

State of the Resource & Regional Goal Action Plan Implementation Report

August 2018

Missouri

Regional Planning Area



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Executive Summary

The Missouri 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.

Groundwater quantity and quality is a key issue in the Missouri Region. The Kansas Geological Society (KGS) completed a study in June 2017 that estimated bedrock elevation and thickness of unconsolidated material. However, only a few static water levels were available and one index well was documented for this large area. The KGS study also documented an unexpected number of wells exceeding the 10 mg/l limit for nitrate. From the 371 wells that were analyzed, 142 were above the national standard, 25 wells over 50 mg/l, 4 over 100 mg/l, and the highest sampled was 128 mg/l. The first year of Phase II has begun and will develop an index well system that will help determine ground water quantity and provide real-time data on nitrate levels in the region.

Surface water is an important resource in the region. The Missouri River Bed Degradation Feasibility Study was completed in June 2017 by the United States Army Corps of Engineers (USACE) in conjunction with multiple partners. It is estimated the bed of the river will degrade another eight to 10 feet on average in the Kansas City area, with degradation in specific locations as high as 22 feet. This could potentially impact water suppliers from both the Missouri and Kansas Rivers with the lower water level exposing water intakes at low flows.

Drought conditions persisted in the region, with only Leavenworth and Wyandotte counties having near or above normal rainfall. Significant impacts were felt in corn and bean production in this area. Algal blooms are often seen when there is insufficient fresh water added to a body of water. This was the case in 2017 for both Brown State Fishing Lake and Hiawatha City Lake. These lakes were sampled the week of August 21 and the lakes remained at warning level through the week of October 30, impacting recreations use.

Watershed implementation moved forward in 2017, with investment from Watershed Restoration and Protection Strategy (WRAPS), Natural Resources Conservation Service (NRCS), and Kansas Department of Agriculture-Division of Conservation (KDA-DOC) for 2016 totaled \$137,700. This combined effort led to a reduction of 1,822 lbs. of nitrogen, 971 lbs. of phosphorus and 898 tons of sediment.

Water Use Trends

Surface water is the primary source of water within the Missouri Region (Figure 1), accounting for more than 90% of the total reported water usage (Figure 2). Surface water sources in the region include the Missouri River, which are a significant source of water supply to the Kansas City metropolitan area and other communities of northeast Kansas. Groundwater is not a major source of water supply for this region, accounting for only 8% of reported water use. Reported total water use for the region totaled nearly 88,000 acre-feet (AF) for 2016.



Figure 1: Missouri Regional Planning Area

Annual reported water use for the region fluctuates based on climate conditions present, with higher water use resulting from periods of hot and dry weather during the growing season and lower water use taking place during periods of cooler and/or wetter weather.

