

State of the Resource & Regional Goal Action Plan Implementation Report

August 2018

Solomon-Republican Regional Planning Area



Table of Contents

EXECUTIVE SUMMARY	3
WATER USE TRENDS.....	4
RESOURCE CONDITIONS.....	6
GROUNDWATER	6
SURFACE WATER.....	6
WATER QUALITY	9
SURFACE WATER.....	9
HARMFUL ALGAL BLOOMS.....	10
SEDIMENTATION.....	10
IMPLEMENTATION PROGRESS.....	13
IMPLEMENTATION NEEDS.....	15
REGIONAL GOALS & PROGRESS	16
REFERENCES	18

Executive Summary

The Solomon-Republican 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.

Surface and groundwater resources within the region suffered from lower than normal precipitation from 2011 to 2015. Due to very low precipitation in 2012, water use spiked at almost 225,000 acre-feet for the region and surface water more than 150,000 acre-feet.

Changes in reservoir sedimentation from the implementation of load reduction practices for reservoirs in this region show the most significant reductions in the Keith Sebelius Lake and Kirwin Reservoir watersheds. These high load reductions are related to relatively low sedimentation rates, meaning fewer Best Management Practices (BMPs) need to be implemented to have a large effect on sedimentation.

Given the projected sedimentation and water supply demands, results show relatively low sedimentation rates in Keith Sebelius Lake, Webster Reservoir, and Kirwin Reservoir compared to the higher rates in Lovewell Reservoir and Waconda Lake. The aggressive RAC goal of 25% reduction in sediment loading per decade would lead to storage obtaining a near steady-state capacity within 50 years.

A 10 year contract with the Almena Irrigation District expired in June 2017 and in July 2017, a new 10 ½ year contract was instituted between the Almena Irrigation District, Kansas Department of Wildlife, Parks and Tourism (KDWPT) and the Norton City/County Economic Development (NCCED) group. The contract paid the Almena Irrigation District \$50,000 for the remainder of 2017 to not release water below 2288.5 National Geodetic Vertical Datum (NGVD). In the remaining years of the contract, the District will receive \$100,000 annually.

An economic study was completed by the Fort Hays State University's Docking Institute on the value of Keith Sebelius Lake. Results of the study indicate in 2016, the 172,300 recreational users of the reservoir had an estimated total economic impact on Norton County of \$4,848,000. The study also estimated the value of the water left in the reservoir by the contract with the Almena Irrigation District to be nearly \$2.5 million.

Progress has been made on the three Watershed Restoration and Protection Strategy (WRAPS) watershed plans within the region. Annual load reduction estimates can be compared to load reduction targets identified within WRAPS watershed plans to evaluate progress in relation to overall goal targets. The percentage of target achieved is less than 5% for all watersheds for nitrogen, phosphorus, and sediment. The progress can also be compared to the remaining needs to quantify the overall funding needed to fully implement watershed plans covering these areas. Overall, the total remaining need to fully implement WRAPS watershed plans for the region is \$138 million.

Water Use Trends

Surface water is the primary source of water within this region (Figure 1), accounting for approximately 75% of the total reported water usage over the last 10 years. Reported usage for the region totaled nearly 108,000 AF for 2016. While surface water is the primary source in the region, groundwater is the primary source for most public water suppliers, principally from alluvial deposits along major streams and tributaries. Irrigation use accounts for 93% of all reported water use; the second largest use is municipal which serves 50 communities and rural water districts. Recreation, industrial, and domestic uses are all less than one percent combined. As anticipated during the drought of 2011 to 2013, overall usage increased; however as rainfall amounts moderated, surface water use dropped below pre-drought conditions (Figure 2).

