



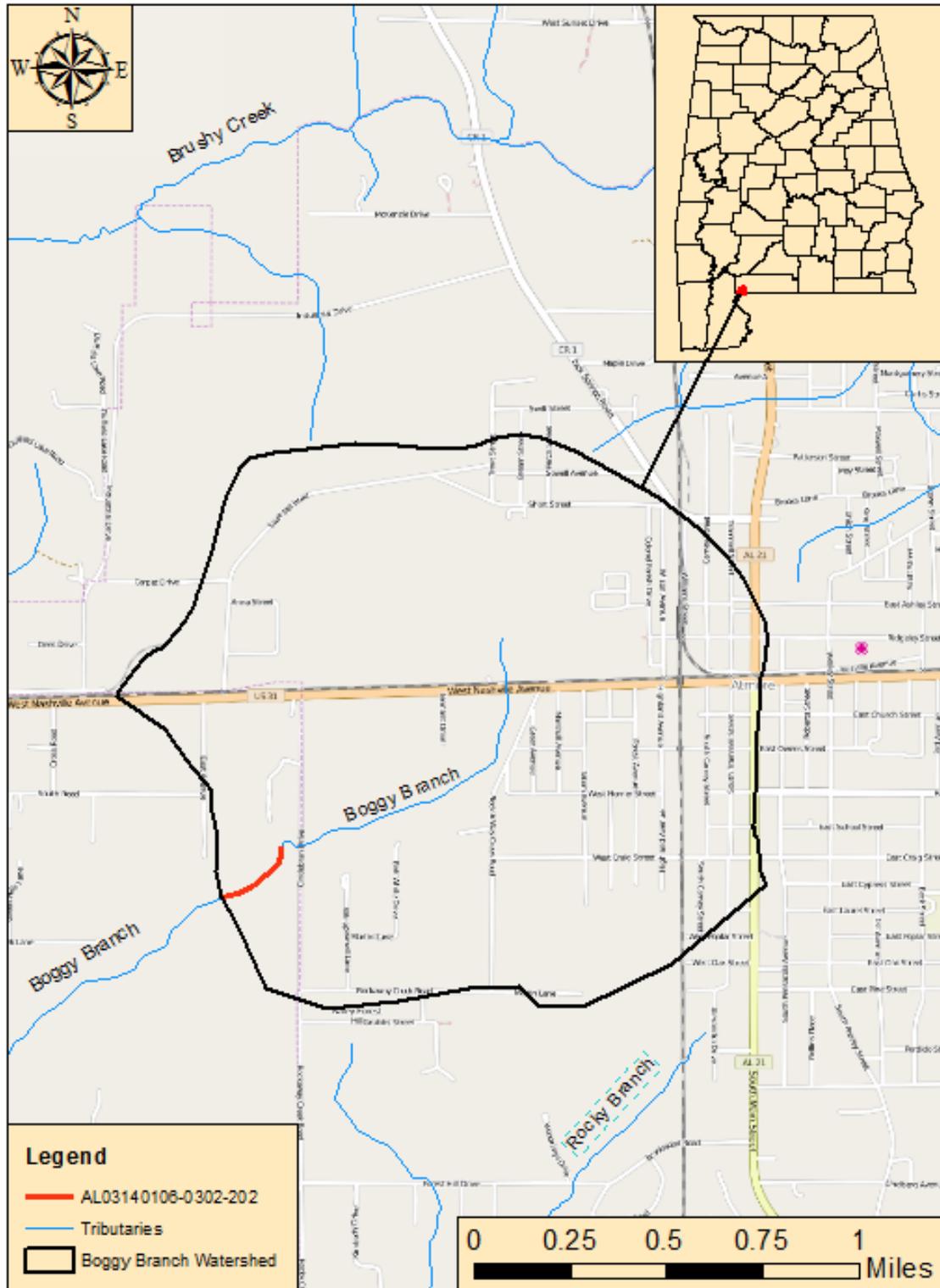
**Draft**  
**Delisting Decision**  
**For**  
**Boggy Branch**

**Assessment Unit ID # AL03140106-0302-202**

**Ammonia**  
**Organic Enrichment (CBOD, NBOD)**

Alabama Department of Environmental Management  
Water Quality Branch  
Water Division  
February 2016

**Figure 1-1 Boggy Branch Watershed**



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## ***1.0 Executive Summary***

Boggy Branch is located in Escambia County just west of the city of Atmore in the Perdido-Escambia River Basin. The total length of Boggy Branch is approximately 2.7 miles, and it has a total drainage area of 2.77 square miles. The subject delisting document covers the impaired portion of Boggy Branch that is 0.22 miles long and extends from Atmore WWTP to Masland Carpets WWTP (assessment unit ID AL03140106-0302-202). This segment has a drainage area of 1.92 square miles. The Boggy Branch headwaters start in Escambia County on the west side of the city of Atmore and flows into Brushy Creek. Boggy Branch has a use classification of *Fish & Wildlife (F&W)*. The entire Boggy Branch watershed is located in the level IV eco-region, 65f.

