



NONPOINT SOURCE SUCCESS STORY

Texas

Oil Field Cleanup and Targeted Control of Invasive Brush Species Reduce Chloride in the Colorado River

Waterbodies Improved

Excess chloride loading from oil and gas wells, invasive brush species and natural salt deposits led to high chloride concentrations in the Colorado River below E.V. Spence Reservoir in Texas. This prompted the Texas Commission on Environmental Quality (TCEQ) to place four assessment units (collectively referred to as segment 1426) of the Colorado River below E.V. Spence Reservoir on the state's 2002 Clean Water Act (CWA) section 303(d) list of impaired waters for failure to meet chloride standards. The TCEQ, Railroad Commission of Texas and the Texas State Soil and Water Conservation Board (TSSWCB) implemented several saltwater minimization projects that reduced chloride concentrations in the impaired segment. Following restoration, TCEQ determined that segment 1426 met the Texas' standard for chloride, and removed it from the list of impaired waters in 2012.

Problem

The Colorado River below E.V. Spence Reservoir flows through Coke and Runnels counties in west-central Texas. The segment begins below E.V. Spence Reservoir and meanders for over 60 miles until it reaches O.H. Ivie Reservoir (Figure 1). The segment contains four assessment units (segment IDs TX-1426_01 through TX-1426_04). The watershed is approximately 2,000 square miles and lies within the Southwestern Tablelands and Central Great Plains ecoregions. The land is primarily used for rangeland and agriculture.

Water quality grab samples collected from multiple stations throughout the segment between March 3, 1996, and February 6, 2001, showed a mean chloride concentration of 898 milligrams per liter (mg/L) for the 2002 assessment period. This exceeded the site-specific chloride standard for segment 1426, which requires that the annual mean chloride concentrations be below 610 mg/L. On the basis of these data, the state added the four assessment units comprising segment 1426 to its list of impaired waters in 2002. Potential nonpoint sources of chloride in the contributing watershed included noncompliant oil and gas wells, invasive brush species and natural salt deposits.

Oil and gas wells produce brine, which, when improperly contained, can contaminate surface water. Saltcedar, an invasive brush species, has the ability to transport salts from groundwater to its leaves. Surface water salinity increases when the

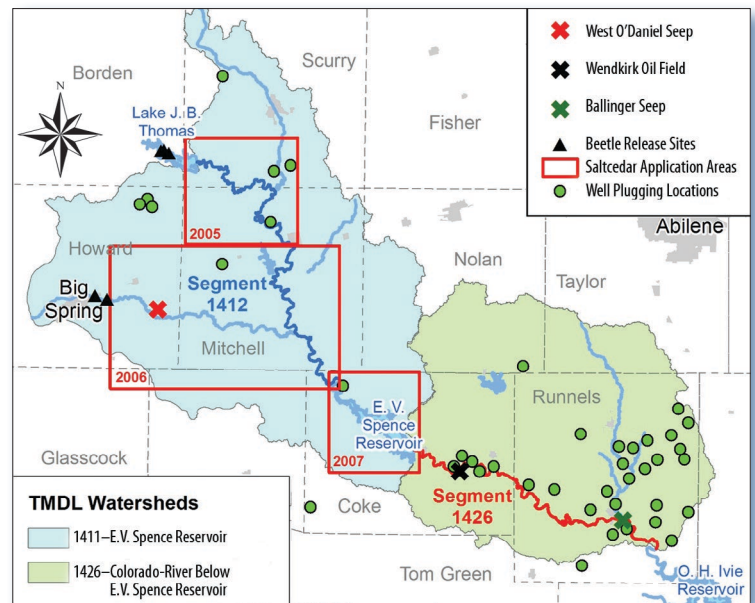


Figure 1. Texas' Colorado River segment 1426 (below E.V. Spence Reservoir) was list as impaired for chloride. Project partners installed numerous projects—within the drainage areas for both segment 1426 and segment 1412 (immediately upstream)—to address the impairment.

leaves are dropped in the fall. In addition, saltcedar uses excessive amounts of water, which reduces surface water flow and consequently increases chloride concentrations.

