



A R K A N S A S
Department of Environmental Quality

April 1, 2010

RE: Responsiveness Summary to Comments Concerning Arkansas's 2010 List of Impaired Water Bodies (303(d))

Dear Sir/Madam:

Enclosed, please find a copy of the Responsiveness Summary prepared by the Arkansas Department of Environmental Quality for Arkansas's 2010 List of Impaired Water Bodies, commonly referred to as the 303(d) list.

This Responsiveness Summary is being provided to you because you submitted either oral or written public comments at the Public Hearing held on February 24, 2010, or during the public comment period which closed on March 10, 2010.

Sincerely,

A handwritten signature in black ink that reads "Steven L. Drown". The signature is written in a cursive, flowing style.

Steven L. Drown, Chief
Water Division

SD/mb

Responsiveness Summary to Comments Concerning Arkansas's Draft 2010 303(d) List

The Arkansas Department of Environmental Quality (ADEQ) appreciates all of those individuals and entities who submitted comments concerning the draft 2010 Impaired Waters List (303(d) list). ADEQ would like to reiterate that this most recent request for public comments was for the draft 2010 303(d) list. Several comments were received addressing other ADEQ documents or issues, such as Regulation No. 2, that are not open to public comment at this time. ADEQ encourages the authors to re-submit those comments when those documents or issues are opened for public review and comment.

Below is a summation of the comments received by ADEQ concerning the draft 2010 303(d) list and a response to those comments.

Comment: The following is a comment received from Ralph Desmarais, Ph.D.:

I'm 100% with Martin Maner for making the water quality report more readable - it used to be that way back when John Giese wrote it and i did the groundwater section - then Y'all messed it up - worse, you have left out important stuff, like the NWAR cave reports i used to do. Don't tell me you don't have time - we did it right and still only worked about 1/10th of the time - Drowns had more time than most - he even took on two jobs he had so much time and still listened to Eric Clapton much of the day - just walk thru ADEQ and you can see all the moribund folks eager to be awakened and given a report to write! For special projects our old director would muster even supervisors out of their stupor to take samples for the Eldo Oil special project - just think "how can i do it?" rather than the state employee dodge - "I'm looking and talking busy" - if you get a rough draft together, I'll use my talents and experience to edit it for readability free!

ADEQ Response: ADEQ acknowledges the comment. The 303(d) list identifies water body segments that are not currently meeting the criteria set forth in "Arkansas's Assessment Methodology for the Preparation of the 2010 Integrated Water Quality Monitoring and Assessment Report," which is based on Regulation No. 2, Arkansas's Water Quality Standards for surface waters.

Comment: The City of Springdale and the Springdale Water Utilities submitted a letter of support to "remove Spring Creek and Osage Creek from the state's 2010 listing of impaired water bodies." They commented that the listing of Osage Creek and Spring Creek in 2008 was added "by the U.S. Environmental Protection Agency (and) based on perceived levels of excess phosphorus." They agreed that the de-listings are justified based on the "findings contained in a *Water Quality and Ecological Assessment of Osage and Spring Creeks in the Illinois River Basin*" report prepared by the University of Arkansas Center for Agricultural and Rural Sustainability, University of Arkansas Division of Agriculture, and the Arkansas Cooperative Extension Service on behalf of McGoodwin, Williams, and Yates.

ADEQ Response: ADEQ concurs with these comments.

Comment: The Bentonville-Bella Vista Chamber of Commerce submitted a fax of support, stating, “We agree with ADEQ’s proposal to remove Osage Creek and Spring Creek from the proposed 303(d) list and believe that they were improperly listed in the last cycle of revisions to the 303(d) list.” They also referenced the *Water Quality and Ecological Assessment of Osage and Spring Creeks in the Illinois River Basin* report.

ADEQ Response: ADEQ concurs with this comment.

Comment: Individuals commented on the difficulty in identifying where the listed water body segments are in the state. They mentioned that individuals who are not familiar with hydrologic unit codes would not be able to identify the particular segments listed or may not be able to identify the actual water body listed.

ADEQ Response: ADEQ agrees with this comment and understands the difficulty in identifying water body segments for those individuals who are not familiar with hydrological unit codes and stream segment identifiers. At the time of public notice of the draft 2010 303(d) list, updated maps of the impaired water body segments were not finalized; however, maps will be available with the finalized 2010 303(d) list and Integrated Water Quality Monitoring and Assessment Report.

Comment: A comment was received that not all abbreviations within the text were explained in the document.

ADEQ Response: ADEQ agrees with this comment and defined the meanings for abbreviations and acronyms within the document.

Comment: ADEQ received several comments requesting that segments of Kings River, Leatherwood Creek, and the Buffalo River be placed in Category 4 instead of Category 5. It was also requested that the source be changed from “UN” (Unknown) to “MP” (Municipal Point).

ADEQ Response: Category 5 waters are those that have been identified to have an impairment, but a Total Maximum Daily Load (TMDL) has not yet been established. There is not an established TMDL for the noted segments of Kings River, Leatherwood Creek, or the Buffalo River for the listed constituent; therefore, the proper categorization is Category 5.

Further, ADEQ does not have defensible documentation to list these water body segments as being impaired by municipal point sources. Until such data can be developed, the segments will be listed as being impaired by unknown sources.

Comment: Ms. Connie Burks requested that her entire comment be entered into the summary of comments. It was received by fax as follows:

I oppose all such listings, present and proposed, as impaired waters in Madison and Newton and Searcy Counties due to failure of ADEQ to coordinate with the Quorum Courts of those counties because they have adopted Land Use and Management Plans as described/ allowed by NEPA, et al, which requires state agencies with federally attached programs/projects/proposals to coordinate with county officials PRIOR to initiating said actions. I am a landowner in both Madison and Newton counties.

Further, I oppose **all** proposed listings due to inadequate notification to the public based on failure to communicate actual data that the public can understand. Hydrologic unit codes are not acceptable communication of data to the public, and I question if they are even a properly promulgated method of identification, due to an EPA document I have that calls them “schemes: because they allegedly are not accurate ways of delineating “watersheds.”

I also specifically oppose all present and proposed listings of Crooked Creek as impaired because I question and disagree with the methods of monitoring and assessing waters in Boone County where I reside as well as ADEQ methods and assessment in all parts of the state- which includes certain independent and/or unprofessionally acquired data.

I require that this comment be entered in its entirety to the record, including the summary of comments. Do not summarize this comment.

Connie Burks

ADEQ Response: The assessment of waters of the State and the listing of impaired waters is governed by the Clean Water Act and associated federal regulations, specifically 40 CFR §§ 130.7, 130.8, and 130.10. ADEQ disagrees with the commenter’s interpretation of the requirements of NEPA.

ADEQ agrees with the comment concerning the difficulty in identifying water body segments for those individuals who are not familiar with hydrological unit codes (HUC) and stream segment identifiers. At the time of public notice of the draft 2010 303(d) list, updated maps of the impaired water body segments were not finalized; however, maps will be available with the finalized 2010 303(d) list and Integrated Water Quality Monitoring and Assessment Report.

The commenter questions whether HUC codes are a “properly promulgated method of identification” based upon an unidentified EPA document. Please note that ADEQ is identifying individual water body segments, not watersheds, in the 303(d) list. The use of HUCs to identify stream reaches is accepted nationally, recommended by EPA, and has been used by ADEQ since 1992. The U.S. Geological Survey developed the classification system based on extensive surveys.

The commenter disagrees with the listing of Crooked Creek and questions ADEQ’s methods and assessment, both in Boone County and throughout the state, because it “includes independent and/or unprofessionally acquired data.” The commenter does not identify the data to which she refers. In accordance with the Clean Water Act and 40 CFR §130.7, ADEQ is required to “...assemble and evaluate *all existing and readily available* water quality-related data and information to develop the list required by §130.7(b)(1) and §130.7(b)(2).” For the 2010 303(d) list, ADEQ considered and evaluated all of the existing and readily available water quality-related data for the period of record, which is April 1, 2004 – March 31, 2009.

Comment: A comment was received that ADEQ did not supply information regarding the justification for removing water body pollutant pairs from the 2010 303(d) list.

ADEQ Response: Justifications for removing a water body from the list are not required, under the Clean Water Act or its associated federal regulations, as a part of the List of Impaired Waters. States are required to public notice the List of Impaired Waters and to respond to comments concerning the list. The List of Impaired Waters are those waters that are classified as Category 5 waters, or those waters “not currently meeting water quality standards” (EPA “Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act”). 40 CFR §130.7(b)(6)(iv) does require that, “[u]pon request by the Regional Administrator each State must demonstrate good cause for not including a water or waters on the list.” ADEQ has fully complied with the federal requirements.

The Oklahoma Department of Environmental Quality (ODEQ) submitted the following comments:

ODEQ comment:

1. The 2010 List does not contain the waterbodies listed below that were included in the 2008 List. No rationale was provided in the document which would indicate why these waterbodies have not been included in the 2010 List.

| Stream Name | HUC | Reach | Planning Segment | Cause |
|--------------------|----------|-------|------------------|----------------------------|
| Poteau River | 11110105 | 931 | 3J | Siltation/Turbidity |
| Baron Fork | 11110103 | 013 | 3J | Pathogens |
| Illinois River | 11110103 | 020 | 3J | Siltation/Turbidity |
| Illinois River | 11110103 | 028 | 3J | Pathogens |
| Osage Creek | 11110103 | 030 | 3J | Total Phosphorus/Pathogens |
| Osage Creek | 11110103 | 930 | 3J | Total Phosphorus |
| Little Osage Creek | 11110103 | 933 | 3J | Pathogens |
| Spring Creek | 11110103 | 931 | 3J | Total Phosphorus/Pathogens |

ADEQ response:

1. ADEQ has determined that the previous listed segments of the Poteau River, Baron Fork, Illinois River, Osage Creek, Little Osage Creek, or Spring Creek are currently meeting their designated uses and water quality standards; therefore, they have not been included in 2010 303(d) list. Justifications for removing a water body from the list are not required, under the Clean Water Act or its associated federal regulations, as a part of the List of Impaired Waters. States are required to public notice the List of Impaired Waters and to respond to comments concerning the list. The List of Impaired Waters are those waters that are classified as Category 5 waters, or those water bodies “not currently meeting water quality standards” (EPA “Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act”). 40 CFR §130.7(b)(6)(iv) does require that, “[u]pon request by the Regional Administrator each State must demonstrate good cause for not including a water or waters on the list.” ADEQ has fully complied with the federal requirements.

ODEQ comment:

2. There are other shared streams and rivers that are contained in Oklahoma's 2008 303(d) list that are not found on the 2010 Arkansas list. Of concern to the State of Oklahoma are the Illinois River, Baron Fork River and Lee Creek. These waters are listed as Category 5 waters in Oklahoma and it is becoming more apparent that the State of Arkansas has not conscientiously assessed the degraded condition of these waters. Although three segments of the Illinois River are included in the 2010 Arkansas List, none of these segments are listed for phosphorus.

ADEQ response:

2. ADEQ has determined that the Illinois River, Baron Fork River, and Lee Creek are currently meeting Arkansas's designated uses and water quality standards, and therefore, were not included on the 2010 303(d) list.

ODEQ comment:

3. Of the three segments in the Illinois River watershed that were listed as impaired by total phosphorus in the 2008 List, three waterbodies (two Osage Creek reaches and Spring Creek) have been completely removed from the 2010 303(d) list, and one other (Muddy Fork Illinois River) has been delisted with respect to total phosphorus. No justification is offered for these de-listings.

ADEQ response:

3. Justifications for removing a water body from the list are not required, under the Clean Water Act and its associated federal regulations, as a part of the List of Impaired Waters. States are required to public notice the List of Impaired Waters and to respond to comments concerning the list. The List of Impaired Waters are those waters that are classified as Category 5 waters, or those waters "not currently meeting water quality standards" (EPA "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act"). 40 CFR §130.7(b)(6)(iv) does require that, "[u]pon request by the Regional Administrator each State must demonstrate good cause for not including a water or waters on the list." ADEQ has fully complied with the federal requirements.

