

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

PUBLIC NOTICE¹

December 28, 2015

Availability of Draft Chlorophyll-*a* TMDLs for Carl Blackwell Lake and Lake Humphreys

Proposed Modification to Incorporate Carl Blackwell Lake and Lake Humphreys
Chlorophyll-*a* TMDLs into Oklahoma's Water Quality Management Plan

Request for Public Comments

Public Comment Period Ends on Thursday, February 11, 2016



Carl Blackwell Lake

(Photo courtesy of Oklahoma State University)

The [Oklahoma Department of Environmental Quality \(DEQ\)](#) is seeking comments on a draft [Total Maximum Daily Load \(TMDL\)](#) report entitled, "**Chlorophyll-*a* TMDL Report for Carl Blackwell Lake and Lake Humphreys**". This report describes the reductions in total nitrogen (TN), and total phosphorus (TP) needed to achieve compliance with water quality standards for [chlorophyll-*a*](#) thus improving water quality in the Carl Blackwell Lake and Lake Humphreys watersheds. Elevated levels of chlorophyll-*a* means that too much [algae](#) is growing in the lakes. Too much algae ([eutrophication](#)) means there is a high concentration of nutrients, especially nitrogen and phosphorus, in the lakes. Since there are no specific water quality standards (WQS) for [nitrogen](#) and [phosphorus](#) (also referred to as [nutrients](#)), this TMDL provides a numeric limit on [nutrients](#) needed to reach the chlorophyll-*a* standard.

[Eutrophication](#) can cause surface scum, poor water clarity, and noxious odors. It can affect the taste of drinking water as well as increase the costs of [treating the water](#). Algae in drinking water can also interact with disinfectants ([chlorine](#)) to produce unwanted byproducts ([trihalomethanes](#)), some of which can be carcinogenic.

DEQ is also proposing to incorporate these TMDLs into Oklahoma's Water Quality Management Plan (208 Plan). The "**208 Factsheet Regarding Chlorophyll-*a* TMDLs in the Carl Blackwell Lake and Lake**

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.

Humphreys Watersheds” is attached. The full Lake Carl Blackwell and Lake Humphreys TMDL report can be found on-line at: <http://www.deq.state.ok.us/wqdnew/tmdl/index.html>.

Background

The [Federal Clean Water Act](#) requires states to develop [Water Quality Standards](#)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 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 and Impairments

Beneficial uses include water for [drinking](#), recreation, aesthetics, agriculture, fishing, and swimming. The beneficial uses are all described in the [Oklahoma Water Quality Standards](#) [Title 785, Chapter 45]. All waterbodies and their designated beneficial uses are listed in Appendix A of the WQS. According to Appendix A.3 of the WQS, Carl Blackwell Lake and Lake Humphreys are also considered to be Sensitive Water Supply (SWS) lakes [785:45-5-25(c)(4)(A)]. The SWS designation means that conditions are present that make these public and private water supply lakes more susceptible to pollution. As a result, the WQS require that the water quality of SWS lakes must be maintained and [protected](#) [785:45-3-2(c)].

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](#)”. 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). States are required to develop Integrated Reports every two years.



According to Oklahoma’s 2014 Integrated Report, the [Public and Private Water Supply](#) (e.g. drinking water) beneficial use for Carl Blackwell Lake and Lake Humphreys is impaired for chlorophyll-a. The Public and Private Water Supply designated use, as outlined in the WQS, limits the amount of chlorophyll-a allowed in SWS lakes to 10.0 µg/L [785:45-5-10(7)]. In addition to being impaired for chlorophyll-a, Carl Blackwell Lake is impaired for [turbidity](#) so it can’t meet its beneficial use for Fish & Wildlife Propagation-Warm Water Aquatic Community (WWAC) Subcategory. This water quality issue will be addressed in a future study.

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 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. In accordance with an [agreement between DEQ and the Environmental Protection Agency \(EPA\)](#), the

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

NPDES Program in Oklahoma is implemented via the *Oklahoma Pollutant Discharge Elimination System* (OPDES) Act. OPDES Standards can be found in Title 252, Chapter 606 (<http://www.deq.state.ok.us/rules/606.pdf>). TMDLs must provide WLAs for all NPDES-regulated point sources.