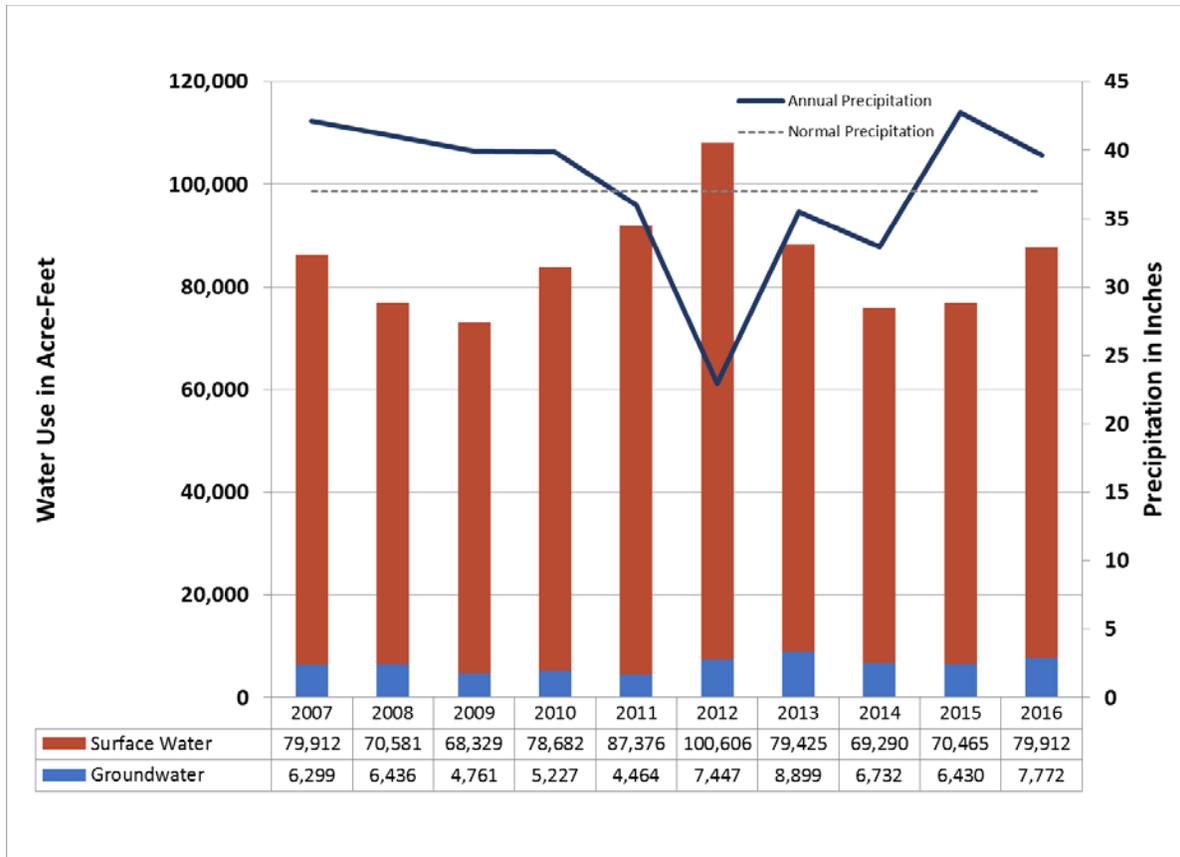


Figure 2: Annual surface water and groundwater reported use with precipitation data, Missouri Region

Water Resource Conditions

Groundwater

The principal aquifers are the Glacial Drift, Alluvial, and the Osage Aquifers in the southern portion of the region (Figure 3). A study completed in 2017 by the KGS shows the bedrock elevation for the region (Figure 4). A total of 1,027 wells and 994 test holes were used to complete this study, with some areas indicating a significant amount of groundwater available.

In addition, this study documented saturated thickness; however, very few static water levels were available for review, including only one index well. Therefore, there still remains a lack of information about the quantity of groundwater within this region. Irrigation has tapped into some of this available water with an increase of nearly 1,700 AF from 2007 to 2016 (Figure 5).