Osage Creek, Spring Creek, and Muddy Fork have never been listed on any 303(d) list through an independent action of ADEQ. These stream segments were listed by EPA based on EPA's interpretation that they exceeded a range of average phosphorus values derived from least-disturbed, ecoregion reference streams. These values have not been legally adopted as water quality standards nor were they established as criteria in the Assessment Methodology. Arkansas currently does not have a specific promulgated water quality standard for total phosphorus (either narrative or numeric); therefore, these water bodies are not now, nor have they ever been assessed as impaired for total phosphorus by an independent action of ADEQ. These water bodies have in the past, and are currently meeting all of their designated uses. In addition, these water bodies have in the past, and are currently meeting the State of Arkansas narrative water quality standard for nutrients.

ODEQ comment:

4(a) Though no justification was provided for the removal of these phosphorus impaired streams, we assume that the “Osage and Spring Creeks Water Quality and Ecological Assessment,” conducted by McGoodwin, Williams and Yates, was relied on as a basis to delist these streams. This study was undertaken to show that Springdale and Rogers wastewater treatment plants do not have a significant impact on the watershed. The study does not indicate that any of the aforementioned water bodies should be removed from the Arkansas 303(d) List.

ADEQ response:

4(a) ADEQ acknowledges the comment. The data collected in conjunction with the McGoodwin, Williams and Yates report was evaluated in the decision not to list Spring and Osage Creeks. However, that data does not provide the sole basis for the decision. First, ADEQ has also collected its own data along those stream segments. Second, ADEQ has repeatedly argued that these streams should not be listed as impaired for phosphorus. For example, in response to the 2008 listing of the streams by EPA, ADEQ stated:

Specifically, ADEQ once again disagrees with the addition of 4 segments on Muddy Fork, Osage Creek, and Spring Creek as impaired for total phosphorous (“TP”). EPA first proposed, and ADEQ first objected to, listing these streams on the 2002 303(d) list. EPA refers to their 2002 ROD in supplying justification for the continued listing of these water bodies. In the 2004 ROD, EPA concluded “that Arkansas did not provide a reasonable rationale for not considering listing due to potential exceedences of narrative standards absent approved implementation procedures.” ADEQ finds several problems with this assessment and listing methodology.

First, the standard for listing is to identify those water bodies for which effluent limitations are not stringent enough to implement any applicable water quality standards. Federal listing requirements do not apply to *potential* exceedences, but to actual exceedences of properly adopted water quality standards. ADEQ has properly adopted water quality standards, with the requisite public participation process, for the surface waters of Arkansas and those standards have been approved by EPA. EPA supports their listing of Muddy Fork, Osage Creek and Spring Creek for TP by comparing ambient monitoring data with the national criterion for TP. However, neither ADEQ nor EPA has adopted the national criterion as the numeric water quality standard for TP. EPA cannot unilaterally apply this numeric criteria without adopting this standard through the appropriate process as set forth in state and federal regulations.

Second, ADEQ believes that the “weight of evidence” approach EPA used to list Muddy Fork, Osage Creek and Spring Creek for TP is not a scientifically defensible listing methodology. There are several flaws with this approach, including:

- The first flaw in EPA’s decision is based on EPA’s interpretation of a guideline that was included in Section 2.509 of Regulation No. 2 in 2004. The total phosphorus concentration mentioned in Section 2.509 was a

guideline and not a water quality standard and has since been removed from Regulation No. 2. 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 evaluated average total phosphorus concentrations at various locations, are indicative of adverse impacts resulting from nutrient enrichment and support listing." Yet, the record contains no 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. However, EPA is provided the assessment methodology and reviews the methodology prior to ADEQ expending time and resources employing the methodology to evaluate the state's waterbodies. It is appropriate for EPA to determine, long after the State has evaluated data pursuant to its assessment methodology, to unilaterally change the basis for listing. In other words, the time to raise any questions about a state's 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.

In addition, the recommendations of the 2004 report on Water Quality in the Illinois River and Kings River Basins relied upon by EPA for their listing decision point out the same problems that ADEQ finds with EPA using this data and the weight of evidence approach for making listing decisions for the Muddy Fork, Osage Creek and Spring Creek. The conclusions and recommendations listed in the 2004 report include, but are not limited to:

- USEPA Region 6 and Region 6 states should develop and make available more definitive assessment procedures and translators for assessing narrative criteria and aquatic life use attainment.
- The most common and potentially dramatic stressor for these streams, sediment, was not explicitly considered in this assessment. Total suspended solids, sediment oxygen demand, and other sediment related parameters should be investigated throughout both river basins.
- USEPA Region 6 should work with the states to develop a consistent, quantitative methodology for a weight-of-evidence approach when using chemical, physical and biological data to determine beneficial use attainment status.

Third, as the authors of the report state:

It is not accurate to state that "This study was undertaken to show that the Springdale and Rogers wastewater treatment plants do not have a significant impact on the watershed." Rather, the purpose of the study was to "collect water quality and biological data from targeted water bodies in Spring and Osage Creek of the Illinois River watershed in northwest Arkansas in order to assess attainment of the aquatic life use in those stream reaches." The report concludes in the final line on page 102 "There appears to be no justification from this data for placing Spring and Osage Creeks on the 303(d) list of impaired waters for impairment by nutrients."

Further, ODEQ did not provide any scientifically defensible information to substantiate the listing of Osage and Spring Creeks.

Additionally, regarding the use of Little Osage Creek as a "reference" stream, according to the authors of the report referenced by ODEQ:

The potential impact of NPS pollution on the biota of Little Osage Creek was recognized in the study design. This site was chosen as a reference of urban and rural NPS impacts in the absence of a point source impact. The goals of the investigation were to evaluate use attainability and evaluate potential source(s) of impairment if detected. This was the purpose of selecting this particular reference stream; it was not intended to represent pristine conditions, as clearly stated in the report.

With respect to the listing of Little Osage as impaired for Aquatic Life Use in the 2008 303(d) list, ADEQ could find no justification for this listing in EPA's Record of Decision. The only justification for listing of Little Osage Creek as impaired is based upon *E. coli* samples collected in August and September of 2006. This study was designed to address the impact of nutrients, not pathogens, relative to ADEQ Reg. 2. Neither biota nor nutrients are mentioned in the 2008 Record of Decision for the 303(d) listing of Little Osage Creek.

ODEQ comment:

4(b) Little Osage Creek also has the highest percentage of hay meadow and pasture of all sampling locations. This site would have a very high potential for nonpoint source phosphorus loading due to land application of chicken litter. This also would seem to disqualify Little Osage Creek for use as a valid reference stream.

ADEQ response:

4(b) See authors' response in comment 4(a) above pertaining to use of Little Osage Creek as a reference stream.

ODEQ comment:

4(c) Both water bodies used as reference streams (Little Osage Creek and Chambers Springs Creek) had geometric means of phosphorus concentration which exceeded 0.037 mg/L total phosphorus criterion for Scenic Rivers in Oklahoma.

ADEQ response:

4(c) According to the authors of the report referenced by ODEQ:
This comment is not relevant, as a geometric mean phosphorous concentration of 0.037 mg/L is not relevant to ADEQ Reg. 2 criteria. This threshold concentration has not been scientifically validated as an important level for biotic community structure. The reference sites were both low in phosphorous concentration when compared to the point source impacted sites. Chambers Springs Creek has been an established reference site for Ozark Plateau stream biota for 20 years.

ODEQ comment:

4(d) The periphyton assessment methods state that samples were "collected from a riffle considered to be representative of the sampling reach." Sampling only in riffles is problematic. Sampling should not be restricted to a single habitat type within a stream. Rather than sampling only in pools, riffles, or runs, a combination of habitat types should be sampled in order to provide a more accurate representation of the stream reach. Sampling only in riffles is not representative of the stream reach.

ADEQ response:

4(d) According to the authors of the report referenced by ODEQ:
The periphyton sampling procedure was designed to match that outlined in EPA's Rapid Bioassessment Protocols Section 6. Specifically section 6.1.1.2 states "For comparability of results, the same substrate/habitat combination should be sampled in all reference and test streams. Single habitat sampling should be used when biomass of periphyton will be assessed." Since we were sampling periphyton for biomass comparison between sites this is the appropriate method to use. Also, artificial substrate (passive diffusion periphytometers) sampling was conducted at all sites in addition to the natural substrate sampling. These passive diffusion periphytometers were deployed in run/pool habitats. The methods used by the project team, documented in the Quality Assurance Project Plan, which was reviewed by USEPA Region VI prior to project initiation, was scientifically valid and justified.

ODEQ comment:

4(e) Large diurnal dissolved oxygen swings were measured for some monitoring sites, but these variations were not discussed. Large swings in dissolved oxygen are indicative of excessive productivity and nutrient enrichment.

ADEQ response:

4(e) According to the authors of the report referenced by ODEQ:

These elevated swings of dissolved oxygen (DO) were recognized and discussed in the report (Pages 94 and 95). With one exception, they did not produce dissolved oxygen depletions below the seasonally acceptable minimums, or diel variations in excess of Regulation 2 criteria for Ozark Plateau streams. The exception was also discussed in detail in the report (Pages 94, 95, and 102).

ODEQ comment:

4(f) The report concludes that the WWTPs do not have a significant impact downstream. The data clearly show that the total phosphorus levels downstream on Osage Creek are more than two times greater than even the selected "reference" streams. These findings provide no basis for removing streams from the 303(d) list.

ADEQ response:

4(f) According to the authors of the report referenced by ODEQ:

The objective of this study was to measure the impacts of the WWTPs of Rogers and Springdale on the designated use attainment of Osage and Spring Creeks. Thus, the objective was to evaluate impairment according to Arkansas Regulation 2; this regulation does not have a numeric limit for phosphorus. To accomplish this the chemical characteristics, biota (fish, invertebrates, and algae) and habitat of the sites downstream of the WWTPs were compared to sites upstream of the WWTPs and from selected reference streams. The biota showed no major impairments from the WWTPs. The report clearly describes the impacts of human activities in the watershed on the ecological condition of the stream (Page 7). At issue in this investigation was not impact, but rather impairment. No evidence of impairment caused by either WWTP was indicated in this 30 month study.

ODEQ comment:

4(g) The report states "the results clearly indicated that there were no upstream-downstream impacts from the WWTPs that rise to the level of impairment of water quality." This statement cannot be made about nutrients, as nutrients were not adequately addressed. One of the goals of this study was to compare to the Arkansas Water Quality Standards. This study failed to adequately address the narrative criteria found in the Arkansas Water Quality Standards. There was no data collected to analyze for "*objectionable algal (sic) densities*" or "*nuisance aquatic vegetation*." Periphyton samples were only taken in riffles. Water Quality Standards apply to more than just the riffles. This does not adequately address if objectionable or nuisance levels are occurring in the stream.

ADEQ response:

4(g) According to the authors of the report referenced by ODEQ:

The periphyton biomass analyses and diel DO analyses addressed the "*objectionable algal densities*" criteria. The primary biotic impact of nuisance algal growth is low night-time DO and DO swings over light-dark cycles. This characteristic was measured continuously for 72 hours two times during each critical season to insure high density data for this critical variable. As indicated in the report, ADEQ Reg. 2 has very specific criteria for this parameter. Although there is no specific criteria in ADEQ Reg. 2 for algal densities, the upper range for aesthetic nuisance of 100-150 mg chl-a per square meter (Welch et al., 1988). In only three instances was this range exceeded. In all other instances values were within or less than this range. Most instances were below this range at all sites.

Habitat assessments included observations of aquatic vegetation conditions for the entire reach. These observations were supported with photographic records of stream conditions. The data did not indicate any issue with "*nuisance aquatic vegetation*". Riffles were selected for rock scrapings in part because the scientific literature shows that increased algal biomass is observed in areas of higher velocity (Allan, 1995 ; Hynes, 1970; Stevenson, 1997; Wehr and Sheath, 2003).

