

State of the Resource & Regional Goal Action Plan Implementation Report

August 2018

Upper Smoky Hill Regional Planning Area

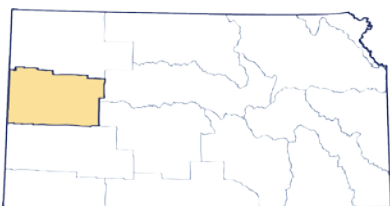


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Executive Summary

The Upper Smoky Hill State of the Resource & Regional Goal Action Plan Implementation Report is intended to provide a background of the regional issues and record activities and progress toward regional goals and the *Long-Term Vision for the Future of Water Supply in Kansas (The Vision)* objectives utilizing the most up to date data available at the time of report development.

The principal aquifers in this region include the Ogallala-High Plains and alluvial aquifers. The High Plains Aquifer consists of several hydraulically connected aquifers, the largest of which is the Ogallala. The Ogallala-High Plains Aquifer is distinctive from other aquifers in Kansas due to the fact it generally has low annual recharge.

Groundwater resources have benefitted from reduced water use the past two years with closer to normal precipitation being received during the irrigation season within the region, though water levels in the Upper Smoky Hill portion of the Ogallala Aquifer have continued to decline each year.

Every year, the Kansas Geological Survey (KGS) and Kansas Department of Agriculture - Division of Water Resources (KDA-DWR) measure water levels for nearly 1,400 wells in central and western Kansas, including 158 wells within the Upper Smoky Hill region. From 2007 through 2016, these water level measurements showed that average groundwater levels declined in every year, with an average annual decline of 0.60 feet and a 10-year cumulative decline of 5.96 feet.

To address the continual declines of the Ogallala Aquifer, goals for the region are to reduce irrigation use by 25% by 2025, develop a water reduction plan and begin implementation by 2017, and an increase in implementation of Best Management Practices (BMPs) for industrial, municipal, and stock watering uses of water. Implementation of these goals has predominately been seen in the Wichita County portion of the region, where local stakeholders have designed the Wichita County Water Conservation Area (WCWCA) management plan and have been actively educating and signing up landowners to take voluntary water conservation measures to extend the usable lifetime of the region's water supplies.

Twenty seven farms have adopted Water Conservation Area (WCA) plans as voluntary water conservation measures. These four WCAs cover 13,089 acres of the 213,696 irrigated acres in the region, covering 6% of the total irrigated acres.

In February 2017, the first Water Talk Series meeting was held in Sharon Springs, Kansas in conjunction with the GMD1 annual meeting. The event was supported by the United States Department of Agriculture's Risk Management Agency (USDA-RMA) Education Partnerships Program grant and was an opportunity to communicate with stakeholders the newly available USDA-RMA limited irrigation crop insurance option, while also communicating information on the region's approved goals, water conditions, conservation programs available, and the economic impacts of water conservation.

Water Use Trends

Groundwater is the primary source of water in the region, accounting for 100% of the total supply, principally from the High Plains Aquifer and alluvial deposits along major streams. A few wells are developed in the Dakota Aquifer. Irrigation use accounts for 95% of the reported water use of the region, with 3% used for stock water, 1% used for municipal use, and the remainder accounted for by industrial, recreational, and other uses, at less than 1% of total use each as seen in Figure 3 below.