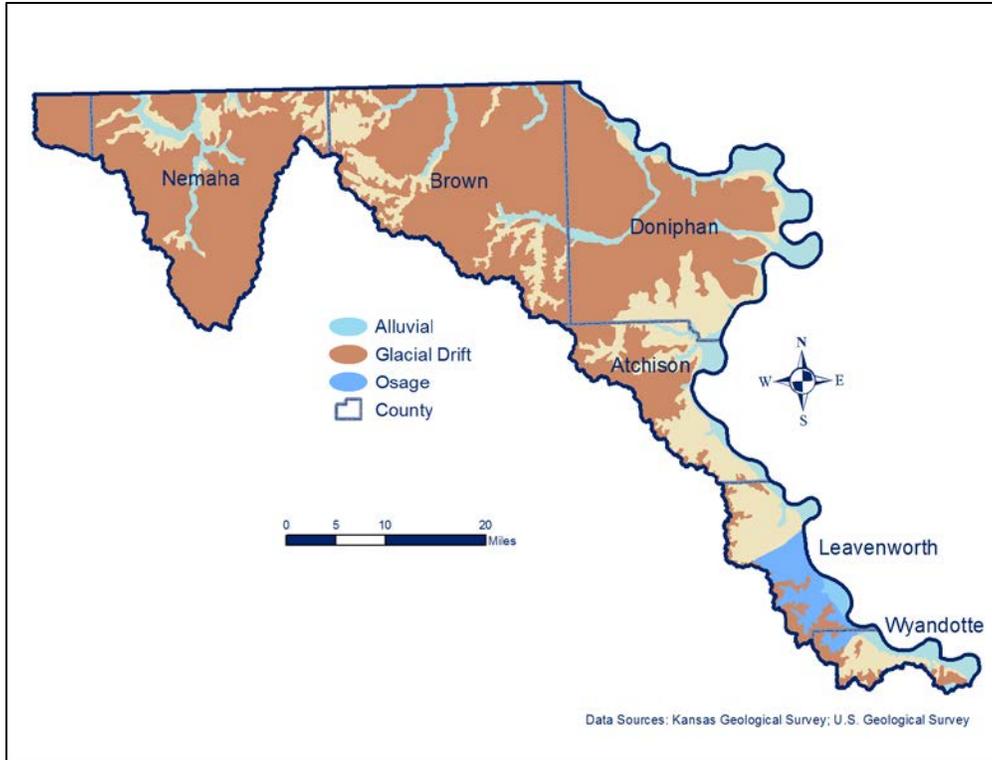


Figure 3: Missouri Region aquifers

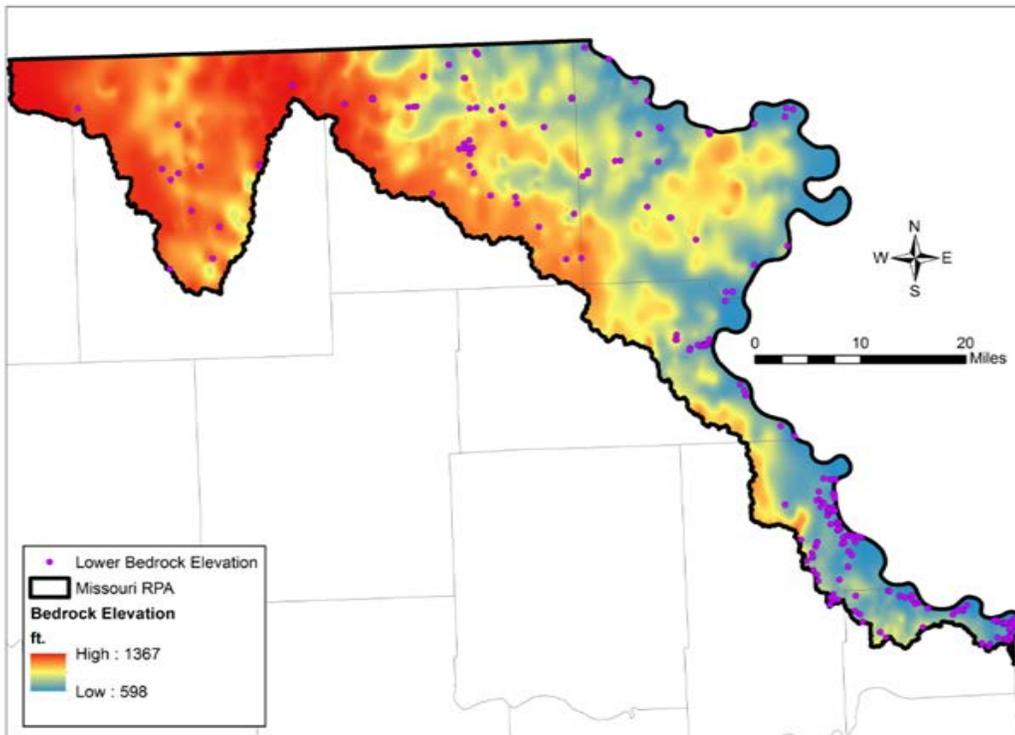


Figure 4: Missouri Region bedrock elevation

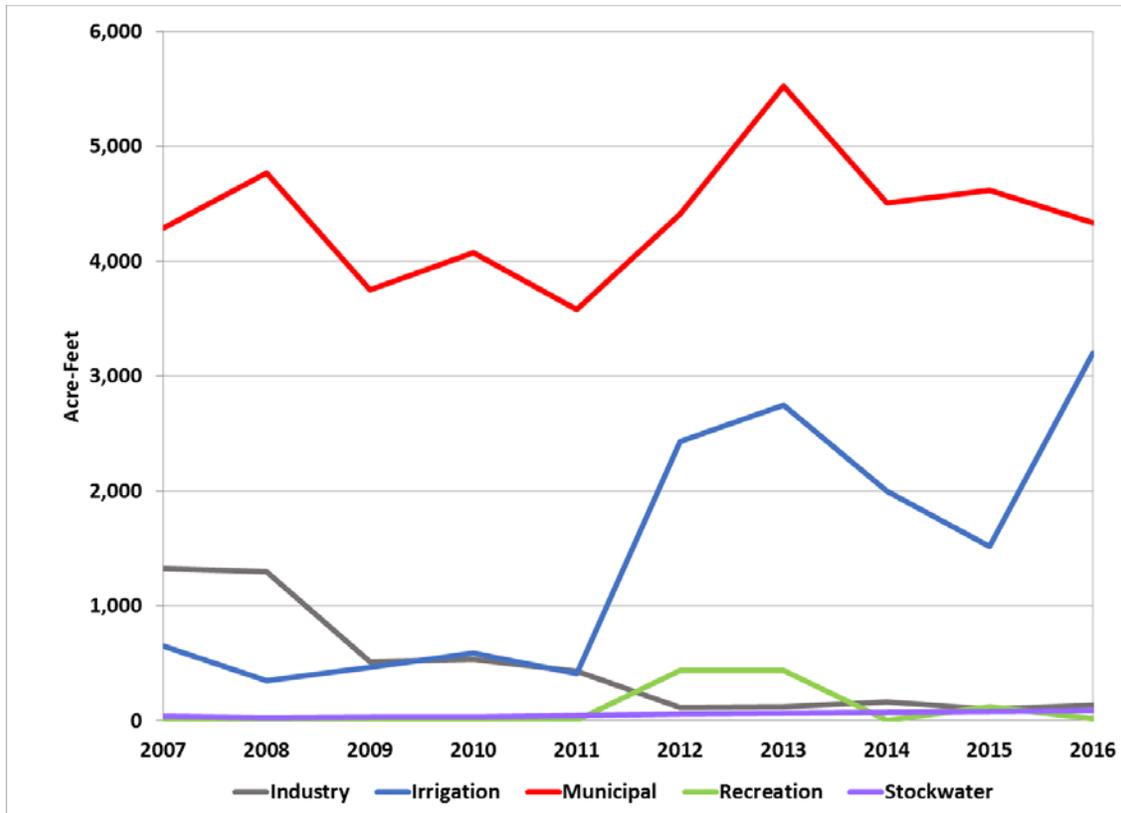


Figure 5: Annual reported groundwater use by type

Surface Water

The main surface water source in this region is the Missouri River and its tributaries. Municipal use from these streams accounts for nearly 80,000 AF annually (Figure 6). The Missouri River is greatly influenced by water released from the six federal reservoirs located in Montana, North Dakota, South Dakota, and Nebraska. In 2017, the river experienced a relatively normal flow pattern (Figure 7). All of the major streams in this region are currently open to new appropriations; there are no locations where minimum desirable streamflow (MDS) have been set.

