MEMO

DATE: November 13, 2017
TO: Chairman Tom Sloan
FROM: Tracy Streeter, Director
RE: Streambank Stabilization Information

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For the Committee's consideration, the Kansas Water Office is providing the following information in support of the state's ongoing efforts to implement streambank stabilization projects aimed at reducing sediment loads entering downstream reservoirs. The following information includes a brief background and history of streambank stabilization project implementation in Kansas, as well as targeted responses to some of the discussion related to these projects that took place during the Oct. 31st meeting. Finally, included is a list of references in support of this memorandum.

Background & History of Streambank Stabilization Project Implementation in Kansas

In order to provide a meaningful response to some of the recent discussion related to the effectiveness of streambank stabilization implementation to reduce sedimentation, it is important to review the history of these projects within the state. Streambank stabilization projects have been implemented in Kansas for over two decades, with many of the early projects funded primarily through the State Conservation Commission and cost-share funding available through the NRCS EQIP program. While these early projects were aimed at addressing individual landowners' concerns related to the loss of valuable cropland, the state recognized the potential for such projects to provide a cost-effective way to reduce erosion and sedimentation in targeted watersheds.

The Reservoir Roadmap[1], which was presented to the Kansas Legislature by the Kansas Water Authority in 2010, provides a brief history of the evolution of these projects and their importance to the protection and restoration of the state's infrastructure. Prior to the state's pursuit of these projects to address sedimentation, the USGS (in cooperation with other partners) performed scientific studies[2,3] to determine trends in chemical occurrence in sediments in order to trace the source of sediment in various watersheds. These studies indicated that stream channel banks are a substantial source of sediment to the reservoir in specific watersheds within the state (including both Perry and John Redmond).

With the support of these science-based studies, the state recognized a need to develop a streamlined, systematic approach to streambank stabilization project implementation in high priority watersheds. As noted in the 2010 Reservoir Roadmap, in May 2009, the Kansas Water Office received funding through the American Reinvestment and Recovery Act (ARRA) to conduct a streambank stabilization and riparian restoration project on an eight-mile reach of the Neosho River above John Redmond Reservoir. That project, which served as a pilot to help illustrate the type of local coordination and funding needs required for the systematic approach, was successfully implemented. Since that time, additional funding has been made available through the Kansas Department of Health and Environment (KDHE) state revolving loan fund for the completion of additional project phases along the Cottonwood River above John Redmond, as well as projects along the Delaware River above Perry Lake.

As a result of the success of the Cottonwood and Delaware streambank stabilization and restoration projects, in 2014, the Kansas Department of Agriculture, Kansas Water Office and KDHE formed an interagency Streambank Coordination Group to streamline multiple agency processes as well as to pool funding to support

priority projects based on assessments[4]. This group also facilitates on-the-ground project administration, and ongoing monitoring efforts aimed at ensuring that each streambank stabilization project is successful. Monitoring efforts have also been in coordination with USGS (stream-gaging above and below implemented projects), KDHE (TSS water quality data) and the University of Kansas (pre and post-construction mussel and fish surveys at implemented sites). In addition, a visual streambank stabilization assessment tool[5] has been utilized to revisit implemented sites in order to assess and document their conditions through the use of a stability index.

In recent years, the interagency Streambank Group has leveraged additional KDHE loan funds in order to plan for the implementation sites along the Big Blue and Little Blue Rivers above Tuttle Creek Reservoir. As funding allows, the Group continues to plan and implement sites in all three of the priority watersheds in order to reduce sedimentation to the downstream reservoirs. As new information is encountered and additional sites are planned, the interagency Streambank Group continues to work to enhance these projects with the constant goal of improving efficiency and effectiveness.

Responses to October 31, 2017 Meeting Discussion

1. *The majority of the sediment loads to the downstream reservoirs, up to 95%, are transported during approximately 5% of runoff events.* This information was provided by the Kansas Water Office to the Committee, and was re-visited by other agency representatives. While the exact percentages will vary depending on the specific watershed, contributing system, and period of hydrologic recorded data utilized, there are numerous publications supporting the fact that the majority of sediment loads within the watershed are transported during small periods of intense runoff. The importance of this statement is the fact that in order to reduce sediment loading in the watershed, an emphasis should be placed on best management practices that will help to slow runoff and/or reduce peak flows.

    - The USGS study[6] aimed at characterizing sediment loading at John Redmond Reservoir included the calculation of suspended-sediment load duration curves at three sites in John Redmond watershed. The information, included as Figure 8 in the study, serves to support the percentages provided by Kansas Water Office staff.

    - Reference is made in various texts regarding temporal variation in sediment yield to the estimate that 50% of the annual sediment load is discharged on 1% of the days based on a review of U.S. stream gage data by Meade and Parker (1984)[7].

    - A 2015 study[8] completed by USGS hydrologists pertaining to the watershed above Cheney Reservoir concluded that the majority of the sediment load over the study period (48 years) was delivered in five years with extreme flow events. In addition, it was determined that during the year that recorded the highest annual sediment loading, 92% of the sediment load occurred in one 24-hour period. That same study also supports statements made by the Kansas Water Office, concluding that "sediment management plans eventually must address large, infrequent inflow events to be effective".

