



**Final
Delisting Decision
For
Broken Arrow Creek**

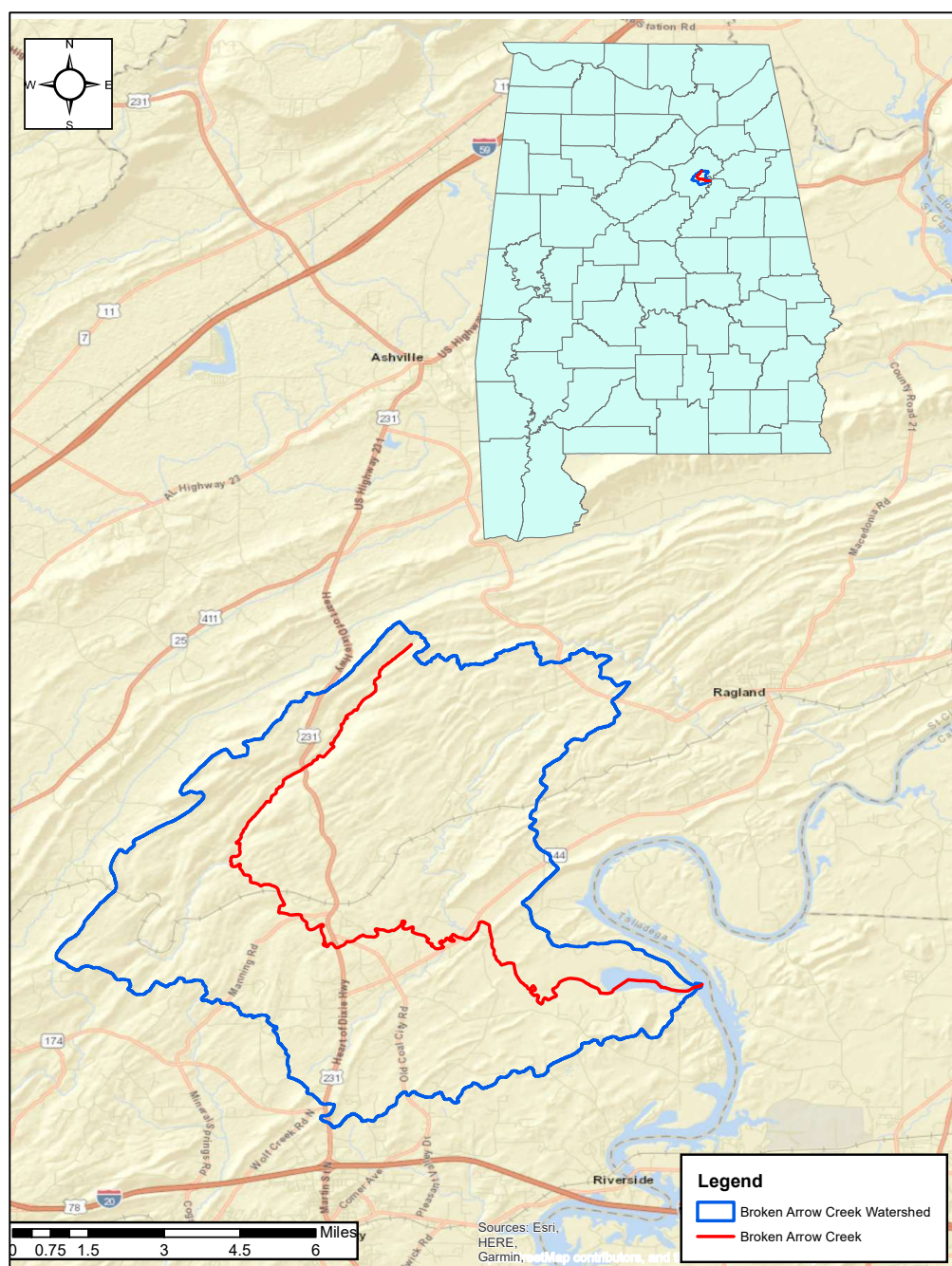
Assessment Unit ID # AL03150106-0602-100

St. Clair County

Siltation

Alabama Department of Environmental Management
Water Quality Branch
Water Division
March 2026

Figure 1: Broken Arrow Creek Watershed



<i>Table of Contents</i>	<i>Page</i>
1.0 Executive Summary	1
2.0 Basis for §303(d) Listing	2
3.0 Watershed Assessment	2
3.1 Water Quality Target Identification	2
3.2 Assessment of Ecoregional Reference Data	3
3.3 Land Use Assessment	5
4.0 Data Availability and Analysis – Basis for Delisting	7
4.1 Habitat Assessment and Macroinvertebrate Assessment	8
4.2 Turbidity and TSS Data Analysis	9
5.0 Conclusion	11
6.0 Public Participation	11
7.0 Appendices	12
7.1 References	12
7.2 2022 Turbidity and TSS Data at BRAS-1	13
7.3 2020 Ecoregional Guidelines for Ecoregion 67g and 67h	14
7.4 Broken Arrow Creek Photos	15

