STEVEN A. THOMPSON
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

MARY FALLIN
Governor

PUBLIC NOTICE

May 31, 2011

AVAILABILITY OF DRAFT BACTERIA AND TURBIDITY TMDLs FOR THE LOWER NORTH CANADIAN RIVER AREA WATERSHED

REQUEST FOR PUBLIC COMMENTS

Public Comment Period Ends: July 15, 2011

The Oklahoma Department of Environmental Quality (DEQ) is seeking comments on a draft report describing reductions needed to improve water quality in the Lower North Canadian River Study Area. Almost all of the waters in this Study Area are in the Lower North Canadian Watershed (USGS HUC 11100302). The exceptions are Coal Creek (Deep Fork Watershed; USGS HUC 11100303) and Mill Creek (Lower Canadian Watershed; USGS HUC 11090204). The Federal Clean Water Act requires DEQ to develop plans with goals and pollution control targets for improving water quality where minimum standards are not met. This is accomplished by establishing limits known as Total Maximum Daily Loads (TMDLs) for each pollutant exceeding the standards. TMDLs set levels for pollutants that allow waterbodies to achieve their beneficial uses. Beneficial uses include water for drinking, recreation, aesthetics, irrigation, fishing, and swimming.

The primary body contact recreation (i.e. swimming) beneficial use of the Lower North Canadian River Study Area was evaluated for excess pathogens. These pathogenic bacteria include fecal coliform, *Escherichia coli* (*E. coli*), and enterococci. These bacteria are found in the intestines of humans and animals and may get into streams as a result of the overflow of domestic sewage or non-point sources of human and animal waste.

The Warm Water Aquatic Community beneficial use of the Lower North Canadian River Study Area was evaluated for turbidity. Turbidity is a measure of the cloudiness of water. It is mostly caused by suspended particles such as clay, silt, plankton, or microscopic organisms, though other factors such as true color, dissolved solids etc may also affect turbidity. The suspended particles are generally referred to as Total Suspended Solids (TSS). Because turbidity cannot be expressed as a mass load, TSS is used as a surrogate for turbidity in this TMDL.

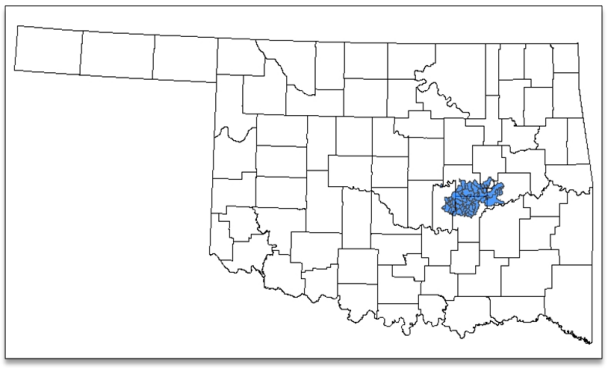
Photo courtesy of USDA NRCS
http://photogallery.nrcs.usda.gov/Index.asp