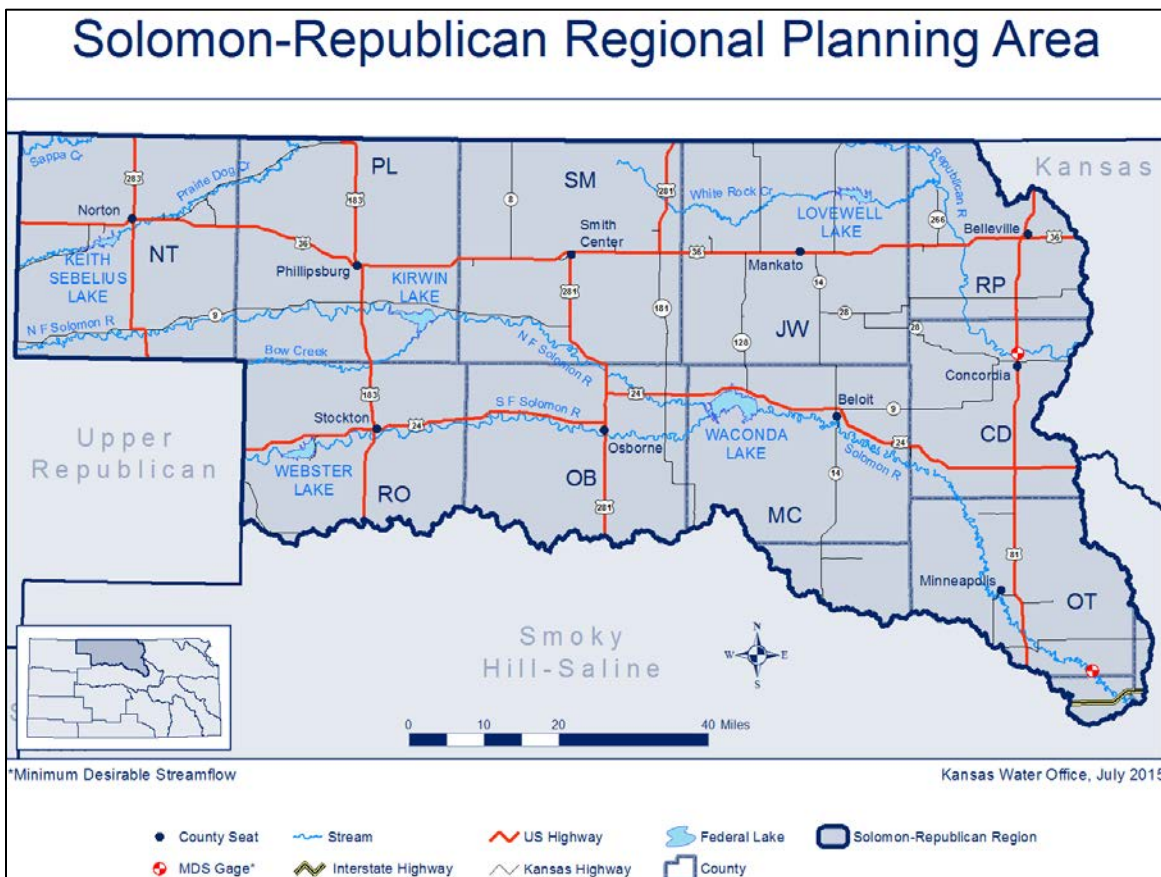


Figure 1: Solomon-Republican Regional Planning Area

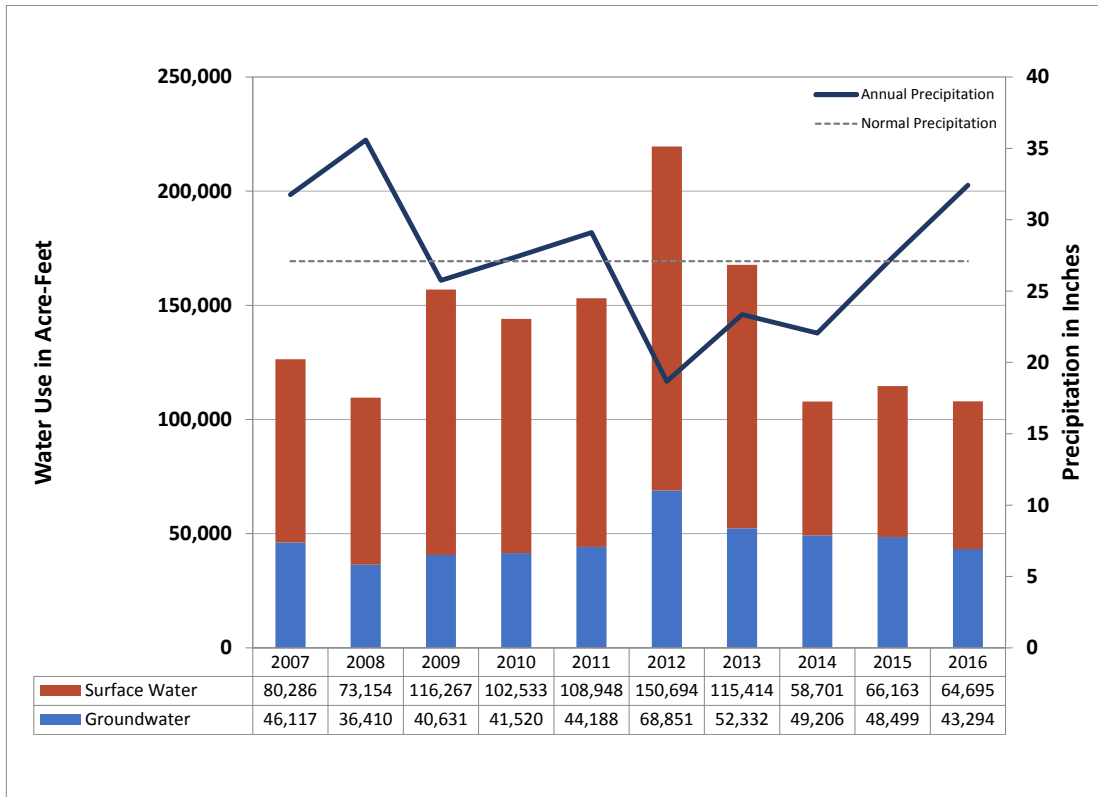


Figure 2: Annual surface and ground water reported use with precipitation data, Solomon-Republican Region

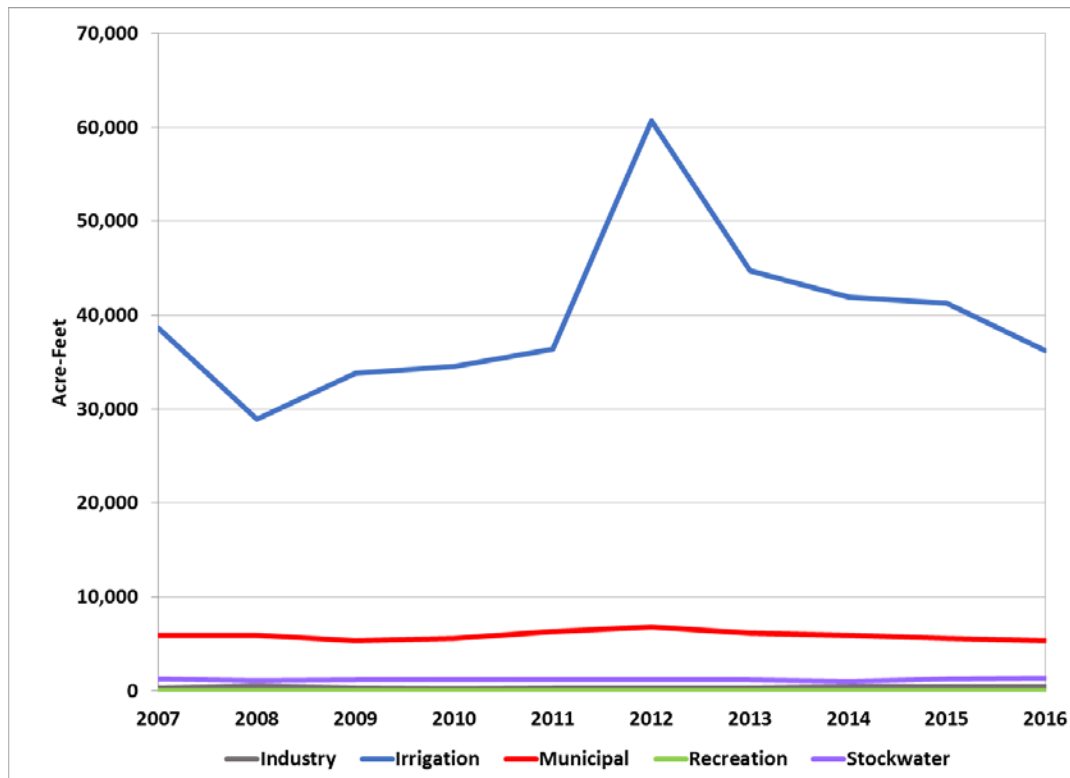


Figure 3: Annual groundwater use by type

Resource Conditions

Groundwater

The principal aquifers in this region are the Dakota, Ogallala-High Plains, and alluvial aquifers (Figure 4). The Ogallala-High Plains Aquifer is present in the most northwestern edge of this region and some localized areas have seen a 5' decline over the past 20 years. Groundwater is the primary source for most public water suppliers, principally from alluvial deposits along major streams and tributaries. Additionally, the Dakota Aquifer underlays this region, but provides very saline water to only a few stock and domestic farmstead wells.

