MEMO

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DATE: September 12, 2017
TO: Missouri RAC Members and Advisors
FROM: Kirk Tjelmeland
RE: September 14, 2017 Meeting

The next meeting of the Missouri Regional Advisory Committee will be held on **Thursday, September 14, 2017 at 9:00 a.m. in the USD 409 Community Room, 626 Commercial, Atchison, Kansas.**

The summer is officially over but you are all remain extremely busy, thank you for dedicating some of your valuable time to the Regional Advisory Committee. The September 14th meeting has a lighter agenda: Andrea Brookfield, KGS will be giving the RAC an overview of Phase II, the groundwater study. Carl and Alan will fill the RAC in on the Legislative Fact Finding Tour. The RAC will discuss the State of the Resource (SOTR) document and the future meeting.

Enclosed please find the following meeting materials:

- Agenda
- June 22nd Meeting Notes
- Press Release
- Draft SOTR document

If you cannot attend, or have any questions or concerns regarding the meeting, please feel free to contact me at Kirk.Tjelmeland@kwo.ks.gov or by phone at 785-368-8149.

Meeting Agenda
Missouri Regional Advisory Committee
September 14, 2017, 9:00 a.m.
USD 409 Meeting Room, 626 Commercial, Atchison, Kansas

1. Welcome/Introductions

2. Public Comments*

3. RAC Business -

    a. New Member – Chris Griffin

    b. Review of June 22nd Meeting Notes

    c. Review of August 16th-17th KWA meeting

    d. MO River Sub-Committee Report

    e. Ag Sub-Committee Report

4. **Action Plan Item -** Update on KGS Phase II Groundwater study – (Andrea Brookfield, KGS-Hydrogeochemist)

5. Legislative Fact Finding Tour – (Carl & Alan)

6. State of the Resource (SOTR) Discussion – (Carl & Tj)

7. **Action Plan Item -** DP Conservation District–Update on RCPP Proposal (Chris G.)

8. Agency Reports:

9. Other issues: Healthy Watersheds RCPP? Tyson chicken processing plant near Tonganoxie.

10. Next Meetings:

    a. KWA Meeting, McPherson (October 10th)

    b. Governor's Water Conference, Manhattan (November 8th-9th)

*These reports are limited to 3-5 minutes.

Missouri Regional Advisory Committee Meeting Notes

Missouri Regional Advisory Committee Meeting
Thursday June 22, 2017, 9:00 am
USD 409 Meeting Room
Atchison, Kansas

Members Attendance:

Name	City	Category	Term	Present
Carl Johnson (Chair)	Leavenworth, KS	Conservation/Environment (cc)	2019	Yes
John Bishop	Atchison, KS	Recreation	2019	Yes
Neil Coufal	Troy, KS	At Large Public (cc)	2017	Yes
Stephen Glaser	Atchison, KS	Industry/Commerce (cc)	2019	No
Jeffrey Grossenbacher	Bern, KS	Agriculture (cc)	2019	No
Carol Hughes	Seneca, KS	WRAPs	2017	No
Alan Kelley	White Cloud, KS	Iowa Tribe of Kansas and NB	2019	Yes
Joel Mahnken	Leavenworth, KS	Public Water Supply (cc)	2017	Yes
Brett Neibling	Highland, KS	Agriculture 2	2019	Yes
Darcy Nightingale	Hiawatha, KS	Agriculture Industry	2017	Yes
Bill Shroyer	Sabetha, KS	Public Water Supply 2	2019	No
Luke Terry	Robinson, KS	Fish and Wildlife	2017	Yes
Michelle Wirth	Kansas City, KS	Public Water Supply 3	2017	Yes

Others in attendance:

Name	Town	Representing
Katie Burke	Manhattan	DoC
Dave Jones	Manhattan	DoC
Chris Griffin	Troy	DP Co Conservation District
Judy Wegener-Stevens	Troy	DP Co Conservation District
Susan Stover	Lawrence	KGS
Jordi Batlle	Lawrence	KGS
Don Whittemore	Lawrence	KGS
Brett Bunger	Topeka	KDA-DWR
John R. Eplee	Atchison	KS House of Rep. 63 District
Travis Daneke	Topeka	KDHE-WRAPS
Jake Geiger	Robinson	
Andrea Brookfield	Lawrence	KGS
Kirk Tjelmeland	Topeka	Kansas Water Office

Welcome and Introductions:
Carl started the meeting at 9 am with a quick rundown of the $1.2 million that was moved from the State General Fund to the State Water Plan Fund: $1 million for Streambank Stabilization, $100,000 for bathymetric surveys and $100,000 for Kansas River Alluvial Aquifer well network observation.

Public Comments:
There were none.
New Vice-Chair – Brett Neibling: Carl introduced Brett as the new Missouri Vice-Chair. This position should have been filled some time ago however the KWO didn't push this, allowing the Committee to focus on Action Plans.

Review of February 14, 2017 Meeting Notes: The meeting notes from reviewed and approved with no changes, Neil moved and John seconded.

Review of May 17-18th KWA Meeting: Carl mentioned about the tour that they had gone on the effort that is being put into water savings in that part of the state through technology advances. He also visited about the other RAC's speaking at the Meeting.

Missouri River Sub-Committee Update: Michelle stated, Corps received 450 comments and 200 form letters (mostly from Standing Rock Sioux Tribe), 7 from county governments, 14 from municipalities, and 51 from NGO's. Responses to comments will be included in the appendix of the final EIS issued next year. Their goal is to finish processing comments this fall. At the August MRRIC meeting, a geographic breakdown of comments will be supplied as well as breakdown of "big themes" in those comments. US Fish and Wildlife (FWS) and Department of the Interior are focused on the Biological Opinion and did not support any alternative stating that not enough was considered in creating the alternatives. FWS seems to be focusing on developing a new Biological Opinion by March of 2018.

Adaptive Management Plan Implementation is the next phase and action items are going to be formed to focus on Birds, Fish, and Human Considerations. Greg Totzke from WaterOne has applied to be on the Fish panel.

Update on Healthy Watershed Meetings: Carl described the three meetings, St. Joe and Parkville, which had taken place so far with help from Chris Griffin and Tj. There is a meeting this evening, 22nd, where both groups will meet and start work on the Independence-Sugar Creek plan. It was assume there will be multiple meetings after this one since the plan could be as complicated as the 9-element plans used in Kansas. There is no Missouri money that will be spent in Kansas.

Update on KGS Phase I Groundwater Study: Mr. Jordi Batlle-Aguilar from the Kansas Geological Survey (KGS) gave a presentation on the current ground water condition in the Missouri Region, which directly addresses Priority Goals #1 & 3. The final report is due to the KWO this week will be available on their website. Jordi mentioned there is a good deal of information out there is was just a matter of collecting, analyzing and digitizing it. Some of the information was detailed and useful and some of it wasn't. There were 4,437 wells found in the region however only 2,011 had the detailed information that was needed. Jordi displayed a map that was computer generated showing the depth to bedrock derived from the driller's logs and added layers to show the amount of unconsolidated material (sand & gravel) that could hold water. The missing information knows the level of water in this unconsolidated material and that is the information that phase II of this project would provide. There is one well in the region that KGS has installed and is monitoring water depths with. The region appears to be covered with pockets of water that may or may not be interconnected.