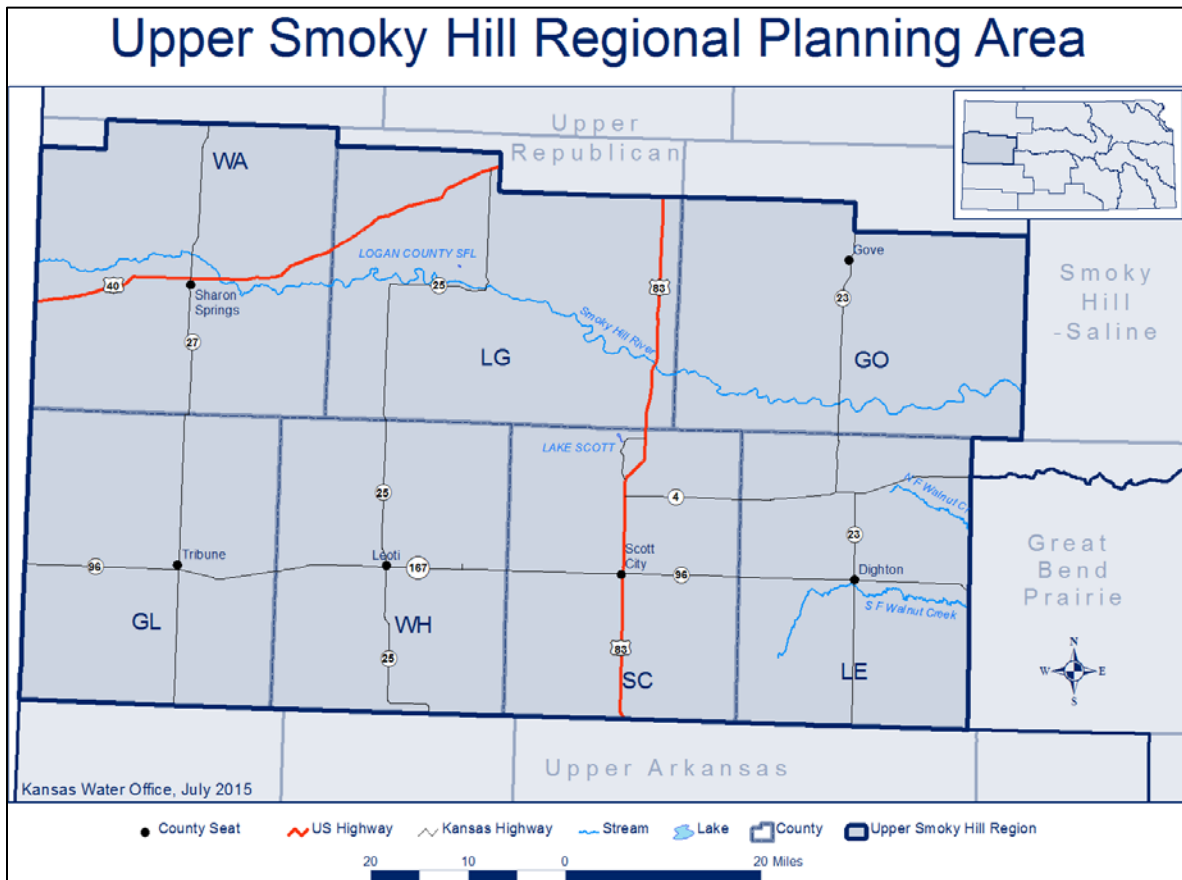


Figure 1: Upper Smoky Hill Regional Planning Area

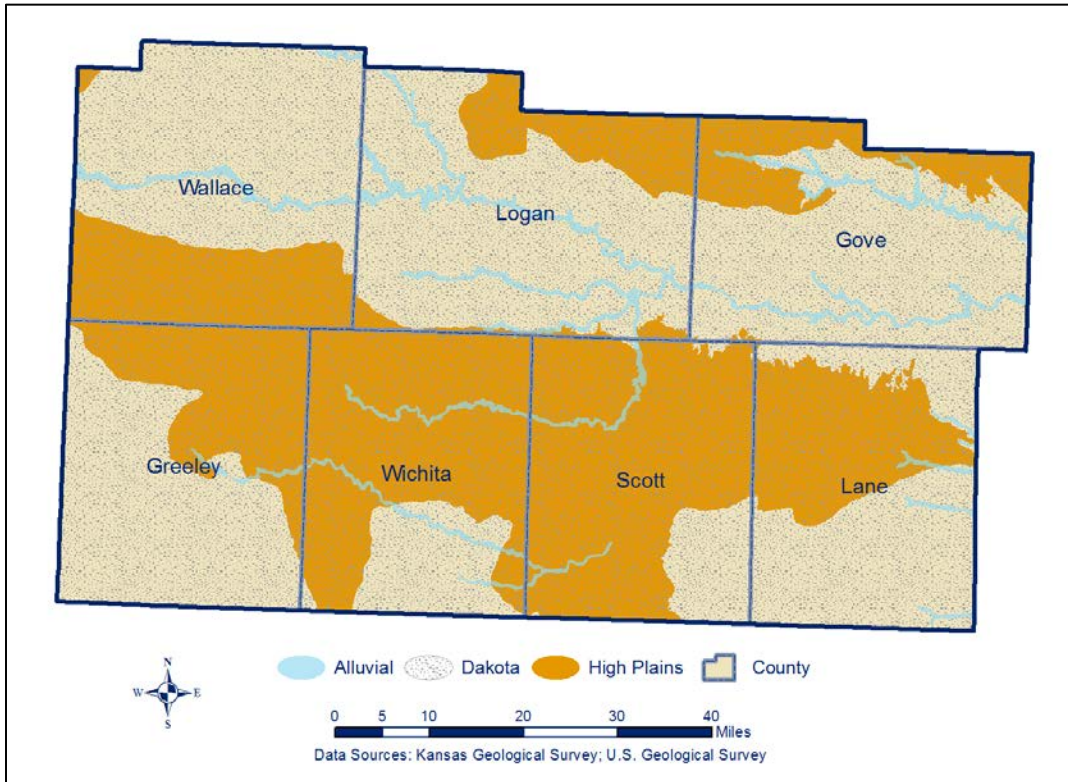


Figure 2: Upper Smoky Hill generalized aquifer extent

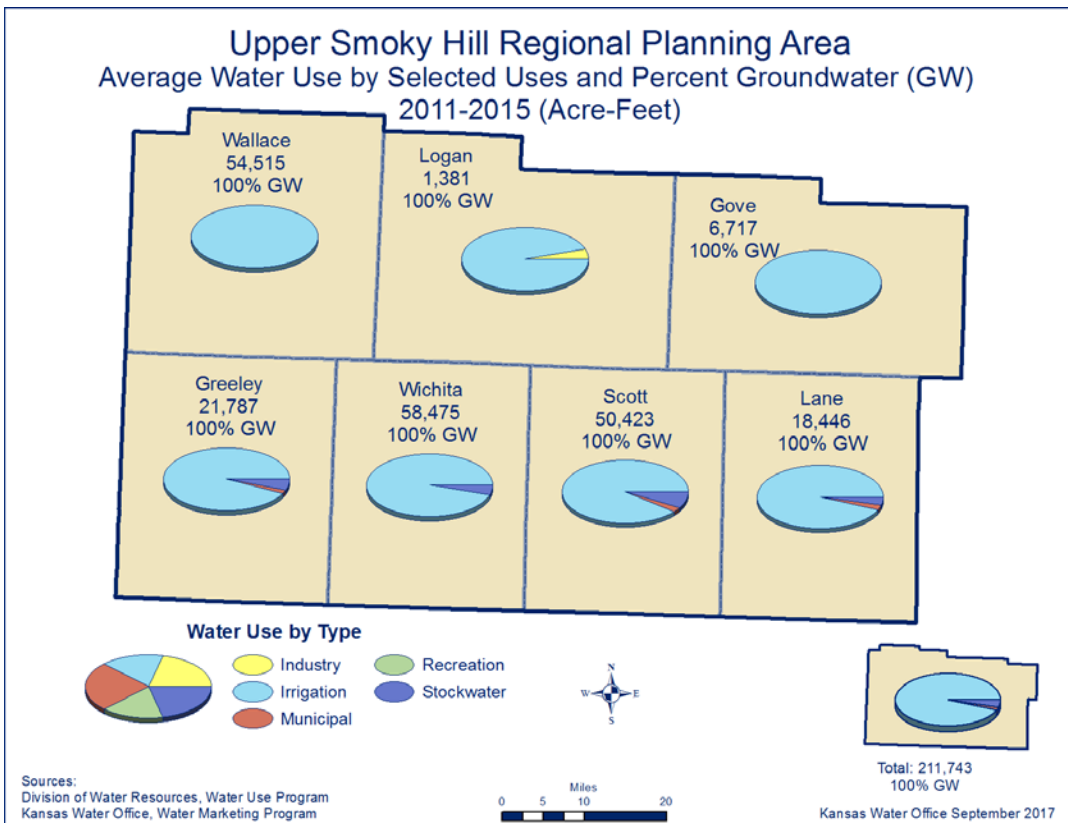


Figure 3: Water use by type of use for the Upper Smoky Hill Region

Water use has historically followed in relation to yearly precipitation, with years of below normal precipitation showing an increase in water use demand (Figure 4).

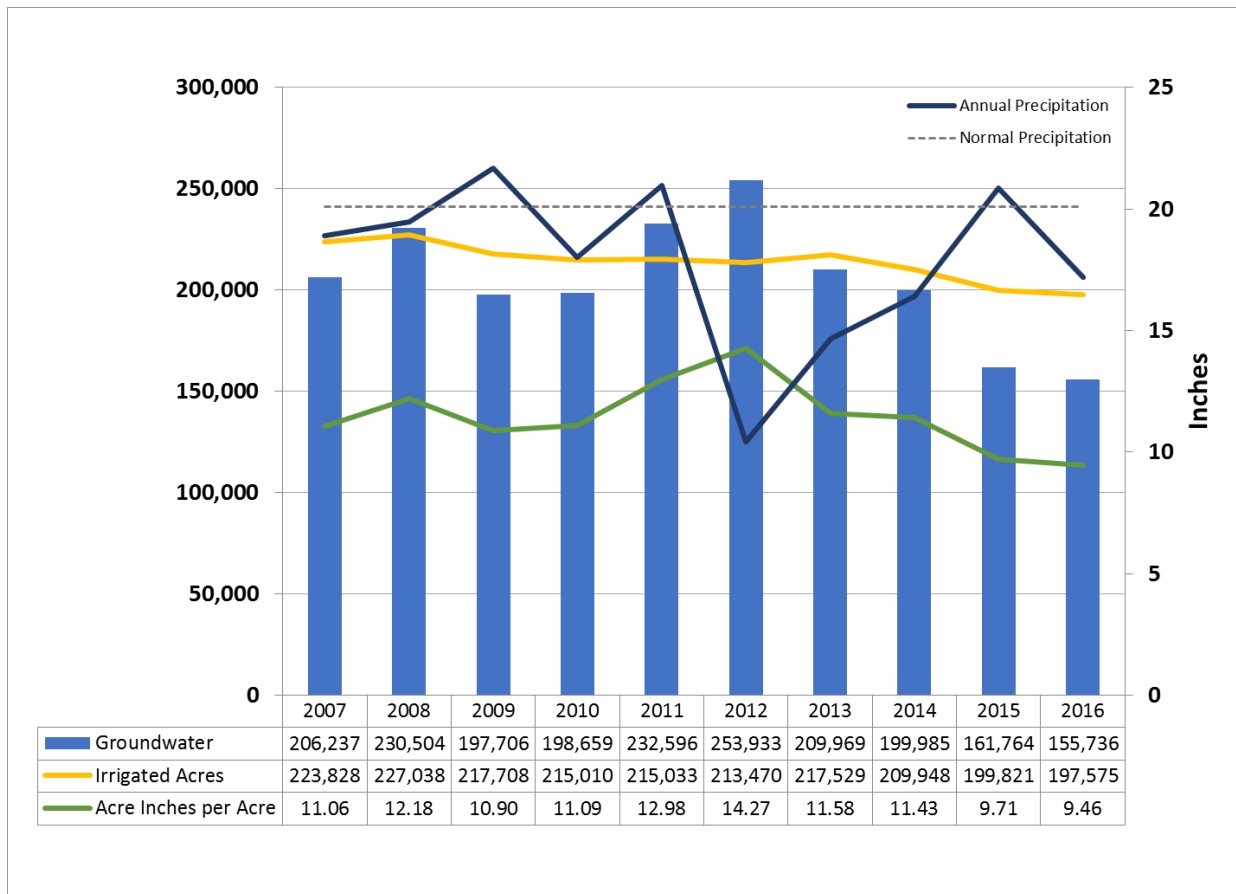


Figure 4: Groundwater use for years 2007- 2016 within the Upper Smoky Hill Region, with annual precipitation, irrigated acres, and acre inches per acre displayed

Water Resource Conditions

Groundwater

The Ogallala-High Plains Aquifer is the principal groundwater source within the Upper Smoky Hill Region. Other aquifers present within the region include the Dakota along with alluvial aquifers near major river reaches within the region.

