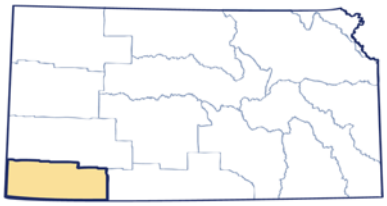
State of the Resource & Regional Goal Action Plan Implementation Report

August 2018

Cimarron

Regional Planning Area



Kansas Water Office

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Executive Summary

The Cimarron 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 above normal precipitation being received during the irrigation season within the region, though water levels in the Cimarron 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 176 wells within the Cimarron region. From 2007 through 2016, these water level measurements showed that average groundwater levels declined in every year, with an average annual decline of 2.28 feet and a 10 year cumulative decline of 22.81 feet.

There are currently no Local Enhanced Management Areas (LEMAs) in place for the region, though there has been one WCA plan adopted by a landowner as a voluntary water conservation measure. This WCA covers 252 acres of the 651,895 irrigated acres in the region, covering less than 0.04% of the total irrigated acres.

In 2017, ranking criteria within the Environmental Quality Incentives Program (EQIP) offered by the United States Department of Agriculture's-Natural Resources Conservation Service (USDA-NRCS) were revised to incentivize water conservation. The year also saw the development of one Water Technology Farm, Hatcher Land and Cattle in Seward County, and in February 2017 the first Water Talk Series meeting was held in Ulysses, Kansas.

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 (Figure 2). Irrigation accounts for 97% of the reported water use of the region (Figure 3). Municipal represents approximately 1% of water use with the remainder accounted for by stockwater, recreation, industrial, and other uses. Annual reported water use within the region fluctuates with variations in climate conditions, and water use has historically followed in relation to yearly precipitation, with years below normal showing an increase in water use, as seen in Figure 4.

