

PROPOSED AMENDMENTS TO CHAPTER 45, OKLAHOMA'S WATER QUALITY STANDARDS**PROPOSED AMENDMENTS TO CHAPTER 46, IMPLEMENTATION OF OKLAHOMA'S WATER QUALITY STANDARDS****OWRB BOARD MEETING MARCH 16, 2021**

OWRB received public comments on the 2021 Revision of Water Quality Standards (WQS) (Chapter 45) and Implementation of Oklahoma's Water Quality Standards (Chapter 46) from 36 organizations and individuals. The comments and OWRB staff responses are presented in the tables below.

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TABLE 1: PUBLIC COMMENTS RECEIVED FROM ORGANIZATIONS
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1. Arkansas Farm Bureau, Letter A
2. Arkansas Farm Bureau, Letter B
3. Arkansas Department of Energy & Environment and Arkansas Department of Agriculture
4. Cargill
5. City of Bentonville
6. Georges Inc, submitted by the Law Group of Northwest Arkansas
7. Northwest Arkansas Council
8. Northwest Arkansas Regional Planning Commission
9. Oklahoma Farm Bureau
10. Poultry Federation
11. Save the Illinois River
12. Simmons Foods, Inc., Letter A
13. Simmons Foods, Inc., Letter B
14. State of Oklahoma, House of Representatives
15. Trout Unlimited, Chapter 420, Brandon & Devon Howe
16. Trout Unlimited, Chapter 420, Dalton Wortham
17. Trout Unlimited, Chapter 420, Franklin Darrell Yates
18. Trout Unlimited, Chapter 420, Jake Miller, Conservation Chair
19. Tyson, Letter A
20. Tyson, Letter B
Attachment A: <i>Defining Critical or Hydrologic Conditions as Sampled During the Joint Study</i> by B.E. Haggard, E. Grantz, and J.T. Scott. This document was referenced by several Arkansas stakeholders.

TABLE 2: PUBLIC COMMENTS RECEIVED FROM INDIVIDUALS	
LIST OF COMMENTERS	
21.	Donavan Clary
22.	Ed Brocksmith
23.	Jim Mathewson
24.	John Davidson
25.	Margaret Britain
26.	Norma Boren
27.	Pat Daly

TABLE 3: PUBLIC COMMENTS RECEIVED AT PUBLIC HEARING ON JANUARY 7, 2021	
LIST OF COMMENTERS (IN ORDER COMMENTS WERE MADE)	
28.	Kathy Martin
29.	Ed Brocksmith
30.	Kim Winton
31.	Jim Mathewson
32.	Marla Peek, OK Farm Bureau
33.	Scott Hood, Trout Unlimited
34.	Jake Miller, Trout Unlimited
35.	Jim Burroughs, OK Department of Wildlife Conservation
36.	Karen Harris
Comments from the public hearing were summarized in Table 3. A recording of the public hearing is available upon request.	

Table 1. Public Comments Received from Organizations		
Comment Number	Comment	Response
	Arkansas Farm Bureau	
1.1	The Arkansas Farm Bureau Federation (ArFB) is a non-profit agricultural advocacy association with more than 190,000 members of whom approximately fifty thousand are directly engaged in production agriculture. This represents 90% of all Arkansas' farmers and ranchers. ArFB welcomes the opportunity to submit the following request to the Oklahoma Water Resources Board (OWRB) related to the proposed revision to the total phosphorus criterion for the protection of the aesthetics beneficial use for Scenic River reaches of Illinois River, Flint Creek, and Barren Fork Creek. ArFB also requests the comment period be extended an additional 90 days.	Comment noted. The public comment period for this water quality standards rulemaking was extended from 45 days to 75 days at the request of stakeholders.
1.2	The proposed rule change stems from a study performed by Dr. Ryan King, with the direction of the joint Study Committee created by the Second Joint Statement of Principles. This study took more than two years. Prior to the study's commencement, both states agreed to	OWRB did not deviate from any agreements. Consistent with the Second Statement of Joint Principles the state of Oklahoma via the OWRB was not required to make any changes to the total phosphorus criterion or associated implementation provisions. Nevertheless, OWRB staff valued the

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	<p>accept the results so long as they fell within certain parameters, however, ORWB deviated from this agreement and opted to not adopt the proposed criteria or assessment methodology used in the study. Because the ORWB deviated from the original agreement, we believe our members, who are likely to be the most impacted by this deviation, and the public deserve more time to evaluate the proposed rule change.</p> <p>In addition, the public's time to review was overlapped at the holiday season as well as the COVID-19 pandemic. These two factors have put stress on the public, which includes farmers and ranchers as well as industry; all of whom will be directly impacted by this rulemaking and deserve additional time to review and make thoughtful comments.</p> <p>The ArFB appreciates OWRB's consideration of this request to extend the time for public comment on the proposed rule change. ArFB plans to submit more substantive comments in the future and would greatly appreciate if OWRB would decide on extending the comment period prior to the current comment period of January 15, 2021 and provide stakeholders with notice before the deadline. Please contact me at john.bailey@arfb.com with any questions.</p>	<p>technical work of the 2016 Joint Study and recognized that the total phosphorus water quality criteria could be functionally improved. Therefore, staff pursued revision of the water quality criterion.</p> <p>OWRB staff values the participation of stakeholders and the public comment period was extended to provide stakeholder ample time for review. Stakeholders were publically notified of the extended comment period.</p>
Arkansas Farm Bureau, Letter B		
2.1	<p>The Arkansas Farm Bureau Federation (ARFBF) is a non-profit agricultural advocacy association with more than 188,000 members of whom approximately fifty thousand are directly engaged in agriculture production representing 90% of all farmers and ranchers. ARFBF is submitting the following comments opposing the proposed revisions to the total phosphorus criterion for Scenic River reaches of Illinois River, Flint Creek, and Barren Fork Creek. ARFBF requests the drafted changes to Oklahoma's Water Quality Standard Chapter 45 and Implementation of Oklahoma's Water Quality Standards Chapter 46 be withdrawn and reconsidered.</p>	Comment noted.

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2.2	<p>The proposed rule changes stem from the Final Report submitted to Arkansas' and Oklahoma's Governors from the Joint Study Committee and Scientific Professionals (Final Report) as required by the Second Joint Statement of Principles. The Joint Study Committee completed a 2-year study of 35 stream reaches within the Illinois River Watershed, reviewed the results and used a weight of evidence approach to support the recommendations put forth. It is these recommendations that OWRB has used to establish the drafted revisions being proposed today. However, the ARFBF is concerned by OWRB's proposed definition of 'critical condition' and believes it to be inconsistent with hydrologic conditions studied. This inconsistency and resulting deviation from that recommended places undue burden on farmers and ranchers in both Arkansas and Oklahoma.</p>	<p>Comment noted. See response to comment 2.3, 3.2, and 20.4.</p>
2.3	<p>OWRB's Draft regulations define critical condition when baseflow is fifty-five (55%) percent or greater of the total daily average flow. However, in a report completed earlier this year Dr. Brian Haggard, a member of the Joint Study Committee, analyzed stream flow data collected from the 2- year study included in the Final Report and found:</p> <p><i>93% of the water samples from the "Joint Study" used to measure [Total Phosphorus] concentrations were Eighty [80%] percent or more of the total stream flow...</i></p> <p>This statement advises OWRB should have defined a critical condition when baseflow is 80% or greater not the 55% baseflow being drafted. Dr. Haggard's report also goes on to say that as base flow proportions in the stream increase total phosphorus concentrations decrease. This suggests that a criterion 0.037 mg/L may be unnecessarily stringent under 55% baseflow conditions. This is confirmed in Dr. Haggard's report as he states:</p> <p><i>Thus, if the TP criteria [is] going to be</i></p>	<p>See response to comment 3.3, 3.6, 6.8, and 20.4</p> <p>OWRB is not establishing a more restrictive requirement than the Joint Study Committee recommendations. In fact, OWRB staff has proposed an adjustment to the criterion frequency recommended by the committee that allows regulatory flexibility. The committee recommended the criterion frequency of "never to exceed" which is extremely rigid and stringent; staff proposed a criterion frequency that recognizes the need for some regulatory flexibility while minimizing risk to the waterbody beneficial use. The committee recommendation for critical condition is a qualitative statement and intends to set a flow condition for water quality monitoring. The critical condition term is not part of the criterion and does not affect criterion stringency.</p> <p>The Oklahoma total phosphorus criterion does not apply in the State of Arkansas and no Arkansas farmers or ranchers will be required to meet the Oklahoma total phosphorus criterion. Additionally, nonpoint source discharges from farm and ranch activities are not regulated under the Clean Water Act or under Oklahoma state statutes.</p>

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	<p><i>applied outside the hydrologic conditions studied, it should be adjusted based on the relationship between TP concentrations during "critical conditions"</i></p> <p>...</p> <p>If the TP criteria is not adjusted to account for the proposed baseflow then it is non-point sources, our farmers and ranchers, who will be most impacted.</p>	<p>In Oklahoma, nonpoint source discharges from farm and ranch activities are mitigated through voluntary programs by the Oklahoma Conservation Commission. There are no regulatory mechanisms through which farmers or ranchers will be required to attain the total phosphorus criterion.</p>
2.4	<p>Arkansas Farm Bureau's focus is to ensure sound science drives the production practices of our farmers and ranchers, and to also ensure that regulatory controls being applied to farmers and ranchers employ the same sound science. That is why, at this time, the ARFBF respectfully requests OWRB withdraw the proposed changes to both chapters 45 and 46 at this time so that the Joint Principles may continue to work together towards a common goal of improving water quality through sound science. Please contact John Bailey at john.bailey@arfb.com with any questions.</p>	<p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p> <p>No change has been made to the proposed total phosphorus criterion 785:45-5-19(c)(3).</p> <p>See response to comments 2.3, 3.2, 3.3, 6.8 and 20.4.</p>
	Arkansas Department of Energy & Environment and Arkansas Department of Agriculture	
3.1	<p>The Arkansas Department of Energy and Environment and the Arkansas Department of Agriculture jointly offer the following comments on the Oklahoma Office of the Secretary of Energy & Environment, Oklahoma Water Resources Board's (OWRB) rulemaking to revise its water quality standard for total phosphorus (TP).</p> <p>The Departments appreciate OWRB's cooperation in advancing water quality monitoring and improvements in the Illinois River Watershed. The Departments acknowledge the significant investments that have been made to reduce nutrient loadings in the Illinois River Watershed. As a result of recommendations of the joint study, the Arkansas Department of Energy and Environment and the Arkansas Department of Agriculture have worked with their Oklahoma counterparts, US EPA, and the Cherokee Nation to advance agreements that allow for</p>	<p>Comment noted. Thank you for your participation in the WQS rulemaking process. OWRB staff is especially appreciative of the cooperation and collaboration with Arkansas Division of Environmental Quality (ADEQ) staff on the revision to Oklahoma's total phosphorus criterion and associated implementation provisions. The contributions and commitment from ADEQ staff was deeply appreciated.</p>

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	appropriate and effective implementation of OWRB's numerical water quality standard for TP of 0.037 mg/L, as revised, consistent with the Oklahoma-Arkansas Scenic Rivers Joint Phosphorus Study (Joint Study) Committee's recommendations.	
3.2	The Joint Study Committee was charged with making "specific recommendations as to what total phosphorus (TP) levels, and what frequency and duration components of measure, are necessary to protect the aesthetics beneficial use and scenic river (Outstanding Water Resource) designations assigned to the designated [Oklahoma] Scenic Rivers based on the relation between TP concentrations and biotic indicators of water quality, including primarily algal taxonomic composition and periphyton biomass." (Final Report to Governors from the Joint Study Committee and Scientific Professionals (Joint Study Report), p. 3.) The Joint Study Committee's recommendations were based, in large part, on the Joint Study and intended to provide guidance for assessment and implementation of OWRB's numerical water quality standard for total phosphorus.	<p>The Joint Study Report provides valuable technical information that was used to inform proposed revisions to Oklahoma's total phosphorus criterion and associated implementation provisions. However, it is vital to recollect that the Joint Committee and associated final report did not wholesale redevelop Oklahoma's WQS. Additionally, the science generated in the Joint Study and presented in the final report did not supplant the foundational science underpinning Oklahoma's WQS since its adoption in 2002 – it added to it. This foundational science along with additional analysis conducted by OWRB staff as part of this rulemaking are also valid and were used to inform the proposed revisions.</p> <p>Also, as noted by this comment (3.2) and per the Second Statement of Joint Principals the charge of the Study Committee was to make recommendations regarding the water quality criterion, which has three components 1) total phosphorus level (magnitude), 2) duration, and 3) frequency. It was beyond the responsibility of the Joint Study Committee to make recommendations regarding the assessment and implementation of Oklahoma's total phosphorus criterion.</p>
3.3	The Joint Study evaluated water quality during base flow conditions. "Samples were collected bimonthly during base flow conditions only (or 'critical flow' as defined by the Joint Study Committee, which were any flow conditions that were not dominated by surface-water runoff)." (Joint Study, p. 13) The Joint Study Committee defined "critical conditions" as "the conditions where surface runoff is not the dominant influence of total flow and stream ecosystem processes." The Joint Study's statement about "critical flow" and the Joint Study Committee's definition of "critical conditions" link both "critical flow"	<p>The reasons 1, 2, and 4 listed in this comment (3.3) are supportive rationale for a sampling schedule typically conducted as part of nutrient-algal stressor response studies. However, when it comes to ensuring the scenic Illinois River beneficial use is fully protected and criterion implementation OWRB staff is required to consider additional factors. These factors include (see staff report for full analysis and rationale):</p> <p>1) The foundational science supporting the criterion utilized flow-weighted phosphorus values, so flow adjustments have already</p>

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	<p>and “critical conditions” to base flow conditions. The Joint Study stated that sampling in base flow conditions is appropriate for the following reasons:</p> <p>1) Base flow conditions provide a more representative estimate of phosphorus availability to benthic algae because storm flows usually result in scouring of algae from rocks and very high turbidity, which is not conducive for algal growth due to attenuation of light;</p> <p>2) Base flows occur the vast majority of the time, thus base flow is the typical condition in streams;</p> <p>3) US EPA recommends, and many other states use, base flow conditions to establish numerical criteria for streams and rivers, thus there is a precedent for using data collected only during base flow for estimating violations of a numerical criterion; and</p> <p>4) Base flow TP is typically strongly correlated to TP calculated across all flow conditions where such data are available (e.g. Joint Study, Figure 3). (Joint Study, p. 13)</p>	<p>been included.</p> <p>2) Phosphorus loading during higher flow events contributes to phosphorus present at lower flows and must be measured and mitigated in order to attain the criterion and protect the beneficial use.</p> <p>3) It is essential that WQS be implementable and functional across programs. Regulatory equitability is an essential characteristic when developing a WQS because it works to promote collaborative efforts towards pollutant reduction between different sources and management programs.</p> <p>4) Water quality criteria must work in concert with Oklahoma’s Antidegradation Policy, which works to mitigate additional pollutant loading</p> <p>Therefore, a typical sampling schedule related to the design of a research project does not suffice as a singular driver of criterion implementation and does not ensure beneficial use protection.</p> <p>Regarding reason 3 listed in this comment, U.S. EPA provides a number of recommendations on the topic of developing nutrient criteria. Oklahoma’s original adoption and subsequent EPA approval of the total phosphorus criterion was consistent with a technical approach presented in EPA Nutrient Criteria Technical Guidance, Rivers and Streams (EPA-822-B-00-002). The original criterion adoption and this 2020-2021 revision are consistent with various EPA technical guidance documents.</p>
3.4	Both Arkansas and Oklahoma agreed with the Joint Study Committee’s recommendation that assessments be performed when surface runoff is not the dominant influence of total flow and stream ecosystem processes.	OWRB staff in full collaboration with ADEQ staff over approximately an 18-month period translated the Joint Study Committee’s qualitative definition into an operational definition that could be effectively and consistently employed in water quality assessment programs. This was a positive working relationship and overall agreement was established between the two agencies.
3.5	In this rulemaking, OWRB has determined that its ongoing assessment would be challenging if OWRB had to replicate the sampling conditions used for the Joint	OWRB staff has not determined any difficulties associated with monitoring for water quality assessment. This seems to be a misunderstanding.

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	Study and has proposed a quantification for the term “critical conditions” of fifty-five percent (55%) percent base flow. The Departments are concerned that the proposed definition expands the term “critical conditions” to include conditions that are not representative of “critical flow” or base flow as intended by the Joint Study Committee.	<p>See response to comment 4.4</p> <p>The proposed definition of critical condition does not expand the term beyond the qualitative definition recommended by the Joint Committee. Any intentions of the committee cannot be inferred beyond the qualitative definition written in the report. The proposed definition by OWRB is a scientifically defensible translation of the qualitative definition into an operational definition that can be implemented consistently and effectively by various water quality management programs.</p> <p>See response to comment 3.4.</p>
3.6	<p>Since OWRB proposed using fifty-five percent (55%) base flow to define “critical conditions,” stakeholders have expressed concerns to the Arkansas Department of Energy and Environment and the Arkansas Department of Agriculture stating that OWRB’s proposal does not reflect base flow dominant conditions and is not consistent with the science that supports OWRB’s revised standard for total phosphorus.</p> <p>A white paper entitled “Defining Critical or Hydrologic Conditions as Sampled During the Joint Study” (Haggard, B.E., E. Grantz, and J.T. Scott) analyzed the data sampled for the Joint Study. That analysis indicated that most of the correlated samples represented flow conditions of greater than eighty percent (80%) base flow, and ninety-eight percent (98%) of the data that could be correlated to stream flow was collected when base flow accounted for seventy-seven percent (77%) or greater of that correlated stream flow.</p> <p>This white paper acknowledges that limiting the data for annual assessments to total flows composed of greater than eighty percent (80%) base flow may be problematic. While OWRB’s proposal of fifty-five percent (55%) base flow indicates that base flow is contributing the majority of the flow, it does not indicate that base flow is the “dominant” factor influencing total flow and stream</p>	<p>OWRB largely relied upon three related areas of scientific information to support this WQS and associated implementation provisions revision; 1) foundational science from the original criterion adoption in 2002 and associated technical review in 2012, 2) Joint Study Committee Final Report, and 3) analyses conducted by OWRB staff specifically for this rulemaking action</p> <p>The proposed critical condition definition by OWRB is a scientifically defensible translation of the qualitative definition, recommended by the Joint Committee, into an operational definition that can be implemented by various water quality management programs. The staff report details all scientific analysis supporting the proposed critical condition definition.</p> <p>See response to comment 20.4. See staff report for details of technical analysis.</p> <p>Consistent with the Clean Water Act and implementing regulations (40 CFR Section 131.11) and Oklahoma’s Water Quality Standards (Title 785, Chapter 45) the fundamental requirement for a water quality criterion and its implementation is that it protects beneficial uses. Staff agrees that the hydrologic condition at the time of collecting data to assess the criterion is important. The staff report includes an analysis of the influence of a critical condition baseflow threshold on the evaluation of total phosphorus data. It is clear that increasing baseflow thresholds</p>

