

Missouri Department of Natural Resources

## Total Maximum Daily Load Information Sheet

### East, Middle, and West Fork of Tebo Creek

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#### Waterbody Segment at a Glance:

**County:** Henry  
**Nearby Cities:** Windsor, Calhoun  
**Length of impairment:** 18 miles  
**Pollutants:** Sulfate and pH  
**Source:** Abandoned mine lands



State map showing location of watershed

**Note: The TMDL for Middle, West and Tributary to Middle Fork of Tebo Creek was completed in February, 2004. East Fork Tebo Creek was found to now be meeting state water quality standards and will be delisted at the next listing cycle. [Instead, EPA wrote a TMDL]**

**TMDL Priority Ranking:** TMDL Completed 2004

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#### Beneficial uses of the Tebo Creeks

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with fish consumption

#### Use That is Impaired

- Protection of Warm Water Aquatic Life

#### Standards that apply

- The impairment of this waterbody is based on exceedence of the specific criteria contained in Missouri's Water Quality Standards, 10 CSR 20-7.031. The specific criteria state:
  - pH. Water contaminants shall not cause pH to be outside of the range of 6.5-9.0. 10 CSR 20-7(4)(E).
  - Sulfate and Chloride Limit for Protection of Aquatic Life. In streams with a 7Q10 low flow less than one cfs, the concentration of chloride plus sulfate shall not exceed one thousand milligrams per liter (1000 mg/L). Table A includes additional chloride criteria. 10 CSR 20-7(4)(L)2.

