water, industrial, or environmental standards during times of degraded natural flow conditions. As seen in 2018 and 2020 along the Kansas River, natural sources of chlorides can degrade water quality leading to impacts on municipal and industrial uses. It is necessary to maintain adequate quantities of higher quality water in storage within Water Quality pools

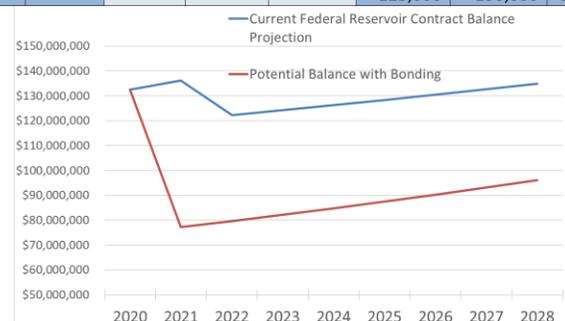
secured within federal reservoirs to respond to these events and maintain supply security to water users of the state.

Reservoir operations are conducted through multiple Lake and River Regulation Manuals overseen by the United States Army Corps of Engineers (USACE), operational agreements with the multiple Water Assurance Districts, and Water Access Districts. With flood pool operations being managed by the USACE and in coordination with out of state downstream river systems. Rights to water storage within the conservation or multi-purpose pools of 14 Federal reservoirs has been contracted for use by the state of Kansas. Multiple cities and agricultural irrigation groups also have water storage agreements in place, namely the City of Wichita and Cheney reservoir. This multi-purpose pool storage is operated in collaboration with the Federal Government to meet the needs of the many diverse water users and instream water quality demands.

For multiple reservoirs, there exists a financial liability that will need to be addressed by the state of Kansas, specifically where the state has agreed to the purchase of reservoir storage volume but has not needed to call the use of the storage into service. As demands rise, storage volumes are lost to reservoir sedimentation, and the storage is needed to meet Kansas needs, the state will need to make the financial payments to call additional water supply into service as shown below and as outlined in the 2017 Public Water Supply Program Comprehensive Capital Development Plan.

FUTURE USE STORAGE - Call-in Schedule															
Calendar Year	Big Hill Reservoir			Clinton Reservoir			Hillsdale Reservoir			Milford Reservoir			Perry Reservoir		
	AF Call	Total AF	% in Service	AF Call	Total AF	% in Service	AF Call	Total AF	% in Service	AF Call	Total AF	% in Service	AF Call	Total AF	% in Service
2020		9,200	35.80		53,520	60.00		16,783	31.67		101,650	33.88		25,000	16.67
2024															
2027															
2028				35,680	89,200	100.00									
2029	16,500	25,700	100.00												
2030							36,217	53,000	100.00						
2034										198,350	300,000	100.00			
2041													125,000	150,000	100.00

With historically low interest rates, the state is evaluating the financial benefits of entering into the current bond market to reduce financial obligations with the federal government for reservoir water supply. Opportunities exist to reduce long-term interest rate obligations, and make remaining payments to call some needed reservoir water supply into service. Taking on this financial challenge at the current time will save Kansas water users and the state millions of dollars, while addressing the water supply needs for several regions of the state.



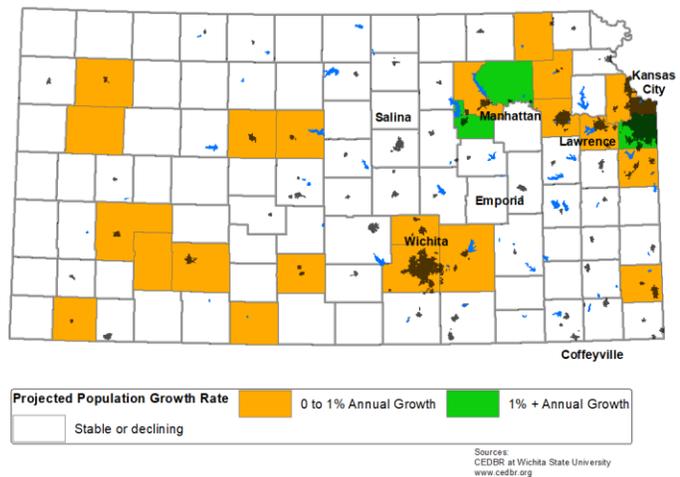
Top: Schedule in which the state will be calling reservoir storage volumes into service to meet demands of water supply needs or contractual obligations with the federal government.

