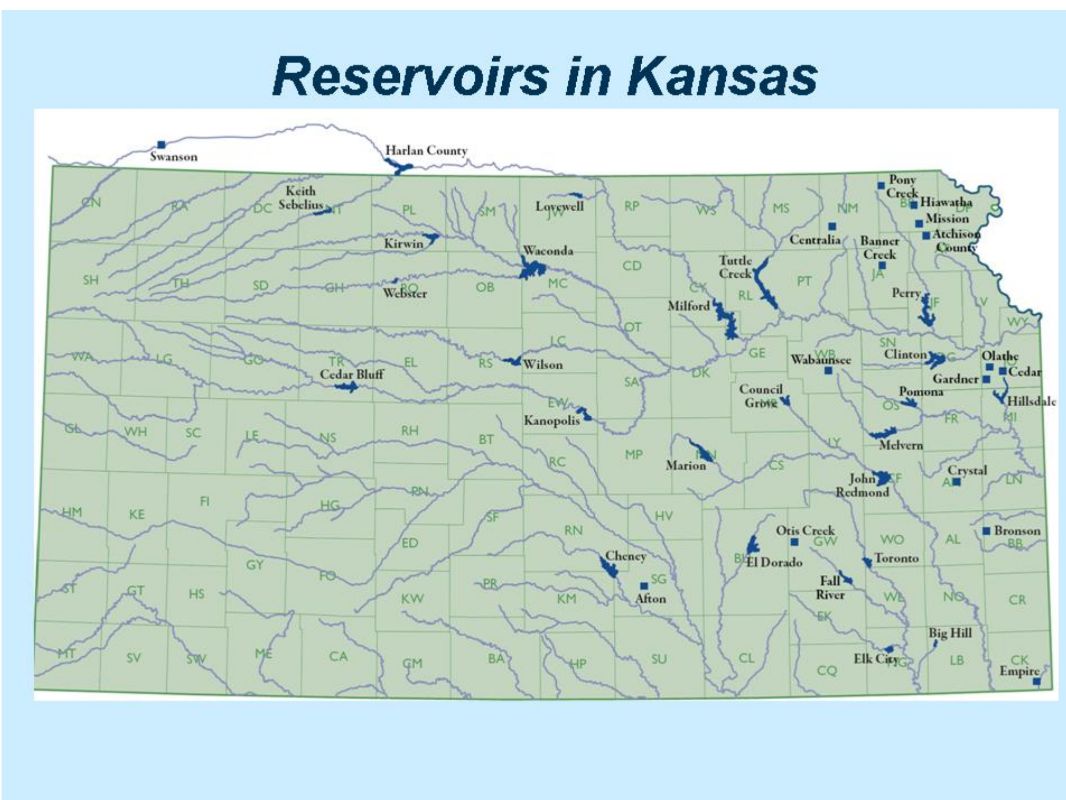
Number 227
January 22, 2010

1. Sedimentation rates of reservoirs in Kansas

Many Kansans in the eastern half of the state rely primarily on surface water for their domestic water supply. Federal reservoirs were originally constructed as a means of flood control, but the state of Kansas eventually purchased the right to use the water stored in the reservoirs. They now serve as the main source of water for many municipalities.



Even when these reservoirs were constructed, it was widely known that sedimentation would occur and eventually reduce their water-holding capacity. But many of the reservoirs have been experiencing higher rates of sedimentation, and are losing water-holding capacity more quickly, than anticipated. The chart below shows the current percent loss of original storage capacity in Kansas reservoirs.

