

2007-2008 Oklahoma Lakes Report

Beneficial Use Monitoring Program

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EXECUTIVE SUMMARY

Beneficial Use Monitoring Program Goal:

The goal of the Beneficial Use Monitoring Program is to document beneficial use impairments, identify impairment sources (if possible), detect water quality trends, provide needed information for the WQS, and facilitate the prioritization of pollution control activities.

The Beneficial Use Monitoring Program exists as a result of the vital economic and social importance of Oklahoma's lakes, streams, wetlands, and aquifers and the associated need for their protection and management. The data contained in this report is scientifically defensible and has been collected and analyzed following procedures outlined in Use Support Assessment Protocols (USAP), developed by Oklahoma Water Resources Board with input and concurrence of Oklahoma's other environmental agencies. Specifically, USAPs establish a consistent method to determine if beneficial uses assigned for individual waters through Oklahoma Water Quality Standards (WQS) are being supported. The legitimacy of data analyzed following protocols other than those outlined in the USAP (or the Oklahoma Continuing Planning Process (CPP) document where the USAP is silent) for use support determination is not appropriate. If the BUMP report indicates that a designated beneficial use is impaired, threatened, or otherwise compromised, measures must be taken to mitigate or restore the water quality.

The Oklahoma Water Resources Board (OWRB) has worked diligently to follow the guidelines outlined in the USAP. Recommendations in this report should be consistent with recommendations for the state's 303(d) list. Although certain inconsistencies do exist, every effort has been taken to assure compatibility between the BUMP Report and the 303(d) list. Issues regarding stream/lake segmenting additional data from non-BUMP sources and unique non-representative conditions all affect the impairment decision-making process.

Traditionally, the State of Oklahoma has utilized numerous water monitoring programs conducted by individual state and federal agencies. In general, each environmental agency designs and implements its own program with only limited participation from with other state, municipal, or federal entities. These programs collect information for a specific purpose or project (e.g., development of Total Maximum Daily Loads, WQS process, lake trophic status determination, water quality impact assessments from non-point and point source pollution, stream flow measurement, assessment of best management practices, etc.). Therefore, the information is specific to each project's data quality objectives (DQOs) and is often limited to a very small geographic area.

To synchronize Oklahoma's monitoring efforts related to water quality, the State Legislature appropriated funds in 1998 to create the Beneficial Use Monitoring Program under the direction of the Oklahoma Water Resources Board, who promulgates the WQS and WQS Implementation Rule. The BUMP brings the OWRB's overall water quality management program full circle. From the promulgation of WQS, to permitting and enforcement of permits stemming from WQS-established criteria, to non-point source controls, all agency water quality management activities are intended to work in concert to restore, protect, and maintain designated beneficial uses.

The specific objectives of the BUMP are to detect and quantify water quality trends, document and quantify impairments of assigned beneficial uses, and identify pollution problems before they become a pollution crisis. This report interprets current Oklahoma Lake data collected as part of the comprehensive, long-term program. As the program has matured, the BUMP report has become one of the most important annually published documents in Oklahoma.

Beneficial Use Monitoring Program Components

- **Monitoring Rivers & Streams**--The OWRB is currently monitoring approximately one hundred thirty (130) stations on a monthly basis. These sites are segregated into two discrete types of monitoring activities. The first monitoring activity is focusing on fixed station monitoring on rivers and streams and the second monitoring activity focuses on a number of sample stations whose location rotate on an annual basis. The two monitoring components are explained below.
- **Fixed Station Monitoring on Rivers & Streams**--Fixed station monitoring is based largely upon the sixty-seven (67) United States Geological Survey 8-digit hydrologic unit code (HUC) basins present in Oklahoma. In general, at least one (1) sample station was located in all of the HUC watersheds with the exception of

some of the smaller HUC watersheds adjacent to the state line or in a HUC that does not contain a free flowing stream at some point during the year. After consultation with the other state environmental agencies and over time the OWRB has identified one hundred seventeen (117) fixed stations of which one hundred (100) are currently being monitored.

- Rotating Station Monitoring on Rivers & Streams--Over the life of the BUMP, rotational sampling has occurred on over two hundred twenty (220) stream segments. Sample stations and variables monitored are based upon Oklahoma's 303(d) list and input from other state environmental agencies on their monitoring needs. Variables monitored as part of this program component are specific for each stream segment monitored
- Fixed Station Load Monitoring--The OWRB is currently working with several partners including the USGS, US Army Corp of Engineers, Grand River Dam Authority, and National Weather Service to conduct flow monitoring on all of our fixed station sites that are not part of the Oklahoma/USGS Cooperative Gaging Network. This cooperative effort will allow for loadings to be calculated, trends to be assessed statewide, and provide much needed data for the Use Support Assessment process.
- Fixed Station Lakes Monitoring--Quarterly sampling (approximately once every 90 days) of approximately 40-45 lakes annually is currently occurring. In general, a minimum of three stations per reservoir, representing the lacustrine zone, transitional zone, and riverine zone, are designated for sampling at each lake, with additional sites sampled as needed. Additional water quality parameters and lake sites were added to the lake sampling program in 2001 to aid in making use support determinations.
- Fixed Station Groundwater Monitoring--Limited monitoring as part of this task has occurred in the program. Results of monitoring are presented in this report. OWRB staff has made recommendations in this report related to the scope and magnitude of groundwater monitoring activities that the state should pursue in the future. Any proposed groundwater monitoring efforts will be coordinated with the Oklahoma Department of Environmental Quality (ODEQ).
- Intensive Investigation Sampling - Although no funding was made available for this element of the program, it is important that waters identified as impaired be restored. If routine monitoring identifies impairment, then an intensive study will be undertaken to document the source of the impairment and recommend restorative actions if possible. This task will not be conducted in year one or year two of the program, but thereafter, intensive investigations will be conducted as warranted. If water bodies are not identified for intensive study as part of this task, then monies will be reallocated to Tasks 1 and 3. Other entities (i.e., tribal or governmental units outside of Oklahoma) are involved as circumstances dictate or allow.

Program History/Overview

Sampling of the numerous lakes, streams, and rivers across this state was initiated in the summer and fall of 1998. Lake sampling in connection with the Beneficial Use Monitoring Program began in July of 1998. Sampling on numerous streams and rivers began in earnest in November of the same year. The two sampling programs, one for lakes and one for streams, had separate starting dates for a number of reasons. First, the OWRB has been conducting a lake-sampling program during the warmer summer months since 1990 as part of the Federal Clean Lakes Program. This historical lake sampling program was funded through federal dollars with the express purpose of determining lake trophic status. The trophic status of a reservoir can range from oligotrophic (low biological productivity) to hypereutrophic (excessive biological productivity). In general, the more productive a reservoir, the more water quality problems it is likely to experience. Federal dollars to fund this trophic state assessment of our state's lakes were discontinued in 1994. At that time, the OWRB searched for other funding sources, and through working with the Secretary of the Environment and the Oklahoma Conservation Commission, the Water Board was able to obtain a one time federal 319 non-point source grant to continue the lake trophic state assessment program. The OWRB subsequently initiated a quarterly lake sampling program in the spring of 1998 and was able to roll the existing lake program into the BUMP.

The OWRB has developed Use Support Assessment Protocols (USAP) for lakes and streams, which are essential if the state is to be consistent in identifying waters that are not meeting their assigned beneficial uses or are threatened. The Water Resources Board has incorporated the USAP into Oklahoma Administrative Code

(OAC) 785:46 to ensure that consistent determinations for impairments are made by the all of the monitoring agencies.

The state must follow consistent procedures for listing waters as impaired. Using the OWRB Use Support Assessment Protocols, it has been possible for OWRB staff to assess whether threats or impairments are present in our waterways. With continued funding, identification of impaired waters will be accomplished on additional waters.

Results of Lakes Sampling Efforts

Data was collected by the OWRB on a quarterly basis for 47 lakes in 2007-2008. For the current sample year, data was collected from the October of 2007 through August of 2008. The results of the sampling efforts are summarized below. As shown in Figure 1, 6% of lakes sampled were determined to have serious water quality nutrient concerns based upon their classification as hypereutrophic reservoirs. Lakes classified as hypereutrophic have the potential for beneficial use impairments due to low dissolved oxygen concentrations, taste and odor problems, nutrient inputs, excessive productivity, and general lake aesthetics. Hypereutrophic waters are adversely impacted primarily by excessive nutrients and primary productivity and should be monitored intensively in the future to document the presence or absence of “beneficial use impairments.” Forty-seven percent of the lakes sampled were classified as eutrophic, characterized by high primary productivity and nutrient rich conditions. A eutrophic lake also has the potential for beneficial use impairments, though the potential is less than for hypereutrophic waters. Mesotrophic waters have a small potential for beneficial use impairments and overall are representative of good water quality, low to moderate levels of nutrients, and productivity. Of the lakes sampled, 43% were classified as mesotrophic. Oligotrophic waters have very low levels of primary productivity and usually low concentrations of nutrient constituents. In Oklahoma, oligotrophic waters are either very clear waters with little nutrient inputs and genuinely good water quality conditions, or the waters are very turbid with poor water clarity with the absence of sufficient ambient light inhibiting lake productivity. Only two of the 47 lakes sampled were classified as oligotrophic. Based on the results for trophic state index calculations, 53% of the waters sampled were exhibiting high to excessive levels of primary productivity and nutrient rich conditions characteristic of eutrophic and hypereutrophic waterbodies.

The distribution changes somewhat when the lake surface acres for each reservoir are classified into the corresponding trophic status. Results in Figure 2 are different than Figure 1, indicating the lakes classified as eutrophic were larger in surface acres than the lakes classified as mesotrophic and hypereutrophic. When you look at lake trophic status broken out by the number of lake surface acres in each trophic state category, 64% of all surface acres sampled were eutrophic, 33% were mesotrophic, 3% were hypereutrophic, and 0% were oligotrophic. Two of the largest reservoirs sampled in 2007-2008 were classified as eutrophic (Oologah and Texoma, which skewed the surface acres percentages heavily towards the eutrophic category. In general, the larger

Trophic Status of Lakes for Sample Year 2007-2008

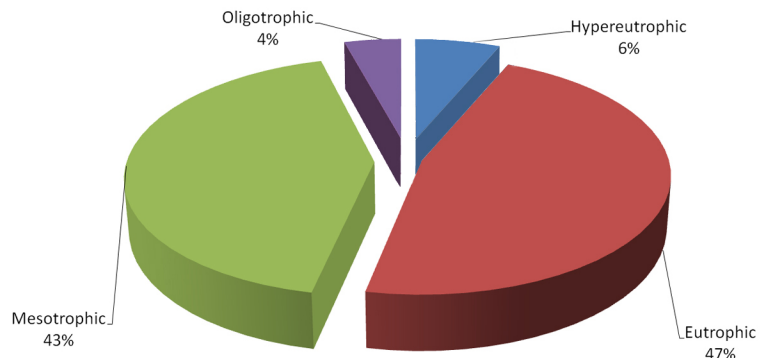


Figure 1. Trophic Status of Lakes Sampled in 2007-2008.

Lake Surface Acres by Trophic State for Lakes Sampled in 2007-2008

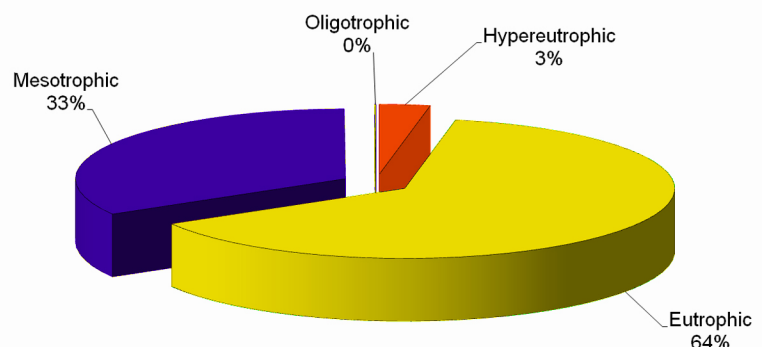


Figure 2. Lakes surface acres segregated by trophic state.

reservoirs in the state have more extensive watersheds and are generally deeper than smaller lakes, which increase the likelihood of beneficial use impairments being present since a larger surface area is available. During stratification, the larger/deeper reservoirs have a greater portion of the water column that becomes anoxic for long periods of time, which also increases the potential for nutrient release from sediments. It is obvious that many reservoirs in Oklahoma are experiencing adverse environmental impacts. However, with the available data it is not possible to adequately assess if lakes are meeting their assigned beneficial uses as they relate to nutrients. At this time 24 lakes have been identified by the OWRB as “Nutrient-Limited Watersheds” (NLW) in the WQS and efforts should be taken to definitively determine if NLW waters are meeting their uses through initiation of a Nutrient Impairment Study to definitively determine the presence or absence of nutrient impairments in our NLW lakes. NLW are lakes with a TSI ≥ 62 , based on Carlson’s trophic state classification system and using chlorophyll-a as the trophic state indicator. Lakes sampled as part of the BUMP, their trophic status, and potential threats or impairments are listed in Table 1.

Table 1. Lakes Sampled by the BUMP with Associated Use Attainment Status.

Lake Name	County	W.Q. Segment #	Last Year Sampled	FWP	PPWS	PBCR	AG	AES
American Horse	Blaine	520620	2007-08	D.O.				True Color
Arbuckle	Murray	310800	2007-08	D.O.				
Arcadia	Oklahoma	520710	2006-07		chlor-a			
Ardmore City	Carter	310800	2006-07	D.O.				
Atoka	Atoka	410400	2006-07	Turbidity				True Color
Bellcow	Lincoln	520700	2007-08	D.O., Turbidity				True Color
Birch	Osage	121300	2006-07	D.O.				True Color
Bixhoma	Wagoner	120410	2005-06	D.O.				
Bluestem	Osage	121300	2005-06	D.O., Turbidity				
Boomer	Payne	620900	2007-08	D.O., Turbidity		Ent.		True Color
Broken Bow	McCurtain	410210	2005-06	pH, D.O.				
Brushy Creek	Sequoyah	220200	2007-08	D.O.				
Burtschi	Grady	31082002	2005-06	pH				NLW
Canton	Blaine	720500	2005-06	Turbidity				
Carl Albert	Latimer	410310	2007-08	pH, D.O.				True Color
Carl Blackwell	Payne	620900	2007-08	D.O., Turbidity				True Color
Carter	Marshall	310800	2007-08					
Cedar (Mena)	LeFlore	410210 410300	2005-06	D.O., pH				
Chandler	Lincoln	520700	2007-08	D.O., Turbidity				True Color
Chickasha	Caddo	310830	2006-07	D.O.			Sulfates	NLW
Claremore	Rogers	121500	2005-06		chlor-a			NLW
Clear Creek	Stephens	310810	2006-07					
Cleveland City	Pawnee	621200	2006-07	D.O.				
Clinton	Washita	310830	2003-2004	Turbidity	chlor-a	Ent.		True Color, NLW
Coalgate City	Coal	410400	2006-07	D.O., Turbidity				
Comanche	Stephens	311300	2007-08					
Copan	Washington	121400	2007-08	Turbidity				True Color
Crowder	Washita	310830	2005-06		chlor-a			NLW
Cushing Municipal	Payne	620900	2006-07	Turbidity				True Color
Dave Boyer (Walters)	Cotton	311300	2007-08	Turbidity				True Color
Dripping Springs	Okmulgee	520700	2006-07	D.O., Turbidity				True Color
Duncan	Stephens	310810	2006-07					True Color

Table 1. Lakes Sampled by the BUMP with Associated Use Attainment Status.

Lake Name	County	W.Q. Segment #	Last Year Sampled	FWP	PPWS	PBCR	AG	AES
El Reno■	Canadian	520530	2006-07	Turbidity				True Color, NLW
Elk City	Beckham	311500	2005-06					NLW
Ellsworth	Comanche	311300	2006-07	D.O., Turbidity				True Color
Elmer Thomas	Comanche	311300	2006-07	pH				
Etling, Carl■	Cimarron	720900	2003-2004	Turbidity, pH				NLW
Eucha●	Delaware	121600	2006-07	D.O.	chlor-a			NLW
Eufaula	Haskell	220600	2006-07	D.O., Turbidity				True Color
Fairfax City	Osage	621200	2006-07	D.O.				
Fort Cobb	Caddo	310830	2005-06	Turbidity	chlor-a			NLW
Fort Gibson	Cherokee	121600	2006-07	D.O.				NLW
Fort Supply†	Woodward	720500	2005-06	Turbidity	chlor-a			NLW
Foss	Custer	310800 310810 310820 310830 310840	2004-2005					
Frederick	Tillman	311310	2006-07	Turbidity				True Color
Fuqua	Stephens	310810	2006-07					
Grand Lake	Mayes	121600	2005-06	D.O.				
Great Salt Plains	Alfalfa	621010	2005-06	Turbidity			Sulfates & Chlorides	NLW
Greenleaf	Muskogee	120400	2005-06	D.O.	chlor-a			
Guthrie■	Logan	620910	2005-06		chlor-a			NLW
Healdton City	Carter	311100	2005-06					
Hefner	Oklahoma	520520 520530	2005-06	D.O.				
Henryetta◆	Okmulgee	520700	2007-08	Turbidity, Lead				True Color
Heyburn	Creek	120420	2007-08	D.O., Turbidity				True Color
Holdenville	Hughes	520800	2006-07	D.O. pH	chlor-a			
Hominy Municipal	Osage	121300	2006-07	D.O.				
Hudson	Osage		2005-06	D.O.				
Hudson	Mayes	121600	2006-07					
Hugo	Choctaw	410300	2007-08	Turbidity				True Color
Hulah	Osage	121400	2007-08	Turbidity				True Color, NLW
True Color								
Humphreys	Stephens	310810	2006-07	D.O.	chlor-a			
Jean Neustadt	Carter	310800	2006-07	D.O.				
John Wells	Haskell	220200	2005-06					
Kaw	Osage	621210	2007-08					
Keystone	Tulsa	621200 620900	2005-06	Turbidity			Sulfates & Chlorides	
Konawa	Seminole		2007-08					
Langston	Logan	620900	2007-08					
Lawtonka	Comanche	311300	2006-07	D.O.	chlor-a			
Liberty	Logan	620910	2005-06	Turbidity	chlor-a			
Lloyd Church	Latimer	220100	2005-06	D.O., pH				True Color
Lone Chimney	Pawnee	621200	2003-2004					

Table 1. Lakes Sampled by the BUMP with Associated Use Attainment Status.

Lake Name	County	W.Q. Segment #	Last Year Sampled	FWP	PPWS	PBCR	AG	AES
Lugert-Altus	Greer	311500 311510	2004-2005	Turbidity				
Maysville/Wiley Post	McClain		2007-08	Turbidity				True Color
McAlester	Pittsburg	220600	2007-08	Turbidity				True Color
McGee Creek	Atoka	410400	2006-07	D.O., pH				
McMurtry	Noble	620900	2007-08	D.O., Turbidity				True Color
Meeker	Lincoln	520700	2005-06	Turbidity				
Murray	Love	311100	2005-06	D.O.				
Nanah Waiya	Pushmataha		2007-08					True Color
New Spiro	LeFlore	220100	2005-06	pH	chlor-a			NLW
Okemah	Okfuskee	520700	2006-07	D.O., Turbidity				True Color
Okmulgee	Okmulgee	520700	2006-07	D.O.				True Color
Oologah	Rogers	121510	2007-08					
Overholser	Oklahoma	520520 520530	2005-06	Turbidity				True Color, NLW
Ozzie Cobb	Pushmataha	410300	2007-08	pH				True Color, NLW
Pauls Valley City	Garvin	310810	2007-08	Turbidity				True Color
Pawhuska	Osage	121600	2007-08	D.O.				
Pawnee	Pawnee	621200	2006-07		chlor-a			
Perry	Noble	621200	2006-07	Turbidity				True Color
Pine Creek	McCurtain	410210	2007-08	D.O., pH				True Color
Ponca	Kay	621200	2007-08	D.O.				True Color
Prague City	Lincoln	520510	2007-08	D.O.				True Color
Purcell	McClain	520610	2007-08	D.O.				
Raymond Gary	Choctaw	410300	2007-08	D.O.				True Color
R.C. Longmire	Garvin	310810	2007-08					
Robert S. Kerr	Sequoyah	220200	2007-08	Turbidity				True Color
Rock Creek	Carter	310800	2006-07	D.O.				
Rocky (Hobart)	Washita	311500	2006-07	Turbidity				NLW
Sahoma	Creek	120420	2005-06	D.O.				
Sardis	Pushmataha	410310	2007-08	D.O.				True Color
Shawnee Twin # 1	Pottawatomie	520510	2005-06	D.O.				
Shawnee Twin # 2	Pottawatomie	520510	2007-08	D.O.				
Shell	Osage	120420	2005-06	D.O.				
Skiatook	Osage	121300	2006-07	D.O.				True Color
Sooner	Pawnee		2006-07	D.O.			Sulfates, TDS, Chlorides	
Spavinaw	Mayes	121600	2006-07	D.O.	chlor-a			NLW
Sportsman	Seminole	520500	2007-08	D.O.				
Stanley Draper	Cleveland		2005-06	D.O.				
Stilwell City	Adair	220200	2005-06	D.O.				
Stroud	Creek	520700	2005-06	D.O.			Sulfates & Chlorides	
Talawanda # 1	Pittsburg	220600	2007-08	D.O.				
Talawanda # 2	Pittsburg	220600	2007-08					
Taylor (Marlow)	Grady	310840	2007-08	Turbidity				NLW
Tecumseh	Pottawatomie	520510	2007-08	Turbidity				True Color

Table 1. Lakes Sampled by the BUMP with Associated Use Attainment Status.

Lake Name	County	W.Q. Segment #	Last Year Sampled	FWP	PPWS	PBCR	AG	AES
Tenkiller Ferry▣	Sequoyah	121700	2005-06	D.O.	chlor-a			
Texoma	Bryan	311100 310800	2007-08	D.O., Turbidity				True Color
Thunderbird▣	Cleveland	520810	2006-07		chlor-a			NLW
Tom Steed▣	Kiowa	311500	2006-07	Turbidity	chlor-a			
Vanderwork	Washita	310830	2007-08	D.O.				NLW
Vincent, Lloyd	Ellis	720500	2007-08					
W.R. Holway	Mayes		2006-07	D.O.				
Waurika	Jefferson	311210	2007-08	Turbidity				True Color
Waxhoma	Osage		2005-06	D.O.				
Wayne Wallace	Latimer	220100	2007-08	pH				True Color
Webbers Falls	Muskogee	121400	2005-06					
Wes Watkins	Pottawatomie	520510	2005-06					
Wetumka	Hughes		2006-07	D.O.				True Color
Wewoka	Seminole	520500	2006-07	D.O., Turbidity				True Color
Wister♣	LeFlore	220100	2007-08	D.O., Turbidity, pH				NLW, True Color
Yahola●	Tulsa	121300	1998-1999					

† Lake Listed Based Upon 1995 U.S. Army Corps. Of Engineers Intensive Study

♣ Lake Listed Based Upon OWRB Phase I Clean Lakes Study

◆ Lake does not fit classic definition of oligotrophy. Inorganic particulates are limiting biological productivity

● Lake was not assessed through the BUMP, but through another OWRB project

▣ These Lakes will be recommended for NLW listing as part of the next WQS revision process

Acronyms: NLW = Nutrient Limited Water; D.O. = Dissolved Oxygen; ENT. = Enterococci Bacteria

Assigned WQS Beneficial Uses: FWP = Fish & Wildlife Propagation; AES = Aesthetics; PPWS = Public & Private Water Supply; AG = Agriculture; PBCR = Primary Body Contact Recreation

Introduction

Protecting Oklahoma's valuable water resources is essential to maintaining the quality of life for all Oklahomans. Used for a myriad of purposes, such as irrigation, hydropower, public/private water supply, navigation, and a variety of recreational activities, the state's surface and ground waters provide enormous benefits to Oklahoma from both an economic and recreational standpoint.

The National Recreation Lakes Study Commission (NRLSC) estimates that 32,100 people in Oklahoma are employed in support of activities related to our numerous man-made lakes. Also according to the NRLSC, 18,718,000 visitor days are spent on Oklahoma lakes each year and recreation in and around these lakes contributes approximately \$2.2 billion each year to Oklahoma's economy. Of additional value are the recreational benefits associated with our smaller municipal/watershed projects, Oklahoma Department of Wildlife lakes, and rivers and streams throughout the state, which infuse millions into state coffers through fishing, hunting, camping, and related activities. (In 1987, the Oklahoma Comprehensive Outdoor Recreation Plan estimated that approximately \$10.7 million was realized through camping and \$15.2 million through hunting/fishing. ¹) According to a 2001 federal study, fishing activities alone contribute \$476,019 dollars to Oklahoma's economy, not including the substantial ancillary costs associated with that extremely popular sport.²

In addition to surface waters, abundant ground waters also fuel the state's economy, serving as supply for thousands of municipalities, rural water districts, industrial facilities, and agricultural operations. According to the 1995 update of the Oklahoma Comprehensive Water Plan, groundwater represents the primary water supply for approximately 300 cities and towns and comprises 60 percent of the total water used in the state each year. ³ Groundwater resources also supply approximately 90 percent of the state's irrigation needs.

Oklahoma works to protect and manage its water resources through a number of initiatives, with the Oklahoma Water Quality Standards (WQS) serving as the cornerstone of the state's water quality management programs. The Oklahoma Water Resources Board (OWRB) is designated by state statute as the agency responsible for promulgating water quality standards and developing or assisting the other environmental agencies with implementation framework. State agencies are responsible for implementing the WQS as outlined by the OWRB through development of Implementation plans. Protecting our waters is a cooperative effort between many state agencies, and because the WQS are utilized by all agencies and represent a melding of both science and policy, they are an ideal mechanism to assess the effectiveness of our diverse water quality management activities.

The WQS are housed in OAC 785:45 and consist of three main components: beneficial uses, criteria to protect beneficial uses, and an anti-degradation policy. An additional component, which is not directly part of the WQS but necessary to water resource protection, is a monitoring program. A monitoring program is required in order to ensure that beneficial uses are maintained and protected. If uses are not being maintained, the cause of that impairment must be identified and restoration activities should be implemented to improve water quality such that it can meet its assigned beneficial uses.

All state agencies are currently required to implement Oklahoma's Water Quality Standards within the scope of their jurisdiction through the development of an Implementation Plan specific for their agency. This process, called WQS Implementation, allows the WQS to be utilized by other state agencies in the performance of their regulatory (statutory) responsibilities to manage water quality or to facilitate best management practice initiatives.

With the development of the BUMP, the need for protocols to determine beneficial use impairment was identified. Development of these protocols would facilitate state agencies in directing their time and money to the areas in most need of protection or remediation. The OWRB, working in close concert with other state environmental agencies and concerned parties, developed Use Support Assessment Protocols (USAP) to be used by all parties for assessing if waters were meeting their assigned beneficial uses. In addition, protocols were developed that could be coupled with a trend monitoring system to detect threatened waters before they become

¹ Oklahoma Statewide Comprehensive Outdoor Recreation Plan (SCORP), 1987.

² U.S. Department of Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

³ Oklahoma Water Resources Board, Update of the Oklahoma Comprehensive Water Plan, 1995.

seriously impaired. Data collection efforts connected with protocol development and/or implementation also serves a vital purpose in refining numerical criteria currently included in the WQS and in developing appropriate numerical and narrative criteria for future WQS documents. It is essential that our waters meet their assigned uses and that WQS implementation protocols are appropriate. Please see Appendix A for the applicable Oklahoma Administrative Code (OAC) 785:46 related to the USAP. Final approval of the USAP occurred in 2000, and the OWRB has constantly worked every year since then to refine the existing protocols and pursue the addition or modification of USAP protocols to further enhance its utility and effectiveness.

Work to be performed towards development and implementation of the critical fourth component of the WQS program, monitoring, is the subject of this report. All sampling activities described and conducted as part of this program were consistent with the Oklahoma USAP. It is also important to note that they are consistent with Environmental Protection Agency (EPA) reporting requirements for the “Integrated Water Quality Monitoring and Assessment Report” [305(b) Report and 303(d) list], §319 Non-point Source (NPS) Assessment, and §314 Lake Water Quality Assessment (LWQA).

Background and Problem Definition

The State of Oklahoma has historically had numerous monitoring programs conducted by several state and federal agencies. In general, each environmental agency conducts their monitoring programs with some degree of integration and coordination with other state, municipal, or federal programs. Most water quality monitoring programs in Oklahoma are designed and implemented by each agency to collect information for one specific purpose or project (i.e., development of Total Maximum Daily Loads, the WQS process, lake trophic status determination, determining water quality impacts from point source dischargers, stream flow measurements, documenting success of best management practices, etc.). Information of this type is very specific to each individual project’s data quality objectives (DQOs) and is often limited to a very small geographic area. This document describes sampling activities the OWRB has historically conducted for lakes and efforts that are currently ongoing for lakes and streams across Oklahoma as part of a comprehensive, long-term, state-wide Beneficial Use Monitoring Program (BUMP). The goal of the BUMP is to detect and quantify water quality trends, document and quantify impairments of assigned beneficial uses, and identify pollution problems before they become a pollution crisis.

Beneficial Use Monitoring Program (BUMP) Overview

The overall goal of the Beneficial Use Monitoring Program is to document beneficial use impairments, identify impairment sources (if possible), detect water quality trends, provide needed information for the WQS, and facilitate the prioritization of pollution control activities.

Beneficial Use Monitoring Program Components

- **Monitoring Rivers & Streams**--The OWRB is currently monitoring approximately 180 stations on a monthly basis. These sites are segregated into two discrete types of monitoring activities. The first monitoring activity focuses on fixed station monitoring on rivers and streams, and the second monitoring activity focuses on a number of sample stations whose locations rotate on an annual basis. The two monitoring components are explained below.
 - **Fixed Station Monitoring on Rivers & Streams**--Fixed station monitoring is based largely upon the 67 United States Geological Survey (USGS) 8-digit hydrologic unit code (HUC) basins present in Oklahoma. In general, at least one sample station was located in all of the HUC watersheds with the exception of some of the smaller HUC watersheds adjacent to the state line or in a HUC that does not contain a free flowing stream at some point during the year. After consultation with the other state environmental agencies and over time the OWRB has identified 119 fixed stations of which 99 are currently being monitored.
 - **Rotating Station Monitoring on Rivers & Streams**--Over the life of the BUMP, rotational sampling has occurred on 200 stream segments. Sample stations and variables monitored are based upon Oklaho-

ma's 303(d) list and input from other state environmental agencies on their monitoring needs. Variables monitored as part of this program component are specific for each stream segment monitored.

- **Fixed Station Load Monitoring**--The OWRB is currently engaged in a cooperative effort with the USGS to conduct flow monitoring at fixed station BUMP sites that do not currently have an existing USGS flow gage. This effort focuses on collecting both water quality and quantity information in order to calculate pollutant loads, which will provide OWRB staff with the data necessary to make a use support determination. This initiative is facilitated through the OWRB's Cooperative Agreement with USGS and various Compact Commission activities. The USGS cost share program, Oklahoma's 319 program, Oklahoma's 314 program and the 303(d)-process will drive sample site locations associated with this task.
- **Fixed Station Lakes Monitoring**--Fixed station lakes monitoring goal is designed to facilitate sampling on the 130 largest lakes in Oklahoma every other year. To accomplish this task, the OWRB is currently sampling approximately 40 to 45 lakes on a quarterly basis. Under this scenario, repeat sampling on a lake will occur approximately every 2-3 years, with the inclusion of lakes data collected by other sources, like the Corps of Engineers, to meet the goal of 130 lakes every two years. Data collected consists primarily of water chemistry, nutrients, and chlorophyll-a information. In general, three stations per reservoir, representing the lacustrine zone, transitional zone, and riverine zone are sampled. On many reservoirs, additional sites are monitored, including major arms of the reservoir as appropriate. Water quality parameters have been added to the lakes sampling effort over the years to enhance our ability to make use support determinations.
- **Fixed Station Groundwater Monitoring**--Limited monitoring as part of this task has occurred in the program. Results of monitoring are presented in this report. OWRB staff has made recommendations in this report related to the scope and magnitude of groundwater monitoring activities that the state should pursue in the future. Any proposed groundwater monitoring efforts will be coordinated with the Oklahoma Department of Environmental Quality (ODEQ).

Intensive Investigations--If beneficial use impairment is identified or suspected, then all appropriate state agencies will be alerted and an investigation will be initiated to confirm if beneficial use impairment is occurring. If routine monitoring cannot definitively identify impairments, then an intensive study will be undertaken, and if impairment is present, the source of the impairment will be identified if possible. One potential use for the intensive studies envisioned was identified during the data analysis phase of this reporting process. For example, monies could be spent to identify if high turbidity readings in rivers and streams are due to natural processes or due to human activities in the watershed of concern.

Some potential causes of beneficial use impairment are improper beneficial use or criteria (Oklahoma Water Resources Board jurisdiction), point source problems (Oklahoma Department of Environmental Quality or Oklahoma Department of Agriculture, Food & Forestry), non-point source problems (Oklahoma Conservation Commission, Oklahoma Department of Agriculture, Oklahoma Corporation Commission, or Oklahoma Department of Environmental Quality), oil and gas contamination (Oklahoma Corporation Commission), agricultural activities (Oklahoma Department of Agriculture, Food & Forestry), or mining activities (Oklahoma Department of Mines). All monitoring activities will be cooperative in nature with the agency with statutory authority assuming the lead role for intensive monitoring.

If water bodies are not identified for intensive study as part of this task, then monies will be reallocated for routine monitoring of beneficial use attainment. Other entities (e.g., tribal or governmental units outside of Oklahoma) will be involved as appropriate. All intensive-monitoring activities will be consistent with the WQS and the USAP. If no protocols exist, then best professional judgment or State/Environmental Protection Agency guidance will be used as appropriate.

Lakes Monitoring Program

Lake trophic status is important from a water quality perspective because it is an indicator of potential nutrient impacts to a lake. In general, the higher the trophic state index (TSI) of a lake, the more nutrient loading into the system is occurring and the more productive the lake. One outcome of historical trophic assessment activity on Oklahoma's lakes was the prioritization of lakes most in need of remediation. Outcomes have

included in-lake restoration activities or implementation of best management practices in the lake watershed. Results from the BUMP sampling effort should be viewed as a means to make relative comparisons between lakes and to determine beneficial use impairments based on USAP, detailed in Oklahoma Administrative Code (OAC) 785:46-15-5. Lakes with relatively poor water quality are identified, but that does not necessarily mean that these lakes have beneficial use impairments. Some lakes, due to the nature of their watershed and basin morphometry, may never attain the water quality of some of the state's more pristine waters. For example, an expectation that Broken Bow Lake and Great Salt Plains Reservoir can attain the same level of water quality would be unrealistic, because these two reservoirs exhibit great differences in basin morphometry and substrate material and are located in totally different parts of the state. Soil types such as clays have a very small particle size such that the clay particulates are constantly re-suspended in the lake water column and never settle out, which is evident in some lakes across the state. In addition, the shallow nature of many of our lakes contributes to lake bottom sediments being re-suspended in the water column due to wind action. Because so many factors affect the water quality of a reservoir, comparing lakes from various parts of the state should only be viewed as a relative comparison.

For each lake assessed, a general analysis of water quality was made and a water quality condition map generated. The maps presented are a representation of the water quality throughout the year based on the average of the data collected. Turbidity, measured in nephelometric turbidity units (NTU), and chlorophyll-a values were averaged to obtain an annual value for each site in the lake, and then the maps were generated accordingly. Graphics for seasonal TSI values at each site were also created, as well as seasonal turbidity and true color graphics for each site. A brief narrative summary is included for each lake that presents water quality issues related to the reservoir and assessment of beneficial use support for that lake. Dissolved oxygen/temperature vertical profiles recorded at site 1 (the dam) for each quarter are also included on a graphics page following the lake summary. Hydrolab® profile information is discussed in the narrative section for each lake. The brief synopsis of information presented for each lake should be beneficial in providing a relative comparison of water quality for lakes across the state.

For 2006-2007, the BUMP identified lakes that had beneficial use impairments or threats. However, a data set to truly determine which lakes are not supporting their beneficial uses due to excess nutrients does not currently exist, nor have nutrient criteria for lakes been promulgated into the WQS. The OWRB has previously identified 20 lakes that are listed in the WQS as Nutrient Limited Watersheds (NLW). More intensive work on these lakes is required before a definitive assessment of nutrient impairment or non-support can be made. The OWRB recommends a Nutrient Impairment Study (NIS) be performed on identified NLW lakes. An NLW is defined in the WQS as "a watershed of a waterbody with a designated beneficial use which is adversely affected by excess nutrients as determined by Carlson's TSI (chlorophyll-a) of 62 or greater." If a lake is identified as having a TSI ≥ 62 based on chlorophyll-a, and the minimum data requirements are met ($n=10$ on lakes with <250 surface acres; $n=20$ on lakes with >250 surface acres), it is recommended for listing as an NLW through the WQS setting process. Currently, the parameters that are analyzed to determine whether or not there is beneficial use impairment or threat include turbidity, true color, dissolved oxygen, metals, chloride, sulfates, biological collections, total dissolved solids, and pH values. A brief discussion on lake monitoring procedures and methods is provided below with data results following.

Materials & Methods for Lake Sampling

Data was collected quarterly on 41 lakes across the state from the fall of 2006 through the summer of 2007. Vertical water quality profiles were recorded at one meter intervals from the lake surface to the lake bottom for the following parameters; temperature, pH, dissolved oxygen, salinity, dissolved oxygen % saturation, oxidation-reduction potential (redox), specific conductivity, and total dissolved solids (TDS). A vertical profile was recorded for at least three sites per reservoir: in the central pool area near the dam (lacustrine zone), in the upper portion of the lake and in the major arms of the water body (riverine zone), and in the area between the lacustrine zone and the riverine zone (transitional zone). Turbidity values for each surface site were measured using a HACH portable turbidimeter. For lakes greater than 250 acres in size with only three routine chemical monitoring stations, additional sample sites have been established to ensure minimum data requirements are met. Secchi disk depths (in centimeters) were determined at all routine water chemistry sample sites. Water quality samples were collected at each site at the surface and one meter from the lake bottom at site 1,

the dam, and preserved for analysis of nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, Kjeldahl nitrogen, ortho-phosphorus, total phosphorus, true color, chloride, sulfate, and total alkalinity. OWRB staff calculated total nitrogen based on laboratory-derived values. A Van Dorn sampler was used to collect samples near the lake bottom and grab samples were collected at the lake surface. At the dam site, a churn-splitter was used to split the surface sample for Quality Assurance (QA) purposes. Surface samples were also collected at all sites and analyzed for chlorophyll-a and pheophytin concentrations. Additional chlorophyll-a samples were collected for QA purposes. Filtration and grinding (extraction of the chlorophyll-a collected in a filter with acetone) of the samples was performed immediately upon return to the OWRB lab. All chlorophyll-a samples were filtered, as

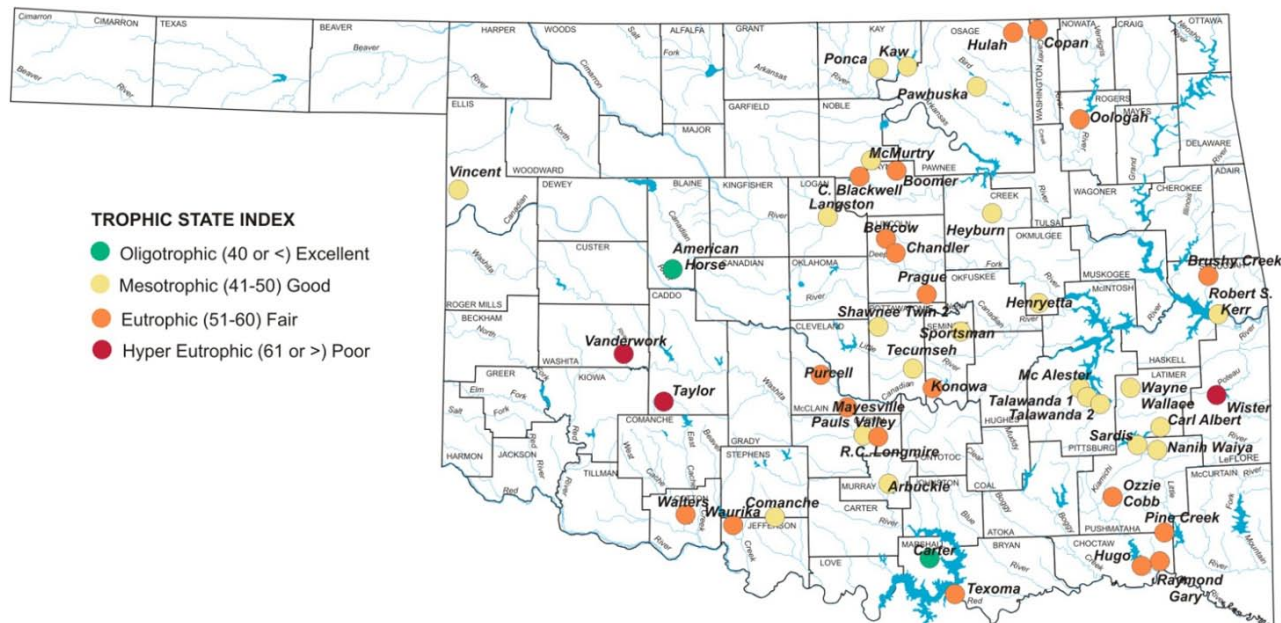


Figure 3. Lakes sampled by the Beneficial Use Monitoring Program in 2008.

stated in Standard Methods (APHA 1995), within 24 hours and stored for no more than 30 days in the freezer.

Sample Lake Locations

Lakes sampled by the BUMP Lakes staff in 2007-2008 are shown in Figure 3. Lake locations are identified on the map and are shaded in different colors based on their calculated TSI values.

Lake Data Analysis Protocols

There are numerous methods available for determining the trophic status of lakes. The majority of the trophic state models rely on a mathematical calculation to generate a single numerical value that is then categorized in an assessment hierarchy. Numerous chemical, and in some cases biological data are utilized in the various trophic indices, which characterize the “trophic status” of a water body. Some of the commonly used water quality parameters utilized in trophic state indices include chlorophyll-a, secchi disc depth, total phosphorus, total nitrogen, aquatic macrophytes, organic nitrogen, turbidity, lake user surveys, and hypolimnetic oxygen depletion rates, etc. Most indices use one or more variables in the determination of trophic status with varying degrees of applicability to reservoir systems. The OWRB has traditionally used Carlson’s Trophic State Index (TSI) (Carlson, 1977) for reporting purposes, utilizing chlorophyll-a concentrations in calculating the lake trophic status. Carlson’s TSI equation using chlorophyll-a (in µg/L) as the trophic status indicator is as follows:

$$TSI = 9.81 \times \ln(\text{chlorophyll-a}) + 30.6.$$

In 1998, 1999, and 2000, the TSI was calculated using chlorophyll-a concentrations from the growing season (spring and summer only). Beginning in sample year 2001, an annualized trophic assessment was made as this was determined to be a more accurate reflection of trophic conditions for each reservoir. In order to make beneficial use determinations, minimum data requirements must be met as listed in OAC 785:46-15-3.

A minimum of 20 samples is required on lakes greater than 250 surface acres, and a minimum of 10 samples on lakes 250 surface acres and less. In 2001-2002, sites were added for chlorophyll-a and turbidity collections on lakes greater than 250 surface acres, in order to meet the minimum data requirements annually. Although data can be aggregated and historical values used, there was a concern in using data that was collected in the summer only as this would bias the data. An analysis of the limnological data collected on lakes is performed to determine the trophic state of each lake monitored. Chlorophyll-a concentrations for each lake sample site are determined and all values are averaged for each lake for all four sampling quarters. This annual chlorophyll-a value is then used in Carlson's TSI equation to determine trophic status of the lake. Through use of this technique the presence of localized trophic conditions are minimized (i.e. the effects of a single elevated chlorophyll-a value is minimized in the calculation of the TSI). The derived TSI represents an accurate assessment of the water quality of the reservoir as a whole and individual isolated areas that may be impacted due to eutrophication will be minimized in the reported TSI. A list of lake trophic state categories and corresponding TSI numerical values are displayed in Table 2. There are other descriptive terms and subset categories for trophic status, like dystrophic; however, Carlson's TSI has four major categories and these will be used to describe lake trophic status. Further discussion is included in each of the lake summaries as necessary. As stated earlier, prior to 2001, the TSI was based on growing season (spring and summer) chlorophyll-a concentrations. However, beginning in 2001, all TSI evaluations were based on an annualized chlorophyll-a value for each lake and comparisons to previous TSI calculations will be specified as annual, growing season, or summer only evaluations. Prior to the onset of BUMP collections, lakes were sampled only in the summer and therefore the TSI was typically much higher than the annual assessments that are being done currently.

The beneficial use support determinations for the reservoirs sampled were determined following guidelines out-

Table 2. Lake Trophic State Categories.

Carlson TSI No.	Trophic State	Definition
≤ 40	Oligotrophic	Low primary productivity and/or low nutrient levels
41 - 50	Mesotrophic	Moderate primary productivity with moderate nutrient levels
51 – 60	Eutrophic	High primary productivity and nutrient rich
≥ 61	Hypereutrophic	Excessive primary productivity and excessive nutrients

line in the Use Support Assessment Protocols (USAP) promulgated into Oklahoma Administrative Code (OAC) 785-46: Subchapter 15. In general the USAP states that environmental data must be collected to take seasonal conditions into consideration. A minimum of 20 samples is required on lakes more than 250 surface acres to assess beneficial use support for water quality parameters such as dissolved oxygen, pH and temperature. In addition, data more than ten years old should not be used for use support purposes unless more recent data is not available. A minimum of 10 samples is required on lakes or lake-arms of 250 surface acres or less. Samples may be aggregated to meet the minimum data requirements. For some parameters such as metals, organic compounds, or toxics, fewer samples are required. Toxicants (metals and organics) require a minimum of 5 samples to determine use support, but less than 5 samples can be used to determine if a use is partially supported or not supported. Furthermore, if at least 2 sample concentrations of a toxicant exceed the criteria prescribed in the WQS by two or more orders of magnitude, then the use is determined to be "not supporting".

The USAP also addresses the issue of how the data should be used spatially for lake monitoring. In general, when determining what size area the data is representative of best professional judgment is used. Such things as major tributaries and major lake arms are considered when deciding the extent of the area that the data was applied to. Arms or portions of lake may be treated separately from the main body of a lake, however in most instances Water Resources Board staff chose to deal with the lake as a single unit. Unless it was demonstrated to the contrary, a single site was not considered representative of an entire lake or an arm of the lake that was greater than two hundred and fifty surface acres in size.