List of Figures

Figure 1	Broken Arrow Creek Watershed	ii
Figure 3-1	Broken Arrow Creek Watershed and Ecoregions	4
Figure 3-2	Land Use Map of the Broken Arrow Creek Watershed	5
Figure 3-3	Land Use Graph of the Broken Arrow Creek Watershed	6
Figure 4-1	Map of 2022 Broken Arrow Creek Sampling Locations	7
Figure 4-2	Habitat Assessment	8
Figure 4-3	Macroinvertebrate Assessment	9

List of Tables

Table 3-1	Land Use for the Broken Arrow Creek Watershed	6
Table 4-1	2022 Broken Arrow Creek Sampling Locations	7
Table 4-2	Summary of Turbidity Data	10
Table 4-3	Summary of TSS Data	10

List of Photos

Photo 7-1	Broken Arrow Creek at BRAS-1 on June 1, 2022, looking upstream	15
Photo 7-2	Broken Arrow Creek at BRAS-1 on June 1, 2022, looking downstream	15
Photo 7-3	Broken Arrow Creek at BRAS-1 on October 20, 2022, looking upstream	16
Photo 7-4	Broken Arrow Creek at BRAS-1 on October 20, 2022, looking downstream	16
Photo 7-5	Broken Arrow Creek at BRAS-1A on June 14, 2022, looking upstream	17
Photo 7-6	Broken Arrow Creek at BRAS-1A on June 14, 2022, looking downstream	17

1.0 Executive Summary

Broken Arrow Creek is located in St. Clair County and is a part of the Coosa River Basin. Broken Arrow Creek begins northwest of Ragland, Alabama and flows southwest then southeast to its confluence with the Coosa River (Logan Martin Lake). Broken Arrow Creek has a use classification of Fish & Wildlife (F&W). The drainage area of the Broken Arrow Creek watershed is approximately 55 square miles.

In 2010, Broken Arrow Creek (AL03150106-0602-100) was added to the State of Alabama's §303(d) list as impaired for siltation (habitat alteration). The source of the impairment was listed as agriculture and pasture grazing. Broken Arrow Creek has been included on Alabama's §303(d) list of impaired waterbodies for siltation from 2010 to 2024.

Over the last six years, additional data has been acquired for Broken Arrow Creek to assess its ability to meet applicable water quality standards. The data indicates that this waterbody now fully supports its use classification with respect to siltation.

This report addresses the results of the delisting analysis for Broken Arrow Creek. Based on an assessment of the available data, ADEM has determined that a water quality impairment due to siltation does not currently exist. Therefore, ADEM will not develop a total maximum daily load (TMDL) due to "more recent or accurate data," which is just cause for delisting a waterbody according to Title 40 of the Code of Federal Regulations (CFR), Part 130.7(b)(6)(iv).

2.0 Basis for §303(d) Listing

Section 303(d) of the Clean Water Act (CWA), as amended by the Water Quality Act of 1987, and the Environmental Protection Agency (EPA) Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations (CFR), Part 130), require states to identify waterbodies which are not meeting water quality standards applicable to their designated use classifications. The identified waters are prioritized based on severity of pollution with respect to designated use classifications. TMDLs for all pollutants causing violation of applicable water quality standards are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality standards with seasonal variations and margins of safety. The TMDL process establishes the allowable loading of pollutants, or other quantifiable parameters for a waterbody, based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution from both point and non-point sources and restore and maintain the quality of their water resources (USEPA, 1991).

Broken Arrow Creek was first placed on the State of Alabama's §303(d) list for siltation in 2010 based on a poor macroinvertebrate assessment score from 2005. The source of the impairment was listed as agriculture and pasture grazing.

3.0 Watershed Assessment

3.1 Water Quality Target Identification

The State of Alabama currently has no numeric criteria for siltation; therefore, narrative criteria must be used to assess the siltation impairment. While numeric criteria normally have a quantifiable endpoint for a given parameter, narrative criteria are qualitative statements that establish a set of desired conditions for all State waters. These narrative criteria are commonly referred to as "free from" criteria that enable states a regulatory avenue to address pollutants or problems that may be causing or contributing to a use impairment that otherwise cannot be evaluated against any numeric criteria. Typical pollutants that fall under this category are nutrients and siltation. Historically, in the absence of established numeric criteria, ADEM and/or EPA would use available data and information coupled with best professional judgement to determine overall use support for a given waterbody. Narrative criteria continue to serve as a regulatory basis for determining use support and making listing/delisting decisions of waters in regard to Alabama's §303(d) list. ADEM's narrative criteria (ADEM Admin. Code r. 335-6-10-.06) are as follows:

335-6-10-.06 Minimum Conditions Applicable to All State Waters. *The following minimum conditions are applicable to all State waters, at all places and at all times, regardless of their uses:*

(a) State waters shall be free from substances attributable to sewage, industrial wastes or other wastes that settle to form bottom deposits which are unsightly, putrescent or interfere directly or indirectly with any classified water use.