Works Cited:

- Allan, J. D. 1995. Stream Ecology: Structure and Function of Running Waters. Dordrecht, Neth.: Kluwer. 388 pp.
- Hynes, H.B.N. 1970. The Ecology of Running Waters. Caldwell, New Jersey, The Blackburn Press.
- Stevenson, R. J. 1997. Scale dependent determinants and consequences of benthic algal heterogeneity. *Journal of the North American Benthological Society* 16: 248-262.
- Welch, E. B., J. M. Jacoby, R. R. Horner, and M. R. Seeley. Nuisance biomass levels of periphytic algae in streams. *Hydrobiologia* 157(2): 161-168.
- Wehr, J.D. and R. G. Sheath. 2003. Freshwater Algae of North America: Ecology and Classification. Academic Press, Boston.

ODEQ comment:

5. In our February 22, 2006 letter to the ADEQ, the Oklahoma Environmental Agencies compiled and submitted additional water quality data to assist the ADEQ in evaluating the waters bordering Oklahoma. There is still no evidence that the State of Arkansas has utilized this and other pertinent data in its assessment and listing processes.

ADEQ response:

5. ADEQ has considered all data that was submitted for the evaluation of the water quality of the streams of Arkansas, including the ODEQ data. Further, ODEQ does not identify what data it believes has been excluded.

Comment: GBMc & Associates commented that based on the EPA record of decision for the 2008 303(d) list, all of the pollutant pairs from Flat Creek, Salt Creek, and the ELCC Tributary should be removed. In addition, the copper listing on the ELCC tributary should be removed because the water quality in the tributary is dominated by the effluent from the facility. The facility has been in compliance with their NPDES permit throughout the 2010 assessment period and, therefore, the water quality of the stream should be in compliance with water quality standards.

ADEQ Response: ADEQ agrees with the comment and has removed these pollutant pairs from Flat Creek, Salt Creek, and the ELCC Tributary from the 2010 303(d) list. However, ADEQ cannot delist a pollutant pair based on the compliance history of a permitted facility; therefore, the ELCC Tributary will remain on the list as impaired for copper. ADEQ must rely on in-stream data from or near the location the original data was collected that previously placed the pollutant pair on the list. In addition, there has been no new data collected to support removal of the pH listing on Salt Creek, thus it will remain on the list.

Comment: An individual commented that the report lacked the use of Categories 2 and 3. The individual suggested that water bodies that had suspected impairments, or those that are of special concern to the citizens of Arkansas, but lacked sufficient data to place them in Category 4 or 5, be placed in Category 2 or 3.

ADEQ Response: EPA guidance, “Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act,” establishes a 5-part categorization for the placement of waters based on water quality assessment and standards attainment levels. Water body segments placed in Category 5 are the only ones included in the List of Impaired Waters (303(d) list). However, ADEQ does utilize Categories 2 and 3 in Appendix A of the Integrated Water Quality Monitoring and Assessment Report (305(b) Report) to identify waters where no current data, or a lack of sufficient data, exists to make a valid assessment. The 2010 Impaired Waters List is just one part of the entire Integrated Water Quality Monitoring and Assessment Report that is submitted to EPA.

Comment: The following are comments submitted by Mr. Gerald Weber on behalf of the Friends of the North Fork and White Rivers:

Although the discussion of what is necessary for a stream to qualify for inclusion on the impaired stream list, I could not associate the various impaired stream segments with specific locations shown in the lists of impaired waters. This makes the document essentially useless for public information. Although HUC is defined as “eight digit number used to identify large sections of streams and/or rivers”, I don’t know how to necessarily translate this to the map shown at the beginning of the document to know where this stream is located and, as you know there may be several creeks with identical names across the State. RCH remains undefined as far as I can determine. The “PLN SEG” numbers simply further confuse the reader but obviously relate to some portion of the named Stream. The document should clearly indicate how one determines where the segment is located on a given stream. Also, the map which is included in the on-line version is of insufficient quality to read the numbers or text on the map.

I am also concerned that a stream such as Mill Creek in IZARD County which was inspected last year by ADEQ and found to have been polluted by silt and whose aquatic habitat and life remains seriously damaged would not have been placed on the list. Even if it is now on a list as a

Category 2 or 3 stream, apparently lacking sufficient data to place it on the Category 4 and 5 lists, these categories are completely absent from the report. I believe many waters that fall under the Category 2 and 3 designations would be of concern to the public, but have been omitted for an unknown reason. I strongly believe that streams and/or waterbodies where concerns for water quality or aquatic habitat should be listed in this report even if there is insufficient data to warrant inclusion in Categories 4 or 5. I feel this report should bring attention to those streams that are suspected to having been harmed even if the extent of harm or how long it may persist are not yet fully understood.

ADEQ Response: ADEQ agrees with this comment and understands the difficulty in identifying water body segments for those individuals who are not familiar with hydrological unit codes and stream segment identifiers. Prior to public notice of the draft 2010 303(d) list, updated maps of the impaired water body segments were not finalized; however, maps will be available with the finalized 2010 303(d) list and Integrated Water Quality Monitoring and Assessment Report.

ADEQ acknowledges the comment that certain, land-clearing activities along the banks of Mill Creek caused these banks to become unstable and resulted in the erosion of sand into Mill Creek. Modification of a stream's hydrology by physical alteration of the stream banks or through disruptions in the watershed that change the hydrology may be considered pollution and may result in an impact to the physical integrity of the stream. However, the regulations and guidance concerning the 303(d) listing decision of impaired waters requires listing and preparation of Total Maximum Daily Loads (TMDLs) only for waters impaired by a pollutant and does not include hydrological modification or stream bank instability. In the event that activities cause violations of the water quality standards, ADEQ may pursue appropriate enforcement.

EPA guidance, "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act," establishes a 5-part categorization for the placement of water bodies based on water quality assessment and standards attainment levels. Water body segments placed in Category 5 are the only ones included on the List of Impaired Waters (303(d) list). However, ADEQ does utilize Categories 2 and 3 in Appendix A of the Integrated Water Quality Monitoring and Assessment Report (305(b) Report) to identify water bodies where no current data, or a lack of sufficient data, exists to make a valid assessment. The 2010 Impaired Waters List is just one part of the entire Integrated Water Quality Monitoring and Assessment Report that is submitted to EPA.

Comment: The City of Sheridan Water and Wastewater Department made the comment that Big Creek, a tributary to the Saline River, should be listed in Category 4a instead of Category 5 for turbidity because a TMDL has been established.

ADEQ Response: ADEQ agrees and will move this listing from Category 5 to Category 4a.

Comment: A comment was received that a segment on the Arkansas River should be evaluated and delisted based on more recent data from the ambient monitoring station instead of relying on the data from the special study that was performed several years earlier.

ADEQ Response: ADEQ can only delist segments based on data derived from the same area of the river and in the same manner. When comparable data becomes available, it will be reviewed.

Comment: A comment was received requesting that the nitrate listing on Whig Creek be removed based on the fact that the creek is not currently nor is it scheduled to be used as a drinking water supply.

ADEQ Response: ADEQ can only remove a listing or a designated use when there is proper documentation to do so. This commenter's request would require either new data that indicates compliance with water quality standards, or a Use Attainability Analysis of the stream indicating that the drinking water use is not currently being utilized, nor will it be so utilized in the future.

The Beaver Water District offered the following comments:

BWD Comment:

1. Beaver Water District (BWD) generally supports the inclusion of the streams in the Beaver Lake Watershed (which include the upper reaches of the White river, the West Fork of the White River, War Eagle Creek, and Holman Creek) and of the upper portion of Beaver Lake in the Proposed 2010 303(d) List.

ADEQ Response:

1. ADEQ acknowledges this comment.

BWD Comment:

2. The tables following page 20 of the Proposed 2010 303(d) List posted on ADEQ's website for public review are incomplete. For example, the Category 4a listing of the West Fork of the White River contains no information in the "Designated Use Not Supported," "Water Quality Standard Non-Attainment," and "Source" columns. Information is missing for other stream segments, as well. BWD suggests that ADEQ consider posting the corrected tables and extending the public comment period to allow for full and complete public review.

ADEQ Response:

2. It was a typographical error that the tables following page 20 were incomplete. In response to the comment, ADEQ has included the missing information on the tables following page 20. The public comment period was not extended because ADEQ is not mandated to list Category 4a streams as part of the 303(d) list.

BWD Comment:

3. BWD requests that, as a part of any proposed 303(d) list of impaired waterbodies, ADEQ include a list of the stream segments that are proposed for delisting and the reasons for delisting. As it is, the public must go line by line through the tables to compare the 2008 303(d) list with the proposed 2010 list in order to determine what stream segments are missing or what individual water quality standard non-attainment has been removed for a particular stream segment. It should be quite simple, on the other hand, for ADEQ to provide this information along with a brief justification for the delisting of the removal of an individual water quality standard non-attainment. See for example, the Draft Water Quality in Oklahoma 2010 Report, which includes Oklahoma's proposed 2010 303(d) list and also includes as Appendix D the "2010 Oklahoma 303(d) Delisting Justifications." The Oklahoma Draft Report currently is out for public notice and comment and is available on the Oklahoma Department of Environmental Quality website at <http://www.deq.state.ok.us/WQDnew>.

ADEQ Response:

3. States are required to public notice the List of Impaired Waters and to respond to comments concerning the list. The List of Impaired Waters are those waters that are classified as Category 5 waters, or those waters “not currently meeting water quality standards” (EPA “Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act”). Justifications for removing a water body from the list are not required, under the Clean Water Act or its associated federal regulations, as a part of the List of Impaired Waters. 40 CFR §130.7(b)(6)(iv) does require that, “[u]pon request by the Regional Administrator each State must demonstrate good cause for not including a water or waters on the list.” ADEQ has fully complied with the federal requirements and the justifications are included in the 2010 Integrated Water Quality Monitoring and Assessment Report package submitted to EPA.

BWD Comment:

4. In the 2008 303(d) List, the upper portion of Beaver Lake was listed as a high priority, category 5a waterbody for siltation/turbidity due to surface erosion. In the Proposed 2010 303(d) List, the upper portion of Beaver Lake is listed as not supporting its fisheries and primary contact designated uses due to non-attainment of the pathogen water quality standard (WQS) in addition to the turbidity WQS, but the priority was changed from high to low. BWD objects to this priority change. According to the information in the “Category 5 Waters” table regarding this waterbody, the designated uses are not being supported. This waterbody does not, therefore, fit the definition of a “Low” or “Category 5a” waterbody set forth on page 1 of the Proposed 2010 303(d) List. In addition, because Beaver Lake is the source of drinking water for one in eight Arkansans, we believe that the Lake and all of the listed streams in its watershed should be given the highest possible priority rankings.

ADEQ Response:

4. ADEQ concurs with this comment and the reasoning for the prioritization of the upper portion of Beaver Lake and will make the appropriate change in the table.

BWD Comment:

5. BWD questions the following proposed delistings: (1) the 23.8 mile segment of the White River in Planning Segment 4K, HUC 11010001, Reach 027, which was on the 2008 303(d) List for non-attainment of the WQS for dissolved oxygen (DO); (2) the 27.2 mile segment of the West Fork of the White River in Planning Segment 4K, HUC 11010001, Reach 024, which was on the 2008 303(d) List for non-attainment of the WQS for DO; and (3) the 8.1 mile segment of the Middle Fork of the White River in Planning Segment 4K, HUC 11010001, Reach 026, which was on the 2008 303(d) List for non-attainment of the WQS for Dissolved Oxygen (DO). BWD objects to these delistings unless and until adequate justification is provided by ADEQ.