Default Protocols

USAP outlines the procedures for determining whether a set of data points for a particular variable support, partially support, or do not support a particular beneficial use. These protocols are constructed around two distinct types of numerical variables--short-term averages and long-term averages. In each case, samples collected for the range of water quality parameters are analyzed and aggregated in different ways.

Short-term average numerical variables measure variables with exposure periods of less than seven days (e.g., turbidity or a sample standard for chlorides). In other words, the set of samples that is being analyzed considers each sample as a separate entity. For example, turbidity samples collected monthly from January through December are considered unique samples, and consequently, are not aggregated into a single sample for analysis but are considered a fraction of the whole. Use support determination for short-term numerical variables requires a three-step process:

1. Each sample exceeding the prescribed criterion or screening level for a particular variable is identified,
2. The number of samples exceeding the prescribed criterion or screening level is divided by the total number of samples collected to obtain a percent exceedance, and
3. The percent exceedance is compared to a range of prescribed percent exceedances to determine use support. The prescribed percent exceedances are:
 - i) supporting — less than or equal to 10%,
 - ii) partially supporting — greater than 10% but less than 25%,
 - iii) not supporting — greater than or equal to 25%.

Long-term average numerical variables measure variables with exposure periods of greater than or equal to seven days (e.g., yearly mean standard for chlorides). In other words, the set of samples that is being analyzed is considered a unique entity. For example, chloride samples collected monthly from January through December are aggregated through the calculation of a geometric mean. Use support determination for long-term numerical variables requires a three-step process:

1. Samples for a particular variable are aggregated into a geometric mean,
2. The geometric mean is compared to the prescribed criterion or screening level, and
3. Use support is determined to be supporting if the mean is less than the prescribed criterion or screening level or not supporting if the mean is greater than the prescribed criterion or screening level.

Because the long-term average compares only one value (the geometric mean) to the prescribed criterion or screening level, it cannot be considered partially supporting. In most instances, at least 10 samples are required to calculate a geometric mean.

Assessment of Fish & Wildlife Propagation Beneficial Use Support

The FWP beneficial use utilizes five different water quality variables to assess use support: dissolved oxygen (D.O.) concentration, toxicants, hydrogen ion activity (pH), and turbidity. For purposes of this report, only D.O., metals concentrations in the water column, pH, and turbidity will be used in the assessment. The USAP for dissolved oxygen beneficial use support for lakes reads as follows:

- A) If greater than 70% of the water column at any given sample site in a lake or an arm of a lake is less than 2 mg/L, the Fish and Wildlife Propagation beneficial use shall be deemed to be not supported.
- B) If 50% or more, but not greater than 70%, of the water column at any given sample site in a lake or arm of a lake is less than 2 mg/L, the Fish and Wildlife Propagation beneficial use shall be deemed to be partially supported.
- C) The screening level for surface D.O. in a lake or arm of a lake shall be 4 mg/L from June 16 through October 15 each year and 5.0 mg/L for the remainder of the year.

Use support for dissolved oxygen concentrations was determined following the above criteria. Estimations of lake volume were made based on the depth at each site sampled and USAP criteria were applied accordingly. Water column information at each site is likely representative of lake volume conditions and is currently considered adequate for reporting purposes. A proposal to modify the USAP for assessment of dissolved oxygen during the last WQS revision process was made to more accurately reflect the decision criteria being followed. As of July 1, 2002, the word "volume" was changed to "column" to more accurately reflect the decision criteria utilized. It is possible that in the future a bathymetric map will be constructed for each of the BUMP lakes and a better assessment of dissolved oxygen conditions for the lake volume can be made. For assessing Fish & Wildlife propagation use support related to turbidity concentrations, the criterion outlined in the WQS was used

as the screening level. If an average lake-wide turbidity concentration of >25 nephelometric turbidity units was detected, then the lake was listed as not supporting its Fish & Wildlife propagation beneficial use for turbidity. Rain and storm events were considered when making this determination as conditions dictated. The protocol for short-term average numerical parameters is used to assess the level of support.

For assessing the beneficial use support from pH concentrations, the following criteria were used:

- 1) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be fully supported with respect to pH occurring other than by natural causes if no more than 10% of the sample concentrations from that waterbody fall outside the screening interval prescribed in 785:45-5-12(g)(3).
- 2) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be partially supported with respect to pH occurring other than by natural causes if greater than 10% but less than 25% of the sample concentrations from that waterbody fall outside the screening interval prescribed in 785:45-5-12(g)(3).
- 3) The Fish and Wildlife Propagation beneficial use designated for a waterbody shall be deemed to be not supported with respect to pH occurring other than by natural causes if at least 25% of the sample concentrations from that waterbody fall outside the screening interval prescribed in 785:45-5-12(g)(3).

Each lake was profiled using a Hydrolab, and pH concentrations were recorded at all sites for all four quarters. Based on all the data collected per sample year, the percentage of pH values above or below the acceptable range of 6.5 to 9 units was assessed for each site and this percentage determined whether or not the lake was supporting the Fish & Wildlife Propagation beneficial use. All lakes that exceeded the pH criteria have been only listed as not supporting at this point in time as further examination is necessary to determine “natural causes”.

Numerical criteria is prescribed for toxicants in WQS 785:45-5-12(g)(6)(G) in a table entitled “Numerical Criteria for Toxic Substances”. To determine use support, the protocol for short-term average numerical parameters is used. Sample values must be compared to both acute and chronic criterion. Both criteria need not be exceeded for the variable to be partially supported or not supported.

Assessment of Agriculture Beneficial Use Support

The AG beneficial use utilizes three variables to assess use support: total dissolved solids, chlorides, and sulfates. Numerical criteria for both yearly mean standards and sample standards are located in Appendix F of OAC 785:45. The yearly mean standard for each variable is compared to the geometric mean of the samples using a long-term average numerical protocol. The sample standard for each variable is also compared to each sample using a short-term average numerical protocol. Use support assessment for each variable requires a three-step process:

- 1) The sample standard and yearly mean standard for the six digit management segment which encompasses the monitoring must be located in Appendix F of OAC 785:45;
- 2) The geometric mean of the samples is compared to the yearly mean standard (if the geometric mean exceeds the yearly mean standard, the use is not supported and no further analysis is necessary);
- 3) If the geometric mean meets the yearly mean standard, the sample standard is compared to each sample and percent exceedance is calculated (depending on the percent exceedance, the variable is supporting, partially supporting, or not supporting). Regardless of the criteria in Appendix F of OAC 785:45, if all TDS samples are less than 750 mg/L and all chloride and sulfate samples are less than 250 mg/L, the AG beneficial use is supported. Only one variable needs to violate the assessment protocol for the beneficial use to be partially supported or not supported.

Assessment of Aesthetics Beneficial Use Support

The Aesthetics beneficial use is assessed using a couple of water quality parameters--true color and nutrients. The sample standard for each variable is compared to the each sample using a short-term average numerical protocol. Criteria are located in OAC 785:45-5-19 and read as follows.

- 1.) Color. Surface waters of the state shall be virtually free from all coloring materials that produce an aesthetically unpleasant appearance. Color producing substances, from other than natural sources, shall be limited to concentrations equivalent to 70 Platinum-cobalt true color units.
- 2.) Nutrients. Nutrients from point source discharges or other sources shall not cause excessive growth of periphyton, phytoplankton, or aquatic macrophyte communities, which impairs any existing or designated beneficial use.

For assessing the Aesthetics beneficial use support status for color, data collected was compared to the numerical standard of 70 units for true color. Assessment of use support for this water quality parameter was simple and straightforward.

For assessing the Aesthetics beneficial use support status for nutrients, Carlson's TSI was applied. As stated in Table 2 a TSI value ≥ 61 is considered to be characteristic of a hypereutrophic lake (excessive primary productivity). Guidelines for determining if a lake is a Nutrient Limited Watershed (NLW) are outlined in the WQS that states a Carlson's TSI value of > 62 is to be the criterion to be used to classify a lake as an NLW. Classification as an NLW in Appendix A of the WQS means that a lake is considered to be threatened due to nutrients. A TSI value of 62 was chosen as the "break-point" because it is a conservative number. As noted in Table 5, several lakes had a TSI value greater than 62 and have not yet been listed as an NLW, and likewise, there are lakes listed as NLW that have a TSI less than 62. This will be addressed during the next standards revision process. If it can be demonstrated that nutrient loading to a lake may be adversely impacting a beneficial use designated for that lake, then the OWRB may determine that the lake and its watershed is an NLW and the lake and watershed will be identified as NLW in Appendix A of OAC 785:45. Once a lake is identified as an NLW, it is assumed to be threatened until an NLW Impairment Study has been conducted to definitively assess if the water body is partially supporting or not supporting. If an NLW Impairment Study demonstrates that beneficial uses are not threatened, then the Board will remove the NLW identification in the WQS.

Assessment of Primary Body Contact Recreation (PBCR) Support

The PBCR beneficial use utilizes two different bacteriological classes and one bacteriological species to assess use support: fecal coliform (FC), *Escherichia coli* (E. coli), and enterococci (Ent.). The assessment is performed by using the long-term average numerical protocol to compare to a prescribed geometric mean and by using a modified version of the short-term average numerical protocol to compare each sample to a prescribed screening level. The prescribed geometric means (GM) and screening levels (SL) are: FC—GM of 400 colony forming units/mL (cfu/mL) and SL of 400 cfu/mL; E. coli—GM of 126 cfu/mL and SL of 235 cfu/mL in scenic rivers and 406 cfu/mL in all other waters; and Ent.—GM of 33 cfu/mL and SL of 61 cfu/mL in scenic rivers and 406 cfu/mL in all other waters. For E. coli and Ent., both the SL (only one sample exceedance is necessary) and the GM must be exceeded for the use to not be supported. If all of the samples meet the SL or the GM is met, the use is supported. In the case of FC, the use may only be supported if the GM is met and no greater than 25% of the sample concentrations exceed the SL. If either the GM is exceeded or greater than 25% of the sample concentrations exceed the SL, the use is not supported for FC. In no instance is the PBCR beneficial use partially supported. Furthermore, PBCR support is only determined from samples collected during the recreational season from May 1 through September 30 of each year. Only one variable needs to violate the assessment protocol for the beneficial use to be not supported.

Lake Monitoring Results & Discussion

A lake-wide annual average of the chlorophyll-a values was calculated for each lake and used in the final calculation of the TSI. A summary table is included (Table 3) to present the number of lakes and appropriate surface acre size for each of the four trophic categories in 2005-2006 as well as the percentages of the total. As shown in Table 3, ten lakes were hypereutrophic, fourteen were eutrophic, nine were mesotrophic, and three were oligotrophic. Of the total 166,431 surface acres sampled, 41,745 were classified hypereutrophic, 97,879 were classified as eutrophic, 3,979 were classified as mesotrophic and 22,828 acres were classified as oligotrophic. TSI results, county, surface area, and volume for lakes sampled in 2005-2006 are listed in Table 4.

Although TSI based on the chlorophyll-a concentration is used for the BUMP, a comparison of TSI values calculated with total phosphorus and secchi disk depth was generated and is displayed on Table 5. Data displayed is for the growing season using the various water quality parameters that can be used in calculating Carlson's TSI. The chlorophyll and phosphorus TSI calculations were derived through results of regression analysis relating secchi disk depth to the other two variables.

Results for each of the 130 BUMP lakes from the most recent sampling are listed in Table 6. As stated previously, the OWRB is currently monitoring 40 to 45 lakes with repeat sampling on each reservoir scheduled to occur every two to three years. Prior to 1998, data was only collected once for each lake during the summer months. In 1998, the OWRB began collecting data on lakes on a quarterly basis resulting in a great improvement to the data set available to make management decisions on our lake resources. Lakes that are identified as hypereutrophic should be sampled more often than quarterly, especially during the warmer months. Lakes identified as “Nutrient-Limited Watersheds” (NLW) should also be sampled more intensively to confirm if a water quality threat or impairment is present. Minimum data requirements as listed in USAP were closely followed to make beneficial use determinations. All impairments are listed in Table 6. Toxicity concerns, if present, are

Table 3. Summary of Lake Trophic Status Results

Trophic Status	Number of Lakes	Percent of Total Lakes	Surface Area (Acres)	Percent of Total Surface Acres
Hyper-Eutrophic	3	6%	7,695	3%
Eutrophic	20	43%	161,722	64%
Mesotrophic	22	53%	84,960	33%
Oligotrophic	2	4%	208	0%
Totals =	47	100%	254,585	100%

Table 4. List of Lakes Sampled in Sample Year 2007-2008

Lake Name	County	Surface Area	Volume	TSI	Year Sampled	Threats or Impairments	Carlson's TSI
American Horse	Blaine	100	2,200	38	2008	D.O., Color	Oligotrophic
Arbuckle	Murray	2,350	72,400	50	2008	D.O.	Mesotrophic
Bell Cow	Lincoln	1,153		52	2008	D.O., Color, Turbidity	Eutrophic
Boomer	Payne	260	3,200	51	2008	D.O., Color, Turbidity, Ent	Eutrophic
Brushy Creek	Sequoyah	358	3,258	53	2008	D.O.	Eutrophic
Carl Albert	Latimer	183	2,739	41	2008	D.O., Ph, Color	Mesotrophic
Carl Blackwell	Payne	3,370	61,500	53	2008	D.O., Color, Turbidity, Ent	Eutrophic
Carter	Marshall	108	990	40	2008		Oligotrophic
Chandler	Lincoln	129	2,778	60	2008	D.O., Color, Turbidity	Eutrophic
Comanche	Stephens	184	2,500	49	2008		Mesotrophic
Copan	Washington	4,850	43,400	60	2008	Color, Turbidity	Eutrophic
Henryetta	Okmulgee	450	6,600	45	2008	Color, Turbidity, Lead	Mesotrophic
Heyburn	Creek	880	7,105	49	2008	D.O., Color, Turbidity	Mesotrophic
Hugo	Choctaw	13,250	157,600	54	2008	Color, Turbidity	Eutrophic
Hulah	Osage	3,570	31,160	55	2008	Color, Turbidity, Nlw	Eutrophic
Kaw	Osage	17,040	428,600	49	2008		Mesotrophic
Kerr, Robert S.	Sequoyah	43,380	525,700	50	2008	Color, Turbidity	Mesotrophic
Konawa	Seminole	1,350	23,000	57	2008		Eutrophic
Langston	Logan	304	5,792	44	2008		Mesotrophic
Longmire, R.C.	Garvin	918		57	2008		Eutrophic
Maysville (Wiley Post)	Mcclain	302	2,082	51	2008	Color, Turbidity	Eutrophic
Mcalester	Pittsburg	1,521	13,398	50	2008	Color, Turbidity	Mesotrophic
Mcmurtry	Noble	1,155	19,733	48	2008	D.O., Color, Turbidity	Mesotrophic
Nanih Waiya **	Pushmataha	131	1,064	45	2008	Color	Mesotrophic
Oologah	Rogers	29,460	553,400	54	2008		Eutrophic
Ozzie Cobb **	Pushmataha	116	833	59	2008		Eutrophic
Pauls Valley	Garvin	750	8,730	50	2008	Color, Turbidity	Mesotrophic
Pawhuska	Osage	96	3,600	41	2008	D.O.	Mesotrophic

Table 4. List of Lakes Sampled in Sample Year 2007-2008

Lake Name	County	Surface Area	Volume	TSI	Year Sampled	Threats or Impairments	Carlson's TSI
Pine Creek	Mccurtain	3,750	53,750	53	2008	D.O., Ph, Color	Eutrophic
Ponca	Kay	805	14,440	48	2008	D.O., Color	Mesotrophic
Prague	Lincoln	225	2,415	51	2008	D.O., Color	Eutrophic
Purcell	Mcclain	150	2,600	54	2008	D.O.	Eutrophic
Raymond Gary	Choctaw	263	1,681	55	2008	D.O., Color	Eutrophic
Sardis	Pushmataha	13,610	274,330	46	2008	D.O., Color	Mesotrophic
Shawnee No. 2	Pottawatomie	1,100	11,400	43	2008	D.O.	Mesotrophic
Sportsman	Seminole	354	5,349	43	2008	D.O.	Mesotrophic
Talawanda No. 1	Pittsburg	91	1,200	42	2008	D.O.	Mesotrophic
Talawanda No. 2	Pittsburg	195	2,750	45	2008		Mesotrophic
Taylor (Marlow)	Grady	227	1,877	64	2008	Turbidity, Nlw	Hypereutrophic
Tecumseh	Pottawatomie	127	1,118	49	2008	Color, Turbidity, Lead	Mesotrophic
Texoma	Bryan	88,000		55	2008	D.O., Color, Turbidity	Eutrophic
Vanderwork	Wahita	135	1,578	64	2008	D.O., Nlw	Hypereutrophic
Vincent, Loyd	Ellis	160	2,579	46	2008		Eutrophic
Walters (Dave Boyer)	Cotton	148	861	51	2008	Color, Turbidity	Eutrophic
Waurika	Jefferson	10,100	203,100	54	2008	Color, Turbidity	Eutrophic
Wayne Wallace	Latimer	94	1,746	48	2008	Ph. Color	Mesotrophic
Wister	Leflore	7,333	62,360	61	2008	D.O., Ph, Color, Turbidity, Nlw	Hypereutrophic

listed as provided by the ODEQ as part of their Rotating Lakes Toxics Program and/or through sampling conducted by the OWRB.

Table 5. Comparison of Methods Used to Calculate Carlson's Trophic State Index for 2007-2008.

Lake Name	Chl-A	Trophic State	Total P	Trophic State	Secchi	Trophic State
American Horse	38	Oligotrophic	55	Eutrophic	58	Eutrophic
Arbuckle	50	Mesotrophic	46	Mesotrophic	56	Eutrophic
Bellcow	52	Eutrophic	53	Eutrophic	69	Hypereutrophic
Boomer	51	Eutrophic	61	Hypereutrophic	76	Hypereutrophic
Brushy Creek	53	Eutrophic	50	Mesotrophic	60	Eutrophic
Carl Albert	41	Mesotrophic	49	Mesotrophic	61	Hypereutrophic
Carl Blackwell	53	Eutrophic	56	Eutrophic	74	Hypereutrophic
Carter	40	Oligotrophic	41	Mesotrophic	57	Eutrophic
Chandler	60	Eutrophic	61	Hypereutrophic	74	Hypereutrophic
Comanche	49	Mesotrophic	48	Mesotrophic	62	Hypereutrophic
Copan	60	Eutrophic	68	Hypereutrophic	76	Hypereutrophic
Henryetta	45	Mesotrophic	67	Hypereutrophic	81	Hypereutrophic
Heyburn	49	Mesotrophic	57	Eutrophic	74	Hypereutrophic
Hugo	54	Eutrophic	63	Hypereutrophic	76	Hypereutrophic
Hulah	55	Eutrophic	63	Hypereutrophic	79	Hypereutrophic
Kaw	49	Mesotrophic	80	Hypereutrophic	71	Hypereutrophic
Kerr, R.S.	50	Mesotrophic	76	Hypereutrophic	79	Hypereutrophic

Table 5. Comparison of Methods Used to Calculate Carlson's Trophic State Index for 2007-2008.

Lake Name	Chl-A	Trophic State	Total P	Trophic State	Secchi	Trophic State
Konawa	57	Eutrophic	55	Eutrophic	63	Hypereutrophic
Langston	44	Mesotrophic	41	Mesotrophic	65	Hypereutrophic
Longmire, R.C.	57	Eutrophic	53	Eutrophic	66	Hypereutrophic
Maysville	51	Eutrophic	72	Hypereutrophic	86	Hypereutrophic
Mcalester	50	Mesotrophic	57	Eutrophic	72	Hypereutrophic
Mcmurtry	48	Mesotrophic	52	Eutrophic	71	Hypereutrophic
Nanih Waiya	45	Mesotrophic	50	Mesotrophic	60	Eutrophic
Oologah	54	Eutrophic	60	Eutrophic	66	Hypereutrophic
Ozzie Cobb	59	Eutrophic	59	Eutrophic	68	Hypereutrophic
Pauls Valley	50	Mesotrophic	57	Eutrophic	74	Hypereutrophic
Pawhuska	41	Mesotrophic	32	Oligotrophic	50	Mesotrophic
Pine Creek	53	Eutrophic	52	Eutrophic	63	Hypereutrophic
Ponca	48	Mesotrophic	56	Eutrophic	64	Hypereutrophic
Prague	51	Eutrophic	51	Eutrophic	64	Hypereutrophic
Purcell	54	Eutrophic	52	Eutrophic	68	Hypereutrophic
Raymond Gary	55	Eutrophic	55	Eutrophic	66	Hypereutrophic
Sardis	46	Mesotrophic	50	Mesotrophic	65	Hypereutrophic
Shawnee #2	43	Mesotrophic	42	Mesotrophic	62	Hypereutrophic
Sportsman	43	MesotrOphic	47	Mesotrophic	64	Hypereutrophic
Talawanda #1	42	Mesotrophic	41	Mesotrophic	54	Eutrophic
Talawanda #2	45	Mesotrophic	37	Oligotrophic	55	Eutrophic
Taylor	64	Hypereutrophic	76	Hypereutrophic	73	Hypereutrophic
Tecumseh	49	Mesotrophic	71	Hypereutrophic	92	Hypereutrophic
Texoma	55	Eutrophic	60	Eutrophic	64	Hypereutrophic
Vanderwork	64	Hypereutrophic	64	Hypereutrophic	68	Hypereutrophic
Vincent	46	Mesotrophic	47	Mesotrophic	66	Hypereutrophic
Walters	51	Eutrophic	67	Hypereutrophic	82	Hypereutrophic

Table 6. Lakes Sampled by the BUMP with Their Associated Use Attainment Status.

Lake Name	County	W.Q. Segment #	Last Year Sampled	FWP	PPWS	PBCR	AG	AES
American Horse	Blaine	520620	2007-2008	D.O.				True Color
Arbuckle	Murray	310800	2007-2008	D.O.				
Arcadia	Oklahoma	520710	2006-2007		Chlor-A			
Ardmore City	Carter	310800	2006-2007	D.O.				
Atoka	Atoka	410400	2006-2007	Turbidity				True Color
Bellcow	Lincoln	520700	2007-2008	D.O., Turbidity				True Color
Birch	Osage	121300	2006-2007	D.O.				True Color
Bixhoma	Wagoner	120410	2005-2006	D.O.				
Bluestem	Osage	121300	2005-2006	D.O., Turbidity				
Boomer	Payne	620900	2007-2008	Turbidity, D.O.		Ent.		True Color
Broken Bow	Mccurtain	410210	2005-2006	pH, D.O.				
Brushy Creek	Sequoyah	220200	2007-2008	D.O.				
Burtschi	Grady	31082002	2005-2006	pH				NLW
Canton	Blaine	720500	2005-2006	Turbidity				
Carl Albert	Latimer	410310	2007-2008	pH, D.O.				True Color
Carl Blackwell	Payne	620900	2007-2008	Turbidity, D.O.				True Color
Carter	Marshall	310800	2007-2008					
Cedar (Mena)	Leflore	410210 410300	2005-2006	D.O., pH				
Chandler	Lincoln	520700	2007-2008	Turbidity, D.O.				True Color
Chickasha	Caddo	310830	2006-2007	D.O.			Sulfates	NLW
Claremore	Rogers	121500	2005-2006		Chlor-A			NLW
Clear Creek	Stephens	310810	2006-2007					
Cleveland City	Pawnee	621200	2006-2007	D.O.				
Clinton	Washita	310830	2003-2004	Turbidity	Chlor-A	Ent.		True Color NLW
Coalgate City	Coal	410400	2006-2007	D.O., Turbidity				True Color
Comanche	Stephens	311300	2007-2008					
Copan	Washington	121400	2007-2008	Turbidity				True Color
Crowder	Washita	310830	2005-2006		Chlor-A			NLW
Cushing Municipal	Payne	620900	2006-2007	Turbidity				True Color
Dave Boyer (Walters)	Cotton	311300	2007-2008	Turbidity				True Color
Dripping Springs	Okmulgee	520700	2006-2007	D.O., Turbidity				True Color
Duncan	Stephens	310810	2006-2007					True Color
El Reno	Canadian	520530	2006-2007	Turbidity				True Color NLW
Elk City	Beckham	311500	2005-2006					NLW
Ellsworth	Comanche	311300	2006-2007	D.O., Turbidity				True Color
Elmer Thomas	Comanche	311300	2006-2007	pH				
Etling, Carl	Cimarron	720900	2003-2004	Turbidity, pH				NLW
Eucha	Delaware	121600	2006-2007	D.O.	Chlor-A			NLW
Eufaula	Haskell	220600	2006-2007	D.O., Turbidity				True Color
Fairfax City	Osage	621200	2006-2007	D.O.				
Fort Cobb	Caddo	310830	2005-2006	Turbidity	Chlor-A			NLW
Fort Gibson	Cherokee	121600	2006-2007	D.O.				NLW
Fort Supply†	Woodward	720500	2005-2006	Turbidity	Chlor-A			NLW

Table 6. Lakes Sampled by the BUMP with Their Associated Use Attainment Status.

Lake Name	County	W.Q. Segment #	Last Year Sampled	FWP	PPWS	PBCR	AG	AES
Foss	Custer	310800 310810 310820 310830 310840	2004-2005					
Frederick	Tillman	311310	2006-2007	Turbidity				True Color
Fuqua	Stephens	310810	2006-2007					
Grand	Mayes	121600	2005-2006	D.O.				
Great Salt Plains	Alfalfa	621010	2005-2006	Turbidity			Sulfates & Chlorides	NLW
Greenleaf	Muskogee	120400	2005-2006	D.O.	Chlor-A			
Guthrie	Logan	620910	2005-2006		Chlor-A			NLW
Healdton City	Carter	311100	2005-2006					
Hefner	Oklahoma	520520 520530	2005-2006	D.O.				
Henryetta	Okmulgee	520700	2007-2008	Turbidity, Lead				True Color
Heyburn	Creek	120420	2007-2008	D.O., Turbidity				True Color
Holdenville	Hughes	520800	2006-2007	D.O., pH	Chlor-A			
Hominy Municipal	Osage	121300	2006-2007	D.O.				
Hudson	Osage		2005-2006	D.O.				
Hudson	Mayes	121600	2006-2007					
Hugo	Choctaw	410300	2007-2008	Turbidity				True Color
Hulah	Osage	121400	2007-2008	Turbidity				NLW True Color
Humphreys	Stephens	310810	2006-2007	D.O.	Chlor-A			
Jean Neustadt	Carter	310800	2006-2007	D.O.				
John Wells	Haskell	220200	2005-2006					
Kaw	Osage	621210	2007-2008					
Keystone	Tulsa	621200 620900	2005-2006	Turbidity			Sulfates & Chlorides	
Konawa	Seminole		2007-2008					
Langston	Logan	620900	2007-2008					
Lawtonka	Comanche	311300	2006-2007	D.O.	Chlor-A			
Liberty	Logan	620910	2005-2006	Turbidity	Chlor-A			
Lloyd Church	Latimer	220100	2005-2006	D.O., pH				True Color
Lone Chimney	Pawnee	621200	2003-2004					
Lugert-Altus	Greer	311500 311510	2004-2005	Turbidity				
Mcalester	Pittsburg	220600	2007-2008	Turbidity				True Color
Mcgee Creek	Atoka	410400	2006-2007	D.O., pH				
Mcmurtry	Noble	620900	2007-2008	Turbidity, D.O.				True Color
MeeKer	Lincoln	520700	2005-2006	Turbidity				
Murray	Love	311100	2005-2006	D.O.				
Nanah Waiya	Pushmataha		2007-2008					True Color
New Spiro	Leflore	220100	2005-2006	pH	Chlor-A			NLW
Okemah	Okfuskee	520700	2006-2007	D.O., Turbidity		Ent.		True Color
Okmulgee	Okmulgee	520700	2006-2007	D.O.				True Color
Oologah	Rogers	121510	2007-2008					

Table 6. Lakes Sampled by the BUMP with Their Associated Use Attainment Status.

Lake Name	County	W.Q. Segment #	Last Year Sampled	FWP	PPWS	PBCR	AG	AES
Overholser■	Oklahoma	520520 520530	2005-2006	Turbidity				NLW True Color
Ozzie Cobb	Pushmataha	410300	2007-2008	pH				NLW True Color
Pauls Valley City	Garvin	310810	2007-2008	Turbidity				True Color
Pawhuska	Osage	121600	2007-2008	D.O.				
Pawnee	Pawnee	621200	2006-2007		Chlor-A			
Perry	Noble	621200	2006-2007	Turbidity				True Color
Pine Creek	Mccurtain	410210	2007-2008	D.O., pH				True Color
Ponca	Kay	621200	2007-2008	D.O.				True Color
Prague City	Lincoln	520510	2007-2008	D.O.				True Color
Purcell	Mcclain	520610	2007-2008	D.O.				
Raymond Gary	Choctaw	410300	2007-2008	D.O.				True Color
R.C. Longmire	Garvin	310810	2007-2008					
Robert S. Kerr	Sequoyah	220200	2007-2008	Turbidity				True Color
Rock Creek	Carter	310800	2006-2007	D.O.				
Rocky (Hobart) ■	Washita	311500	2006-2007	Turbidity				NLW
Sahoma	Creek	120420	2005-2006	D.O.				
Sardis	Pushmataha	410310	2007-2008	D.O.				True Color
Shawnee Twin # 1	Pottawatomie	520510	2005-2006	D.O.				
Shawnee Twin # 2	Pottawatomie	520510	2007-2008	D.O.				
Shell	Osage	120420	2005-2006	D.O.				
Skiatook	Osage	121300	2006-2007	D.O.				True Color
Sooner	Pawnee		2006-2007	D.O.			Chlorides, Sulfates &TDS	
Spavinaw●	Mayes	121600	2006-2007	D.O.	Chlor-A			NLW
Sportsman	Seminole	520500	2007-2008	D.O.				
Stanley Draper	Cleveland		2005-2006	D.O.				
Stilwell City	Adair	220200	2005-2006	D.O.				
Stroud	Creek	520700	2005-2006	D.O.			Sulfates & Chlorides	
Talawanda # 1	Pittsburg	220600	2007-2008	D.O.				
Talawanda # 2	Pittsburg	220600	2007-2008					
Taylor (Marlow)	Grady	310840	2007-2008	Turbidity				NLW
Tecumseh	Pottawatomie	520510	2007-2008	Turbidity				True Color
Tenkiller Ferry■	Sequoyah	121700	2005-2006	D.O.	Chlor-A			NLW
Texoma	Bryan	311100 310800	2007-2008	D.O., Turbidity				True Color
Thunderbird■	Cleveland	520810	2006-2007		Chlor-A			NLW
Tom Steed■	Kiowa	311500	2006-2007	Turbidity	Chlor-A			
Vanderwork	Washita	310830	2007-2008	D.O.				NLW
Vincent, Lloyd	Ellis	720500	2007-2008					
W.R. Holway	Mayes		2006-2007	D.O.				
Waurika	Jefferson	311210	2007-2008	Turbidity				True Color
Waxhoma	Osage		2005-2006	D.O.				
Wayne Wallace	Latimer	220100	2007-2008	pH				True Color

Table 6. Lakes Sampled by the BUMP with Their Associated Use Attainment Status.

Lake Name	County	W.Q. Segment #	Last Year Sampled	FWP	PPWS	PBCR	AG	AES
Webbers Falls	Muskogee	121400	2005-2006					
Wes Watkins	Pottawatomie	520510	2005-2006					
Wetumka	Hughes		2006-2007	D.O.				True Color
Wewoka	Seminole	520500	2006-2007	Turbidity, D.O.				True Color
Wiley Post (Maysville)	Mcclain		2007-2008	Turbidity				True Color
Wister♣	Leflore	220100	2007-2008	D.O., Turbidity & pH				NLW True Color
Yahola●	Tulsa	121300	1998-1999					

† Lake Listed Based Upon 1995 U.S. Army Corps. Of Engineers Intensive Study

♣ Lake Listed Based Upon OWRB Phase I Clean Lakes Study

◆ Lake does not fit classic definition of oligotrophy. Inorganic particulates are limiting biological productivity

● Lake was not assessed through the BUMP, but through another OWRB project

■ These Lakes will be recommended for NLW listing as part of the next WQS revision process

Acronyms: NLW = Nutrient Limited Water; D.O. = Dissolved Oxygen; ENT. = Enterococci Bacteria

Assigned WQS Beneficial Uses: FWP = Fish & Wildlife Propagation; AES = Aesthetics; PPWS = Public & Private Water Supply; AG = Agriculture;

PBCR = Primary Body Contact Recreation

The pH was examined and compared to the WQS for pH, 6.5 to 9 units, listed in 785:45-5. Five of the 47 lakes sampled in 2007-2008 were listed as partially supporting the FWP beneficial use based on pH values and one lake were listed as not supporting (Figure 4). Turbidity, in Nephelometric turbidity units (NTU), was measured via a HACH turbidimeter for all sites on each lake sampled to identify lakes that exceeded the WQS of 25 NTU. Seasonal turbidity values at each site are displayed for each lake as well as the lake-wide annual turbidity value. Of the 47 lakes sampled in 2007-2008, twenty lakes were not supporting their Fish & Wildlife Propagation (FWP) beneficial use, two did not have enough information and twenty-five were fully supporting the use based on turbidity values (see Figure 6). True color units were also averaged for the year to compare to the WQS of 70 units. Seasonal true color values per site are displayed graphically for each lake (see Figure 5.). In 2007-2008, twenty-nine lakes were not supporting the Aesthetics beneficial use based on high true color values. Vertical profiles recorded with a Hydrolab® were examined to determine if anoxic conditions were present and whether or not the lake was meeting the FWP beneficial use. The USAP lists dissolved oxygen violations as values below 2.0 mg/L for 70% of the entire water column and partially supporting if between 50% and 70% of the lake. Of the 47 lakes sampled in 2007-2008, twenty-three were not supporting the FWP beneficial use based on anoxic conditions, primarily in the summer season (See Figure 9.). Chloride and sulfate water quality parameters were also added to the lake sampling program in year 2003-2004. These additions allow for an assessment of the agriculture beneficial use of our reservoirs and much like metals sampling is a sampling effort that we plan on continuing into the future. Analysis of the chloride and sulfate data revealed that all lakes sampled were supporting the agriculture beneficial use (See Figure 8). Analysis of the bacteria data indicated twenty-seven of the lakes sampled were supporting their Primary Body Contact Recreation beneficial use (See Figure 8). It is the intent of the OWRB monitoring program to pursue adding additional monitoring parameters to the lake sampling initiative to allow all beneficial uses to be assessed. It is also the OWRB intent to accomplish this without having to reduce the number of lakes sampled annually.

A brief synopsis of the results from OWRB field sampling for each of the 47 lakes sampled in 2007-2008 as well as the 3 lakes sampled in 2006-2007 is discussed in alphabetical order on the following pages.

Comparison of pH Values to the OWQS for Sample Year 2007-2008

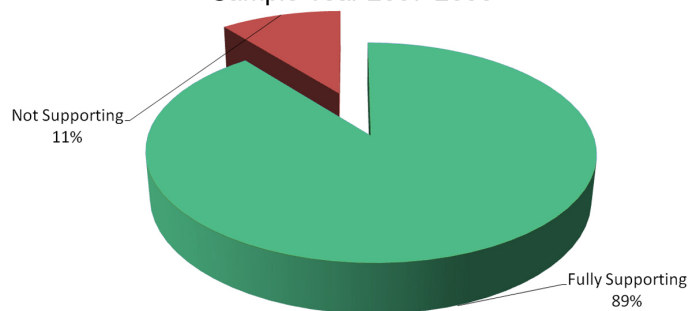


Figure 4. Percent of lakes assessed that exceeds or meets the WQS for pH.

Comparison of True Color Values to the OWQS for Sample Year 2007-2008

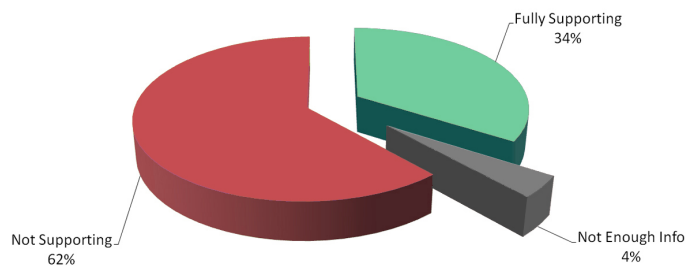


Figure 5. Percent of lakes assessed that exceeds or meets the WQS for true color.

Comparison of Turbidity Values to the OWQS for Sample Year 2007-2008

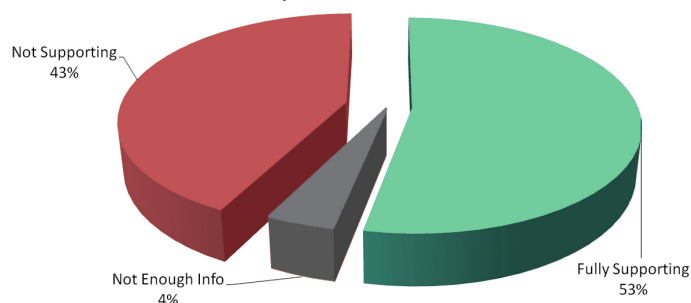


Figure 6. Percent of lakes assessed that exceeds or meets the WQS for turbidity.

Comparison of Dissolved Oxygen Values to the OWQS for Sample Year 2007-2008

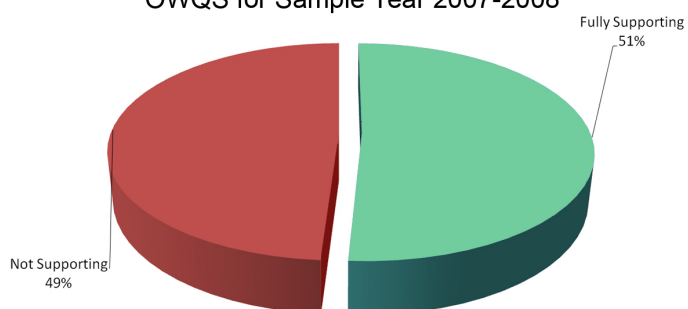


Figure 7. Percent of lakes assessed and their support status of the WQS for dissolved oxygen

Comparison of Bacteria Values to the OWQS for Sample Year 2007-2008

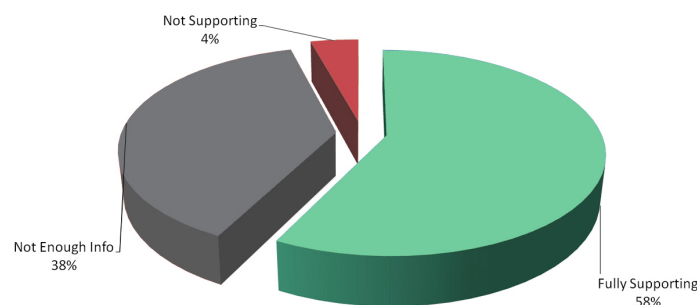


Figure 8. Percent of lakes assessed and their support status of the WQS for bacteria.

Comparison of Chloride & Sulfate Values to the OWQS for Sample Year 2007-2008

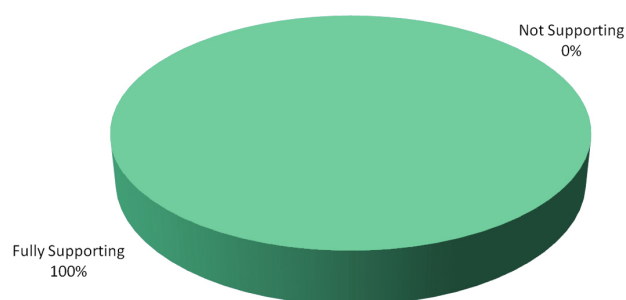
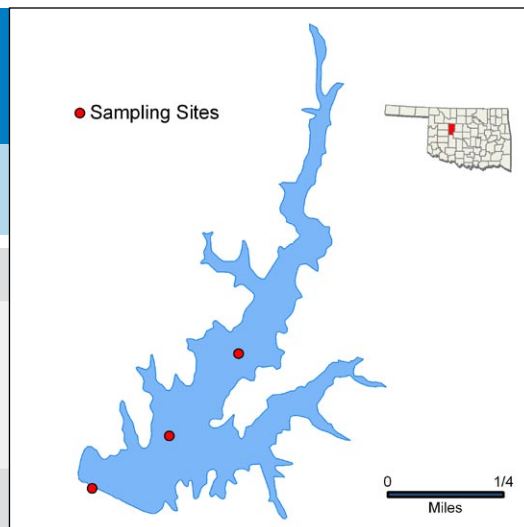


Figure 9. Percent of lakes assessed and their support status of the WQS for chlorides & sulfates.

