

Missouri Department of Natural Resources

# Total Maximum Daily Load Information Sheet

## Buffalo Ditch

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### Water Body Segment at a Glance:

**County:** Dunklin  
**Nearby Cities:** Kennett  
**Length of impaired segment:** 18.0 miles  
**Length of impairment within segment:** 3.0 miles  
**Pollutant:** Low Dissolved Oxygen (DO)  
**Source:** Kennett Wastewater Treatment Plant (WWTP)  
**Water Body ID:** 3118



State map showing location of watershed

**TMDL Priority Ranking:** EPA approved March 3, 2010  
**Scheduled for TMDL Development:** 2009

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### Description of the Problem

#### Beneficial uses of Buffalo Ditch

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Human Health Protection (Fish Consumption)
- Whole Body Contact Recreation

#### Use that is impaired

- Protection of Warm Water Aquatic Life

#### Standards that apply

- The Missouri Water Quality Standards are found in 10 CSR 20-7.031. The chronic criterion for dissolved oxygen (DO) in streams, found in Table A of this section, is 5.0 mg/L (milligrams per liter, or parts per million). Dissolved oxygen criteria are related to load capacity of biochemical oxygen demand (BOD) in the TMDL.

### Background Information and Water Quality Data

Buffalo Ditch was originally placed on the 303(d) list of impaired waters in 1994 for biochemical oxygen demand (BOD), with the City of Kennett's wastewater treatment plant (WWTP) identified as the source of the impairment. For the 2004/2006 303(d) list, BOD was changed to low DO in order to make the list more understandable to the general public. Most aquatic organisms require high levels of oxygen to survive, but wastewater high in BOD reduces the amount of dissolved oxygen in the stream's water.

Additional data showing nonconformance with state ammonia standards below the WWTP also prompted the department to add ammonia to the list at this time. However, there was an error in how the data were evaluated for listing. A water is judged to be impaired by ammonia if the chronic numeric criteria are exceeded for two or more 30-day exposure periods during a three year time frame, or if the acute numeric criteria are exceeded for two or more 24-hour exposure periods during a three year time frame. Neither the acute nor chronic criteria for ammonia was exceeded during the time period for which data is available. Therefore, Buffalo Ditch is judged to be unimpaired by ammonia and is proposed to be delisted from the 2008 303(d) list for this pollutant.

Like all wastewater discharges in Missouri, the Kennett WWTP has to meet the requirements of a Missouri State Operating Permit issued by the Department of Natural Resources that is designed to protect the water quality of the receiving stream. Kennett’s permit includes instream monitoring of Buffalo Ditch, both upstream and downstream of the WWTP, to further judge the exact impact of its discharge on the creek.

Water quality studies conducted on Buffalo Ditch in July and August 2003, and again in January 2004, revealed that there are early-morning low dissolved oxygen problems both upstream and downstream of the WWTP. These studies also found that there are no aquatic macroinvertebrates downstream of the WWTP for many miles. Additional water quality sampling was conducted by the Environmental Protection Agency (EPA) in May and September of 2008 to obtain data to be used in setting point and nonpoint source limits for DO in the TMDL for Buffalo Ditch. And as part of the TMDL, other potential sources of low DO upstream of the WWTP – both point and nonpoint – will be examined. The earlier water quality sampling data, along with the recent data collected for the TMDL, are summarized in the table below.

The U.S. Environmental Protection Agency approved this TMDL on March 3, 2010.

### Water Quality in Buffalo Ditch in the Vicinity of the Kennett Wastewater Lagoon, 2003-2004 and 2008

Org	Site Name	Yr	Mo	Dy	Time	CBOD	C	DO	pH	SC	NH3N
EPA	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2008	5	21	900	2.3	19.2	3.95	6.8		0.22
EPA	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2008	9	5	1245	3.0	22.6	6.99	7.7		0.39
MoDNR	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2003	7	8	620		22.5	2.1	7.3	367	0.64
MoDNR	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2003	7	8	1325		30	7.15	8	339	0.55
MoDNR	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2003	7	9	630		22	1.8	7.6	342	0.69
MoDNR	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2003	7	9	1240		29	7	8	336	0.57
MoDNR	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2003	8	12	700		21	2.3	7.4	345	0.24
MoDNR	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2003	8	12	1310		28	10.9	8	348	0.17
MoDNR	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2003	8	13	645		22	3.4	7.6	350	0.26
MoDNR	Buffalo Ditch 4.4 mi.bl. Kennett WWTP	2003	8	13	1300		25	7.9	8	352	0.17
EPA	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2008	5	21	1000	2.9	18.9	6.49	7.1		0.68
EPA	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2008	9	5	1215	2.0	22	7.15	7.8		0.63
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2003	7	8	1310		32	8.6	7.8	436	1.19
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2003	7	8	610		24.5	1.6	7.2	467	1.68

