

## IRRIGATION EFFICIENCY STUDY - KSU AND USGS

A collaborative study is on-going on how effective the more efficient irrigation systems in the Kansas High Plains aquifer have been in reducing total water use, particularly "consumptive water" use. Virtually all parties (local, state and federal) have been vigorously promoting the use of more efficient irrigation systems as a way to achieve water conservation - which has been assumed to mean pumping less water. But do these systems save consumptive water use which is largely driving the aquifer declines?

At concern is whether or not more efficient irrigation systems actually reduce consumptive water use. Potential reasons why these systems may not be achieving such consumptive water savings include:

- ◆ Water saved through more efficiency may be used on another crop
- ◆ More efficient irrigation may allow a higher water use crop to be grown
- ◆ More efficient system may allow more acres to be watered
- ◆ Individual operation of the system may not maximize the efficiency
- ◆ Nozzling or hardware may not maximize system efficiency
- ◆ Reducing deep percolation may make more water available for yield
- ◆ More efficient systems may allow irrigation to continue longer in time

Another aspect of this study is to examine the cost effectiveness of the state cost share programs for water conservation - to quantitatively evaluate water reductions in reported water use per dollar spent. The study is also expected to qualitatively indicate economic benefits to the producer from efficiency upgrade (lower output costs, higher crop yields, or other measures.)

The study will NOT address the following:

- ◆ Motivating factors for individual farmers' crop selection
- ◆ Impact of farm program price supports on farming operations
- ◆ Field checks of acre-inches applied compared to ET by crop
- ◆ Evaluation of KanSched adoption for crop water monitoring

The USGS is using aggregated county data from 1989-2003 to assess water savings and implications of reductions in consumptive use. KSU is using field data comparing water use patterns before and after adoption of more efficient irrigation systems.

A recent study update has already indicated possible data issues. For example, tracking incentive contracts in the state and federal programs by technology has not been consistent; and there are areas with not enough contracts to be relevant; and there are a high number of water right records with complex overlaps that make evaluation difficult.

The final report is due by June, 2006. This will no doubt be an interesting study to follow. We'll keep you posted on any more updates and on the final report when released.

## DISSERTATION COMPLETED

*GIS Integration and Error Analysis for Hydrogeologic Evaluations* is the title of a doctoral dissertation completed by Gary Hecox, Kansas University, which covers NW Kansas (all of this GMD) and parts of NE Colorado and SW Nebraska. The original question was: How many water level data points are required to make confident management decisions and to confidently support any evaluation of said management decisions - in other words, did they work or not? What began as a single question to be answered for 2 small study areas eventually blossomed into much more. Here are some of the conclusions:

- ⊕ Available data in the study area (except Colorado) for the time period 1991-2001 are sufficient to develop regional models for predicting water level declines;
- ⊕ Hydrologically, specific yield changes temporally. Thus different model values are needed to match the observed data - a low value for well interference concerns and a higher value for water level decline rate concerns;
- ⊕ Model prediction errors were approximately equal to observed data errors. Thus more accurate data is needed to develop more accurate predictions;
- ⊕ The current January nonpumping water levels do not adequately represent areas in danger of near-term declines in well yields;
- ⊕ The area aquifer is a series of sub-systems controlled largely by topography;
- ⊕ The underlying aquitard provides about 10% of the High Plains aquifer water;
- ⊕ Groundwater depletion is occurring in Sherman & eastern Thomas/western Sheridan Counties; and 2 areas saw rising water levels in the study time period;
- ⊕ Depletion occurs over areas of 10's of kilometers in scale and trying to manage smaller areas may not have the desired results;
- ⊕ Depletion in Kit Carson Cty, CO will have a long-term impact on water in Sherman Cty, KS;
- ⊕ A well density of 1 well per 3-5 mi<sup>2</sup> is needed to predict an area's loss in well yields;

(continued on back)

## SINK HOLE IN HUTCHINSON

In early January the City of Hutchinson contacted the Kansas Department of Health and Environment (KDHE) about a newly developing sinkhole at the Carey salt mining facility in the SE part of town. The hole was about to encroach on a set of mainline railroad tracks immediately adjacent to the new hole. A recent article in the *Kansas Environmental News* indicates that a group of city, railroad and state officials are continuing to work on solutions to this problem. For more information, contact KDHE's Mike Cochran at 785-296-5560 or visit their web page: [www.kdhe.state.ks.us/geo](http://www.kdhe.state.ks.us/geo) and click on: *Underground News - Spring 2005*.