American Horse

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	3

Lake Data	Location	Blaine County
	Impoundment	1966
	Area	100 acres
	Capacity	2,200 acre-feet
	Purposes	Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	13 NTU	Lake-wide average
		Average True Color	54 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	118 cm	
		Water Clarity Rating	good	
		Trophic State Index	38	Previous value = 49
		Trophic Class	oligotrophic	
		Salinity	0.07 - 0.13 ppt	
		Specific Conductivity	151.5 - 274.7 µS/cm	
		pH	7.01 - 8.08 pH units	
		Oxidation-Reduction Potential	-4 to 551 mV	
		Dissolved Oxygen	Up to 60% of water column < 2 mg/L in July	
	Nutrients	Surface Total Nitrogen	0.38 mg/L to 1.07 mg/L	
		Surface Total Phosphorus	0.018 mg/L to 0.053 mg/L	
		Nitrogen to Phosphorus Ratio	19:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En. cal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		S	S	NS	NEI				
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div><div>S = Fully Supporting</div><div>NS = Not Supporting</div><div>NEI = Not Enough Information</div></div>		Notes							
Lab accident – not enough data to make an assessment										

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

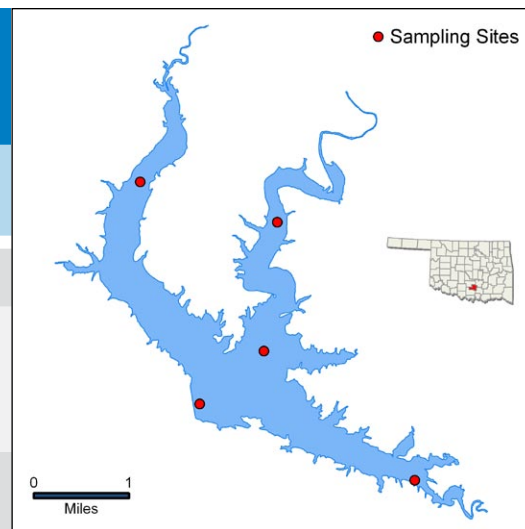
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Arbuckle

Sample Period	Times Visited	Sampling Sites
November 2007 - August 2008	4	5

Lake Data	Location	Murray County
	Impoundment	1967
	Area	2,350 acres
	Capacity	72,400 acre-feet
	Purposes	Water Supply, Flood Control, Fish and Wildlife, and Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	5 NTU	All values < OWQS of 25 NTU
		Average True Color	22 units	All values < OWQS of 70
		Average Secchi Disk Depth	128 cm	
		Water Clarity Rating	Excellent	
		Trophic State Index	50	Previous value = 46
		Trophic Class	mesotrophic	
		Salinity	0.19 – 0.30 ppt	
		Specific Conductivity	320- 511 µS/cm	
		pH	6.84 - 8.54 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	-57 to 499 mV	
	Dissolved Oxygen	Up to 73% of water column < 2 mg/L in August		
	Nutrients	Surface Total Nitrogen	0.43 mg/L to 0.71 mg/L	
		Surface Total Phosphorus	0.010 mg/L to 0.024 mg/L	
Nitrogen to Phosphorus Ratio		33:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					S	S				
	Agriculture							S			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	Lab accident – not enough data to make an assessment								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

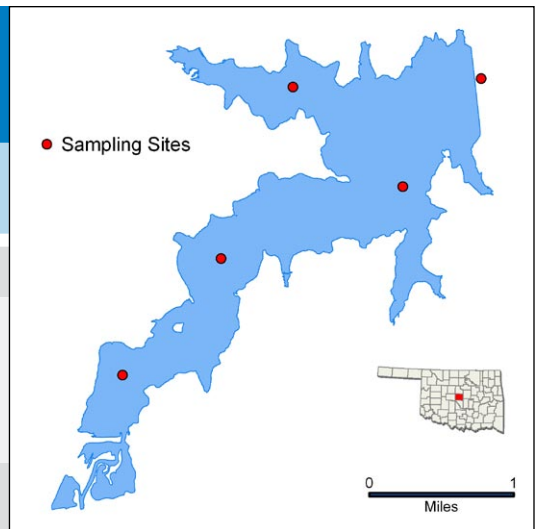
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Arcadia

Sample Period	Times Visited	Sampling Sites
October 2006 - August 2007	4	5

Lake Data	Location	Oklahoma County
	Impoundment	1986
	Area	1,820 acres
	Capacity	27,520 acre-feet
	Purposes	Water Supply, Flood Control, Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	42 NTU	30% of values > OWQS of 25 NTU	
	Average True Color	53 units	10% of values > OWQS of 70	
	Average Secchi Disk Depth	67 cm		
	Water Clarity Rating	average		
	Trophic State Index	58		
	Trophic Class	eutrophic		
	Profile	Salinity	0.10 – 0.20 ppt	
		Specific Conductivity	209.7 - 422 µS/cm	
		pH	7.32 - 8.47 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	148 to 415 mV	
		Dissolved Oxygen	Up to 38% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.75 mg/L to 1.85 mg/L	
		Surface Total Phosphorus	0.025 mg/L to 0.231 mg/L	
Nitrogen to Phosphorus Ratio		15:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for E.coli and Enterococci. The peaks reported in turbidity & color are due to seasonal storm events and the lake is considered the supporting the Fish and Wildlife Propagation and Aesthetics beneficial uses.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

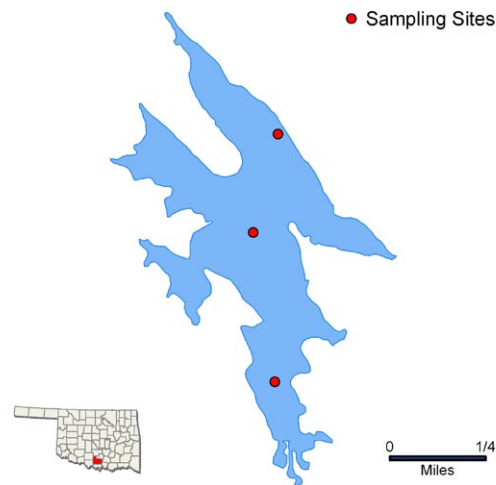
ppt = parts per thousand
 En = Enterococci

Ardmore City

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	3

Lake Data

Location	Carter County
Impoundment	1910
Area	142 acres
Capacity	600 acre-feet
Purposes	Recreation



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	10 NTU	100% of values < OWQS of 25 NTU
Average True Color	25 units	100% of values < OWQS of 70
Average Secchi Disk Depth	106 cm	
Water Clarity Rating	excellent	
Trophic State Index	52	
Trophic Class	eutrophic	
Profile	Salinity	0.13 – 0.18 ppt
	Specific Conductivity	278.6 – 365 µS/cm
	pH	7.16 - 8.85 pH units Neutral to slightly alkaline
	Oxidation-Reduction Potential	48 to 436 mV
Nutrients	Dissolved Oxygen	Up to 63% of water column < 2 mg/L in August
	Surface Total Nitrogen	0.32 mg/L to 0.62 mg/L
	Surface Total Phosphorus	0.009 mg/L to 0.035 mg/L
	Nitrogen to Phosphorus Ratio	22:1 Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S					
Aesthetics					S	S			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

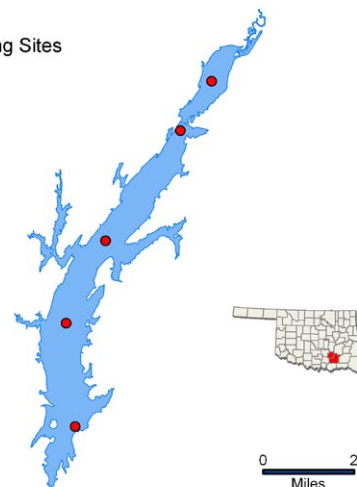
ppt = parts per thousand
 En = Enterococci

Atoka

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Atoka County
	Impoundment	1964
	Area	5,700 acres
	Capacity	125,000 acre-feet
	Purposes	Water Supply, Recreation

● Sampling Sites



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	53 NTU	85% of values > OWQS of 25 NTU
		Average True Color	160 units	100% of values > OWQS of 70
		Average Secchi Disk Depth	33 cm	
		Water Clarity Rating	poor	
		Trophic State Index	51	
		Trophic Class	eutrophic	
		Salinity	0.01 – 0.04 ppt	
		Specific Conductivity	44.1 – 97.7 µS/cm	
		pH	6.36 – 8.41 pH units	Only 12 values (6.9%) <6.5 pH units
		Oxidation-Reduction Potential	325 to 457 mV	
	Dissolved Oxygen	Up to 50% of water column < 2 mg/L in August		
	Nutrients	Surface Total Nitrogen	0.46 mg/L to 1.06 mg/L	
		Surface Total Phosphorus	0.039 mg/L to 0.105 mg/L	
Nitrogen to Phosphorus Ratio		11:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

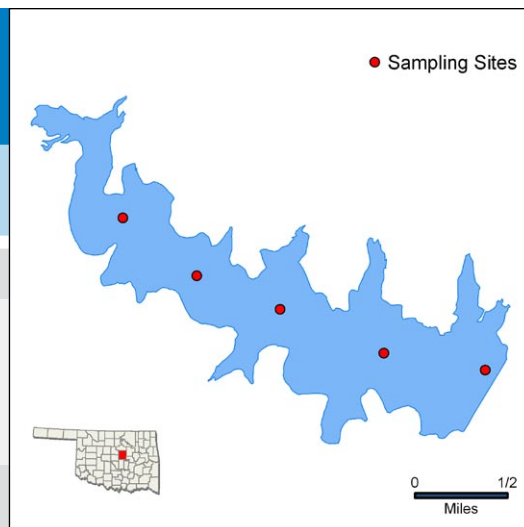
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Bell Cow

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	5

Lake Data	Location	Lincoln County
	Impoundment	1990
	Area	1,153 acres
	Capacity	15,613 acre-feet
	Purposes	Water Supply, Flood Control, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	22 NTU	30% of values > OWQS of 25 NTU
		Average True Color	67 units	75% of values > OWQS of 70
		Average Secchi Disk Depth	54 cm	
		Water Clarity Rating	average	
		Trophic State Index	52	
		Trophic Class	eutrophic	
		Salinity	0.10 - 020 ppt	
	Nutrients	Specific Conductivity	205 - 442 μ S/cm	
		pH	7.18 - 8.49 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	34 to 434 mV	
		Dissolved Oxygen	Up to 50% of water column < 2 mg/L in August	
		Surface Total Nitrogen	0.56 mg/L to 0.92 mg/L	
		Surface Total Phosphorus	0.016 mg/L to 0.073 mg/L	
		Nitrogen to Phosphorus Ratio	24:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		NS	S	NS	S				
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

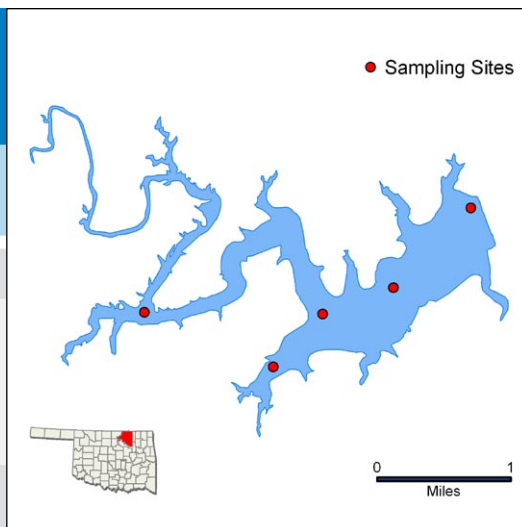
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Birch

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Osage County
	Impoundment	1977
	Area	1,137 acres
	Capacity	19,200 acre-feet
	Purposes	Water Supply, Recreation, Flood Control, Water Quality Control and Fish and Wildlife



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	12 NTU	5% of values > OWQS of 25 NTU
		Average True Color	55 units	30% of values > OWQS of 70
		Average Secchi Disk Depth	90 cm	
		Water Clarity Rating	good	
		Trophic State Index	52	
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.03 – 0.09 ppt	
		Specific Conductivity	86.6 – 196.9 μ S/cm	
		pH	6.47 – 7.92 pH units	Only 5 values (2.9%) <6.5 pH units
		Oxidation-Reduction Potential	4 to 482 mV	
		Dissolved Oxygen	Up to 73% of water column < 2 mg/L in May	
		Surface Total Nitrogen	0.43 mg/L to 0.82 mg/L	
		Surface Total Phosphorus	0.008 mg/L to 0.037 mg/L	
		Nitrogen to Phosphorus Ratio	29:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		S	S	NS	S				
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

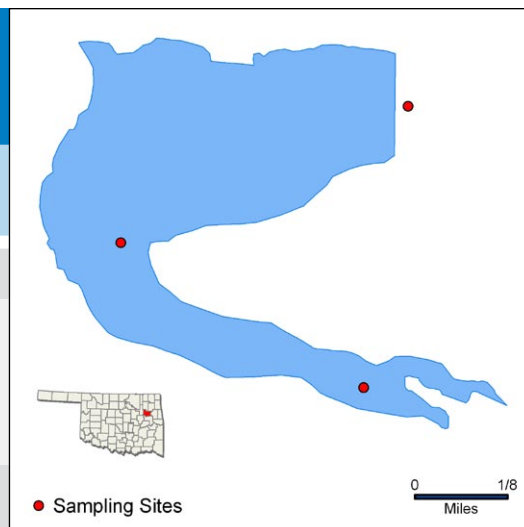
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Bixhoma

Sample Period	Times Visited	Sampling Sites
October 2005 - July 2006	4	3

Lake Data	Location	Wagoner County
	Impoundment	1965
	Area	110 acres
	Capacity	3,130 acre-feet
	Purposes	Water Supply, Recreation



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	5 NTU	100% of values < OWQS of 25 NTU
		Average True Color	23 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	146 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	45	
		Trophic Class	mesotrophic	
		Profile	Salinity	0.01 – 0.05 ppt
	Specific Conductivity		47.4 – 127.5 µS/cm	
	pH		6.44 – 8.63 pH units	Only 3 (2.3%) values < 6.5 pH units
	Oxidation-Reduction Potential		111 to 482 mV	
	Dissolved Oxygen		Up to 56% of water column < 2 mg/L in the fall & 67% in July	
	Nutrients	Surface Total Nitrogen	0.25 mg/L to 0.45 mg/L	
		Surface Total Phosphorus	0.010 mg/L to 0.026 mg/L	
Nitrogen to Phosphorus Ratio		22:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

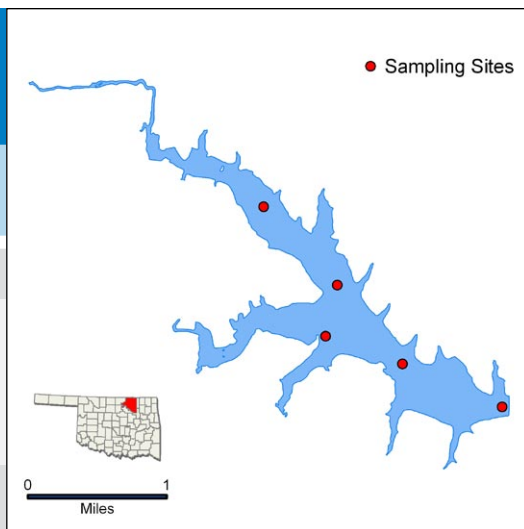
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Bluestem

Sample Period	Times Visited	Sampling Sites
October 2005 - July 2006	4	5

Lake Data	Location	Osage County
	Impoundment	1958
	Area	762 acres
	Capacity	17,000 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	14 NTU	10.5% of values > OWQS of 25 NTU
		Average True Color	20 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	84 cm	
		Water Clarity Rating	average	
		Trophic State Index	44	
		Trophic Class	mesotrophic	
	Nutrients	Salinity	0.14 – 0.18 ppt	
		Specific Conductivity	290.7 – 366.6 µS/cm	
		pH	7.18 – 8.41 pH units	
		Oxidation-Reduction Potential	113 to 437 mV	
		Dissolved Oxygen	Up to 53% of water column < 2 mg/L in July	Occurred at sites 1 and 5
		Surface Total Nitrogen	0.15 mg/L to 0.54 mg/L	
		Surface Total Phosphorus	0.016 mg/L to 0.132 mg/L	
		Nitrogen to Phosphorus Ratio	12:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

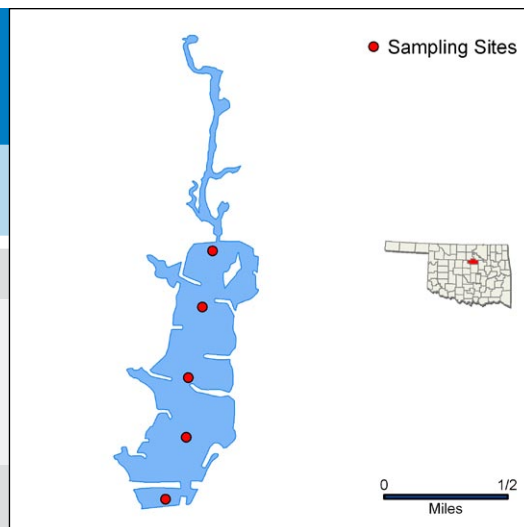
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Boomer

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	5

Lake Data	Location	Payne County
	Impoundment	1932
	Area	260 acres
	Capacity	3,200 acre-feet
	Purposes	Cooling Water and Recreation



Parameters	Parameter		Result	Notes/Comments	
	Average Turbidity		50 NTU	75% of values > 25 NTU	
	Average True Color		177 units	75% of values > OWQS of 70	
	Average Secchi Disk Depth		32 cm		
	Water Clarity Rating		average		
	Trophic State Index		51	Previous value = 53	
	Trophic Class		eutrophic		
	Profile	Salinity		0.09 - 0.16 ppt	
		Specific Conductivity		191.4 - 322.1 μS/cm	
		pH		5.15 - 8.19 pH units	Only 1 value <6.5 units
		Oxidation-Reduction Potential		33 to 606 mV	
		Dissolved Oxygen		100% of water column < 2 mg/L in July	Occurred at site 3
	Nutrients	Surface Total Nitrogen		0.60 mg/L to 1.09 mg/L	
		Surface Total Phosphorus		0.035 mg/L to 0.083 mg/L	
		Nitrogen to Phosphorus Ratio		17:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	NS	S	NS	S						
	Aesthetics					S	NS				
	Agriculture							S			
	Primary Body Contact Recreation								NS		
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	The PBCR use is not supported as 50% of reported values exceeded the screening level for all three parameters								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

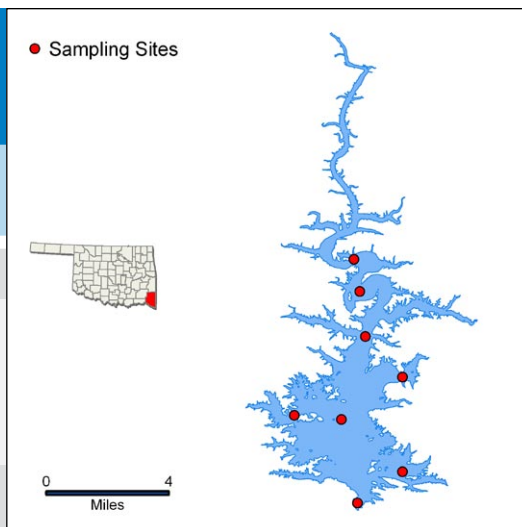
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Broken Bow

Sample Period	Times Visited	Sampling Sites
October 2005 - July 2006	4	8

Lake Data	Location	McCurtain County
	Impoundment	1970
	Area	14,200 acres
	Capacity	918,070 acre-feet
	Purposes	Flood Control, Hydropower, Water Supply, Recreation, Fish & Wildlife



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		4 NTU	100% of values < OWQS of 25 NTU
	Average True Color		14 units	100% of values < OWQS of 70
	Average Secchi Disk Depth		293 cm	
	Water Clarity Rating		excellent	
	Trophic State Index		35	
	Trophic Class		oligotrophic	
	Profile	Salinity	0.0 – 0.05 ppt	
		Specific Conductivity	25.3 – 66.4 µS/cm	
		pH	5.73 – 7.56 pH units	69% of recorded values < 6.5 pH units
		Oxidation-Reduction Potential	193 to 532 mV	
	Nutrients	Dissolved Oxygen	Up to 66% of water column < 2 mg/L in the fall and up to 62% in July	
		Surface Total Nitrogen	0.07 mg/L to 0.39 mg/L	
		Surface Total Phosphorus	0.008 mg/L to 0.015 mg/L	
	Nitrogen to Phosphorus Ratio		19:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		S	NS*	NS	S				
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<div><div>S = Fully Supporting</div><div>NS = Not Supporting</div><div>NEI = Not Enough Information</div></div>		Notes	*Slightly acidic conditions are not unusual in this part of the state due to relatively low soil pH and lack of soluble bedrock. Because of these conditions it is likely that the low pH values may be due to natural causes; therefore the Water Board is looking at the applicability of developing site-specific criteria for waters in the southeastern portion of the state.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

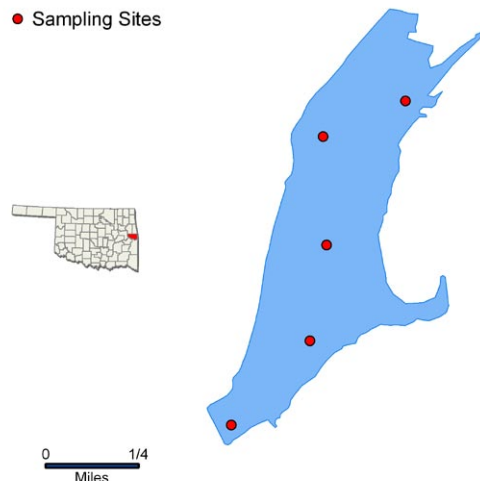
ppt = parts per thousand
 En = Enterococci

Brushy Creek

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	5

Lake Data	Location	Sequoyah County
	Impoundment	1964
	Area	358 acres
	Capacity	3,258 acre-feet
	Purposes	Flood Control and Recreation

● Sampling Sites



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	10 NTU	25% of values > 25 NTU
		Average True Color	41 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	103 cm	
		Water Clarity Rating	good	
		Trophic State Index	53	Previous value = 51
		Trophic Class	eutrophic	
		Profile	Salinity	0.00 - 0.10 ppt
	Specific Conductivity		36.3 - 605 µS/cm	
	pH		6.02 - 8.12 pH units	Only 7 values < 6.5 units
	Oxidation-Reduction Potential		33 to 606 mV	
	Dissolved Oxygen		Up to 69% of water column < 2 mg/L in July	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.38 mg/L to 0.72 mg/L	
		Surface Total Phosphorus	0.016 mg/L to 0.050 mg/L	
		Nitrogen to Phosphorus Ratio	20:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					S	S				
	Agriculture							S			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes Precipitation data suggests the peak in color & turbidity are likely due to runoff, therefore the uses are considered supporting.								

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

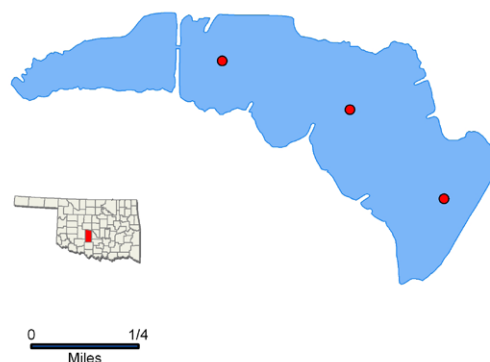
Burtschi

● Sampling Sites

Sample Period	Times Visited	Sampling Sites
November 2005 - August 2006	4	3

Lake Data

Location	Grady County
Impoundment	1958
Area	180 acres
Capacity	2,140 acre-feet
Purposes	Recreation



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	11 NTU	100% of values < OWQS of 25 NTU
Average True Color	18 units	100% of values < OWQS of 70
Average Secchi Disk Depth	72 cm	
Water Clarity Rating	good	
Trophic State Index	63	
Trophic Class	hypereutrophic	
Profile	Salinity	0.53 – 0.67 ppt
	Specific Conductivity	1011 – 1273 μ S/cm
	pH	7.19 – 10.74 pH units 16% of values were > 9 pH units
	Oxidation-Reduction Potential	42 to 428 mV
Nutrients	Dissolved Oxygen	Up to 38% of water column < 2 mg/L in August
	Surface Total Nitrogen	0.92 mg/L to 1.82 mg/L
	Surface Total Phosphorus	0.027 mg/L to 0.109 mg/L
	Nitrogen to Phosphorus Ratio	24:1 Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	NS	S	S					
Aesthetics					S	S			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting

NS = Not Supporting

NEI = Not Enough Information

Notes

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

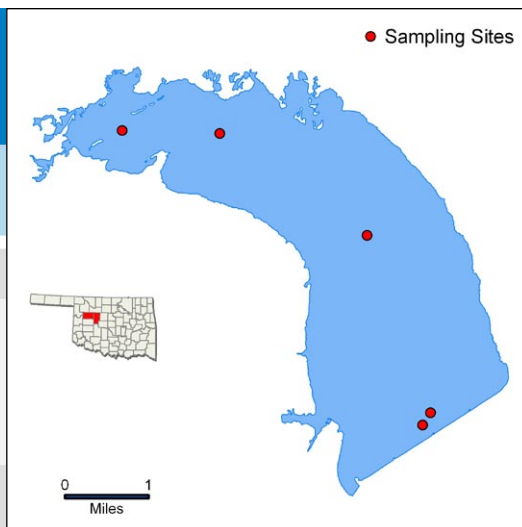
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Canton

Sample Period	Times Visited	Sampling Sites
October 2005 - July 2006	4	5

Lake Data	Location	Blaine County
	Impoundment	1948
	Area	7,910 acres
	Capacity	111,310 acre-feet
	Purposes	Flood Control, Water Supply, Irrigation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		16 NTU	15% of values > OWQS of 25 NTU
	Average True Color		18 units	100% of values < OWQS of 70
	Average Secchi Disk Depth		63 cm	
	Water Clarity Rating		average	
	Trophic State Index		57	
	Trophic Class		eutrophic	
	Profile	Salinity	0.63 – 0.93 ppt	
		Specific Conductivity	1201 – 1749 μ S/cm	
		pH	7.51– 8.49 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	368 to 487 mV	
	Nutrients	Dissolved Oxygen	Up to 25% of water column < 2 mg/L in July	Occurred at sites 1 and 2
		Surface Total Nitrogen	0.63 mg/L to 1.03 mg/L	
		Surface Total Phosphorus	0.033 mg/L to 0.167 mg/L	
	Nitrogen to Phosphorus Ratio		13:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

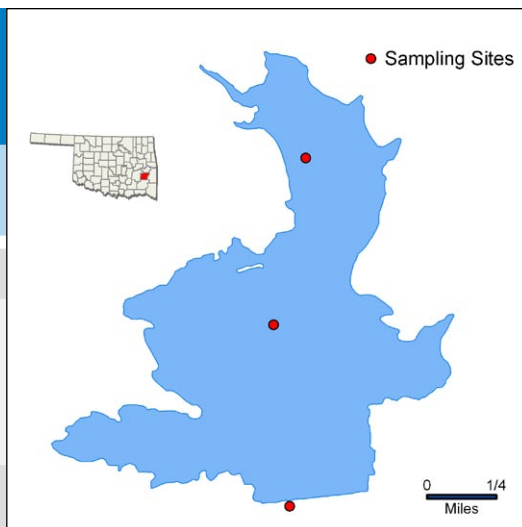
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Carl Albert

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	3

Lake Data	Location	Latimer County
	Impoundment	1964
	Area	183 acres
	Capacity	2,739 acre-feet
	Purposes	Water Supply, Flood Control, and Recreation



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	14 NTU	All values < 25 NTU
		Average True Color	72 units	50% of values > OWQS of 70
		Average Secchi Disk Depth	90 cm	
		Water Clarity Rating	good	
		Trophic State Index	41	Previous value = 41
		Trophic Class	mesotrophic	
		Profile	Salinity	0.00 - 0.01 ppt
	Specific Conductivity		36 - 97 µS/cm	
	pH		5.8 - 7.32 pH units	21% of values <6.5 units
	Oxidation-Reduction Potential		22 to 553 mV	
	Dissolved Oxygen		Up to 62% of water column < 2 mg/L in August	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.28 mg/L to 0.49 mg/L	
		Surface Total Phosphorus	0.013 mg/L to 0.031 mg/L	
		Nitrogen to Phosphorus Ratio	16:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	NS	NS	*					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div><div>S = Fully Supporting</div><div>NS = Not Supporting</div><div>NEI = Not Enough Information</div></div>	Notes	*Not supporting for lead as chronic criteria was exceeded. All other toxicants are fully supporting.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

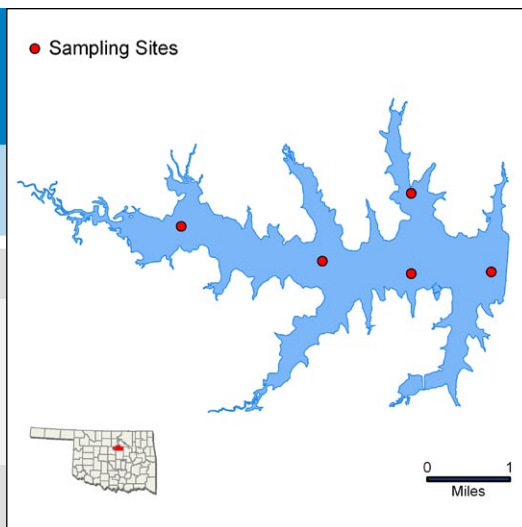
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Carl Blackwell

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	5

Lake Data	Location	Payne County
	Impoundment	1937
	Area	3,370 acres
	Capacity	61,500 acre-feet
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		40 NTU	60% of values > 25 NTU
	Average True Color		119 units	60% of values > OWQS of 70
	Average Secchi Disk Depth		37 cm	
	Water Clarity Rating		average	
	Trophic State Index		53	Previous value = 56
	Trophic Class		eutrophic	
	Profile	Salinity	0.14 - 0.20 ppt	
		Specific Conductivity	287 - 393.4 μ S/cm	
		pH	7.18 - 8.70 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	-8 to 496 mV	
	Nutrients	Dissolved Oxygen	Up to 57% of water column < 2 mg/L in July	Occurred at site 1, the dam
		Surface Total Nitrogen	0.71 mg/L to 1.14 mg/L	
		Surface Total Phosphorus	0.025 mg/L to 0.070 mg/L	
	Nitrogen to Phosphorus Ratio		23:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								NS	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes The PBCR use is not supported as 20% of enterococci values exceeded the screening level.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

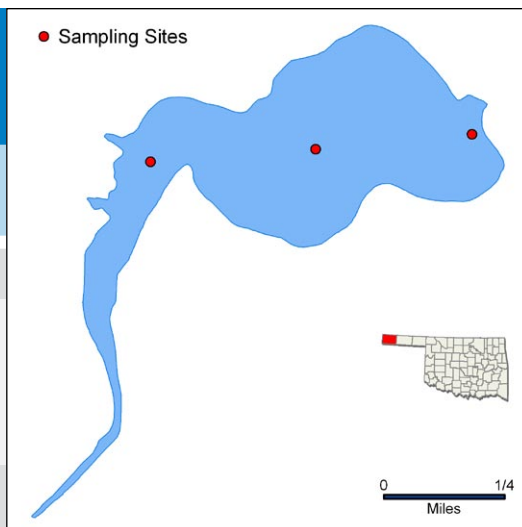
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Carl Etling

Sample Period	Times Visited	Sampling Sites
September 2003 – June 2004	4	3

Lake Data	Location	Cimarron County
	Impoundment	1958
	Area	159 acres
	Capacity	1717 acre-feet
	Purposes	Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	65 NTU	75% of values > OWQS of 25 NTU
		Average True Color	18 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	22 cm	
		Water Clarity Rating	fair	
		Trophic State Index	72	
		Trophic Class	hypereutrophic	
		Salinity	0.90 – 1.4 ppt	
		Specific Conductivity	1688 – 2596 µS/cm	
		pH	8.18 – 9.42 pH units	28% of recorded values > 9.0 pH units
	Oxidation-Reduction Potential	269 to 499 mV		
	Dissolved Oxygen		Lake well-mixed – not stratified	
	Nutrients	Surface Total Nitrogen	2.31 mg/L to 4.51 mg/L	
Surface Total Phosphorus		0.122 mg/L to 0.293mg/L		
Nitrogen to Phosphorus Ratio		16:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	NS	S	S					
	Aesthetics					NS*	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.							

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

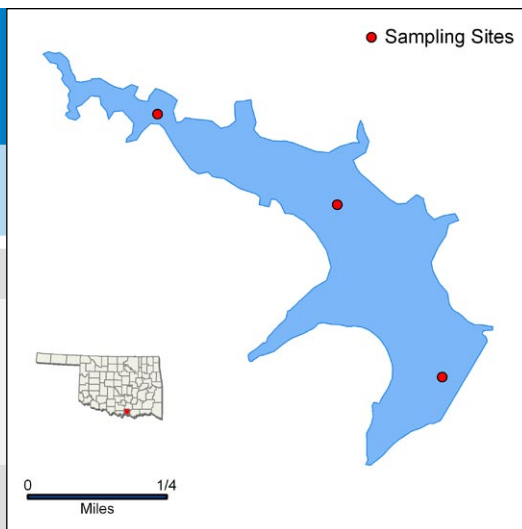
mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Carter

Sample Period	Times Visited	Sampling Sites
November 2007 - August 2008	4	3

Lake Data	Location	Marshall County
	Impoundment	1960
	Area	108 acres
	Capacity	990 acre-feet
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		7 NTU	All values < 25 NTU
	Average True Color		25 units	All Values < OWQS of 70
	Average Secchi Disk Depth		121 cm	
	Water Clarity Rating		excellent	
	Trophic State Index		40	Previous value = 40
	Trophic Class		oligotrophic	
	Profile	Salinity	0.10 - 0.20 ppt	
		Specific Conductivity	212 – 325 µS/cm	
		pH	6.98 – 8.33 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	60 to 557 mV	
	Nutrients	Dissolved Oxygen	Up to 44% of water column < 2 mg/L in August	Occurred at site 1, the dam
		Surface Total Nitrogen	0.41 mg/L to 0.54 mg/L	
		Surface Total Phosphorus	0.011 mg/L to 0.018 mg/L	
	Nitrogen to Phosphorus Ratio		37:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

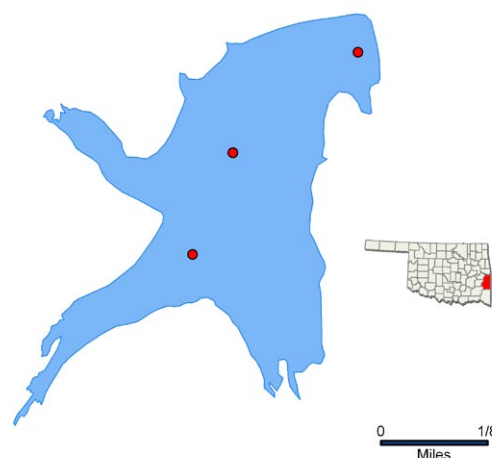
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Cedar

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
October 2005 - July 2006	4	3

Lake Data	Location	Le Flore County
	Impoundment	1937
	Area	78 acres
	Capacity	1,000 acre-feet
	Purposes	Recreation

Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	4 NTU	100% of values < OWQS of 25 NTU
		Average True Color	19 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	162 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	53	
		Trophic Class	eutrophic	
		Profile	Salinity	0.0– 0.09 ppt
	Specific Conductivity		4.9 – 195.7 μS/cm	
	pH		5.43– 9.16 pH units	36% of values < 6.5 and 6% >9 pH units
	Oxidation-Reduction Potential		18 to 560 mV	
	Dissolved Oxygen		Up to 70% of water column < 2 mg/L in July	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.34 mg/L to 0.84 mg/L	
Surface Total Phosphorus		0.019 mg/L to 0.376 mg/L		
Nitrogen to Phosphorus Ratio		7:1	Possibly co-limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	NS	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	Slightly acidic conditions are not unusual in this part of the state due to relatively low soil pH and lack of soluble bedrock. Due to these conditions it is likely that the low pH values may be due to natural causes; therefore the Water Board is looking at the applicability of developing site-specific criteria for waters in the southeastern portion of the state.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Chandler

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	3

Lake Data	Location	Lincoln County
	Impoundment	1960
	Area	129 acres
	Capacity	2,778 acre-feet
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		29 NTU	58% of values > 25 NTU
	Average True Color		59 units	25% of values > OWQS of 70
	Average Secchi Disk Depth		39 cm	
	Water Clarity Rating		average	
	Trophic State Index		60	Previous value = 50
	Trophic Class		eutrophic	
	Profile	Salinity	0.10 - 0.18 ppt	
		Specific Conductivity	268 – 365.7 μ S/cm	
		pH	7.35 – 8.82 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	23 to 533 mV	
		Dissolved Oxygen	Up to 62% of water column < 2 mg/L in July	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.82 mg/L to 1.59 mg/L	
		Surface Total Phosphorus	0.036 mg/L to 0.082 mg/L	
		Nitrogen to Phosphorus Ratio	27:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS						
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply				S					
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

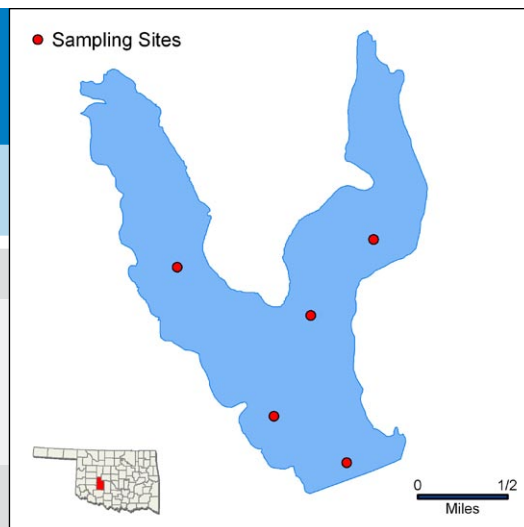
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Chickasha

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Caddo County
	Impoundment	1958
	Area	820 acres
	Capacity	41,080 acre-feet
	Purposes	Water Supply, Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	10 NTU	100% of values < OWQS of 25 NTU
		Average True Color	23 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	64 cm	
		Water Clarity Rating	good	
		Trophic State Index	62	
		Trophic Class	hypereutrophic	
		Salinity	1.01 – 2.11 ppt	
		Specific Conductivity	1884 – 3872 µS/cm	
		pH	7.02 – 8.30 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	-141 to 498 mV	
	Dissolved Oxygen	Up to 57% of water column < 2 mg/L in July		
	Nutrients	Surface Total Nitrogen	1.61 mg/L to 3.72 mg/L	
		Surface Total Phosphorus	0.016 mg/L to 0.082 mg/L	
Nitrogen to Phosphorus Ratio		61:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					NS	S				
	Agriculture							Sulfate			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes The lake is currently listed in the Oklahoma Water Quality Standards (WQS) as a Nutrient Limited Watershed (NLW). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status.								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

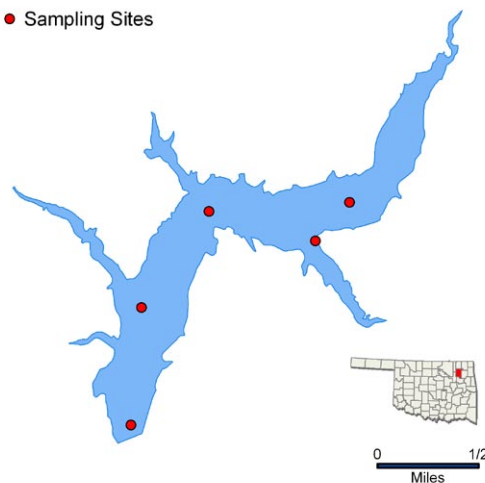
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Claremore

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
November 2005 - August 2006	3	5

Lake Data	Location	Rogers County
	Impoundment	1930
	Area	470 acres
	Capacity	7,900 acre-feet
	Purposes	Water Supply, Recreation

Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	19 NTU	13% of values > OWQS of 25 NTU
		Average True Color	24units	100% of values < OWQS of 70
		Average Secchi Disk Depth	41 cm	
		Water Clarity Rating	good	
		Trophic State Index	67	
		Trophic Class	hypereutrophic	
	Profile	Salinity	0.11– 0.12 ppt	
		Specific Conductivity	242 – 257.4 μS/cm	
		pH	7.03– 8.10 pH units	
		Oxidation-Reduction Potential	252 to 454 mV	
		Dissolved Oxygen	Up to 29% of water column < 2 mg/L in May	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.91 mg/L to 2.00 mg/L	
Surface Total Phosphorus		0.072 mg/L to 0.193 mg/L		
Nitrogen to Phosphorus Ratio		12:1	Phosphorus Limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	*	S	S	S					
	Aesthetics					NS**	*			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div><div>S = Fully Supporting</div><div>NS = Not Supporting</div><div>NEI = Not Enough Information</div></div>	Notes	<div>*An assessment of the Fish & Wildlife Propagation (FWP) and Aesthetics beneficial use based on turbidity and color cannot be made at this time as minimum data requirements were not met for this sample year.</div> <div>**The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.</div>							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

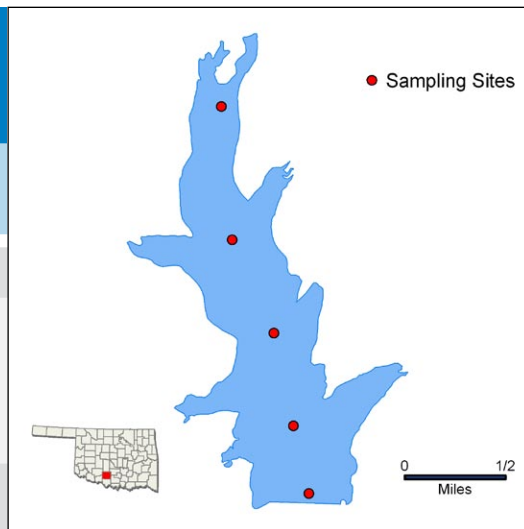
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Clear Creek

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Stephens County
	Impoundment	1948
	Area	722 acres
	Capacity	7,711 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	12 NTU	100% of values < OWQS of 25 NTU
		Average True Color	32 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	70 cm	
		Water Clarity Rating	average	
		Trophic State Index	58	
		Trophic Class	eutrophic	
		Salinity	0.22 – 0.40 ppt	
	Nutrients	Specific Conductivity	441.1 – 771 µS/cm	
		pH	7.21 – 8.34 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	-109 to 443 mV	
		Dissolved Oxygen	Up to 11% of water column < 2 mg/L in May	
		Surface Total Nitrogen	0.66 mg/L to 0.96 mg/L	
		Surface Total Phosphorus	0.020 mg/L to 0.059 mg/L	
		Nitrogen to Phosphorus Ratio	25:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
<div><div>S = Fully Supporting</div><div>NS = Not Supporting</div><div>NEI = Not Enough Information</div></div>		Notes	The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for E.coli. The peak reported in color is due to seasonal storm events and the lake is considered the supporting the Aesthetics beneficial uses.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

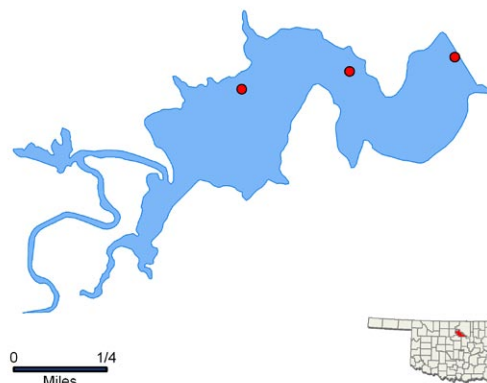
Cleveland City

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	3

Lake Data

Location	Pawnee County
Impoundment	1936
Area	159 acres
Capacity	2,200 acre-feet
Purposes	Water Supply, Recreation

● Sampling Sites



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	17 NTU	8% of values >OWQS of 25 NTU
Average True Color	63 units	25% of values > OWQS of 70
Average Secchi Disk Depth	56 cm	
Water Clarity Rating	average	
Trophic State Index	56	
Trophic Class	eutrophic	
Salinity	0.08 – 0.11 ppt	
Specific Conductivity	173.3 – 235.3 μ S/cm	
pH	6.93 – 8.64 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	82 to 438 mV	
Dissolved Oxygen	Up to 70% of water column < 2 mg/L in May	
Surface Total Nitrogen	0.85 mg/L to 1.24 mg/L	
Surface Total Phosphorus	0.021 mg/L to 0.050 mg/L	
Nitrogen to Phosphorus Ratio	30:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S					
Aesthetics					S	S			
Agriculture							S		
Primary Body Contact Recreation								NEI	
Public & Private Water Supply									
<p><i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i></p>		<p>Notes The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for enterococci. The peak reported in color is due to seasonal storm events and the lake is considered supporting the Aesthetics beneficial use.</p>							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

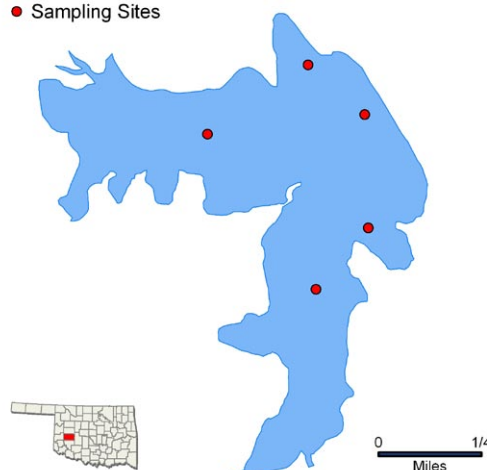
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Clinton

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
October 2003 – July 2004	4	5

Lake Data	Location	Washita County
	Impoundment	1931
	Area	335 acres
	Capacity	3,980 acre-feet
	Purposes	Water Supply, Recreation

Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	67 NTU	100% of values > OWQS of 25 NTU	
	Average True Color	36 units	15% of values > OWQS of 70	
	Average Secchi Disk Depth	23 cm		
	Water Clarity Rating	poor		
	Trophic State Index	66		
	Trophic Class	hypereutrophic		
	Profile	Salinity	0.23 – 0.33 ppt	
		Specific Conductivity	460.4 – 642.9 µS/cm	
		pH	8.00 – 8.74 pH units	Alkaline
		Oxidation-Reduction Potential	149 to 534 mV	
		Dissolved Oxygen		Lake well-mixed – not stratified
	Nutrients	Surface Total Nitrogen	1.36 mg/L to 3.06 mg/L	
Surface Total Phosphorus		0.089 mg/L to 0.244 mg/L		
Nitrogen to Phosphorus Ratio		13:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					NS*	NS			
	Agriculture							S		
	Primary Body Contact Recreation								NS**	
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes	<div>*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.</div> <div>** Both the screening level & geometric mean for enterococci were exceeded.</div>							

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

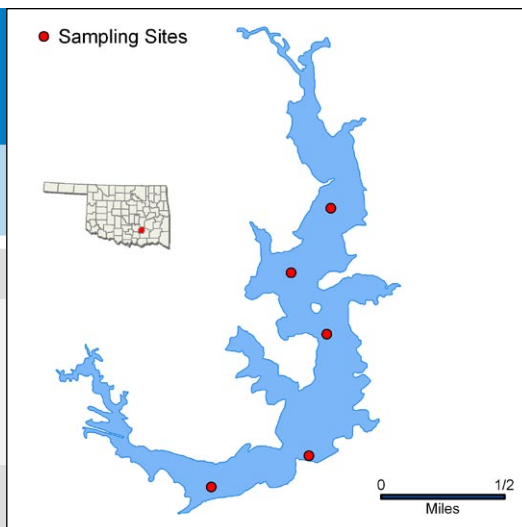
mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Coalgate City

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Coal County
	Impoundment	1965
	Area	352 acres
	Capacity	3,437 acre-feet
	Purposes	Water Supply, Recreation and Flood Control



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	92 NTU	85% of values > OWQS of 25 NTU
		Average True Color	249 units	100% of values > OWQS of 70
		Average Secchi Disk Depth	26 cm	
		Water Clarity Rating	poor	
		Trophic State Index	47	
		Trophic Class	mesotrophic	
	Nutrients	Salinity	0.01 – 0.02 ppt	
		Specific Conductivity	47.1 – 72.7 µS/cm	
		pH	6.32– 8.03 pH units	Only 8 (8%) of vales < 6.5 pH units
		Oxidation-Reduction Potential	230 to 445 mV	
		Dissolved Oxygen	Up to 71% of water column < 2 mg/L in July	Occurred at site 2
		Surface Total Nitrogen	0.90 mg/L to 1.43 mg/L	
		Surface Total Phosphorus	0.061 mg/L to 0.155 mg/L	
		Nitrogen to Phosphorus Ratio	13:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<p><i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i></p> <p>Notes The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for fecal coliform.</p>									

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

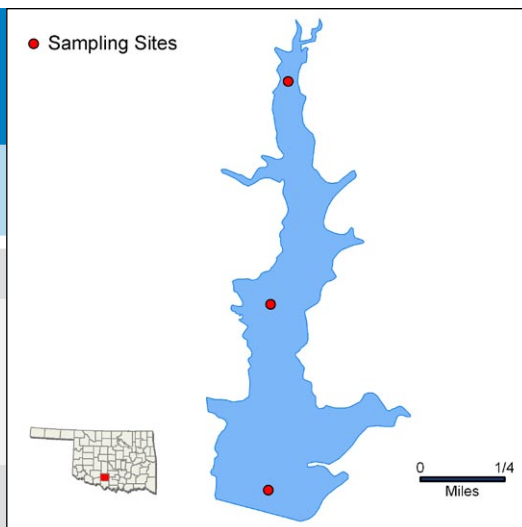
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Comanche

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	3

Lake Data	Location	Stephens County
	Impoundment	1960
	Area	184 acres
	Capacity	2,500 acre-feet
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		10 NTU	All values < 25 NTU
	Average True Color		34 units	All values < OWQS of 70
	Average Secchi Disk Depth		87 cm	
	Water Clarity Rating		good	
	Trophic State Index		49	Previous value = 46
	Trophic Class		mesotrophic	
	Profile	Salinity	0.12 - 0.18 ppt	
		Specific Conductivity	254 – 359 μ S/cm	
		pH	7.39 – 8.46 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	18 to 625 mV	
		Dissolved Oxygen	36% of water column < 2 mg/L in July	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.52 mg/L to 0.88 mg/L	
		Surface Total Phosphorus	0.017 mg/L to 0.025 mg/L	
		Nitrogen to Phosphorus Ratio	30:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S						
	Aesthetics				S	S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

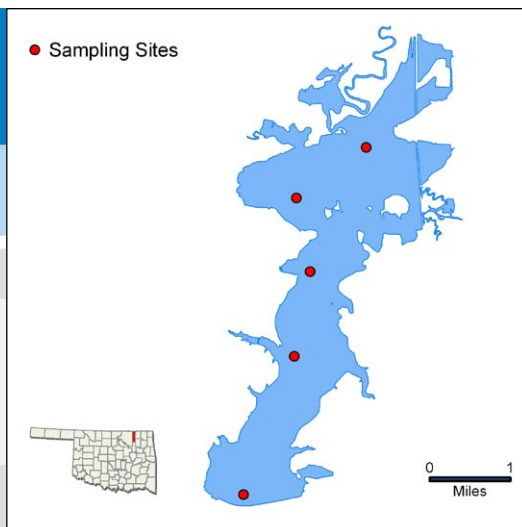
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Copan

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	5

Lake Data	Location	Washington County
	Impoundment	1983
	Area	4,850 acres
	Capacity	43,400 acre-feet
	Purposes	Flood Control, Water Supply, Water Quality Control, Fish and Wildlife, and Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	46 NTU	80% of values > 25 NTU
		Average True Color	123 units	60% of values > OWQS of 70
		Average Secchi Disk Depth	32 cm	
		Water Clarity Rating	average	
		Trophic State Index	60	Previous value = 51
		Trophic Class	eutrophic	
		Salinity	0.07 - 0.14 ppt	
	Nutrients	Specific Conductivity	152.2 – 286.8 µS/cm	
		pH	6.95 – 8.33 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	230 to 486 mV	
		Dissolved Oxygen	44% of water column < 2 mg/L in July	Occurred at site 1, the dam
		Surface Total Nitrogen	0.49 mg/L to 1.24 mg/L	
		Surface Total Phosphorus	0.034 mg/L to 0.160 mg/L	
		Nitrogen to Phosphorus Ratio	10:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								NEI	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and enterococci.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

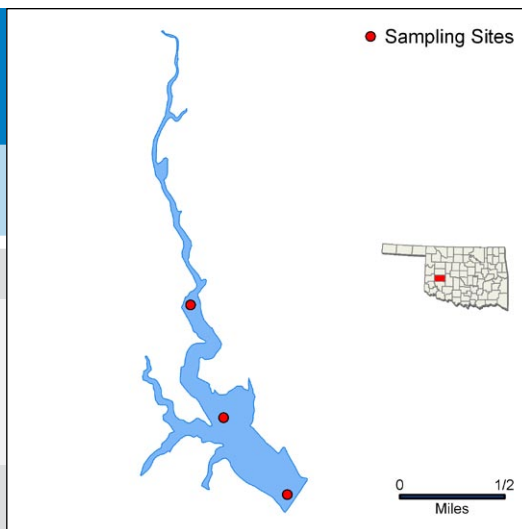
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Crowder

Sample Period	Times Visited	Sampling Sites
November 2005 - August 2006	3	3

Lake Data	Location	Washita County
	Impoundment	1959
	Area	158 acres
	Capacity	2,094 acre-feet
	Purposes	Flood Control, Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	9 NTU	100% of values < OWQS of 25 NTU
		Average True Color	17 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	65 cm	
		Water Clarity Rating	average	
		Trophic State Index	57	
		Trophic Class	eutrophic	
		Salinity	0.38– 0.57 ppt	
	Nutrients	Specific Conductivity	744 – 1088 µS/cm	
		pH	7.03– 8.34 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	275 to 445 mV	
		Dissolved Oxygen	Up to 37.5% of water column < 2 mg/L in May	Occurred at sites 1 and 2
		Surface Total Nitrogen	0.54 mg/L to 0.93 mg/L	
		Surface Total Phosphorus	0.026 mg/L to 0.053 mg/L	
Nitrogen to Phosphorus Ratio		21:1	Phosphorus Limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					NS*	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.							

