



## **Draft**

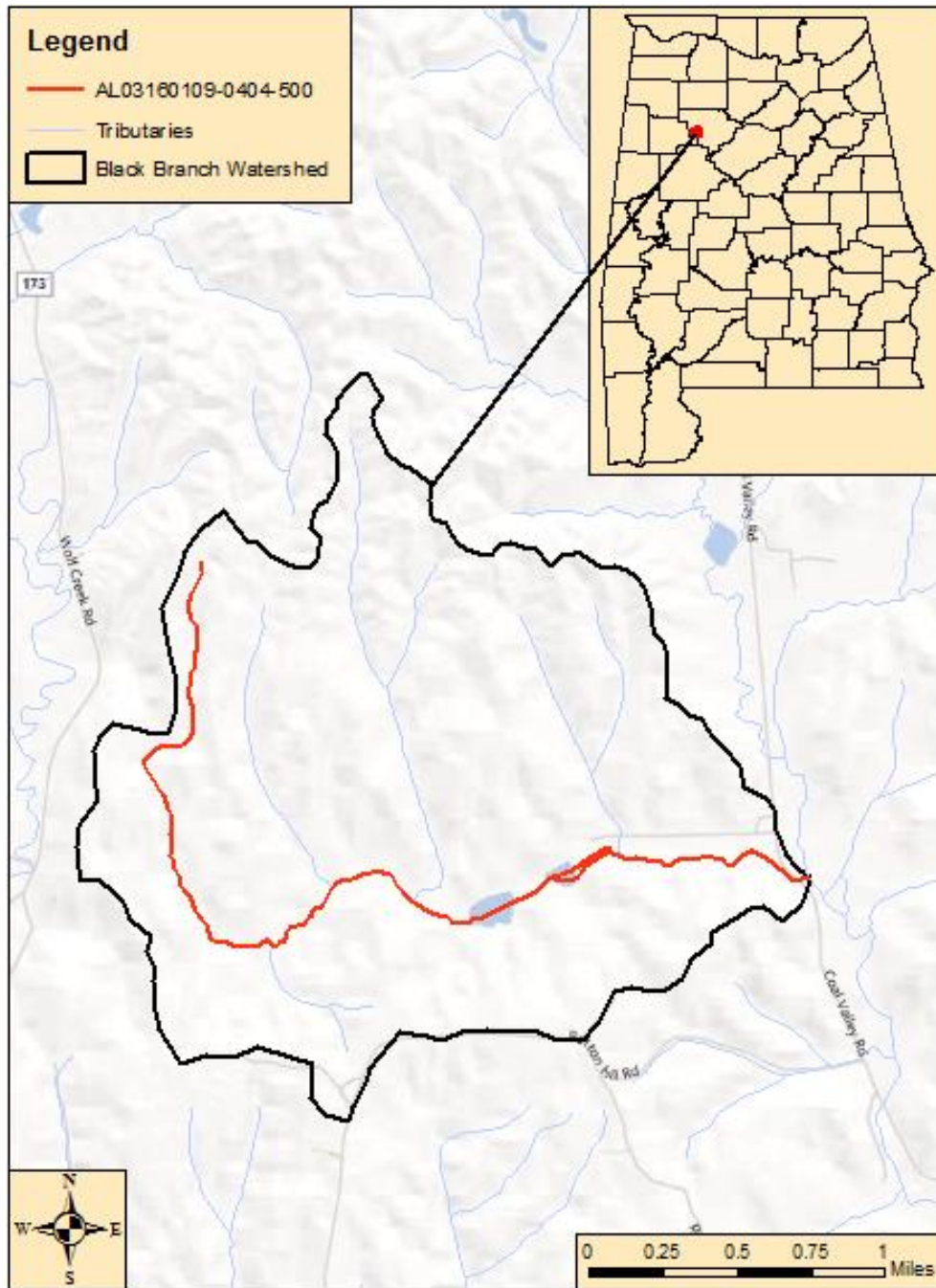
### **Delisting Decision For Black Branch**

**Assessment Unit ID # AL03160109-0404-500**

**Metals (Iron)  
Siltation (Habitat Alteration)**

Alabama Department of Environmental Management  
Water Quality Branch  
Water Division  
February 2014

**Figure 1-1 Black Branch Watershed**



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## ***1.0 Executive Summary***

Black Branch is located in Walker County approximately 2.5 miles northwest of the Town of Oakman in the Black Warrior River Basin. The total length of Black Branch is 4.11 miles, and it has a total drainage area of 3.36 square miles. Black Branch is a tributary to Cane Creek and has a use classification of Fish and Wildlife (F&W). The entire Black Branch watershed is located within the Level IV Eco-region 68f.

Black Branch was added to the State of Alabama's 1998 §303(d) list of impaired streams for metals, pH, siltation and other habitat alteration by the United States Environmental Protection Agency (USEPA). The listing was based on data collected by the Auburn Fisheries Cooperative Research Center in 1996 and 1997. The impaired segment extends from Cane Creek to its source. The source of the impairments is currently listed as abandoned surface mining. Black Branch was subsequently listed on Alabama's §303(d) list of impaired streams for metals, pH, siltation and habitat alteration from 2000-2012.

In 2008, the metals impairment was narrowed down to aluminum and iron, and the habitat alteration impairment was combined with the siltation impairment. This delisting decision will focus on the iron and siltation (habitat alteration) impairments. The aluminum and pH impairments are currently scheduled to be addressed in 2014. Also, Black Branch could potentially be listed for total dissolved solids on the next §303(d) list.