Boggy Branch was added to the State of Alabama's 1998 §303(d) list of impaired waters for Organic Enrichment/Dissolved Oxygen, Zinc, and Chlorides by the Alabama Department of Environmental Management (ADEM) based on a 1997 water quality assessment which indicated a moderate impairment for the segment. The impairment extended from Atmore WWTP to Masland Carpets WWTP. In 2006, a second segment of Boggy Branch (AL03140106-0302-201) was added to Alabama's §303(d) list. This segment was listed for metals (copper, lead) and pathogens and extends from Brushy Creek to Atmore WWTP. Ammonia was also added as an impairment to the original listed segment (AL03140106-0302-202) in 2006. These listings were all based on data collected by the Department in 2004. Then in 2008, mercury was added as an impairment for both segments of Boggy Branch. This delisting document will cover the original listed segment (AL03140106-0302-202) only.

In 2014, ADEM collected data on Boggy Branch at station BOB-2. These samples were collected in an effort to more fully evaluate existing conditions as related to the previous listing decision. The data collected for ammonia, five day carbonaceous biochemical oxygen demand (CBOD<sub>5</sub>), and total Kjeldahl nitrogen (TKN) were analyzed and compared to Alabama's 2010 Eco-regional Reference Guidelines for each parameter. The comparison indicates that ammonia and CBOD<sub>5</sub> concentrations in the impaired segment are at or well below background levels. The TKN concentrations were somewhat elevated, but after evaluation of the in-situ and 72-hour diurnal dissolved oxygen data, the Department believes that there is no organic enrichment impairment. All of the dissolved oxygen measurements collected during the 72-hour diurnal study were well above 5 mg/L. Therefore, ADEM will not develop a TMDL for this waterbody due to "more recent or accurate data," which is considered to be just cause for delisting a waterbody pursuant 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], requires 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, Boggy Branch was originally listed for organic enrichment/dissolved oxygen in 1998 based on a 1997 water quality assessment which indicated a moderate impairment for the segment. Boggy Branch was then listed in 2006 for ammonia based on data collected in 2004 at BOB-3. The 2004 data showed elevated concentrations of ammonia. This data can be found in the appendices of this report.

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

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

The State of Alabama currently has no water quality criteria for ammonia. The ammonia impairment will be analyzed by comparing the median of the ammonia samples with the 90<sup>th</sup> percentile of the data distributions from selected eco-region reference sites. This 90<sup>th</sup> percentile value from the eco-region reference sites is considered to be background conditions for waterbodies in that eco-region.

The use classification of Boggy Branch is *Fish and Wildlife (F&W)*. According to ADEM's Water Quality Criteria (Administrative Code 335-6-10), the dissolved oxygen criteria for the *Fish and Wildlife* use classification is as follows:

*For a diversified warm water biota, including game fish, daily dissolved oxygen concentrations shall not be less than 5 mg/L at all times; except under extreme conditions due to natural causes, it may range between 5 mg/L and 4 mg/L, provided that the water quality is favorable in all other parameters. The normal seasonal and daily fluctuations shall be maintained above these levels.*

In order to determine if an organic enrichment impairment exists in Boggy Branch, the Department will evaluate measured dissolved oxygen concentrations against the above criteria. Furthermore, the Department will also focus on some of the primary drivers affecting in-stream dissolved oxygen concentrations, including carbonaceous biochemical oxygen demand (CBOD<sub>5</sub>) and nitrogenous biochemical oxygen demand (NBOD). The 90<sup>th</sup> percentile of the data distributions from the selected eco-region reference sites will again be used in establishing CBOD<sub>5</sub> and NBOD evaluation concentrations that will serve as values for comparison to the recently collected ambient water quality data.

## **3.2 Source Assessment**

### **3.2.1 Continuous Point Sources**

As shown in Table 3-1 below, Masland Carpets (AL0021997) and Atmore WWTP (AL0049557) are the only two NPDES facilities with a permitted discharge to Boggy Branch. Masland Carpets has a current NPDES permit; however, the facility recently ceased discharging process wastewater to Boggy Branch. The facility was discharging at the time of the data collection in 2014.