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	ecosystem processes. The white paper indicates that an adjustment to the base flow percentage can impact the outcome of an assessment. To assure both goals of annual assessment and dominant base flow conditions, consistent with the Joint Study Committee's recommendations, the white paper recommends that OWRB adjust the proposed definition of "critical conditions" from fifty-five percent (55%) to seventy-five percent (75%) base flow.	<p>dramatically influence the evaluation of total phosphorus concentration in the river. Based on the analysis presented in the staff report, as the baseflow threshold increases to 75% or greater the phosphorus data included in the assessment becomes so restricted that an accurate evaluation of the total phosphorus concentration in the river is suspect.</p> <p>The Aesthetic beneficial use in the Illinois River watershed applies at all times and water quality standards and their implementation must protect the beneficial use. Water quality assessment must provide an accurate evaluation of beneficial use condition. Implementation of a critical condition baseflow threshold must not be used to manipulate when samples are collected and present a partial picture of ambient phosphorus concentrations in the river and place the beneficial use at risk by using a biased data set for beneficial use assessment. Based on the analysis presented in the staff report, OWRB staff finds that a 55% baseflow threshold would protect the beneficial use and reasonably address the critical condition recommendation from Joint Committee.</p>
3.7	<p>The Departments agree that using seventy-five percent (75%) or greater base flow aligns with the Joint Study Committee's recommendation to include "critical conditions" and the Joint Study's linking of "critical flow" to base flow conditions. Both the Arkansas Department of Energy and Environment and the Arkansas Department of Agriculture consider using seventy-five percent (75%) as an acceptable alternative to the proposed definition that would make annual assessment possible during flow conditions that are dominated by base flow.</p> <p>The Departments respectfully request the Oklahoma Office of the Secretary of Energy & Environment, Oklahoma Water Resources Board consider their recommendations to define "critical conditions" using total flows that are composed of seventy-five percent (75%) or greater base flow. We look forward to continuous improvements in the</p>	<p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p> <p>OWRB staff look forward to continuing our positive working relationship with ADEQ staff and other interested parties.</p>

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	watershed and future partnership in appropriate and effective protection of scenic waterways that benefit both Oklahoma and Arkansas.	
	Cargill	
4.1	Cargill Meat Solutions Corporation ("Cargill") submits these comments to the Oklahoma Water Resources Board ("OWRB") regarding OWRB's proposal to amend the Oklahoma Administrative Code 785:46 provisions related to the Scenic River reaches of Illinois River, Flint Creek, and Barren Fork Creek ("Proposed Rule"). Cargill appreciates the opportunity to provide comments on the Proposed Rule since Cargill has operations in the Illinois River watershed that would be directly affected by the Proposed Rule. Further, the Proposed Rule would affect Cargill's growers in the Illinois River watershed, which would have an indirect impact on Cargill and Cargill's supply chain.	Comment noted. OWRB staff values the participation of stakeholders in the WQS rulemaking process.
4.2	<p>Cargill appreciates Oklahoma's efforts, in collaboration with Arkansas, to commission the Joint Study Committee and three-year water quality study of the designated scenic rivers and their watershed, and Oklahoma's commitment to follow the scientific conclusions of this study.</p> <p>Further, Cargill generally supports OWRB's efforts to define science-based parameters to monitor and ensure compliance with the total phosphorous limit based on the Joint Study Committee's work. Toward this end, Cargill recommends that OWRB adopt a baseflow of 80% as an underlying parameter for the 0.037 mg/L total phosphorous limit. A baseflow of 80% is consistent with the underlying work and findings of the Final Report to Governors from the Joint Study Committee and Scientific Professionals (hereinafter referred to as "2016 Joint Study"). Cargill believes that OWRB should consider the 2016 Joint Study's total phosphorous limit recommendation along with the baseflow upon which these findings were based, instead adopting a lower baseflow of</p>	<p>Thank you, OWRB staff worked extensively with counterparts at ADEQ on the scientific foundations of this WQS revision. Communication and cooperation between Oklahoma and Arkansas agencies and stakeholders is central to continued pollution reduction in the Illinois River watershed.</p> <p>See response to comment 4.3</p> <p>Over the last 20 years there has been progress in phosphorus pollution reduction, which has led to measurable improvements in water quality. This has been achieved through the implementation actions of various water quality management programs (e.g., wastewater permits and nonpoint source management practices). Yet, the total phosphorus water quality criterion still has not been attained and the Aesthetic beneficial use of Oklahoma's scenic Illinois River remains impaired. Continued pollution reduction efforts from various sources of phosphorus are necessary to restore the Illinois River's aesthetic beneficial use. Implementing the total phosphorus criterion in manner that is scientifically defensible and evenhanded across diverse water quality management programs is essential to</p>

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	55%. Significant reductions in total phosphorous levels in the Illinois River watershed have already been achieved due to regulation and voluntary efforts, and adopting the right definition of critical condition and baseflow is important to continue to appropriately monitor phosphorous levels and realize such improvements.	eventually attaining the criterion and restoring and maintaining the Aesthetic beneficial use.
4.3	<p>A. OWRB should embrace an 80% baseflow parameter for the 0.037 mg/L total phosphorous limit based on the recommendation and findings of the 2016 Joint Study.</p> <p>OWRB is proposing to adopt a baseflow of 55% as a parameter for the 0.037 mg/L limit. The Proposed Rule would adopt the following language in Oklahoma Administrative Code 785:46-15-14(c)(2)(B): "The critical condition is when baseflow is fifty-five percent (55%) or greater of the total daily average flow calculated by the USGS hydrograph separation method sliding-interval (USGS Water Resources Investigations Report 96-4040)." OWRB's adoption of the concept of "critical condition" is based on a recommendation from the Joint Study Committee. At the conclusion of the 2016 Joint Study, the Joint Study Committee unanimously recommended "a six-month average TP level of not to exceed 0.035 mg/L based on water samples taken during the CRITICAL CONDITION, as previously defined, [as] necessary to protect the aesthetics beneficial use and scenic river (Outstanding Resource Water) designations" 2016 Joint Study, pg. 7.</p> <p>While the 2016 Joint Study did not define a specific baseflow as part of the critical condition, the Joint Study Committee's recommendation for the total phosphorous limit was based on water samples that were collected during higher baseflows. In particular, 93% of the water samples used for the 2016 Joint Study were collected when baseflow contributions were 80% or more of total stream flow. Haggard, B.E., E. Grantz, and J.T. Scott; Defining Critical or</p>	<p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p> <p>See response to comments 3.2, 3.3, 3.6, 20.4.</p> <p>OWRB is not establishing a more restrictive requirement than the Joint Study Committee recommendations. In fact, OWRB staff has proposed an adjustment to the criterion frequency recommend by the committee that allows regulatory flexibility. The committee recommended the criterion frequency of "never to exceed" which is extremely rigid and stringent; staff proposed a criterion frequency that recognizes the need for some regulatory flexibility while minimizing risk to the waterbody beneficial use. The committee recommendation for critical condition is a qualitative statement and intends to set a flow condition for water quality monitoring. The critical condition term is not part of the criterion and does not affect criterion stringency.</p> <p>See response to comment 3.6 and 6.8.</p>

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	<p>Hydrologic Conditions as Sample During the Joint Study (Jan. 15, 2021), pg. 1. The 2016 Joint Study's recommended total phosphorous limit was therefore a direct function of the baseflow upon which the 2016 Joint Study was conducted, i.e., greater than or equal to 80% baseflow 93% of the time.</p> <p>OWRB should not implement more restrictive requirements than recommended by the 2016 Joint Study. The 2016 Joint Study demonstrated that changes to the baseflow are directly correlated to total phosphorous levels. In other words, samples pulled during lower baseflow would result in higher total phosphorous levels and more exceedances of the total phosphorous limit. Haggard, B. E., E. Grantz, and J.T. Scott; Defining Critical or Hydrologic Conditions as Sample During the Joint Study (Jan. 15, 2021), pg. 1. Adopting a lower baseflow of 55% as the critical condition would therefore render the 0.037 mg/L total phosphorous more stringent than the limit recommended by the 2016 Joint Study to protect the aesthetic beneficial use of the Illinois River watershed.</p> <p>For these reasons, following the scientific findings of the 2016 Joint Study in their entirety, including the baseflow conditions along with the total phosphorous limit, is critical. If OWRB still seeks to adopt a lower baseflow of 55%, the agency should reevaluate the 0.037 mg/L total phosphorous limit and conduct further sampling during lower baseflow events to determine what total phosphorous limit would be appropriate to protect the aesthetic beneficial use of the Illinois River watershed.</p>	
4.4	<p>In addition, we understand that OWRB has considered adopting a lower 55% baseflow for ease of collecting samples on a regular basis. OWRB Illinois River Watershed Total Phosphorus Criterion Revision Staff Report (December 1, 2020), pg. 55. There is apparent concern that adopting a higher baseflow (OWRB examined 75% and 90% baseflows)</p>	<p>This comment reflects a misunderstanding of the conclusions presented in the staff report on pages 55 and 56. OWRB staff is not concerned about the ease of collecting samples on a regular basis. Concerns regarding the critical condition term and restricting data included in a water quality assessment are because when the population of data used in the assessment is</p>

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	would constrain an agency's ability to collect samples. However, the 2016 Joint Study demonstrated that it is possible to collect samples on a monthly basis even during rainy months to satisfy a higher baseflow parameter. This is evidenced by the fact that 93% of the 2016 Joint Study's samples were collected when the baseflow was 80% or higher. In addition, there is already a mechanism in the Proposed Rule to provide flexibility and account for months where a sample cannot be collected. OWRB has proposed that the rolling 6-month arithmetic mean, which Cargill fully supports, must include at least four values from four months, meaning that the mean can still be calculated even in situations where it is not possible to take samples in a few months due to lower baseflows. Proposed Oklahoma Administrative Code 785:46-15-14(c)(2)(C).	<p>restricted to greater baseflow thresholds generally the observed total phosphorus concentration in the river is skewed lower; that is closer to the magnitude of 0.037 mg/L (Staff report pages 48-56). The Aesthetic beneficial use in the Illinois River watershed applies at all times and water quality assessment must provide an accurate evaluation of beneficial use condition. Implementation of a critical condition baseflow threshold must not be used to manipulate when samples are collected and present a partial representation of ambient phosphorus concentrations and place the beneficial use at risk through the use of biased data for beneficial use assessment.</p> <p>See response to comment 3.6.</p> <p>The staff report clearly articulates OWRB staff's rational for proposing the 55% baseflow threshold. These include the following: 1) need to accurately evaluate beneficial use condition, 2) influence that flow restrictions have on evaluation of ambient TP concentrations and loads, 3) the need for evenhandedness across water quality programs, 4) loading restrictions under the Antidegradation Policy, 5) foundational science for original criterion magnitude was based on flow weighted TP values, and 6) longstanding monitoring practices</p> <p>Thank you for your support of criterion duration as a 6-month average and the approach to its calculation.</p>
4.5	<p>B. OWRB should consider the cascade effects that will result from adopting a lower baseflow for the total phosphorous criterion and the significant impacts on a range of regulated entities that would follow.</p> <p>The OWRB rulemaking package does not consider the impacts on municipalities, companies, and growers in the Illinois River watershed that will result from adopting a "critical condition" baseflow of 55%, instead of a higher baseflow, for the total phosphorous criterion. Under Oklahoma law, agencies must consider the effect its intended action may have on</p>	<p>The critical condition term and baseflow threshold works to set a flow condition for water quality monitoring as part of the Oklahoma use assessment protocols (USAP) (785:46-15). This proposed change is mostly likely to affect state agencies or other groups that conduct water quality assessments. Municipalities, companies, and growers do not typically conduct water quality assessments in Oklahoma; so it is unlikely that they would be impacted by this change to USAP. Moreover, Oklahoma's rules do not apply in Arkansas and municipalities, companies, and growers in Arkansas are not responsible to implement or comply with Oklahoma rules.</p>

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	<p>businesses and governmental entities. 75 O.S. § 303(A)(4). The agency must describe the "probable quantitative and qualitative impact of the proposed rule, economic or otherwise, and use quantifiable data to the extent possible, taking into account both short-term and long-term consequences." 75 O.S. § 303(A)(4).</p> <p>The OWRB Rule Impact Statement for Rule Amendments in OAC 785:46 ("Rule Impact Statement") does not describe or assess the probable quantitative and qualitative impacts of the proposed rule on municipalities, companies, and growers. The Rule Impact Statement states that "the updates to the criterion and the implementation are minor and the proposed rules are not expected to cause an economic impact on affected persons or political subdivisions." Rule Impact Statement, pg. 3. The Rule Impact Statement further states that "[t]he proposed revisions to the implementation of the total phosphorous criterion are not expected to create additional costs or have an adverse economic effect on small business (defined in 75 O.S. § 502)." Rule Impact Statement, pg. 3. The Rule Impact Statement does not account for the fact that: (a) the baseflow parameters are critical to determining if and when there are exceedances of the 0.037 mg/L total phosphorous limit; and (b) adopting lower baseflow conditions will lead to more exceedances and trigger more stringent regulations.</p> <p>The baseflow parameters underlying the total phosphorous limits will have a real impact on regulated entities that are in the watershed or contribute phosphorous to the watershed. Samples pulled during lower baseflow conditions (based on the proposed 55% baseflow) are more likely to exceed the 0.037 mg/L total phosphorous limit, and exceedances of the total phosphorous limit will result in policy changes that trigger more stringent regulation. This would create a clear and predictable cascade effect that impacts the following regulated entities:</p>	<p>The outcome of a water quality assessment, if a beneficial use is impaired, is for the State to pursue regulatory or voluntary management actions to reduce pollution and restore the waterbody beneficial use. Entities that are a source of pollution would likely be called upon through various water quality management programs to reduce their pollution contributions. This framework between water quality assessment and actions by other Clean Water Act programs has long been in place. No new impacts or responsibilities are created by these proposed rules.</p> <p>OWRB staff prepared the rule impact statements consistent with applicable Oklahoma rules.</p>

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	<ul style="list-style-type: none"> • Municipal publicly owned treatment works; • Companies that discharge to municipal publicly owned treatment works; • Companies that directly discharge to the Illinois River watershed; and • Growers operating in the Illinois River watershed. <p>Direct impacts on regulated entities would take the form of more restrictive wastewater or direct discharge permitting obligations in the watershed that could curtail operations and lead to significant capital costs to improve wastewater infrastructure. This could also result in more stringent Nutrient Management Plans for companies in the Illinois River Watershed. Finally, growers could be subject to further limitations or even prohibitions on litter disposal, that could limit operations and drive up costs. We recommend that OWRB consider the operational and economic impacts on regulated entities and small businesses of any proposed baseflow.</p>	
4.6	<p>For the reasons stated above, we encourage OWRB to follow the science of the 2016 Joint Study and consider defining the "critical condition" for purposes of the total phosphorous limit as conditions when baseflow is 80% or greater of the total daily average flow .</p> <p>Cargill appreciates the opportunity to provide comments on this rulemaking and OWRB's consideration of our comments. Please do not hesitate to contact me at Timothy Maupin@cargill.com or (316) 291-1306 if you have any questions regarding our comments.</p>	<p>See response to comment 4.3</p> <p>Thank you, comment noted.</p>
City of Bentonville		
5.1	<p>I appreciate the opportunity to submit comments regarding the Oklahoma Water Resources Board's Illinois River Watershed Total Phosphorus Criterion Revision. I wholly appreciate the efforts of the Oklahoma Water Quality Standards Team and fully respect their duty and commitment to improve and protect the Illinois River as an essential resource and vital amenity to the State of Oklahoma as</p>	<p>Comment noted. Thank you for your participation in the WQS rulemaking process.</p>

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	well as Arkansas. However, I am concerned about the proposed sampling criteria, specifically collecting samples when base flow constitutes 55 percent of the river's flow as I feel this criteria does not align with the stressor response study performed by Dr. Ryan King of Baylor University.	
5.2	<p>As a result of the second "Statement of Joint Principles and Action" (SJPA) executed between Arkansas and Oklahoma in 2013, Dr. Ryan King of Baylor University was hired to conduct a stressor response study of the Illinois River to determine the total phosphorus threshold including sampling adequate to determine the frequency and duration component of the numeric criterion. In the SJPA, both Arkansas and Oklahoma agreed to be bound by the results of this study. An extensive sampling population was collected throughout the duration of the study which should be the basis for implementing the water quality standard.</p> <p>The King study referenced above showed and the panel of six experts overseeing the study recommended that to be protective of the aesthetics beneficial use and scenic river designation a six-month average of the total phosphorus level shall not exceed 0.035 milligrams per liter based on water samples taken during critical conditions. Given the results of the study, I fully support Oklahoma Water Resources Board's decision to use 0.037 milligrams per liter for total phosphorus as well as the six-month rolling average. However, I do have concern with proposing sampling conditions inconsistent with Dr. King's study. The vast majority (more than 90%) of samples taken by Dr. King's team were taken when base flow made up 80 percent or more of the stream flow. To properly align with the study and its recommendations, sampling for the total phosphorus criterion should follow suit. Oklahoma Water Resources Board's recommendation of sampling when base flow accounts for 55 percent or more of the stream flow is not consistent with the study and, therefore, subsequent water quality monitoring and</p>	<p>See response to comments 3.2, 3.3, 6.8, 20.4, and 20.5.</p> <p>Thank you for your support of the total phosphorus criterion revision (785:45-5-19(c)).</p> <p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders. OWRB staff look forward to continuing our positive working relationship with ADEQ staff and other interested parties.</p>

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	<p>assessment will not be consistent with the study and recommendations of the panel. Total phosphorus concentrations change as the base flow proportion of flow in a stream changes, thus it is imperative that sampling conditions used to enforce the criteria match the sampling conditions of the King study. A base flow proportion of 55 percent is a much different scenario than 80 percent. I feel it is irresponsible to ignore the sampling details of the King study, and I believe this does not honor the agreement and commitment between Arkansas and Oklahoma to let the science govern.</p> <p>To further support my concerns, I have attached Dr. Brian Haggard's technical memorandum "Defining Critical or Hydrologic Conditions as Sampled During the Joint Study" prepared for the Northwest Arkansas Regional Planning Commission, January 15, 2021. Dr. Haggard was one of the six expert panelists selected to oversee Dr. King's study, and the attached document clearly illustrates that the Oklahoma Water Resources Board's recommendation to sample when base flow constitutes 55 percent or more of the stream flow does not align with Dr. King's study.</p>	
5.3	Thank you for the opportunity to express my concerns regarding the proposed Total Phosphorus Criterion Revision. I trust the science from Dr. King's study will be used to direct the outcome of the criterion revision. Feel free to contact me with any questions.	Thank you, comment noted.
	Georges Inc	
6.1	George's, Inc. (George's), submits the following comments to the Oklahoma Water Resources Board (OWRB) related to the proposed revision to Oklahoma's Use Support Assessment Protocols [Title 785, Chapter 46-15-14(b)] (Proposed Rule) relating to the total phosphorus (TP) criterion for the protection of the aesthetics beneficial use for Scenic River reaches of Illinois River, Flint Creek, and Barren Fork Creek (Scenic Rivers).	Comment noted, thank you for your participation in the WQS rulemaking process.
6.2	Since 2003, the States of Arkansas and Oklahoma (States) have entered into two	Comment noted. See response to comment 10.3.

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	<p>separate Statements of Joint Principles and Actions. The first in 2003 (First Statement), and the second in 2013 (Second Statement). These statements represented agreement between the two States that meeting water quality goals should involve coordinated strategies and serve the best interest of both States. The First Statement outlined several activities the States already had initiated, or would initiate, to meet Oklahoma's total phosphorus criterion of 0.037 mg/l in Oklahoma's scenic rivers.</p> <p>The Second Statement, in addition to extending commitments from the First Statement, initiated a "Joint Phosphorous Criteria Study (Study)." The Second Statement indicated this Study "will provide an objective analysis of the water quality data and identify relationships, if any, between various concentration of the phosphorus in the designated Scenic Rivers and multiple ecological response levels commonly used in the scientific community to describe undesirable aesthetic and water quality conditions." Further, the Second Statement provided that both States would agree to be bound by the findings of the Study. Further, Oklahoma, through the Oklahoma Water Resources Board, agreed to "promulgate any Numeric Phosphorus Criterion, subject to applicable Oklahoma statutes, rules and regulations if significantly different than the current 0.037 mg/L standard. 'Significantly different' means the new Numeric Phosphorus [sic] Criterion exceeds -0.10 or + 0.10 than the current .037 [sic] criterion."</p>	
6.3	<p>Representatives for Arkansas and Oklahoma executed a "Memorandum of Agreement" (MOA) in 2018, for the purpose of implementing the Joint Study Recommendation. The Joint Study Committee's Final Recommendations were made in a report to the Governors of Arkansas and Oklahoma in December 2016. As part of the MOA, "the OWRB agree[d] to initiate rulemaking in Oklahoma Administrative Code (OAC), Chapters 45 and 46, to implement the</p>	Comment noted.

