Arkansas Department of Environmental Quality

Mineral Criteria Development Strategy

Background

Revision of minerals criteria, specifically chlorides, sulfates, and total dissolved solids (TDS) (Regulation 2.511), has been a challenging task for Arkansas, U.S EPA, and permittees. Arkansas's proposed path forward will provide a clear and expedited process for revising mineral criteria and development of protective site-specific criteria (SSC).

Arkansas's history with mineral criteria dates back to 1967, "[W]aste discharge shall not affect mineral quality so as to interfere with other beneficial uses." In 1973, mineral SSC were adopted for 51 streams/stream segments; and for all other streams limits, chlorides, sulfates and TDS shall be 250, 250, and 500 mg/L, respectively. An additional 15 mineral SSC were added in 1975 as well as assessment language that precluded no more than a one in ten sample exceedance rate. The 1975 language went further to add that for tributary streams not listed, an increase of no more than 1/3 over naturally occurring levels may be permitted.

Most notable and likely most contentious addition to the Arkansas minerals saga was the 1991 inclusion of ecoregion values. Ecoregion value rationale and calculation was based in representation of maximum naturally occurring levels derived from least-disturbed ecoregion reference streams. Perhaps thought rather benign during inclusion and solely intended to be protective, ecoregion values have become the most contested and misapplied component of Arkansas's mineral criteria.

Arkansas's interpretation of ecoregion mineral values has been that these values should serve as guidance values for protection of water quality and not as water quality standards; therefore, they should not be assessed as such for Clean Water Act (CWA) purposes. For any waterbody without site-specific mineral criteria, said waterbody would be assessed at secondary maximum containment levels (MCL) for drinking water (i.e. 250 mg/L Cl, 250 mg/L SO4, 500 mg/L TDS). For nearly a decade, U.S. EPA submitted Record of Decision (ROD) on Arkansas's mineral criteria that included EPA's interpretation for how Reg. 2.511 should be implemented and assessed. However, some resolution came to fruition with the issuance of U.S EPA's ROD on Arkansas 2016 303(d) in that U.S. EPA agreed to, "during this period of time while Arkansas is working on revised minerals criteria, as we review and take action on Arkansas 303(d) lists, EPA will be consistent with our actions on previous Arkansas 303(d) lists (2006 and prior)." U.S. EPA's willingness to work with Arkansas is contingent upon submission of a plan outlining the state's objectives for developing or specifying minerals criteria in waters lacking site-specific

criteria. The remainder of this document provides an outline of how Arkansas will continue to address mineral criteria development.

Path Forward

In 2012, Arkansas and U.S. EPA took the first step forward toward a resolution through the evaluation of three approved approaches for mineral criteria development. In 2016, the U.S. EPA finalized its report to Arkansas with methods for calculation of criteria from reference conditions, hardness-based (toxicity), and field-based species sensitivity distribution (SSD) (stressor-response). Each approach was coupled with strengths and weaknesses, but overall the report was devoid of any prescriptive component (U.S. EPA 2016). Arkansas is actively considering all viable options for development of mineral criteria.

Arkansas's proposed path forward will include a close working relationship with stakeholders and EPA to develop defensible and attainable mineral criteria. The goal of the 2017 Mineral Strategy (Strategy) must include a multi-phase implementation process that will focus on building strong foundational components within the Antidegradation Policy, Designated Uses, and water quality criteria. Also included as a Strategy deliverable will be development and implementation of expedited processes and study design for site-specific mineral criteria. The Strategy will culminate in 2027 with adoption of revised mineral criteria into Arkansas's water quality standards.

In the timeline below, Arkansas provides a brief description of foundational components and key objectives to reach the necessary goals to complete these objectives.

Integral Components

Revision of Aquatic Life Designated Uses

Tiered aquatic life designated uses (TALUs) derived from effects based studies and supported with defensible biological indices are critical components to afford the most appropriate level of protection for aquatic life. ADEQ has recently initiated an Ambient Biological Network (ABN) that includes probabilistic and hand-selected sites to evaluate aquatic life use attainment. Data generated from the ABN will be used to re-evaluate current ADEQ similarity indices or to develop new multi-metric indices in order to appropriately assess Biological Integrity (Reg. 2.405) and Aquatic Life designated use attainment (Reg. 2.302(F)). TALU's will allow for better interpretation of designated uses (40 CFR 131.3(e)), protect high quality waters (40 CFR 131.12), and better support attainment decisions (40 CFR 130.23).

Additional data requirements for statewide revision and implementation of biological indices will involve detailed field collections for approximately five years (2017-2022). ADEQ can update stakeholders of progress on yearly basis, with a goal of having a final progress report by 2023.

Data collected will be evaluated using standard protocols for index development, including but not limited to: removal of redundant metrics, correlation of metrics to protection of biological assemblages, and statistical confidence of biological shifts due to differing degree of degradation.