In 2007 and 2012, ADEM collected data on Black Branch at station BKBW-1 in an effort to more fully evaluate existing conditions as related to the previous listing decision. The iron data collected was compared to the USEPA's recommended water quality criterion of 1.0 mg/L for dissolved iron. None of the samples collected were above this criterion. The data collected was also compared to Alabama's 2010 Ecoregional Reference Guidelines for dissolved and total iron. These comparisons indicate that the iron concentrations in the impaired segment are well below the eco-reference values.

ADEM also collected data to evaluate the siltation (habitat alteration) impairment. Total suspended solids (TSS) and turbidity were both collected as well as habitat and macroinvertebrate assessments. All of the TSS and turbidity samples were very low and were well below the eco-reference levels. The habitat assessment was rated "sub-optimal", and the macroinvertebrate assessment was rated as "fair".

From examination of all available data, ADEM has determined that neither an iron nor siltation (habitat alteration) water quality impairment currently exist within Black Branch. Therefore, ADEM will not develop a TMDL for these parameters due to "more recent data" which is just cause for delisting waterbodies 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 EPA's 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 criteria applicable to their designated use classifications. The identified waters are prioritized based on severity of pollution with respect to designated use classifications. Total maximum daily loads (TMDLs) for all pollutants causing violation of applicable water quality criteria are established for each identified water. Such loads are established at levels necessary to implement the applicable water quality criteria 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).

As mentioned in the Executive Summary, Black Branch was listed on the 1998 §303(d) list by the USEPA based on data collected by the Auburn Fisheries Cooperative Research Center. Based on the historical data that could be retrieved, pH values were very low and the metals data appeared to be elevated. After a thorough records search, no chemical, physical, or biological data was found to substantiate the siltation or habitat alteration listing. It is believed that Black Branch was listed for siltation based on evaluated data (i.e. best professional judgement) and because of the historical mining operations. These evaluations may have been concluded from knowledge of complaints, fish kills, discharge monitoring report violations, and/or best professional judgement determinations.

## ***3.0 Technical Basis for Delisting Decision***

### ***3.1 Water Quality Target Identification***

The State of Alabama currently has no water quality criteria for iron. The USEPA has two recommended water quality criteria for iron. The USEPA recommends a freshwater chronic aquatic life toxicity value of 1.0 mg/L and a domestic water supply criterion of 0.3 mg/L. Toxicity is based on the dissolved, biologically available fraction.

The State of Alabama currently has no numeric criteria for siltation and 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 regards to Alabama's §303(d) list. For this delisting decision, biological and habitat assessment data along with other physical and field data were used in order to determine if Black Branch was impaired for siltation or not.

## ***3.2 Source Assessment***

### **3.2.1 Point Sources in the Black Branch Watershed**

#### *Continuous Point Sources*

Currently there are no active NPDES Permits within the Black Branch watershed.

#### *Non-Continuous Point Sources*

Black Branch does not currently have any non-continuous point sources within the watershed. There are no CAFOs located in the Black Branch watershed and currently none of the watershed qualifies as a Municipal Separate Stormwater Sewer System (MS4) area.

It should be noted that there is a history of coal mining in the Black Branch watershed. Documented studies show the abandoned mines in the watershed were continuing to discharge highly acidic water into the drainage areas. ADEM, along with other state and federal agencies, have implemented a great deal of projects in the Black Branch watershed in an effort to improve the watershed and overall water quality of Black Branch.

### **3.2.2 Nonpoint Sources in the Black Branch Watershed**

From review of the data collected and land source assessment, it is believed that nonpoint sources are not causing or contributing to any iron or siltation issues in Black Branch. Again it should be noted that there is a history of coal mining in the Black Branch watershed. Documented studies show the abandoned mines in the watershed were continuing to discharge highly acidic water into the drainage areas. EPA and ADEM's nonpoint source section have contributed much time and resources in an effort to improve the watershed.

## ***3.3 Watershed Improvements***

ADEM, along with other state and federal agencies have dedicated much time and resources in efforts to improve the Black Branch watershed. In 1997, the Black Branch Project was started in order to try and reclaim some of the abandoned mines. During the period between June 2006 and May 2011, EPA and ADEM's nonpoint source section, along with other federal and state agencies, implemented a great deal of BMP projects in the Black Branch watershed in an effort to improve overall water quality of the watershed. Some of the highlights of these projects included the filling of a large existing mine subsidence with limestone rip rap and remediating a gob pile left from the mining operations. Other projects include road and ditch repairs as well as

constructing a passive water treatment system in one of the tributaries to Black Branch. ADEM hopes these efforts will continue to improve the water quality in this watershed and help continue to mitigate the aluminum and pH impairments in Black Branch.

