

Missouri Department of Natural Resources

Total Maximum Daily Load Information Sheet

North Fork Spring River and Dry Branch (Fork¹)

Water Body Segment at a Glance:

Counties: Dade, Barton and Jasper
Nearby Cities: Lamar, Galesburg
Length of Impaired Segment - N. Fork Spring River
Water Body ID 3186: 14.5 miles
Pollutant: Bacteria
Source: Rural Nonpoint Source
Length of Impaired Segment
Water Body ID 3188: 51.5 miles
Pollutant 1: Bacteria
Source: Rural Nonpoint Source
Pollutant 2: Unknown
Source: Unknown
Pollutant 3, 4: Low Dissolved Oxygen, Ammonia
Source: Lamar Wastewater Treatment Plant



State Map Showing Location of Watershed

Length of Impairments

Within Segment 3188: 26.5 miles (dissolved oxygen)
51.5 miles (bacteria and unknown)
[none given] miles (ammonia)

Length of Impaired Segment – Dry Branch (Fork)

Water Body ID 3189: 9 miles
Pollutant: Bacteria
Source: Rural Nonpoint Source

Scheduled for TMDL development: 2013; 2016 (low DO)

Description of the Problem

Beneficial uses of North Fork Spring River and Dry Branch (Fork)

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health (Fish Consumption)
- Whole Body Contact Recreation – Category A (Dry Fork) and B (North Fork Spring River)
- Secondary Contact Recreation (WBID 3186 only)

Uses that are impaired

- Protection of Warm Water Aquatic Life (unknown, low DO and ammonia)
- Whole Body Contact Recreation – Categories A and B (bacteria)

¹ While this water body is named Dry Branch on the 2008 303(d) List, it is named Dry Fork on USGS topographic maps and in Missouri's water quality standards. The name will be corrected to Dry Fork and the length corrected to 10.2 miles in the 2010 303(d) List.

Standards that apply

- Missouri's water quality standards, or WQS, at 10 CSR 20-7.031(4)(C) state that the *E.coli* bacteria count shall not exceed 126 colonies per 100 milliliters of water (126 col/100 mL) for Category A and 206 col/100 mL for Category B. This count is the geometric mean during the recreational season (April 1- October 31) in waters designated for whole body contact recreation.
- In Table A of the Water Quality Standards, the criteria for dissolved oxygen, or DO, in streams is a minimum of 5 mg/L (milligrams per liter or parts per million).
- The standards for ammonia vary with water temperature and pH. At typical temperatures and pH values, a summer ammonia criterion would be 1.5 mg/L with a winter criterion of 3.1 mg/L. These values are taken from Table B3 in 10 CSR 20-7.031.
- Because North Fork Spring River is also impaired by other unknown pollutants, specific criteria cannot be cited. However, all Missouri streams are protected by the general criteria found in 10 CSR 20-7.031 (3). The general criteria that could apply to North Fork Spring River state:
 - (A) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses.
 - (C) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses.
 - (G) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community.

Background information and water quality data

The North Fork of the Spring River is a major tributary to the Spring River, which flows into Kansas just north of Joplin, Missouri. Around Lamar, the river it is known locally as Muddy Creek. A TMDL for sediment was written for the North Fork and approved by the U.S. EPA in Oct. 2006.

The name and length of Dry Branch were corrected in the 10/30/09 revision of the Missouri's WQS to Dry Fork, length 10.2 miles. It is a tributary to the North Fork Spring River, entering at Carytown in Jasper County (see map on last page).

