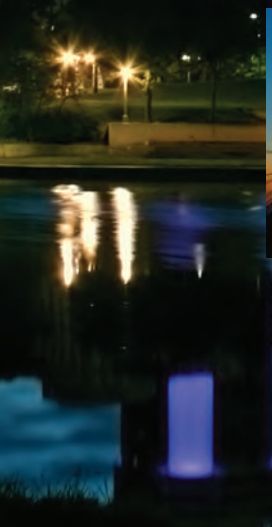
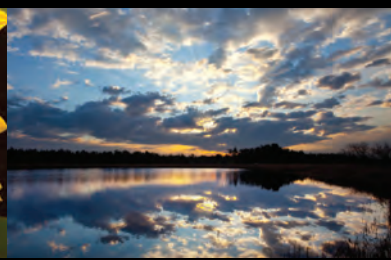
PERC Case Studies

Cheney Lake Watershed:

Farming Water Quality in Kansas





By Reed Watson & Brandon Scarborough

Edited by Laura Huggins

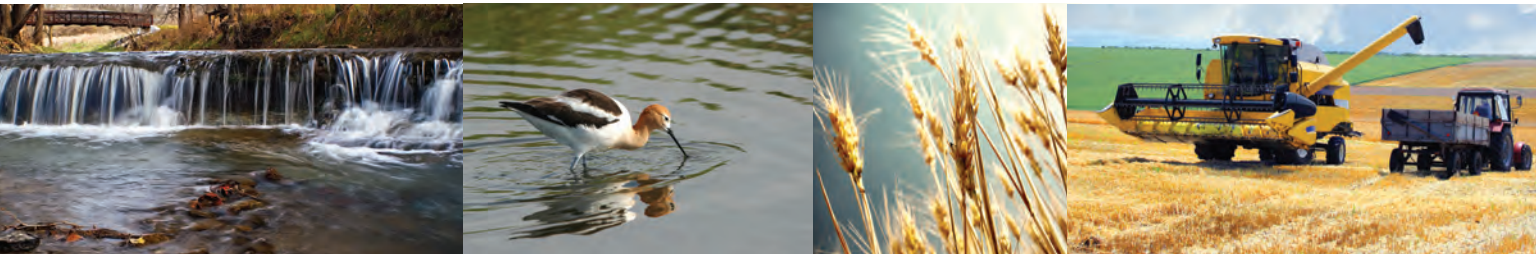
Farmers in the Cheney Lake Watershed in south central Kansas are managing their lands for improved water quality, in addition to agricultural production. In the early 1990s, algal blooms and increased sedimentation in Cheney Lake alerted area residents, farmers, and the City of Wichita, which relies on the lake for drinking water, that water quality could no longer be taken for granted.

In a region dominated by agricultural users, the source of the declining water quality was clear, and local farmers took responsibility. Working cooperatively with water conservation districts, and the City of Wichita, farmers initiated a watershed-wide program to address declining water quality and the associated economic and environmental costs. Since 1994, funding from private and government cost share programs and the City of Wichita has provided incentives to farmers throughout the watershed to implement conservation practices. The result has been widespread voluntary participation by area farmers that have been able to maintain and, at times, improve agricultural production while creating cleaner water for the Cheney Lake Watershed.

BACKGROUND

Just west of Wichita lies Cheney Lake Watershed, an agriculturally rich region spanning 633,000 acres (933 square miles) and five counties. The watershed supports a diverse mix of agricultural operations, from small dairies and livestock farms to commercial scale crop and range lands. The watershed drains into the North Fork Ninescah River, which then flows into Cheney Lake. The lake was constructed in the early 1960s as part of a 100-year project to provide drinking water, flood control, recreational uses, and benefits for local fish and wildlife. It is particularly important to the City of Wichita, which relies on the lake to provide 60 to 70 percent of its daily water needs.

The health of the watershed is critical for fish and wildlife species, farmers, and the City of Wichita. With nearly 99 percent of the watershed lands in agricultural production, management practices have a direct and profound impact on water quality in streams and in the lake. Evidence of these impacts became clear in the early 1990s when algal blooms spread across parts of the lake, killing fish and affecting the taste and odor of Wichita's drinking water. The cause of the blooms was excessive run-off of phosphorus and other nutrients from farms.[1] Accord-



With nearly 99 percent of the watershed lands in agricultural production, management practices have a direct and profound impact on water quality in streams and in the Cheney Lake.

ing to a report from the U.S. Geological Survey, between 1965 and 1998, an estimated 8.4 million pounds of phosphorus was transported through streams to Cheney Lake.[2]

Another threat to the viability of the lake and ecosystem health is excess erosion from farms and stream banks, which clouds stream flows, degrades water quality with excess nutrients, and reduces the storage capacity due to the build-up sediment. Erosion became a particular concern in the 1990s when farmers and anglers began to notice significant changes in the amount of sediment in the lake. Anglers at the mouth of the lake could no longer fish along the shores, but had to walk further and further out across the sediment to reach the water.