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

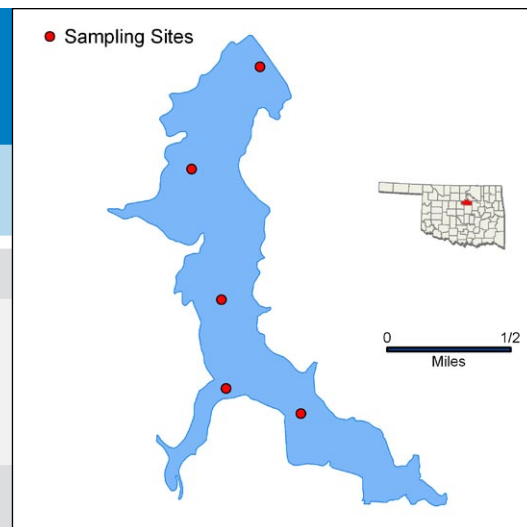
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Cushing Municipal

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Payne County
	Impoundment	1950
	Area	591 acres
	Capacity	3,304 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		45 NTU	70% of values > OWQS of 25 NTU
	Average True Color		85 units	45% of values > OWQS of 70
	Average Secchi Disk Depth		43 cm	
	Water Clarity Rating		poor	
	Trophic State Index		50	
	Trophic Class		mesotrophic	
	Profile	Salinity	0.05 – 0.15 ppt	
		Specific Conductivity	131.5 – 325 μS/cm	
		pH	6.84– 8.31 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	359 to 432 mV	
		Dissolved Oxygen	Up to 25% of water column < 2 mg/L in July	
	Nutrients	Surface Total Nitrogen	0.66mg/L to 1.71 mg/L	
		Surface Total Phosphorus	0.036 mg/L to 0.187 mg/L	
		Nitrogen to Phosphorus Ratio	9:1	Approaching co-limitation

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									

S = Fully Supporting

NS = Not Supporting

NEI = Not Enough Information

Notes

The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for all parameters.

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

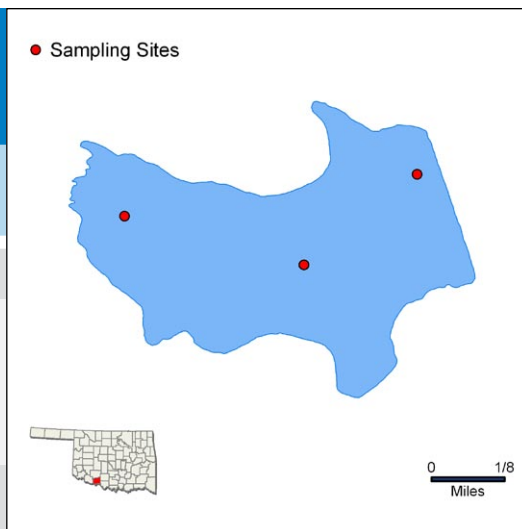
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Dave Boyer (Walters)

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	3

Lake Data	Location	Cotton County
	Impoundment	1936
	Area	148 acres
	Capacity	861 acre feet
	Purposes	Water Supply, and Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	98 NTU	75% of values > 25 NTU
		Average True Color	166 units	75% of values > OWQS of 70
		Average Secchi Disk Depth	21 cm	
		Water Clarity Rating	poor	
		Trophic State Index	51	Previous value = 52
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.12 – 0.17 ppt	
		Specific Conductivity	253.8 – 353 µS/cm	
		pH	7.92 – 8.34 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	376 to 520 mV	
		Dissolved Oxygen		All values >7 mg/L
		Surface Total Nitrogen	0.47 mg/L to 1.19 mg/L	
		Surface Total Phosphorus	0.029 mg/L to 0.138 mg/L	
		Nitrogen to Phosphorus Ratio	10:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

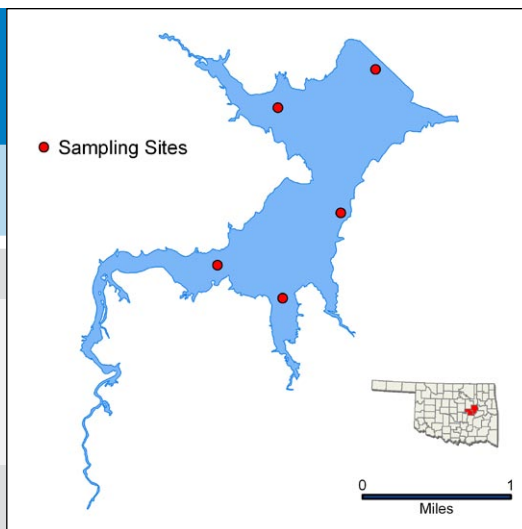
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Dripping Springs

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Okmulgee County
	Impoundment	1950
	Area	1,150 acres
	Capacity	16,200 acre-feet
	Purposes	Water Supply, Recreation and Flood Control



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	21 NTU	45% of values > OWQS of 25 NTU
		Average True Color	89 units	75% of values > OWQS of 70
		Average Secchi Disk Depth	76 cm	
		Water Clarity Rating	average	
		Trophic State Index	48	
		Trophic Class	mesotrophic	
	Nutrients	Salinity	0.01 – 0.07 ppt	
		Specific Conductivity	49.7 – 156 µS/cm	
		pH	6.31– 7.70 pH units	Only 13 (7.8%) of values < 6.5 pH units
		Oxidation-Reduction Potential	128 to 454 mV	
		Dissolved Oxygen	Up to 69% of water column < 2 mg/L in July	Occurred at site 1, the dam
		Surface Total Nitrogen	0.43 mg/L to 1.07 mg/L	
		Surface Total Phosphorus	0.014 mg/L to 0.044 mg/L	
		Nitrogen to Phosphorus Ratio	26:1	Phosphorus limited

Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	NS	S	NS	S					
					S	NS			
							S		
								NEI	

<p><i>S = Fully Supporting</i></p> <p><i>NS = Not Supporting</i></p> <p><i>NEI = Not Enough Information</i></p>	Notes	The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for fecal coliform and enterococci.
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NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

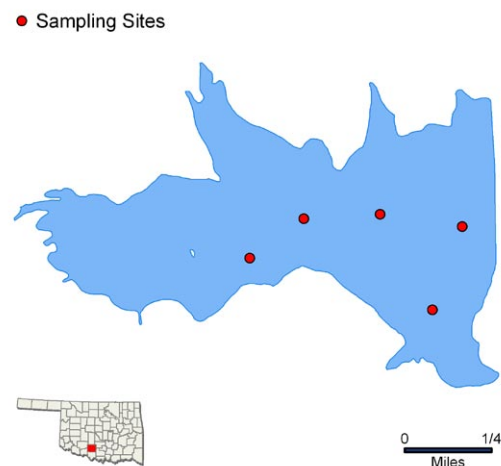
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Duncan

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Stephens County
	Impoundment	1937
	Area	500 acres
	Capacity	7,200 acre-feet
	Purposes	Water Supply, Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	15 NTU	100% of values < OWQS of 25 NTU
		Average True Color	34 units	15% of values > OWQS of 70
		Average Secchi Disk Depth	58 cm	
		Water Clarity Rating	average	
		Trophic State Index	57	
		Trophic Class	eutrophic	
		Salinity	0.12 – 0.24 ppt	
	Nutrients	Specific Conductivity	244.5 – 472.2 μS/cm	
		pH	7.32– 8.44 pH units	Only 13 (7.8%) of values < 6.5 pH units
		Oxidation-Reduction Potential	95 to 426 mV	
		Dissolved Oxygen	Up to 22% of water column < 2 mg/L in August	Occurred at site 2
		Surface Total Nitrogen	0.59 mg/L to 0.84 mg/L	
Surface Total Phosphorus		0.016 mg/L to 0.039 mg/L		
	Nitrogen to Phosphorus Ratio	26:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for fecal coliform and enterococci.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

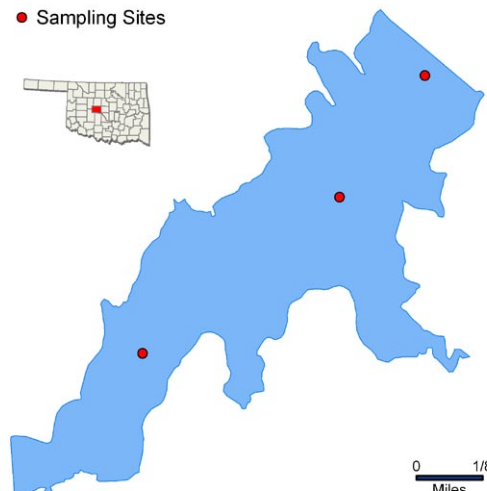
El Reno

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	3

Lake Data

Location	Canadian County
Impoundment	1937
Area	500 acres
Capacity	7,200 acre-feet
Purposes	Flood Control, Recreation

● Sampling Sites



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	36 NTU	50% of values > OWQS of 25 NTU
Average True Color	86 units	25% of values > OWQS of 70
Average Secchi Disk Depth	35 cm	
Water Clarity Rating	poor	
Trophic State Index	65	
Trophic Class	hypereutrophic	
Profile	Salinity	0.53 – 0.79 ppt
	Specific Conductivity	1019 – 1494 μ S/cm
	pH	8.25 – 8.45 pH units Slightly alkaline
	Oxidation-Reduction Potential	412 to 435mV
Nutrients	Dissolved Oxygen	All DO was > 2 mg/L throughout the study period
	Surface Total Nitrogen	1.39 mg/L to 2.05 mg/L
	Surface Total Phosphorus	0.093 mg/L to 0.670 mg/L
	Nitrogen to Phosphorus Ratio	6:1 Nitrogen limited or possibly co-limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	NS	S	S	S					
Aesthetics					NS	NS			
Agriculture							S		
Primary Body Contact Recreation								NEI	
Public & Private Water Supply									

S = Fully Supporting

NS = Not Supporting

NEI = Not Enough Information

Notes

The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for fecal coliform and enterococci.

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

All DO was >2⁵⁹ mg/L throughout the study period.

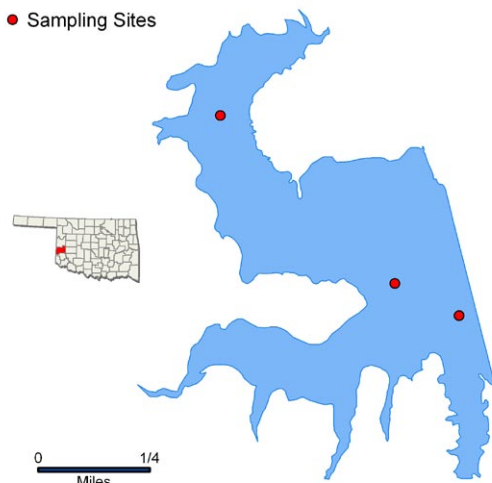
Elk City

Sample Period	Times Visited	Sampling Sites
November 2005 - August 2006	4	3

Lake Data

Location	Beckham County
Impoundment	1970
Area	240 acres
Capacity	2,583 acre-feet
Purposes	Flood Control, Recreation

● Sampling Sites



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	15 NTU	100% of values < OWQS of 25 NTU
Average True Color	26 units	100% of values < OWQS of 70
Average Secchi Disk Depth	56 cm	
Water Clarity Rating	Fair to poor	
Trophic State Index	59	
Trophic Class	eutrophic	
Salinity	0.30– 0.39 ppt	
Specific Conductivity	593.3 – 749.9 μ S/cm	
pH	7.70– 8.49 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	374 to 448 mV	
Dissolved Oxygen	Up to 22% of water column < 2 mg/L in May	
Surface Total Nitrogen	0.74 mg/L to 1.08 mg/L	
Surface Total Phosphorus	0.037 mg/L to 0.067 mg/L	
Nitrogen to Phosphorus Ratio	17:1	Possibly co-limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	S	S					
Aesthetics					NS*	S			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting

NS = Not Supporting

NEI = Not Enough Information

Notes

*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

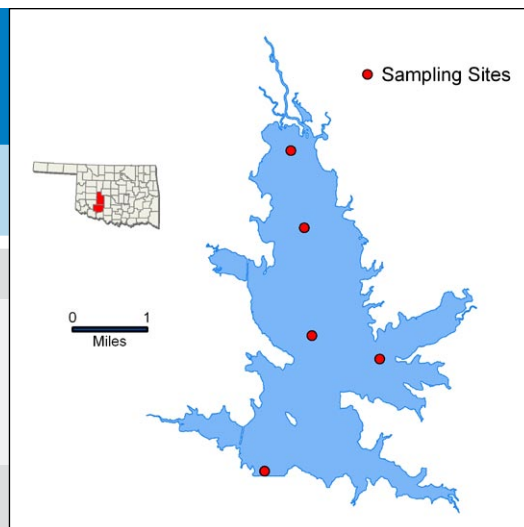
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Ellsworth

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Comanche County
	Impoundment	1962
	Area	5,600 acres
	Capacity	95,200 acre-feet
	Purposes	Water Supply, Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	45 NTU	80% of values > OWQS of 25 NTU
		Average True Color	52 units	10% of values > OWQS of 70
		Average Secchi Disk Depth	48 cm	
		Water Clarity Rating	Fair to poor	
		Trophic State Index	56	
		Trophic Class	eutrophic	
		Salinity	0.11 – 0.30 ppt	
	Nutrients	Specific Conductivity	235.1 – 591.6 μS/cm	
		pH	6.86 – 8.28 pH units	Slightly alkaline
		Oxidation-Reduction Potential	110 to 474mV	
		Dissolved Oxygen	Up to 64% of water column < 2 mg/L in July	Occurred at site 1, the dam
		Surface Total Nitrogen	0.57 mg/L to 0.96 mg/L	
		Surface Total Phosphorus	0.056 mg/L to 0.235 mg/L	
Nitrogen to Phosphorus Ratio		9:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<div><div>S = Fully Supporting</div><div>NS = Not Supporting</div><div>NEI = Not Enough Information</div></div>	Notes	The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for fecal coliform.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

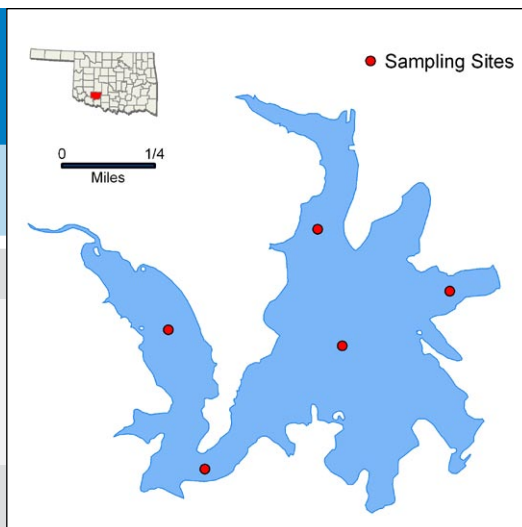
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Elmer Thomas

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Comanche County
	Impoundment	N/A
	Area	334 acres
	Capacity	12,000 acre-feet
	Purposes	Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	2 NTU	100% of values < OWQS of 25 NTU
		Average True Color	27 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	175 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	39	
		Trophic Class	oligotrophic	
		Salinity	0.01 – 0.07 ppt	
	Nutrients	Specific Conductivity	36.2 – 150.6 µS/cm	
		pH	5.43 – 8.13 pH units	38 (15.4%) of values < 6.5 pH units
		Oxidation-Reduction Potential	41 to 522mV	
		Dissolved Oxygen	Up to 76% of water column < 2 mg/L in July	Occurred at sites 1 and 2
		Surface Total Nitrogen	0.31 mg/L to 0.63 mg/L	
		Surface Total Phosphorus	0.005 mg/L to 0.015 mg/L	
		Nitrogen to Phosphorus Ratio	46:1	Phosphorus limited

Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	NS	NS	S				
	Aesthetics				S	S			
	Agriculture						S		
	Primary Body Contact Recreation							NEI	
	Public & Private Water Supply								
	<p><i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i></p> <p>Notes The PBCR beneficial use cannot be assessed as minimum data requirement were not met due to QA/QC issues for E. coli and fecal coliform.</p>								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

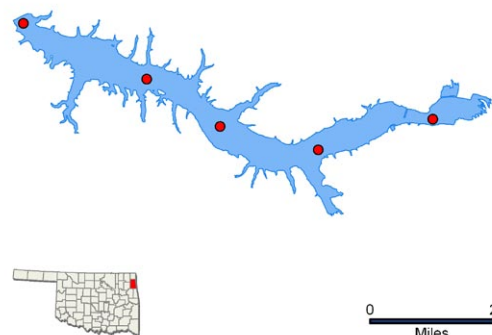
Eucha

● Sampling Sites

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data

Location	Delaware County
Impoundment	1952
Area	2,860 acres
Capacity	79,600 acre-feet
Purposes	Water Supply, Recreation



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	4 NTU	100% of values < OWQS of 25 NTU
Average True Color	14 units	100% of values < OWQS of 70
Average Secchi Disk Depth	151 cm	
Water Clarity Rating	excellent	
Trophic State Index	50	
Trophic Class	mesotrophic	
Profile	Salinity	0.07 – 0.14 ppt
	Specific Conductivity	168.2 – 296.3 µS/cm
	pH	7.15 – 8.76 pH units Neutral to slightly alkaline
	Oxidation-Reduction Potential	63 to 500 mV
Nutrients	Dissolved Oxygen	Up to 71% of water column < 2 mg/L in August Occurred at sites 1, the dam
	Surface Total Nitrogen	0.36 mg/L to 3.26 mg/L
	Surface Total Phosphorus	0.007 mg/L to 0.050 mg/L
	Nitrogen to Phosphorus Ratio	71:1 Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S					
Aesthetics					NS	S			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

The lake is currently listed as a Nutrient Limited Watershed (NLW) in the Oklahoma Water Quality Standards (WQS) and is considered nutrient threatened.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
µS/cm = microsiemens/cm

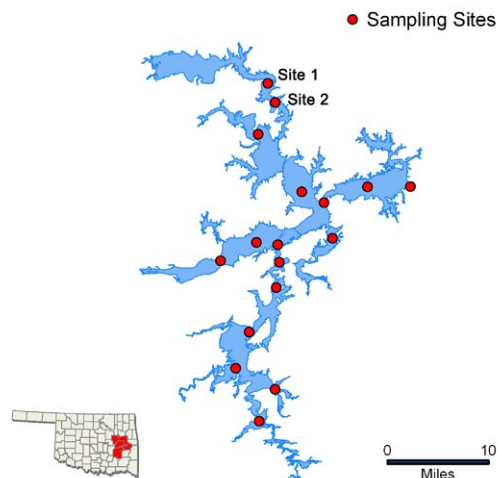
ppt = parts per thousand
En = Enterococci

Eufaula, Deep Fork Arm (1-2)

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	17

Lake Data

Location	Haskell County
Impoundment	1964
Area	105,000 acres
Capacity	2,314,600 acre-feet
Purposes	Water Supply, Flood Control, Hydropower, Sediment Control



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	24 NTU	25% of values > OWQS of 25 NTU
Average True Color	71 units	67% of values > OWQS of 70
Average Secchi Disk Depth	44 cm	
Water Clarity Rating	poor	
Trophic State Index	53	
Trophic Class	eutrophic	
Salinity	0.10 – 0.30 ppt	
Specific Conductivity	206.4 – 596.1 $\mu\text{S}/\text{cm}$	
pH	6.85 – 8.15pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	216 to 302 mV	
Dissolved Oxygen	Up to 45% of water column < 2 mg/L in August	
Surface Total Nitrogen	0.68mg/L to 0.93 mg/L	
Surface Total Phosphorus	0.061 mg/L to 0.108 mg/L	
Nitrogen to Phosphorus Ratio	9:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	NEI	S	S	S					
Aesthetics					S	NEI			
Agriculture							S		
Primary Body Contact Recreation								NEI	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Although 25% of values exceeded the OWQS for turbidity and 67 % true color, the minimum data requirements were not met and an assessment of the FWP and Aesthetics beneficial use cannot be made for this sample year.

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

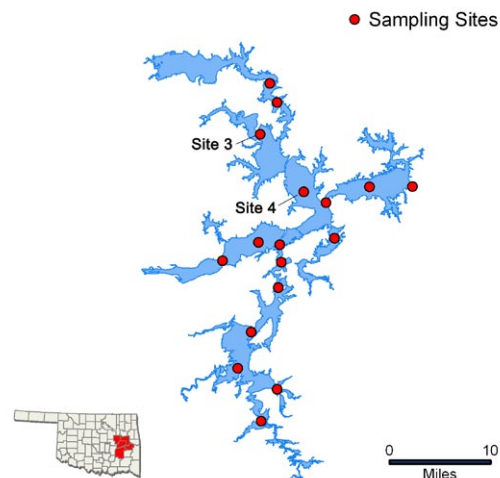
ppt = parts per thousand
En = Enterococci

Eufaula, N. Canadian Arm (3-4)

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	17

Lake Data

Location	Haskell County
Impoundment	1964
Area	105,000 acres
Capacity	2,314,600 acre-feet
Purposes	Water Supply, Flood Control, Hydropower, Sediment Control



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	27 NTU	25% of values > OWQS of 25 NTU
Average True Color	69 units	50% of values > OWQS of 70
Average Secchi Disk Depth	49 cm	
Water Clarity Rating	poor	
Trophic State Index	55	
Trophic Class	eutrophic	
Salinity	0.13 – 0.30 ppt	
Specific Conductivity	262.2 – 578.7 µS/cm	
pH	6.92 – 8.21 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	242 to 328 mV	
Dissolved Oxygen	Up to 41% of water column < 2 mg/L in August	
Surface Total Nitrogen	0.66 mg/L to 1.52 mg/L	
Surface Total Phosphorus	0.053 mg/L to 0.146 mg/L	
Nitrogen to Phosphorus Ratio	11:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
Fish & Wildlife Propagation	NEI	S	S	S					
Aesthetics					S	NEI			
Agriculture							S		
Primary Body Contact Recreation								NEI	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Although 25% of values exceeded the OWQS for turbidity and 50% true color, the minimum data requirements were not met and an assessment of the FWP and Aesthetics beneficial use cannot be made for this sample year.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

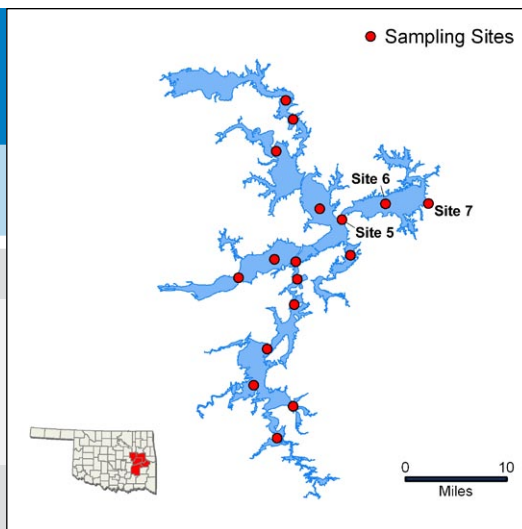
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Eufaula (5-7)

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	17

Lake Data	Location	Haskell County
	Impoundment	1964
	Area	105,000 acres
	Capacity	2,314,600 acre-feet
	Purposes	Water Supply, Flood Control, Hydropower, Sediment Control



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		23 NTU	8% of values > OWQS of 25 NTU
	Average True Color		62 units	25% of values > OWQS of 70
	Average Secchi Disk Depth		84 cm	
	Water Clarity Rating		Fair to poor	
	Trophic State Index		55	
	Trophic Class		eutrophic	
	Profile	Salinity	0.13 – 0.29 ppt	
		Specific Conductivity	272.8 – 574.9 µS/cm	
		pH	6.95 – 8.16 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	194 to 382 mV	
	Nutrients	Dissolved Oxygen	Up to 55% of water column < 2 mg/L in August	
		Surface Total Nitrogen	0.65 mg/L to 1.46 mg/L	
		Surface Total Phosphorus	0.030 mg/L to 0.127 mg/L	
	Nitrogen to Phosphorus Ratio		16:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NEI	S	NS	S					
	Aesthetics					S	NEI			
	Agriculture							S		
	Primary Body Contact Recreation								NEI	
	Public & Private Water Supply									
	<p><i>S = Fully Supporting</i></p> <p><i>NS = Not Supporting</i></p> <p><i>NEI = Not Enough Information</i></p>		<p>Notes Although 8% of values exceeded the OWQS for turbidity and 25% true color, the minimum data requirements were not met and an assessment of the FWP and Aesthetics beneficial use cannot be made for this sample year.</p>							

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

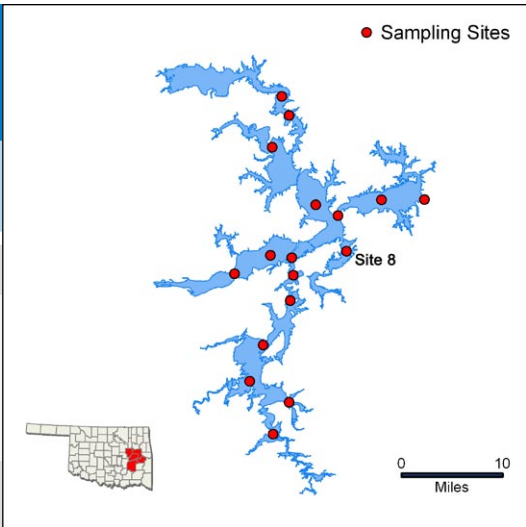
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Eufaula, Longtown Creek Arm (8)

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	17

Lake Data	Location	Haskell County
	Impoundment	1964
	Area	105,000 acres
	Capacity	2,314,600 acre-feet
	Purposes	Water Supply, Flood Control, Hydropower, Sediment Control



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		8 NTU	100% of values < OWQS of 25 NTU
	Average True Color		32 units	100% of values < OWQS of 70
	Average Secchi Disk Depth		86 cm	
	Water Clarity Rating		good	
	Trophic State Index		56	
	Trophic Class		eutrophic	
	Profile	Salinity	0.17– 0.29 ppt	
		Specific Conductivity	339.6 – 567.4 µS/cm	
		pH	6.94 – 8.29 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	186 to 335 mV	
	Nutrients	Dissolved Oxygen	Up to 56% of water column < 2 mg/L in August	
		Surface Total Nitrogen	0.61 mg/L to 1.20 mg/L	
		Surface Total Phosphorus	0.026 mg/L to 0.034 mg/L	
	Nitrogen to Phosphorus Ratio		24:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		NEI	S	NS	S				
	Aesthetics					S	NEI			
	Agriculture							S		
	Primary Body Contact Recreation								NEI	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

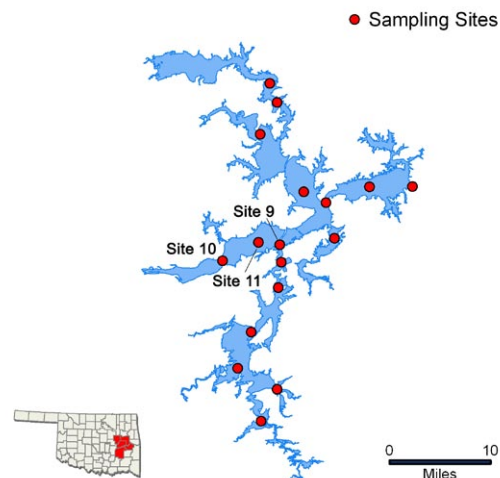
ppt = parts per thousand
 En = Enterococci

Eufaula, Canadian River Arm (9-11)

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	17

Lake Data

Location	Haskell County
Impoundment	1964
Area	105,000 acres
Capacity	2,314,600 acre-feet
Purposes	Water Supply, Flood Control, Hydropower, Sediment Control



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	74 NTU	58% of values > OWQS of 25 NTU
Average True Color	100 units	50% of values > OWQS of 70
Average Secchi Disk Depth	59 cm	
Water Clarity Rating	poor	
Trophic State Index	45	
Trophic Class	mesotrophic	
Salinity	0.20– 0.30 ppt	
Specific Conductivity	346 – 578.9 μ S/cm	
pH	7.24 – 8.27 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	120 to 450 mV	
Dissolved Oxygen	Up to 56% of water column < 2 mg/L in August	
Surface Total Nitrogen	0.74 mg/L to 1.27 mg/L	
Surface Total Phosphorus	0.045 mg/L to 0.220 mg/L	
Nitrogen to Phosphorus Ratio	11:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	NEI	S	NS	S					
Aesthetics					S	NEI			
Agriculture							S		
Primary Body Contact Recreation								NEI	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Although 58% of values exceeded the OWQS for turbidity and 50% true color, the minimum data requirements were not met and an assessment of the FWP and Aesthetics beneficial use cannot be made for this sample year.

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

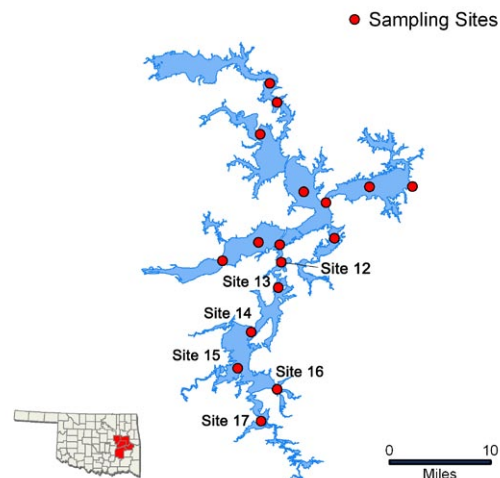
ppt = parts per thousand
En = Enterococci

Eufaula, Gaines Creek Arm (12-17)

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	17

Lake Data

Location	Haskell County
Impoundment	1964
Area	105,000 acres
Capacity	2,314,600 acre-feet
Purposes	Water Supply, Flood Control, Hydropower, Sediment Control



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	44 NTU	58% of values > OWQS of 25 NTU
Average True Color	124 units	63% of values > OWQS of 70
Average Secchi Disk Depth	59 cm	
Water Clarity Rating	Fair to poor	
Trophic State Index	52	
Trophic Class	eutrophic	
Salinity	0.10– 0.26 ppt	
Specific Conductivity	339.6 – 567.4 µS/cm	
pH	6.94 – 8.29 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	27 to 481 mV	
Dissolved Oxygen	Up to 46% of water column < 2 mg/L in August	
Surface Total Nitrogen	0.55 mg/L to 2.18 mg/L	
Surface Total Phosphorus	0.030 mg/L to 0.129 mg/L	
Nitrogen to Phosphorus Ratio	13:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	NS	S	S	S					
Aesthetics					S	NS			
Agriculture							S		
Primary Body Contact Recreation								NEI	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

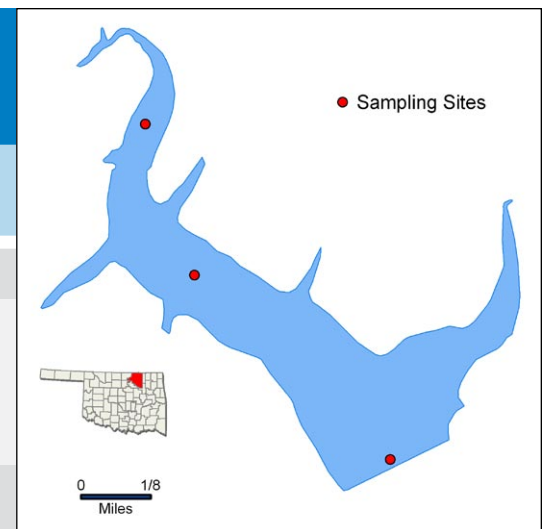
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Fairfax

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	3

Lake Data	Location	Osage County
	Impoundment	1936
	Area	111 acres
	Capacity	1,795 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	10 NTU	100% of values < OWQS of 25 NTU
		Average True Color	41 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	73 cm	
		Water Clarity Rating	good	
		Trophic State Index	57	
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.09– 0.13 ppt	
		Specific Conductivity	191.6 – 275.3 μ S/cm	
		pH	7.00 – 8.93 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	2 to 428mV	
		Dissolved Oxygen	Up to 67% of water column < 2 mg/L in May	
		Surface Total Nitrogen	0.61 mg/L to 0.92 mg/L	
		Surface Total Phosphorus	0.016 mg/L to 0.042 mg/L	
		Nitrogen to Phosphorus Ratio	27:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes Although 25% of the color exceed the OWQS of 70, this peak is likely the result of seasonal storm events, therefore the Aesthetics beneficial use is considered supported.								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

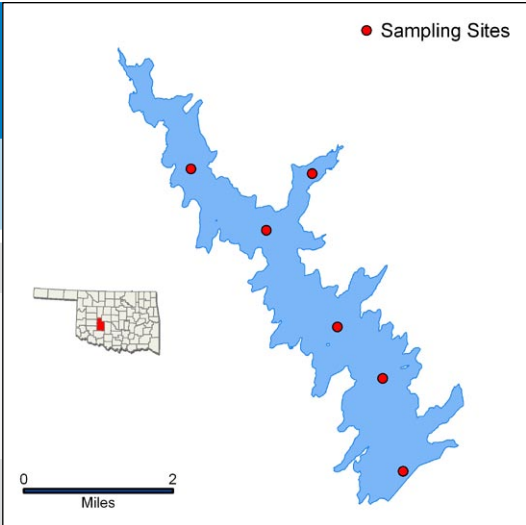
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Fort Cobb

Sample Period	Times Visited	Sampling Sites
November 2005 - August 2006	4	6

Lake Data	Location	Caddo County
	Impoundment	1959
	Area	4,100 acres
	Capacity	80,010 acre-feet
	Purposes	Flood Control, Water Supply, Fish & Wildlife, Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	13 NTU	12.5% of values > OWQS of 25 NTU	
	Average True Color	20 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	62 cm		
	Water Clarity Rating	good		
	Trophic State Index	65		
	Trophic Class	hypereutrophic		
	Profile	Salinity	0.23– 0.58ppt	
		Specific Conductivity	451.5 – 1111 μS/cm	
		pH	7.26– 10.69 pH units	Only 5.6% of values > 9.0 pH units
		Oxidation-Reduction Potential	249 to 429 mV	
		Dissolved Oxygen	Up to 27% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.77 mg/L to 1.52 mg/L	
		Surface Total Phosphorus	0.050 mg/L to 0.210 mg/L	
		Nitrogen to Phosphorus Ratio	11:1	Possibly co-limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					NS*	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

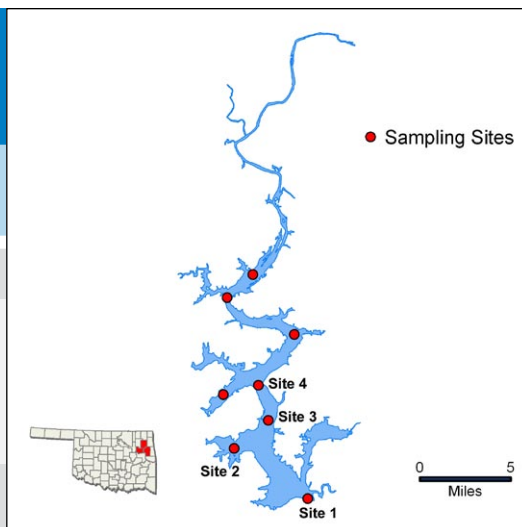
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Fort Gibson, Lower (1-4)

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	8

Lake Data	Location	Cherokee County
	Impoundment	1953
	Area	14,900 acres
	Capacity	355,200 acre-feet
	Purposes	Hydropower and Flood Control



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	7 NTU	100% of values < OWQS of 25 NTU
		Average True Color	32 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	86 cm	
		Water Clarity Rating	good	
		Trophic State Index	60	
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.07– 0.15 ppt	
		Specific Conductivity	168.8 – 303.9 µS/cm	
		pH	6.26 – 8.79 pH units	12% of values < 6.5 pH units
		Oxidation-Reduction Potential	2 to 403 mV	
		Dissolved Oxygen	Up to 82% of water column < 2 mg/L in July	Occurred at site 3
		Surface Total Nitrogen	0.62 mg/L to 1.43 mg/L	
		Surface Total Phosphorus	0.038 mg/L to 0.125 mg/L	
		Nitrogen to Phosphorus Ratio	11:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	S		S	NS	S					
						NS	S			
								S		
									S	
S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes The lake is currently listed in the Oklahoma Water Quality Standards (WQS) as a Nutrient Limited Watershed (NLW). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status.								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

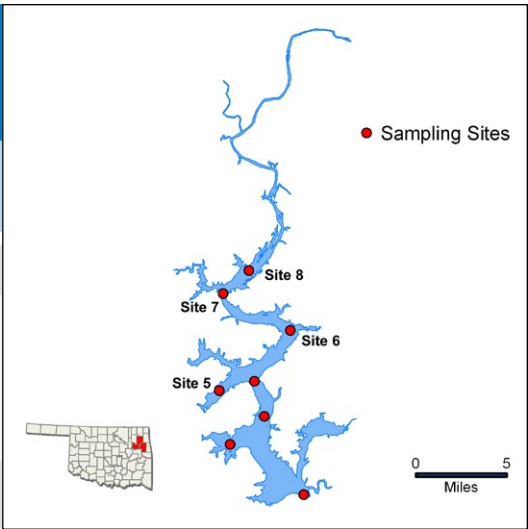
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Fort Gibson, Upper (5-8)

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	8

Lake Data	Location	Cherokee County
	Impoundment	1953
	Area	14,900 acres
	Capacity	355,200 acre-feet
	Purposes	Hydropower and Flood Control



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	10 NTU	100% of values < OWQS of 25 NTU	
	Average True Color	33 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	73 cm		
	Water Clarity Rating	good		
	Trophic State Index	61		
	Trophic Class	hypereutrophic		
	Profile	Salinity	0.07– 0.15 ppt	
		Specific Conductivity	164.9 – 351.1 µS/cm	
		pH	6.04 – 8.91 pH units	16.5% of values < 6.5 pH units
		Oxidation-Reduction Potential	6 to 382 mV	
		Dissolved Oxygen	Up to 79% of water column < 2 mg/L in July	Occurred at site 6
	Nutrients	Surface Total Nitrogen	0.62 mg/L to 1.50 mg/L	
		Surface Total Phosphorus	0.034 mg/L to 0.261 mg/L	
		Nitrogen to Phosphorus Ratio	8:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					NS	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information	Notes The lake is currently listed in the Oklahoma Water Quality Standards (WQS) as a Nutrient Limited Watershed (NLW). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status.								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

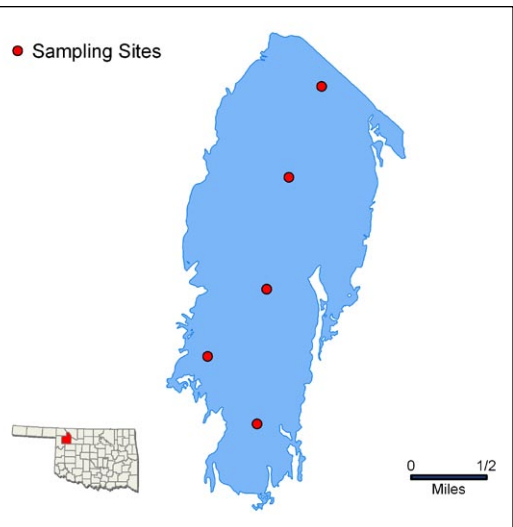
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Fort Supply

Sample Period	Times Visited	Sampling Sites
October 2005 - July 2006	4	6

Lake Data	Location	Woodward County
	Impoundment	1942
	Area	1,820 acres
	Capacity	13,900 acre-feet
	Purposes	Flood Control, Conservation Purposes



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	45 NTU	74% of values > OWQS of 25 NTU
		Average True Color	46 units	5% of values > OWQS of 70
		Average Secchi Disk Depth	57 cm	
		Water Clarity Rating	Fair to poor	
		Trophic State Index	57	
		Trophic Class	eutrophic	
		Salinity	0.45– 0.55 ppt	
		Specific Conductivity	867.2 – 1053 μS/cm	
		pH	7.33 – 8.39 pH units	
		Oxidation-Reduction Potential	345 to 424 mV	
	Dissolved Oxygen		Not stratified in any quarter	
	Nutrients	Surface Total Nitrogen	0.76 mg/L to 1.36 mg/L	
		Surface Total Phosphorus	0.035 mg/L to 0.126 mg/L	
		Nitrogen to Phosphorus Ratio	12:1	Possibly co-limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					NS*	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Foss

Sample Period	Times Visited	Sampling Sites
September 2004 – June 2005	4	5

Lake Data	Location	Custer County
	Impoundment	1961
	Area	8,800 acres
	Capacity	256,220 acre-feet
	Purposes	Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	9 NTU	100% of values < OWQS of 25 NTU
		Average True Color	8 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	97 cm	
		Water Clarity Rating	average	
		Trophic State Index	52	
		Trophic Class	eutrophic	
		Salinity	1.06– 1.24 ppt	
	Specific Conductivity	1963 –2320 µS/cm		
	pH	6.68 – 8.3 pH units	28% of recorded values > 9.0 pH units	
	Oxidation-Reduction Potential	357 to 557mV		
	Dissolved Oxygen		D.O. never below 2.0mg/L during study period	
	Nutrients	Surface Total Nitrogen	0.49 mg/L to 1.24 mg/L	
		Surface Total Phosphorus	0.014 mg/L to 0.039 mg/L	
		Nitrogen to Phosphorus Ratio	30:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	S	S						
	Aesthetics					S	S				
	Agriculture							S			
	Primary Body Contact Recreation									NEI	
	Public & Private Water Supply										
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes								
			*Bacteriological not collected during sample year 2004-2005.								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

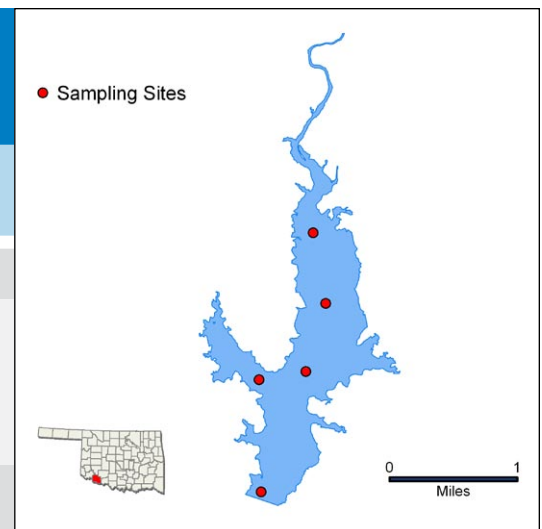
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Frederick

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Tillman County
	Impoundment	1974
	Area	925 acres
	Capacity	9,526 acre-feet
	Purposes	Water Supply, Recreation and Flood Control



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		59 NTU	100% of values > OWQS of 25 NTU
	Average True Color		83 units	50% of values > OWQS of 70
	Average Secchi Disk Depth		26 cm	
	Water Clarity Rating		poor	
	Trophic State Index		57	
	Trophic Class		eutrophic	
	Profile	Salinity	0.12– 0.31 ppt	
		Specific Conductivity	245.5 – 614 μ S/cm	
		pH	7.61 – 8.61 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	47 to 394 mV	
	Nutrients	Dissolved Oxygen	Up to 36% of water column < 2 mg/L in August	
		Surface Total Nitrogen	0.74 mg/L to 1.09 mg/L	
		Surface Total Phosphorus	0.023 mg/L to 0.069 mg/L	
	Nitrogen to Phosphorus Ratio		21:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Fuqua

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Stephens County
	Impoundment	1953
	Area	1,500 acres
	Capacity	21,100 acre-feet
	Purposes	Water Supply, Recreation and Flood Control



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	25 NTU	45% of values > OWQS of 25 NTU
		Average True Color	51 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	57 cm	
		Water Clarity Rating	average	
		Trophic State Index	52	
		Trophic Class	eutrophic	
		Salinity	0.13– 0.32 ppt	
	Nutrients	Specific Conductivity	272.6 – 616.3 μ S/cm	
		pH	7.29 – 8.44 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	43 to 472 mV	
		Dissolved Oxygen	Up to 40% of water column < 2 mg/L in August	
		Surface Total Nitrogen	0.44 mg/L to 0.73 mg/L	
		Surface Total Phosphorus	0.015 mg/L to 0.050 mg/L	
		Nitrogen to Phosphorus Ratio	19:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	S		S	S	S					
						S	S			
								S		
									S	
S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes Available flow and rainfall data suggest that the peak in turbidity and true color, which occurred in May and August is likely due to seasonal storm events, therefore Fuqua Lake will be listed as supporting its Fish & Wildlife Propagation (FWP) and Aesthetics beneficial use for these parameters.								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