The KGS and KDA-DWR measure water levels in 1,400 wells in central and western Kansas, including 158 wells within the Upper Smoky Hill Region. From 2007 through 2016, these water level measurements showed that average groundwater levels declined in every year, with an average annual decline of 0.60 feet and a 10-year cumulative decline of 5.96 feet (Figure 5).

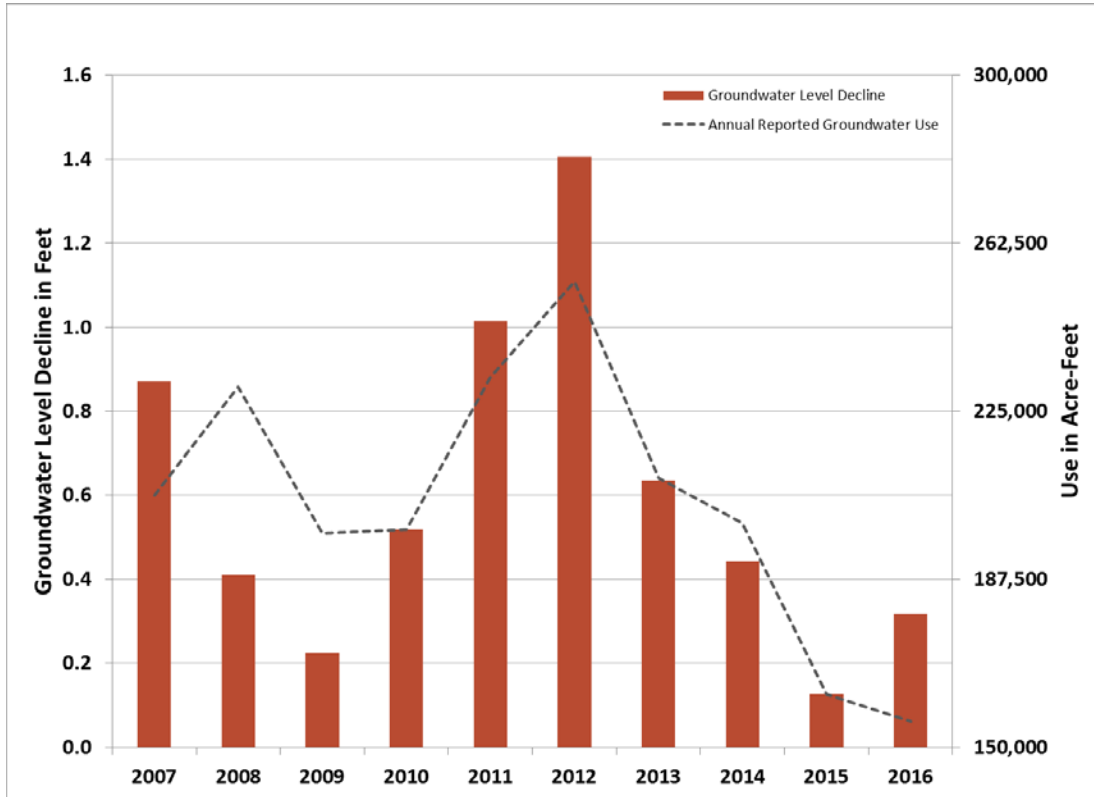


Figure 5: Groundwater level changes from 2007 to 2016

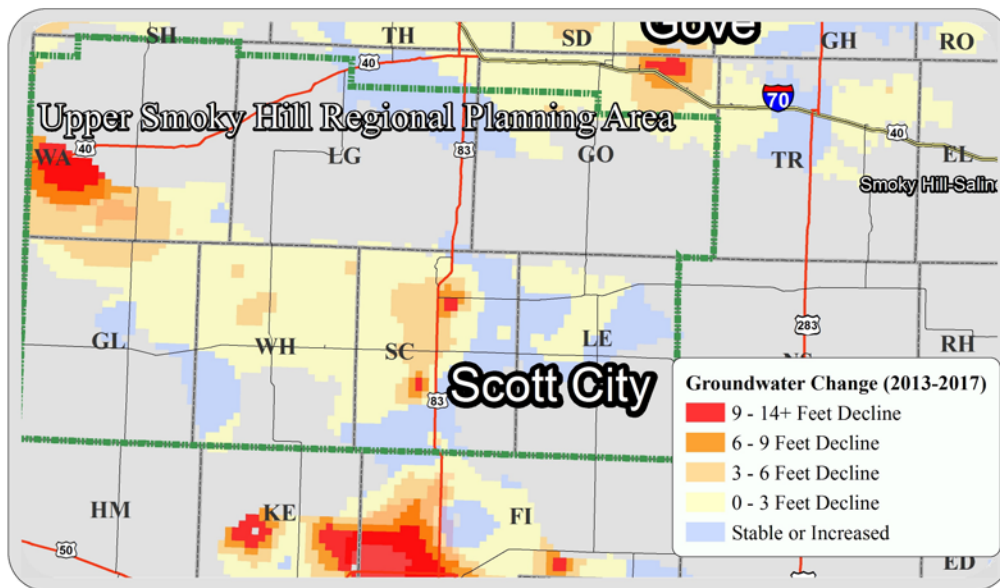


Figure 6: Groundwater level declines for 2013 to 2017, with data from the KGS water level monitoring program

Table 1: Groundwater level changes for 2007 to 2016 by High Plains Aquifer Regional Planning Area

Region	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	10 Year Change	Average Annual Change (2007-16)
Cimarron	-2.37	-2.90	-1.65	-2.52	-3.93	-3.63	-1.72	-1.90	-0.91	-1.29	-22.81	-2.28
Equus-Walnut	1.87	1.56	0.00	-0.80	-2.96	-1.48	2.44	-1.21	1.38	1.94	2.74	0.27
Great Bend Prairie	3.11	0.59	0.70	-0.46	-2.88	-1.89	0.55	-0.68	-0.26	0.51	-0.69	-0.07
Upper Arkansas	-1.47	-2.29	-1.28	-2.97	-2.64	-2.82	-2.40	-1.85	-0.70	-0.45	-18.86	-1.89
Upper Republican	-0.69	-0.20	0.18	-0.39	-0.42	-1.40	-0.64	-0.39	-0.53	-0.29	-4.77	-0.48
Upper Smoky Hill	-0.87	-0.41	-0.22	-0.52	-1.01	-1.41	-0.63	-0.44	-0.13	-0.32	-5.96	-0.60
ENTIRE HIGH PLAINS AQUIFER REGION	-0.09	-0.60	-0.24	-1.08	-1.93	-1.98	-0.65	-0.93	-0.39	-0.12	-8.00	-0.80

Increase =	
Decrease =	
Unchanged =	

Using regional water level change information and annual water use information, the KGS has developed a sustainability assessment method to predict the required amount of water use reductions required to reach a level of short term sustainability. For the entire GMD1 area, it has been predicted that a 33% reduction of water use is necessary. This sustainability assessment method will support decision making processes for future water use reduction plans within the region.

