

NewsWatch

Sedimentation can't be stopped, but it can be slowed

By TYLER HARRIS

KANSAS' federal reservoirs aren't that old. The first one, Kanopolis, was built in 1948.

Two-thirds of Kansans rely on these reservoirs for water in one way or another. There are another 200,000 impoundments of all sizes across Kansas. As many know, these reservoirs are facing a problem. "They're all filling with sediment, and we can't stop it," says Jerry deNoyelles, deputy director and senior scientist at the Kansas Biological Survey and University of Kansas professor of ecology and evolutionary biology.

On average, all 24 federal reservoirs in the state will have lost 43% of storage capacity by the end of the century — that's about 2.3 billion cubic yards of sediment. Already, an estimated 838 million cubic yards have accumulated. Some reservoirs have lost more than others. Eleven of the 24 reservoirs will have lost 50% or more of their original storage capacity by the end of the century, most notably Tuttle Creek, which will be half infilled by 2022. For all 11, that's about 927 million cubic yards, or 522,000 football fields covered in sediment 1-foot deep.

"As the century proceeds, at a clip of 17.6 million cubic yards a year we will reach 2.3 billion cubic yards of sediment, and a financial liability of about \$13.8 billion at today's costs if we were to remove it all by dredging. It would cost \$106 million to remove just what is coming in each year," deNoyelles says. While there are examples where dredging is necessary, like John Redmond Reservoir, deNoyelles says, "It is not the answer."

A handle on the situation

It isn't certain what the best solution is, but increasing the amount of water available helps buy some time until that solution is reached, although costly and not practical in certain cases. For example, reservoir water level can be raised, new reservoirs can be built, and water can be

Key Points

- By 2100, 11 of Kansas' 24 federal reservoirs will be 50% infilled.
- Sedimentation can be reduced; saving water buys more time.
- Some reservoirs are infilling faster than others; key step is finding out why.

transferred — eight of the 11 reservoirs most impacted by sedimentation are within 35 miles of one of the 13 that aren't.

What about sedimentation? About 90% of sediment that enters a reservoir does so 10% of the time, during high flows. So, bypass systems are often used to channel this water around the reservoir. However, these reservoirs usually aren't designed for flood control. Most reservoirs in Kansas are, so this isn't a likely possibility.

A more practical option is building a settling basin above the reservoir to catch sediment before it can enter, providing an opportunity to excavate sediment more easily. Some basins use a pipe going through or around the reservoir, allowing the basin's normal flow to pick up sediment, bypass the reservoir and deposit it downstream.

Another possibility is flushing the reservoir, which can be done one of several ways. This includes releasing water at the bottom of the dam, stirring up sediment and taking it downstream; changing the shape of the reservoir to be more conducive to flushing; or even using a mechanical arm equipped with a dredge continuously moving across the bottom of the reservoir, stirring up and siphoning out sediment.

Conservation is key

As deNoyelles notes, these options require "fundamental changes in the way [reservoirs] are designed and operated," quoting the Reservoir Sedimentation Handbook written by Morris and Fan in 1998. "We really have quite a challenge,"

he says, because 200,000 impoundments are already built. "We already have all these reservoirs, and it's not always so easy to go back and redesign them and change them so they can be operated differently."

That's why soil conservation is important. It won't stop sedimentation, but will slow it down.

"What we're ultimately looking at is a combination of managing reservoirs and preventing soil erosion. What farmers have been doing for decades is very important, and now we know stream bank erosion may be contributing more than we thought," he says. "If we hadn't been using soil conservation practices, we'd have a whale of a bigger problem. We have to remain vigilant about slowing down erosion to give time to make design and operation changes."

What can be done immediately is conserving more water to reduce demand. "There's no question it works, there's no question we can do it, and there's no question it would be effective. We just need to do it. What it comes down to is using less water," deNoyelles says. "There's no easy fix for this. We've got to begin to use less water. We can do a heck of a better job than we have been doing. Kansans are good at these kinds of things. They just need to realize it."

Why sedimentation happens

Why is sedimentation happening? Kansas' reservoirs were built for good reason — to store water for future use, and later, for flood control. However, certain characteristics of reservoirs promote infilling, deNoyelles says. "Reservoirs are not natural lakes," he says. "We have problems with reservoirs we don't have with natural lakes, yet we think of reservoirs as natural lakes, and they'll take care of themselves."

Reservoirs are often built on long, narrow river channels with the intent of slowing down flooding, and built on larger watersheds to maximize water collection. This means reservoirs are constantly barraged with intensive flows from one prominent source and are more subject to sedimentation. However, some reservoirs, like the 13 other federal reservoirs, are less subject to sedimentation than others. "You have a series of them that are less than 5% infilled," deNoyelles says. "You have a series of them that are approaching 40% to 50% infilled."