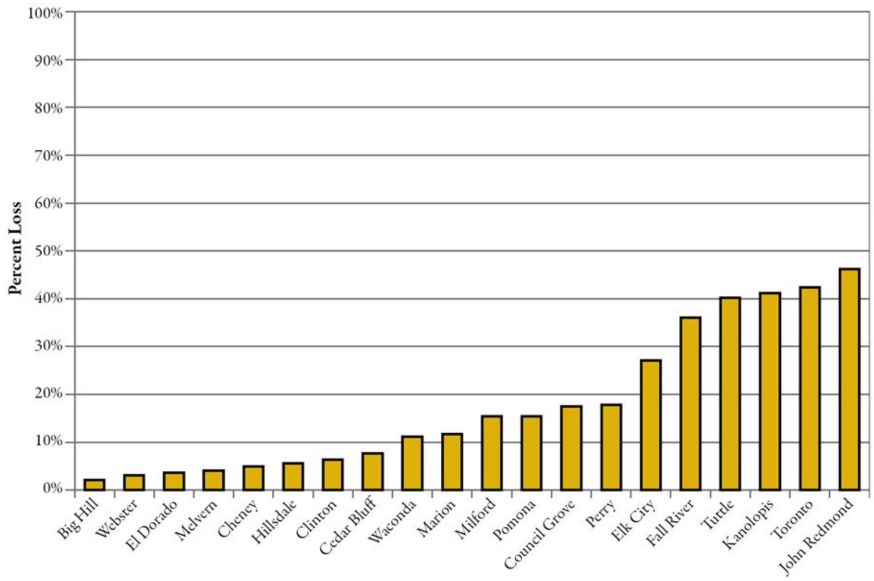
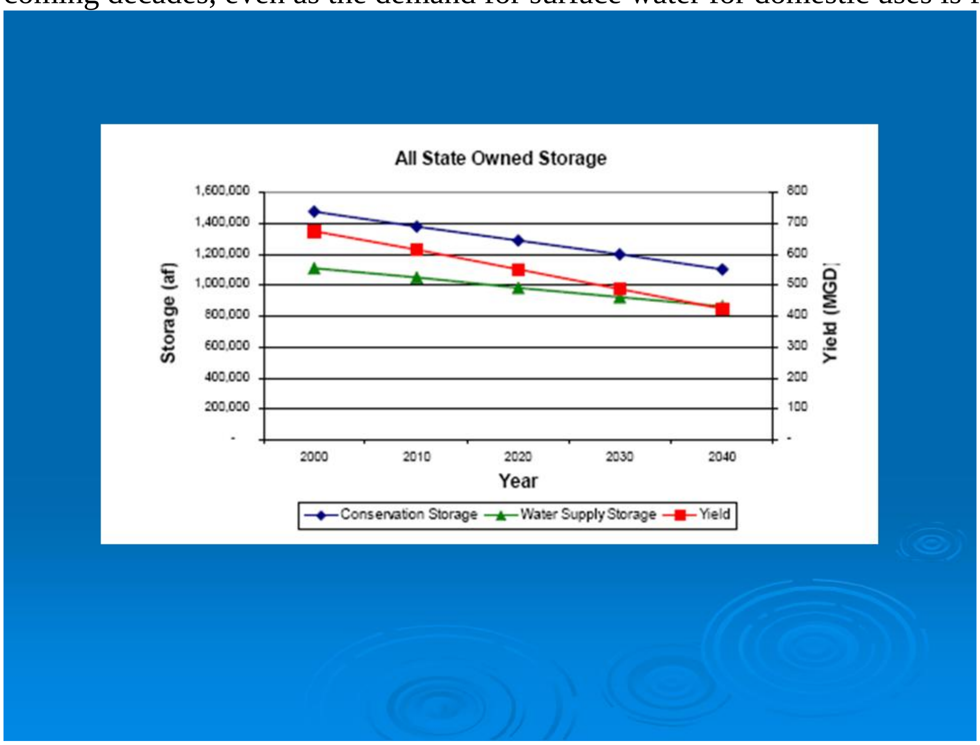


Figure 5. Loss of multipurpose pool water-storage capacity in Kansas federal reservoirs
Data source: KWO (2008)