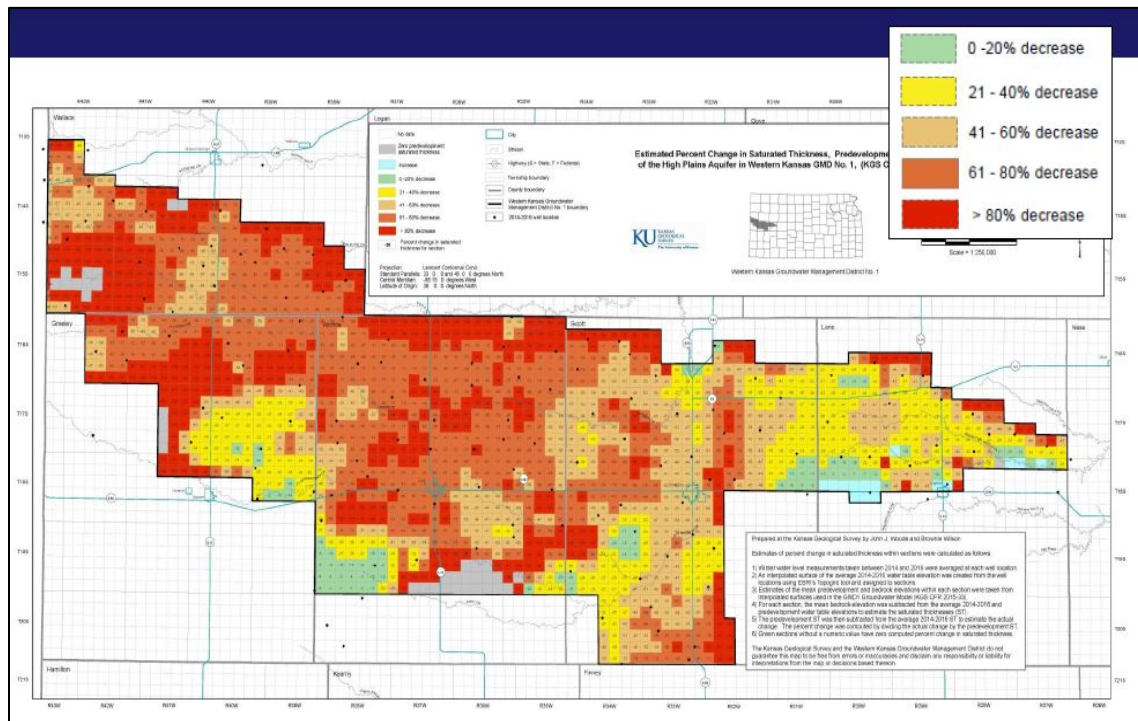


Figure 7: KGS map showing estimated change in aquifer saturated thickness since predevelopment to 2016

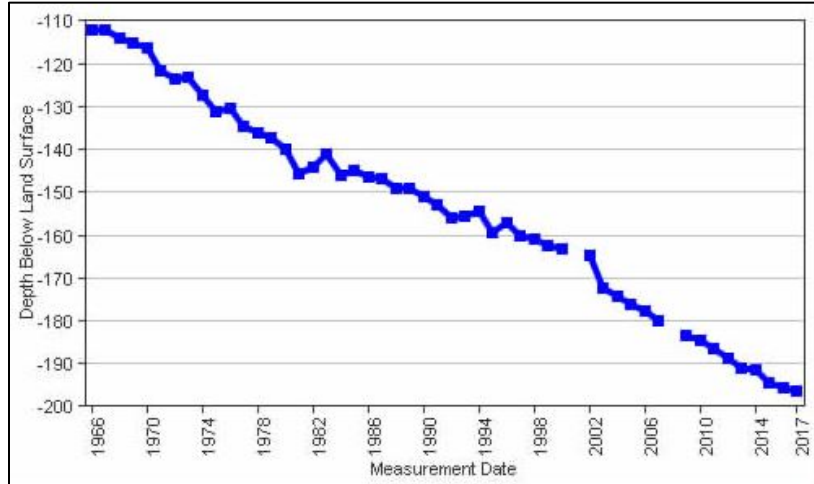


Figure 8: Hydrograph showing the decline of the Ogallala Aquifer through time, with well measurements in Wallace County

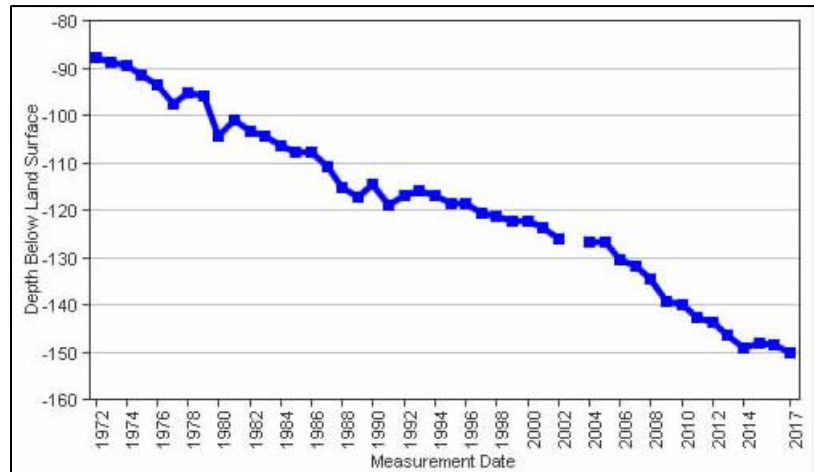


Figure 9: Hydrograph showing the decline of the Ogallala Aquifer through time, with well measurements near Leoti in Wichita County

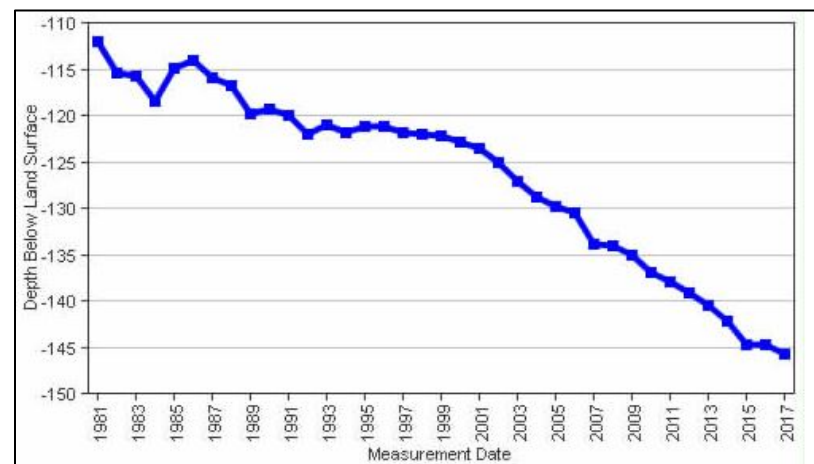


Figure 10: Hydrograph showing the decline of the Ogallala Aquifer through time, with well measurements near Scott City in Scott County



Figure 11: Hydrograph showing the decline of the Ogallala Aquifer through time, with well measurements near Dighton in Lane County

Groundwater level declines have been prevalent in the region since the proliferation of high volume pumps for irrigation use in the 1950s and 1960s.