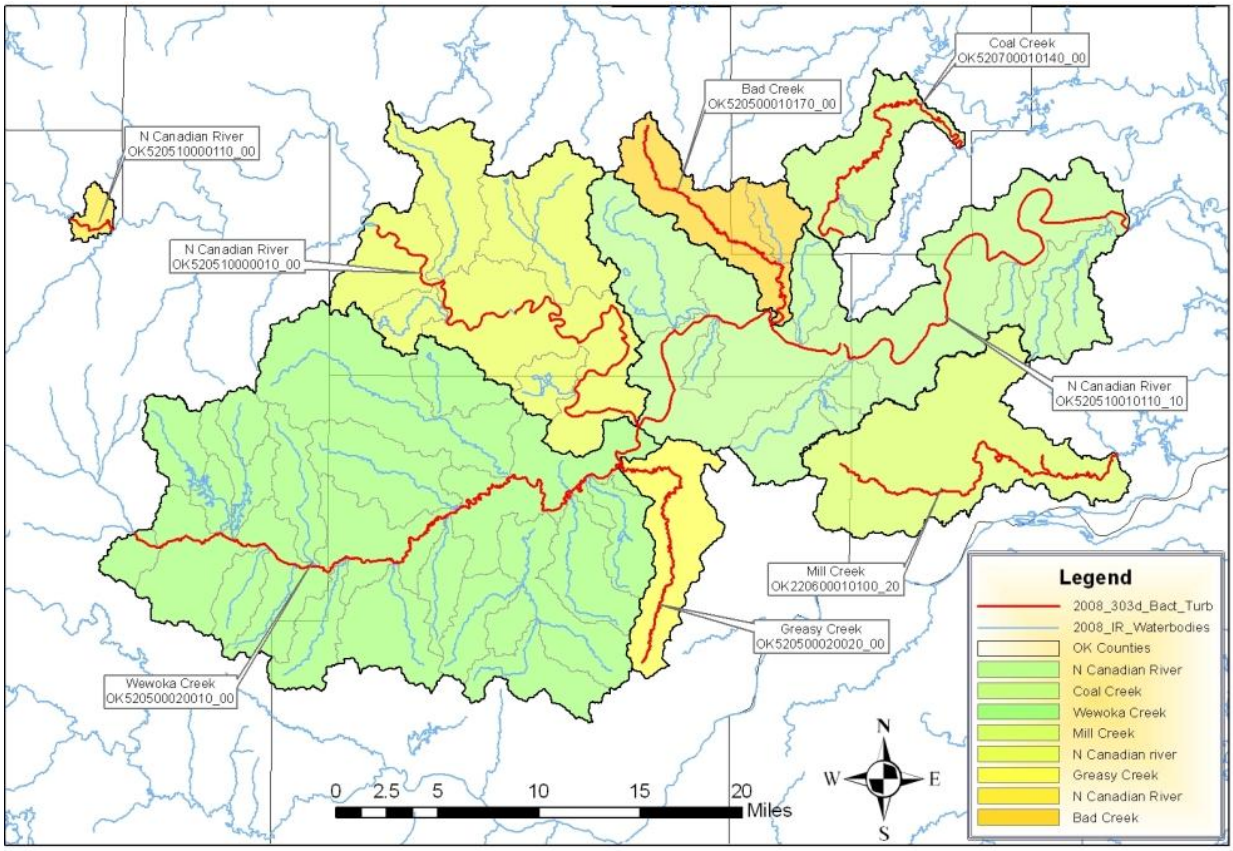
Turbidity/TSS can affect fish by causing gill abrasion or fin rot. It can also impact aquatic biota by reducing habitat through the blanketing of fish spawning and feeding areas. In addition, it can eliminate sensitive food organisms or reduce sunlight penetration to aquatic plants, thereby impairing photosynthesis. Turbidity/TSS may add to the mechanical wear of water supply pumps and distribution systems, thus increasing water treatment costs. In addition, turbidity/TSS can provide a

mechanism for the transport of pesticides or other toxic compounds. Thus, reductions in turbidity/TSS will improve water quality.

The TMDL study focused on eight waterbodies in the Lower North Canadian River Study Area that DEQ placed in Category 5 of the 2008 Integrated Report [303(d) list][1] for nonsupport of the primary body contact recreation (PBCR) and/or warm water aquatic community (WWAC) designated uses. (See the map below.) The waterbodies that were sampled are:

- Lower North Canadian River (OK520500010110_10)
- Wewoka Creek (OK520500020010_00)
- Middle North Canadian River (OK520510000010_00)
- Upper North Canadian River (OK520510000110_00)
- Bad Creek (OK520500010170_00)
- Greasy Creek (OK520500020020_00)
- Coal Creek (OK520700010140_00)
- Mill Creek (OK220600010100_20)





1 http://www.deq.state.ok.us/wqdnew/305b_303d/2008_integrated_report_app_c_303d_list.pdf