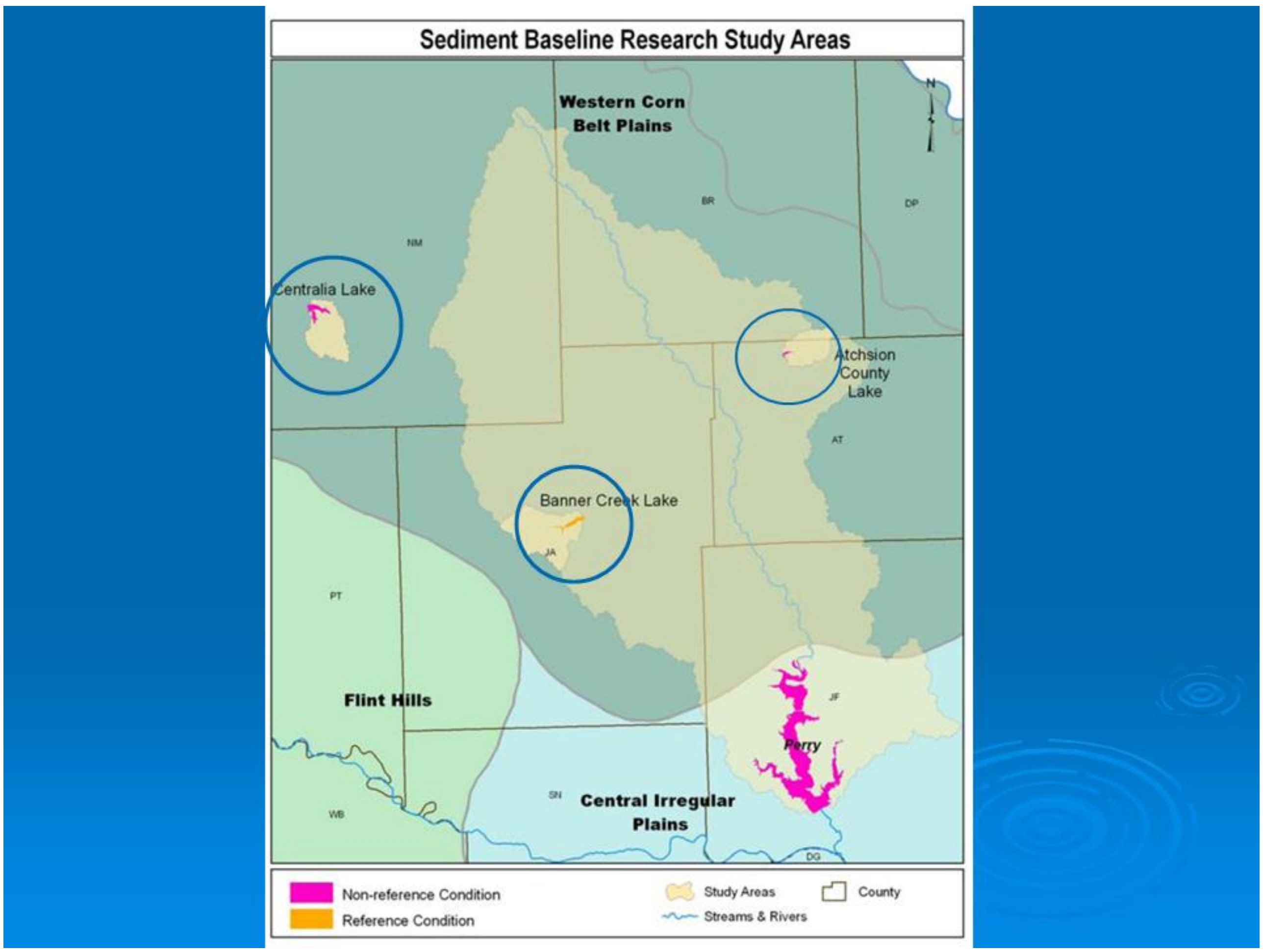
The amount of all state-owned water storage capacity is forecast to continue to decline over the coming decades, even as the demand for surface water for domestic uses is forecast to increase.