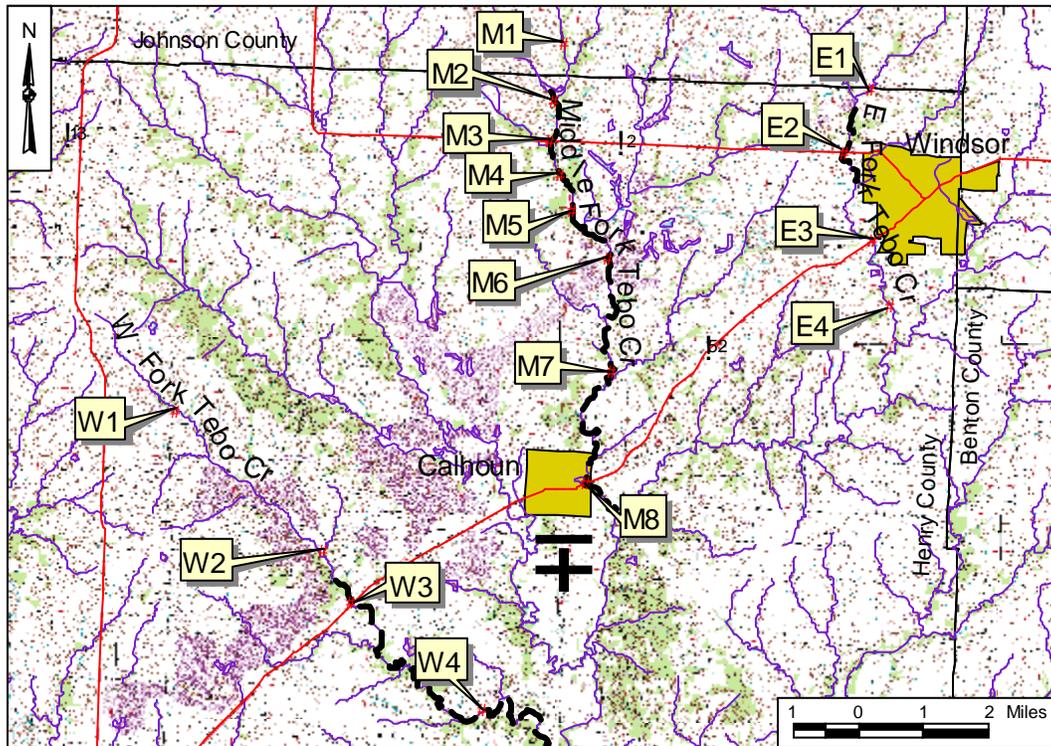
## **Description of the Problem**

The Tebo Creek area has been an important coal-producing site since the 1800s. By 1895, there were numerous underground mines along the MKT railroad near Lewis, Calhoun and Windsor. Between 1942 and the early 1950s, over 1200 acres in this area were strip-mined. Large amounts of coal wastes were deposited in pits in and along the upper portions of Middle Fork Tebo Creek near the Johnson-Henry County line. A smaller coal waste site was located on East Fork Tebo Creek about 1.5 miles northwest of downtown Windsor. When sulfide minerals in rock are exposed to water and oxygen, they oxidize and form highly acidic (low pH) iron- and sulfate-rich drainage, which is harmful to aquatic life. These minerals make up a large amount of the coal wastes in the Tebo Creek area. Acid mine drainage affected both Middle and East Fork Tebo Creeks, and was particularly severe in Middle Fork Tebo Creek due to the large volumes of coal wastes that were continually eroding into the stream and the seepage of acid water from the surface coal waste deposits along the edges of the stream. Also, groundwater moving through the spoils is being mineralized and producing high levels of sulfate in West Fork Tebo Creek all the way to its confluence with the main stem of Tebo Creek. About 4.5 miles of Middle Fork Tebo Creek was rated as continuously polluted by acid mine drainage with another four miles downstream intermittently affected by slugs of acid water. Ten major fish kills in Middle Fork Tebo occurred between 1955 and 1988.

The Missouri Department of Natural Resources reclaimed these coal waste areas in the early 1990s. A total of 486 acres were re-graded, covered with soil and revegetated. On the Middle Fork Tebo site, a wetland was constructed for treatment of acid water and seven grade stabilization structures were placed in the creek to stabilize the stream channel. Cost for the Middle and East Fork Tebo projects was \$4.6 million. The table of recent water quality data shows that reclamation projects have been successful in greatly reducing acid water discharge to East and Middle Tebo creeks. In East Fork Tebo Creek there is approximately one mile of slightly acid water. On Middle Fork Tebo Creek there are two miles of acid water and an additional seven miles of highly mineralized water that exceeds the state standard for sulfate. The remaining acidity and sulfate problems are now due only to the movement of shallow groundwater through spoils and buried coal wastes and the emergence of these groundwaters into the Middle and West Forks of Tebo Creek. The only practical option for additional treatment would be the interception and transport of these groundwaters to a suitable treatment system. Because of the extensive nature of mined lands in this area, many individual treatment systems would be needed. The U.S. Environmental Protection Agency approved TMDLs for West Fork, Middle Fork and Tributary to Middle Fork of Tebo Creek Feb. 12, 2004. These may be accessed at <http://www.dnr.mo.gov/env/wpp/tmdl/tebo-ck-final-tmdl.pdf>.

A map of the area and graphs summarizing the existing data are found below.

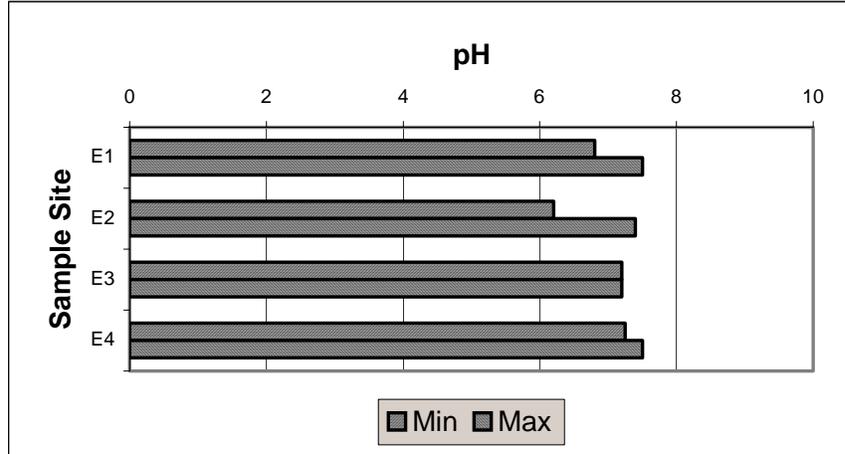
## Map of Impaired Portion of East, Middle and West Forks of Tebo Creek Showing Location of Sampling Sites



