

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

PUBLIC NOTICE¹

July 9, 2014

Availability of Draft Bacterial and Turbidity TMDLs for the Arkansas River and North Canadian River Study Area

Proposed Modification to Incorporate Arkansas River and North Canadian River Area
Bacterial and Turbidity TMDLs into Oklahoma's Water Quality Management Plan

Request for Public Comments

Public Comment Period Ends on August 25, 2014



Beaver River ([OK720500010140_10](#)) in Woodward
County at Boiling Springs State Park.

(Photo courtesy of K. Miles)

The [Oklahoma Department of Environmental Quality \(DEQ\)](#) is seeking comments on a draft [Total Maximum Daily Load \(TMDL\)](#) report describing reductions of [bacteria](#) and [turbidity](#) needed to improve water quality in the Arkansas River and North Canadian River Study Area. This Study Area is in the northwestern portion of Oklahoma in the [Black Bear-Red Rock](#) (USGS [HUC](#) 11060006), [Kaw Lake](#) (USGS [HUC](#) 11060001), and [Middle North Canadian](#) (USGS [HUC](#) 11100301) watersheds. The Study Area covers portions of [Dewey](#), [Ellis](#), [Garfield](#), [Grant](#), [Kay](#), [Major](#), [Noble](#), and [Woodward](#) counties.

DEQ is also proposing to incorporate these TMDLs into Oklahoma's Water Quality Management Plan (208 Plan). The "**208 Factsheet Regarding Bacterial and Turbidity TMDLs in the Arkansas River and North Canadian River Study Area**" is attached. The full TMDL report can be found on-line at: www.deq.state.ok.us/WQDnew/tmdl/index.html.

Background: The [Federal Clean Water Act](#) requires states to develop [Water Quality Standards \(WQS\)](#)² which provide goals and pollution control targets for improving water quality where the standards are not met. The waterbodies where standards are not met are considered to be "[impaired](#)." Impaired waterbodies are

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² A PowerPoint presentation on "Implementation of Water Quality Standards" can be found at the [Oklahoma Water Resources Board's \(OWRB\)](#) website. It can be found at: www.owrb.ok.gov/supply/ocwp/pdf_ocwp/WaterPlanUpdate/waterscienceseminar/SmolenWQImplementation.pdf

listed on what is known as the 303(d) list, which refers to Section 303(d) of the [Clean Water Act](#). The plan to improve water quality for impaired waterbodies is accomplished by establishing limits known as [Total Maximum Daily Loads \(TMDLs\)](#) for each pollutant not meeting the standards. TMDLs set levels for pollutants that allow waterbodies to achieve their WQS for [beneficial uses](#). Beneficial uses include water for [drinking](#), recreation, aesthetics, agriculture, fishing, and swimming. The beneficial uses are all described in in the [Oklahoma Water Quality Standards \(OWQS\)](#) [Title 785, Chapter 45]. All waterbodies and their designated beneficial uses can be found in Appendix A of the OWQS. The assessment on whether the waterbodies are meeting their designated beneficial uses along with the current 303(d) list of impaired waterbodies is in a document entitled the "[Integrated Report](#)". States are required to develop these Integrated Reports every two years. The assessment of all Oklahoma waterbodies for their beneficial uses can be found in [Appendix B \(Comprehensive Waterbody Assessment\)](#) of Oklahoma's Integrated Report.

Beneficial Uses: The [designated beneficial uses](#) for the waterbodies in the Arkansas River and North Canadian River Study Area are:

- Aesthetics (AES)
- Agriculture (AG)
- Fish & Wildlife Propagation-Warm Water Aquatic Community Subcategory (WWAC)
- Fish Consumption (FISH)
- Primary Body Contact Recreation (PBCR)
- Public & Private Water Supply (PPWS)

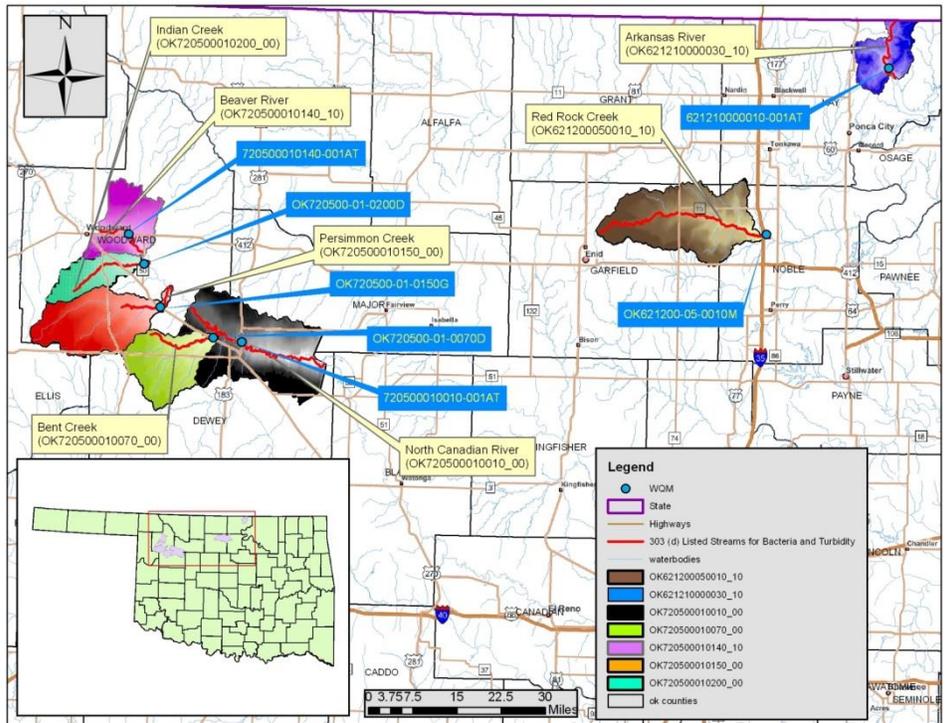


Table 1 is an assessment from Oklahoma's [2012 Integrated Report](#) on whether or not the waterbodies in the Study Area met their designated beneficial uses. The designated beneficial uses addressed in the Arkansas River and North Canadian River Study Area TMDL Report were PBCR and WWAC:

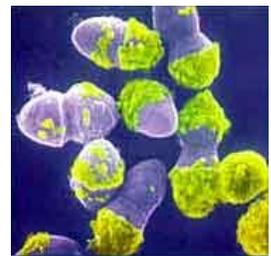
Table 1: Designated Beneficial Uses for Waterbodies in the Study Area

Waterbody Identification	Waterbody Name	AES	AG	WWAC	FISH	PBCR	PPWS
OK621200050010_10	Red Rock Creek	F	N	N	X	N	
OK621210000030_10	Arkansas River	I	N	N	I	N	I
OK720500010010_00	North Canadian River	F	F	F	N	N	F
OK720500010070_00	Bent Creek	F	N	F	X	N	I
OK720500010140_10	Beaver River	F	F	F	F	N	
OK720500010150_00	Persimmon Creek	I	F	F	X	N	I
OK720500010200_00	Indian Creek	I	F	F	X	N	I

F – Fully supporting that designated use; N – Not supporting that use; I – Insufficient information; X – Not assessed

Impairments

- **Bacteria:** The PBCR beneficial use includes [swimming](#). If the PBCR beneficial use is not met, that means there is too much bacteria in that waterbody. Many types of bacteria are [pathogens](#) which are things that can cause disease in animals or plants. According to the OWQS, bacterial testing is done for [Escherichia coli](#) (*E. coli*) and [Enterococci](#). These are micro-organisms found in the intestines of humans and animals that may cause disease. They may be found in fecal matter entering waterbodies from sources such as sewage discharges, leaking septic tanks, or runoff from animal feedlots. Enterococci impairs 6,964 miles of streams in Oklahoma, and *E. coli* impairs 4,136 miles of streams.³



Enterococci

Photo courtesy of the U.S. Dept. of Energy's Lawrence Berkeley National Laboratory

- **Turbidity:** The other beneficial use evaluated in this study was the WWAC subcategory of Fish and Wildlife Propagation. The WWAC subcategory evaluates whether the water quality and habitat are adequate to support a [climax](#) (fully-developed) fish community. [Turbidity](#) is one of the impairments that keeps waterbodies from attaining their WWAC beneficial use. Turbidity is a measure of the cloudiness of water and is one of the threats to the fish community. It is mostly caused by [suspended particles](#) such as [sediment](#), clay, silt, plankton, or microscopic organisms. 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.



Erosion of Sugar Creek in Caddo County (DEQ file photo)

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. Turbidity was found to be the cause of impairment for 2,775 miles of streams in Oklahoma.⁴

TMDL Study: The TMDL study evaluated seven waterbodies in the Arkansas River and North Canadian River Study Area that DEQ designated as impaired in the [2012 Integrated Report 303\(d\) list](#) for nonsupport of the PBCR or WWAC beneficial uses. The criteria to determine if a stream is listed on the 303(d) list can be found in [Implementation of Oklahoma's Water Quality Standards](#) (Title 785, Chapter 46).

The Oklahoma WQS used to contain three bacterial indicators (fecal coliform, *E. coli* and Enterococci). In keeping with EPA's recommended [Recreational Water Quality Criteria for States](#), the Oklahoma WQS were revised on July 1, 2011 to contain only *E. coli* and Enterococci. No more fecal coliform TMDLs have been developed since then. The WQS for *E. coli* and Enterococci bacteria are listed in the *Assessment of Primary Body Contact Recreation support* [OAC 785:46-15-6(b-c)]. The PBCR season every year is May 1 – September 30.



E. coli

Photo courtesy of [USDA ARS](#)

The WQS for turbidity is listed under the *Protection of Fish and Wildlife Propagation* beneficial use (OAC 785:45-5-12(f)(7)). Turbidity, from other than natural sources, cannot exceed 50 NTUs ([nephelometric turbidity units](#)) for streams with a WWAC beneficial use in 10% or more of the samples.⁵ 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. If a waterbody is impaired by a pollutant so that it is unable to meet its designated beneficial

³ Table 6 of DEQ's [2012 Oklahoma Integrated Report](#).

⁴ Ibid

⁵ OAC 785:46-15-4(b)(2): http://www.owrb.ok.gov/util/rules/pdf_rul/Chap46.pdf

use, then the impairment is listed on the 303(d) list in the Integrated Report. Impaired waterbodies in this Study Area are shown in the half of Table 2 with the blue-shaded header. An “x” indicates that the impaired waterbody is on the 303(d) list for Enterococci, *E. coli*, or turbidity.

Water quality monitoring is conducted to see whether or not the waterbodies are actually impaired. In Oklahoma, water quality monitoring is conducted by several different agencies including the [Oklahoma Conservation Commission](#) (OCC), the [Oklahoma Water Resources Board](#) (OWRB), and the [U.S. Geological Survey](#) (USGS). Between 2001 – 2012, 160 bacterial samples were collected for the waterbodies in the Study Area. Between 2001 – 2013, 205 turbidity samples (187 after high flow samples were excluded) were collected in the Study Area. For this study, the water quality data generated by all of these samples was analyzed to find out if the waterbodies in the Study Area were impaired for bacteria or turbidity thus necessitating a TMDL. The water quality data examined to make these determinations can be found in Appendix A of the “**2014 Arkansas River and North Canadian River Study Area Bacterial and Turbidity TMDL Report**”.

The results of the data analyses are also summarized in Table 2. An “x” in the half of the table with the yellow header indicates that sampling data showed the waterbody to be impaired for bacteria or turbidity. TMDLs were developed for these waterbodies. The “x” in red represents a waterbody that was found to be impaired when the water quality data was analyzed but that the waterbody had not been on the 2012 303(d) list as being impaired. That was the case with Persimmon Creek (OK720500010150_00) which was found to be impaired for turbidity when it was sampled. As a result, a TMDL for turbidity for Persimmon Creek was developed.