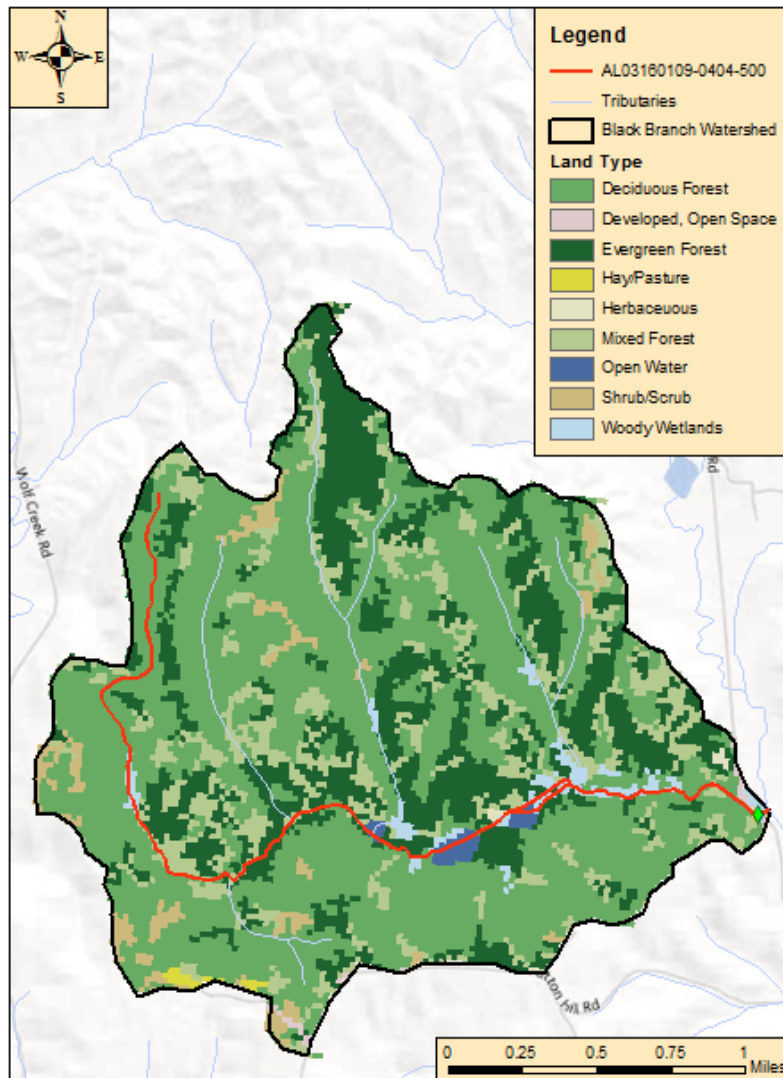
### 3.4 Land Use Assessment

Land use for the Black Branch watershed was determined using ArcMap with land use datasets derived from the 2006 National Land Cover Dataset (NLCD). Figure 3-1 and Table 3-1 display the land use areas for the Black Branch watershed.

Figure 3-2 is a graph depicting the primary land uses in the Black Branch watershed.

The majority of the Black Branch watershed is 98.76% forested/natural. Other major land uses within the watershed account for 0.67% open water, 0.32% developed land, and 0.25% agricultural land. Developed land includes both commercial and residential land uses.

