Scott Thompson
Executive Director

Mary Fallin
Governor

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

PUBLIC NOTICE[1]

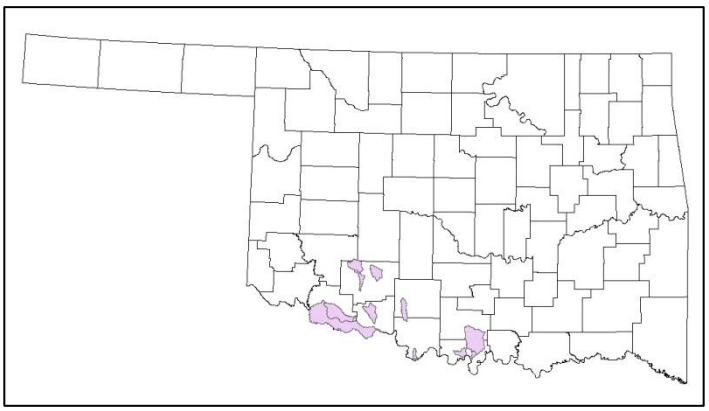
May 31, 2016

Availability of Draft Bacterial and Turbidity TMDLs for the Red River Study Area

Proposed Modification to Incorporate Red River Study Area Bacterial and Turbidity TMDLs into Oklahoma's Water Quality Management Plan

Request for Public Comments

Public Comment Period Ends on Thursday, July 14, 2016



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 Red River Study Area. This Study Area is in the southern portion of Oklahoma in the Blue-China (USGS HUC 11130102), Farmers-Mud (USGS HUC 11130201), Cache (USGS HUC 11130202), West Cache (USGS HUC 11130203), Northern Beaver (USGS HUC 11130208), and Lake Texoma (USGS HUC 11130210) watersheds. The Study Area covers portions of Carter, Comanche, Cotton, Jefferson, Love, Stephens, and Tillman 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 Red 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 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

[1] As a convenience, this DEQ public notice includes links to third-party sites. DEQ's inclusion of a linked site does NOT constitute an endorsement, recommendation, or favoring of the contents. Please be aware that we do not control or guarantee the accuracy, relevance, timeliness, or completeness of this outside information. Further, the inclusion of third-party sites is not intended to reflect their importance, nor is it intended to endorse any views expressed by the author or organization of the reference. The purpose of providing these links is to ensure that the recipient or reader of this notice has additional useful information and references to assess this TMDL report.

[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/watersciencesseminar/SmolenWQImplementation.pdf

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 Red 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)
- Emergency Water Supply (EWS)
- Sensitive Water Supply (SWS)

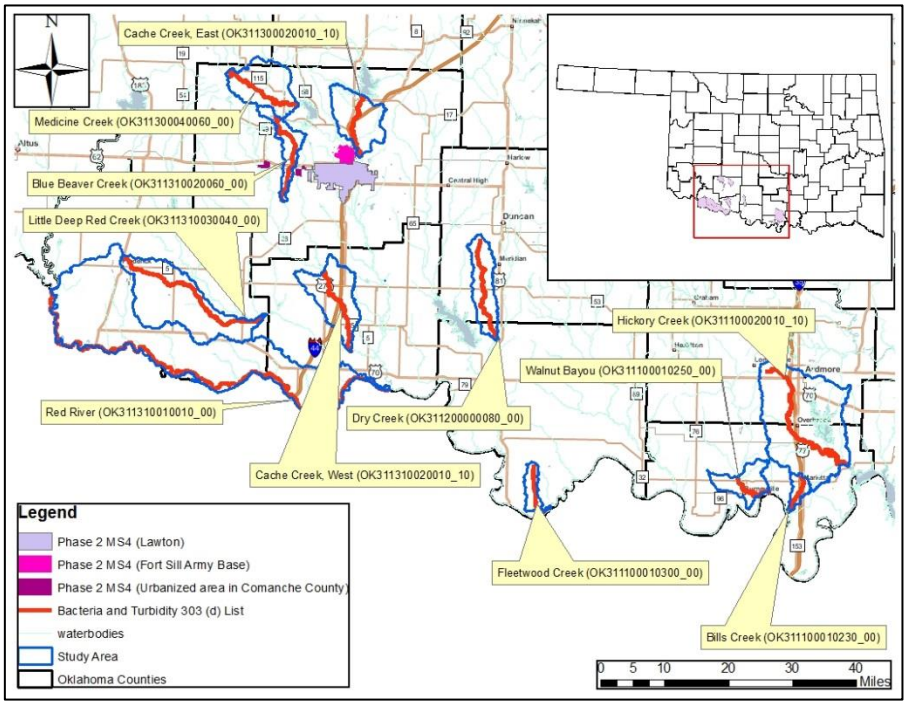


Table 1 is an assessment from Oklahoma's 2014 Integrated Report on whether or not the waterbodies in the Study Area met their designated beneficial uses. The designated beneficial uses addressed in the Red River TMDL Report were PBCR and WWAC:

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

Waterbody Identification	Waterbody Name	AES	AG	WWAC	FISH	PBCR	PPWS	EWS	SWS
OK311100010230_00	Bills Creek	I	X	I	X	N			
OK311100010250_00	Walnut Bayou	I	F	F	I	N	I		
OK311100010300_00	Fleetwood Creek	I	F	N	X	N	I		
OK311100020010_10	Hickory Creek	I	F	F	I	N	I		
OK311200000080_00	Dry Creek	F	I	N	X	N	I		
OK311300020010_10	Cache Creek, East	F	N	N	X	N	X		
OK311300040060_00	Medicine Creek	F	F	F	X	N	I		V
OK311310010010_00	Red River	I	N	N	F	N		F	
OK311310020010_10	Cache Creek, West	F	F	F	X	N	I		
OK311310020060_00	Blue Beaver Creek	F	F	I	X	N	F		
OK311310030040_00	Little Deep Red Creek	I	N	N	X	N	I		

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

Impairments:

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

- **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. They may be found in fecal matter entering waterbodies from sources such as sewage discharges, leaking septic tanks, or runoff from animal feedlots. Therefore, they are used as a surrogate for pathogen bacteria in this TMDL. Enterococci impair 7,442 miles of streams in Oklahoma, and *E. coli* impair 4,006 miles of streams.[3]

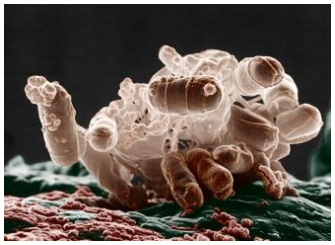
- **Turbidity:** The other beneficial use evaluated in this study was the WWAC subcategory of Fish and Wildlife Propagation. The WWAC subcategory evaluates whether the water quality and habitat are adequate to support a climax (fully-developed) fish community. Turbidity is one of the impairments that keep 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 2,709 miles of streams in Oklahoma.[4]

TMDL Study: The TMDL study evaluated 11 waterbodies in the Red River Study Area that DEQ designated as impaired in the 2014 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 (nepholometric turbidity units) for streams with a WWAC beneficial use in 10% or more of

[3] Table 6 of DEQ's 2014 Oklahoma Integrated Report.

[4] Ibid

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 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 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 2000 – 2013, 214 bacterial samples were collected for the waterbodies in the Study Area. Between 2001 – 2014, 235 turbidity samples 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 "**2015 Bacterial and Turbidity TMDLs for Oklahoma Streams in the Red River Study Area**".

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.

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

WBID	Waterbody Name	Waterbody impairments from the 2014 303(d) List			TMDLs needed after sampling results analyzed		
		Enterococci	*E. coli*	Turbidity	Enterococci	*E. coli*	Turbidity
OK311100010230_00	Bills Creek	X			Delist – Insufficient data		
OK311100010250_00	Walnut Bayou	X			X		TMDL required
OK311100010300_00	Fleetwood Creek	X	X		X	X	
OK311100020010_10	Hickory Creek	X			X		
OK311200000080_00	Dry Creek	X	X		Delist – Insufficient data	Delist – Insufficient data	
OK311300020010_10	Cache Creek, East	X			X		TMDL required
OK311300040060_00	Medicine Creek	X			X		
OK311310010010_00	Red River			X			X
OK311310020010_10	Cache Creek, West	X			X		
OK311310020060_00	Blue Beaver Creek	X			X		
OK311310030040_00	Little Deep Red 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.