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	Joint Study Recommendations as they apply to the total phosphorus criterion subject to applicable laws, rules, and regulations.”	
6.4	Arkansas and Oklahoma have shown tremendous collaboration and cooperation in improving Scenic River water quality, as evidenced by the First and Second Statements and the MOA. This collaboration has also yielded measurable improvements in water quality in the Illinois River, indicated in OWRB data. As noted by other stakeholders and commenters, OWRB has presented evidence of these improvements in recent presentations to stakeholders. Based on the Total Phosphorus (TP) in the Illinois River near Watts, such concentration has reduced from well over 0.2 mg/l in 1999 to nearly 0.037 mg/l in 2019. George’s is pleased to be one of many stakeholders that can contribute to such improvements, and also proud of the cooperation between the States to create positive and meaningful trends in water quality.	OWRB staff agree; cooperation in the watershed over the last 20 years has promoted progress in phosphorus pollution reduction. This has led to measurable improvements in water quality. This has been achieved through the implementation actions of various water quality management programs (e.g., wastewater permits and nonpoint source management practices). Yet, the total phosphorus water quality criterion still has not been attained and the Aesthetic beneficial use of Oklahoma’s scenic Illinois River remains impaired. OWRB, USGS, and ADEQ data from the Watts and South Siloam Springs monitoring locations document that total phosphorus criterion magnitude of 0.037 mg/L is considerably exceeded on a routine basis. (See staff report figures 23 & 24). Continued pollution reduction efforts from all sources of phosphorus are necessary to restore the Illinois River’s Aesthetic beneficial use.
6.5	The joint study conducted as a part of the Second Statement (Joint Study), was conducted by Baylor University with oversight by the Joint Study Committee. The work of Baylor concluded the Phosphorus criteria should be, “A six-month total phosphorus level not to exceed 0.035 mg/l based on water samples taken during the critical condition.” Critical condition was defined in the final report of the Joint Study as: “conditions where surface runoff is not the dominate influence of total flow and stream ecosystem processes.” The conclusion and definition were unanimously recommended by all six members of the Joint Study Committee.	Comment noted.
6.6	Through a December 2020 Notice of Proposed Rulemaking, the OWRB issued a proposed Phosphorus Criterion for the Scenic Rivers. After reviewing the Joint Study, Joint Study Recommendations, and resulting Proposed Rule, George’s supports the duration and frequency of	Thank you for the support and participation in the water quality standards rulemaking process.

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	the proposed water quality criteria in the Proposed Rule.	
6.7	<p>OWRB's proposal defines the critical condition term as "[W]hen baseflow is fifty-five (55%) or greater of the total daily flow calculated by the USGS hydrograph separation method sliding interval. Measurements of total daily average flow must be obtained from a permanent continuous stream flow gage." This definition seems more related to a general understanding of the term "dominant," rather than a definition supported by the findings of the Joint Study. Additionally, when most of the sample collection and research was conducted for the Joint Study, the conditions of the stream were not set with the 55% or greater total daily flow measure.</p> <p>George's has included as part of these comments the report, "Defining Critical or Hydrologic Conditions as Sampled During the Joint Study," authored by Dr. Brian Haggard (University of Arkansas) and Dr. Thad Scott (Baylor University) (Haggard/Scott report). The authors of the Haggard/Scott report analyzed 20 stream sites paired with United States Geological Survey (USGS) stream monitoring stations where samples were collected as part of the Joint Study. During the Joint Study, samples were taken near these USGS monitoring stations 12 times over a two-year period. Ninety-three percent of the water samples collected for the Joint Study to measure TP concentrations were collected when base flow conditions were greater than 80% or more of stream flow conditions.</p>	<p>To clarify, almost all of the stream sampling conducted as part of the 2016 Joint Study was done when baseflow comprised 55% or greater of the total flow. There were a few events when sampling took place during a lower baseflow percentage. The summarization that ninety-three percent of the 2016 Joint Study sampling occurred when baseflow was 80% or more of stream flow conditions falls under the "or greater" language of the proposed baseflow threshold. Thus, the 55% or greater baseflow threshold includes flow conditions under which the majority of sampling in the 2016 Joint Study occurred.</p> <p>OWRB staff scientific analysis to operationally define critical condition encompassed 11 years of daily average flow values from 7 USGS stations in the watershed (~ 4,000 flow values per station), which was used to characterize the dynamic nature of the hydrograph and evaluate where various critical condition baseflow thresholds fall on the hydrograph and how this impacts the availability of phosphorus data and the representation of phosphorus concentration in the river. This is a scientifically defensible analysis and establishes the technical foundation to translate the qualitative critical condition definition, recommended by the Joint Committee, into an operational definition that can be implemented by various water quality management programs. The staff report details all scientific analysis supporting the proposed critical condition definition.</p> <p>See response to comment 20.4</p>
6.8	It appears OWRB is not proposing a change to the numeric criterion of 0.037 mg/L TP, though this is not stated in the Proposed Rule. It is presumed OWRB has elected not to change the numeric criterion because 0.035 mg/L TP (recommended numeric criterion by the Joint Study Committee) is within the stipulated -0.010 to +0.010 of 0.037 mg/L.	Correct, OWRB is not proposing a change to the criterion magnitude of 0.037 mg/L total phosphorus.
6.8	If OWRB finalizes the Proposed Rule, as written, to include the operational	The 2016 Joint Study is not the foundational science for Oklahoma's total phosphorus

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	<p>definition of “critical condition” as “when baseflow is fifty-five (55%) or greater of the total daily flow,” then the OWRB must change the numeric criteria of 0.037 mg/L TP to reflect the proposed definition of “critical flow.” As stated in the Haggard/Scott report, this is important because the TP criteria magnitude from the “Joint Study” was tied to these specific hydrologic or “critical conditions”, which suggests assessment of the TP criteria in Oklahoma’s Scenic Rivers (0.037 mg/L; OWRB, 2002) should be tied to these same hydrologic or “critical conditions.”</p> <p>The Haggard/Scott report also states, “If assessment of the TP magnitude was applied outside the hydrologic conditions sampled, then some consideration should be given to how TP concentrations vary with BFP (base flow proportions) or total streamflow. Across this region and landscape, stream TP concentrations and loads increase with increasing discharge, especially if comparing base flow to storm events (e.g., Haggard 2010; Scott et al., 2011; Giovannetti et al., 2013; Grantz et al., 2014; McCarty and Haggard, 2016). Haggard/Scott showed across eight different sites that stream TP concentrations changed with discharge; in particular, stream TP concentrations significantly ($P < 0.01$) decreased with BFP. In fact, the magnitude of change (i.e., $\Delta TP_{0.1BFP}$) varies with magnitude of stream TP during predominantly base flow conditions (i.e., TPBF – Total Phosphorous at dominant base flow conditions) across the Illinois River Watershed. Defining the hydrologic conditions used to assess the magnitude of the Oklahoma Scenic River TP criteria definitely matters at streams with TPBF approaching 0.037 mg/L. For example, if three water samples were collected at BFPs of 0.80, 0.70, and 0.60 with TPBF of 0.037 mg/L, then the mean of those three samples could [theoretically] be</p>	<p>criterion. The foundational science for the 2002 adoption of this criterion is a USGS study evaluating nutrient concentrations in undeveloped stream basins in the U.S.¹ Staff agrees that it has long been observed in water quality monitoring that streamflow influences the concentration and load of the parameter being monitored and that this has been observed in the Illinois River watershed. Therefore, scientists apply methods to address confounding factors such as flow in order to accurately evaluate trends and compare measurements sampled across the flow regime. There is a long history of using statistical models to compute flow-weighted parameter concentrations; the phosphorus data in the USGS study was adjusted to be flow-weighted and thus flow has been addressed as a factor affecting total phosphorus concentration. It is critical to recognize that the original science underpinning Oklahoma’s total phosphorus criterion incorporated adjustments for flow and provides the scientific foundation for Oklahoma assessing the criterion across various flow conditions since its original adoption in 2002. Oklahoma’s use of this USGS study and the approach of setting phosphorus criteria from a frequency distribution is consistent with EPA Nutrient Criteria Technical Guidance, Rivers and Streams (EPA-822-B-00-002).</p> <p>The 2016 Joint Study added valuable scientific knowledge to the understanding of phosphorus and algae relationships, particularly in the Illinois River watershed. However, it did not supplant previous scientific foundations supporting Oklahoma’s phosphorus criterion - it added to them. The 2016 Joint Study and committee recommendations did not wholesale redevelop OK’s total phosphorus water quality criterion or its implementation. For example, the final report clearly states that addressing criterion frequency was beyond the scope of the study (Joint Study Committee Final Report, page 13).</p>

¹ Clark, G., Mueller, D., Mast, M.A. 2000. Nutrient Concentrations and Yield in Undeveloped Stream Basins of the United States, Journal of the American Water Resources Association, Vol. 36, No. 4 849-860

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	<p>0.045 mg TP L-1 (exceeding the TP criteria magnitude). Thus, if the magnitude was going to be applied outside the hydrologic conditions studied, then it should be adjusted based on both $\Delta TP_{0.1BFP}$ and TPBF to limit risk of spurious exceedances and violations.” George’s advocates for this approach to be considered in the formation of the final rule.</p>	<p>Therefore, OWRB staff, in cooperation with partners pursued the science necessary to establish the criterion frequency. Staff agrees that the hydrologic condition at the time of collecting data to assess the criterion is important. The staff report includes an analysis of the influence of a critical condition baseflow threshold on the evaluation of total phosphorus data. It is clear that increasing baseflow thresholds dramatically influence the evaluation of total phosphorus. The Aesthetic beneficial use in the Illinois River watershed applies at all times and water quality assessment must provide an accurate evaluation of beneficial use condition. Implementation of a critical condition baseflow threshold must not be used to manipulate when samples are collected and present a partial representation of ambient phosphorus concentrations and place the beneficial use at risk through the use of biased data for beneficial use assessment.</p> <p>Although, not directed by the Second Statement of Joint Principals, the Joint Study Committee presented a critical condition recommendation as a qualitative statement. In order to honor this recommendation, even though the foundational science incorporated flow adjustments, OWRB staff pursued a scientifically defensible analysis to operationally define the critical condition in a manner that ensures beneficial use protection and reasonably address the committee recommendation. The 55% baseflow threshold excludes samples when stormflow is overtly dominating the river and yet allows for accurate beneficial use assessment and protection. Details on analysis and considerations are presented in the staff report.</p> <p>See response to comment 3.3 and 3.6.</p>
6.9	<p>George’s supports use of the Haggard/Scott operational definition, “when baseflow is eighty percent (80%) or greater of the total daily flow,” not the proposed fifty-five percent (55%). If OWRB does not intend to change the operational definition, then OWRB must reconsider the numeric criterion of 0.037 mg/L TP as both of these should follow</p>	<p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p>

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	the science that formed the basis for the Joint Study and the Joint Study Committee Recommendations made to the States in 2016.	See response to comment 6.8
6.10	George's appreciates OWRB's consideration of these comments, and looks forward to OWRB's updates on the proposed rulemaking. Please do not hesitate to contact me at gary.weeks@lawgroupnwa.com or (479) 316-3760 with any questions you may have.	Thank you, comment noted.
Northwest Arkansas Council		
7.1	The Northwest Arkansas Council is a private nonprofit organization established in 1990 by Sam Walton, Don and John Tyson, J.B. Hunt, Mark Simmons and other leaders to tackle our region's top challenges. The protection of water quality continues to be a primary focus of our work, and we respectfully submit these public comments regarding Oklahoma's proposed changes to its standards regarding total phosphorus in the state's scenic rivers.	Comment noted.
7.2	It is our view that the Oklahoma Water Resources Board (OWRB) should take the necessary steps, consistent with available science, to protect the Illinois River and other Oklahoma designated scenic rivers. At the same time, we are asking the Board to do no more than science necessitates. Our states agreed from the beginning to be bound by the findings of the two-state study completed as a partnership in 2016.	See response to comment 3.2, 3.3, 3.6, 6.8, and 20.4.
7.3	This study, conducted by independent researcher Dr. Ryan King, made recommendations regarding a numeric phosphorus standard and how to calculate whether that standard is being achieved. We support OWRB staffs recommendation regarding those two components.	Thank you for your support of the total phosphorus criterion revision(785:45-5-19(c))
7.4	However, Dr. King's research also focused on when Oklahoma should collect water samples to determine if the water quality standard is being met. Contrary to the staff recommendation, we believe the Water Resources Board	The Joint Study (conducted by Ryan King, PhD) did not focus identifying conditions for collection of water quality samples. The Joint Study was a stressor-response study design to characterize phosphorus-algal relationships. The Second Statement of Joint Principals did not direct or include water

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	<p>should sample just as Dr. King did to align with the two-state study. Dr. King collected almost all of his water samples when rivers were at least 80 percent baseflow. We'd ask OWRB to do the same.</p> <p>In recent weeks, an analysis of Dr. King's study and the water sampling he did was completed by Dr. Brian Haggard of the University of Arkansas. It's an important consideration for the OWRB. We know Northwest Arkansas cities and the Arkansas Division of Environmental Quality provided the OWRB with that important document.</p>	<p>sample collection as a mandatory study requirement (see response to comment 3.2) nor did the request for statement of qualifications put forward by the Joint Study Committee indicate that a waters sample collection condition was to be part of the study design. Lastly, the Joint Study Final Report does report the flow condition at the time samples for the study were collected; however, that does not automatically translate to a flow condition suitable or scientifically defensible for criterion implementation and assessment. See response to comment 3.3.</p> <p>See response to comments 3.6, 6.8 and 20.4.</p> <p>The document Defining Critical Conditions as Sampled during the Joint Study by B.E. Haggard, E. Grantz, and J.T. Scott was received and reviewed.</p>
7.5	<p>The Illinois River and the rivers that flow from Arkansas into Oklahoma continue to improve, and that's been true for many years. We want that to continue, and we'll do all we can to keep our states working together to protect water quality.</p> <p>Thank you for the opportunity to provide these comments</p>	Thank you, comment noted.
	Northwest Arkansas Regional Planning Commission	
8.1	Thank you for the opportunity to provide public comments regarding the Oklahoma Water Resources Board's plan to codify how the state determines if Oklahoma's Scenic Rivers are meeting the total phosphorus standard as defined by the Oklahoma -Arkansas Scenic Rivers Joint Study.	Comment noted, thank you for your participation in the WQS rulemaking process.
8.2	<p>We are the mayors of five Northwest Arkansas cities: Bentonville, Fayetteville, Rogers, Siloam Springs and Springdale, and our cities collaborate on many priorities through the Northwest Arkansas Regional Planning Commission, including water and wastewater.</p> <p>Our cities operate the region's largest wastewater treatment plants and have</p>	Comment noted. Thank you for the efforts to reduce phosphorus pollution in the watershed. These efforts have contributed to improved water quality conditions.

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	<p>invested more than \$225 million over the past two decades in capital projects to help ensure the protection of the Illinois River watershed. Moreover, our communities spend \$20 million annually to safely operate our facilities, and much of that annual spending is directly related to reducing how much phosphorus is discharged into streams.</p> <p>The investments by our cities are leading to improvements as we continue to work toward reducing phosphorus, and we know that's helpful toward achieving goals being pursued by the Water Resources Board. Reports delivered to the Arkansas-Oklahoma Arkansas River Compact Commission in 2020 show a downward trend in phosphorus in the Illinois River and its tributaries.</p>	
8.3	<p>We ask Oklahoma to embrace every recommendation - nothing more and nothing less - described in a report on the joint study that was completed as a partnership and delivered to our states' governors in December 2016. The pursuit of science drove the two-year stressor response study, and we ask Oklahoma to accept it all as it codifies its phosphorus standards. That has not occurred, and it's why we are writing this letter.</p>	<p>The proposed rules in this action are an outgrowth of recommendations from the Joint Study Committee. Consistent with the Second Statement of Joint Principals the state of Oklahoma via the OWRB was not required to make any changes to the total phosphorus criterion or associated implementation provisions. Nevertheless, OWRB staff valued the technical work of the 2016 Joint Study and recognized that the water quality criteria could be functionally improved. Therefore, staff pursued revision of the water quality criterion and associated implementation provisions</p> <p>OWRB largely relied upon three related areas of scientific information to support this WQS and associated implementation provisions revision; 1) foundational science from the original criterion adoption in 2002 and associated technical review in 2012, 2) Joint Study Committee Final Report, and 3) analyses conducted by OWRB staff specifically for this rulemaking action</p> <p>The proposed total phosphorus criterion revision and associated implementation provisions are scientifically defensible, an outgrowth of committee recommendation, and ensure beneficial use protection. The staff report details all scientific analysis supporting the proposed revisions.</p>

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		See response to comments 3.2, 3.3, 3.6, 6.8, and 20.4
8.4	<p>We support the Oklahoma Water Resources Board's decision to use 0.037 milligrams per liter because it's what an independent researcher and six water-quality experts who hired him recommended.</p> <p>We also support Oklahoma's plan to calculate whether the numeric standard is being achieved by using a six-month rolling average as was recommended.</p>	<p>Thank you for the support of these two revised criterion elements.</p> <p>See response to comment 3.2</p>
8.5	<p>However, Oklahoma does not intend to follow the recommendations when it comes to water sampling. We ask Oklahoma to follow the science to ensure that Oklahoma's standards align with an of the study's recommendations.</p> <p>Because these water standards are so impactful to Northwest Aransas cities, the Aransas Division of Environmental Quality and our cities hired Dr. Brian Haggard of the University of Aransas to look specifically at when the independent researcher, Dr. Ryan King of Baylor University, collected water samples.</p> <p>The review by Dr. Haggard, who was among the six water-quality experts who oversaw King's work found that Oklahoma's plan to collect samples when 55 percent or more of a river's flow consists of baseflow does not align with King's sampling regiment or the recommendation. In fact, Dr. King collected water samples when rivets were 80 percent or higher baseflow, and almost never sampled at or near 55 percent. To align with the science to sample at times when the growth of algae can be tied to the availability of phosphorus and to do as Oklahoma promised when our states agreed to collaborate on the two-state joint study, Oklahoma needs to collect water samples when baseflow dominates at 80 percent or higher. Its plan to sample when baseflow is barely a majority does not align with the science that the two states agreed to accept.</p>	<p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p> <p>See response to comments 1.2, 3.2, 3.3, 3.4, 3.6, 6.8, 20.4.</p>

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	We are providing additional Information from Dr. Haggard as an enclosure to this letter.	
8.6	Thank you for the opportunity to address Oklahoma's proposed water quality standards. We look forward to working together as we follow the science and protect the Illinois River.	Thank you, comment noted.
	Oklahoma Farm Bureau	
9.1	Oklahoma Farm Bureau is the largest agricultural organization in the state, with more than 85,000 member families. Many of our members have agricultural operations in the Illinois River watershed. Our members there support conservation and clean water. They have a great deal of pride and appreciation for their scenic area of the state.	Comment noted. Thank you to Oklahoma Farm Bureau members for their conservation and efforts to improve water quality in the Illinois River watershed.
9.2	It is our understanding that the state of Arkansas has concerns that the Oklahoma Water Resources Board's proposed assessment protocol for the total phosphorus criterion in Chapter 46 is not consistent with the second "Statement of Joint Principles" and the subsequent "Joint Study" conducted by Oklahoma and Arkansas. The Arkansas Farm Bureau has shared the same concerns with us.	Comment noted
9.3	We appreciate the work and public outreach the OWRB has conducted for this proposed rule. However, because we share the concerns of the state of Arkansas and Arkansas Farm Bureau, we respectfully request the OWRB to not adopt the proposed rule. We would like to see Oklahoma and Arkansas work together to develop an assessment protocol that is consistent with the "Statement of Joint Principles" and "Joint Study" and acceptable to both states.	Thank you, sharing information and stakeholder participation is important to the OWRB WQS program. See response to comment 2.4
9.4	We would like to avoid public disagreements and possible litigation between Arkansas and Oklahoma on this issue. We think cooperation and coordination between our states can be productive and successful in protecting our shared natural resources. We respectfully request the OWRB to not adopt the proposed rule. Thank you for your consideration in this matter.	OWRB and all Oklahoma environmental agencies have a long history of working patiently and cooperatively with Arkansas on the goal of restoring the Aesthetic beneficial uses to the Illinois River watershed. We will continue this long working relationship.
	Poultry Federation	