The environmental and economic costs of sedimentation and nutrient loading were far reaching. Declining water quality increased treatment costs to the City of Wichita. Furthermore, degraded water quality and habitat had compromised the ecological integrity of the watershed, affecting local fish and wildlife habitat and opportunities for local anglers and recreationists.

ENVIRONMENTAL AND AGRICULTURAL PRODUCTION

Farmers in the Cheney Lake Watershed have incorporated water quality and wildlife habitat into their agricultural practices. In addition to growing crops, they manage their lands in ways that provide improved water quality and enhanced habitat for fish and wildlife species.

FARMING WATER QUALITY

In the early 1990s, farmers Lyle Newby and Marion Krehbiel, members of the local Reno County Conservation District, decided it was time to address the problem of sedimentation and declining water quality. As the primary beneficiary of any water quality improvements, the City of Wichita supported their efforts. In 1994, they formed the Citizen's Management Committee (CMC), a farmer-led organization tasked with implementing the watershed plan. The committee set a goal to reduce sediment loading and phosphorus by 40 to 45 percent and double the life of the lake. In 1999, the CMC established a non-profit organization called Cheney Lake Watershed, Inc. (CLW). This group provides education and assistance to landowners in the watershed interested in improving water quality. As an alternative to regulatory actions, CLW works with farmers and agencies to inform and assist in the implementation of voluntary best management practices (BMPs) or conservation practices

In a cooperative effort with the City of Wichita, farmers, and state and federal agency representatives, a plan was developed to improve and protect water quality.

that improve water quality while preserving agricultural production. To provide incentives to farmers, it obtains funding from private entities to assist landowners in implementing conservation projects.

With a better understanding of how land management practices affect local resources, landowners are more likely to consider environmental outputs, in addition to agricultural outputs, in their management approach. As an alternative to top-down regulations from local governments, this watershed program promotes responsible landowner stewardship that puts environmental outputs in the hands of the landowners.

Landowners are provided with the information needed to integrate BMPs or conservation practices. For example, nutrient management practices, conservation tilling, and wetland restoration can reduce nutrient loading in streams and improve water quality without having to sacrifice agricultural production. Similarly, terrace farming, planting riparian buffers and windbreaks, and conservation tilling reduce soil erosion and sedimentation—allowing farmers to maintain or even improve production levels in the longterm. Watershed projects have been particularly popular with area farmers who see it as an opportunity to be better stewards of the land. To date, more than 2,000 conservation practices have been implemented, protecting approximately 17 percent of the watershed (77,800 acres).

FINANCIAL INCENTIVES

Cheney Lake Watershed, Inc., has partnered with the City of Wichita to protect water quality for more than 300,000 people. The city recognized the economic value of reducing pollution levels in streams and tributaries to improve water quality before it enters the reservoir. To encourage watershed projects, Wichita agreed to provide partial reimbursement (typically

ECONOMIC AND ENVIRONMENTAL COSTS

The economic and environmental costs of nutrient loading and excessive sedimentation in Cheney Lake are far reaching. Sedimentation has reduced the lifespan of the lake and increased the future costs of remediation or replacement. Declining water quality has affected drinking water and raised treatment costs to the City of Wichita. And degraded habitat has compromised the ecological integrity of the watershed, affecting local fish and wildlife populations and opportunities for anglers and recreationists. In the end, the initiative to restore the quality of the watershed was taken, not by the city nor by state agencies or environmentalists, but rather local farmers that realized the importance of responsible land stewardship and the production of ecosystem services.

To encourage watershed projects the city agreed to provide partial reimbursement to farmers for implementing certain conservation practices that reduce pollutants entering streams.

30–40 percent) to farmers for implementing certain conservation practices that reduce pollutants entering streams. Wichita will also provide up to 50 percent of the cost to landowners to install perimeter fencing for maintaining grasslands established under the federal Conservation Reserve Program (CRP).[3] The funding provides incentives to maintain grass and pasture lands when CRP contracts expire instead of returning the lands to crop production. The partnership between the city and farmers is mutually beneficial. Farmers improve their land use practices and potentially their economic returns, while the city reduces water treatment costs and extends the lifespan of the reservoir.

In addition to incentive payments from the city, landowners are usually eligible for federal (Natural Resource Conservation Service or Environmental Protection Agency) or state (Kansas State Conservation Commission) cost share programs. Generally, farmers are eligible for cost share payments between 50–70 percent of the total project costs. Together with the city's incentive payments, the costs to farmers is minimal.