The other portion of Jordi's report focused on nitrate levels in the ground water and he displayed a map showing where 370 nitrate concentrations were found. The maximum allowable level of nitrates in drinking water is 10 mg/l, 90 wells tested at 20 mg/l with the highest being 128 mg/l. A good deal of the sampling took place in Nemaha County. Please review final report for more detailed information. A scope of work for Phase II was requested by the RAC, this should be available by the September 14th RAC meeting.

Legislative Fact Finding Tour: Ms. Susan Stover (KGS) gave a short presentation on what the Kansas Field Conference (Legislative Tour) history and 2017 tour activities. The mission of the Conference is to educate those that participate on the resources of the region and provide factual information. This is the 23 year of the tour with sponsorship from: KGS, KWO, KDOT and KDWPT. The tour will start in Lawrence on September 11and return back to Lawrence on the 13th with presentations about the: Kansas River, WaterOne facilities, Leavenworth History, MGP from Atchison, Missouri River boat tour, Benedictine Bottoms tour, proposed reservoir for Kansas Aqueduct and water quality and quantity in our Region with Alan Kelley participating.

DoC Funding: Mr. Dave Jones gave a quick update on the FY 2018 County Cost-Share Allocations. Dave outlined the steps for program and mentioned there is a $10,000 maximum. The Conservation Districts (CD) provides a 2 week signup with local advertising. NRCS assists with filtering through applications however it is up to the CD to rank projects and approve applications. The State Conservation Commission approved $75,835 (NPS) and $87,826 (WR DNA) for Atchison, Brown, Doniphan, Leavenworth, Marshall, Nemaha and Wyandotte Counties however not all of this money falls within the Missouri Region. A power point is available to further clarify the information.

DoC Interactive map: Ms. Katie Burke presented the map that DoC and KWO has been working on, not completed yet. The map shows HUC 12's in different colors for different items: dollars spent on practices, sediment reduction and various nutrient reductions. They will also be looking at water quality and DP CD will be helping collect some of the data.

DP Conservation District RCPP: Ms. Chris Griffin read through the executive summary of the RCPP they have submitted. They should know the week of June 26th if the proposal has made it to the next stage if so the full proposal will be submitted in August. Her proposal has the major sponsorship of DP County and is for protection of roads while helping to reduce soil loss.

MO RAC Talking points: Carl went through a list of talking points for the August KWA meeting in Pittsburg. Carl wanted to make sure that we don't miss anything the RAC has been involved with. John suggested that Tj contact Margaret and see if there is anything that she feels should be added to the points. Joel suggested that we move the EIS comments up to goal #2.

Agency Reports: There were none.

Next Meeting:

KWA Meeting, Pittsburg (August 16th – 17th)

MO RAC Meeting: (Sept 14th)
Governor's Water Conference, Manhattan (November 8th-9th)

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For Immediate Release:
August 30, 2017

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Missouri RAC Meeting in Atchison

September 14, 2017 at 9 a.m., in the USD 409 Community Room

The Kansas Water Office's (KWO) Missouri Regional Advisory Committee (RAC) is set to meet to discuss current water issues affecting the region, as well as the state.

The meeting is scheduled for Thursday, September 14, at 9 a.m., in the USD 409 Community Room, 626 Commercial in Atchison, Kansas. The committee will receive updates on activities taking place to implement the Action Plans for the region that were adopted by the Kansas Water Authority, including a presentation on a groundwater study Phase II proposed by the Kansas Geological Survey. The RAC will also be working on the State Of The Resource materials with an expected public meeting this fall.

The agenda and meeting materials will be available at www.kwo.org or you may request copies by calling (785) 296-3185 or toll-free at (888) KAN-WATER (526-9283).

If accommodations are needed for a person with disabilities, please notify the Kansas Water Office at 900 SW Jackson Street, Suite 404, Topeka, KS 66611-1249 or call (785) 296-3185 at least five working days prior to the meeting.

Note to Editor: The Americans with Disabilities Act, (42 U.S.C. 12101) requires the Kansas Water Office to print the reasonable accommodations messages.

# # #

As the state's water office, KWO conducts water planning, policy coordination and water marketing as well as facilitates public input throughout the state.

The agency prepares the KANSAS WATER PLAN, a plan for water resources development, management and conservation. KWO also reviews all water laws and makes recommendations to the Governor and Legislature for needed legislation.

State of the Resource

September 14

2017

Prepared by the Kansas Water Office, in cooperation with multiple State of Kansas agencies.

Missouri Regional Planning Area

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Executive Summary

The long term Vision for the Future of Water in Kansas and its statewide and regional goals and action plans are now in place. This State of the Resource document is intended to provide a background of the regional issues and record activities and progress toward regional goals and the Vision objectives.

The Missouri Region is attempting to establish the quantity and quality of ground water using existing data either electronic or driller logs.

Purpose

As stated within *A Long-Term Vision for the Future of Water Supply in Kansas*, "following the first year of the goal setting process and annually thereafter, the Kansas Water Authority will evaluate progress towards meeting milestones and overall goals and will assess the need for further action. Annual public meetings will be held in each water resource planning region, highlighting the current groundwater, surface water and water storage conditions. Additionally, progress towards achieving the goals will be assessed through the Kansas Water Plan every five years." An important tool to be able to provide regional groundwater, surface water, and water storage condition information on an annual basis is the State of the Resource Report.

The State of the Resource Report is intended to provide an inventory and an update of the Region's water resources and their conditions. This Report is intended to inform and educate the members of the Regional Advisory Committees (RACs), as well as any and all members of the public, including those directly involved with water management, legislators, and/or those who may hold a deep interest and concern for our State's water resources. As a comprehensive compilation of the Region's water resources, this Report will serve as a document to assist RAC members in conversations and presentations that relate to water, specific to the Region.

Background

In October 2013, Governor Brownback charged the Kansas Water Office and Kansas Department of Agriculture to work with Kansans to develop a long term Vision for the Future of Water in Kansas. In response to that charge, The Vision for the Future of Water Supply in Kansas (the Vision) was created. The Vision's Statement is "Kansans act on a shared commitment to have the water resources necessary to support the state's social, economic and natural resource needs for current and future generations." Taking this to heart, collaboration between the Kansas Water Office, Kansas Department of Agriculture, and the Kansas Water Authority (KWA) was created and they embarked on a one-year mission to seek input from water users, compile data, conduct research, and chart a path forward.

From all the information, input, and data that was gathered across the state, the Vision was developed to addresses the water resource needs of Kansans. Kansas water resources are groundwater dominated in the western half of the state and surface water dominated in the eastern half. Therefore, the Vision provides framework, policy, and the tools to manage, secure and protect a reliable, long term statewide water supply while balancing conservation with economic growth for both eastern and western Kansas.

The Vision is divided into four themes and strategies to address water resource needs and implement appropriate tactics both statewide and regionally. These included:

- Water conservation
- Water management
- Technology and crop varieties
- Additional sources of supply

Within each strategy, action items are identified and categorized in Phases according to the priority for implementation:

- Phase I action items are the highest priority and will be initiated, but not necessarily completed, during the first year of this draft of the Vision
- Phase II action items will be initiated within five years
- Phase III action items are longer-term and may require additional research, development and stakeholder coordination before the action item can be initiated

With the development of the Vision, along came the development of Region specific goals and plans to accomplish those goals for each of the 14 River Regions within Kansas. The goals and subsequent plans were developed by those living within each of the Regions to address their specific water resource needs and concerns. Each of the 14 Regions' goals and plans looked to increased water supply and provide proper management of the Regions water resources at both local and state levels.

