

**RESPONSIVENESS SUMMARY CONCERNING THE
EPA'S JUNE 17, 2008 PUBLIC NOTICE PROPOSING
TO APPROVE/DISAPPROVE THE ARKANSAS 2006 303(D) LIST**

Public Participation Process:

On June 18, 2008, EPA Region 6 published a notice in the legal advertising sections of the Arkansas Democrat-Gazette (Little Rock, AR) and the Morning News of Northwest Arkansas (Springdale, AR) notifying the public of the availability of the Environmental Protection Agency (hereinafter, "EPA") decisions identifying water quality limited segments and associated pollutants in Arkansas. Notice of availability was also published in the Federal Register, Vol. 73, Num. 117, pages 34295-34296 on June 17, 2008. Copies of documents which explain the rationale for the EPA's decisions were provided at the EPA Region 6 public website <http://www.epa.gov/earth1r6/6wq/tmdl.htm> and were available on request. The public comment period closed on July 16, 2008.

Summary of Public Participation:

Two people contacted the EPA Region 6 offices to obtain additional information.

1. Philip Massirer
FTN & Associates,
E-mail request with follow/up phone conversation

2. Shon Simpson
Principal/Senior Project Manager
GBMc & Associates
E-mail request with follow/up phone conversation

The following persons or entities provided written comments during the public comment period:

1. Steve Drown, Chief
Water Division
Arkansas Department of Environmental Quality
North Little Rock, Arkansas

2. Trevor L. Bowman, P.E.
Water/Wastewater Director
City of Siloam Springs

Agency's Specific Responses to Comments Made by the Public:

Comment: *The Arkansas Department of Environmental Quality (hereinafter, "ADEQ") disagrees with the listing of several waterbodies for fecal coliform. They have never been listed for fecal coliform, but have been listed as impaired for pathogens as per the 2006 Integrated*

Report (IR) Guidance and the 2002 Consolidated Assessment and Listing Methodology (CALM). Both of those documents stated that EPA recommends the use of E. coli for the assessment of bacteria.

Response: The State of Arkansas water quality standards Regulation 2.507 include definitions and numeric criteria for both fecal coliform and *Escherichia coli* bacteria. The terms “pathogen” or “pathogens” are not defined in the standards, nor do they appear anywhere in the standards. Available data for either fecal coliform or *E. coli*, or both, may be assessed to determine attainment of applicable standards. EPA recognizes that both fecal coliform and *E. coli* are indicators of potential risks associated with many other pathogens that may cause waterborne diseases, but the identification of the specific indicator on the section 303(d) list is simply more informative and consistent with the water quality standards.

Both the 2006 Integrated Report Guidance and the 2002 CALM guidance use the term “pathogens” generally as a causative agent of disease. Listing a waterbody for “pathogens” is analogous to listing a waterbody as impaired by metals or minerals, rather than listing the specific metal or mineral for which the waterbody is impaired.

Comment: ADEQ disagrees with the listings of several waterbodies for fecal coliform stating that “Also, additional data... has been developed as per the 1986 Ambient Water Quality Criteria for Bacteria. The Arkansas Water Quality Standards were updated in 2004 to reflect this change to E. coli and approved by EPA. Data collected since that time has focused on E. coli. This additional data supports delisting from the list of impaired waterbodies.”

Response: On January 19, 2006 EPA met with ADEQ to discuss the inconsistency between the 2006 draft Assessment Methodology and Reg. 2.507. The assessment methodology states primary and secondary contact uses will be assessed based on *Escherichia coli*. Reg. 2.507 (A) provides criteria for the primary contact season for both *Escherichia coli* and fecal coliforms, (B) provides criteria for the Secondary Contact season criteria using both *Escherichia coli* and fecal coliform and (C) states “ For assessment of ambient waters as impaired by bacteria, the above listed applicable values shall not be exceeded in more than 25% of samples...” One could interpret this to mean that both criteria are applicable for assessment purposes and therefore, the fecal coliform criteria should also be included in the Ecoregion Assessment Criteria tables. In some cases both *E. coli* and fecal coliform data will be available for analysis. In these cases, a water body will need to be listed as impaired if either of the criteria shows impairment.

It was agreed at the end of the meeting that fecal coliform would not be assessed for ambient waters because fecal coliform criteria are included in the standards for the purpose of providing permit limits for discharges. *E. coli* data will continue to be assessed for ambient waters. ADEQ suggested that Reg. 2.507(c) be revised during the triennial review to state the following: “For assessment of ambient waters as impaired by *E. coli* bacteria, the above listed applicable values shall not be exceeded in more than...”.

As a follow-up to January 2006 meeting, Region 6 staff discussed the use of only *E. coli* for assessment purposes with Regional Counsel to determine if it is in agreement with Reg. 2.507 as written. Regional Counsel’s response was “The assessment methodology states “primary and

secondary contact uses will be assessed based on *Escherichia coli*.” Arkansas water quality standards (Regulation 2) provide water quality criteria for both fecal coliform and *E. coli*. The opinion is that since both criteria are in the standards, then both need to be used for assessment purposes for the 2006 listing cycle. Using only one is not consistent with the standards.” Regional Counsel’s decision to assess for both *E. coli* and fecal coliform was emailed to ADEQ on February 2, 2006.

Comment: ADEQ disagrees with the listing of several waterbodies because ADEQ believes that EPA is misapplying the geometric mean criteria. As per the 2006 IR Guidance, the geometric mean is based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period). None of the data collected above meet this criteria.

Response: Neither Reg. 2.507 (April 23, 2004) or the 2006 Assessment Methodology address how to apply the geometric mean criteria. Bacteria data were provided to EPA in Excel format. In the spreadsheets the geometric mean was calculated using all the available monthly data for the primary contact season and the secondary contact season. Therefore, EPA followed the same method as was used by ADEQ for calculating the geometric means.

Comment: ADEQ disagrees with the listing of several waterbodies in Category 5 which it believes was properly listed in Category 4b as per the 2006 IR Guidance. ADEQ followed the guidance and supplied justification to support a listing in Category 4b. EPA does not state in the ROD specific rationale for disapproving the justification of ADEQ's listing determination.

Response: Initial comments on the Arkansas draft 2006 Section 303(d) list, including the following comment regarding the Category 4b listings, was provided to ADEQ by email on September 5, 2006.

“The justification submitted for including waters in Category 4b does not follow the 2006 Integrated Report Guidance. EPA will evaluate on a case-by-case basis the decision to place a waterbody in category 4b. Based on the 2006 Integrated Report Guidance the rationale should include:

1. A statement of the problem causing the impairment
2. A description of the proposed implementation strategy and supporting pollution controls necessary to achieve water quality standards, including the identification of point and nonpoint source loadings that when implemented assure the attainment of all applicable water quality standards
3. An estimate or projection of the time when water quality standards will be met
4. A reasonable schedule for implementing the necessary pollution controls
5. A description of, and schedule for, monitoring milestone for tracking and reporting progress to EPA on the implementation of the pollution controls and
6. A commitment to revise as necessary the implementation strategy and corresponding pollution controls if progress towards meeting water quality standards is not being shown.

Page 56 of the 2006 Integrated Report Guidance provides some example to illustrate how the guidance would be applied.”

