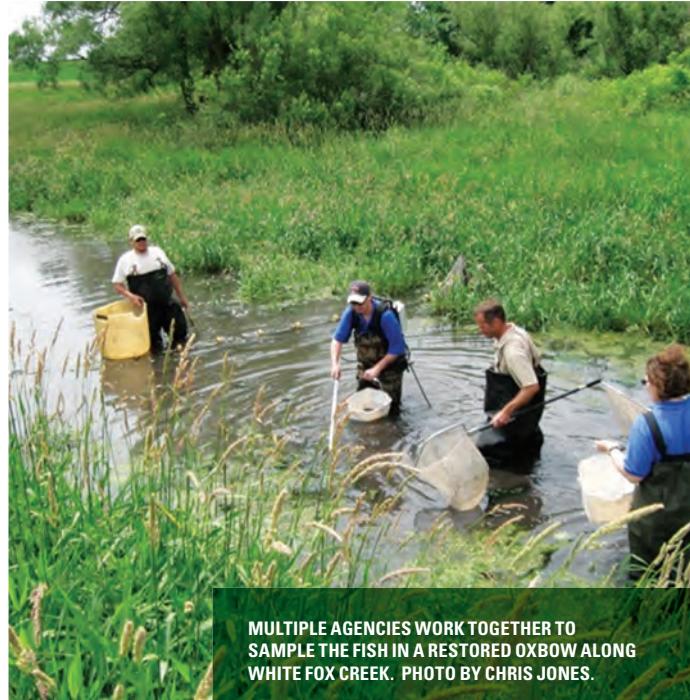


Oxbows at Work

The benefits of reconstructed oxbows were seen in full during flooding this past spring. Oxbows are old riverbeds; areas where the river used to meander and wind through the landscape. Eventually these meanders are cut off by the river in its persistent pursuit to take the path of least resistance. Over time, these oxbows fill in with sediment and lose many of the benefits that they once provided. Some of the benefits that functional oxbows offer are habitat for fish and wildlife, floodwater storage, and removal of pollutants. The photographs below show the storage capacity of oxbows during flood events; oxbows can serve to help slow water moving downstream.

Over the past few years, The Nature Conservancy in Iowa, Iowa Soybean Association (ISA), Iowa Department of Natural Resources (IDNR), U.S. Fish and Wildlife Service (USFWS), Fishers and Farmers Partnership, Sand County Foundation and local landowners have come together to help restore oxbow habitat along White Fox Creek, a tributary to the Boone River. The excess sediment that has deposited over the years is removed and the oxbow is reconnected to the creek. When possible, tile water can be redirected to be intercepted by the oxbow, allowing tile water to be filtered of excess nutrients before entering groundwater and rivers. So far, five oxbows have been restored along White Fox Creek, and funding is available to install more in the Boone River watershed.



Although these five oxbows are comprised of only two acres of land total, they have the ability to hold 3.7 million gallons of water and remove an average of 45 percent of nitrates from water entering the oxbows.

In an effort to understand the benefits that these oxbows provide, bi-weekly water samples are collected in the oxbows, the surrounding groundwater, and the creek. The water samples are then tested by the ISA lab for chemicals such as nitrates, phosphorus and chloride. This information will allow us to track and measure the specific impacts that the oxbows have on tile water, ground water, and the quality of the river as a whole. Sampling will also allow us to ensure that the oxbows are functioning properly, and tells us if improvements in the design of the oxbow are needed.

One of the best indicators of a healthy aquatic system is the presence of a diversity of plants and animals. Many species are sensitive to the conditions of their habitat, so their presence speaks volumes about the quality of the ecosystem they are living in. For this reason the USFWS, DNR and the Conservancy have been conducting fish surveys in restored oxbows to test improvements in water quality and habitat. Just this fall more than 13,000 fish, representing 18 fish species, were identified in an oxbow along White Fox Creek. These oxbows are designed to provide backwater hideaways for small fish, such as the endangered Topeka shiner, to seek refuge from larger predators. So far it seems that the restored oxbows have provided the watershed with the many benefits that they once provided.