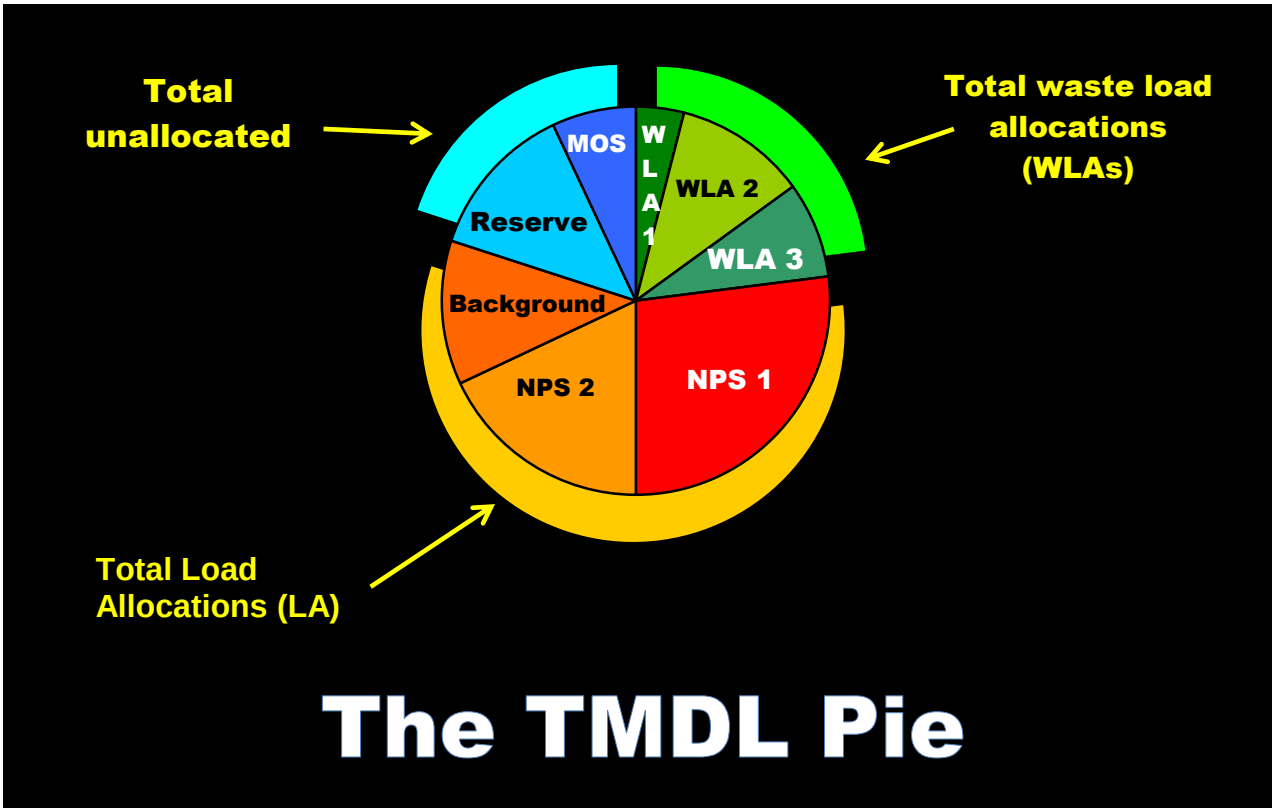
The National Pollutant Discharge Elimination System (NPDES) program regulates point source discharges. The NPDES Program in Oklahoma, in accordance with an agreement between DEQ and EPA, is

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

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.

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:

TMDL = WLA (waste load allocations from point sources) **+ LA** (from nonpoint sources) **+ MOS** (Margin of safety)



Point Source Discharges in the Red River Study Area:

- **OPDES regulated municipal and industrial wastewater treatment facilities (WWTF):** There are seven municipal and two industrial OPDES-permitted facilities that discharge wastewater to waters in the Red River Study Area. One of the industrial facilities is inactive. All of these facilities are listed in Table 3-1 of the TMDL report and displayed in Figure 3-1.

- **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 Fort Sill Army Base is the Phase II MS4s in the Red River Study Area.

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 were 16 facilities in the Red River Study Area with MSGPs during the time of the study.

  - **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)]. This Permit does not allow discharge of wastewater into turbidity-impaired waters on Oklahoma's 303(d) list. There are four sand and gravel mines, but they aren't allowed discharge of wastewater in the Study Area.

- **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 24 OKR10 permits for construction projects in the Red River Study Area during the time period when water samples were taken. This can be found in Table 3-2 of the TMDL report.

- **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 to bacteria or TSS getting 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. There are 20 facilities in the Red River Study Area.

DEQ file photo of land application

- **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 Red River Study Area between 1989 and 2014, 1,351 SSO occurrences were reported with amounts ranging from a minimal amount to about 44.6 million gallons. Details about these SSOs are summarized in Table 3-5 of the TMDL report with specific details in Appendix H.

- **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. This is done through the use of Best Management Practices (BMPs). BMPs include dikes, berms, terraces, ditches or other similar structures used to isolate animal waste from outside surface drainage. 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 Red 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 BMPs. 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

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

[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.

discharges to State waterbodies and failure to properly operate wastewater lagoons. There are 3 CAFOs with 24,920 animal units.

Photo courtesy of Michigan State University.