Table 2: Assessed Impairments and Actual Impairments in the Study Area

WBID	Waterbody Name	Waterbody impairments from the 2012 303(d) List			TMDLs needed after sampling results analyzed		
		Enterococci	<i>E. coli</i>	Turbidity	Enterococci	<i>E. coli</i>	Turbidity
OK621200050010_10	Red Rock Creek	X			X		
OK621210000030_10	Arkansas River	X		X	X		X
OK720500010010_00	North Canadian River	X			X		
OK720500010070_00	Bent Creek	X	X		X	X	
OK720500010140_10	Beaver River	X			X		
OK720500010150_00	Persimmon Creek	X	X		X	X	X
OK720500010200_00	Indian Creek	X	X		X	X	

TMDLs: A TMDL is a plan of action to reduce pollutant loads so that impaired waterbodies will be able to meet their beneficial uses. TMDLs calculate the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will be able to meet water quality standards for that particular pollutant. The TMDL report uses scientific data collection, analysis, and [water quality modeling](#) to determine the sources and amounts of the pollutants entering the waterbodies. Then the TMDL allocates loads to point sources (these are known as waste load allocation or WLA) and [nonpoint sources](#) (NPS) which are given a load allocation or LA.

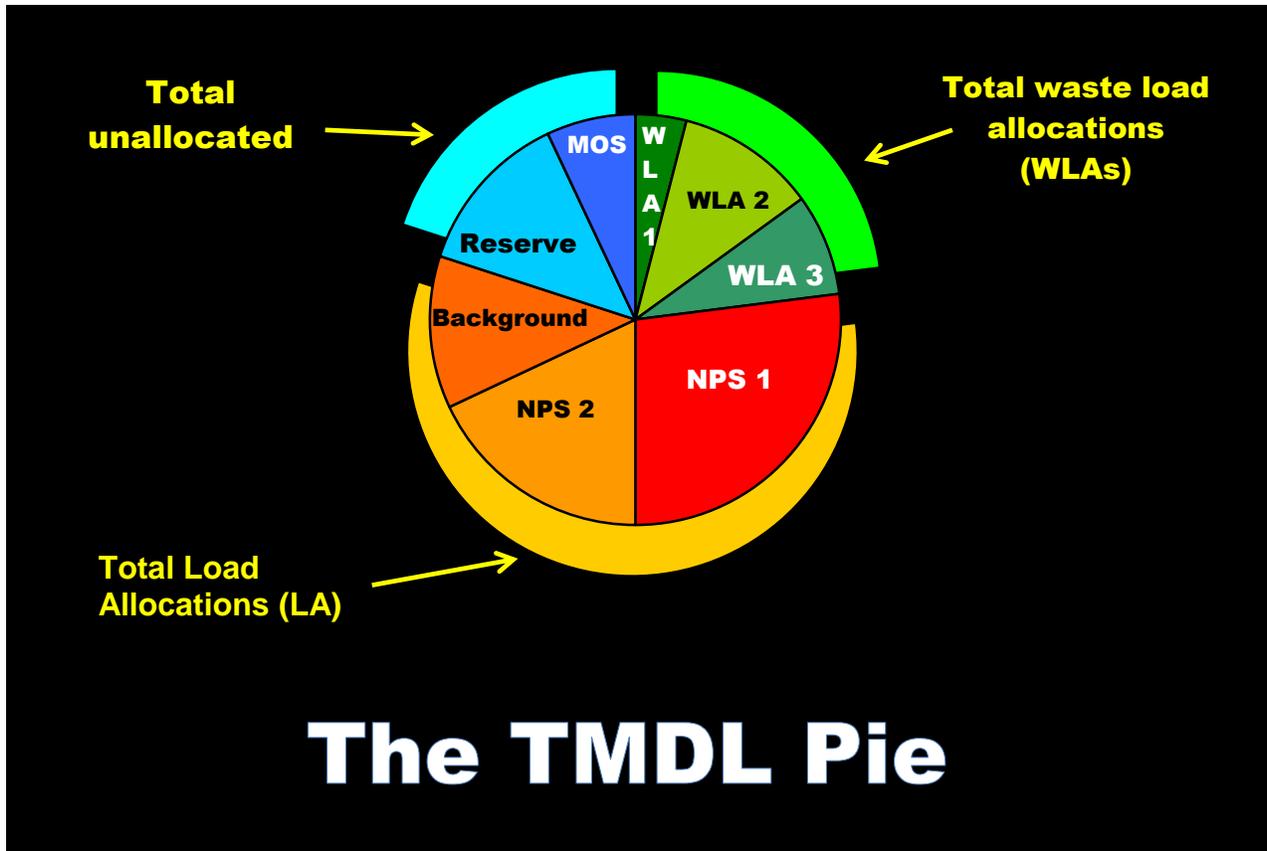
The [National Pollutant Discharge Elimination System \(NPDES\) program](#) regulates point source discharges. The NPDES Program in Oklahoma, in accordance with an agreement between DEQ and EPA, is implemented via the Oklahoma Pollutant Discharge Elimination System (OPDES) Act [Title 252, Chapter 606 (<http://www.deq.state.ok.us/rules/606.pdf>)]. A point source is described as a “discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters.” These are usually, but not always, discharges from a pipe. TMDLs must provide WLAs for all NPDES regulated point sources. Nonpoint sources (NPS) are ones, like agricultural runoff, that cannot be identified as entering a waterbody at a single location.



DEQ file photo of a point source discharge

An important part of TMDL analysis is the identification of all sources of pollutants (both point and nonpoint) in the watershed. Once identified, all contributing sources of the pollutants are allocated a portion of the allowable load. This usually requires a reduction in the amount of pollution the source is discharging in order to help the waterbody no longer be impaired. Natural background sources, seasonal variations, and a margin of safety (usually at least 10%) are all taken into account in the allocations. The TMDL equation is as follows:

$$\text{TMDL} = \text{WLA (waste load allocations from point sources)} + \text{LA (from nonpoint sources)} + \text{MOS (Margin of safety)}$$



Point Source Discharges in the Arkansas River and North Canadian River Study Area:

- **OPDES-regulated municipal and industrial wastewater treatment facilities (WWTF):** There was one municipal (Woodward WWTF) and one industrial (Western Farmers Electric Cooperative-Mooreland plant) OPDES-permitted facility that discharge wastewater into the Beaver River (OK720500010140_10) watershed. These facilities are listed in Table 3-1 of the TMDL report. Even though they both discharge into a waterbody that requires a TMDL for Enterococci, only Woodward WWTF will receive a WLA for bacteria since the Western Farmers Electric Cooperative-Mooreland plant is not considered a potential source of bacteria.
- **OPDES-regulated stormwater discharges:** DEQ regulates stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s), industrial sites, and construction sites. But DEQ's stormwater program does not include discharges from Indian Country lands, discharges related to oil & gas extraction, or discharges associated with agricultural purposes. Stormwater discharges occur only during or immediately following periods of rainfall and elevated flow conditions when the turbidity criteria do not apply. Because of this and because these facilities are permitted, they are not considered potential contributors to turbidity impairment. For details about DEQ's Stormwater Program, go to <http://www.deq.state.ok.us/WQDnew/stormwater/>