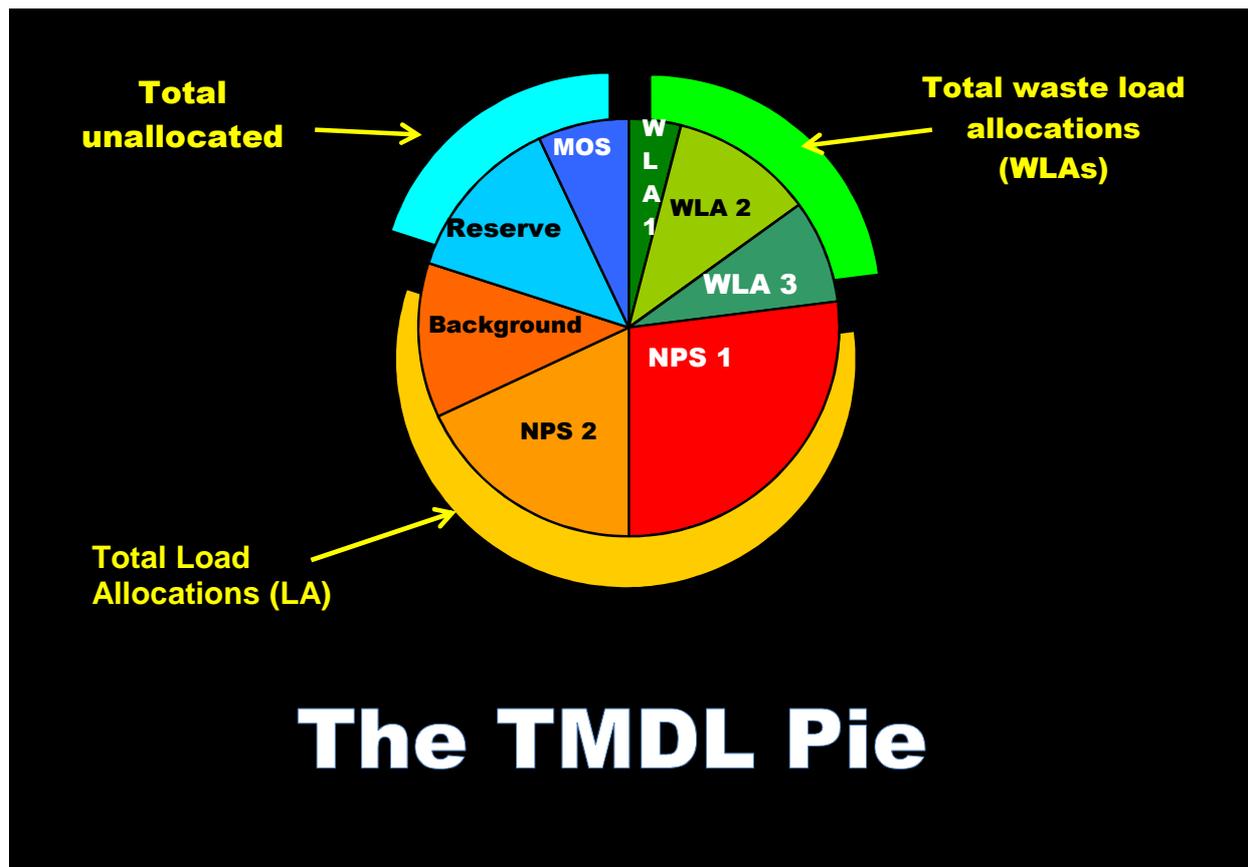
A point source is described as a “discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters.” These are usually, but not always, discharges from a pipe. Nonpoint sources (NPS) are ones, like agricultural runoff, that cannot be identified as entering 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:

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



WATERSHED

This TMDL Study Area is in two different watersheds, one in the north central and the other in south east Oklahoma. [Carl Blackwell Lake](#) (OK620900040280_00) is in the [Lower Cimarron watershed](#) (USGS HUC 11050003). [Lake Humphreys](#) (OK310810040150_00) is in the [Middle Washita](#) watershed (USGS HUC 11130303).

