



FY18 RSM IPR - Kansas City District (NWK)

RSM Effects of Bank Stabilization - Kansas River Basin

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BLUF: Sediment accumulation has and continues to decrease benefits provided by federal reservoirs. The purpose of this study is to quantify the regional sediment management effects of three decades of USACE bank stabilization projects (volume of sediment prevented from entering downstream reservoirs) and to distill lessons learned on the performance of those projects that could improve future projects from a regional sediment management perspective.

Challenge

- Majority of Bank Stabilization Projects are located in remote areas and are difficult to access.
- Minimal to no pre-construction and construction information (especially older projects).
- Uncertainty associated with bed load material and travel time to deposition in reservoir. Volume estimates reasonably made using available aerial photos and lidar, however bank material and geometry must be measured in the field.

Approach

- Estimate erosion rates prior to project construction using aerial photography.
- Measure channel geometry in field to better estimate sediment volume.
- Collect bed and bank samples to better estimate the percentage of material being transported to reservoir in wash load not bed load.
- Visually inspect projects and try determine how/why projects are or aren't performing as designed.

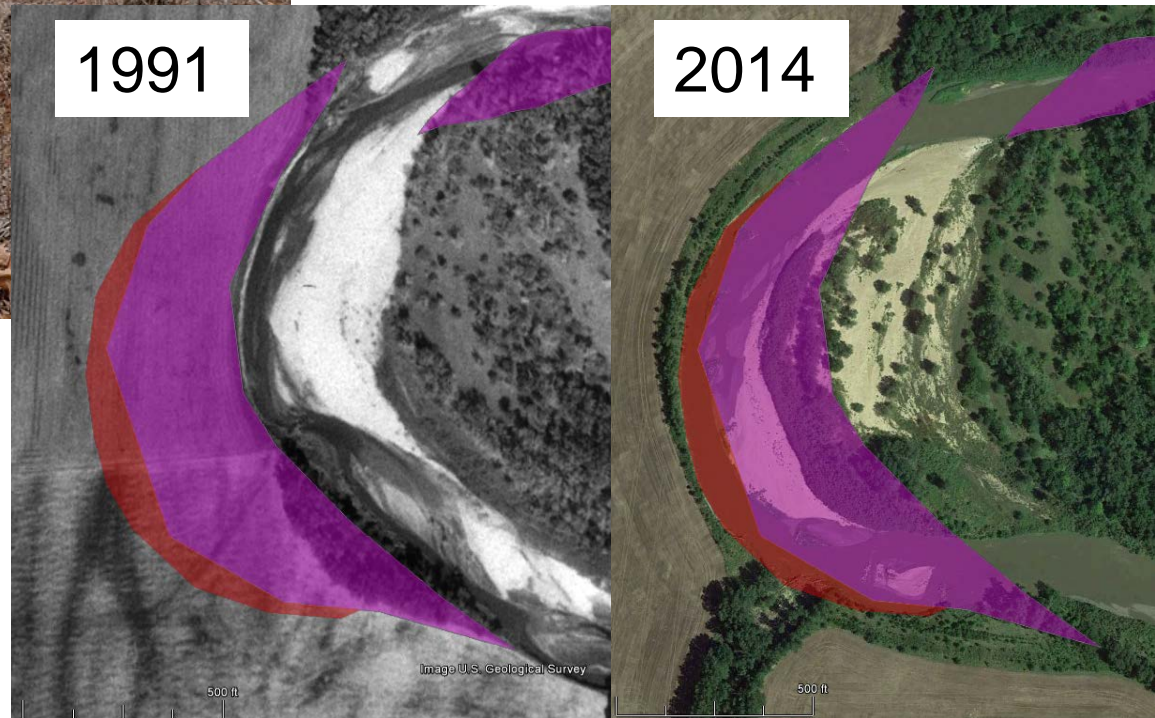
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**Surveying Structures
and Bank Geometry**

Aerial Photo for Erosion Areas



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Sampling Bank Material

Sampling Bed/Bar Material



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**Ineffective Bank Stabilization Project
Bend Way Weirs (Flanked)**