EPA then met with ADEQ on February 28, 2007 to discuss these comments. Additional discussions were held the fall of 2007 at which time EPA provided an example from Region 7 of an acceptable justification for listing impaired waters in Category 4b. EPA also provided a template based on the Region 7 example to simplify writing an acceptable justification.

Comment: *ADEQ disagrees on several occasions with the listing of a waterbody because the sample size was not large enough to be assessed for impairment.*

There was much discussion at the January 19, 2006 meeting with ADEQ over small sample sizes and related issues regarding sample size and just how much information should be included in the assessment methodology. EPA discussed the small sample size with Regional Counsel and provided feedback to ADEQ in an email dated February 2, 2006.

According to the 2006 Integrated Report Guidance “a methodology may provide for an initial sample size screen, but should also provide for a further assessment of sample sets that do not meet the target sample size.” EPA believes that even the smallest data sets should be evaluated and in appropriate circumstances, used in assessment decisions. A “non-support” decision can be made with less than 12 samples if the WQS for the samples collected is equal to or greater than the number of exceedances needed to list if there were 12 samples. For example, based on a > 10% exceedance (using the “rounding” to calculate number of samples needed for support) 2 exceedances out of 12 would be supporting. However, if only 3 samples have been collected and all of them exceed water quality standards, the water body should be listed as “non-support” because the number of exceedances for such a decision based on a minimum of 12 samples has already been met. It doesn’t matter if any of the remaining 9 samples to be collected exceed or not.

Comment: Little Cossatot River, HUC 11140109, Reach 918, Station LC0001, impairment – TDS: ADEQ disagrees with the listing of this waterbody because the sample size was not large enough to determine percent exceedance. According to the assessment methodology, there must be a minimum of 12 samples available to calculate the percent exceedance rate. Waterbody segments with a greater than ten percent exceedance rate are considered impaired. For this waterbody segment only six samples were available during the period of record. The TDS standard for the Cossatot River is 70 mg/l and there were only two exceedances of that standard during the period of record (39, 60, 73, 67, 70, and 83 mg/L).

Response: There seems to be a disparity in one of the data values, 70 vs. 73.5. The table below shows the TDS data that was assessed by Segeval (automated assessment program). Based on these data there are three exceedances of the 70 mg/l criterion. Based on a sample size of 12, three exceedances are required to list. Since there are already 3 exceedances, an additional 6 data points will not alter the outcome of the analysis. Therefore, the water is considered impaired for TDS. Additionally see the comment on small sample sizes above.

StationID	LogNumber	DateCollected	TDS
LCO001	101026	8/20/2002	83
LCO001	91828	8/1/2000	73.5
LCO001	93534	1/8/2001	39
LCO001	94274	3/12/2001	60
LCO001	95532	6/18/2001	73
LCO001	96741	9/4/2001	67.0

Comment: Jack's Bayou, HUC 8040205, Reach 904, Station OUA0150, Impairment- FC, PA: "...Four fecal coliform samples were collected during the primary contact recreation season with no exceedances of the monthly maximum criteria of 400 col/100ml (270, 144, 165, & 30 col/100ml). Five secondary contact recreation season samples collected with no exceedances of the monthly maximum criteria of 2000 col/100 m l(600, 280, 700, 204, and 4 col/100ml)."

Response: Jack's Bayou was first listed on the 2004 Section 303(d) list for pathogens based on fecal coliform data (13 data points). TMDLs were established by EPA for fecal coliform and *E. coli* on September 21, 2007. Without new data, the smaller data set described above would be a subset of the data that was used for the 2004 listing. Because there was no new data submitted to support a delisting, the waterbody should have been carried forward to the 2006 Section 303(d) list.

Comment 5: Bearhouse Creek, HUC 8040205, Reach 901, Station OUA0155, Impairment – Cu: "ADEQ disagrees with the listing of this waterbody because there is only one exceedance of the acute copper criterion using the 25 mg/l hardness value. Based on the assessment methodology, listing is only warranted with more than one exceedance in the three-year period of record."

Response: EPA has reviewed the calculation made in the Segeval report submitted by ADEQ. While the calculation for the acute criterion was correct, the comparison of the acute criterion with the data value was performed incorrectly, identifying two exceedances when in fact there is only one exceedance. EPA will remove Bearhouse Creek from the proposed 2006 303(d) list for copper.

Comment: Fourche Creek, HUC 11110207, Reach 022, Station ARK0131+ [the" + " indicates multiple stations], Impairment - Pb, Zn: "ADEQ agrees that this waterbody should be listed and it was listed for Pb and Zn on the 2006 303(d) list, Category 5d."

Response: EPA agrees. Lead and zinc should not have been highlighted for Fourche Creek, reach 22, in Appendix I. Because Fourche Creek, reach 22, was not included in Appendix V as impaired for lead and zinc, it is not one of the water body pollutant pairs proposed for addition to the list.

Comment: South Big Creek, HUC 11010012 0 1 3, Station WHI0143J,K,L,M, Impairment - FC,PA: "...In addition, there are not four sample sites on South Big Creek, only two, WHI0143J & K."

Response: In Appendix I of the ROD, Stations WHI0143L and M were included in error. Appendix V shows that the listing was based on sample site WHI0143J only. EPA agrees there are only two sampling sites on South Big Creek as identified in ADEQ's report titled "Physical, Chemical and Biological Assessment of the Strawberry River Watershed".

Comment: Mill Creek, HUC 11010012, Reach 016, Station WHI0143N & P, Impairment - FC, PA: "... In addition, WHI0143P is a Strawberry River site, it is not located on Mill Creek."

Response: In Appendix I of the ROD, Station WHI0143P was included in error. Appendix V shows that the listing was based on sample site WHI0143N. EPA agrees there is only one sampling site on Mill Creek, Reach 16 as identified in ADEQ's report titled "Physical, Chemical and Biological Assessment of the Strawberry River Watershed".

Comment: Salt Creek, HUC 8040201, Reach 806, Station OUA137D, Impairment – pH: "ADEQ disagrees with the listing of this waterbody because the sample size was not large enough to be assessed for impairment. According to the assessment methodology, there must be a minimum of 6 samples available to assessment for impairment. For this segment there were only five samples in the database."

Response: While there are only five data points for pH, all of them are below a pH of 6 and therefore, below the minimum pH criterion. See the discussion on small sample sizes above.

Comment: Fourche Creek, HUC 11110207, Reach 022, Station ARK0131+ [the]+ "indicates multiple stations], Impairment - Pb, Zn: "ADEQ agrees that this waterbody should be listed and it was listed for Pb and Zn on the 2006 303d list, Category 5d."

Response: EPA agrees that ADEQ listed reach 22 of Fourche Creek for lead and zinc on the 2006 Section 303(d) list. EPA should have shown a "Y" instead of a "YE" in the column titled Status L06 of Appendix II. This error was not carried over to Appendix V; therefore, lead and zinc for Fourche Creek, reach 22, were not included in the list of proposed additions to the Arkansas 2006 Section 303(d) list.

Comment: Bayou Meto, HUC 8020402, Reach 907, Station ARK0060, Impairment – Pb: "ADEQ disagrees with the listing for this waterbody because the data does not support listing. There were 24 samples available during the period of record and a total three exceedances. Based on the assessment methodology, a ten percent exceedance rate was required for listing for

chronic toxicity. This rate was not met. Additionally there were no exceedances of the acute criterion.”

