# Kansas Water Resources Institute

***KWRI Mission***

***The Kansas Water Resource Institute develops and supports research on high priority water resource problems and objectives, as identified through the state water planning process. It is also designed to facilitate effective communication between water resources professionals and to foster the dissemination and application of research results.***


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K-STATE Research and Extension

# 2013 KWRI Sponsored Projects

## Sediment Baseline Assessment:

Sedimentation of our reservoirs has been identified as one of Kansas' most critical water resource issues. Because of that concern, a group of researchers, led by the Kansas Water Office and the Kansas Center for Agricultural Resources and the Environment/Kansas Water Resources Institute (KWRI), developed a research plan and conducted a broad research effort in a attempt to better understand sedimentation of our lakes and also to identify best management practices and policies that would reduce the rate of sedimentation. The research group included researchers from Kansas State University, the University of Kansas, the Kansas Biological Survey, the Kansas Forest Service, United States Geological Survey and others. State and federal agency personnel also assisted in developing and conducting the research program. The research and evaluation part of the project has been completed.

## Aquifer Storage and Recovery in Near-Surface Aquifers: Development of a New Recharge Approach Using Small-Diameter, Low Cost Wells

This study involves the development of a new recharge approach using small-diameter, low-cost wells for aquifer storage and recovery utilizing direct push technology. These injection wells are low in construction and maintenance costs and limited to depths of less than 30m. Potential sites for the aquifer recharge have been chosen and simulations are planned.

## Governor's Conference on the Future of Water in Kansas

The second statewide Kansas "Governor's Conference on the Future of Water in Kansas Conference" was held on October 24-25, 2013 in Manhattan, Kansas. The conference was highly successful with 584 people attending both days of the conference. Attending the conference was the Governor of Kansas, Sam Brownback, and several state and national senators and representatives. The Governor fully supports this conference and has expressed his concern about the issue of preserving and protecting the future viability of water in Kansas. Thirty-eight volunteer scientific and 9 invited presentations were presented in plenary and concurrent sessions. Thirty-eight scientific posters were presented in the poster session. An undergraduate/graduate student poster award program was conducted to encourage student participation. Twenty-four students participated.

## Water Research for the Fort Riley Net Zero Initiative

Kansas State University is working with Fort Riley personnel, EPA ORD, and EPA Region 7 to develop strategies for meeting the Department of Defense Net Zero Water goals. Specific project objectives for the Fort Riley demonstrations are:

1. Investigation of methods for safe reuse of waste water through the decentralized treatment of water from sewer lines;
2. Containment, control and disposal of large volumes of wastewater following an event involving biological agents;
3. Use of engagement, education, motivation, and empowerment to reduce water demand at Ft. Riley, with a measurement of the effectiveness of each.

## Impacts of In-channel Dredging on the Morphology of the Kansas River

Two active dredge holes in the Kansas River were surveyed using an ADCP (Acoustic Doppler Current Profiler) on two occasions, once in Fall of 2012 and once in Spring of 2013. During this time period, no significant transport active flow occurred on the Kansas River. Repeat surveys show substantial deepening and enlargement of each dredge hole due to continued excavation and no/insufficient transport-related replacement or infilling by the river. Resampling will occur with the ADCP when flow rises on the Kansas River.

## Evaluation of the Kansas P Index using APEX

Substantial progress was made in calibrating and validating the Agricultural Policy Environmental Extender (APEX) model for use in predicting phosphorus (P) loss from agricultural fields. The researchers identified sensitive input parameters involved with simulation of P loss from 11 field-scale watersheds, which included seven different cropping and management systems. The results showed that the APEX model can accurately predict water loss with little or minimal calibration, however, the APEX model required calibration for accurate prediction of sediment and total P loss. The researchers are conducting sensitivity analysis of the calibrated parameters and comparing results to similar research conducted in Missouri and Iowa to determine if they can identify a set of optimum parameter values for use in the Heartland region.

A second study was started to determine the appropriate P sorption parameters for modeling P leaching in small packed soil columns. Preliminary research has been completed to identify the appropriate flow rates and column packing procedures. A simulation model was developed in MatLab to predict P leaching based on the convective dispersive equation with retardation factors based on linear, Freundlich, and Langmuir equations. The model will be expanded to include kinetic rate coefficients and three P pools. The model results will be compared to results from column leaching studies.

## Investigation of Recharge to the High Plains Aquifer, Northwestern Kansas

This study directly addresses the issue of water availability in a high priority area of the High Plains Aquifer by identifying recharge sources, quantifying recharge amounts, and providing important information on the behavior of low permeability units that have become perched as a result of declining water levels. In areas of groundwater mining, year-over-year increases in water levels are not expected to occur because water extracted from the aquifer is not replaced by recharge. In one area of the Kansas High Plains Aquifer with assumed groundwater mining conditions (water level declines exceed 20 m, saturated thicknesses reduced in excess of 35% of pre-development values), unexpected year-over-year increases in water-levels were recently recorded by enhanced monitoring as part of the Kansas Geological Survey (KGS) Index Well Program. Hydrograph analysis indicates post-irrigation season recovery is not tied to precipitation, amount of water pumped, length of pumping, or pumping rate. Rather, recovery is constant from year to year – indicating an unknown source of inflow (recharge) to the system.

## Getting the Information Modelers Need: Extracting Hydrostatigraphic Information From Driller's Logs

Understanding aquifer characteristics is important for effective ground-water management practices. A largely overlooked source of geologic information is drillers' logs, which contain vast amounts of qualitative information regarding subsurface structure. The purpose of this project, which has recently been dubbed HyDRA (Hydrostratigraphic Drilling Record Assessment), is to develop and test procedures for employing this lithologic information in the development of quantitative three-dimensional depictions of subsurface properties for estimation of aquifer yield and use in flow and transport models. In project year 2, the researchers continued to develop the 3D groundwater flow model for the Thomas County index well area. Simulated water levels produced by this model, based on the hydraulic property model developed from the drillers' logs, are being compared to the actual water levels observed in the index well and other nearby continuously monitored wells in order to assess the utility of the information provided by the drillers' logs.

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