- [Carl Blackwell Lake](#) is a 3,370-acre lake in Payne County with conservation pool storage of 61,500 acre-feet. It was impounded in 1937, and serves as a recreational lake and water supply. Stillwater Creek (OK620900040270_10) 10.6 miles long, Little Stillwater Creek (6.7 miles long) and Hunt Creek (5.2 miles long) are the primary tributaries flowing to Carl Blackwell Lake. Between 2004 and 2013, Carl Blackwell Lake chlorophyll-a samples averaged 14.2 µg/L. Between 1998 and 2013 in Carl Blackwell Lake, TN levels averaged approximately 0.81 mg/L, and TP levels averaged 0.04 mg/L.
- [Lake Humphreys](#) is an 882-acre lake in Stephens County with conservation pool storage of 14,041 acre-feet. It was impounded in 1958, and serves as a recreational lake, water supply and flood control reservoir. Wildhorse Creek (7.9 miles long) and McCubbin Creek (6.9 miles long) are the primary tributaries flowing to Lake Humphreys. Between 2002 and 2014, Lake Humphreys' chlorophyll-a samples averaged 23.8 µg/L. Between 1998 and 2013 in Lake Humphreys, TN levels averaged approximately 1.03 mg/L, and TP levels averaged 0.04 mg/L.

Point Source Discharges in the Carl Blackwell Lake and Lake Humphreys Watersheds

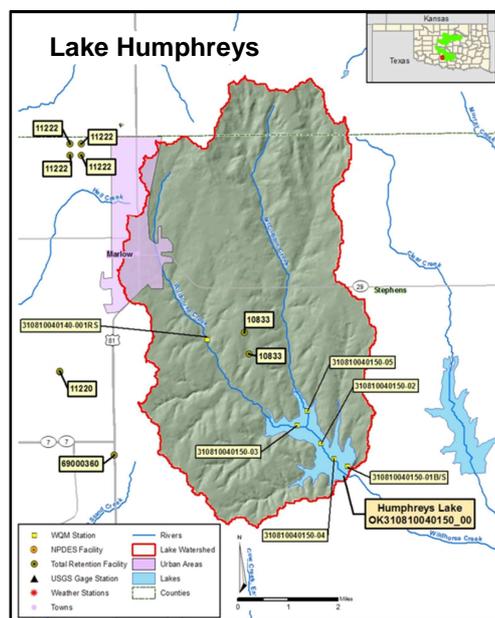
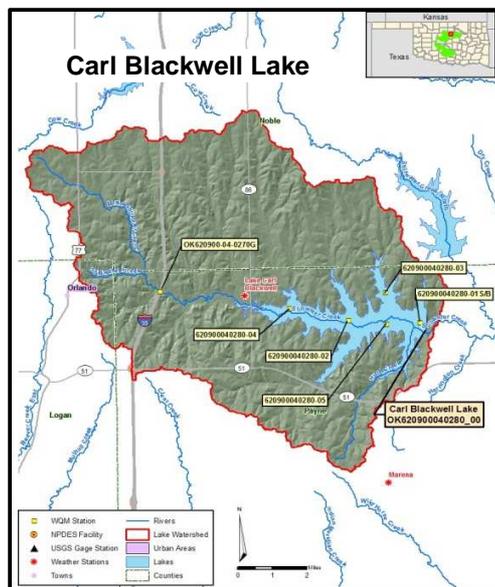
- **OPDES regulated [municipal](#) and [industrial wastewater treatment facilities](#):** There are no point source dischargers in the Study Area.
- **OPDES regulated [stormwater](#) discharges:** DEQ [regulates stormwater discharges](#) from Municipal Separate Storm Sewer Systems (MS4s), industrial sites, and construction sites. But DEQ's stormwater program does not include 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 <http://www.deq.state.ok.us/WQDnew/stormwater/>.

- **[MS4s](#)**

Polluted stormwater runoff is commonly transported through MS4s, from which it is often discharged untreated into local waterbodies. Phase I of the MS4 program required *medium* and *large* cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. There are no Phase I permittees in the Study Area.