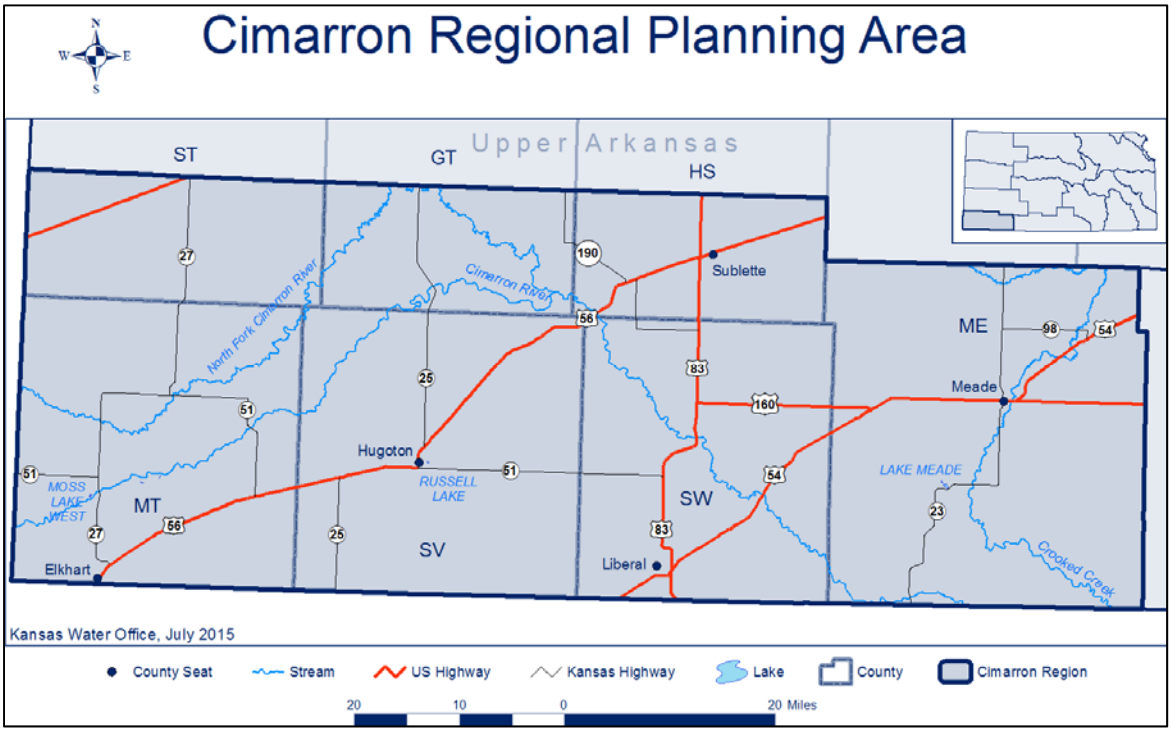


Figure 1: Cimarron Regional Planning Area

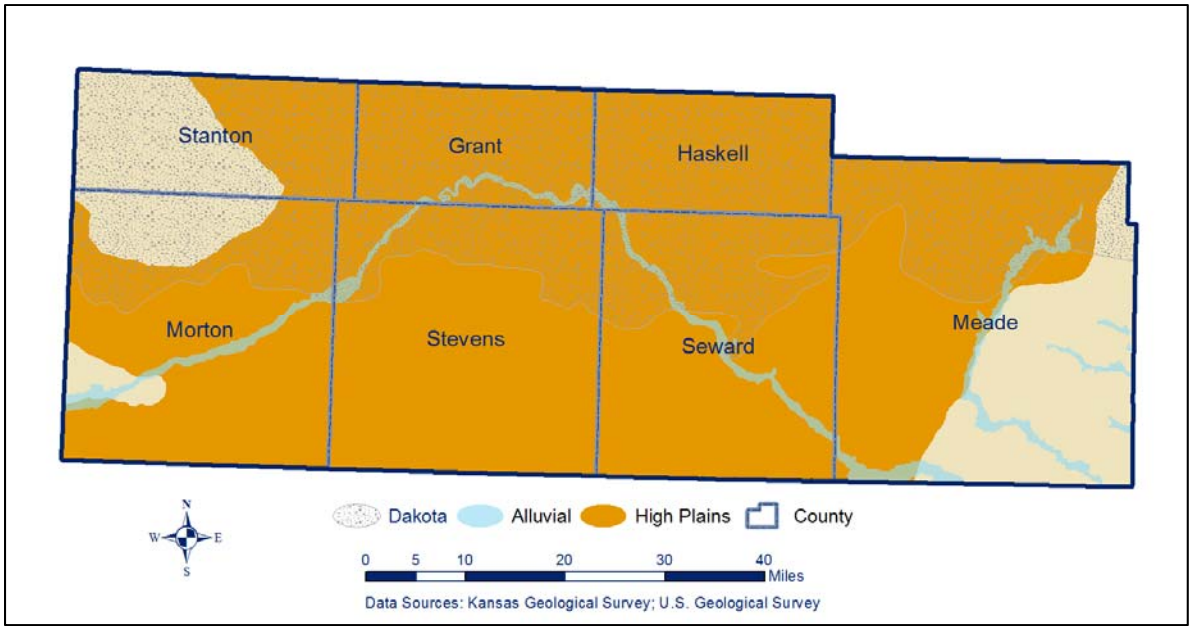


Figure 2: Cimarron generalized aquifer extent

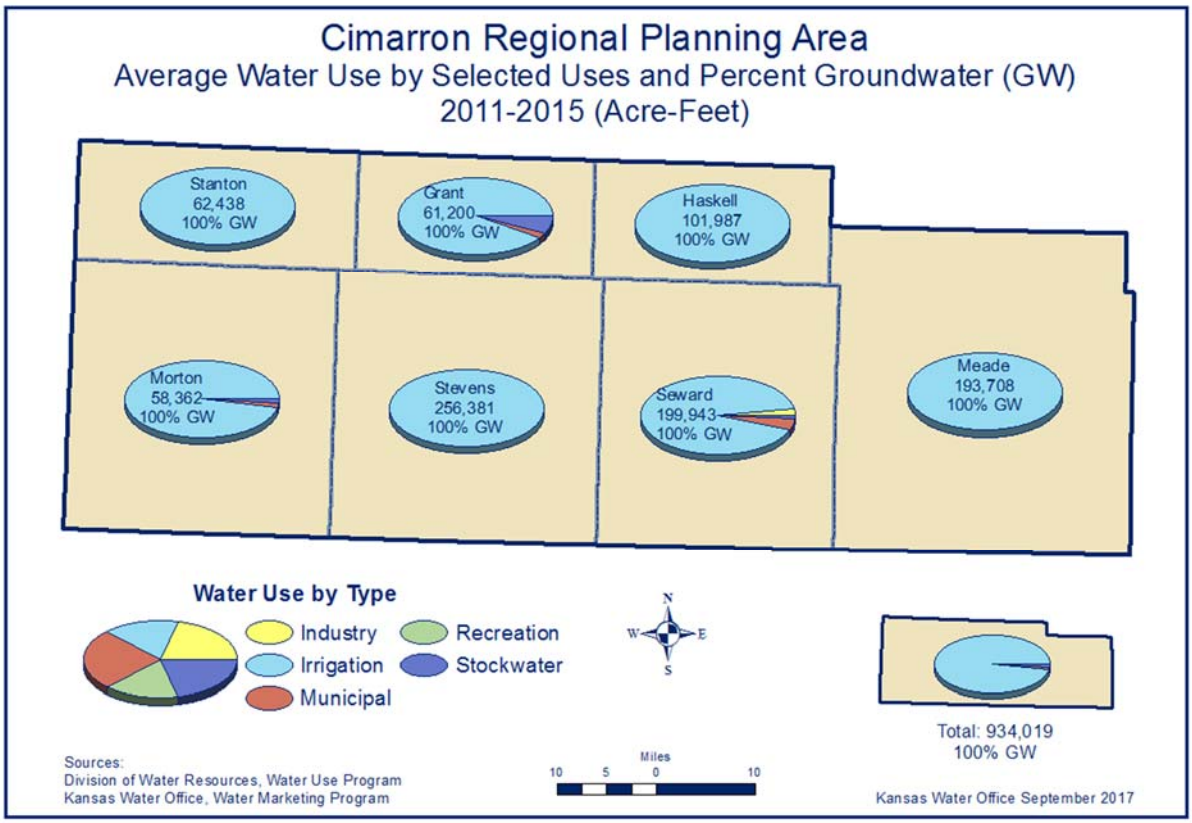
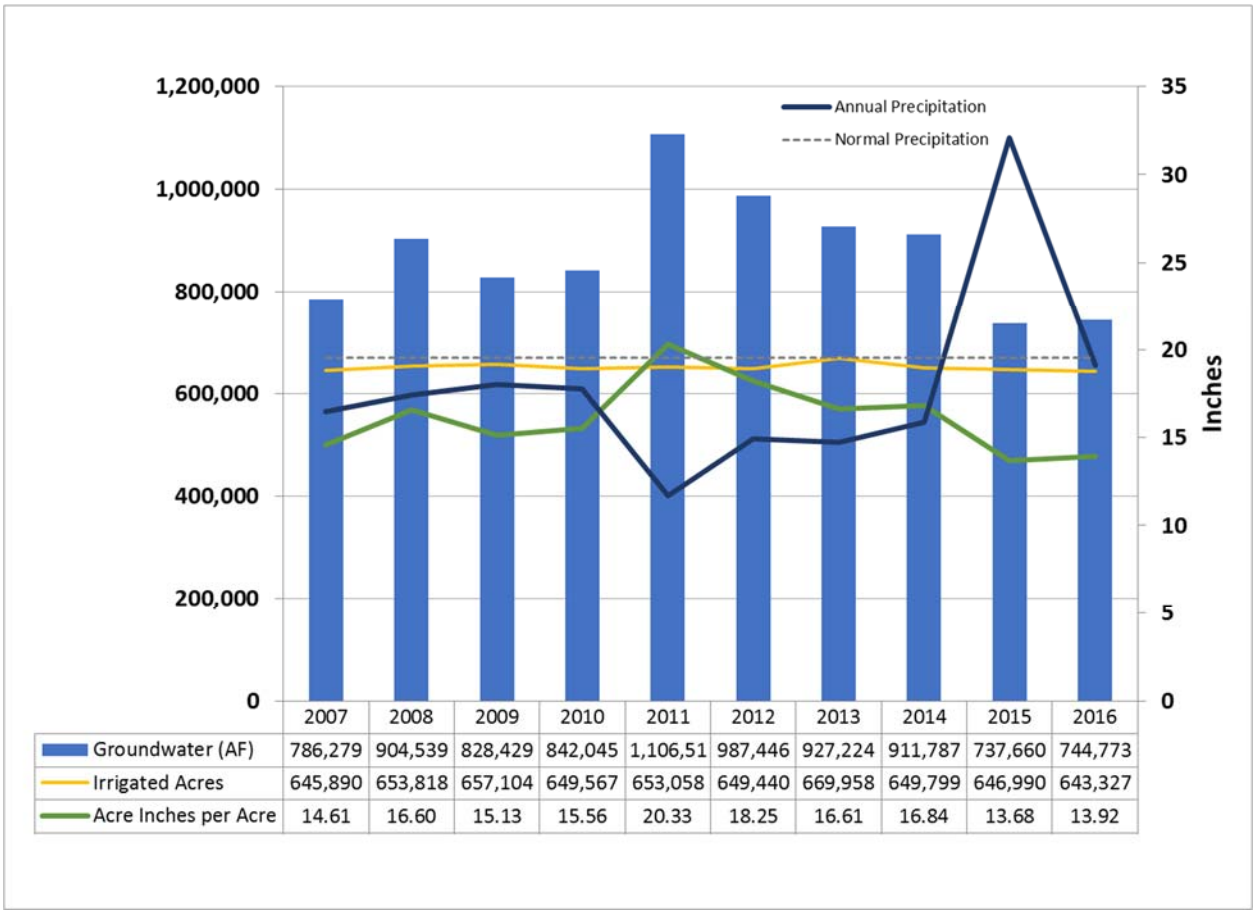


Figure 3: Water use by type of use for the Cimarron Region



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Groundwater (AF)	786,279	904,539	828,429	842,045	1,106,51	987,446	927,224	911,787	737,660	744,773
Irrigated Acres	645,890	653,818	657,104	649,567	653,058	649,440	669,958	649,799	646,990	643,327
Acre Inches per Acre	14.61	16.60	15.13	15.56	20.33	18.25	16.61	16.84	13.68	13.92

Figure 4: Groundwater use for years 2007- 2016 within the Cimarron 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 Cimarron Region. Other aquifers present within the region include the Dakota, along with alluvial aquifers along and near major river reaches within the region. The Ogallala-High Plains Aquifer is distinctive from other aquifers in Kansas in that it generally has low annual recharge.

The KGS and KDA-DWR measure water levels in 1,400 wells in central and western Kansas, including 176 wells within the Cimarron Region. From 2007 through 2016, these water level measurements showed that average groundwater levels declined in every year, with an average annual decline of 2.28 feet and a 10 year cumulative decline of 22.81 feet (Figure 5).

