

PUBLIC NOTICE¹

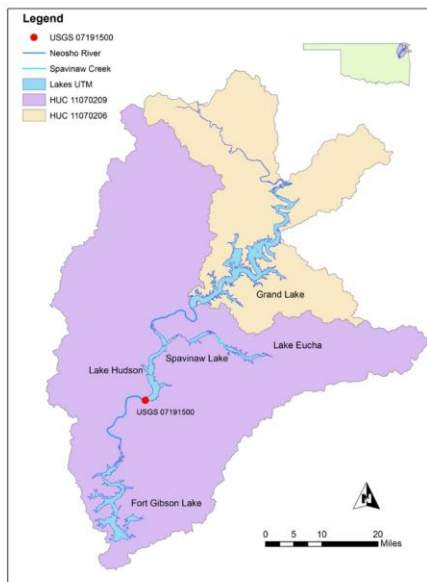
April 7, 2023

Availability of Draft Dissolved Oxygen (DO), Chlorophyll-a and Turbidity TMDLs for Fort Gibson Lake

Proposed Modification to Incorporate Fort Gibson Lake DO,
Chlorophyll-a and Turbidity TMDLs into Oklahoma's Water Quality
Management Plan



Request for Public Comments

Public Comment Period Ends on Monday, May 22, 2023



The [Oklahoma Department of Environmental Quality \(DEQ\)](https://www.deq.ok.gov/water-quality-division/watershed-planning/tmdl/) is seeking comments on a draft [Total Maximum Daily Load](https://www.deq.ok.gov/water-quality-division/watershed-planning/tmdl/) (TMDL) report entitled, "Fort Gibson Lake TMDL Report". This report describes the reductions in total phosphorus (TP), total nitrogen (TN), total organic carbon (TOC), and total suspended solids (TSS) needed to achieve compliance with water quality standards (WQS) for DO, trophic state index (TSI) and turbidity and improve water quality (WQ) in the Fort Gibson Lake Area. This TMDL report is based on Oklahoma's 2010 Integrated Report and 303(d) list. DEQ is also proposing to incorporate these TMDLs into Oklahoma's Water Quality Management Plan (208 Plan). The full TMDL report can be found on-line at: <https://www.deq.ok.gov/water-quality-division/watershed-planning/tmdl/>.

Beneficial Uses: The designated beneficial uses for Fort Gibson Lake (WBID: OK121600010050_00) and Upper Fort Gibson Lake (WBID: OK121600010200_00):

-  Aesthetics (AES)
-  Agriculture (AG)

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- 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 [2010 Integrated Report](#) (IR) on whether or not the waterbodies in the Study Area met their designated beneficial uses.

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

Waterbody Identification	Waterbody Name	AES	AG	WWAC	FISH	PBCR	PPWS	SWS
OK121600010050_00	Fort Gibson Lake	I	F	N	I	I	I	
OK121600010200_00	Fort Gibson Lake, Upper	I	F	N	I	I	I	

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

Impairments: Based on an assessment of water quality monitoring data for the 2010 IR, Oklahoma DEQ has determined that Fort Gibson Lake is not supporting its designated uses for Fish and Wildlife Propagation for a WWAC because of high levels of turbidity in Fort Gibson Lake, Upper (OK121600010200_00) and low dissolved oxygen (DO) in Fort Gibson Lake (OK121600010050_00). Fort Gibson Lake is also designated as one of 21 Nutrient Limited Watersheds (NLW) in Oklahoma because of nutrient enrichment and excessive levels of chlorophyll-a that impair aesthetic uses of the lake. High levels of turbidity and chlorophyll-a can have deleterious effects on raw water quality, such as taste and odor complaints and treatment costs of drinking water. Low levels of dissolved oxygen below the thermocline reflect decay of organic matter in the sediment bed and restricted transfer of dissolved oxygen from the surface layer because of summer thermal stratification.

- **DO:** The WWAC beneficial use will be considered not attained with respect to DO if either the surface or water column criteria produce a result of not attained as below:
 - ◆ Surface Criteria for WWAC Lakes: More than 10% of the samples from the epilimnion during periods of thermal stratification or the entire water column when nutrification is present, are less than 5.0 mg/L from June 16 through October 15 (6.0 mg/L from April 1 – June 15).
 - ◆ Water Column Criteria for WWAC Lakes: 50% or more of the water volume has a DO concentration of less than 2 mg/L or more than 70% of the water column at any given samples site has a DO concentration of less than 2 mg/L if no volumetric data is available.
- **Chlorophyll-a:** NLW in Appendix A of the WQS means a watershed of a waterbody with a designated beneficial use that is adversely affected by excess nutrients as determined by a Carlson's Trophic State Index (using chlorophyll-a) of 62 or greater.
- **Turbidity:** When more than 10% of turbidity samples in a lake are greater than 25 NTU based on long-term record of most recent 10 years, the WWAC beneficial use will be considered not attained. Turbidity is a measure of water clarity, so it cannot be expressed as a mass load. Total suspended solids (TSS) are therefore modeled and evaluated as a surrogate for turbidity using a site-specific relationship derived from TSS and turbidity measurements.