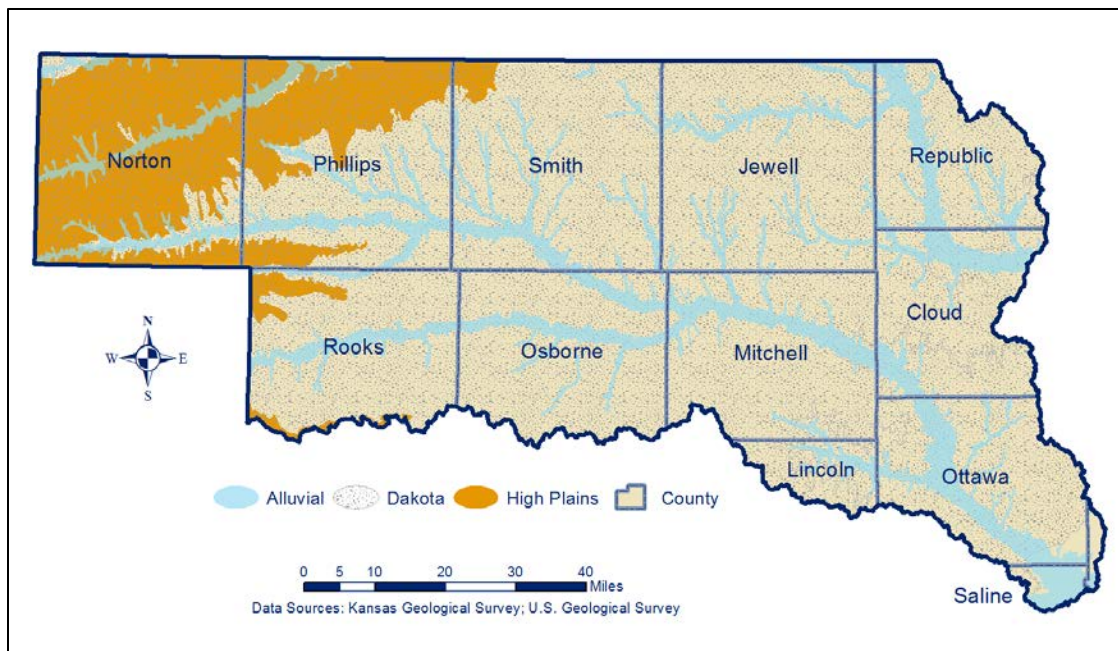


Figure 4: Aquifers of the Solomon-Republican Region

Surface Water

Major rivers and streams within the region are: Prairie Dog Creek, White Rock Creek, Republican River, Bow Creek, Solomon River, and the North and South Fork Solomon Rivers. Principal federal reservoirs include Bureau of Reclamation reservoirs Keith Sebelius Lake, Kirwin Reservoir, Lovewell Reservoir, Waconda Lake and Webster Reservoir.

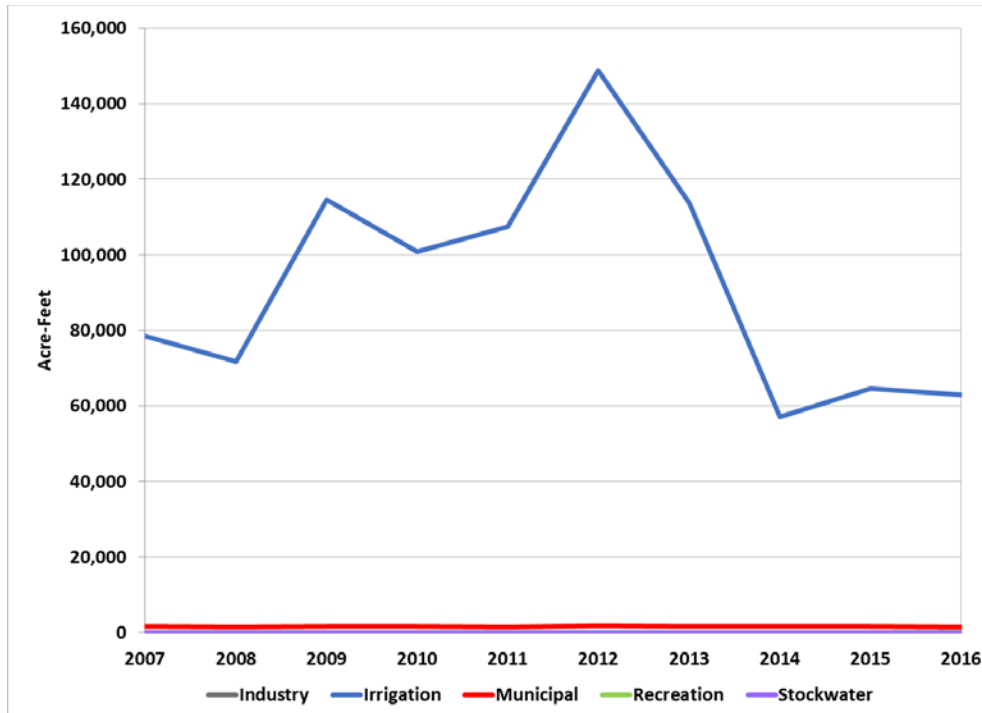


Figure 5: Annual surface water use by type of use

[Lake Level Management Plans](#) (LLMPs) are currently in operation in the Solomon-Republican Region to help manage pool elevations within the basin for specific operating rules (Figure 6-10). A conservation pool is maintained in accordance with the lake level management plans to optimize conditions for fish and wildlife benefits and recreational uses.