- - - - Impaired segments
→ Direction of Flow

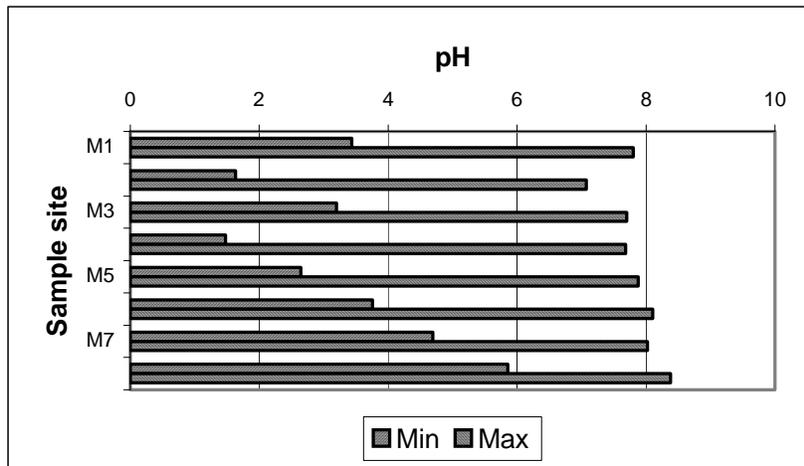
<b>Sample Site Index</b>	
E1	– East Fork Tebo Creek 0.5 mile above Triple AML
E2	– East Fork Tebo Creek 0.5 mile below Triple AML
E3	– East Fork Tebo Creek 2 miles below Triple AML
E4	– East Fork Tebo Creek 3 miles below Triple AML
M1	– Tributary to Middle Fork Tebo Creek 0.1 mile above AML
M2	– Tributary to Middle Fork Tebo Creek within AML
M3	– Tributary to Middle Fork Tebo Creek 0.1 mile below AML
M4	– Tributary to Middle Fork Tebo Creek at Highway 2
M5	– Tributary to Middle Fork Tebo Creek 1.2 miles below AML
M6	– Middle Fork Tebo Creek 2 miles below AML
M7	– Middle Fork Tebo Creek 4 miles below AML
M8	– Middle Fork Tebo Creek at Highway 52
W1	– Tributary to West Fork Tebo Creek
W2	– Tributary to West Fork Tebo Creek
W3	– West Fork Tebo Creek at Highway 52
W4	– West Fork Tebo Creek at County Road

### Range of pH values on the East Fork of Tebo Creek, 1987-2000



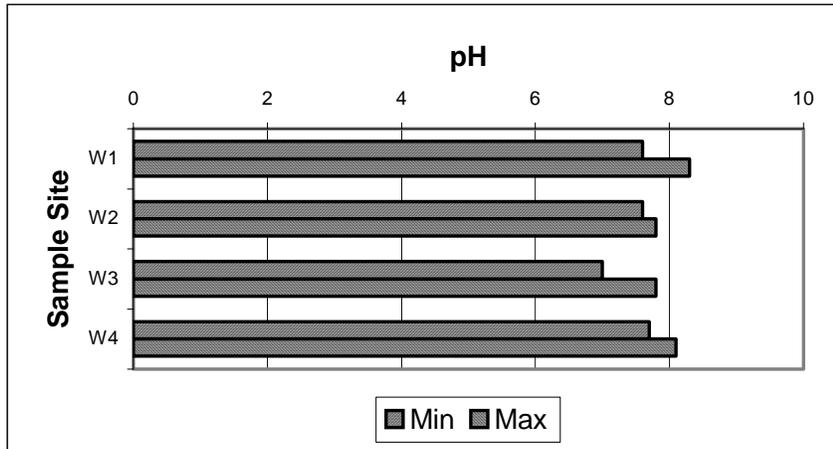
Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