- ☛ **OPDES regulated stormwater discharges through Municipal Separate Storm Sewer Systems (MS4s):** Polluted stormwater runoff is commonly transported through MS4s, from which it is often discharged untreated into local waterbodies. Cities and towns in [urbanized areas](#) must use [Best Management Practices \(BMPs\)](#) to prevent harmful pollutants from being washed or dumped into local streams and lakes. MS4s outline these [BMPs](#) in their stormwater management program. They must also obtain an [MS4 Permit](#) from DEQ ([OKR04](#)). The Arkansas River and North Canadian River Study Area does not have any MS4s.



DEQ file photo of storm drain marker

- ☛ **Industrial Sites:** Stormwater run-off from industrial sites is regulated because stormwater from industrial facilities may come into contact with many different types of pollutants including process wastewater, equipment wash run-off, leaks from storage tanks, oil & gas from vehicles, pesticides & fertilizers, and sediment. [DEQ's Multi-Sector General Permit \(MSGP\)](#) authorizes the discharge of stormwater from industrial facilities. The determination of whether or not an industrial facility must obtain stormwater discharge permit coverage is based both on the facility's Standard Industrial Classification (SIC) code and whether or not the facility has the potential to contaminate stormwater. To find out which industries are covered, refer to Table 1-2 beginning on Page 3 of the MSGP ([OKR05](#)). To get an industrial stormwater permit, a [Notice of Intent \(NOI\)](#) must be filed with DEQ and the applicable application and annual permit fees must be paid. Also, a [stormwater pollution prevention plan \(SWP3\)](#) **must** be developed and implemented according to the requirements of this permit. There are five facilities in the Arkansas River and North Canadian River Study Area with MSGPs. Information about the facilities with OKR05 permits can be found in Table 3-2 of the TMDL report.



In the Arkansas River ([OK621210000030_10](#)) watershed, which is impaired for TSS, the City of Miami ([OKR051020](#)) is the only discharging facility. The City of Miami's airport ([OKR051020](#)) is permitted as scheduled air transportation (SIC 4512). They will not have a WLA because stormwater discharges from them occur only during or immediately following periods of rainfall and elevated flow conditions when the turbidity criteria do not apply.

- **Rock, Sand, and Gravel Quarries:** [Stormwater](#) from rock, sand and gravel quarries in Oklahoma fall under the MSGP. But [wastewater](#) generated at quarries is regulated under [DEQ General Permit OKG950000](#). General Permit OKG950000 does not allow discharge of wastewater into Outstanding Resource Waters, High Quality Waters, Sensitive Public & Private Water Supplies, and Appendix B Waters [OAC 785.45-5-25(c)(2)]. In addition, this Permit does not allow discharge of wastewater into turbidity-impaired waters on Oklahoma's 303(d) list. This is the case if a TMDL has not been performed or the result of the TMDL indicates that discharge limits more stringent than 45 mg/l for TSS are required. There are three quarries in the Study Area (listed in Table 3-5 and shown in Figure 3-2 of the TMDL report), but they don't discharge wastewater so they won't receive a WLA.



Photo courtesy of the Oklahoma Department of Mines

- ☛ **Construction Sites:** A [Construction General 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 (e.g. concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, and borrow areas) 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.

An authorization to discharge from DEQ must be received prior to beginning any construction activities with stormwater discharges. In order to receive this authorization, a [Notice of Intent \(NOI\)](#) must be filed with DEQ and the applicable application and annual permit fees must be paid. Also, a [stormwater pollution prevention plan \(SWP3\)](#) must be developed and implemented according to the requirements of the OKR10 permit. There were nine OKR10 permits for construction projects in the Arkansas River and North Canadian River Study Area during the time period when water samples were taken. Information about these permits can be found in Table 3-2 of the TMDL report and their locations can be seen in Figure 3-2.

- **No-Discharge Facilities:** Certain municipal facilities are classified as no-discharge. These facilities are required to sign an affidavit of no discharge. For the purposes of these TMDLs, it is assumed that no-discharge facilities (such as towns with [total retention lagoons](#)) do not contribute bacteria or TSS into the waterbodies. However, it is possible that the wastewater collection systems associated with these no-discharge facilities could be a source of bacteria, or that discharges from the wastewater plant may occur during large rainfall events that exceed the systems' storage capacities. In the Arkansas River and North Canadian River Study Area, there are eight no-discharge facilities, including five municipal and three industrial facilities. Details about them are in Table 3-3 of the TMDL report.
- **[Sanitary Sewer Overflows \(SSO\)](#):** The sanitary sewer system is the network of underground pipes that carry wastewater from sinks, toilets, showers, bathtubs, and interior floor drains to the wastewater treatment plant where it is cleaned and treated before being discharged into local waterbodies. Although infrequent, [sanitary sewer overflows \(SSO\)](#) from wastewater collection systems can be a major source of harmful bacteria into streams. Most overflows are caused by blockage of sewer pipes by grease, tree roots, trash, 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 Raleigh, NC

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.⁶ All SSOs falling into these two categories are addressed through DEQ's formal enforcement process. While not all sewer overflows are reported, DEQ has some data. For example in the Arkansas River and North Canadian River Study Area between 1989 and 2001, 77 SSO occurrences were reported with amounts ranging from a minimal amount to over 38 million gallons. Data about these SSOs are summarized in Table 3-4 of the TMDL report with specific details in Appendix D.