Collection and analysis of physical, chemical, and biological data for the Ouachita Mountain ecoregion is nearing completion. In an effort to move forward as quickly as possible, a phased implementation of revised TALUs is proposed, starting with the Ouachita Mountain ecoregion. A proposed schedule of collection and implementation of TALUs for Arkansas' five major ecoregions (excluding Crowley's Ridge) is provided within Appendix 1 (Mineral Strategy Timeline).

Revision of Regulation 2.511

In 2016, the U.S. EPA described to Arkansas three approaches for development of mineral criteria in what is commonly referred to as the Ion Report. These approaches included methods for calculation of criteria from reference conditions, hardness-based (toxicity), and field-based species sensitivity distribution (SSD) (stressor-response). Each approach was coupled with strengths and weaknesses, but overall the report was devoid of any prescriptive component (U.S. EPA 2016)..

Data currently being collected by ADEQ will work to address data gaps identified in the Ion Report, particularly limited sample size of paired chemical and biological data and increased resolution of macroinvertebrate taxonomic identifications. Addressing both measures ADEQ will work towards developing key objectives necessary for mineral criteria refinement. Key objectives will encompass the review of background mineral concentrations, analysis of sensitive species shifts, and analysis of effects from elevated minerals on macroinvertebrate community structure. From here on, revised mineral criteria will be directly linked to protection of TALU's.

Pro tem Site-Specific Mineral Criteria Process

Until such time that TALU's are adopted and implemented, Arkansas will continue with existing policy of the 95th percentile for the development of site specific criteria. To ensure aquatic life designated use is protected during this interim period, third-parties may be required to submit additional analyses that evaluate sensitivity of aquatic organism to dissolved minerals including, but not limited to review of species shifts or distribution or extirpation concentrations.

Expedited Process for Site-Specific Mineral Criteria

Current state of the science indicates biological shifts, particularly loss of taxa, in sensitive macroinvertebrate communities can occur near 300 µS/cm^3 conductivity (U.S. EPA 2011). The relationship between conductivity and minerals (Cl, SO4, and TDS) is variable in natural waters. However, in limited datasets the 300 µS/cm^3 correlates to an approximate value of 250 mg/L total dissolved solids. To ensure protection of aquatic life until completion of the Strategy, proposed site-specific criteria below 250 mg/L total dissolved solids (TDS) will be expedited. Procedures outlined within the Continuing Planning Process and Regulation 2.308 will be still required.

Use Attainability Analysis

Regulation 2.306 will remain unchanged.

Revision of Antidegradation Policy

Revision of the Antidegradation Policy will include updates for Arkansas's process for identifying Tier 2 (High Quality) waterbodies per revisions to 40 CFR 131.12 as well as refined implementation procedures.

References

U.S. Environmental Protection Agency. 2011. A Field-based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams. National Center for Environmental Assessment, Office of Research and Development. EPA/600/R-10/023F. Available online at: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=233809

U.S. Environmental Protection Agency. 2016. EPA Technical Support: Evaluation of Several Approaches to Develop Mineral Criteria in Arkansas. 76pp.

Appendix I

Mineral Strategy Timeline

2017	Revise Antidegradation Policy
	ADEQ proposes an interim procedure for expedited site-specific mineral criteria for proposals less than (<) 250 mg/L TDS
	Mineral Stakeholder Subcommittee during Triennial Review (two meetings)
	Revise 2.309 Temporary Variance to remove three (3) year period
2017-2022	Collection of additional physical, chemical, and biological data
2018-2019	Data analysis and report preparation for the Ouachita Mtn. ecoregion
2020-2021	Present proposed revised mineral criteria to Mineral Stakeholder workgroup (two meetings)
	Present proposed multi-metric biological indices (IBIs) and tiered aquatic life uses (TALU) (three meetings) for the Ouachita Mountain ecoregion
2023	Triennial Review with Ouachita Mountain ecoregion TALU
2021-2022	Data collection, analysis, and report preparation Gulf Coastal Plains, Boston Mountain, Arkansas River Valley, and Ozark Highland
2023	Present proposed revised mineral criteria to Mineral Stakeholder workgroup (two meetings)
	Present proposed multi-metric biological indices (IBIs) and tiered aquatic life uses (TALU) for the Gulf Coastal Plains, Boston Mountain, Arkansas River Valley, and Ozark Highland ecoregions
2025	Incorporate multi-metric indices (IBIs) into assessment methodology for use in Integrated Report
	Draft proposed language for revised mineral criteria and TALU for adoption Regulation 2 Triennial Review, also includes any necessary revision to Reg. 2.308
2028	Initiate 2027 Triennial Review Stakeholder process
2030	Adopt revised mineral criteria, IBIs and TALUs into Triennial Review