**Effective Bank Stabilization Project
Longitudinal Stone Toe Protection**

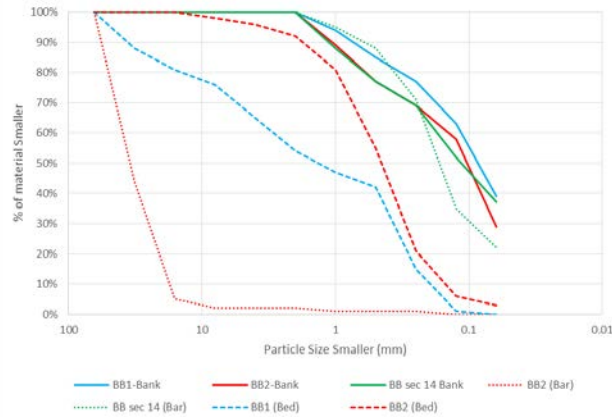


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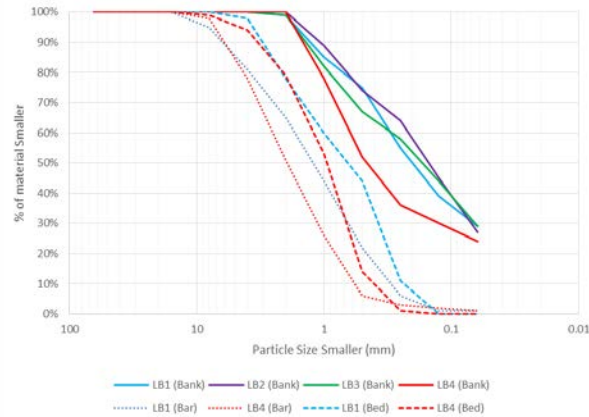
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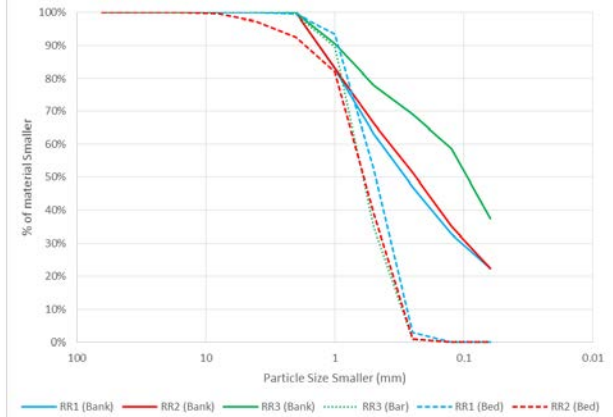
Big Blue River Stream Bank Protection Projects
Bed and Bank Material Gradation



Little Blue River Stream Bank Protection Projects
Bed and Bank Material Gradation



Republican River Stream Bank Protection Projects
Bed and Bank Material Gradation



River Basin	Republican River			Little Blue River				Big Blue River		
Project Name	RR1	RR2	RR3	LB1	LB2	LB3	LB4	BB1	BB sec 14	BB2
Year Constructed	2004	2006	2004	2002	2002	2004	2011	2003	2010	2010
Erosion Rate Years	13	15	13	11	11	13	17	12	17	17
Erosion Area (ft2)	462,143	241,231	325,298	311,494	66,162	307,884	84,956	269,514	165,687	99,140
Erosion Area Length (ft)	1,987	1,391	2,019	1,633	1,173	2,176	1,268	2,290	1,289	1,474
Ave Erosion Width (ft)	233	173	161	191	56	141	67	118	129	67
Bank Height (ft)	13.8	13.8	13.8	21.0	17.9	21.0	21.0	20.3	19.4	22.3
Volume (yd3)	235,351	122,849	165,661	242,273	43,863	239,465	66,077	202,635	119,049	81,882
Rate (yd3/yr)	18,104	8,190	12,743	22,025	3,988	18,420	3,887	16,886	7,003	4,817
Reduced Erosion Until 2018 (yd3)	253,454	98,279	178,404	352,397	63,801	257,886	27,208	253,293	56,023	38,533

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Accomplishments/Deliverables

- **Conduct RSM Workshop**
- **Provide RSM Workshop Slides to PROSPECT Instructors**
- **RSM whitepaper**
- **Dredging Magazine Article Submission**