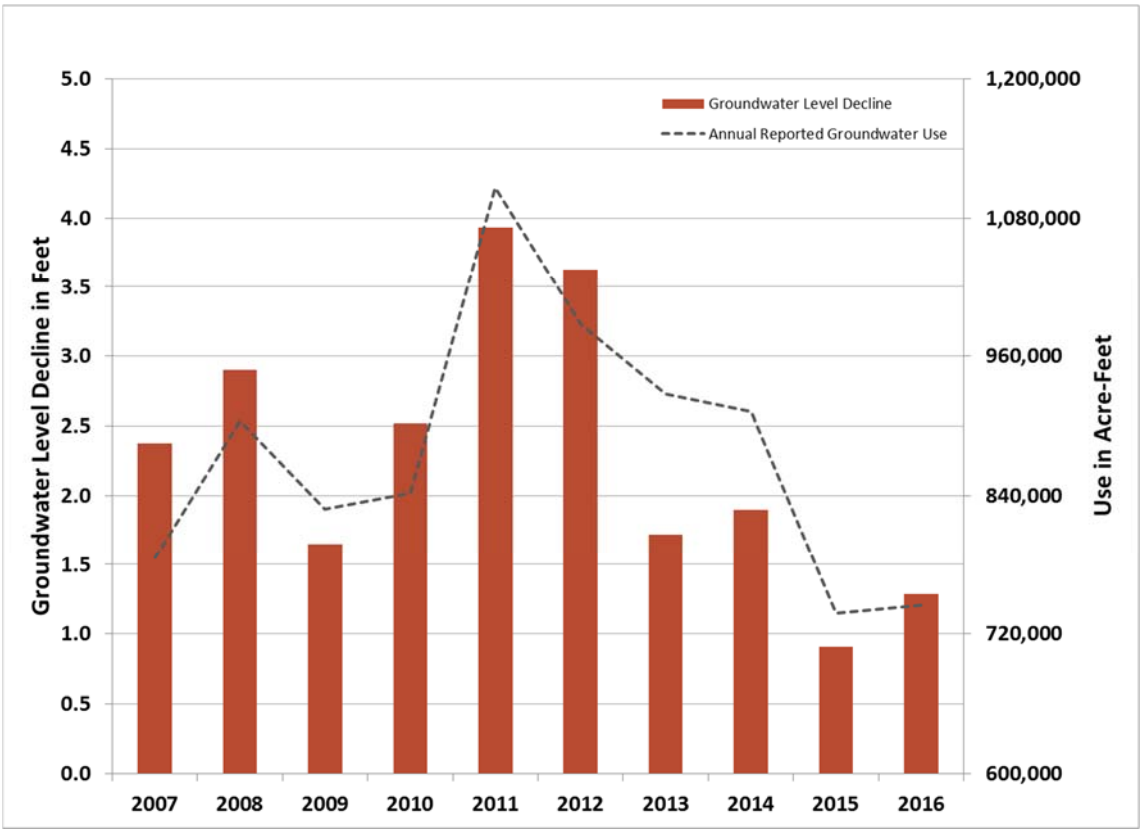


Figure 5: Groundwater level changes from 2007 to 2016

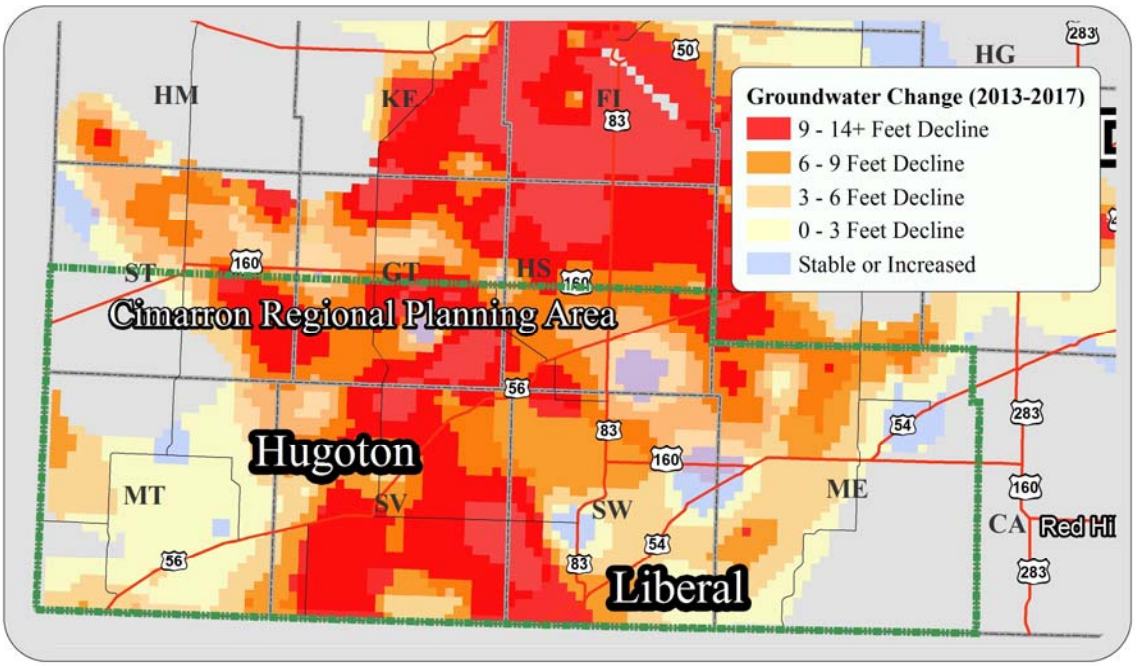


Figure 6: Groundwater level declines for 2013 to 2017, with data from the KGS water level monitoring program

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 =

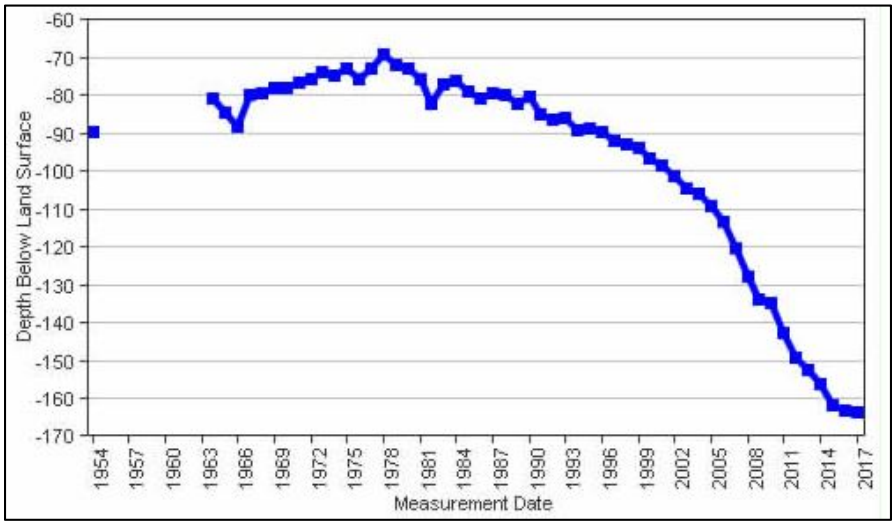


Figure 7: Hydrograph showing the decline of the Ogallala Aquifer through time, with well measurements near Hugoton in Stevens County