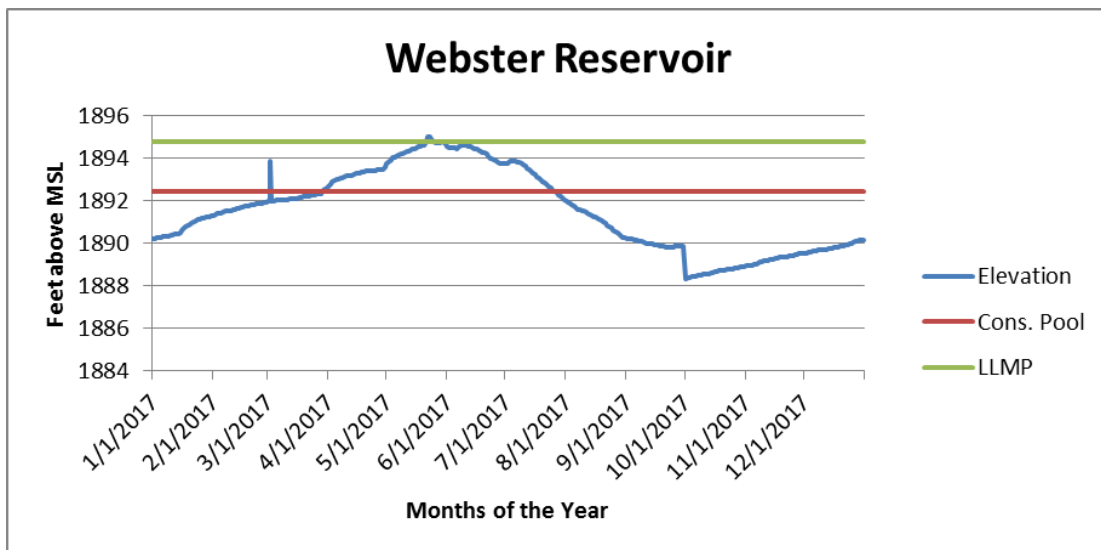


Figure 6: Webster Reservoir, 2017 water level information

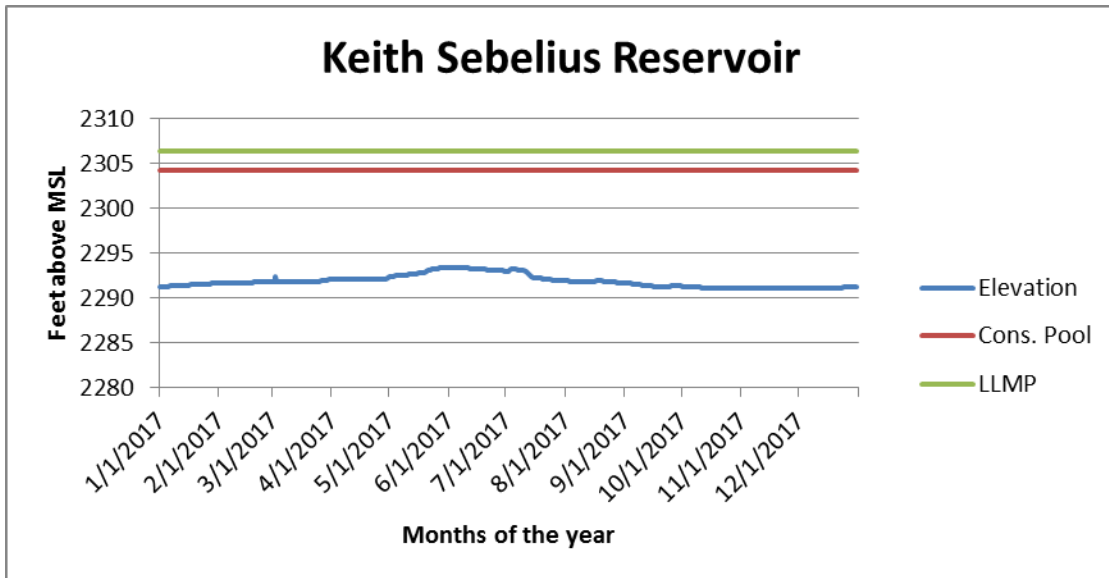


Figure 7: Keith Sebelius Reservoir, 2017 water level information

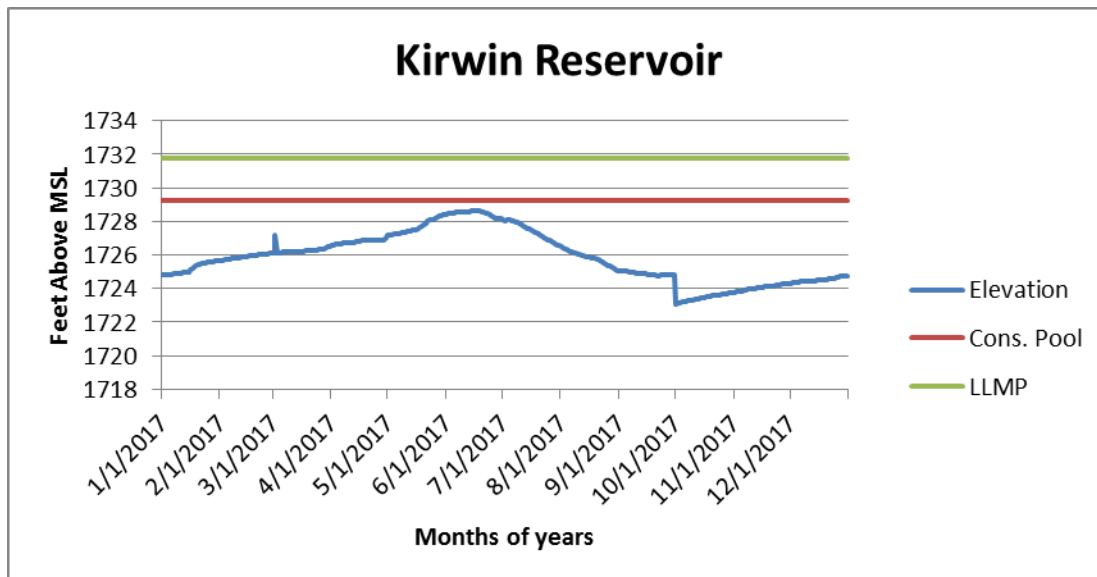


Figure 8: Kirwin Reservoir, 2017 Water Level Information

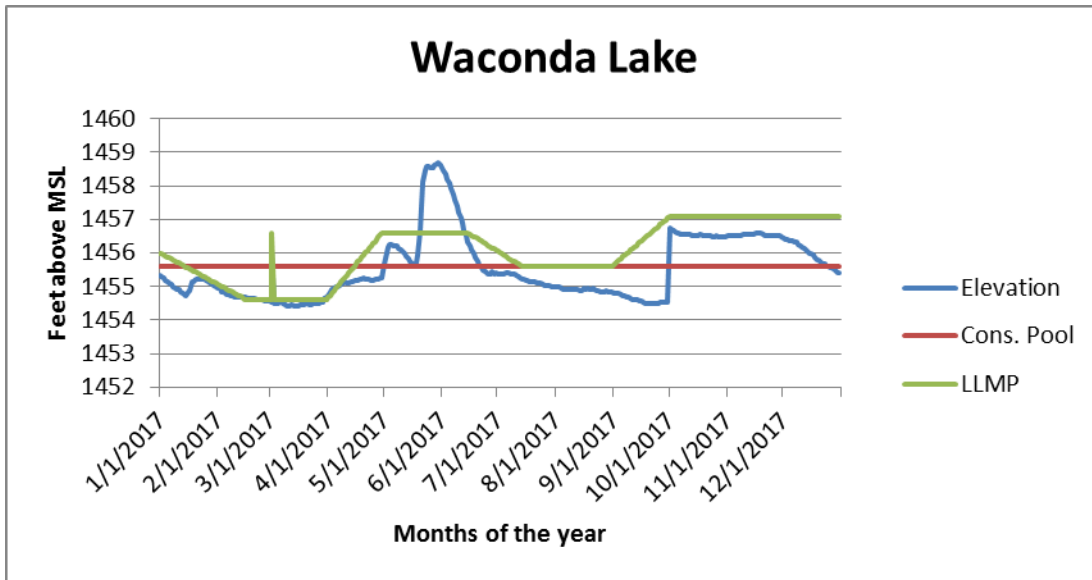


Figure 9: Waconda Lake, 2017 water level information

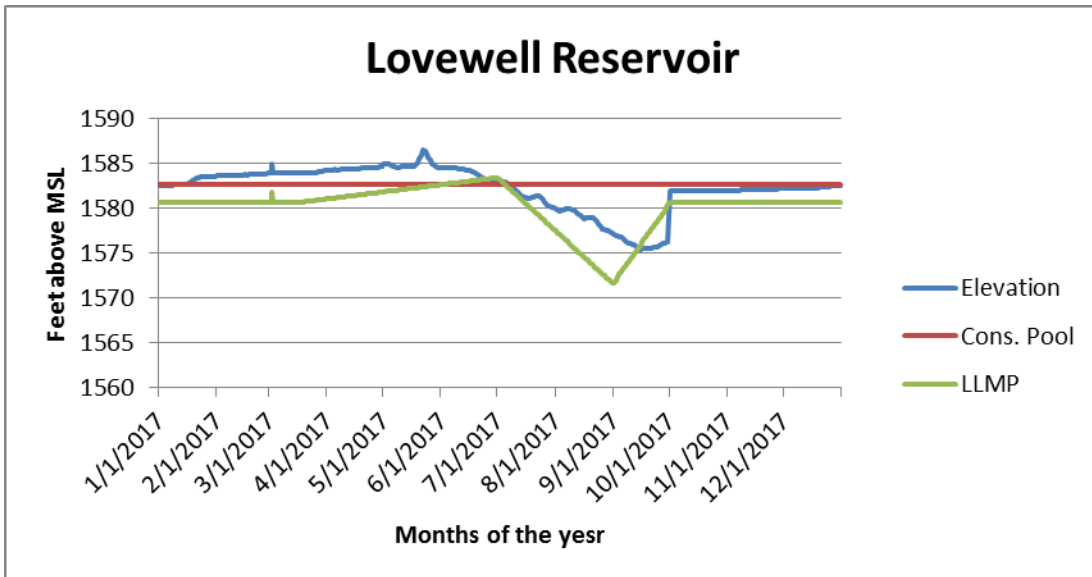


Figure 10: Lovewell Reservoir, 2017 water level information

Water Quality

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). Total Maximum Daily Loads are quantitative objectives and strategies needed to achieve the state’s surface water quality standards. A list of all impaired/potentially impaired waters can be

found on the Kansas Department of Health and Environment (KDHE) [impaired waters](#) website.

The 2014 303(d) list showed 152 stream impairments and 3 lake impairments. Changes from the 2014 list to the 2016 303(d) list: one body of water delisted, two bodies with new TMDL developed for: DO, Eutrophication and Selenium, and 10 waters requiring development of a TMDL because of impairments from: Arsenic, Atrazine or Gross Alpha.