(b) State waters shall be free from floating debris, oil, scum, and other floating materials attributable to sewage, industrial wastes or other wastes in amounts sufficient to be unsightly or which interfere directly or indirectly with any classified water use.

(c) State waters shall be free from substances attributable to sewage, industrial wastes or other wastes in concentrations or combinations which are toxic or harmful to human, animal or aquatic life to the extent commensurate with the designated usage of such waters.

For the siltation impairment status, relative biological health and habitat suitability will be evaluated along with an assessment of the instream total suspended solids (TSS) and turbidity data.

Although ADEM does not currently have numeric criteria for siltation, there is an existing criterion for turbidity. According to ADEM Admin. Code 335-6-10-.09(5)(e)9, the following criterion is applicable for a waterbody classified as Fish and Wildlife:

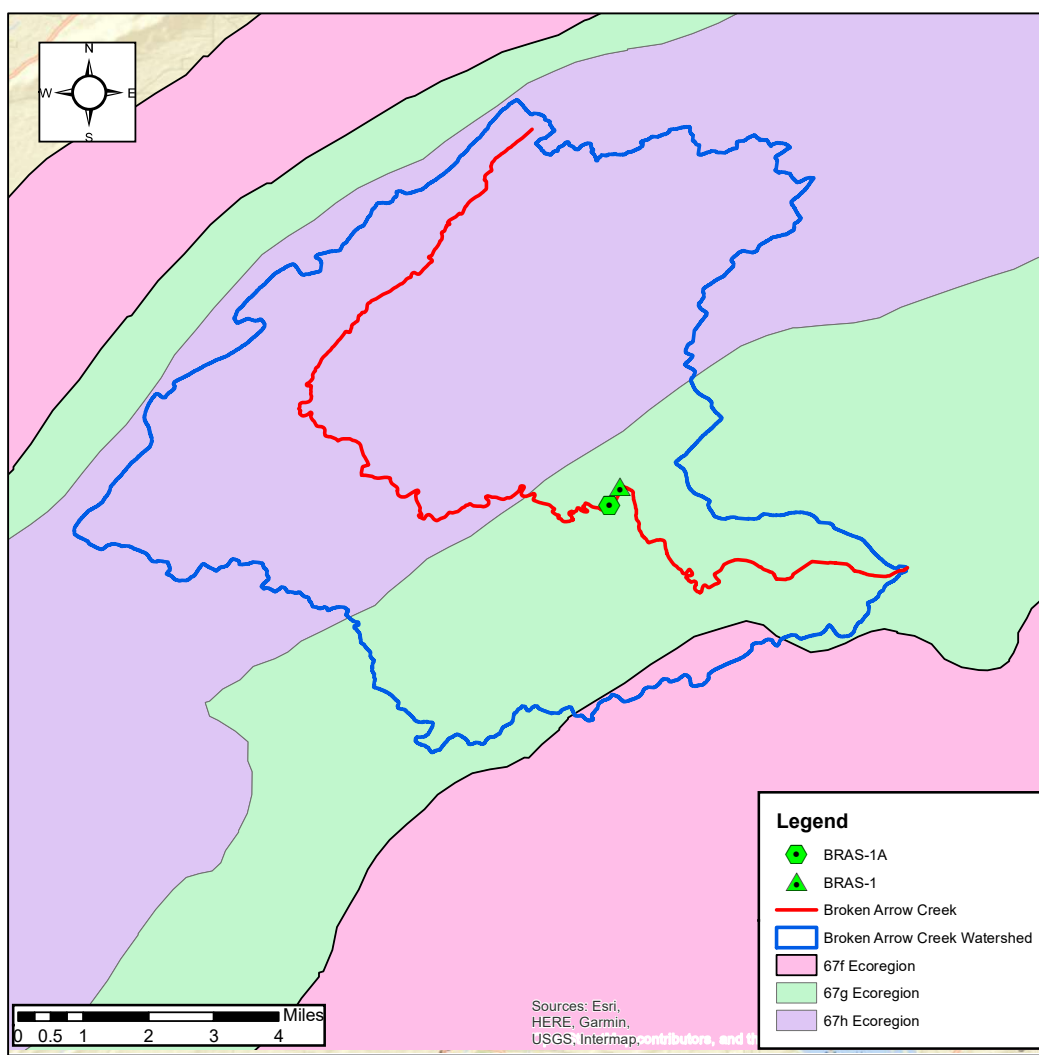
Turbidity: there shall be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of waters or interfere with any beneficial uses which they serve. Furthermore, in no case shall turbidity exceed 50 Nephelometric units above background. Background will be interpreted as the natural condition of the receiving waters without the influence of man-made or man-induced causes. Turbidity levels caused by natural runoff will be included in establishing background levels.