Lessons Learned

- **Success of bank stabilization projects not always dependent on structures alone, large events very near construction can cause project failures that may not otherwise occur.**
- **Monitoring projects post construction to ensure failure of single or few project features does not lead to complete project failure.**
- **The sites analyzed have a large percentage of material that would be transported in wash load and new constructions would have an immediate impact on reservoir storage.**

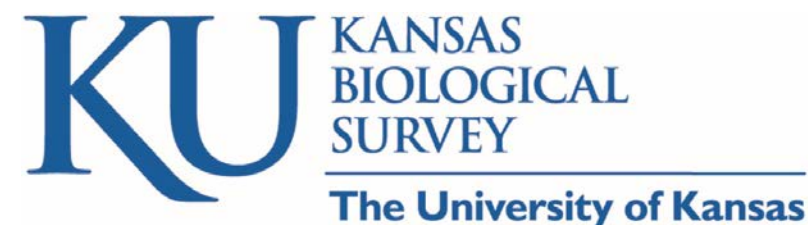
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Provide RSM Workshop for USACE and local partners (KWO, KDA, KDHE, KBS, KGA, KFS)

The NWK will host a Regional Sediment Management & Analysis workshop for engineers in Lawrence Kansas from June 11-15, 2018. Workshop topics include sedimentation mechanics, computing reservoir volume change, an overview of available management methods, selecting a reservoir management method, empirical analysis for future without project conditions, and numerical modeling of sediment management scenarios such as altered release timing and drawdown flushes.



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District/Other USACE PDT Members

- John Shelley (RSM Lead)
- Aaron Williams (Project engineer)
- Cassidy Garden (Section 14 lead PM)
- Kaely Magero (Grand River Basin PM)

Leveraging/Collaborative Opportunities

- Current PAS agreement with KWO to create and calibrate a HEC-RAS sediment model for the Kansas River.
- Future PAS agreement to update and run future projection simulations on the calibrated sediment transport model to analyze effects of reservoir management actions.
- Future PAS Study for Water Injection Dredging of Tuttle Creek reservoir under DOER research unit.
- Future Kansas River Basin Study

Stakeholders/Partners

Cara Hendricks
Kansas Water Office (KWO)
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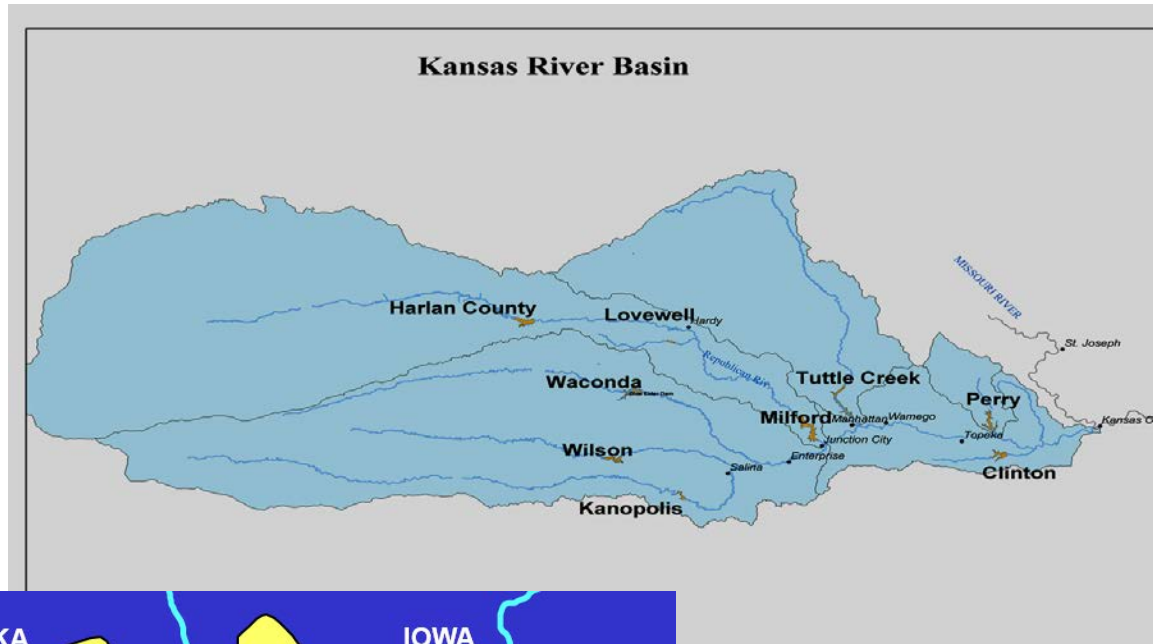