**Figure 3-1. Land Use Map for the Black Branch Watershed**

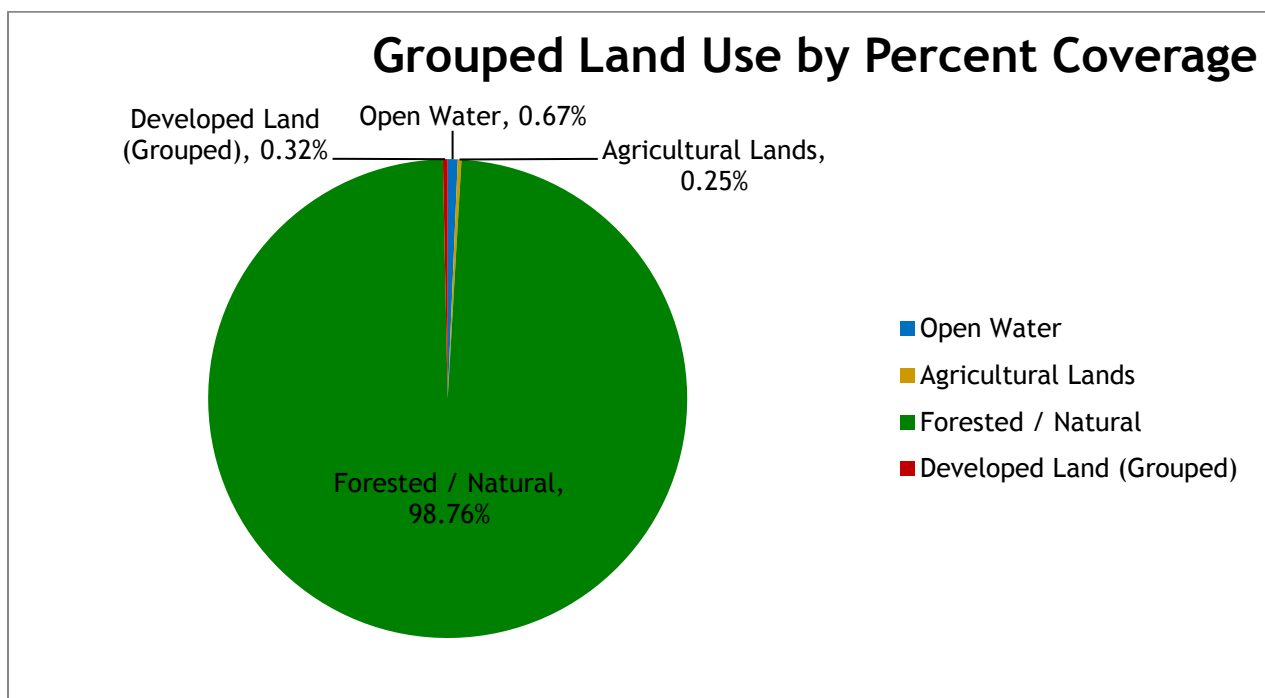




**Table 3-1. Land Use Areas for the Black Branch Watershed**

Class Description	Mi <sup>2</sup>	Acres	Percent
Open Water	0.02	14.46	0.67%
Developed, Open Space	0.01	6.89	0.32%
Deciduous Forest	1.87	1198.26	55.81%
Evergreen Forest	0.80	515.07	23.99%
Mixed Forest	0.47	301.12	14.02%
Shrub/Scrub	0.10	65.16	3.03%
Herbaceous	0.01	3.56	0.17%
Hay/Pasture	0.01	5.34	0.25%
Cultivated Crops	0.00	0.00	0.00%
Woody Wetlands	0.06	37.36	1.74%
<b>TOTALS →</b>	<b>3.36</b>	<b>2147.22</b>	<b>100.00%</b>
Class Description	Mi <sup>2</sup>	Acres	Percent
Open Water	0.02	14.46	0.67%
Agricultural Lands	0.01	5.34	0.25%
Forested / Natural	3.31	2120.53	98.76%
Developed Land (Grouped)	0.01	6.89	0.32%
<b>TOTALS →</b>	<b>3.36</b>	<b>2147.22</b>	<b>100.00%</b>

**Figure 3-2. Graph of the Primary Land Uses in the Black Branch Watershed**



## ***4.0 Data Availability and Analysis***

### ***4.1 Data Summary***

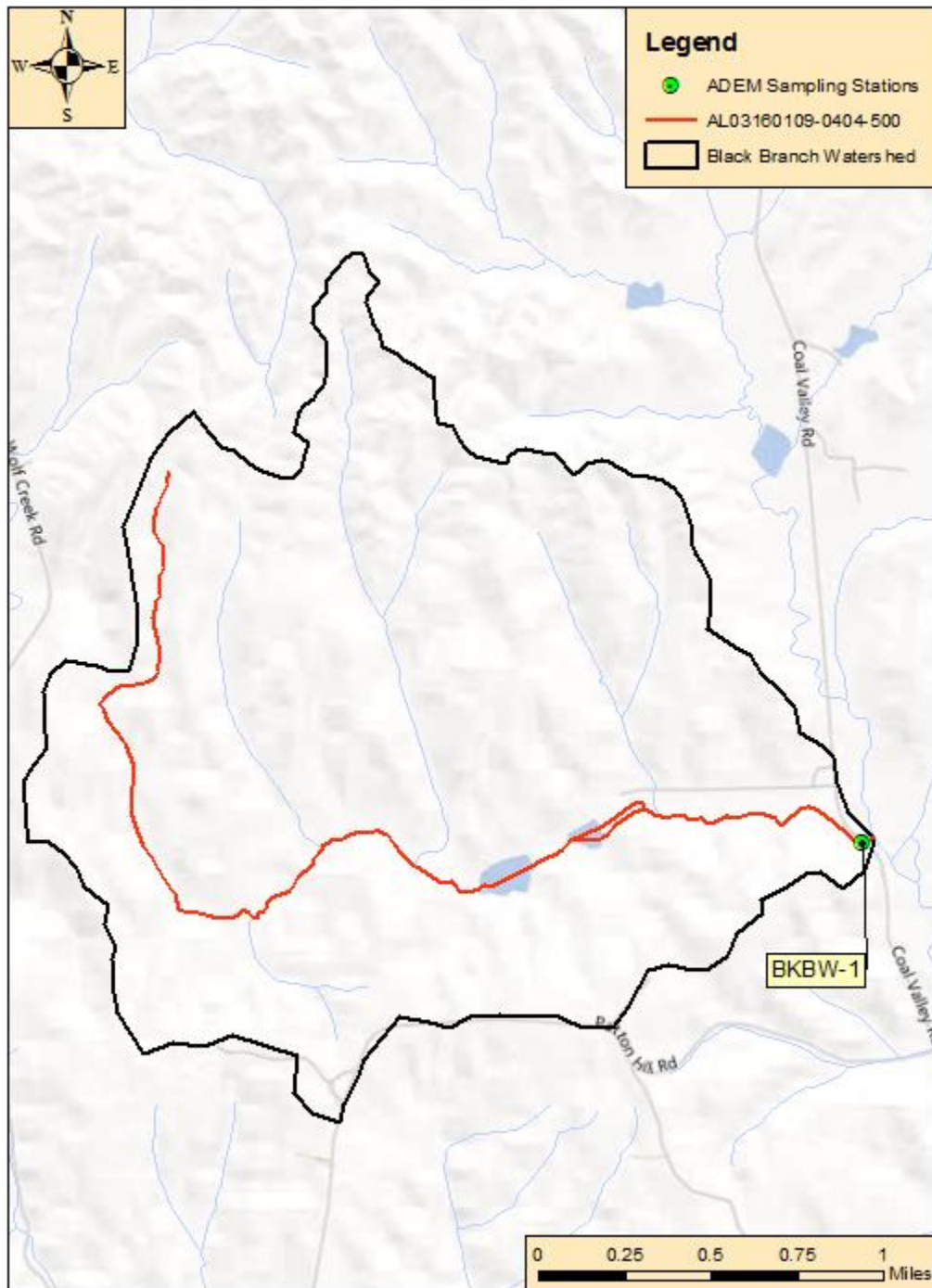
In 2007 and 2012, ADEM collected chemical, physical, and biological data on Black Branch at BKBW-1 to more fully evaluate existing conditions as related to the previous listing decision. This data did not indicate that Black Branch was impaired for iron or siltation (habitat alteration). Dissolved iron concentrations were below the USEPA recommended criteria of 1.0 mg/L. Also, the median value of the dissolved iron samples was well below the eco-reference dissolved iron value. Total iron was also evaluated. Since there is no criterion for total iron, the median value of the total iron samples was compared to the eco-reference value. The median value of the total iron samples was also well below the eco-reference total iron value further indicating that there is no iron impairment.