Brine wells have been constructed and operated in the Hutchinson area since the late 1880s, and prior to the enactment of current regulations these wells were often constructed and operated such that the area was susceptible to subsidence and sinkhole formation at the surface.

These early brine wells were commonly completed and operated such that they caused maximum dissolution in the shallowest salt members (closest to the roof of the cavern) and exposed the shale in the open borehole above the salt formation to injection pressures, water and brine which weakened these formations to a point where they could subside and fall into the cavern - eventually resulting in the formation of a sinkhole at the surface.

This mechanism is not the only way sinkholes form in Kansas. Other holes already open, or known to exist but not yet opened, are the product of improperly plugged oil and gas wells. But this is another story. Current KDHE well construction regulations (since 1979) insure that all wells are constructed with subsidence and most other environmental issues in mind.

## GROUNDWATER FLOW MODEL SHOWN

Thanks to the Kansas Water Office the High Plains Aquifer GMD's were invited to share their booth at the 3i show in Garden City this year. GMD 4 was there the first day operating its groundwater flow model on how water moves underground and moves in response to wells pumping and natural discharge areas. The KWO backdrop of High Plains Aquifer groundwater mapping was impressive and brought a lot of people in to look at their specific areas and talk about water issues. The model was also demonstrated for the 2005 Leadership Kansas Class during their Colby Session held May 26. The group asked many questions and appreciated the demonstration.

Non-Profit  
U.S. Postage  
PAID  
Permit #12  
Zip + 4  
Colby, KS

Northwest Kansas Groundwater  
Management District No. 4  
PO Box 905  
1175 S. Range, Colby, KS 67701-0905

CHANGE SERVICE REQUESTED

Assisted by RSPY Printed on recycled paper with soybean ink

**DISSERTATION COMPLETED** *(continued from Front)*

- ⊕ Distribution of recharge appears to differ from published maps;
- ⊕ Hydraulic conductivity and specific yield are reasonably precise across the study area but for parts of Sherman and Cheyenne Counties, KS;
- ⊕ Published bedrock maps are reasonably precise;
- ⊕ Decline areas are well defined and do not translate very far;
- ⊕ The evaluation and modeling methods used can be used in other areas of the western High Plains aquifer with water level declines; and
- ⊕ In order to improve groundwater predictions, the current data needs to be supplemented on a similar scale to the 2 detailed study areas - not necessarily over the entire aquifer, but certainly in decline areas.

These are not all the conclusions and recommendations of the dissertation, but they are perhaps the most interesting to non-technical readers. The included maps tell much of the story, but alas, they are in color and would not render well in our newsletter. The entire Dissertation is available in the district office.

**EQIP PROGRAM ASKED TO FOCUS**

The EQIP ground and surface water program in Kansas is being asked (by local GMDs, some state agencies and others) to focus most of its funding on reducing consumptive water use in the High Plains Aquifer, with locally set "quick response areas" getting top priority. The state technical committee will consider this recommendation on July 21. If approved, state conservationist Harold Klaege must also approve it. If successful, next year's program will offer increased incentives for setting aside irrigation water rights in these special areas. More info to come.

**WATER RIGHT FLEX ACCOUNTS AMENDED**

The Governor recently signed a bill amending the multi-year flex accounts available to water right owners. Under this new bill, a water right owner can reconstitute his or her existing water right into a 5-year allocation with no annual limitation (but for the full 5-year amount). The 5-year quantity will be not more than 90% of the average 1992-2002 annual water use, times 5 - except that if significant water conservation measures had been implemented in each year of this 10-year period, the 10-year period immediately ahead of the first year of conservation could be approved for use by the chief engineer.

Before the amendments, the 5-year period from 1996-2000 (again, with the same water conservation exception) were to be used. Also the "not more than 90%" quantity was specifically set at exactly and only 90% of the average annual water use times 5. Both bills were intended to give irrigators more annual water use flexibility in exchange for a 10% reduced water right. If you think you're interested, contact DWR or your GMD about your 1992-2002 reported water use history.

**REMINDER ON METERS**

The district's new metering requirement will begin implementation in 2006 with meter orders generated later this year for all wells in the NW quarter of any district section. The orders will come from the division of water resources. All NW/4 wells will need to be metered before the well pumps in 2006 or by December 31, 2006 - whichever date comes first. For those wanting to get a head start on next year, the NE/4 wells will be due in 2007. For any questions, contact the district office. More program details will be provided in the next newsletter.

**The Water Table**

Sponsored by the NW Kansas Groundwater Management District No. 4, 1175 S. Range, Colby, KS 67701-0905. Office hours: 8:00 a.m. to 5:00 p.m. Monday through Friday (except the noon hour) - closed during State holidays.