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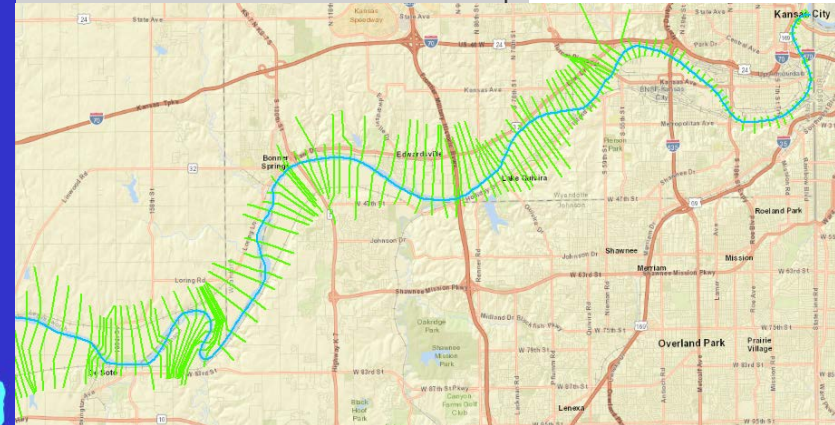
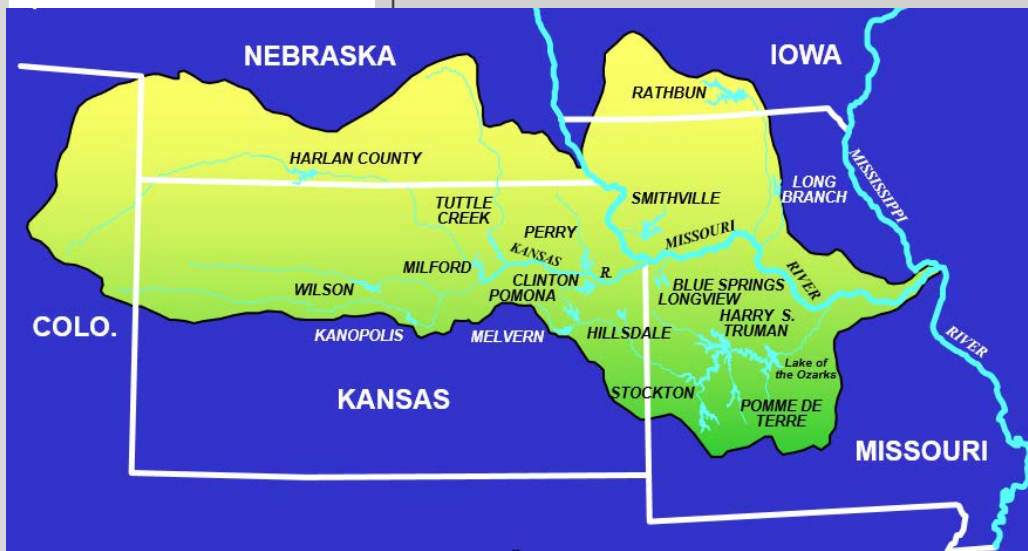
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Kansas
River
Basin
Maps



Kansas
River
HEC-RAS
Model



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Challenges

The greatest challenges facing this project is the minimal amount of pre-construction and immediate post construction information along with the remote location of project sites. Additionally, finding USACE projects upstream of the Kansas River proved difficult however our local partner, the Kansas Water Office, had multiple projects we could analyze.

Path forward

Finish analyzing field data and photos, compiling information into RSM-U presentation, whitepaper, and dredging magazine article submission. Pursue additional projects with local partners within the Kansas River Basin.

Benefits to USACE and the Nation

Benefits of this project include managing sediment prior to it being transported into our reservoirs helping to avoid costly maintenance dredging, maintain landowner property, and building relationships with local state partners allowing us to leverage future opportunities.



Questions/Comments?