- **NPDES regulated [Animal Feeding Operations \(AFOs\)](#):** The [Agricultural Environmental Management Services \(AEMS\)](#) is a program within the Oklahoma Department of Agriculture, Food and Forestry (ODAFF). Through regulations established by the Oklahoma [Concentrated Animal Feeding Operation \(CAFO\) Act](#), [Swine Feeding Operation \(SFO\) Act](#), and the [Poultry Feeding Operation \(PFO\) Registration Act](#), AEMS helps develop, coordinate, and oversee environmental policies and programs aimed at protecting the Oklahoma environment from pollutants associated with agricultural animals and their waste. ODAFF is the NPDES-permitting authority for CAFOs and SFOs in Oklahoma under what ODAFF calls the [Agriculture Pollutant Discharge Elimination System \(AgPDES\)](#). PFOs are smaller animal feeding operations so they are not required to get NPDES permits. They are only required to register with ODAFF and follow [PFO rules](#). In the Arkansas River and North Canadian River Study Area, there weren't any PFOs.

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 Rules](#) are designed to protect water quality through the use of Best Management Practices ([BMPs](#)). BMPs include dikes, berms, terraces, ditches or other similar structures

⁶ For environmental complaints, go to: www.deq.state.ok.us/ECLSnew/Complaints/onIncmpl.htm

used to isolate animal waste from outside surface drainage. Except for a 25-year, 24-hour rainfall event, CAFOs are considered “no discharge” facilities and are not considered a source of TSS loading. If not managed properly, CAFOs have the potential to cause serious impacts on water quality.⁷ Potential problems for CAFOs include possible animal waste discharges to State waterbodies and failure to properly operate wastewater lagoons. There are no CAFOs in the Arkansas River and North Canadian River Study Area. However, according to ODAFF, there are six SFOs with 38,564 swine.

An SFO is a lot or facility where swine kept for at least ninety (90) consecutive days or more in any twelve-month period. A “concentrated swine feeding operation” has a certain number of swine⁸ and either discharges its pollutants into nearby waterbodies through a ditch, flushing system or other constructed device, or the pollutants flow directly into waterbodies that flow through or come into direct contact with swine at the facility. SFOs are required to follow [Oklahoma SFO Rules](#) and develop a [Swine Waste Management Plan](#) to prevent swine waste from being discharged into surface or groundwaters. This Plan includes the use of BMPs to prevent runoff & erosion.⁹ The Swine Waste Management Plan may include, but is not limited to, a Comprehensive Nutrient Management Plan per NRCS guidance or Nutrient Management Plan per EPA guidance.



Photo courtesy of [Michigan State University](#).



Stones placed in Tahlequah Creek under a 401/404 project.

(DEQ file photo)

● **Section 404 Permits:** Because discharge of dredged or fill material in waters can be a significant source of impairments such as turbidity/TSS, [Section 404 of the Clean Water Act \(CWA\)](#) requires a permit from the [U.S. Army Corps of Engineers \(USACE\)](#) before discharging those materials into waters of the United States, including [wetlands](#). Activities regulated under this program include - but are not limited to - fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. However, certain farming and forestry activities are exempt. Both USACE and EPA can take enforcement actions for violations of Section 404. Under Section 401 of the CWA, [DEQ](#) reviews and certifies that Oklahoma Water Quality Standards are protected.

⁷ The United States Department of Agriculture’s (USDA) Natural Resources Conservation Service (NRCS) has a program where operators of Animal Feeding Operations/Confined Animal Feeding Operations (AFO/CAFO) can apply for financial assistance for the storage, treatment, and utilization of animal waste. This is a statewide process to address the water quality impacts of these facilities to the rivers and streams of the State. For more information, go to www.nrcs.usda.gov/wps/portal/nrcs/detail/ok/programs/financial/?cid=nrcs142p2_000482.

⁸ A concentrated swine feeding operation has at least 750 swine that each weighs over 25 kilograms (about 55 pounds), 3,000 weaned swine weighing under 25 kilograms, or 300 swine animal units. A swine animal unit is a unit of measurement for any swine feeding operation calculated by adding the following numbers: The number of swine weighing over twenty-five (25) kilograms, multiplied by four-tenths (0.4), plus the number of weaned swine weighing under twenty-five (25) kilograms multiplied by one-tenth (0.1)

⁹ Swine Animal Waste Management Plan Requirements [Title 35 (ODAFF), Chapter 17 (Water Quality), Subchapter 3 (Swine Feeding Operations)] can be found in 35:17-3-14.

Nonpoint Sources of Discharges in the Arkansas River and North Canadian River Study Area:

Nonpoint sources include those sources that cannot be identified as entering the waterbody at a specific location. [Nonpoint sources](#) of pollutants are typically separated into [urban](#) and rural categories. Surface [storm runoff](#)¹⁰ is an important source of loading in urban or residential settings with many [roads](#) and other [paved, impervious areas](#). In [rural settings](#)¹¹, the sources of bacteria may include runoff of manure applied to agricultural land, the runoff of farm 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 bacterial loading to a waterbody. Bacteria from wildlife are also deposited onto land surfaces, where they may be washed into nearby streams by rainfall runoff. It must be noted that no data are available in Oklahoma to estimate wildlife populations 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.

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 bacterial 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](#) (ODWC) county data, the population of deer can be roughly estimated. By using this estimate and the percentage of the watershed area within each county, wild deer population can be calculated for each watershed. This comes to about 3,250 deer in the Arkansas River and North Canadian River Study Area. The average deer per acre rate ranges from 0.0001 [Beaver River (OK720500010140_10) and Indian Creek (OK720500010200_00)] to 0.0087 [Arkansas River (OK621210000030_10)]. At this minimal concentration, wildlife is considered to be a minor contributor of bacteria in those impaired watersheds.



Photo courtesy of [USDA ARS](#)

- **Farm Animals** - Agricultural [livestock grazing](#) in pastures deposit [manure](#) containing bacteria onto land surfaces. Detailed information is not currently 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, land application of commercially raised farm animal manure is considered a potential source of bacterial loading into watersheds in the Arkansas River and North Canadian River Study Area for the purpose of these TMDLs. Examples of livestock activities that could result in bacteria getting into creeks, streams, and rivers include:



Processed manure from livestock operations such as poultry facilities: This manure is often applied to fields as fertilizer and can contribute to fecal bacterial loading into waterbodies if washed into streams by runoff. In Oklahoma, [poultry waste applicators must be certified](#).