Phase II of the MS4 Program requires regulated [small MS4s](#) to obtain an MS4 Permit from DEQ ([OKR04](#)). Phase II permittees must develop stormwater management programs that are designed to reduce discharges of pollutants to the "maximum extent practicable". This is done through the implementation of [Best Management Practices \(BMPs\)](#) and must address the following six minimum control measures:

1. [Public Education and Outreach](#)
2. [Public Participation/Involvement](#)
3. [Illicit Discharge Detection and Elimination](#)
4. [Construction Site Runoff Control](#)
5. [Post-Construction Runoff Control](#)



6. [Pollution Prevention/Good Housekeeping](#)

There aren't any Phase II permittees within the contributing watersheds of Carl Blackwell Lake or Lake Humphreys.

- **[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 \(MSGP\)](#) is required from all industrial facilities whose Standard Industrial Classification (SIC) code is listed on Table 1-2 of the MSGP. But facilities with those SIC codes are not sources of nutrients so their stormwater discharge was not considered in this study.

- **[Construction Sites](#)**

Stormwater from construction sites is not a source of nutrients so it was not considered in this study.

- **No-Discharge Facilities:** There weren't any of these facilities in the Study Area.

- **[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. [Sanitary sewer overflows](#) from wastewater collection systems can be a major source of harmful bacteria and other pollutants 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.



SSO

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 come from citizen complaints. 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. There aren't any known SSOs in the Study Area.

- **[Animal Feeding Operations \(AFOs\)](#)**



Photo courtesy of the [USDA's ARS](#)

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). AEMS works with producers who use [BMPs](#) to ensure that animal waste does not impact the waters of the State. However, there are no AFOs in the Study Area.

Nonpoint Sources

Nonpoint sources include those sources that cannot be identified as entering the waterbody at a specific location. Non-point sources of pollutants are typically separated into [urban](#) and rural categories. Surface [storm runoff](#)³ is an important source of loading in urban or residential settings with [high amounts of paved, impervious areas](#). Many nutrients from nonpoint sources get into waterbodies through polluted runoff.

Almost all nutrient loading into Carl Blackwell Lake and Lake Humphreys watersheds comes from nonpoint sources. Nutrient sources in rural watersheds originate from [soil erosion](#), [agricultural fertilization](#), residues from mowing and harvesting, leaf litter, and [fecal waste deposited](#) in the watershed by livestock. Causes of [soil erosion](#) can include natural causes such as flooding and wind, construction activities, vehicular traffic, and [agricultural activities](#). Other sources of nutrient loading in a watershed include [atmospheric deposition](#), [failing onsite wastewater disposal \(OSWD\) systems](#), and fecal matter deposited in the watershed by wildlife and pets.



Green driveways and rain gardens are attractive ways of reducing runoff from paved areas.

Nonpoint sources of [nutrients](#) may include:

- [Agriculture](#) (e.g., fertilized soils, manure application)
- [Urban runoff](#) (e.g., [lawns](#), [roads & highways](#))
- [Grazing livestock](#)
- [Failing Septic Systems](#) (source of nutrients)
- [Domestic pets](#)

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. Given the lack of in-stream water quality data and pollutant source data available to quantify nutrient and sediment loading directly from the tributaries of Carl Blackwell Lake and Lake Humphreys, the [Soil and Water Assessment Tool \(SWAT\)](#), which is a basin-scale watershed loading model, was used to develop nonpoint source loading estimates. Major components of SWAT include weather, hydrology, soil temperature and properties, plant growth, nutrients, and land management. These estimates from SWAT were used to quantify the nutrient contributions to each lake from agricultural, forest, and range management activities. For more information, see Section 3.2 and Appendix C of the *Chlorophyll-a TMDL Report for Carl Blackwell Lake and Lake Humphreys*.

