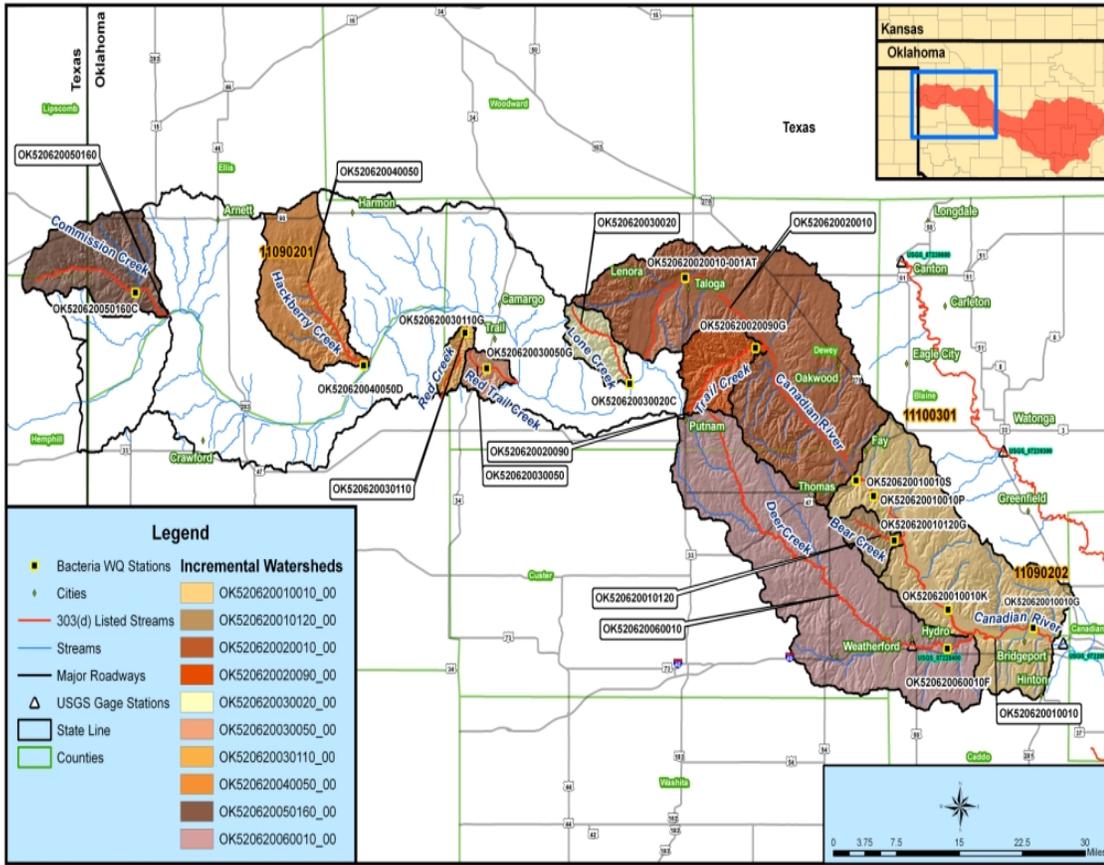


Bacteria TMDLs for Upper Canadian River Watershed (OK520620010010, OK520620010120, OK520620020010, OK520620020090, OK520620030020, OK520620030050, OK520620030110, OK520620040050, OK520620050160, OK520620060010)

Fact Sheet

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's Water Quality Planning and Management Regulations require states to develop Total Maximum Daily Loads (TMDLs) for waterbodies that are not meeting water quality standards. A TMDL establishes the amount of a pollutant that a waterbody can assimilate without exceeding its water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources. The TMDL report does not stipulate specific control actions (regulatory controls) or management measures (voluntary best management practices) necessary to reduce bacteria loadings within each watershed. Watershed-specific control actions and management measures will be identified, selected, and implemented under a separate process.

Figure 1 Location of Impaired Waterbodies



Problem Identification and Water Quality Target

A decision was made to place the following Canadian River waterbodies (OKWBID 52062) on the ODEQ 2002 303(d) list because evidence of nonsupport of primary body contact recreation (PBCR) was observed (Table ES-1).