Bottom: Current federal reservoir contract debt obligations and one potential debt bonding projection.

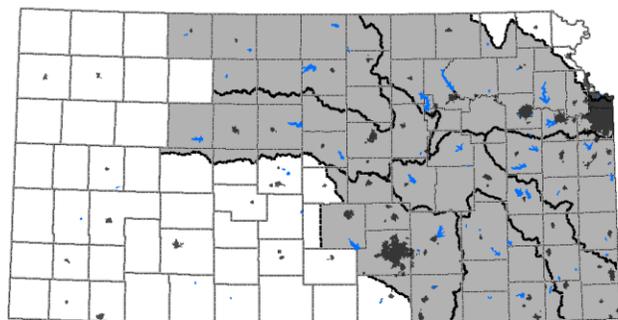
The reservoirs of the state were built with expected operational lifespans. There is a projected loss of storage as sediment carried by inflowing rivers and creeks is trapped within the reservoirs, with some Kansas reservoirs trapping over 98% of the sediment carried from their headwaters. This makes for future conflicts where the amount of water able to be retained in reservoir storage will be insufficient to meet the demands of multiple user groups and puts the state in the position of being unable to supply adequate amounts of water for anticipated future uses or in contrast to the requirements of K.S.A. 82a-928.

As stated in the Kansas Water Vision, there have been targeted investments in the watersheds above multiple reservoirs used for water supply purposes, such as stream bank stabilization projects, water shed dam construction, and increased support for soil health initiatives. However, the acres of agricultural lands that have had conservation practices implemented and the number of streambank stabilization sites completed, with past and current levels of funding, has not remediated the reservoir sedimentation issues.

### Reservoir locations and population growth



### Regional Advisory Committees supporting increased reservoir investment



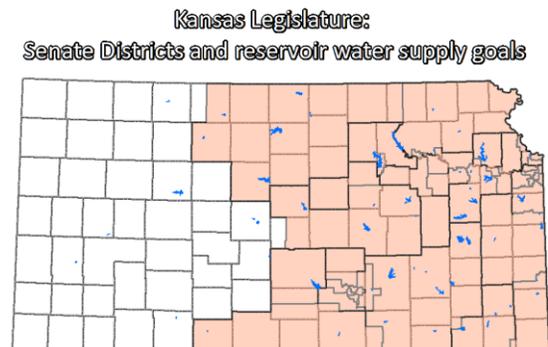
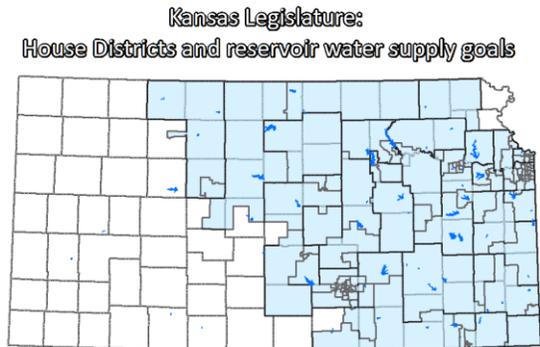
Top: Counties with projected population growth and current large reservoir sites. (Reservoir over 500 surface acres)

Middle: Summer 2020 Harmful Algae Bloom through Milford Reservoir. Increased frequency of algal blooms will increase water treatment costs and cost of living for downstream water users, while also impacting recreational users and their economic activity in the state.

Bottom: Regional Advisory Committee regions supporting increased reservoir investment with targeted Action Plan development.

As identified by the Blue Ribbon Water Funding Task Force for Water Resource Management additional funding support is needed to adequately reduce sedimentation rates to protect future water supply. The funding task force consisted of a diverse group of stakeholders, legislators, and government officials, who identified a funding need of \$21 million per year

to support conservation and remediation activities to secure future reservoir water supplies. ([www.kwo.ks.gov/water-vision-water-plan/water-vision](http://www.kwo.ks.gov/water-vision-water-plan/water-vision)) Regional Advisory committee action plans for the Equus-Walnut (Goals 3 & 4), Kansas (Goals 1, 3, & 5), Marais des Cygnes (Goals 1 & 2), Neosho (Goals 1 & 3), Smoky Hill-Saline (Goal 3), Solomon-Republican (Goal 2), and Verdigris (Goals 1 & 3) basins support and advocate for investments to secure and develop reservoir water supplies.