Watershed: Reservoirs located upstream of Fort Gibson Lake in the Neosho River basin include Grand Lake, Lake Hudson, Spavinaw Lake, and Lake Eucha. Grand Lake (Lake o' the Cherokees) and Lake Hudson are owned and operated for hydropower by the Grand River Dam Authority (GRDA). The outflow from Grand Lake is discharged into the Neosho River which in turn, flows into Lake Hudson. Flow and loading from Lake Eucha and Spavinaw Lake are discharged into the upper end of Lake Hudson via Spavinaw Creek. In addition to inflow from the outlet of Lake Hudson on the Neosho River, tributaries to Fort Gibson Lake include Clear Creek, Spring Creek, and Fourteen Mile Creek on the eastern shore of the lake and Pryor Creek, Crutchfield Branch, and Choteau Creek on the western shore. The outflow from Lake Hudson provides the upstream boundary inflow to the lake model domain of the Lower Neosho River and Fort Gibson Lake. Drainage area of the entire watershed to Fort Gibson Lake is 12,492 square miles.

Fort Gibson Lake: Fort Gibson Lake (OK121600010050_00 and OK121600010200_00) is a 19,900 acre reservoir located in the hills of eastern Oklahoma in Cherokee County about 5 miles northwest of Fort Gibson and 50 miles southeast of Tulsa. The dam is located at river mile 7.7 of the Lower Neosho River at Longitude: 95° 13' 47" and Latitude: 35° 52' 11". The lake, with 225 miles of shoreline in Wagoner, Cherokee and Mayes Counties, was constructed in 1953 by impounding the Lower Neosho River for hydropower and flood control. The lake also plays a role in ensuring adequate water for the operation of the McClellan-Kerr Arkansas River Navigation System. The reservoir, owned and operated by the USACE, Tulsa District, is located 7.7 miles upstream of the confluence of the Lower Neosho River with the Arkansas River.

Point Source Discharges:

- **OPDES regulated municipal and industrial wastewater treatment facilities:** There are 11 facilities in the Study Area, including one inactivated facility. The watershed and lake models include the facilities with the effluent flow rate larger than 0.1 MGD. This can be found in Table 3-1 of the TMDL report.
- **OPDES regulated stormwater discharges:** DEQ regulates stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s), industrial sites, and construction sites. However, DEQ's stormwater program does not include the discharges from Indian Country lands, discharges related to oil & gas extraction, or discharges associated with agricultural purposes. For details about DEQ's Stormwater Program, go to <https://www.deq.ok.gov/stormwater-permitting/>.
 - ◆ **MS4s:** Within the domain of the Fort Gibson Lake watershed model, Wagoner County and Tahlequah have been issued Phase II MS4 permits. However, Wagoner County and Tahlequah combined account for only a very small contribution (0.14%) to the total area of the watershed model domain. Therefore, the MS4 permits will not be included as WLAs and will be accounted for by LA.
 - ◆ **Multi-Sector General Permit (MSGP):** An NPDES permit authorization to discharge stormwater from an industrial activity must be obtained prior to the start of any operations. The owner/operator permit holder must also develop and implement a Storm Water Pollution Prevention Plan (SWP3) for the industrial facility maintained at the site. There are 37 MSGP facilities in the Study Area. This can be found in Table 3-6 of the TMDL report.
 - ◆ **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. A [stormwater pollution prevention plan \(SWP3\)](#) must be developed and implemented according to the requirements of the OKR10 permit. There were 13 OKR10 permits for construction projects in the Fort Gibson Lake Study Area during the time period when water samples were taken. This can be found in Table 3-5 of the TMDL report.

- ◆ **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 to nutrients or TSS getting into the waterbodies. However, It is possible that the wastewater collection system associated with no-discharge facilities could be a source of pollutant loading to streams, or that discharges from the WWTP may occur during large rainfall events that exceed the storage capacity of the wastewater system. There are four facilities in the Study Area.
- ◆ **Sanitary Sewer Overflows (SSO):** 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.² 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 Fort Gibson Lake Study Area between 1999 and 2015, 117 SSO occurrences were reported with amounts greater than 1,000 gallons (maximum bypass volume of more than 3 million gallons). Details about these SSOs are summarized in Table 3-3 of the TMDL report with specific details in Appendix F.
- ◆ 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 [Registered Poultry Feeding Operation \(PFO\) 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 Study Area, there were 30 PFOs.

Chicken litter data was not explicitly included in the watershed model. The impact of chicken litter on water quality, however, has been implicitly accounted for by agricultural land use in calibration of the watershed model.