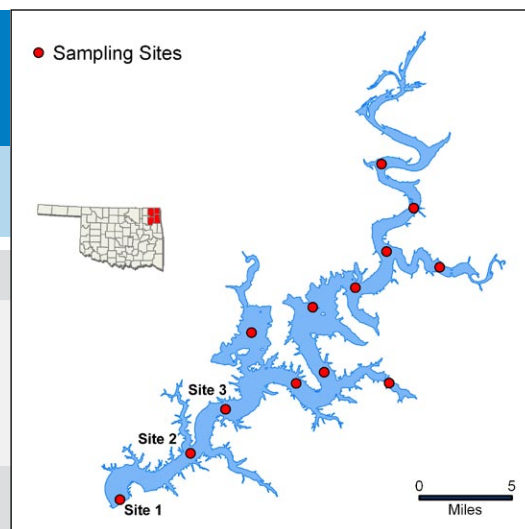
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Grand, Lower Lake (1-3)

Sample Period	Times Visited	Sampling Sites
November 2005 - August 2006	4	13

Lake Data	Location	Mayes County
	Impoundment	1940
	Area	1,820 acres
	Capacity	13,900 acre-feet
	Purposes	Flood Control, Hydropower



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	5 NTU	100% of values < OWQS of 25 NTU
		Average True Color	21units	100% of values < OWQS of 70
		Average Secchi Disk Depth	134 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	50	
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.13– 0.19 ppt	
		Specific Conductivity	264 – 374 μS/cm	
		pH	7.07– 8.68 pH units	
		Oxidation-Reduction Potential	289 to 460 mV	
		Dissolved Oxygen	Up to 62% of water column < 2 mg/L in August	
	Surface Total Nitrogen	0.46 mg/L to 0.77 mg/L		
	Surface Total Phosphorus	0.023 mg/L to 0.107 mg/L		
	Nitrogen to Phosphorus Ratio	10:1	Phosphorus limited or possibly co-limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

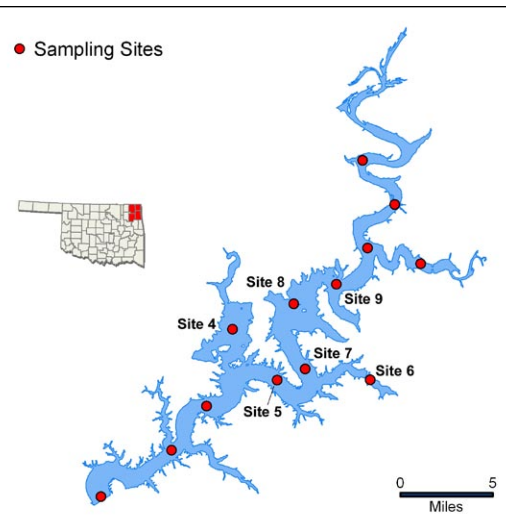
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Grand, Mid Lake (4-9)

Sample Period	Times Visited	Sampling Sites
November 2005 - August 2006	4	13

Lake Data	Location	Mayes County
	Impoundment	1940
	Area	1,820 acres
	Capacity	13,900 acre-feet
	Purposes	Flood Control, Hydropower



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	9 NTU	100% of values < OWQS of 25 NTU
		Average True Color	25 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	91 cm	
		Water Clarity Rating	Average to good	
		Trophic State Index	60	
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.11– 0.15ppt	
		Specific Conductivity	235.5 – 354 μS/cm	
		pH	6.53– 8.59 pH units	
		Oxidation-Reduction Potential	62 to 469 mV	
		Dissolved Oxygen	Up to 43% of water column < 2 mg/L in August	
		Surface Total Nitrogen	0.50 mg/L to 1.54 mg/L	
Surface Total Phosphorus	0.031 mg/L to 0.103 mg/L			
Nitrogen to Phosphorus Ratio	9:1	Phosphorus limited or possibly co-limited		

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

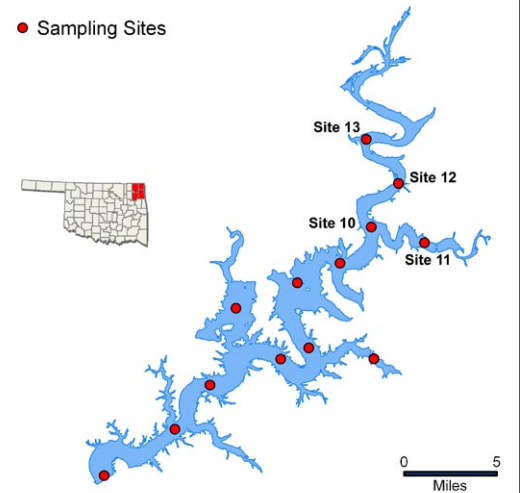
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Grand, Upper Lake (10-13)

Sample Period	Times Visited	Sampling Sites
November 2005 - August 2006	4	13

Lake Data	Location	Mayes County
	Impoundment	1940
	Area	1,820 acres
	Capacity	13,900 acre-feet
	Purposes	Flood Control, Hydropower



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	13 NTU	100% of values < OWQS of 25 NTU	
	Average True Color	25 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	69 cm		
	Water Clarity Rating	average		
	Trophic State Index	62		
	Trophic Class	hypereutrophic		
	Profile	Salinity	0.11– 0.23 ppt	
		Specific Conductivity	233.4 – 453.7 μS/cm	
		pH	6.75– 8.34 pH units	
		Oxidation-Reduction Potential	331 to 423 mV	
		Dissolved Oxygen	Up to 43% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.45 mg/L to 1.79 mg/L	
		Surface Total Phosphorus	0.040 mg/L to 0.212 mg/L	
Nitrogen to Phosphorus Ratio		8:1	Phosphorus limited or possibly co-limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									

S = Fully Supporting
 NS = Not Supporting
 NEI = Not Enough Information

Notes

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

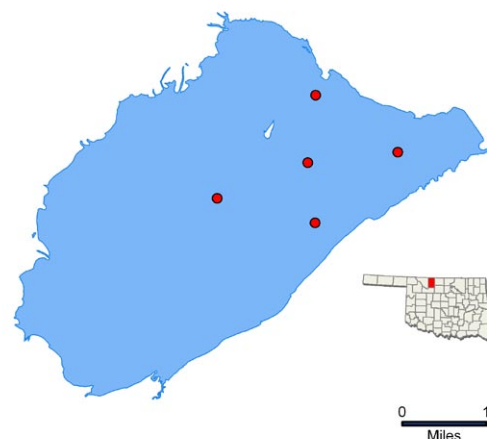
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Great Salt Plains

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	2	5

Lake Data	Location	Alfalfa County
	Impoundment	1941
	Area	8,690 acres
	Capacity	31,240 acre-feet
	Purposes	Flood Control, Conservation

Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	193 NTU	98% of values > OWQS of 25 NTU
		Average True Color	62 units	17% of values > OWQS of 70
		Average Secchi Disk Depth	10 cm	
		Water Clarity Rating	poor	
		Trophic State Index	71	
		Trophic Class	hypereutrophic	
	Nutrients	Salinity	0.02– 5.67 ppt	
		Specific Conductivity	494.6 – 10,016 μ S/cm	
		pH	5.11 – 8.80 pH units	Only 6.4% of values < 6.5 pH units
		Oxidation-Reduction Potential	93 to 490 mV	
		Dissolved Oxygen		Not stratified at any sampling event
	Nutrients	Surface Total Nitrogen	0.75 mg/L to 2.85 mg/L	
		Surface Total Phosphorus	0.046 mg/L to 1.783 mg/L	
		Nitrogen to Phosphorus Ratio	6:1	Nitrogen limited or possibly co-limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					NS*	S			
	Agriculture							NS**		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.
** Because the extremely high chloride conditions are due to natural conditions, the OWRB is looking into site-specific criteria for this waterbody.

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

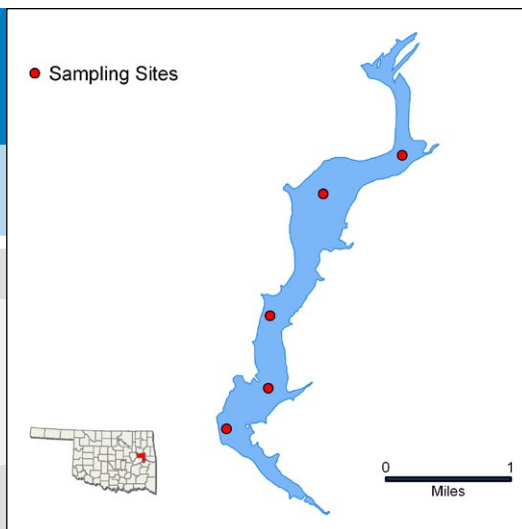
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Greenleaf

Sample Period	Times Visited	Sampling Sites
November 2005 – Sept. 2006	4	5

Lake Data	Location	Muskogee County
	Impoundment	1939
	Area	920 acres
	Capacity	14,720 acre-feet
	Purposes	Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	7 NTU	100% of values< OWQS of 25 NTU	
	Average True Color	15 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	111 cm		
	Water Clarity Rating	good		
	Trophic State Index	52		
	Trophic Class	eutrophic		
	Profile	Salinity	0.06– 0.14 ppt	
		Specific Conductivity	143.6 – 297 µS/cm	
		pH	6.81 – 8.31 pH units	
		Oxidation-Reduction Potential	55 to 511 mV	
		Dissolved Oxygen	Up to 71% of water column < 2 mg/L in September	
	Nutrients	Surface Total Nitrogen	0.42 mg/L to 0.83 mg/L	
		Surface Total Phosphorus	0.025 mg/L to 0.067 mg/L	
		Nitrogen to Phosphorus Ratio	15:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

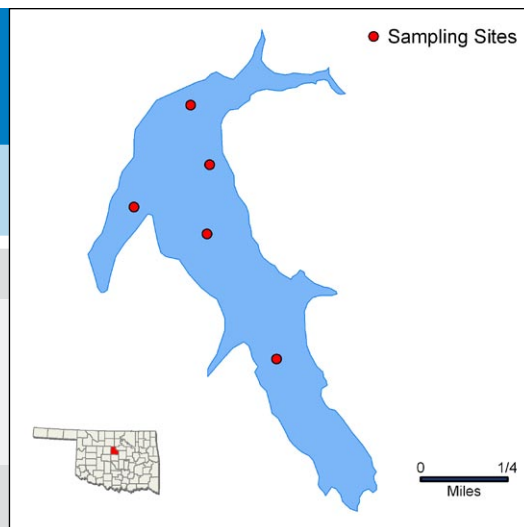
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Guthrie

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	5

Lake Data	Location	Logan County
	Impoundment	1919
	Area	274 acres
	Capacity	3,875 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	19 NTU	20% of values > OWQS of 25 NTU
		Average True Color	21 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	52 cm	
		Water Clarity Rating	Average to good	
		Trophic State Index	61	
		Trophic Class	hypereutrophic	
		Salinity	0.32– 0.43 ppt	
		Specific Conductivity	623.1 – 821 μ S/cm	
		pH	7.78 – 8.21 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	357 to 470 mV	
		Dissolved Oxygen		Not stratified during any sampling interval
	Nutrients	Surface Total Nitrogen	0.61 mg/L to 1.33 mg/L	
		Surface Total Phosphorus	0.041mg/L to 0.103 mg/L	
		Nitrogen to Phosphorus Ratio	15:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S*	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes	* Although 20% of the collected turbidity values exceeded the WQS of 25 NTU, available flow and rainfall data suggest that the peak in turbidity, which occurred in October, is likely due to seasonal storm events. Therefore, the lake will be listed as supporting its FWP use.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

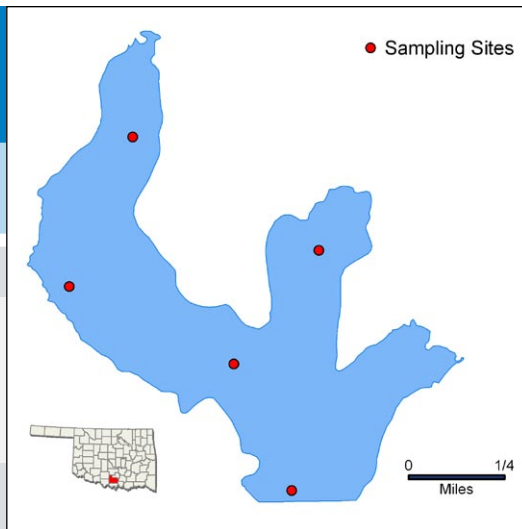
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Healdton

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	5

Lake Data	Location	Carter County
	Impoundment	1979
	Area	370 acres
	Capacity	3,766 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	48 NTU	100% of values > OWQS of 25 NTU	
	Average True Color	159 units	100% of values > OWQS of 70	
	Average Secchi Disk Depth	34 cm		
	Water Clarity Rating	poor		
	Trophic State Index	49		
	Trophic Class	mesotrophic		
	Profile	Salinity	0.13– 0.19 ppt	
		Specific Conductivity	275.6 – 378.5 µS/cm	
		pH	7.05 – 7.86 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	304 to 450 mV	
		Dissolved Oxygen	Up to 33% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.59 mg/L to 0.94 mg/L	
		Surface Total Phosphorus	0.043 mg/L to 0.100 mg/L	
		Nitrogen to Phosphorus Ratio	11:1	Phosphorus limited

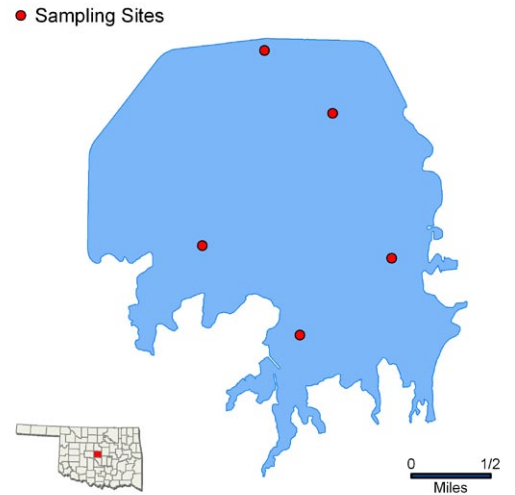
Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS*	S	S	S					
	Aesthetics					S	NS*			
	Agriculture							S		
	Primary Body Contact Recreation									NEI*
	Public & Private Water Supply									
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information	Notes	* Due to inclement weather conditions all sites could not be sample in May, therefore an assessment cannot be made for turbidity, true color or bacteria as minimum data requirements were not met.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli
 OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a
 mg/L = milligrams per liter
 µS/cm = microsiemens/cm
 ppt = parts per thousand
 En = Enterococci

Hefner

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	5

Lake Data	Location	Oklahoma County
	Impoundment	1947
	Area	2,500 acres
	Capacity	75,000 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	7 NTU	100% of values < OWQS of 25 NTU	
	Average True Color	19 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	92 cm		
	Water Clarity Rating	good		
	Trophic State Index	63		
	Trophic Class	hypereutrophic		
	Profile	Salinity	0.50– 0.68 ppt	
		Specific Conductivity	959 – 1314 μS/cm	
		pH	7.77 – 8.68 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	47 to 461 mV	
		Dissolved Oxygen	Up to 50% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.69 mg/L to 1.06 mg/L	
		Surface Total Phosphorus	0.055 mg/L to 0.120 mg/L	
Nitrogen to Phosphorus Ratio		10:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

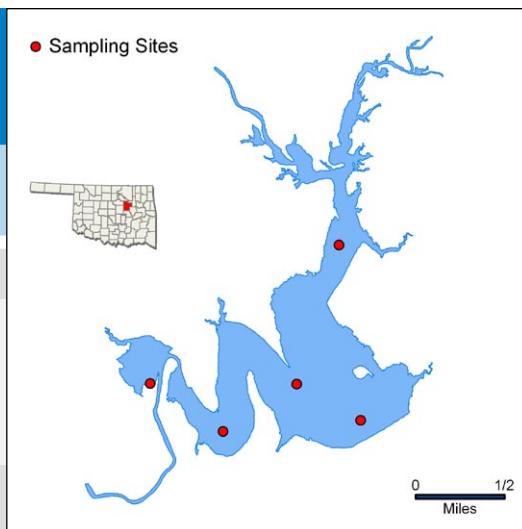
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Heyburn

Sample Period	Times Visited	Sampling Sites
November 2007 - August 2008	4	5

Lake Data	Location	Creek County
	Impoundment	1950
	Area	880 acres
	Capacity	7,105 acre-feet
	Purposes	Flood Control and Conservation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	50 NTU	75% of values > 25 NTU
		Average True Color	168 units	75% of values > OWQS of 70
		Average Secchi Disk Depth	39 cm	
		Water Clarity Rating	average	
		Trophic State Index	49	Previous value = 47
		Trophic Class	mesotrophic	
	Nutrients	Salinity	0.05 - 0.15 ppt	
		Specific Conductivity	116.3 – 304.8 µS/cm	
		pH	6.57 – 7.97 pH units	Neutral
		Oxidation-Reduction Potential	129 to 560 mV	
		Dissolved Oxygen	Up to 62% of water column < 2 mg/L in August	Occurred at site 1, the dam
		Surface Total Nitrogen	0.62 mg/L to 1.15 mg/L	
		Surface Total Phosphorus	0.008 mg/L to 0.088 mg/L	
		Nitrogen to Phosphorus Ratio	17:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								NEI*	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes * The PBCR cannot be assessed as minimum data requirements were not met due to inability to access all sample sites.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

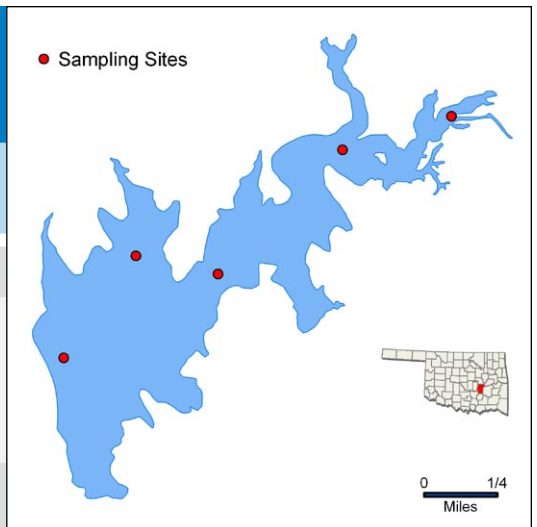
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Holdenville

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	3	5

Lake Data	Location	Hughes County
	Impoundment	1931
	Area	550 acres
	Capacity	11,000 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	16 NTU	20% of values > OWQS of 25 NTU
		Average True Color	42 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	75 cm	
		Water Clarity Rating	Average to good	
		Trophic State Index	60	
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.06– 0.19 ppt	
		Specific Conductivity	141.6 – 391.7 µS/cm	
		pH	6.10 – 8.26 pH units	11% of values < 6.5 pH units
		Oxidation-Reduction Potential	2 to 435 mV	
		Dissolved Oxygen	Up to 83% of water column < 2 mg/L in July	
		Surface Total Nitrogen	0.57 mg/L to 1.01 mg/L	
		Surface Total Phosphorus	0.015 mg/L to 0.067 mg/L	
		Nitrogen to Phosphorus Ratio	21:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	NS	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes Although 20% of the samples collected in 2006-2007 were above the standard, minimum data requirements were not met therefore assessment of the Fish & Wildlife Propagation (FWP) beneficial cannot be made at this time.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

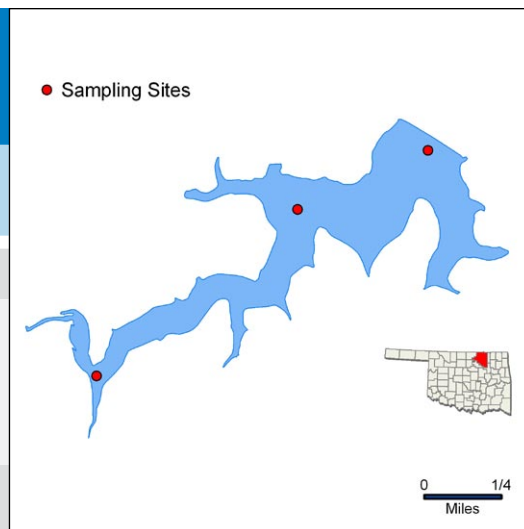
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Hominy Municipal

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	3	3

Lake Data	Location	Osage County
	Impoundment	1940
	Area	165 acres
	Capacity	5,000 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	9 NTU	100% of values< OWQS of 25 NTU	
	Average True Color	35 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	101 cm		
	Water Clarity Rating	excellent		
	Trophic State Index	56		
	Trophic Class	eutrophic		
	Profile	Salinity	0.10– 0.14 ppt	
		Specific Conductivity	224 – 297.7 µS/cm	
		pH	7.12 – 8.66 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	-22 to 430 mV	
		Dissolved Oxygen	Up to 62% of water column < 2 mg/L in August	Occurred at sites 1 and 2
	Nutrients	Surface Total Nitrogen	0.45 mg/L to 0.98 mg/L	
Surface Total Phosphorus		0.010 mg/L to 0.028 mg/L		
Nitrogen to Phosphorus Ratio		34:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NEI	S	NS	S					
	Aesthetics					S	NEI			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<p><i>S = Fully Supporting</i></p> <p><i>NS = Not Supporting</i></p> <p><i>NEI = Not Enough Information</i></p>	Notes	Although 100% of the turbidity and color samples were below the standard, the Fish & Wildlife Propagation (FWP) and Aesthetics beneficial use cannot be assessed as minimum data requirements were not met.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

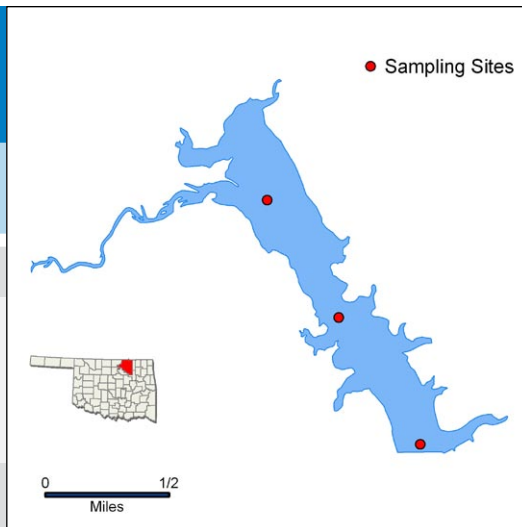
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Hudson

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	3

Lake Data	Location	Osage County
	Impoundment	1949
	Area	250 acres
	Capacity	4,000 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		8 NTU	100% of values < OWQS of 25 NTU
	Average True Color		21 units	100% of values < OWQS of 70
	Average Secchi Disk Depth		98 cm	
	Water Clarity Rating		good	
	Trophic State Index		57	
	Trophic Class		eutrophic	
	Profile	Salinity	0.08– 0.14 ppt	
		Specific Conductivity	178.3 – 297.4 µS/cm	
		pH	6.84 – 8.75 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	61 to 442 mV	
		Dissolved Oxygen	Up to 44% of water column < 2 mg/L in July	
	Nutrients	Surface Total Nitrogen	0.45 mg/L to 1.01 mg/L	
		Surface Total Phosphorus	0.021 mg/L to 0.073 mg/L	
		Nitrogen to Phosphorus Ratio	18:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

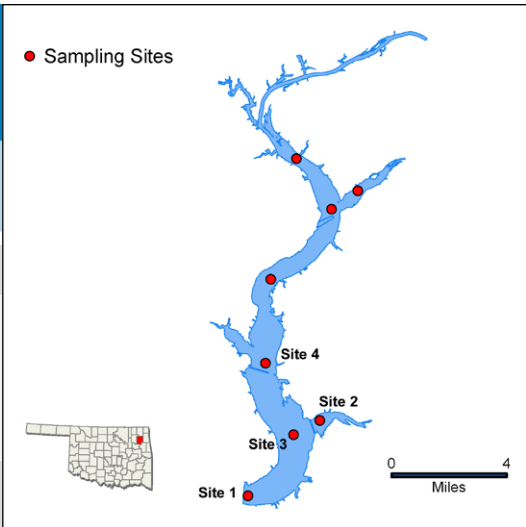
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Hudson, Lower (1-4)

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	8

Lake Data	Location	Mayes County
	Impoundment	1964
	Area	10,900 acres
	Capacity	200,300 acre-feet
	Purposes	Flood Control, Hydropower



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	7 NTU	100% of values< OWQS of 25 NTU	
	Average True Color	32 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	107 cm		
	Water Clarity Rating	excellent		
	Trophic State Index	58		
	Trophic Class	eutrophic		
	Profile	Salinity	0.08– 0.14 ppt	
		Specific Conductivity	172.8 – 286.2 μS/cm	
		pH	6.98 – 9.36 pH units	Only 0.28% of values > 9.0 pH units
		Oxidation-Reduction Potential	255 to 464 mV	
		Dissolved Oxygen	Up to 43% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.53 mg/L to 1.75 mg/L	
		Surface Total Phosphorus	0.051 mg/L to 0.118 mg/L	
		Nitrogen to Phosphorus Ratio	12:1	Phosphorus limited

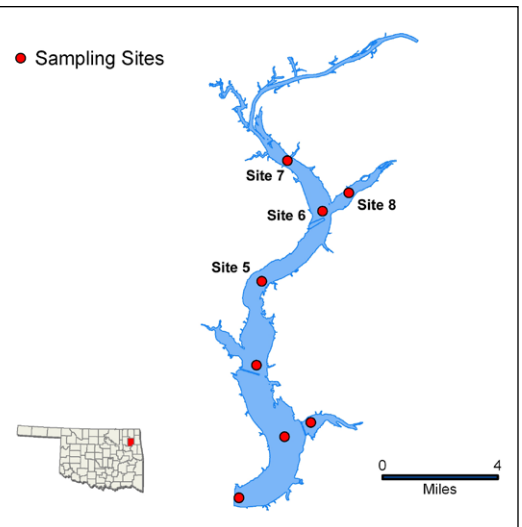
Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli
 OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a
 mg/L = milligrams per liter
 µS/cm = microsiemens/cm
 ppt = parts per thousand
 En = Enterococci

Hudson, Upper (5-8)

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	8

Lake Data	Location	Mayes County
	Impoundment	1964
	Area	10,900 acres
	Capacity	200,300 acre-feet
	Purposes	Flood Control, Hydropower



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	7 NTU	100% of values< OWQS of 25 NTU	
	Average True Color	35 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	90 cm		
	Water Clarity Rating	good		
	Trophic State Index	58		
	Trophic Class	eutrophic		
	Profile	Salinity	0.08– 0.14 ppt	
		Specific Conductivity	172.3 – 298.7 μS/cm	
		pH	6.86 – 9.30pH units	Only 2.4% of values > 9.0 pH units
		Oxidation-Reduction Potential	288 to 447 mV	
		Dissolved Oxygen	Up to 44% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.54 mg/L to 1.74 mg/L	
		Surface Total Phosphorus	0.032mg/L to 0.128 mg/L	
Nitrogen to Phosphorus Ratio		12:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En. cal. coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

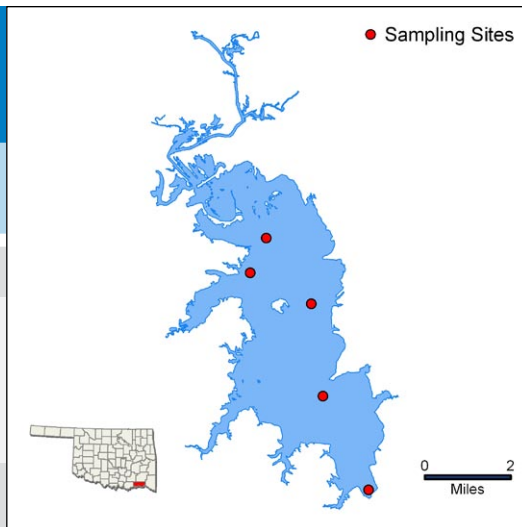
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Hugo

Sample Period	Times Visited	Sampling Sites
November 2007 - August 2008	4	5

Lake Data	Location	Choctaw County
	Impoundment	1974
	Area	13,250 acres
	Capacity	157,600 acre-feet
	Purposes	Flood Control, Water Supply, Water Quality Control, Fish and Wildlife, and Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	37 NTU	80% of values > 25 NTU
		Average True Color	116 units	95% of values > OWQS of 70
		Average Secchi Disk Depth	33 cm	
		Water Clarity Rating	poor	
		Trophic State Index	54	Previous value = 53
		Trophic Class	eutrophic	
		Salinity	0.00 - 0.02 ppt	
		Specific Conductivity	55 – 78 µS/cm	
		pH	6.64 – 7.44 pH units	Neutral
		Oxidation-Reduction Potential	388 to 553 mV	
		Dissolved Oxygen		All DO was >2 mg/L throughout the study period
	Nutrients	Surface Total Nitrogen	0.50 mg/L to 0.83 mg/L	
		Surface Total Phosphorus	0.047 mg/L to 0.079 mg/L	
		Nitrogen to Phosphorus Ratio	10:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		NS	S	S	S	NS			
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								NEI*	
Public & Private Water Supply										
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes * The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and fecal coliform.								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

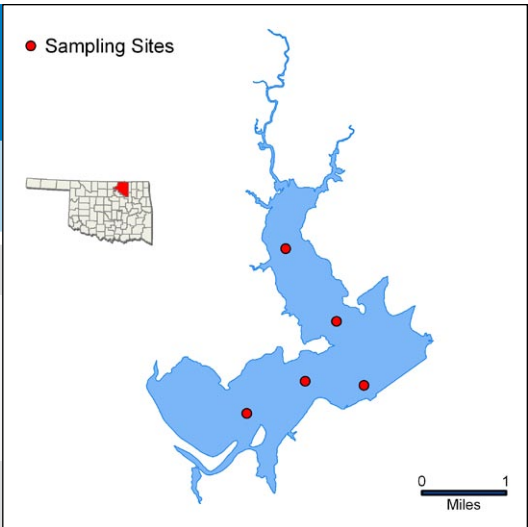
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Hulah

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	5

Lake Data	Location	Osage County
	Impoundment	1951
	Area	3,570 acres
	Capacity	31,160 acre-feet
	Purposes	Flood Control, Water Supply, Low-flow Regulation, and Conservation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	48 NTU	85% of values > 25 NTU
		Average True Color	106 units	75% of values > OWQS of 70
		Average Secchi Disk Depth	27 cm	
		Water Clarity Rating	poor	
		Trophic State Index	55	Previous value = 54
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.10 - 0.20 ppt	
		Specific Conductivity	249 – 398.5 μ S/cm	
		pH	7.21 – 8.37 pH units	Neutral
		Oxidation-Reduction Potential	188 to 487 mV	
		Dissolved Oxygen	Up to 40% of water column < 2 mg/L	Occurred at site 5
		Surface Total Nitrogen	0.60 mg/L to 1.24 mg/L	
		Surface Total Phosphorus	0.029 mg/L to 0.083 mg/L	
		Nitrogen to Phosphorus Ratio	13:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.f ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					NS	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<p><i>S = Fully Supporting</i></p> <p><i>NS = Not Supporting</i></p> <p><i>NEI = Not Enough Information</i></p>		<p>Notes Currently, this lake is listed as a Nutrient Limited Watershed (NLW) in the Oklahoma Water Quality Standards (WQS). This means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status.</p>								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

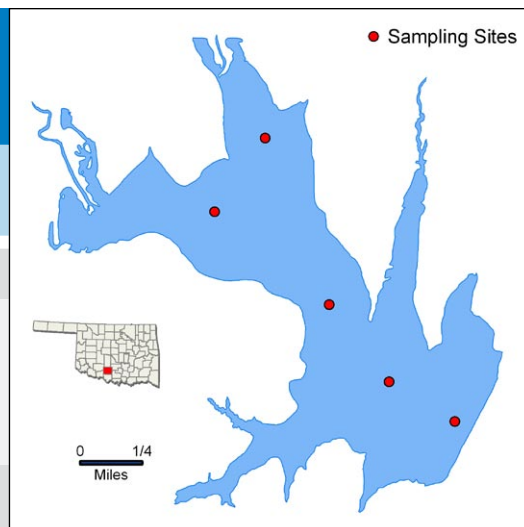
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Humphreys

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Stephens County
	Impoundment	1958
	Area	10,900 acres
	Capacity	200,300 acre-feet
	Purposes	Water Supply, Flood Control, Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	16 NTU	10% of values >OWQS of 25 NTU
		Average True Color	32 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	58 cm	
		Water Clarity Rating	Good to average	
		Trophic State Index	61	
		Trophic Class	hypereutrophic	
		Salinity	0.19– 0.34 ppt	
		Specific Conductivity	389.8 – 659.3 μS/cm	
		pH	7.32 – 8.30 pH units	
		Oxidation-Reduction Potential	-61 to 435mV	
	Dissolved Oxygen	Up to 54% of water column < 2 mg/L in August	Occurred at site 1, the dam	
	Nutrients	Surface Total Nitrogen	0.61 mg/L to 1.20 mg/L	
		Surface Total Phosphorus	0.026mg/L to 0.091 mg/L	
Nitrogen to Phosphorus Ratio		20:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	The PBCR beneficial use cannot be determined as minimum data requirements were not met due to quality control issues for E. coli and enterococci.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

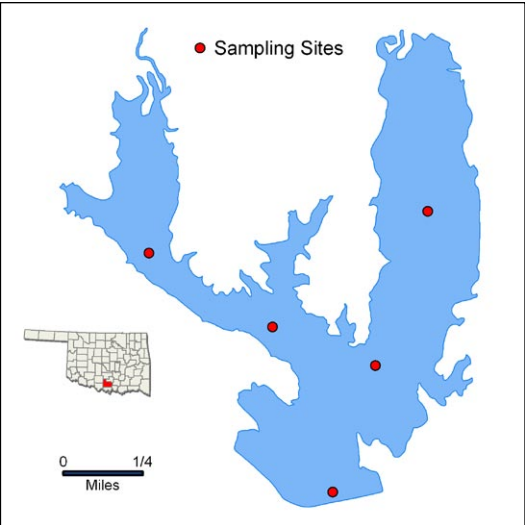
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Jean Neustadt

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Carter County
	Impoundment	1969
	Area	462 acres
	Capacity	6,106 acre-feet
	Purposes	Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	13 NTU	100% of values <OWQS of 25 NTU	
	Average True Color	27 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	76 cm		
	Water Clarity Rating	Good		
	Trophic State Index	58		
	Trophic Class	eutrophic		
	Profile	Salinity	0.11– 0.16 ppt	
		Specific Conductivity	231.1 – 332.4 µS/cm	
		pH	7.16 – 8.7 pH units	
		Oxidation-Reduction Potential	95 to 440mV	
		Dissolved Oxygen	Up to 70% of water column < 2 mg/L in July	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.45 mg/L to 0.98 mg/L	
		Surface Total Phosphorus	0.015mg/L to 0.048 mg/L	
		Nitrogen to Phosphorus Ratio	27:1	Phosphorus limited

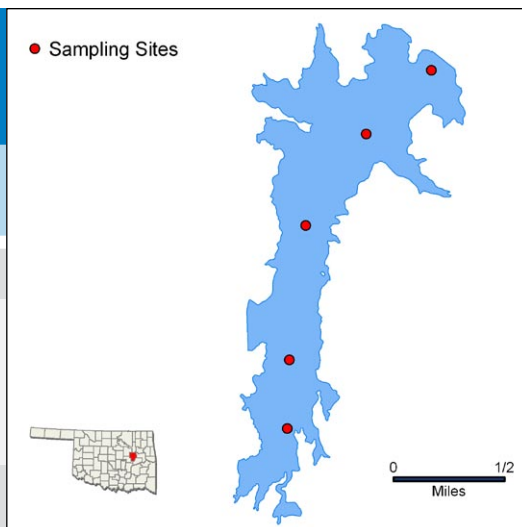
Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div><div>S = Fully Supporting</div><div>NS = Not Supporting</div><div>NEI = Not Enough Information</div></div>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli
 OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a
 mg/L = milligrams per liter
 µS/cm = microsiemens/cm
 ppt = parts per thousand
 En = Enterococci

Jim Hall (Henryetta)

Sample Period	Times Visited	Sampling Sites
October 2007 - July 2008	4	5

Lake Data	Location	Okmulgee County
	Impoundment	1928
	Area	450 acres
	Capacity	6,600 acre-feet
	Purposes	Water Supply and Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	69 NTU	All values > 25 NTU
		Average True Color	254 units	All values > OWQS of 70
		Average Secchi Disk Depth	23 cm	
		Water Clarity Rating	poor	
		Trophic State Index	45	Previous value = 47
		Trophic Class	mesotrophic	
		Salinity	0.01 - 0.04 ppt	
	Nutrients	Specific Conductivity	50.7 – 105.1 μS/cm	
		pH	6.58 – 7.53 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	126 to 636 mV	
		Dissolved Oxygen	30% of water column < 2 mg/L in July	Occurred at site 1, the dam
		Surface Total Nitrogen	0.90 mg/L to 1.08 mg/L	
		Surface Total Phosphorus	0.058 mg/L to 0.121 mg/L	
		Nitrogen to Phosphorus Ratio	12:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	NS	S	S	*						
	Aesthetics					S	NS				
	Agriculture							S			
	Primary Body Contact Recreation									NEI**	
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes *Not supporting for lead as chronic criteria was exceeded. All other toxicants are fully supporting. **The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for all parameters.								

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

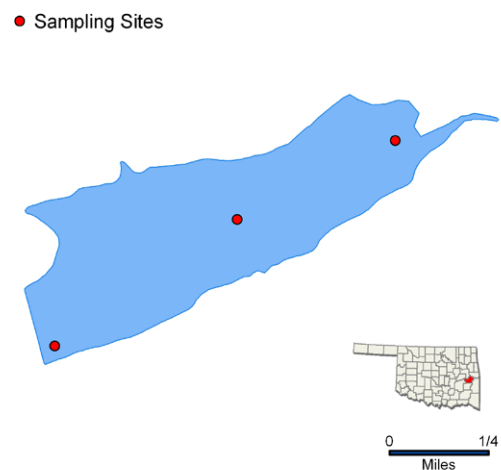
mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

John Wells

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	3

Lake Data	Location	Haskell County
	Impoundment	1936
	Area	194 acres
	Capacity	1,352 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	5 NTU	100% of values < OWQS of 25 NTU
		Average True Color	16 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	151 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	46	
		Trophic Class	mesotrophic	
		Salinity	0.01– 0.05 ppt	
	Nutrients	Specific Conductivity	59.8 – 117.9 µS/cm	
		pH	6.4 – 8.38 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	189 to 483 mV	
		Dissolved Oxygen	Up to 45% of water column < 2 mg/L in May	
		Surface Total Nitrogen	0.20 mg/L to 0.56 mg/L	
		Surface Total Phosphorus	0.013 mg/L to 0.020 mg/L	
		Nitrogen to Phosphorus Ratio	27:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		S	S	S	S	S	S		
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

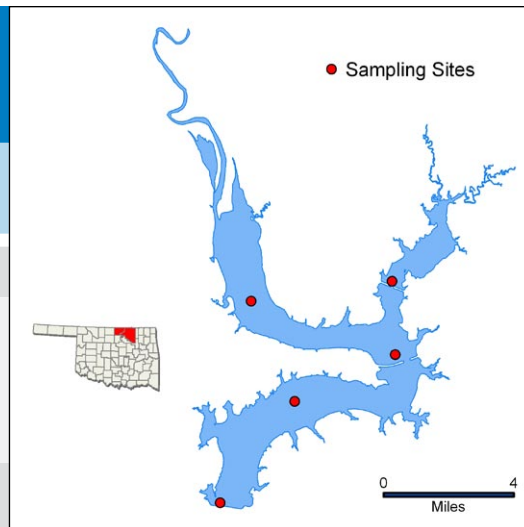
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Kaw (Lower)

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	5

Lake Data	Location	Osage County
	Impoundment	1976
	Area	17,040 acres
	Capacity	428,600 acre-feet
	Purposes	Flood Control, Water Supply, Water Quality Control, and Conservation



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	18 NTU	25% of values > 25 NTU
		Average True Color	75 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	66 cm	
		Water Clarity Rating	average	
		Trophic State Index	42	Previous value = 56 (lake-wide average)
		Trophic Class	mesotrophic	
		Profile	Salinity	0.21 - 0.58 ppt
	Specific Conductivity		416.2 – 1100 µS/cm	
	pH		6.97 – 8.38 pH units	Neutral to slightly alkaline
	Oxidation-Reduction Potential		103 to 487 mV	
	Dissolved Oxygen		Up to 24% of water column < 2 mg/L	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	1.08 mg/L to 2.46 mg/L	
		Surface Total Phosphorus	0.168 mg/L to 0.223 mg/L	
Nitrogen to Phosphorus Ratio		10:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					NS	NEI			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes	Although 25% of values exceeded the OWQS for turbidity and true color, the minimum data requirements were not met and an assessment of the FWP and Aesthetics beneficial use cannot be made for this sample year.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

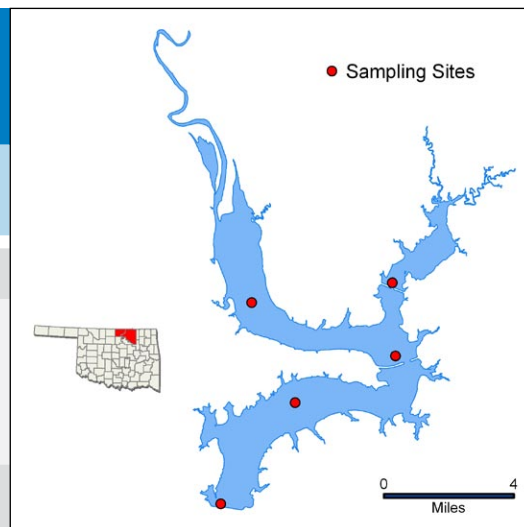
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Kaw (Upper)

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	5

Lake Data	Location	Osage County
	Impoundment	1976
	Area	17,040 acres
	Capacity	428,600 acre-feet
	Purposes	Flood Control, Water Supply, Water Quality Control, and Conservation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	27 NTU	50% of values > 25 NTU
		Average True Color	81 units	67% of values > OWQS of 70
		Average Secchi Disk Depth	35 cm	
		Water Clarity Rating	poor	
		Trophic State Index	53	Previous value = 56 (lake-wide average)
		Trophic Class	eutrophic	
		Salinity	0.16 - 0.65 ppt	
	Nutrients	Specific Conductivity	332.2– 1233 µS/cm	
		pH	7.09 – 8.54 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	103 to 487 mV	
		Dissolved Oxygen	Up to 24% of water column < 2 mg/L	Occurred at site 1, the dam
		Surface Total Nitrogen	1.14 mg/L to 2.64 mg/L	
		Surface Total Phosphorus	0.119 mg/L to 0.263 mg/L	
		Nitrogen to Phosphorus Ratio	9:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		NS	S	S	S				
	Aesthetics					NS	NEI			
	Agriculture							S		
	Primary Body Contact Recreation								S	
Public & Private Water Supply										
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes	Although 50-67% of values exceeded the OWQS for turbidity and true color, the minimum data requirements were not met and an assessment of the FWP and Aesthetics beneficial use cannot be made for this sample year.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

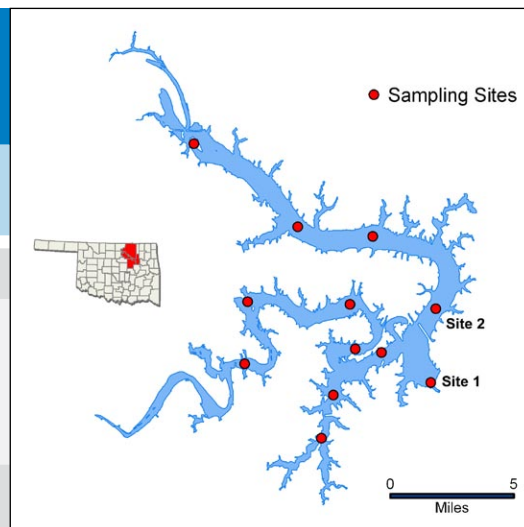
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Keystone (1-2)

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	12

Lake Data	Location	Tulsa County
	Impoundment	1964
	Area	23,610 acres
	Capacity	557,600 acre-feet
	Purposes	Flood Control, Water Supply, Hydropower, Navigation, Fish & Wildlife



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	13 NTU	13% of values > OWQS of 25 NTU
		Average True Color	29 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	91 cm	
		Water Clarity Rating	good	
		Trophic State Index	54	
		Trophic Class	eutrophic	
		Profile	Salinity	0.45 – 4.03 ppt
	Specific Conductivity		867 – 7232 μS/cm	
	pH		7.16 – 8.56 pH units	Neutral to slightly alkaline
	Oxidation-Reduction Potential		93 to 511 mV	
	Dissolved Oxygen		Up to 62% of water column < 2 mg/L in July	
	Nutrients	Surface Total Nitrogen	0.65 mg/L to 1.10 mg/L	
		Surface Total Phosphorus	0.063 mg/L to 0.193 mg/L	
Nitrogen to Phosphorus Ratio		8:1	Possibly co-limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S*	S	NS	S					
	Aesthetics					S	S*			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	*Although 12.5% of the values exceeded 25 NTU an assessment of the Fish & Wildlife Propagation (FWP) beneficial use cannot be made, as minimum data requirements are not being met. All true color values were below the Aesthetics criteria 70 units however like turbidity there are not enough data for this segment to assess the Aesthetics beneficial use.							