Response: The Lead listing for Bayou Meto in Appendix III is incorrect. The pollutant Pb should have been shown as the pollutant Zn. This error was not carried over to Appendix V. Bayou Meto is correctly shown as impaired for Zinc in Appendix V and is proposed for addition to the Arkansas 2006 Section 303(d) list.

Comment: Beryllium listings – ADEQ agrees with the listing of these waterbodies.

Response: The beryllium listings were discussed with ADEQ on several occasions including a meeting on February 28, 2007. Up until the 2006 §303(d) list, ADEQ did not assess for beryllium. During this listing cycle, Segeval (an automated assessment program) reports showed a number of waters impaired for beryllium. Upon examination of the results, it was determined that the state lab does not have the capability to analyze for beryllium at or below the criterion of 0.076 ug/l. As a result, the analytical data reported by the laboratory is not sufficient to determine if a true impairment exists using the 0.076 ug/l criterion given the 0.110 ug/l detection limit. ADEQ began steps to revise the beryllium criterion by adopting EPA’s recommended beryllium criterion of 4 ug/l MCl. The new criterion was adopted by the Arkansas Pollution Control and Ecology Commission (APC&EC) on September 28, 2007 and became effective under Arkansas Sate Law on October 10, 2007. EPA approved the revision of the beryllium criterion on January 24, 2008. EPA recommended not listing these waters for the 2006 listing cycle because both ADEQ and EPA believe a true impairment does not exist except for Chamberlin Creek (HUC 8040102, reach 971). Refer to detailed discussion in the Record of Decision for Review of Arkansas’ 2006 §303(d) List dated June 17, 2008.

Comment: ADEQ does not agree that the waterbodies listed below should be listed as impaired. In the 2006 ROD, EPA justified the listing of these waterbodies because they were listed on the 2004 list and that TMDLs had been completed. For the lakes listed for nutrients, EPA’s ROD for the 2004 303(d) list stated that a special one-year study was conducted to collect additional data and reevaluate an earlier listing decision. EPA noted that review of the new data "shows that several lakes are now meeting their designated uses and water quality criteria." In the 2006 ROD, EPA offers no scientific explanation for listing of the waterbodies beyond that they were listed on the 2004 list. ADEQ does recognize that TMDLs for these waterbodies were public noticed on December 13, 2006. However, the TMDLs were finalized after the period of record for the 2006 list.

<i>Lake Frierson</i>	<i>8030202</i>	<i>Lake</i>	<i>SI</i>
<i>Bear Creek Lake</i>	<i>8020205</i>	<i>Lake</i>	<i>NU</i>
<i>Horseshoe Lake</i>	<i>8020203</i>	<i>Lake</i>	<i>NU</i>
<i>Old Town Lake</i>	<i>8020203</i>	<i>Lake</i>	<i>NU</i>
<i>Mallard Lake</i>	<i>8020204</i>	<i>Lake</i>	<i>NU</i>
<i>Grand Lake</i>	<i>8050002</i>	<i>Lake</i>	<i>NU</i>
<i>First Old River Lake</i>	<i>11140106</i>	<i>Lake</i>	<i>NU</i>

Response: The statement in the 2004 ROD is correct, but pertains to only Lakes Calion and June which were listed in 2002 as impaired due to chlorides. Based on data collected during the study, these two lakes are now meeting their designated uses and water quality criteria for chlorides. The turbidity values were greater than 25 NTU for all monthly sample collection events; therefore, Lake Frierson must continue to remain on the 2006 Section 303(d) list showing siltation/turbidity (SI) as the impairment.

The data collected for the 6 lakes listed above for nutrients were assessed based on ADEQ Regulation 2.509 which states “Materials stimulating algal growth shall not be present in concentration sufficient to cause objectionable algal densities or other nuisance aquatic vegetation or otherwise impaired any designed use of the waterbody. Impairment of a waterbody from excess nutrients are dependent on the natural waterbody characteristics such as stream flow, residence time, stream slope, substrate type, canopy, riparian vegetation, primary use of waterbody, season of the year and ecoregion water chemistry. Because nutrient water column concentration do [does] not always correlate directly with stream impairments, impairments will be assessed by a combination of factors such as **water clarity**, periphyton or phytoplankton production, **dissolved oxygen values**, **dissolved oxygen saturation**, **diurnal dissolved oxygen fluctuation**, **pH values**, aquatic-life community structure and possibly others. However, when excess nutrients result in impairment, based upon Department assessment methodology, by an established, numeric water quality standard, the waterbody will be determined to be impaired by nutrients.” Therefore, if a lake was not meeting one or more the numeric water quality standards (i.e. pH, dissolved oxygen, turbidity) and also experienced excessive dissolved oxygen fluctuations, dissolved oxygen saturation greater than 125%, water clarity, etc. then it was considered impaired. All of the lakes listed above met one or more of these criteria and must remain on the list until additional data is collected to support a delisting. Please refer to Appendix A for a detailed discussion.

Comment: L. Strawberry River, HUC 11010012, Reach 010, Station WHI014H+ [the ”+“ indicates multiple stations], and Mill Creek, HUC 11010012, Reach 015, Station WHI0143N, Impairment – EC, PA: “ADEQ disagrees with the listing of Mill Creek and Strawberry River for E. coli because these segments have also been properly listed for pathogens per the IR Guidance and CALM.”

Response: The Strawberry River was first listed for pathogens on the 2004 Section 303(d) list. The data included both fecal coliform data and *E. coli* data (Station WHI0143E – 14 data points). Based on a 25% exceedance rate, 5 or more exceedances would result in a listing. There were 6 exceedances in the *E. coli* data and 7 exceedances in the fecal coliform data which resulted in the 2004 listing. Since there was no new data to support a delisting, the waterbody should have been carried forward to the 2006 list. TMDLs were established by EPA for fecal coliform and *E. coli* on September 21, 2007. Mill Creek, Reach 16, (Station WHI0143N – 15 data points) was first listed for pathogens on the 2004 303(d) list based on fecal coliform data. Based on a 25% exceedance rate, 5 or more exceedances would result in a listing. There were 5 exceedances in the fecal coliform data. Since there was no new data to support a delisting, the waterbody should have been carried forward to the 2006 list. TMDLs were established by EPA for both fecal coliform and *E. coli* on

September 21, 2007. Since the impairment is based on fecal coliform data, EPA will remove the *E. coli* listing on the proposed list.

