

Your water... ...our focus

The Kansas Water Resources Institute (KWRI) develops and supports research on high-priority water resource problems as defined by the Kansas state water plan. KWRI is designed to facilitate effective communication between water resources professionals and to foster the dissemination and application of research results.

The projects we fund represent key issues affecting Kansas water quality and water resources. These projects have diverse and wide-ranging subjects, including studies on the efficacy of new irrigation technologies, studies on river morphology, drought assessment tools, or water quality assessments.

KWRI is committed to fostering excellence in research, at all levels. To that end, we are proud to support student research at different Kansas universities. Currently, funded projects provide support for eight undergraduate students, three graduate students and one post-doctoral researcher.

This newsletter issue focuses on current KWRI projects. Take a moment to read about this important research that seeks to answer key questions about water issues for our state, including projects on harmful algae blooms, streambank stabilization efforts and riparian buffer strips. If you would like additional information about any project, please contact us at KWRI for more information or email the project leader directly.

Want more information? Visit the online version of this newsletter at the KCARE website for publication links, project websites and more!



Tim Keane (across river, Co-PI), Trisha Moore (on boat, Co-PI) and Max Burden (undergrad assistant) surveying Cottonwood streambed bathymetry with total station. Photo courtesy Kari Bigham.

Evaluation of the geomorphological adjustment of a meandering, alluvial river

This study will measure the short-term, reach-scale impacts of streambank stabilization projects on a meandering, alluvial river that outlets into a federally owned reservoir. More specifically, the research team aims to test the following hypotheses: if streambank stabilization projects utilizing rock (1) decrease sediment input from streambank erosion at the stabilized site but (2) increase sediment transport capacity along the site, resulting in localized bed scour, upstream channel degradation, and accelerated streambank erosion upstream of the project, and (3) induce aggradation and accelerated streambank erosion downstream of the stabilized streambank.

So far, the research team has selected two study reaches on the Cottonwood River near Plymouth, upstream of John Redmond Reservoir. Pre-construction surveys were completed using a total station to characterize study reaches prior to the instillation of streambank stabilization projects. The team characterized the geotechnical properties of streambank material using soil borings and also developed preliminary hydraulic models to estimate boundary shear stress exerted by the flow at the research site.

Contact: Trisha Moore, Department of Biological and Agricultural Engineering, Kansas State University

Does nutrient form control harmful algal bloom toxin release?



Visual results of a multi-month large-scale experiment focused on understanding the causes of cyanobacterial blooms and cyanotoxin production. Photo courtesy of Ted Harris and Kansas Bio Survey Field Station.

The causes of cyanobacterial blooms and cyanotoxin production are yet to be fully elucidated. Researchers on this project experimentally tested the effects of different nutrient limitation regimes and nutrient forms on phytoplankton community composition and cyanotoxin concentrations in 18 large-scale mesocosms inoculated with Milford reservoir water at the University of Kansas Field Station for 21 days. Mesocosms were fertilized with

one of six nutrient treatments.

Preliminary results indicate that nutrient loading amendments were successful at creating substantially different nutrient regimes in the large-scale mesocosms. After initial amendments, P-limited and control mesocosms had an average TN:TP ratio >30 whereas N-limited mesocosms averaged <10 (by mass).

Phytoplankton biomass was substantially larger in N-limited mesocosms compared to P-limited and control mesocosms by day 21; “surface scums” formed only on tanks fertilized with N and P. Microcystin was detected in all treatments and was highest in mesocosms where N and P were added. Overall, preliminary results show that N and P act synergistically to form surface scums and produce toxins.

Contact: Ted Harris, Kansas Biological Survey

Stochastic Forecasting of Harmful Algal Blooms in Cheney Reservoir

Periodic Cyanobacterial Harmful Algal Blooms (CyanoHAB) in Kansas reservoirs such as Cheney Lake have the potential to produce toxins and taste-and-odor compounds that may cause substantial economic, public health, and environmental concerns. Predictive tools are needed to better manage CyanoHAB outbreaks, including predictive simulation models, fine-scale remote sensing data, and bacteria detection floating devices. So far, this project has developed and calibrated a comprehensive watershed model for Cheney Lake Watershed to predict inflows and influent nutrient concentrations in the lake; conducted correlation analysis of cyanobacteria concentration against environmental parameters based on multi-year sub-daily USGS dataset from Cheney Reservoir; and began development of a mechanistic modeling framework considering watershed modeling of contributing catchment, process-based modeling of cyanobacteria growth in a lake, and rapid lake assessment. In the next part of the project, a forecasting tool linking with climate and reservoir watershed models would help to conceptualize future CyanoHAB prevention strategies, and its relation with climatic change, watershed condition, and nutrient abundance in the lake.

Contact: Aleksey Sheshukov, Department of Biological and Agricultural Engineering, Kansas State University

2018 Governor’s water conference

The 6th statewide Kansas “Governor’s Conference on the Future of Water in Kansas Conference” was held on November 13-14, 2018 in Manhattan, Kansas. The conference was highly successful with nearly 700 people registered and attending. Attending the conference was the Lt. Governor of Kansas, Tracey Mann, and several state and national senators

and representatives. The Governor fully supports this conference and has expressed her concern about the issue of preserving and protecting the future viability of water in Kansas. Fifty-four volunteer scientific, four panel discussions and six invited presentations were presented in sessions. The conference will be held again on November 7-8, 2019 in Wichita, Kansas.

Determining if Riparian Buffer Strip Age Impacts Phosphorus Retention Potential

In total, 24 riparian buffer strips were surveyed and sampled along the Little Blue, Big Blue, and Republican Rivers. At each site, three transects were set up extending across the buffer strip from the streambank towards the crop field. A streambank stability assessment was performed at each transect, along with a plant survey. Five sampling points for soil samples were established for each buffer strip, including one at the slope break, one at the field edge, one in the field, and two in the buffer strip between the slope break and field edge. Each sampling point was sampled for soil phosphorus samples different depths, and sampled for bulk density at the surface. Samples are currently being submitted to the K-State Soil Testing Lab for analysis.

Contact: Colby Moorberg, Department of Agronomy, Kansas State University

Assessing the effectiveness of streambank stabilization projects on the Cottonwood River using UAS

Multiple UAS flight tests were performed at one stabilized streambank site. It was determined that at least three ground control points (GCPs) should be installed at the top of each stabilized streambank in order to generate accurate 3D models. Vegetation was a significant source of error in the 3D models; therefore, flight surveys conducted in the fall/winter would provide the most accurate baseline datasets.

Researchers performed multiple KHawk UAS flight tests for aerial ortho-photo collection. UAS generated orthorectified aerial maps were compared with satellite imagery. ublox RTK GPS and RTK2 GPS ground tests and position error quantification were performed.

Multiple UAS flight surveys were conducted in the fall/winter on the Cottonwood River. Eleven reaches were surveyed and included two proposed construction sites, 17 constructed sites and four KBS/KU-CE natural survey sites. These datasets provide the baseline data needed to assess the effectiveness of stabilization projects on the Cottonwood River.

Contact: Tony Layzell, Kansas Geological Survey