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

¹⁰ For information on how to reduce runoff after rainstorms, request the free DVD from EPA entitled "Reduce Runoff: Slow it Down, Spread it Out, Soak it in!" (EPA Publication #84211001) by calling them at 800-490-9198 or by ordering it from their webpage (www.epa.gov/nscep/). The DVD includes the video, "After the Storm", which was co-produced by EPA and The Weather Channel. The "After the Storm" brochure (PDF) can be downloaded at <http://water.epa.gov/action/weatherchannel/index.cfm>.

¹¹ The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program from the USDA NRCS that promotes agricultural production and environmental quality. Through EQIP, farmers and ranchers may receive financial and technical assistance to install or implement structural and management conservation practices on eligible agricultural land. To find out what programs are available, go to: www.nrcs.usda.gov/wps/portal/nrcs/detail/ok/programs/financial/?cid=nrcs142p2_000353 or contact your local [NRCS Field Service Center](#).



Direct access to waterbodies by livestock: Livestock standing in or crossing streams can provide a direct concentrated source of fecal bacteria and TSS into the streams. In the four bacterially-impaired watersheds in the Arkansas River and North Canadian River Study Area, cattle (an estimated 74,510 head) generate the largest amount of fecal coliform and often have direct access to streams and tributaries. The estimated numbers of livestock by watershed are based on the USDA county agricultural census data. The estimated farm animal populations were derived by using the percentage of the watershed within each county. Refer to the full TMDL report for the estimated number of all agricultural animals (Table 3-8) as well as their daily fecal coliform production rates (Table 3-9).



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

Photo courtesy of [USDA NCRS](https://www.usda.gov/nrcrs)

- **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)]. Based on these national averages, it is estimated that there are about 3,876 dogs and 4,370 cats in the Arkansas River and North Canadian River Study Area. See Section 3.3.3 of the TMDL report for the estimated bacterial load from dogs and cats. Pets are considered to be a minor contributor of bacteria in those impaired watersheds.



- **Failing Septic Systems** – If a septic system is not working properly, then raw sewage - a concentrated source of bacteria - can go directly into streams. Bacterial 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 241 failing septic systems in the Arkansas River and North Canadian River Study Area. Refer to the full TMDL report (Section 3.3.4) on how these numbers were calculated and the estimated bacterial load from failing septic systems.

Summary of Possible Sources of Impairment:

- **Bacteria** - The health effects of bacteria should be a concern for the public who use these waterbodies for activities such as swimming, wading, or boating because some waterborne bacteria can cause serious human illness or disease. In the Arkansas River and North Canadian River Study Area, most of the bacteria appears to come from nonpoint sources. In the Beaver River (OK720500010140_10) watershed, there is one continuous point source discharger [Woodward WWT (OK0034509)] which contributes bacteria. But the available data suggests that the proportion of bacteria from that point source is minor since that discharger has a bacterial limit in their permit. There are six SFOs in the North Canadian River (OK720500010010_00) watersheds. But since SFOs are not allowed to discharge or allow the runoff of animal waste, they are not considered to be major sources of the bacteria in the North Canadian River watershed. Therefore, the various nonpoint sources are considered to be the major source of bacterial loading in each watershed that requires a TMDL.

Though most of the pathogens come from nonpoint sources, the specific sources from which the bacteria come cannot be determined without additional study. Of the four major nonpoint sources (wildlife, farm animals, failing septic systems, and domesticated dogs & cats), most of the fecal coliform load estimates from nonpoint sources to land surfaces appears to come from farm animals. Cattle, in particular, are thought to contribute the most to bacterial nonpoint source pollution because:

-  There are quite a few of them (74,510 in the Study Area).
-  They produce a lot of fecal coliform.



They graze in fields where rain can result in runoff into nearby waterbodies.



Sometimes cattle are allowed to wade in creeks and streams that flow to waterbodies.

Table 3-8 of the TMDL report is an estimated percentage of fecal coliform load estimates from the four major nonpoint source categories that can contribute to the elevated bacterial concentrations found in the impaired waterbodies in the Study Area.

- **Turbidity** - Of the two watersheds in the Study Area that require turbidity TMDLs, neither has an industrial source of TSS. Therefore, nonpoint sources are thought to be responsible for most of the TSS impairments in these watersheds.

However, it is difficult to know the exact cause of turbidity impairment in these watersheds. Cattle grazing in the field can result in sediment from erosion. Sediment loading of streams can also originate from natural erosion processes. This includes weathering of soil, rocks, and uncultivated land; geological abrasion; and other natural phenomena. There is insufficient data available to quantify contributions of TSS from these natural processes. TSS or sediment loading can also occur under non-runoff conditions as a result of anthropogenic (man-made) activities in riparian corridors which cause erosive conditions. There isn't enough data to know how much of the turbidity in the impaired waterbodies is naturally-occurring and how much is from other sources.

TMDL Calculations:

The purpose of a TMDL is to identify sources of pollutants in a watershed and calculate the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. The Arkansas River and North Canadian River Study Area contains waterbodies that are in violation of Oklahoma Water Quality Standards with respect to bacteria and/or turbidity. The TMDL calculates the reduction in bacteria and turbidity that would be needed in order for these streams to be in compliance with Oklahoma's WQS. This was done using [load duration curves](#). The calculations include present and future sources as well as a margin of safety. For more information on how the TMDLs were developed, read Sections 4 & 5 and Appendix B of the TMDL report.

Recommendations:

After re-evaluating both bacterial and turbidity data following Oklahoma's assessment protocol, 12 TMDLs (Table 3) were developed for the 7 streams in the Arkansas River and North Canadian River Study Area. There is also a bacterial waste load allocation (WLA) for the Woodward WWTF (Table 4) in the Beaver River watershed (OK720500010140_00). Table 3 indicates the amount that each pollutant will need to be reduced [Percent Reduction Goal (PRG)] in order for that waterbody to meet water quality standards and thus its designated beneficial uses:

Table 3: Percent Reduction Goal Needed for Waterbody to Meet Water Quality Standards

Waterbody ID	Waterbody Name	These impairments must be reduced by the following amounts in order to meet water quality standards.		
		<i>E. coli</i>	Enterococci	Turbidity
OK621200050010_10	Red Rock Creek		94.7%	
OK621210000030_10	Arkansas River		93.3%	92.4%
OK720500010010_00	North Canadian River		42.5%	
OK720500010070_00	Bent Creek	59.8%	93.0%	
OK720500010140_10	Beaver River		48.0%	
OK720500010150_00	Persimmon Creek	62.5%	94.2%	1.3%
OK720500010200_00	Indian Creek	48.5%	85.3%	

The TMDLs include a bacterial WLA for the point source discharger shown in Table 4.