### Range of pH values on the Middle Fork of Tebo Creek, 1987-2000



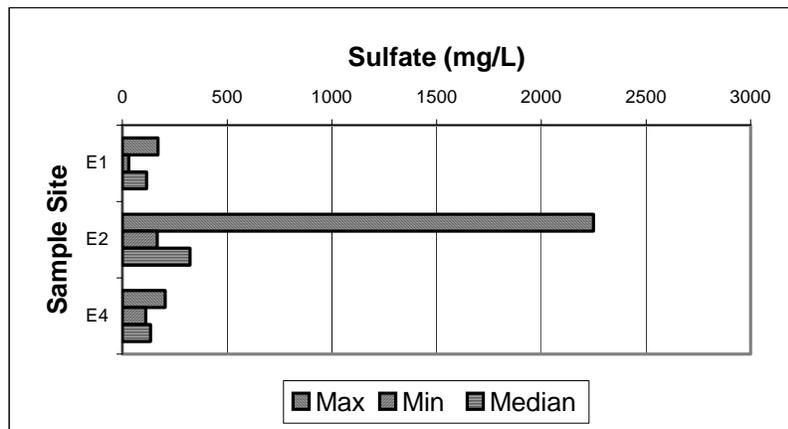
Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

**Range of pH values on the West Fork of Tebo Creek, 1987-2000.**



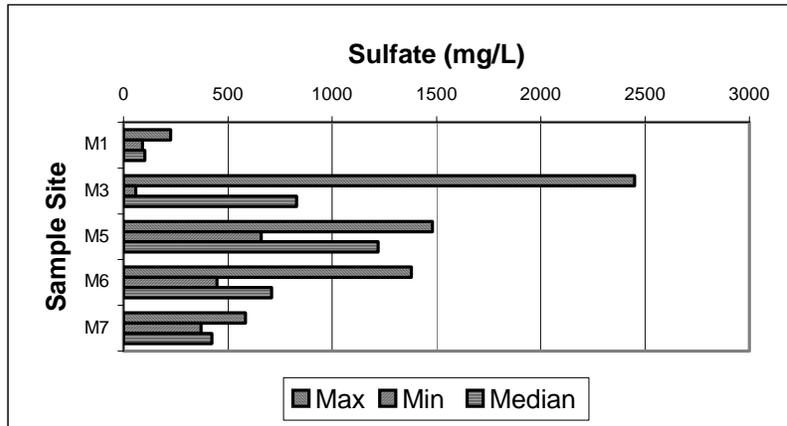
Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

**Sulfate concentrations in East Fork of Tebo Creek, 1987-2000**



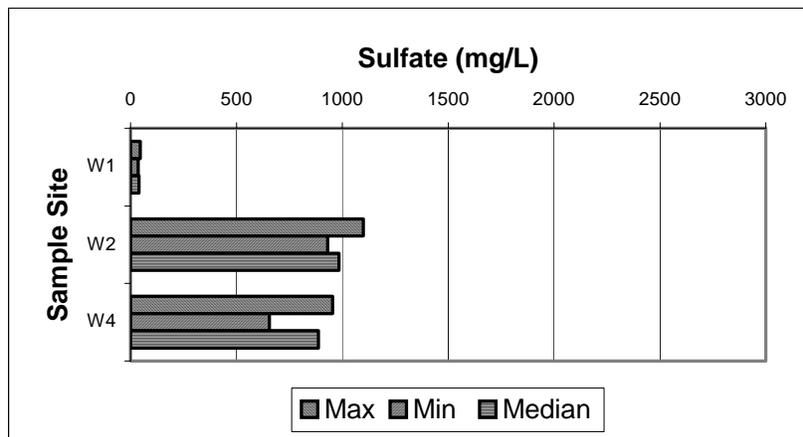
Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

### Sulfate concentrations in Middle Fork of Tebo Creek, 1987-2000.



Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

### Sulfate concentrations in West Fork of Tebo Creek, 1987-2000.



Sources: Missouri Department of Natural Resources and U.S. Geological Survey.

**For more information call or write:**

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