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10.1	The Poultry Federation, a tri-state trade association representing poultry and egg companies in Arkansas, Oklahoma and Missouri is pleased to submit comments to the Oklahoma Water Resources Board (OWRB) concerning the proposed revision to Oklahoma's Use Support Assessment Protocols, the (Proposed Rule), relating to the total phosphorus criterion for the protection of the aesthetics beneficial use for Oklahoma's Scenic River reaches of the Illinois River and its tributaries, Flint Creek and Barren Fork Creek.	Comment noted, thank you for your participation in the WQS rulemaking process.
10.2	First let me say The Poultry Federation has been involved with this issue for years, including in 2003 when Arkansas and Oklahoma entered into the Statement of Joint Principles. I commend both states, including elected officials, cabinet officials, state agencies directors, members of boards and commissions, and all staff members who have worked together for years to find science based solutions to complex issues that affect both states. The work by all parties is significant and I am confident that all parties will continue to work to find additional science based solutions to the issue at hand.	Thank you for the long time support of cooperative efforts by Oklahoma and Arkansas to reduce phosphorus pollution in the Illinois River watershed.
10.3	In 2013, a Second Statement of Joint Principles and Actions (Second Statement) was entered into. Language in the Second Statement provides that the parties agree to be bound by the findings of the Joint Study. The Joint Study was conducted and the states entered into a Memorandum of Agreement which required OWRB to initiate implementing rulemaking consistent with the findings of the Joint Study.	<p>Consistent with the Second Statement of Joint Principles the state of Oklahoma via the OWRB was not required to make any changes the total phosphorus criterion or associated implementation provisions. Nevertheless, OWRB staff valued the technical work of the 2016 Joint Study and recognized that the water quality criteria could be functionally improved. Therefore, staff pursued revision of the water quality criterion.</p> <p>Additionally, recommending a critical condition was beyond the scope of Joint Committee responsibility. Yet, in order to honor this recommendation OWRB staff pursued a scientifically defensible analysis to operationally define the critical condition in a manner that ensures beneficial use protection and reasonably address the committee recommendation.</p>
10.4	The Poultry Federation supports OWRB's	Thank you for your support of the revised

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	work with one exception. We do not believe the definition of "critical condition" is supported by the Joint Study. We believe this definition needs additional analysis and respectfully requests all parties work together to resolve this issue in the Proposed Rule.	total phosphorus criterion (785:45-5-19(c)). In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders. See response to comments 1.2, 3.2, 3.3, 3.4, 3.6, 6.8, 20.4.
10.5	Thank you for the opportunity to make these comments and I look forward to working with you to find science based solutions.	Thank you, comment noted.
	Save the Illinois River	
11.1	The Oklahoma Water Resources Board has proposed amendments to Oklahoma's standard for phosphorus, a pollutant that threatens designated Scenic Rivers, streams, and lakes. Save the Illinois River Inc., believes the Oklahoma Water Resources Board's proposed Oklahoma Scenic Rivers phosphorus criterion should be adopted with the grammatical clarification we present in this public comment.	Comment noted. Thank you for your support of the revised total phosphorus criterion.
11.2	What is commendable is that OWRB staff crafted this revision as well as possible within the constraints of the Oklahoma-Arkansas Joint Agreement. OWRB staff's public presentations on the revised criterion were outstanding.	Thank you for the positive recognition of staff's work on stakeholder participation via webinar. Staff dedicated both time and effort into ensuring the material was communicated as effectively as possible, while following required covid-19 precautions. However, the preferred method of communicating with WQS stakeholders is in person and we hope to resume that in future rulemakings and continue the use of webinars, as needed.
	What is not commendable is that the 0.037 mg/L phosphorus standard was first adopted twenty years ago, and it has NEVER been met. Certainly, the river is a little cleaner now than it was 20-years ago because sewage treatment plants have removed much phosphorus from their point-source discharges to the Illinois River and its tributaries. But much non-point source	Over the last 20 years there has been progress in phosphorus pollution reduction, which has led to measurable improvements in water quality. This has been achieved through the implementation actions of various water quality management programs (e.g., wastewater permits and nonpoint source management practices). Yet, the total phosphorus water quality criterion still has not been attained and the Aesthetic beneficial use of Oklahoma's scenic Illinois

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	phosphorus and legacy phosphorus continues from the poultry industry, especially after a rain. The U.S. EPA has declined to complete a TMDL for the Illinois River, and so regulators cannot quantify the phosphorus loading between point and non-point sources, and thus non-point phosphorus continues to defile the river and prevent compliance with the 0.037 standard.	<p>River remains impaired. Continued pollution reduction efforts from various sources of phosphorus are necessary to restore the Illinois River's Aesthetic beneficial use.</p> <p>Various partner agencies in Oklahoma are responsible for the implementation of WQS. OWRB staff work cooperatively with these partners and provide assistances, as needed, to reduce phosphorus pollution in the watershed.</p>
11.3	<p>In the event this standard is met one day in the future, then you must realize that, by its very design, this revision will pass unaccounted phosphorus to Lake Tenkiller and to the Lower Illinois River which is included in STIR's mission of protection and preservation for the entire Illinois River watershed.</p> <p>The Scenic Illinois River is a great treasure, deserving of our highest protections. Lake Tenkiller, which sits in the middle of the Illinois River, deserves no less. Lake Tenkiller was once known nationwide as a divers' paradise because of its clarity. Now it is nearly opaque.</p> <p>And so, in addition to adopting this revision, the OWRB should do everything possible to encourage states and the non-point source industries to achieve compliance with this standard, starting with a demand to the U.S. EPA to complete the TMDL on the Illinois River.</p>	<p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p> <p>We value the hard work of stakeholders in the watershed who have provided and continue to provide an essential voice in the water quality standards process.</p>
11.4	<p>Suggested change in criterion wording of the proposed Oklahoma Scenic Rivers phosphorus criterion.</p> <p>Chapter 45: Proposed Criterion: The total phosphorus six month rolling average of 0.037 mg/L shall not be exceeded more than once in a one-year period and not more than three times in a five-year period.</p> <p>Using the word "and" as a conjunction could be construed to mean both a one-year exceedance AND a five-year exceedance would be required before Arkansas could be found to be in violation of the new standard. That would be a</p>	<p>In Chapter 45 (785:45-5-19(c)(3)), the word "and" is used because both the one-year and five-year frequency components of the criterion must be attained for the beneficial use to be protected.</p> <p>Conversely, in Chapter 46, Assessment of Aesthetics Support (785:46-15-14(C)(3)), the word "or" is used. Because if either the one-year or five-year components of the criterion frequency are not satisfied, the waterbody will not be supporting its beneficial uses and will be identified as impaired.</p>

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	<p>travesty.</p> <p>We suggest changing this text to read: ... more than once during a one-year period or more than three times during a five-year period.</p> <p>Thank you for your consideration of our views on this issue.</p>	
	Simmons Foods, Inc. Letter A	
12.1	I write on behalf of Simmons Foods of Siloam Springs, AR, to respectfully request a 90-day extension to the comment period for the proposed revisions to Oklahoma's Use Support Assessment Protocols in connection with the water quality of Oklahoma's Scenic Rivers, specifically the Illinois River and its affected tributaries.	In response to comments, the public comment period for this water quality standards rulemaking was extended from 45 days to 75 days.
12.2	<p>Simmons will join other Arkansas based commenters but needs more time to complete its evaluation of the proposed rule which is based on (but diverges from) the King Study which itself took over two years to complete. The current deadline of January 15, 2021 provides inadequate time for us to meaningfully comment on the impact, for instance, of Oklahoma's proposal to change the sampling protocol on which the King Study conclusions are based.</p> <p>I express appreciation for the Board's willingness to provide us this brief expansion of time.</p>	Comment noted. OWRB staff values the participation of stakeholders and the public comment period was extended to provide stakeholder ample time for review.
	Simmons Foods, Inc. Letter B	
13.1	<p>Simmons Foods, Inc. (Simmons) submits these comments to the Oklahoma Water Resources Board (OWRB) in connection with the proposed revision to Oklahoma's Use Support Assessment Protocols; Title 785, Chapter 46-15-14(b), the Proposed Rule, relating to the total phosphorus (TP) criterion for the protection of the aesthetic beneficial use for Oklahoma's Scenic River reaches of the Illinois River and its tributaries, Flint Creek and Barren Fork Creek.</p> <p>Simmons is a poultry producer headquartered on the Arkansas/Oklahoma state line in Siloam</p>	Comment noted. Thank you for your participation in the WQS rulemaking process.

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	Springs, AR. A large amount of its poultry grow out housing is located in the Illinois River Watershed (the IRW). It also contributes to POTW effluent which discharges into the IRW.	
13.2	<p>Simmons has participated in supporting the removal of nearly 1.5 million tons of poultry litter containing over 44 million pounds of phosphorus from the Illinois River watershed during the last 5 years. The P indices the two states have implemented are functioning as intended. An objective observer will agree that the aesthetic goals of the two state regulatory schemes are being met.</p>	<p>Thank you for your participation in efforts to remove phosphorus pollution from the watershed.</p> <p>Water quality standards are composed of three components 1) a waterbody's beneficial uses, 2) water quality criteria, and 3) the antidegradation policy. Beneficial uses establish the water quality goals for the waterbody and criteria define the minimum water quality condition necessary to achieve those goals. Oklahoma's WQS designate the scenic Illinois River with the Aesthetic beneficial use and the total phosphorus criterion protects this beneficial use. In the past twenty years of water quality monitoring in the Illinois River watershed the total phosphorus criterion has been continually exceeded (see OWRB staff report & website supporting materials). Additionally, the Federal Clean Water Act requires Oklahoma to report on the quality of its surface water every two years. For this assessment, data are used to evaluate beneficial use condition; the outcome of this assessment since 1998 has been that the Aesthetic beneficial use is impaired and actions need to be taken to reduce phosphorus pollution and restore the Aesthetic beneficial use in the Illinois River watershed.</p> <p>See response to comment 4.2.</p>
13.3	In 2013, the two states entered into the "Second Statement of Joint Principles and Actions." Both states agreed to be bound by the results of a study to be conducted by Baylor University. Following its completion two years later, the states entered into a Memorandum of Agreement which required the OWRB to initiate rulemaking consistent with the findings of the Baylor study. It's the proposed divergence by the OWRB from the Baylor study that brings us to this objection.	<p>OWRB did not deviate from any agreements. Consistent with the Second Statement of Joint Principles the state of Oklahoma via the OWRB was not required to make any changes the total phosphorus criterion or associated implementation provisions. Nevertheless, OWRB staff valued the technical work of the 2016 Joint Study and recognized that the water quality criteria could be functionally improved. Therefore, staff pursued revision of the water quality criterion.</p> <p>Additionally, recommending a critical condition was beyond the scope of Joint</p>

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		Committee responsibility. Yet, in order to honor this recommendation OWRB staff pursued a scientifically defensible analysis to operationally define the critical condition in a manner that ensures beneficial use protection and reasonably address the committee recommendation.
	Attached is a copy of a White Paper authored by Dr. Brian Haggard and others entitled "Defining Critical or Hydrologic Conditions as Sampled During the Joint Study", dated 15 January 2021. The "Joint Study" referred to is of course the Baylor Study prepared under contract with the two states and the results of which the two states agreed to be bound. Dr. Haggard is highly respected and is the most prolific investigator of the IRW. He tells us that 93% of the samples taken in support of the recommendations of the Joint Study were taken during a baseflow of 80% or more; not the 55% sought to be imbedded in the new OWRB regulations.	In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders. See response to comments 1.2, 3.2, 3.3, 3.4, 3.6, 6.8, 20.4.
13.4	The last twenty years has seen a remarkable diminution in phosphorus levels in the waters of the IRW. Simmons appreciates the opportunity to present this comment and to continue working with the OWRB to assess and protect the water quality of the IRW.	Over the last 20 years through various collaborative efforts there has been progress in phosphorus pollution reduction. These efforts have resulted in measurable improvements in water quality. Yet, the total phosphorus water quality criterion still has not been attained and the Aesthetic beneficial use of Oklahoma's scenic Illinois River remains impaired. OWRB staff look forward to continued collaborative partnerships with Arkansas agencies and all stakeholders.
	State of Oklahoma, House of Representatives	
14.1	As members of the Oklahoma Legislature, we review proposed rulemaking by Oklahoma agencies to ensure we are properly representing the people of our districts and making sure it is in the best interest of our State. Recently we have reviewed two proposed rule makings by the Oklahoma Water Resources Board (OWRB). In review of the Proposed Rule changes to Chapter 20 and 46 by OWRB, we have some concerns we would like for OWRB to consider and address.	Thank you for your participation in the WQS rulemaking process.
14.2	The Chapter 46 Proposed Rule pertains to the Use Assessment Protocol of the Phosphorus Criterion of Oklahoma Scenic	Managing water resources is often technically complicated and challenging and OWRB is a science agency that employs

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	<p>Rivers. Including the Illinois River Watershed. This is a longstanding issue for our State, and it is important for this rule to be correct. In our review, it appears this Proposed Rule is not consistent with the Oklahoma Scenic Rivers Joint Study Committee Final Report from December 2016. Specifically, the definition of "critical conditions" in the Proposed Rule does not represent the conditions of the river during the 2-year study conducted by Baylor University. It is important that OWRB follow the science and work done previously on this issue as this rule is changed. We would encourage OWRB to go back to the Baylor University study and the Joint Study Committee's Recommendations from 2016 to ensure those and the prior agreements of Oklahoma are properly reflected in any rule change.</p>	<p>scientist as experts to navigate these issues on behalf of all Oklahomans. OWRB staff scientists serve the State of Oklahoma with integrity and do not disregard applicable scientific information on any project.</p> <p>Although considerable stakeholder outreach was conducted (see response to comment 14.3) concern regarding the critical condition term has developed. In response to comments from stakeholders a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p> <p>Specifically for the Chapter 46 proposed rules related to the critical condition term, OWRB staff relied upon three related areas of scientific information 1) foundational science from the original criterion adoption in 2002 and associated technical review in 2012, 2) Joint Study Committee Final Report (Baylor University Study), and 3) analyses conducted by OWRB staff specifically for this rulemaking action.</p> <p>The proposed rules are an outgrowth of recommendations from the Joint Study Committee and these three related areas of scientific information. The proposed critical condition definition by OWRB is a scientifically defensible translation of the qualitative definition, recommended by the Joint Study Committee. The staff report details all scientific analysis supporting the proposed critical condition definition.</p> <p>Moreover, consistent with the Clean Water Act and implementing regulations (40 CFR Section 131.11) and Oklahoma's Water Quality Standards (Title 785, Chapter 45) it is a fundamental requirement for a water quality criterion and its implementation provisions to protect beneficial uses. The analysis conducted by OWRB staff, which included use of the Joint Study Committee Final Report (Baylor University Study), ensures that this legal obligation for beneficial use protection is met. OWRB staff</p>

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		<p>work would protect the beneficial use and reasonably address the critical condition recommendation from Joint Committee. OWRB did not deviate from any agreements between the states of Oklahoma and Arkansas. Consistent with the Second Statement of Joint Principals the state of Oklahoma via the OWRB was not required to make any changes to the total phosphorus criterion or associated implementation provisions. Nevertheless, OWRB staff valued the technical work of the 2016 Joint Study and recognized that the total phosphorus water quality criteria could be functionally improved. Therefore, staff pursued revision of the water quality criterion.</p> <p>See response to comments 3.2, 3.3, 3.4, 3.6, 6.8 and 20.4</p>
14.3	<p>These rules are both important to us and our constituents and we will continue to monitor the progress. We encourage OWRB not to create more onerous processes and to be sure that all rules (these and others) are supported by sound science. We also believe that it is important for OWRB to collaborate with all stakeholders interested in these rules to address the above concerns.</p>	<p>It is agreed that these rules are important and OWRB works on behalf of all Oklahomans in the best interest of Oklahoma's water resources and all technical analysis is scientifically defensible. We would welcome the opportunity to meet with legislatures and share more information about our work and address questions on these rules specifically.</p> <p>OWRB staff values the feedback and participation of stakeholders and works diligently for an inclusive stakeholder process. On these rules specifically, staff collaborated with staff from the Arkansas Division of Environmental Quality over an 18-month period to develop rules that would be feasible for both states. Additionally, staff held invitational stakeholder meetings for Oklahoma agriculture stakeholders, Oklahoma environmental stakeholders, and a diverse group of NW Arkansas stakeholders and three evening general public webinars on the rule development and implementation were held to provide information and transparency.</p>
	Trout Unlimited, Chapter 420, Brandon & Devon Howe	
15.1	<p>First I would like to state that my wife and I bought a property on the East side of Lake TenKiller (walking distance to the</p>	<p>Thank you for your participation in the WQS process. OWRB values stakeholders participation and recognizes the impact</p>

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	<p>water) at the end of 2020. This was after camping at the state park multiple times over the last year and completely falling in love with the area. Ultimately the decision was driven by the incredible Upper Illinois River access and Small Mouth Bass fishing coupled with the year round Trout Fishery below the lake. We could easily also see the opportunity for us to open a business to support all things outdoor activity in and around the TenKiller/Tahlequah/Gore areas. Any adverse conditions caused by poor standards around the water quality for the Illinois River basin would dramatically impact my family in a negative financial manner.</p> <p>While I am pleased to hear of a collective decision made by joint state committee outlining the rules that would monitor the water quality of the Illinois River basin, I do have 3 main topics of concern I would like to see addressed.</p>	water quality has on the way of life of residents in the Illinois River watershed.
15.2	<p>First, Phosphorous/water quality testing should not only occur in the Upper Illinois River, but should take place in both Lake Tenkiller and the Lower Illinois River. This will be the only way to understand a wholistic view of the River basin.</p> <p>Secondly, water quality testing should also occur during drought and flood stage events, and not just during ideal/average conditions.</p> <p>Third and likely most importantly, we would like to see more data gathered in general, so that we can more confidently isolate and identify areas with reoccurring issues, extreme concentrations, or seasonal shifts.</p>	See responses to comments 17.3 & 18.3, and 17.4 & 18.4.
15.3	I greatly appreciate the opportunity to address this matter of concern directly with you regarding this beautiful piece of Oklahoma in hopes of it not only protecting the area, but ultimately protecting a multimillion dollar tourism area.	Thank you, comment noted.
	Trout Unlimited, Chapter 420, Dalton Wortham	
16.1	A little over a year ago I started my	OWRB staff commends Trout Unlimited