It isn't just a matter of age or size. Some fairly new reservoirs and both small and large reservoirs are approaching 50% infill. However, some reservoirs with large size relative to the size of the watershed are infilling less. The answer most likely lies in the watershed's location and condition, deNoyelles says. The amount of extreme rainfall events, ground cover and cultivation, and topography are all factors. "Why are there such differences [in the 13]? We don't know," he says. "But we had better find out, because it's very instrumental in how we choose our actions."

Advertisement

Trait Stewardship Responsibilities Notice to Farmers

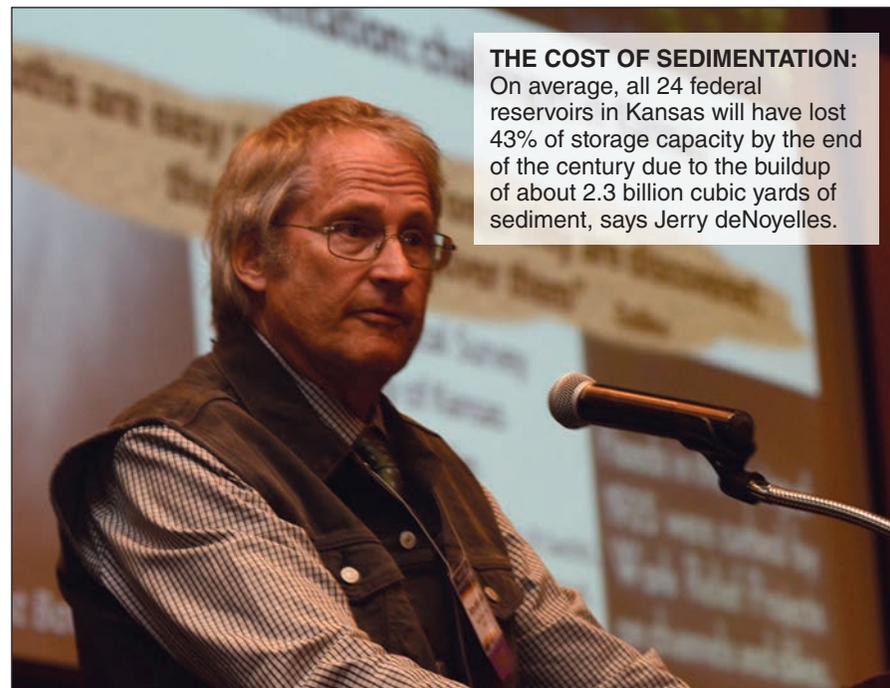
Certain statements contained in this presentation are "forward-looking statements," such as statements concerning the company's anticipated financial results, current and future product performance, regulatory approvals, business and financial plans and other non-historical facts. These statements are based on current expectations and currently available information. However, since these statements are based on factors that involve risks and uncertainties, the company's actual performance and results may differ materially from those described or implied by such forward-looking statements. Factors that could cause or contribute to such differences include, among others: continued competition in seeds, traits and agricultural chemicals; the company's exposure to various contingencies, including those related to intellectual property protection, regulatory compliance and the speed with which approvals are received, and public acceptance of biotechnology products; the success of the company's research and development activities; the outcomes of major lawsuits and the previously announced SEC investigation; developments related to foreign currencies and economies; successful operation of recent acquisitions; fluctuations in commodity prices; compliance with regulations affecting our manufacturing; the accuracy of the company's estimates related to distribution inventory levels; the company's ability to fund its short-term financing needs and to obtain payment for the products that it sells; the effect of weather conditions, natural disasters and accidents on the agriculture business or the company's facilities; and other risks and factors detailed in the company's most recent periodic report to the SEC. Undue reliance should not be placed on these forward-looking statements, which are current only as of the date of this presentation. The company disclaims any current intention or obligation to update any forward-looking statements or any of the factors that may affect actual results.

This information is for **educational purposes only** and is not an offer to sell **Roundup Ready 2 Xtend™**. This product is **not yet registered or approved for sale or use** anywhere in the United States.

Commercialization is dependent on multiple factors, including successful conclusion of the regulatory process. **The information presented herein is provided for educational purposes only, and is not and shall not be construed as an offer to sell, or a recommendation to use, any unregistered pesticide for any purpose whatsoever.** It is a violation of federal law to promote or offer to sell an unregistered pesticide.

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. Genuity®, Ground Breakers®, Roundup®, Roundup Ready®, Roundup Ready 2 Xtend™ and Roundup Ready 2 Yield® are trademarks of Monsanto Technology LLC. ©2014 Monsanto Company. MDIC-15007 FP LC 09_14_REV



THE COST OF SEDIMENTATION:

On average, all 24 federal reservoirs in Kansas will have lost 43% of storage capacity by the end of the century due to the buildup of about 2.3 billion cubic yards of sediment, says Jerry deNoyelles.