As part of the development of the 14 Regions goals and plans, water resource education was highlighted as a need in each Region and statewide. To address this need a Vision Education and Public Outreach Working Group (Education Working Group) was created. The Education Working Group formed a strategic plan that represents an opportunity to build upon and maximize the many successful education organizations and activities currently in place in Kansas. As the strategic plan is implemented success will require cooperation and collaboration between many entities and agencies with a common goal of conserving and protecting our water resources for the next generation.

Another key part of the Vision was the need to fund the goals and plans of the Vision, the Regional Plans, and the Education Working Group. As the funding mechanism was recognized as a critical component, the Blue Ribbon Task Force was established to develop a balanced, affordable, and sustainable method to provide financing for water resource management and protection, including alternatives that utilize public and private partnerships.

The Vision is a living document. It is continuously referred to, evaluated, updated, and used as a source of guidance to develop methods to ensure there is water to meet the needs of Kansans now and into the future. Working together to use locally driven solutions will equal long term success. Our long term success will include conscientious management and protection of the great state's most valuable resource. By completing an annual State of the Resource Report, we will allow for the Vision to stay relevant, Goals to be achieved, Plans to be accomplished, and RAC members to stay informed and be able to educate others.

Regional Goals & Action Plan Overview

While the 50-year Vision for the Future of Water in Kansas provides a framework for the management of the State's water supply overall, Regional Goals identify and address issues at a more local level. Each of the 14 regions had a Regional Goal Leadership Team of local water users develop goals, along with input from area stakeholders in 2015. 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.

> **Guiding Principle:**
> *Over the next 50 years, there needs to be an adequate, sustainable and affordable quality water supply in the Missouri Region, while protecting Tribal water rights and sacred and cultural sites. All government agencies, local through state, shall vigorously uphold and enforce all water conservation and management rules and regulations throughout the state*.

Priority Goal #1: 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 best management practices will be developed to maintain and improve existing conditions. Monitoring and reevaluation of groundwater quality conditions and should continue at 5 year intervals.

Priority Goal #3: 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.

Action Steps

- **Evaluate what is known about groundwater quantity and quality in glacial, alluvial and bedrock aquifers in the Missouri Region**
  - Any and all available information about groundwater quality and quality will be collected and compiled
  - Digital database from the collected historical and online existing data would be constructed
  - Digital maps of updated bedrock surface topography, saturated aquifer thickness, pre-glacial drainage ways, water use, and groundwater quality from digital databases would be prepared
  - An assessment report would be prepared that includes:
    - A determination of groundwater in storage and groundwater quality conditions in the glacial, alluvial and bedrock aquifers in the area
    - A determination of the greatest needs for collection of additional data
    - Recommendations on the need for, and number and location of wells to allow for well level and quality monitoring on a continuing basis
  - This phase would be conducted by the KGS for at a cost of $50,000. The work would take 12 months, beginning August 2016

- **Collection of additional data and re-evaluation of groundwater information**

- Based on needs as determined in the evaluation phase, obtain a scope of work on collection of additional data that would improve the characterization of the glacial, alluvial and bedrock aquifers. Main expected field activities would include: drilling, hydraulic testing, and groundwater sampling and analysis
- Enter new data into databases developed in the evaluation phase
- Re-evaluate groundwater recharge estimates at a more detailed scale than the currently available potential annual recharge estimates based on soils
- Combine existing and new data to establish safe groundwater yields and a groundwater quality baseline
- On the basis of future climate and water usage conditions, establish a plan to periodically update safe yield estimates of groundwater resources
- This phase would be a minimum of 18 months, as determined in the evaluation phase. Cost would be determined in Phase 1

Maintain and Improve groundwater quality conditions

- Evaluate groundwater quality protection practices based on needs as determined in the assessment
- Within 3 years after the baseline is established, a plan to implement best management practices will be developed to maintain and improve existing conditions

Ongoing monitoring and evaluation

- Expand groundwater level monitoring wells as determined during Assessment phase
- Monitoring and reevaluation of groundwater quality conditions should continue at 5 year intervals

Priority Goal #2: To ensure a reliable surface water supply in the future, best management practices 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.

Action Steps

Collection of Additional Data

- Collect data on a voluntary basis to evaluate the benefits of tile outlet terrace systems within the Missouri Region. Prior to proposing any design changes to outlets of tile terraces in the Missouri Region, conduct research on cropland field input amounts (rates, dates applied, how it was applied, etc.) and collect water samples to evaluate the water runoff into the streams in the region. Collect data working with interested local landowners with assistance of area conservation districts, Kansas Department of Health and Environment (KDHE), Natural Resources Conservation Service (NRCS) and other existing agencies. Collection sites will be: tile terrace runoff, waterway runoff, land with no conservation work or no conservation tillage, and land with no conservation work but using no-till
- Collect data on the benefits of capturing and reusing water on a producer's property
- Gather existing information on the impact of extreme events (droughts and floods) on water quality and availability of water resources into the future in the Missouri Region
- Assess 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

Implementation

- Support and encourage implementation of the best management practices (BMPs) in the adopted 9-Element Plan. Those BMPs are: No-till, cover crops, grassed and forested buffers, convert steep slopes, sediment basins, pasture management, nutrient management,

livestock waste management, alternative watering supplies, streambank stabilization, onsite wastewater system repair, urban lawn management, pet waste management. The Plan should be updated every 5-years

- Focus on finding local volunteers that are willing to adopt and promote new practices, including streambank stabilization
- Ensure the value of maintenance of BMPs is understood to allow BMPs to have the desired long term effects, through education and outreach
- Recognize the value of protection of water quality through education and outreach.
- Prevent sedimentation by using existing cost - share programs through the Kansas Department of Agriculture, Division of Conservation (DOC); KDHE; and NRCS, to fund conservation practices in the Missouri Region
- Continue to use the NRCS for technical assistance on implementation practices suited to the unique topography of the Missouri Region
- Prioritize the existing ranking systems from agencies, to secure funding for protecting water quality and water supply in the Missouri Region
- Raise awareness about water quality and the importance of proper urban lawn application

- **Monitoring**
  - Determine if additional monitoring sites are needed to better characterize and prioritize project priorities in the Region

- **Funding Needs**
  - To ensure water quality is maintained and improved, the state should fully fund the Kansas Water Plan for implementation of best management practices through programs of the DOC, KDHE and others as needed
  - Ensure continued and improved coordination with the NRCS to access and make the best use of funding for priority projects for water quality protection in the Region
  - Assess possible involvement of other agencies, businesses and interest groups to determine interest and possible funding of water quality projects in the Region
  - Continue to ensure that funding from the Clean Drinking Water Fee Fund for technical assistance for small public water supply systems is maintained at least at the current level
  - Include funding for streambank stabilization projects as identified in the WRAPS 9 Element Plan
  - Fully fund the 9-Element Plan implementation (approximately $140,000/year)
  - Develop a funding strategy within the next year for additional data collection and implementation as identified above in a phased manner in conjunction with DOC, NRCS, and KDHE and others as appropriate. Funding needs will then be reviewed on an annual basis and brought to the KWA

Priority Goal #4: Within 3-5 years the state should initiate a comprehensive education and outreach program. By the time of 8th grade graduation, kids 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 water quantity. 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.