**Table 3-1. Point Sources within the Boggy Branch Watershed**

<b>Point Sources</b>	<b>NPDES Permit</b>	<b>Receiving Waterbody</b>
Masland Carpets	AL0021997	Boggy Branch
Atmore WWTP	AL0049557	Boggy Branch

### **3.2.2 Non-Continuous Point Sources**

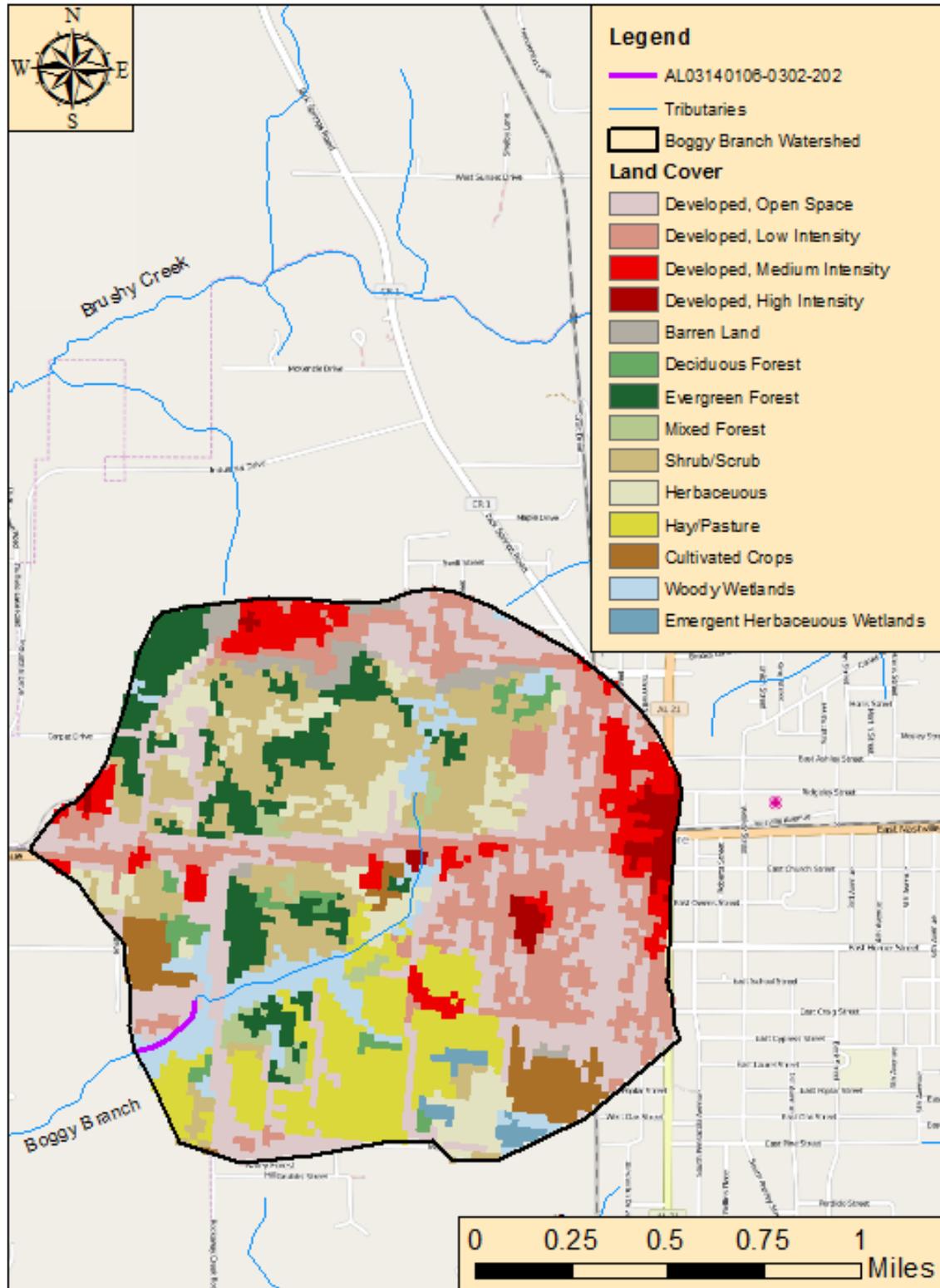
There are no CAFOs in the Boggy Branch watershed. Currently none of the Boggy Branch watershed qualifies as a Municipal Separate Storm water Sewer System (MS4) area.

### **3.2.3 Nonpoint Sources**

Nonpoint impacts in the Boggy Branch watershed are considered to come from its land uses. Land use for the Boggy Branch watershed was determined using ArcMap with land use datasets derived from the 2011 National Land Cover Dataset (NLCD). Figure 3-1 and Table 3-2 display the land use areas for the Boggy Branch watershed. Figure 3-2 is a graph depicting the primary land uses in the Boggy Branch watershed.