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	<p>personal journey as a fly fisherman. This past year has opened my eyes to a whole new world of sporting. Fly fishing in itself has a very steep learning curve. Insurmountable almost without the help of others and content shared in online communities these days. That is when I found out about the Trout Unlimited Chapter 420 in Tulsa from a local fisherman, I met on the Lower Illinois River. He invited me to the group's Facebook page, and subsequently the physical meetings. One would argue that the conservation overshadowed the fishing stories, tips, and tricks in these meetings. I became very motivated to research and participate in any conservation efforts to accompany this newfound hobby, as we all know fishing, hunting, and recreation go hand in hand with conservation. This past year with the COVID-19 pandemic has shed a light on the aforementioned hobbies. Sporting goods stores were basically assembly lines of kayaks, fishing poles, tents, and other outdoor toys out the door. You can not drive down any major interstate without seeing countless transport trucks hauling brand new travel trailers. This positive economic impact was no doubt felt across the state and likely kept already hurting small business afloat. This is why the well-being of the Illinois River basin is more important than ever.</p>	<p>members for their dedication to conservation efforts in the Illinois River Watershed.</p>
16.2	<p>A few points to summarize: Phosphorous/water quality testing should not only occur in the Upper Illinois River, but should also take place in Lake Tenkiller and the Lower Illinois River. These areas are huge economic producers for the state and the health and safety of the inhabitants and visitors alike should be taken seriously.</p> <p>Water quality testing should also occur during drought and flood stage events, and not just during ideal average conditions.</p> <p>We all as Oklahomans would like to see more data gathered in general, so that we can more confidently isolate and identify areas with reoccurring issues, extreme</p>	<p>See responses to comments 17.3 & 18.3, and 17.4 & 18.4.</p>

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	concentrations, and seasonal shifts.	
16.5	I appreciate having the ability, and the OWRB providing the forum to give input on the matter at hand before implementation.	Thank you, comment noted.
Note: the text content of letter 17 & 18 were the same, so they were combined in this table.	Trout Unlimited, Chapter 420, Franklin Darrell Yates & Jake Miller, Conservation Chair	
17.1 & 18.1	Our membership and board are thrilled that the joint state committee finally came to a decision on the rules that would monitor water quality for our beloved Illinois River basin. Several of our members reside within walking distance of the Illinois River, where almost all of our members can be found fishing the bountiful smallmouth bass population in the spring and early summer as well as the trout in the Lower Illinois River year-round. Needless to say, we don't feel that we can overstate the economic and recreational value of that scenic river and the negative revenue impact that habitat loss would create for our state and the several industries that rely on the health of that river for their income and livelihoods.	Comment noted.
17.2 & 18.2	The complicated nature of multiple states and their state agencies combining efforts to monitor water quality, collect and publish data, and enforce violations is not lost on us. We want to be quick to ensure the allied nature of our club with the OWRB. With that being said, we would also like to be transparent when it comes to some of our concerns and questions regarding the new rules and procedures regarding one of our favorite Oklahoma rivers. We would like the following questions and concerns to be submitted as our chapter's comments and inquiries during the OWRB's designated public comment period.	Comment noted, than you for participating in the WQS rulemaking process. OWRB staff looks forward to working with Trout Unlimited members on this and other water quality concerns in the future.
17.3 & 18.3	First and foremost, we believe that the data collection needs to extend to Lake Tenkiller and the Lower Illinois River. Both of those water bodies contribute millions of dollars to the Oklahoma economy, and it would be a grave mistake to not monitor the water quality of the entirety of the river	Lake Tenkiller is monitored as part of OWRB's Lake Beneficial Use Monitoring Program (BUMP). Information from this program is available via the OWRB website. https://www.owrb.ok.gov/quality/monitoring/bumplakes.php Please contact OWRB staff if you would like

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	system as opposed to just a minimal stretch. While we applaud the data collection that has occurred for decades now at the current 4 sites (in Oklahoma) for sample gathering, we think a bigger picture that includes Lake Tenkiller and the Lower Illinois River would be fundamental for protecting the watershed and would also provide an additional USGS data point at Gore.	to discuss the water quality monitoring and current condition of Lake Tenkiller. OWRB staff wants to thank members of Trout Unlimited and other stakeholders in the watershed for alerting us to water quality concerns in the lower Illinois River. We agree that routine monitoring of the lower Illinois River, one of Oklahoma's high quality waters, deserves consideration. We look forward to future discussions on how to better address stakeholders concerns in Lake Tenkiller and the lower reach of the river.
17.4 & 18.4	Secondly, we are very concerned that the current data collection isn't enough for being able to identify Nonpoint Source Pollution (NPS) offenders. We understand that enforcement is neither this agency's concern nor responsibility, but we would like to see a more robust collection plan that would provide the data necessary to those agencies that are tasked with identifying violations.	In addition, to water quality monitoring conducted by the OWRB the USGS and Oklahoma Conservation Commission (OCC) conduct monitoring in the watershed. The USGS monitoring program specifically targets at least 6 high flow events per year which serves to quantify the phosphorus load that is mobilized from nonpoint sources. Additionally, the OCC Water Quality Division is responsible for identifying waters impaired by nonpoint source pollution. Their water quality monitoring program is designed to carry out this responsibility.
17.5 & 18.5	Thirdly, we agree with the several other individuals on the latest OWRB Zoom call that appealed for data collection at high water events. We believe that collecting samples throughout all river flow regimes would give a more comprehensive understanding of the true effect that all environmental variables have on phosphorous input into the river system. On a similar note, we are equally concerned that the new rolling average reporting would potentially allow for a sequestering of seasonally specific concentrations that would be important for isolated study to better understand each unique factor contributing to phosphorous increases or reductions in the river basin.	In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders. See response to comment 17.4 & 18.4. Monthly phosphorus data from 1999-2018 was used to evaluate the revised criterion duration as a 6-month average. The detailed analysis presented in the staff report concludes that this averaging period will be protective of beneficial uses. The 6-month average period effectively integrates stress inter-seasonally, across periods of both phosphorus loading and biological uptake. However, it is not unnecessarily long in duration, and does not allow for higher phosphorus values to be muted in the overall average.
17.6 & 18.6	We appreciate the transparency of the	Thank you, OWRB staff value the

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	OWRB on the new water quality rules and the efforts to include and invite stakeholder feedback before their implementation. We will look forward to working together with the OWRB in protecting our resources and are pleased to have your agency as water advocates.	contributions and hard work of stakeholders and look forward to working with Trout Unlimited members on this and other water quality concerns in the future.
	Tyson, Letter A	
19.1	Tyson Foods, Inc. (Tyson), submits the following request to the Oklahoma Water Resources Board (OWRB) related to the proposed revision to the total phosphorus criterion for the protection of the aesthetics beneficial use for Scenic River reaches of Illinois River, Flint Creek, and Barren Fork Creek. Tyson respectfully requests the comment period for this very important rule be extended by 90 days.	See response to comment 12.1
19.2	Tyson will be submitting more substantive comments in the future. In the meantime, Tyson believes it is important to request OWRB allow the additional 90 days to fully review and comment on the proposed changes. This request for additional time is based on several factors. First, the proposed rule change is based upon a study conducted by Dr. Ryan King at the direction of the Joint Study Committee created by the Second Joint Statement of Principles. The study by Dr. King took more than two years to complete and more time is needed by the public to evaluate the study and how it has been considered related to the proposed changes. The current proposed comment timeframe providing only 45 days to review the proposed rule, supplemental documents, and presentations and then relate the proposed rule back to science is not ample time for an adequate review. Second, it is also important to note several business days within the current comment period are absorbed by the holiday season and limit meaningful time for review and comment. Finally, the global pandemic has presented significant challenges to the public, government agencies, and industry. These challenges also impact the time needed to conduct a thorough review of the proposed changes.	See response to comment 12.2
19.3	Tyson appreciates OWRB's consideration	See response to comment 12.2.

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	of this request to extend the time for public comment on the proposed rule change. Tyson would greatly appreciate if OWRB would decide on extending the comment period prior to the current comment deadline of January 15, 2021 and provide stakeholders with notice before the deadline. Please contact me at kevin.igli@tyson.com with any questions you may have.	Stakeholders were publically noticed regarding the extension of the public comment period.
	Tyson, Letter B	
20.1	Tyson Foods, Inc. (Tyson), submits the following comments to the Oklahoma Water Resources Board (OWRB) related to the proposed revision to Oklahoma's Use Support Assessment Protocols [Title 785, Chapter 46-15-14(b)] (Proposed Rule) relating to the total phosphorus (TP) criterion for the protection of the aesthetics beneficial use for Scenic River reaches of Illinois River, Flint Creek, and Barren Fork Creek (Scenic Rivers).	Comment noted. Thank you for your participation in the WQS rulemaking process.
20.2	To begin, Tyson would like to acknowledge the positive results from the long-term collaborative efforts of the states of Arkansas and Oklahoma to improve water quality in the Illinois River. In the appendix of this document is a slide taken from a recent OWRB proposal showing a near order of magnitude reduction of Total Phosphorus (TP) in the Illinois River in a 20-year period from 1999 through 2019. We look forward to continuing a collaborative relationship for improving water quality guided by sound science.	Staff agrees with this comment. Over the last 20 years through various collaborative efforts there has been progress in phosphorus pollution reduction. These efforts have resulted in measurable improvements in water quality. Yet, the total phosphorus water quality criterion still has not been attained and the Aesthetic beneficial use of Oklahoma's scenic Illinois River remains impaired. OWRB staff look forward to continued collaborative partnerships with Arkansas agencies and all stakeholders.
20.3	In December 2020, the OWRB issued a proposed Phosphorus Criterion for the Scenic Rivers through a Notice of Proposed Rulemaking. Tyson has carefully reviewed the Proposed Rule, the Joint Study, and the Joint Study Recommendations. Upon this review Tyson supports the duration and frequency of the proposed water quality criteria in the Proposed Rule, however, the definition of "critical condition" does not parallel the science in the Joint study.	Thank for your support of the revised water quality criterion in Chapter 45 (785:45-19(c)(3)).
20.4	Specifically, the OWRB proposes the "operational definition for the critical condition term" to be, "The critical condition is when baseflow is fifty-five	OWRB largely relied upon three related areas of scientific information to support this WQS and associated implementation provisions revision; 1) foundational science

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	<p>(55%) or greater of the total daily flow calculated by the USGS hydrograph separation method sliding interval. Measurements of total daily average flow must be obtained from a permanent continuous stream flow gage." The definition contained in the proposed rule is not supported by the Joint Study or sound science and appears to follow a simple meaning of "dominant", meaning most important, powerful, or influential.</p> <p>Included as an Appendix to this document is a report entitled, "Defining Critical or Hydrologic Conditions as Sampled During the Joint Study", authored by Dr. Brian Haggard (University of Arkansas) and Dr. Thad Scott (Baylor University), hereinafter referred to as the Haggard / Scott report. Tyson requests the Haggard / Scott report be incorporated as a part of Tyson's comments and included in the record for the Proposed OWRB Rule. As evidenced by the Haggard / Scott report, the authors analyzed 20 stream sites, paired with United States Geological Survey (USGS) stream monitoring stations where samples were collected as part of the Joint Study. During the Joint Study, samples were taken near these USGS monitoring stations 12 times over a two-year period. Ninety-three percent of the water samples collected for the Joint Study to measure TP concentrations were collected when base flow conditions were greater than 80% or more of daily stream flow conditions.</p> <p>Tyson believes this approach from the Haggard / Scott report should be considered and applied when defining "critical condition" in the final rule.</p>	<p>from the original criterion adoption in 2002 and associated technical review in 2012, 2) Joint Study Committee Final Report, and 3) analyses conducted by OWRB staff specifically for this rulemaking action.</p> <p>OWRB staff scientific analysis to operationally define critical condition encompassed 11 years of daily average flow values from 7 USGS stations in the watershed (~ 4,000 flow values per station), which was used to characterize the dynamic nature of the hydrograph and evaluate where various critical condition baseflow thresholds fall on the hydrograph and how this impacts the availability of phosphorus data and the representation of phosphorus concentration in the river. Additionally, an algal scour analysis was done to investigate and document when flows dominate the ecosystem. This is a scientifically defensible analysis and establishes the technical foundation to translate the qualitative critical condition definition, recommended by the Joint Committee, into an operational definition that can be implemented by various water quality management programs. The staff report details all scientific analysis supporting the proposed critical condition definition.</p> <p>Consistent with the Clean Water Act and implementing regulations and Oklahoma's Water Quality Standards the fundamental requirement for a water quality criterion and its implementation is that it protects beneficial uses. Staff agrees that the hydrologic condition at the time of collecting data to assess the criterion is important. The staff report includes an analysis of the influence of a critical condition baseflow threshold on the evaluation of total phosphorus data. It is clear that increasing baseflow thresholds dramatically influence the evaluation of total phosphorus concentration in the river. Based on the analysis presented in the staff report, it is clear that as the baseflow threshold increases to 75% or greater the phosphorus data included in the assessment becomes so restricted that an accurate evaluation of the total phosphorus concentration in the river becomes suspect.</p>

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		<p>The Aesthetic beneficial use in the Illinois River watershed applies at all times and water quality standards and their implementation must protect the beneficial use. Water quality assessment must provide an accurate evaluation of beneficial use condition. Implementation of a critical condition baseflow threshold must not be used to manipulate when samples are collected and present a partial representation of ambient phosphorus concentrations in the river and place the beneficial use at risk by using biased data set for beneficial use assessment. Based on the analysis presented in the staff report, OWRB staff finds that a 55% baseflow threshold would protect the beneficial use and reasonably address the critical condition recommendation from Joint Committee.</p>
20.5	<p>BACKGROUND In 2003, the States of Arkansas and Oklahoma (States) entered into an agreement termed the “Statement of Joint Principles and Actions” (First Statement), where both states “agree[d] that individual but coordinated strategies to meet water quality goals is in the best interest of both States.” The First Statement outlined several activities both states would or already had initiated to meet Oklahoma’s total phosphorus criterion of 0.037 mg/l in Oklahoma scenic rivers.</p> <p>Subsequent to the First Statement, the States entered into a “Second Statement of Joint Principles and Actions” (Second Statement) in 2013, which extended several commitments of the First Statement, established new commitments and initiated a “Joint Phosphorus Criteria Study (Study).” As described in the Second Statement, the study findings and results, “...will provide an objective analysis of the water quality data and identify relationships, if any, between various concentration of the phosphorus in the designated Scenic Rivers and multiple ecological response levels commonly used in the scientific community to describe undesirable aesthetic and water quality conditions.” The States also agreed to be bound by</p>	<p>Defining the critical condition was not a finding of the 2016 Joint Study nor was determining a critical condition one of the mandatory study requirements per the Second Statement of Joint Principals. Additionally, recommending a critical condition was beyond the scope of Joint Committee responsibility. Yet, in order to honor this recommendation OWRB staff pursued a scientifically defensible analysis to operationally define the critical condition in a manner that ensures beneficial use protection and reasonably address the committee recommendation.</p> <p>See response to comment 20.4.</p>

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	<p>the findings of the Joint Study which would apply to defining “critical condition” and should be considered in this Proposed Rule.</p> <p>Arkansas and Oklahoma, acting through their respective parties, went on to execute a “Memorandum of Agreement” (MOA) in 2018. This MOA was “for the implementation of the Joint Study Recommendation.” The Joint Study Committee’s Final Recommendations were made in a report to the Governors of Arkansas and Oklahoma in December 2016. As part of the MOA, “the OWRB agree[d] to initiate rulemaking in Oklahoma Administrative Code (OAC), Chapters 45 and 46, to implement the Joint Study Recommendations as they apply to the total phosphorus criterion subject to applicable laws, rules, and regulations.”</p>	
20.6	<p>The First Statement, Second Statement and MOA are all examples of both States’ cooperative and collaborative efforts to improve water quality in the Scenic Rivers. There has been tremendous improvement in water quality in the Illinois River as evidenced by OWRB data. A slide from a recent OWRB stakeholder presentation is included in the appendix of this document. Based on the TP in the Illinois River near Watts, TP concentration has reduced from well over 0.2 mg/l in 1999 to nearly 0.037 mg/l in 2019. This improvement in water quality is nearly an order of magnitude less from 1999 to 2019. This trend shows how collaborative efforts, keeping agreements, and stakeholder engagement can lead to great improvements in water quality. Tyson commends the efforts of both States and the stakeholders involved to realize these improvements in water quality.</p>	See response to comment 20.2
20.7	<p>The Joint Study conducted as a part of the Second Statement (Joint Study), was conducted by Baylor University with oversight by the Joint Study Committee. The work of Baylor concluded the Phosphorus criteria should be, “A six-month total phosphorus level not to</p>	Comment noted. See response to comment 3.4.

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	exceed 0.035 mg/l based on water samples taken during the critical condition." Critical condition was defined in the final report of the Joint Study as: "conditions where surface runoff is not the dominate influence of total flow and stream ecosystem processes." The conclusion and definition were unanimously recommended by all six members of the Joint Study Committee.	
20.8	<p>In summary, OWRB's Proposed Rule does not appear to meet the spirit or commitments of the Second Statement or MOA. The Haggard / Scott study shows, and the science supports, the operational definition should be, "when baseflow is eighty (80%) or greater of the total daily flow", not the proposed fifty-five (55%).</p> <p>Tyson appreciates OWRB's consideration of these comments and looks forward to the OWRB's response. Tyson also offers to work with OWRB to resolve this issue in the Proposed Rule and ensure the outcome is supported by sound science. Please contact me at kevin.igli@tyson.com with any questions you may have.</p>	<p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p> <p>OWRB's proposed rule does meet both the spirit and commitments of the Second Statement of Joint Principals and the MOA. Consistent with the Second Statement of Joint Principals the state of Oklahoma via the OWRB was not required to make any changes to the total phosphorus criterion or associated implementation provisions. Nevertheless, OWRB staff valued the technical work of the 2016 Joint Study and recognized that the water quality criteria could be functionally improved. Therefore, staff pursued revision of the water quality criterion.</p> <p>Additionally, recommending a critical condition was beyond the scope of the Joint Committee responsibility. Yet, in order to honor this recommendation OWRB staff pursued a scientifically defensible analysis to operationally define the critical condition in a manner that ensures beneficial use protection and reasonably address the committee recommendation.</p> <p>OWRB staff worked extensively with ADEQ staff when developing the proposed rules (see response to comment 3.4) and conducted stakeholder outreach (see response to comment 14.3).</p> <p>See response to comments 1.2, 3.2, 3.3, 3.6, 6.8. and 20.4.</p>

Table 2. Public Comments Received from Individuals		
Comment Number	Comment	Response
	Donavan Clary	
21.1	<p>My name is Donavan Clary. I guide fishing trips on the Illinois river. My family has lived around Tenkiller lake since before it was a lake. My grandparents were both displaced from their homes when the lake was built. My family fished the river before the lake was even thought of. We all, including them in their early 90's, are concerned.</p> <p>I'm 47 years old and have grown up on the river. I have seen drastic changes in mismanagement of the river. I've seen negative changes to the quality of the fishing and wildlife in the area. I've seen water quality change and aquatic plant life suffer.</p>	Thank you, comment noted.
21.2	<p>I'm very concerned about the changes and mismanagement of this wonderful natural resource. I hope someone with your organization has as much concern and care for the river as me and my family. My self and everyone I know is watching and paying attention to how this is being handled. We have yet to get more involved, but I assure you, it has been discussed.</p> <p>Please represent us well.</p>	<p>The OWRB is the state agency responsible for promulgating water quality standards to ensure water quality protection across the state (82 O.S. §1085.30). Oklahoma has long recognized the importance of maintaining and protecting the state's waters through adoption of water quality standards. OWRB's water quality monitoring programs have long documented the water quality condition of the river and Lake Tenkiller. Additionally, OWRB staff work with partner agencies to implement WQS. It is recognized that continued pollution reduction efforts from various sources of phosphorus are necessary to restore the Illinois River's aesthetic beneficial use. OWRB will continue programs under its authority and collaboration with partners to reduce pollution in the Illinois River watershed. OWRB staff encourages stakeholder participation in the WQS rulemaking process and values the thoughts and concerns of engaged citizens.</p>
	Ed Brocksmith	
22.1	<p>As a stakeholder in the Illinois River watershed and as a member of Save the Illinois River, Inc. (STIR) and the Greater Tenkiller Area Association (GTAA) Board of Directors, I hope that the work of the Joint Study Committee, Baylor University (nuisance phosphorus study), and the OWRB will ultimately provide greater protection for entire the Illinois River</p>	<p>Comment noted. OWRB recognizes stakeholders in the watershed have long championed the need for pollution reduction. This includes reducing phosphorus loading to Lake Tenkiller.</p> <p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical</p>