It is necessary to establish a linkage between the external loading of nutrients and the waterbody response in terms of lake water quality conditions, as evaluated by chlorophyll-a concentrations. The water quality linkage analysis was performed using the [BATHTUB](#) reservoir water quality model. BATHTUB is a USACE model designed to simulate eutrophication in reservoirs and lakes. BATHTUB has been cited as an effective tool for reservoir and lake water quality assessment and management, particularly where data are

³ For information on how to reduce runoff after rainstorms, request the free DVD, "Reduce Runoff: Slow it Down, Spread it Out, Soak it in!" (EPA Publication #84211001) from the National Service Center for Environmental Publications at their webpage (<http://www.epa.gov/nscep/>) or call them at 800-490-9198. 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>.

limited. The model incorporates several empirical equations of nutrient settling and algal growth to predict steady-state water column nutrient and chlorophyll-a concentrations based on waterbody characteristics, hydraulic characteristics, and external nutrient loadings. The BATHTUB models for each lake were run under average existing conditions, and calibrated to measure in-lake water quality conditions (based on 1999-2012 data) using phosphorus, nitrogen, chlorophyll-a and secchi disk calibration factors. For more information about how BATHTUB was used in this study, see Section 4 of the *Chlorophyll-a TMDL Report for Carl Blackwell Lake and Lake Humphreys*.

Recommendations

The following table summarizes the percent reduction goals for nutrient loading established for each lake.

Total Phosphorus and Nitrogen Load Reductions Needed to Meet Chlorophyll-a In-lake Water Quality Targets

Lake	Percent Reduction	Maximum Allowable Load (kg/yr) ^a	
		Total Phosphorus	Total Nitrogen
Carl Blackwell Lake	55%	27,000	18,400
Lake Humphreys	84%	864	1,360

^a Loads do not include atmospheric deposition.

These maximum allowable loads for both nitrogen and phosphorus include an inherent margin of safety.

TMDLs for Chlorophyll-a Expressed in Kilograms of Total Phosphorus and Nitrogen Per Day

Waterbody Name	Waterbody ID	Nutrient	TMDL	WLA	LA	MOS
Carl Blackwell Lake	OK620900040280_00	Total Phosphorus	74.0	0	66.6	7.4
		Total Nitrogen	50.4	0	45.4	5.0
Lake Humphreys	OK310810040150_00	Total Phosphorus	2.4	0	2.2	0.2
		Total Nitrogen	3.7	0	3.3	0.4

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:

David Akakpo
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, February 11, 2016

Obtaining copies: You may view the full Carl Blackwell Lake and Lake Humphreys 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.



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.

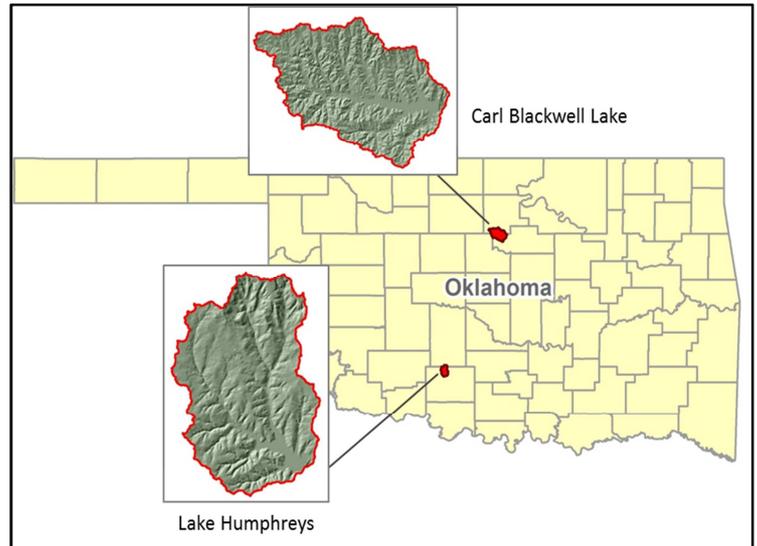


Note to newspapers: This notice is for your information only. **Do not publish in the legal section or as a legal notice.**

208 FACTSHEET REGARDING CHLOROPHYLL-*a* TMDLs in the CARL BLACKWELL LAKE AND LAKE HUMPHREYS WATERSHEDS

Watershed: This TMDL Study Area is in two different watersheds, one in the north central and the other in south east Oklahoma. [Carl Blackwell Lake](#) (OK620900040280_00) is in the [Lower Cimarron watershed](#) (USGS HUC 11050003). [Lake Humphreys](#) (OK310810040150_00) is in the [Middle Washita watershed](#) (USGS HUC 11130303).