The majority of the Boggy Branch watershed is 48% developed land (grouped) and 39% forested/natural. Other major land uses within the watershed account for approximately 14% agriculture land and no open water. Developed land includes both commercial and residential land uses.

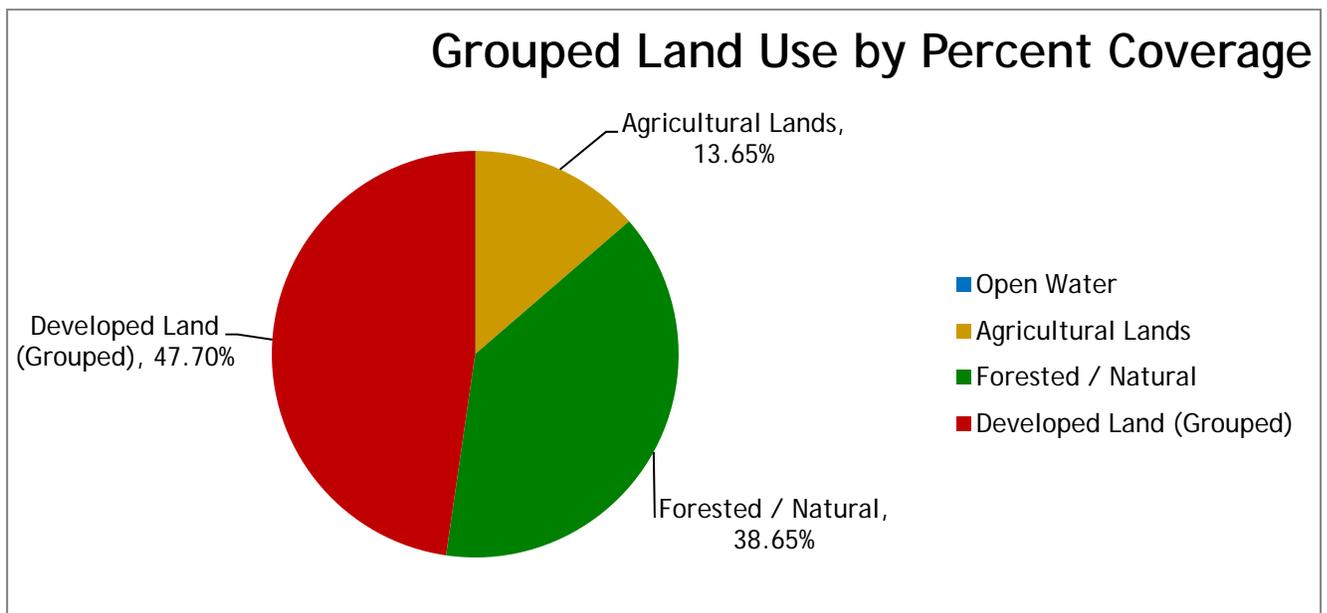
**Figure 3-1. Land Use Map for the Boggy Branch Watershed**



**Table 3-2. Land Use Areas for the Boggy Branch Watershed**

Class Description	Mi <sup>2</sup>	Acres	Percent
Open Water	0.00	0.00	0.00%
Developed, Open Space	0.42	266.43	21.70%
Developed, Low Intensity	0.31	195.71	15.94%
Developed, Medium Intensity	0.11	73.17	5.96%
Developed, High Intensity	0.04	23.57	1.92%
Barren Land	0.04	26.91	2.19%
Deciduous Forest	0.03	18.68	1.52%
Evergreen Forest	0.15	99.19	8.08%
Mixed Forest	0.03	16.68	1.36%
Shrub/Scrub	0.29	182.59	14.87%
Herbaceous	0.13	83.62	6.81%
Hay/Pasture	0.20	126.32	10.29%
Cultivated Crops	0.06	41.37	3.37%
Woody Wetlands	0.10	63.83	5.20%
Emergent Herbaceous Wetlands	0.02	10.01	0.81%
<b>TOTALS →</b>	<b>1.92</b>	<b>1228.06</b>	<b>100.00%</b>
Class Description	Mi <sup>2</sup>	Acres	Percent
Open Water	0.00	0.00	0.00%
Agricultural Lands	0.26	167.69	13.65%
Forested / Natural	0.74	474.59	38.65%
Developed Land (Grouped)	0.92	585.79	47.70%
<b>TOTALS →</b>	<b>1.92</b>	<b>1228.06</b>	<b>100.00%</b>

