

Missouri Department of Natural Resources

# Total Maximum Daily Load Information Sheet

## Lamar Lake

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### Waterbody Segment at a Glance:

**County:** Barton  
**Nearby Cities:** Lamar  
**Length of Impairment:** 180 acres  
**Pollutant:** Nutrients  
**Source:** Agricultural Nonpoint Source



State map showing location of watershed

**TMDL Priority Ranking:** TMDL Approved 2006

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### Description of the Problem

#### Beneficial uses of Lamar Lake

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with Fish Consumption
- Drinking Water Supply

#### Use that is impaired

- Drinking Water Supply

#### Standards that apply

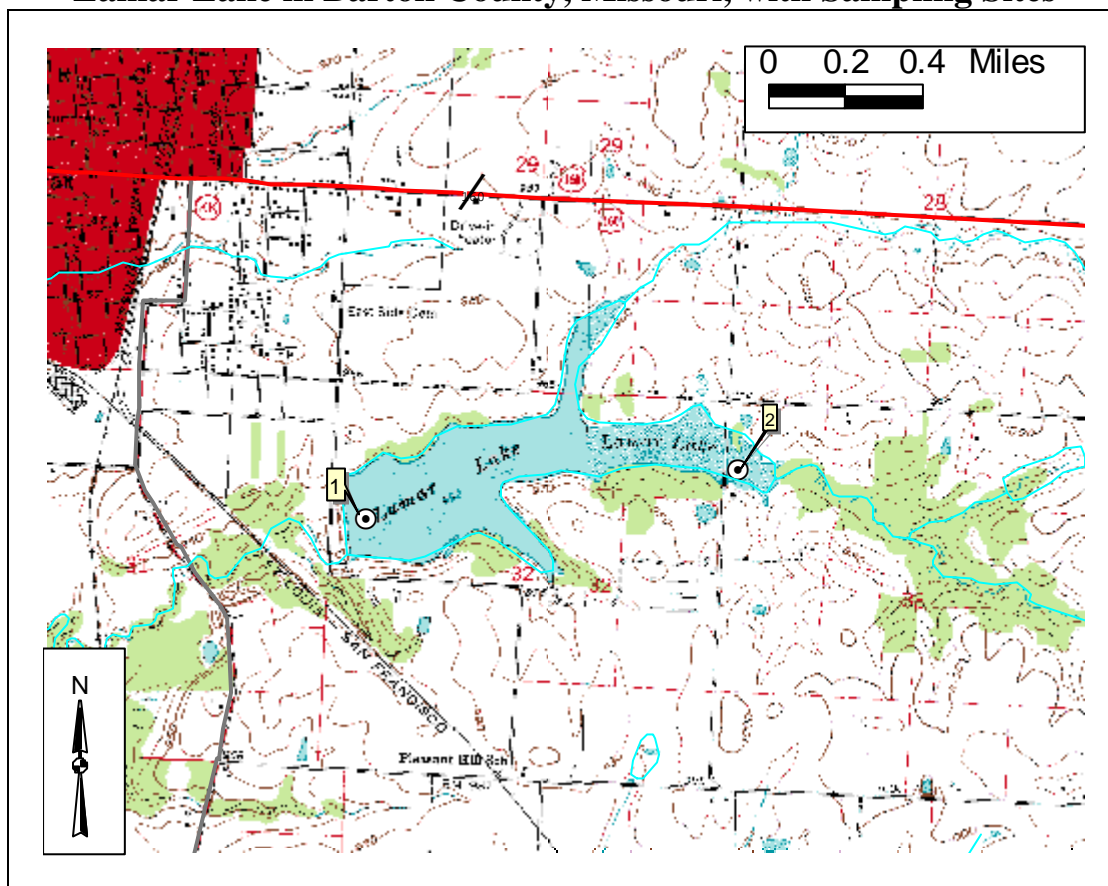
- The impairment of Lamar Lake is based on exceedence of the general criteria contained in Missouri's Water Quality Standards, 10 CSR 20-7.031 (3)(A) and (C). These criteria state:
  - Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses.
  - Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses.