2. *Eroding streambanks in the watersheds above both John Redmond Reservoir and Perry Lake have been identified as one of the major sources contributing to sedimentation in the downstream reservoirs.* There was some discussion by other agency staff questioning the accuracy of this statement. As previously referenced in this testimony, studies[2,3] completed by the USGS in both the Perry Lake and John Redmond Reservoir watersheds indicate that sediment from bank erosion is a significant sediment source for these two reservoirs. For this reason, the interagency Streambank Group has identified these two watersheds, as well as the watershed above Tuttle Creek Lake, as the three high priority implementation areas for state-funded streambank stabilization projects.

3. *Ongoing monitoring and assessment work is a critical task of the interagency Streambank Group. Based on recent visual site assessments and review of updated aerial imagery, there has been no evidence to suggest that streambank stabilization projects have caused adverse downstream affects.* Since the first projects were implemented in 2009 with the ARRA funding, the state has facilitated, participated in, and even promoted opportunities to monitor and assess these projects. The ARRA-funded project included an agreement between the Corps, the Kansas Water Office and the USGS for monitoring the changes in turbidity of the Neosho River before, during, and after the streambank restoration project was completed[1]. This activity was initiated, and continues to proceed through agreements between the Kansas Water Office and USGS.

   In addition to the stream-gage monitoring, the Kansas Water Office has entered into a contract (16-110) with the Kansas Biological Survey (KBS) through the Kansas Center for Research, Inc. (KUCR) to complete an assessment of the effectiveness of streambank stabilization projects above John Redmond Reservoir. The study includes comparing survey information of treated/implemented sites to controlled sites along the Cottonwood River. This information will help inform the state of the effectiveness of these projects, and potential changes or improvements that could be made to the designs or planned site selection. While the project has been delayed due to staff changes at KBS, the Kansas Water Office looks forward to evaluating the results of this study upon completion.

4. *Streambank stabilization projects, when implemented in the appropriate watersheds, are a cost-effective alternative to dredging and provide multiple benefits.* The Kansas Water Office has not been provided any scientific evidence to support the recent questions being raised as to the effectiveness of streambank stabilization projects at reducing sedimentation. Additionally, no feasible alternatives to these projects have been proposed. The primary purpose of these projects has always been, and continues to be, to reduce sedimentation to the reservoirs. To that end, the Kansas Water Office is supportive of any research truly aimed at determining the effectiveness of these projects, and the potential to make improvements to the existing approach with adaptive management.

In closing, the Kansas Water Office would like to thank the Committee and Chairman Sloan for the opportunity to participate in this interim committee and to present this information. We would also like to express our continued support and appreciation to the members of the interagency Streambank Group, and to all those who have worked to implement these important projects over the years. The state has made a significant investment in these projects, and continued success relies on the public and private partnerships that have been developed over the years, as well as landowner awareness and participation. Our office continues to support these projects and recognizes their importance to the long-term protection and restoration of the downstream reservoirs.

References Cited:

[1]Kansas Water Authority, 2010, Reservoir Roadmap: accessed November 6, 2017, at http://kwo.ks.gov/docs/default-source/reservoirs/rpt_volume-i-iii_030810.pdf?sfvrsn=0

[2]Juracek, K.E., and Zeigler, A.C., 2007, Estimation of sediment sources using selected chemical tracers in the Perry Lake and Lake Wabaunsee Basins, northeast Kansas: U.S. Geological Survey Scientific Investigations Report 2007-5020, 53 p.

[3]Juracek, K.E., 2010, Sedimentation, sediment quality, and upstream channel stability, John Redmond Reservoir, east-central Kansas, 1964-2009: U.S. Geological Survey Scientific Investigations Report 2010-5191, 34 p.

[4]Kansas Water Office, 2017, Streambank Assessment Fact Sheet: accessed November 6, 2017, at http://www.kwo.ks.gov/docs/default-source/streambank-erosion-assessments/stream-bank-assessment-temp-1.pdf?sfvrsn=23

[5]Bigham, Kari, P.E., *Streambank Stabilization Assessment Tool (SSAT)*, Department of Biological & Agricultural Engineering, Kansas State University

[6]Lee, Casey J., Rasmussen, Patrick P., and Zeigler, Andrew C., 2008, Characterization of suspended-sediment loading to and from John Redmond Reservoir, east-central Kansas, 2007-2008: U.S. Geological Survey Scientific Investigations Report 2008-5123, 25 p.

[7]Meade, R.H., and R.S. Parker, 1985, Sediment in rivers of the United States, National Water Summary 1984; U.S. Geological Survey Water-Supply Paper 2275, p. 49-60.

[8]Stone, M.L., Juracek, K.E., Graham, J.L., and Foster, G.M., 2015, Quantifying suspended sediment loads delivered to Cheney Reservoir, Kansas: Temporal patterns and management implications: *Journal of Soil and Water Conservation*, vol. 70, No. 2, p. 91

Additional References:

Kansas Water Office, 2017, *Tuttle Creek Watershed Streambank Erosion Assessment* ArcGIS® Comparison Study: 1991, 2002, 2003 vs. 2015 Aerial Photography, 13 p.

Kansas Water Office, 2017, *John Redmond Watershed Streambank Erosion Assessment* ArcGIS® Comparison Study: 1991, 2003 vs. 2015 Aerial Photography, 15 p.

Kansas Water Office, 2017, *Delaware River Watershed Streambank Erosion Assessment* ArcGIS® Comparison Study: 1991, 2002, 2003 vs. 2015 Aerial Photography, 14 p.

TWI, 2010, *Kansas River Basin Regional Sediment Management Section 204 Stream and River Assessment.*