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



## 4.0 Data Availability and Analysis

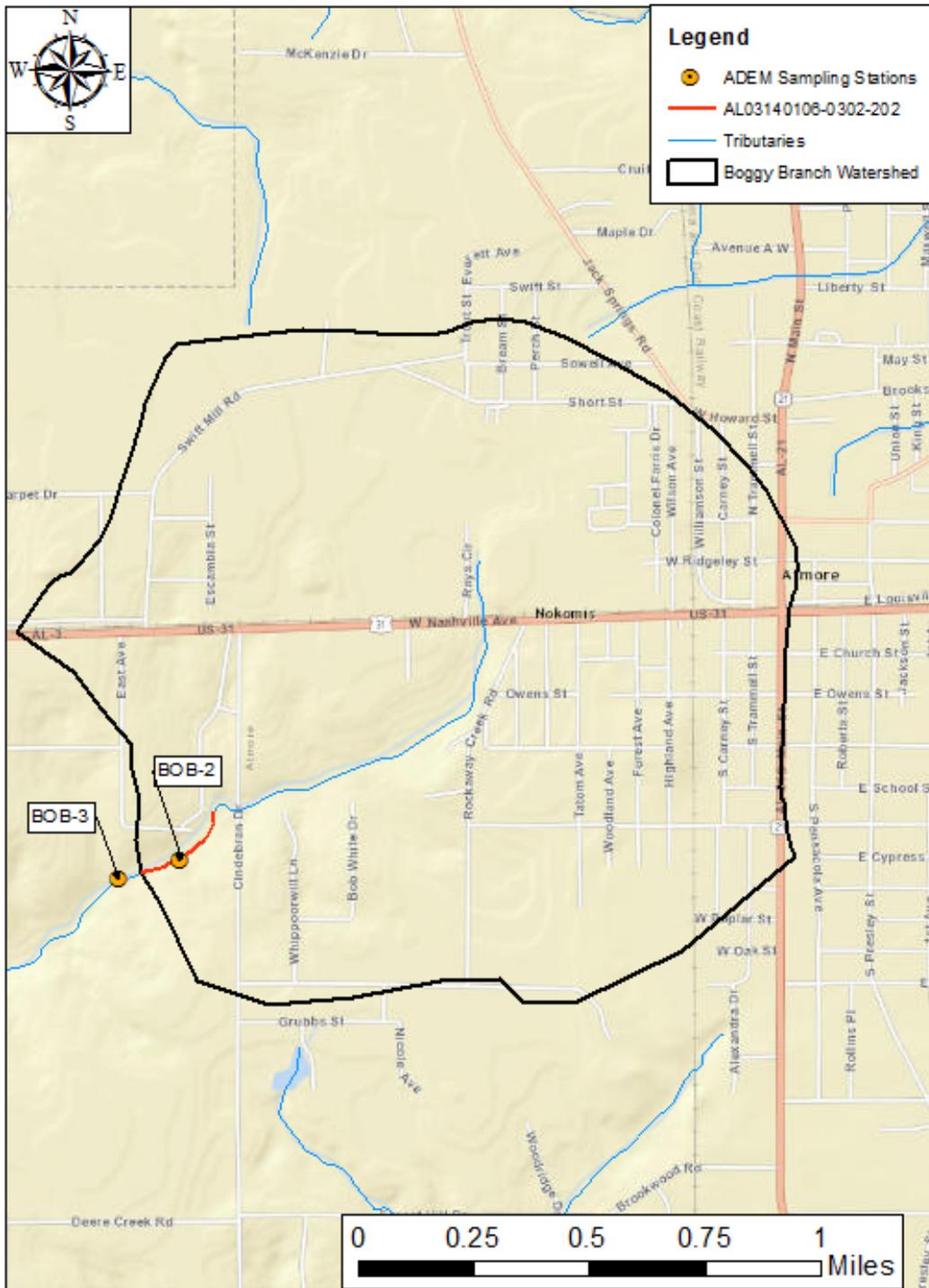
### 4.1 Data Summary

In 2014, ADEM collected data on Boggy Branch at station BOB-2. These samples were collected to more fully evaluate existing conditions as related to the previous ammonia and organic enrichment listing decisions. This data did not indicate that Boggy Branch was impaired for ammonia or organic enrichment. The median of the ammonia samples collected at BOB-2 on Boggy Branch was well below the eco-reference values. The ammonia concentrations were also below Alabama’s current ammonia toxicity criterion as well as EPA’s recommended ammonia toxicity criterion. CBOD<sub>5</sub> and TKN samples, as well as a 72-hour diurnal study, were collected to evaluate the organic enrichment impairment. The median CBOD<sub>5</sub> value at BOB-2 was well below the 90<sup>th</sup> percentile eco-reference value. It should be noted that all of the samples collected at BOB-2 were less than the method detection limit of 2 mg/L; based on Department protocol, one-half of the method detection limit concentration will be used in data analysis for samples reading below the method detection limit. The median TKN value was somewhat elevated, but the 72-hour diurnal study showed that during the entire 72 hours of the study, the in-stream dissolved oxygen concentrations never went below the water quality criterion of 5.0 mg/L. Based on the collected data, there is no impairment for ammonia or organic enrichment.