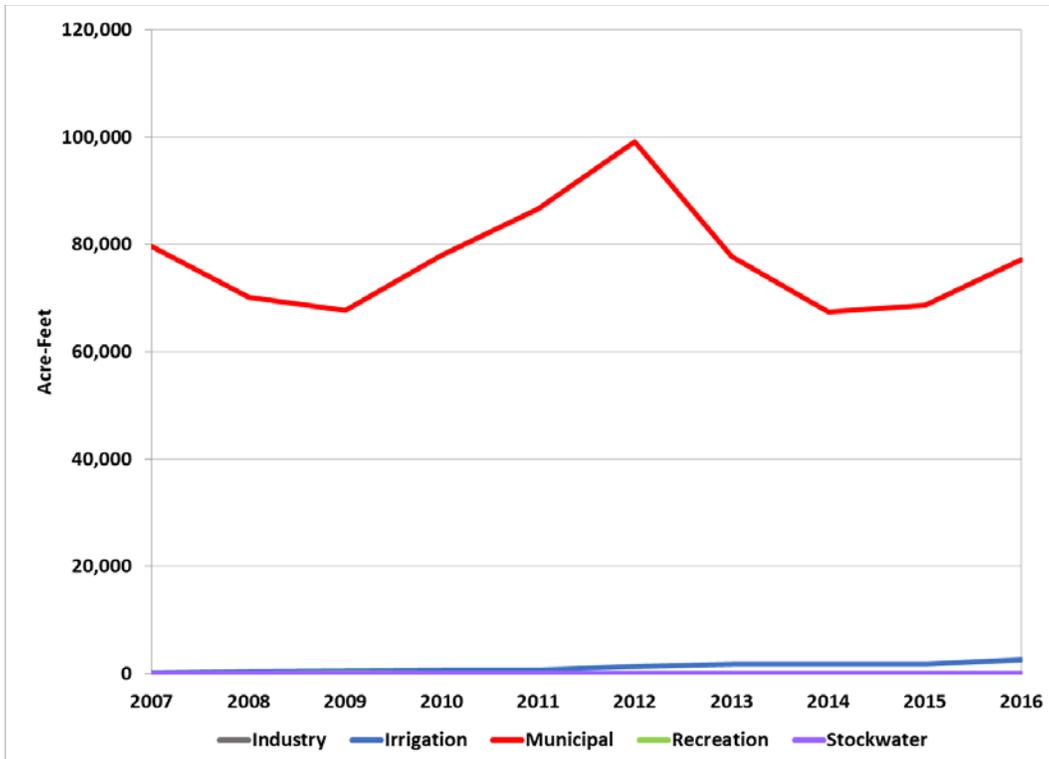


Figure 6: Surface water use by type 2007-2016

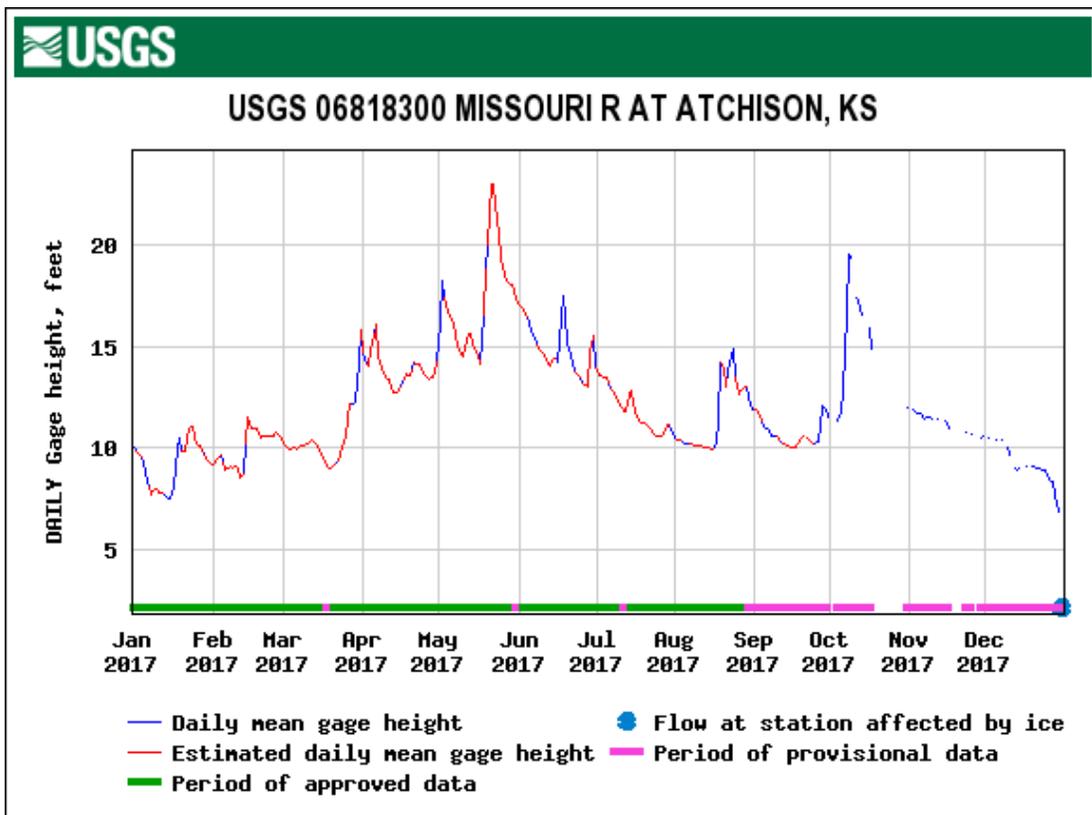


Figure 7: Missouri River Gage at Atchison, KS, streamflow data. (Data Source U.S. Geological Survey)

Water Quality

Groundwater

Water quality is currently being addressed through a recently completed study by the KGS that compiled nitrate levels from 371 wells in the Missouri Region. 142 of those wells were over the national standard of 10 mg/l, and 25 of those wells over 50 mg/l (Figure 8). In October of 2017, the City of Hiawatha broke ground on a \$3.5 million dollar water treatment plant to reduce nitrate levels to an acceptable level.