If you think you have an oxbow on your land that you may be interested in restoring, contact **Karen Wilke, Boone River Project Director, at 515-832-2916 x112.**

THE NUTRIENT REDUCTION STRATEGY and the Boone River

To many, the new statewide Nutrient Reduction Strategy may seem a bit overwhelming. It's hard to envision how one farmer's choices can affect as big a problem as the "dead zone" in the Gulf of Mexico. The dead zone is created by excess nutrients accumulating at the outlet of all Midwest rivers – the Gulf of Mexico. Excess nutrients stimulate the growth of large amounts of algae that use most of the dissolved oxygen in the water during the process of decay. This depletes the amount of dissolved oxygen required to sustain aquatic life, especially those of economic significance, such as fish and shrimp, and creates an aquatic "dead zone." However, there are many things we can all do to reduce nutrient loss from our lands and help meet Iowa's goals. The purpose of the Nutrient Reduction Strategy is to reduce excess nutrients from Iowa's waters in an effort to ensure safe drinking water, ample recreational opportunities and resiliency to ever-increasing flood risk, while also contributing to the reduction of the dead zone in the Gulf of Mexico. Specifically, the plan seeks to reduce nitrogen (N) and phosphorus (P) in Iowa's waterways by at least 45 percent. These nutrients come from many different sources including waste water treatment plants, farm tile, urban runoff and stream bank erosion. In the Boone River Watershed, the primary water quality concern is excess nitrogen, a majority of which enters the river through subsurface tile drainage.

The majority of farmers in the watershed are already using a variety of conservation practices, but it is clear that additional improvements are needed. The strategy asks farmers to assess their individual operations to find ways to make improvements that meet their individual needs. There are many conservation practice options, such as those listed below, that reduce nutrient losses and improve soil and water quality:

COVER CROPS: Winter-hardy cover crops are typically planted in early fall, either into the existing crop or after the crop is harvested, to establish a good root system before winter freeze. After the plant overwinters, it is killed off in early spring before planting another crop. Cover crop—such as winter rye, wheat, or oats—help protect farms from soil erosion caused by wind and water, and prevent the growth of persistent weeds. Nutrients in the soil are absorbed by the cover crop, preventing loss of valuable nutrients such as nitrogen. The deep roots of the cover crops increase the organic matter and improve soil quality as they biodegrade. Cover crops can reduce nitrogen losses from a farm by up to 31%. In a survey of farmers using cover crops conducted by the North Central Sustainable Agriculture and Education program, respondents reported increases in 2012 cash crop yields in fields where they used cover crops—an average corn yield of 126.2 bushels per acre after cover crops vs. 115.1 bushels per acre without cover crops, despite the severe drought conditions experienced in 2012. Further, among drought-affected growers, respondents that had been using cover crops for less than three years achieved a 6 percent increase in corn and an 11 percent increase in soybean yields after cover crops during the 2012 growing season.

REDUCED TILLAGE: Strip tilling reduces the amount of ground tilled in an effort to improve soil structure, which allows water to infiltrate the soil profile faster and reduces soil erosion. Strips that are 6-10 inches wide are tilled to allow the soil to dry out and warm up in the spring exactly where the crop will be planted, combining the benefits of conventional tillage and no-till. This practice leaves complete residue cover in between rows, amounting to nearly 75 percent residue left on the field. Since fewer passes across the field are needed and fertilizer can be applied at the same time as strip tilling, the amount of time and resources needed to till is greatly reduced.

BIOREACTOR: A bioreactor is a practice that intercepts tile water before it outlets to a stream. Tile water is diverted to an underground system consisting of woodchips. As the water moves through the system, microorganisms living on the woodchips consume nitrates and convert it to N₂ gas, which is released into the atmosphere. N₂ currently makes up 78 percent of the earth's atmosphere, so release from the bioreactors is not harmful. During the spring, when tiles must accommodate high flows, tile water can bypass the bioreactor and flow straight to the river through a simple water control structure, preventing any back-up of water in adjacent fields. Bioreactors can reduce nitrogen losses by 43-100 percent.