**Table 4-1. Location Descriptions of ADEM Sampling Stations**

Station ID	Stream	Station Description	Latitude	Longitude	County	Ecoregion/ Subregion
BOB-2	Boggy Branch	Boggy Branch Approx. 150 ft upstream of the Atmore WWTP discharge and approx. 600 ft downstream of Masland discharge stream.	31.0161°	-87.5155°	Escambia	65f
BOB-3	Boggy Branch	Boggy Branch Approx 150 ft downstream of Atmore WWTP discharge and 1.65 miles upstream of confluence with Brushy Creek	31.0156°	-87.5164°	Escambia	65f

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



## 4.2 Ammonia

In 2014, ADEM collected a total of 8 ammonia samples at BOB-2. These samples are shown below in Table 4-2. Most of the sample concentrations were very low and some were below the method detection limit of 0.006 mg/L. These samples were compared to the eco-reference values. The median of the samples at BOB-2 was well below the 90<sup>th</sup> percentile eco-reference value, and all of the samples were also well below Alabama’s current ammonia toxicity criterion as well as below EPA’s recommended ammonia toxicity criterion. Table 4-3 shows the comparison of the median value of the samples to the eco-reference values.

**Table 4-2. Ammonia Samples from Boggy Branch**

Station ID	Visit Date	NH3 (mg/L)	NH3 Detect Condition	Alabama's NH3 Toxicity Criterion	EPA Recommended NH3 Toxicity Criterion	pH (SU)	pH Detect Condition	Water Temp. (°C)
BOB-2	4/24/2014	0.011	Jl	4.55	2.1	6.63		20.12
BOB-2	5/22/2014	0.006	< MDL .006					
BOB-2	6/12/2014	0.125		4.23	1.9	6.2		22.03
BOB-2	7/10/2014	0.006	< MDL .006	3.60	1.6	6.76		23.35
BOB-2	8/21/2014	0.01	< MDL .01	3.40	1.5	6.58		24.78
BOB-2	9/18/2014	0.067		4.02	1.8	6.13		22.92
BOB-2	10/29/2014	0.135		5.12	2.3	6.17		19.1
BOB-2	11/19/2014	0.355		6.93	4.6	6.05		8.74

MDL: Method Detection Limit

Jl: 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. Boggy Branch Ammonia Concentration Compared to the Eco-reference Value**

Boggy Branch Ammonia		
Station	Median Ammonia (mg/L)	Eco-Reference Ammonia (mg/L)
BOB-2	0.039	0.046

## 4.3 Organic Enrichment (CBOD, NBOD)

In 2014, ADEM collected a total of 13 dissolved oxygen in-situ measurements at station BOB-2. ADEM also conducted a 72-hour diurnal study on Boggy Branch at BOB-2. Of the 13 in-situ samples, only two dissolved oxygen samples were below the 5.0 mg/L criterion. During the 72-hour diurnal study, the dissolved oxygen concentration never went below the 5.0 mg/L criterion. The in-situ dissolved oxygen measurements along with the 72-hour diurnal measurements can be found in the appendices of this report.

To further analyze the organic enrichment impairment, some of the primary drivers affecting in-stream dissolved oxygen were also evaluated. In 2014, ADEM collected a total of 8 CBOD<sub>5</sub> samples from BOB-2. All of the CBOD<sub>5</sub> samples collected were below the method detection limit of 2.0 mg/L. Alabama does not currently have a water quality criterion for CBOD<sub>5</sub>; therefore, the samples had to be compared to the eco-reference value. The CBOD<sub>5</sub> eco-reference value for Boggy Branch is 1.96 mg/L. As previously stated, all of the samples were below the method of detection limit of 2.0 mg/L; therefore, based on Department protocol, one-half of the method detection limit concentration will be used in data analysis for samples reading below the method detection limit. These low CBOD<sub>5</sub> concentrations further illustrate that there is no organic enrichment impairment on Boggy Branch. A summary of the median total CBOD<sub>5</sub> values at each station compared to the eco-reference value is shown below in Table 4-4.