### Background Information and Water Quality Data

Lamar Lake serves as a drinking water supply source for the town of Lamar. It was created in 1955 by damming a small tributary to the North Fork of the Spring River just southeast of Lamar. The watershed of Lamar Lake is agricultural in nature, and agricultural fertilizer use and animal manure are significant sources of nitrogen and phosphorus. High levels of nitrogen and phosphorus in the stream feeding the lake have resulted in the production of large amounts of algae in Lamar Lake. Dieoff of

large algal populations in the lake have led to chronic taste and odor problems. Implementation of nutrient management plans on farms in this watershed may be effective in reducing the present problem. A Source Water Protection Plan was created in 2002 protect Lamar's drinking water reservoir, Lamar Lake. The plan is being reviewed (spring 2006) and updated. The steering committee set up to create the original plan was reactivated and is working with Missouri Rural Water Association to complete the review. The objectives of the plan will serve for the implementation of the TMDL. The U.S. Environmental Protection Agency approved this TMDL July 20, 2006. A map of the lake and graphs summarizing the data may be found below.

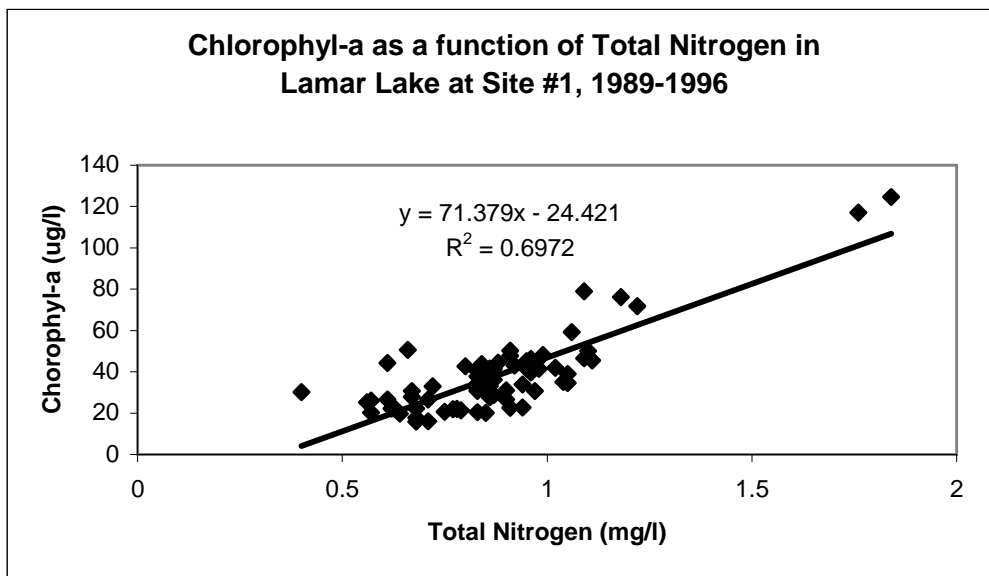
### Lamar Lake in Barton County, Missouri, with Sampling Sites



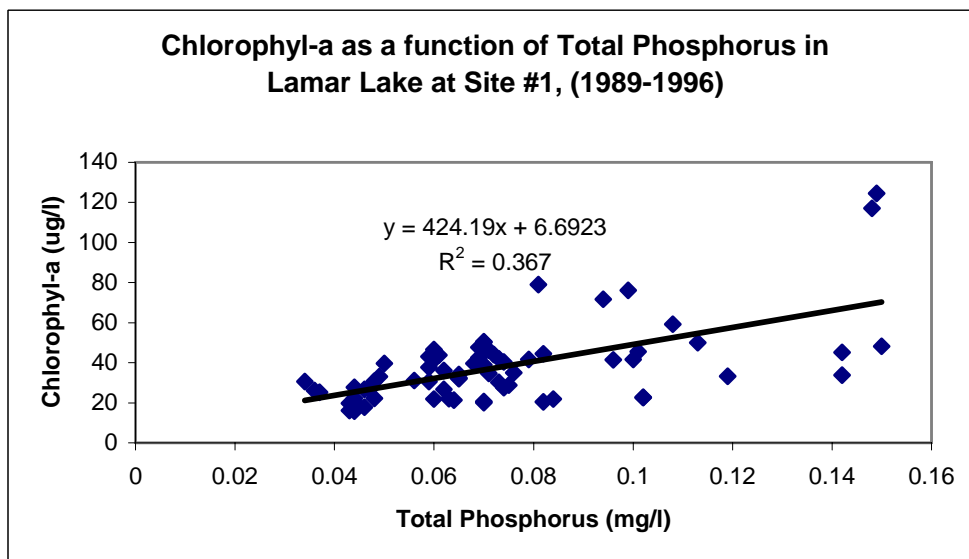
Site Index  
1 – Lamar City Lake near dam  
2 – Lamar City Lake near upper end

Missouri does not have specific standards for nutrients (total nitrogen and total phosphorus); however, the TMDL has determined a numeric endpoint for total phosphorus (TP) of 40 µg/L (micrograms per liter or parts per billion) using the reference lake approach. For comparison, 27 µg/L was calculated for the McDaniel Lake TMDL as the concentration of phosphorus that would limit chlorophyll-a to 10 µg/L. Chlorophyll-a occurs in all green plants and is used as a measure of the amount of algae. When a certain type of algae, blue-green algae, die, they release the particular compounds that cause

unpleasant taste and odor. Suspended chlorophyll-a has been found to predict the risk of dominance of blue-green algae. This risk increases exponentially in lakes when chlorophyll-a exceeds 10 µg/L. The two graphs below show how chlorophyll-a increases as nitrogen and phosphorus increase.