Bacteria

Evidence for the bacteria impairment is based on monitoring conducted by the Jasper County Health Department and the Carthage High School Stream Team in 2007. Excessive amounts of fecal bacteria in surface water used for recreation are an indication of an increased risk of pathogen-induced illness to humans. Infections due to pathogen-contaminated waters include gastrointestinal, respiratory, eye, ear, nose, throat and skin diseases. *E. coli*, are bacteria found in the intestines of warm blooded animals and are used as indicators of the risk of waterborne disease from pathogenic (disease causing) bacteria or viruses. Most *E. coli* strains are harmless, but some can cause serious illness in humans and are occasionally responsible for product recalls. The harmless strains are part of the normal flora of the intestines, and can benefit their hosts by preventing the establishment of pathogenic bacteria within the intestine^{2,3}. Missouri's bacteria criteria are based on specific levels

² Hudault S, Guignot J, Servin AL (July 2001). "[Escherichia coli strains colonising the gastrointestinal tract protect germfree mice against Salmonella typhimurium infection](#)". *Gut* **49** (1): 47-55

³ Reid G, Howard J, Gan BS (September 2001). "Can bacterial interference prevent infection?". *Trends Microbiol.* **9** (9): 424-8.

of risk of acute gastrointestinal illness. The levels of risk correlating to these criteria are no more than eight illnesses per 1,000 swimmers in fresh water.

Dry Fork is designated as Category A for the whole body contact recreation use, which means it has swimming areas that are open to and fully accessible by the public. The geometric mean of the 2007 recreational season data was 488 col/100 mL, which exceeds the *E. coli* criterion of 126 col/100 mL for Category A waters (Figure 1).

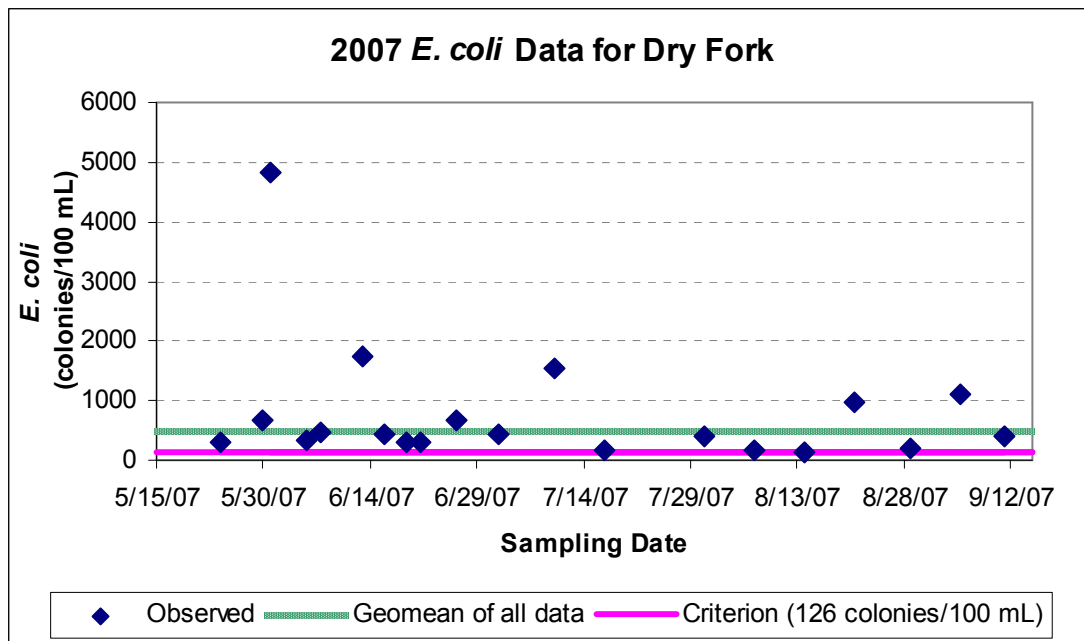


Figure 1

North Fork Spring River is designated as Category B for the whole body contact recreation use, which means it has places deep enough for total immersion (i.e., swimming), but they may be on private lands or inaccessible to the public. The geometric mean of 488 col/100 mL for the 2007 recreational season data from both segments of North Fork Spring River (WBIDs 3186 and 3188) exceeded the *E. coli* criterion of 206 col/100 mL for Category B waters (Figure 2).

