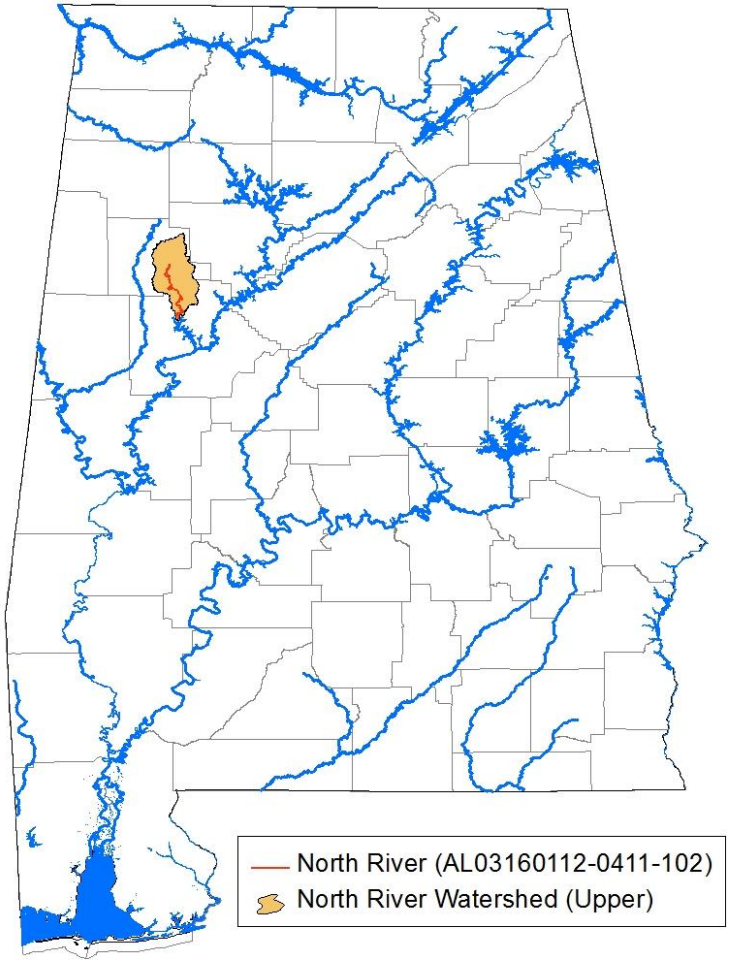
DRAFT

DELISTING DECISION
for
Siltation / Habitat Alteration / Nutrients
for
North River

(Assessment Unit ID # AL03160112-0411-102)



Alabama Department of Environmental Management
Water Division - Water Quality Branch
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Useful Acronyms & Abbreviation

A

A&I - Agriculture and Industry Use Classification
AAF - Average Annual Flow
ACES - Alabama Cooperative Extension Service
ADEM - Alabama Department of Environmental Management
ADPH - Alabama Department of Public Health
AEMC - Alabama Environmental Management Commission
AFO - Animal Feeding Operation
AL - Alabama; Aluminum (Metals)
AS - Arsenic
ASWCC - Alabama Soil & Water Conservation Committee
AWIC - Alabama Water Improvement Commission

B

BAT - Best Available Technology
BCT - Best Conventional Pollutant Control Technology
BMP - Best Management Practices
BOD - Biochemical Oxygen Demand
BPJ - Best Professional Judgment

C

CAFO - Confined Animal Feeding Operation
$CBOD_5$ - Five-Day Carbonaceous Biochemical Oxygen Demand
$CBOD_u$ - Ultimate Carbonaceous Biochemical Oxygen Demand
CFR - Code of Federal Regulations
CFS - Cubic Feet per Second
CMP - Coastal Monitoring Program
COD - Chemical Oxygen Demand
COE - Corps of Engineers (US Army)
CPP - Continuing Planning Process
CWA - Clean Water Act
CY - Calendar Year

D

DA - Drainage Area
DEM - Digital Elevation Model
DMR - Discharge Monitoring Report
DNCR - Department of Conservation & Natural Resources
DO - Dissolved Oxygen

E

E. coli - Escherichia Coliform Bacteria
EOP - End of Pipe

F

F&W - Fish and Wildlife Use Classification
FDA - Food and Drug Administration
Fe - Iron
FO - Field Operations
FS - Forestry Service (US)
FY - Fiscal Year

G

GIS - Geographic Information Systems
GOMA - Gulf of Mexico Alliance
GPS - Global Positioning System
GSA - Geological Survey of Alabama

H

HCR - Hydrographic Controlled Release
Hg - Mercury
HUC - Hydrologic Unit Code

I

IBI - Index of Biotic Integrity
IF - Incremental Flow
IWC - Instream Waste Concentration

L

LA - Load Allocation
Lat/Long- Latitude / Longitude
LDC - Load Duration Curve
LIDAR - Light Detection & Ranging
LWF - Limited Warmwater Fishery Use Classification

M

m^3/s - Cubic Meters per Second
MAF - Mean Annual Flow (MAF = AAF)
mg/l - Milligrams per Liter
MGD - Million Gallons per Day
mi - Miles
MOS - Margin of Safety
MS4s - Municipal Separate Storm Sewer Systems
MZ - Mixing Zone

N

N - Nitrogen
NA - Not Applicable
NASS - National Agricultural Statistics Service
$NBOD_x$ - Nitrogenous Biochemical Oxygen Demand
NED - National Elevation Database
NH_3-N - Ammonia Nitrogen
NHD - National Hydrography Database
NLCD - National Land Cover Dataset
NO_3+NO_2-N -Nitrate + Nitrite Nitrogen
NOAA - National Oceanic and Atmospheric Administration
NOV - Notice of Violation
NPDES - National Pollutant Discharge Elimination System
NPS - Non-Point Source
NRCS - National Resource Conservation Service
NTUs - Nephelometric Turbidity Units
NWS - National Weather Service

O

OAW – Outstanding Alabama Water Use Classification
OE - Organic Enrichment
ONRW - Outstanding National Resource Water

P

P - Phosphorus
Pb - Lead
PCBs - Polychlorinated Biphenyl
pH - Concentration of Hydrogen Ions Scale
POTW - Publicly Owned Treatment Works
ppb - Parts per Billion
ppm - Parts per Million
ppt - Parts per Trillion
PS - Point Source
PWS - Public Water Supply Use Classification
PWSS - Public Water Supply System

Q

Q - Flow (MGD, m^3/s, cfs)
QA/QC - Quality Assurance / Quality Control
QAPP - Quality Assurance Project Plan

R

RRMP - River and Reservoirs Monitoring Program
RSMP - River and Streams Monitoring Program

S

S - Swimming and Other Whole Body Waters Contact Sports Use Classification

S (cont.)