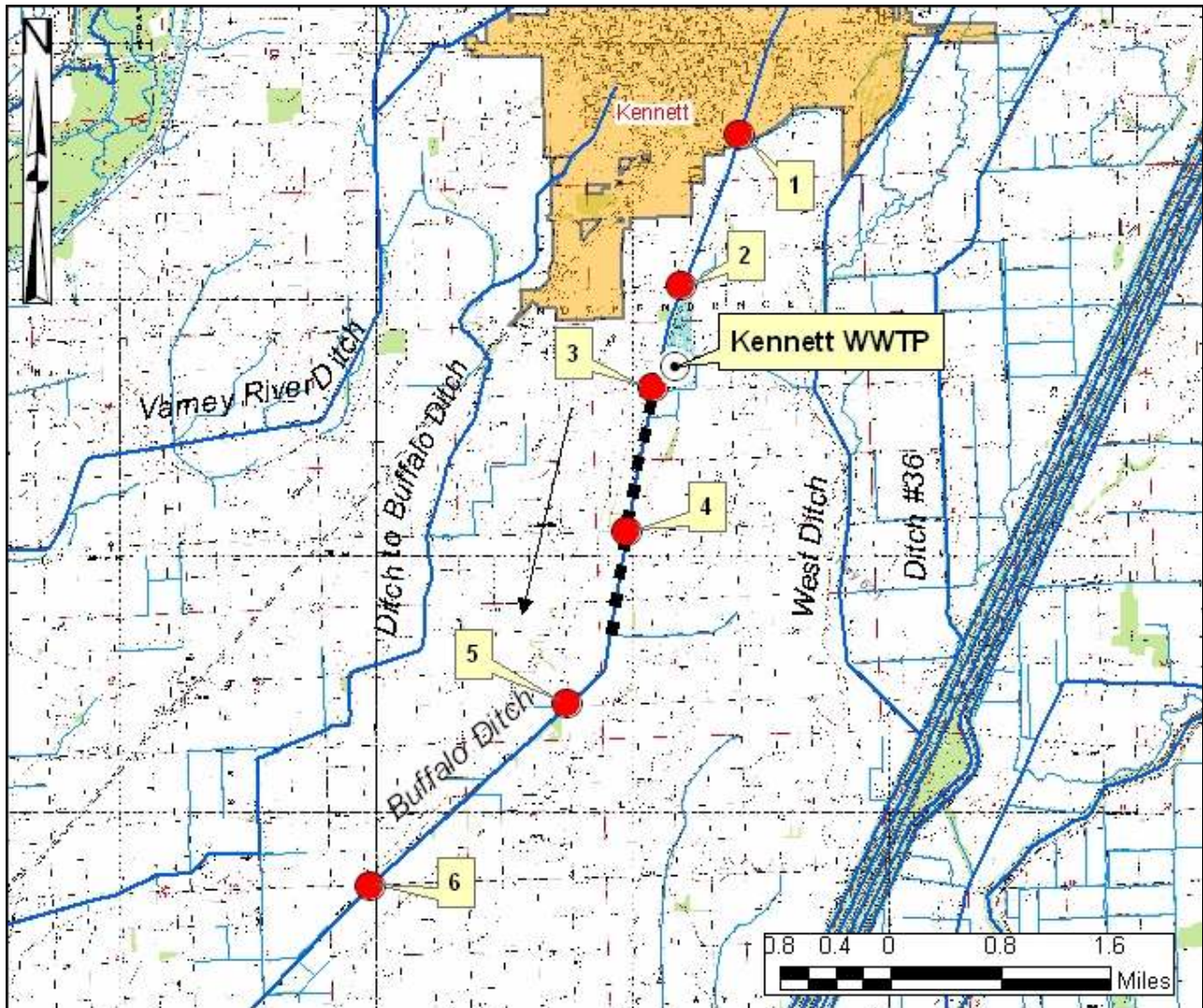
Org	Site Name	Yr	Mo	Dy	Time	CBOD	C	DO	pH	SC	NH3N
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2003	7	9	1230		31	8.6	7.9	436	1.22
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2003	7	9	610		24	1.6	7.4	442	1.73
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2003	8	12	645		23	1.8	7.2	472	1.08
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2003	8	12	1300		30	10.9	8.1	453	0.42
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2003	8	13	1245		27	10.1	7.9	461	0.59
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2003	8	13	630		23	1.7	7.4	487	1.08
MoDNR	Buffalo Ditch 2.5 mi.bl. Kennett WWTP	2004	1	7	1435		4	5.6	7.2		7.00
MoDNR	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2004	1	7	1420		5	4.8	7		12.10
EPA	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2008	5	21	1100	4.4	21.1	10.6	7.3		0.76
EPA	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2008	9	5	1145	2.7	22.4	6.19	7.7		0.71
MoDNR	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2003	7	8	555		25	1.4	7.2	472	1.57
MoDNR	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2003	7	8	1335		36	10.5	8.2	461	0.81
MoDNR	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2003	7	9	1255		35.5	10.8	8.1	453	0.76
MoDNR	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2003	7	9	610		24.5	1.5	7.2	473	1.52
MoDNR	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2003	8	12	1305		29	12	8.4	488	0.71
MoDNR	Buffalo Ditch 1.1 mi.bl. Kennett WWTP	2003	8	12	647		23	0.499	7.4	511	1.43
EPA	Kennett WWTP effluent	2008	5	21	1150	8.6	21.8	7.97	7.4		0.0115
EPA	Kennett WWTP effluent	2008	9	5	1110	3.1	27.7	6.9	7.8		0.19