People can protect themselves from waterborne illness by avoiding contact with contaminated water. However, when swimming anywhere, it is wise to take common sense precautions. These include washing hands before eating, showering after swimming and avoiding exposure to questionable water if you have open cuts or wounds.

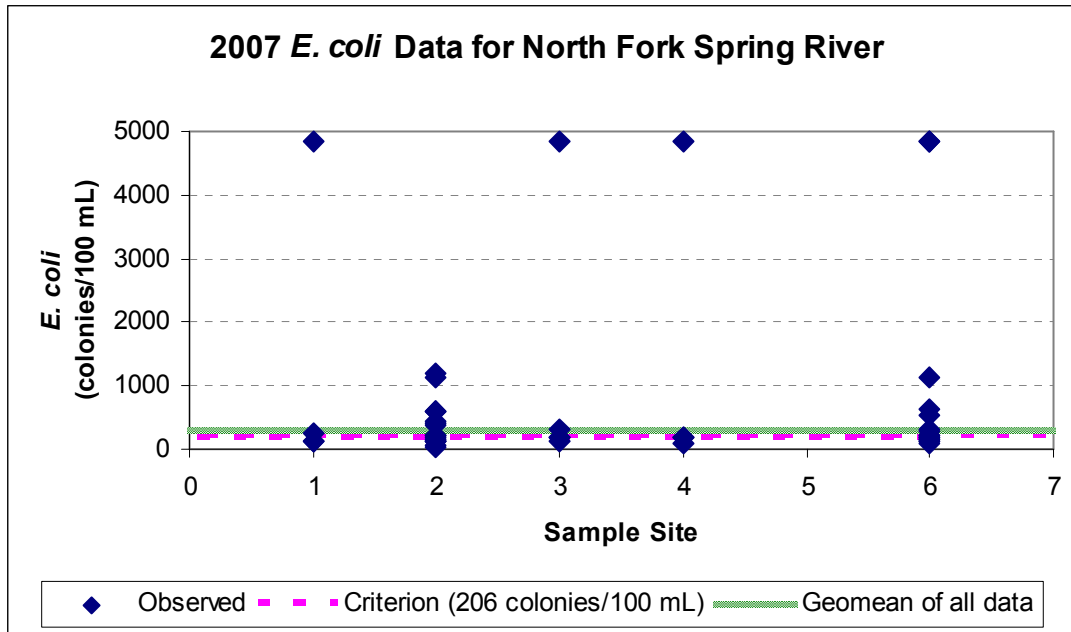


Figure 2

Dissolved Oxygen

For dissolved oxygen, or DO, if more that 10 percent of measurements in a water body fail to meet the water quality criteria, that water body is judged to be impaired. In the case of North Fork Spring River, evidence of low DO is based on monitoring by the department from 2003-07. Of these data, 1192 of 1415 samples (84.2 percent) did not meet the DO water quality criterion of 5 mg/L (Table 1). This situation is believed to be caused by the Lamar Wastewater Treatment Plant, or WWTP. Wastewater effluent that is high in biochemical oxygen demand will lower the dissolved oxygen in a stream and stress, or be lethal to, the aquatic organisms that require dissolved oxygen to survive. Like all wastewater discharges in Missouri, the Lamar WWTP must meet the requirements of a discharge permit issued by the Missouri Department of Natural Resources. The limits in this permit can be adjusted to prevent the creek from being impaired.

Table 1. Dissolved Oxygen Data for North Fork Spring River

Site	From	To	No. Samples	No. <5 mg/L	Percent <5
15 - 20	2003	2007	15	1	6.7
17	8/28/2006	8/31/2006	303	298	98.3
14	7/31/2006	8/4/2006	382	291	76.2
10 - 14	2003	2007	40	26	65
8	8/7/2006	8/10/2006	332	330	99.4
5	2003	2007	11	3	27.3
5	8/7/2006	8/10/2006	332	243	73.2
			1415	1192	84.2*

*Frequency of exceedance for all data is greater than 10 percent, thus indicating an impaired condition.