Comment:

Muddy Fork	11110103	027		TP
Osage Creek	11110103	030	ARK0041	TP
Osage Creek	11110103	930		TP
Spring Creek	11110103	931	SPG03+	TP

ADEQ disagreed with the listing of the above waterbodies because the available data does not show that the segments are impaired for nutrients. Arkansas Water Quality Standards do not include a numeric criterion for total phosphorus. ADEQ has adopted appropriate narrative criteria to protect the designated uses for these segments and, based on available data, the designated uses are being met. ADEQ also disagrees with the listing of these waterbodies because the "weight of evidence" assessment methodology employed by EPA is flawed in the following ways:

- The first flaw in EPA's decision is based on EPA's interpretation of Section 2.509 of Regulation No. 2. The total phosphorus concentration mentioned in Section 2.509 is a guideline and not a water quality standard. EPA has failed to demonstrate a water quality standard violation or use impairment, only that the guideline has been exceeded.*
- The second flaw in EPA's decision is based on EPA's interpretation of an ADEQ letter dated June 4, 2003, in which we submitted additional data on dissolved oxygen, pH, and turbidity for the reaches in question citing no violations for these parameters occurred in these reaches during the period of record. ADEQ explained, "the methodology states that narrative criteria for nutrients must also result in diurnal DO fluctuations which violate the DO standard or result in violations of pH, dissolved metals or other numeric standards, or result in a significant alteration of the aquatic life community structure." EPA determined the assessment methodology was not appropriate for flowing streams, especially for streams of the type found in the Ozark Highlands. "EPA believes that a review of the DO and pH profiles in these streams demonstrates swings and upward shifts in these factors, along with elevated average total phosphorus concentrations at various locations, are indicative of adverse impacts resulting from nutrient enrichment and support listing." Yet EPA failed to provide any DO or pH data to support this conclusion. In addition, nutrient enrichment does not automatically equate to aquatic life use impairment. Furthermore, without a specific numeric water quality standard for total phosphorus, there is no water quality standards violation and therefore no impairment. Pursuant to 40 CFR 130.7, EPA does not have approval authority over the assessment methodology and it is not appropriate for EPA to determine the appropriateness of the assessment methodology after-the-fact. In other words, the time to raise the appropriateness of the assessment methodology would have been during EPA's initial review of the methodology.*
- The third flaw in EPA's decision is based on EPA's interpretation of ADEQ's 1997 Report. While nutrient levels are elevated and algal production has increased in*

some reaches of streams in the Illinois River basin, EPA did not demonstrate that, "algal production will interfere with or adversely affect designated uses and/or fish and wildlife propagation." Nor did EPA demonstrate that daily fluctuations in DO actually caused stress to game fish.

Response: EPA recognizes that ADEQ has not adopted numeric criteria for nutrients into State water quality standards; however, decisions about standards attainment are not limited to numeric water quality criteria. Applicable regulations require listing segments where existing controls are not stringent enough to implement any applicable water quality standard, including numeric and narrative criteria, waterbody uses, and antidegradation requirements (See 40 CFR 130.7(b)(3)). Details regarding EPA's position and decision to add these segments to the section 303(d) list are provided in EPA's Responsiveness Summary Concerning the EPA's October 31, 2006 Public Notice Proposing to Approve/Disapprove the Arkansas 2004 Section 303(d) List. EPA maintains that the segments must remain on the section 303(d) list until TMDLs are completed, and/or a more up to date assessment indicates that all applicable water quality standards are attained.

EPA considered, but did not rely solely on, the total phosphorus concentration "guideline" historically mentioned in Section 2.509 in making the decision to list the waters in question. EPA has examined available data and determined that lower total phosphorous concentrations than the historic guideline may be more appropriate as site-specific criteria, based on natural background concentrations; therefore, it was not unreasonable to apply the guideline in evaluating instream phosphorus concentrations, in conjunction with other indicators selected to evaluate attainment of Arkansas' narrative water quality standards.

ADEQ acknowledged that ". . . nutrient levels are elevated and algal production has increased in some reaches of streams in the Illinois River basin", but rejected this as basis for 303(d) listing, because EPA had not demonstrated non-attainment of a designated use and/or stress to game fish. EPA maintains that the loss of biological integrity is sufficient to demonstrate non-attainment of the designated aquatic life use, as documented in the responsiveness summary referenced above. In addition we utilized an approach that was consistent with the State's narrative nutrient criteria contained in Reg. 2.

Comment: Bayou Bartholomew, HUC 8040205, Reach 001, Station OUA0013 & OUA0012A, Impairment - CL: "ADEQ disagrees with the listing of this segment because OUA0012A is not on Bayou Bartholomew is located on overflow creek. This mistake has been noted to EPA on previous occasions. In addition, there are 60 samples from Bayou Bartholomew (OUA0013) and only one exceedance. Overflow Creek has been properly listed on the 303(d) list."

Response: Bayou Bartholomew, reach 001, Station OUA0013 was listed for chloride on the 2004 Section 303(d) list. A TMDL is in house under review for approval and establishment. The data for the 2006 period of record shows Bayou Bartholomew is no longer impaired for chloride. EPA will remove this reach from the proposed list. EPA has noted that station OUA0012A is associated with Overflow Creek, reach 908, which is already on the list for chloride.

Comment: Saline River, HUC 8040204, Reach 006, Station OUA0118, Impairment - SO4: "ADEQ disagrees with the listing of this segment for SO4 because the data does show that impairment for that parameter. The ROD states that the segment should be added to the list for SO4 because 8/59 samples exceed the site specific criterion of 120 mg/L. This is the criterion for TDS and the 8/59 exceedances noted are most likely exceedances of TDS. ADEQ has properly listed this segment for TDS."

Response: EPA agrees the listing should be for TDS and not SO4. The Saline River, reach 006, has been removed from the proposed listing for SO4.

Comment: Melton's Creek, HUC 8040205, Reach 903, Station OUA0148, Impairment – SI: "ADEQ disagrees with the listing of this segment because only 9 samples (32, 5.4, 6.8, 3.3, 15, 50,100,100, and 24 NTU) in the database and 3 exceedances. Two samples were recorded for 6/5/2000; one is an error. In addition, in accordance with Regulation No. 2.503, 24 samples are needed to assess for turbidity, thus requiring 6 exceedances to list."

Response: EPA agrees and will remove this reach from the list.

Comment: Dorcheat Bayou, HUC 11140203, Reach 024, Impairment – Pb: "ADEQ disagrees with the listing of this segment because it is inappropriate to evaluate reach 024 with data collected in Reach 022. There is no data available from Reach 024. Reach 024 is directly upstream of Reach 022 but a tributary with numerous potential sources enters between these two reaches, thus making data collected from Reach 022 inapplicable to Reach 024."

Response: At the top of the Segeval Report it states that data from Reach 22 can be used to make an evaluated assessment for Reaches 20 and 24. ADEQ has made an evaluated assessment for Reach 24 using Reach 22 data for the pH listing. EPA based its decision using the same approach as that was applied by ADEQ.

Comment: M. Fork Little Red, HUC 11010014, Reach 030, Station UWMLK01, Impairment - SI: "ADEQ disagrees with the listing of this segment because EPA does not present any additional data that supports this listing of this segment for turbidity. In the ROD for the 2004 list, EPA stated "ADEQ shows a new listing for this segment as being impaired for turbidity (SI). The 2006 Segeval report is in disagreement with this decision." At that time, ADEQ reviewed the listing and agreed with EPA that the segment should not be listed. The ROD for the 2006 list does not present any additional data that would support this change."

Response: EPA reviewed the information above. The Segeval Report provided to EPA for this waterbody incorrectly assessed for turbidity for "all flows" in that data for critical season months was excluded from the "all flows or storm flow" assessment, thus identifying an impairment for turbidity. EPA re-ran the Segeval Report using a version that was programmed to correctly assess for turbidity and found that the Middle Fork of the Little Red

is not impaired for turbidity. EPA will remove this waterbody pollutant pair from the proposed list.