SH - Shellfish Harvesting Use Classification
SID - State Indirect Discharge
SMZ - Streamside Management Zone
SOD - Sediment Oxygen Demand
SOP - Standard Operating Procedure
SRF - State Revolving Fund
SSO - Sanitary Sewer Overflow
STP - Sewage Treatment Facility
SW - Surface Water
SWMP - Stormwater Management Plan
SWQM - Spreadsheet Water Quality Model (AL)
SWQMP - Surface Water Quality Monitoring Program

T

TBC - Technology-Based Controls
TBD - To be Determined
TDS - Total Dissolved Solids
TKN - Total Kjeldahl Nitrogen
TMDL - Total Maximum Daily Load
TON - Total Organic Nitrogen
TOT - Time of Travel
Total P - Total Phosphorus
TSS - Total Suspended Solids
TVA - Tennessee Valley Authority

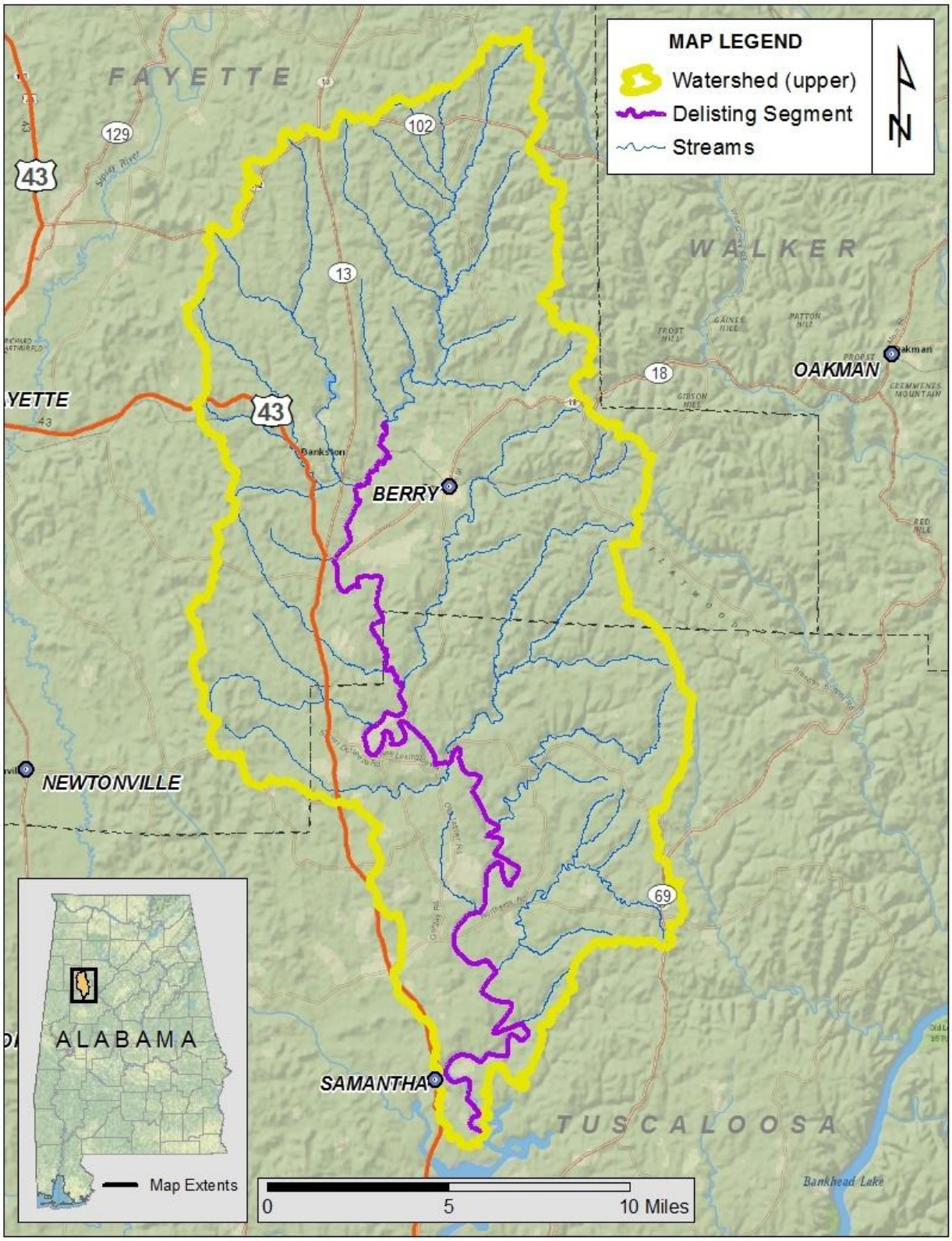
U

UAA - Use Attainability Analysis
UIC - Underground Injection Control
USDA - United Stated Department of Agriculture
USGS - United States Geological Survey
USEPA - United States Environmental Protection Agency
USFWS - United States Fish & Wildlife Services
UT - Unnamed Tributary
UV - Ultraviolet Radiation