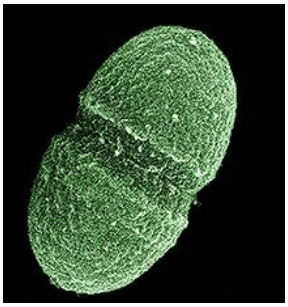
2 http://www.owrb.ok.gov/util/rules/pdf_rul/Chap46.pdf
3 **OAC 785:46-15-4(b)(2)**: http://www.owrb.ok.gov/util/rules/pdf_rul/Chap46.pdf

Study

The Lower North Canadian River Study Area is located in the east central portion of Oklahoma. The waterbodies addressed in this report are located in Okfuskee, Hughes, Okmulgee, McIntosh, Seminole and Pottawatomie counties.

Bacteria

Between 1999 and 2010, data was collected from the waterbodies in the Lower North Canadian River Study Area. To determine if there were violations of water quality standards (WQS) for bacteria, 219 samples were taken during primary contact recreation season (May 1st to September 30th). The criteria to determine if a stream is listed on the 303(d) list can be found in Title 785, Chapter 46 of the Oklahoma Administrative Code.[2] Screening levels for bacteria are listed in the *Assessment of Primary Body Contact Recreation support* (OAC 785:46-15-6(c-e)).



Enterococci faecalis
Photo courtesy of USDA ARS

Of the waterbodies sampled for bacteria, five were found to be in violation of water quality standards for enterococci, thus requiring a TMDL. The Lower North Canadian River (OK520500010110_10) requires an additional TMDL due to elevated fecal coliform concentrations. (See the following table.)

Summary of Indicator Bacteria Samples from Primary Body Contact Recreation Season

Waterbody ID	Stream Segments	Bacteria Indicator	Standards	GeoMean	# of Violations	# of Samples	% violations	2008 303(d)	Comments
OK520500010110_10	Lower North Canadian River	FC	400	172.5	7	22	32%	X	**TMDL required**
		EC	406	27.5	1	22	5%		
		ENT	108	133.7	7	22	32%	X	**TMDL required**
OK520500020010_00	Wewoka Creek	FC	400	0.0	3	16	19%	X	Delist: less than 25%
		EC	406	57.9	2	20	10%		
		ENT	108	64.8	6	20	30%		Added, **TMDL required**
OK520510000010_00	Middle North Canadian River	FC	400	130.0	2	12	17%		
		EC	406	32.9	2	12	17%		
		ENT	108	408.1	6	12	50%	X	**TMDL required**
OK520510000110_00	Upper North Canadian River	FC	400	132.4	1	9	11%		
		EC	406	19.1	1	11	9%		
		ENT	108	314.7	8	11	73%	X	**TMDL required**
OK520510000110_00	Bad Creek	EC	406	54.5	3	15	20%		
		ENT	108	63.2	5	15	33%	X	**TMDL required**

2 http://www.owrb.ok.gov/util/rules/pdf_rul/Chap46.pdf

Turbidity

From 2002 - 2010, turbidity samples were taken from the same water quality monitoring (WQM) stations, but these samples were taken all year round. Of these, samples from base flow conditions were used to determine if there were violations of water quality standards for turbidity in the Lower North Canadian River Study Area.

The Water Quality Standards for turbidity are listed under the *Protection of Fish and Wildlife Propagation* beneficial use (OAC785:45-5-12(f)(7)). According to the Oklahoma WQS, the turbidity criterion for streams with a WWAC beneficial use is 50 NTUs (nepholometric turbidity units). This criterion applies only to seasonal base flow conditions. Turbidity levels are expected to be elevated during, and for several days after, a storm event.