Comment: FTN & Associates commented; "For Big Creek near Sheridan (reach 08040203-904), the Record of Decision document states at the top of page 23 that "EPA is taking no action on the TP and NO3 listing in Category 4b because the data do not support such a listing." Given that the data do not support the listing, why is the TP and NO3 listings not being disapproved (as opposed to no action)? Does that mean the TP and NO3 listing is still on the list?"

Response: Under Federal Regulations, states must submit the 303(d) list to EPA for approval. If EPA is not in agreement with everything on the list, then we can take an approval/disapproval action and in some cases "no action". During the past few listing cycles, EPA has taken a disapproval action on waters we believe should have been listed but were omitted from the list. We have taken a "no action" action on waterbody pollutant pairs we do not agree should be on the list. Since we do not recognize the "no action" items, they are not reflected in the final federally approved list. In the end, the final approved list consists of those waterbody pollutant pairs EPA approved on the Arkansas 2006 Section 303(d) list plus those that EPA added to the list.

In this particular case, ADEQ changed the Arkansas 2004 Section 303(d) listing for Big Creek from organic enrichment (OE) to dissolved oxygen (DO), total phosphorus (TP) and nitrate (NO3) in 2006 and placed Big Creek in Category 4b for these pollutants. In simple terms, ADEQ delisted Big Creek from Category 5 in Arkansas 2004 Section 303(d) list to Category 4b for the Arkansas 2006 Section 303(d) list. Category 4b is reserved for when available data and /or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed. While EPA does not approve Category 4b listings, EPA does require the State to provide an adequate justification to place a waterbody in Category 4b. ADEQ failed to provide an adequate justification which supports its conclusion that there are "other pollution control requirements" sufficiently stringent to achieve applicable water quality standards within a reasonable period of time for the DO, TP and NO3 listings. When EPA reviewed the data and information, it was determined that Big Creek is impaired for DO but not for TP and NO3. During discussions with ADEQ, ADEQ informed us they listed Big Creek for TP and NO3 in error. If EPA does not agree with the rationale for a Category 4b listing, then the waterbody must be included in Category 5. In this particular situation, EPA proposed to list Big Creek for DO, but took a "no action" for the TP and NO3 listings because the data and information to support listings for TP and NO3 in either Category 4b or Category 5 are lacking.

Comment: GBMc & Associates, representing El Dorado Chemical Company, requested from EPA the ADEQ responsiveness summaries to its public comment period for the Arkansas 2006 and 2008 303(d) lists. They do not believe Salt Creek, Flat Creek and Elcc Creek should be listed for metals, especially due to the recent UAA which also requested the removal of the drinking water use for Elcc Trib.

Response: EPA explained that even though the data for the metals listings is old, there has been no new data collected to determine if these waterbodies are currently meeting the appropriate metals standard. Elcc Trib is also listed for nitrate; however, the UAA was submitted after the

period of record for the 2006 Section 303(d) list. GBMc decided their comments were more relevant to the 2008 Section 303(d) list and indicated comments would be submitted during the public comment period for the 2008 Section 303(d) list.

Comment: The City of Siloam Springs requested that Sager Creek, HUC 11110103 be removed from the 2006 and 2008 lists because ADEQ does not have the authority to designate a water body impaired based upon the level of a parameter for which Arkansas does not have a water quality criterion [referring to NO3].

Response: The Arkansas water quality standards (Reg. 2) do not have a specific numeric criteria/criterion for nitrate; however, the State has other provisions that apply. For instance, the definition at Reg. 2.106 - Human Health Criteria: "Levels of toxicants in ambient water which will not manifest adverse health effects in humans." Clearly, there can be no toxicants at levels that can affect human health. EPA's current MCL for nitrates is 10 ppm, and for nitrites, it is 1 ppm. These are human health/drinking water related criteria to protect against the occurrence of methemoglobinemia. Methemoglobinemia can be problematic for infants, who are particularly sensitive to nitrates. Therefore, any translator method the State may have would apply. In the absence of a translator, EPA has the discretion to utilize a reasonable method or procedure to translate a narrative standard.

In addition, under Reg. 2.508 Toxic Substances, the provision says that "Toxic substances shall not be present in receiving waters, after mixing, in such quantities as to be toxic to human, animal, plant or aquatic life or to interfere with the normal propagation, growth and survival of the indigenous aquatic biota." In fresh water nitrate at high levels can potentially cause lethality in fish (<http://en.wikipedia.org/wiki/Freshwater>, <http://en.wikipedia.org/wiki/Estuary>). While combined nitrate plus nitrite is less toxic than ammonia or nitrite individually, it is suggested that levels of nitrate (NO₃-N) above 90 mg/L and nitrite (NO₂) above 30 mg/L will impair most warm water fish. That includes inhibition of growth, impairment of the immune system and just generally stressing some aquatic species (http://en.wikipedia.org/wiki/Nitrate_-_cite_note-2).

Therefore, although a numeric for nitrate is not specifically contained in Reg. 2, ADEQ (or EPA) has the discretion to assess and list for nitrate.

Final Decision Based on Comments Received from the Public

Based on the additional information received from the Arkansas Department of Environmental Quality, EPA has decided to remove six waterbody pollutant combinations (Table 1) identified in EPA's Final Action on Arkansas' 2006 Section 303(d) list. Therefore, EPA has revised its decision to disapprove Arkansas' decisions not to list 73 water body-pollutant combinations instead of 79 waterbody pollutant combinations (Table 2). These 73 additional water body pollutant-combinations along with priority rankings for inclusion on the 2006 Section 303(d) List are shown in Table 2.

Table 1. List of waterbody pollutant combinations EPA is removing from its proposed additions to the Arkansas 2006 Section 303(d) list.

Stream Name	HUC	RCH	P-Seg	Station ID	Pollutant
Bayou Bartholomew	8040205	001	2B	OUA13	Cl
Bearhouse Creek	8040205	901	2B	OUA0155	Cu
Melton's Creek	8040205	903	2B	OUA0148	SI
Saline River	8040204	006	2C	OUA0118	SO4
M. Fk. Little Red	11010014	030	4E	UWMFK01	SI
Mill Creek	11010012	015	4G	WHI0143N	EC

Table 2. List of waterbody pollutant combinations EPA is adding to the Arkansas 2006 Section 303(d) list.