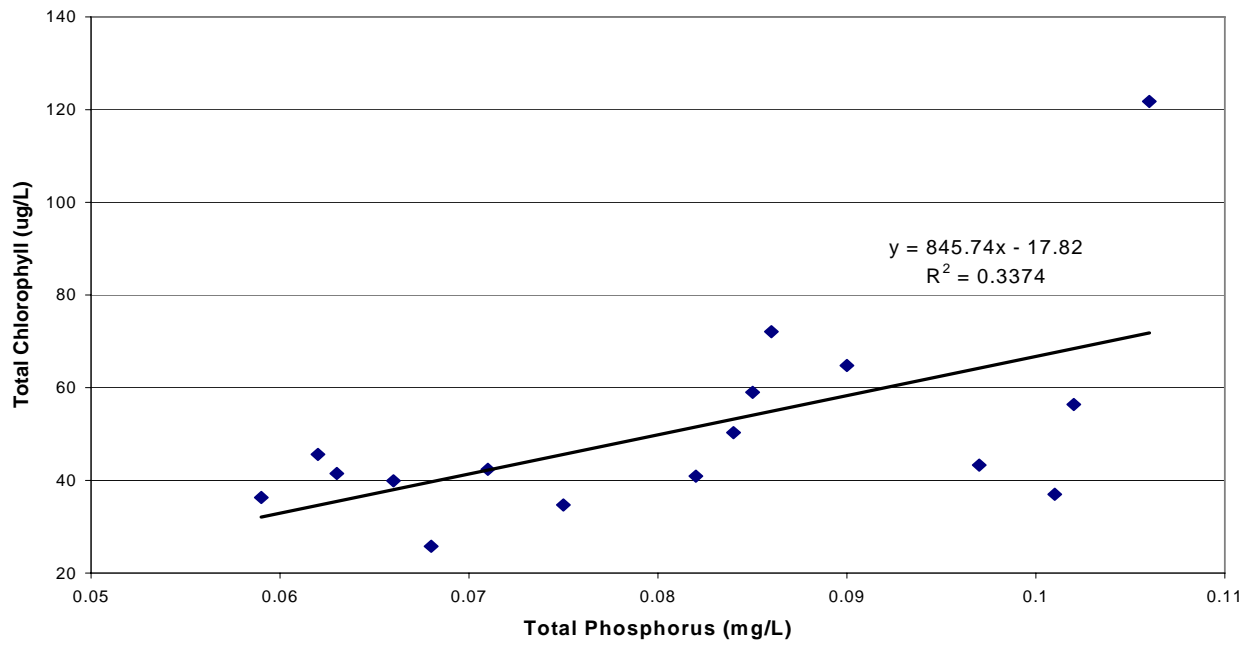
Data Source: Dr. Jack Jones, Professor of Limnology, University of Missouri at Columbia