Physical and biological data were also collected to evaluate the siltation (habitat alteration) impairment. All of the total suspended solid (TSS) samples were below 5.0 mg/L and most were below the method detection limit (MDL) of 1.0 mg/L. When compared to the eco-reference value, the median of the TSS samples was much lower than the eco-reference TSS value. All of the turbidity samples taken were also very low. Every sample was at or below 2.5 NTU. The samples were also compared to the eco-reference value, and every individual sample was well below the eco-reference turbidity value. Biological assessments were also conducted to help evaluate the siltation impairment. The habitat assessment was rated “sub-optimal”, and the macroinvertebrate assessment was rated “fair” further indicating that Black Branch is not impaired for siltation (habitat alteration).

**Table 4-1. Location Description of ADEM Sampling Station**

<b>Station ID</b>	<b>Stream</b>	<b>Station Description</b>	<b>Latitude</b>	<b>Longitude</b>	<b>County</b>	<b>Ecoregion/ Sub region</b>
BKBW-1	Black Branch	Black Branch at Coal Valley Road	33.73807°	-87.41524°	Walker	68f

**Figure 4-1. Map of Sampling Locations for Black Branch**



## 4.2 Iron

In 2007 and 2012, ADEM collected a total of 12 dissolved iron samples and 12 total recoverable iron samples from station BKBW-1 on Black Branch. None of the dissolved iron samples were above the EPA recommended criteria of 1.0 mg/L. The iron samples collected on Black Branch are shown below in Table 4-2. The median value of those samples was also compared to the eco-reference value. The median value was well below the eco-reference value further indicating that there is no iron impairment in Black Branch.

As stated previously, ADEM collected a total of 12 total recoverable iron samples from station BKBW-1 in 2007 and 2012. These samples are shown below in Table 4-2. Since neither ADEM nor EPA have any water quality criteria for total iron, the iron samples were only compared to the eco-reference value. The median value of the total iron samples was well below the eco-reference value, again indicating that there is no iron impairment in Black Branch. A summary of the median dissolved and total iron values compared to the eco-reference values is shown below in Table 4-3.

**Table 4-2. Iron Samples from Black Branch**

Station ID	Visit Date	Fe Dissolved (mg/L)	Fe Dissolved Detect Condition	Fe Total (mg/L)	Fe Total Detect Condition
BKBW-1	3/14/2007	0.24		0.22	
BKBW-1	4/3/2007	0.4		0.534	
BKBW-1	5/8/2007	0.72		0.78	
BKBW-1	7/10/2007	0.626		0.684	
BKBW-1	4/11/2012	0.04	JI	0.063	JI
BKBW-1	5/2/2012	0.019	< MDL .019	0.102	JI
BKBW-1	6/6/2012	0.067	JI	0.074	JI
BKBW-1	7/18/2012	0.059	JI	0.084	JI
BKBW-1	8/15/2012	0.112	JI	0.138	JI
BKBW-1	9/12/2012	0.065	JI	0.094	JI
BKBW-1	10/3/2012	0.095	JI	0.126	JI
BKBW-1	11/6/2012	0.124	JI	0.139	JI

MDL: Method Detection Limit

JI: The identification of the analyte is acceptable; the reported value is an estimate. The reported value is between the MDL (method detection limit) and the RL (Reporting Limit).

**Table 4-3. Black Branch Iron Concentrations Compared to the Eco-reference Value**

BKBW-1 Iron Data Summary			
	Fe Dissolved (mg/L)		Fe Total (mg/L)
Median:	0.104		0.132
Eco-ref 90th %tile:	0.588		1.046

### 4.3 Siltation (Habitat Alteration)

In 2007 and 2012, physical and biological data were collected to further analyze the siltation (habitat alteration) impairment. There were a total of 11 total suspended solids (TSS) samples collected during this time. All of the samples collected were below 5.0 mg/L and most were below the method detection limit (MDL) of 1.0 mg/L. Also, the median value of these samples was compared to the eco-reference value. The median value of the samples was well below the eco-reference TSS value. Turbidity samples were also collected to help analyze the siltation impairment. There were a total of 14 turbidity samples collected at station BKBW-1. All of these samples were at or below 2.5 NTU, and all of the samples were well below the eco-reference turbidity value. A summary of the TSS and turbidity samples are shown below in Table 4-4.

**Table 4-4. Black Branch Siltation Data Summary**

Station ID	Visit Date	TSS (mg/L)	TSS Detect Condition	Turbidity (NTU)	Turbidity Detect Condition	Turbidity Ecoref 90th %tile
BKBW-1	3/14/2007	1		0.84		10.1
BKBW-1	4/3/2007	2		0.59		10.1
BKBW-1	5/8/2007	4		1.25		10.1
BKBW-1	7/10/2007	2		0.95		10.1
BKBW-1	10/2/2007			0.41		10.1
BKBW-1	4/11/2012	1	< MDL 1	0.41		10.1
BKBW-1	5/2/2012	1	< MDL 1	0.4		10.1
BKBW-1	5/8/2012			2.54		10.1
BKBW-1	6/6/2012	1	< MDL 1	1.02		10.1
BKBW-1	7/18/2012	1	< MDL 1	1.84		10.1
BKBW-1	8/15/2012	1	< MDL 1	0.59		10.1
BKBW-1	9/12/2012		< MDL 1	0.77		10.1
BKBW-1	10/3/2012	1	< MDL 1	1.01		10.1
BKBW-1	11/6/2012	1	< MDL 1	1.61		10.1
<b>Median:</b>		1				
<b>Eco-ref 90th %tile:</b>		14.00				

MDL: Method Detection Limit

In 2012, biological assessments were conducted to further assess the siltation (habitat alteration) impairment. The habitat assessment was rated “sub-optimal”, and the macroinvertebrate assessment was rated as “fair”. Results of the biological and habitat sampling provide further evidence that there is no impairment in Black Branch due to siltation (habitat impairment). The habitat and macroinvertebrate assessments are shown below in Table 4-5 and Table 4-6.

