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Review of Arkansas Water Quality from 2008 to 2016

Thursday, 20 July 2017, Arkansas Governor Asa Hutchinson released an announcement stating Arkansas has achieved drastic improvements in water quality from 2008 to 2016, with 76 percent of "water bodies" no longer showing impairment[1]. If that statement seems a little bit fishy, that's because it absolutely is. This calculation is misleading, at best, and was likely based on what are referred to as "assessment units" (aka monitoring segments) that are defined as *stream reaches* or lakes[2]. Meaning these are segments of rivers and streams, not usually an entire river from headwaters to tailwaters. While assessment units are utilized for assessment and reporting purposes, they are completely arbitrary and meaningless in the context of determining the actual extent of impairment[3] within the state.

To emphasize the arbitrariness of calculating metrics of success based on this approach is: assessment units on the 2016 303(d) list[4] ranged from less than 0.2 to greater than 100 miles in length. To give an accurate depiction of water quality improvements, one would have to compare the total number of stream miles removed from the impaired waterbodies list - as length or area are more relevant units of measure than number of stream segments.

Calculating the total number of stream miles removed from the 2008 to 2016 list shows that 973 stream miles listed as not meeting water quality standards in 2008 were considered as meeting standards in 2016. This only leaves us with approximately **23 percent now considered as meeting water quality standards**, which doesn't sound nearly as impressive as the 76 percent improvement reported by the Governor's office. But that is still only a fraction of the whole story.

Regardless of the unit of measure, a missing part of the story is the fact that impairment thresholds have risen for several parameters. So, when Asa remarked about appreciating

[1] https://governor.arkansas.gov/press-releases/detail/arkansas-water-quality-shows-dramatic-improvement
[2] See page 8 of 2016 Assessment Methodology for the Preparation of The 2014 Integrated Water Quality Monitoring and Assessment Report https://www.adeq.state.ar.us/water/planning/integrated/assessment/pdfs/2016-assessment-methodology-draft-04apr16-305b.pdf
[3] "Impairment" means that water quality insufficient to support a designated use of a water body, such as the ability to provide fishable, swimmable, or drinkable waters. An impaired water body is considered of too poor quality to provide these beneficial uses that are necessary for our public health and safety or for other uses, such as being able to provide sufficient quality water for agricultural or industrial purposes.
[4] Refers to Section 303(d) of the Clean Water Act which requires states to compile a list of impaired waterbodies needing water quality improvements to be reported to EPA, and ultimately to Congress every two years.

"Administrator Pruitt for listening to the states about how regulations affect our citizens," I hope he was not referring to the fact that a lessening of water quality protections was in any way beneficial to the citizens of Arkansas. An example of this can be found in how water quality was assessed for minerals. In 2008, Arkansas Department of Environmental Quality (ADEQ) assessed minerals (chlorides, sulfates, and total dissolved solids) at a threshold of 10% exceedance of water quality standards[5]. Meaning that for samples collected within the period of record, if greater than 10% exceed the standard, a waterbody is considered impaired.

ADEQ made an attempt to change the 10% exceedance threshold for site-specific minerals standards; however, in 2008 EPA disapproved the removal of the language, stating mineral standards were "not to be exceeded in more than one (1) in ten (10) samples" from Arkansas's Water Quality Standards[6]. Meaning, when water quality standards are assessed for attainment/impairment purposes, a 10% exceedance threshold must be utilized. But contrary to EPA's 2008 decision, ADEQ chose to ignore the disapproval and raised the threshold to a 25% exceedance rate[7].

Although geospatial datasets (aka map data) used to recreate ADEQ's 2008 and draft 2016 303(d) list of impaired waterbodies could vary slightly from those used in the creation of the report due to resolution of spatial data, deviations are minimal and comparisons between 2008 and 2016 offer close and accurate estimates of the shifts in water quality trends (Table 1 and Figure 1).