3.2 Assessment of Ecoregional Reference Data

ADEM has published ecoregional reference guidelines for a number of parameters and pollutants. Reference streams, also referred to as “reference reaches” or “ecoregional reference sites,” are defined as relatively homogeneous areas of similar climate, land form, soil, natural vegetation, hydrology, and other ecologically relevant variables (USEPA, 2000b) which have remained comparatively undisturbed or minimally impacted by human activity over an extended period of time in relation to other waters of the State. While not necessarily pristine or completely undisturbed by humans, reference streams do represent desirable chemical, physical and biological conditions for a given ecoregion that can be used for evaluation purposes. The reference streams selected for a particular analysis depends primarily on the available number of reference streams and associated data within a particular ecoregion. Therefore, the total number of reference sites selected and the aerial scale (i.e., Ecoregion Level III, Level IV) used to represent a reference condition will often vary on a case-by-case basis.

Broken Arrow Creek is located in ecoregions 67h (Southern Sandstone Ridges) and 67g (Southern Shale Valleys). A very small portion of the watershed is in ecoregion 67f (Southern Limestone/Dolomite Valleys and Low Rolling Hills). Since the drainage area for ADEM sampling station BRAS-1 (described in Table 4-1 below) is primarily in ecoregion 67h, Alabama's 2020 Ecoregional Reference Guidelines for ecoregion 67h (Level IV) were used in this analysis and are shown in Appendix 7-3. ADEM elected to use the 90th percentile of the data distributions from the selected reference sites to establish goals for siltation, specifically TSS and turbidity, on an ecoregional basis. The 90th percentile of the data distribution is considered an appropriate target since it falls within an acceptable range of "least-impacted" conditions (i.e., upper quartile). Median values are used to represent existing TSS conditions within the impaired waterbody, and turbidity values are assessed on an individual sample basis. A map of the Broken Arrow Creek watershed and ecoregions is shown below in Figure 3-1.

Figure 3-1. Broken Arrow Creek Watershed and Ecoregions



Land use for the Broken Arrow Creek watershed was determined using ArcMap with land use datasets derived from the 2021 National Land Cover Dataset (NLCD). Figure 3-2 and Table 3-1 display the land use areas for the Broken Arrow Creek watershed. Figure 3-3 is a chart depicting the primary land uses in the Broken Arrow Creek watershed.

Figure 3-2 Land Use Map of the Broken Arrow Creek Watershed

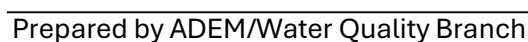
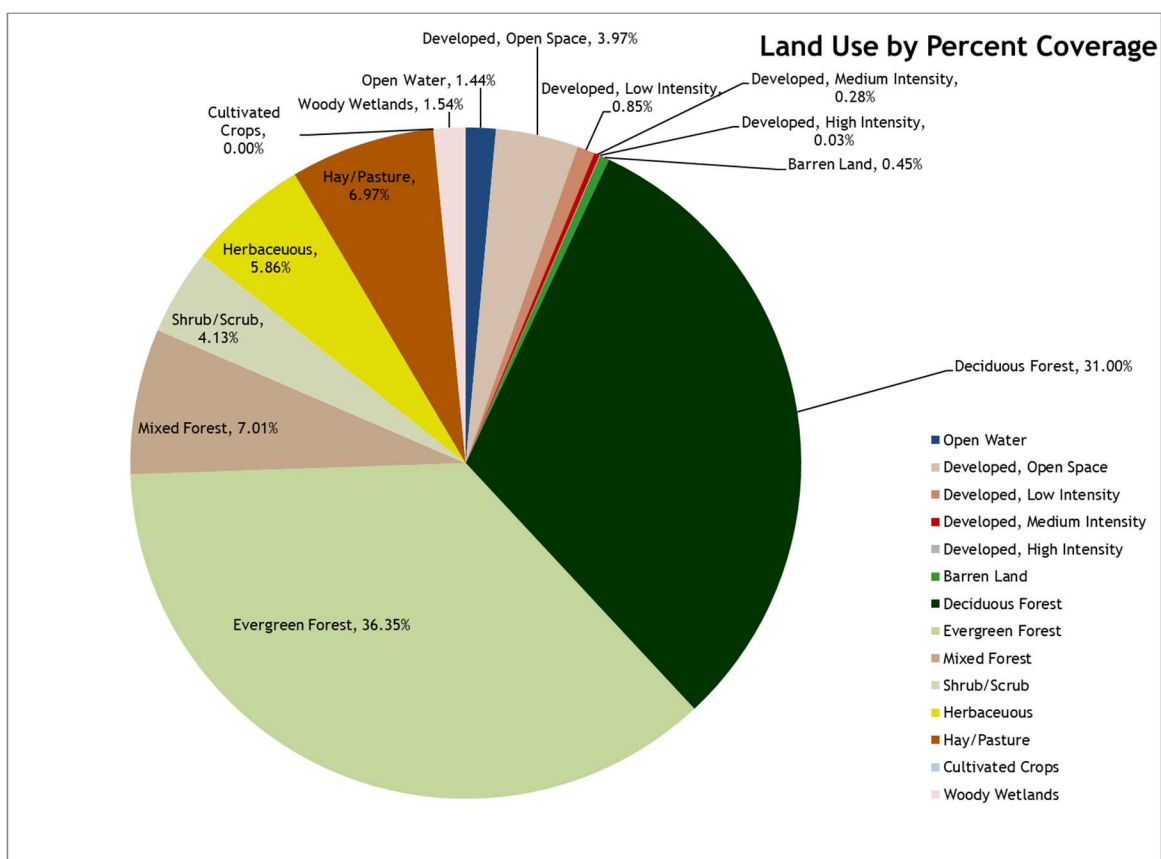