**DIRECTORS:** Roger Zwegardt - St Francis, CN Cty; Monty Biggs - Atwood, RA/DC Cty; Robin Deeds - President, Goodland, SH/WA Cty; Dave Rietcheck - Goodland, SH/WA Cty; Jon Friesen - Vice President, Colby, TH Cty; Lon Frahm - Colby, TH Cty; Mitch Baalman - Secretary, Menlo, SD Cty; Bill Nondorf - Hoxie, SD Cty; Doug David - Hill City, GH Cty; Scott Maurath - Oakley, LG Cty; Dave Mann - Treasurer, Quinter, GO Cty

**STAFF:** Wayne Bossert - Manager; Ray Luhman - Assistant Manager; Dan Simmering - Field Technician; Rita Wade - Secretary/Receptionist; Ron Vignery - Attorney

ADDRESS CORRECTIONS ARE APPRECIATED

**2005 WATER CELEBRATION**

Kansas Association for Conservation and Environmental Education (KACEE) will hold the **2005 Water Celebration Planning Workshop** (with the Topeka Water Festival) on **September 22-23** at the Topeka & Shawnee County Public Library. The workshop is open to anyone currently implementing, or wishing to implement a school or community water celebration event in Kansas.

A water celebration is an educational, interactive and fun event to increase awareness and appreciation of local water resources and issues. This workshop will include experienced water celebration planners from across Kansas and is designed to provide tools for planning water celebration events.

Registration is \$15.00, and travel stipends are available. Registration deadline for those applying for travel stipends is August 23, and for all others is September 8, 2005. Registration forms, the agenda, and grant information are available online at [www.kacee.org](http://www.kacee.org) For more information call or email Melissa Arthur at 785-597-5452 or [MelisArth7@aol.com](mailto:MelisArth7@aol.com).

**OIL AND GAS PRODUCTION NUMBERS**

According to the Kansas Geological Survey (KGS) there were 1,706 operators producing oil in Kansas in FY 2004 producing a total of 34,047,466 barrels of oil (bbl) ranging from the top producer at 1,497,848 bbl to the lowest at 2 bbl. The top 20 operators produced 37.9% of the total oil, or 12,904,867 bbl. There were also 903 gas operators who produced a total of 414 billion cubic feet (Bcf). For gas production, the top 20 operators produced 77.3% of the total. While oil production was up about 500,000 bbl from FY 2002 production, gas production was down 58 Bcf from FY 2002. 34 Mbbbl = 4,382 AF. What do you suppose is the KS oil level decline?

**NOTE:** With all the spam, viruses and junk emails about, the district is now taking a "safe" approach regarding incoming emails. If we don't recognize your name or a GMD/Water-related subject, the email will not be opened. Please help us avoid missing your emails by clearly making us aware that your email is meant for us and is relating to district business. Thanks, Wayne.

**Pumping the Tailwater**

*Editorial Comment by Wayne Bossert, GMD 4 Manager*

**REVISITING ITAP**

Last edition I expressed disappointment in the lack of Legislative support for the proposed ITAP (Irrigation Transition Assistance Program) effort. I lamented that we at the district level are being asked to slow the decline rates and/or increase river baseflows and then all our proposals for doing so (ITAP; Circle K; Regulation by IGUCA) are being rejected. I asked rhetorically if the Legislature did not like the decision to reduce water use, or, did they just oppose the ways we are proposing to do it. To me it all boiled down to a question of whether or not the state had the right goal, and did the Legislature agree with it. If not, we'd better be looking for some common direction.

Most everything we've tried by regulation or enhanced planning to date, including the new ITAP, has been designed either to use less water at the expense of the economy, or, to boost the economy with precious little regard for what happens to post water use patterns. The value-added efforts, 2-pool proposal, irrigation efficiency improvements and the Ogallala protocol program are all examples. These efforts may be producing some results toward their singular goals, but they can actually offset each other - producing progressively stronger arguments over which is more important - the water or the economy.

We should be focused and looking for ways that simply and directly use less consumptive water AND increase economic returns. We need to be rewarding ideas that do both. What if the new version of ITAP were to sponsor some "X-Prize" awards for the best approaches to reducing consumptive water use AND increasing economic returns on the reduced water use?

With such incentives there should be created a "fertile climate" for entrepreneurial, innovative, and focused ideas to meet the new (and common?) state goal. Once the very best ideas are evaluated and chosen, the only thing left to do is make sure all the state movers and shakers and planners are in concert with, and prepared to support, the ideas into implementation.