**Table 4-4. Boggy Branch CBOD<sub>5</sub> Compared to the Eco-reference Value**

Boggy Branch CBOD <sub>5</sub>		
Station	Median CBOD <sub>5</sub> (mg/L)	Eco-Reference CBOD <sub>5</sub> (mg/L)
BOB-2	1	1.96

NBOD was also evaluated using TKN samples which were collected on Boggy Branch. ADEM collected a total of 8 TKN samples in 2014 at BOB-2. These samples showed somewhat elevated concentrations of TKN. Although TKN was elevated, dissolved oxygen concentrations show that there is no impairment for organic enrichment. A summary of the median total TKN value at BOB-2 compared to the eco-reference value is shown below in Table 4-5. The raw TKN data collected by ADEM can be found in the appendices of this report.

**Table 4-5. Boggy Branch TKN Compared to the Eco-Reference Value**

Boggy Branch TKN		
Station	Median TKN (mg/L)	TKN Eco-ref (mg/L)
BOB-2	0.6105	0.4176

## 5.0 Conclusions

From examination of all available data, ADEM has determined that a water quality impairment does not currently exist for either ammonia or organic enrichment within Boggy Branch. Therefore, ADEM will not develop a TMDL due to “more recent data,” which is just cause for delisting waterbodies according to Title 40 of the Code of Federal Regulations (CFS), 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 Ms. Kimberly Minton at 334-271-7826 or [kminton@adem.state.al.us](mailto:kminton@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, 2015. 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. 2014. ADEM.

Alabama Department of Environmental Management, 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012, & 2014 §303(d) Lists. ADEM.

ALAWADR Database (Water Quality Data). ADEM.

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

United States Environmental Protection Agency. 1986. *Quality Criteria for Water 1986*, Office of Water Regulations and Standards, EPA 440/5-86-001.

## 7.2 ADEM Water Quality Data

**Table 7-1. Ammonia Listing Data Collected in 2004-2005**

Station ID	Visit Date	NH3 (mg/L)	NH3 Detect Conditions
BOB-3	3/2/2004	0.96	
BOB-3	4/6/2004	0.13	
BOB-3	5/4/2004	0.07	
BOB-3	6/8/2004	2.9	
BOB-3	7/6/2004	4.3	
BOB-3	7/28/2004	6.3	
BOB-3	9/7/2004	4.4	
BOB-3	10/12/2004	1.8	
BOB-3	3/24/2005	1.8	
BOB-3	4/20/2005	4.2	
BOB-3	5/19/2005	2.6	
BOB-3	6/22/2005	6	
BOB-3	7/26/2005	4.4	
BOB-3	8/23/2005	22	
BOB-3	9/20/2005	15	
BOB-3	10/25/2005	10.7	

**Table 7-2. ADEM Ammonia Data on Boggy Branch**

Station ID	Visit Date	NH3 (mg/L)	NH3 Detect Condition
BOB-2	4/24/2014	0.011	Jl
BOB-2	5/22/2014	0.006	< MDL .006
BOB-2	6/12/2014	0.125	
BOB-2	7/10/2014	0.006	< MDL .006
BOB-2	8/21/2014	0.01	< MDL .01
BOB-2	9/18/2014	0.067	
BOB-2	10/29/2014	0.135	
BOB-2	11/19/2014	0.355	