Table ES-1 Section 303(d) Listing for Waterbodies in this report (2002 IR, ODEQ)

Oklahoma Waterbody ID	NAME	Stream Miles	Category	TMDL Date	Primary Body Contact Recreation	Warm Water Aquatic Community
OK520620010010	Canadian River	41.98	5	2008	N	I
OK520620010120	Bear Creek	6.07	5	2008	N	I
OK520620020010	Canadian River	38.52	5	2005	N	I
OK520620020090	Trail Creek	14.34	5	2008	N	I
OK520620030020	Lone Creek	13.18	5	2008	N	I
OK520620030050	Red Trail Creek	7.95	5	2008	N	N
OK520620030110	Red Creek	12.34	5	2008	N	I
OK520620040050	Hackberry Creek	16.49	5	2008	N	I
OK520620050160	Commission Creek	12.51	5	2008	N	I
OK520620060010	Deer Creek	55.73	5	2005	N	I

A = Attaining I = Insufficient Data N = Not Attaining X = Not Assessed

Source: 2002 Integrated Report, ODEQ 2002

The consistent percentage of water quality criterion exceedances at most water quality monitoring (WQM) stations, regardless of bacteria indicator, suggests that the temporal and spatial severity of bacteria loading is significant and chronic. The TMDLs in this report only address the PBCR-designated use.

The definition of PBCR is summarized by the following excerpt from Chapter 45 of the Oklahoma WQSs.

- (a) *Primary Body Contact Recreation involves direct body contact with the water where a possibility of ingestion exists. In these cases the water shall not contain chemical, physical or biological substances in concentrations that are irritating to skin or sense organs or are toxic or cause illness upon ingestion by human beings.*
- (b) *In waters designated for Primary Body Contact Recreation...limits...shall apply only during the recreation period of May 1 to September 30. The criteria for Secondary Body Contact Recreation will apply during the remainder of the year.*

Oklahoma's numeric criteria to protect the PBCR beneficial use are (OWRB 2004):

- (1) *Coliform Bacteria: The bacteria of the fecal coliform group shall not exceed a monthly geometric mean of 200/100 ml, as determined by multiple-tube fermentation or membrane filter procedures based on a minimum of not less than five (5) samples collected over a period of not more than thirty (30) days. Further, in no more than 10% of the total samples during any thirty (30) day period shall the bacteria of the fecal coliform group exceed 400/100 ml.*
- (2) *Escherichia coli (E. coli): E. coli shall not exceed a monthly geometric mean of 126/100 ml based upon a minimum of not less than five (5) samples collected over a period of not more than thirty (30) days. No sample shall exceed a 75% one-sided confidence level of 235/100 ml in lakes and high use waterbodies and the 90% one-sided confidence level of 406/100 ml in all other Primary Body Contact Recreation beneficial use areas.*
- (3) *Enterococci: Enterococci shall not exceed a monthly geometric mean of 33/100 ml based upon a minimum of not less than five (5) samples collected over a period of not more than thirty (30) days. No sample shall exceed a 75% one-sided confidence level of 61/100 ml in lakes and high use waterbodies and the 90% one-sided confidence level of 108/100 ml in all other Primary Body Contact Recreation beneficial use areas.*

This fact sheet presents a summary of the TMDLs that have been developed for the pathogen indicator bacteria fecal coliform, *Escherichia coli* (*E. coli*), or *Enterococci* for certain waterbodies in the Canadian River Basin. The data and assessment are in accordance with requirements of Section 303(d) of the Clean Water Act, Water Quality Planning and Management Regulations (40 CFR Part 130), U.S. Environmental Protection Agency (USEPA) guidance, and Oklahoma Department of Environmental Quality (ODEQ) guidance and procedures.

Pollutant Source Assessment

NPDES-permitted facilities are absent from most of the watersheds in the study area, and most point sources are relatively minor and for the most part, tend to meet instream water quality criteria in their effluent. Thus, nonpoint sources are considered to be the

major source of bacteria loading in each watershed. Nonpoint source bacteria loading to the receiving streams of each waterbody emanate from a number of different sources. The data analysis and the load duration curves (LDC) demonstrate that exceedances at the WQM stations are the result of a variety of nonpoint source loading. The load allocations (LA), calculated as the difference between the TMDL, the margin of safety (MOS), and the wasteload allocation (WLA), for each WQM station.

Using Load Duration curves to Develop TMDLs

The TMDL calculations presented in this report are derived from LDCs. LDCs facilitate rapid development of TMDLs and as a TMDL development tool, are effective in identifying whether impairments are associated with point or nonpoint sources.