RESULTS

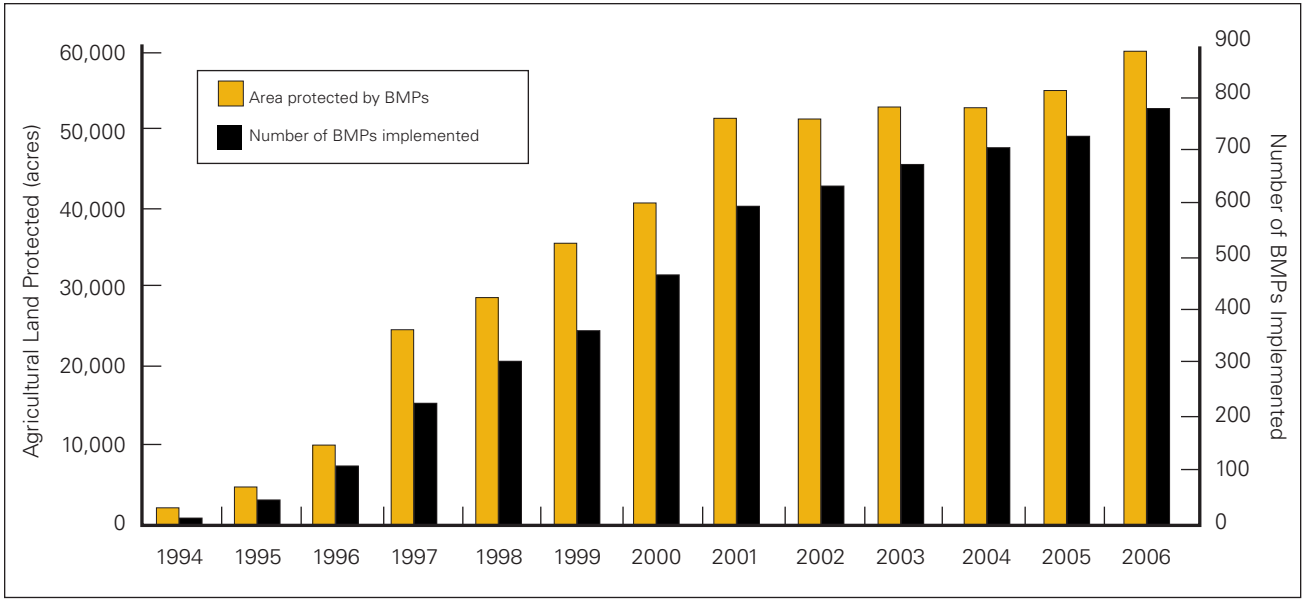
As of 1994, the number of conservation practices and acres protected have increased annually. Between 1994 and 2006, 1,369 conservation projects were implemented—protecting nearly 80,000 acres of the watershed. Since 1996, nearly 1,000 new projects have been completed. To date, 39 different types of practices have been used, with the four most popular (nutrient management,

terracing, waste management, and conservation tilling) accounting for roughly 65 percent of all contracts.

To evaluate the effectiveness of conservation practices in the watershed, Kansas State University and Cheney Lake Watershed, Inc. are conducting a series of studies using data sources from field monitoring, computer modeling, producer interviews, and historical data coupled with statistical, spatial, economic, and social analysis. The research will help to determine the following:

1. Changes in soil erosion rates over time.
2. The effect of BMPs on water quality in select tributaries, streams, and in Cheney Lake.
3. Changes in water quality over time by comparing current measurements with previous data.
4. The best locations for future conservation practices.
5. The social factors that have

Figure 1: Increases in the land area protected by conservation practices and the number of conservation practices implemented in the Cheney Lake Watershed from 1994 through 2006.



Source: Daniel Devlin et al. 2008. *Conservation Practice Implementation History and Trends,* Kansas State University. Available online: www.ksre.ksu.edu/library/h20ql2/EP157.pdf.

influenced landowners to adopt and maintain BMPs.

6. The economic impact of BMPs. Net return for production systems with and without BMP implementation will be computed at the farm scale. These results will be analyzed to examine the trade-offs in net return per acre, variability in net return per acre, and water quality for different BMP implementation scenarios.

LESSONS FROM THE CHENEY LAKE WATERSHED PROGRAM

The management of agricultural lands in the Cheney Lake Watershed is unique in that landowners have incorporated measures to improve water quality into their management practices. What began with informal discussions among area farmers about water quality is now a well-organized watershed-wide program aimed at improving water quality, protecting Wichita's primary water source, maintaining fish and wildlife habitat, and reducing sediment runoff without sacrificing agricultural production. Among the roughly 1,000 farmers, more than 2,000 conservation practices have been implemented on a voluntary basis. The farmers of Cheney Lake Watershed have illustrated that responsible land management begins with the landowner and that a bottom-up approach to watershed management works.

NOTES:

1. The release of an excess of nutrients (phosphorus in particular) into a water-body causes a rapid increase in algal and plant growth. Given the short life span of algal species, there is a concurrent increase in the amount of dead organic matter. The decomposition of this matter by bacteria and other organisms depletes dissolved oxygen levels, creating hypoxic conditions that can kill fish and other aquatic species, including plants.
2. Fertilizer use for crop production was estimated to have more than doubled between 1965 and 1998.
3. The Conservation Reserve Program provides technical and financial assistance to eligible farmers and ranchers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as native grasses, wildflowers, trees, or riparian buffers.

This case study was done in partnership with the Sand County Foundation with support from the Bradley Fund for the Environment.