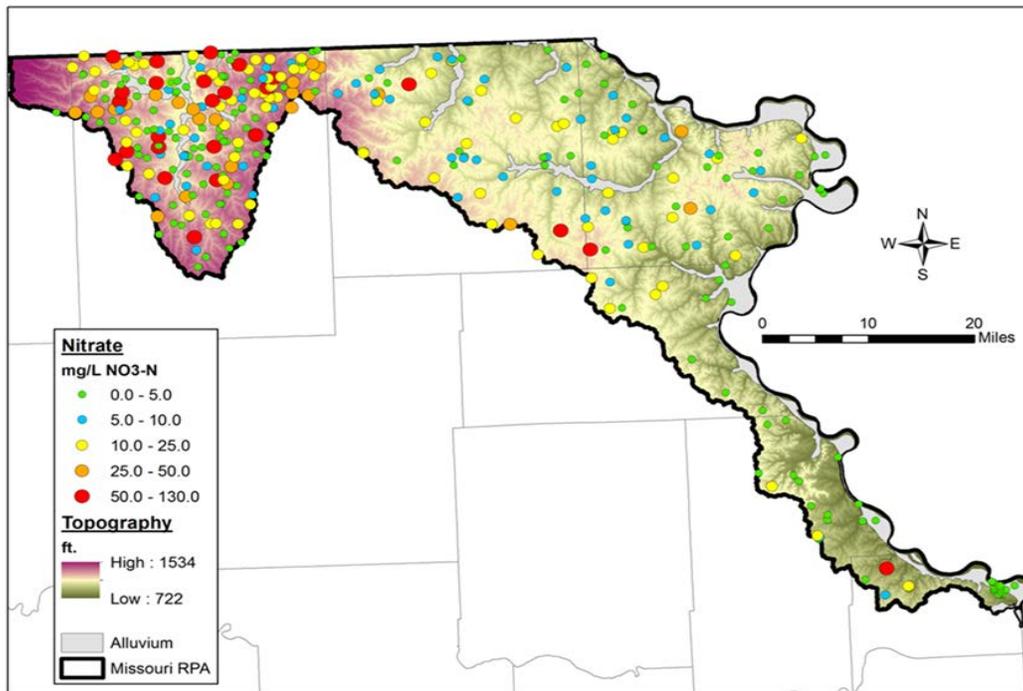


Figure 8: Groundwater samples compiles by KGS in the Missouri Region

Surface Water

Water quality and related water resource issues are addressed through a combination of watershed restoration and resource protection efforts utilizing voluntary, incentive-based approaches, as well as regulatory programs. 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. A list of all impaired/potentially impaired water for the Kansas Basin can be found on the Kansas Department of Health and Environment (KDHE) [impaired waters](#) website.