TMDLs for turbidity in streams designated as warm water aquatic communities must take into account that no more than 10% of the samples may exceed the numeric criterion of 50 NTU.[3] The following table summarizes how many samples were taken from each stream and what percentage of these samples exceeded 50 NTUs:

Waterbody ID	Waterbody Name	Number of turbidity samples	Number of Turbidity samples greater than 50 NTU	% turbidity samples exceeding criterion	2008 303(d)	Comments
OK520500010110_10	Lower North Canadian River	32	23	**72%**	X	**TMDL required**
OK520700010140_00	Coal Creek	12	0	0%	X	Delist: no violation
OK520500020010_00	Wewoka Creek	37	8	**22%**	X	**TMDL required**
OK220600010100_20	Mill Creek	18	1	6%	X	Delist: < 10% violation
OK520510000010_00	Middle North Canadian River	31	26	**84%**	X	**TMDL required**
OK520500020020_00	Greasy Creek	12	0	0%	X	Delist: no violation
OK520510000110_00	Upper North Canadian River	13	12	**92%**	X	**TMDL required**

After re-evaluating both bacteria and turbidity data following Oklahoma's assessment protocol, ten TMDLs were developed for the streams and pollutants listed in the following table.

Waterbody ID	Waterbody Name	enterococci	fecal coliform	Turbidity
OK520500010110_10	Lower North Canadian River	X	X	X
OK520500020010_00	Wewoka Creek	X		X
OK520510000010_00	Middle North Canadian River	X		X
OK520510000110_00	Upper North Canadian River	X		X
OK520500010170_00	Bad Creek	X		

3 **OAC 785:46-15-4(b)(2)**: http://www.owrb.ok.gov/util/rules/pdf_rul/Chap46.pdf

TMDLs

A TMDL document uses scientific data collection and analysis to determine the amount and source of each pollutant entering the system, and allocates pollutant loads to each source at levels that would ultimately restore water quality to meet clean water standards. A TMDL is the amount of each pollutant a waterway can receive and not violate water quality standards. A TMDL takes into account the pollution from all sources.

An important part of TMDL analysis is the identification of individual sources of pollutants in the watershed that affect pathogens and the amount of loading contributed by each source. Under the Clean Water Act, sources are classified as either point or non-point sources. The National Pollutant Discharge Elimination System (NPDES) program[4] regulates point source discharges. A point source is described as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters.

DEQ file photo of a point-source discharge

Most of the pollution in these watersheds comes from non-point source pollution (NPS). Non-point sources are widespread sources that cannot be identified as entering a waterbody at a single location. These include wildlife, various agricultural activities, livestock, domesticated animals, bacteria from land application fields, urban runoff, bacteria from failing septic systems, and bacteria from domestic pets.

Point Source Discharges

Point source discharges are single, identifiable, and localized, like discharges from a pipe. Point source discharges can be described by three broad subcategories: 1) NPDES regulated municipal and industrial wastewater treatment facilities (WWTF); 2) NPDES regulated industrial and municipal stormwater discharges; and 3) NPDES regulated Concentrated Animal Feeding Operations (CAFOs). A TMDL must provide Waste Load Allocations (WLAs) for all NPDES regulated point sources. Non-point sources are widespread sources that cannot be identified as entering a waterbody at a single location. For the purposes of this TMDL, all sources of pollutant loading not regulated by NPDES permits are considered non-point sources. The TMDL must provide a Load Allocation (LA) for these sources.

- **NPDES regulated municipal and industrial wastewater treatment facilities:** There are nine[5] continuous municipal WWTF point source discharge facilities in the Lower North Canadian River Study Area. These facilities have permit limits equal to the water quality standard so they do not contribute to the impairment. However, they could be a source of bacteria if the disinfection unit is not properly maintained, if the facility is of poor design, or if flow rates are above the disinfection capacity.

- **NPDES regulated industrial and municipal stormwater discharges:** Polluted stormwater runoff is commonly transported through Municipal Separate Storm Sewer Systems (MS4s), from which it is often discharged untreated into local waterbodies. To prevent harmful pollutants from being washed or dumped into an MS4, cities and towns must obtain a NPDES permit and

4 EPA NPDES home page: http://cfpub.epa.gov/npdes/index.cfm

5 City of Wewoka, City of Seminole, City of Wetumka-South Lagoon, Okemah Utilities Authority, City of Wetumka-North Lagoon, Weleetka Public Works Authority, Dustin Public Works Authority, Dewar Public Works Authority, and City of Henryetta.

develop a stormwater management program. However, there are no permitted MS4s within the Lower North Canadian River Study Area.