NUTRIENT MANAGEMENT: Managing the amount, timing and placement of nutrients on a field can be one of the most effective ways to reduce nutrient losses and maximize the use of fertilizers. The goal is to find the exact amount of each nutrient needed in specific locations throughout the field, and apply them at the optimal time of year. Using these tactics will allow producers to save money by preventing over application, and will reduce the amount of nutrients that leach into Iowa's waterways. Because nutrients are lost from many different sources, it will be important for everyone to do their part to help prevent nutrients from entering Iowa's streams. To learn more about what you can do to keep soil, water and nutrients on your farm, contact your local Natural Resources Conservation Service office or the Boone River Project Director; contact information is listed below.

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LOCAL PRODUCER TIM SMITH ON STRIP TILLED FIELD. PHOTO BY JORGE RIBAS.



Farmer Highlight: **TIM SMITH**

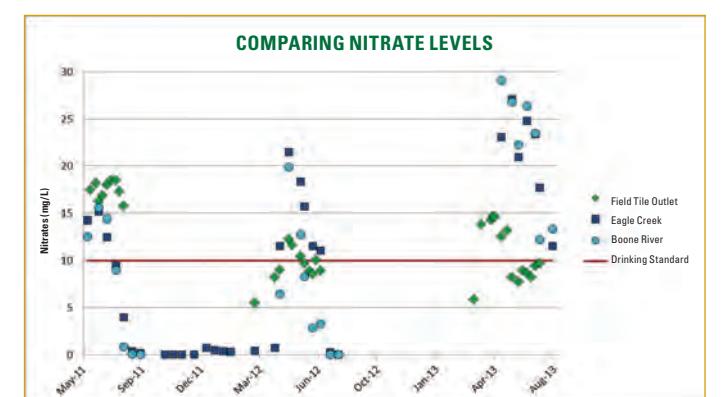
TIM SMITH, A FOURTH GENERATION FARMER, IS HELPING TO LEAD THE WAY IN AGRICULTURAL CONSERVATION IN THE BOONE RIVER WATERSHED.

Cover crops, strip till, nutrient management and a bioreactor all help keep soil and nutrients on Tim's farm. He was recently recognized for his commitment to healthy soils and improved water quality by being awarded the 2012 Iowa Farm Environmental Leader Award. This fall we visited Tim to tour his farm and talk with him about the benefits he is seeing from his conservation practices.

Tim explained that in 2011, he signed up for several conservation practices and edge-of-field water monitoring. The water quality monitoring, conducted by the Iowa Soybean Association and the Agriculture's Clean Water Alliance, tests the changing levels of nitrates over time in his tile water and Eagle Creek, the stream that runs through Tim's property. The initial results of these tests really opened Tim's eyes to the nitrate levels he was losing from his fields. He thought he was already maximizing his nitrogen use; no farmer wants to realize that his money is literally going down stream in the form of wasted fertilizers. So Tim decided to test what would happen if he reduced the amount of nitrogen applied on his field with a replicated strip trial compared to a normal rate of nitrogen. Not only were his yields exactly the same as when he applied a normal rate of nitrogen, but he saved money by not having to buy more fertilizers than needed. In fact, research shows that 9,848 tons of nitrogen were carried down the Boone River from April 1 through July 3 2013, amounting to a loss of more than \$9,800,000 worth of nitrogen.

Tim's water sampling data from 2011 now provides him with baseline data to compare future water samples to on his farm. Any reductions in nitrogen levels in the water can be attributed to the new conservation practices implemented on his farm. In order to measure the exact nitrate level reductions his bioreactor is providing, water samples are taken from the inlet and outlet of the bioreactor. On average, Tim is seeing a 30-50 percent annual reduction in nitrate loads from the 40 acres of farmland that drain through his wood chip bioreactor into Eagle Creek.

The data is in and results are looking good so far. Although there are only three years of water quality data, preliminary results show that all of Tim's conservation practices have drastically reduced the level of nitrates leaving his farm fields. Tim's nitrate level losses are considerably lower than the nitrate levels in Eagle Creek. As other producers in the watershed join the effort to reduce nitrate losses, measurable improvements in water quality will be realized.



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The Boone River REVIEW