- **Action Steps:** Allow state agencies to work through the coordination and facilitation process to hire a state coordinator/work group that would do the heavy lifting on the vision education piece

Resource Conditions

Regional Description

The Missouri regional planning area covers 1,466 square miles of the northeastern corner of Kansas. While this is the smallest of the planning areas in Kansas, this represents a small fraction of the entire Missouri River watershed which covers all or part of ten states and extends into Canada. The region in Kansas contains all or parts of Atchison, Brown, Doniphan, Leavenworth, Marshall, Nemaha and Wyandotte counties in Kansas. The eastern boundary of the region is formed by the Missouri River.

Hydrology/Water Resources/Water Use

Tributaries of the Missouri River in Kansas include the Wolf River and numerous smaller creeks. The South Fork of the Big Nemaha River, along with other tributaries in Washington, Nemaha and part of Brown County, drains northward into Nebraska. This system is part of the Big Nemaha River watershed which enters the Missouri River just upstream of the Kansas border. For planning purposes, that portion of the Blue River drainage in Johnson County, which joins the Missouri River in Jackson County, Missouri, is included in the Kansas region.

Surface water is the primary source for all uses in the region, accounting for more than 90% of the use. The Missouri River is a significant source of water supply to the Kansas City metropolitan area and other communities of northeast Kansas along the river and beyond (including water for cooling at power generation facilities). Flow in the Missouri River as it borders Kansas is greatly influenced by water releases from the six federal reservoirs located in Montana, North Dakota, South Dakota and Nebraska. Pony Creek Multipurpose Small Lake serves as the water supply for the City of Sabetha, which is located just south of the Missouri region watershed divide. All the major streams in the region are open to new appropriations. There are no sites in the region where minimum desirable streamflow's (MDS) have been set.

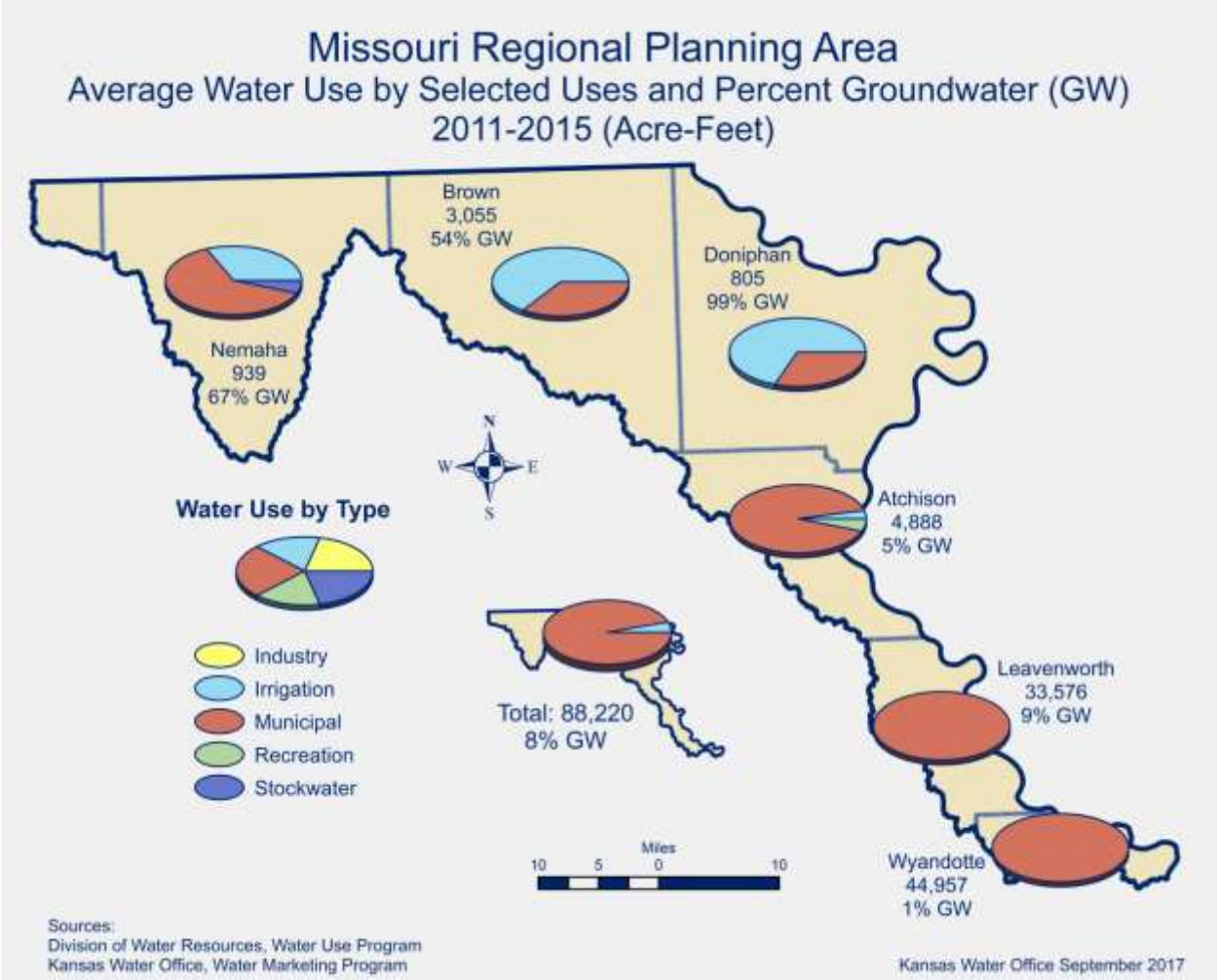

Figure 1. Average water use per County by use 2011-2015.

Groundwater sources available in the region include alluvial and glacial deposits. Groundwater development by private individuals for irrigation has increased recently.

Municipal water supply (92%) accounts for the majority of water used in the region. Irrigation was almost 5% of reported water use in 2013; as recently as 2011, reported use for irrigation was only 1%). Industrial use in 2013 represented only 0.2% of total reported use.
Pony Creek Reservoir

There are over 30 public water suppliers in the region, including more than 10 rural water districts. There are currently no public wholesale water supply districts in the region. There is one state multipurpose small lake in the region which serves as the water supply for the City of Sabetha. *42 public water suppliers have their source in the Missouri region; of those, 13 are actually located in the Kansas region. Eight suppliers in the Kansas region have their source of water in the Missouri region.*

