All the Way **to the Bank**

Stream restoration as a way to combat erosion

By Jeri Fleming

The Illinois River, located in northeast Oklahoma, is one of the state's six scenic rivers. It provides tourists with floating, fishing and swimming experiences, and brings millions of tourism dollars to the local economy. In the last 30 to 40 years, however, the water quality has degraded as a result of increased development and changing land use in the watershed. Because this river is designated a scenic river, it enjoys special protections under Oklahoma law, including more stringent water quality standards than other state waters. The watershed has been the subject of lawsuits and interstate agreements, in part due to increased phosphorous in the river and the changing land use within its watershed.

Pollutants enter the river through both point and nonpoint sources. The point sources are monitored, and technologies are available to help wastewater treatment plants and other point sources meet the river's water quality standards. Nonpoint sources, such as runoff from both rural and urban areas, are more difficult to identify and manage. Several programs have been established to help reduce nonpoint source pollutants, especially sediment, by reestablishing riparian areas, fencing cattle out of streams and requiring that construction site erosion control measures be installed. One issue that has not been addressed on a large scale in Oklahoma is bank erosion. Eroding banks not only add sediment to streams and reservoirs, but because phosphorous particles bind to soil, when that soil erodes into a stream, the phosphorous also enters the stream.

Restoration

To help address this bank erosion problem, the Oklahoma Conservation Commission (OCC) partnered with Oklahoma State University (OSU) to undertake an ambitious project to restore more than 6,500 ft of streambank, effectively reducing the amount of sediment in the system by more than 900 tons per year. OCC received $2 million in American Recovery and Reinvestment Act (ARRA) funds through the Oklahoma Water Resources Board for the project. ARRA stipulated the project had to be completed no later than Sep. 30, 2012.

"The ARRA funding had a specific end date, and due to some early challenges, we only had about a year to complete the entire project," said Shanon Phillips, water quality director for OCC. "We also used a

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new contracting process the state of Oklahoma was implementing, called design-build best value. This new process allowed us to select a design-build team based on experience and allowed us to get the best value for our money."

North State Environmental, partnering with Stantec Inc., ultimately was selected in the design-build best value bidding process.

"Having the design team and the construction team work together throughout the project ensured a designer was on site during the entire construction phase. This helped make the construction process go smoothly," said Gina Levesque, project manager for OCC. "For example, when the contractor ran into issues that required design changes, they could get answers immediately and adjust that day."

To repair the streams, the designer used bioengineering techniques, which included installing rock vanes, J-hooks and other instream structures, in conjunction with channel realignment, bank resloping and reestablishing vegetation in the riparian area. These methods of stream restoration have not been widely used in Oklahoma; therefore, educating people about the methods was an important part of the project. The intent was that by educating the public, decision-makers, local engineers and contractors about the benefits of natural stream restoration as a way to reduce erosion, more stream restoration will be done in the watershed and throughout the state.

"We directly reached more than 1,200 people through our outreach and education programs. As a result, we were able to connect people that need this type of work done with the people that can help them do it," said Dr. Jason Vogel, storm water specialist for OSU.

Selecting the sites for repair involved several state and federal agencies. The project team began by identifying 48 potential sites based on extent of erosion. The list was reduced to 11 sites based on ease of obtaining permits, potential sediment load reduction and willingness of landowners. The sites were located on streams ranging from first- to sixth-order streams, with six sites located in rural areas and five located within the city of Tahlequah,

One of the sites located in a public park, pre-construction, in June 2012.

Okla. Four of the sites in Tahlequah were located adjacent to public parks and one was privately owned. The six rural sites were mostly privately owned, although the Oklahoma Scenic River Commission had two public access sites that were improved.

Each site had significant bank erosion and was impacting or threatening infrastructure like roads, sewer lines and trails. Several of the sites had vertical banks of up to 15 ft, minimal vegetation and little floodplain connectivity. At two of the rural sites, landowners had lost more than 4,500 cu yd of land over a period of five to 10 years.

Challenges & Successes

One challenge the contractors faced was having to complete construction on the 11 sites in four months. Additionally, some of the channels they worked in were narrow—not much wider than their track hoe. They worked around exposed and unexposed sewer lines, and dealt with record-breaking summer heat.

The urban sites proved to be the most challenging. The adjacent parks were not closed during construction, so people were in the parks every day, many with small children or dogs. In addition, several workshops were held that included tours of the construction sites. The classes of 40 or more were there to learn about the techniques being used and wanted an up-close view of what was being done.

Moving equipment and bringing natural materials such as boulders and trees to the sites had to be done before daylight to reduce the impact on local traffic, which also proved demanding.

"Moving the equipment from job to job in the intense summer heat was a challenge. We had to unload our large equipment on asphalt, which meant we had to lay plywood down to ensure we didn't scar the asphalt with the machines," said Mike Stanley, project manager for North State Environmental. "Because we were working in parks, we also had a lot of people wanting to watch—adults and children—which we don't normally get. It meant we had to be extra vigilant when moving equipment and materials around."

Despite the challenges, the project coordinators and the contractors are pleased with the results. The first noticeable success of the project is the improved appearance of the areas. Each of the landowners involved is pleased with how each site turned out. They are already seeing a reduction in the amount of erosion occurring during high flow events. Additional successes will be measured next summer when fish surveys are conducted at all of the sites, and as water quality improvements are seen. The project has met expectations: More than 6,600 ft of bank were repaired, with an estimated 900 tons of sediment per year being kept out of the system. SWS

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