Nonpoint Sources Discharges:

² For environmental complaints, go to: <https://www.deq.ok.gov/deq-contacts/deq-division/ecls/>

- **Upstream River and Watershed Loading** – External loading of nutrients and sediments to Fort Gibson Lake is contributed by the outflow from Lake Hudson to the Neosho River and runoff over the watershed drainage area to Fort Gibson Lake from Lake Hudson to the dam in Fort Gibson Lake. Loading from Lake Hudson is driven by outflow from Spavinaw Lake and Eucha Lake to the Spavinaw River, and outflow from Grand Lake to the Neosho River. Outflows from these reservoirs are controlled by upstream watershed loading and physical transport and biochemical processes in the reservoirs.

Watershed loading results from precipitation and hydrologic runoff processes over drainage area catchments that are dependent on characteristic properties of the landscape such as topography, land use, soil types and physical processes such as infiltration and erosion. Flow and pollutants, derived from watershed runoff, are transported through a network of streams and rivers with discharge into the lake at downstream outlets of the streams. Streamflow, runoff and pollutant loading of nutrients and sediments from the Lower Neosho drainage basin into Fort Gibson Lake is estimated using a public domain and peer reviewed watershed model, Hydrologic Simulation Program-FORTRAN (HSPF).

- **Atmospheric Deposition** – Atmospheric deposition of nitrogen and phosphorus to a waterbody is contributed by both dry and wet deposition. For Fort Gibson Lake, wet and dry deposition data was estimated as the average of annual data from 2005-2006 for ammonia and nitrate from the National Atmospheric Deposition Program (NADP) for Station AR27 (Fayetteville, AR) and the Clean Air Status and Trends Network (CASTNET) Station CHE185 (Cherokee Nation). Dry deposition for phosphorus was estimated using the CASTNET and NADP data for nitrogen with annual average N/P ratios for atmospheric deposition of N and P reported for 6 sites located in Iowa. Annual average wet phosphorus concentration was estimated in proportion to the Dry/Wet ratio for phosphate deposition fluxes.
- **Internal Loading** – Particulate organic matter settles out of the water column, accumulates within the sediment bed, and undergoes decomposition processes. During the summer months of stratification from April through October, decay processes within the sediment bed deplete dissolved oxygen below the thermocline and release inorganic nutrients from the sediment bed back into the water column. The sediment diagenesis sub-model of the EFDC lake model was developed to simulate nutrient release from the sediment for Fort Gibson Lake.

TMDL Calculations:

The methodology for the Maximum Daily Load (MDL) is based on calculations of the (a) long-term average load (LTA) of reduced pollutant loading data calculated with data derived from the upstream boundary inflow from Lake Hudson, NPDES wastewater dischargers and the watershed (HSPF) model; and (b) an estimation of the statistical variability of the time series for loading data based on calculation of the mean (μ), standard deviation (σ), variance (σ^2) and the coefficient of variation (CV). The lognormal distribution is used to represent loading from watershed runoff from the HSPF model and NPDES wastewater sources. The delta lognormal distribution is used to represent loading from the inflow from Lake Hudson to the Neosho River and upper Fort Gibson Lake.

Recommendations:

The WLA and LA for TN, TP, TOC and TSS, determined from the lake model response

to external load reductions, are based on 45% reduction of the existing 2006 inflow from Lake Hudson, NPDES wastewater dischargers, and watershed runoff loads. Load reductions are needed because the criteria for the NLW TSI in the upper and lower WBID segments of the lake are not in compliance under the existing loading conditions. Critical conditions for dissolved oxygen at the sampling site near the dam are also not satisfied under the existing loading conditions.

Summary tables of the existing 2006 loads, the percentage contribution of the existing loads, and the load allocation and wasteload allocations for the inflow from Lake Hudson, watershed runoff, and wastewater dischargers are found in Table 5-1, Table 5-2, Table 5-3, and Table 5-4 of the TMDL report.

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.
- DEQ will hold a public meeting from 2:00 PM to 4:00 PM on Thursday, May 11, 2023. This meeting will occur at the DEQ main office (2nd floor), 707 North Robinson Avenue, Oklahoma City. A virtual option is available by Zoom at <https://www.zoomgov.com/j/1613573114>.
- 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) 702-8195; E-mail: Water.Comments@deq.ok.gov

Comments must be received by 4:30 pm on Monday, May 22, 2023.

Obtaining copies: You may view the full Fort Gibson Lake TMDL Report by going to the DEQ website at: <https://www.deq.ok.gov/water-quality-division/watershed-planning/tmdl/> or by picking up copies at the DEQ main office, Water Quality Division, 707 North Robinson, Oklahoma City from 8:30 am – 4:00 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.



able to click on helpful FYI hyperlinks.

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