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 three reservoirs located in this region in 2017 (Figure 11). Algal problems were reported on three lakes: Webster Reservoir, Kirwin Reservoir, and Keith Sebelius Lake. Keith Sebelius Lake has experienced HABs the last 4 years. Lovewell Reservoir has made the HAB list in the years 2010, 2012, and 2015.

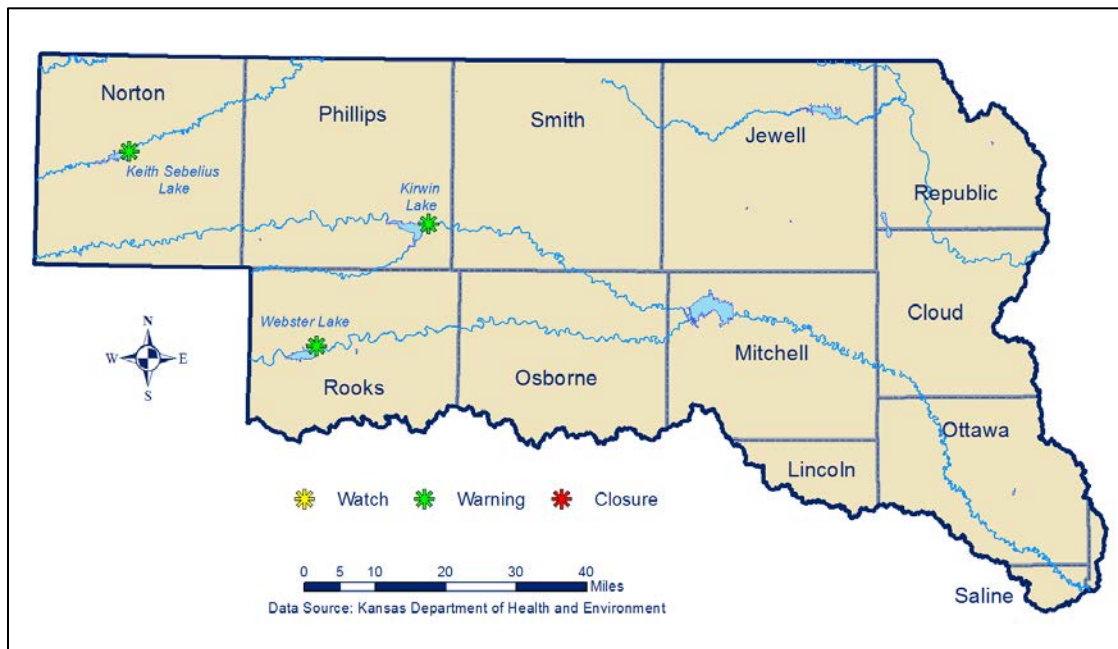


Figure 11: 2017 Harmful Algal Blooms, Solomon-Republican Region

Sedimentation

Sedimentation in lakes is a major problem in Kansas. Soil type, land practices and extreme rainfall events are the main causes which lead to reservoir sedimentation. High flow events following heavy rainfall account for a large portion of the siltation that takes place in reservoirs. Periodic bathymetric surveys are necessary to monitor the loss of capacity.

The sedimentation rate in the Solomon-Republican Region is not a result of streambank erosion. Currently, there are 21 streambank hotspots within the region. These streambank hotspots are located on the Lower Republican River, above Milford Lake in the Kansas Region (Figure 12). One site has been stabilized, reducing the sediment load by an estimated 1,125 tons per year. There are 20 sites that

remain to be completed, which, if completed, will reduce the sediment load into Milford Lake by an additional estimated 17,400 tons per year.