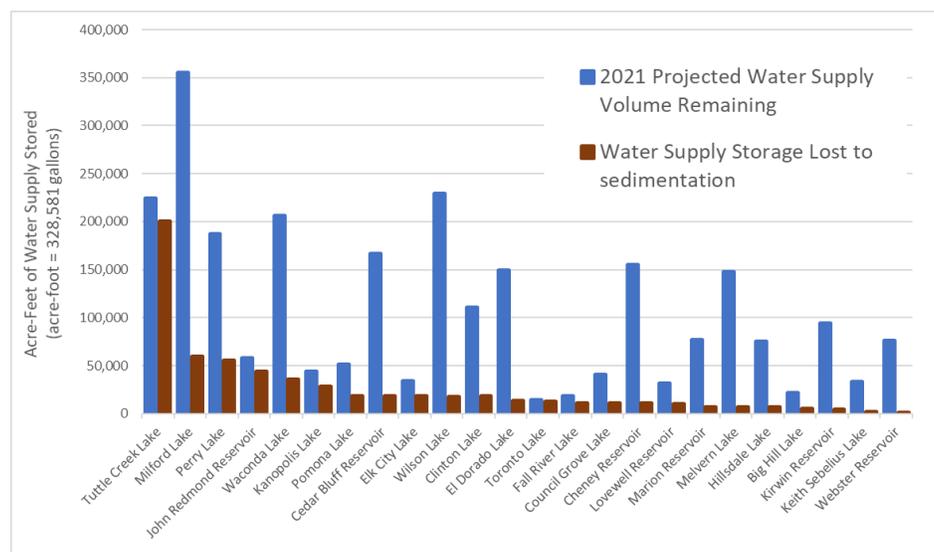
Above: Regional Advisory Committees supporting increased investment into water supply reservoirs cover all or part of 111 of 125 State House Districts and 36 of 40 State Senate Districts.

While the initial reservoir designs included projections for the storage loss and operational plans designed to account for climate variations, it is of growing importance for future water supply and recreational planning to fund adequate levels of reservoir research. Adequate funding of reservoir research is necessary to measure the impacts of conservation initiatives that have been funded with taxpayer and water user fee support. This includes studying the sedimentation reduction provided by streambank stabilization sites, conducting harmful algal bloom pilot studies with monitoring, and measuring the impact of soil health initiatives on the nutrient and sediment loads entering the reservoirs of the state.

Below: Amount of reservoir water supply storage remaining and lost to reservoir sedimentation.

Reservoir research support is needed to:

- better quantify the sedimentation issue
- identify if the reservoirs are infilling as initially projected or responses to behavioral changes within the watersheds
- impacts of large-scale climatic events, such as the extensive flood events of 2019.



Water users along the Kansas River will financially, environmentally, and recreationally benefit from having additional storage designated as Water Quality within Milford and Perry reservoir multi-purpose storage pools. With it dedicated to support the low flow quantity and quality requirements of all water user groups dependent on reservoir supported streamflow and instream uses.

Reservoirs of the state, including Federal reservoirs, multi-purpose small lakes, municipal reservoirs, and watershed dams all play a role in reducing the impacts of extreme flood events on the state and its citizens. Following the prolonged, and in some regions of the state, record flooding of 2019, there were identified several improvements the state should make to prepare before the next destructive flood event. See the Reducing Our Vulnerability to Extreme Events section for more information on flood impacts to Kansans.

With flood operations being conducted in accordance with river and reservoir operations manuals by the USACE, there is an opportunity for the state to invest into the review and development of recommendations to be incorporated into operational manuals. The ongoing Kansas River Reservoirs Flood and Sediment study is a collaborative initiative between the USACE and state to review current reservoir conditions, needs, and operations, while also planning for the future water supply needs, challenges, and limitations within the Smoky Hill-Saline, Solomon-Republican, and Kansas Regional Planning Areas. With some incorporation of how future climatic variability may impact water supply and recreational reservoir uses, including analysis of what happens if no actions are taken to sustain the usable lifetimes of the federal reservoirs.