ADEQ Response:

5. States are required to public notice the List of Impaired Waters and to respond to comments concerning the list. The List of Impaired Waters are those waters that are classified as Category 5 waters, or those waters “not currently meeting water quality standards” (EPA “Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act”). Justifications for removing a water body from the list are not required, under the Clean Water Act or its associated federal regulations, as a part of the List of Impaired Waters. 40 CFR §130.7(b)(6)(iv) does require that, “[u]pon request by the Regional Administrator each State must demonstrate good cause for not

including a water or waters on the list.” ADEQ has fully complied with the federal requirements and the justifications are included in the 2010 Integrated Water Quality Monitoring and Assessment Report package submitted to EPA.

BWD Comment:

6. BWD notes that the identification of the “Designated Use Not Supported” appears to be missing from the proposed 2010 listing of the 6.2 mile segment of the White River in Planning Segment 4K, HUC 11010001, Reach 023. On the 2008 303(d) List, the agriculture and industry water supply use was identified as not supported.

ADEQ Response:

6. In accordance with EPA Guidance, a stream may be listed as impaired because it does not meet either its designated use and/or its water quality criteria as set out in the assessment methodology. The 6.2 mile reach of the White River in Planning Segment 4K, HUC 11010001, Reach 023, was listed because several water quality constituents are not meeting the assessment criteria, not because it’s failing to meet its designated uses. The magnitude and duration of the exceedances are not severe enough, and there is no data to suggest, that the agriculture and industrial water supply use is not being attained in the water body.

BWD Comment:

7. BWD believes that information regarding the Arkansas Pollution Control and Ecology Commission (APCEC) Regulation No. 2, §2.507 WQS for *Escherichia coli* (*E. coli*) in the table on page 17 of the Proposed 2010 303(d) List is incorrect. The information in the table provides that the *E. coli* criteria calculated as a geometric mean are 126 colonies per 100 milliliters for primary contact waters and 630 colonies per 100 milliliters for secondary contact waters and that these criteria **apply only to Lakes, Reservoirs, Extraordinary Resource Waters (ERWs), Ecologically Sensitive Waterbodies (ESWs), and Natural and Scenic Waterways (NSWs)**. This is contrary to the express language of Regulation No. 2, §2.507(A) and (B). Although this regulation could have been written more clearly, BWD is confident that the only reasonable interpretation of the regulation is that the *E. Coli* criteria calculated a geometric means **apply to all waterbodies** (according to the applicable primary versus secondary contact designation), not just to lakes, reservoirs, ERWs, ESWs, and NSWs.

BWD questions whether this was just a typographical error in preparing the table on page 17 of the Proposed 2010 303(d) List or whether the ADEQ has been applying incorrect criteria in its assessment of Arkansas’s waterbodies. Should the latter be the case, then a reassessment of the data would seem to be in order.

ADEQ Response:

7. ADEQ acknowledges this comment, however, ADEQ disagrees with BWD’s interpretation of Regulations No. 2, §2.507(A) and (B) and the assessment criteria for these regulations. The geometric mean only applies to the water bodies listed in the Regulation No. 2.

BWD Comment:

8. The information of page 19 of the Proposed 2010 303(d) under the heading “Domestic, Agricultural, and Industrial Water Supply” seems incomplete or at least likely to cause confusion regarding how the Site Specific Mineral Quality criteria of APCEC Regulation No. 2, §2.511(A) are to be applied.

ADEQ Response:

8. ADEQ acknowledges this comment; however, for assessment purposes the standard is 250 chlorides/250 sulfates/500 total dissolved solids, as it states in the assessment methodology on page 19.

BWD Comment:

- 9(a) In general, it is very difficult to review and make sense of the Proposed 2010 303(d) List. In ADEQ's "Responsiveness Summary to Comments Concerning Arkansas 2008 303 (d) Listing," ADEQ notes on page 1 that "Several comments were received stating that it is difficult to determine what portion of the stream is listed because there are no reference maps with the 303(d) list." ADEQ's response to these comments in the Responsiveness Summary at page 1 was "ADEQ agrees and plans to include maps depicting the planning segments and the major streams with future 303(d) lists [sic] publications" Unfortunately, this was not done.
- 9(b) When ODEQ releases its proposed 303(d) list for public review, it is included as part of its Integrated Report prepared pursuant to CWA sections 303(d) and 305(b). The Integrated Report includes numerous maps, well-constructed tables, and detailed information along with clear, easily readable 303(d) listing. Again, a copy of the documents is available on the ODEQ website at <http://www.deq.state.ok.us/WQDnew>. ADEQ stated on page 1 of its "Responsiveness Summary to Comments Concerning Arkansas 2008 303(d) Listing" that "the Draft 305(b) Report cannot be completed until after the public comment period on the List of Impaired Waterbodies, therefore, the report cannot be made available until after the list has been reviewed." If, however, ODEQ can do this, why can't ADEQ?

ADEQ Response:

- 9(a) ADEQ agrees with this comment and understands the difficulty in identifying water body segments. Prior to public notice of the draft 2010 303(d) list, updated maps of the impaired water body segments were not finalized; however, maps will be available with the finalized 2010 303(d) list and Integrated Water Quality Monitoring and Assessment Report.
- 9(b) States are required to public notice the List of Impaired Waters and to respond to comments concerning the list. The List of Impaired Waters are those waters that are classified as Category 5 waters, or those waters "not currently meeting water quality standards" (EPA "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act"). The final 303(d) list is incorporated into the 2010 Integrated Water Quality Monitoring and Assessment Report (305(b) Report), which is made available to the public after the 303(d) list is finalized.

BWD Comment:

10. In ADEQ's 2008 303(d) List, county locations were given for the listed lakes, but not for the streams. In the Proposed 2010 303(d) List, county locations were omitted entirely. This is a step backward in terms of facilitating public review of the list.

ADEQ Response:

10. ADEQ acknowledges this comment.

Comments received at the February 24, 2010 Public Hearing:

Comment: Martin Maner made the following comments:

1. He commented on the difficulty in identifying where the listed stream segments are in the state, specifically the Saline River. He mentioned that lay people are not familiar with hydrologic unit codes and a cross reference or something that would enable the general public to see whether a stream is listed or not would be helpful.
2. He also commented asking if data from the USGS's monitoring station on the Middle Fork of the Saline River was considered for the period of record (which was April 1, 2004 to March 31, 2009). Particularly concerning turbidity and dissolved oxygen, and if so, perhaps it should be considered as a category 5 water.

ADEQ Response:

1. ADEQ agrees with this comment and understands the difficulty in identifying water body segments for those individuals who are not familiar with hydrologic unit codes and stream segment identifiers. Prior to public notice of the draft 2010 303(d) list, updated maps of the impaired water body segments were not finalized; however, maps will be available with the finalized 2010 303(d) list and Integrated Water Quality Monitoring and Assessment Report.
2. ADEQ has considered all data that was submitted for the evaluation of the water quality of the waters of Arkansas and appreciates all of the entities that submitted data.

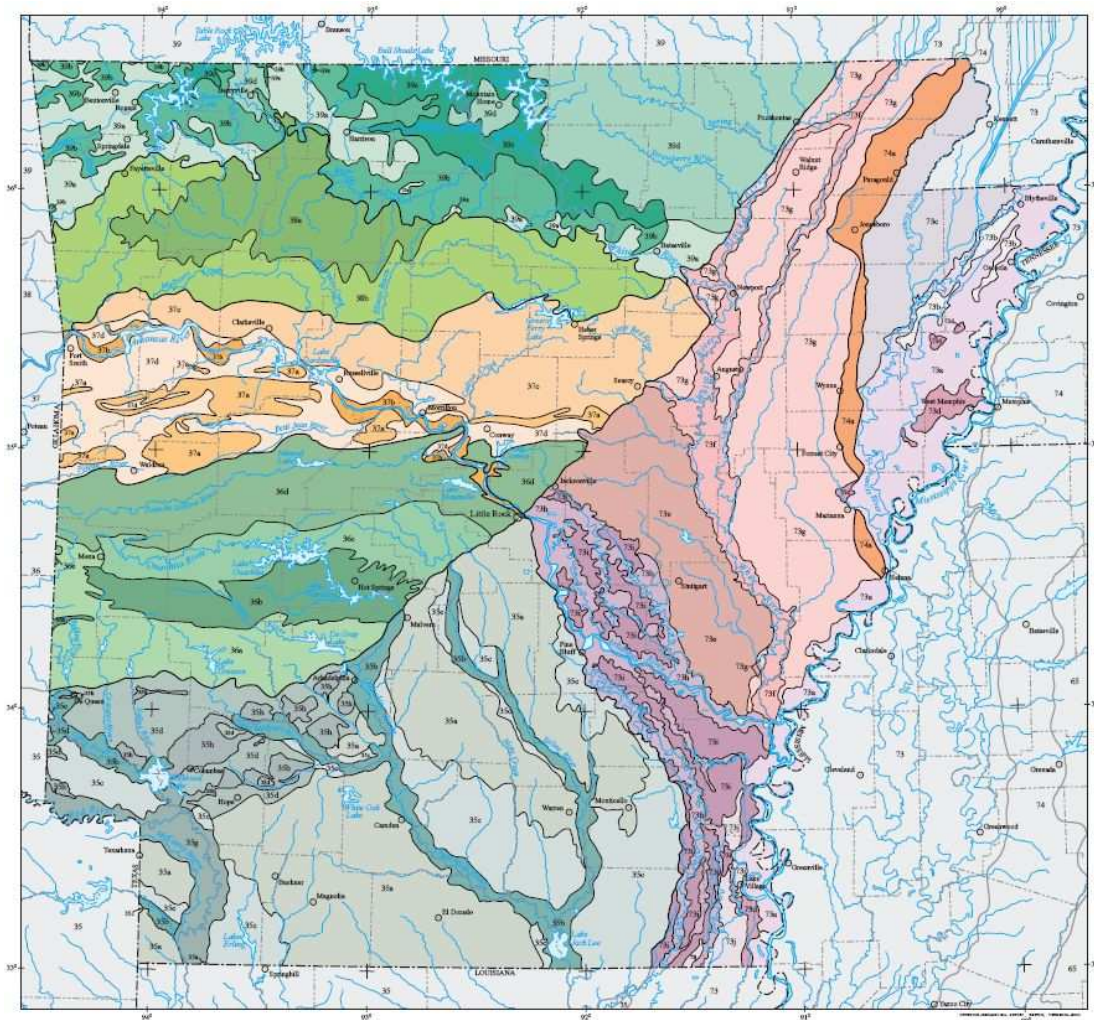
Comment: Allen Gates representing NACA made the following comments:

1. First of all we'd like to commend the Department for the work they've done and timely preparation of the 303(d) list. We encourage you to stay on track and commend you for doing so.
2. He also commented wondering if all of the data (including the data outside the period of record) from the Marty Matlock, Brian Haggard and Art Brown study on the Osage and Spring Creek tributaries of the Illinois River were considered. Additionally, he stated they would be submitting the entire study and asked that it be made part of the public record.

ADEQ Response:

1. ADEQ acknowledges this comment.
2. ADEQ has considered all data (within the period of record) that was submitted for the evaluation of the water quality of the streams of Arkansas. The complete report was submitted into the record.

State of Arkansas



DEPARTMENT OF ENVIRONMENTAL QUALITY

2010

List of Impaired Water Bodies

Prepared pursuant to Section 305(b) and 303(d) of the of the
Federal Water Pollution Control Act



ARKANSAS'S 2010 303(d) LIST (LIST OF IMPAIRED WATER BODIES)

Arkansas's 2010 List of Water Quality Limited Water Bodies has been formatted to reflect the most current guidance issued by the U.S. Environmental Protection Agency (EPA). As part of that guidance, EPA suggests placing water body segments into categories reflecting their attainment status. Category 5 is subdivided by the Arkansas Department of Environmental Quality (ADEQ) for planning and management purposes.