The 2016 Integrated Water Quality Monitoring Assessment Report details that of over 11,000 miles of rivers and streams assessed in 2016[8], 40% were considered impaired. However, less than half of the stream miles considered as supporting year-round flow have enough water quality data available for water quality attainment decisions[9]. While assessment information for approximately 45% of our rivers and streams is actually pretty impressive, a vast number of these determinations were based on attainment decisions carried over from previous reporting cycles. Although basing assessment decisions on most recently available information *does* have merit, it tends to overshadow the fact that **Arkansas needs more funding for up to date water quality data and information, not less**.

The comments listed above are given on the assumption that EPA approved ADEQ's Draft 2016 list in its entirety. EPA does not simply check a box to approve or disapprove a list of impaired waterbodies. A Record of Decision will be provided detailing the basis of approvals and

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[5] See page 55 of 2008 Integrate Report
https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2008/integrated-report.pdf
[6] See page 10 of 24 January 2008 Record of Decision for Reg. 2.
https://www.adeq.state.ar.us/water/planning/reg2/pdfs/record-of-decision/2007-epa-action-ltr-rod-ar-tr-phase-2.pdf
[7] See page 50 of 2016 Integrated Report
https://www.adeq.state.ar.us/water/planning/integrated/assessment/pdfs/2016-assessment-methodology-draft-04apr16-305b.pdf
[8] See Table III-31, page III-71 https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2016/integrated-report.pdf
[9] Page II-3 of 2016 Integrated Report lists ~ 24,000 miles of perennial streams
https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2016/integrated-report.pdf

disapprovals broken down by assessment units. EPA must justify their decisions by citing previous decisions as precedent, water quality regulations, defensible assessment thresholds, and outside information as a weight of evidence approach for approving or disapproving of all decisions. But at least as far as publicly available information, there has been no sign of a Record of Decision provided for the 2016 303(d) list[10]. It is possible that EPA approved the list with revisions, as is usually the case.

And to address the elephant in the room of the determination that is of most significance and controversy…a few remarks on Big Creek located in Newton County:
Big Creek, a tributary to the Buffalo National River, has grown a lot of notoriety over the past few years due to the controversial permit that was granted to a large industrial swine facility due in part to inadequate environmental review. Due to the significance of the Buffalo River and the fragile karst landscape in which it exists, a considerable amount of research conducted and data collected has resulted in Big Creek likely being the most intensely monitored stream in Arkansas over the past five years. Big Creek Research and Extension Team (BCRET) was formed under Governor Mike Beebe, with of over $500,000 in state funds granted since 2013 to evaluate the environmental impact of C&H Hog Farm on Big Creek and the Buffalo River.

However, during the 2016 303(d) water quality assessment cycle, ADEQ ignored data collected by BCRET. Bacteria data (*Escherichia coli*) from Big Creek, that met all ADEQ's data quality considerations, as outlined in the 2016 Assessment Methodology, exceeded the allowable threshold a water body can exceed its water quality limits (i.e. criteria, number of bacteria colonies allowable for a set volume of water) during the 2014 primary contact season for "all other waters"[11]. This is notable because most public commentary regarding application of water quality standards to Big Creek has focused on whether to apply the more stringent bacteria limits used to evaluate Extraordinary Resource Waters (e.g. Buffalo National River). But even utilizing the less stringent criteria, Big Creek still exceeded the allowable exceedance threshold, and yet it was still not included in the 303(d) list. This is extremely egregious because our tax dollars are being wasted in the sense that data collected by BCRET are not being utilized to evaluate environmental impacts, as it turns out.