Stream Name	HUC	RCH	P-Seg	Station ID	Pollutant	Priority Ranking
Dorcheat Bayou	11140203	024	1A		Pb	L
First Old River	11140106	Lake	1B		NU	H
Blue Bayou	8020301	009	1C	BLB0001	FC	L
Holly Creek	11140109	013	1C	RED0034B	Zn	H
Holly Creek	11140109	013	1C		FC	H
Bear Creek	11140109	025	1C	RED0033	NO3	H
Mine Creek	11140109	033	1C	RED0048B+	FC	H
Mine Creek	11140109	033	1C	RED0048A & 18B	EC	H
Rolling Fork	11140109	919	1C	RED0058	Cu	H
Mine Creek	11140109	933	1C	RED0048B	DO	H
Mine Creek	11140109	933	1C	RED0048B	CU	H
Mine Creek	11140109	933	1C	RED0048B	Zn	H
Little Cossatot R.	11140109		1C	LCO01	TDS	M
Grand Lake	8050002	Lake	2A		NU	H
Jack's Bayou	8040205	904	2B	OUA0150	FC	H
Big Creek	8040203	904	2C	OUA0018	OE	H
Elcc Trib.	8040201	606	2D	OUA137A&B	Cu	H
Elcc Trib.	8040201	606	2D	OUA137A&B	NO3	H
Flat Cr.	8040201	706	2D	OUA0137C	Cu	H
Flat Cr.	8040201	706	2D	OUA0137C	Zn	H
Salt Creek	8040201	806	2D	OUA0137D	Cu	H
Salt Creek	8040201	806	2D	OUA137D	pH	M
Bayou Meto	8020402	007	3B	ARK0050	Zn	H
Big Piney Creek	11110202	018	3H	ARK105	FC	M
Hurricane Creek	11110202	022	3H	ARK119	FC	M
Little Piney Creek	11110202	024	3H	ARK104	FC	M
Little Piney Creek	11110202	025	3H	ARK126	FC	M

Short Mountain Cr	11110202	043	3H	ARK11B	Cu	H
Mill Creek	11110202	901	3H	ARK110	FC	M
Walnut Creek	11110202	902	3H	ARK125	FC	M
Muddy Fork	11110103	027	3J		TP	H
Osage Creek	11110103	030	3J	ARK0041	TP	H
Town Branch	11110103	901	3J	ARK0056	TP	H
Osage Creek	11110103	930	3J	ARK041 (eval)	TP	H
Spring Creek	11110103	931	3J	SPG03+	TP	H
Sager Creek	11110103	932	3J	ARK0005	NO3	H
Cache River	8020302	028	4B	CHR04	FC	M
Lake Frierson	8030202	Lake	4B		SI	H
Village Creek	11010013	012	4C	VGC02	FC	M
Glaise Creek	11010013	021	4C	GSC01	FC	M
Cypress Bayou	8020301	010	4D	CPB01	FC	H
Cypress Bayou	8020301	011	4D		FC	H
Cypress Bayou	8020301	012	4D		FC	H
Bull Creek	8020301		4D	UWBLB01	FC	L
Overflow Creek	11010014	004	4E		FC	H
Overflow Creek	11010014	006	4E	OFC01	FC	H
Little Red River	11010014	007	4E	WHI0059	FC	H
Little Red River	11010014	008	4E		FC	H
Ten Mile Creek	11010014	009	4E	TMC01	FC	H
Little Red River	11010014	010	4E		FC	H
Little Red River	11010014	012	4E		FC	H
S. F. Little Red River	11010014	038	4E	SRR01&02	FC	H
Hicks Creek	11010004	015	4F	WHI0065	FC	H
Greenbrier Creek	11010014	017	4F	WHI0167	FC	M
Big Creek	11010014	018	4F	WHI0164	FC	M
Data Creek	11010009	902	4G	WHI065	FC	H
Cooper Creek	11010012	003	4G	WHI0143S	FC	H
Strawberry R.	11010012	008	4G		FC	H
Strawberry R.	11010012	009	4G	SBR02	FC	M
L. Strawberry River	11010012	010	4G	WHI0143H+	FC	H
L. Strawberry River	11010012	010	4G	WHI0143H+	EC	H
Strawberry R.	11010012	011	4G	SBR01	FC	H
Strawberry River	11010012	011	4G	WHI0143A	FC	H
South Big Creek	11010012	013	4G	WHI0143J	FC	L
Reed's Creek	11010012	014	4G	RDC01	FC	H
Caney Creek	11010012	015	4G	WHI0143Q&R	FC	H
Mill Creek	11010012	015	4G	WHI0143N	FC	H

St. Francis River	8020203	008	5A	FRA0013	SI	L
St. Francis River	8020203	009	5A		SI	L
Horseshoe Lake	8020203	Lake	5A		NU	H
Bear Creek Lake	8020205	Lake	5A		NU	H
Old Town Lake	8020303	Lake	5A		NU	H
Mallard Lake	8020204	Lake	5C		NU	H

APPENDIX A: Rationale for the Continued Listing of Six Lakes for Nutrients on the 2006 Section 303(d) List

History

EPA added nine lake listings (Attachment A) to the 2002 Section 303(d) list for nutrients, chloride, and/or turbidity. A multi-parameter approach was used in assessing lakes for a violation of the narrative nutrient criteria. This is the same approach used by ADEQ when identifying whether a stream is impaired for nutrients. In the absence of a state methodology, EPA considered chlorophyll *a* data, dissolved oxygen, pH, and total phosphorus data in addition to other information contained in *Water Quality Assessment of Arkansas' Significantly Publicly-owned Lakes* (1989, 1995, 1999) and 305(b) reports (1996, 2002). The lakes listed for nutrients showed an elevated chlorophyll *a*, dissolved oxygen, and pH values, which are strong indicators of nutrient impairment. Although, total phosphorus values were considered, they alone were not the basis for EPA's decision. Algal density is typically driven by nutrients. Chlorophyll *a* is a surrogate measure for algal density; therefore, the greater the concentration the higher the density. Waters with objectionable algal densities typically display diurnal dissolved oxygen fluctuations with wide swings in the dissolved oxygen concentration from supersaturation during the daytime to below standards in the nighttime. High dissolved oxygen concentrations during the daytime may be an indication of supersaturation. Carbon dioxide concentrations increase in waters with large algal densities as a result of respiration resulting in a change in the pH from neutral to alkaline. Increased pH levels may be an indication of large algal densities.

Changes in Regulation No. 2 since the 2002 Arkansas Section 303(d) Listing Cycle

The 2002 listing decision was based upon ADEQ's Regulation 2.509 (current version at time of listing) which states "Materials stimulating algal growth shall not be present in concentrations sufficient to cause objectionable algal densities or other nuisance aquatic vegetation. As a guideline total phosphorous shall not exceed 100 ug/l in streams or 50 ug/l in lakes and reservoirs except in waters highly laden with natural silts or color which reduce the penetration of sunlight needed for plant photosynthesis, or in other waters where it can be demonstrated that algal production will not interfere with or adversely affect designated uses an/or fish and wildlife propagation."

The total phosphorus guideline was removed and the narrative expanded to include numerous indicators in the ADEQ water quality standards dated April 23, 2004 and approved by EPA in December 2004. Reg. 2.509 states "Materials stimulating algal growth shall not be present in concentration sufficient to cause objectionable algal densities or other nuisance aquatic vegetation or otherwise impaired any designed use of the waterbody. Impairment of a waterbody from excess nutrients are dependent on the natural waterbody characteristics such as stream flow, residence time, stream slope, substrate type, canopy, riparian vegetation, primary use of waterbody, season of the year and ecoregion water chemistry. Because nutrient water column concentration do not always correlate directly with stream impairments, impairments will be assessed by a combination of factors such as **water clarity**, periphyton or phytoplankton production, **dissolved oxygen values**, **dissolved oxygen saturation**, **diurnal dissolved oxygen**

fluctuation, pH values, aquatic-life community structure and possibly others. However, when excess nutrients result in an impairment, based upon Department assessment methodology, by an established, numeric water quality standard, the waterbody will be determined to be impaired by nutrients.”