- 1 = Attaining all water quality standards;
- 2 = Attaining some water quality standards, but there is insufficient data to determine if other standards are being attained;
- 3 = Insufficient data to determine if any water quality standards are attained;
 - No data available;
 - The data does not meet the spatial and/or temporal requirements outlined in this assessment methodology;
 - Waters in which the data is questionable because of QA/QC procedures and those requiring confirmation of impairment before a TMDL is scheduled.
- 4 = One or more water quality standards not attained but does not require the development of a TMDL because:
 - a. A TMDL has been completed for the listed parameter(s);
 - b. Waters which are impaired by point source discharges and future permits restrictions are expected to correct the problem(s).
 - c. Waters that currently do not meet an applicable water quality standard, but the impairment is not caused by a pollutant.
- 5 = The water body may be impaired, or one or more water quality standards may not be attained. Water bodies in Category 5 will be prioritized in the following manner:
 - a. High
 - Truly impaired; develop a TMDL or other corrective action(s) for the listed parameter(s).
 - b. Medium
 - Waters currently not attaining standards, but may be de-listed with future revisions to Regulation No. 2, the state water quality standards; or
 - Waters which are impaired by point source discharges and future permit restrictions are expected to correct the problem(s).
 - c. Low
 - Waters currently not attaining one or more water quality standards, but all designated uses are determined to be supported; or
 - There is insufficient data to make a scientifically defensible decision concerning designated use attainment; or
 - Waters ADEQ assessed as unimpaired, but were added to the list by EPA.

Water quality data from a very large pool of stream and lake sampling sites was considered. These stations were associated with either one of ADEQ's monitoring networks; special surveys conducted by ADEQ; sites maintained by the U.S. National Park Service; sites maintained by the U.S. Geological Survey; sites associated with the Arkansas Natural Resources Commission activities; and other entities that supplied ADEQ data.

Each table within the list contains the name of the water body, hydrologic unit code (HUC) and stream reach identifier, the number of stream miles affected, and the monitoring station(s) used to assess the segment. Some segments may have more than one designated use, or none at all, assessed as not attaining. Some segments are listed solely because a water quality standard is not being attained. Some stream segments are impaired by multiple sources (i.e. municipal point source and surface erosion) or causes (metals and silt), while an individual cause (silt) may be from multiple sources (municipal point source and surface erosion).

The Water Quality Limited Water Body tables utilize the following abbreviations:

General:

x = Designated Use or
Water Quality Standard not attained
H = High Priority
M = Medium Priority
L = Low Priority

Designated Uses:

FC = Fish Consumption
FSH = Fisheries¹
PC = Primary Contact
SC = Secondary Contact
DW = Domestic Water Supply
AI = Agriculture & Industry Water Supply

Water Quality Standard:

Tb = Siltation/Turbidity
AM = Ammonia
NO₃ = Nitrogen
TP = Total Phosphorus
pH = pH
DO = Dissolved Oxygen
PA = Pathogen Indicators (bacteria)
Tm = Temperature
CL = Chlorides
SO₄ = Sulfates
TDS = Total Dissolved Solids
PO = Priority Organics
Be = Beryllium
Cd = Cadmium
Cu = Copper
Pb = Lead
Zn = Zinc
Hg = Mercury

Sources:

AG = Agriculture
SE = Surface Erosion²
RE = Resource Extraction
SV = Silviculture
UR = Urban Runoff
RC = Road Construction/Maintenance
IP = Industrial Point Source
MP = Municipal Point Source
HP = Hydropower
UN = Unknown

Notes:

1 Previously Aquatic Life Use.

2 Surface Erosion – This category includes erosion from agriculture activities, construction activities, unpaved road surfaces, and in-stream erosion mainly from unstable stream banks.

Glossary of Terms Used

Channel-Altered Stream – Water bodies mainly located in the State’s Delta ecoregion that have been straightened for irrigation and flood control purposes.

Fisheries – Fish, macroinvertebrate, and plant life in a water body.

Hydrologic Unit Code (HUC) – An eight digit number used to identify large sections of streams and/or rivers. Used in conjunction with the Stream Reach Identifiers.

Macroinvertebrate – Small aquatic organisms that live all or part of their life in the water. They are a vital part of the food chain in the stream.

Nitrates – A chemical in the water derived from nitrogen. Excessive nitrates in drinking water pose serious human health threats. Excessive nitrates in streams, rivers, and lakes can lead to excessive algae growth and can threaten the health of the aquatic life in those systems.

Pathogens – Bacteria, most commonly fecal coliforms and/or *Escherichia coli*.

Quality Assurance/Quality Control (QA/QC) – The procedures used when sampling, analyzing, assessing, and reporting environmental data to insure that the data is scientifically defensible.

Regulation No. 2 – Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas (<http://www.adeq.state.ar.us/regs/default.htm>).

Silt – Very fine particles of soil that are easily transported in the water column of streams and rivers. These particles settle out onto the bottom of the streams and rivers and can impair the aquatic life of the water body.

Stream Reach Identifier – Three digit numbers used to identify distinct small portions of streams, rivers, and/or tributaries that make up larger hydrologic units.

Total Dissolved Solids (TDS) – Those particles in the water column that exist in the dissolved form and typically do not settle out onto the bottom of the stream.

Total Maximum Daily Load (TMDL) - a determination of the total amount of a substance that can be present in a water body without adversely affecting the designated use(s) of the water body.

Water Body – A stream, river, lake, reservoir, or any portion thereof being referred to.

INTRODUCTION

This assessment methodology considers the EPA's most current 305(b) reporting and 303(d) listing requirements and guidance following the percent method. In addition, ADEQ follows the specific requirements of 40 CFR Sections 130.7 and 130.8. The criterion within this assessment methodology are utilized to make attainment decisions of the designated uses of a given water body or water body segment. Monitoring data will be assessed based upon the frequency, duration, and/or magnitude of water quality standard exceedances. A one-time exceedance of water quality criteria due to anthropogenic disruptions may or may not cause a water quality impact, but allows for the pursuit of enforcement actions.

ADEQ develops a biennial report on the condition of the State's waters. As per EPA guidance, "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act July 29, 2005," these waters are evaluated in terms of whether their assigned designated uses, as delineated in the Arkansas Pollution Control and Ecology Commission's Regulation No. 2, Reg 2.302, are being supported.

The following assessment methodology will be used to determine water quality standards attainment from long-term and/or frequently occurring exceedances of the water quality criteria.

The primary data used in the evaluations is generated as part of the ADEQ's water quality monitoring activities as described in the most recent version of the "State of Arkansas's Water Quality Monitoring and Assessment Program." In addition, pursuant to 40 CFR §130.7(b)(5), ADEQ will assemble and evaluate all existing and readily available water quality data and information.

State and federal agencies and other entities that collect water quality data are solicited to aid ADEQ in its evaluation of the State's waters. All data submitted to ADEQ will be considered. However, the data must:

- represent actual annual ambient conditions, as described below;
- have been collected and analyzed under a quality-assurance/quality-control protocol equivalent to or more stringent than that of ADEQ or the U.S. Geological Survey;
- have been analyzed pursuant to the rules outlined in the State Environmental Laboratory Certification Program Act (Act 876 of 1985 as amended);
- be reported in standard units recommended in the relevant approved method;
- be accompanied by precise sample site location(s) data, preferably latitude and longitude in either decimal degrees or degrees, minutes, seconds;
- be received in either an excel spreadsheet or compatible format; and
- have been collected within the period of record.

The data set must be spatially and temporally representative of the actual annual ambient conditions of the water body. Sample locations in streams and open water bodies should be characteristic of the main water mass or distinct hydrologic areas. At a minimum, samples distributed over at least three seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) will be utilized. The data set should not be biased toward specific

conditions, such as flow, runoff, or season. No more than two-thirds of the samples should be in one year or one season. The exception to this is the analysis of data for those designated uses that require seasonally based water quality data; i.e. primary contact recreation, or macroinvertebrate data that should be collected over two seasons.

PERIOD OF RECORD:

Metals and ammonia toxicity analysis - April 1, 2006 to March 31, 2009

All other analyses - April 1, 2004 to March 31, 2009

Data developed prior to the period of record should only be used for long-term trend analysis because the data would have been evaluated as part of a previous assessment. Data developed after the period of record, including but not limited to water quality data, the completion of surveys (including the completion of the final report), changes in water quality standards, and the completion of total maximum daily loads, will be considered during the next assessment period.

ASSESSMENT

ADEQ must take into consideration the possibility of naturally occurring disruptions that may cause exceedances of a standard, but do not result in designated use impairment. Exceedances resulting from *Naturally Occurring Excursions* (NOE), or determined to be *Natural Background* conditions, as defined in Reg. 2.106, will not be assessed as impaired. These determinations will be made on a case-by-case basis, which will usually involve performing an intensive survey of the stream segment as outlined in the “State of Arkansas Water Quality Monitoring and Assessment Program, Revision 3, March 2009.”

Routine water quality data collection generally follows a monthly or bimonthly sampling regime, producing 12 to 60 data points over a five-year period. Therefore, a minimum of 12 water quality samples is required for water quality standards attainment decisions, unless otherwise established by Regulation No. 2 or elsewhere in this assessment methodology

For the assessment of water bodies with no new data, the previous assessment decisions will be carried forward. However, if a significant change in the water quality standards or the assessment methodology has occurred, and those changes would affect the previous assessment decisions, the water body will be re-assessed utilizing the dataset from the previous assessment.

The percent exceedance shown in the Assessment Criteria Tables are calculated using the total number of samples collected. The number of data points exceeding the criteria that are necessary for an assessment decision will be calculated and rounded up to the nearest whole number; e.g. 25% of 38 data points = 9.5, therefore ten (10) exceedances equal 25%.

An evaluated assessment of attainment of water quality standards, in the absence of data, can be made for contiguous stream segments to monitored waters if there is reason to believe that the segments are similar with respect to the watershed characteristics and watershed conditions. Otherwise, the contiguous stream segments will remain unassessed.

An evaluated assessment of non-attainment can be made for contiguous stream segments to monitored waters if there is reason to believe that the segments are similar with respect to the potential cause and magnitude of impairment. However, an evaluation of non-attainment can not be made for contiguous stream segments to monitored waters when the source or the origin of the source of the impairment is unknown, and/or when the magnitude or frequency of the impairment is such that contiguous segments may not be affected. In addition, an evaluation of non-attainment can not be made for contiguous stream segments to monitored waters when a tributary enters the water body either upstream or downstream of the monitored segment, and monitoring data for that tributary indicates impairment. In such cases, the contiguous stream segments will remain unassessed.

Water quality standards, assessment criteria, and monitoring strategies are currently being developed for the State's lakes. Once these items have been adopted into Regulation No. 2 and compiled into the State's overall monitoring strategy plan, an assessment methodology can be developed that will address lake water quality standards. Until this has been accomplished, only those water quality standards currently listed in Regulation No. 2 can be assessed. In addition, there has not been a significant quantity of data collected from any of the State's lakes in the past five years, except for a very limited amount of data collected from four lakes to determine reference conditions.

Narrative Criteria

Waters will be assessed as "non-support" when violation of any narrative water quality standard has been verified by ADEQ. This will be accomplished by use of reports documenting a water quality standards impairment caused by the exceedance of a narrative criterion. The validity of the report must have been verified by an ADEQ employee. In addition, waters will be assessed as "non-support" if any associated numeric standard of a narrative criterion is violated pursuant to this assessment methodology.

Numeric Criteria

All waters of the State with qualifying data will be assessed as either "support" or "non-support" based on the assessment of numeric criteria outlined in Section 4.0.

Impairment Source Determination

For any water body segment where a water quality standard has been evaluated as not supported, the source(s) of impairment will be identified using available information (field observation, land use maps, point source location, nonpoint source assessment reports, special studies, and knowledge of field personnel familiar with the water body) and best professional judgment.

WATER QUALITY STANDARDS

Antidegradation

A Tier 3 water body (e.g. Extraordinary Resource Waters, Ecologically Sensitive Waters, Natural and Scenic Waterways) will be listed as “non-support” if the water quality that existed at the time of designation has declined. For all other waters (Tier 1 and Tier 2) the listing requirements discussed above will apply.

The following are ecoregion or stream segment-specific assessment criteria that are used to evaluate water body water quality standards attainment. These criteria were developed using Arkansas’s water quality standards, EPA guidance documents, and historical surveys.