Water storage capacity is being lost because of sedimentation. To address this problem, the Kansas Water Office led the development of "Sediment Management Strategy Outline" in 2005. Then, in 2006, the Kansas Water Resources Institute (KWRI) at K-State convened a sediment discussion of state and federal agencies and universities to develop a series of sediment white papers. In 2008, KWRI convened a follow-up conference to review the white papers and discuss the development of a research strategy to identify sedimentation factors. Since the 2008 meeting, the group has continued to develop a "Sediment Baseline Assessment Research Plan."

Sediment Baseline Assessment Research Plan

The group chose three representative watersheds to study. Seven watershed characteristics are being assessed: geomorphology, hydrology, geology/soils, riparian condition, land use/management, and biology and water chemistry. The goal is to relate watershed characteristics to sediment loads.



At K-State, we have been charged with studying the land use/management characteristics of these watersheds. With the help of county Extension agents, we have been doing detailed ground-level surveys of each square mile of land within the watersheds, making note of tillage practices and conservation structures. This information will be combined with all the other characteristics (which is being collected by other agencies, including the Kansas Biological Survey; KU Department of Civil, Environmental, and Architectural Engineering; U.S.

Geological Survey; Kansas Geological Survey; Kansas Forest Service; and Kansas Biological Survey and Kansas Department of Health and Environment).

We will then have a more complete understanding of what factors are most important in sedimentation rates of reservoirs within a watershed. To date, our survey of land use/management characteristics show that high rates of sedimentation are related to higher percentages of cropland using conventional tillage, and low rates are related to higher percentages of land in permanent grasses. In addition, where there are more acres of land that have terraces with waterways, sedimentation rates are lower.

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2. Effect of prescribed burn timing on both grasses and undesirable plants

In just another month or so, it will be time to start conducting prescribed burns on cool-season pastures. Temperatures have been mild in southeast Kansas, and soils have good moisture. This could cause some of the cool-season pastures starting to green up earlier than normal.

Cool-season pastures, such as tall fescue and smooth bromegrass, are normally burned in late February or March, if soil moisture is good. If the grass is green and starting to grow, producers could start burning cool-season pastures by mid-February. Cool-season grasses should have about 1 to 2 inches of new growth before burning. At this stage, the plants are able to regrow quickly.

There is no agronomic reason to delay the prescribed burn until later in February or March if the grass is already growing. If the weather suddenly turns extremely cold shortly after a cool-season pasture is burned, that does not predispose the plants to more severe winterkill injury. However, cold temperatures may delay growth. Warmer soil temperatures following burning due to removal of protective insulation usually results in more rapid growth and earlier maturity. The key reasons for burning cool-season pasture are to remove heavy accumulations of mulch or old growth , annual grass control, and to control eastern redcedar.

Warm-season range grasses will not start growing until later in the spring, regardless of how warm the winter temperatures are. The time to burn native warm-season grasses depends upon your goals. Increased livestock gains and brush control are normally enhanced by burning in the mid- to late-spring when the native grasses have an average of ½ to 2 inches of new growth. This usually occurs by mid- to late-April in the Flint Hills region, and early-May in northwest Kansas. Ideal dates may be shifted as much as 10 days earlier or later, depending on temperatures. Ideally, the soil profile should have adequate water at the time of burning and the surface should be damp.

Other reasons for burning include improved livestock distribution, wildlife habitat enhancement, maintenance of CRP stands, and conservation of native plant communities. Timing for these purposes is more flexible and can be done earlier. CRP should be burned between February 1 and April 15.

Timing of the prescribed burn will affect species composition on grazed rangeland. Big bluestem, indiangrass, and switchgrass basal cover increase when the range is burned in late spring compared to unburned sites. The basal cover of little bluestem is normally maintained by late-spring burning. In the tallgrass prairie area, late spring burning will generally maintain sideoats grama and buffalograss, but increase the basal cover of blue grama. Kentucky bluegrass seems to be decreased by burning at any time of the year.