- **NPDES regulated construction discharges:** A general stormwater permit (OKR10) is required for any stormwater discharges associated with construction activities that result in land disturbance of equal to or greater than one (1) acre, or less than one (1) acre if they are part of a larger common plan of development or sale that totals at least one (1) acre. The permit also authorizes any stormwater discharges from support activities that are directly related to a construction site that is required to have permit coverage, and is not a commercial operation serving unrelated different sites.[6] Support activities include concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, and borrow areas. Stormwater discharges occur only during or immediately following periods of rainfall and elevated flow conditions when the turbidity criteria do not apply and are not considered potential contributors to turbidity impairment. There are currently two construction permits in the Lower North Canadian River Study Area: one is for an Oklahoma Department of Transportation project in Okfuskee County, and the other is for the Davis Correctional Facility in Hughes County.

- **NPDES regulated Concentrated Animal Feeding Operations (CAFOs):** The Agricultural Environmental Management Services (AEMS) is a program within the Oklahoma Department of Agriculture, Food and Forestry (ODAFF).[7] Its goal is to help develop, coordinate, and oversee environmental policies and programs aimed at protecting the Oklahoma environment from pollutants associated with agricultural animals and their waste.

Photo courtesy of USDA NRCS

A CAFO is an animal feeding operation that confines and feeds 1,000 or more animal units for 45 days or more in a 12 month period. The CAFO Act is designed to protect water quality through the use of best management practices such as dikes, berms, terraces, ditches or other similar structures used to isolate animal waste from outside surface drainage except for a twenty-five year, 24–hour rainfall event. CAFOs are considered "no discharge" facilities. CAFOs may have the potential to cause serious impacts on water quality if not managed properly. Though CAFOs are not considered a source of turbidity/TSS loading, they can result in bacterial contamination if there are animal waste discharges to waters of the state or if there is a failure to properly operate wastewater facilities.

According to ODAFF, there are 20 swine CAFOs located in the Lower North Canadian River Study Area. Regulated CAFOs within this Study Area operate under NPDES and State permits issued and overseen by EPA and ODAFF. In order to comply with this TMDL, those CAFO permits in the Study Area and their associated management plans must be reviewed. Further actions to reduce bacteria loads and achieve progress toward meeting the specified reduction goals must be implemented. This provision will be forwarded to EPA and ODAFF for follow up. See Table 3-2 in the TMDL report on more specifics about CAFOs in this watershed.

6 Reissuance of General Permit OKR10 for Stormwater Discharges from Construction Activities within the State of Oklahoma. Fact Sheet. July 24, 2007: http://www.deq.state.ok.us/wqdnew/stormwater/construction/okr10_fact_sheet_13_sep_2007.pdf

7 http://www.oda.state.ok.us/aems.htm

- **Sanitary sewer overflows (SSO)**: Although infrequent, sanitary sewer overflows (SSO) from wastewater collection systems can be a major source of harmful bacteria in streams. SSOs have existed since the introduction of separate sanitary sewers. Most overflows are caused by blockage of sewer pipes by grease, tree roots, and other debris that clog sewer lines; by sewer line breaks and leaks; by cross connections with storm sewers; excessive rain; and by inflow and infiltration of groundwater into sanitary sewers.

Photo courtesy of the City of Knoxville (TN) Engineering Department Stormwater Engineering Division

SSOs are a common result of the aging wastewater infrastructure around Oklahoma. Oklahoma has been ahead of other states and, in some cases EPA itself, in its handling of SSOs. Due to the widespread nature of the SSO problem, DEQ has focused its limited resources to first target SSOs that result in definitive environmental harm (such as fish kills), or lead to citizen complaints.[8] All SSOs falling into these two categories are addressed through DEQ's formal enforcement process. A Notice of Violation (NOV) is first issued to the owner of the collection system, and a Consent Order (CO) is negotiated between the owner and DEQ to establish a schedule for necessary collection system upgrades to eliminate future SSOs. In the Lower North Canadian River Study Area, no SSOs have been reported.