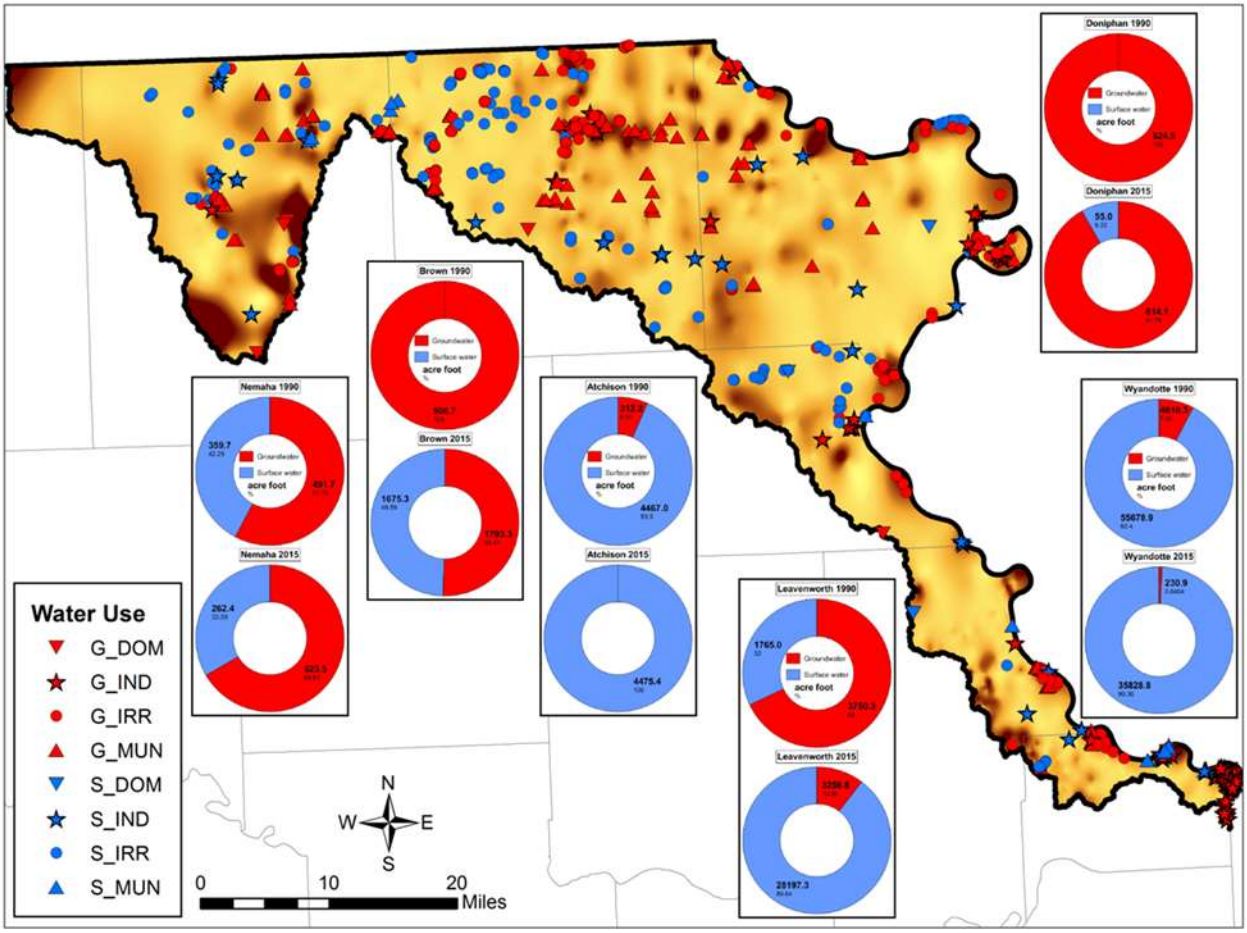

Figure 2. Map of groundwater and surface water use in each county in the MRPA (Marshall County in the MRPA has no water use reported). For comparison, water use from 1990 and 2015 are shown. G: Groundwater; S: Surface water; DOM: Domestic use; IND: Industrial use; IRR: Irrigation use; MUN: Municipal use.

There are six watershed districts in the region primarily engaged in flood control. Watershed districts are formed to construct, operate and maintain structures and improvements for water management. Each county also has a Conservation District dedicated to improving water quality and reducing soil erosion. Much of the region is covered by the Glacial Hills Resource Conservation and Development Program**.**

Climate & Land Use

The climate of the region in Kansas is classified as humid continental with cold winters and hot summers. Normal mean temperature generally increases from northwest to southeast across the region. The average annual mean temperature of the region is 54°. Most of the precipitation falls in the growing season, with June typically being the wettest month with a region wide average annual precipitation of 38 inches. Flood events, such as in July 1993 and more recently in 2011, and the drought experienced from 1952-1956, underscore the variability in precipitation.

The predominant land use in the region is cultivated crop at over 53%, with hay/pasture a distance second at 14%. Deciduous forest accounts 12% and Herbaceous for 10%. Classes of developed land total collectively equal about 8% of the land cover.

Figure 3. Missouri Region Land Cover.

The region contains many important highway and rail transportation corridors. U.S. Highways 73, 75 and 159 cross the region from north to south while U.S. 36 crosses from east to west. The Union Pacific Railroad services most of the region. The Missouri River as it borders Kansas is also maintained for barge traffic by the U.S. Army Corps of Engineers (Corps) although activity varies depending on flood and drought which are increasingly affecting flows in the Missouri River.

Population and Economy

In 2010, there were an estimated 126,177 residents, a slight increase from 2000. However, this region demonstrates the statewide trend of population continuing to concentrate in larger cities with rural towns and counties losing population.

Wyandotte County, the smallest county in the state, is one of the most heavily developed areas of Kansas with expanding retail, entertainment and residential development in the western portion of the county. In the remainder of the region, agricultural production is the primary economic activity. Corn, wheat, soybeans and grain sorghum are the primary crops with the highest quantity of harvested acres in the northern tier of counties. Midwest Grain Products (MGP) in Atchison exerts great impact on the regional economy, using corn from within a 65 mile radius of the city. Beef cattle and hog production are also concentrated in the northern counties with significant dairy production in Leavenworth and Nemaha counties. Fort Leavenworth and the Leavenworth Federal Penitentiary along with the Lansing State Prison are economic drivers in Leavenworth County.

Tribal Nations

The Iowa Tribe of Kansas and Nebraska and the Sac and Fox Nation of Missouri in Kansas and

Nebraska reside in the Missouri Regional Planning area. The Tribes each place cultural and historic value on sites and natural resources throughout the region. In addition, Federal Reserve water rights exist for the tribes.

Water Quality

Sedimentation and eutrophication due to nutrient loading are the primary water quality problems affecting streams and small reservoirs in this region. Surface waters not meeting water quality standards in the region are included on the 303d list of impaired waters. As part of the Phase I study completed by Kansas Geological Survey (KGS) in July of 2017 nitrate levels were compiled for 371 wells in the Missouri Region with 142 over the national standard of 10 mg/l and 25 wells over 50 mg/l. These levels are adversely affecting small communities in the region in an effort to combat the nitrate problem millions of dollars are being spent to provide safe drinking water, such as $4.5 million dollar water treatment plant in Hiawatha.