Designated Uses

| Designated Use | Parameters |
|---|---|
| Fisheries (Regulation 2.302F) | Biological Integrity (macroinvertebrate and/or fish) data. |
| Domestic Water Supply (Regulation 2.302G) | Compounds which are not easily removed by drinking water treatment facilities; compounds with established secondary MCL’s, e.g., Cl, SO ₄ , TDS, |
| Primary and Secondary Contact (Regulation 2.302D, E) | <i>Escherichia coli</i> (use Fecal Coliform bacteria data in the absence of <i>E. coli</i> data). |
| Industrial Water Supply (Regulation 2.302H) | Compounds which interfere with industrial uses such as cooling water or the water used in certain manufacturing processes; or waters unsuitable for livestock watering or crop irrigation; most often includes CL, SO ₄ , TDS. |
| Agriculture Water Supply (Regulation 2.302I) | |

Arkansas bases its water quality assessments on the ability of a water body to support the State’s water quality standards. Two decisions are employed – “Supporting” and “Not Supporting.” A water body is assessed as “Supporting” if the water body meets all assessment criteria for which data are available. A water body will be assessed as “Not-Supporting” if any assessment criterion is not attained.

Key to the footnotes in the assessment criteria tables is as follows:

- 1 - Except for site specific standards approved in water quality standards
- 2 - Criteria based on 90th percentile of ecoregion values
- 3 - Refers to the number of data points instead of a percentage (i.e. greater than one value exceeding criteria = non-support).

General Criteria

Reg. 2.405 - Biological Integrity

The Fisheries designated use (aquatic life) will be evaluated based on the biological integrity (macroinvertebrate and/or fish communities) of the water body, if biological data exists to make an evaluation. At a minimum, the data must have been collected over two seasons using methods outlined in a quality assurance project plan with requirements equal to or more stringent than that of ADEQ’s. The following tables outline the evaluation protocol and the listing protocol for biological integrity support determinations.

Biological Integrity Evaluation Protocol

| Indicator | Data Type | Supporting | Not Supporting |
|-----------------------------|--|---|---|
| Macroinvertebrate Community | Macroinvertebrate Community Data Available | Until MBMI* is developed and critiqued, an upstream/downstream comparison of communities will be utilized, or the community data will be compared to historical ecoregion data using: total taxa richness, EPT, and % dominant taxa. As these metrics are indicative of perturbation/degradation. | |
| | | Hilsenhoff Biotic Index (HBI), Ephemeroptera/Plecoptera/Trichoptera (EPT), and taxa richness indices are highly, generally, or fairly similar to comparison site. | HBI, EPT, and taxa richness indices are not similar to comparison site.** |
| Fish Community | Fish Community Data Available | IBI score either highly, generally, or fairly similar; general presence of sensitive and indicator species. | IBI score not similar; absence of sensitive and indicator species.** |

* - Macroinvertebrate Biological Monitoring Index

** - The aquatic life will be assessed as fully supporting if the low IBI score is caused by an abnormal occurrence in the aquatic life community, not an environmental factor (low dissolved oxygen, low pH, toxicity).

Evaluation methods for the determination of similarity as referenced in the table above are those outlined in Arkansas’s Water Quality and Compliance Monitoring Quality Assurance Project Plan, May 2009 (QTRAK #07-350).

Specific Standards

Reg. 2.502 - Temperature

If more than 10 percent of the total samples from a site exceed the water temperature standard, as listed in the following tables, because of a discernible man-induced cause, the water body will be listed as not attaining the temperature standard. However, if the water temperature standard is exceeded due to a natural condition, excessively high ambient temperatures, drought, etc., the water body will not be listed as impaired.

Fisheries Designated Use Listing Protocols

| Type of Data Present | Evaluation Result | | Final Assessment | 303 (d) Listing Category |
|---|-------------------|-----------------------------|------------------|--------------------------|
| | Fish Community | Macroinvertebrate Community | | |
| Fish Community, Macroinvertebrate Community | S | S | FS | 1 |
| | S | NS | NS | 5 |
| | NS | S | NS | 5 |
| | NS | NS | NS | 5 |
| At Least One Biological Community | S | NA | FS | 1 |
| | NA | S | FS | 1 |
| | S | S | NA | 1 |
| | NA | S | NA | 1 |
| | NS | NA | NS | 5 |
| | NA | NS | NS | 5 |
| Fish Community and/or Macroinvertebrate Community | S | S | FS | 1 |
| | S | NS | NS | 5 |
| | NS | S | NS | 5 |
| | NS | NS | NS | 5 |

S = Supporting NS = Not Supporting FS = Fully Supporting NA = None Available

ASSESSMENT CRITERIA FOR OZARK HIGHLANDS ECOREGION STREAMS

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|---|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 29 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| <10 mi ² | 6 | 2 | < 5 samples or < = 10% | | >10% | |
| 10-100 mi ² | 6 | 5 | < 5 samples or < = 10% | | >10% | |
| > 100 mi ² | 6 | 6 | < 5 samples or < = 10% | | >10% | |
| Trout Waters | 6 | 6 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 10 NTU | | < = 25% | | >25% | |
| All Flows | 17 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR BOSTON MOUNTAINS ECOREGION STREAMS

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 31 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| <10 mi ² | 6 | 2 | < 5 samples or < = 10% | | >10% | |
| > 10 mi ² | 6 | 6 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 10 NTU | | < = 25% | | >25% | |
| All Flows | 19 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR ARKANSAS RIVER VALLEY ECOREGION STREAMS

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 31 C | | < =10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| <10 mi ² | 5 | 2 | < 5 samples or < = 10% | | >10% | |
| 10-150 mi ² | 5 | 3 | < 5 samples or < = 10% | | >10% | |
| 151-400 mi ² | 5 | 4 | < 5 samples or < = 10% | | >10% | |
| >400 mi ² | 5 | 5 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 21 NTU | | < = 25% | | >25% | |
| All Flows | 40 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR OUACHITA MOUNTAINS ECOREGION STREAMS

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 30 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| <10 mi ² | 6 | 2 | < 5 samples or < = 10% | | >10% | |
| >10 mi ² | 6 | 6 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 10 NTU | | < = 25% | | >25% | |
| All Flows | 18 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR GULF COASTAL ECOREGION (typical streams)

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 30 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| <10 mi ² | 5 | 2 | < 5 samples or < = 10% | | >10% | |
| 10-500 mi ² | 5 | 3 | < 5 samples or < = 10% | | >10% | |
| >500 mi ² | 5 | 5 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 21 NTU | | < = 25% | | >25% | |
| All Flows | 32 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR GULF COASTAL ECOREGION (springwater influenced)

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 30 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| ALL WATERSHEDS | 6 | 5 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 21 NTU | | < = 25% | | >25% | |
| All Flows | 32 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR DELTA ECOREGION (least altered)

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 30 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| <10 mi ² | 5 | 2 | < 5 samples or < = 10% | | >10% | |
| 10-100 mi ² | 5 | 3 | < 5 samples or < = 10% | | >10% | |
| >100 mi ² | 5 | 5 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 45 NTU | | < = 25% | | >25% | |
| All Flows | 84 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR DELTA ECOREGION (channel-altered)

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 32 C | | < =10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| <10 mi ² | 5 | 2 | < 5 samples or < = 10% | | >10% | |
| 10-100 mi ² | 5 | 3 | < 5 samples or < = 10% | | >10% | |
| >100 mi ² | 5 | 5 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 75 NTU | | < = 25% | | >25% | |
| All Flows | 250 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR WHITE RIVER (MAIN STEM)

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | | | | | | |
| DAM #1 TO MOUTH | 32 C | | < =10% | | >10% | |
| OZARK HIGHLANDS | 29 C | | < = 10% | | >10% | |
| TROUT WATERS | 20 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| DELTA | 5 | 5 | < 5 samples or < = 10% | | >10% | |
| OZARK HIGHLANDS | 6 | 6 | < 5 samples or < = 10% | | >10% | |
| TROUT WATERS | 6 | 6 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| CL/SO ₄ /TDS ¹ | | | | | | |
| MOUTH TO DAM #3 | 20/60/430 | | < =10% | | >10% | |
| DAM #3 TO MO. LINE ¹ | 20/20/180 | | < =10% | | >10% | |
| MO. LINE TO HEADWATERS ¹ | 20/20/160 | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows - Delta | 45 NTU | | < = 25% | | >25% | |
| All Flows - Delta ² | 84 NTU | | < = 20% | | >20% | |
| Base Flows - Ozark Highlands | 10 NTU | | < = 25% | | >25% | |
| All Flows - Ozark Highlands ² | 17 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR ST. FRANCIS RIVER

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|---|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 32 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| ALL WATERS | 5 | 5 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| CL/SO ₄ /TDS ¹ | | | | | | |
| MOUTH TO 36 ⁰ N. LAT. ¹ | 10/30/330 | | < =10% | | >10% | |
| 36 ⁰ N. LAT. TO 36 ⁰ 30'N LAT. ¹ | 10/20/180 | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 75 NTU | | < = 25% | | >25% | |
| All Flows | 100 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR THE ARKANSAS RIVER

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 32 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| ALL WATERS | 5 | 5 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| CL/SO ₄ /TDS ¹ | | | | | | |
| MOUTH TO L&D #7 ¹ | 250/100/500 | | < =10% | | >10% | |
| L&D #7 TO L&D #10 ¹ | 250/100/500 | | < =10% | | >10% | |
| L&D #10 TO OK LINE ¹ | 250/120/500 | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 50 NTU | | < = 25% | | >25% | |
| All Flows | 52 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR THE OUACHITA RIVER

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 32 C | | <= 10% | | >10% | |
| L. MISSOURI TO S.LINE | 32 C | | <=10% | | >10% | |
| ABOVE L. MISSOURI | 30 C | | <=10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| ALL WATERS | 5 | 5 | < 5 samples or <= 10% | | >10% | |
| pH | 6 to 9 standard pH units | | <=10% | | >10% | |
| CL/SO ₄ /TDS ¹ | | | | | | |
| LA LINE TO CAMDEN ¹ | 160/40/350 | | <=10% | | >10% | |
| CAMDEN TO CARPENTER DAM ¹ | 50/40/150 | | <=10% | | >10% | |
| CARPENTER DAM TO HEADWATERS ¹ | 10/10/100 | | <=10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 21 NTU | | <= 25% | | >25% | |
| All Flows | 32 NTU | | <= 20% | | >20% | |

ASSESSMENT CRITERIA FOR THE RED RIVER

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 32 C | | <= 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| ALL WATERS | 5 | 5 | < 5 samples or <= 10% | | >10% | |
| pH | 6 to 9 standard pH units | | <=10% | | >10% | |
| CL/SO ₄ /TDS ¹ | | | | | | |
| OK LINE TO CONFLUENCE WITH LITTLE RIVER ¹ | 250/200/850 | | <=10% | | >10% | |
| LITTLE RIVER TO LA LINE ¹ | 250/200/500 | | <=10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 50 NTU | | <= 25% | | >25% | |
| All Flows | 150 NTU | | <= 20% | | >20% | |

ASSESSMENT CRITERIA FOR THE MISSISSIPPI RIVER

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|----------|--------------------------------|----------|-------------|----------|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 32 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | Primary | Critical | Primary | Critical | Primary | Critical |
| ALL WATERS | 5 | 5 | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| CL/SO ₄ /TDS ¹ | | | | | | |
| LA LINE TO AR RIVER ¹ | 60/150/425 | | < =10% | | >10% | |
| AR RIVER TO MO LINE ¹ | 60/175/450 | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 50 NTU | | < = 25% | | >25% | |
| All Flows | 75 NTU | | < = 20% | | >20% | |

ASSESSMENT CRITERIA FOR LAKES

| PARAMETER | STANDARD | | SUPPORT | | NON-SUPPORT | |
|--------------------------------------|--------------------------|--|--------------------------------|--|-------------|--|
| | | | DATA POINTS EXCEEDING CRITERIA | | | |
| TEMPERATURE ¹ | 32 C | | < = 10% | | >10% | |
| DISSOLVED OXYGEN ¹ (mg/L) | 5 | | < 5 samples or < = 10% | | >10% | |
| pH | 6 to 9 standard pH units | | < =10% | | >10% | |
| CL/SO ₄ /TDS ¹ | 205/205/500 | | < =10% | | >10% | |
| TURBIDITY | | | | | | |
| Base Flows | 25 NTU | | < = 25% | | >25% | |
| All Flows | 45 NTU | | < = 20% | | >20% | |

Reg. 2.503 – Turbidity

Turbidity, Reg. 2.503, will be evaluated for both base and all flows. If a water body is not meeting either of these conditions, it will be listed as not supporting the turbidity criteria.