On grazed tallgrass rangeland early burning reduces forage yield. There is no difference in forage yield between a late-spring burn and unburned range. Long-term research on the Aldous Burn Plots near Manhattan has shown that annual burning on ungrazed prairie in late spring over many years does not reduce overall forage yields. Repeated annual burning does result in a gradual decline in the percentage of broadleaf forbs and cool-season grasses (in a warm-season grassland), and an increase in the percentage cover of warm-season grasses. When annually burned rangelands are grazed, this shift is not as pronounced and a greater mix of various grasses and forbs is maintained.

With no burning over the long term, the cover of woody plants increases by about one percent per year initially, but then accelerates such that prairie grasses and forbs can be completely displaced by 100 percent tree and shrub cover in less than 40 years.

The effect of burning on undesirable woody plants and forbs will vary, depending on the growth habit. In general, plants are more easily killed by burning when their growing points are aboveground, are unable to resprout from belowground, and their food reserves are at the lowest point.

Burning readily kills eastern red cedar, especially when it is less than 5 feet in height. It does not have buds that can resprout, so when this plant is defoliated, it dies. Larger cedar trees will generally not be killed by fire and must be cut at ground level to be controlled. Buckbrush (coral berry) or sand plum must be burned in late spring for 2 to 3 consecutive years for effective control. During late spring, these plants are actively growing and fire destroys the topgrowth. Regrowth is slow since its food reserves are low. Successive burns prevent buildup of food reserves and eventually kill the plant. Western ragweed and western ironweed are perennial forbs, which can also be reduced with 2 or 3 consecutive late-spring burns.

Smooth sumac has a life cycle similar to warm-season grasses in that it doesn't reach the lowest point in its food reserves until late May or June. Burning in late spring will kill the topgrowth, but results in an increase in the number of stems that resprout from belowground buds. The net result is that smooth sumac will actually spread more rapidly as a result of late-spring burning.

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3. Does stacked-trait corn pay on dryland?

Most corn hybrids now come with at least one or more transgenic traits – resistance to corn borers, corn rootworms, other caterpillar insects, or glyphosate. Often, two or more of these traits are "stacked" in a given hybrids. Although glyphosate tolerance has an obvious weed-control benefit and corn borer resistance makes sense in many situations, the value of the rootworm resistance trait in hybrids for dryland corn in the Great Plains is not immediately apparent.

Dryland corn is most often planted in rotation with other crops, usually with at least two years between corn crops. In Kansas, the corn rootworm has not been documented to display the variants found in areas of the Corn Belt, making rotation an effective tool for reducing feeding damage to roots and protecting yield.

Yields of dryland corn are often less than 100 bushels per acre. This leads to the question: Do stacked corn hybrids, with rootworm resistance along with corn borer and glyphosate resistance, pay in dryland production systems in the Great Plains?

To answer this question, we analyzed yield data from the K-State dryland corn performance tests. All tests included in this analysis were conducted in no-till cropping systems using rotations such as wheat/corn/fallow, wheat/corn/soybean, etc. Since 2000, these tests have included hybrids with different traits and combinations of traits, including stacked hybrids. However, yields are highly variable across years and locations in these tests, making traditional calculations of average yields over years and locations essentially useless for hybrid comparisons.

To make good comparisons, we can use a method developed by Arlin Feyerherm, former K-State statistician, to come up with the differential yielding ability (DYA) of corn hybrids in the tests. This allows us to standardize yields based on yields of check hybrids present in all tests in a given set of years.

Yields of top-yielding hybrids with different sets of traits from Kansas corn performance tests.