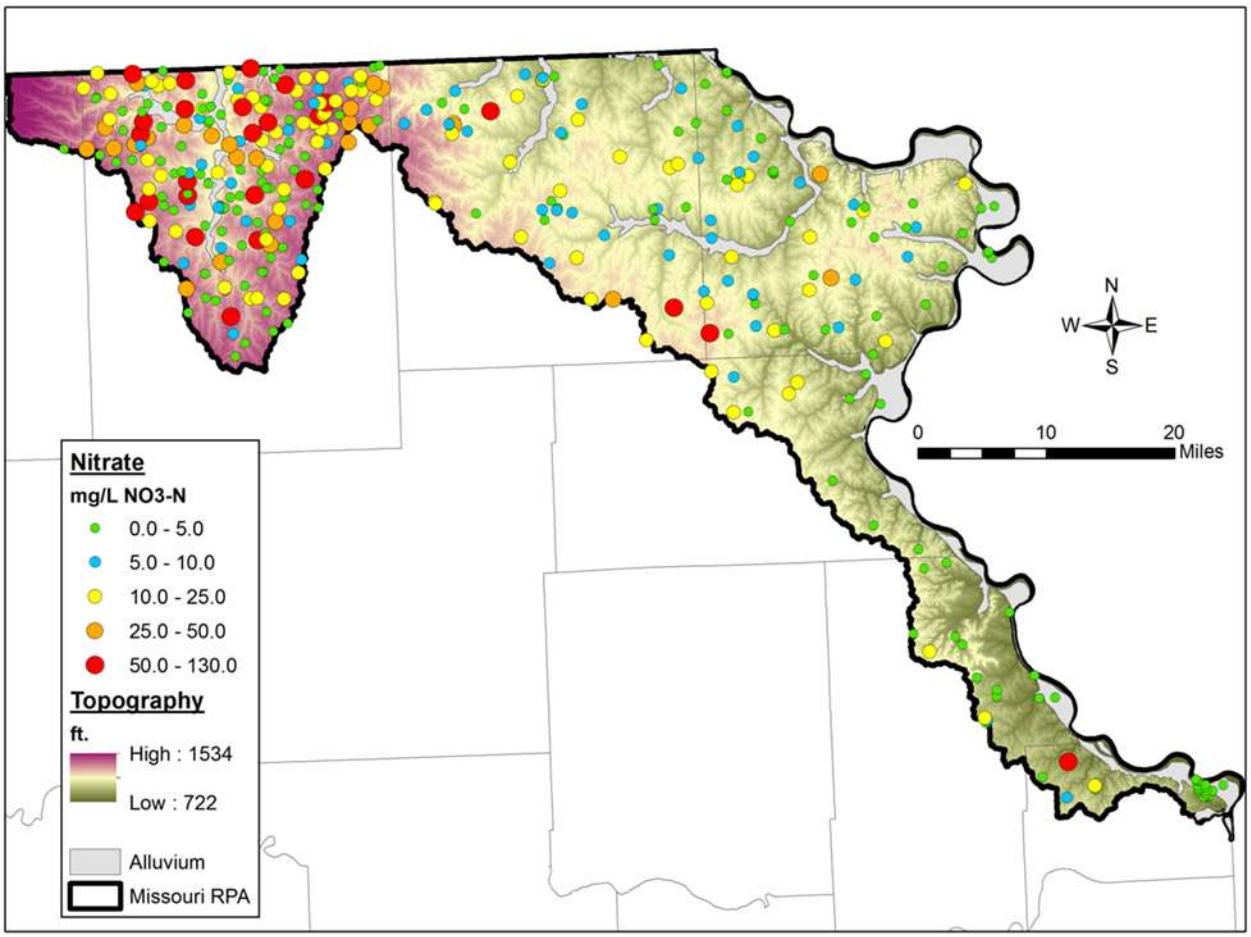

Figure 4. Map showing the 371 groundwater samples in the MRPA with nitrate concentrations available (in mg/L NO_3-N).

Total Maximum Daily Loads (TMDLs) [21] are developed to address the causes of impairments. A TMDL is the maximum amount of a pollutant that a water body can receive without violating water quality standards. Since pollution can arrive via point and non-point sources, the TMDL development process identifies contributing sources for the pollutant loads. High priority TMDL watersheds are identified to target technical and financial assistance for implementation of non-point source

pollution management practices to address designated pollutants.

An important consideration for watershed restoration and protection in this region, particularly in the southern portion of the watershed, is urbanization. The population of Leavenworth County is increasing. All other counties in the region are experiencing declines in population. Wyandotte County remains the most urbanized county in the region.

Watershed Restoration and Protection Strategies (WRAPS) are stakeholder-driven management plans designed to address multiple water resource issues within a specific watershed. A region-wide Missouri River WRAPS has been developed. WRAPS projects in the region encompass priority areas for water quality improvement, source water assessment areas and priority areas for wetland and riparian protection. The WRAPS process provides a means to integrate objectives from multiple local, state and federal programs into a comprehensive, coordinated strategy for a specific watershed. This can include Total Maximum Daily Load (TMDL) attainment, nutrient reduction, source water protection, riparian and wetland management and other natural resource objectives.

Regional Issues and Challenges

Missouri River

The Missouri River is the largest river that flows through or adjacent to the State of Kansas. It is also the longest river in North America and its basin covers one-sixth of the lower 48 states. The mainstem reservoir system includes six large dams located in Montana, North Dakota, South Dakota and Nebraska. Section 9 of the 1944 Flood Control Act authorized the System to be operated for the purposes of flood control, navigation, irrigation, power, water supply, water quality control, recreation, and fish and wildlife. These reservoirs have the capacity to store over 74 million acre feet (MAF), not counting exclusive flood control storage, about three times the river's average annual runoff above Sioux City, Iowa, located just downstream of the last reservoir on the mainstem reservoir system. The upper three reservoirs are the first, second and third largest Corps reservoirs in the country.

While issues related to the use of water from the river are complex, it potentially provides a very large water supply for use in Kansas. The history and the hydrological record indicate that the flows of the Missouri River are highly variable experiencing large floods and major droughts in the basin. In 2007, the system was at record low levels; in 2011, a record flood occurred.

Navigation on the Missouri River occurs from Sioux City to the mouth near St. Louis. Commercial traffic has ranged from as high as 3.3 million tons in 1978 but has declined in recent years to less than 2 million tons. In 1999, total commercial traffic moved by barge reached a record peak of 9.25 million tons. Commercial tonnage, not including sand, gravel, and waterway materials, accounted for 1.58 million tons. The Missouri River Bank Stabilization and Navigation Project is authorized to provide a 9-footdeep by a minimum of 300-foot-wide navigation channel. The Missouri River Fish and Wildlife

Figure 6. Missouri River Drainage.

Mitigation Program (Mitigation Program) was authorized by the Water Resources Development Acts of 1986 and 1999 (WRDA86 and WRDA99) to develop fish and wildlife habitat along the lower Missouri River from Sioux City, Iowa, to the mouth near St. Louis, Missouri, to mitigate for the loss of habitat that resulted from construction, operation, and maintenance of the Missouri River Bank Stabilization and Navigation Project (BSNP). The Missouri River Recovery Program is designed to assist in the recovery of three federally listed species – endangered pallid sturgeon, interior least tern and threatened piping Plover. Managed by the USACE, the project extends from Sioux City, Iowa to the mouth of the Missouri River near St. Louis, a distance of 735 river miles[(5)].