Unlike the expansive dataset generated out of BCRET's state funded project, datasets of a much smaller caliber have been utilized to list streams as impaired and for developing Total Maximum Daily Loads (TMDL) to correct water quality impairments[12]. TMDL's provide a plan for

[10] For an example, see Record of Decision for EPA Action on Arkansas' 2008 303(d) List https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2008/epa-rod.pdf
[11] Regulation 2.507 outlines water quality standards based on designated use of the waterbody. Most of the comments submitted during the 2016 303(d) public comment cycle contended that Big Creek was in violation of bacteria standards based on the criteria applied to Extraordinary Resource Waters (ERW), since ERW's are defined as "a combination of the chemical, physical and biological characteristics of a waterbody and its ***watershed***…".
[12] See: Pathogen TMDLS for Selected Reaches in Planning Segment 1C https://www.adeq.state.ar.us/downloads/WebDatabases/Water/TMDL/pdfs/Mine_Creek_2008_01_07.pdf; Pathogen TMDLS for Selected Reaches in Planning Segment 2B https://www.adeq.state.ar.us/downloads/WebDatabases/Water/TMDL/pdfs/pathogen_2b_2007_06_01.pdf; Pathogen TMDLs for Planning Segments 4D Reaches https://www.adeq.state.ar.us/downloads/WebDatabases/Water/TMDL/pdfs/Seg%204D%20Pathogens.pdf ;

restoring water quality by allocating maximum amounts of pollution that can be discharged to a waterbody without violating water quality standards. As TMDL's can be extremely effective in providing a watershed plan to help meet water quality standards, Governor Hutchinson's mention of the great strides Arkansas has taken to protect and enhance our natural environment was undoubtedly an acknowledgment of their effectiveness, whether unknowingly or not. Given the precedent provided by years of impairment decisions, the numerous TMDL's developed using far less water quality data, ADEQ's Assessment Methodology, and the fact that no explanation was provided by the state about why those data were ignored, it will be most interesting to find out EPA's final decision on Big Creek. And if for some reason EPA approved Arkansas's Draft 2016 303(d) list in its entirety, it will be of utmost interest to learn of the weight of evidence approach they utilized in their justification for not concluding that Big Creek should be listed as impaired.

As the 303(d) list is ultimately reported to Congress every two years to help inform how funds should be appropriated to address water quality concerns throughout the country, and as a review of how successful states were in utilizing funds previously granted to address water quality concerns, it is quite troubling that misleading information is being spread. It's hard not to assume that given the extreme budget cuts and environmental regulatory rollbacks that are being proposed at the federal level, spreading misinformation about the status of state waters is likely an attempt to help justify these actions. Don't be fooled by this rhetoric.

Pathogen TMDLs for Planning Segments 4G Reaches https://www.adeq.state.ar.us/downloads/WebDatabases/Water/TMDL/pdfs/seg_4g_pathogens_2007_06_01.pdf; Pathogen TMDLS for Clear Creek 11110103-029 in Arkansas Planning Segment 3J https://www.adeq.state.ar.us/downloads/WebDatabases/Water/TMDL/pdfs/Clear%20Creek%20Patogens.pdf; Pathogen TMDLS for Selected Reaches in Planning Segment 4E https://www.adeq.state.ar.us/downloads/WebDatabases/Water/TMDL/pdfs/seg_4e_pathogens_2007_06_01.pdf

Tables and Figures

Table 1. Stream miles and number of lakes impaired in 2008 and 2016. Impairments are based on Category 5 and Category 4a listings, impaired needing TMDL and impaired with TMDL, respectively. A total number of stream miles impaired in 2008 and 2016 are reported. Impairment status was carried over from 2008 to 2016 for 77% of rivers and streams that were listed as impaired in 2008. No evaluations or analyses were conducted for lakes; only total number of impaired waterbodies were reported for comparison purposes.