Use of the LDC obviates the need to determine a design storm or selected flow recurrence interval with which to characterize the appropriate flow level for the assessment of critical conditions. For waterbodies impacted by both point and nonpoint sources, the “nonpoint source critical condition” would typically occur during high flows, when rainfall runoff would contribute the bulk of the pollutant load, while the “point source critical condition” would typically occur during low flows, when treatment plant effluents would dominate the base flow of the impaired water.

LDCs display the maximum allowable load over the complete range of flow conditions by a line using the calculation of flow multiplied by the water quality criterion. The TMDL can be expressed as a continuous function of flow, equal to the line, or as a discrete value derived from a specific flow condition.

TMDL Calculations

As indicated above, the bacteria TMDLs for the 303(d)-listed WQM stations covered in this report were derived using LDCs. A TMDL is expressed as the sum of all WLAs (point source loads), LAs (nonpoint source loads), and an appropriate MOS, which attempts to account for uncertainty concerning the relationship between effluent limitations and water quality.

This definition can be expressed by the following equation:

$$TMDL = \Sigma WLA + \Sigma LA + MOS$$

For each WQM station the TMDLs presented in this report are expressed as a percent reduction across the full range of flow conditions (See Table ES-2). The TMDL, WLA, LA, and MOS vary with flow condition, and can be calculated for any flow value. The WLA component of each TMDL is the sum of all WLAs within the contributing watershed of each WQM station. The sum of the WLAs can be represented as a single line below the LDC. The LDC and the simple equation of:

$$Average LA = average TMDL - MOS - \Sigma WLA$$

can provide an individual value for the LA in counts per day which represents the area under the TMDL target line and above the WLA line. Percent reductions necessary to achieve the water quality target are also provided for all WQM stations as another acceptable representation of the TMDL.

Federal regulations (40 CFR §130.7(c)(1)) require that TMDLs include an MOS. The MOS is a conservative measure incorporated into the TMDL equation that accounts for the uncertainty associated with calculating the allowable fecal coliform pollutant loading to ensure WQSs are attained. For the explicit MOS the water quality target was set at 10 percent lower than the water quality criterion for each pathogen which equates to 360 cfu/100 ml, 365.4 cfu/100 ml, and 97.2/100 ml for fecal coliform, *E. coli*, and *Enterococci*, respectively. The net effect of the TMDL with MOS is that the assimilative capacity or allowable pollutant loading of each waterbody is slightly reduced. These TMDLs incorporate an explicit MOS by using a curve representing 90 percent of the TMDL as the average MOS. There are other conservative elements utilized in these TMDLs that can be recognized as an implicit MOS such as:

- The use of in stream bacteria concentrations to estimate existing loading; and
- The highest Percent Reduction Goals for nonpoint sources.

This conservative approach to establishing the MOS will ensure that both the 30-day geometric mean and instantaneous bacteria standards can be achieved and maintained.

The TMDLs require reductions ranging from 51 to 98 percent. A summary of the TMDLs for each WQM Station is presented in Table ES-2.

Table ES-2 TMDL Summaries and Percent Reductions Required

WQM Station	Indicator Bacteria Species	WLA† (cfu/day)	LA† (cfu/day)	MOS† (cfu/day)	TMDL† (cfu/day)	Percent Reduction
OK520620010010G	Fecal Coliform	0	7.93E+11	8.81E+10	8.81E+11	84%
OK520620010120G	Enterococci	0	4.76E+08	5.28E+07	5.28E+08	98%
OK520620020010-00 AT	Enterococci	3.60E+08	1.77E+11	1.97E+10	1.97E+11	96%
OK520620020090G	Enterococci	0	4.76E+08	5.28E+07	5.28E+08	90%
OK520620030020C	Enterococci	0	2.38E+08	2.64E+07	2.64E+08	89%
OK520620030050G	Enterococci	0	2.38E+06	2.64E+05	2.64E+06	98%
OK520620030110G	Enterococci	0	2.38E+08	2.64E+07	2.64E+08	81%
OK520620040050D	Enterococci	0	4.76E+08	5.28E+07	5.28E+08	81%
OK520620050160C	Enterococci	0	2.38E+08	2.64E+07	2.64E+08	51%
OK520620060010F	Enterococci	8.74E+09	5.31E+10	6.87E+09	6.87E+10	82%

† Derived for illustrative purposes at the median flow value

For More Information

EPA seeks input on this proposed TMDL, including comments, information, and data from the general and affected public. For additional information on this TMDL project, please contact the EPA staff listed below:

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