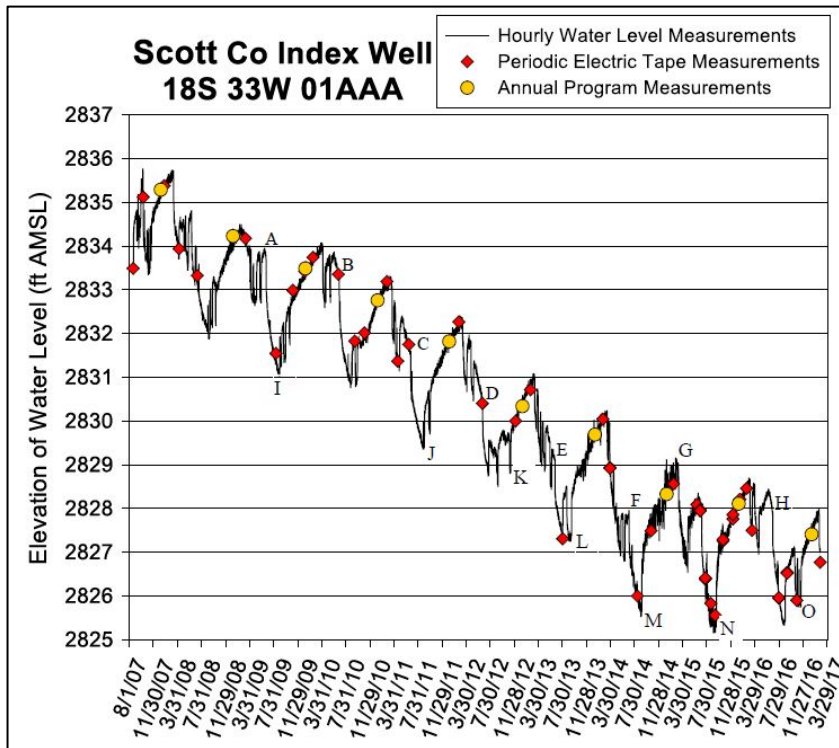


Figure 12: Kansas Geological Survey Scott County index well hydrograph

The KGS operates four index wells within the region in addition to the annual water level measurement wells. These index wells provide near real time measurements of the aquifers water level status and allow for the study of the aquifer drawdown and recovery properties in different areas of the aquifer. The Scott County index well shows the continued decline of the aquifer from 2007 to 2017, with the

annual drawdown and recovery that occurs in relation to the area’s irrigation pumping trends (Figure 12).

Surface Water

Surface water is limited in the Upper Smoky Hill Region, averaging only 4 acre-feet of reported surface water use per year for the 2007 to 2016 timeframe, or 0.002% of total annual water use per year. 2 acre-feet of surface water use was reported within the region for irrigation use in 2016.

Water Quality

Groundwater

Groundwater quality issues in the region are variable and generally localized. Individual municipalities are left to address issues, primarily through pumping changes or blending processes in an effort to dilute any contaminants. A groundwater quality concern within the region is elevated levels of nitrates being picked up in public water supply wells. The Environmental Protection Agency (EPA) Drinking Water Regulations set a limit of 10 mg/l for nitrate which is monitored and enforced by the Kansas Department of Health and Environment (KDHE). Long term exposure to drinking water that contains excess levels of nitrates can be a public health concern, with impacts to infants documented and other population groups being researched to understand impacts. Potential sources for excess nitrates in groundwater supplies include excessive fertilizer use, leaking from waste water treatment systems, and natural occurrence.

Elevated levels of nitrates have been detected in samples taken from public water supply wells in the cities of Leoti and Scott City (Figures 14 and 15). There is need for an evaluation to look at long-term water quality trends and annual fluctuations, including the time it takes for nitrate to reach the aquifer and projections of future water quality. Reports from the KDHE Drinking Water Watch system show reoccurring arsenic levels in Scott City above the EPA limit of 10 µg/l up until 2016 (Figure 13).

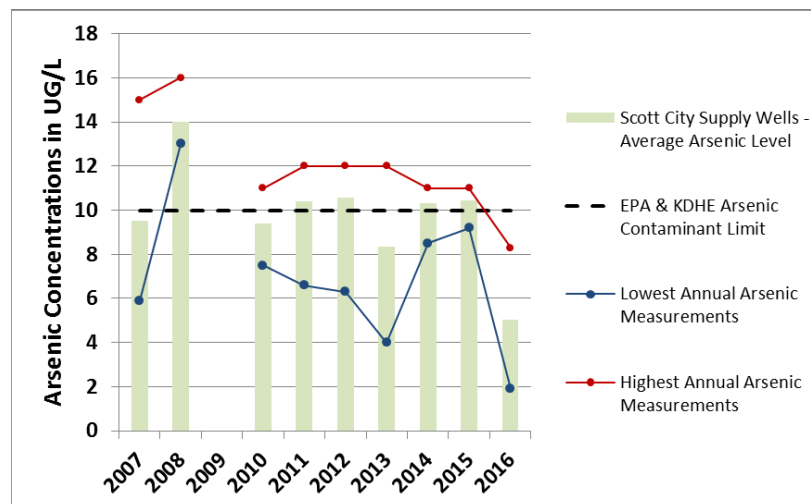


Figure 13: Concentrations of arsenic as reported from Scott City public water supply wells. Data from KDHE Drinking Water Watch System

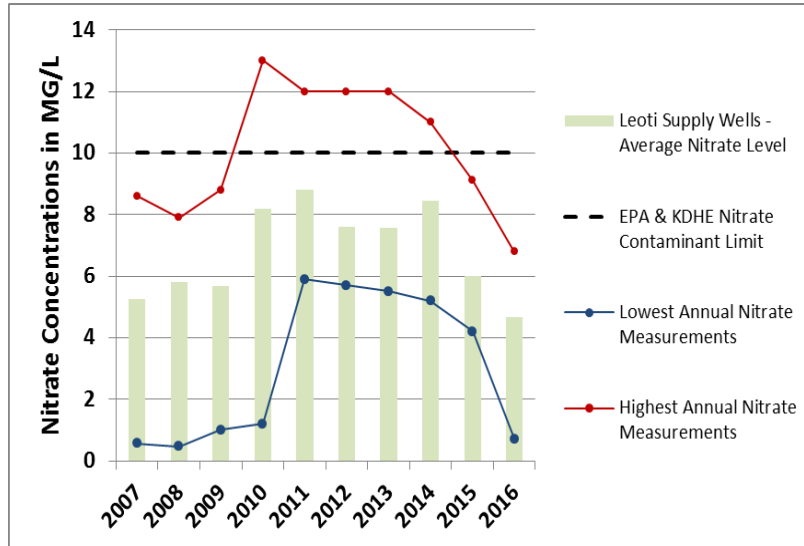


Figure 14: Concentrations of nitrate as reported from Scott City public water supply wells. Data from KDHE Drinking Water Watch System

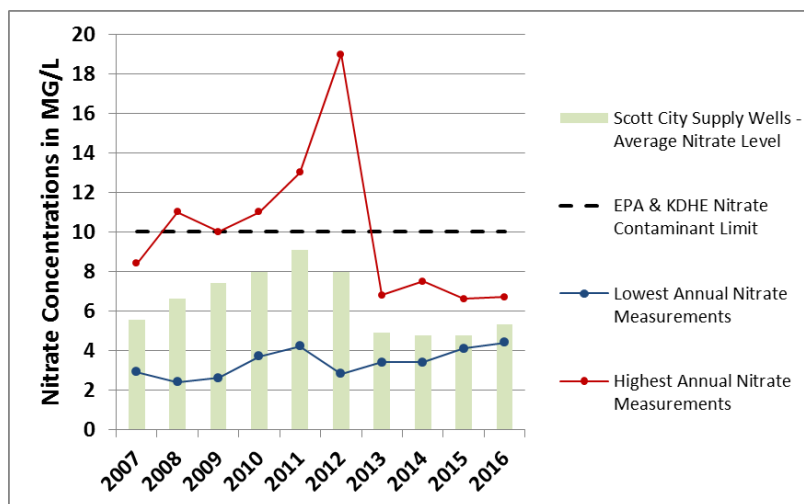


Figure 15: Concentrations of nitrate as reported from Leoti public water supply wells. Data from KDHE Drinking Water Watch System

Surface Water

All the counties within the region have adopted and are enforcing sanitary codes that can help manage bacteria and nutrient inputs into surface and groundwater. All conservation districts in the region have adopted nonpoint source pollution management plans.

The Clean Water Act requires states to conduct Total Maximum Daily Load (TMDL) studies and develop TMDLs for water bodies identified on the state’s List of Impaired Waters (Section 303(d) List). TMDLs are quantitative objectives and strategies needed to achieve the state’s surface water quality standards. In the Upper Smoky Hill Region, TMDLs have been developed to address dissolved oxygen, total phosphorus, fluoride, arsenic, cadmium, E. coli, gross alpha (bundled with uranium), total suspended solids, selenium, sulfate, aquatic plants, pH, and eutrophic conditions. With 18 TMDLs in place,

additional information on TMDLs and the Section 303(d) list of impaired waters can be found at the [Kansas Department of Health and Environment \(KDHE\)](#).