**Table 4-5. Habitat Assessment at BKBW-1**

<b>Table 3.</b> Results of the habitat assessment conducted on Black Br at BKBW-1, May 8, 2012. Macroinvertebrates were also collected.		
<b>Habitat Assessment</b>	<b>%Maximum Score</b>	<b>Rating</b>
<b>RR</b>		
Instream Habitat Quality	63	Sub-optimal (59-70)
Sediment Deposition	75	Optimal >70
Sinuosity	85	Optimal >84
Bank and Vegetative Stability	69	Sub-optimal (60-74)
Riparian Buffer	33	Poor <50
<b>Habitat Assessment Score</b>	<b>157</b>	
<b>% Maximum Score</b>	<b>65</b>	Sub-optimal (59-70)

**Table 4-6. Macroinvertebrate Assessment at BKBW-1**

<b>Macroinvertebrate Assessment (Completed 5/8/2012 10:55)</b>		
	<b>Results</b>	<b>Scores</b>
<b>Taxa richness measures</b>		<b>(0-100)</b>
# EPT taxa	7	13
<b>Taxonomic composition measures</b>		
% Non-insect taxa	4	92
% Dominant taxon	36	30
% EPC taxa	15	25
<b>Functional feeding group measures</b>		
% Predators	21	91
<b>Tolerance measures</b>		
% Taxa as Tolerant	29	57
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>51</b>
<b>WMB-I Assessment Rating</b>		<b>Fair (39-58)</b>

## ***5.0 Conclusions***

From examination of all available chemical, physical and biological data, ADEM has determined that neither an iron nor siltation (habitat alteration) water quality impairment currently exist within Black Branch. Therefore, ADEM will not develop a TMDL for these parameters due to “more recent data” which is 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) will be placed on public notice and made available for review and comment. The public notice will be prepared and published in the major daily newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who have requested to be on ADEM’s postal and electronic mailing distributions. In addition, the public notice and subject DD will be made available on ADEM’s Website: [www.adem.state.al.us](http://www.adem.state.al.us). The public can also request paper or electronic copies of the DD by contacting Mr. Chris Johnson at 334-271-7827 or [cljohnson@adem.state.al.us](mailto:cljohnson@adem.state.al.us). The public will be given an opportunity to review the DD and submit comments to the Department in writing. At the end of the public review period, all written comments received during the public notice period will become part of the administrative record. ADEM will consider all comments received by the public prior to finalization of this DD and subsequent submission to EPA Region 4 for final review and approval.

## **7.0 Appendices**

### **7.1 References**

ADEM Administrative Code, 2013. Water Quality Program, Chapter 335-6-10, Water Quality Criteria, and Chapter 335-6-11 Use Classifications for Interstate and Intrastate Waters.

Alabama's §303(d) Monitoring Program. 2007 & 2012. ADEM.

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## 7.2 ADEM Water Quality Data and Reference Documents

**Table 7-1. ADEM Iron Data at Station BKBW-1**

Station ID	Visit Date	Fe Dissolved (mg/L)	Fe Dissolved Detect Condition	Fe Total (mg/L)	Fe Total Detect Condition
BKBW-1	3/14/2007	0.24		0.22	
BKBW-1	4/3/2007	0.4		0.534	
BKBW-1	5/8/2007	0.72		0.78	
BKBW-1	7/10/2007	0.626		0.684	
BKBW-1	4/11/2012	0.04	JI	0.063	JI
BKBW-1	5/2/2012	0.019	< MDL .019	0.102	JI
BKBW-1	6/6/2012	0.067	JI	0.074	JI
BKBW-1	7/18/2012	0.059	JI	0.084	JI
BKBW-1	8/15/2012	0.112	JI	0.138	JI
BKBW-1	9/12/2012	0.065	JI	0.094	JI
BKBW-1	10/3/2012	0.095	JI	0.126	JI
BKBW-1	11/6/2012	0.124	JI	0.139	JI

MDL: Method Detection Limit

JI: The identification of the analyte is acceptable; the reported value is an estimate. The reported value is between the MDL (method detection limit) and the RL (Reporting Limit).

**Table 7-2. ADEM Siltation Data at Station BKBW-1**

Station ID	Visit Date	TSS (mg/L)	TSS Detect Condition	Turbidity (NTU)	Turbidity Detect Condition	Turbidity Ecoref 90th %tile
BKBW-1	3/14/2007	1		0.84		10.1
BKBW-1	4/3/2007	2		0.59		10.1
BKBW-1	5/8/2007	4		1.25		10.1
BKBW-1	7/10/2007	2		0.95		10.1
BKBW-1	10/2/2007			0.41		10.1
BKBW-1	4/11/2012	1	< MDL 1	0.41		10.1
BKBW-1	5/2/2012	1	< MDL 1	0.4		10.1
BKBW-1	5/8/2012			2.54		10.1
BKBW-1	6/6/2012	1	< MDL 1	1.02		10.1
BKBW-1	7/18/2012	1	< MDL 1	1.84		10.1
BKBW-1	8/15/2012	1	< MDL 1	0.59		10.1
BKBW-1	9/12/2012		< MDL 1	0.77		10.1
BKBW-1	10/3/2012	1	< MDL 1	1.01		10.1
BKBW-1	11/6/2012	1	< MDL 1	1.61		10.1