Restoration is being accomplished by means of land acquisition from willing sellers, dredging filled-in areas, reopening historic chutes, bank stabilization, dike notching, pumping, dike/levee construction, vegetative plantings and vegetation and land management. In Kansas, four bottomland tracts have been acquired. The project includes the 2,112-acre Benedictine Bottoms area; the 1,597 acres at Dalbey Bottoms in Atchison county; Elwood bottoms, 1,118 acres in Doniphan county and Burr Oak, 245 acres in Doniphan county. All sites are managed by the Kansas Department of Wildlife, Parks and Tourism (KDWPT) and include a variety of habitat types that existed in the area before development including shallow water habitat, timber, native grass and wetlands. Sites are open to the public, providing recreational opportunities including bird watching, hiking, hunting and fishing.

The bed of the Missouri River has been eroding (degrading) in some locations for decades. The rate of the erosion accelerated in the early 1990s. In the Kansas City area, the river bed has lowered more than 10 feet in some locations. Infrastructure along portions of the river is now at risk due to bed degradation

and lower water surface elevations. This includes highway bridges, water supply intakes, cooling water intakes, levees and floodwalls, and the BSNP. If no action is taken, it is estimated that 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. The most severe degradation is in the Kansas City reach between river miles 340 and 400, but is also occurring at other locations. Degradation on the Missouri is considered to be causing the lower Kansas River to degrade as well. Observations from the Missouri River near Kansas City indicate that the rate of degradation is accelerating. The Corps, along with local partners, is engaged in a multiyear study that will assess riverbed degradation between Rulo, Neb., and St. Louis, Mo., focusing on the stretch of river in the Kansas City area, where degradation is the most severe (Figure 7). The study was completed in the summer of 2017 and if referred to in the implementation progress section of the report.

Figure 7. Missouri River Bed Degradation Study Area.

Recreation

While the region lacks large federal reservoirs and associated wildlife areas, there are two state fishing lakes and 10 county and city lakes which support public recreation. Waterfowl hunting along the Missouri River and associated riparian areas attracts sportsmen to both private (with permission) and public lands. The Missouri River is one of three rivers legally open to public recreational access.

There are currently public boat ramps in Leavenworth, Atchison, Elwood, White Cloud and Kansas City, Kansas. There are additional ramps and accesses on the Missouri side of the River. The four parcels

in the Missouri River Recovery Project provide opportunities for bird watching, hiking, hunting and fishing.

Figure 8. Mallard ducks from Benedictine Bottoms.

Implementation Progress

The primary concern of the Missouri RAC was to evaluate or collect data on the ground water quality and quantity in the region. Kansas Geological Survey (KGS) was contracted to extract and compile digital and non-digital data and produce a digital map or maps illustrating their results, Phase I of study. Phase I was completed in June of 2017 resulting in Figures 4, 9 and 10 in this document. The report is available (here) and plainly shows there are water quality problems in the region especially in Nemaha County. The data available was able to establish bedrock elevation and thickness of unconsolidated material however water levels were not established.

With the social, historical and economic benefit the Missouri River provides to the region the Missouri River Bed Degradation Study was enlightening but provided no solutions to the problem. The report can be found (here) and the study area is show in Figure 7. The USACE documented that the headcut continues to migrate upstream from Kansas impacting structures however there was no formal solution or funding mechanism developed to help those industries along the river with infrastructure problems.

The USACE developed a Draft Missouri River Recovery Management Plan and Environment Impact Statement (EIS) which they requested comments on. The RAC assembled a sub-committee and provided comments that supported the preferred option, draft EIS can be found (here). The sub-committee thought alternative 3 provided the best alternative for a multitude of reasons. The USACE will provide an official course of action later this year.

RAC involvement with the state of Missouri on the Healthy Watershed meetings for the Independence-Sugar Creek Watersheds. Attended several meetings and directly involved with the initial steps in developing a plan similar to the Kansas 9-element plans. The most recent meeting concluded with the idea of using a Regional Conservation Partnership Program (RCPP) approach to funding improvements across state lines.

The RAC has fully supported a Regional Conservation Partnership Program (RCPP) developed and submitted by the Doniphan County Conservation District. The project would use the EQIP program to fund sediment reduction through: Sediment Control Basins, Diversions, Terraces, Underground Outlets and Streambank Stabilization Projects. The project has been submitted for final approval with the Doniphan Co. Road and Bridge Department being the primary contributor.

An EPA grant that began in 2013 on Tile Outlet Terraces (TOT) in Douglas County has implications to the MO Region with the tremendous number of TOT's that have been constructed. The RAC provided input to the on-going TOT work that is being completed as part II of an EPA Wetland Grant. Questions and input will add more meaning to the project.

RAC members have raised awareness of the Missouri RAC issues by participating in the Legislative Tour September 11-13. Contacts and information sharing during the tour will prove invaluable in the future. Also a continuing effort by RAC members to educate young people of the Region through Water Festivals and Earth Day activities on regional water issues.

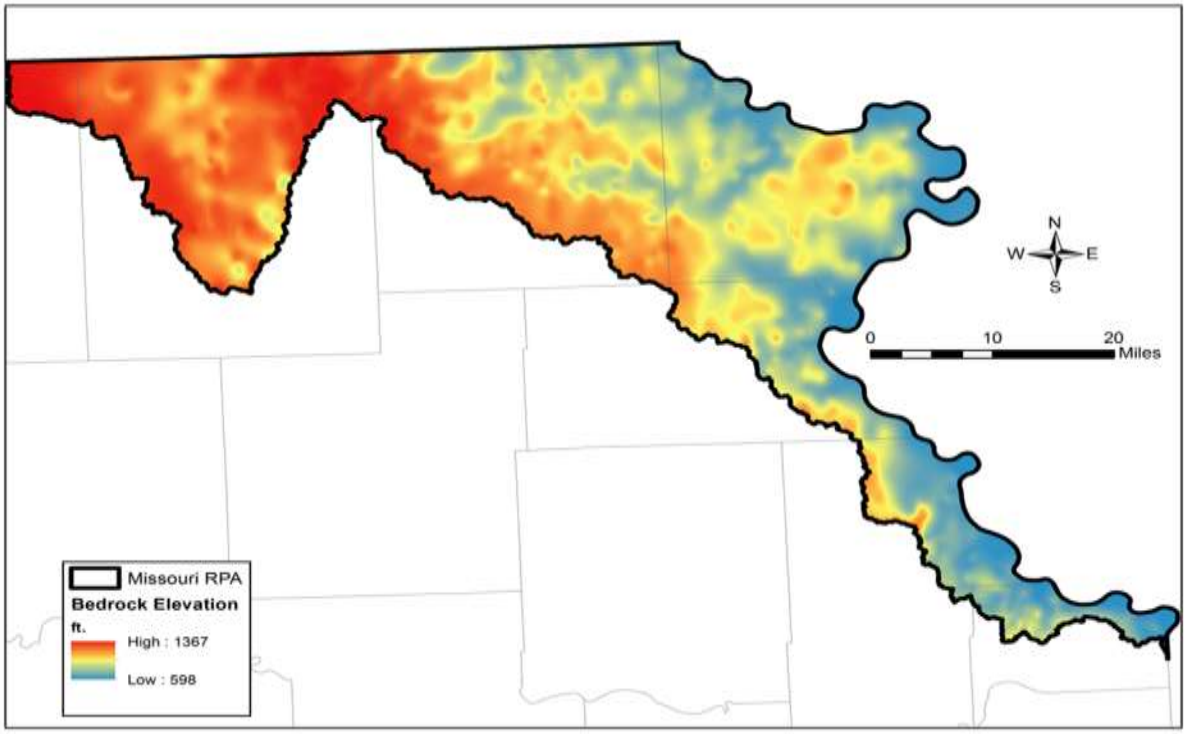

Figure 9. Map of bedrock elevation. A total of 1,027 wells and 994 test holes were used to build the map.