Implementation Progress

Water Conservation Area

Water Conservation Areas (WCAs) were signed into law in April 2015 and are a simple 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 Ogallala-High Plains Aquifer.

Twenty seven farms are enrolled in a WCA plan that has been adopted by landowners as voluntary water conservation measures. There are four WCAs that cover 13,089 acres of the 213,696 irrigated acres in the region, equating to 6.1% of the average total of irrigated acres (Figure 16). The largest WCA in the state is the Wichita County Water Conservation Area (WCWCA) with 50 water rights enrolled on 24 farms covering over 10,500 acres.

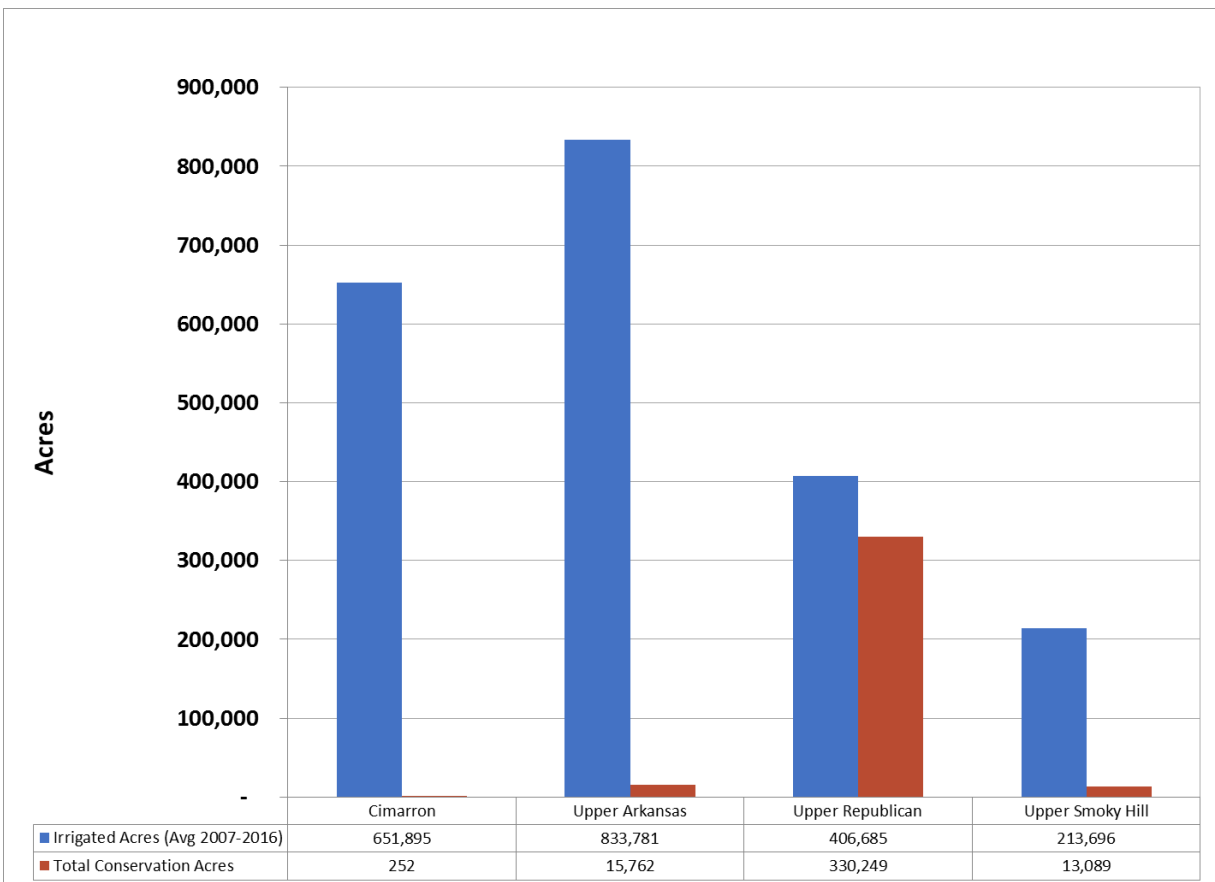


Figure 16: Total conservation acres compared to irrigated acres in the four western RACs

Outreach and Education

In February 2017, the first Water Talk Series meeting was held in Sharon Springs, Kansas in conjunction with the GMD1 annual meeting. The event was supported by the USDA-RMA Education Partnerships

Program grant and was an opportunity to communicate with stakeholders the newly available USDA-RMA limited irrigation crop insurance option, while also communicating information on the region's approved goals, water conditions, conservation programs available, and the economic impacts of water conservation.

A high school education initiative has been started within the region as a response to the need for water education that is specific to Western Kansas. Several schools were chosen to have pilot projects developed and implemented in the classroom in 2018. These projects, including any projects developed in following years, will be taken to Western Kansas administrators, agriculture teachers, and science teachers to become supplemental curriculum.

Limited Irrigation Crop Insurance

A Phase I Statewide Action Item in *The Vision* includes working with the USDA-RMA to address crop insurance policies that disincentivize water conservation. Working with the USDA-RMA, limited irrigation crop insurance coverage was expanded to 47 counties for corn and 28 counties for soybeans in Kansas, making Kansas the first and only state in the nation with a limited irrigation crop insurance option available to mitigate risk for those wishing to implement water conservation practices and reduce their historical water use. In September 2016, the Kansas Water Office (KWO) was awarded a USDA-RMA Education Partnerships Program grant to build a limited irrigation crop insurance calculator and hold public awareness educational events.