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Comment Number	Comment	Response
	watershed including Lake Tenkiller. I am deeply concerned about the continuing water quality degradation of Lake Tenkiller and the Lower Illinois River. While the proposed phosphorus criterion is expected to benefit the Illinois River, Barren Fork Creek and Flint Creek, Tenkiller Lake will still be heavily impacted by phosphorus, especially after heavy rain events.	condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.
22.2	I urge the Oklahoma Water Resources Board to give increased attention and protection to Tenkiller Lake and the Lower Illinois River. Both resources are vital to the economy of northeastern Oklahoma and to the lives of people who live in the region.	<p>Lake Tenkiller and the lower Illinois River are both protected with applicable WQS, which protect their beneficial uses. Various partner agencies in Oklahoma are responsible for the implementation of WQS; OWRB staff work cooperatively with these partners and provide assistances, as needed.</p> <p>The Oklahoma Conservation Commission Illinois River Watershed Based Plan has been an effective management action to reduce phosphorus loading in the watershed overall. Implementation of this plan has contributed to improved water quality conditions. Yet, the total phosphorus water quality criterion still has not been attained and the Aesthetic beneficial use of Oklahoma's scenic Illinois River remains impaired. Continued pollution reduction efforts from various sources of phosphorus are necessary to restore the Illinois River's Aesthetic beneficial use.</p> <p>The staff report documents the millions of dollars that the Illinois River and Lake Tenkiller contribute to the local economy.</p>
22.3	Decades have lapsed since Oklahoma approved the 0.037 mg/L phosphorus limit for Oklahoma Scenic Rivers. Sadly, that protective limit has not been achieved. Arkansas has only recently agreed that the 0.037 mg/L limit is correct and has agreed to help meet the limit. Phosphorus levels at our state border with Arkansas are many times greater than the 0.037 mg/L limit. Phosphorus and bacteria from sewage treatment plants and from animal feeding operations, especially the poultry industry, continue to pollute the Illinois River watershed. Much of this phosphorus is a legacy deposited in the river's shores waiting to enter the stream through	<p>Since the adoption of the Illinois River total phosphorus criterion in 2002, staff has continuously worked with Oklahoma partner agencies and Arkansas agencies to implement the criterion and restore the Aesthetic beneficial use. Over the last 20 years there has been progress in phosphorus pollution reduction, which has led to measurable improvements in water quality.</p> <p>Communication and cooperation between Oklahoma and Arkansas agencies and stakeholders is central to continued pollution reduction in the Illinois River watershed. OWRB staff is committed to continue this</p>

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	erosion from storm events.	work.
22.4	I believe Oklahoma, Arkansas, and the U.S. EPA has failed the Illinois River watershed by neglecting to perform a Total Maximum Daily Load (TMDL) study of the Illinois River and Tenkiller Lake. Perhaps one day this blatant oversight will be realized and will be corrected.	Comment noted.
	Jim Mathewson	
23.1	<p>I am Jim Mathewson a past Board member of Trout Unlimited Chapter 420 (TU) and the Tulsa Fly Fisher Chapter of Fly Fishers International (FFI). I am also a frequent angler on the Lower and Upper Illinois River and have been a resident of Tulsa since 1987. I have not had an opportunity to ask questions or make comments at previous TP Public Hearings and would like to do so at this time. Although they are formatted as questions, and I would appreciate a response, you could consider them as concerns or comments as well.</p> <p>In the 1990s I had two daughters in grade and high school that frequently returned from floating events on the Upper Illinois River with eye infections and intestinal issues. I felt that the water quality had improved since that time but, with increased agricultural activity in or near the IR Basin, I am concerned that there might be a degradation in the water quality in the future.</p>	Thank you, comment noted. Please see response to questions and comments below.
23.2	I would like to thank you for your efforts to keep our rivers and streams in compliance with EPA and Oklahoma Standards and hope that your efforts will continue for other current or potential future contaminants on these valuable water resources.	Thank you.
23.3	<p>Proposed Chapter 45 and 46 Amendments Title 785:45-5-25-a-1</p> <p>1) Why are pre June 25, 1992 point source discharge exceeding 0.037 and color limitations exempted? If they are currently in exceedance why would they not be limited in order to be in compliance? 2) Where is Appendix B? Does that mean that storm water is excluded from the 0.037mg/L limit?</p>	Many of these comments refer to the Antidegradation Policy so, first a definition of the Antidegradation Policy is provided as general information. The Antidegradation Policy has a tiered grouping of waters with various levels of protection and specifies the framework to be used in making decisions regarding any intentional lowering of water quality. The antidegradation policy ensures that good water quality is conserved where possible and lowered only when necessary,

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		<p>that stakeholders affected by the lowering are included in the process, and that beneficial uses are maintained and protected.</p> <p>Under the federal Clean Water Act urban stormwater discharges are considered point source discharges. The intention of the “exemption” from requirements in 785:45-5-25(c)(1) is to make the distinction between stormwater as a point source and other types of individual point source discharges (e.g. wastewater treatment plants or industrial dischargers). The rules at 785:45-5-25(c)(1) regulate individual point source discharges within an Outstanding Resource Water and 785:45-5-25(a)(1) regulates urban stormwater discharges; note that neither of these discharges are allowed to increase the load of any pollutant.</p> <p>Appendix B waters, are listed in Appendix B of Chapter 45. No, stormwater is not excluded from the 0.037 mg/L total phosphorus criterion; this criterion protects the Aesthetic beneficial use in the Illinois River watershed and is applicable to stormwater discharges. 785:45-5-25(a)(2) provides direction regarding provisions to implement the Antidegradation Policy in particular waters.</p>
23.4	<p>Title 785:45-5-25-b</p> <p>1) Why does “specified pollutants” not include Ar, N, Cu, bacteria, etc. or is that included in the “other substances” under – b-5. If so, will there be additional provisions for limits on these pollutants?</p>	<p>This group of specified pollutants were identified of particular concern for loading into groups of waters that receive additional protections under the Antidegradation Policy. The water quality criteria (785:45 Part 3) apply to all waters in accordance with their beneficial uses. The OK WQS include criteria for the parameters of arsenic, nitrogen, copper, bacteria, and many others.</p>
23.5	<p>Title 785:45-5-25-c-1</p> <p>1) Is the Lower Illinois River and Lake Tenkiller considered an ORW (Outstanding Resource Waters) and/or a “Scenic River”, as defined by C-1-b-ii = within waterbodies located within the watersheds of “Scenic Rivers” and therefore subject to the Total Phosphorus limitations. Where do I find Appendix A?</p>	<p>No, the Lower Illinois River from the headwaters of the Robert S. Kerr Reservoir to Tenkiller Dam and Lake Tenkiller and upstream to the upper Illinois River confluence with Barren Fork Creek are designated as High Quality Waters (HQW). Although Lake Tenkiller and the lower Illinois River are within the Illinois River Watershed, they are located downstream of the reaches of the Illinois River with scenic river designation and therefore the total phosphorous criterion does not apply to</p>

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		<p>these reaches. Total phosphorous criterion does apply to tributaries to the upper Illinois River.</p> <p>An electronic version of Chapter 45 and 46 can be accessed on the Water Quality Standards page on OWRB's website at the following web address. Appendix A and Appendix B are located within Chapter 45, Oklahoma's Water Quality Standards, beginning on page 30.</p> <p>https://www.owrb.ok.gov/quality/standards/standards.php</p>
23.6	<p>Title 785:45-5-25-c-2</p> <p>1) Same question as above.</p>	<p>Chapter 45, Appendix B-Areas with Waters of Recreational and/or Ecological Significance contains areas including but not limited to the National and State parks, forests, wilderness areas, wildlife management areas, and wildlife refuges and areas which contain federally listed threatened or endangered species pursuant to the Federal Endangered Species Act (ESA). There are several areas within the Illinois River Watershed that are designated Appendix B waters. See comment 23.5 on where to find Appendix B.</p>
23.7	<p>Title 785:45-5-25-c-3</p> <p>1) Is the IR and Tenkiller considered a HQW (High quality waters) i.e. water bodies that "support sensitive and intolerant climax communities of aquatic organisms, support high levels of recreational opportunity...". Have there been studies that include or exclude the Lower Illinois River or Lake Tenkiller?</p>	<p>Yes, the lower Illinois River from the headwaters of the Robert S. Kerr Reservoir to Tenkiller Dam and all of Lake Tenkiller and upstream to the upper Illinois River confluence with Barren Fork Creek are designated as HQW.</p> <p>Throughout the years, the waters within the Illinois River watershed have been monitored and studied by state and federal agencies, as well as universities and private organizations. The 2012 Review of the Scenic River Total Phosphorous Criterion webpage on the OWRB website has a sizeable list of scientific literature on studies in the Illinois River Watershed.</p> <p>https://www.owrb.ok.gov/quality/standards/scenicrivers.php#documents</p>
23.8	<p>Title 785:45-5-25-c-4-A</p> <p>1) Is IR or Tenkiller considered SWS (sensitive water supply) as a 'water supply reservoir'? Where is Appendix A referred to in this document?</p> <p>2) Why post June 11, 1989 limitation if</p>	<p>No, neither the Illinois River nor Lake Tenkiller are designated SWS. See 23.5 on where to access Appendix A.</p> <p>The June 1989 date serves as a means to demarcate regulation regarding new or</p>

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	<p>it is currently in exceedance?</p> <p>3) (Section B) Who is the permitting authority specifically that will determine if a new point source discharge or increased load happens? Will the OWRB notify them if they have determined an exceedance has occurred?</p>	<p>increased pollutant load from any discharge into a SWS water. When individually implemented for a specific waterbody, the waterbody's current condition (exceeding or attaining criteria) for a given pollutant would be considered.</p> <p>Oklahoma Department of Environmental Quality is the agency responsible for point source discharge permits. Monitoring and data analysis is conducted and used for waterbody beneficial use assessments by the OWRB. Assessments are submitted to the ODEQ every two years and compiled with other state agency and tribal data as part of the 303(d) and 305(b) Integrated Report, a requirement of the CWA which is submitted to EPA for approval.</p>
23.9	<p>Title 785:45-5-25-c-6</p> <p>Non-Point source discharges or runoff. Who monitors "Best Management practices for control of non-point sources of discharge or runoff..." ? How is it regulated?</p> <p>What does this mean in terms of safeguards to the Illinois River Basin (IRB) water quality? Will non-point source exceedances be regulated under this proposal? Will point source entities be penalized if non-point source exceedances occur? Is it possible to determine where or who is responsible for an exceedance?</p>	<p>Oklahoma Conservation Commission is responsible for implementation of nonpoint source programs for the state of Oklahoma.</p> <p>Point source discharges are regulated through an OK Pollutant Discharge Elimination System (OPDES) permit issued by the Oklahoma Department of Environmental Quality. The point source permit compliance is based on effluent limits and not receiving water quality. This assures that permittees are only responsible for pollutants in their discharge.</p> <p>Through a source assessment analysis it is possible to identify what is the relative contribution of different sources to the exceedance of the water quality criterion.</p>
23.10	<p>785:46-15-14-c</p> <p>As asked from above, if Lake Tenkiller and the Lower Illinois River are within the Illinois River Basin and considered part of the Scenic River designation why would they not be included in the TP Aesthetics Beneficial Use designation and in the monitoring and data analysis and rolling average calculations. The addition of the USGS monitoring station at Gore could provide another data point for your calculations.</p>	<p>See response to comment 23.5.</p> <p>See response to comment 17.3 & 18.3.</p>
23.11	<p>785:46-15-14-c-2-B</p> <p>Who will be responsible for doing sample acquisition and analysis, when will they take samples and will these data be</p>	<p>Predominately in Oklahoma the water quality monitoring is conducted by OWRB, Oklahoma Conservation Commission, and USGS. Data from these various monitoring</p>

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	<p>available to the public?</p> <p>Will this preclude the use of any other sample data at other positions along the rivers and streams or the possible addition of future USGS monitoring stations or other state or independent monitoring stations?</p>	<p>efforts are available to the public.</p> <p>In response to comments from stakeholders 785:46-15-14(c)(2)(B) was struck from the proposed rule.</p> <p>See response to comment 17.3 & 18.3.</p>
23.12	<p>785:46-15-14-c-2-C to 785:46-15-c-3</p> <p>Could you explain the calculations again: i.e. What if several months of data are missing (more missing than the minimum 4 values in a six month average) or were not taken at a sampling event due to less than 55% baseflow? Will that station not be included in the overall calculation?</p>	<p>A rolling 6-month arithmetic mean must be calculated based on data from the current month and the five (5) preceding months. The calculation of a rolling 6-month arithmetic mean must include at least four values from four separate months. All available individual data values from any given month must be included in the rolling 6-month arithmetic mean calculation.</p> <p>If less than four total phosphorus values from four separate month are available a 6-month total phosphorus value cannot be calculated for that particular month.</p>
23.13	<p>Will the TP values for each of the 8 stations (am I correct in assuming that there are 8 monitoring stations?) be calculated/treated separately and that value would represent the portion of the river upstream of the station and only that portion considered Aesthetic beneficial use supported or not supported?; or are all the 8 stations averaged (?) and a single TP value calculated for the entire basin?</p>	<p>OWRB only conducts water quality monitoring and assessment of beneficial use condition in the Oklahoma portion of the watershed. On a regular basis 4 scenic river sites are monitored and assessed; these sites are evaluated individually and used to represent various reaches of the river. The 4 sites are 1) Barren Fork Creek at Eldon, 2) Illinois river at Tahlequah, 3) Illinois River at Watts, and 4) Flint Creek at Kansas. When additional data is available from special studies or other monitoring efforts this data is also assessed for beneficial use condition. Also, the Oklahoma Conservation Commission also conducts some monitoring in the watershed and they also evaluate their data for beneficial use condition.</p>
23.14	<p>Will there be opportunities to make future revisions to the data stations, data acquisition methods and calculations as well as TP criterion? If a flooding event should damage or destroy a data station will a replacement be allowed possibly in a new location and will the TP calculation from the damaged station be replaced with some other means for sampling (e.g. independent private company or state sponsored data acquisition).</p>	<p>There are opportunities to update and revise Oklahoma's WQS and various implementation procedures, as warranted.</p> <p>If needed, monitoring locations may be relocated and infrastructure is repaired.</p>
	John Davidson	
24.1	<p>It's been a long road to clear up the river</p>	<p>Over the last 20 years through various</p>

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Comment Number	Comment	Response
	and appears to be working. Let's not return to the nastiness of former algae problems. Changing the phosphorus standard level will only enable polluters to gamble with the rivers health.	collaborative efforts there has been progress in phosphorus pollution reduction. These efforts have resulted in measurable improvements in water quality. Yet, the total phosphorus water quality criterion still has not been attained and the Aesthetic beneficial use of Oklahoma's scenic Illinois River remains impaired. Consistent with federal regulation 40 CFR § 131.11 and Oklahoma Water Quality Standards (785: Chapter 45), water quality criteria must protection beneficial uses and be based on sound scientific rationale. The staff report details the technical analysis for each criterion component (magnitude, duration, and frequency) documenting the scientific foundation for the criterion revision and that the Aesthetic beneficial use will be protected.
	Margaret Britain	
25.1	I concur with STIR (Save the Illinois River) with their suggested change to the text as follows below. I live in AR and I do not believe that AR should be allowed to further degrade the Illinois River, which I consider to be a national treasure. Non-point P pollution must be brought under control.	Comment noted.
25.2	Suggested change in criterion wording of the proposed Oklahoma Scenic Rivers phosphorus criterion. Chapter 45: Proposed Criterion: The total phosphorus six month rolling average of 0.037 mg/L shall not be exceeded more than once in a one-year period and not more than three times in a five-year period. Using the word "and" as a conjunction could be construed to mean both a one-year exceedance AND a five-year exceedance would be required before Arkansas could be found to be in violation of the new standard. That would be a travesty. We suggest changing this text to read: ... more than once during a one-year period or more than three times during a five-year period.	See response to comment 11.4.

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Norma Boren		
26.1	I am a property owner and a long-standing member is Save the Illinois River (STIR) in Cherokee County, Oklahoma. I and my family have enjoyed the recreational use of our scenic river and Tenkiller Lake for decades.	Comment noted. OWRB staff values stakeholder concern and involvement over the years.
26.2	<p>The economy of Cherokee County is greatly dependent upon the two water sources as a recreational asset and it is imperative that you closely monitor the phosphorus limit of 0.037 mg/L that has been established by Oklahoma. Our river has been greatly impacted in recent years as a result of the rapid population growth in NW Arkansas and the added sewage treatment plants that contribute phosphorus into the Illinois River watershed.</p> <p>NE Oklahoma has also been inundated with poultry feeding operations (mega farms) supplying the Arkansas poultry processing plants near the Oklahoma border. We need our Oklahoma agencies to recognize how this added phosphorus is adding to the degradation of the Illinois River.</p>	<p>OWRB staff agrees that poor water quality and impaired Aesthetic beneficial use in the Illinois River watershed impacts recreation and may affect the local economy in Eastern Oklahoma. The staff report documents impacts on recreation activities and the millions of dollars that the Illinois River and Lake Tenkiller contribute to the local economy.</p> <p>Continued pollution reduction efforts from various sources of phosphorus are necessary to restore the Illinois River's Aesthetic beneficial use. Various partner agencies in Oklahoma are responsible for the implementation of WQS. OWRB staff work cooperatively with these partners and provide assistances, as needed. We are committed to continued work with stakeholders, responsible parties, and all agencies to restore beneficial uses in the Illinois River for Oklahomans and visitors to enjoy.</p>
26.3	I ask that the OWRB give greater protection to our state scenic river by closely monitoring the phosphorus limit by point and non-point source contributions, especially in the lower Illinois River and Lake Tenkiller.	<p>Thank you, comment noted.</p> <p>The OWRB water quality monitoring program conducts monitoring on a regular basis in the Illinois River watershed and provides data on the phosphorus concentration in the river and lake. This data is used to evaluate the water quality condition.</p>
Pat Daly		
27.1	<p>I strongly OPPOSE the Illinois River Watershed Total Phosphorous Criterion Revision</p> <p>-Blocks the ability to study phosphorus during high water events which is when 90% of Phosphorus from non-point sources enter the watershed making truly meaningful studies and corrective action impossible.</p>	<p>Comment noted.</p> <p>In response to comments a revision has been made to 785:46-15-14(c)(2)(B). The proposed operational definition of critical condition, including the 55% baseflow threshold, has been struck in order to allow for additional communication and cooperation between Oklahoma and Arkansas agencies and stakeholders.</p>

Table 2. Public Comments Received from Individuals		
Comment Number	Comment	Response
		<p>No change has been made to the proposed total phosphorus criterion 785:45-5-19(c)(3).</p> <p>The total phosphorus criterion revision does not place any restrictions on the OWRB water quality monitoring program or any other monitoring program. These programs maintain their ability to conduct monitoring at any flow condition of interest.</p> <p>See response to comment 3.6.</p>
27.2	<p>Criterial is in direct contradiction of the charter of both the study group and the OWEB as a whole. It is purely political in nature, i.e. "it is all the Governor will approve" says the study committee in public hearings on the matter. Therefore, it is not SCIENCE BASED and must not be implemented.</p>	<p>OWRB is the state agency responsible for promulgating water quality standards to ensure water quality protection across the state (82 O.S. §1085.30). All WQS must protect and maintain the quality of Oklahoma's waters and be scientifically sound (40 CFR 131.11). The OWRB staff technical analysis supporting this criterion revision is scientifically defensible. The staff report provides background information and details the technical analyses.</p>
27.3	<p>The criteria has not been tested. It must not be implemented until such a major criteria change is implemented before that the long term results will yield true, measurable results for corrective. This Criteria revision must not be implemented.</p>	<p>OWRB and USGS have been conducting monitoring in the Illinois River Watershed for over 20 years. That data is used to track water quality, including total phosphorous, over time and determine if beneficial uses are being supported. This long-term data set was also utilized in the criterion development process for the proposed rules. For example, this data was used to evaluate various potential averaging periods and how a critical condition implementation provision may affect water quality assessment. This established monitoring program will continue and OWRB will continue to evaluate beneficial use protection and attainment in the Illinois River Watershed.</p> <p>See response to comment 13.2</p>