Table 3-1: Land Use for the Broken Arrow Creek Watershed

Class Description	mi ²	Acres	Percent
Open Water	0.79	507.06	1.44%
Developed, Open Space	2.19	1399.09	3.97%
Developed, Low Intensity	0.47	298.23	0.85%
Developed, Medium Intensity	0.15	96.96	0.28%
Developed, High Intensity	0.02	12.23	0.03%
Barren Land	0.25	158.12	0.45%
Deciduous Forest	17.07	10924.70	31.00%
Evergreen Forest	20.02	12810.39	36.35%
Mixed Forest	3.86	2469.69	7.01%
Shrub/Scrub	2.27	1453.79	4.13%
Herbaceous	3.22	2063.82	5.86%
Hay/Pasture	3.84	2455.46	6.97%
Cultivated Crops	0.00	0.00	0.00%
Woody Wetlands	0.85	542.20	1.54%
Emergent Herbaceous Wetlands	0.08	50.04	0.14%
TOTALS →	55.07	35241.79	100.00%

Figure 3-3: Land Use Graph of the Broken Arrow Creek Watershed



4.0 Data Availability and Analysis - Basis for Delisting

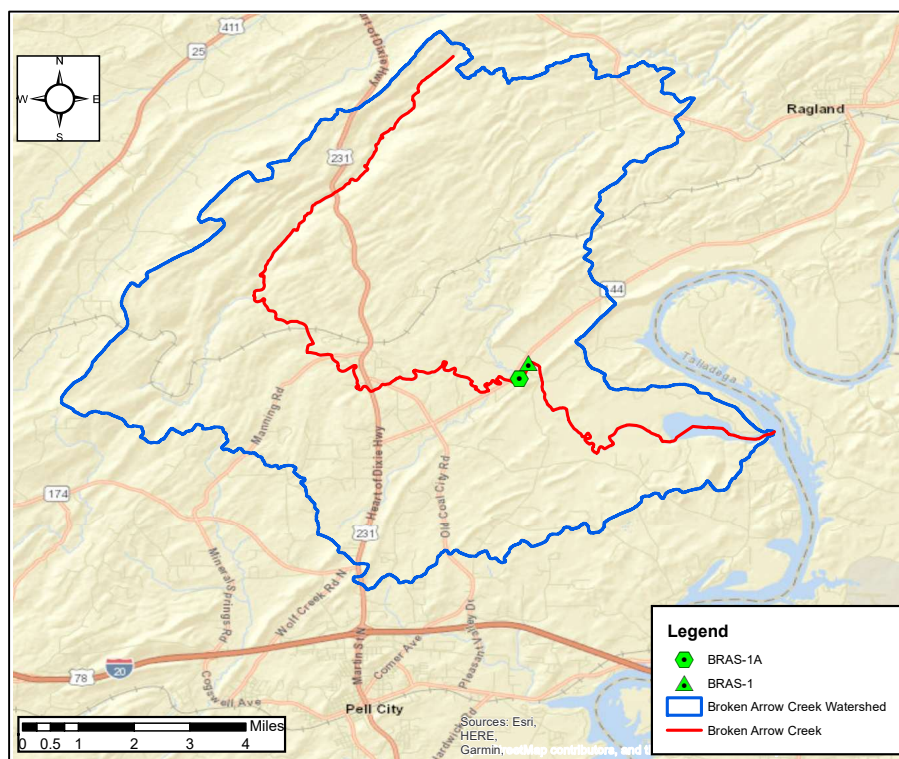
The data used for this analysis is from 2022. It should be noted that Broken Arrow Creek was sampled prior to 2022, but only the data that is six years in age or less will be used in this analysis, which is consistent with *Alabama's Water Quality Assessment and Listing Methodology* (ADEM, 2024).

Broken Arrow Creek was sampled at ADEM stations BRAS-1 and BRAS-1A in 2022. Refer to Table 4-1 for location descriptions of the sampling stations and to Figure 4-1 for a map depicting the locations of the stations. Habitat and macroinvertebrate assessments were conducted at station BRAS-1A, and physical and chemical data were collected at station BRAS-1 in 2022. (BRAS-1 was too deep for macroinvertebrate sampling in 2022; therefore, the macroinvertebrate and habitat assessments were conducted at station BRAS-1A, which is approximately 0.2 miles upstream of BRAS-1.)