Map with Reservoirs identified for WQ and low flow modifications. Include RWD map of impacted suppliers

Map of irrigated acres below reservoirs

## Measuring Success

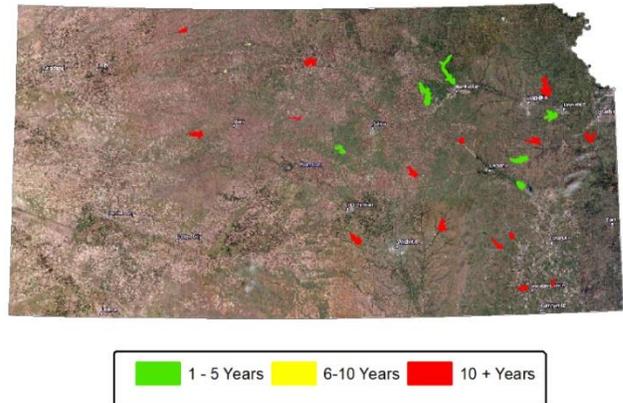
To identify and measure the impact of investments in supporting reservoir goals, there needs to be increased observation and measurement of the condition of the reservoirs. Observing changes to sedimentation and stream channel geomorphology through additional and more frequent data collection will help agricultural, industrial, municipal, and recreational water user groups better plan for their future use demands and capital investments.

Additional reservoir monitoring and research will help to better predict, monitor, and respond to Harmful Algal Bloom events, that impact recreational and water supply user groups. And further development in algal bloom response and mitigation techniques.

It is necessary to incorporate metrics both, quantitative and qualitative into future water resource plan development to monitor whether public funds and user fees are being utilized productively and efficiently to support the future of reservoirs within the state. With the requirements of Performance Based Budgeting, there has been increased incorporation of regionally supported budget initiatives into State Water Plan Budget proposals and development of performance metrics for expenditures. The Kansas Water Authority approved the Kansas Water Plan Budget Guidelines in January 2020, stating how funds should be used to:

- meet statutory obligations
- tied to projects in the 50 year water vision or state water plan
- supported by appropriate metrics and benchmarks
- that a water user group's fees be allocated to reasonably support that water user group's future water supply, as seen with sedimentation reduction projects being funded above reservoirs that provide water supply for downstream water user groups and fee payers
- allow the flexibility to fund expenditures that can be justified to be in response to an emerging threat to water resources or public health.

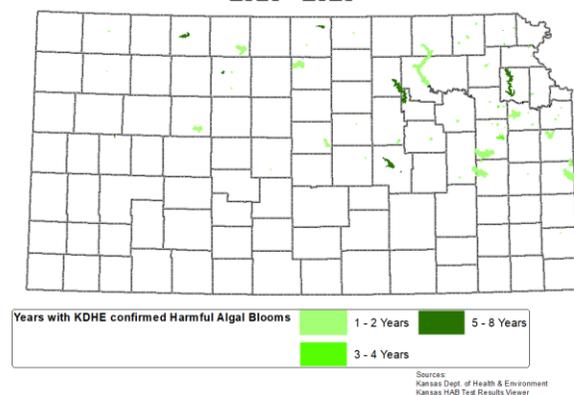
Years since last reservoir survey



Above: Years since last reservoir volumetric survey has been completed. With reservoir research funding level, the state is working to conduct more frequent reservoir surveys to monitor impacts to reservoir sedimentation from practices within watersheds.

Below: Reservoirs with Harmful Algal Blooms confirmed by Kansas Department of Health and Environment testing for 2010 – 2020.