Table 3. Public Comments Received at January 7, 2021 Public Hearing		
Comment Number	Summary of Verbal Comment	Response
	Kathy Martin	
28.1	<p>Inquiry regarding what sources of phosphorus are contributing to exceedance of total phosphorus criterion.</p> <p>How will various state agency approach to implementation change with the revised criterion?</p> <p>Should the degree of an exceedance above the criterion magnitude be a factor in not attainment of the criterion</p>	<p>There are several sources of phosphorus pollution in the watershed that cause or contribute to an exceedance of the total phosphorus criterion. Sources generally include nonpoint source runoff, urban stormwater discharge, and effluent from wastewater treatment plants.</p> <p>Each state agency is individually responsible for implementation programs under their jurisdiction. At this time, OWRB staff is not aware of any planned changes by partner agencies in response to the criterion revision.</p> <p>The criterion magnitude (0.037 mg/L) and duration (6-month average) and frequency work together to ensure beneficial use protection. The magnitude of 0.037 mg/L is determined (see staff report for details) to be an ecologically relevant concentration to limit the growth of algal biomass. Also, the 6-month average integrates stress inter-seasonally across periods of both phosphorus loading and biological uptake.</p> <p>Once this magnitude and duration are exceeded more than the criterion prescribed frequency, for criterion evaluation purposes, it does not matter to what degree it is exceeded the Illinois River Aesthetic beneficial use is impaired. An exceedance factor regarding degree of above the criterion magnitude does not improve the protectiveness of the overall criterion.</p>
	Ed Brocksmith	
29.1	Comments reflect those submitted in writing.	See response to comments 22.1 through 22.4
	Kim Winton	
30.1	Will critical period monitoring target high flows?	See response to comment 17.4 & 18.4, and 27.3
	Jim Mathewson	
31.1	Who conducts water quality monitoring in the Illinois River watershed?	<p>Predominately in Oklahoma the water quality monitoring is conducted by OWRB, Oklahoma Conservation Commission, and USGS.</p> <p>Predominately in Arkansas the water quality</p>

Table 3. Public Comments Received at January 7, 2021 Public Hearing

Comment Number	Summary of Verbal Comment	Response
		monitoring is conducted by ADEQ, USGS, and University of Arkansas
	Marla Peek, Oklahoma Farm Bureau	
32.1	Comments reflect those submitted in writing.	See response to comments 9.1 through 9.4
	Scott Hood, Trout Unlimited	
33.1	Advocate for OWRB to extend water quality monitoring program to the lower Illinois River and Lake Tenkiller	See response to comment 17.3 & 18.3
	Jake Miller, Trout Unlimited	
34.1	Advocate for OWRB to extend water quality monitoring program to the lower Illinois River and Lake Tenkiller	See response to comment 17.3 & 18.3
	Jim Burroughs, ODWC	
35.1	Lake Tenkiller and the lower Illinois River are important sporting areas for anglers and water quality in these waterbodies is of concern to ODWC.	Thank you, OWRB staff looks forward to opportunities to cooperate with ODWC on improving water quality and protecting beneficial uses in Lake Tenkiller and the lower Illinois River.
	Karen Harris	
36.1	How many measured phosphorus values will be include in a 6-month average total phosphorus calculation?	At least at least 4 individual measured total phosphorus data values are required for the calculation of 6-month average total phosphorus.
36.2	Stated that algal blooms in the river are increasing, even in the winter. Expressed concern that water quality in the river is not improving	Comment noted

Table 4. List of Comments Received after the close of the Public Comment Period

1. Nathan Moseley
2. Erin Moseley
3. Stephen Williams
4. Jeff Moore
5. Luke Sleeper
6. Caleb Rice
7. Daniel Roberts

ATTACHMENT A

DEFINING CRITICAL OR HYDROLOGIC CONDITIONS AS SAMPLED DURING THE JOINT STUDY

Final Report Submitted to the Northwest Arkansas Regional Planning Commission

15 January 2021

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EXECUTIVE SUMMARY

The “Joint Study” was conducted to fulfill the obligations of the second “Statement of Joint Principles and Actions” agreed to by the states of Arkansas and Oklahoma. The “Joint Study” affirmed the magnitude of Oklahoma’s Scenic River total phosphorus (TP) criteria (i.e., 0.037 mg/L), but it added the new caveat of applying the criteria to “critical conditions.” The primary purpose of this paper was to define “critical conditions” based on the range in base flow proportions (BFP) of total streamflow on days that were sampled in the “Joint Study,” where BFP is base flow discharge divided by total stream flow for a given site and sampling date. We focused on 20 stream sites that could be paired with USGS stream discharge monitoring stations where water samples were collected approximately 12 times over the two-year “Joint Study” (June 2014–April 2016). In fact, 93% of the water samples from the “Joint Study” used to measure TP concentrations were collected when base flow contributions were 80 percent or more of total stream flow (i.e., BFP greater than or equal to 0.80). A subset of these sites in northwest Arkansas have been monitored more frequently between 2015 and 2019, and data from these sites (plus one additional urban stream) was used to evaluate the relation between TP concentrations and BFP. Across all sites, TP concentrations decreased as a function of increasing BFP – that is, TP concentrations were less on average as the proportion of base flow discharge increased at each site. The change in TP concentration per 0.1 unit change in BFP was positively correlated to mean TP concentrations when BFP was greater than 0.80. Defining the appropriate hydrologic conditions to assess the magnitude of the Oklahoma Scenic River TP criteria (0.037 mg/L) definitely matters for streams with TP concentrations approaching 0.037 mg/L during “critical conditions.” For example, if three water samples were collected at BFPs of 0.80, 0.70 and 0.60 with TP of 0.037 mg/L during “critical conditions,” then the mean of those three samples could [theoretically] be 0.045 mg/L (exceeding the TP criteria magnitude). Thus, if the TP criteria was going to be applied outside the hydrologic conditions studied, it should be adjusted based on the relation between TP concentrations during “critical conditions” and change in TP concentration per 0.1 unit change in BFP.

BACKGROUND AND INTRODUCTION

The Illinois River Watershed has been the focus of environmental concerns and issues for decades, and the states of Arkansas and Oklahoma signed a first “*Statement of Joint Principles and Actions*” in 2003 with the goal of improving and protecting water quality. This agreement continued several watershed management changes, including municipal phosphorus (P) effluent reductions, poultry litter export and nutrient management with a P index; these actions, among others, resulted in significant reductions in total P (TP) concentrations and loads across the watershed (Haggard, 2010; Scott et al., 2011). The elevated TP concentrations at the Illinois River can be traced upstream over 45 river km to the major effluent input (Ekka et al., 2006; Haggard, 2010). However, the TP concentrations in the Illinois River near the state border did not decrease to a level near the Scenic Rivers TP criteria (0.037 mg/L; OWRB, 2002).

The next step occurred when the states of Arkansas and Oklahoma signed a second “*Statement of Joint Principles and Action*” in 2013 (hereafter, second statement), providing a continuation of the first statement’s agreement for three years and setting up the requirements of the “Joint Study.” This study of the Illinois River Watershed, Arkansas and Oklahoma, evaluated “the TP threshold response level at which any statistical shift in algal species composition or algal biomass production resulting in undesirable aesthetic or water quality conditions” occurred (Haggard et al., 2017). There were three important components to this, including the need to define TP threshold, to follow EPA’s most recent guidance on stressor–response studies (EPA, 2010), and to include sampling sufficient to determine the frequency and duration component of the criterion. However, the latter was focused on assessment, not promulgation of the water quality standard.

The sampling sites selected for the “Joint Study” included 35 stream reaches with the majority of sites within five of the six watersheds of Oklahoma’s Designated Scenic Rivers (mostly within the

larger Illinois River Watershed). The stream reaches were selected to be not different in terms of an open canopy, type of substrate, and hydrology considering riffles with turbulent flow. Water and biological sampling was every other month during “**critical conditions**” from June 2014 to April 2016, where sampling, analytical, and data analysis details are available in the appendix to Haggard et al. (2017). The term “**critical conditions**” was subjectively defined as hydrologic conditions “where surface runoff is not the dominant influence of total flow and stream ecosystem processes” (Haggard et al., 2017). More specifically, this is the hydrologic condition with which the “Joint Study” was conducted.

Based on the multiple lines of evidence and a general focus on nuisance algal species in the “Joint Study” (see Haggard et al., 2017), the Joint Study Committee unanimously recommended “a six-month average TP level of not to exceed 0.035 mg/L based on water samples taken during the CRITICAL CONDITION, as previously defined, was necessary to protect the aesthetics beneficial use and scenic river (Outstanding Resource Water) designations assigned to the designated Scenic Rivers.” This meant the magnitude identified by the “Joint Study” was within the strike zone (± 0.01 mg/L) defined by the second statement, allowing Oklahoma to keep the magnitude of the existing Scenic Rivers TP criteria (0.037 mg/L; OWRB, 2002). Oklahoma is moving forward to revise the Scenic Rivers TP criteria, proposing “the total phosphorus six month rolling average of 0.037 milligrams per liter (mg/L) shall not be exceeded more than once in a one-year period and not more than three times in a five-year period” (OWRB, 2021). However, the new caveat is linking the magnitude to “**critical conditions**.”

The purpose of this paper is to define the hydrologic conditions under which the “Joint Study” was conducted to better understand the term “**critical conditions**” defined by the six-person Joint Study Committee and scientific professionals. The objectives were to (1) define the range in base flow proportions (BFP) of total streamflow on days that were sampled in the “Joint Study”, (2) evaluate the relation between TP concentrations and BFP across limited sites, and (3) present potential numeric

adjustments to the magnitude if assessed outside the hydrologic conditions sampled during and relied upon to conduct the “Joint Study”.

METHODS

The hydrology data from the US Geological Survey (USGS) stream gages (n=20) that were paired with or in close proximity to sampling sites within the ‘Joint Study’ was downloaded from the National Water Information System (NWIS). These pairs included [alphabetically] BARR1 Barron Fork at Dutch Mills, AR (USGS 07196900); BARR4 Barron Fork at Eldon, OK (USGS 07197000); BEAT1 Beaty Creek near Jay, OK (USGS 07191222); CANE1 Caney Creek near Barber, OK (USGS 07197360); FLIN1 Flint Creek near Springtown, AR (USGS 07195800); FLIN2 Flint Creek near West Siloam Springs, OK (USGS 07195855); ILLI2 Illinois River at Savoy, AR (USGS 07194800); ILLI3 Illinois River at HWY16 near Siloam Springs, AR (USGS 07195400); ILLI4 Illinois River South of Siloam Springs (USGS 07195430); ILLI5 Illinois River near Watts, OK (USGS 07195500); ILLI6 and ILLI7 Illinois River at Chewey, OK (USGS 07196090); ILLI8 Illinois River near Tahlequah, OK (USGS 07196500); LLEE1 Little Lee Creek near Nicut, OK (USGS 07249920); OSAG1 Osage Creek near Cave Springs, AR (USGS 07194880); OSAG2 Osage Creek near Elm Springs, AR (USGS 07195000); SAGE1 Sager Creek near West Siloam Springs, OK (USGS 07195865); SPAR1 Spring Creek at HWY112 near Springdale, AR (USGS 07194933); SPAV1 Spavinaw Creek near Maysville, AR (USGS 07191160); and SPAV2 Spavinaw Creek near Colcord, OK (USGS 071912213). Sixteen of these sites are within the drainage area of the Illinois River Watershed in Arkansas and Oklahoma.

The data from these sites were used in hydrograph separation (i.e., HYSEP, Sloto and Crouse, 1996) to quantify the base flow proportion on individual sampling dates specifically used in the study. Mean daily discharge records from each USGS gaging station were used in HYSEP with the R code from the USGS–R/DVstats GitHub (<https://rdr.io/github/USGS-R/DVstats/man/hysep.html>). The hydrograph separation begins one interval ($2*N$, where N is five days) prior to the start of the dates selected and

ends one interval after the final date of interest. The method within HYSEP selected was the sliding-interval method, which finds the lowest discharge in one half the interval $[0.5(2*N-1)]$ before and after the date of interest and assigns that discharge to that day as base flow. These assigned discharges were connected to form the estimated base flow hydrograph and for computing the base flow proportion (base flow/total flow) for each sampling date in the “Joint Study.” While all HYSEP methods were evaluated, the sliding interval approach was presented within to be consistent with OWRB’s evaluation of hydrograph separation (OWRB, 2020). The BFP range on days that were sampled in the “Joint Study” was presented using box plots (*Objective 1*), where BFP is the base flow discharge in cubic feet per second (cfs) divided by the total discharge (cfs) at a site on a given sampling date.

At select streams in Northwest Arkansas, the Arkansas Water Resources Center (AWRC) has collected water samples following the same sampling procedures since ~2009 (see Scott and Haggard, 2019). These sites, which are paired with USGS gages, include the Illinois River at Savoy (ILLI2), South of Siloam Springs (ILLI4), and Watts (ILLI5), Osage Creek near Elm Springs (OSAG2) and at Highway 112 (OSAG1), Spring Creek at Highway 112 (SPAR1), Mud Creek at Fayetteville (not included in “Joint Study”) and the Baron Fork at Dutch Mills (BARR1). Water samples are collected from bridges just below the surface using an alpha style horizontal sampler near the centroid of stream flow; water samples are collected 2–4 times per month across the range of flow conditions observed at each site. Total P was measured in water samples in the certified AWRC water quality lab using persulfate autoclave digestion and standard methods (APHA 4500-P J; EPA 365.1) on a Skalar Sans Plus wet chemistry auto-analyzer (Skalar Analytical BV, The Netherlands). Total P concentration data from CY 2015 through 2019 were paired with BFPs estimated at each site as described above. The relation between BFP and TP concentration was evaluated using simple linear regression (*Objective 2*), where TP concentrations changed near linearly with BFPs (typically BFP greater than 0.50 across sites).

The assumption is that TP concentrations and base flow proportion are related and that if one intends to apply nutrient threshold outside the conditions studied (i.e., range in base flow proportion), then the relation (i.e., linear regression and slope) could be used to adjust the magnitude to fit the desired conditions. The state of Oklahoma has proposed the Scenic River TP Criterion be extended to water samples collected with a BFP of 55% or greater (see OWRB, 2020) based on its own hydrograph separation analysis and interpretation of ‘**critical conditions**’. We used the slope of the linear regressions between BFP and TP concentrations to provide an adjustment factor, suggesting changes to the criteria magnitude if the nutrient threshold was applied or assessed outside the conditions sampled in the “Joint Study” (*Objective 3*).

RESULTS

Base Flow Proportion on Joint Study Sampling Dates

Base flow conditions were dominant on almost all dates sampled by the “Joint Study.” The 35 sites used in the “Joint Study” were narrowed down to 20 sites that had USGS discharge gaging stations at or near close proximity, and these sites were sampled on dates (June 2014–April 2016) when BFP was greater than 0.75 on almost all dates. The 3rd percentile of calculated BFPs across all sites and dates was 0.75, showing that all but five events across all sites had BFPs at 0.75 or greater. These individual events were looked at more closely, showing:

- (1) on or around 5 December 2014 at BARR1 a minor hydrograph peak of approximately 40 cfs occurred, resulting in a BFP of 0.35;
- (2) on or around 18 June 2014 at BEAT1 there was ~100 cfs event, resulting in a BFP of 0.56;
- (3) on or around 8 August 2014 at BEAT1 another minor hydrograph peak of approximately 20 cfs occurred, resulting in a BFP of 0.38;

- (4) on 10 December 2015 ILLI3 was sampled on the receding limb of a larger storm event (peak discharge ~8300 cfs), when BFP was calculated to be 0.62; and
- (5) on 7 December 2014 ILLI8 was sampled on the rising limb of a relatively modest storm event (peak discharge ~1600 cfs) when BFP was 0.74.

Base flow proportion was not calculated for two events at one stream (i.e., CANE1) because the “Joint Study” did not sample that site during Event 7 or 10. Including these five events above, mean and median BFPs calculated across all sites and sampling dates were 0.92 and 0.94, respectively. The BFP calculated across all sites and sampling dates exceeded 0.80 almost 93% of time during this study.

If we focused on the sites in the Illinois River Watershed, then that reduced our site numbers down to 16 sites with paired or close proximity USGS stream gages (excluding BEAT1, SPAV1, LLEE1 and SPAV2; Figure 1). The mean and median calculated BFPs were 0.92 and 0.94 across only the sites in this watershed. The BFP calculated across all 16 of these sites and sampling dates exceeded 0.80 almost 93% of time, showing that base flow conditions were dominant on almost all dates.

If we focused exclusively on the sampling events and base flow conditions on the Illinois River (Figure 1, top graph; ILLI2–ILLI8), mean BFP was 0.92 across all sites. The two least BFPs sampled were noted in a preceding paragraph, and next least BFP was 0.77 across the sites on the Illinois River. Therefore, 98% of the sampling dates on the Illinois River relied upon in the “Joint Study” had BFPs of 0.77 or greater across these sites. In fact, 93% of the sampling dates for the Illinois River had a BFP of 0.80 or greater during the “Joint Study.”

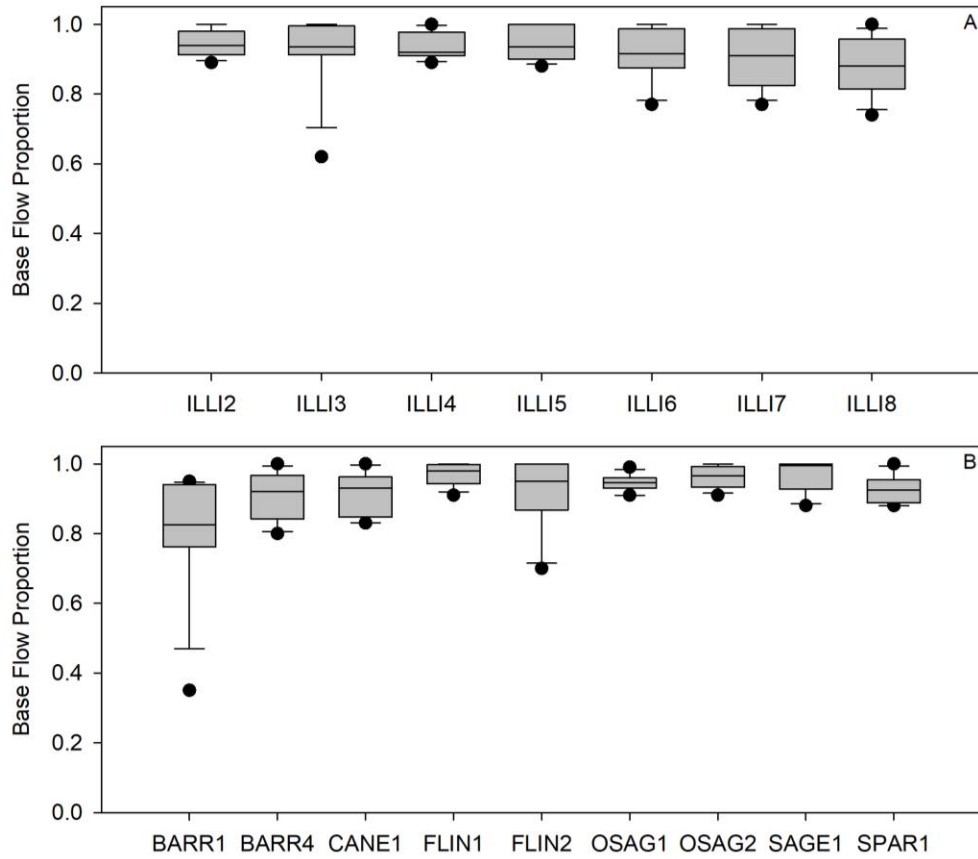


Figure 1. Base flow proportions (BFPs) calculated by HYSEP sliding interval approach across the stream sites and sampling dates from the “Joint Study”; site identification is ILLI (Illinois River, least number most upstream and greatest number most downstream), BARR (Barron Fork), CANE (Caney Creek), FLIN (Flint Creek), OSAG (Osage Creek), SAGE (Sager Creek), and SPAR (Spring Creek).