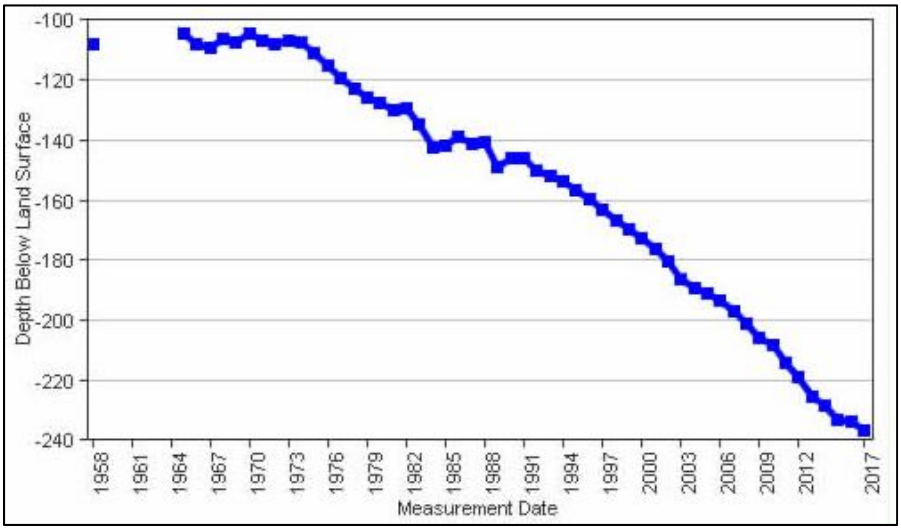


Figure 8: Hydrograph showing the decline of the Ogallala Aquifer through time, with well measurements near Liberal in Seward County

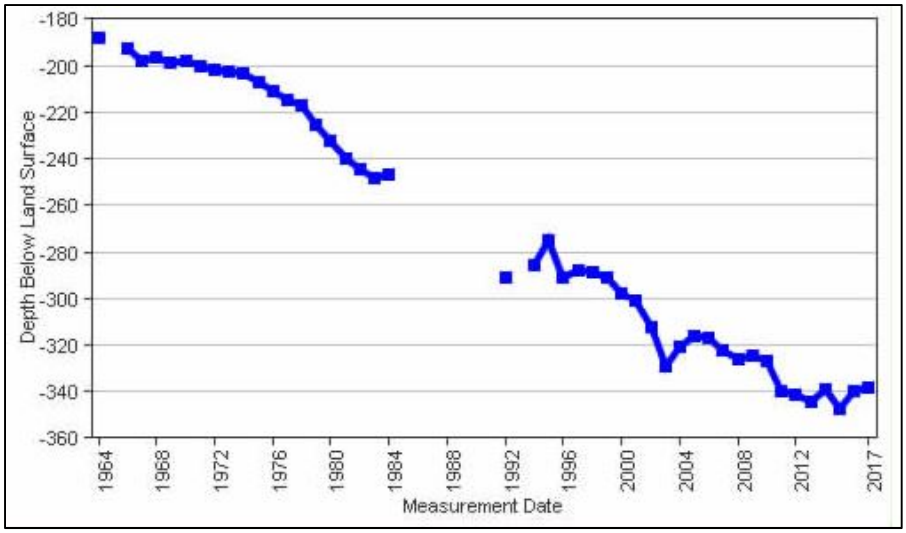


Figure 9: Hydrograph showing the decline of the Ogallala Aquifer through time, with well measurements near Sublette in Haskell County

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

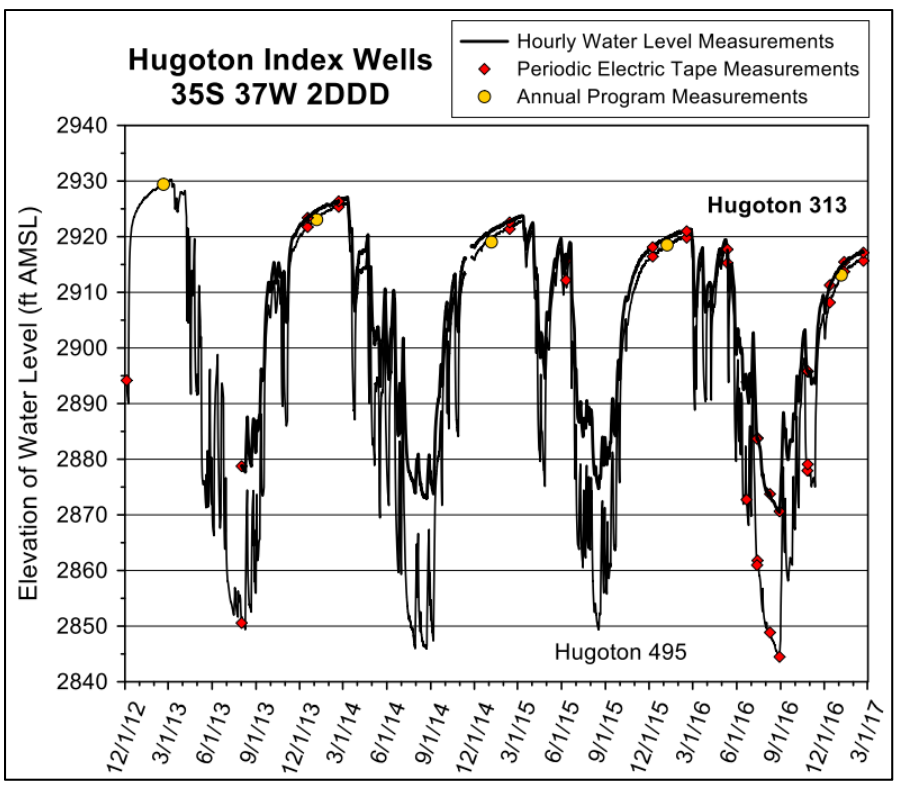


Figure 10: Kansas Geological Survey Hugoton index wells hydrographs

The KGS operates six 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 Hugoton index wells clearly show the annual drawdown and recovery that occurs in relation to the area's irrigation pumping trends (Figure 10).

Surface Water

The principal streams in the Cimarron Region are the Cimarron River and Crooked Creek, neither of which has sustained flows and have the characteristics of ephemeral streams with localized flow for brief periods in response to rainfall and climatic events. In a study of historic streamflow of the Cimarron River in Kansas, there is a distinct decrease in discharge that occurred prior to 1985, with multiple researchers concluding the declines in streamflow are in response to groundwater-level declines within the region.

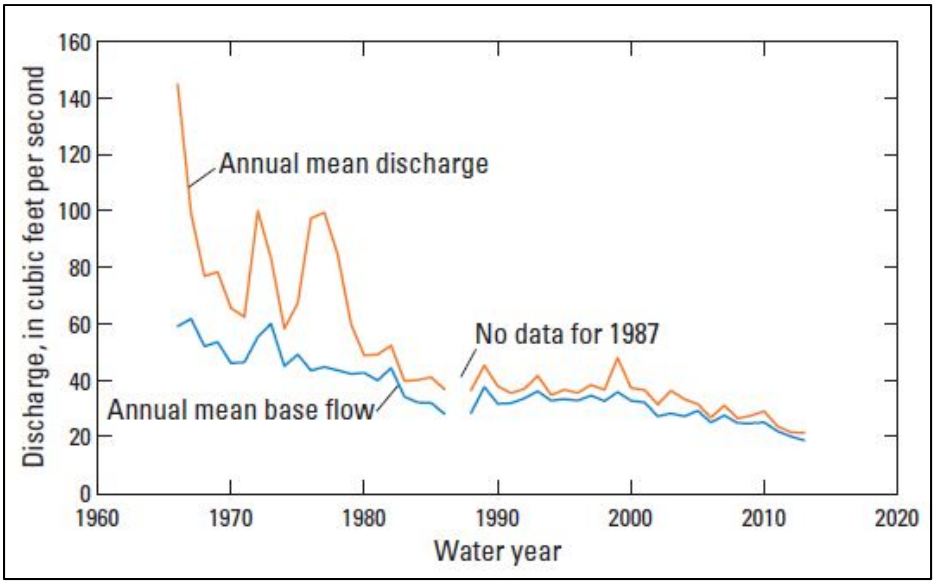


Figure 11: Declining historical Cimarron River flows near Forgan, Oklahoma streamgage (station 07156900), 1966–2013. USGS 2015-5167

Playas are present throughout much of the region. These shallow and ephemeral ponds that are seen after rainfall events act as areas of enhanced groundwater recharge within the area and provide habitat for many species of plants and wildlife (Figure 12).