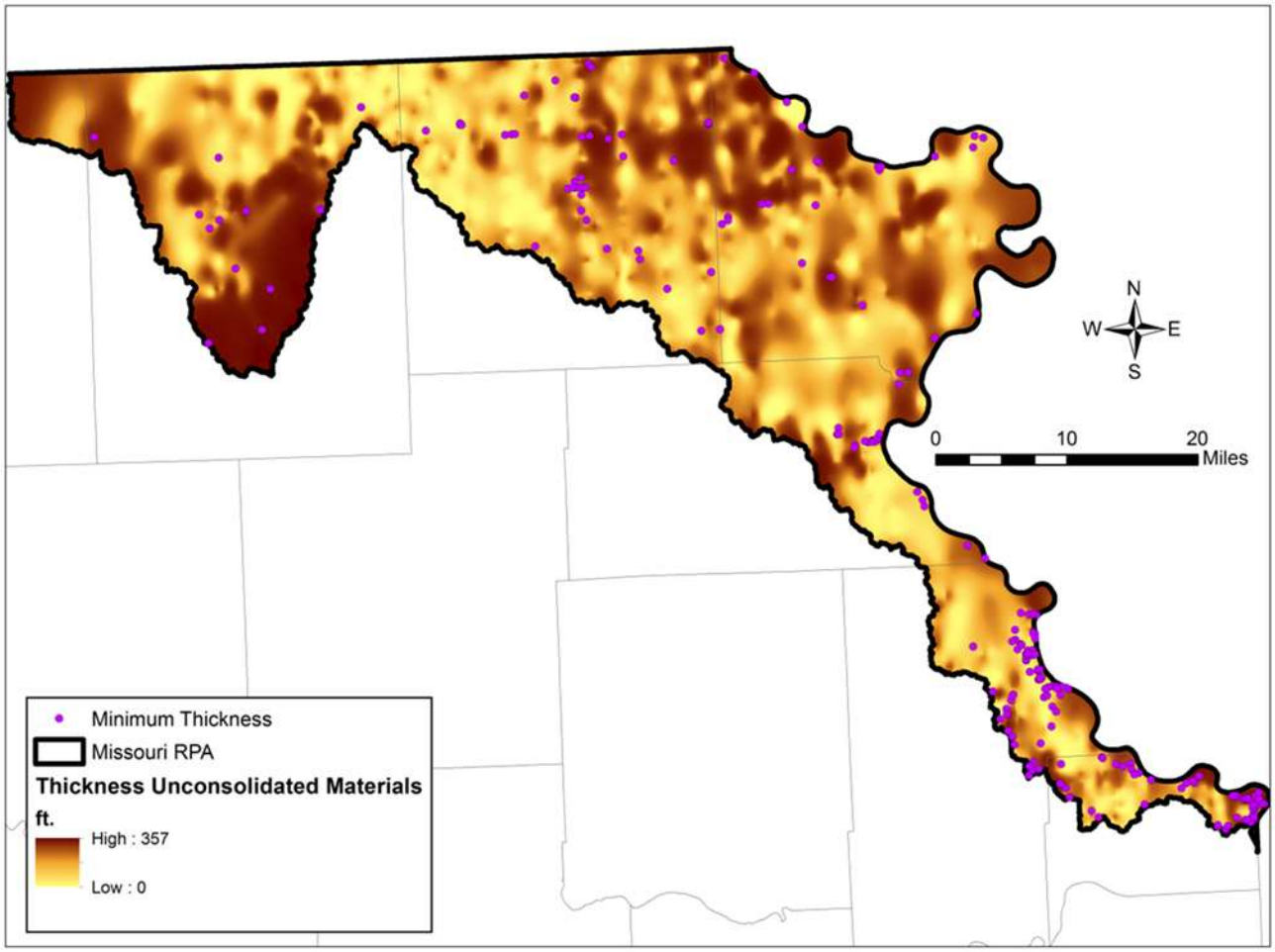

Figure 10. Thickness of unconsolidated materials. Dots represent wells that did not reach the bedrock but whose completion depth is lower than the interpolated bedrock; they thus represent areas of a minimum thickness of unconsolidated materials.

Implementation Needs

Collection of Additional Data/Projects

Promote funding for Phase II of the Ground water monitoring by KGS. Fund a study that 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. This project will be costly but directly addresses priority goals #1 & 3.

The Missouri Region is the only part of state that is touched by the Missouri River so the issues of the river could have substantial impact. The RAC will continue to use the established sub-committee to monitor the progress of the Draft EIS for the Missouri River and provide input as needed.

Review tile outlet terrace systems within the Missouri Region. Prior to proposing any design changes to outlets of tile terraces in the Missouri Region, conduct research on cropland field input amounts (rates, dates applied, how it was applied, etc.) and collect water samples to evaluate the water runoff into the streams in the region. Collect data working with interested local landowners with assistance of area conservation districts, Kansas Department of Health and Environment (KDHE), Natural Resources Conservation Service (NRCS) and other existing agencies. Collection sites will be: tile terrace runoff, waterway runoff, land with no conservation work or no conservation tillage, and land with no conservation work but using no- till.

Promote a project that would collect data on the number and size of irrigation ponds that have been constructed in the past 10 years. Use this information to formulate data on the benefits of capturing and reusing water on a producer's property. This should be coupled with some water quality monitoring data.

Gather existing information on the impact of extreme events (droughts and floods) on water quality and availability of water resources into the future in the Missouri Region. Solicit a speaker from the National Weather Service to provide some insight into how these events have changed over the period of record. Use the tools available to compile this information in a useful format.

Assess 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. Similar to Healthy Watershed meetings, have a seat at the table to ensure that good ideas or projects in the general topography are given an opportunity to succeed.

Focus on finding local volunteers that are willing to adopt and promote new practices and support a soil health workshop in the region. With more emphasis on being good stewards soil health seems to solve several problems. Recent articles promoted savings to the producer, the bottom line can have an impact on how a business is run.

For nearly a decade the State Water Plan has been shorted funding. The process to transfer $6 million from the State general Fund and $2 million form EDIF has not taken place due to the State's budget difficulties. However the 2017 legislators did approve

the movement of $1.2 million for stream bank work, bathymetric surveys and a study of the Kansas River alluvium. The RAC should support efforts to fully fund the State Water Plan so that the WRAPS 9 Element Plan is funded to maximum (approximately $93,000).

Remaining Load Reduction Needs/Costs to Implement Progress

Information provided by the Kansas Department of Health and environment lists the priority ranking around the state with Tuttle Creek Lake water and Cottonwood River receiving the highest rankings. The Missouri ranks at the lower end of the scale at 23rd. The total amount of dollars needed to complete the WRAP 9 element plan for the Missouri is $2,644,724.27.