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

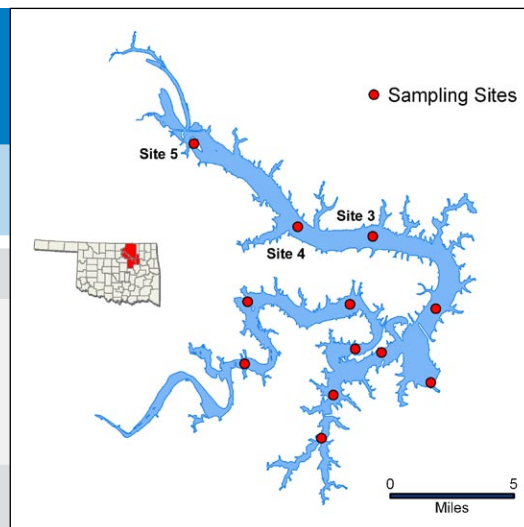
mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Keystone, Arkansas River Arm (3-5)

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	12

Lake Data	Location	Tulsa County
	Impoundment	1964
	Area	23,610 acres
	Capacity	557,600 acre-feet
	Purposes	Flood Control, Water Supply, Hydropower, Navigation, Fish & Wildlife



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	51 NTU	67% of values > OWQS of 25 NTU	
	Average True Color	40 units	8% of values > OWQS of 70	
	Average Secchi Disk Depth	47 cm		
	Water Clarity Rating	average		
	Trophic State Index	64		
	Trophic Class	hypereutrophic		
	Profile	Salinity	0.28– 1.24 ppt	
		Specific Conductivity	542 – 2317 μS/cm	
		pH	7.34 – 8.96 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	68 to 421 mV	
		Dissolved Oxygen	Up to 20% of water column < 2 mg/L in July	
	Nutrients	Surface Total Nitrogen	0.64 mg/L to 2.04 mg/L	
Surface Total Phosphorus		0.094 mg/L to 0.362 mg/L		
Nitrogen to Phosphorus Ratio		6:1	Possibly co-limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S*	S	S	S					
	Aesthetics					S	S*			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes	*Although 67% of the values exceeded 25 NTU an assessment of the Fish & Wildlife Propagation (FWP) beneficial use cannot be made, as minimum data requirements are not being met. Similarly, only 8.3% of true color values were below the Aesthetics criteria 70 units however like turbidity there are not enough data for this segment to assess the Aesthetics beneficial use.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

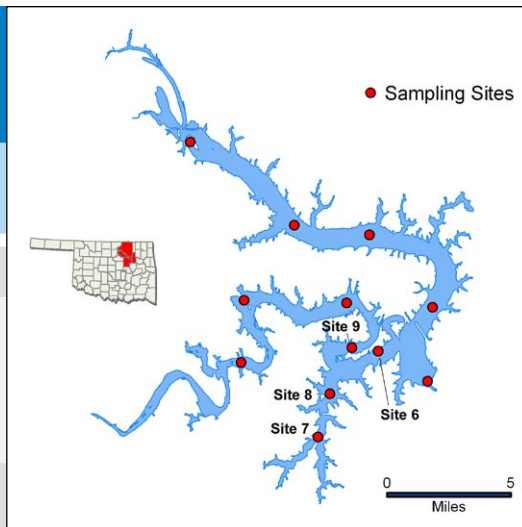
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Keystone, Lower Cimarron River Arm (6-9)

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	12

Lake Data	Location	Tulsa County
	Impoundment	1964
	Area	23,610 acres
	Capacity	557,600 acre-feet
	Purposes	Flood Control, Water Supply, Hydropower, Navigation, Fish & Wildlife



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	14 NTU	19% of values > OWQS of 25 NTU
		Average True Color	28 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	76 cm	
		Water Clarity Rating	good	
		Trophic State Index	60	
		Trophic Class	eutrophic	
		Salinity	0.15– 2.66 ppt	
	Nutrients	Specific Conductivity	314 – 4849 μ S/cm	
		pH	7.36 – 8.56 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	233 to 432 mV	
		Dissolved Oxygen	Up to 47% of water column < 2 mg/L in July	
		Surface Total Nitrogen	0.61 mg/L to 1.20 mg/L	
		Surface Total Phosphorus	0.055 mg/L to 0.186 mg/L	
		Nitrogen to Phosphorus Ratio	8:1	Possibly co-limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	S*		S	S	S					
						S	S*			
								S		
									NEI	
S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes *Although 19% of the values exceeded 25 NTU an assessment of the Fish & Wildlife Propagation (FWP) beneficial use cannot be made, as minimum data requirements are not being met. All true color values were below the Aesthetics criteria 70 units however like turbidity there are not enough data for this segment to assess the Aesthetics beneficial use.								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

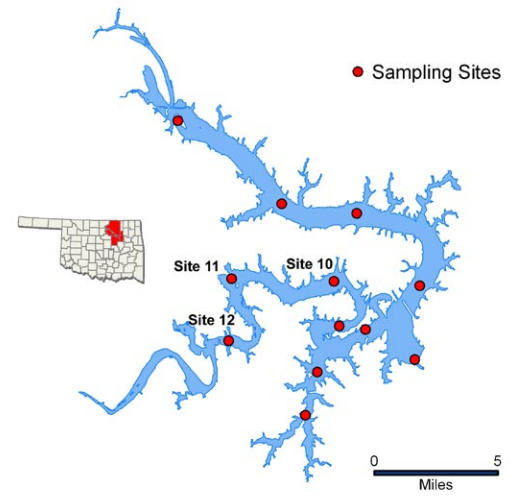
ppt = parts per thousand
 En = Enterococci

Keystone, Upper Cimarron River Arm (10-12)

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	12

Lake Data

Location	Tulsa County
Impoundment	1964
Area	23,610 acres
Capacity	557,600 acre-feet
Purposes	Flood Control, Water Supply, Hydropower, Navigation, Fish & Wildlife



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	41 NTU	58% of values > OWQS of 25 NTU
Average True Color	40 units	17% of values > OWQS of 70
Average Secchi Disk Depth	41 cm	
Water Clarity Rating	average	
Trophic State Index	63	
Trophic Class	hypereutrophic	
Salinity	0.73– 6.34 ppt	
Specific Conductivity	1373 – 11,134 µS/cm	
pH	7.39 – 8.38 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	331 to 423 mV	
Dissolved Oxygen	Up to 31% of water column < 2 mg/L in July	
Surface Total Nitrogen	0.66 mg/L to 1.77 mg/L	
Surface Total Phosphorus	0.059 mg/L to 0.328 mg/L	
Nitrogen to Phosphorus Ratio	8:1	Possibly co-limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S*	S	S	S					
Aesthetics					S	S*			
Agriculture							S		
Primary Body Contact Recreation								NEI	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*Although 58% of the values exceeded 25 NTU an assessment of the Fish & Wildlife Propagation (FWP) beneficial use cannot be made, as minimum data requirements are not being met. Similarly, 17% of true color values were below the Aesthetics criteria 70 units however like turbidity there are not enough data for this segment to assess the Aesthetics beneficial use.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

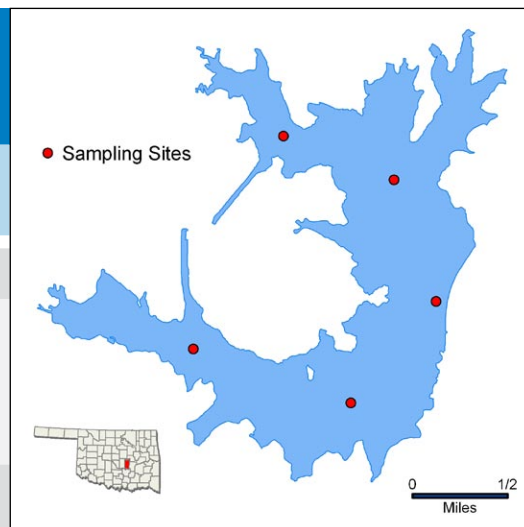
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Konawa

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	5

Lake Data	Location	Seminole County
	Impoundment	1968
	Area	1,350 acres
	Capacity	23,000 acre-feet
	Purposes	Cooling Water



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	8 NTU	100% of values < 25 NTU
		Average True Color	21 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	82 cm	
		Water Clarity Rating	good	
		Trophic State Index	57	Previous value = 53
		Trophic Class	eutrophic	
	Profile	Salinity	0.51 – 0.62 ppt	
		Specific Conductivity	971.7 – 1178 µS/cm	
		pH	7.07 – 8.66 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	-94 to 452 mV	
		Dissolved Oxygen	Up to 33% of water column , 2 mg/L in July	Occurred at site 1
	Nutrients	Surface Total Nitrogen	0.64 mg/L to 0.99 mg/L	
		Surface Total Phosphorus	0.022 mg/L to 0.045 mg/L	
		Nitrogen to Phosphorus Ratio	23:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes	The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and enterococci.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

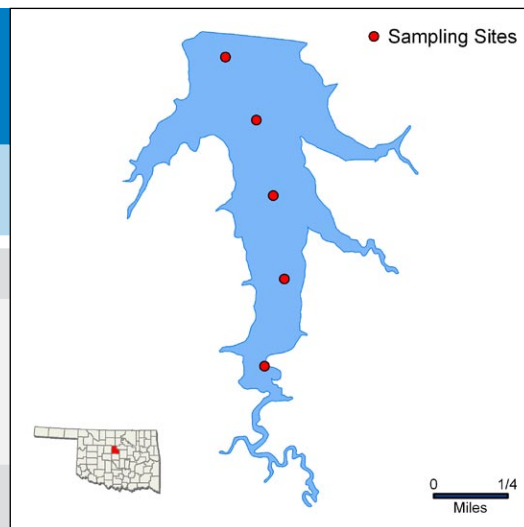
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Langston

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	5

Lake Data	Location	Logan County
	Impoundment	1966
	Area	304 acres
	Capacity	5,792 acre-feet
	Purposes	Water Supply, Flood Control, and Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	12 NTU	All values < 25 NTU
		Average True Color	29 units	All values < OWQS of 70
		Average Secchi Disk Depth	70 cm	
		Water Clarity Rating	good	
		Trophic State Index	44	Previous value = 47
		Trophic Class	mesotrophic	
	Nutrients	Salinity	0.10 – 0.14 ppt	
		Specific Conductivity	289.1 – 303 μ S/cm	
		pH	7.44 – 8.47 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	94 to 586 mV	
		Dissolved Oxygen	Up to 36% of water column < 2 mg/L in July	Occurred at site 4
		Surface Total Nitrogen	0.45 mg/L to 0.80 mg/L	
		Surface Total Phosphorus	0.009 mg/L to 0.021 mg/L	
		Nitrogen to Phosphorus Ratio	46:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	S		S	S						
						S	S			
								S		
									S	
					S					
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

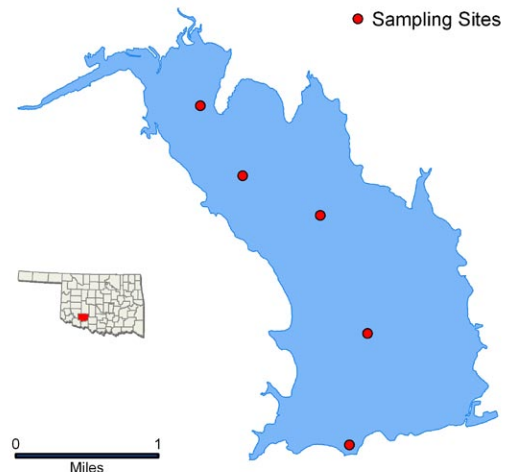
ppt = parts per thousand
 En = Enterococci

Lawtonka

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data

Location	Comanche County
Impoundment	1905
Area	2,398 acres
Capacity	56,574 acre-feet
Purposes	Water Supply, Recreation



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	8 NTU	100% of values < OWQS of 25 NTU
Average True Color	26 units	100% of values < OWQS of 70
Average Secchi Disk Depth	108 cm	
Water Clarity Rating	Good	
Trophic State Index	60	
Trophic Class	eutrophic	
Profile	Salinity	0.11– 0.24 ppt
	Specific Conductivity	225.2 – 469.7 μ S/cm
	pH	6.76 – 8.60 pH units
	Oxidation-Reduction Potential	42 to 419 mV
	Dissolved Oxygen	Up to 67% of water column < 2 mg/L in July Occurred at sites 1 and 2
Nutrients	Surface Total Nitrogen	0.59 mg/L to 0.81 mg/L
	Surface Total Phosphorus	0.015mg/L to 0.058 mg/L
	Nitrogen to Phosphorus Ratio	23:1 Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S					
Aesthetics					S	S			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

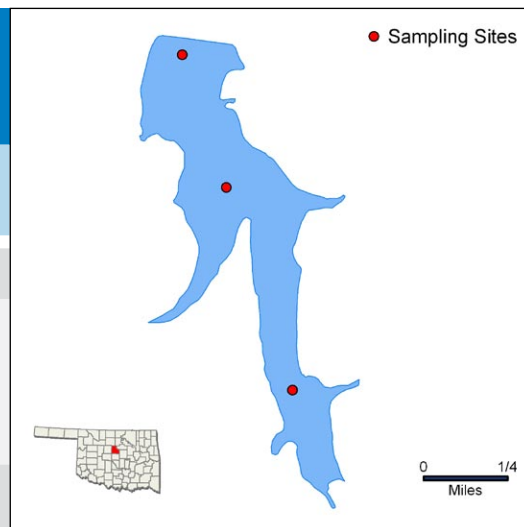
ppt = parts per thousand
En = Enterococci

Liberty

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	3

Lake Data

Location	Logan County
Impoundment	1948
Area	167 acres
Capacity	2,740 acre-feet
Purposes	Water Supply, Recreation



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	21 NTU	16.7% of values > OWQS of 25 NTU
Average True Color	20 units	100% of values < OWQS of 70
Average Secchi Disk Depth	42 cm	
Water Clarity Rating	good	
Trophic State Index	67	
Trophic Class	hypereutrophic	
Profile	Salinity	0.22 – 0.30 ppt
	Specific Conductivity	439.1 – 580.5 μ S/cm
	pH	7.94 – 8.48 pH units Neutral to slightly alkaline
	Oxidation-Reduction Potential	404 to 544 mV
	Dissolved Oxygen	All DO was >2 mg/L throughout the study period
Nutrients	Surface Total Nitrogen	0.82 mg/L to 1.19mg/L
	Surface Total Phosphorus	0.056 mg/L to 0.110 mg/L
	Nitrogen to Phosphorus Ratio	16:1 Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
Fish & Wildlife Propagation	NS	S	S	S					
Aesthetics					S	S*			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

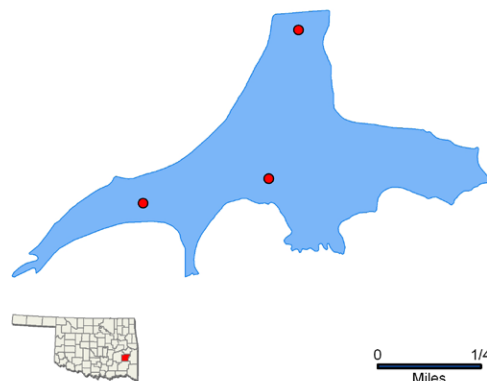
ppt = parts per thousand
 En = Enterococci

Lloyd Church (Wilburton)

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	3

Lake Data	Location	Latimer County
	Impoundment	1964
	Area	160 acres
	Capacity	3,060 acre-feet
	Purposes	Water Supply, Recreation, Flood Control

● Sampling Sites



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	14 NTU	25% of values > OWQS of 25 NTU	
	Average True Color	79 units	75% of values > OWQS of 70	
	Average Secchi Disk Depth	64 cm		
	Water Clarity Rating	good		
	Trophic State Index	45		
	Trophic Class	mesotrophic		
	Profile	Salinity	0.0 – 0.01 ppt	
		Specific Conductivity	25.4 – 71.9 μS/cm	
		pH	5.9 – 7.51 pH units	26% of values <6.5 pH units
		Oxidation-Reduction Potential	79 to 503 mV	
		Dissolved Oxygen	Up to 62% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.15 mg/L to 0.57 mg/L	
		Surface Total Phosphorus	0.020 mg/L to 0.043 mg/L	
Nitrogen to Phosphorus Ratio		12:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	NS	NS	S						
	Aesthetics					S	NS				
	Agriculture							S			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	Available flow and rainfall data suggest that the peak in turbidity, which occurred in March is likely due to seasonal storm events, therefore Lloyd Church Lake will be listed as supporting its Fish & Wildlife Propagation (FWP) beneficial use								

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

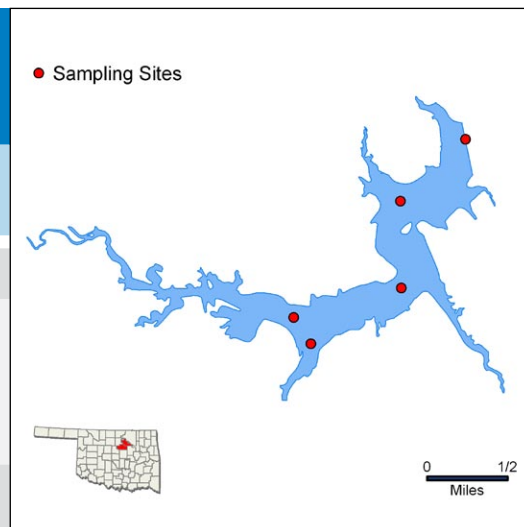
mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Lone Chimney

Sample Period	Times Visited	Sampling Sites
October 2003 - June 2004	4	5

Lake Data	Location	Pawnee County
	Impoundment	1984
	Area	550 acres
	Capacity	6,200 acre-feet
	Purposes	Water Supply, Recreation and Flood Control



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	18 NTU	25% of values >OWQS of 25 NTU
		Average True Color	41 units	20% of values > OWQS of 70
		Average Secchi Disk Depth	63 cm	
		Water Clarity Rating	Good	
		Trophic State Index	53	
		Trophic Class	eutrophic	
		Profile	Salinity	0.06– 0.17 ppt
	Specific Conductivity		156.9 – 312.5 μS/cm	
	pH		7.01 – 8.31 pH units	
	Oxidation-Reduction Potential		319 to 552 mV	
	Dissolved Oxygen		Up to 44% of water column < 2 mg/L in June	Occurred at sites 1 and 2
	Nutrients	Surface Total Nitrogen	0.58 mg/L to 1.05 mg/L	
		Surface Total Phosphorus	0.021 mg/L to 0.083 mg/L	
Nitrogen to Phosphorus Ratio		19:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	*					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes	Available flow and rainfall data suggest that the peak in turbidity and true color, which occurred in March is likely due to seasonal storm events, therefore Lone Chimney Lake will be listed as supporting its Fish & Wildlife Propagation (FWP) and Aesthetics beneficial use for these parameters *Metals not collected this sample period).							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

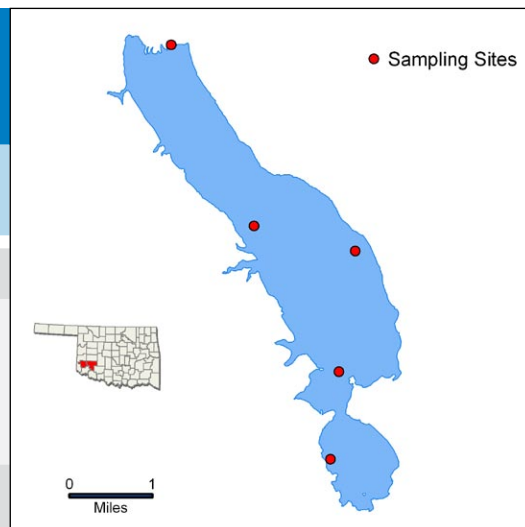
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Lugert-Altus

Sample Period	Times Visited	Sampling Sites
September 2004 - June 2005	4	5

Lake Data	Location	Greer County
	Impoundment	1947
	Area	6,260 acres
	Capacity	132,830 acre-feet
	Purposes	Water Supply, Flood Control, Irrigation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	23 NTU	30% of values >OWQS of 25 NTU
		Average True Color	18 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	37 cm	
		Water Clarity Rating	fair	
		Trophic State Index	59	
		Trophic Class	eutrophic	
		Salinity	1.01 – 1.29 ppt	
		Specific Conductivity	1866 – 2397 µS/cm	
		pH	7.67 – 8.22 pH units	
		Oxidation-Reduction Potential	343 to 480 mV	
	Dissolved Oxygen		All DO was >2 mg/L throughout the study period	
	Nutrients	Surface Total Nitrogen	0.69 mg/L to 1.17 mg/L	
		Surface Total Phosphorus	0.031 mg/L to 0.084 mg/L	
Nitrogen to Phosphorus Ratio		17:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	*					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<div><div><div>S = Fully Supporting</div><div>NS = Not Supporting</div><div>NEI = Not Enough Information</div></div><div>Notes</div><div>Bacteriological samples were not collected during the 2005 recreation season therefore an assessment of the Primary Body Contact Recreation (PBCR) beneficial use cannot be made at this time. *Metals not collected this sample period.</div></div>									

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

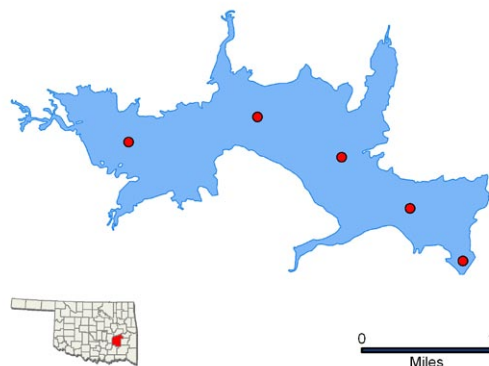
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

McAlester

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	5

Lake Data	Location	Pittsburg County
	Impoundment	1930
	Area	1,521 acres
	Capacity	13,398 acre feet
	Purposes	Water Supply and Recreation

Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	26 NTU	40% of values > 25 NTU	
	Average True Color	96 units	50% of values > OWQS of 70	
	Average Secchi Disk Depth	44 cm		
	Water Clarity Rating	average		
	Trophic State Index	50	Previous value = 42	
	Trophic Class	mesotrophic		
	Profile	Salinity	0.00 – 0.10 ppt	
		Specific Conductivity	85.5 – 164 µS/cm	
		pH	6.59 – 8.42 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	50 to 635 mV	
		Dissolved Oxygen	Up to 42% of water column < 2 mg/L in August	Occurred at site 1
	Nutrients	Surface Total Nitrogen	0.45 mg/L to 0.83 mg/L	
Surface Total Phosphorus		0.027 mg/L to 0.066 mg/L		
Nitrogen to Phosphorus Ratio		15:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

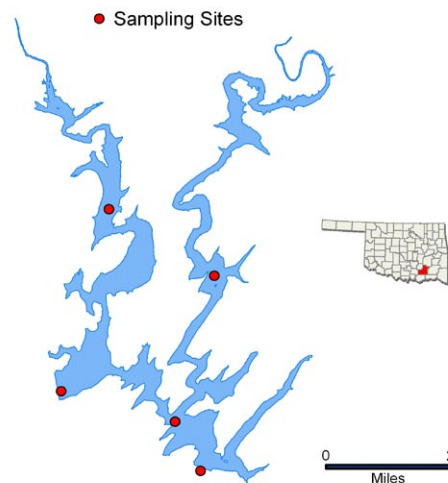
ppt = parts per thousand
En = Enterococci

McGee Creek

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data

Location	Atoka County
Impoundment	1987
Area	3,810 acres
Capacity	113,930 acre-feet
Purposes	Water Supply, Recreation, Water Quality Control, Flood Control, Fish & Wildlife



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	9 NTU	5% of values >OWQS of 25 NTU
Average True Color	52 units	10% of values >OWQS of 70
Average Secchi Disk Depth	132 cm	
Water Clarity Rating	Good	
Trophic State Index	43	
Trophic Class	mesotrophic	
Salinity	0.0– 0.03 ppt	
Specific Conductivity	0.6 – 76.9 µS/cm	
pH	5.58 – 7.63 pH units	41% of values < 6.5 pH units
Oxidation-Reduction Potential	-43 to 486 mV	
Dissolved Oxygen	Up to 57% of water column < 2 mg/L in October and up to 80% in July	
Surface Total Nitrogen	0.0– 0.03 ppt	
Surface Total Phosphorus	0.6 – 76.9 µS/cm	
Nitrogen to Phosphorus Ratio	5.58 – 7.63 pH units	41% of values < 6.5 pH units

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	NS*	NS	S					
Aesthetics					S	S			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*Slightly acidic conditions are not unusual in this part of the state due to relatively low soil pH and lack of soluble bedrock. Because of these conditions it is likely that the low pH values may be due to natural causes; therefore the Water Board is looking at the applicability of developing site-specific criteria for waters in the southeastern portion of the state.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

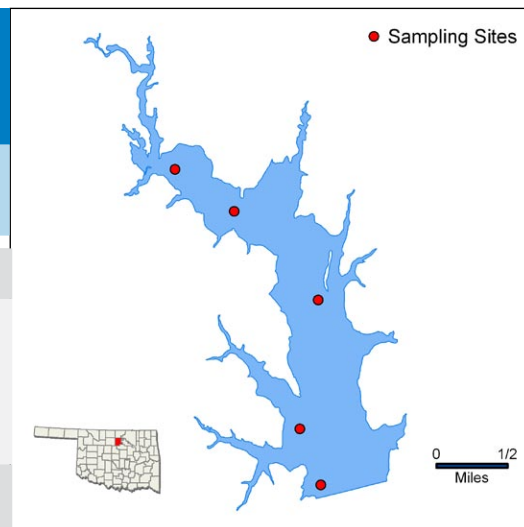
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

McMurtry

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	5

Lake Data	Location	Noble County
	Impoundment	1971
	Area	1,155 acres
	Capacity	19,733 acre feet
	Purposes	Water Supply, Flood Control, and Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	33 NTU	55% of values > 25 NTU
		Average True Color	103 units	50% of values > OWQS of 70
		Average Secchi Disk Depth	48 cm	
		Water Clarity Rating	average	
		Trophic State Index	48	Previous value = 47
		Trophic Class	mesotrophic	
		Salinity	0.15 – 0.20 ppt	
		Specific Conductivity	303.8 – 348.3 μS/cm	
		pH	7.36 – 8.60 pH units	Neutral to slightly alkaline
	Nutrients	Oxidation-Reduction Potential	41 to 820 mV	
		Dissolved Oxygen	Up to 62% of water column < 2 mg/L in August	Occurred at site 1
		Surface Total Nitrogen	0.43 mg/L to 1.02 mg/L	
		Surface Total Phosphorus	0.014 mg/L to 0.056 mg/L	
Nitrogen to Phosphorus Ratio		27:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

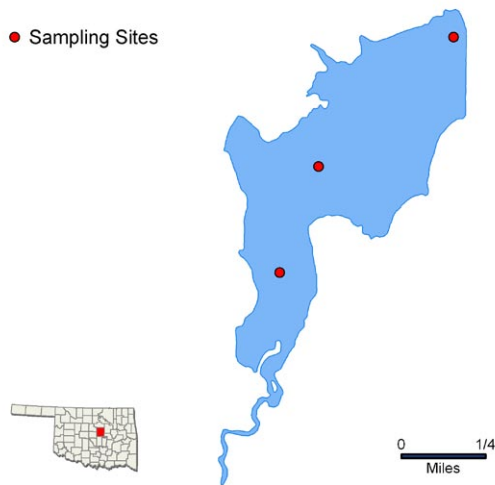
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Meeker

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
October 2005 – August 2006	4	3

Lake Data	Location	Lincoln County
	Impoundment	1970
	Area	250 acres
	Capacity	1,818 acre-feet
	Purposes	Water Supply, Recreation, Flood Control

Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	48 NTU	75% of values > OWQS of 25 NTU
		Average True Color	43 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	39 cm	
		Water Clarity Rating	Fair to poor	
		Trophic State Index	50	
		Trophic Class	mesotrophic	
		Profile	Salinity	0.12 – 0.36 ppt
	Specific Conductivity		253.2 – 705.4 μS/cm	
	pH		7.67 – 8.72 pH units	Neutral to slightly alkaline
	Oxidation-Reduction Potential		37 to 451 mV	
	Dissolved Oxygen		Up to 38% of water column < 2 mg/L in August	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.50 mg/L to 0.89 mg/L	
Surface Total Phosphorus		0.027 mg/L to 0.090 mg/L		
Nitrogen to Phosphorus Ratio		13:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

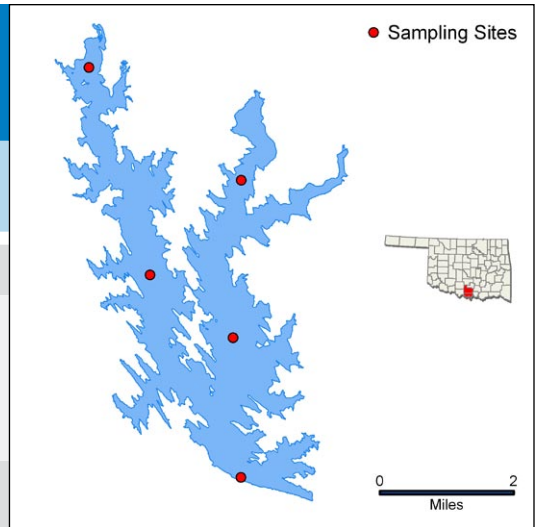
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Murray

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	5

Lake Data	Location	Love County
	Impoundment	1937
	Area	5,728 acres
	Capacity	153,250 acre-feet
	Purposes	Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	4 NTU	100% of values < OWQS of 25 NTU	
	Average True Color	12 units	100% of values < OWQS of 70	
	Average Secchi Disk Depth	184 cm		
	Water Clarity Rating	excellent		
	Trophic State Index	36		
	Trophic Class	oligotrophic		
	Profile	Salinity	0.11 – 0.15ppt	
		Specific Conductivity	230 – 311.9 μS/cm	
		pH	7.16– 8.34 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	147 to 496 mV	
		Dissolved Oxygen	Up to 70% of water column < 2 mg/L in August	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.20 mg/L to 0.36 mg/L	
		Surface Total Phosphorus	0.008 mg/L to 0.026 mg/L	
Nitrogen to Phosphorus Ratio		16:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes								

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
E. coli = *Escherichia coli*

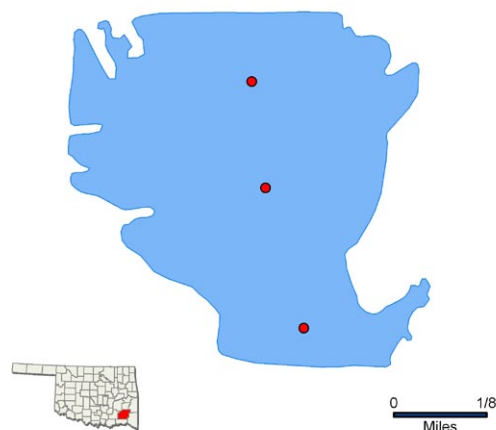
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Nanlih Waiya

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
December 2007 – July 2008	4	3

Lake Data	Location	Pushmataha County
	Impoundment	1958
	Area	131 acres
	Capacity	1,064 acre feet
	Purposes	Recreation

Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		9 NTU	All values < 25 NTU
	Average True Color		45 units	25% of values > OWQS of 70
	Average Secchi Disk Depth		98 cm	
	Water Clarity Rating		average	
	Trophic State Index		45	Previous value = 45
	Trophic Class		mesotrophic	
	Profile	Salinity	0.0 – 0.10 ppt	
		Specific Conductivity	63 – 262 µS/cm	
		pH	6.31 – 8.22 pH units	4 values (6.5%) <6.5 pH units
		Oxidation-Reduction Potential	5 to 576 mV	
		Dissolved Oxygen	Up to 42% of water column < 2 mg/L in August	Occurred at site 1
	Nutrients	Surface Total Nitrogen	0.32 mg/L to 0.70 mg/L	
		Surface Total Phosphorus	0.018 mg/L to 0.032 mg/L	
Nitrogen to Phosphorus Ratio		18:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En. ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

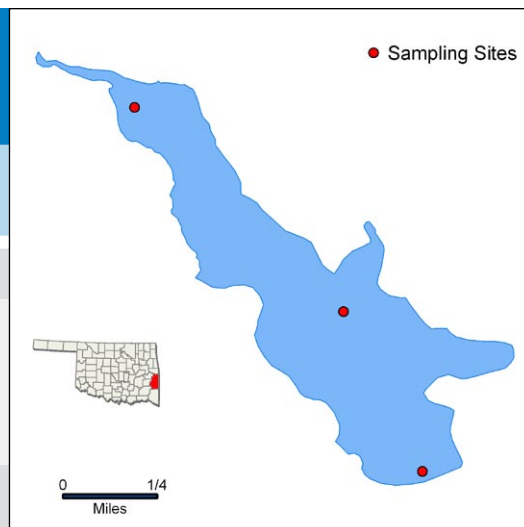
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

New Spiro

Sample Period	Times Visited	Sampling Sites
October 2005 – August 2006	4	3

Lake Data	Location	Le Flore County
	Impoundment	1960
	Area	254 acres
	Capacity	2,160 acre-feet
	Purposes	Water Supply, Recreation



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	18 NTU	8% of values >OWQS of 25 NTU
		Average True Color	26 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	47 cm	
		Water Clarity Rating	good	
		Trophic State Index	68	
		Trophic Class	hypereutrophic	
		Profile	Salinity	0.04 – 0.09 ppt
	Specific Conductivity		106.8 – 155.4 μS/cm	
	pH		7.09 – 9.24 pH units	10% of values > 9.0 pH units
	Oxidation-Reduction Potential		121 to 483 mV	
	Dissolved Oxygen		Up to 33% of water column < 2 mg/L in August	Occurred at site 2
	Nutrients	Surface Total Nitrogen	0.98 mg/L to 1.68 mg/L	
		Surface Total Phosphorus	0.076 mg/L to 0.170 mg/L	
Nitrogen to Phosphorus Ratio		11:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	NS	S	S					
	Aesthetics					NS*	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>		<div>Notes</div> <div>*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.</div>							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

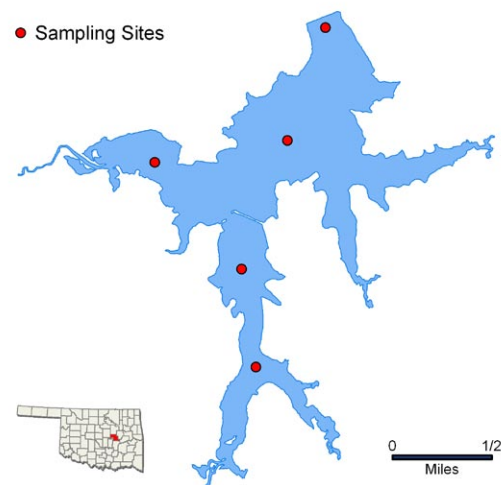
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Okemah

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Okfuskee County
	Impoundment	N/A
	Area	761 acres
	Capacity	13,100 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	17 NTU	20% of values >OWQS of 25 NTU
		Average True Color	61 units	35% of values >OWQS of 70
		Average Secchi Disk Depth	78 cm	
		Water Clarity Rating	average	
		Trophic State Index	46	
		Trophic Class	mesotrophic	
		Salinity	0.06– 0.14ppt	
		Specific Conductivity	140.7 – 289.3 μ S/cm	
		pH	6.71 – 8.03 pH units	
		Oxidation-Reduction Potential	126 to 426 mV	
		Dissolved Oxygen	Up to 69% of water column < 2 mg/L in July	
	Nutrients	Surface Total Nitrogen	0.38 mg/L to 1.01 mg/L	
		Surface Total Phosphorus	0.012 mg/L to 0.063 mg/L	
		Nitrogen to Phosphorus Ratio	23:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En. cal. coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								NS	
	Public & Private Water Supply									
<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>		Notes	Of the 10 samples collected, 20% of the values exceeded the screening level of 61 cfu/100 ml and the geometric mean of 33 was also exceeded for enterococci.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

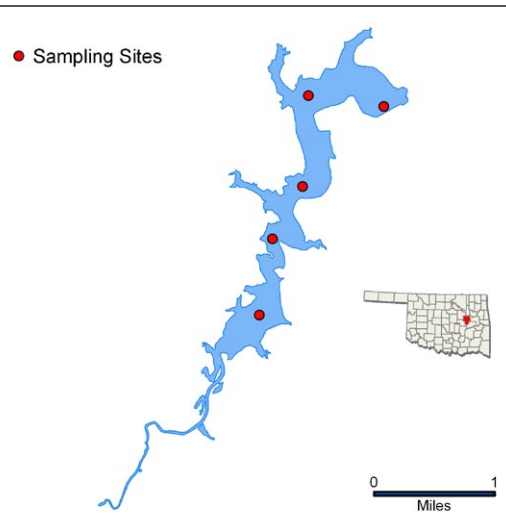
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Okmulgee

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Okmulgee County
	Impoundment	1928
	Area	668 acres
	Capacity	14,170 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	11 NTU	100% of values <OWQS of 25 NTU
		Average True Color	56 units	30% of values >OWQS of 70
		Average Secchi Disk Depth	99 cm	
		Water Clarity Rating	good	
		Trophic State Index	46	
		Trophic Class	mesotrophic	
		Salinity	0.02– 0.10ppt	
	Nutrients	Specific Conductivity	71.3 – 209.8 µS/cm	
		pH	6.36 – 7.90 pH units	12 (6%) of values were < 6.5 pH units
		Oxidation-Reduction Potential	194 to 600 mV	
		Dissolved Oxygen	Up to 71% of water column < 2 mg/L in July	
		Surface Total Nitrogen	0.36 mg/L to 0.77 mg/L	
		Surface Total Phosphorus	0.011 mg/L to 0.034 mg/L	
		Nitrogen to Phosphorus Ratio	30:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

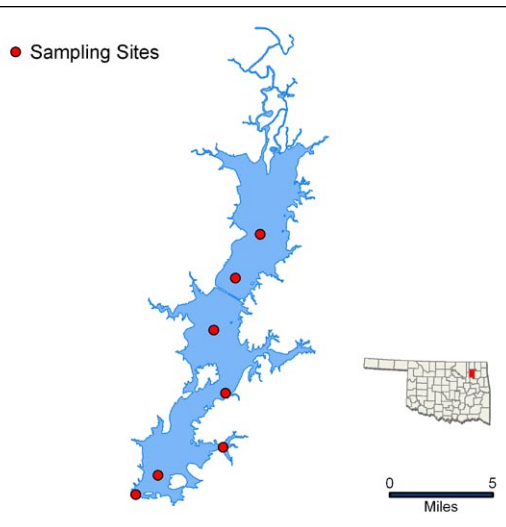
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Oologah

Sample Period	Times Visited	Sampling Sites
December 2007 – July 2008	4	7

Lake Data	Location	Rogers County
	Impoundment	1963
	Area	29,460 acres
	Capacity	553,400 acre feet
	Purposes	Water Supply, Flood Control, and Navigation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	20 NTU	25% of values > 25 NTU
		Average True Color	54 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	68 cm	
		Water Clarity Rating	average	
		Trophic State Index	54	Previous value = 46
		Trophic Class	eutrophic	
		Salinity	0.10 – 0.23 ppt	
		Specific Conductivity	161- 451.9 µS/cm	
	Nutrients	pH	7.10 – 8.65 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	171 to 563 mV	
		Dissolved Oxygen	Up to 85% of water column < 2 mg/L in August	Occurred at site 1
		Surface Total Nitrogen	0.33 mg/L to 1.13 mg/L	
		Surface Total Phosphorus	0.026 mg/L to 0.109 mg/L	
Nitrogen to Phosphorus Ratio		12:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	Precipitation data suggest that the peak in turbidity and true color, which occurred in May are likely due to seasonal storm events, therefore Oologah Lake will be listed as supporting its Fish & Wildlife Propagation (FWP) and Aesthetics beneficial use for these parameters. The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

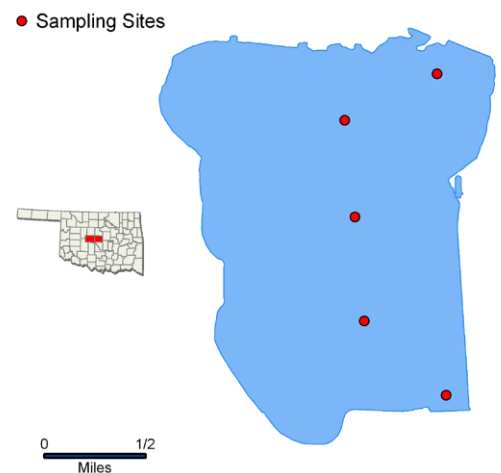
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Overholser

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	5

Lake Data	Location	Oklahoma County
	Impoundment	1919
	Area	1,500 acres
	Capacity	15,000 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	60 NTU	75% of values > OWQS of 25 NTU
		Average True Color	38 units	10% of values > OWQS of 70
		Average Secchi Disk Depth	32 cm	
		Water Clarity Rating	Fair to poor	
		Trophic State Index	67	
		Trophic Class	hypereutrophic	
		Salinity	0.04 – 0.74 ppt	
		Specific Conductivity	102 – 1399 μ S/cm	
		pH	7.80– 8.64 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	359 to 431 mV	
		Dissolved Oxygen		Not stratified during any sampling interval
	Nutrients	Surface Total Nitrogen	0.88 mg/L to 2.38 mg/L	
		Surface Total Phosphorus	0.100 mg/L to 0.317 mg/L	
		Nitrogen to Phosphorus Ratio	7:1	Possibly co- limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		NS	S	NS	S				
	Aesthetics					NS*	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
Public & Private Water Supply										
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes *The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

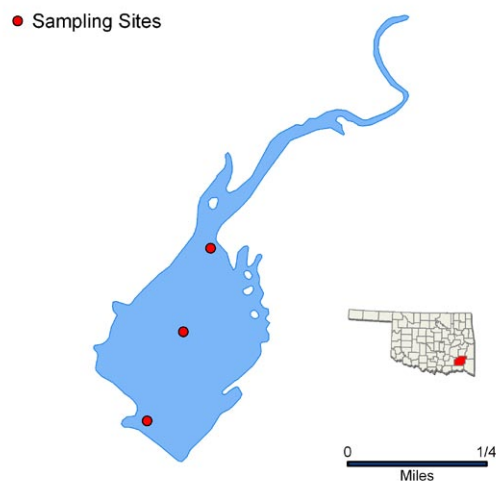
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Ozzie Cobb

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	3

Lake Data	Location	Pushmataha County
	Impoundment	1958
	Area	116 acres
	Capacity	833 acre feet
	Purposes	Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	12 NTU	All values < 25 NTU
		Average True Color	51 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	56 cm	
		Water Clarity Rating	average	
		Trophic State Index	59	Previous value = 55
		Trophic Class	eutrophic	
		Salinity	0.00 – 0.20 ppt	
		Specific Conductivity	50.6 - 311 µS/cm	
		pH	6.32 – 7.96 pH units	7 (13%) of values < 6.5
		Oxidation-Reduction Potential	15 to 543 mV	
	Dissolved Oxygen	Up to 50% of water column < 2 mg/L in August	Occurred at site 1	
	Nutrients	Surface Total Nitrogen	0.47 mg/L to 0.94 mg/L	
		Surface Total Phosphorus	0.034 mg/L to 0.072 mg/L	
		Nitrogen to Phosphorus Ratio	17:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.e.coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	NS	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes	Slightly acidic conditions are not unusual in this part of the state due to relatively low soil pH and lack of soluble bedrock. Because of these conditions it is likely that the low pH values may be due to natural causes; therefore the Water Board is looking at the applicability of developing site-specific criteria for waters in the southeastern portion of the state.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

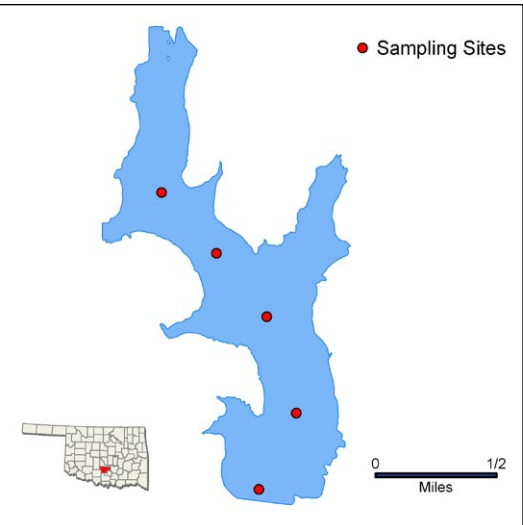
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Pauls Valley City

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	5

Lake Data	Location	Garvin County
	Impoundment	1954
	Area	750 acres
	Capacity	8,730 acre feet
	Purposes	Water Supply and Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	43 NTU	80% of values > 25 NTU
		Average True Color	126 units	75% of values > OWQS of 70
		Average Secchi Disk Depth	37 cm	
		Water Clarity Rating	poor	
		Trophic State Index	50	Previous value = 49
		Trophic Class	mesotrophic	
		Salinity	0.10 – 0.12 ppt	
	Nutrients	Specific Conductivity	206.9 - 271 μS/cm	
		pH	7.14 – 8.59 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	82 to 494 mV	
		Dissolved Oxygen	Up to 44% of water column < 2 mg/L in July	Occurred at site 1
		Surface Total Nitrogen	0.44 mg/L to 0.98 mg/L	
		Surface Total Phosphorus	0.018 mg/L to 0.078 mg/L	
		Nitrogen to Phosphorus Ratio	17:1	Phosphorus limited

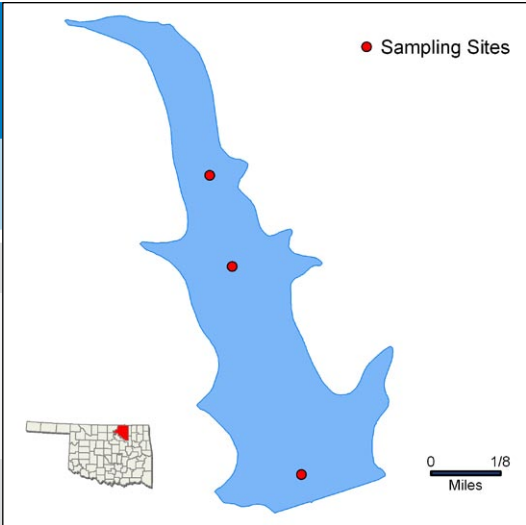
Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli
 OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a
 mg/L = milligrams per liter
 µS/cm = microsiemens/cm
 ppt = parts per thousand
 En = Enterococci

Pawhuska

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	3

Lake Data	Location	Osage County
	Impoundment	1936
	Area	96 acres
	Capacity	3,600 acre feet
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		3 NTU	All values < 25 NTU
	Average True Color		21 units	All values < OWQS of 70
	Average Secchi Disk Depth		195 cm	
	Water Clarity Rating		excellent	
	Trophic State Index		41	Previous value = 39
	Trophic Class		mesotrophic	
	Profile	Salinity	0.15 – 0.27 ppt	
		Specific Conductivity	311.1 – 523.1 μ S/cm	
		pH	6.91 – 8.66 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	-114 to 485 mV	
		Dissolved Oxygen	Up to 54% of water column < 2 mg/L in July	Occurred at site 1
	Nutrients	Surface Total Nitrogen	0.24 mg/L to 0.46 mg/L	
		Surface Total Phosphorus	0.005 mg/L to 0.009 mg/L	
		Nitrogen to Phosphorus Ratio	51:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and fecal coliform.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

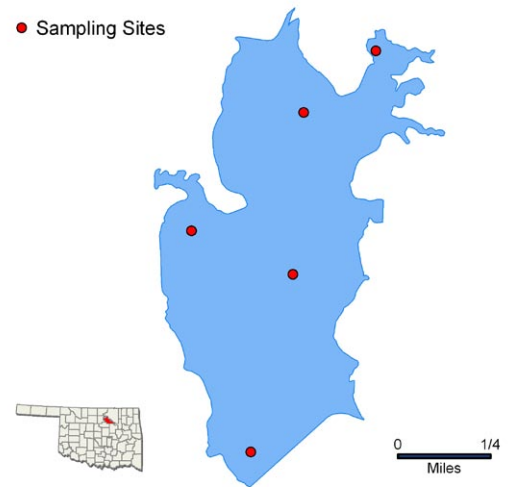
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Pawnee