Table 4-1: 2022 Broken Arrow Creek Sampling Locations

ADEM Station	Latitude	Longitude	Description
BRAS-1	33.6762	-86.23844	Broken Arrow Creek at unnamed Co Rd S off SR 144.
BRAS-1A	33.67209	-86.24077	Broken Arrow Creek 0.11 miles downstream of confluence with No Business Creek off Center Start Rd in St. Clair County.

Figure 4-1: Map of 2022 Broken Arrow Creek Sampling Locations



4.1 Habitat Assessment and Macroinvertebrate Assessment

A habitat assessment and a macroinvertebrate assessment were conducted by ADEM's Field Operations Division at station BRAS-1A on June 14, 2022. These assessments are generally conducted during the same station visit and are done to evaluate the existing aquatic communities. The habitat assessment and macroinvertebrate results can be seen below in Figures 4-2 and 4-3, respectively. The habitat assessment shows BRAS-1A to be in "Fair" condition, and the macroinvertebrate survey results indicate the community to be in "Fair" condition also, providing further evidence that there is no impairment in Broken Arrow Creek due to siltation.

Figure 4-2: Habitat Assessment

Table 3. Results of the habitat assessment survey conducted on Broken Arrow Creek at BRAS-1A, June 14, 2022. Macroinvertebrates were also collected.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	70	Sub-optimal (55-74.999)
Sediment Deposition	56	Sub-optimal (55-74.999)
Frequency of Riffles	69	Sub-optimal (55-74.999)
Bank Vegetative Stability	53	Marginal/Sub-optimal (50-54.999)
Riparian Zone Measurements	49	Marginal (30-49.999)
Habitat Assessment Score	157	
% Maximum Score	60	Fair (41-63.999)

Index Description

Habitat quality and availability was evaluated using ADEM's Habitat Survey for Low Gradient Streams. Measures of instream habitat availability and quality, sediment deposition, reach sinuosity, bank stability, and riparian zone quality are used to assess the overall availability and quality of habitat in comparison with reference reaches in the same ecoregion. Each metric is scored and rated as percent of maximum score. The overall habitat score and rating is the average of all metric scores. The length of reach being evaluated for habitat conditions depends on the type of biological survey being conducted: wadeable macroinvertebrate survey=100m; nonwadeable macroinvertebrate survey=500m; wadeable fish IBI=300m.

Figure 4-3: Macroinvertebrate Assessment

Table 4. Results of the Macroinvertebrate survey conducted on Broken Arrow Creek at BRAS-1A, 06/14/2022.		
Macroinvertebrate Assessment	Results	Scores
Taxonomic richness and diversity metrics		
Taxa Count	67	67
# rare and highly sensitive taxa	1	1
# sensitive taxa	13	13
# sensitive EPT taxa	7	7
Percent taxon metrics		
% rare and highly sensitive taxa	1	1
% sensitive taxa	19	19
% sensitive EPT taxa	10	10
% highly tolerant taxa	15	15
Percent individual metrics		
% rare and highly sensitive individuals	0	0
% sensitive individuals	3	3
% sensitive EPT individuals	2	2
% tolerant individuals	5	5
WMB-I Survey Score		4.0
WMB-I Survey Rating		Fair (3.85-4.149)
Index Description		
The benthic macroinvertebrate community was sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Measures of taxonomic richness, community composition and pollution tolerance were used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in north Alabama streams and rivers. Each site is placed in one of six levels ranging from 1, or natural, to 6, or highly altered.		

4.2 Turbidity and TSS Data Analysis

The turbidity and TSS data collected from station BRAS-1 during 2022 were compared to Alabama's 2020 Ecoregional Reference Guidelines for Level IV ecoregion 67h. Individual turbidity samples were compared to the applicable numeric criterion (50 NTU plus reference guideline of 9.24 NTU), and the median of the TSS samples was compared to the reference guideline of 9.1 mg/L. Applicable ecoregional reference data can be seen in Appendix 7-3.

Ten turbidity and eight TSS samples were collected at station BRAS-1 during the 2022 sampling season. A summary of the data can be seen below in Tables 4-2 and 4-3. The turbidity and TSS data can also be found in Appendix 7-2.