MDL: Method Detection Limit

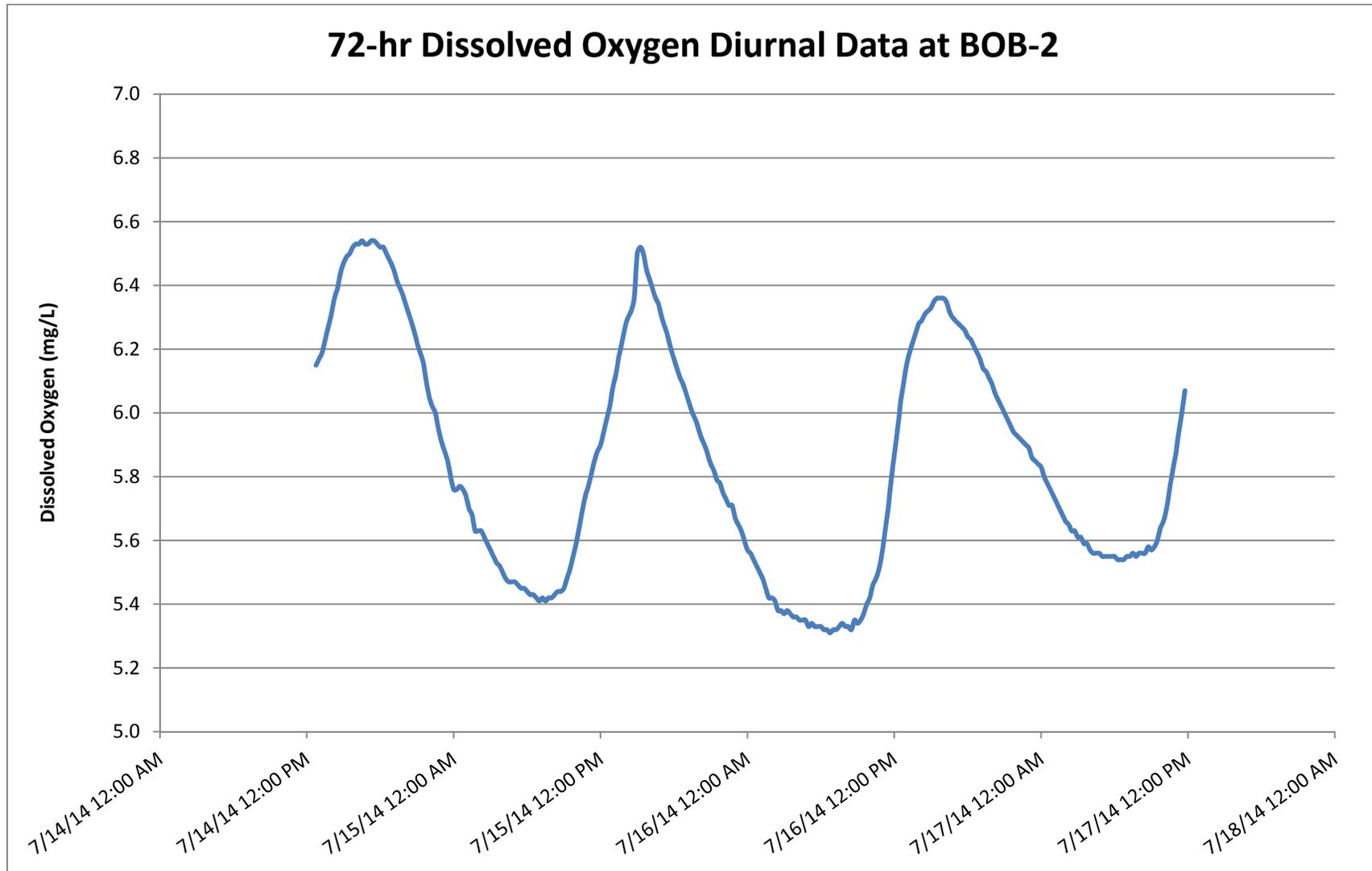
Jl: The identification of the analyte is acceptable; the reported value is an estimate. The reported value is between the MDL (method detection limit) and the RL (Reporting Limit).

**Table 7-3. ADEM Organic Enrichment Data on Boggy Branch**

Station ID	Visit Date	CBOD-5 (mg/L)	CBOD-5 Detect Condition	DO (mg/L)	TKN (mg/L)	TKN Detect Condition
BOB-2	4/24/2014	2	< MDL 2		0.902	
BOB-2	5/22/2014	2	< MDL 2		0.618	
BOB-2	6/12/2014	2	< MDL 2	5.13	0.603	
BOB-2	6/17/2014			5.75		
BOB-2	6/18/2014			5.84		
BOB-2	6/19/2014			5.33		
BOB-2	6/24/2014			5.53		
BOB-2	7/10/2014	2	< MDL 2	5.71	0.754	
BOB-2	8/21/2014	2	< MDL 2	5.89	0.054	< MDL .054
BOB-2	8/26/2014			5.57		
BOB-2	8/28/2014			5.9		
BOB-2	9/4/2014			4.83		
BOB-2	9/18/2014	2	< MDL 2	4.45	0.397	
BOB-2	10/29/2014	2	< MDL 2	5.46	0.423	
BOB-2	11/19/2014	2	< MDL 2	7.11	1.14	

MDL: Method Detection Limit

Figure 7-1 72-hr Dissolved Oxygen Diurnal Data at BOB-2



**Table 7-4. 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 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	10.85	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	6.632	7.64	6.8	7.44	7	7	5.603	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	6.63	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	7.18	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	0.2538	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	9.118	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	0.9803	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	0.075	0.043	0.043	0.043	0.043	0.0298	0.043	0.043	0.1	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	0.0267	0.0438	0.0345	0.03	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 *Boggy Branch Watershed Photos*



**Photo 1 – BOB-2 Looking Upstream**



**Photo 2 – BOB-2 Looking Downstream**