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Pawnee County
	Impoundment	1932
	Area	257 acres
	Capacity	3,855 acre-feet
	Purposes	Water Supply, Recreation

Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		22 NTU	30% of values > OWQS of 25 NTU
	Average True Color		66 units	50% of values > OWQS of 70
	Average Secchi Disk Depth		44 cm	
	Water Clarity Rating		average	
	Trophic State Index		59	
	Trophic Class		eutrophic	
	Profile	Salinity	0.09– 0.16 ppt	
		Specific Conductivity	205.9 – 331 µS/cm	
		pH	7.25 – 8.69 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	73 to 506 mV	
	Nutrients	Dissolved Oxygen	Up to 38% of water column < 2 mg/L in August	Occurred at sites 1 & 2
		Surface Total Nitrogen	0.80 mg/L to 1.25 mg/L	
		Surface Total Phosphorus	0.023 mg/L to 0.060 mg/L	
	Nitrogen to Phosphorus Ratio		24:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes Available flow and rainfall data suggest that the peak in turbidity and color, which occurred in May is likely due to seasonal storm events, therefore Pawnee Lake will be listed as supporting its Fish & Wildlife Propagation (FWP) and Aesthetics beneficial uses.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

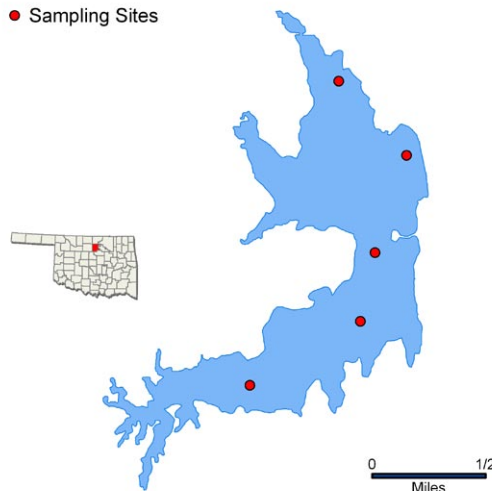
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Perry

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Noble County
	Impoundment	1937
	Area	614 acres
	Capacity	6,892 acre-feet
	Purposes	Water Supply, Recreation and Flood Control

Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	75 NTU	100% of values > OWQS of 25 NTU
		Average True Color	143 units	50% of values > OWQS of 70
		Average Secchi Disk Depth	22 cm	
		Water Clarity Rating	poor	
		Trophic State Index	48	
		Trophic Class	mesotrophic	
		Profile	Salinity	0.08– 0.21 ppt
	Specific Conductivity		181.9 – 415 μS/cm	
	pH		6.90 – 8.19 pH units	Neutral to slightly alkaline
	Oxidation-Reduction Potential		339 to 435mV	
	Dissolved Oxygen		Up to 36% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.50 mg/L to 1.35 mg/L	
Surface Total Phosphorus		0.027 mg/L to 0.253 mg/L		
Nitrogen to Phosphorus Ratio		9:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	NS	S	S	S						
	Aesthetics					S	NS				
	Agriculture							S			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>		Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

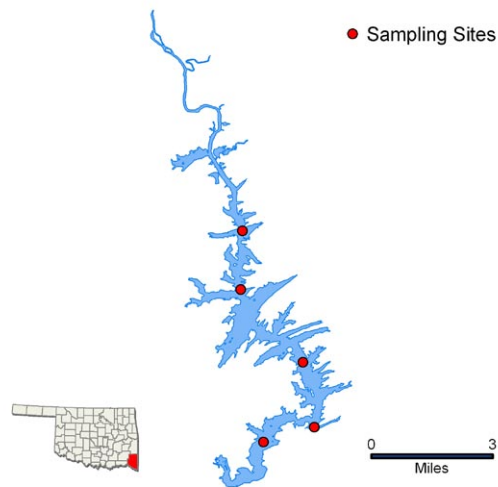
ppt = parts per thousand
 En = *Enterococci*

Pine Creek

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	5

Lake Data

Location	McCurtain County
Impoundment	1969
Area	3,750 acres
Capacity	53,750 acre feet
Purposes	Water Supply, Flood Control, Water quality Control, Fish and Wildlife, and Recreation



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	10 NTU	All values < 25 NTU
Average True Color	51 units	30% of values > OWQS of 70
Average Secchi Disk Depth	83 cm	
Water Clarity Rating	good	
Trophic State Index	53	Previous value = 54
Trophic Class	eutrophic	
Salinity	0.0 – 0.01 ppt	
Specific Conductivity	35 – 106 µS/cm	
pH	5.88 – 8.70 pH units	87 (44%) of values < 6.5
Oxidation-Reduction Potential	75 to 600 mV	
Dissolved Oxygen	Up to 56% of water column < 2 mg/L in August	Occurred at site 1
Surface Total Nitrogen	0.36 mg/L to 0.75 mg/L	
Surface Total Phosphorus	0.014 mg/L to 0.040 mg/L	
Nitrogen to Phosphorus Ratio	19:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En. cal. coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	NS	NS	S					
Aesthetics					S	NS			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Slightly acidic conditions are common in this part of the state, due to relatively low soil pH and lack of soluble bedrock. Due to these conditions it is likely that the low pH values may be due to natural causes; therefore the Water Board is looking at the applicability of developing site-specific criteria for waters in the southeastern portion of the state.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

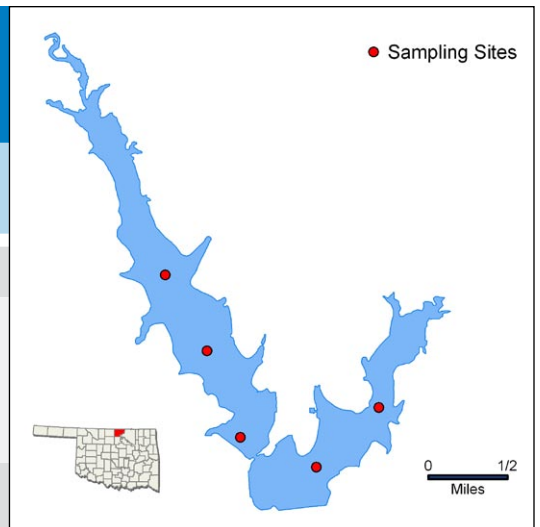
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Ponca

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	5

Lake Data	Location	Kay County
	Impoundment	1935
	Area	805 acres
	Capacity	14,440 acre feet
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments	
	Average Turbidity		12 NTU	All values < 25 NTU	
	Average True Color		46 units	10% of values > OWQS of 70	
	Average Secchi Disk Depth		74 cm		
	Water Clarity Rating		good		
	Trophic State Index		48	Previous value = 52	
	Trophic Class		mesotrophic		
	Profile	Salinity		0.0 – 0.20 ppt	
		Specific Conductivity		112 – 362 µS/cm	
		pH		6.78 – 8.65 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential		-51 to 543 mV	
		Dissolved Oxygen		57 - 63% of water column < 2 mg/L in August	Occurred at sites 1, 4 & 5
	Nutrients	Surface Total Nitrogen		0.51 mg/L to 1.17 mg/L	
		Surface Total Phosphorus		0.024 mg/L to 0.057 mg/L	
Nitrogen to Phosphorus Ratio		25:1	Phosphorus limited		

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					S	NS				
	Agriculture							S			
	Primary Body Contact Recreation									NEI	
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes	The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

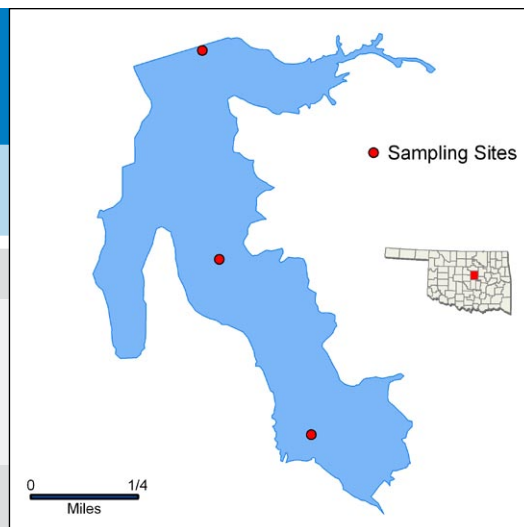
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Prague City

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	3

Lake Data	Location	Lincoln County
	Impoundment	1984
	Area	225 acres
	Capacity	2,415 acre feet
	Purposes	Water Supply, Flood Control and Recreation



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	14 NTU	All values < 25 NTU
		Average True Color	55 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	78 cm	
		Water Clarity Rating	good	
		Trophic State Index	51	Previous value = 45
		Trophic Class	eutrophic	
	Profile	Salinity	0.09 – 0.20 ppt	
		Specific Conductivity	201 – 403.6 µS/cm	
		pH	7.18 – 8.37 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	77 to 457 mV	
		Dissolved Oxygen	Up to 50% of water column < 2 mg/L in July	Occurred at site 1
	Nutrients	Surface Total Nitrogen	0.61 mg/L to 0.76 mg/L	
		Surface Total Phosphorus	0.021 mg/L to 0.036 mg/L	
		Nitrogen to Phosphorus Ratio	25:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, e.coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

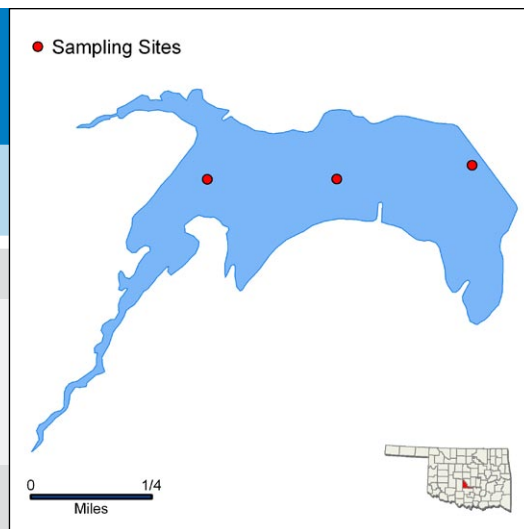
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Purcell

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	3

Lake Data	Location	McClain County
	Impoundment	1930
	Area	150 acres
	Capacity	2,600 acre feet
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		14 NTU	All values < 25 NTU
	Average True Color		25 units	All values < OWQS of 70
	Average Secchi Disk Depth		57 cm	
	Water Clarity Rating		good	
	Trophic State Index		51	Previous value = 50
	Trophic Class		eutrophic	
	Profile	Salinity	0.19 – 0.23 ppt	
		Specific Conductivity	374 – 462.8 μ S/cm	
		pH	7.17 – 8.37 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	18 to 645 mV	
		Dissolved Oxygen	Up to 50% of water column < 2 mg/L in August	Occurred at site 1 & 2
	Nutrients	Surface Total Nitrogen	0.60 mg/L to 0.83 mg/L	
		Surface Total Phosphorus	0.018 mg/L to 0.041 mg/L	
		Nitrogen to Phosphorus Ratio	24:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and fecal coliform.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

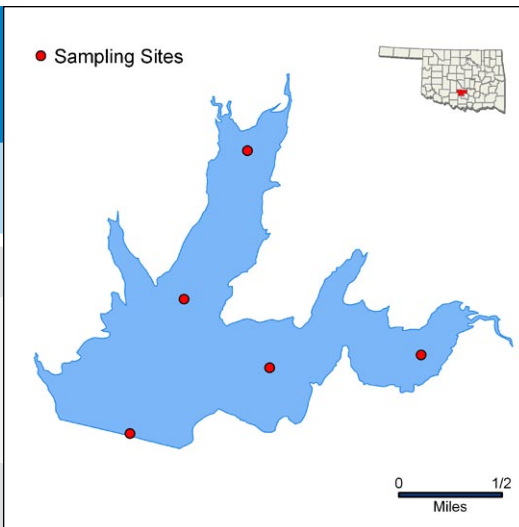
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

R.C. Longmire

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	5

Lake Data	Location	Garvin County
	Impoundment	1989
	Area	918 acres
	Capacity	N/A
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments	
	Average Turbidity		12 NTU	All values < 25 NTU	
	Average True Color		29 units	All values < OWQS of 70	
	Average Secchi Disk Depth		67 cm		
	Water Clarity Rating		good		
	Trophic State Index		57	Previous value = 56	
	Trophic Class		eutrophic		
	Profile	Salinity		0.10 – 0.20 ppt	
		Specific Conductivity		267 – 388 µS/cm	
		pH		6.9 – 8.61 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential		65 to 545 mV	
		Dissolved Oxygen		Up to 58% of water column < 2 mg/L in August	Occurred at site 1
	Nutrients	Surface Total Nitrogen		0.56 mg/L to 0.89 mg/L	
		Surface Total Phosphorus		0.021 mg/L to 0.047 mg/L	
Nitrogen to Phosphorus Ratio		24:1	Phosphorus limited		

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S						
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply				S					
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Raymond Gary

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	5

Lake Data	Location	Choctaw County
	Impoundment	1956
	Area	263 acres
	Capacity	1,681 acre feet
	Purposes	Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	11 NTU	All values < 25 NTU
		Average True Color	53 units	32% of values > OWQS of 70
		Average Secchi Disk Depth	67 cm	
		Water Clarity Rating	good	
		Trophic State Index	55	Previous value = 50
		Trophic Class	eutrophic	
		Salinity	0.0 – 0.60 ppt	
	Nutrients	Specific Conductivity	64.4 – 1217 µS/cm	
		pH	6.64 – 7.53 pH units	Neutral
		Oxidation-Reduction Potential	38 to 513 mV	
		Dissolved Oxygen	Up to 50% of water column < 2 mg/L in August	Occurred at site 1
		Surface Total Nitrogen	0.23 mg/L to 0.62 mg/L	
		Surface Total Phosphorus	0.027 mg/L to 0.059 mg/L	
Nitrogen to Phosphorus Ratio		12:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En. ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes	The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and fecal coliform.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

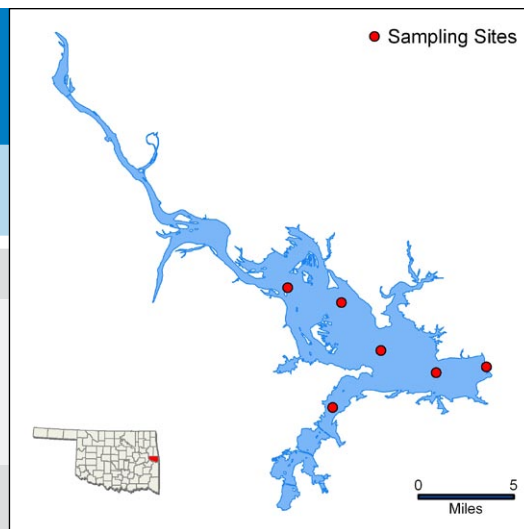
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Robert S. Kerr

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	6

Lake Data	Location	Sequoyah County
	Impoundment	1970
	Area	43,800 acres
	Capacity	525,700 acre feet
	Purposes	Navigation, Hydropower, and Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	78 NTU	88% of values > 25 NTU
		Average True Color	137 units	All values > OWQS of 70
		Average Secchi Disk Depth	26 cm	
		Water Clarity Rating	poor	
		Trophic State Index	50	Previous value = 58
		Trophic Class	eutrophic	
		Salinity	0.02 – 0.60 ppt	
	Nutrients	Specific Conductivity	57.6 – 1148 µS/cm	
		pH	6.98 – 8.43 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	272 to 526 mV	
		Dissolved Oxygen		Never below 6.0 mg/L
		Surface Total Nitrogen	0.70 mg/L to 1.72 mg/L	
Surface Total Phosphorus		0.065 mg/L to 0.210 mg/L		
	Nitrogen to Phosphorus Ratio	8:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes	The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and fecal coliform.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

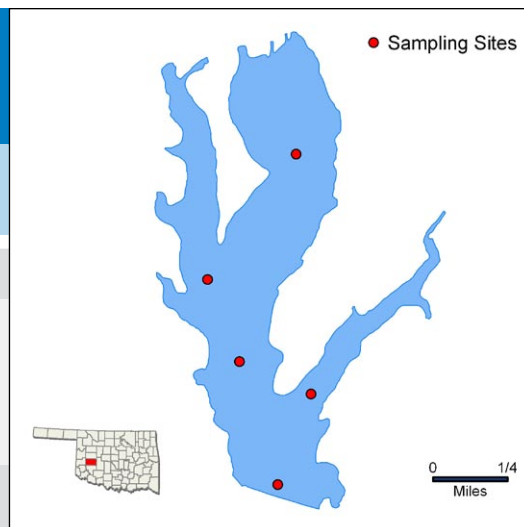
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Rocky

Sample Period	Times Visited	Sampling Sites
November 2006 - July 2007	4	5

Lake Data	Location	Washita County
	Impoundment	1933
	Area	347 acres
	Capacity	4,210 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	46 NTU	90% of values > OWQS of 25 NTU
		Average True Color	46 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	27 cm	
		Water Clarity Rating	poor	
		Trophic State Index	69	
		Trophic Class	hypereutrophic	
		Salinity	0.24– 0.34 ppt	
		Specific Conductivity	471.5 – 652.6 µS/cm	
		pH	7.77 – 8.67 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	264 to 430 mV	
	Nutrients	Dissolved Oxygen	Up to 25% of water column < 2 mg/L in July	
		Surface Total Nitrogen	1.23 mg/L to 1.81 mg/L	
		Surface Total Phosphorus	0.074 mg/L to 0.181 mg/L	
		Nitrogen to Phosphorus Ratio	12:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					NS*	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI**
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes *The lake is currently listed in the Oklahoma Water Quality Standards (WQS) as a Nutrient Limited Watershed (NLW). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status. **The PBCR beneficial use cannot be determined as minimum data requirements were not met due to quality control issues for E. coli and Fecal Coliform.								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

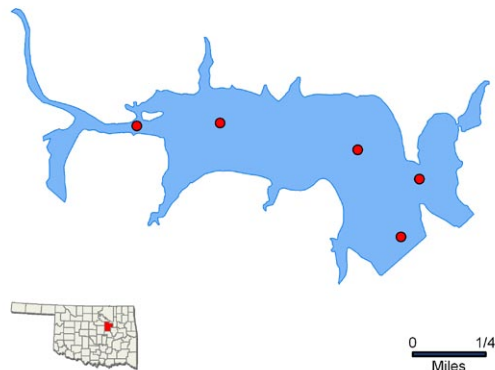
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Sahoma

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	5

Lake Data

Location	Creek County
Impoundment	1947
Area	312 acres
Capacity	4,850 acre-feet
Purposes	Water Supply, Recreation

Parameters

Parameter	Result	Notes/Comments
Average Turbidity	9 NTU	100% of values < OWQS of 25 NTU
Average True Color	30 units	100% of values < OWQS of 70
Average Secchi Disk Depth	73 cm	
Water Clarity Rating	Fair	
Trophic State Index	51	
Trophic Class	eutrophic	
Salinity	0.08 – 0.09 ppt	
Specific Conductivity	184.1 – 203.1 μ S/cm	
pH	7.02– 7.80 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	125 to 451 mV	
Dissolved Oxygen	Up to 69% of water column < 2 mg/L in May	Occurred at site 1, the dam
Surface Total Nitrogen	0.58 mg/L to 0.74 mg/L	
Surface Total Phosphorus	0.023 mg/L to 0.039 mg/L	
Nitrogen to Phosphorus Ratio	22:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S					
Aesthetics					S	S			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = Escherichia coli

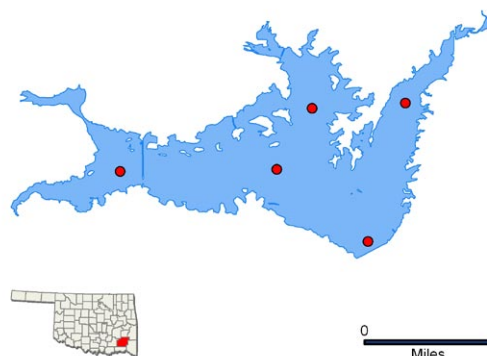
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Sardis

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
December 2007 – August 2008	4	5

Lake Data	Location	Pushmataha County
	Impoundment	1970
	Area	13,610 acres
	Capacity	274,330 acre feet
	Purposes	Flood Control, Water Supply, Fish and Wildlife, and Recreation

Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	15 NTU	30% of values > 25 NTU
		Average True Color	62 units	30% of values > OWQS of 70
		Average Secchi Disk Depth	72 cm	
		Water Clarity Rating	average	
		Trophic State Index	46	Previous value = 50
		Trophic Class	mesotrophic	
		Salinity	0.0 – 0.02 ppt	
	Nutrients	Specific Conductivity	47 – 81 µS/cm	
		pH	6.58 – 7.74 pH units	Neutral
		Oxidation-Reduction Potential	29 to 574 mV	
		Dissolved Oxygen	Up to 42% of water column < 2 mg/L in August	Occurred at site 1
		Surface Total Nitrogen	0.24 mg/L to 0.56 mg/L	
		Surface Total Phosphorus	0.013 mg/L to 0.045 mg/L	
Nitrogen to Phosphorus Ratio		16:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Available rainfall data suggest that the peak in turbidity and true color, which occurred in May is likely due to seasonal storm events, therefore Sardis Lake will be listed as supporting its Fish & Wildlife Propagation (FWP) and Aesthetics beneficial use for these parameters.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

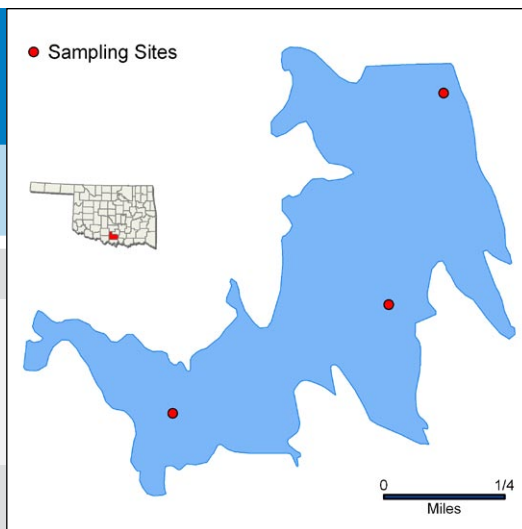
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Scott King (Rock Creek)

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	3

Lake Data	Location	Carter County
	Impoundment	1979
	Area	248 acres
	Capacity	3,588 acre-feet
	Purposes	Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	13 NTU	100% of values < OWQS of 25 NTU
		Average True Color	26 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	85 cm	
		Water Clarity Rating	good	
		Trophic State Index	48	
		Trophic Class	mesotrophic	
		Salinity	0.12– 0.16 ppt	
		Specific Conductivity	250.7 – 333 µS/cm	
		pH	7.20 – 8.71 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	97 to 519 mV	
	Dissolved Oxygen	Up to 60% of water column < 2 mg/L in July	Occurred at site 1, the dam	
	Nutrients	Surface Total Nitrogen	0.44 mg/L to 0.96 mg/L	
		Surface Total Phosphorus	0.011 mg/L to 0.032 mg/L	
		Nitrogen to Phosphorus Ratio	33:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					S	S				
	Agriculture							S			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes									

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

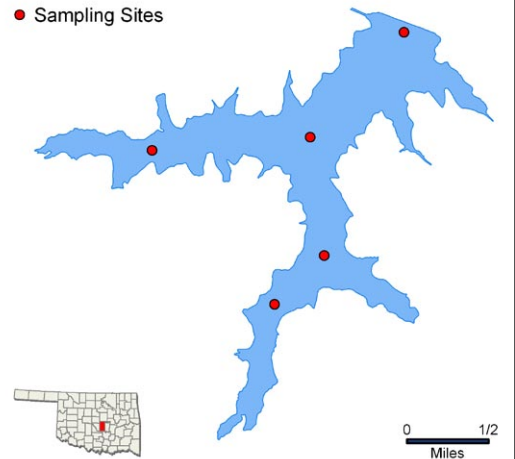
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Shawnee Twin No. 1

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	5

Lake Data	Location	Pottawatomie County
	Impoundment	1935
	Area	1,336 acres
	Capacity	22,600 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	15 NTU	9% of values > OWQS of 25 NTU	
	Average True Color	29 units	7% of values > OWQS of 70	
	Average Secchi Disk Depth	67 cm		
	Water Clarity Rating	good		
	Trophic State Index	41		
	Trophic Class	mesotrophic		
	Profile	Salinity	0.08 – 0.22 ppt	
		Specific Conductivity	82 – 433.5 μS/cm	
		pH	7.08 – 9.85 pH units	Only 0.34% of values > 9.0 pH units
		Oxidation-Reduction Potential	43 to 523 mV	
		Dissolved Oxygen	Up to 67% of water column < 2 mg/L in summer	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.06 mg/L to 2.33 mg/L	
Surface Total Phosphorus		0.003 mg/L to 0.078 mg/L		
Nitrogen to Phosphorus Ratio		22:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Shawnee Twin No. 2

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	5

Lake Data	Location	Pottawatomie County
	Impoundment	1960
	Area	1,100 acres
	Capacity	11,400 acre feet
	Purposes	Water Supply and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		8 NTU	All values < 25 NTU
	Average True Color		35 units	5% of values > OWQS of 70
	Average Secchi Disk Depth		89 cm	
	Water Clarity Rating		good	
	Trophic State Index		43	Previous value = 42
	Trophic Class		mesotrophic	
	Profile	Salinity	0.01 – 0.11 ppt	
		Specific Conductivity	52.8 – 242.3 µS/cm	
		pH	7.03 – 8.23 pH units	Neutral
		Oxidation-Reduction Potential	40 to 625 mV	
		Dissolved Oxygen	Up to 58% of water column < 2 mg/L in July	Occurred at site 1
	Nutrients	Surface Total Nitrogen	0.45 mg/L to 1.02 mg/L	
		Surface Total Phosphorus	0.010 mg/L to 0.027 mg/L	
		Nitrogen to Phosphorus Ratio	39:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

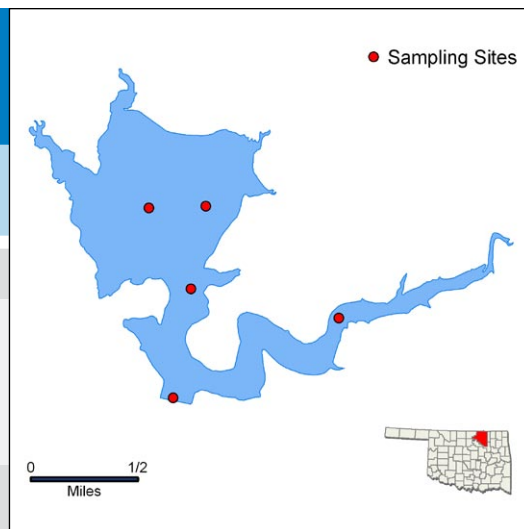
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Shell

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	5

Lake Data	Location	Osage County
	Impoundment	1922
	Area	573 acres
	Capacity	9,500 acre-feet
	Purposes	Water Supply, Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		9 NTU	100% of values < OWQS of 25 NTU
	Average True Color		21 units	100% of values < OWQS of 70
	Average Secchi Disk Depth		83 cm	
	Water Clarity Rating		excellent	
	Trophic State Index		53	
	Trophic Class		eutrophic	
	Profile	Salinity	0.08 – 0.20 ppt	
		Specific Conductivity	172.2 – 280.5 μ S/cm	
		pH	6.74 – 8.52 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	327 to 496 mV	
	Nutrients	Dissolved Oxygen	Up to 67% of water column < 2 mg/L in May	Occurred at site 1, the dam
		Surface Total Nitrogen	0.55 mg/L to 0.96 mg/L	
		Surface Total Phosphorus	0.019 mg/L to 0.027 mg/L	
	Nitrogen to Phosphorus Ratio		35:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

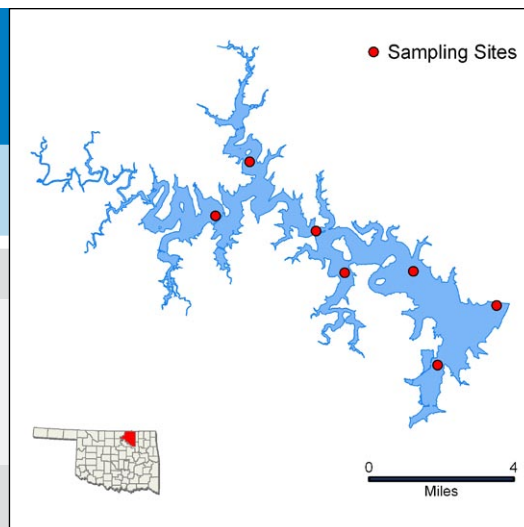
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Skiatook

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	7

Lake Data	Location	Osage County
	Impoundment	1984
	Area	10,190 acres
	Capacity	322,700 acre-feet
	Purposes	Flood Control, Water Supply, Water Quality Control, Recreation and Fish & Wildlife



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	13 NTU	7% of values > OWQS of 25 NTU
		Average True Color	34 units	10% of values > OWQS of 70
		Average Secchi Disk Depth	98 cm	
		Water Clarity Rating	good	
		Trophic State Index	47	
		Trophic Class	mesotrophic	
		Salinity	0.07– 0.15 ppt	
		Specific Conductivity	7.5 – 305.5 μ S/cm	
		pH	6.80 – 8.05 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	38 to 395 mV	
	Dissolved Oxygen	Up to 59% of water column < 2 mg/L in August	Occurred at site 3	
	Nutrients	Surface Total Nitrogen	0.35 mg/L to 1.02 mg/L	
		Surface Total Phosphorus	0.006 mg/L to 0.054 mg/L	
Nitrogen to Phosphorus Ratio		29:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

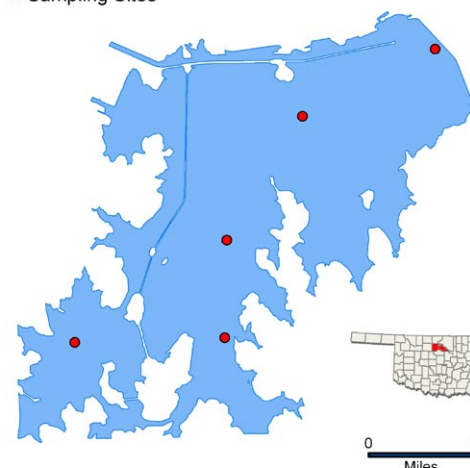
Sooner

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data

Location	Pawnee County
Impoundment	1972
Area	5,400 acres
Capacity	149,000 acre-feet
Purposes	Cooling Water

● Sampling Sites



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	6 NTU	100% of values < OWQS of 25 NTU
Average True Color	20 units	100% of values < OWQS of 70
Average Secchi Disk Depth	115 cm	
Water Clarity Rating	excellent	
Trophic State Index	46	
Trophic Class	mesotrophic	
Salinity	0.54 – 1.10 ppt	
Specific Conductivity	1039 – 2066 µS/cm	
pH	7.21 – 8.46 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	269 to 485 mV	
Dissolved Oxygen	Up to 52% of water column < 2 mg/L in August	Occurred at sites 1 and 4
Surface Total Nitrogen	0.46 mg/L to 0.69 mg/L	
Surface Total Phosphorus	0.007 mg/L to 0.027 mg/L	
Nitrogen to Phosphorus Ratio	38:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S					
Aesthetics					S	S			
Agriculture							NS*		
Primary Body Contact Recreation								NEI**	
Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes * Approximately 70% of the Sulfate values were above the standard, the AG use is therefore considered not supported. ** Due to minimum data requirements not being met, an assessment of the PBCR beneficial use cannot be made for sample year 2006-2007.								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

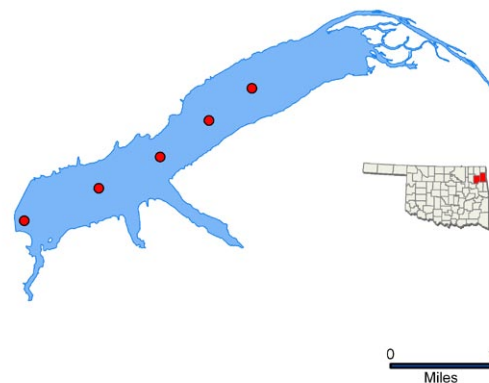
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Spavinaw

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Mayes County
	Impoundment	1924
	Area	1,584 acres
	Capacity	38,000 acre-feet
	Purposes	Water Supply, Recreation, Fish & Wildlife

Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		6 NTU	100% of values < OWQS of 25 NTU
	Average True Color		15 units	100% of values < OWQS of 70
	Average Secchi Disk Depth		131 cm	
	Water Clarity Rating		excellent	
	Trophic State Index		53	
	Trophic Class		eutrophic	
	Profile	Salinity	0.07 – 0.16 ppt	
		Specific Conductivity	167.9 – 331.2 μ S/cm	
		pH	7.22 – 8.89 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	58 to 485 mV	
		Dissolved Oxygen	Up to 67% of water column < 2 mg/L in August	Occurred at sites 1, the dam
	Nutrients	Surface Total Nitrogen	0.44 mg/L to 1.24 mg/L	
		Surface Total Phosphorus	0.009 mg/L to 0.038 mg/L	
		Nitrogen to Phosphorus Ratio	33:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					NS*	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes	*The lake is currently listed as a Nutrient Limited Watershed (NLW) in the Oklahoma Water Quality Standards (WQS) and is considered nutrient threatened.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

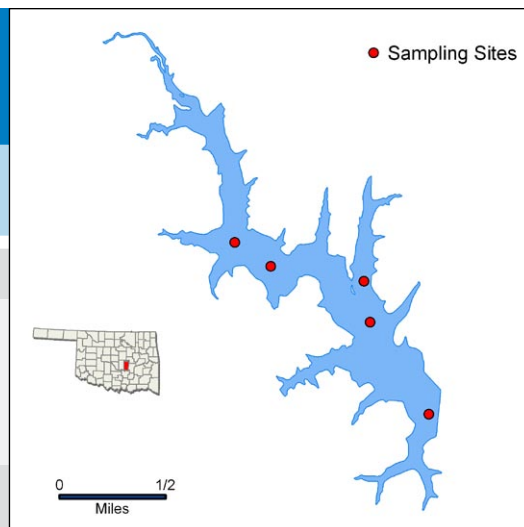
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Sportsman

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	5

Lake Data	Location	Seminole County
	Impoundment	1958
	Area	354 acres
	Capacity	5,349 acre feet
	Purposes	Waters Supply and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		23 NTU	25% of values > 25 NTU
	Average True Color		82 units	25% of values > OWQS of 70
	Average Secchi Disk Depth		76 cm	
	Water Clarity Rating		average	
	Trophic State Index		43	Previous value = 40
	Trophic Class		mesotrophic	
	Profile	Salinity	0.06 – 0.12 ppt	
		Specific Conductivity	148.3 – 251.2 µS/cm	
		pH	6.6 – 7.93 pH units	Neutral
		Oxidation-Reduction Potential	37 to 504 mV	
		Dissolved Oxygen	Up to 60% of water column < 2 mg/L in July	Occurred at site 1
	Nutrients	Surface Total Nitrogen	0.43 mg/L to 0.71 mg/L	
		Surface Total Phosphorus	0.010 mg/L to 0.062 mg/L	
Nitrogen to Phosphorus Ratio		23:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					S	S				
	Agriculture							S			
	Primary Body Contact Recreation									NEI	
	Public & Private Water Supply										
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information	Notes	Precipitation data suggest that the peaks in turbidity and true color, which occurred in May are likely due to seasonal storm events, therefore Sportsman Lake will be listed as supporting its Fish & Wildlife Propagation (FWP) and Aesthetics beneficial use for these parameters. The PBCR cannot be assessed due to QA/QC issues for fecal coliform and enterococci.								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

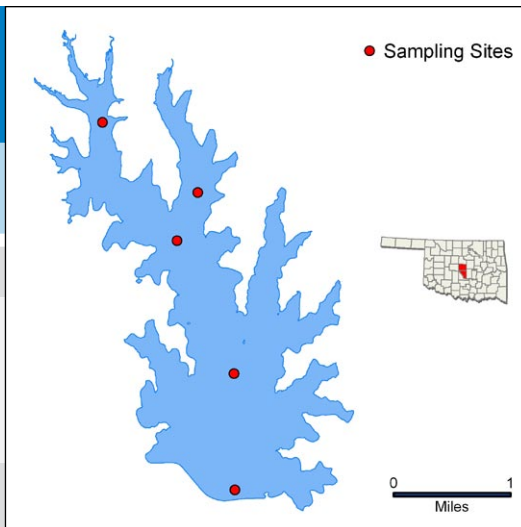
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Stanley Draper

Sample Period	Times Visited	Sampling Sites
November 2005 – August 2006	4	5

Lake Data	Location	Cleveland County
	Impoundment	1962
	Area	2,900 acres
	Capacity	100,000 acre-feet
	Purposes	Water Supply, Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	7 NTU	100% of values < OWQS of 25 NTU
		Average True Color	28 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	133 cm	
		Water Clarity Rating	good	
		Trophic State Index	40	
		Trophic Class	oligotrophic	
		Salinity	0.03 – 0.09 ppt	
	Nutrients	Specific Conductivity	95 – 191.5 μS/cm	
		pH	6.90 – 8.18 pH units	
		Oxidation-Reduction Potential	356 to 445 mV	
		Dissolved Oxygen	Up to 52% of water column < 2 mg/L in August	Occurred at site 1, the dam
		Surface Total Nitrogen	0.16 mg/L to 0.33 mg/L	
		Surface Total Phosphorus	0.010 mg/L to 0.015 mg/L	
Nitrogen to Phosphorus Ratio		20:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					S	S				
	Agriculture							S			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

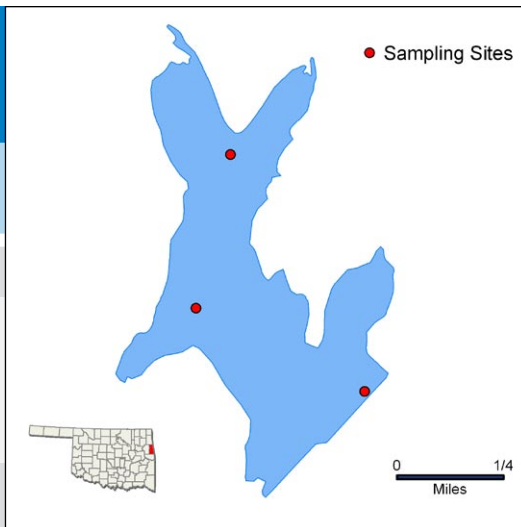
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Stilwell City

Sample Period	Times Visited	Sampling Sites
October 2005 – August 2006	3	3

Lake Data	Location	Adair County
	Impoundment	1965
	Area	188 acres
	Capacity	3,110 acre-feet
	Purposes	Water Supply, Recreation, Flood Control



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	6 NTU	100% of values < OWQS of 25 NTU
		Average True Color	14 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	161 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	54	
		Trophic Class	eutrophic	
		Salinity	0.07 – 0.14 ppt	
		Specific Conductivity	159.1 – 297.2 μS/cm	
		pH	6.87 – 8.53 pH units	
		Oxidation-Reduction Potential	88 to 452 mV	
	Dissolved Oxygen	Up to 64% of water column < 2 mg/L in August	Occurred at site 1, the dam	
	Nutrients	Surface Total Nitrogen	0.32 mg/L to 0.88 mg/L	
		Surface Total Phosphorus	0.019 mg/L to 0.044 mg/L	
Nitrogen to Phosphorus Ratio		20:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<div>S = Fully Supporting</div> <div>NS = Not Supporting</div> <div>NEI = Not Enough Information</div>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

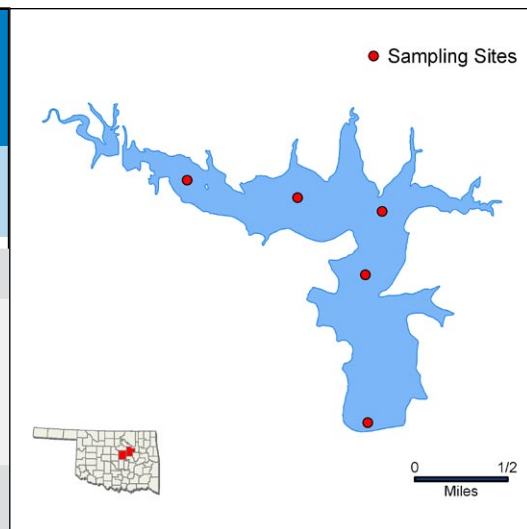
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Stroud

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	5

Lake Data	Location	Creek County
	Impoundment	1968
	Area	600 acres
	Capacity	8,800 acre-feet
	Purposes	Water Supply, Recreation, Flood Control



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	5 NTU	100% of values < OWQS of 25 NTU
		Average True Color	15 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	126 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	41	
		Trophic Class	mesotrophic	
	Nutrients	Salinity	0.08 – 0.10 ppt	
		Specific Conductivity	178.6 – 214.5 µS/cm	
		pH	7.03 – 8.90 pH units	
		Oxidation-Reduction Potential	155 to 500 mV	
		Dissolved Oxygen	Up to 60% of water column < 2 mg/L in July	Occurred at site 2
		Surface Total Nitrogen	0.10 mg/L to 0.41 mg/L	
		Surface Total Phosphorus	0.008 mg/L to 0.020 mg/L	
		Nitrogen to Phosphorus Ratio	22:1	Phosphorus limited

Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S				
	Aesthetics				S	S			
	Agriculture						NS*		
	Primary Body Contact Recreation							S	
	Public & Private Water Supply								
	<p><i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i></p> <p>Notes *Sampling in 2005-2006 found the Agriculture beneficial use not supported based on numerical criteria for sulfates located in OAC 785:45 – Appendix F.</p>								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

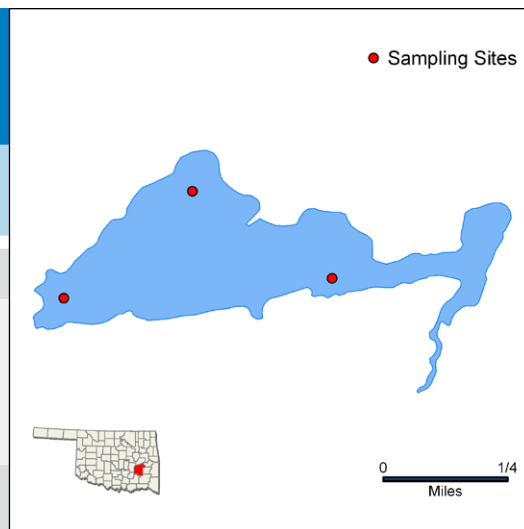
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Talawanda No. 1

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	3

Lake Data	Location	Pittsburg County
	Impoundment	1902
	Area	91 acres
	Capacity	12,000 acre feet
	Purposes	Waters Supply and Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	3 NTU	All values < 25 NTU
		Average True Color	28 units	All values < OWQS of 70
		Average Secchi Disk Depth	155 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	42	Previous value = 44
		Trophic Class	mesotrophic	
		Salinity	0.0 – 0.10 ppt	
		Specific Conductivity	82 – 192 µS/cm	
	Nutrients	pH	6.36 – 7.57 pH units	3 (4%) of values < 6.5
		Oxidation-Reduction Potential	13 to 513 mV	
		Dissolved Oxygen	Up to 60% of water column < 2 mg/L in August	Occurred at site 1
		Surface Total Nitrogen	0.43 mg/L to 1.50 mg/L	
		Surface Total Phosphorus	0.010 mg/L to 0.017 mg/L	
Nitrogen to Phosphorus Ratio		45:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					S	S				
	Agriculture							S			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

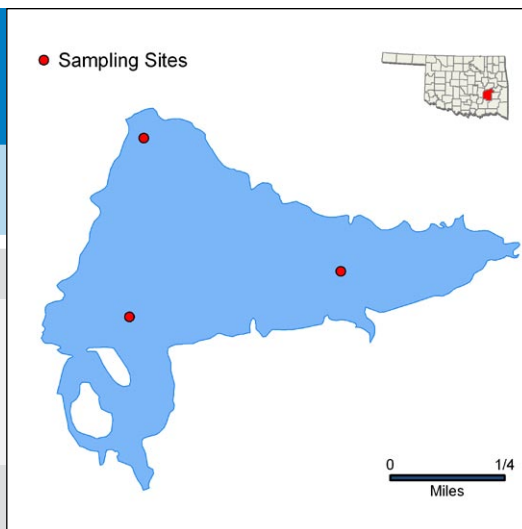
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Talawanda No. 2

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	3

Lake Data	Location	Pittsburg County
	Impoundment	1924
	Area	195 acres
	Capacity	2,750 acre feet
	Purposes	Waters Supply and Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	5 NTU	All values < 25 NTU
		Average True Color	22 units	All values < OWQS of 70
		Average Secchi Disk Depth	140 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	45	Previous value = 38
		Trophic Class	mesotrophic	
		Salinity	0.0 – 0.10 ppt	
		Specific Conductivity	100.6 – 145 µS/cm	
		pH	6.57 – 7.85 pH units	Neutral
	Oxidation-Reduction Potential	61 to 513 mV		
	Dissolved Oxygen	Up to 47% of water column < 2 mg/L in August	Occurred at site 1	
	Nutrients	Surface Total Nitrogen	0.19 mg/L to 0.42 mg/L	
		Surface Total Phosphorus	0.008 mg/L to 0.011 mg/L	
Nitrogen to Phosphorus Ratio		32:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 $\mu\text{S}/\text{cm}$ = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

mg/L = milligrams per liter
 $\mu\text{S}/\text{cm}$ = microsiemens/cm

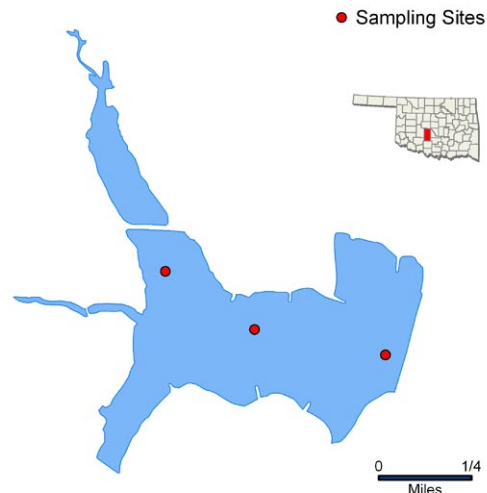
ppt = parts per thousand
 En = Enterococci

Taylor

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	3

Lake Data

Location	Grady County
Impoundment	1960
Area	227 acres
Capacity	1,877 acre feet
Purposes	Waters Supply, Flood Control, and Recreation



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	20 NTU	17% of values > 25 NTU
Average True Color	34 units	All values < OWQS of 70
Average Secchi Disk Depth	41 cm	
Water Clarity Rating	average	
Trophic State Index	64	Previous value = 63
Trophic Class	hypereutrophic	
Salinity	0.20 – 0.33 ppt	
Specific Conductivity	399.9 – 645 µS/cm	
pH	7.7 – 8.62 pH units	Neutral to slightly alkaline
Oxidation-Reduction Potential	381 to 460 mV	
Dissolved Oxygen		D.O. always > 5.0 mg/L
Surface Total Nitrogen	0.95 mg/L to 1.53 mg/L	
Surface Total Phosphorus	0.077 mg/L to 0.237 mg/L	
Nitrogen to Phosphorus Ratio	8:1	Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
Fish & Wildlife Propagation	NS	S	S	S					
Aesthetics					NS	S			
Agriculture							S		
Primary Body Contact Recreation								S	
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Currently, the lake listed as a Nutrient Limited Watershed (NLW) in the Oklahoma Water Quality Standards (WQS). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

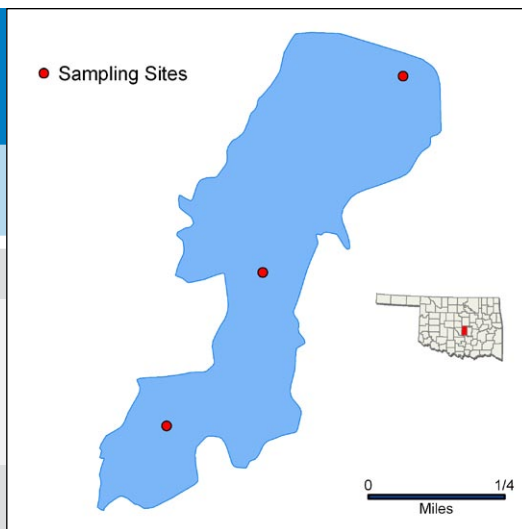
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Tecumseh

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	3

Lake Data	Location	Pottawatomie County
	Impoundment	1934
	Area	127 acres
	Capacity	1,118 acre feet
	Purposes	Waters Supply, and Recreation



Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	132 NTU	All values > 25 NTU
		Average True Color	244 units	All values > OWQS of 70
		Average Secchi Disk Depth	11 cm	
		Water Clarity Rating	poor	
		Trophic State Index	49	Previous value = 57
		Trophic Class	mesotrophic	
	Profile	Salinity	0.00 – 0.10 ppt	
		Specific Conductivity	105.6 – 141 µS/cm	
		pH	7.08 – 7.60 pH units	Neutral
		Oxidation-Reduction Potential	337 to 537 mV	
		Dissolved Oxygen		D.O. always > 5.0 mg/L
	Nutrients	Surface Total Nitrogen	1.01 mg/L to 1.55 mg/L	
		Surface Total Phosphorus	0.066 mg/L to 0.131 mg/L	
		Nitrogen to Phosphorus Ratio	12:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	NS	S	S	*						
	Aesthetics					S	NS				
	Agriculture							S			
	Primary Body Contact Recreation									NEI**	
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	*Not supporting for lead as chronic criteria was exceeded. All other toxicants are fully supporting.								
	**The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and enterococci.										