Table 4-2: Summary of Turbidity Data

Station ID	Sample Date	Turbidity (NTU)	Eco-reference (Background) Turbidity (NTU)	Maximum Turbidity (NTU) at BRAS-1	Turbidity Criterion (50 NTU + Background)
BRAS-1	3/22/2022	17.8	9.24	17.8	59.24
BRAS-1	4/11/2022	10.7			
BRAS-1	5/10/2022	12.9			
BRAS-1	5/18/2022	13			
BRAS-1	6/1/2022	16			
BRAS-1	7/26/2022	17			
BRAS-1	7/28/2022	7.8			
BRAS-1	8/23/2022	8.5			
BRAS-1	9/27/2022	12.7			
BRAS-1	10/20/2022	12.6			

Table 4-3: Summary of TSS Data

Station ID	Sample Date	TSS (mg/l)	TSS (mg/l) DET_COND	Median TSS (mg/l)	Eco-reference TSS (mg/l)
BRAS-1	3/22/2022	7	-	8	9.1
BRAS-1	4/11/2022	6	-		
BRAS-1	5/10/2022	2	-		
BRAS-1	6/1/2022	7	-		
BRAS-1	7/26/2022	10	-		
BRAS-1	8/23/2022	9	-		
BRAS-1	9/27/2022	10	-		
BRAS-1	10/20/2022	13	JQ*		

*The qualifier JQ indicates that the identification of the analyte is acceptable; the reported value is an estimate. The reported value failed to meet established QC criteria.

As can be seen from the tables above, each measured turbidity value was less than the applicable criterion of 59.24 NTU (50 NTU plus reference guideline of 9.24 NTU). The median value for the collected TSS samples was 8 mg/L, which is lower than the ecoregional reference value of 9.1 mg/L for ecoregion 67h.

While the reference guidelines for ecoregion 67h were utilized in the data analysis since the drainage area at ADEM station BRAS-1 is primarily in ecoregion 67h, it is noted that the median TSS value is also less than the reference value for ecoregion 67g, which encompasses all but a very small portion of the remaining Broken Arrow Creek drainage area. In addition, the maximum turbidity values are less than the criterion calculated utilizing the ecoregion 67g reference value. The ecoregional reference values for ecoregions 67g and 67h can be seen in Appendix 7-3.

5.0 Conclusion

From an examination of all available data, ADEM has determined that a water quality impairment due to siltation does not currently exist within Broken Arrow Creek. Therefore, ADEM will not develop a TMDL due to “more recent data,” which is a just cause for delisting waterbodies according to Title 40 of the Code of Federal Regulations (CFR), Part 130.7(b)(6)(iv).

6.0 Public Participation

As part of the public participation process, this Delisting Decision (DD) was placed on public notice and made available for review and comment. The public notice was prepared and published in newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who requested to be on ADEM’s postal and electronic mailing distributions. In addition, the public notice and subject DD were made available on ADEM’s Website: www.adem.alabama.gov. The public could also request paper or electronic copies of the DD by contacting Ms. Kimberly Minton at 334-271-7826 or kminton@adem.alabama.gov. The public was given an opportunity to review the DD and submit comments to the Department in writing. No written comments were received during the public notice period.

7.0 Appendices

Appendix 7-1 References

ADEM Administrative Code, 2025. Water Quality Program, Chapter 335-6-10, Water Quality Criteria, and Chapter 335-6-11 Use Classifications for Interstate and Intrastate Waters.

Alabama Department of Environmental Management's Monitoring Program. 2022.

Alabama Department of Environmental Management. *Alabama's 2020 Ecoregional Reference Guidelines*. 2020. ADEM

Alabama Department of Environmental Management. *Alabama's Water Quality Assessment and Listing Methodology*, January 2024.

Alabama Department of Environmental Management. Standard Operating Procedures #4910, Revision 7.2 - Laboratory Data Qualification. January 2022.

United States Environmental Protection Agency. April 1991. Guidance for Water Quality-Based Decisions: The TMDL Process, Office of Water, EPA 440/4-91-001.

Appendix 7-2 2022 Turbidity and TSS Data at BRAS-1

Station ID	Sample Date	Flow (cfs)	Turbidity (NTU)	TSS (mg/l)	TSS (mg/l) DET_COND
BRAS-1	3/22/2022	-	17.8	7	
BRAS-1	4/11/2022	49.9557	10.7	6	
BRAS-1	5/10/2022	12.7674	12.9	2	
BRAS-1	5/18/2022	7.785	13		
BRAS-1	6/1/2022	0.6702	16	7	
BRAS-1	7/26/2022	0.6436	17	10	
BRAS-1	7/28/2022	5.676	7.8		
BRAS-1	8/23/2022	0.9661	8.5	9	
BRAS-1	9/27/2022	0.7174	12.7	10	
BRAS-1	10/20/2022	0.125	12.6	13	JQ*

*The qualifier JQ indicates that the identification of the analyte is acceptable; the reported value is an estimate. The reported value failed to meet established QC criteria.