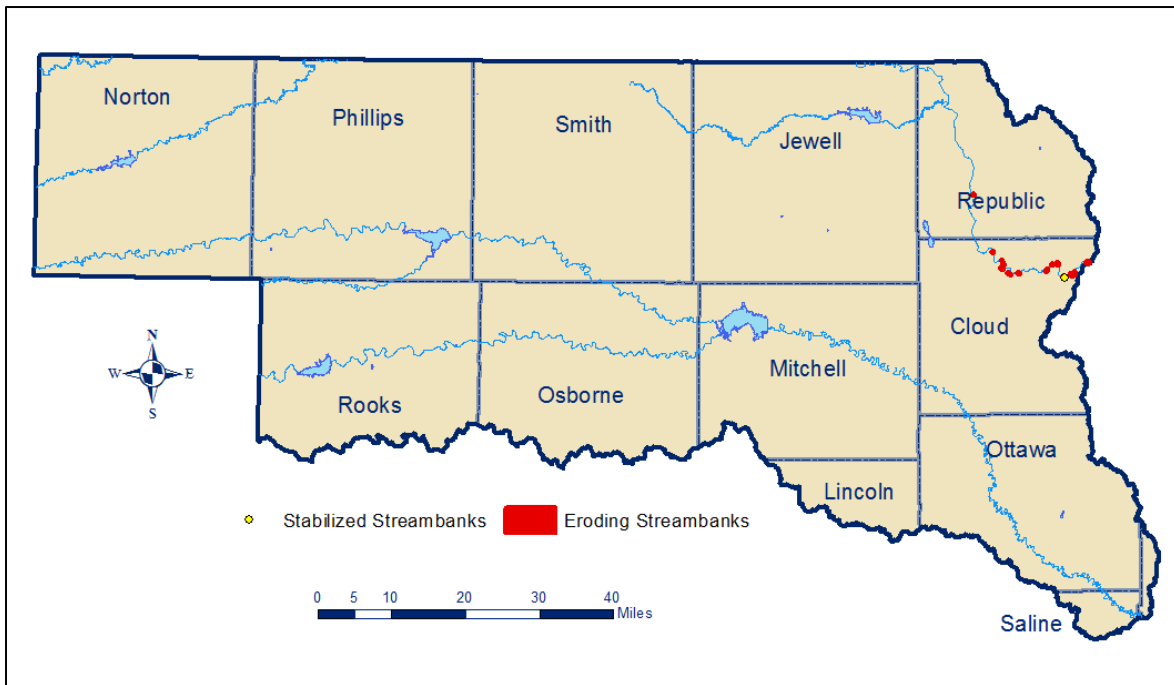


Figure 12: Solomon-Republican Regional Planning Area streambank stabilization projects

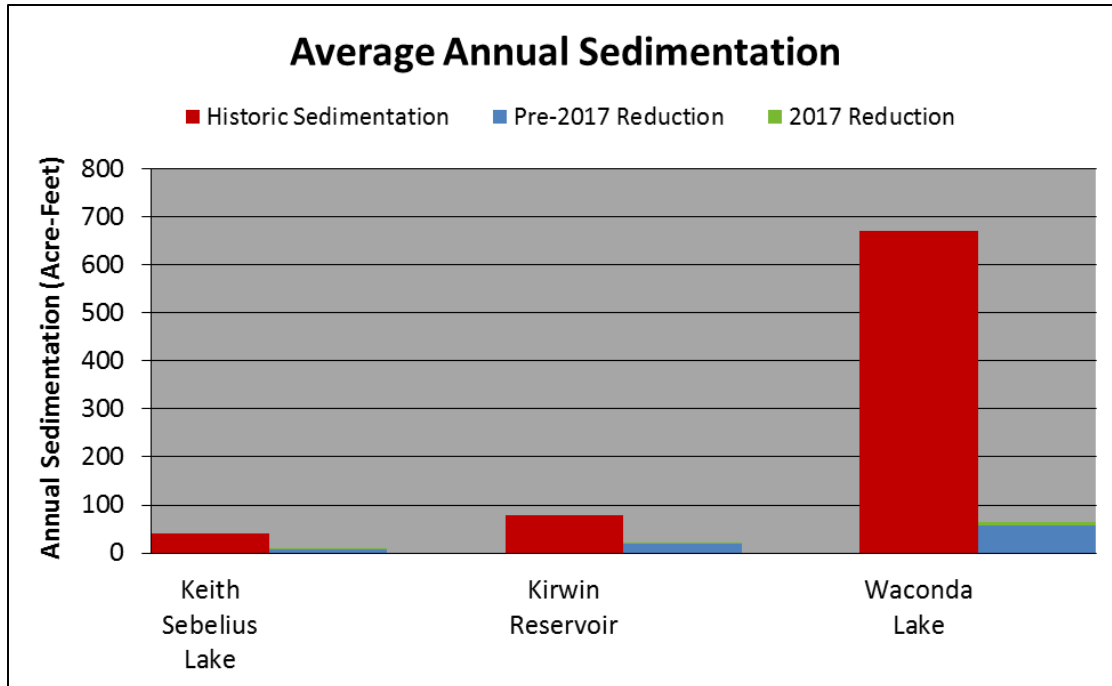


Figure 13: Average annual sedimentation in Solomon-Republican Region reservoirs

Figure 13 shows the average annual sedimentation, estimated using the change in conservation storage between bathymetric surveys, compared to the estimated sediment load reduction of the BMPs as well

as stream stabilization project implemented in the watersheds above federal reservoirs in the Solomon-Republican Region.

The estimated annual reductions compare total implementation prior to 2017 (beginning in 2012) to reduction in 2017. The results show Waconda Lake has the highest historical sedimentation rate of approximately 670 acre-feet per year but also has the highest estimated sediment reduction. All sediment reduction has been achieved through BMP implementation.

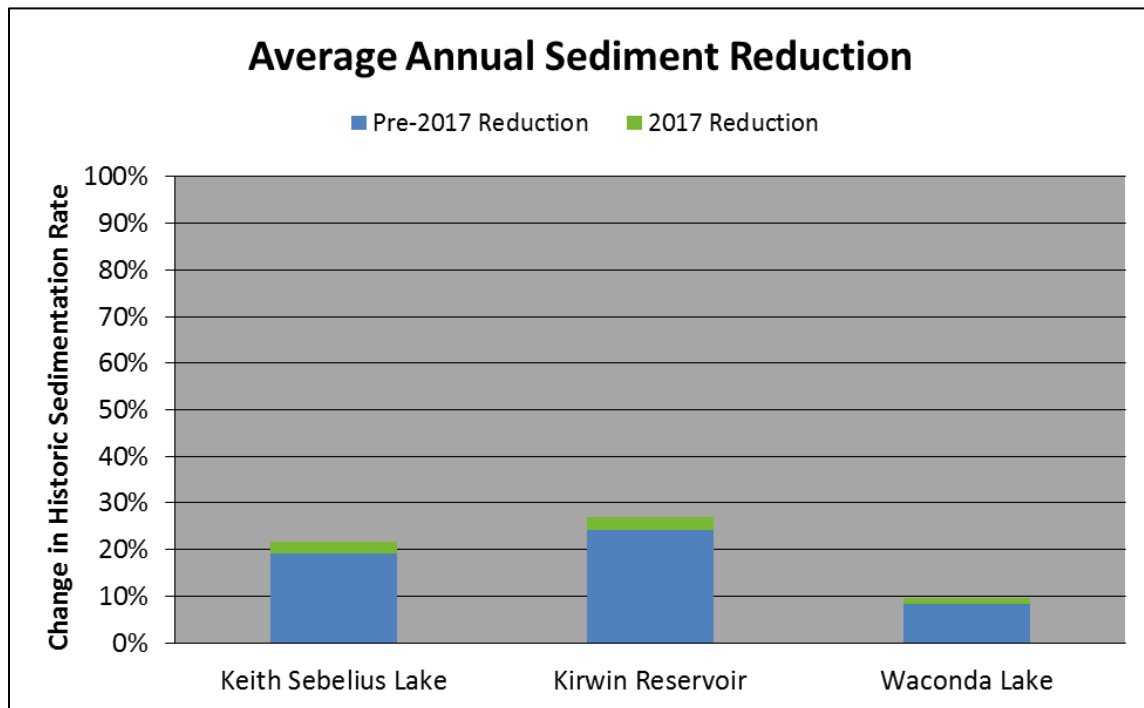


Figure 14: Average annual sediment reduction in Solomon-Republican Region reservoirs

Figure 14 shows the change in reservoir sedimentation from the implementation of load reduction practices. Results show the most significant reductions in the Keith Sebelius Lake and Kirwin Reservoir watersheds. These high load reductions are related to relatively low sedimentation rates, meaning that fewer BMPs need to be implemented to have a large effect on sedimentation.