Non-Point Sources

Non-point sources include those sources that cannot be identified as entering the waterbody at a specific location. Non-point sources of pollutants are typically separated into urban and rural categories. Surface storm runoff is an important source of loading in urban or residential settings with high amounts of paved, impervious areas. In rural settings, the sources of bacteria may include runoff of manure applied to agricultural land, the runoff of animal wastes associated with the erosion of sediments in grazing fields, contributions from wildlife, and failing septic tanks. Some examples include:

- **Wildlife** – Disease-causing bacteria can be produced by all warm-blooded animals, including birds. Wildlife is naturally attracted to riparian corridors of streams and rivers. With direct access to the stream channel, wildlife can be a concentrated source of bacteria loading to a waterbody. Bacteria from wildlife are also deposited onto land surfaces, where they may be washed into nearby streams by rainfall runoff.

Photo courtesy of USDA NRCS

Currently there are insufficient data available to estimate populations and spatial distribution of wildlife and avian species by watershed. Consequently it is difficult to assess the magnitude of bacteria contributions from wildlife species as a general category. However, adequate data are available by county to estimate the number of deer by watershed. Using Oklahoma Department of Wildlife Conservation county data, the population of deer can be roughly estimated. By using this estimate and the percentage of the watershed area within each county, a wild deer population can be calculated for each watershed. For the Lower North Canadian River Study Area, this comes to about 6433 deer. This is

8 For environmental complaints, go to: http://www.deq.state.ok.us/ECLSnew/Complaints/onlncmpl.htm

an average deer per acre rate ranging from 0.0095-0.0170. At this minimal concentration, wildlife is considered to be a minor contributor of bacteria in the watersheds.

It must be noted that while no data are available to estimate populations and the fecal loading by wildlife other than deer, a number of bacteria source tracking studies around the nation demonstrate that wild birds and mammals can represent a major source of the fecal bacteria found in streams.

- **Agricultural Animals** - Agricultural livestock grazing in pastures deposit manure containing bacteria onto land surfaces. Detailed information is not available to describe or quantify the relationship between in-stream concentrations of bacteria and land application of manure from commercially raised farm animals. Despite the lack of specific data, for the purpose of these TMDLs, land application of commercially raised farm animal manure is considered a potential source of bacteria loading to watersheds in the Lower North Canadian River Study Area.

  Examples of livestock activities that can contribute to bacteria sources include:

  - **Processed manure from livestock operations such as poultry facilities:** This manure is often applied to fields as fertilizer and can contribute to fecal bacteria loading to waterbodies if washed into streams by runoff.

  - **Livestock grazing in pastures:** Livestock deposit manure containing fecal bacteria onto land surfaces. These bacteria may be washed into waterbodies by runoff.

This cattle crossing keeps the cattle out of the stream except at the time of crossing.

Photo courtesy of USDA NCRS

  - **Direct access to waterbodies by livestock:** Livestock standing in or crossing streams can provide a direct concentrated source of fecal bacteria in the streams. In the Lower North Canadian River Study Area, cattle (an estimated 63,358 head) generate the largest amount of fecal coliform and often have direct access to streams and tributaries with most of these being in the Wewoka Creek watershed. Refer to the full TMDL report for the estimated number of all agricultural animals (Table 3-5) as well as their daily fecal coliform production rates (Table 3-6).

- **Failing Septic Systems** – If a septic system is not working properly, then raw sewage - a concentrated source of bacteria - can go directly into streams. Bacteria loading from failing septic systems can be transported to streams in a variety of ways, including runoff from surface ponding or through groundwater. Bacteria-contaminated groundwater can also enter creeks through springs and seeps. It is estimated that there are 429 failing septic systems in the Lower North Canadian River Study Area. Refer to the full TMDL report (Section 3.2.3) on how these numbers were calculated.