An SFO is a lot or facility where swine kept for at least ninety (90) consecutive days or more in any twelve-month period. SFOs are required to develop a Swine Waste Management Plan[8], to prevent swine waste from being discharged into surface or groundwaters. This Plan includes the BMPs being used to prevent runoff & erosion. The Swine Waste Management Plan may include, but is not limited to, a Comprehensive Nutrient Management Plan (CNMP) per NRCS guidance or Nutrient Management Plan (NMP) per EPA guidance. SFOs are required to store wastewater in Waste Retention Structures (WRS) and either to land apply wastewater or make the WRS large enough to be total retention lagoons. SFOs are not allowed to discharge to State waterbodies. There weren't any SFOs in the Red River Study Area.

- **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.

Stones placed in Tahlequah Creek under a 401/404 project. (DEQ file photo)

Nonpoint Sources Discharges in the Red 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[9] is an important source of loading in urban or residential settings with many roads and other paved, impervious areas. In rural settings[10], 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

8 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.

9 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.

10 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.

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 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. For the eight watersheds required to bacterial TMDL in the Red River Study Area, this comes to about 4,095 deer. This is an average deer per acre rate ranging from 0.0036 [Cache Creek, East (OK311300020010_10) and Blue Beaver Creek (OK311310020060_00)] to 0.0099 [Hickory Creek (OK311100020010_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 Red 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.

  - **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 eight watersheds required to bacterial TMDL in the Red River Study Area, cattle (an estimated 35,936 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 3-12) as well as their daily fecal coliform production rates (Table 3-13).

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

Photo courtesy of USDA NCRS

- **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 7,561 dogs and 8,529 cats in the eight watersheds required to bacterial TMDL in the Red River Study Area.

- **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 266 failing septic systems in the eight watersheds required to bacterial TMDL in the Red River Study Area. Refer to the full TMDL report (Section 3.3.4) on how these numbers were calculated.

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 Red River Study Area, most of the bacteria appear to come from nonpoint sources. Of the eight watersheds required to bacterial TMDL in the Study Area, three [Hickory Creek (OK311100020010_10), Cache Creek, East (OK311300020010_10), and Little Deep Red Creek (OK311310030040_00)] have a continuous point source discharger in them. However, available data suggests that the proportion of bacteria from those point sources is minor. There are three CAFOs (24,920 units) which could possibly contribute bacterial loading into the Red River watershed. But CAFOs are not allowed to discharge or allow the runoff of animal waste so they are not considered to be major sources of bacteria as long as they are in compliance with their Nutrient Management Plans and Animal Waste Management Plans as outlined in the ODAFF CAFO Rules. 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 land surface based on their estimated number (64,251 units in the Red River Study Area) and coliform production. They graze in fields where rain can result in runoff into nearby waterbodies and, sometimes, are allowed to wade in creeks and streams that flow to waterbodies.

  Table 3-16 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 these watersheds. It is estimated that commercially raised farm animals contribute 97.86% - 99.88% of the fecal coliform load estimates to land surfaces in these 11 watersheds. However, the magnitude of loading to land surfaces may not reflect the magnitude of loading to a stream.

- **Turbidity** –Of the three watersheds in the Study Area that require turbidity TMDLs, one of them, East Cache Creek (OK311300020010_10), has minor industrial permitted sources of TSS that will necessitate a WLA. The East Cache Creek and Red River watersheds have other permitted activities such as construction activities that contribute some TSS loading. Therefore, nonsupport of WWAC use in these watersheds is likely caused primarily by nonpoint sources of TSS. Sediment loading of streams can originate from natural erosion processes, including the 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.

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 Red River Study Area contains waterbodies that are in violation of Oklahoma Water Quality Standards with respect to bacteria and 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 C of the TMDL report.

Recommendations:

After re-evaluating both bacterial and turbidity data following Oklahoma's assessment protocol, 13 TMDLs were developed for the 9 streams in the Red River Study Area. **Table 3** and **4** are summaries of these TMDLs at the 50% flow percentile. Permitted stormwater discharges are considered point sources. The Fort Sill Army Base is the designated Phase II MS4s within the watersheds of the Study Area impaired for contact recreation. Therefore, they will receive WLAs for MS4s in East Cache Creek.