W

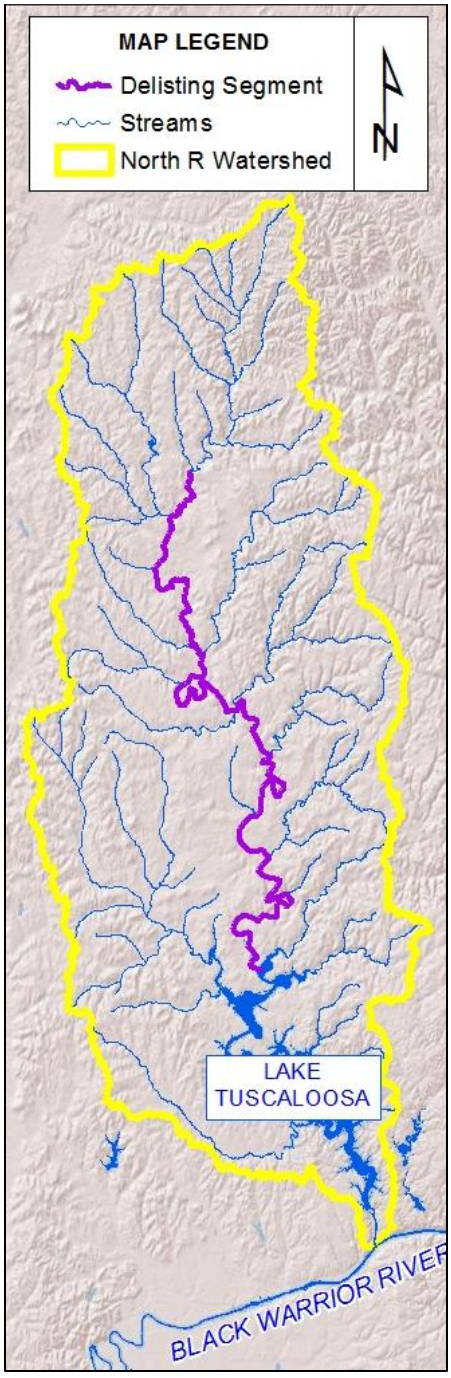
WCS - Watershed Characterization System
WET - Whole Effluent Toxicity
WLA - Wasteload Allocation
WMA - Wildlife Management Area
WPCP - Wastewater Pollution Control Plant
WQB - Water Quality Branch
WRDB - Water Resources Database
WTP - Water Treatment Plant
WWTF - Wastewater Treatment Facility
WWTP - Wastewater Treatment Plant
WY - Water Year

Map 1: Upper North River Watershed



1.0 EXECUTIVE SUMMARY

Map 2: North River Watershed



North River is a major tributary of the Black Warrior River located in west central Alabama. The 78.8-mile-long river has approximately 425 mi² of drainage area located in Fayette and Tuscaloosa Counties. In 1969, a 21.5-mile-long segment of the lower portion of North River was impounded by the City of Tuscaloosa thereby creating Lake Tuscaloosa, a 5,320-acre reservoir which serves as a water supply for surrounding communities. The remaining free-flowing upper segment of North River boasts unique and critical habitat for many species of fish, mussels, and other aquatic life.

The segment of North River from Lake Tuscaloosa upstream to the confluence of Ellis Creek was originally placed on Alabama's *1998 §303(d) List of Impaired Waters* as impaired for nutrients, siltation, and other habitat alteration (HA) caused by unknown sources based on data collected in the 1980s. This 40.8-mile-long segment of North River holds a *Fish & Wildlife* (*F&W*) use classification. Since the time of the original listing, three sampling stations located on the mainstem of the impaired portion of North River have been routinely monitored for water quality parameters, ecological health, and other physical/chemical indicators. For the delisting decision analysis, only the most recent (past 6 years) data was utilized.

After reviewing this data, it is evident that North River is currently meeting the water quality criteria applicable to the *F&W* use classification. Conventional water quality parameters and nutrient levels were consistent with ecoregional guidelines developed for each ecoregion in Alabama based on reference streams. Observed nutrients levels were below ecoregional guidelines at all three stations as well. In addition, recent biological and habitat assessments conducted on North River in 2012 rated macroinvertebrate community health as "fair" and overall habitat conditions as "optimal" (See 4.2). As a result, North River assessment unit AL03160112-0411-102 is being proposed as a candidate for delisting. Map 1 on the previous page shows the delisting segment and upper North River Watershed. Table 1 on the following page summarizes the desisting decision.

Table 1: North River Delisting Summary

North River Delisting Summary	
Waterbody	North River (from Lake Tuscaloosa to Ellis Creek)
Use Classification	*Fish & Wildlife (F&W)*
River Basin	Black Warrior
County	Fayette (FIPS 01057), Tuscaloosa (FIPS 01125)
12-Digit HUCs	03160112-0401,-0402,-0403,-0404,-0405,-0406,-0407, -0408,-0411
HUC-12 Names	See Table 2 below
Assessment Unit	AL03160112-0411-102 Total Length = 40.814 mi Watershed Area (Upper) = 256.23 mi²
Feature Extents	Upstream: (33.685370°, -87.630846°) Downstream: (33.401356°, -87.580846°)
Year Listed	1998
Date of Data	1987 (listing); 2008–2013 (delisting)
Water Quality Impairment	Siltation / Habitat Alteration / Nutrients
Water Quality Criteria (*F&W*)	• Siltation/HA: Narrative; Macroinvertebrate & Habitat Metrics • Nutrients: Narrative; Ecoregional Guidelines; Metrics
Sampling Results	• Siltation/HA: Metrics scored "fair" or better • Nutrients: Consistent w/ ecoregional guidelines, metrics scored "fair" or better

Table 2: HUC-12s in the Upper North River Watershed

HUC-12 ID	HUC-12 Name	Drainage Area (mi²)
031601120401	Deadwater Creek-Clear Creek	35.96
031601120402	Headwaters North River	59.58
031601120403	Cedar Creek-North River	44.26
031601120404	Tyro Creek	23.92
031601120405	Boone Creek-North River	27.84
031601120406	Dry Branch-Bear Creek	16.42
031601120407	Cripple Creek	17.45
031601120408	Gin Branch-North River	16.39
031601120411	Turkey Creek-North River	14.40*
	Total Area (mi²) =	256.23

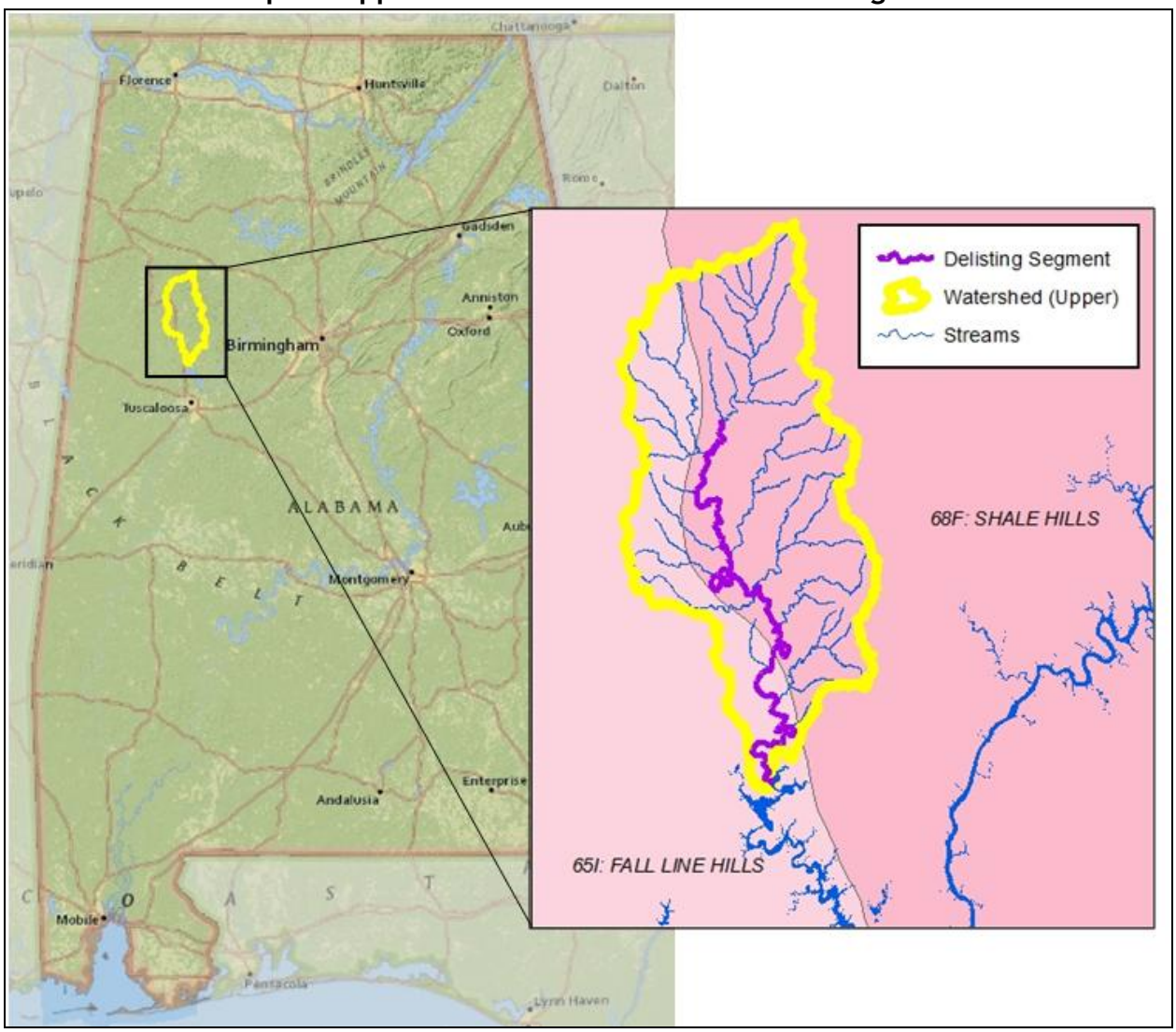
*Partial area of HUC-12 that omits drainage to Lake Tuscaloosa

2.0 NORTH RIVER WATERSHED DESCRIPTION

2.1 General Geographic Location

As mentioned in the introduction, North River is located in the Black Warrior River Basin just north of City of Tuscaloosa in northwest Alabama. The northern half of the Upper North River Watershed lies within Fayette County, while the lower half is in Tuscaloosa County. This watershed is about 50 miles west of Birmingham, AL. The western third of the watershed lies within *Ecoregion 65i: Fall Line Hills*, which is known for mostly forested terrain with 200-400 feet of relief and loamy or sandy sediments. The eastern two-thirds of the watershed falls within *Ecoregion 68f: Shale Hills*, which is sometimes referred to as the Warrior Coal Field and is characterized by extensive hills and strongly sloping topography with an abundance of shale and sandstone (Griffith et al, 2001).

Map 3: Upper North River Watershed & Ecoregions



2.2 Hydrology

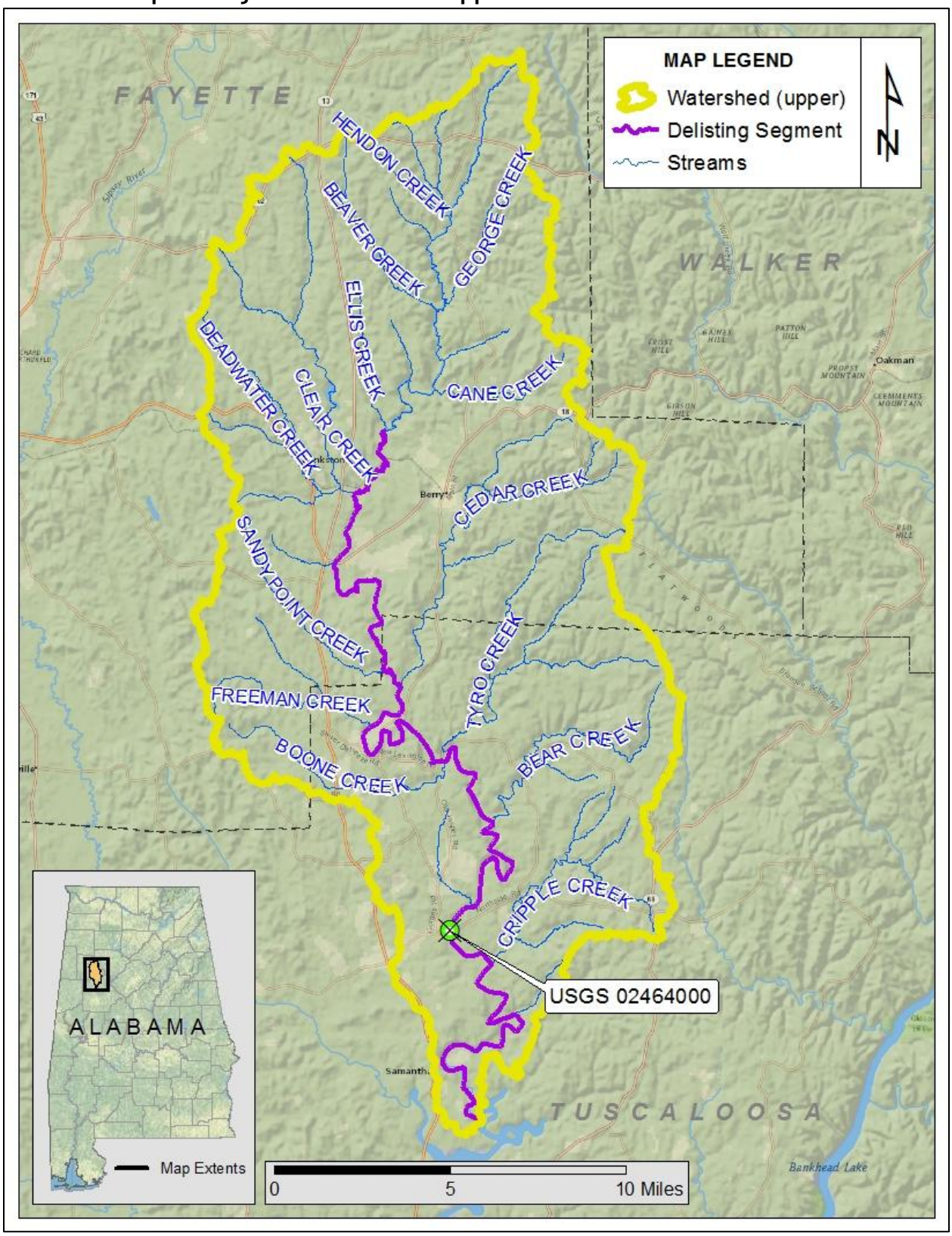
The free-flowing portion of North River (i.e. "Upper North River") is characteristic of many upland Alabama streams with variable flows, slow-to-moderate stream velocities, and contains a mixture of glide pools with intermittent riffle runs over substrates of bedrock, sand, gravel, and cobble. The 256.23 mi^2 drainage area of the upper North River watershed has an average annual flow of about 445.3 cfs based on flow data ratioed from USGS Gage 02464000 (North River near Samantha, AL; 1972-2013). Additional flow statistics can be found in Table 3: Upper North River Flow Summary below. The drainage features in the upper portion of the Black Warrior Basin are characterized by steep-sided valleys and strongly sloping topology, especially near streams. Larger perennial streams generally have sustained flows throughout the year, though smaller headwater streams can go dry during the low-flow months of late summer and fall. Map 4 on the following page shows the major tributaries of the upper portion of North River and the location of USGS gage 02464000.

Table 3: Upper North River Flow Summary

Upper North River Low-flow Summary	
Drainage Area (mi^2)	256.2
Date Range of Data	01/01/1972 - 12/31/2013
# of Daily Records	15,341
Average Daily Flow (Mean Annual Flow) (cfs)	445.3
Minimum Daily Avg Flow Observed (cfs)	0.55
Maximum Daily Avg Flow Observed (cfs)	21,601
Calculated $7Q_{10}$ (cfs)	1.87
Calculated $7Q_{2}$ (cfs)	8.1
Calculated $1Q_{10}$ (cfs)	1.48

+ Ratioed based on USGS Gage #02464000 (North River near Samantha, AL)

Map 4: Major Tributaries of Upper North River & USGS Station



3.0 BASIS FOR §303(D) LISTING

3.1 §303(d) List of Impaired Waters

Section 303(d) of the Clean Water Act and EPA's *Water Quality Planning and Management Regulations* (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the total maximum daily load (TMDL) for pollutants causing use impairment. The TMDL process establishes the allowable loading of pollutants for a waterbody based on the relationship between pollution sources and instream water quality conditions, so that states can establish water quality-based controls to reduce pollution and restore and maintain the quality of their water resources (USEPA, 1991). If subsequent water quality sampling shows that segments listed in a previous cycle are meeting applicable water quality standards and fully supporting their use classification(s), the waterbody can be proposed as a candidate for delisting based on more recent or more accurate data.

3.2 Water Quality Criteria

Nearly all of the applicable water quality criteria for the impairments considered in this document are narrative instead of numeric. However, the narrative criteria is often evaluated and supported using quantifiable numeric endpoints derived from ecoregional reference sites, metrics of relative biological and habitat health, and other measures. This is discussed further in 4.2 Data Availability and Analysis . The water quality criteria for *F&W* are listed below:

ADEM ADMINISTRATIVE CODE CH. 335-6-10-.09(5): FISH AND WILDLIFE

(a) Best usage of waters: fishing, propagation of fish, aquatic life, and wildlife, and any other usage except for swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes.

(b) Conditions related to best usage: the waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.

(c) Other usage of waters: it is recognized that the waters may be used for incidental water contact and recreation during June through September, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.

(d) Conditions related to other usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming places and will be considered satisfactory for swimming and other whole body water-contact sports.

(e) Specific criteria:

1. Sewage, industrial wastes, or other wastes: none which are not effectively treated in accordance with rule 335-6-10-.08.

2. pH: sewage, industrial wastes or other wastes shall not cause the pH to deviate more than one unit from the normal or natural pH, nor be less than 6.0, nor greater than 8.5. For salt waters and estuarine waters to which this classification is assigned, wastes as herein described shall not cause the pH to deviate more than one unit from the normal or natural pH, nor be less than 6.5, nor greater than 8.5.

3. Temperature:

(i) The maximum temperature in streams, lakes, and reservoirs, other than those in river basins listed in subparagraph (ii) hereof, shall not exceed 90° F.

(ii) The maximum temperature in streams, lakes, and reservoirs in the Tennessee and Cahaba River Basins, and for that portion of the Tallapoosa River Basin from the tailrace of Thurlow Dam at Tallassee downstream to the junction of the Coosa and Tallapoosa Rivers which has been designated by the Alabama Department of Conservation and Natural Resources as supporting smallmouth bass, sauger, or walleye, shall not exceed 86 °F.

(iii) The maximum in-stream temperature rise above ambient water temperature due to the addition of artificial heat by a discharger shall not exceed 5 °F in streams, lakes, and reservoirs in non-coastal and non-estuarine areas.

(iv) the maximum in-stream temperature rise above ambient water temperature due to the addition of artificial heat by a discharger shall not exceed 4 °F in coastal or estuarine waters during the period October through May, nor shall the rise exceed 1.5 °F during the period June through September.

(v) In lakes and reservoirs there shall be no withdrawal from, nor discharge of heated waters to, the hypolimnion unless it can be shown that such discharge or withdrawal will be beneficial to water quality.

(vi) In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained, and there shall be no thermal block to the migration of aquatic organisms.

(vii) Thermal permit limitations in NPDES permits may be less stringent than those required by subparagraphs (i) - (iv) hereof when a showing by the discharger has been made pursuant to Section 316 of the Federal Water Pollution Control Act (FWPCA), 33 U.S.C. § 1251 et seq. or pursuant to a study of an equal or more stringent nature required by the State of Alabama authorized by Title 22, Section 22-22-9(c), Code of Alabama, 1975, that such limitations will assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife, in and on the body of water to which the discharge is made. Any such demonstration shall take into account the interaction of the thermal discharge component with other pollutants discharged.

4. Dissolved oxygen:

(i) 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

no event shall the dissolved oxygen level be less than 4 mg/l due to discharges from existing hydroelectric generation impoundments. All new hydroelectric generation impoundments, including addition of new hydroelectric generation units to existing impoundments, shall be designed so that the discharge will contain at least 5 mg/l dissolved oxygen where practicable and technologically possible. The Environmental Protection Agency, in cooperation with the State of Alabama and parties responsible for impoundments, shall develop a program to improve the design of existing facilities.

(ii) In coastal waters, surface dissolved oxygen concentrations shall not be less than 5 mg/l, except where natural phenomena cause the value to be depressed.

(iii) In estuaries and tidal tributaries, dissolved oxygen concentrations shall not be less than 5 mg/l, except in dystrophic waters or where natural conditions cause the value to be depressed.

(iv) In the application of dissolved oxygen criteria referred to above, dissolved oxygen shall be measured at a depth of 5 feet in waters 10 feet or greater in depth; and for those waters less than 10 feet in depth, dissolved oxygen criteria will be applied at mid-depth.

5. Toxic substances attributable to sewage, industrial wastes, or other wastes: only such amounts, whether alone or in combination with other substances, as will not exhibit acute toxicity or chronic toxicity, as demonstrated by effluent toxicity testing or by application of numeric criteria given in rule 335-6-10-.07, to fish and aquatic life, including shrimp and crabs in estuarine or salt waters or the propagation thereof.

6. Taste, odor, and color-producing substances attributable to sewage, industrial wastes, or other wastes: only such amounts, whether alone or in combination with other substances, as will not exhibit acute toxicity or chronic toxicity, as demonstrated by effluent toxicity testing or by application of numeric criteria given in rule 335-6-10-.07, to fish and aquatic life, including shrimp and crabs in estuarine and salt waters or adversely affect the propagation thereof; impair the palatability or marketability of fish and wildlife or shrimp and crabs in estuarine and salt waters; or unreasonably affect the aesthetic value of waters for any use under this classification.

7. Bacteria:

(i) In non-coastal waters, bacteria of the *E. coli* group shall not exceed a geometric mean of 548 colonies/100 ml; nor exceed a maximum of 2,507 colonies/100 ml in any sample. In coastal waters, bacteria of the enterococci group shall not exceed a maximum of 275 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours.

(ii) For incidental water contact and recreation during June through September, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean *E. coli* organism density does not exceed 126 colonies/100 ml nor exceed a maximum of 487 colonies/100 ml in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not

exceed a geometric mean of 35 colonies/100 ml nor exceed a maximum of 158 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric bacterial coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water- contact sports.

8. Radioactivity: the concentrations of radioactive materials present shall not exceed the requirements of the State Department of Public Health.

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

3.3 Environmental Importance

In addition to routine water quality monitoring, additional scrutiny is often warranted when streams have significant environmental importance such as threatened and endangered species. Alabama's diverse water resources are renowned for their biodiversity, including taxonomic richness and abundance, and are home to a number of rare aquatic species. North River is no exception and also hosts a large variety of aquatic life such as fish and mussels that thrive in its unique ecosystem. This includes two endangered species of mussels: the dark pigtoe mussel (*Pleurobema furvum)* and the orange-nacre mucket (*Hamiota perovalis*). Other Threatened and Endangered (T&E) species include the Alabama Water Dog salamander (*Necturus alabamesis*) and the Flattened Musk Turtle (*Sternotherus depressus*) (BWCWP, 2010). Stressors such as excess sedimentation and nutrification can adversely affect population and habitat.

Since North River represents critical habitat for aquatic species, it has been designated as a Strategic Habitat Unit (SHU) by the US Fish & Wildlife Service (USFWS) in conjunction with the Alabama Department of Conservation and Natural Resources (ADCNR) and the Geological Survey of Alabama (GSA). SHUs represent "a substantial part of Alabama's remaining high-quality water courses and reflect the variety of aquatic habitat occupied by these species historically and presently (Wynn, et al, 2012)."

3.4 Original Listing Information

This segment of North River was originally placed on Alabama's *1998 §303(d) List of Impaired Waterbodies* for siltation, other habitat alteration, and nutrients based on data reviewed by USEPA Region 4. The rational for inclusion of this segment on the 1998 §303(d) list by USEPA was not documented, but probably stemmed from nonpoint source reports, ambient monitoring data, and/or a USGS study conducted in the 1980s and published in 1987 (Water quality of Lake Tuscaloosa and streamflow and water quality of selected tributaries to Lake Tuscaloosa, Alabama, 1982-86).

3.5 Changes in Listing Nomenclature & Attributes

It should be noted that since the time of the original listing, assessment unit IDs, HUC information, and segment/watershed attributes (segment length, watershed area, etc.) have been updated. The original 1998 listing of North River (Waterbody ID AL03160112-100_01) corresponds to the updated 2012 §303(d) listing of North River with assessment unit ID AL03160112-0411-102.

4.0 TECHNICAL BASIS FOR DELISTING

Following the listing in 1998, additional sampling was conducted annually as part of ADEM's Surface Water Quality Monitoring Plan (SWQMP). In addition, other agencies and individuals (GSA, USGS, universities, stakeholders) also conducted water quality monitoring and biological assessments.

4.1 Water Quality Target Identification

As mentioned in 3.2 Water Quality Criteria, the water quality criteria siltation/habitat alteration and nutrients are narrative and generally lack quantifiable endpoints. However, narrative criteria can often be supported by establishing metrics for biological and habitat health, developing guidelines for healthy streams based on established ecoregional reference sites, and other analytical tools.

4.1.1 Siltation / Habitat Alteration Target Identification

In this case, for the siltation and habitat alteration impairment status, relative biological health and habitat suitability are the drivers for a delisting decision. Biological health will be rated based on macroinvertebrate metrics for the EPT group of benthic insects (Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly)). This includes taxa richness, composition, and community tolerance. These metrics have been established on a site-by-site basis based on observations/data for healthy streams similar in hydrology, ecology, and relative size. In addition, habitat assessments provide additional support by rating the suitability of stream conditions for flora and fauna. In summary, water quality targets for the siltation/habitat alteration aspect will be established through the following:

- Narrative Water Quality Criteria
- Numeric Water Quality Criteria
- Macroinvertebrate Metrics
- Habitat Assessments

4.1.2 Nutrients Target Identification

For the nutrients listing, data collected on the North River segment over the past 6 years (i.e. "recent" data) will be compared the latest ecoregional guidelines which are based on healthy streams (unimpacted or low-impacted) with similar characteristics as the delisting segment. Levels for chlorophyll-a, ammonia-nitrogen (NH_3-N), nitrates and nitrites (NO_3 + NO_2), total Kjeldahl nitrogen (TKN), and total phosphorus (TP) as well as conventional water quality parameters will be assessed. For nutrients, the following assessments will be used to establish water quality targets and assess the delisting segment:

- Narrative Water Quality Criteria
- Numeric Water Quality Criteria
- Macroinvertebrate Metrics
- Habitat Assessments
- 2010 Ecoregional Guidelines (nutrients)

4.2 Data Availability and Analysis

Map 5: Upper North River Sampling Stations

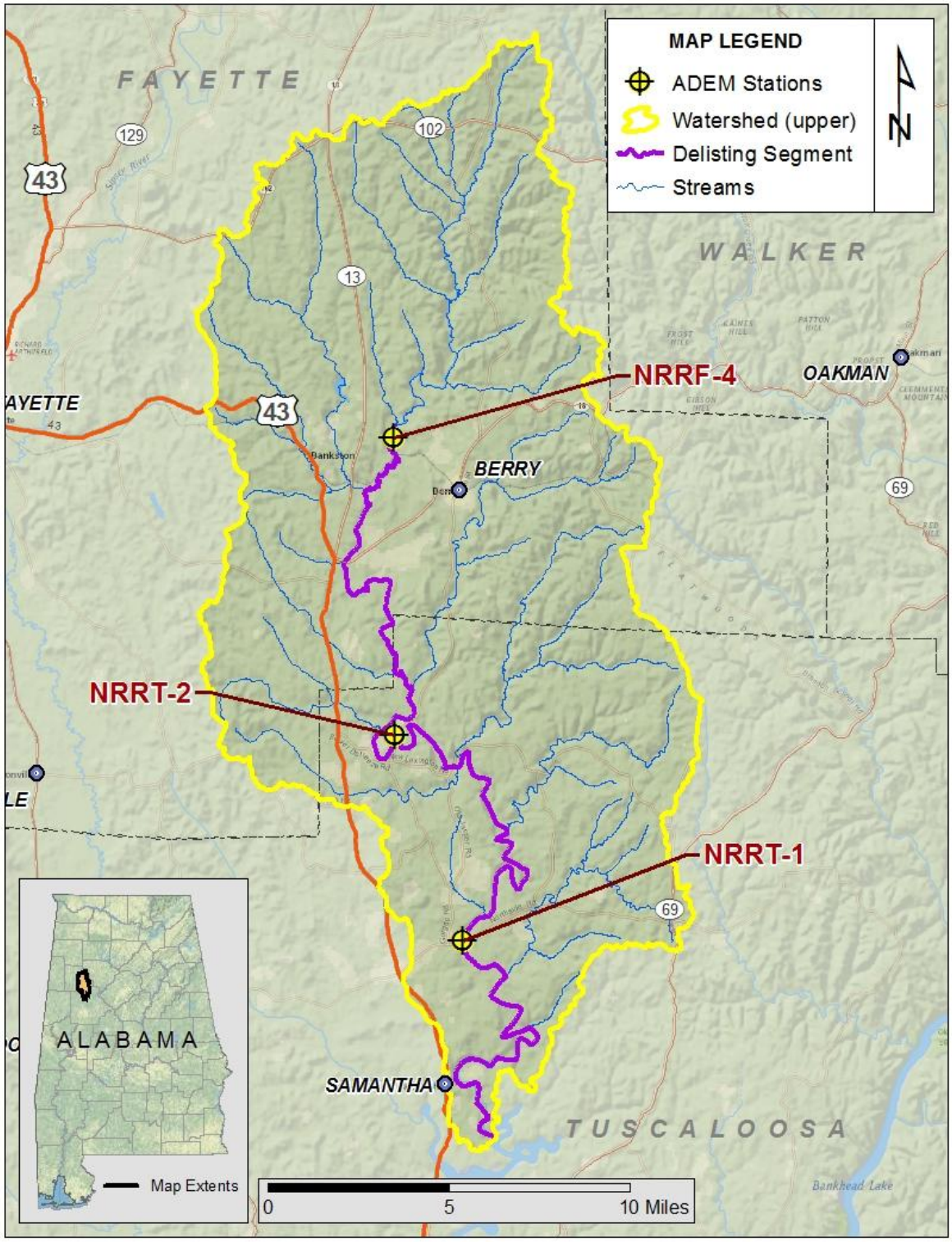


Table 4: North River Delisting Segment Sampling Locations

Station	Latitude	Longitude	Ecoregion	County	HUC-12	Location Description
NRRT-1	33.479800	-87.596806	65i	Tuscaloosa	031601120408	North R @ CR 38
NRRT-2	33.561930	-87.630263	68f	Tuscaloosa	031601120405	North R @ CR 63 (Gorgas Rd)
NRRF-4	33.680733	-87.631504	68f	Fayette	031601120402	North R @ CR30

Table 5: Stream Characteristics at Macroinvertebrate Assessment Stations

Table 2. Physical characteristics of North R at NRRT-1, July 25, 2012.