Table 4: Bacterial WLA

Waterbody ID	Stream Name	Facility Name	OPDES Permit No.	Disinfection?	Design Flow (mg/d)	Wasteload Allocation (x10 ⁸ cfu/day)
						ENT
OK720500010140_00	Beaver River	Woodward WWTF	OK0034509	Yes	4.0*	5.0

* Maximum 30-day flow (Q_{e(30)})

Providing comments

- DEQ invites your comments. The comment period will be open for 45 days. The TMDL report is a draft document and is subject to change based on comments received during the public participation process.
- You may also request a public meeting in writing. If there is a significant degree of interest, DEQ will schedule a public meeting.
- All official comments for the record must be submitted either in writing or by e-mail before the end of the comment period. DEQ will prepare a responsiveness summary addressing all comments received. After evaluating comments received and making any necessary changes, the TMDL report will be submitted to EPA for final approval. The final results of the TMDL will be incorporated into Oklahoma’s Water Quality Management Plan.

Please submit your comments in writing to: Dr. Karen Miles, 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 4:30 pm on Monday, August 25, 2014

Obtaining copies: You may view the full Arkansas River and North Canadian River Bacterial and Turbidity TMDL Report by going to the DEQ website at: www.deq.state.ok.us/WQDnew/tmdl/index.html or by picking up copies at the DEQ main office, Water Quality Division, 707 North Robinson, Oklahoma City from 8:30 am – 4:30 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, or you requested notices about your watershed. In addition to proposed TMDL reports, DEQ’s Watershed Planning & Stormwater Permitting Section sends out public notices about proposed wasteload allocations (208s), proposed changes to the CPP or Integrated Report, 404 projects, 401 Certification requests, and stormwater permits.

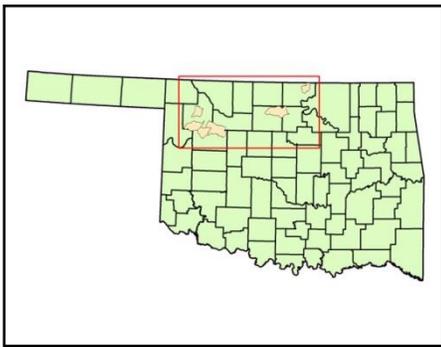
If you would like to receive any or all of these public notices via e-mail, please send your e-mail address to Water.Comments@deq.ok.gov. Also, please let us know if you want to receive notices for the entire State or just for your [watershed](#).

By receiving PDF public notices via e-mail, you will help save money and the environment by reducing the amount of paper we use to mail them. In addition to helping the environment, you will be able to click on helpful FYI hyperlinks.



Note to newspapers: This notice is for your information only. **Do not publish in the legal section or as a legal notice.**

208 FACTSHEET FOR BACTERIAL AND TURBIDITY TMDLs in the ARKANSAS RIVER AND NORTH CANADIAN RIVER STUDY AREA



Watershed:

The Arkansas River and North Canadian River TMDL Study Area is located in the northwestern portion of Oklahoma in the [Black Bear-Red Rock](#) (USGS HUC 11060006), [Kaw Lake](#) (USGS HUC 11060001), and [Middle North Canadian](#) (USGS HUC 11100301) watersheds. The Study Area covers portions of [Dewey](#), [Ellis](#), [Garfield](#), [Grant](#), [Kay](#), [Major](#), [Noble](#), and [Woodward](#) counties.

Beneficial Uses in the Arkansas River and North Canadian River Study Area:

According to the [Oklahoma Water Quality Standards](#), the [designated beneficial uses](#) for the waterbodies in the Arkansas River and North Canadian River Study Area are Aesthetics (AES), Agriculture (AG), Fish & Wildlife Propagation-Warm Water Aquatic Community Subcategory (WWAC), Fish Consumption (FISH), Primary Body Contact Recreation (PBCR), and Public & Private Water Supply (PPWS). The designated beneficial uses addressed in the Arkansas River and North Canadian River TMDL Study Area were WWAC and PBCR. Table 1 is the assessment from Oklahoma's [2012 Integrated Report](#) on whether or not these waterbodies met their beneficial uses.

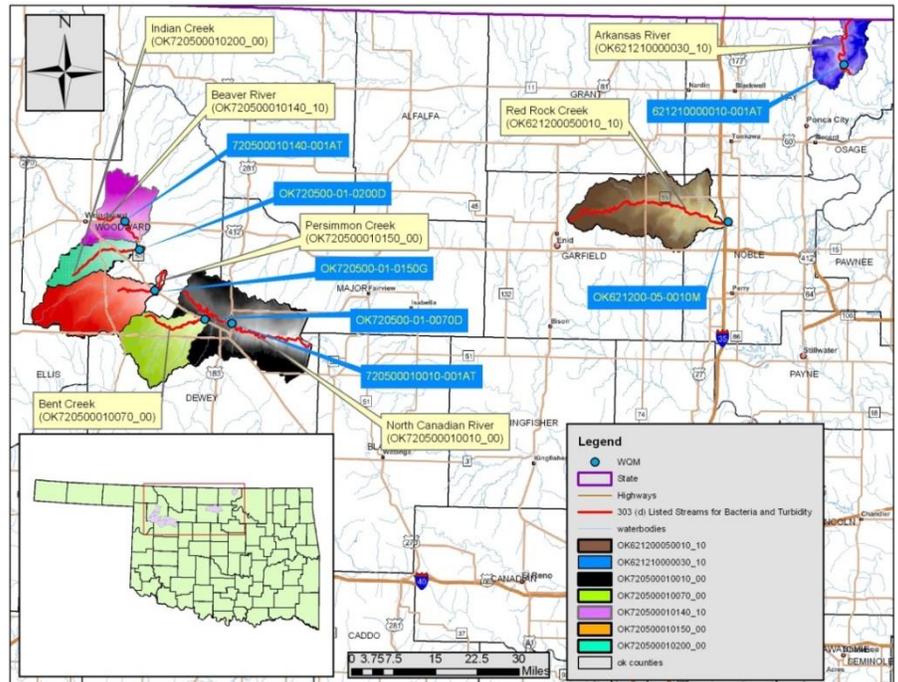


Table 1: Designated Beneficial Uses for Waterbodies in the Study Area

Waterbody Identification	Waterbody Name	AES	AG	WWAC	FISH	PBCR	PPWS
OK621200050010_10	Red Rock Creek	F	N	N	X	N	I
OK621210000030_10	Arkansas River	I	N	N	I	N	I
OK720500010010_00	North Canadian River	F	F	F	N	N	F
OK720500010070_00	Bent Creek	F	N	F	X	N	I
OK720500010140_10	Beaver River	F	F	F	F	N	I
OK720500010150_00	Persimmon Creek	I	F	F	X	N	I
OK720500010200_00	Indian Creek	I	F	F	X	N	I