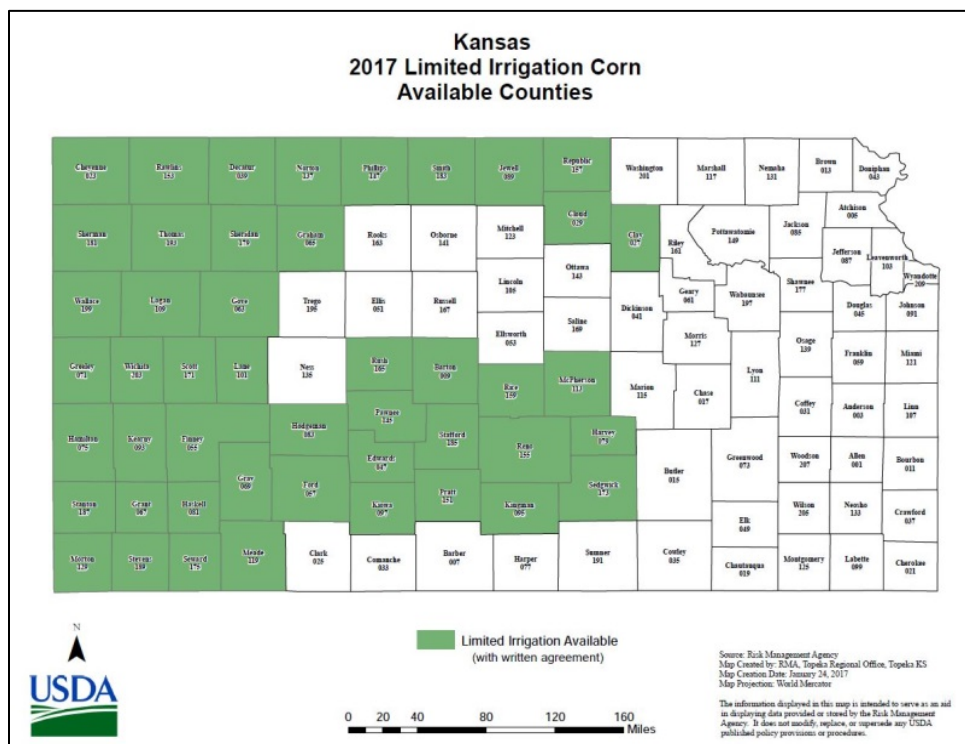


Figure 17: Counties where limited irrigation insurance is available for corn

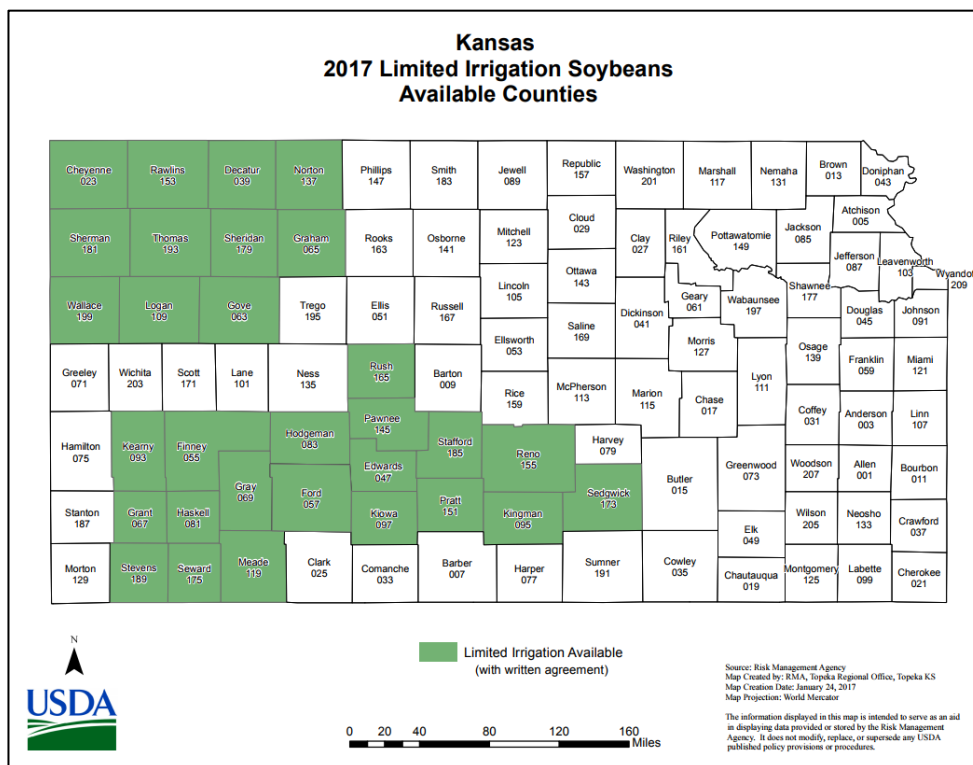


Figure 18: Counties where Limited Irrigation insurance is available for soybeans

Water Technology Farms

Water Technology Farms (Tech Farms) are a Phase II action item from the Ogallala-High Plains Aquifer section of *The Vision*. These demonstration projects allow irrigation technology options to be implemented and tested on a field scale with the oversight of Kansas State University Southwest Extension personnel.

Two Tech Farms were established within the region, with each farm enrolled in a WCA plan designed by their landowners. Soil moisture sensors, various types of sprinkler nozzles, field mapping, variable rate irrigation, and aerial imagery are being used on these two Tech Farms.

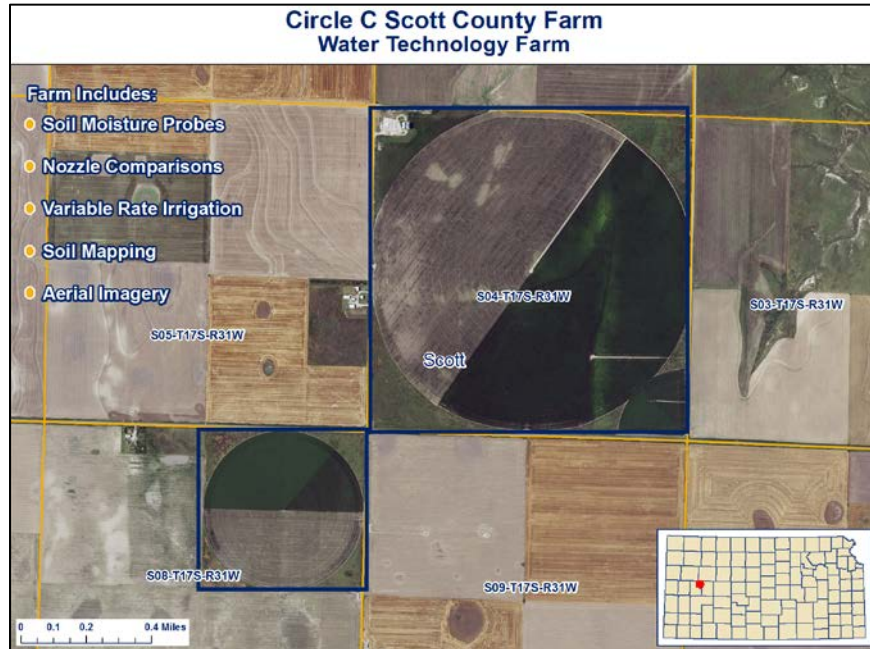


Figure 19: Scott County Water Technology Farm established in 2017

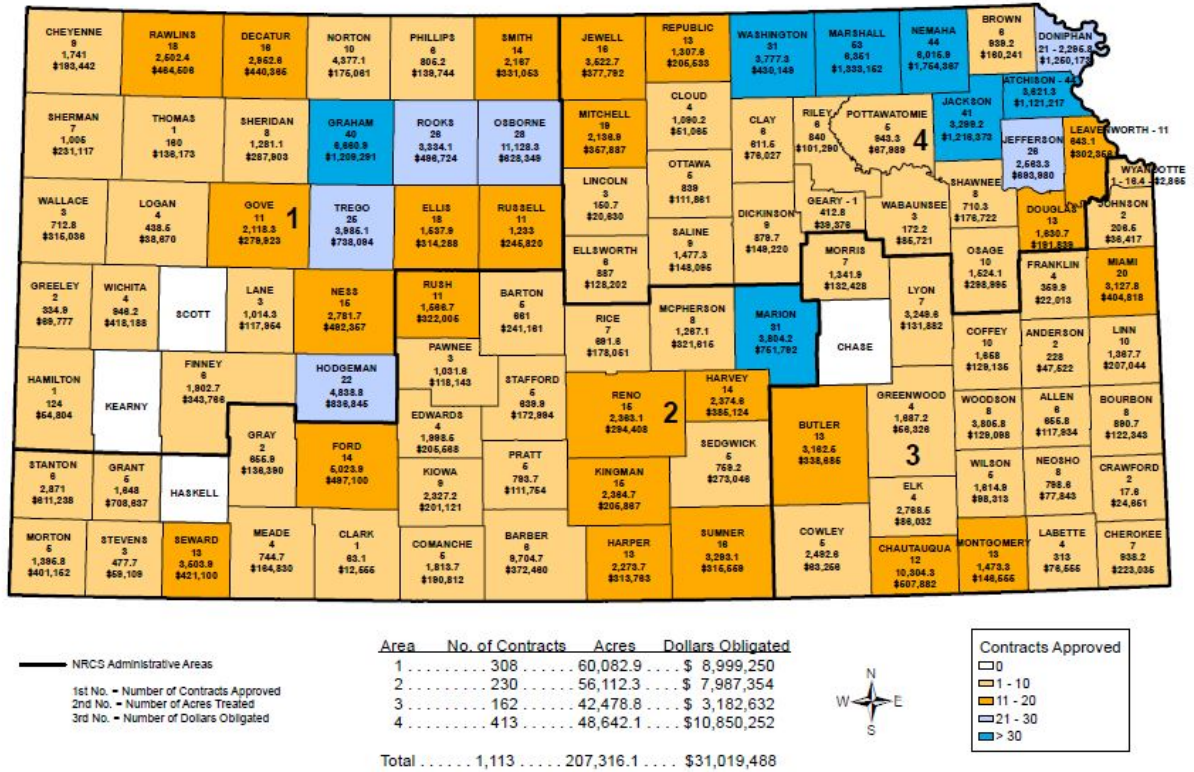
Irrigation Technology Incentives

GMD1 recently launched a cost share program for Water Efficient Irrigation Technologies and soil moisture probes. The GMD1 program gives water right owners enrolled in a WCA \$1,500 towards the purchase of a soil moisture probe and \$2,500 towards the purchase of water efficient technologies. Water rights not enrolled in a WCA are given \$1,000 for soil moisture probes and \$2,000 per water efficient technology. The program provides an incentive to those formally committing to a water conservation plan, while still supporting those that are looking to conserve water on their own. In the program's first year, 63 soil moisture probes, 5 bubbler nozzle packages, 4 pivot control systems, and 1 mobile drip irrigation system were supported.