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

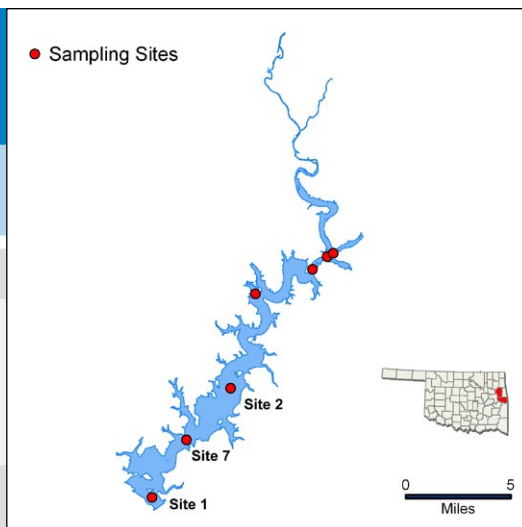
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Tenkiller (1,2,7)

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	7

Lake Data	Location	Sequoyah County
	Impoundment	1953
	Area	12,900 acres
	Capacity	654,100 acre-feet
	Purposes	Flood Control, Hydropower



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	2 NTU	100% of values < OWQS of 25 NTU
		Average True Color	11 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	217 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	48	
		Trophic Class	mesotrophic	
		Salinity	0.05 – 0.42 ppt	
	Nutrients	Specific Conductivity	135.3 – 806.2 µS/cm	
		pH	6.57 – 10.05 pH units	10% of recorded values > 9.0 pH units
		Oxidation-Reduction Potential	38 to 528 mV	
		Dissolved Oxygen	52 to 69% of water column < 2 mg/L in July	
		Surface Total Nitrogen	0.11 mg/L to 0.46 mg/L	
		Surface Total Phosphorus	0.009 mg/L to 0.022 mg/L	
		Nitrogen to Phosphorus Ratio	23:1	Phosphorus limited

Beneficial Uses										
		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S*	S	NS	S					
	Aesthetics					NS	S*			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes	*Although values were below 25 NTU an assessment of the FWP beneficial use cannot be made, as minimum data requirements are not being met. True color values were below the Aesthetics criteria 70 units however like turbidity there are not enough data for this segment to assess the Aesthetics beneficial use. The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

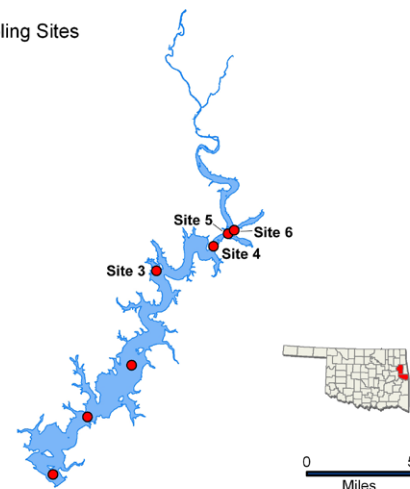
Tenkiller, Illinois River Arm (3-6)

Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	7

Lake Data

Location	Sequoyah County
Impoundment	1953
Area	12,900 acres
Capacity	654,100 acre-feet
Purposes	Flood Control, Hydropower

● Sampling Sites



Parameters

Parameter	Result	Notes/Comments
Average Turbidity	7 NTU	100% of values < OWQS of 25 NTU
Average True Color	13 units	100% of values < OWQS of 70
Average Secchi Disk Depth	106 cm	
Water Clarity Rating	excellent	
Trophic State Index	59	
Trophic Class	eutrophic	
Profile	Salinity	0.07 – 0.41 ppt
	Specific Conductivity	159.3 – 786.4 µS/cm
	pH	7.02 – 9.23 pH units 4% of recorded values > 9.0 pH units
	Oxidation-Reduction Potential	103 to 454 mV
	Dissolved Oxygen	50 to 60% of water column < 2 mg/L in July
Nutrients	Surface Total Nitrogen	0.19 mg/L to 0.85 mg/L
	Surface Total Phosphorus	0.015 mg/L to 0.085mg/L
	Nitrogen to Phosphorus Ratio	10:1 Phosphorus limited

Beneficial Uses

	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
Fish & Wildlife Propagation	S*	S	NS	S					
Aesthetics					NS	S*			
Agriculture							S		
Primary Body Contact Recreation									NEI
Public & Private Water Supply									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*Although values were below 25 NTU an assessment of the FWP beneficial use cannot be made, as minimum data requirements are not being met. True color values were below the Aesthetics criteria 70 units however like turbidity there are not enough data for this segment to assess the Aesthetics beneficial use. The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a

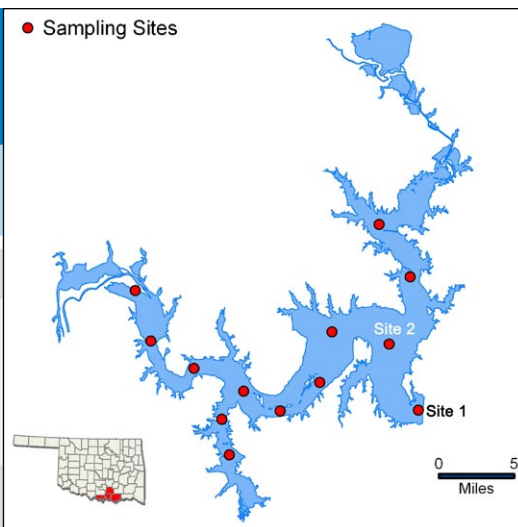
mg/L = milligrams per liter
µS/cm = microsiemens/cm

ppt = parts per thousand
En = Enterococci

Texoma (1-2)

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	13

Lake Data	Location	Bryan County
	Impoundment	1944
	Area	88,000 acres
	Capacity	2,643,000 acre-feet
	Purposes	Flood Control, Waters Supply, Hydropower, Low-flow Regulation, and Recreation



Parameters	Parameter		Result	Notes/Comments	
	Average Turbidity		5 NTU	All values < 25 NTU	
	Average True Color		19 units	All values < OWQS of 70	
	Average Secchi Disk Depth		130 cm		
	Water Clarity Rating		excellent		
	Trophic State Index		51	Previous value = 57	
	Trophic Class		mesotrophic		
	Profile	Salinity		0.46 – 0.70 ppt	
		Specific Conductivity		887.6 – 1301 µS/cm	
		pH		7.27 – 8.42 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential		28 to 581 mV	
		Dissolved Oxygen		Up to 63% of water column < 2 mg/L in July	Occurred at site 1
	Nutrients	Surface Total Nitrogen		0.53 mg/L to 0.86 mg/L	
		Surface Total Phosphorus		0.018 mg/L to 0.050 mg/L	
Nitrogen to Phosphorus Ratio		19:1	Phosphorus limited		

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, e.coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

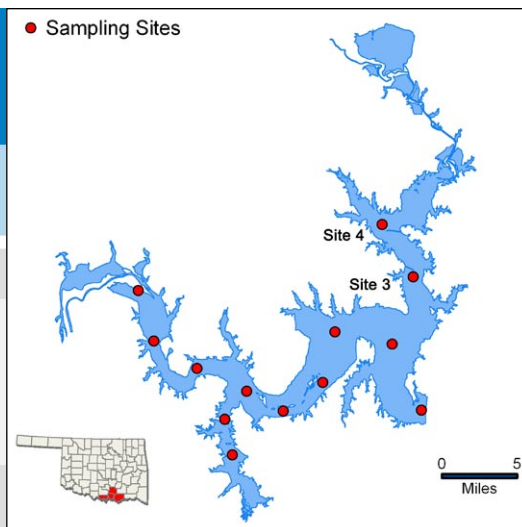
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Texoma Lower Washita River Arm (3-4)

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	13

Lake Data	Location	Bryan County
	Impoundment	1944
	Area	88,000 acres
	Capacity	2,643,000 acre-feet
	Purposes	Flood Control, Waters Supply, Hydropower, Low-flow Regulation, and Recreation



Parameters	Parameter	Result	Notes/Comments
	Average Turbidity	8 NTU	All values < 25 NTU
	Average True Color	22 units	All values < OWQS of 70
	Average Secchi Disk Depth	97 cm	
	Water Clarity Rating	excellent	
	Trophic State Index	52	Previous value = 57
	Trophic Class	eutrophic	
	Profile	Salinity	0.30 – 0.63 ppt
		Specific Conductivity	587.2 – 1204 μ S/cm
		pH	7.29 – 8.39 pH units Neutral to slightly alkaline
		Oxidation-Reduction Potential	-12 to 528 mV
		Dissolved Oxygen	Up to 38% of water column < 2 mg/L in July Occurred at site 3
	Nutrients	Surface Total Nitrogen	0.51 mg/L to 1.02 mg/L
		Surface Total Phosphorus	0.019 mg/L to 0.048 mg/L
		Nitrogen to Phosphorus Ratio	19:1 Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

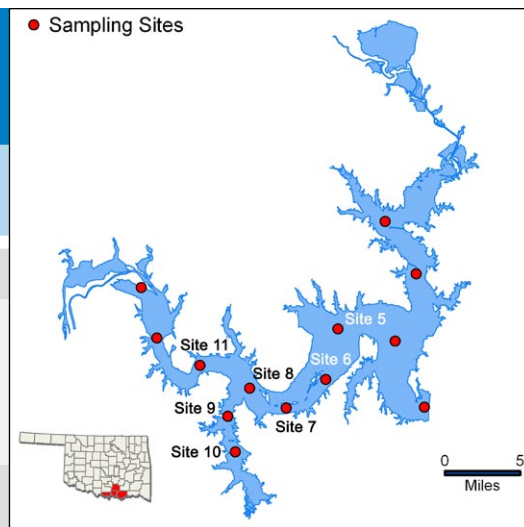
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Texoma Lower Red River Arm (5-11)

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	13

Lake Data	Location	Bryan County
	Impoundment	1944
	Area	88,000 acres
	Capacity	2,643,000 acre-feet
	Purposes	Flood Control, Waters Supply, Hydropower, Low-flow Regulation, and Recreation



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		12 NTU	7% of values > 25 NTU
	Average True Color		32 units	3.5% of values > OWQS of 70
	Average Secchi Disk Depth		71 cm	
	Water Clarity Rating		good	
	Trophic State Index		55	Previous value = 57
	Trophic Class		eutrophic	
	Profile	Salinity	0.50 – 1.70 ppt	
		Specific Conductivity	976 – 3055 μ S/cm	
		pH	7.13 – 8.75 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	-12 to 528 mV	
		Dissolved Oxygen	Up to 58% of water column < 2 mg/L in July	Occurred at site 7
	Nutrients	Surface Total Nitrogen	0.57 mg/L to 1.08 mg/L	
		Surface Total Phosphorus	0.020 mg/L to 0.086 mg/L	
		Nitrogen to Phosphorus Ratio	16:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		S	S	S	S	S			
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

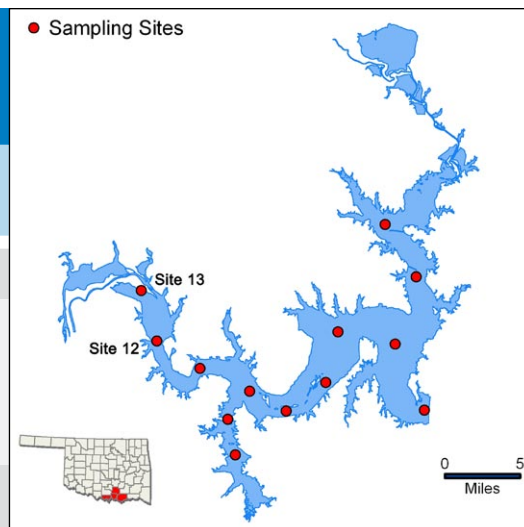
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Texoma Upper Red River Arm (12-13)

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	13

Lake Data	Location	Bryan County
	Impoundment	1944
	Area	88,000 acres
	Capacity	2,643,000 acre-feet
	Purposes	Flood Control, Waters Supply, Hydropower, Low-flow Regulation, and Recreation



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	59 NTU	50% of values > 25 NTU
		Average True Color	67 units	25% of values > OWQS of 70
		Average Secchi Disk Depth	33 cm	
		Water Clarity Rating	average	
		Trophic State Index	63	Previous value = 57
		Trophic Class	hypereutrophic	
	Nutrients	Salinity	0.70 – 1.70 ppt	
		Specific Conductivity	1364 – 3062 μ S/cm	
		pH	7.84 – 8.65 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	255 to 457 mV	
		Dissolved Oxygen		DO always > 3 mg/L
	Nutrients	Surface Total Nitrogen	0.77 mg/L to 1.28 mg/L	
		Surface Total Phosphorus	0.070 mg/L to 0.173 mg/L	
		Nitrogen to Phosphorus Ratio	10:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	NS		S	S	S					
	NS					NS	NS			
								S		
									S	
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes Not supporting for Aesthetics based on TSI greater than 62.								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

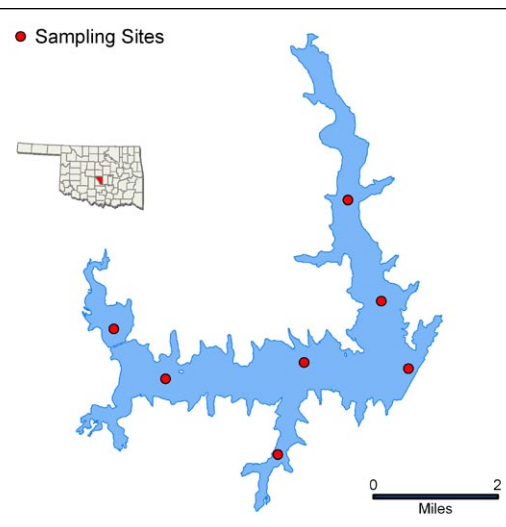
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Thunderbird

Sample Period	Times Visited	Sampling Sites
October 2006 - June 2007	4	7

Lake Data	Location	Cleveland County
	Impoundment	1965
	Area	6,070 acres
	Capacity	119,600 acre-feet
	Purposes	Flood Control, Water Supply, Recreation, Fish & Wildlife



Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		28 NTU	46% of values > OWQS of 25 NTU
	Average True Color		32 units	7% of values >OWQS of 70
	Average Secchi Disk Depth		53 cm	
	Water Clarity Rating		average	
	Trophic State Index		57	
	Trophic Class		eutrophic	
	Profile	Salinity	0.18 – 0.23 ppt	
		Specific Conductivity	367.5 – 460.9 μ S/cm	
		pH	7.28 – 8.57 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	95 to 447 mV	
	Nutrients	Dissolved Oxygen	Up to 47% of water column < 2 mg/L in June	Occurred at sites 1, the dam
		Surface Total Nitrogen	0.59 mg/L to 1.18 mg/L	
		Surface Total Phosphorus	0.023 mg/L to 0.429 mg/L	
	Nitrogen to Phosphorus Ratio		13:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E.coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					NS*	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes * The lake is listed in the Oklahoma Water Quality Standards (WQS) as a Nutrient Limited watershed (NLW). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status.								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

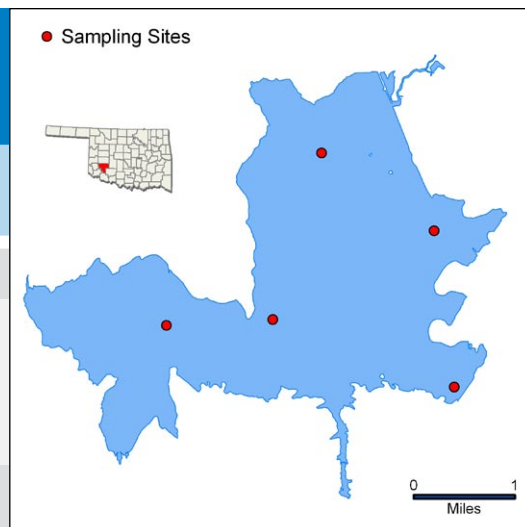
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Tom Steed

Sample Period	Times Visited	Sampling Sites
November 2006 - July 2007	4	5

Lake Data	Location	Kiowa County
	Impoundment	1975
	Area	6,400 acres
	Capacity	88,970 acre-feet
	Purposes	Flood Control, Water Supply, Recreation, Fish & Wildlife



Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	30 NTU	50% of values > OWQS of 25 NTU
		Average True Color	40 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	57 cm	
		Water Clarity Rating	average	
		Trophic State Index	55	
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.37 – 0.52ppt	
		Specific Conductivity	722.9 – 1001 µS/cm	
		pH	7.70 – 8.55 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	277 to 399 mV	
		Dissolved Oxygen	Up to 25% of water column < 2 mg/L in July	Occurred at sites 1, the dam
		Surface Total Nitrogen	0.59 mg/L to 1.04 mg/L	
		Surface Total Phosphorus	0.038 mg/L to 0.108 mg/L	
		Nitrogen to Phosphorus Ratio	12:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation		NS	S	S	S	S	S		
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>		Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

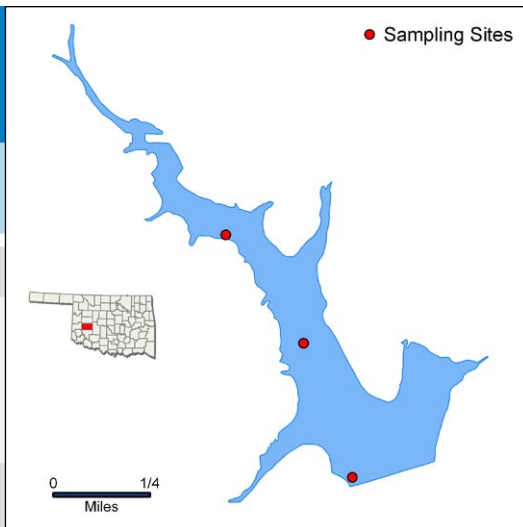
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Vanderwork

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	3

Lake Data	Location	Washita County
	Impoundment	1968
	Area	135 acres
	Capacity	1,578 acre feet
	Purposes	Recreation



Parameters	Parameter		Result	Notes/Comments	
	Average Turbidity		9 NTU	All values < 25 NTU	
	Average True Color		17 units	All values < OWQS of 70	
	Average Secchi Disk Depth		59 cm		
	Water Clarity Rating		good		
	Trophic State Index		64	Previous value = 60	
	Trophic Class		hypereutrophic		
	Profile	Salinity		0.83 - 1.01 ppt	
		Specific Conductivity		1568 – 1896 µS/cm	
		pH		7.2 – 8.18 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential		-116 to 530 mV	
		Dissolved Oxygen		Up to 50% of water column < 2 mg/L in June	Occurred at site 1
	Nutrients	Surface Total Nitrogen		0.87 mg/L to 1.75 mg/L	
		Surface Total Phosphorus		0.041 mg/L to 0.100 mg/L	
Nitrogen to Phosphorus Ratio		18:1	Phosphorus limited		

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En. ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					NS	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information	Notes The lake is listed as a Nutrient Limited Watershed (NLW) in the Oklahoma Water Quality Standards (WQS). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status.								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

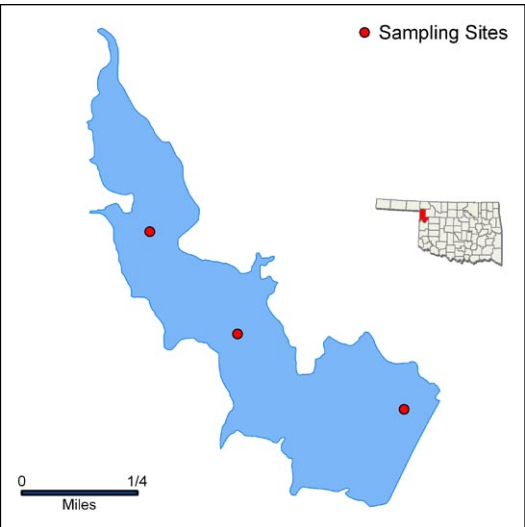
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Vincent

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	3	3

Lake Data	Location	Ellis County
	Impoundment	1961
	Area	160 acres
	Capacity	2,579 acre feet
	Purposes	Recreation



Parameters	Parameter		Result	Notes/Comments	
	Average Turbidity		14 NTU	All values < 25 NTU	
	Average True Color		36 units	All values < OWQS of 70	
	Average Secchi Disk Depth		68 cm		
	Water Clarity Rating		good		
	Trophic State Index		46	Previous value = 44	
	Trophic Class		mesotrophic		
	Profile	Salinity		0.40 – 0.42 ppt	
		Specific Conductivity		808.6 – 832 µS/cm	
		pH		7.32 – 8.38 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential		394 to 512 mV	
		Dissolved Oxygen			All values > 6 mg/L
	Nutrients	Surface Total Nitrogen		0.52 mg/L to 0.74 mg/L	
		Surface Total Phosphorus		0.018 mg/L to 0.023 mg/L	
		Nitrogen to Phosphorus Ratio		32:1	Phosphorus limited

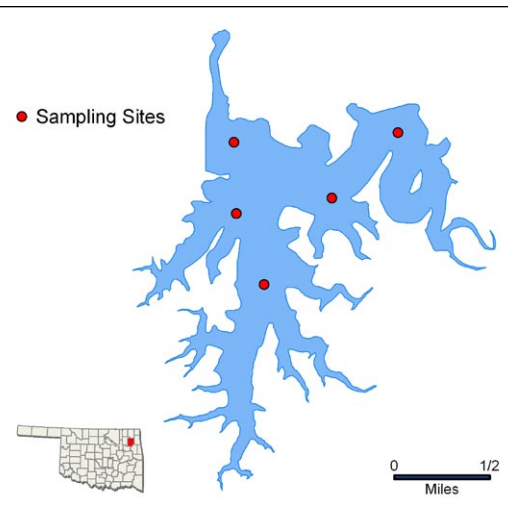
Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	The PBCR cannot be assessed as minimum data requirements were not met due to the lake being drained during the summer quarter.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli
 OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a
 mg/L = milligrams per liter
 µS/cm = microsiemens/cm
 ppt = parts per thousand
 En = Enterococci

W.R. Holway

Sample Period	Times Visited	Sampling Sites
November 2006 - August 2007	4	5

Lake Data	Location	Mayes County
	Impoundment	1968
	Area	712 acres
	Capacity	48,000 acre-feet
	Purposes	Water Supply, Hydropower, Recreation



Parameters		Parameter	Result	Notes/Comments
	Physical	Average Turbidity	4 NTU	100% of values < OWQS of 25 NTU
		Average True Color	24 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	161 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	58	
		Trophic Class	eutrophic	
	Chemical	Salinity	0.09 – 0.16 ppt	
		Specific Conductivity	190.1 – 322.2 µS/cm	
		pH	7.10 – 9.25 pH units	Only 8% of values > 9.0 pH units
		Oxidation-Reduction Potential	263 to 514 mV	
		Dissolved Oxygen	Up to 41% of water column < 2 mg/L in August	
	Nutrients	Surface Total Nitrogen	0.529 mg/L to 1.35 mg/L	
Surface Total Phosphorus		0.022 mg/L to 0.088 mg/L		
Nitrogen to Phosphorus Ratio		13:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

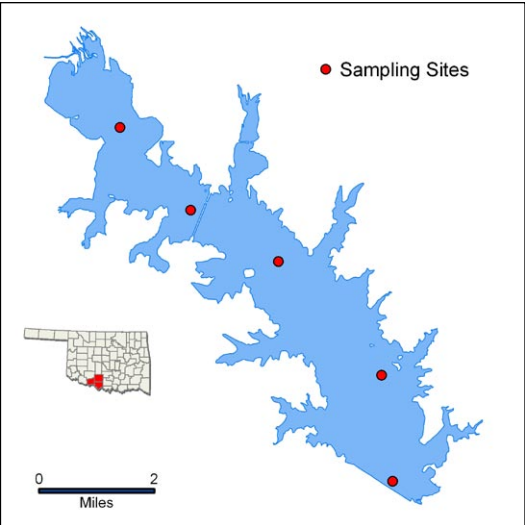
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Waurika

Sample Period	Times Visited	Sampling Sites
October 2007 – July 2008	4	5

Lake Data	Location	Jefferson County
	Impoundment	1977
	Area	10,100 acres
	Capacity	203,100 acre feet
	Purposes	Flood Control, Irrigation, Water Supply, Water Quality Control, Fish and Wildlife, and Recreation



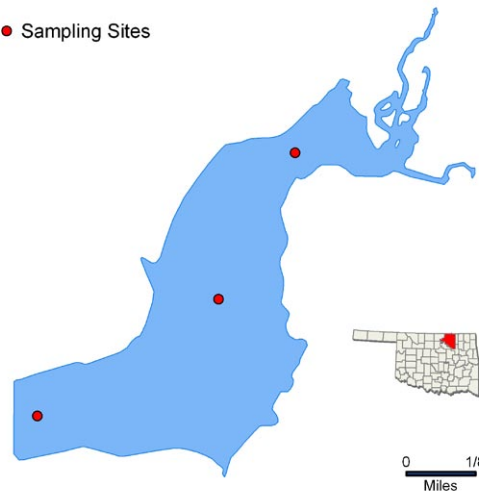
Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		34 NTU	45% of values > 25 NTU
	Average True Color		63 units	10% of values > OWQS of 70
	Average Secchi Disk Depth		51 cm	
	Water Clarity Rating		average	
	Trophic State Index		54	Previous value = 60
	Trophic Class		eutrophic	
	Profile	Salinity	0.19 – 0.35 ppt	
		Specific Conductivity	389.3 – 353 µS/cm	
		pH	7.57 – 8.59 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	228 to 507 mV	
		Dissolved Oxygen	Up to 27% of water column , 2 mg/L in July	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.53 mg/L to 1.09 mg/L	
		Surface Total Phosphorus	0.063 mg/L to 0.154 mg/L	
		Nitrogen to Phosphorus Ratio	8:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	NS	S	S	S						
	Aesthetics					S	NS				
	Agriculture							S			
	Primary Body Contact Recreation								S		
	Public & Private Water Supply										
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes								

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli
 OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a
 mg/L = milligrams per liter
 µS/cm = microsiemens/cm
 ppt = parts per thousand
 En = Enterococci

Waxhoma

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
October 2005 – July 2006	4	3

Lake Data	Location	Osage County
	Impoundment	1955
	Area	197 acres
	Capacity	2,100 acre-feet
	Purposes	Water Supply, Recreation

Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	5 NTU	100% of values < OWQS of 25 NTU
		Average True Color	18 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	153 cm	
		Water Clarity Rating	excellent	
		Trophic State Index	45	
		Trophic Class	mesotrophic	
	Profile	Salinity	0.09 – 0.11 ppt	
		Specific Conductivity	187.6 – 231.6 μ S/cm	
		pH	6.77 – 8.77 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	135 to 438 mV	
		Dissolved Oxygen	Up to 62% of water column < 2 mg/L in July	
	Nutrients	Surface Total Nitrogen	0.15 mg/L to 0.49 mg/L	
		Surface Total Phosphorus	0.011mg/L to 0.023 mg/L	
Nitrogen to Phosphorus Ratio		14:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	S	NS	S					
	Aesthetics					S	S			
	Agriculture							S*		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	*Sampling in 2005-2006 found the Agriculture beneficial use not supported based on numerical criteria for sulfates located in OAC 785:45 – Appendix F.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

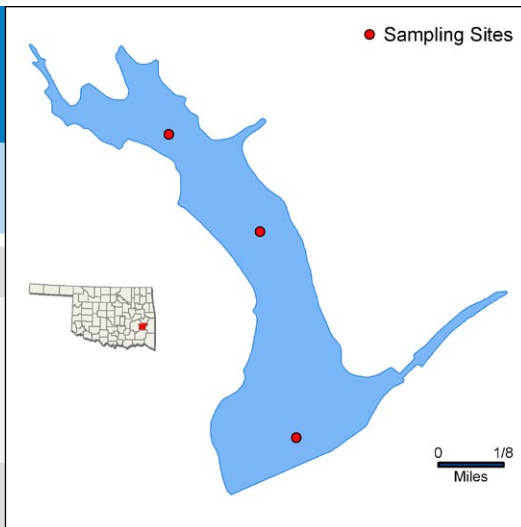
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Wayne Wallace

Sample Period	Times Visited	Sampling Sites
December 2007 – August 2008	4	3

Lake Data	Location	Latimer County
	Impoundment	1969
	Area	94 acres
	Capacity	1,746 acre feet
	Purposes	Flood Control and Recreation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	16 NTU	All values < 25 NTU
		Average True Color	98 units	All values > OWQS of 70
		Average Secchi Disk Depth	76 cm	
		Water Clarity Rating	average	
		Trophic State Index	48	Previous value = 41
		Trophic Class	mesotrophic	
		Salinity	0.0 – 0.02 ppt	
		Specific Conductivity	46 – 59.5 µS/cm	
	Nutrients	pH	6.09 – 7.11 pH units	33% of pH values < 6.5
		Oxidation-Reduction Potential	437 to 542 mV	
		Dissolved Oxygen	Up to 20% of water column , 2 mg/L in August	Occurred at site 1, the dam
		Surface Total Nitrogen	0.47 mg/L to 0.59 mg/L	
Surface Total Phosphorus		0.027 mg/L to 0.045 mg/L		
	Nitrogen to Phosphorus Ratio	16:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En.ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S	NS	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	S = Fully Supporting NS = Not Supporting NEI = Not Enough Information	Notes	Slightly acidic conditions are common in this part of the state, due to relatively low soil pH and lack of soluble bedrock. Due to these conditions it is likely that the low pH values may be due to natural causes; therefore the Water Board is looking at the applicability of developing site-specific criteria for waters in the southeastern portion of the state.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

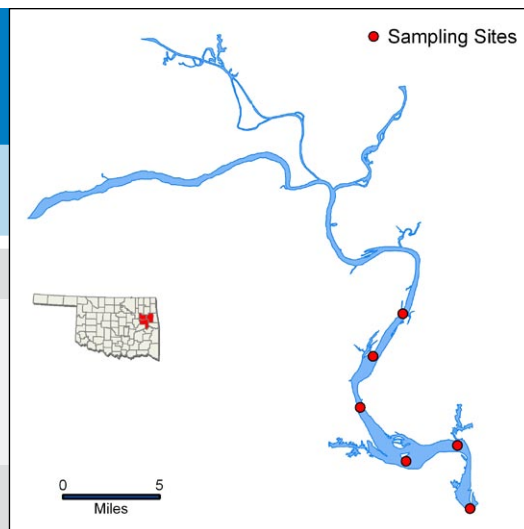
mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Webbers Falls

Sample Period	Times Visited	Sampling Sites
November 2005 – Sept. 2006	4	6

Lake Data	Location	Muskogee County
	Impoundment	170
	Area	11,600 acres
	Capacity	170,100 acre-feet
	Purposes	Navigation, Hydropower



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	21 NTU	30% of values > OWQS of 25 NTU
		Average True Color	32 units	4% of values > OWQS of 70
		Average Secchi Disk Depth	53 cm	
		Water Clarity Rating	average	
		Trophic State Index	56	
		Trophic Class	eutrophic	
		Salinity	0.37 – 1.47 ppt	
	Nutrients	Specific Conductivity	718 – 2733 µS/cm	
		pH	7.32 – 8.56 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	346 to 4451 mV	
		Dissolved Oxygen		Values > 2.0 mg/L throughout study period
		Surface Total Nitrogen	0.73 mg/L to 1.39 mg/L	
Surface Total Phosphorus		0.117 mg/L to 0.230 mg/L		
	Nitrogen to Phosphorus Ratio	6:1	Possibly co-limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	S*	S	S	S					
	Aesthetics					S	S			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	*Seven of the 23 turbidity values (30%) exceeded the Oklahoma Water Quality Standard (WQS) of 25 NTU, however available flow and rainfall data suggest that the peak in turbidity, which occurred in May is likely due to seasonal storm events, therefore Webbers Falls Lake will be listed as supporting its FWP beneficial use.							

NTU = nephelometric turbidity units
 µS/cm = microsiemens per centimeter
 E. coli = Escherichia coli

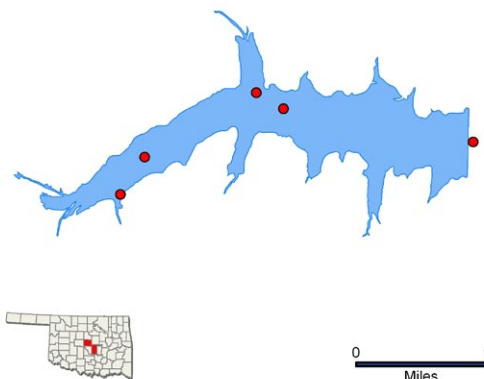
OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
 µS/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Wes Watkins

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
October 2005 – August 2006	4	5

Lake Data	Location	Pottawatomie County
	Impoundment	1997
	Area	1,142 acres
	Capacity	14,065 acre-feet
	Purposes	Water Supply, Recreation, Flood Control

Parameters	Parameter		Result	Notes/Comments
	Profile	Average Turbidity	8 NTU	100% of values < OWQS of 25 NTU
		Average True Color	19 units	100% of values < OWQS of 70
		Average Secchi Disk Depth	92 cm	
		Water Clarity Rating	good	
		Trophic State Index	53	
		Trophic Class	eutrophic	
	Nutrients	Salinity	0.13 – 0.15 ppt	
		Specific Conductivity	262.4 – 313.7 μ S/cm	
		pH	7.38 – 8.13 pH units	
		Oxidation-Reduction Potential	377 to 452 mV	
		Dissolved Oxygen		
		Surface Total Nitrogen	0.57 mg/L to 1.25 mg/L	
		Surface Total Phosphorus	0.016 mg/L to 0.043 mg/L	
		Nitrogen to Phosphorus Ratio	34:1	Phosphorus limited

Beneficial Uses										
	Turbidity		pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En, ecal coli, & E. coli	Chlor-a
	S		S	S	S					
	S		S	S	S	S	S			
	S		S	S	S			S		
	S		S	S	S				S	
	S		S	S	S					
S = Fully Supporting NS = Not Supporting NEI = Not Enough Information		Notes								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

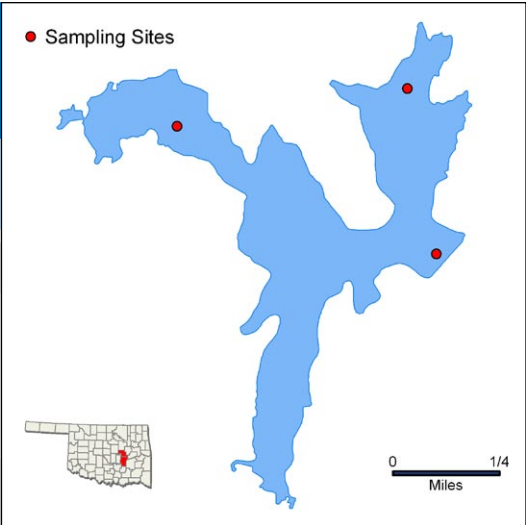
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Wetumka

Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	3

Lake Data	Location	Hughes County
	Impoundment	1939
	Area	169 acres
	Capacity	1839 acre-feet
	Purposes	Water Supply, Recreation



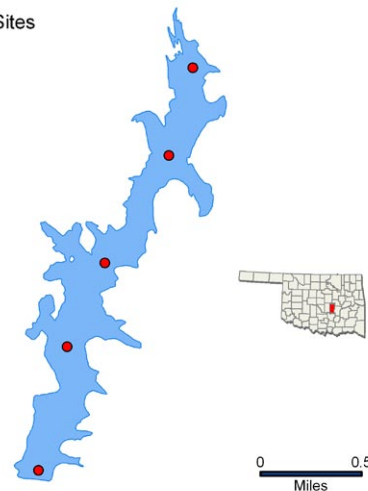
Parameters	Parameter		Result	Notes/Comments
	Average Turbidity		18 NTU	8% of values >OWQS of 25 NTU
	Average True Color		58 units	58% of values > OWQS of 70
	Average Secchi Disk Depth		59 cm	
	Water Clarity Rating		fair	
	Trophic State Index		53	
	Trophic Class		eutrophic	
	Profile	Salinity	0.03 – 0.08 ppt	
		Specific Conductivity	92.4 – 173.3 μS/cm	
		pH	6.49 – 7.90 pH units	Only 2 values < 6.5 pH units
		Oxidation-Reduction Potential	298 to 461 mV	
		Dissolved Oxygen	Up to 67% of water column < 2 mg/L in July	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.52 mg/L to 1.35 mg/L	
		Surface Total Phosphorus	0.022 mg/L to 0.088 mg/L	
		Nitrogen to Phosphorus Ratio	13:1	Phosphorus limited

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a	
	Fish & Wildlife Propagation	S	S	NS	S						
	Aesthetics					S	NS				
	Agriculture							S			
	Primary Body Contact Recreation									NEI	
	Public & Private Water Supply										
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>										
	Notes	The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for fecal coliform and enterococci.									

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli
 OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a
 mg/L = milligrams per liter
 μ S/cm = microsiemens/cm
 ppt = parts per thousand
 En = Enterococci

Wewoka

● Sampling Sites



Sample Period	Times Visited	Sampling Sites
October 2006 - July 2007	4	5

Lake Data	Location	Seminole County
	Impoundment	1925
	Area	371 acres
	Capacity	3,301 acre-feet
	Purposes	Water Supply, Recreation

Parameters		Parameter	Result	Notes/Comments
		Average Turbidity	59 NTU	75% of values > OWQS of 25 NTU
		Average True Color	103 units	60% of values > OWQS of 70
		Average Secchi Disk Depth	35 cm	
		Water Clarity Rating	poor	
		Trophic State Index	55	
		Trophic Class	eutrophic	
	Profile	Salinity	0.00 – 0.10 ppt	
		Specific Conductivity	25.6 – 219 µS/cm	
		pH	6.67 – 8.18 pH units	
		Oxidation-Reduction Potential	139 to 447 mV	
		Dissolved Oxygen	Up to 50% of water column < 2 mg/L in July	Occurred at site 1, the dam
	Nutrients	Surface Total Nitrogen	0.67 mg/L to 1.32 mg/L	
		Surface Total Phosphorus	0.021 mg/L to 0.190 mg/L	
Nitrogen to Phosphorus Ratio		15:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	NS	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for fecal coliform and enterococci.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
E. coli = *Escherichia coli*

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = *Chlorophyll-a*

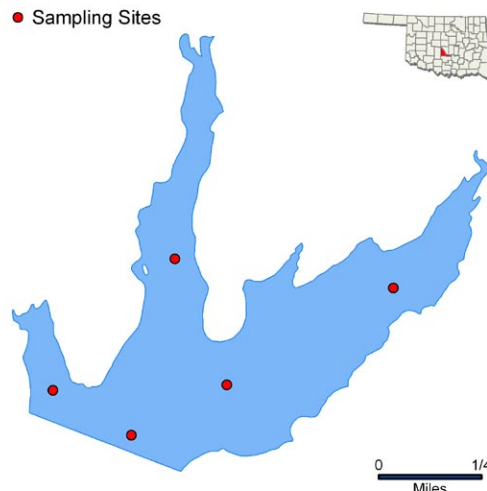
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = *Enterococci*

Wiley Post Memorial (Maysville)

Sample Period	Times Visited	Sampling Sites
November 2007 – August 2008	4	5

Lake Data	Location	McClain County
	Impoundment	1971
	Area	302 acres
	Capacity	2,086 acre feet
	Purposes	Water Supply, Flood Control, and Recreation



Parameters	Parameter	Result	Notes/Comments	
	Average Turbidity	79 NTU	100% of values > 25 NTU	
	Average True Color	223 units	100% of values > OWQS of 70	
	Average Secchi Disk Depth	16 cm		
	Water Clarity Rating	poor		
	Trophic State Index	51	Previous value = 57	
	Trophic Class	eutrophic		
	Profile	Salinity	0.10 – 0.20 ppt	
		Specific Conductivity	280 – 349.9 µS/cm	
		pH	7.24 – 8.41 pH units	Neutral to slightly alkaline
		Oxidation-Reduction Potential	246 to 664 mV	
		Dissolved Oxygen	Up to 50% of water column < 2 mg/L in August	Occurred at site 4
	Nutrients	Surface Total Nitrogen	0.66 mg/L to 1.28 mg/L	
		Surface Total Phosphorus	0.081 mg/L to 0.159 mg/L	
Nitrogen to Phosphorus Ratio		9:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	S	S	S					
	Aesthetics					S	NS			
	Agriculture							S		
	Primary Body Contact Recreation									NEI
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>	Notes	The PBCR cannot be assessed as minimum data requirements were not met due to QA/QC issues for E. coli and fecal coliform.							

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

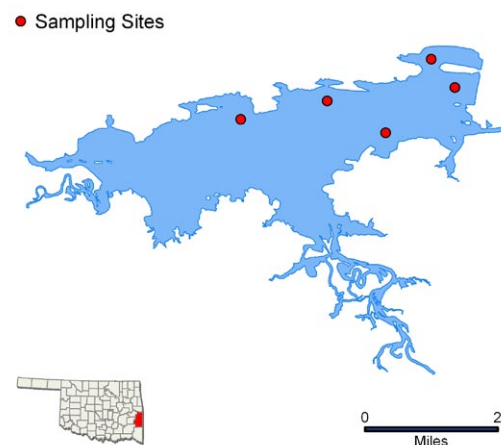
mg/L = milligrams per liter
 μ S/cm = microsiemens/cm

ppt = parts per thousand
 En = Enterococci

Wister

Sample Period	Times Visited	Sampling Sites
December 2007 – August 2008	4	5

Lake Data	Location	LeFlore County
	Impoundment	1949
	Area	7,333 acres
	Capacity	62,360 acre feet
	Purposes	Flood Control, Water Supply, Low flow Regulation, Conservation



Parameters		Parameter	Result	Notes/Comments
	Profile	Average Turbidity	25 NTU	35% of values > 25 NTU
		Average True Color	91 units	65% of values > OWQS of 70
		Average Secchi Disk Depth	41 cm	
		Water Clarity Rating	average	
		Trophic State Index	61	Previous value = 52
		Trophic Class	hypereutrophic	
		Salinity	0.0 – 0.03 ppt	
		Specific Conductivity	58.5 – 93.9 µS/cm	
		pH	6.23 – 7.47 pH units	15% of pH values < 6.5
		Oxidation-Reduction Potential	382 to 545 mV	
	Dissolved Oxygen	Up to 62% of water column, 2 mg/L in August	Occurred at site 1, the dam	
	Nutrients	Surface Total Nitrogen	0.43 mg/L to 0.77 mg/L	
		Surface Total Phosphorus	0.049 mg/L to 0.099 mg/L	
Nitrogen to Phosphorus Ratio		9:1	Phosphorus limited	

Beneficial Uses		Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates, Chlorides & TDS	En,ecal coli, & E. coli	Chlor-a
	Fish & Wildlife Propagation	NS	NS	NS						
	Aesthetics					NS	NS			
	Agriculture							S		
	Primary Body Contact Recreation								S	
	Public & Private Water Supply									
	<i>S = Fully Supporting</i> <i>NS = Not Supporting</i> <i>NEI = Not Enough Information</i>									
	Notes	Slightly acidic conditions are common in this part of the state, due to relatively low soil pH and lack of soluble bedrock. Due to these conditions it is likely that the low pH values may be due to natural causes; therefore the Water Board is looking at the applicability of developing site-specific criteria for waters in the southeastern portion of the state.								

NTU = nephelometric turbidity units
 μ S/cm = microsiemens per centimeter
 E. coli = Escherichia coli

OWQS = Oklahoma Water Quality Standards
 mV = millivolts
 Chlor-a = Chlorophyll-a

mg/L = milligrams per liter
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ppt = parts per thousand
 En = Enterococci