Trait Group	2001-2004 Yield	2001-2004 Standard error	2005-2007 Yield	2005-2007 Standard error	2007-2009 Yield	2007-2009 Standard error
	bushels per acre					
Conventional	74	1.6	81	1.9		
CB (corn borer)	80	1.1	88	2.2	124	1.5
CBRW (corn borer, rootworm)					122	4.9
HX (corn borer)			80	3.0	117	4.2
HXX (corn borer, rootworm)			97	8.2	118	4.1
RR (Roundup Ready)	70	2.2	84	2.3	115	3.5
RRCB	70	3.1	92	1.9	123	2.1
RRHX			87	6.9	118	2.6
TS (RR, corn borer, rootworm)			90	2.8	122	2.4
VT3 (RR, corn borer, rootworm)			93	4.2	133	1.9

The first set of years (2001-2004) included only conventional, corn borer resistance (CB), glyphosate resistance (RR), and combinations of those two traits. Top-yielding hybrids containing corn borer resistance traits yielded an average of 6 bushels per acre (9%) more than top-yielding conventional hybrids. Hybrids with RR traits and combinations of RR and CB traits were either similar to or less than conventional hybrids in this set of years.

The second set of years (2005-2007) included stacked hybrids with both CB and RW resistance traits in the same hybrid. Hybrids with resistance traits yielded up to 19% more than conventional hybrids in this set of tests. Hybrids with insect resistance traits yielded up to 11% more than hybrids with glyphosate resistance traits only. Hybrids with both CB and RW traits had yields similar to hybrids with only CB traits.

The last set of years (2007-2009) overlapped the previous set because the check hybrids overlapped, providing a greater number of comparisons. These tests contained an insufficient number of conventional hybrids to make meaningful comparisons with the various trait groups. Hybrids with insect resistance traits yielded up to 15% more than hybrids with glyphosate resistance only. Triple stack hybrids (TS) had yields similar to hybrids with the CB trait only. However, VT3 hybrids had a 7% yield advantage over RRCB hybrids.

Conclusions

Results of this analysis indicate the potential for yield benefits of 2% to 5% or more with stacked hybrids compared to CB-only hybrids in dryland production in the Great Plains. This advantage was not always consistent and depended on the set of years being examined and the specific hybrids being compared. To do an economic analysis, we can focus on two situations:

* *Yield potential of 60 bu/acre or more*. If we assume a market price for corn of $3.79/bushel and additional seed cost of $11/acre for stacked hybrids, the stacked hybrids will result in higher profits if they provide at least a 5% yield advantage.

* *Yield potential of 150 bu/acre or more*. Using the same price assumptions, stacked hybrids are more profitable if they provide at least a 2% yield advantage.

A few qualifiers must be kept in mind when considering the above analysis. The data set contained a limited set of hybrids. Hopefully the performance tests contain the best hybrids companies have to offer, but not all companies enter their hybrids in these tests. Another consideration is that stacked hybrids may have represented the latest genetics. In any year, the newest hybrids were typically those with the greatest number of traits. Finally, the price differentials used for this economic analysis may not reflect current conditions. The pricing structure for hybrid seed changes constantly, and prices paid vary greatly depending on timing, volume, special offers, etc.

It is important for corn producers to look at independent yield data, compare the whole hybrid package – not just traits, and make their own comparisons using their own costs and prices. Taking advantage of seed pricing and grain marketing opportunities will reduce the yield advantage required to make stacked hybrids profitable.

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4. NC Kansas Experiment Fields winter update and farewell to Barney Gordon, Feb. 4

The winter update meeting for the North Central Kansas Experiment Fields at Scandia and Belleville will be held on February 4 from 9:30 am to noon in the 4-H building at the Republic County Fairgrounds in Belleville. Topics to be covered include an overview of ongoing research at the experiment field, biofuels research, soybean production issues, and weed control. In addition, the meeting will also serve as an opportunity to say farewell and recognize Barney Gordon for his many contributions at the fields over the years. A meal will be served at the conclusion of the meeting.

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, or Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu