



**Draft
Delisting Decision
for
Sweetwater Creek**

Assessment Unit ID # AL06030005-0803-400

Nutrients

Alabama Department of Environmental Management
Water Quality Branch
Water Division
September 2015

Figure 1-1 Sweetwater Creek Watershed



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1.0 Executive Summary

Sweetwater Creek is located in Lauderdale County on the east side of Florence, AL in the Tennessee River Basin. Sweetwater Creek is a tributary to the Tennessee River and has a total drainage area of 5.32 square miles. It has a use classification of *Fish and Wildlife (F&W)*. The Sweetwater Creek watershed lies within two level IV eco-regions, 71f and 71g.

Sweetwater Creek was added to the State of Alabama's 2012 §303(d) list of impaired streams for nutrients by ADEM. The listing was based on a macroinvertebrate assessment conducted in 2009 which had a rating of "Very Poor." The impaired segment extends from the Tennessee River (Florence Canal) to its source. The source of the impairment is listed as urban runoff/storm sewers. Sweetwater Creek was subsequently listed on Alabama's §303(d) list of impaired streams for nutrients in 2014.

In 2009, ADEM collected physical, chemical, and biological data on Sweetwater Creek at station SWTL-1 in order to assess the water quality of Sweetwater Creek. In 2013, physical, chemical, and biological data were collected in an effort to more fully evaluate the existing conditions as related to the listing decision. These assessments did not indicate that Sweetwater Creek was impaired for nutrients. Based on the 2009 and 2013 sampling, total phosphorus (TP), total nitrogen (TN), and chlorophyll-*a* concentrations were near or below eco-reference values. 72-hr diurnal studies were conducted on Sweetwater Creek at stations SWTL-1 and SWTL-2 in 2013 and 2014. During the 2013 study, the dissolved oxygen (DO) probe malfunctioned, but pH samples were still collected. The pH samples at both stations were normal, mostly ranging between 7.5 SU and 8.0 SU. A 72-hr study was also conducted in 2014 at stations SWTL-1 and SWTL-2. During this study, the DO samples remained within normal levels with normal fluctuations. The pH samples during this study were also normal, ranging mostly between 7.5 SU and 8.0 SU.

Biological assessments were also conducted in 2009 and 2013. Habitat and macroinvertebrate assessments were conducted at SWTL-1 in 2009 and at SWTL-2 in 2013. The habitat assessment at SWTL-1 was rated as "Marginal," and it was rated as "Sub-optimal" at SWTL-2. Both macroinvertebrate assessments were rated as "Very Poor." Although these assessments rated the macroinvertebrate community as "Very Poor," the Department does not believe this to be caused by a nutrient impairment.

Based on the assessment of all available water quality data obtained on Sweetwater Creek, inclusive of physical, chemical, and biological data, ADEM concludes that no water quality impairment from nutrients exists. The Department believes the poor macroinvertebrate assessments may be the result of a habitat alteration issue; therefore, Sweetwater Creek may potentially be listed for habitat alteration on the subsequent §303(d) list. Accordingly, ADEM will not proceed in developing a nutrient TMDL for this stream due to "more recent and accurate data," which is just cause for delisting a waterbody in conformance with 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).

Sweetwater Creek was originally added to Alabama's §303(d) list as being impaired for nutrients in 2012. It was listed based on a macroinvertebrate assessment conducted in 2009 which had a rating of "Very Poor."

3.0 Technical Basis for Delisting Decision

3.1 Water Quality Target Identification

The listing of Sweetwater Creek as being impaired for nutrients was authorized under ADEM's Water Quality Standards Program, which employs both numeric and narrative criteria to ensure adequate protection of designated uses for surface waters of the State. Numeric criteria typically have quantifiable endpoints for a given parameter, such as pH, dissolved oxygen, or a toxic pollutant, whereas narrative criteria are qualitative statements that establish a set of desired conditions for all State waters. These narrative criteria are more 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 nutrient criteria, ADEM and/or EPA would use available data and information coupled with best professional judgment 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. ADEM's Narrative Criteria, as shown in ADEM's Administrative Code, Rule 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.

ADEM is continuing its efforts to develop comprehensive numeric nutrient criteria for all surface waters throughout Alabama, including rivers/streams, lakes/reservoirs, wetlands, and coastal/estuarine waters. However, until numeric nutrient criteria or some form of quantitative interpretations of ADEM's narrative criteria are developed, the Department will continue to use all available data and information coupled with best professional judgment to make informed decisions regarding overall use support and when establishing numeric targets for TMDLs.

3.2 Land Use Assessment

Land use for the Sweetwater Creek watershed was determined using ArcMap with land use datasets derived from the 2011 National Land Cover Dataset (NLCD). Figure 3-1 and Table 3-1 display the land use areas for the Sweetwater Creek watershed. Figure 3-2 is a graph depicting the primary land use in the Sweetwater Creek watershed.

The majority of the watershed is developed land at 97%. Other land uses within the watershed include 1.6% forested/natural, 1.3% agriculture land, and less than 1% open water.

Figure 3-1 Sweetwater Creek Land Use

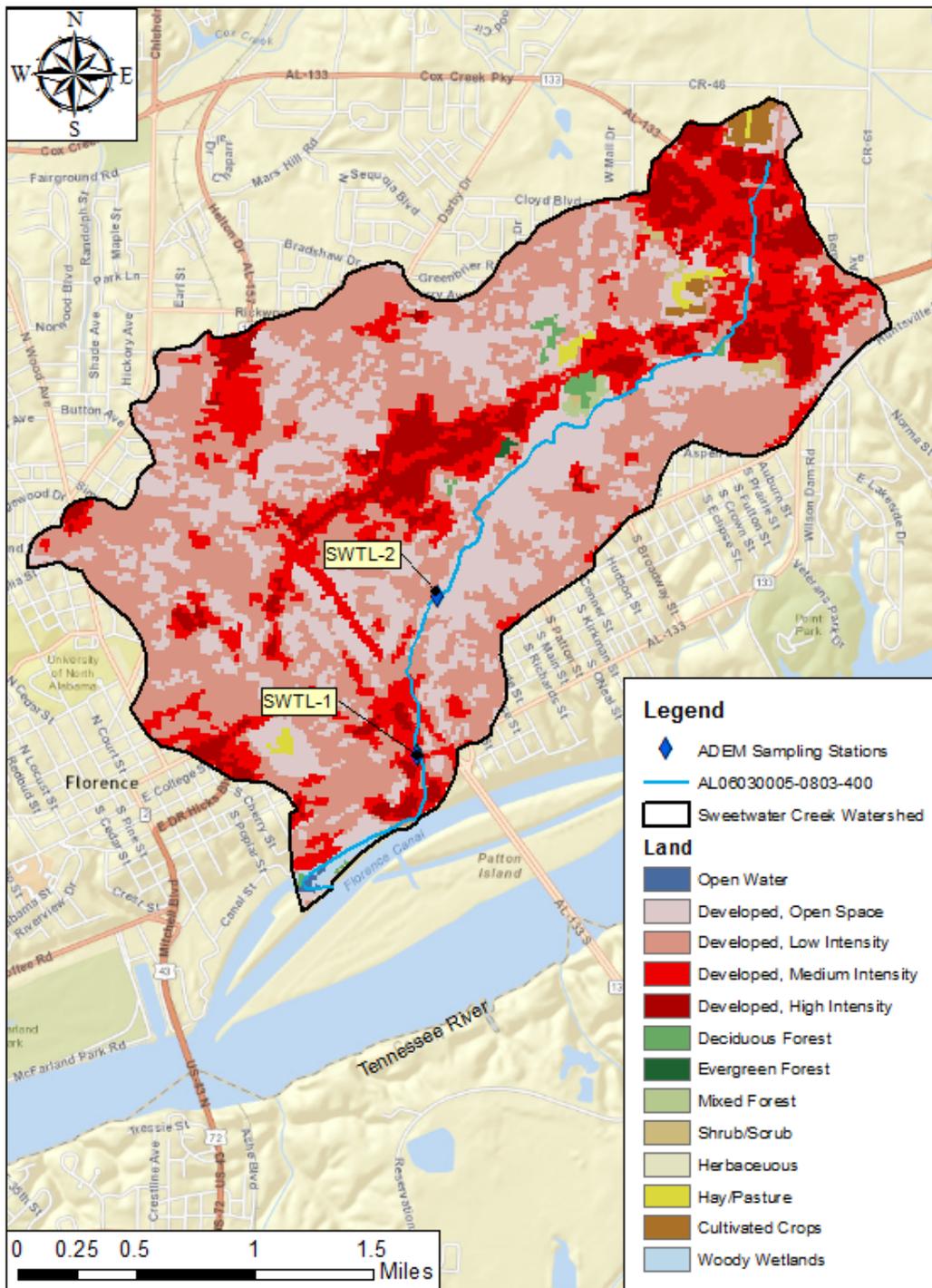
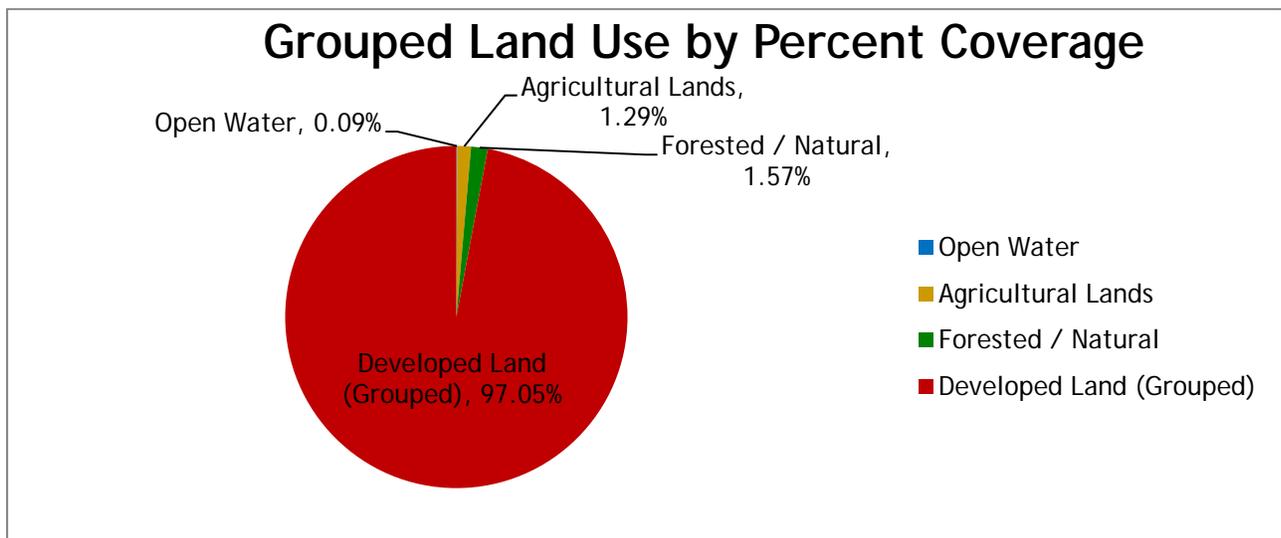


Table 3-1 Land Use Summary

| Class Description | Mi ² | Acres | Percent |
|------------------------------|-----------------|----------------|----------------|
| Open Water | 0.00 | 3.11 | 0.09% |
| Developed, Open Space | 1.43 | 917.82 | 26.97% |
| Developed, Low Intensity | 2.26 | 1448.24 | 42.55% |
| Developed, Medium Intensity | 0.97 | 618.48 | 18.17% |
| Developed, High Intensity | 0.50 | 318.69 | 9.36% |
| Barren Land | 0.00 | 0.00 | 0.00% |
| Deciduous Forest | 0.03 | 18.68 | 0.55% |
| Evergreen Forest | 0.00 | 2.45 | 0.07% |
| Mixed Forest | 0.01 | 7.12 | 0.21% |
| Shrub/Scrub | 0.02 | 12.68 | 0.37% |
| Herbaceous | 0.00 | 0.22 | 0.01% |
| Hay/Pasture | 0.03 | 19.35 | 0.57% |
| Cultivated Crops | 0.04 | 24.46 | 0.72% |
| Woody Wetlands | 0.02 | 12.45 | 0.37% |
| Emergent Herbaceous Wetlands | 0.00 | 0.00 | 0.00% |
| TOTALS → | 5.32 | 3403.75 | 100.00% |
| Class Description | Mi ² | Acres | Percent |
| Open Water | 0.00 | 3.11 | 0.09% |
| Agricultural Lands | 0.07 | 43.81 | 1.29% |
| Forested / Natural | 0.08 | 53.60 | 1.57% |
| Developed Land (Grouped) | 5.16 | 3303.23 | 97.05% |
| TOTALS → | 5.32 | 3403.75 | 100.00% |

Figure 3-2 Grouped Land Use



4.0 Data Availability and Analysis

4.1 Methodology for Evaluating Nutrient Impacts

In determining appropriate or acceptable levels of nutrients necessary to support Sweetwater Creek's designated use, ADEM elected to use a "reference condition" approach. This approach is based on the use of ambient water quality data from candidate reference streams located in characteristically similar types of watersheds known as ecoregions. ADEM considers the "reference condition" approach for determining appropriate nutrient levels to be reasonable, consistent with USEPA guidance, protective of designated uses, and scientifically defensible in assessing and evaluating nutrient influences or impacts.

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.

In developing and establishing reference conditions from best available data, frequency distributions are recommended by the *Nutrient Criteria Technical Guidance Manual for Rivers and Streams* (USEPA, 2000b) as the preferred method for setting nutrient criteria. ADEM elected to use the 90th percentile of the data distributions from the selected reference sites to be used to establish goals for Total Phosphorus (TP) and Total Nitrogen (TN) on an ecoregional basis. Median values were used to represent existing conditions of TP and TN within the impaired waterbody. The 90th percentile of the data distribution was considered an appropriate target, since it falls within an acceptable range of "least-impacted" conditions (i.e. upper quartile). If the TP and TN concentrations within the impaired stream are shown to be above the reference conditions, then other water quality data and information are used in the evaluation. The additional data and information that can be used includes, but is certainly not limited to, chlorophyll-*a* (Chl-*a*) data, diurnal dissolved oxygen readings, algal biomass measurements (periphyton or suspended algae), habitat assessments, and macroinvertebrate and fish community indices.

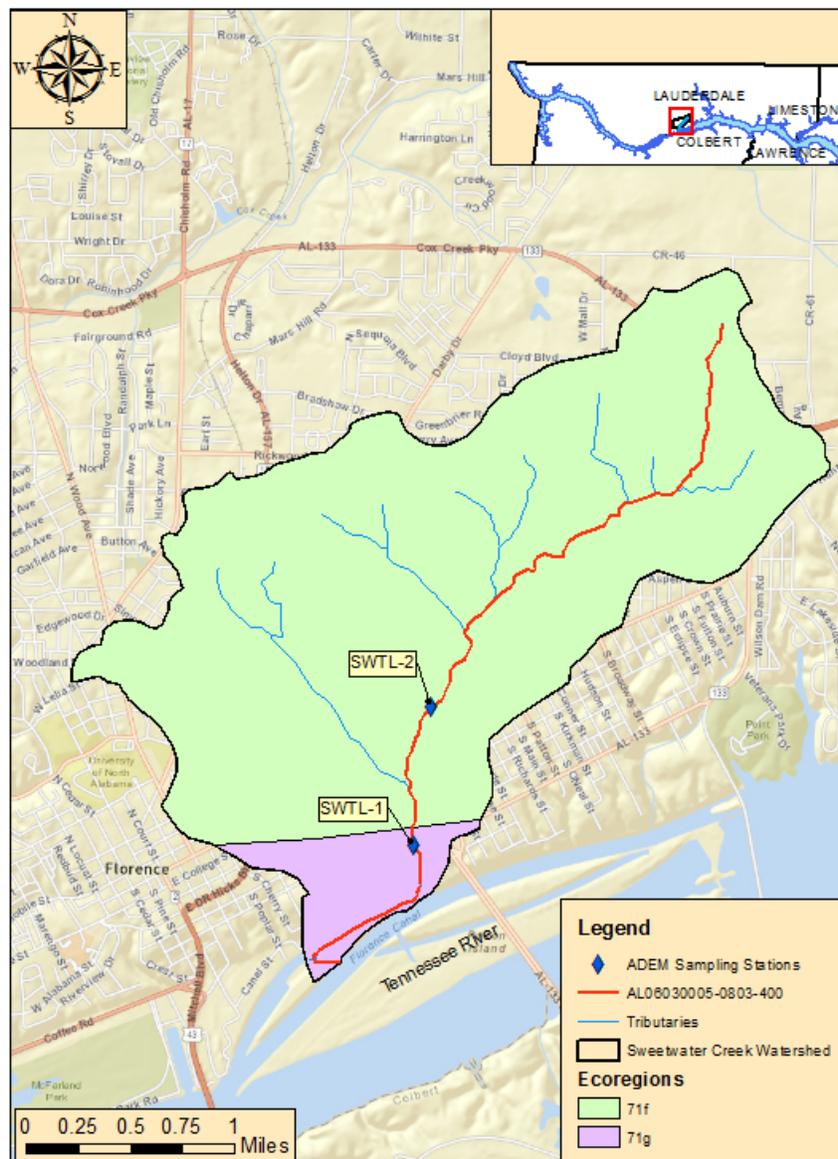
4.2 Assessment of Ecoregion Reference Data

Based upon EPA recommended procedures outlined in the *Nutrient Criteria Technical Guidance Manual: Rivers and Streams* (USEPA, 2000b), data from selected reference sites have been compiled and analyzed for the entire State of Alabama. Through much peer review, every effort was made to use the highest quality least-impacted reference reach data to accurately define

background conditions. The reference reaches and their associated watersheds were established by ADEM using various methods to characterize their condition and determine if they were good candidates. Such methods include, but are not limited to, watershed surveys, landuse coverage, collecting chemical, physical, and biological data to ensure their condition and verifying the streams are of high quality and fully meet designated uses. The current data is included in a table referred to as “Alabama’s 2010 Ecoregional Reference Guidelines.” This table of relevant ecoreference data can be found in Appendix 7.2, Table 7-11.

The Sweetwater Creek watershed lies within two Level IV ecoregions (71f and 71g), as depicted in Figure 4-1 below. Typically, when a watershed covers two Level IV ecoregions, a weighted average is calculated for each parameter (TP, TN, & Chl-*a*); however, since the drainage areas of both stations are primarily in ecoregion 71f, the reference values for that ecoregion alone will be used.

Figure 4-1 Level IV Ecoregions within the Sweetwater Creek Watershed



4.3 Data Analysis

In 2009, ADEM collected chemical, physical, and biological data on Sweetwater Creek at station SWTL-1. In 2013, ADEM collected chemical, physical, and biological data at stations SWTL-1 and SWTL-2. During these sampling periods, ADEM collected 12 TP samples from SWTL-1 and 8 TP samples from SWTL-2. There were 12 TN samples collected at SWTL-1 and 8 TN samples collected at SWTL-2. There were also 15 Chl-*a* samples collected at SWTL-1 and 8 Chl-*a* samples collected at SWTL-2. The median of the samples for each parameter was compared to the eco-reference values. The median values for TP and Chl-*a* were well below the eco-reference values. The median value for TN was slightly higher than the eco-reference value, but the Department does not believe this represents a nutrient impairment. A summary of the median sample values compared to the eco-reference values at each station are shown in Table 4-2 and Table 4-3.

Table 4-1 Location Descriptions of ADEM Sampling Stations

| Station ID | Local Name | Station Description | Latitude | Longitude | County | Ecoregion/ Sub region |
|------------|------------------|--|----------|-----------|------------|--------------------------|
| SWTL-1 | Sweetwater Creek | Sweetwater Cr @ Union Ave and AL hwy 133 exit. | 34.8022 | -87.6546 | Lauderdale | 71g |
| SWTL-2 | Sweetwater Creek | Sweetwater Cr. @ Colorado Ave. | 34.8119 | -87.6532 | Lauderdale | 71g |

Table 4-2 Data Summary at SWTL-1

| Data Summary at SWTL-1 | | | |
|------------------------|-----------|-----------|----------------------|
| | TP (mg/L) | TN (mg/L) | Chl- <i>a</i> (µg/L) |
| Median: | 0.025 | 1.707 | 0.800 |
| Eco Ref 90th %tile: | 0.106 | 1.295 | 3.044 |

Table 4-3 Data Summary at SWTL-2

| Data Summary at SWTL-2 | | | |
|------------------------|-----------|-----------|----------------------|
| | TP (mg/L) | TN (mg/L) | Chl- <i>a</i> (µg/L) |
| Median: | 0.022 | 1.557 | 0.270 |
| Eco Ref 90th %tile: | 0.106 | 1.295 | 3.044 |

In 2013, ADEM also conducted a 72-hr diurnal study on Sweetwater Creek. The study was conducted between September 23, 2013 and September 26, 2013. During that study, the dissolved oxygen (DO) probe at each station malfunctioned. Therefore, there was no DO data collected during that study; however, the pH data collected during the study were all normal, ranging mostly between 7.5 SU and 8.0 SU. In 2014, ADEM conducted another 72-hr diurnal study on Sweetwater Creek between August 25, 2014 and August 28, 2014. The DO data collected during this study were all within normal levels with normal daily swings. This data further illustrates that there is no impairment for nutrients.

Biological assessments were conducted in 2009 at SWTL-1 and in 2013 at SWTL-2. Habitat assessments and macroinvertebrate assessments were both conducted. The habitat assessment at SWTL-1 was rated as “Marginal,” and the habitat assessment at SWTL-2 was rated as “Sub-optimal.” The macroinvertebrate community was rated “Very Poor” at both stations. Although the macroinvertebrate community was rated as “Very Poor,” the Department does not believe that nutrients are the cause of that rating. Habitat alteration is believed to be the cause of these “Very Poor” ratings.

Based on the instream TP and TN values, chlorophyll-*a* values, and DO concentrations, ADEM does not consider Sweetwater Creek to be impaired as a result of nutrient over-enrichment. The available data that was utilized to support this delisting decision can also be found in Appendix 7.2.

5.0 Conclusion

From examination of all available data, ADEM has determined that a water quality impairment due to nutrients does not currently exist within Sweetwater Creek. Therefore, ADEM will not develop a TMDL for nutrients 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. 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. 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, 2014. 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, 2012, 2014 §303(d) Lists. ADEM.

Alabama Department of Environmental Management, *Alabama's 2010 Ecoregional Reference Guidelines*. 2010. 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.

United States Environmental Protection Agency. 2000a. *Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria. Rivers and Streams in Ecoregion XI*. Office of Water. EPA 822-B-00-020.

United States Environmental Protection Agency. 2000b. *Nutrient Criteria Technical Guidance Manual: River and Streams*. Office of Water. EPA 822-B-00-002.

7.2 ADEM Water Quality Data

Table 7-1 Total Phosphorus (TP) Data at Station SWTL-1

| Station ID | Visit Date | TP (mg/L) | TP Detect Condition |
|------------|------------|-----------|----------------------|
| SWTL-1 | 3/25/2009 | 0.124 | |
| SWTL-1 | 5/27/2009 | | Not Reported .01, RQ |
| SWTL-1 | 8/13/2009 | 0.025 | |
| SWTL-1 | 9/8/2009 | 0.021 | Y |
| SWTL-1 | 10/13/2009 | 0.026 | Y |
| SWTL-1 | 3/12/2013 | 0.02 | |
| SWTL-1 | 4/2/2013 | 0.018 | |
| SWTL-1 | 5/7/2013 | 0.025 | |
| SWTL-1 | 6/18/2013 | 0.025 | |
| SWTL-1 | 7/8/2013 | 0.023 | |
| SWTL-1 | 8/21/2013 | 0.077 | |
| SWTL-1 | 9/10/2013 | 0.022 | |
| SWTL-1 | 10/8/2013 | 0.025 | |

RQ: The presence or absence of the analyte cannot be determined from the data due to quality control problems. The reported value failed to meet established QC criteria

Table 7-2 Total Nitrogen (TN) Data at Station SWTL-1

| Station ID | Visit Date | NO3 NO2 N (mg/L) | NO3 NO2 N Detect Condition | TKN (mg/L) | TKN Detect Condition | TN (mg/L) |
|------------|------------|------------------|----------------------------|------------|----------------------|-----------|
| SWTL-1 | 3/25/2009 | 0.597 | | 0.47 | | 1.067 |
| SWTL-1 | 5/27/2009 | 0.379 | JQ | | Not Reported .2, RQ | |
| SWTL-1 | 8/13/2009 | 1.742 | | 0.353 | | 2.095 |
| SWTL-1 | 9/8/2009 | 1.711 | | 0.089 | < MDL .089 | 1.8 |
| SWTL-1 | 10/13/2009 | 1.712 | | 0.198 | | 1.91 |
| SWTL-1 | 3/12/2013 | 1.514 | | 0.059 | | 1.573 |
| SWTL-1 | 4/2/2013 | 1.552 | | 0.146 | JL | 1.698 |
| SWTL-1 | 5/7/2013 | 1.412 | | 0.065 | < MDL .065 | 1.477 |
| SWTL-1 | 6/18/2013 | 1.558 | | 0.381 | | 1.939 |
| SWTL-1 | 7/8/2013 | 1.651 | | 0.065 | < MDL .065 | 1.716 |
| SWTL-1 | 8/21/2013 | 0.72 | | 2.5 | | 3.22 |
| SWTL-1 | 9/10/2013 | 1.516 | | 0.065 | < MDL .065 | 1.581 |
| SWTL-1 | 10/8/2013 | 1.554 | | 0.058 | < MDL .058 | 1.612 |

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

RQ: The presence or absence of the analyte cannot be determined from the data due to quality control problems. The reported value failed to meet established QC criteria

Table 7-3 Chlorophyll-*a* Data at Station SWTL-1

| Station ID | Visit Date | Chl- <i>a</i> (µg/L) | Chl- <i>a</i> Detect Condition |
|------------|------------|----------------------|-----------------------------------|
| SWTL-1 | 3/25/2009 | 6.23 | |
| SWTL-1 | 4/30/2009 | 1 | < MDL 1 |
| SWTL-1 | 5/27/2009 | 1 | < MDL 1 |
| SWTL-1 | 6/18/2009 | 1 | < MDL 1 |
| SWTL-1 | 8/13/2009 | 1 | < MDL 1 |
| SWTL-1 | 9/8/2009 | 0.8 | |
| SWTL-1 | 10/13/2009 | 0.27 | |
| SWTL-1 | 3/12/2013 | 0.1 | < MDL .1 |
| SWTL-1 | 4/2/2013 | 0.27 | |
| SWTL-1 | 5/7/2013 | 0.1 | < MDL .1 |
| SWTL-1 | 6/18/2013 | 0.1 | < MDL .1 |
| SWTL-1 | 7/8/2013 | 0.27 | |
| SWTL-1 | 8/21/2013 | 1.07 | |
| SWTL-1 | 9/10/2013 | 0.8 | |
| SWTL-1 | 10/8/2013 | 0.53 | |

MDL: Method Detection Limit

Table 7-4 Total Phosphorus (TP) Data at Station SWTL-2

| Station ID | Visit Date | TP (mg/L) | TP Detect Condition |
|------------|------------|-----------|------------------------|
| SWTL-2 | 3/12/2013 | 0.018 | |
| SWTL-2 | 4/2/2013 | 0.017 | |
| SWTL-2 | 5/7/2013 | 0.023 | |
| SWTL-2 | 6/18/2013 | 0.022 | |
| SWTL-2 | 7/8/2013 | 0.022 | |
| SWTL-2 | 8/21/2013 | 0.055 | |
| SWTL-2 | 9/10/2013 | 0.021 | |
| SWTL-2 | 10/8/2013 | 0.023 | |

Table 7-5 Total Nitrogen (TN) Data at Station SWTL-2

| Station ID | Visit Date | NO3 NO2 N (mg/L) | NO3 NO2 N Detect Condition | TKN (mg/L) | TKN Detect Condition | TN (mg/L) |
|------------|------------|------------------|----------------------------|------------|----------------------|-----------|
| SWTL-2 | 3/12/2013 | 1.392 | | 0.053 | | 1.445 |
| SWTL-2 | 4/2/2013 | 1.427 | | 0.178 | | 1.605 |
| SWTL-2 | 5/7/2013 | 1.353 | | 0.426 | | 1.779 |
| SWTL-2 | 6/18/2013 | 1.473 | | 0.307 | | 1.78 |
| SWTL-2 | 7/8/2013 | 1.532 | | 0.065 | < MDL .065 | 1.597 |
| SWTL-2 | 8/21/2013 | 0.968 | | 0.147 | Jl | 1.115 |
| SWTL-2 | 9/10/2013 | 1.385 | | 0.131 | Jl | 1.516 |
| SWTL-2 | 10/8/2013 | 1.419 | | 0.058 | < MDL .058 | 1.477 |

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 Level)

MDL: Method Detection Limit

Table 7-6 Chlorophyll-*a* Data at Station SWTL-2

| Station ID | Visit Date | Chl- <i>a</i> (µg/L) | Chl- <i>a</i> Detect Condition |
|------------|------------|----------------------|--------------------------------|
| SWTL-2 | 3/12/2013 | 0.1 | < MDL .1 |
| SWTL-2 | 4/2/2013 | 0.27 | |
| SWTL-2 | 5/7/2013 | 0.1 | < MDL .1 |
| SWTL-2 | 6/18/2013 | 0.27 | |
| SWTL-2 | 7/8/2013 | 0.1 | < MDL .1 |
| SWTL-2 | 8/21/2013 | 1.07 | |
| SWTL-2 | 9/10/2013 | 0.27 | |
| SWTL-2 | 10/8/2013 | 0.27 | |