In 2007 the U.S. Environmental Protection Agency (USEPA) approved two total maximum daily loads

(TMDLs) for the segment to address chloride and total dissolved solids (TDS). The TMDL load allocations specified that concentrations of chloride and TDS released from E.V. Spence Reservoir must remain at or below 550 mg/L and 1,537 mg/L, respectively, to allow segment 1426 to meet water quality standards.

Project Highlights

To better define the sources of chloride and TDS in segment 1426, the University of Texas' Bureau of Economic Geology conducted TCEQ-sponsored ground-based and airborne geophysical surveys using electromagnetic induction instruments to delineate the extent and intensity of ground salinization and to identify salinity sources. This information was used to target implementation projects.

Several management measures to reduce chloride and TDS levels were defined in the TMDL implementation plan, including plugging abandoned, unplugged, noncompliant oil and gas wells; fixing improperly plugged wells; and conducting targeted brush control. Between February 2003 and August 2007, 272 wells were plugged in Runnels, Coke, Nolan, Mitchel, Howard and Scurry counties. Then, in 2008, a 300-foot recovery trench was installed in and across the West O'Daniel Seep in Howard County and wells were plugged in the Ballinger Seep and the Wendkirk Oil Field in Runnels and Coke counties, respectively (see Figure 1).

The TSSWCB implemented a targeted brush control project to chemically treat saltcedar by aerial application of the herbicide Arsenal in a 150-foot corridor along the Colorado River and its tributaries below Lake J.B. Thomas to E.V. Spence Reservoir. Through this effort, a total of 11,391 acres were treated from 2005 through 2007. The estimated life of a one-time chemical treatment of Arsenal is approximately 15 years.

The TSSWCB also implemented biological control of saltcedar by releasing leaf beetles in April 2004 along Beals Creek near Big Spring, Texas, and in Lake J.B. Thomas. By 2008, the leaf beetles had defoliated about 140 acres of saltcedar trees. No beetle damage was seen on any other plants in the area and the native grasses had recovered after approximately 2 years.

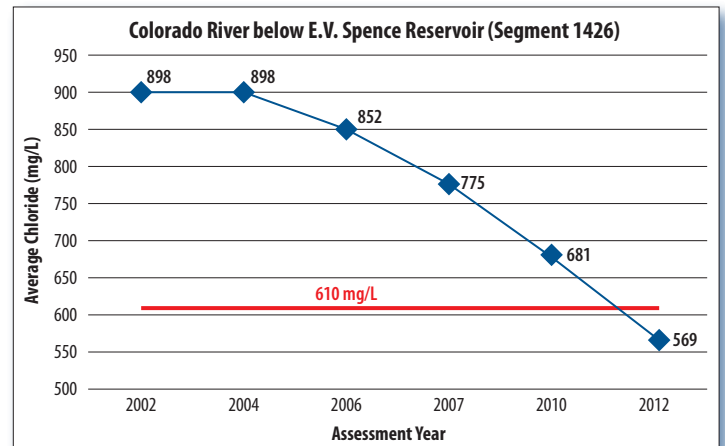


Figure 2. The average chloride concentration for segment 1426 as determined during Texas' assessment of water quality in the years 2002, 2006, 2008, 2010 and 2012. Note that segment 1426 was not included in the 2004 assessment.

Results

Chloride concentrations have declined since the segment was originally identified as impaired in 2002. This downward trend corresponds with the implementation of the management measures identified in the TMDL implementation plan. The average chloride concentration decreased from 898 mg/L in the 2002 assessment to 569 mg/L in the 2012 assessment (Figure 2). Segment 1426, which includes four assessment units, now meets its applicable chloride standard and was removed from Texas' list of impaired waters in 2012.

Partners and Funding

Funding for the Railroad Commission of Texas' saltwater minimization projects was provided by the USEPA through the TCEQ. A total of \$2,924,005 in CWA section 319 funds were used; these funds were matched by \$2,177,797 in state funds. The TSSWCB worked cooperatively with Upper Colorado Soil and Water Conservation District (SWCD), Mitchell SWCD, Coke County SWCD, Colorado River Municipal Water District, Texas Department of Agriculture, Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, Natural Resource Conservation Service, Texas A&M AgriLife Extension Service and local landowners to use \$2,307,692 in CWA section 319 funding, matched with \$1,466,166 in state and local funding for the targeted control of saltcedar.



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