Appendix 7-3

2020 Reference Guidelines for Ecoregions 67g and 67h

Alabama's 2020 Ecoregional Re		
	Level 4	Level 4
Parameters	67g	67h
Physical		
Temperature (°C)	24.28	26.00
Turbidity (NTU)	25.90	9.24
Total Dissolved Solids (mg/L)	119.60	311.00
Total Suspended Solids (mg/L)	14.00	9.10
Specific Conductance (µmhos/cm@25c)	106.35	36.00
Hardness (mg/L)	48.00	8.20
Total Alkalinity (mg/L)	104.23	87.24
Chemical		
Dissolved Oxygen (mg/L)	5.92	7.00
pH (SU)	7.00	6.70
pH (SU)	8.10	8.00
Ammonia Nitrogen (mg/L)	0.0480	0.0221
Nitrate + Nitrite Nitrogen (mg/L)	0.2840	0.0675
Total Kjeldahl Nitrogen (mg/L)	0.6344	0.5180
Total Nitrogen (mg/L)	0.7720	0.5401
Dissolved Reactive Phosphorous (mg/L)	0.0270	0.0138
Total Phosphorous (mg/L)	0.0623	0.0418
CBOD-5 (mg/L)	2.80	2.20
Total Chlorides (mg/L)	5.10	13.76
Total Metals		
Total Aluminium (mg/L)	1.0156	0.4985
Total Iron (mg/L)	1.3280	0.7822
Total Manganese (mg/L)	0.1414	0.1143
Dissolved Metals		
Dissolved Aluminium - Al (mg/L)	0.10	0.10
Dissolved Antimony - Sb (µg/L)	1.00	5.00
Dissolved Arsenic - As (µg/L)	1.0540	-
Dissolved Cadmium - Cd (µg/L)	1.50	-
Dissolved Chromium - Cr (µg/L)	8.8500	34.10
Dissolved Copper - Cu (µg/L)	12.00	21.50
Dissolved Iron - Fe (mg/L)	0.4734	0.1881
Dissolved Lead - Pb (µg/L)	1.00	1.00
Dissolved Manganese - Mn (mg/L)	0.0537	0.1001
Dissolved Mercury - Hg (µg/L)	-	-
Dissolved Nickel - Ni (µg/L)	15.00	87.30
Dissolved Selenium - Se (µg/L)	5.00	5.00
Dissolved Silver - Ag (µg/L)	1.50	2.50
Dissolved Thallium - Tl (µg/L)	0.50	0.50
Dissolved Zinc - Zn (µg/L)	15.00	25.95
Biological		
Chlorophyll a (mg/m ³)	2.27	1.60
E Coli (mpn/dl)	101.22	-

Appendix 7-4 Broken Arrow Creek Photos

Photo 7-1: Broken Arrow Creek at BRAS-1 on June 1, 2022, looking upstream



Photo 7-2: Broken Arrow Creek at BRAS-1 on June 1, 2022, looking downstream



Photo 7-3: Broken Arrow Creek at BRAS-1 on October 20, 2022, looking upstream



Photo 7-4: Broken Arrow Creek at BRAS-1 on October 20, 2022, looking downstream

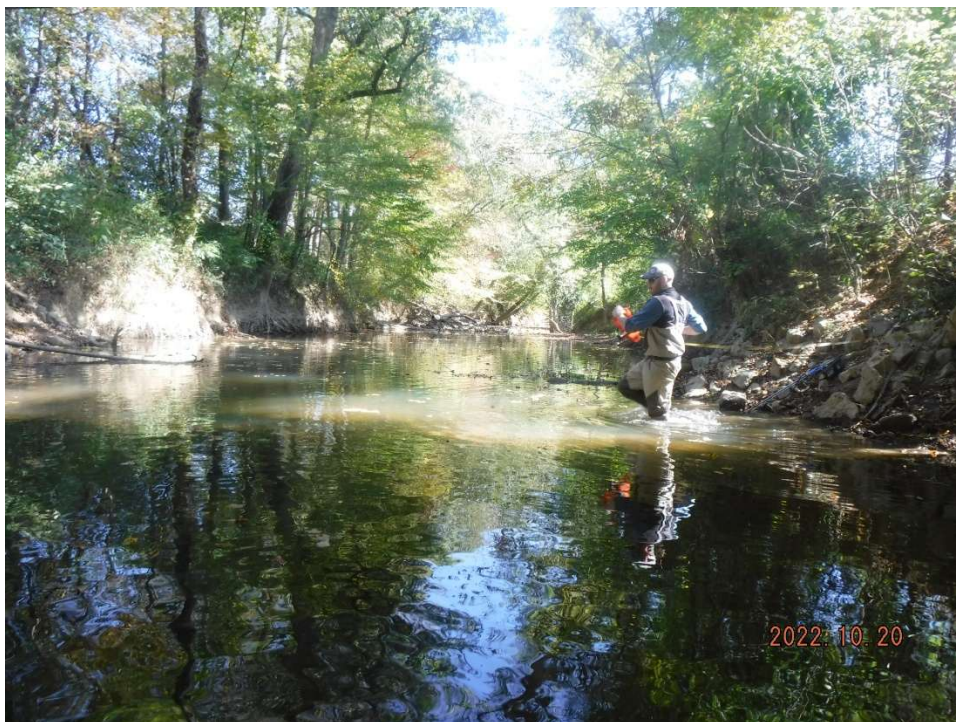


Photo 7-5: Broken Arrow Creek at BRAS-1A on June 14, 2022, looking upstream



Photo 7-6: Broken Arrow Creek at BRAS-1A on June 14, 2022, looking downstream