MDL: Method Detection Limit

**Table 7-3. Habitat Assessment at Station BKBW-1**

<b>Table 3.</b> Results of the habitat assessment conducted on Black Br at BKBW-1, May 8, 2012. Macroinvertebrates were also collected.		
<b>Habitat Assessment</b>	<b>%Maximum Score</b>	<b>Rating</b>
<b>RR</b>		
Instream Habitat Quality	63	Sub-optimal (59-70)
Sediment Deposition	75	Optimal >70
Sinuosity	85	Optimal >84
Bank and Vegetative Stability	69	Sub-optimal (60-74)
Riparian Buffer	33	Poor <50
<b>Habitat Assessment Score</b>	<b>157</b>	
<b>% Maximum Score</b>	<b>65</b>	Sub-optimal (59-70)

**Table 7-4. Macroinvertebrate Assessment at Station BKBW-1**

<b>Macroinvertebrate Assessment (Completed 5/8/2012 10:55)</b>		
	<b>Results</b>	<b>Scores</b>
<b>Taxa richness measures</b>		<b>(0-100)</b>
# EPT taxa	7	13
<b>Taxonomic composition measures</b>		
% Non-insect taxa	4	92
% Dominant taxon	36	30
% EPC taxa	15	25
<b>Functional feeding group measures</b>		
% Predators	21	91
<b>Tolerance measures</b>		
% Taxa as Tolerant	29	57
<b>WMB-I Assessment Score</b>	<b>---</b>	<b>51</b>
<b>WMB-I Assessment Rating</b>		<b>Fair (39-58)</b>