Total Phosphorus Concentrations Relation with Base Flow Proportion

We focused on the relation between TP concentrations and BFP at the Illinois River near the Arkansas and Oklahoma border, i.e. ILLI4. Total P concentrations at the Illinois River (ILLI4) generally decreased within increasing BFP (Figure 2, graph A), where mean TP concentration of all data was ~0.145 mg/L. The mean TP concentration of the samples collected at ILLI4 decreased as BFP increased with the largest change occurring with BFPs greater than 0.30, where mean TP was ~0.075 mg/L. The mean TP concentration continued to decrease with increasing BFP, decreasing to ~0.049 mg/L when BFP was 0.90 or greater.

The TP concentration data at ILLI4 exceeded 0.037 mg/L in almost 2/3 of the water samples collected across the range of flow. The percent of samples with TP concentrations exceeding 0.037 mg/L decreased as BFP increased at this site. However, the reality was that the TP concentrations at the Illinois River (ILLI4) flowing into Oklahoma from Arkansas exceeded the Scenic Rivers TP criteria (0.037 mg/L) almost 50% of the time when BFP was greater than 0.80.

The \log_{10} TP concentrations decreased linearly with BFP across the range observed ($R^2=0.69$, slope=-1.09, $n=200$, $P<0.01$), excluding one outlier from June 2019 when TP was ~0.8 mg/L under predominately base flow conditions. If we limited analysis to when base flow was more than half or the majority of total flow (i.e., $BFP>0.50$), then TP concentrations (not log-transformed) also decreased with increasing BFP. The linear decrease in TP concentrations was significant ($P<0.01$) with a slope of -0.127, but the coefficient of determination was less ($R^2=0.27$, $n=142$); this change in mean TP concentrations was ~0.013 mg/L per 0.1 BFP units at ILLI4.

All sites within the Upper Illinois River Watershed sampled more intensively by the AWRC showed that \log_{10} TP concentrations significantly decreased with increasing BFP (Figure 2; $R^2=0.56-0.75$, $P<0.01$). If we focused on data when BFP was greater than 0.50, then each site showed that TP

concentrations (not log-transformed) decreased with increasing BFP ($P<0.01$), except OSAG1 ($P=0.08$). This particular site had a gap in BFPs sampled between the 0.50 to 0.60, so the regression was extended to BFP greater than 0.20 where the TP increase was linear ($R^2=0.39$, $n=134$, slope=-0.086, $P<0.01$). The slopes of these linear relations were significantly ($R^2=0.86$, $P<0.01$) related to mean TP concentration when BFP exceeded 0.80 (i.e., mean TP concentration at dominant base flow conditions, TP_{BF}). If you used change in mean TP concentration per 0.1 BFP unit ($\Delta TP_{0.1BFP}$), then the linear equation was $\Delta TP_{0.1BFP}=0.178*TP_{BF}+0.001$ (Figure 3). This observation showed that TP concentrations were more influenced by BFP when TP_{BF} was greater; in fact, $\Delta TP_{0.1BFP}$ was 0.008 at 0.037 mg TP L⁻¹ compared to 0.019 at TP_{BF} of ~0.1 mg L⁻¹.

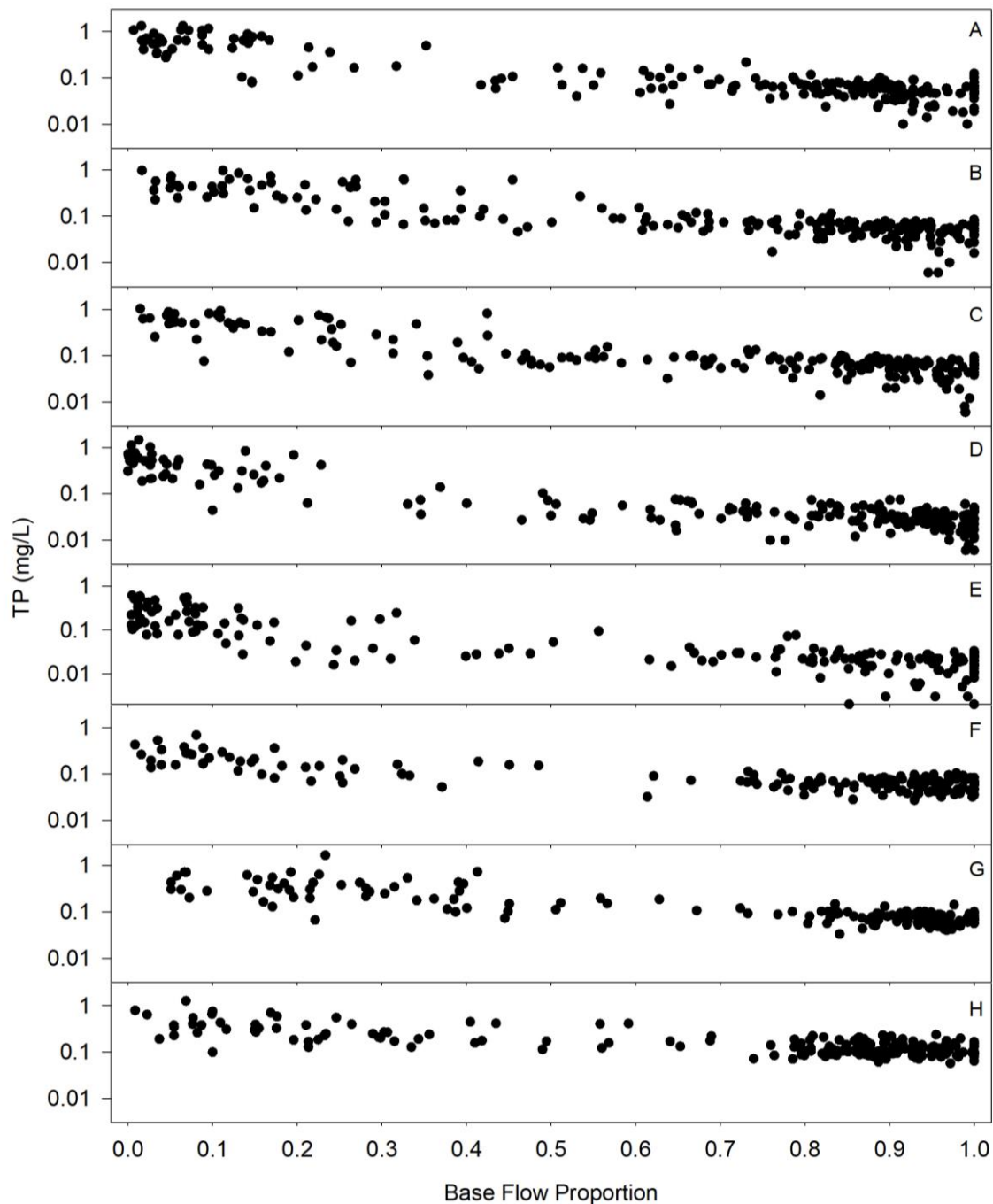


Figure 2. Total phosphorus (TP) concentrations as a function of base flow proportion (BFP) calculated using the HYSEP sliding interval approach from water quality monitoring project in the upper Illinois River Watershed, 2015–2019 (Scott and Haggard, 2019; Haggard, B.E. unpublished data); the graphs are A ILLI2, B ILLI4, C ILLI5, D BARR1, E Mud Creek, F OSAG1, G OSAG2, and H SPAR1.

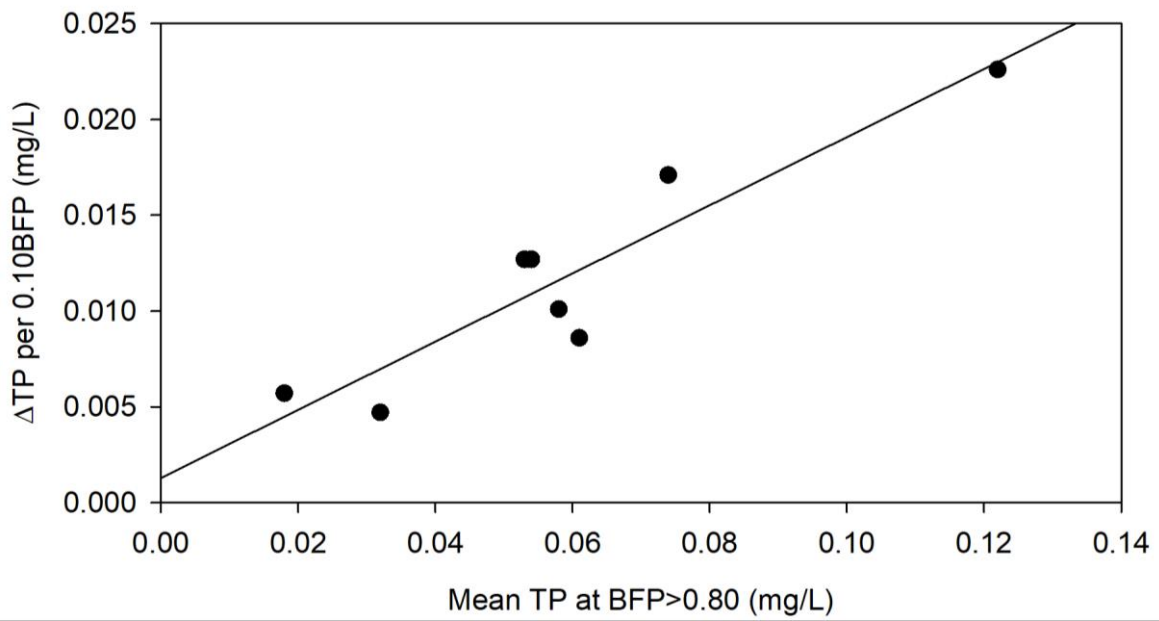


Figure 3. Change in total phosphorus (TP) concentrations per 0.10 proportional change in base flow proportion (BFP) as a function of mean TP concentrations from water samples collected when BFP is greater than 0.80 across limited sites in the upper Illinois River Watershed.

DISCUSSION

The use of nutrient [specifically P] thresholds in stream biological responses is becoming more prominent to help guide the establishment of water quality criteria or standards protecting beneficial uses like aquatic life; thus, the magnitude can be linked directly to the desired biological response. The response variable of interest and thresholds in these studies may vary by water body type (Poikane et al., 2019), watershed characteristics (D'Amario et al., 2019) and even stakeholders' interests and perceptions (West et al., 2016). For example, the magnitude to protect from changes in the natural assemblage of a stream algal community (Taylor et al., 2014, 2018; Tibby et al., 2019) would likely be less than that to protect from nuisance algal blooms (Wagenhoff et al., 2016). The "Joint Study" evaluated the magnitude of Oklahoma's Scenic River TP Criteria (0.037 mg/L), which was found to be protective of the river's designated uses and water quality conditions (Haggard et al., 2017).

These numeric thresholds are derived from some measure of the nutrient concentration on the x-axis. The nutrient concentrations in stressor response studies are bound to some sampling frequency, duration and hydrologic condition when the individual value is calculated for threshold analysis. For example, sestonic chlorophyll-a showed hierarchical structure and thresholds with nutrients across the Red River Basin (Haggard et al., 2013); the values used in the statistical analysis were medians from long-term databases with a minimum number of observations (Longing and Haggard, 2010). Thus, if nutrient criteria were promulgated from the referenced study, one would need to consider how nutrient and response values were calculated because that can influence assessment and potential water quality standard exceedances or violations (see Scott and Haggard, 2015).

The nutrient value used is usually tied to the calculation of some central tendency, e.g. mean, geometric mean (geomean) or median, across water samples collected over a length of time. For example, Taylor et al. (2014) used the mean of triplicate water samples collected at 38 different sites

during base flow conditions to evaluate natural algal and fish assemblage changes across a sharp nutrient gradient. In fact, most stream studies evaluating various biological responses to increasing nutrient concentrations have been conducted during base flow conditions, because the researchers need to be able to get into the water safely to collect substrate and biological data. The “Joint Study” itself was conducted under “**critical conditions**” when water and substrate samples could be collected every other month.

The term “**critical conditions**” was subjectively defined, which may have been intentional to gain unanimous approval by the six-person committee overseeing the “Joint Study”. However, the key to specifically defining this term may lie in the word “*dominant*” and the specific hydrologic conditions sampled during the “Joint Study”. Dominant used as an adjective means “most important, strong, or influential” (Google, 2020) with synonyms of “controlling” and or “paramount”. The definition “when surface runoff is not the dominant influence of total flow...” inherently suggests that streamflow would be dominated by base flow contributions. The descriptive term used was “dominant influence” not simply base flow being the majority of total flow (i.e., BFP greater than 0.50).

The obvious question is can we quantify “dominant” in terms of base flow contributions? The best way would be looking at the specific hydrologic conditions sampled during the “Joint Study”, which clearly showed that base flow contributions were dominant. In fact, 93% of the water samples from the “Joint Study” used to measure TP concentrations were collected when base flow contributions were 80 percent or more of total stream flow (i.e., BFP greater than or equal to 0.80). Based on calculated BFPs, base flow contribution to total streamflow was clearly dominant not just slightly more than half of total streamflow (i.e., BFP greater than 0.50). This is important because the TP criteria magnitude from the “Joint Study” was tied to these specific hydrologic or “**critical conditions**”, which suggests that assessment of the TP criteria in Oklahoma’s Scenic Rivers (0.037 mg/L; OWRB, 2002) should be tied to these same hydrologic or “**critical conditions**.”

If assessment of the TP magnitude was applied outside the hydrologic conditions sampled, then some consideration should be given to how TP concentrations vary with BFP or total streamflow. Across this region and landscape, stream TP concentrations and loads increase with increasing discharge, especially if comparing base flow verse storm events (e.g., Haggard 2010; Scott et al., 2011; Giovannetti et al., 2013; Grantz et al., 2014; McCarty and Haggard, 2016). We showed across eight different sites that stream TP concentrations changed with discharge; in particular, stream TP concentrations significantly ($P < 0.01$) decreased with BFP. In fact, the magnitude of change (i.e., $\Delta TP_{0.1BFP}$) varies with magnitude of stream TP during predominantly base flow conditions (i.e., TP_{BF}) across the Illinois River Watershed. Defining the hydrologic conditions used to assess the magnitude of the Oklahoma Scenic River TP criteria definitely matters at streams with TP_{BF} approaching 0.037 mg/L. For example, if three water samples were collected at BFPs of 0.80, 0.70 and 0.60 with TP_{BF} of 0.037 mg/L, then the mean of those three samples could [theoretically] be 0.045 mg TP L⁻¹ (exceeding the TP criteria magnitude). Thus, if the magnitude was going to be applied outside the hydrologic conditions studied, then it should be adjusted based on both $\Delta TP_{0.1BFP}$ and TP_{BF} to limit risk of spurious exceedances and violations.

We see two potential arguments against limiting the magnitude to the hydrologic or “**critical conditions**” based on the “Joint Study,” including (1) the question of how would limiting the magnitude to dominant base flow conditions address both point and nonpoint P sources, and (2) the ease of collecting water samples when BFP is 0.80 or greater across the duration assessed. First, we know that effluent discharges (i.e., point P sources) are an important driver of elevated stream TP concentrations throughout the region (Haggard et al., 2001, 2005; Ekka et al., 2006; Haggard, 2010; Jarvie et al., 2012) and globally (e.g., see Marti et al., 2004; Neal et al., 2005; Gibson and Meyer, 2007); elevated TP concentrations have been observed downstream from effluent discharges for tens of river kilometers. However, we also know that land use (i.e., potential nonpoint sources) is a driver of stream nutrient concentrations during base flow conditions within the region (Giovannetti et al., 2013; Sharpley et al.,

2017) and globally (McDowell et al., 2020); stream P concentrations increase with the increasing potential for nonpoint source contributions. Thus, we would argue that applying stream TP criteria to base flow conditions at the Illinois River Watershed will capture the influence and contributions of both point and nonpoint sources (McCarty and Haggard, 2016).

The ability to collect water samples during hydrologic conditions when base flow is dominant might be easier than expected. It is clear by the relations between \log_{10} TP concentrations and BFPs that most (54–72%) water samples over the five-year period (2015–2019) were from BFP greater than 0.75 across the eight sites within the upper Illinois River Watershed (Figure 2). The least percent (54%) was at the urban tributary Mud Creek at Fayetteville, whereas the range across the three sites on the Illinois River was 58 to 61%. Without intention, the AWRC was able to collect water samples when BFP was greater than 0.75 with relative ease. The “Joint Study” itself was able to meet these hydrologic conditions across almost all sites when limited to sampling every other month.

The ability to target hydrologic conditions when base flow contributions will vary seasonally and with episodic rainfall runoff events, but over a five year period water samples meeting this BFP criteria (i.e., $BFP > 0.75$) were able to be collected each month (Figure 4). The lesser percent of all samples collected meeting this BFP criteria during spring months (i.e., March, April and May) is because the AWRC targets surface runoff events more frequently during the rainy season. Even during those rainy months, the AWRC was able to collect water samples when base flow was dominant with relative ease.

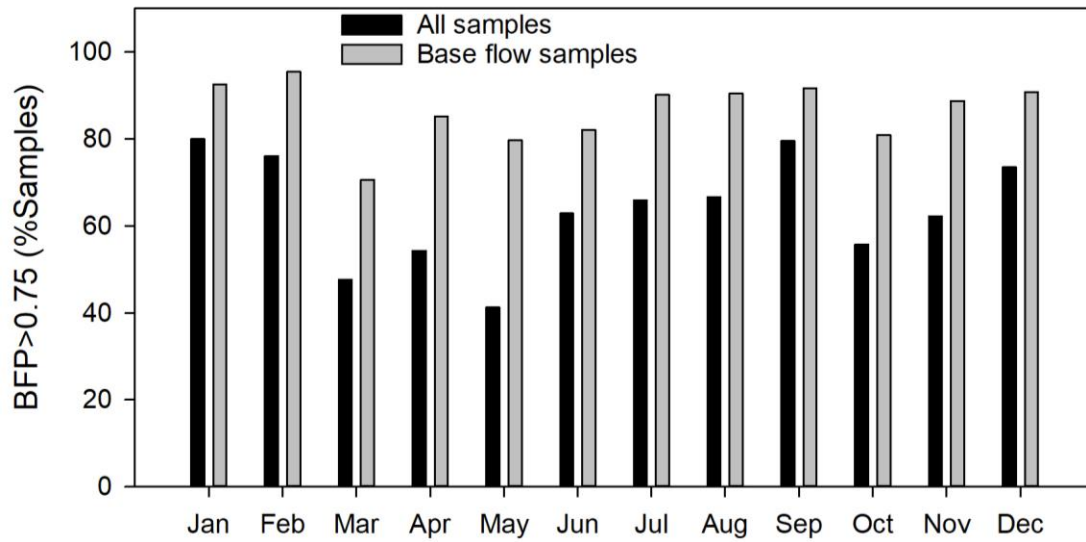


Figure 4. Frequency of water samples collected when base flow proportion (BFP) is greater than 0.75, as percent of all samples and percent of water samples when base flow was the majority of total flow (i.e., BFP>0.50), across all AWRC long-term monitoring sites from 2015 through 2019.

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