MDL: Method Detection Limit

Figure 7-1 Sweetwater Creek 72-hr Diurnal Dissolved Oxygen Data

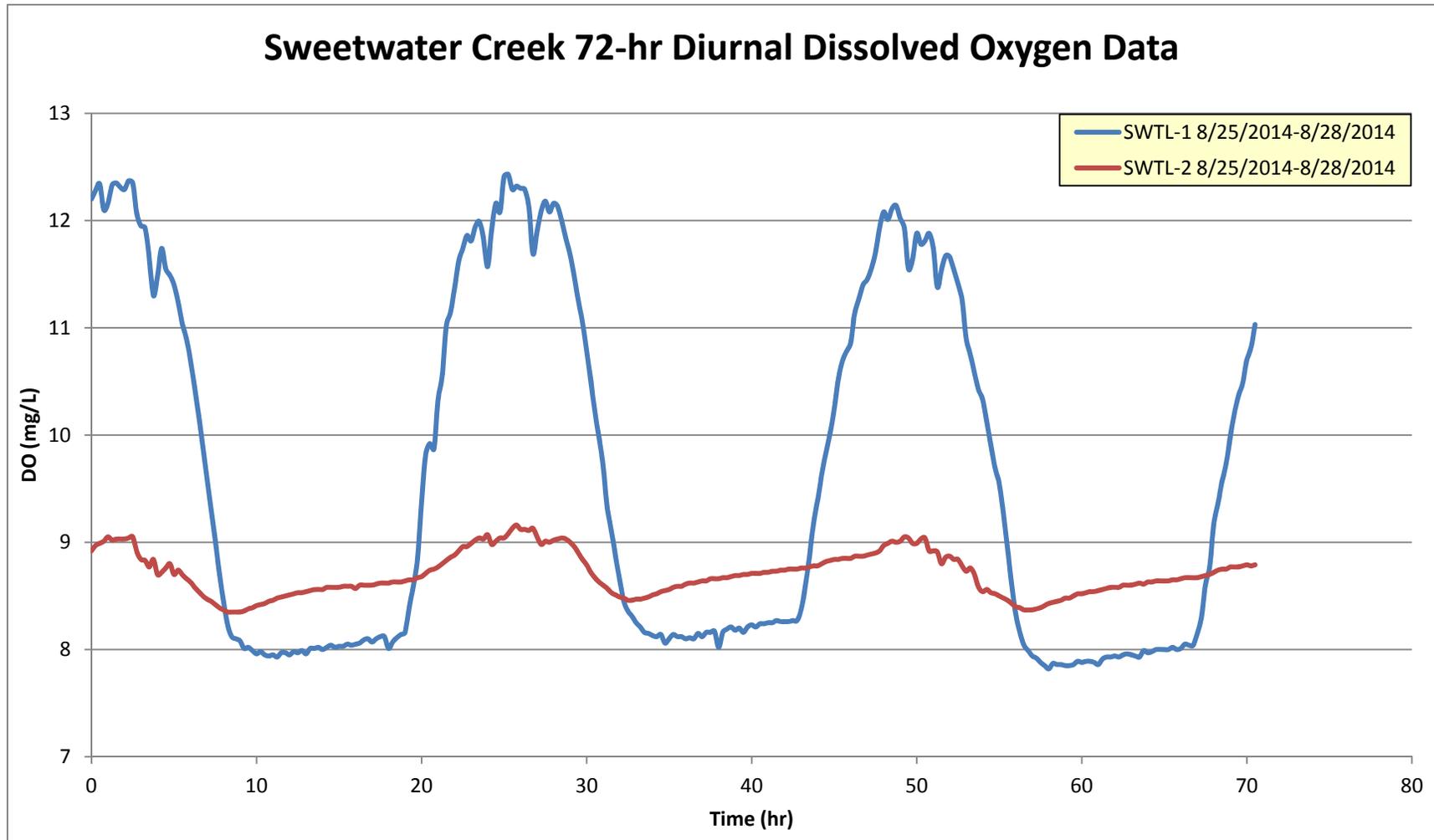


Figure 7-2 Sweetwater Creek 72-hr Diurnal pH Data

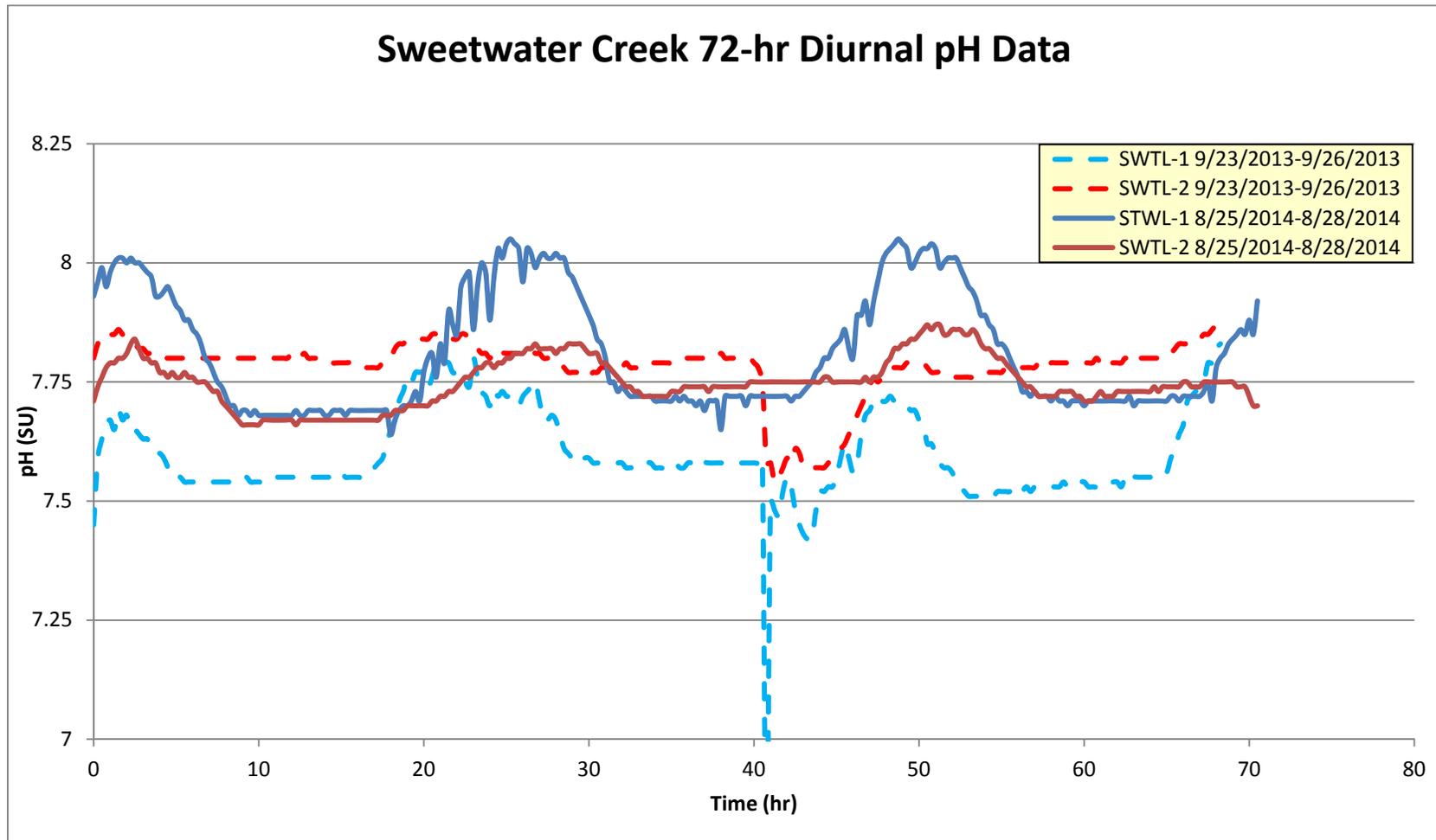


Table 7-7 Habitat Assessment Results from SWTL-1

| Table 3. Results of the habitat assessment conducted on Sweetwater Ck at SWTL-1, July 1, 2009. Macroinvertebrates were also collected. | | |
|---|-----------------------|---------------------|
| Habitat Assessment | %Maximum Score | Rating |
| RR | | |
| Instream Habitat Quality | 68 | Sub-optimal (59-70) |
| Sediment Deposition | 62 | Sub-optimal (59-70) |
| Sinuosity | 88 | Optimal >84 |
| Bank and Vegetative Stability | 43 | Marginal (35-59) |
| Riparian Buffer | 18 | Poor <50 |
| Habitat Assessment Score | 135 | |
| % Maximum Score | 56 | Marginal (41-58) |

Table 7-8 Macroinvertebrate Assessment Results from SWTL-1

| SWTL-1 7/1/2009 | | |
|---|----------------|---------------------------|
| Macroinvertebrate Assessment | | |
| | Results | Scores (0-100) |
| Taxa richness and diversity measures | | |
| # EPT taxa | 3 | 0 |
| Shannon Diversity | 3.45 | 35 |
| Taxonomic composition measures | | |
| % EPT minus Baetidae and Hydropsychidae | 1 | 1 |
| % Non-insect taxa | 33 | 0 |
| Functional feeding group | | |
| % Predator Individuals | 1 | 0 |
| Community tolerance | | |
| % Tolerant taxa | 47 | 3 |
| WMB-I Assessment Score | --- | 7 |
| WMB-I Assessment Rating | | Very Poor (0-14) |

Table 7-9 Habitat Assessment Results from STWL-2

| Table 3. Results of the habitat assessment conducted on Sweetwater Ck at SWTL-2, May 22, 2013. Macroinvertebrates were also collected. | | |
|---|-----------------------|---------------------|
| Habitat Assessment | %Maximum Score | Rating |
| RR | | |
| Instream Habitat Quality | 57 | Marginal (41-58) |
| Sediment Deposition | 79 | Optimal >70 |
| Sinuosity | 90 | Optimal >84 |
| Bank and Vegetative Stability | 79 | Optimal >74 |
| Riparian Buffer | 68 | Marginal (50-69) |
| Habitat Assessment Score | 167 | |
| % Maximum Score | 70 | Sub-optimal (59-70) |