Description	Stream Miles	# Lakes
2008 Impaired	4315	28
2016 Impaired	4261	26
Impaired 2008 and 2016	3342	-
Impaired 2008, removed 2016	973	-

Comparison of Improvements and Impairments of Arkansas Rivers and Streams from 2008 and 2016 Impaired Waterbody Listings

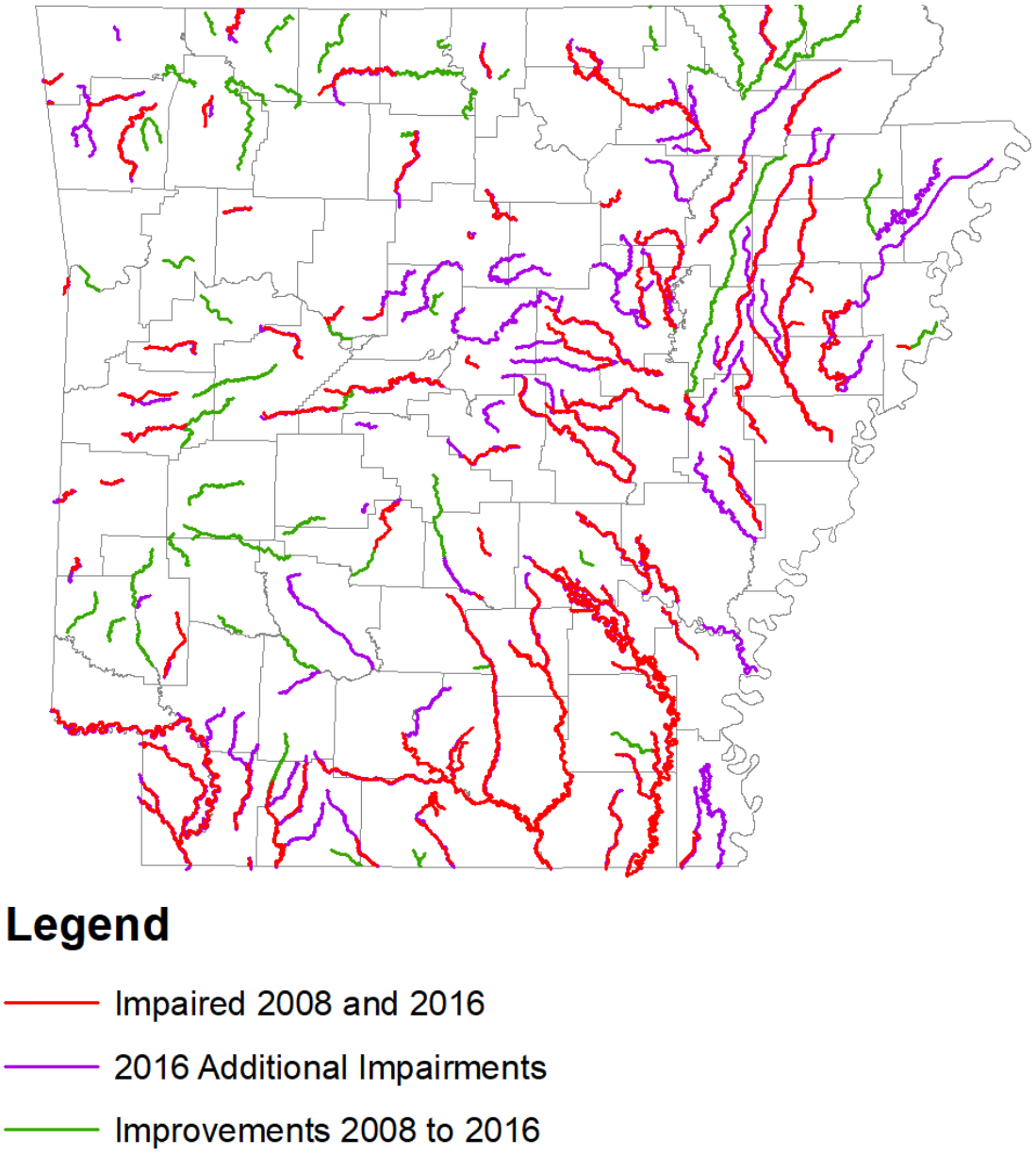

Figure 1. Map comparing rivers and streams not meeting water quality standards in 2008 and 2016, additional streams listed as impaired from 2008 to 2016, and stream reaches that were considered impaired in 2008 but were deemed as meeting water quality standards in 2016.