The 2014 303(d) list shows 35 streams and 5 lakes with impairments. The 2016 303(d) list is the same as the 2014 list with the following additions: 1 body of water requiring more information to make a decision on future listing and 6 waters requiring development of a TMDL because of impairments for: Atrazine, Arsenic and Biology.

Harmful Algal Blooms

Harmful Algal Blooms (HABs) are common in bodies of water when nutrient loading is excessive during

periods of elevated temperatures. Health effects of HABs are well documented from flu like symptoms in humans to the death of pets and livestock. A combination of conditions provided an ideal situation for blooms to occur in two small lakes within the Missouri Region in 2017. HABs were reported on both Brown State Fishing Lake and Hiawatha City Lake in 2017 (Figure 9). Both of these lakes, along with Sabetha City Lake, are prone to warning level blooms since KDHE started documenting HABs in 2011.

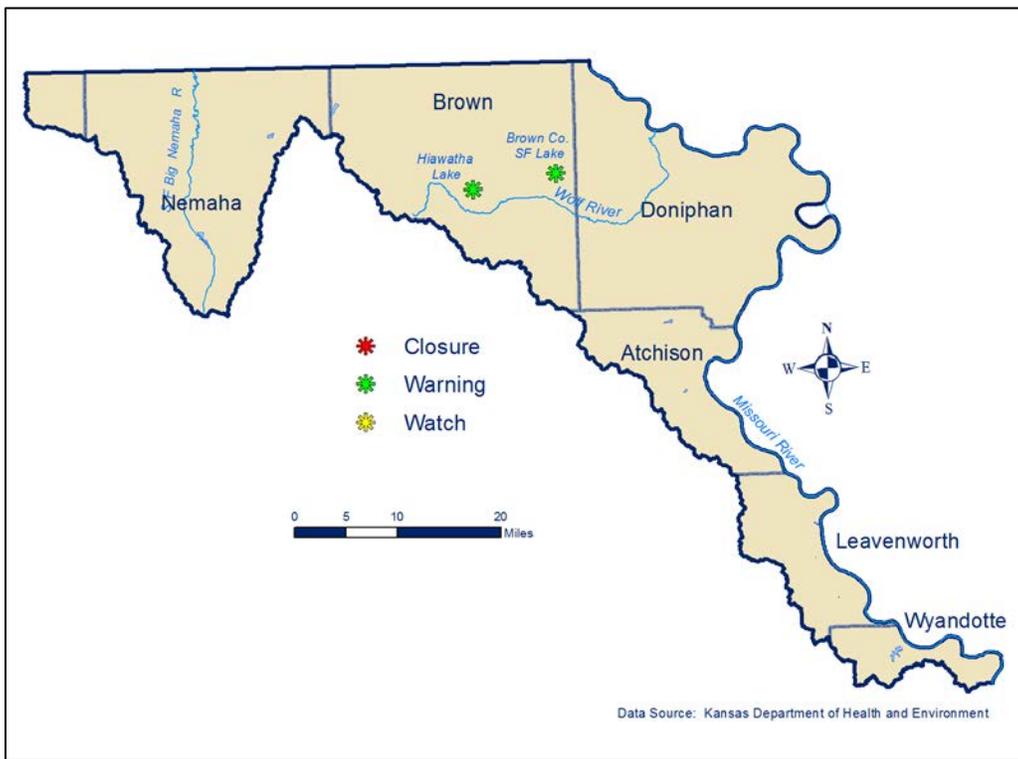


Figure 9: 2017 Harmful Algal Blooms in the Missouri Region

Implementation Progress

Groundwater

Phase I of a study by KGS on the water quantity and quality in the Missouri Region was completed in June 2017. The report demonstrated the water quality problems within the region, especially in Nemaha County, and estimated bedrock elevation and thickness of unconsolidated material; however, water levels were not established. KGS has been contracted for the first year of a five year study, Phase II, to develop an index well system that will help determine ground water quantity and provide real-time data on nitrate levels in the region.

Members of the Missouri RAC attended several Healthy Watershed meetings for the Independence-Sugar Creek Watersheds, hosted by the State of Missouri. Meetings included the idea of using a Regional Conservation Partnership Program (RCPP) approach to funding improvements across state lines. Following the series of meetings, RAC members created a draft document plan, similar to the KDHE approved 9-Element Watershed Plans, to improve water quality and quantity in the Missouri

Region. An alternative funding source was recognized through a Bureau of Reclamation (BOR) grant to finalize this plan. The application was submitted, however this project was not chosen for funding.