F – Fully supporting that designated use; N – Not supporting that use; I – Insufficient information; X – Not assessed

Impaired Waterbodies in the Arkansas River and North Canadian River Study Area:

Waterbodies that were indicated as impaired for bacteria or turbidity on Oklahoma's 2012 [303\(d\) list](#), are designated with an "x" in the half of Table 2 with a dark blue header. Bacterial water quality monitoring results from 2001 – 2012 (160 samples) and turbidity water quality monitoring results from 2001 – 2013 (187 after high flow samples were excluded) were examined to verify if these waterbodies were still impaired. The

results of the data analyses are also summarized in Table 2. An "x" in the half of the table with the yellow header indicates that sampling data showed the waterbody to still be impaired for bacteria or turbidity. TMDLs were developed for these waterbodies. The "x" in red represents a waterbody that was found to be impaired when the water quality data was analyzed but that the waterbody had not been on the 2012 303(d) list as being impaired. That was the case with Persimmon Creek (OK720500010150_00) which was found to be impaired for turbidity. As a result, a TMDL for turbidity for Persimmon Creek was developed.

Table 2: Assessed Impairments and Actual Impairments in the Study Area

WBID	Waterbody Name	Waterbody impairments from the 2012 303(d) List			TMDLs needed after sampling results analyzed		
		Enterococci	<i>E. coli</i>	Turbidity	Enterococci	<i>E. coli</i>	Turbidity
OK621200050010_10	Red Rock Creek	X			X		
OK621210000030_10	Arkansas River	X		X	X		X
OK720500010010_00	North Canadian River	X			X		
OK720500010070_00	Bent Creek	X	X		X	X	
OK720500010140_10	Beaver River	X			X		
OK720500010150_00	Persimmon Creek	X	X		X	X	X
OK720500010200_00	Indian Creek	X	X		X	X	

Possible Sources of Impairments:

Point sources - The point sources examined in the Arkansas River and North Canadian River Study Area were:

- **OPDES-regulated [municipal](#) and [industrial wastewater treatment facilities \(WWTF\)](#)** – There is one municipal (Woodward WWTF) and one industrial (Western Farmers Electric Cooperative-Mooreland plant) OPDES-permitted facility that discharge wastewater into the Beaver River (OK720500010140_10) watershed.
- **OPDES regulated stormwater discharges:**
 - ☛ [Municipal Separate Storm Sewer Systems \(MS4s\)](#) - There aren't any in the Study Area.
 - ☛ [Industrial Sites](#) – The City of Miami's airport is the only facility with a [Multi-Sector General Permit \(MSGP\)](#) in the Study Area.
 - Rock, Sand, and Gravel Quarries – Wastewater generated at quarries is regulated under [DEQ General Permit OKG950000](#). There are three quarries in the Study Area (listed in Table 3-5 and shown in Figure 3-2 of the TMDL report).
 - ☛ [Construction Sites](#) - There was one DEQ-permitted construction site during the time period that water samples were taken in the Study Area.
- **Sanitary Sewer Overflows (SSO):** In the Study Area between 1989 and 2001, 77 SSO occurrences were reported with amounts ranging from a minimal amount to over 38 million gallons.
- **No-Discharge Facilities** – In the Study Area, there are eight (five municipal and three industrial facilities) no-discharge facilities. For the purposes of these TMDLs, it is assumed that no-discharge facilities (such as towns with [total retention lagoons](#)) do not contribute bacteria or TSS into the waterbodies.
- **NPDES-regulated [Animal Feeding Operations \(AFOs\)](#)** –The Oklahoma Department of Agriculture, Food and Forestry (ODAFF) has been approved by EPA to issue NPDES permits in Oklahoma under what ODAFF calls the [Agriculture Pollutant Discharge Elimination System \(AgPDES\)](#). There are six [Swine Feeding Operations](#) (SFOs) with 38,564 swine in the Study Area. SFOs must follow [SFO rules](#) and develop a [Swine Waste Management Plan](#) to prevent swine waste from being discharged into surface or groundwater.

Nonpoint sources - The nonpoint sources examined in the Arkansas River and North Canadian River Study Area were:

- Wildlife – There are about 3,250 deer in the Study Area. They are thought to be a minor contributor of bacteria.
- Farm animals – There are an estimated 74,510 head of cattle in the Study Area. They are considered to be a major contributor of fecal coliform in the Study Area.
- Pets – There are an estimated 3,876 dogs and 4,370 cats in the Study Area. They are considered to be a minor contributor of bacteria in the Study Area.
- Failing Septic Systems – There are 241 failing septic systems in the Study Area which are considered to be a minor contributor of bacteria.

For details about each of these sources and their impact on the impairment of waterbodies in the Study Area, consult the full Arkansas River & North Canadian River Bacterial and Turbidity TMDL report at the following DEQ webpage: <http://www.deq.state.ok.us/WQDnew/tmdl/index.html>.

TMDLs:

The TMDLs were calculated using load duration curves. Afterwards, 12 TMDLs (Table 3) and 1 WLA (Table 4) were developed for the 7 streams in the Arkansas River and North Canadian River Study Area. Table 3 shows the amount that each pollutant will need to be reduced [Percent Reduction Goal (PRG)] in order for that waterbody to meet water quality standards and its designated beneficial uses:

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Table 4: Bacterial WLA

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EPA Approval Date: Pending
Record Last Updated: 7/7/2014