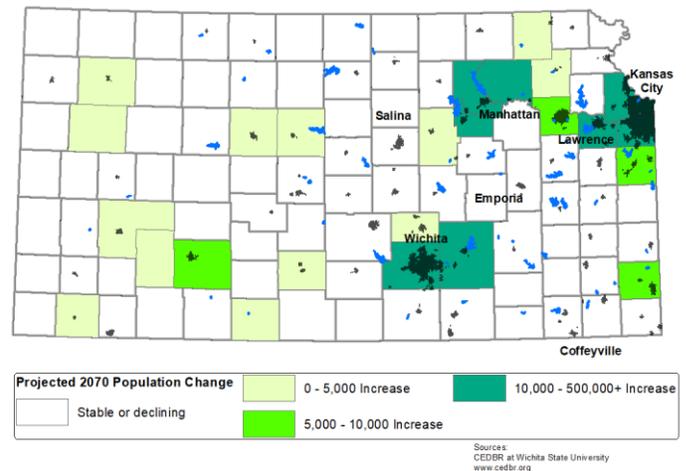
Harmful Algal Bloom Frequency  
2010 - 2020



## Recommended Actions and Strategies

Though the reservoirs in the state were designed with a finite lifetime to their water supply capabilities, the needs of a growing Kansas population and agricultural use downstream of reservoirs do not have finite lifetimes. Multiple regions of the state need to have reservoir water supply secured, protected, or restored to meet the water needs of the future.

### Reservoir locations and population growth



### **Securing: the water supply for future Kansans**

1. Utilize the current financial climate and low borrowing rates to issue bonds to secure reservoir storage. Complete principal and interest payments to the federal government to fulfill contractual obligations.
2. Collaborate with USACE to increase Water Quality pool allocations where needed, to ensure sufficient flows to support instream uses and maintain water quality for users.
3. Work to increase efficiency of reservoir operations through low flow release modifications and operating reservoirs as a system. As data resources and climate conditions allow, incorporate Forecast Informed Reservoir Operations to increase water supply resiliency and efficiency.

### **Protecting: reservoir water supply by reducing sedimentation and nutrient loading rates**

1. Fund and implement strategies supported by Regional Advisory Committees to reduce sedimentation and nutrient loading rates within water supply reservoirs. In reservoirs where conservation alone will not satisfy future water supply demands, work towards implementation of active sediment management strategies.
2. Support watershed conservation practices, with soil health initiatives, streambank stabilization, and riparian corridor restoration being some methods outlined in the Kansas Water Vision and Regional Advisory Committee Action Plans.
3. The Blue Ribbon Water Funding Task Force for Water Resource Management identified some funding levels for conservation practices that have not been supported thus far. Additionally, Regional Advisory Committees are having discussions on new methods to fund reservoir conservation initiatives, with some privately funded initiatives being implemented.

### **Restoring: continued reservoir research, data collection, and sediment management projects**

1. Support Harmful Algal Bloom data collection and remediation projects.
2. Study benefits of watershed conservation practice implementation on sedimentation and nutrient loading rates, utilize budgetary guidelines and performance metrics to direct future funding sources to those that are shown to improve reservoir conditions.

3. Engage in active sediment management studies with federal partners as cost share and funding opportunities arise.
4. Support reservoir research priorities as developed by the Kansas Water Resource Research coordination group.
5. In regions where it is infeasible to restore water supply storage in current reservoirs, explore additional storage possibilities with the construction of multipurpose small lakes to alleviate regional water supply issues.

# MEMO



DATE: December 4, 2020  
TO: Kansas Water Authority  
FROM: Cara Hendricks & Matt Unruh  
RE: 2021 KWA Report to the Governor & Legislature

900 SW Jackson Street, Suite 404  
Topeka, KS 66612  
Phone: (785) 296-3185  
Fax: (785) 296-0878  
[www.kwo.ks.gov](http://www.kwo.ks.gov)

---

Each year the Kansas Water Authority (KWA) submits a report to the Governor and Kansas Legislature highlighting the past year's accomplishments and providing priorities/recommendations of the KWA in advance of the upcoming legislative session. Kansas Water Office staff are currently working on this year's report for review and approval by the KWA in advance of submittal to Governor Kelly and the 2021 Kansas Legislature. A draft copy of the 2021 Annual Report will be made available in advance of the December 11 KWA meeting for review, comments, and action.

---

*The Kansas Water Office recommends the Kansas Water Authority approve the 2021 Annual Report to the Governor and Legislature, with final edits to be completed by the KWO following feedback provided by the KWA at the December 11, 2020 meeting.*

---