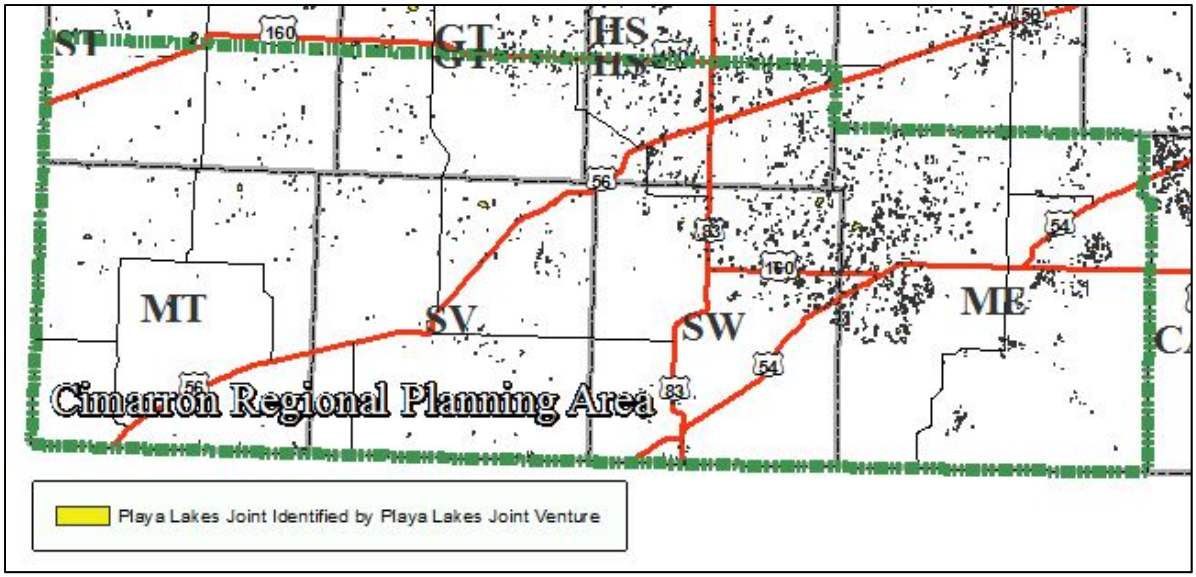


Figure 12: Playas within the Cimarron Region as identified by the Playa Lakes Joint Venture

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 highly agricultural areas has the potential for elevated levels of nitrates being picked up in public water supply wells.

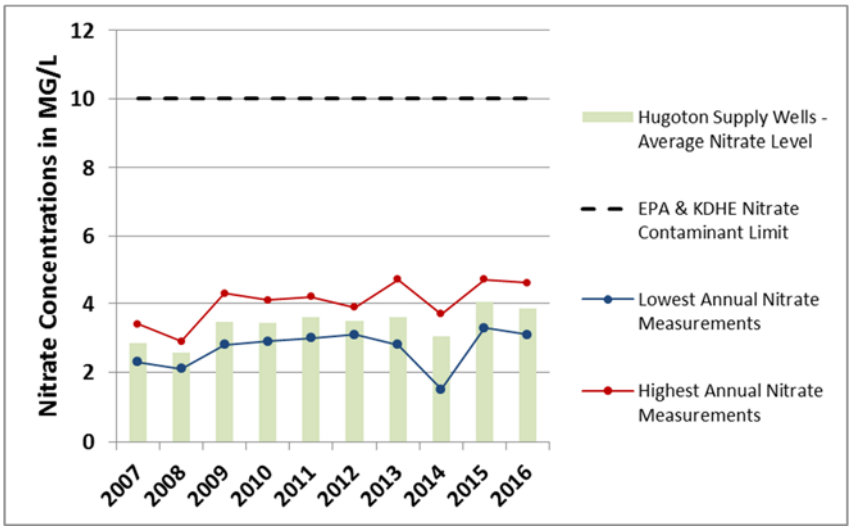


Figure 13: Nitrate concentrations reported from Hugoton public water supply wells, all results below drinking water permit limits. Data from KDHE Drinking Water Watch system

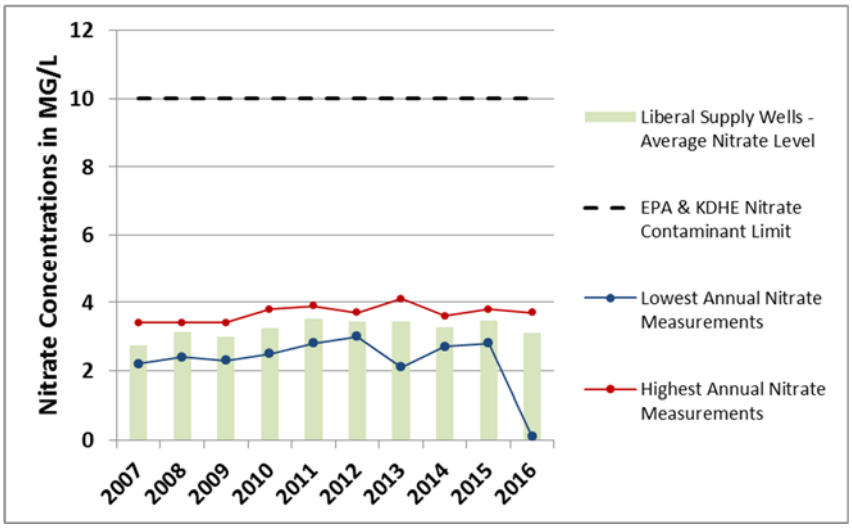


Figure 14: Nitrate concentrations reported from Liberal public water supply wells, all results below drinking water permit limits. Data from KDHE Drinking Water Watch system

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, leakage from waste water treatment systems, and natural occurrences. Recent nitrate sample results from the public water supply wells of Hugoton and Liberal show nitrate levels substantially below public drinking water limits (Figures 13 and 14). Samples collected at the Hugoton public water supply wells appear to be slowly trending upward.

Surface Water

Despite the region's lack of surface water flows, many of the surface water reaches have ongoing water quality concerns. 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 Cimarron Region, TMDLs have been developed to address dissolved oxygen, pH, aquatic plants, fluoride, sulfate, selenium, total phosphorous, chloride, E. coli and eutrophic conditions. With 10 TMDLs in place for the limited amount of surface water within the region, additional information on TMDLs and the Section 303(d) list of impaired waters can be found at the Kansas Department of Health and Environment website.

Natural sources of chloride and sulfates have been found to impact Cimarron River and Crooked Creek. Chloride concentrations may also be elevated in the Ogallala-High Plains Aquifer and streams of the area from the upwelling of groundwater from the Permian formations below. This is especially true in the southern portions of eastern Seward and western Meade counties.

Implementation Progress

Water Technology Farms

Water Technology Farms (Tech Farms) are a Phase II action item from the Ogallala-High Plains Aquifer section of T*he Vision*. Theses 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. In 2017, the region saw the development of the first Water Conservation Area and Tech Farm. The Hatcher Water Technology Farm is located six miles north of Liberal on Highway 83.

The two fields that make up the farm have had field mapping completed to identify management zones and locate where soil moisture probes were to be installed. One pivot is the site of water application comparisons with different nozzle packages. Another field has plant-based sensors being used to manage plant stress. Aerial imagery is being collected to monitor the results and then evaluate the impacts of different water management strategies.