Beneficial Uses and Impairments: This TMDL study was done because the Public and Private Water Supply beneficial use for both of these lakes is impaired because of elevated chlorophyll-*a* levels. Carl Blackwell Lake and Lake Humphreys are Sensitive Water Supply (SWS) lakes [785:45-5-25(c)(4)(A)]. The Public and Private Water Supply designated use limits the amount of chlorophyll-*a* allowed in SWS lakes to 10.0 µg/L [785:45-5-10(7)]. In addition to being impaired for chlorophyll-*a*, Carl Blackwell Lake is impaired for turbidity so it can't meet its beneficial use for Fish & Wildlife Propagation-Warm Water Aquatic Community (WWAC) Subcategory. This water quality issue will be addressed in a future study.



Possible Sources of Impairments:

Point sources - The point sources examined in the Carl Blackwell Lake and Lake Humphreys watersheds examined in this TMDL study were:

- **OPDES-regulated [municipal](#) and [industrial wastewater treatment facilities \(WWTF\)](#)** (WWTF) – There were no OPDES point source dischargers in the Study Area.
- **[OPDES regulated stormwater discharges](#)** - DEQ [regulates stormwater discharges](#) from Municipal Separate Storm Sewer Systems (MS4s), industrial sites, and construction sites.
 - [Municipal Separate Storm Sewer Systems \(MS4s\)](#) - There aren't any Phase I permittees in the Study Area.
 - [Industrial Sites](#) – [DEQ's Multi-Sector General Permit \(MSGP\)](#) is required from all industrial facilities whose Standard Industrial Classification (SIC) code is listed on Table 1-2 of the MSGP. But facilities with those SIC codes are not sources of nutrients so their stormwater discharge was not considered in this study.
 - [Construction Sites](#) - Stormwater from construction sites is not a source of nutrients so it was not considered in this study.
- **No-Discharge Facilities** – There weren't any of these facilities in the Study Area.
- **[Sanitary Sewer Overflows \(SSO\)](#)** (SSO) - There aren't any known SSO's reported with in the Study Area.

- **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 the [Agriculture Pollutant Discharge Elimination System \(AgPDES\)](#). There aren't any AFOs in the Carl Blackwell Lake or Lake Humphreys watersheds.

Since the amount of nutrients from point sources is considered to be negligible, then almost all nutrient loading to the Carl Blackwell Lake and Lake Humphreys watersheds must come from nonpoint sources.

Recommendations:

The TMDL models used in this Study were SWAT (to develop nonpoint source loading estimates) and BATHTUB (which simulates eutrophication in reservoirs and lakes). The following table summarizes the percent reduction goals for nutrient loading established for each lake:

Total Phosphorus and Nitrogen Load Reductions Needed to Meet Chlorophyll-*a* In-lake Water Quality Targets

Lake	Percent Reduction	Maximum Allowable Load (kg/yr) ^a	
		Total Phosphorus	Total Nitrogen
Carl Blackwell Lake	55%	27,000	18,400
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^a Loads do not include atmospheric deposition.

These maximum allowable loads for both nitrogen and phosphorus include an inherent margin of safety:

TMDLs for Chlorophyll-*a* Expressed in Kilograms of Total Phosphorus and Nitrogen Per Day

Waterbody Name	Waterbody ID	Nutrient	TMDL	WLA	LA	MOS
Carl Blackwell Lake	OK620900040280_00	Total Phosphorus	74.0	0	66.6	7.4
		Total Nitrogen	50.4	0	45.4	5.0
Lake Humphreys	OK310810040150_00	Total Phosphorus	2.4	0	2.2	0.2
		Total Nitrogen	3.7	0	3.3	0.4

The full Carl Blackwell Lake and Lake Humphreys TMDL report can be found on the following DEQ webpage: <http://www.deq.state.ok.us/WQDnew/tmdl/index.html>.

EPA Approval Date: Pending
Record Last Updated: 11/12/2015