Table 7-10 Macroinvertebrate Assessment Results from SWTL-2

| SWTL-2 5/22/2013 | | |
|---|----------------|-------------------------|
| Macroinvertebrate Assessment | | |
| | Results | Scores |
| Taxa richness and diversity measures | | (0-100) |
| # EPT taxa | 4 | 0 |
| Shannon Diversity | 3.64 | 44 |
| Taxonomic composition measures | | |
| % EPT minus Baetidae and Hydropsychidae | 1 | 0 |
| % Non-insect taxa | 24 | 0 |
| Functional feeding group | | |
| % Predator Individuals | 2 | 0 |
| Community tolerance | | |
| % Tolerant taxa | 41 | 21 |
| WMB-I Assessment Score | --- | 11 |
| WMB-I Assessment Rating | | Very Poor (0-14) |

Table 7-11 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 |
| Physical | | | | | | | | | | | | | | | | | | | |
| 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 | 3.7 | 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 | 47.492 | 109.4 |
| Stream Flow (cfs) | | | | | | | | | | | | | | | | | | | |
| Chemical | | | | | | | | | | | | | | | | | | | |
| 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 | 7.18 | 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 | 0.63205 | 0.6836 | 0.69365 | 0.7109 | 2.269 | 0.9185 | 1.41685 | 1.235 | 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 | 0.0593 | 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 | 3.69 | 9.118 | 1.051 | 6.37 | 2.4112 | 2.622 |
| Total Metals | | | | | | | | | | | | | | | | | | | |
| 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 |
| Dissolved Metals | | | | | | | | | | | | | | | | | | | |
| 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 | 0.043 | 0.0298 | 0.043 | 0.043 | 0.1 |
| Iron (mg/L) | 90th %ile | Median | 0.232 | 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 | 0.03 |
| Biological | | | | | | | | | | | | | | | | | | | |
| 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 |

7.3 Sweetwater Creek Watershed Photos



Photo 1 – SWTL-1 Looking Upstream (Photo Taken 4/2/2013)



Photo 2 – SWTL-1 Looking Downstream (Photo Taken 9/10/2013)



Photo 3 – SWTL-2 Looking Upstream (Photo Taken 8/28/2014)



Photo 4 – SWTL-2 Looking Downstream (Photo Taken 8/28/2014)