**Table 7-5. Alabama's 2010 Ecoregional Reference Guidelines**

Alabama's 2010 Ecoregional Reference Guidelines																			
Parameters	Basis of comparison	Result to compare	Level 4	Level 4	Level 3	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 4	Level 3	Level 4	Level 4	Level 3	Level 4	Level 3
			45a	45d	45	65a/b	65f	65g	65i	65j	65q	67f	67h	67	68d	68e	68	71f	71
<b>Physical</b>																			
Temperature (°C)	90th %ile	Median	24.656	25	25	27	24.6	27	25	24	27	24	26	25.7	25	23.48	24	22.12	22.586
Turbidity (NTU)	90th %ile	INDIVIDUAL	21.7	6.823	15	49.56	9.7	13.05	26.21	10.73	42.3	6.622	10.787	8.824	9.667	9.025	10.1	3.693	11.1
Total Dissolved Solids (mg/L)	90th %ile	Median	67.9	85.4	80	162.8	53.4	97.4	63.3	167.6	103.4	165	79.4	151.2	118	84.8	97.2	79.6	150.5
Total Suspended Solids (mg/L)	90th %ile	Median	16	12	15	45	13.2	16.3	27.5	26.9	104.6	11.3	12.7	12.4	27	10	14	9.6	8.9
Specific Conductance (µmhos)	Median	Median	40.1	37	39.05	129.7	20.4	53.4	25.8	70	72.5	207	34.35	86	49.5	37	39.15	96	109
Hardness (mg/L)	Median	Median	10.65	11.1	11	56	14	14.2	6.52	82.1	34.6	94.05	8.56	42.3	16.2	10	12.15	47.2	56
Alkalinity (mg/L)	90th %ile	Median	21.8	23.5	23.01	84.41	11.8	21.85	21.05	130.64	36.36	121.73	16.54	117.716	21	44.2	42.2	57.492	109.4
Stream Flow (cfs)																			
<b>Chemical</b>																			
Dissolved Oxygen (mg/L)	10th %ile	Median	7.665	7.6	7.6	5.1	6.94	4.484	6.692	7.64	6.8	7.44	7	7	5.609	7.51	6.79	8.113	7.61
pH (su)	10th %ile	Median	6.5	6.787	6.64	6.758	4.436	5.69	5.82	6.31	6.6	6.938	6.69	6.768	6.482	6.522	6.5	7.162	7.345
pH (su)	90th %ile	Median	7.68	7.679	7.7	8.052	6.55	6.815	7.16	8.1	7.74	8.294	8	8.278	7.352	7.852	7.84	8.35	8.34
Ammonia Nitrogen (mg/L)	90th %ile	Median	0.0078	0.0105	0.0105	0.04802	0.046	0.0203	0.0905	0.0932	0.074	0.0228	0.031	0.0346	0.119	0.0945	0.1007	0.023	0.023
Nitrate+Nitrite Nitrogen (mg/L)	90th %ile	Median	0.1241	0.0718	0.0974	0.286	0.3258	0.2432	0.2764	0.3436	0.0634	0.261	0.0888	0.2403	1.202	0.456	0.6191	0.6895	1.42
Total Kjeldahl Nitrogen (mg/L)	90th %ile	Median	0.40482	0.2598	0.28448	0.887	0.4176	0.583	0.6782	0.4858	0.6346	0.431	0.5107	0.5826	1.46	0.6595	0.733	0.624	0.466
Total Nitrogen (mg/L)	90th %ile	Median	0.53114	0.3224	0.40016	1.1634	0.6396	0.773	0.8512	0.8064	0.69205	0.6836	0.69365	0.7109	2.269	0.9185	1.41685	1.295	1.57
Dissolved Reactive Phosphorus (mg/L)	90th %ile	Median	0.0214	0.027	0.0243	0.0618	0.0264	0.0236	0.023	0.0167	0.0193	0.0174	0.0162	0.017	0.0109	0.019	0.0182	0.017	0.0155
Total Phosphorus (mg/L)	90th %ile	Median	0.0663	0.0537	0.0599	0.201	0.04	0.0698	0.0682	0.0577	0.064	0.0514	0.0429	0.0566	0.0491	0.0501	0.05	0.1059	0.0497
CBOD-5 (mg/L)	90th %ile	Median	2.57	2.37	2.4	3.2	1.96	2.65	2	2.53	2.3	1.78	2.58	2.3	1.86	1.9	1.9	1.1	1.1
Chlorides (mg/L)	90th %ile	Median	4.778	4.029	4.495	12.032	6.692	6.066	4.2852	5.247	5.95	4.266	3.61	3.89	3.118	1.051	6.37	2.4112	2.622
<b>Total Metals</b>																			
Aluminum (mg/L)	90th %ile	Median	0.2437	0.1558	0.1954	1.181	0.4886	0.2732	0.801	0.4045	1.561	0.2104	0.356	0.4114	0.155	0.265	0.3055	0.1954	0.127
Iron (mg/L)	90th %ile	Median	1.094	0.5648	0.8722	2.362	1.352	3.976	3.548	0.839	2.13	0.893	0.733	0.9603	0.6855	1.047	1.046	0.4085	0.4294
Manganese (mg/L)	90th %ile	Median	0.0554	0.0647	0.057	0.215	0.0436	0.7372	0.8094	0.081	0.113	0.067	0.052	0.0628	0.184	0.0563	0.1553	0.025	0.025
<b>Dissolved Metals</b>																			
Aluminum (mg/L)	90th %ile	Median	0.05485	0.0545	0.0545	0.1365	0.2242	0.0545	0.1	0.11	0.193	0.1	0.1	0.1	0.1	0.1	0.1	0.03	0.03
Antimony (µg/L)	90th %ile	Median	1	1	1	1	3.75	1	5	5	3.75	5	1	5		14	14	5	5
Arsenic (µg/L)	90th %ile	Median	5	5	5	5	5	5	5	5	5	9.2	5	5		5	5	12.1	12
Cadmium (mg/L)	90th %ile	Median	0.0435	0.0435	0.0435	0.0435	0.0394	0.0435	0.0435	0.0435	0.0435	0.0435	0.0435	0.0435		0.0448	0.04415	0.0075	0.0075
Chromium (mg/L)	90th %ile	Median	0.0395	0.0395	0.0395	0.0395	0.0321	0.0395	0.0395	0.0395	0.0395	0.0395	0.0395	0.0395		0.0416	0.04055	0.025	0.025
Copper (mg/L)	90th %ile	Median	0.043	0.043	0.043	0.043	0.0349	0.043	0.043	0.043	0.075	0.043	0.043	0.043	0.043	0.0298	0.043	0.043	0.1
Iron (mg/L)	90th %ile	Median	0.292	0.2248	0.256	0.503	0.6132	0.8042	0.5392	0.2445	1.255	0.1218	0.1885	0.2428	0.1552	0.588	0.588	0.025	0.0579
Lead (µg/L)	90th %ile	Median	1	1	1	1	2.5	1	5	5	2.5	5	1	5	1	5	5	5	5
Manganese (mg/L)	90th %ile	Median	0.02665	0.0235	0.0253	0.1224	0.0328	0.7886	0.8218	0.025	0.1084	0.025	0.0235	0.025		0.05	0.05	0.025	0.025
Mercury (µg/L)	90th %ile	Median	0.15	0.15	0.15	0.15	0.25	0.15	0.25	0.2	0.25	0.2	0.2	0.2	0.18	0.2	0.2	0.15	0.15
Nickel (mg/L)	90th %ile	Median	0.114	0.114	0.114	0.114	0.0936	0.114	0.05	0.114	0.114	0.0884	0.114	0.114		0.114	0.114	0.025	0.025
Selenium (µg/L)	90th %ile	Median	5	5	5	5	5	5	25	23	5	23	5	5		50	50	15	25
Silver (mg/L)	90th %ile	Median	0.058	0.058	0.058	0.058	0.0467	0.058	0.05	0.058	0.058	0.0548	0.058	0.058		0.058	0.058	0.025	0.025
Thallium (µg/L)	90th %ile	Median	0.5	0.5	0.5	0.5	4.5	0.5	5	5	4.5	5	0.5	5		18.5	18.5	5	5
Zinc (mg/L)	90th %ile	Median	0.0345	0.0345	0.0345	0.0345	0.0294	0.0345	0.0345	0.0345	0.0345	0.0345	0.0345	0.0345	0.0345	0.0267	0.0438	0.0345	0.0285
<b>Biological</b>																			
Chlorophyll a (µg/L)	90th %ile	Median	5.019	2.14	2.67	5.181	1.755	1.282	4.732	3.31	3.949	2.562	2.086	2.322	1.392	2.458	2.67	3.044	4.255
Fecal Coliform (col/100 mL)	90th %ile	Median	332	116	201.2	1564	400	234	620	582	1025	141.6	152.2	197	829	252	320	200	435

## 7.5 *Black Branch Watershed Photos*

**Photo 1 – BKBW-1 Looking Upstream (Photo Taken 10/2/2007)**



**Photo 2 – BKBW-1 Looking Downstream (Photo Taken 10/2/2007)**



**Photo 3 – BKBW-1 Looking Upstream (Photo Taken 8/15/2012)**



**Photo 4 – BKBW-1 Looking Downstream (Photo Taken 8/15/2012)**