New Data and Information

A special one-year study (June 2004 – July 2005) was conducted to collect additional data to re-evaluate EPA’s 2002 listing decision. The scope of the one-year study included lake reconnaissance, selection of two regional “minimally impacted” reference lakes for comparison, a 48-hour diurnal study for dissolved oxygen, monthly water column profile data (1 foot intervals) for dissolved oxygen, % saturation, pH, temperature and specific conductance, and monthly water quality sampling. The water samples were analyzed for a suite of nutrients (total ammonia plus organic nitrogen; dissolved ammonia, nitrite, nitrate, orthophosphorus, and total phosphorus) and nutrient response variables (chlorophyll *a* phaeophytin *a*, turbidity, nonpurgeable organic carbon, suspended solids, and biochemical oxygen demand). Samples were collected monthly (except for November, January and March) for one year. Monthly profile data included dissolved oxygen, % saturation, pH, temperature, and specific conductance. Secchi Disk depth was also recorded. A 48-hour dissolved oxygen investigation was conducted during August to capture critical summer conditions.

A multiple weight-of-evidence approach was used to evaluate the aquatic life use attainment. The approach considers the suite of indicators identified in ADEQ Reg. 2.509 dated April 23, 2004 including total phosphorus (TP), daily fluctuations in dissolved oxygen (DO) concentration, DO saturation, pH, and turbidity. Additionally, if one or more of the indicators listed in the narrative criterion (Reg. 2.509) are present and a numeric water quality criterion (Attachment B) was not met, EPA determined the lake impaired.

It is recognized that neither a single indicator nor a single event represents adequate information upon which to base an assessment of aquatic life use status. However, when a suite of indicators suggests aquatic life use is impacted more than one time, there is reasonable cause to characterize aquatic life at that site as impacted to some degree. EPA believes this is the intent of Reg. 2.509.

Results

Review of the data from this study shows that Lakes Calion and June are now meeting their designated uses and water quality criteria for chlorides. EPA believes the lakes listed for nutrients on the attachment are still impaired. Below is an individual justification for each lake including the reference lake.

Stave Lake (Reference Lake)

A review of the data supports the use of Stave Lake as “minimally impacted” reference lake. The dissolved oxygen criterion was below 5 mg/l on one occasion, July 2005 (4.58 mg/l). The dissolved oxygen swing over a 24 hour period was small (range 4.87 mg/l to 5.37 mg/l)

compared to the swing for most the other lakes. The pH was always between 6 and 9 units; however, the range was 1.1 units on one occasion. The maximum % saturation for dissolved oxygen was 126%. EPA believes the reference lake is in compliance with Regulation 2.509 and could be considered as a “minimally impacted” reference lake.

Bear Creek Lake

A review of the data shows that Bear Creek Lake is most similar to the reference lake (Stave Lake). The dissolved oxygen criterion was less than 5 mg/l for August, September and October which is an unacceptable number of exceedances according to the 2006 Assessment Methodology. The pH concentration during the entire 48-hour diurnal investigation was above 9 units which is in violation of Reg. 2.504 which states “pH values shall not be below 6.0 or above 9.0”. It is interesting to note that the pH concentration never exceeded 9 units on any of the monthly sampling events. A note in the report states that the datasonde was deployed beneath and two feet from the edge of a large fishing dock, thus placing it in the shade for most if not all of the 48 hour period. The % saturation exceeded 125% during the diurnal event and on several monthly sampling events. The DO swing was 3 mg/l. The TP concentration was less than 0.05 mg/l for most of the study. EPA believes that Bear Creek Lake is not in compliance with Regulation 2.509.

First Old River Lake

A review of the data for First Old River Lake supports the continued listing for nutrients. The dissolved oxygen was above 5 mg/l for the monthly sampling events; however, it was well below the criterion during the diurnal sampling event. On each of the three days of the continuous monitoring, the dissolved oxygen ranged from a low of 4.93 gm/l to 14.40 mg/l; 3.35 mg/l to 13.3 mg/l; and 4.2 mg/l to 13.98 mg/l which resulted in large dissolved oxygen fluctuations (9.47 mg/l, 9.68 mg/l and 9.78 mg/l respectively). The pH concentration ranged from 9.1 units to 9.9 units, which exceeds the pH criterion. The maximum dissolved oxygen percent saturation was well above 125% for each of the three days (201.4%, 176.3%, and 187.8%). EPA believes that First Old River Lake is not in compliance with Regulation 2.509.

Grand Lake

A review of the data for Grand Lake supports the continued listing for nutrients. Two sampling locations were established on Grand Lake (north and south). The pH concentration was greater than 9 units for July, August and September at the north location which is an unacceptable number of exceedances according to the 2006 Assessment Methodology. The pH concentration was greater than 9 units in July and September at the south location. Two days of diurnal data were collected. The pH concentration ranged from 8.1 to 9.8 on the first day resulting in a 1.7 unit swing. This is in violation of Reg. 2.504 which states “the pH must not fluctuate in excess of 1.0 unit over a period of 24 hours”. On day two the pH concentration ranged from 9.2 units to 10 units exceeding the maximum criterion of 9 units. The dissolved oxygen concentration on day one ranged from 1.32 mg/l to 13.59 mg/l resulting in a 12.25 mg/l swing. The maximum dissolved saturation was 185.9%. The dissolved oxygen concentration on day two ranged from 4.89 mg/l to 14.11 mg/l resulting in a daily swing of 9.22 mg/l. The maximum dissolved

saturation was 195.5%. The dissolved oxygen concentration was depressed below 5 mg/l for 10 hours and below 4 mg/l for 6.5 hours. EPA believes that Grand Lake is not in compliance with Regulation 2.509.

Mallard Lake

A review of the data for Mallard Lake supports the continued listing for nutrients. The dissolved oxygen criterion was less than 5 mg/l for July, August and September which is an unacceptable number of exceedances according to the 2006 Assessment Methodology. Two days of diurnal data were collected. On the first day, the dissolved oxygen concentration ranged from 0.97 mg/l to 4.74 mg/l and never reached the 5 mg/l criterion. The dissolved oxygen concentration was depressed below 5 mg/l for 24 hours and below 4 mg/l for 17 hours. On day two, the dissolved oxygen concentration ranged from 3.16 mg/l to 13.71 mg/l resulting in a daily swing of 10.55 mg/l. The pH concentration ranged from 8.2 units to 9.5 units resulting in a daily swing of 1.4 units; a violation of Reg. 2.504. EPA believes that Mallard Lake is not in compliance with Reg. 2.509.

Horseshoe Lake

A review of the data for Horseshoe Lake supports the continued listing for nutrients. The dissolved oxygen criterion was less than 5 mg/l for July. Two days of diurnal data were collected. On the first day, the dissolved oxygen concentration ranged from 5.99 mg/l to 14.54 mg/l resulting in a daily swing of 8.55 mg/l. The maximum dissolved oxygen saturation was 195.4%. The pH concentration ranged from 8.9 units to 9.8 units exceeding the maximum pH level criterion of 9 units. On day two, the dissolved oxygen concentration ranged from 1.89 mg/l to 15.24 mg/l resulting in a daily swing of 13.35 mg/l. The maximum dissolved oxygen saturation was 216.4%. The dissolved oxygen concentration was depressed below 5 mg/l for 8 hours and below 4 mg/l for 7.5 hours. The pH concentration ranged from 8.0 units to 9.9 units resulting in a daily swing of 1.9 units; a violation of Reg. 2.504. EPA believes that Horseshoe Lake is not in compliance with Reg. 2.509.