The Doniphan County Conservation District has developed and submitted a RCPP plan. The project would use the Environmental Quality Incentives Program (EQIP) to assist in funding sediment reduction through sediment control basins, diversions, terraces, underground outlets, and streambank stabilization projects. The project has been approved and is in the final phase before actual implementation. The Doniphan Co. Road and Bridge Department is the primary contributor.

Additionally, education and awareness was a focus of the Missouri Region. A Legislative Tour in mid-September, 2017 helped to raised awareness of the problems in the Missouri Region. RAC members focused on educating young people of the region through Water Festivals, Earth Day activities, and surface water issues occurring within the region. A Farm Agriculture Education Day and a teacher education conference were also held, with a focus on Cover Crop Education and the Missouri River, respectively.

Surface Water

In 2017, the Missouri River Bed Degradation Study was conducted by the USACE to document the movement of the head cut. This head cut migrates upstream through Kansas and Missouri, consequently impacting structures along the way. It is estimated the bed of the river will degrade another 8 to 10 feet on average in the Kansas City area, with degradation in specific locations as high as 22 feet. There was no formal solution or funding mechanism developed to help those industries along the river with infrastructure problems.

The USACE also developed a Draft Missouri River Recovery Management Plan and Environment Impact Statement (DEIS) and requested comments from the Missouri RAC. The RAC supported the Preferred Alternative No. 3 as it would be the least impactful means of meeting species objectives. The USACE will provide an official course of action later this year.

Best Management Practices (BMPs) are vegetative, structural, or management practices that reduces the pollutants in the surface and ground waters. BMPs may be incorporated independently or in combination with other BMPs compounding their positive effects. The 2016 load reductions (Table 1) are a collaborative effort between WRAPS, NRCS, and KDA-DOC. Table 2 illustrates the investment that NRCS has made in this region since 2015, totaling nearly \$3.3 million.

Table 1: 2016 Missouri watershed targeted HUC 12 load reductions

Region	Nitrogen (lbs./yr.)	Phosphorus (lbs./yr.)	Sediment (tons/yr.)
Missouri	7,528	4,272	1,856

Table 2: FY2015-FY2017 Environmental Quality Incentives Program and Regional Conservation Partnership Program contacts - NRCS

Region	Number of Contracts	Contract Acres	Contract Obligations
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Missouri	73	7,318	\$3,228,972.90
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Implementation Needs

While the Missouri Region has begun to address the water quality and quantity concerns, significant efforts are still needed. The following items need to be addressed:

Funding the remaining 4 years of the Phase II groundwater monitoring study through KGS is needed, estimated to be nearly \$100,000 over the 4 year period. This study would establish a monitoring network capable of collecting current nitrate information and ground water levels and drill new wells in areas of limited spatial distribution of existing wells.

Conservation practice implementation continues to be necessary to reduce nutrient and sediment runoff impacting the surface waters of the Missouri Region. Progress made within the region can be compared to the remaining needs identified to quantify the overall financial need to fully implement watershed plans in this region (Table 3). These figures include costs associated with conservation practice implementation, as well as technical assistance needs to help landowners implement conservation practices. Overall, the total remaining need to fully implement WRAPS watershed plans for the region is \$2.65 million.

Table 3: 2017 costs by region

RAC Area	Number of plans	State Interest Priority Score Rank	Updated Information and Education Costs	Updated Total Livestock and Cropland Plan Costs	Updated Total Streambank Costs	Updated Technical Assistance Plan Costs	Updated Total Implementation Plan Costs
	(1) Plan						
Missouri		23	\$195,650.00	\$1,768,154.27	\$93,200.00	\$783,370.00	\$2,644,724.27
Total			\$195,650.00	\$1,768,154.27	\$93,200.00	\$783,370.00	\$2,644,724.27

The goal is to find local volunteers who are willing to adopt or promote new practices and support a soil health workshop in the region and submit a Conservation Innovation Grant (CIG) to help fund any new work to be accomplished.

The tile outlet terrace systems need to be reviewed within the Missouri Region. Research on cropland field input amounts needs to be conducted and water samples collected to evaluate the water runoff into the streams in the region. The goal is to collect data working with interested local landowners with assistance of area conservation districts, KDHE, NRCS and other existing agencies.

The region also wants to promote a project that would collect data on the number and size of irrigation ponds that have been constructed in the past 10 years. This information would be used to formulate data on the benefits of capturing and reusing water on a producer's property and should be coupled with standard water quality monitoring data.