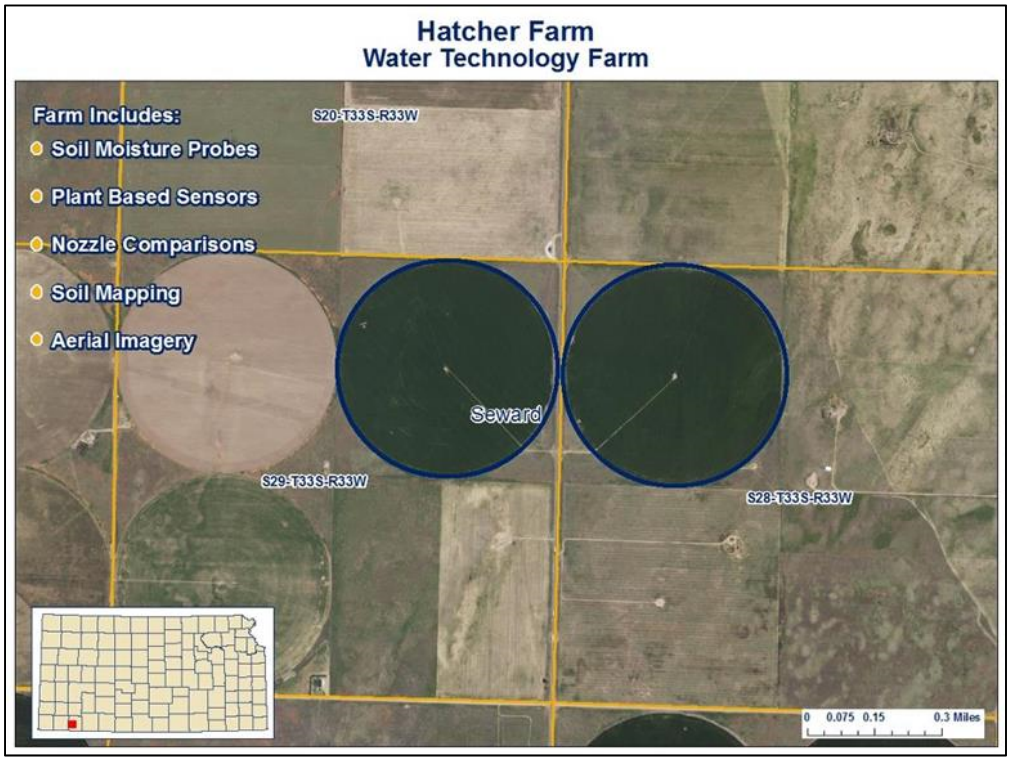


Figure 15: Hatcher Farm Water Technology Farm layout

Limited Irrigation Crop Insurance

A Phase I Statewide Action Item in *The Vision* includes working with the United States Department of Agriculture's Risk Management Agency (USDA-RMA) to address crop insurance policies that disincentive 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.

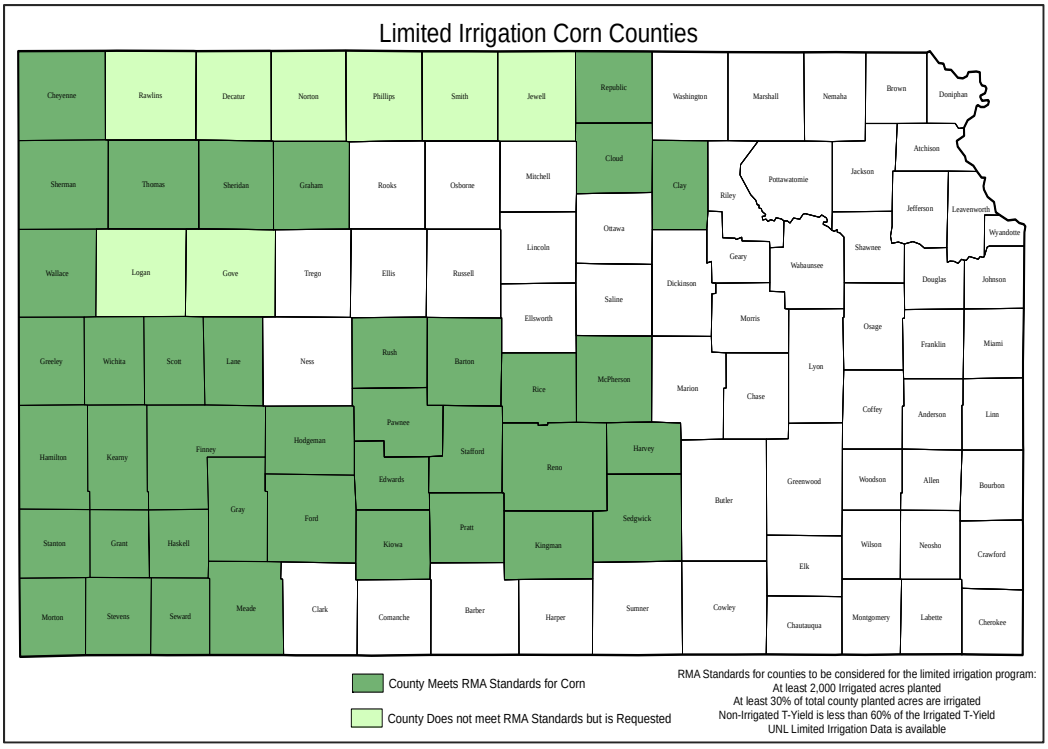


Figure 16: Counties where limited irrigation insurance is available for corn

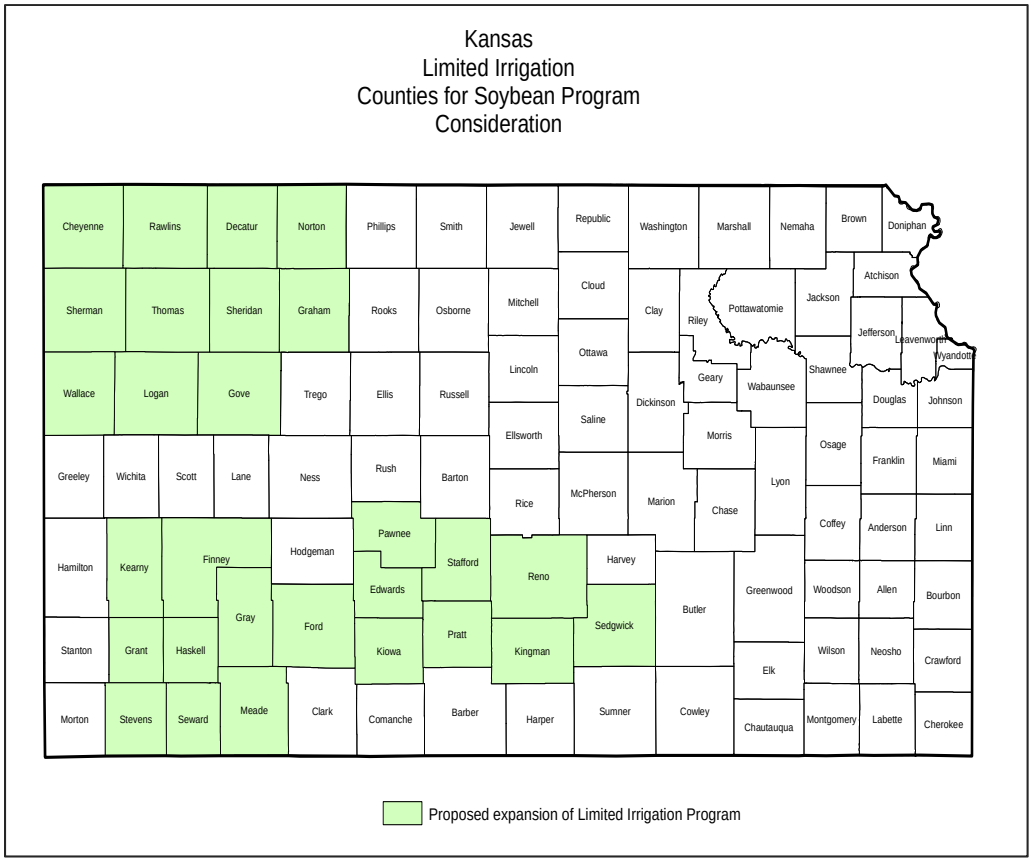


Figure 17: Counties where limited irrigation insurance is available for soybeans

Conservation Incentives

The State of Kansas worked with the United States Department of Agriculture's Natural Resources Conservation Service (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.