- **Pets** - Bacteria from the feces of dogs and cats can be a potential source of in-stream bacteria when it is transported to streams by runoff from urban and suburban areas. On average nationally, there are 1.7 dogs per household and 2.2 cats per household [American Veterinary Medical Association (2007)]. This means there are about 7,706 dogs and 8,687 cats in the Lower North Canadian River Study Area.

In the entire Lower North Canadian River Study Area, cattle and other commercially raised farm animals are estimated to be the primary contributors of bacteria to land surfaces.

Conclusions and Recommendations

The Lower North Canadian River Study Area contains waterbodies that are in violation of Oklahoma Water Quality Standards with respect to pathogens and/or turbidity. The TMDL calculations of a reduction in bacteria and turbidity that would be needed in order for these streams to be in compliance with Oklahoma's WQS were derived using load duration curves. The calculations include present and future sources as well as a margin of safety.

In order to meet water quality standards for swimming (Primary Body Contact Recreation), the levels of pathogens must be reduced by the following amounts:

Waterbody ID	Waterbody Name	Required Reduction Rate				
		FC	EC		ENT	
		Instant-aneous	Instant-aneous	Geo-mean	Instant-aneous	Geo-mean
OK520500010110_10	Lower N Canadian River	**53.0%**	-	-	89.3%	**85.4%**
OK520500020010_00	Wewoka Creek	-	-	-	99.1%	**67.5%**
OK520510000010_00	Middle N Canadian River	-	-	-	99.9%	**93.8%**
OK520510000110_00	Upper N Canadian River	-	-	-	90.3%	**87.1%**
OK520500010170_00	Bad Creek	-	-	-	99.2%	**49.5%**

* Selection of the appropriate Percent Reduction Goal for each bacteria indicator for each waterbody is denoted by the **bold** text

Most of the pathogens come from non-point sources, though it is not known which sources these are specifically from without additional study. The health effects of pathogens should be a concern for the public who uses these waterways for activities such as swimming, wading, or boating. This is because some waterborne pathogenic bacteria can cause serious human illness or disease.

In order to meet water quality standards for turbidity, the levels of total suspended solids must be reduced by the following amounts:

Waterbody ID	Waterbody Name	Required Reduction Rate
OK520500010110_10	Lower North Canadian River	86.0%
OK520500020010_00	Wewoka Creek	26.4%
OK520510000010_00	Middle North Canadian River	83.9%
OK520510000110_00	Upper North Canadian River	77.3%

Providing comments

The comment period will be open for 45 days. If you have any concerns regarding these proposed limits, please submit your comments in writing to:

Watershed Planning
Water Quality Division
Oklahoma Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73101-1677
(405) 702-8192
E-mail: Water.Comments@deq.ok.gov

Comments must be received by close of business on July 15, 2011

You may also request a public meeting in writing. If there is a significant degree of interest, the Department of Environmental Quality will schedule a public meeting. After evaluating comments received and making any necessary changes, the modification will be submitted to EPA for final approval. The final results of the TMDL will be incorporated into Oklahoma's Water Quality Management Plan.

Obtaining copies

You may view the study this TMDL was based on by going to the DEQ website at: http://www.deq.state.ok.us/WQDnew/tmdl/index.html

OR

Pick up copies of the studies at the DEQ main office, Water Quality Division, 707 North Robinson, Oklahoma City from 7:30 am – 5:00 pm. A document copying fee may apply.

You are receiving this notice because you are either on DEQ's list to receive all public notices about changes in this watershed or you are located downstream in the watershed where changes have been recommended.

OKLAHOMA
DEPARTMENT OF ENVIRONMENTAL QUALITY

This notice is for informational purposes only; it is not to be published in the legal section of newspapers. If you are receiving this notice in error, are getting multiple notices, or do not want to receive future notices, please let us know.

If you are receiving this in paper form, please help save money and the environment by receiving the notice in PDF format via e-mail. Just let us know your e-mail address at Water.Comments@deq.ok.gov.