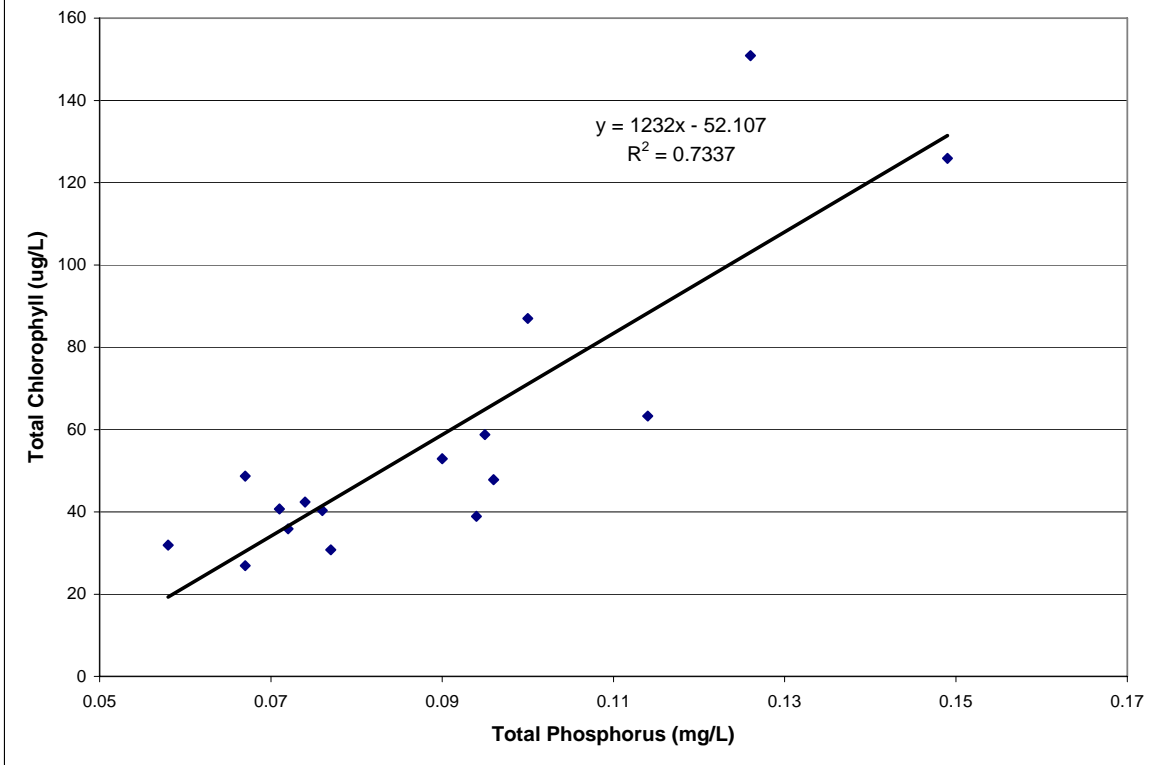
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In 2003, the Lakes of Missouri Volunteer Program (LMVP) started monitoring Lamar Lake. This program trains volunteers to collect high quality data from Missouri's lakes to monitor problems such as excess nutrients. These data show the same relationships as above. The site farthest from the dam (#4) is included for comparison to the site at the dam (#1). Note that the LMVP collected total chlorophyll, rather than chlorophyll-a. Also note that all the total phosphorus data points are greater than 25 µg/L (or 0.025 mg/L in the graphs below). These levels are higher than they were from 1989-1996 (above).

**Total Chlorophyll as a Function of Total Phosphorus in Lamar Lake at Site #1, 2003-2004**



**Total chlorophyll as a function of total phosphorus at site #2, 2003-2004**



## Lamar Lake – Data from Site #1, 1989-2002 (averaged per year)

Water quality data by University of Missouri, Columbia.

Site Name	Year	Secchi (meters)	TP ug/L	TN ug/L	CHL A ug/L	NVSS mg/L	VSS mg/L	Trophic Status
LAMAR LAKE	1989	0.7	65.0	815.0	29.0	4.9	7.5	Eutrophic
LAMAR LAKE	1990	0.7	107.0	1335.0	68.0	2.3	10.8	Hypereutrophic
LAMAR LAKE	1991	0.8	57.0	820.0	35.0	1.5	5.4	Eutrophic
LAMAR LAKE	1992	0.8	99.0	1090.0	54.0	2.5	6.5	Eutrophic
LAMAR LAKE	1993	0.9	69.0	813.0	44.0	1.7	6.6	Eutrophic
LAMAR LAKE	1994	0.9	71.0	855.0	29.0	2.2	5.9	Eutrophic
LAMAR LAKE	1995	1.0	94.0	920.0	36.0	2.5	4.8	Eutrophic
LAMAR LAKE	1996	0.5	64.0	912.0	39.0	1.7	5.5	Eutrophic
LAMAR LAKE	2002	0.7	85.0	1100.0	62.5	0.9	6.6	Hypereutrophic
<b>Mean:</b>		<b>0.8</b>	<b>79.0</b>	<b>962.2</b>	<b>44.1</b>	<b>2.2</b>	<b>6.6</b>	<b>Eutrophic</b>

Note: Trophic Status refers to the levels of nutrients or algae growth in lakes. Eutrophic lakes have high levels of nutrients or algae, hypereutrophic lakes have very high levels of nutrients or algae growth.

TP = Total phosphorus; TN = Total nitrogen; CHL A = Chlorophyll a; NVSS = Non-Volatile Suspended Solids; VSS = Volatile Suspended Solids

### For more information call or write:

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

(573) 522-9920 fax

Program Home Page: [www.dnr.mo.gov/env/wpp/index.html](http://www.dnr.mo.gov/env/wpp/index.html)