In 2015, GMD3 was awarded a $2.4 million dollar Regional Conservation Partnership Program (RCPP) grant from the NRCS to help incentivize Advanced Irrigation Water Management across the region. The grant can be used to partially cover the cost of soil moisture probes, telemetry enabled flowmeters, and other irrigation technologies. There have been three contracts signed under the grant program for 2016 and 2017, totaling $40,360 of incentive payments to landowners within the Cimarron Region (Figures 18 and 19).

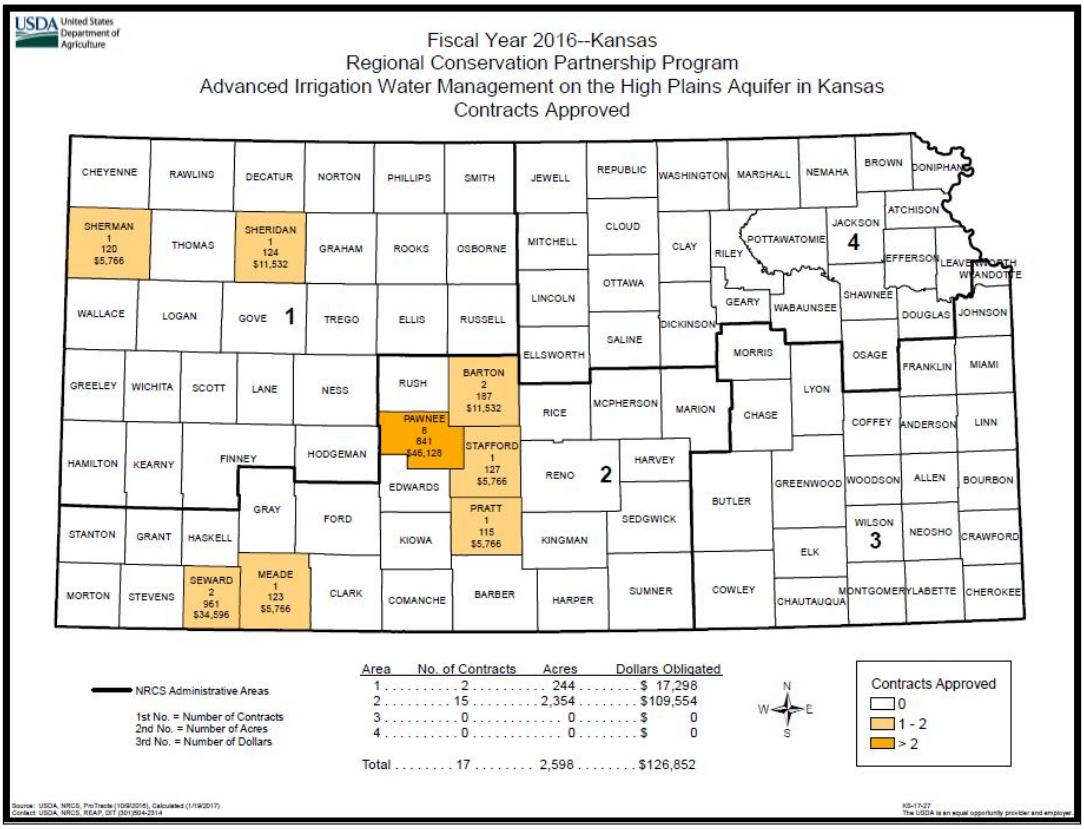


Figure 18: RCPP Advanced Irrigation Water Management contracts approved for 2016

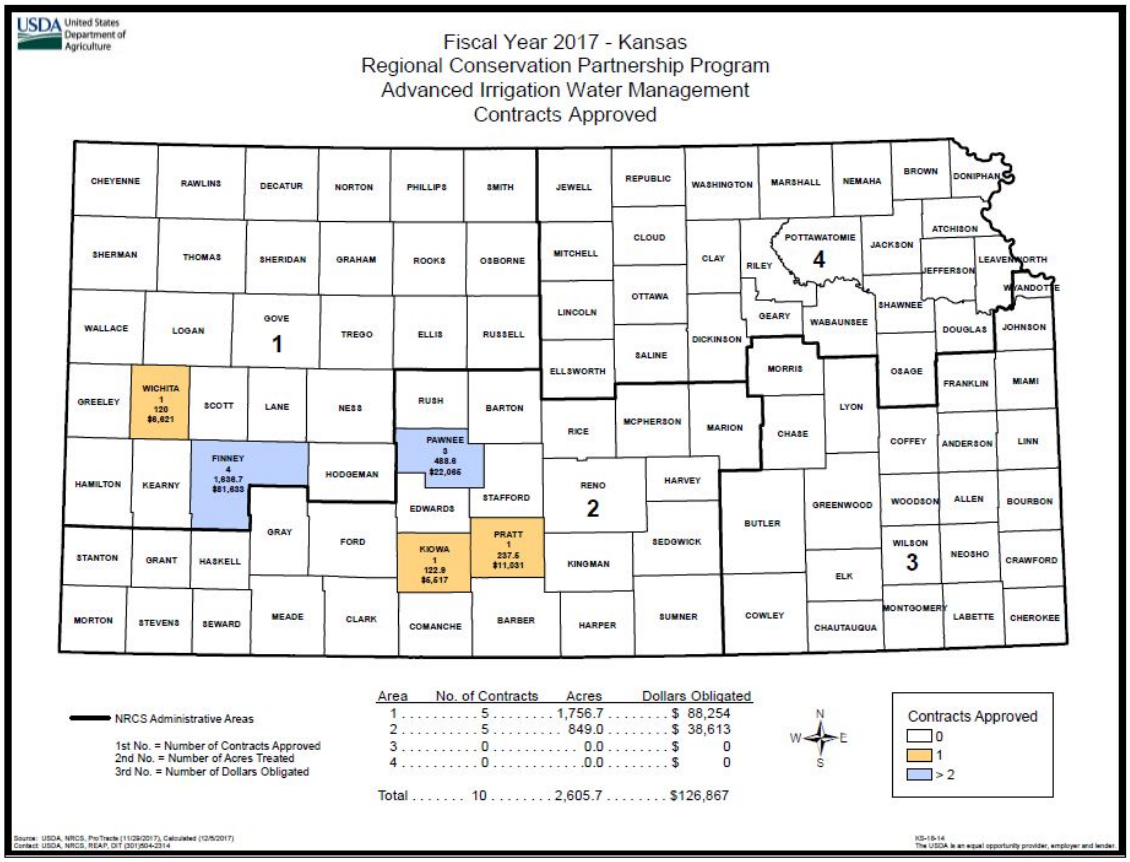


Figure 19: RCPP Advanced Irrigation Water Management contracts approved for 2017

Education and Information

In February 2017, the first Water Talk Series meeting was held in Ulysses in conjunction with the Southwest Kansas Irrigation Association 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, the economic impacts of water conservation, and the conclusion of the area's recent water right impairment court case.

Water Conservation Areas

Water Conservation Areas 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.