Conservation Incentives

The State of Kansas worked with the United States Department of Agriculture's Natural Resources Conservation Service (USDA-NRCS) in 2017 to revise the ranking criteria within the Environmental Quality Incentives Program (EQIP) to further incentivize water conservation within the state. Starting in 2018, EQIP applications located within a LEMA, WCA, or Intensive Groundwater Use Control Area (IGUCA) shall be designated as high priority applications. Producers will have to show there will be a net water savings from the previous five years of water use.

Fiscal Year 2017 - Kansas Environmental Quality Incentives Program - General Contracts Approved



Source: USDA, NRCS, ProTracts (11/09/2017), Calculated (10/30/2017)
Contact: USDA, NRCS, REAP, DT (201704-2314)

KS-15-3
The USDA is an equal opportunity provider, employer and lender.

Figure 20: EQIP contracts approved by county in 2017

Implementation Needs

The largest need for the Upper Smoky Hill Region is increased water conservation education and communication of water conservation options. Needs identified by the RAC are listed below:

- Water conservation education
 - Basic water education (where does their water come from/where is it going)
 - Education of teachers
 - Develop lesson plans
 - Work with established groups (4H, FFA, KS Corn, KHI)
 - Field trips to get out of classroom exposure (demo farms, tech college trip)
- Establish historical aquifer decline trends and track conservation progress
 - More wells monitored with more real time data to monitor the goal
- Water conservation area and water efficient irrigation technology incentives
 - Make more irrigation technology qualify for cost share incentives
 - Communicate and promote LEMA & WCA EQIP ranking criteria changes

- More funding for education and demonstration projects
 - Seek more private funding partners and sponsorships
 - Request Water Plan Funds annually to fund education and demonstration projects
- Improved communication methods, avenues, and new partner groups
 - Work with Kansas Farm Bureau for local outreach and communication events
 - Local COOPs – visit board meetings and determine interests and needs for communication or what they’d like their role to be
 - Continue to promote via social media, especially with limited funding options
- Development of additional BMPs and communication/education of existing BMPs for industrial, municipal, and stockwatering uses
 - One page informational sheet to document what is currently been done and their experiences to communicate to more organizations
 - Tie back practice changes to potential benefits for water users (operate one less well, expand without having to purchase additional water rights)
- Support development of water use reduction plan

Regional Goals & Action Plan Progress

While *The Vision* provides a framework for the management of the state’s water supply overall, regional goals identify and address issues at the local level. In 2015, Regional Goal Leadership Teams were developed for each of the 14 regional planning areas which were comprised of local water users along with input from area stakeholders to help develop regional water supply goals. These goals were adopted by the Kansas Water Authority in August 2015 and 14 RAC members were appointed. The first task for the newly formed RACs was to develop action plans to correspond with the regional goals. The Upper Smoky Hill RAC completed action plans for their regional goals in the fall of 2016. Information included within this section highlights recent progress made on regional goal action plan implementation.

Regional Goal #1	Goal Theme	Annual Progress			
		2017	2018	2019	2020
By 2025, reduce irrigation use by 25% based on recent average pumping history per water right. Allow water right transfers and other flexibilities as long as a net reduction is achieved. In addition, annual water use for all irrigation users will not exceed net irrigation requirement for that county.	Irrigation			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete

<p>2018 Update:</p> <ul style="list-style-type: none"> • 8 new farms approved and added to the WCWCA • Continuous education and outreach conducted by the WCWCA Group
<p>Next Step(s):</p> <ul style="list-style-type: none"> • Continue to support development of local water conservation initiatives including WCAs

Regional Goal #2	Goal Theme	Annual Progress			
		2017	2018	2019	2020
<p>Develop a water reduction plan and begin implementation by January 2017. Short term: Reduce the rate of depletion of the aquifer within five years to sustain the economy, but begin implementation of conservation immediately. Long term: By evaluating success every five years, determine if conservation measures are achieving a reduced rate of depletion. (Rationale: Within each five year evaluation period new technologies and crop varieties as well as additional sources of supply will be more and more available.)</p>	Water Conservation/Aquifer Sustainability			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete

<p>2018 Update:</p> <ul style="list-style-type: none"> • GMD1 reviewing some potential water management scenarios, while following progress of surrounding Local Enhanced Management Area implementation • GMD1 working on the development of the proposed Wichita County LEMA for implementation in 2020 • Public informational meeting held in July to inform local producers of the proposed Wichita County LEMA
<p>Next Step(s):</p> <ul style="list-style-type: none"> • Work with GMD1 to evaluate options for potential Local Enhanced Management Area(s) within the region • Continue to support development and implementation of LEMAs within the region

Regional Goal #3 & #4	Goal Theme	Annual Progress			
		2017	2018	2019	2020
All municipal users within the planning region will be at or below the regional 2015 average gallons per capita per	Water Conservation			--	--

<p>day (GPCD) within the next five years. All municipal users as defined by the Kansas Water Appropriation Act in planning area will follow BMPs and implement a conservation plan. Maximum water use per head will be maintained as defined by the Kansas Water Appropriation Act. Stockwater allocations as defined by Kansas Water Appropriation Act will implement BMPs and be as efficient as possible. Measure the implementation of this goal by a 15% increase in the adoption of management practice plans (overflow reuse, etc.) within the next five years.</p>					
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update: No new progress.					
Next Step(s):					
<ul style="list-style-type: none"> Establish a baseline of current water use conditions to measure future progress 					

Regional Goal #5	Goal Theme	Annual Progress			
		2017	2018	2019	2020
Industrial users and all other beneficial uses of water will develop BMPs plans to be as efficient as possible. By 2020, all industrial users will have a BMPs plan and the adoption of practices will increase by 15%.	Water Conservation			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update: No new progress.					
Next Step(s):					
<ul style="list-style-type: none"> Establish a baseline of current water use conditions to measure future progress 					

References

“2018 303(d) List of All Impaired & Potentially Impaired Waters.” *Kansas Department of Health and Environment*, [http://www.kdheks.gov/tmdl/2018/Approved_2018_303_d\)_List_of_All_Impaired_Waters.pdf](http://www.kdheks.gov/tmdl/2018/Approved_2018_303_d)_List_of_All_Impaired_Waters.pdf).

Butler , J.J., et al. “High Plains Aquifer Index Well Program: 2016 Annual Report.” *Kansas Geological Survey*, www.kgs.ku.edu/Hydro/Publications/2017/OFR17_10/OFR2017-10.pdf.

“Drinking Water Watch.” *Kansas Department of Health and Environment*, <http://165.201.142.59:8080/DWW/KSindex.jsp>.

“Fiscal Year 2017 Accomplishment Maps.” *USDA Natural Resource Conservation Service Kansas*, www.nrcs.usda.gov/wps/portal/nrcs/detail/ks/programs/?cid=nrcseprd1373842.

“Kansas High Plains Aquifer Atlas.” *Kansas Geological Survey*, www.kgs.ku.edu/HighPlains/HPA_Atlas/index.html.

Woods, J.J., Wilson, B.B. “Western Kansas GMD1 maps” *Kansas Geological Survey*, http://www.kgs.ku.edu/Hydro/Publications/2016/OFR16_19/gmd1_change_st_predv_1994_1996_percent.pdf