Ammonia

Ammonia is a common by-product of wastewater treatment and, under certain conditions, can be toxic to aquatic life. Again, evidence for this impairment is based on data gathered by the department from 2003-07. A water body is judged to be impaired if the chronic or acute numeric

criteria are exceeded on more than one occasion during the last three years for which data is available. In the North Fork Spring River, there were two exceedences of the acute (one hour exposure) criterion on two consecutive days in 2005 (Table 2). Like all wastewater discharges in Missouri, the Lamar WWTP must meet the requirements of a discharge permit issued by the Missouri Department of Natural Resources. The limits in this permit can be adjusted to prevent the creek from being impaired.

Table 2. Ammonia as Nitrogen (NH₃N) Data for North Fork Spring River Exceedances highlighted*

Site Number	Sample Date	Temp (°C)	pH	NH ₃ N (mg/L)
19	9/22/2003	19	8	3.56
12	7/27/2005	23.5	8	9.34
12	7/27/2005	25.7	8	8.15
12	7/28/2005	22.9	7	8.71
12	7/28/2005	27.4	9	7.82
10	8/30/2004	24	7	4.22
8	9/27/2006	18	8	2.91

* Ammonia criteria are pH and temperature dependant

Unknown

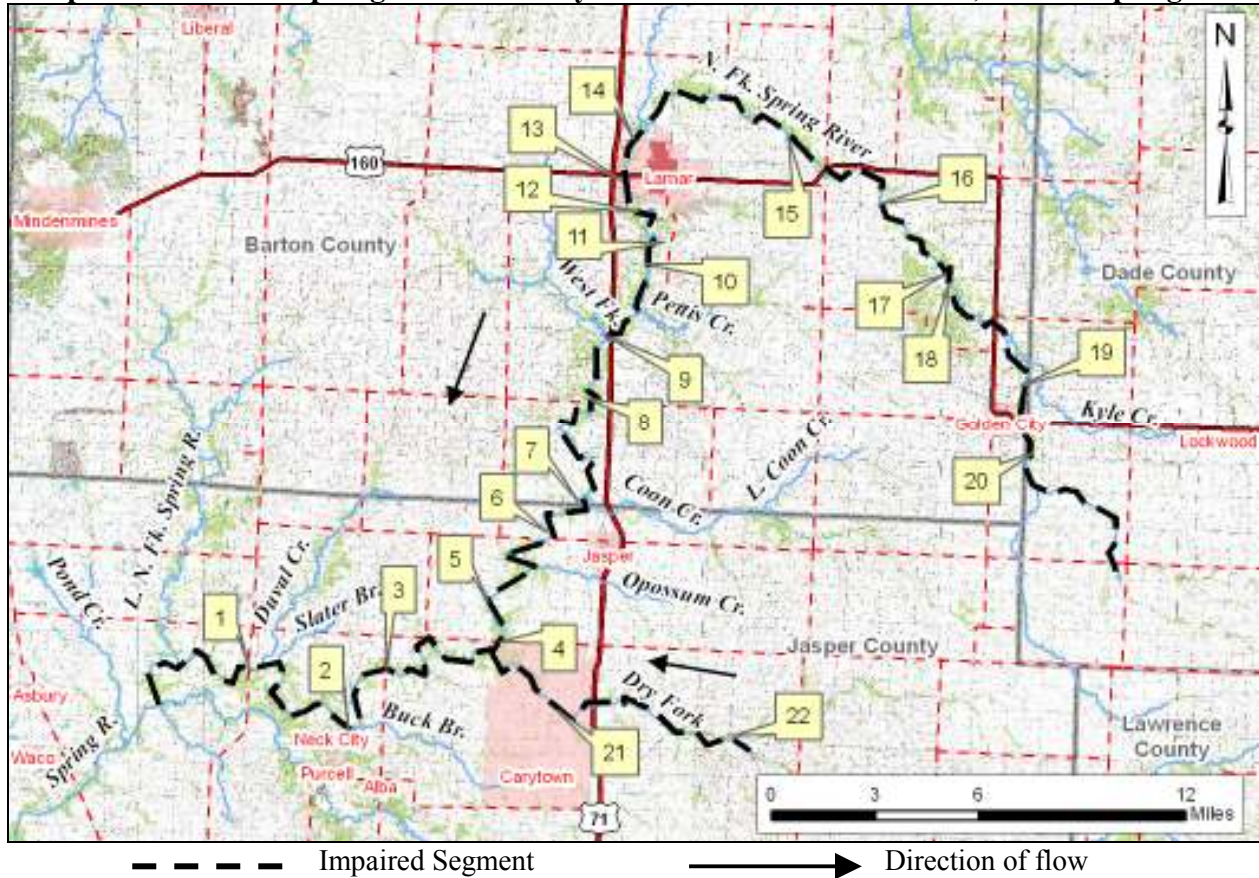
The unknown impairment is based on biological data gathered by the department when they monitored invertebrate community in 2003, 2004, 2006 and 2007. A Stream Condition Score of 16 or higher indicates no impairment (Table 3). Reference streams in this ecological drainage unit score 16 or higher on 90.9 percent of riffle/pool samples. For North Fork Spring River, only 13 of 33 samples, or 39 percent, received a score of 16 or higher so it is judged to be impaired. However, the cause of the substandard biological community is unknown.