Base flow values represent the critical season, June 1 to October 31, when rainfall is infrequent. If four or more samples, or more than 25 percent of the total samples, whichever is greater, collected between June 1 and October 31 for the period of record exceed the base flows values, the stream segment will be listed as not attaining the turbidity standard.

All flows assessment takes into account samples collected throughout the year. If more than 20 percent of the total samples (not to be less than 24) collected from the Ambient Water Quality

Monitoring Network (AWQMN) sites exceed the all flows values, the water body will be listed as not attaining the turbidity standard. For data collected from sites other than the AWQMN, if five or more samples, or more than 20 percent of the total samples, whichever is greater, exceed the all flows values, the water body will be listed as not attaining the turbidity standard.

Reg. 2.504 - pH

If greater than 10 percent of the samples collected exceed the pH standards due to a waste discharge, the water body will be listed as not attaining the pH standard.

Reg. 2.505 - Dissolved Oxygen

Dissolved oxygen standards are divided into two categories: primary season when water temperatures are at or below 22°C; and critical season when water temperatures exceed 22°C. If five or more samples, or greater than 10 percent of the total samples collected, which ever is greater, fail to meet the minimum dissolved oxygen standard, the water body will be listed as not attaining the dissolved oxygen standard.

Reg. 2.506 - Radioactivity

For the assessment of ambient waters for radioactivity, at no time shall the concentration of radium-226 exceed 3 picocuries/Liter nor shall the concentration of strontium-90 exceed 10 picocuries/Liter. If qualifying data indicate an exceedance of either of these parameters, the water body will be listed as impaired.

Reg. 2.507 - Bacteria

For assessment of ambient waters, contact recreation designated uses will be evaluated using *Escherichia coli* (*E. coli*) as outlined in Reg. 2.507. In the absence of *E. coli* bacteria data, fecal coliform bacteria data will be utilized as outlined in Reg. 2.507. In either case, a minimum of eight (8) samples, all of which must be collected and equally spaced within one contact recreation season (May through September or October through April of contiguous months) to make an evaluation of non-attainment. However, a minimum of six (6) samples, all of which must meet the criteria, may be used to make an evaluation of attainment. The geometric mean will be calculated on a minimum of five (5) samples equally spaced over a 30-day period.

In either case, if either the single sample criterion or the geometric mean is exceeded for the period of record, the water body will be listed as impaired. Data sets of less than those described above will be evaluated if they represent actual seasonal or annual ambient conditions as discussed earlier. Listings prior to 2004 may have identified water bodies as water quality impaired using fecal coliform data. These listings were, and will be retained unless additional data for *E. coli* becomes available. If data shows the current *E. coli* criteria are met, the water body will be de-listed.

Statewide Bacteria Assessment Criteria

| <i>Escherichia coli</i> | | STANDARD | SUPPORT | NON-SUPPORT |
|---|-----------------------------|---------------------------|--------------|-------------|
| PRIM. CONTACT | ERW, ESW, and NSW Waters | 298 col/100 ml (May-Sept) | < = 25% | >25% |
| | Lakes, Reservoirs | GM 126 col/100 ml | < = standard | > standard |
| | All other waters | 410 col/100 ml (May-Sept) | < = 25% | >25% |
| SEC. CONTACT | ERW, ESW, and NSW Waters | 1490 col/100 ml(anytime) | < = 25% | >25% |
| | Lakes, Reservoirs | GM 630 col/100 ml | < = standard | > standard |
| | All other waters | 2050 col/100 ml(anytime) | < = 25% | >25% |
| <i>Fecal Coliform</i> | | STANDARD | SUPPORT | NON-SUPPORT |
| <u>PRIMARY CONTACT</u> | | 400 col/100 ml (May-Sept) | < = 25% | >25% |
| All Waters including ERW, ESW, NSW, Lakes, and Reservoirs | | GM 200 col/100 ml | < = standard | > standard |
| <u>SECONDARY CONTACT</u> | | 2000 col/100 ml(anytime) | < = 25% | >25% |
| All Waters including ERW, ESW, NSW, Lakes, and Reservoirs | | GM 1000 col/100 ml | < = standard | > standard |

In accordance with Reg. 2.508, metals toxicity will be evaluated based on instream hardness values at the time of sample collection. If the ambient hardness value is less than 25 mg/L, then a hardness value of 25 mg/L will be used to calculate metals toxicity. If more than one exceedance of the criterion occurs during the period of record, the water body will be listed as impaired for that criterion.

Statewide Metals Assessment Criteria

| | Acute ³ | Chronic |
|-------------|--------------------|---------|
| Support | < =1 | < =1 |
| Non-Support | >1 | >1 |

Waters will be listed as “non-support” for fish consumption if a primary segment of the fish community (e.g., all predators or all Largemouth bass) is recommended for non-consumption by any user group (e.g., general population or high risk groups). However, if a consumption restriction is recommended, e.g., no more than two meals per month or no consumption of fish over 15-inches, these waters will not be listed as “non-support.”

Statewide Fish Consumption Assessment Criteria

| | |
|-------------|---------------------------------------|
| Support | No restriction or limited consumption |
| Non-Support | No consumption for any user group |

Reg. 2.511 - Mineral Quality

Mineral quality will be evaluated as follows: assessments for water bodies with site specific criteria are made according to the specific values listed in Reg. 2.511(A). For those water bodies without site specific criteria, and those stream segments that receive waste water effluent, the criteria of 250 mg/L of chlorides, 250 mg/L of sulfates, and 500 mg/L of total dissolved solids will apply. In either case, if greater than 10 percent of the total samples for the period of record exceed the applicable criteria, the water body will be included on the 303(d) list as being impaired for the mineral(s) assessed.

Statewide Minerals Assessment Criteria

| Parameter | Standard | Support | Non-Support |
|--------------------------------------|-------------------|---------|-------------|
| Site Specific Standards (mg/L) | See Reg. 2.511(A) | < =10% | >10% |
| CL/SO ₄ /TDS ¹ | 250/250/500 | < =10% | >10% |

The Calculated Ecoregion Reference Stream Values (mg/L) listed in Reg. 2.511(B) are used to determine whether there is a ‘significant modification of the water quality.’ These values are not intended to be used to evaluate designated use attainment. Any discharge that results in instream chlorides, sulfates, and or total dissolved solids concentrations greater than the calculated values listed below and greater than 10 percent of the time will be considered to be a significant modification of the water quality and the process outlined in Reg. 2.306 should be implemented.

CALCULATED ECOREGION REFERENCE STREAM VALUES (mg/L)

| Ecoregion | Chlorides | Sulfates | TDS |
|-----------------------|-----------|----------|-------|
| Ozark Highlands | 17.3 | 22.7 | 250 |
| Boston Mountains | 17.3 | 15 | 95.3 |
| Arkansas River Valley | 15 | 17.3 | 112.3 |
| Ouachita Mountains | 15 | 20 | 142 |
| Gulf Coastal Plains | 18.7 | 41.3 | 138 |
| Delta | 48 | 37.3 | 411.3 |

Reg. 2.512 - Ammonia

Total ammonia nitrogen will be evaluated using Reg. 2.512A - D based on instream pH and temperature, as applicable, at the time of sample collection.

If more than one violation of the one-hour average concentration of total ammonia nitrogen exceeds the calculated Acute Criterion; or

If more than one violation of the thirty-day average concentration of total ammonia nitrogen exceeds the Chronic Criterion; or

If more than one violation of the four-day average within a 30-day period exceeds 2.5 times the Chronic Criterion value, the water body will be listed as not attaining ammonia toxicity standards.

Statewide Total Ammonia Nitrogen Assessment Criteria

| | ONE-HOUR AVERAGE | THIRTY-DAY AVERAGE | 4-DAY AVERAGE |
|-------------|------------------|--------------------|----------------|
| Support | <=1 in 3 years | <=1 in 3 years | <=1 in 3 years |
| Non-Support | >1 in 3 years | >1 in 3 years | >1 in 3 years |

Domestic, Agricultural, and Industrial Water Supply

For assessment of ambient waters, the domestic, agricultural, and industrial water supply designated uses will be evaluated using (Reg 2.511) chloride, sulfate, and total dissolved solids in accordance with the Federal Safe Drinking Water Act. If greater than 10 percent of the total samples for the period of record exceed the criteria, the water body will be listed as impaired.

Statewide Water Supply Assessment Criteria

| PARAMETER | STANDARD | SUPPORT | NON-SUPPORT |
|--------------------------------------|-------------|---------|-------------|
| CL/SO ₄ /TDS ¹ | 250/250/500 | <=10% | >10% |

REOCCURRING ISSUES

The evaluation of the fisheries designated use (aquatic life) as impaired based solely on water chemistry data instead of biological data has become an issue. Past and recent studies conducted by ADEQ (Physical, Chemical and Biological Assessment of the Bayou Bartholomew Watershed, April 2001; Physical, Chemical and Biological Assessment of the Strawberry River Watershed, December 2003; TMDL for pH, Mulberry River, Arkansas, 2009) have all indicated that stream segments that were listed as not supporting the fisheries designated use based on

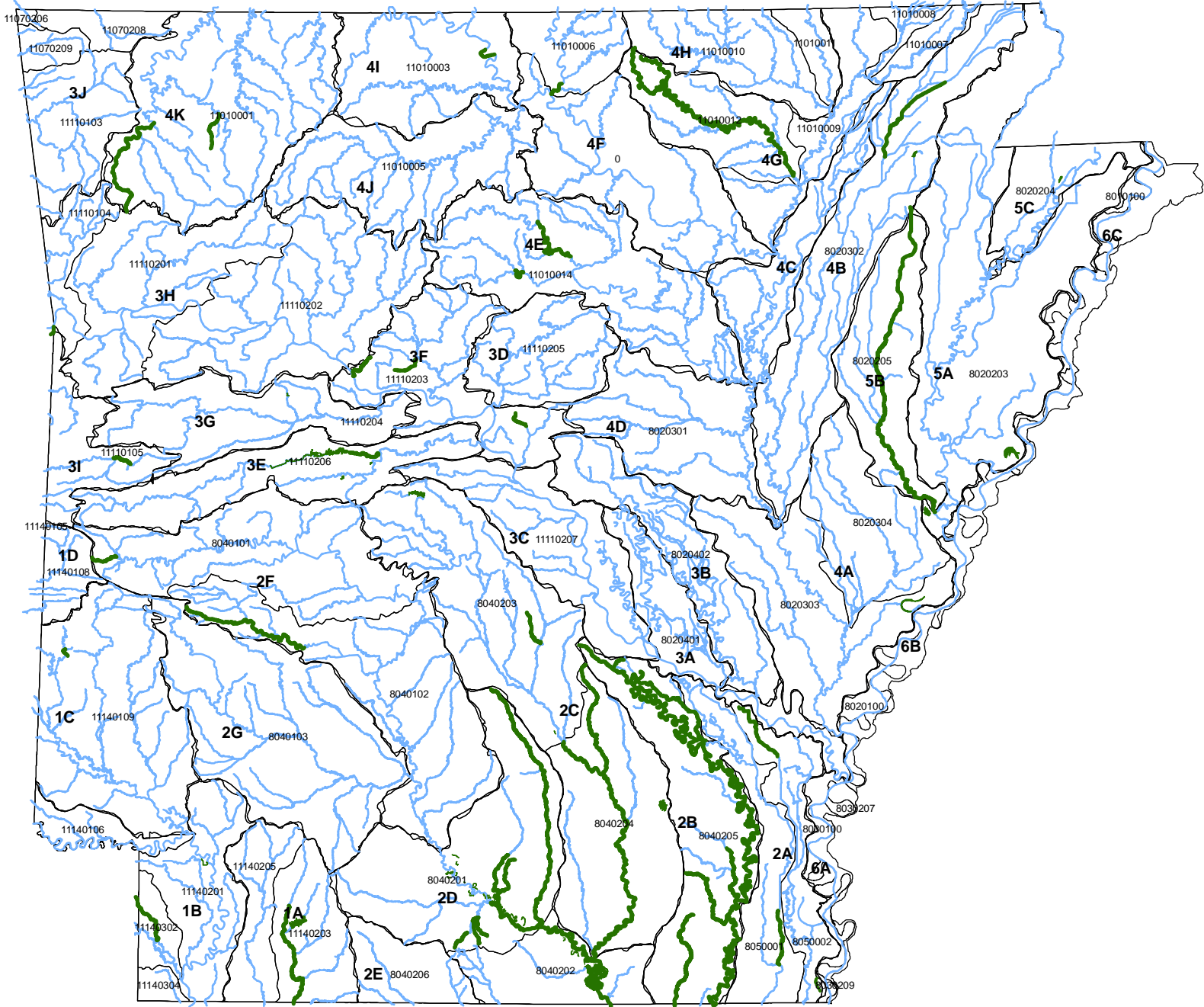
water chemistry data were in fact fully supporting the fisheries designated use. This list has over 130 stream segments, over 2100 stream miles, listed as not supporting the fisheries designated use; yet only five of these stream segments, less than 25 stream miles, have biological data to support the listing.