The region is interested in learning what other interest groups, agencies and individuals locally and

from states with similar topography and precipitation (Iowa, South Dakota, Nebraska, and Missouri) can provide on alternative projects that could contribute to water quality in the Missouri Region

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 a more local level. In 2015, each of the 14 regions consisted of a Regional Goal Leadership Team comprised of local water users, along with input from area stakeholders, to help develop goals. These goals were adopted by the KWA for development by the Regional Advisory Committees (RACs). The Missouri RAC completed action plans for their regional goals in late 2016 and their progress is documented below.

Regional Goal #1	Goal Theme	Annual Progress			
		2017	2018	2019	2020
Since groundwater quality is not well known, compile existing and collect additional data over the next 5 years to establish a baseline. Within 3 years after the baseline is established, a plan to implement BMPs will be developed to maintain and improve existing conditions. Monitoring and reevaluation of groundwater quality conditions should continue at 5 year intervals.	Groundwater Quality			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update: <ul style="list-style-type: none"> • KGS was contracted to extract and compile digital and non-digital data relevant to water quality in the Missouri Region as part of the Phase I project. Phase I was completed in July of 2017 and the entire report can be seen at the KWO website • RCPP submitted by Doniphan County Conservation District, has been approved, will use EQIP dollars to fund sediment control structures • In cooperation with Missouri, participation in Healthy Watershed meetings for the Independence-Sugar Creek Watersheds occurred • Submitted BOR grant application to finalize watershed plan, however, the plan was not funded Next Step(s): Pursue funding for the remaining 4 years of the Phase II KGS study, which will use index wells to establish and monitor groundwater quality. Continue to look towards participating in a soil health workshop in the region.					

Regional Goal #2	Goal Theme	Annual Progress			
		2017	2018	2019	2020

To ensure a reliable surface water supply in the future, BMPs will be implemented so surface water quality in identified drainages is maintained or improved using goals and milestones as identified in the Missouri Watershed Restoration and Protection Area 9 Element Plan.	Surface Water Quality			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update:					
<ul style="list-style-type: none"> RAC formed the Missouri River subcommittee, who formulated and submitted comments to the USACE on the Missouri River Draft EIS The Missouri River Bed Degradation Feasibility Study was completed in June by the USACE in conjunction with multiple partners. The entire report can be seen at the KWO website Continued engagement with the Tile Outlet Terrace work that is being completed as part of an EPA wetland grant Submitted FY 2020 budget recommendations to the KWA to increase funding to address surface water quality 					
Next Step(s): Fully support annual WRAPS funding and the submitted RCPP to help meet load reductions.					

Regional Goal #3	Goal Theme	Annual Progress			
		2017	2018	2019	2020
Collect additional information to improve safe yield estimate of groundwater and tributary streams within 3 years. Place a moratorium on additional permits until safe yield is identified. Once determined, only issue permits that do not exceed that yield. Safe yield should then be continuously monitored.	Groundwater Quantity			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update:					
<ul style="list-style-type: none"> KGS was contracted to extract and compile digital and non-digital data and produce a digital map of bedrock elevations. Phase I was completed in June of 2017 and the entire report can be seen at the KWO website The Missouri River Bed Degradation Feasibility Study was completed in June by the USACE in conjunction with multiple partners Presentations by KDA in January and May of 2016 indicated that there is no evidence at this time for a moratorium to be placed on additional permits in the Missouri Region. Both of these DWR presentations are located on the KWO website under the 2016 presentations 					
Next Step(s): Pursue funding for the remaining 4 years of the Phase II KGS study, which will use index wells to establish and monitor groundwater quantity.					

Regional Goal #4	Goal Theme	Annual Progress			
		2017	2018	2019	2020
<p>Within 3-5 years the state should initiate a comprehensive education and outreach program. By the time of 8th grade graduation, students should know where their water comes from, understand the basics of the water cycle, know basic water conservation principles and understand that their actions impact water quality and quantity. Adult education should also be a component of this. As consumers that make decisions that could have far reaching impacts, adults must be given the knowledge to make wise choices. Schools, water providers and conservation districts should be the primary deliverers. A component of the comprehensive program should include enhancing information and outreach on research, technology and management practices using social media and public information outlets.</p>	Education			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
<p>2018 Update:</p> <ul style="list-style-type: none"> • A Legislative tour facilitated by KGS in mid-September helped raise awareness of the issues within the Missouri Region • Continued effort by Conservation Districts, WRAPS, and RAC members to educate young people of the region through water festivals, Earth Day activities, outdoor classrooms, and classroom presentations on water issues occurring in the region • A Farm Agriculture Education/Soil Health Day and a teacher education conference were held with help from the Farm Bureau and conservation districts with a focus on cover crop education and the Missouri River respectively • Presentations at 5 of the 6 County Conservation District Annual Meetings to discuss water issues in the Missouri Region • Submitted FY 2020 budget recommendations to the KWA asking for increased funding for education <p>Next Step(s): RAC members continue to engage groups in region on water issues. Utilize the developing education piece to promote water issues in the region.</p>					

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