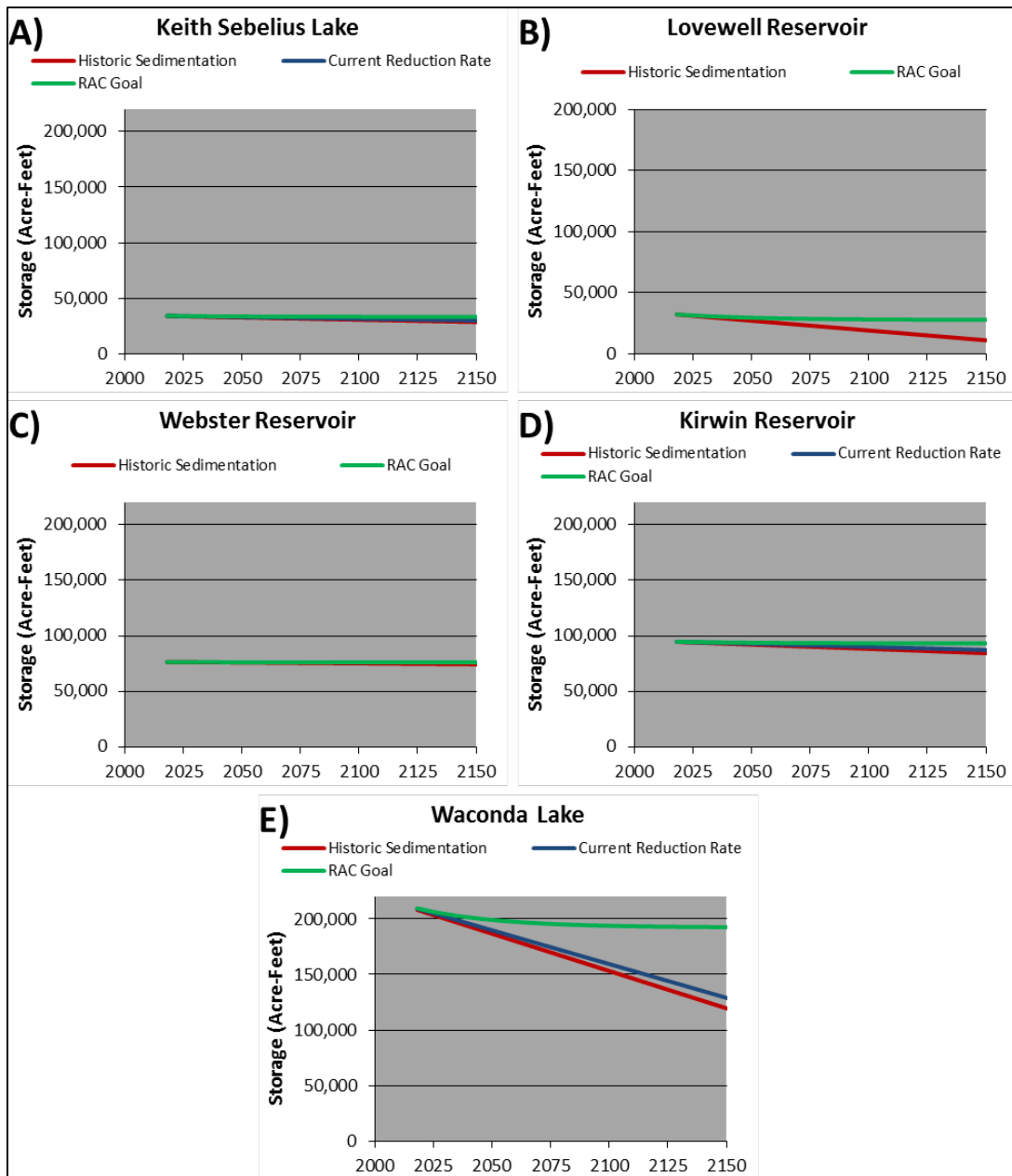


Figure 15: Reservoir capacity at conservation pool for Solomon-Republican Region reservoirs

Figure 15 shows the relatively low sedimentation rates in Keith Sebelius Lake, Webster Reservoir, and Kirwin Reservoir compared to the higher rates in Lovewell Reservoir and Waconda Lake. The aggressive RAC goal of 25% reduction in sediment loading per decade would lead to storage obtaining a near steady-state capacity within 50 years.

Implementation Progress

Best Management Practices are vegetative, structural, or management practices that when implemented, reduce pollutants that reach surface and groundwater. Practices may be incorporated

independently or in combination with other BMPs, compounding their positive effects. Table 1 shows 2016 load reductions, estimated as a result of collaborative efforts between WRAPS, Natural Resource Conservation Service (NRCS) and Kansas Department of Agriculture - Division of Conservation (KDA-DOC) to implement load-reducing BMPs in the region. WRAPS worked with many stakeholders in the Solomon-Republican watershed to address TMDL impairments in the targeted HUC 12s. Table 2 illustrates the investment that NRCS has made in this region since 2015, nearly \$3.6 million.

Table 1: 2016 Solomon-Republican watershed targeted HUC12 load reductions

Region	Nitrogen (lbs./yr.)	Phosphorus (lbs./yr.)	Sediment (tons/yr.)
Solomon-Republican	35,191	18,286	13,913

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

Region	Number of Contracts	Contract Acres	Contract Obligations
Solomon-Republican	157	24,557	\$3,583,513.15

The conservation practices implemented through the above mentioned partners are compiled on an annual basis by KDHE, with load reduction estimates from these efforts being calculated and reported to the Environmental Protection Agency (EPA) to show progress made within Kansas to reduce nutrient and sediment runoff from non-point sources of pollution. The annual load reduction estimates can then be compared to load reduction targets identified within WRAPS watershed plans to evaluate annual watershed plan implementation progress in relation to overall watershed plan goal targets (Table 3). The percentage of target achieved is less than 5% for all watersheds for nitrogen, phosphorus, and sediment.

Table 3: Watershed load reductions

Watershed	Load Reduction Information	Nitrogen (lbs./yr)	Phosphorus (lbs./yr)	Sediment (tons/yr)
Sebelius Reservoir	2017 SOTR Reported Load Reductions	883	514	354
	WRAPS Watershed Plan Reduction Target	N/A	11,195	N/A
	% Target Achieved	N/A	4.60%	N/A
Kirwin Reservoir	2017 SOTR Reported Load Reductions	1,198	686	541
	WRAPS Watershed Plan Reduction Target	N/A	152,000	32,999
	% Target Achieved	N/A	0.45%	1.60%
Waconda Lake	2017 SOTR Reported Load Reductions	7,475	3,919	2,997
	WRAPS Watershed Plan Reduction Target	N/A	209,720	N/A
	% Target Achieved	N/A	1.90%	N/A

Station SC231, a monitoring site near Hardy, Nebraska, is currently being monitored by KDHE to evaluate Nebraska's contribution of nutrients and sediment to the Republican River basin and Milford Lake. Data

indicates that 30% of the total nutrient load in the basin originated in Nebraska, while 8% of the total sediment load originated in Nebraska.