EPA	Buffalo Ditch 0.8 mi.ab. Kennett WWTP	2008	5	21	1240	1	26.6	8.6	7.2		0.0115
MoDNR	Buffalo Ditch 0.8 mi.ab. Kennett WWTP	2003	7	8	644		27.5	1.1	7	137	
MoDNR	Buffalo Ditch 0.8 mi.ab. Kennett WWTP	2003	7	8	1315		31.5	6.9	7.4	138	
MoDNR	Buffalo Ditch 0.8 mi.ab. Kennett WWTP	2003	7	9	1215		30	5.8	7.3	136	
MoDNR	Buffalo Ditch 0.8 mi.ab. Kennett WWTP	2003	7	9	555		27	1.2	7.1	138	
MoDNR	Buffalo Ditch 0.8 mi.ab. Kennett WWTP	2003	8	12	707		23	0.499	7.2	112	
MoDNR	Buffalo Ditch 0.8 mi.ab. Kennett WWTP	2003	8	12	1335		30.5	4.5	7.9	102	
EPA	Buffalo Ditch 1.9 mi.ab. Kennett WWTP	2008	5	21	150	1	21.7	5.23	7.14		0.0115
EPA	Buffalo Ditch 1.9 mi.ab. Kennett WWTP	2008	9	5	950	1	21.7	5.32	6.71		0.05

*Note:* Highlighted DO data do not meet WQS during the critical period (morning hours), when DO is the lowest.

*Abbreviations:* C= water temperature (Celsius), DO= dissolved oxygen in milligrams per liter (mg/L), SC=specific conductivity (micro mhos per centimeter), NH3N= ammonia as nitrogen (mg/L), CBOD=carbonaceous biochemical oxygen demand (mg/L).

A map showing the sample sites is on the next page.

## Impaired Segment of Buffalo Ditch in Dunklin County, Missouri, with Sample Sites



----- Impaired segment      —————> Direction of flow

Sample Site Index for Buffalo Ditch	
1 – 1.9 miles above Kennett WWTP	4 – 1.1 miles below Kennett WWTP
2 – 0.8 miles above Kennett WWTP	5 – 2.5 miles below Kennett WWTP
3 – Kennett WWTP outfall (effluent)	6 – 4.4 miles below Kennett WWTP

**For more information call or write:**  
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 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: <http://www.dnr.mo.gov/env/wpp/index.html>