One WCA plan has been adopted by a landowner as a voluntary water conservation measure. This WCA covers 252 acres of the 651,895 irrigated acres in the region, equating to 0.04% of the average total of irrigated acres (Figure 20).

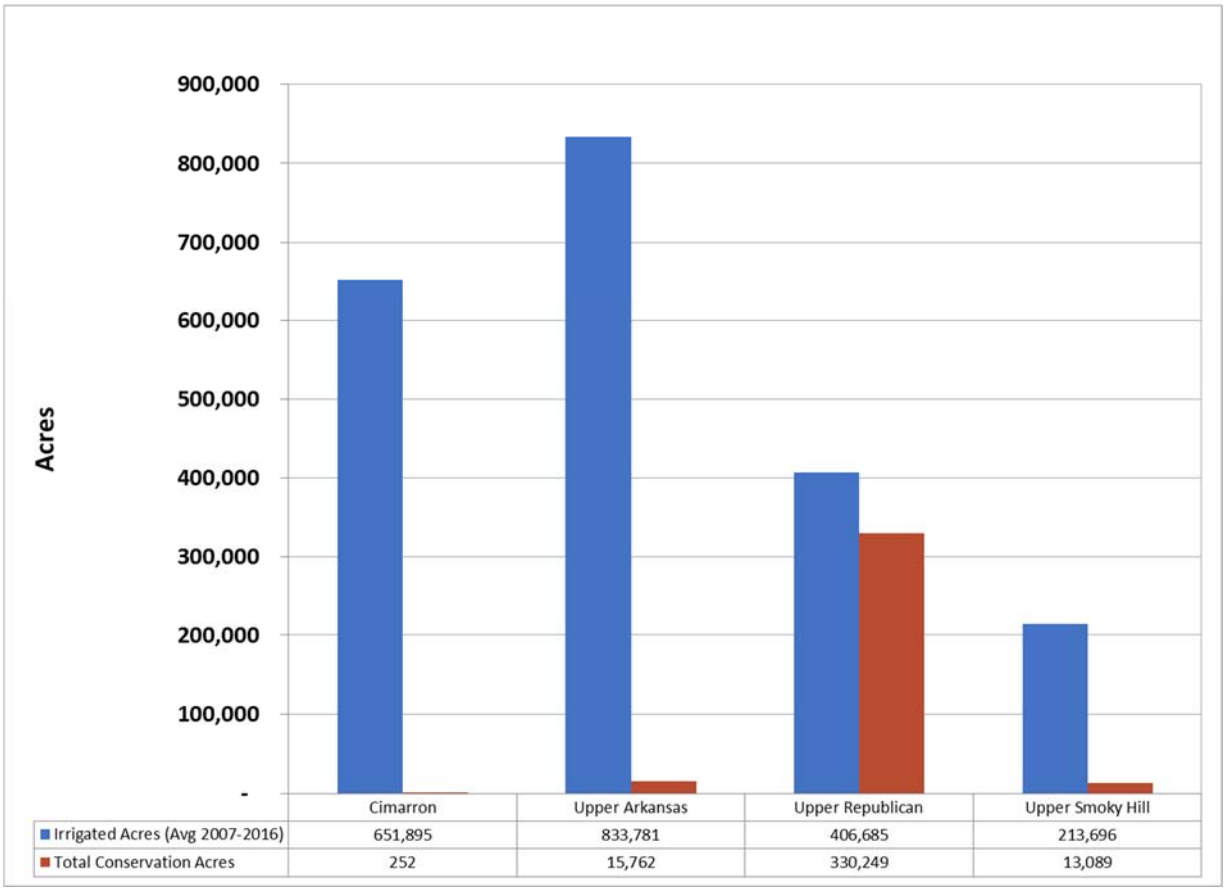


Figure 20: Total conservation acres compared to irrigated acres in the four western RACs

Implementation Needs

The Cimarron Regional Advisory Committee has identified multiple needs to fully achieve the Region's Priority Goals in the regional action plan that was developed through Advisory Committee meetings. The need for more water conservation education and incentives to increase utilization of efficient irrigation technologies has been stated repeatedly by the Regional Advisory Committee as a need. The needs identified by the Regional Advisory Committee are listed below:

- Water conservation education
    - Need for increased communication of conservation information
        - Radio ads communicating water events and water conservation information
    - Session at GMD 3 Annual Meeting March 14th –presentation of info on action plan and Goals
- Water conservation area and water efficient irrigation technology incentives
- More funding for education and demonstration projects
    - Focus on screening and filtration methods to expand water reuse within the region
        - Water reuse project with city of Liberal effluent (3-4 mg/d)(filtration and screening)
            - Conestoga fields, Liberal ball fields, and parks

        - Livestock water reuse for cattle drinking water and irrigating fields, evaluate irrigation technology (filtration and screening)
- Improved communication methods, avenues, new partner groups
    - Increase social media presence
        - Utilize Cimarron FB page
    - Submit articles and photos to local newspapers
    - Email articles and information to producer groups
        - KFB weekly newsletter
        - Use and distribute already existing information
        - Ask Extension offices and FSA groups to email information
    - Look to find existing meetings and public info sessions for the RAC to communicate information
        - Distribute speaking or info opportunities to the RAC to see who is available to present
- To increase communication and collaboration with those in the Panhandle region of Oklahoma on the state of the water resources and strategies to extend the lifetime of the water supplies in both regions
- Encourage the exploration into alternative crops
    - Reduce barriers to risk management for alternative crops
    - Focus on local silage production for livestock feeding operations
        - Triticale, forage sorghum,
            - Resurrection of forage sorghum program (was used in SE CO) how to fix the program
- Document current conservation measures to develop baseline
    - Survey to identify and establish baseline of where we currently are at
        - Adoption of irrigation strategies
        - Cotton or alternative crops currently grown
        - Livestock water reuse – drinking water and irrigation
        - Boundaries to conservation
        - Ask for new "conservation project ideas or outside the box ideas"
    - Work with Irrigation Research Coordination group to help document baseline and what is conservation within irrigation

Regional Goals & 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

Cimarron 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&2	Goal Theme	Annual Progress			
		2017	2018	2019	2020
Reduce the rate of decline of the Ogallala Aquifer in the region through voluntary, incentive - based conservation as assessed every five years. Extend the usable lifetime of the Ogallala Aquifer in the region through technology adoption (irrigation, industrial, municipal, etc.), new crop varieties and conservation for all uses and for many generations.	Aquifer Sustainability			--	--

Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete

2018 Update:

- Continuation of local WCA and LEMA outreach and education

Next Step(s):

- Encourage development of additional WCAs within the region
- Evaluate potential LEMAs

Regional Goal #3	Goal Theme	Annual Progress			
		2017	2018	2019	2020
If individuals elect to conserve then they would be afforded flexibility (e.g. - allowing quantities to be moved, water bank movement, water conservation areas, etc.) Individuals may choose to remain with current water use but not be afforded the flexibilities.	Water Conservation			--	--

Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete

2018 Update:

- Continuation of local outreach and education

Next Step(s):

- Encourage development of additional WCAs within the region

Regional Goal #4	Goal Theme	Annual Progress			
		2017	2018	2019	2020
As measured through increase in adoption by 50% as assessed each five years, promote the adoption of irrigation efficient technology and invest in university research to evaluate the effectiveness of such technology and crop varieties to develop voluntary incentives and tools to economically reduce water usage. Recommended strategy to achieve Goal - Increase adoption through education by those who are currently using the technology.	Technology			--	--

Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete

2018 Update:

- Water Technology Farm field demonstration day held

Next Step(s):

- Communicate information on efficient irrigation technologies
- Develop cost share strategy to incentivize adoption of new irrigation technologies to reduce water use
- Establish a baseline of current irrigation and cropping practices within the region

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