KDHE is also collecting data from two additional sites: White Rock Creek and the Courtland Canal above Lovewell Reservoir. Samples collected in 2016 indicated the highest calculated sediment load delivered to Lovewell Reservoir originated from the Courtland Canal at 9,540 tons per year, which is considerably less than the 92,000 tons per year established by the 2011 bathymetric survey.

In July 2017, a new 10 ½ year contract was put in place involving Keith Sebelius Lake, between the Alma Irrigation District and the KDWPT. Collaboration with the Norton City/County Economic Development (NCCED) group and KDWPT made the first payment possible. The purpose of this contract is to provide additional water within the reservoir.

Additionally, in 2017 the KWO, NCCED and the Fort Hays State University Docking Institute entered into a contract to quantify the total economic impact that arises from in-state and out-of-state users of the Keith Sebelius Lake and adjoining park. Preliminary results of the study indicated for 2016, the 172,300 recreational users of the reservoir had an estimated total economic impact to Norton County of \$4,848,000.

The Lower Republican Access District is continuing progress on its formation. The District would benefit producers along the Lower Republican River when Minimum Desired Streamflow (MDS) is in effect. There is considerable interest among producers in the area and a steering committee has been formed. Remaining issues to still be resolved include: how will the district function and introduction and passage of legislation to provide authority for the district.

The Kansas Bostwick Irrigation District (KBID) continues to convert portions of the remaining open irrigation canal systems to a buried pipe system within the district. A contract between KBID and KWO was signed in 2016 and is effective through 2024. This allows for the use of awarded funds from the case of *Kansas v. Nebraska No. 126*. Original, in which the United States Supreme Court ruled in favor of Kansas in the dispute over the states' rights to the waters of the Republican River Basin. In fall 2018, KBID will start on Year 3 on the project.

Implementation Needs

While the Solomon-Republican Region has started to address the water quality concerns within the region, continued work needs to be completed. With the Kansas Water Authority's (KWA) approval of the RAC's plans of action, the following items need to be addressed:

Conservation practices need to be implemented to reduce nutrient and sediment runoff impacting the surface waters of the region. Progress has been made on the three WRAPS watershed plans within the region. This can be compared to the remaining needs to quantify the overall funding required to fully implement watershed plans covering these areas (Table 4). 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 \$138 million.

Table 4: 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 Technical Assistance Plan Costs	Updated Total Implementation Plan Costs
	(3) Plan					
Solomon-Republican	Kirwin	28	\$4,933,253.73	\$31,534,680.80	\$3,552,297.47	\$35,086,978.27
	Waconda	10	\$6,298,556.73	\$65,492,870.81	\$11,135,092.50	\$76,627,963.31
	Prairie Dog	13	\$879,006.63	\$23,430,939.00	\$2,966,887.77	\$26,397,826.77
Total			\$12,110,817.09	\$120,458,490.61	\$17,654,277.73	\$138,112,768.35

Bathymetric surveys have been completed within the region, but more recent bathymetric surveys need to be completed to determine a more accurate estimation of loss of storage over time.

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 KWA in August of 2015 and at that same time members for the 14 Regional Advisory Committees (RAC) were appointed. The first task for the newly formed RACs was to develop action plans to correspond with the regional goals. The Solomon-Republican RAC completed action plans for their regional goals in fall of 2016. Information included within this section highlights recent progress made on regional goal action plan implementation.

Regional Goal #1	Goal Theme	Annual Progress			
		2017	2018	2019	2020
Within the next two years, develop a clearinghouse of technical tools, agreements and agency personnel for use alternatives for Solomon-Republican region waters. An example could be the marketing contract for Keith Sebelius Reservoir/Almena Irrigation District that reached agreement to convert irrigation to recreation use.	Water Use			--	--

Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update:					
<ul style="list-style-type: none"> • New 10.5 year contract was put in place in July of 2017. RAC members/local citizens of Norton formed a group and started soliciting donations to fund a new contract • The KWO and Norton City/County Economic Development entered into a contract with the Docking Institute, Fort Hays University, to evaluate data collected from reservoir interests and document the value • Final Economic Study regarding Keith Sebelius Lake submitted to KWO 					
Next Step(s): Plan public meeting to release findings of the economic study concerning Keith Sebelius Lake. Work with the Kirwin- Webster Irrigation District to capture some BOR funding and improve delivery efficiency.					

Regional Goal #2	Goal Theme	Annual Progress			
		2017	2018	2019	2020
Reduce inbound sediment loads, through conservation measures, with a focus on White Rock Creek to Lovewell Reservoir, by 25% every 10 years.	Sedimentation			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update:					
<ul style="list-style-type: none"> • KWO staff performed streambank assessment. The 2017 assessment found no areas with streambank hotspots of specific erosion concerns • KDHE is using site SC231 to document Nebraska’s contribution of nutrients and sediment to Milford, 30% and 8% respectively • KBID assisted with a WaterSMART grant class at McCook, NE 					
Next Step(s): Work with KDHE to collect data from the rotational site in White Rock Creek. Monitor data collected from the new site that will be installed in the Courtland Canal in 2018.					

Regional Goal #3	Goal Theme	Annual Progress			
		2017	2018	2019	2020
Complete a bathymetric assessment every 10 years on all reservoirs in the Solomon-Republican Region. This goal will be a tool to periodically monitor sediment accumulation and rates. If sediment loads exceed 10%, actions should be initiated to determine the source watersheds and remedies within a twelve month period from assessment report.	Monitoring			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update:					
<ul style="list-style-type: none"> • Reservoirs in other regions were selected for funding at this time 					

Next Step(s): Build funding into a budget so the bathymetric surveys can be completed in a timely manner.

Regional Goal #4	Goal Theme	Annual Progress			
		2017	2018	2019	2020
Continue initiative that will maintain, and annually fund a Kansas Administrative Team to facilitate Republican River Compact (RRC) compliance by 2015. An annual report of progress and activities should be prepared and presented to the Republican-Solomon Regional Advisory Committee.	Compliance			--	--
Progress Legend	Not Started	In Progress	Delayed	Cannot Complete	Complete
2018 Update: <ul style="list-style-type: none"> Multiple updates from the Kansas Department of Agriculture - Division of Water Resources (KDA-DWR) at RAC meetings on the Republican River Compact Administration Formation of a Steering Committee to help form the Lower Republican Access District, with a Board being elected and formed Continual modification of OASIS model by KGS 					
Next Step(s): Continue information presentations on the RRCA. Work with the ad hoc Access District steering committee to draft legislation to establish the District as a taxing authority.					

References

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