Old Town Lake

A review of the data for Old Town Lake supports the continued listing for nutrients. The dissolved oxygen criterion was less than 5 mg/l for July, August and September and the turbidity criterion was exceeded in June, July, August, September and October both of which are an unacceptable number of exceedances according to the 2006 Assessment Methodology. Two days of diurnal data were collected. On day one, the dissolved oxygen concentration ranged from 2.34 mg/l to 9.56 mg/l resulting in a daily swing of 7.22 mg/l. The dissolved oxygen concentration was depressed below 5 mg/l for 8.5 hours and below 4 mg/l for 4 hours. The maximum dissolved oxygen saturation was 128.8%. The pH concentration ranged from 7.5 units to 9.2 units resulting in a daily swing of 1.7 units; a violation of Reg. 2.504. On day two, the dissolved oxygen concentration ranged from 1.85 mg/l to 7.71 mg/l resulting in a daily swing of 5.86 mg/l. The dissolved oxygen concentration was depressed below 5 mg/l for 15.5 hours and below 4 mg/l for 13 hours. The pH concentration ranged from 7.3 units to 8.7 units resulting in a

daily swing of 1.4 units; a violation of Reg. 2.504. EPA believes that Old Town Lake is not in compliance with Reg. 2.509.

The complete report titled Water Quality of Eleven Lakes in Eastern and Southern Arkansas from August 2004 – July 2005 prepared by the U. S. Geological Survey can be downloaded from the following website:

<http://www.epa.gov/region06/water/ecopro/watershd/monitoring/studies/index.htm>.

Attachment A: Listing of EPA added lakes to the Arkansas Section 2002 303(d) list and justification.

STREAM NAME	HUC	P-SEG	STATION	POLLUTANT	JUSTIFICATION
Lake Calion	8040201	2D	LOUA013A	chlorides	2/3 samples (67%) exceed chloride standard of 19 mg/l; values were 9.4, 23.10 and 22.5 mg/l for 1989, 1994 & 1999 respectively. Use not supported.
Lake June	11140203	1A	LRED004A	chlorides	2/3 samples (67%) exceed chloride standard of 19 mg/l; values were 11.6, 30.4, 44.2 mg/l for 1989, 1994 and 1999 respectivel, use not supported.
Bear Creek Lake	8020205	2B	LMIS003A	nutrients	Based on elevated chlorophyll a (72.2, 38.81, 37.6 ug/l for 1989, 1994 & 1999 respectively), DO (9.2 mg/l - 1999), pH (8.91 - 1999) and TP values (0.09, 0.12 and 0.05 mg/l), EPA believes this lake is in violation of the Arkansas narrative criterion for nutrients.
First Old River Lake	11140106	1B	LRED006A	nutrients	Based on elevated chlorophyll a (52.1, 13.35, 43.7 ug/l for 1989, 1994 & 1999 respectively), DO (8.3 mg/l - 1999), pH (8.61 - 1999) and TP values (0.10, 0.15 and 0.08 mg/l), EPA believes this lake is in violation of the Arkansas narrative criterion for nutrients.
Grand Lake	8050002	2A	LOUA001A	nutrients	Based on elevated chlorophyll a (147.5, 40.0, 37.3 ug/l - 1989, 1994, & 1999 respectively), DO (8.27 mg/l - 1999), pH (9.41 - 1999) and TP values (0.30, 0.19 & 0.26 mg/l), EPA believes this lake is in violation of the Arkansas narrative criterion for nutrients. Additionally, the Arkansas 1996 305(b) report stated this lake "suffers from enriched agricultural runoff".
Horseshoe Lake	8020203	4A	LMIS001A	nutrients	Based on elevated chlorophyll a (87.7, 170.0, 50.5 ug/l for 1989, 1994 & 1999 respectively), DO (9.10 - 1999), pH (8.82 - 1999) and TP values (0.10, 0.15 & 0.09 mg/l), EPA believes this lake is in violation of the Arkansas narrative criterion for nutrients. Additionally, the Arkansas 1996 305(b) report stated this lake "suffers from enriched agricultural runoff".
Mallard Lake	8020204	5C	LMIS005A	nutrients	Based on elevated chlorophyll a (115.8, 45.42, 62.10 ug/l for 1989, 1994 & 1999 respectively), DO (10.6 mg/l - 1999), pH (9.02 - 1999) and TP values (0.20, 0.20 and 0.15 mg/l), EPA believes this lake is in violation of the Arkansas narrative criterion for nutrients. Additional information considered is that this lake routinely fertilized for fisheries enhancement; however, the pH is in violation of the standards.

Old Town Lake	8020303	5A	LWHI003A	nutrients	Based on elevated chlorophyll a (174.3, 110.36, 123.4 ug/l for 1989, 1994 & 1999 respectively), DO (13.62 mg/l - 1999), pH (9.42 - 1999) and TP values (0.32, 0.21 and 0.38 mg/l), EPA believes this lake is in violation of the Arkansas narrative criterion for nutrients. Additional information includes: reported to be significantly impacted by enriched agricultural runoff in 1996 305(b) Report; 1999 Lake Assessment Report states "Old Town Lake is an example of an impacted lake from nutrient-enriched and silt-laden agricultural run-off. This lake has a long history of excessive siltation and eutrophication..."
Lake Frierson	8020302	4B	LWHI002A	turbidity	2/3 samples exceed standard of 25 NTU; values were 16, 76 and 75 NTU for 1989, 1994 & 1999 respectively. Additional information from the 1999 Lake Assessment Report states "Lake Frierson has displayed elevated turbidity values during the last two surveys and is perhaps impacted by silt laden agricultural runoff."

Attachment B: Water quality criteria for the Delta Ecoregion applicable to lakes and reservoirs based on Regulation No. 2. April 23, 2004.

- Temperature: Reg. 2.502 – 32°C
- Turbidity (NTU): Reg.2.503 – base (June 1-Oct 31) 25 NTU; all (all months) 45 NTU
- pH: Reg. 2.504 - must not fluctuate in excess of 1.0 unit over a period of 24 hours and pH values shall not be below 6.0 or above 9.0.
- DO: Reg. 2.505 – Lakes and Reservoirs: 5mg/l.
- Nutrients: Reg. 2.509: “Materials stimulating algal growth shall not be present in concentration sufficient to cause objectionable algal densities or other nuisance aquatic vegetation or otherwise impaired any designed use of the waterbody. Impairment of a waterbody from excess nutrients are dependent on the natural waterbody characteristics such as stream flow, residence time, stream slope, substrate type, canopy, riparian vegetation, primary use of waterbody, season of the year and ecoregion water chemistry. Because nutrient water column concentration do not always correlate directly with stream impairments, impairments will be assessed by a combination of factors such as water clarity, periphyton or phytoplankton production, dissolved oxygen values, dissolved oxygen saturation, diurnal dissolved oxygen fluctuation, pH values, aquatic-life community structure and possibly others. However, when excess nutrients result in an impairment, based upon Department assessment methodology, by an established, numeric water quality standard, the waterbody will be determined to be impaired by nutrients.”