Table 3. Aquatic Macroinvertebrate data for North Fork Spring River (2003 – 2007)

Site Number	No. of Samples	No. of Samples ≥16*	Percentage of Samples ≥16
5	2	1	50%
7	2	2	100%
8	2	2	100%
9	2	0	0%
10	2	1	50%
14	4	2	50%
15	2	1	50%
16	4	1	25%
17	2	1	50%
18	5	2	40%
19	3	0	0%
20	3	0	0%
Total No. of Samples =			33
Total No. of Samples ≥16 =			13
Percentage of Total Samples ≥16 =			39%

*Scores greater than or equal to (≥) 16 indicate no impairment

Map of North Fork Spring River and Dry Fork in southwest Missouri, with sampling sites



Sample Sites			
Site #	Site Description	Site #	Site Description
1	N. Fk. Spring R. at Hwy 43	12	N. Fk. Spring R. 0.5 mi.bl. Lamar WWTP
2	N. Fk. Spring R at CR 210	13	N. Fk. Spring R. just ab. Lamar WWTP
3	N. Fk. Spring R. at Hwy O	14	N. Fk. Spring R. at Lamar Heights
4	N. Fk. Spring R. at Hwy M	15	N. Fk. Spring R. ds NE 50th Ln.
5	N. Fk. Spring R 22 mi bl Lamar WWTP	16	N. Fk. Spring R. 12 mi.ab. Lamar
6	N. Fk. Spring R. nr Hwy H	17	N. Fk. Spring R. us SE 30th Rd.
7	N. Fk. Spring R 16 mi bl Lamar WWTP	18	N. Fk. Spring R. 15 mi.ab. Lamar
8	N. Fk. Spring R 10.5 mi bl Lamar WWTP	19	N. Fk. Spring R. 20 mi.ab. Lamar
9	N. Fk. Spring R. nr. Hwy. 71	20	N. Fk. Spring R. nr. SE 79th Road
10	N. Fk. Spring R 3.5 mi bl Lamar WWTP	21	Dry Fork at County Road 150
11	N. Fk. Spring R 2.7 mi bl Lamar WWTP	22	Dry Fork at County Road 100

The final North Fork Spring River TMDL will be based on the most current available data and information. For TMDL status or additional information, please contact the Water Protection Program at:

Missouri Department of Natural Resources, Water Protection Program
 P.O. Box 176
 Jefferson City, MO 65102-0176
 1-800-361-4827 or 573-751-1300 office or 573-522-9920 fax
 Program Home Page: dnr.mo.gov/env/wpp/index.html