Many streams in the state have low pH values and are unable to meet the minimum pH standard of 6 standard units. Arkansas's pH standards, adopted in the 1970s, were established to protect the variable life stages of the most sensitive aquatic life species. These standards were based on data generated in a laboratory setting, unlike most of Arkansas's other water quality standards that were developed by utilizing the least-disturbed ecoregion reference stream approach. In addition, the current assessment protocol is from an EPA guidance document that establishes a nationwide exceedance criterion. Thus, neither Arkansas's current pH standards, nor the assessment criteria, can adequately evaluate natural occurring conditions.

Category 4a Waters: Impaired Waterbodies (Lakes) With Completed TMDLs.

| LAKE NAME | HUC | LAKE TYPE | PLNG SEG | ACRES | COUNTY | ASSESS | FISH COMSUMF | AQUATIC LIFE | PRIMARY CONTACT | ECONDAR CONTACT | DRINKING WATER | AGRI & INDUSTRY | SOURCE | | | CAUSE | | | TMDL DATE | Year Listed |
|------------------------------------|----------|-----------|----------|--------|---------------------------------------|--------|--------------|--------------|-----------------|-----------------|----------------|-----------------|--------|---|---|-------|---|---|-----------|-------------|
| | | | | | | | | | | | | | 1 | 2 | 3 | 1 | 2 | 3 | | |
| Columbia | 11140203 | E | 1A | 3000 | Columbia | M | N | | | | | | UN | | | HG | | | 2002 | 2002 |
| First Old Rive | 11140201 | D | 1B | 240 | Miller | M | | N | | | | | UN | | | NU | | | 2007 | 2004 |
| Grand | 8050002 | E | 2A | 900 | Chicot | M | | N | | | | | UN | | | NU | | | 2007 | 2004 |
| Grays | 8040204 | NC | 2C | 36 | Cleveland | M | N | | | | | | UN | | | HG | | | 2004 | 2002 |
| Monticello | 8040204 | B | 2C | 1520 | Drew | M | N | | | | | | UN | | | HG | | | 2004 | 2002 |
| Winona | 8040203 | A | 2C | 715 | Saline | M | N | | | | | | UN | | | HG | | | 2002 | 2002 |
| Ouachita River Oxbows below Camden | 8040202 | | 2D | | Ashley Calhoun Union Bradley Ouachita | M | N | | | | | | UN | | | HG | | | 2002 | 2002 |
| Big Johnson | 8040201 | NC | 2D | 49 | Calhoun | M | N | | | | | | UN | | | HG | | | 2004 | 2002 |
| Felsenthal | 8040202 | E | 2D | 14,000 | Bradley | M | N | | | | | | UN | | | HG | | | 2004 | 2002 |
| Cove Creek | 11110202 | B | 3H | 42 | Logan | M | N | | | | | | UN | | | HG | | | 2002 | 2002 |
| Nimrod | 11110206 | E | 3E | 3550 | Yell | M | N | | | | | | UN | | | HG | | | 2002 | 2002 |
| Dry Fork | 11110206 | | 3E | 90 | Perry | M | N | | | | | | UN | | | HG | | | 2002 | 202 |
| Horseshoe | 8020203 | E | 4A | 1200 | Crittenden | M | | N | | | | | UN | | | NU | | | 2007 | 2004 |
| Frierson | 8020302 | C | 4B | 335 | Greene | M | | N | | | | | UN | | | SI | | | 2007 | 2004 |
| Johnson Hole | 11010014 | A | 4E | | Van Buren | M | N | | | | | | UN | | | HG | | | 2002 | 2002 |
| Spring | 11110204 | B | 3G | 82 | Yell | M | N | | | | | | UN | | | HG | | | 2004 | 2002 |
| Old Town | 8020302 | D | 5A | 900 | Phillips | M | | N | | | | | UN | | | NU | | | 2007 | 2004 |
| Bear Creek | 8020205 | C | 5B | 625 | Lee | M | | N | | | | | UN | | | NU | | | 2007 | 2004 |
| Mallard | 8020204 | D | 5C | 300 | Mississippi | M | | N | | | | | UN | | | NU | | | 2007 | 2004 |

Arkansas's Impaired Water Bodies With Completed TMDLs (Category 4a)

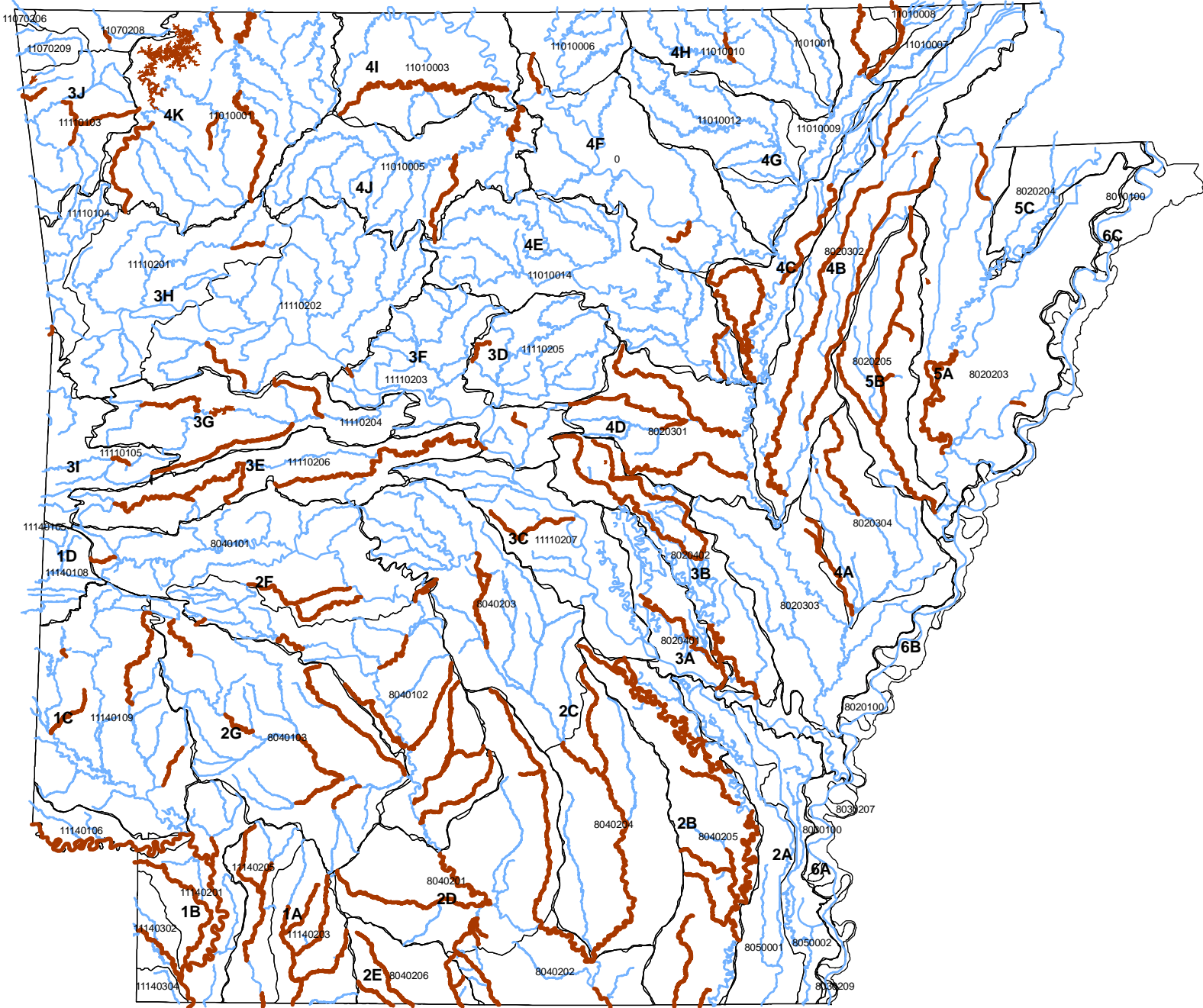


— 2010 4a Water Bodies

Category 5 Waters: Arkansas Water Quality Limited Waterbodies (Lakes) 2010 303(d) List

| LAKE NAME | HUC | RCHPLNG SEG | Acres | MONITORING STATION | Designated Use Not Supported | | | | | | Water Quality Standard Non-Attainment | | | | | | | | | | | SOURCE | | | | | | Priority | | | | | | |
|----------------|----------|----------------|-------|-----------------------|------------------------------|-----|----|----|----|----|---------------------------------------|----|----|----|----|-----|-----|----|----|----|----|--------|----|----|----|----|----|----------|----|--|--|---|---|---|
| | | | | | FC | FSH | PC | SC | DW | AI | DO | pH | Tm | Tb | Cl | SO4 | TDS | PA | Cu | Pb | Zn | Other | IP | MP | SE | AG | UR | | UN | | | | | |
| Pickthorne | 8020402 | D 3B | 350 | LARK025A | | N | | | | | | | | | | | | | | | | | | | | UN | | | | | | | x | L |
| Blue Mountian | 11110204 | E 3G | 2910 | LARK028A+B | | N | | | | | | | | | | | | | | | | | | | | | | | | | | x | L | |
| Swepeco | 11110103 | B 3J | 531 | LARK009A | | N | | | | | | | | | | | | | | | | | | | | UN | | | | | | x | L | |
| Greenlee | 8020304 | D 4A | 320 | LWHI006A | | N | | | | | | | | | | | | | | | | | | | | UN | | | | | | x | L | |
| Frierson | 8020302 | C 4B | 335 | LWHI002A | | N | | | | | | | | | | | | | | | | | | | | | | | | | | x | L | |
| Beaver - Upper | 1101001 | A 4K | 1500 | LWHI013B | | N | N | | | | | | | | | | | | | | | | | | | | | | | | | x | H | |
| Poinsette | 8020203 | C 5A | 600 | LMIS002A | | N | | | | | | | | | | | | | | | | | | | | UN | | | | | | x | L | |

Arkansas's Impaired Water Bodies Without Completed TMDLs (Category 5)



— 2010 Category 5 Water Bodies