Table 3 Summary of Bacterial TMDLs in the Red River Study Area

Stream Name	Waterbody ID	Pollutant	TMDL (cfu/day)	WLA $_{WWTF}$ (cfu/day)	WLA$_{_MS4}$ (cfu/day)	LA (cfu/day)	MOS (cfu/day)
Walnut Bayou	OK311100010250_00	**ENT**	1.41E+09	0.00E+00	0.00E+00	1.27E+09	1.41E+08
Fleetwood Creek	OK311100010300_00	***E. coli***	5.28E+08	0.00E+00	0.00E+00	4.76E+08	5.28E+07
		ENT	1.38E+08	0.00E+00	0.00E+00	1.25E+08	1.38E+07
Hickory Creek	OK311100020010_10	**ENT**	2.86E+09	9.55E+08	0.00E+00	1.62E+09	2.86E+08
Cache Creek, East	OK311300020010_10	**ENT**	1.94E+10	5.37E+09	4.43E+07	1.20E+10	1.94E+09
Medicine Creek	OK311300040060_00	**ENT**	1.08E+10	0.00E+00	0.00E+00	9.70E+09	1.08E+09
Cache Creek, West	OK311310020010_10	**ENT**	2.68E+09	0.00E+00	0.00E+00	2.41E+09	2.68E+08
Blue Beaver Creek	OK311310020060_00	**ENT**	8.88E+08	0.00E+00	0.00E+00	7.99E+08	8.88E+07
Little Deep Red Creek	OK311310030040_00	***E. coli***	5.73E+09	2.62E+09	0.00E+00	2.53E+09	5.73E+08
		ENT	1.50E+09	6.87E+08	0.00E+00	6.63E+08	1.50E+08

Table 4 Summary of TSS TMDLs in the Red River Study Area

Stream Name	Waterbody ID	Pollutant	TMDL (lbs/day)	WLA (lbs/day)	WLA$_{_MS4}$ (lbs/day)	WLA$_{_Growth}$ (lbs/day)	LA (lbs/day)	MOS (lbs/day)
Walnut Bayou	OK311100010250_00	**TSS**	225	0	0	2	166	56
Cache Creek, East	OK311300020010_10	**TSS**	7,759	14	0	78	6,116	1,552
Red River	OK311310010010_00	**TSS**	126,125	0	0	1,261	112,252	12,613

Table 5 and **6** indicate 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:

Table 5 Percent Reduction Goal Needed for Waterbody to Meet Bacterial Water Quality Standards

Waterbody ID	Waterbody Name	Required Reduction Rate	
		E. coli	ENT
OK311100010250_00	Walnut Bayou	-	73.5%
OK311100010300_00	Fleetwood Creek	79.8%	97.0%
OK311100020010_10	Hickory Creek	-	62.8%
OK311300020010_10	Cache Creek, East	-	70.9%

Waterbody ID	Waterbody Name	Required Reduction Rate	
		E. coli	ENT
OK311300040060_00	Medicine Creek	-	79.4%
OK311310020010_10	Cache Creek, West	-	79.0%
OK311310020060_00	Blue Beaver Creek	-	87.9%
OK311310030040_00	Little Deep Red Creek	11.5%	93.0%

Table 6 Percent Reduction Goal Needed for Waterbody to Meet TSS Water Quality Standards

Waterbody ID	Waterbody Name	Required Reduction Rate
OK311100010250_00	Walnut Bayou	63.5%
OK311300020010_10	Cache Creek, East	34.3%
OK311310010010_00	Red River	92.8%

TMDLs include bacterial and TSS WLAs for point source dischargers. The WLAs are in **Table 7** and **8**.

Table 7 Bacterial Wasteload Allocations for OPDES-Permitted Facilities

Stream Name & Waterbody ID	Name	OPDES Permit No.	Current Disinfection Requirement	Design Flow (mg/d)	Wasteload Allocation ($x10^9$ cfu/day)	
					E. coli	ENT
Hickory Creek OK311100020010_10	**Lone Grove WWT**	OK0034266	Yes	0.764	-	0.955
Cache Creek, East OK311300020010_10	**Fort Sill WWT**	OK0030295	Yes	4.3	-	5.4
Little Deep Red Creek OK311310030040_00	**Fredrick POTW**	OK0027171	Yes	0.55	2.6	0.7

Table 8 TSS Wasteload Allocations for OPDES-Permitted Facilities

Stream Name & Waterbody ID	Name	OPDES Permit No.	Average Monthly Flow (mgd)	Effluent TSS Target (mg/L)	Daily Maximum TSS limit (mg/L)	Wasteload Allocation (lb/day)
Cache Creek, East OK311300020010_10	**Dolese Bros Richard's Spur Quarry**	OKG950031	0.0384	60.0	45.0[a]	14.4

[a] Maximum Daily TSS limit was used due to no Monthly Average TSS limit.

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: Soojung Lim, 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 Thursday, July 14, 2016

Obtaining copies: You may view the full Red River Bacterial and Turbidity TMDL study 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 – 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, 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.

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

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.**