Physical Characteristics		
Canopy Cover		Open
Width (ft)		50.0
Depth (Ft)		
	Riffle	0.3
	Run	1.0
	Pool	1.5
% of Reach		
	Riffle	10
	Run	80
	Pool	10
% Substrate		
	Bedrock	70
	Boulder	2
	Clay	0
	Cobble	8
	Mud/Muck	0
	Gravel	0
	Hard Pan Clay	0
	Sand	5
	Silt	10
	Organic Matter	5

Table 2. Physical characteristics of North R at NRRT-2, July 25, 2012.

Physical Characteristics		
Canopy Cover		Open
Width (ft)		50.0
Depth (Ft)		
	Riffle	0.3
	Run	1.0
	Pool	2.0
% of Reach		
	Riffle	5
	Run	15
	Pool	80
% Substrate		
	Bedrock	79
	Boulder	1
	Clay	0
	Cobble	2
	Mud/Muck	0
	Gravel	1
	Hard Pan Clay	0
	Sand	2
	Silt	10
	Organic Matter	5

Table 2. Physical characteristics of North R at NRRF-4, July 26, 2012.

Physical Characteristics		
Canopy Cover		Mostly Open
Width (ft)		15.0
Depth (Ft)		
	Riffle	0.2
	Run	0.5
	Pool	1.0
% of Reach		
	Riffle	5
	Run	85
	Pool	10
% Substrate		
	Bedrock	59
	Boulder	0
	Clay	0
	Cobble	20
	Mud/Muck	0
	Gravel	2
	Hard Pan Clay	0
	Sand	1
	Silt	10
	Organic Matter	8

4.2.1 Siltation and Habitat Alteration Assessment Data & Results

4.2.1.1 Narrative Water Quality Criteria

As mentioned previously, the water quality criteria for siltation and habitat alteration are narrative. Since Alabama's water resources are so diverse, applying single statewide numeric criteria to parameters such as total suspended solids or macroinvertebrate health metrics would not be a valid approach to assessment. Therefore, site-specific metrics have been developed for streams that are similar in nature. The next three sections detail the relative health of the North River with respect to siltation and habitat alteration impairment

4.2.1.2 Numeric Water Quality Criteria & Ecoregional Guidelines

The numeric water quality criteria for the F&W use classification is listed in 3.2 Water Quality Criteria. The following box plots summarize the water quality data collected on the North River in the past 6 years for conventional water quality parameters. The "whiskers" represent the minimum and maximum observations, while the "box" represents the interquartile range (where the top line of the box is the 3rd quartile, the bottom line is the 1st quartile, and the middle line is the median of the dataset). For most water quality constituents, ADEM compares the median of observed data to the 90th percentile of ecoregional reference site data.

Figure 1: Water Temperature (NRRT-1, NRRT-2, NRRF-4)

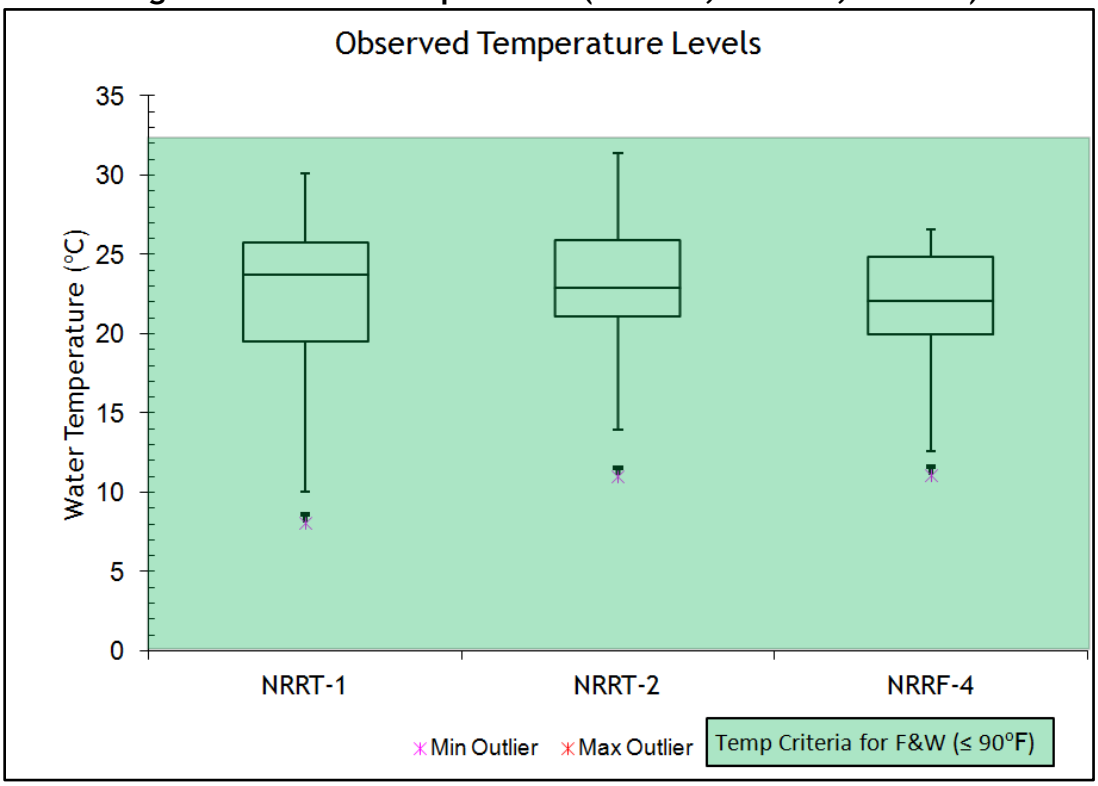


Figure 2: pH (NRRT-1, NRRT-2, NRRF-4)

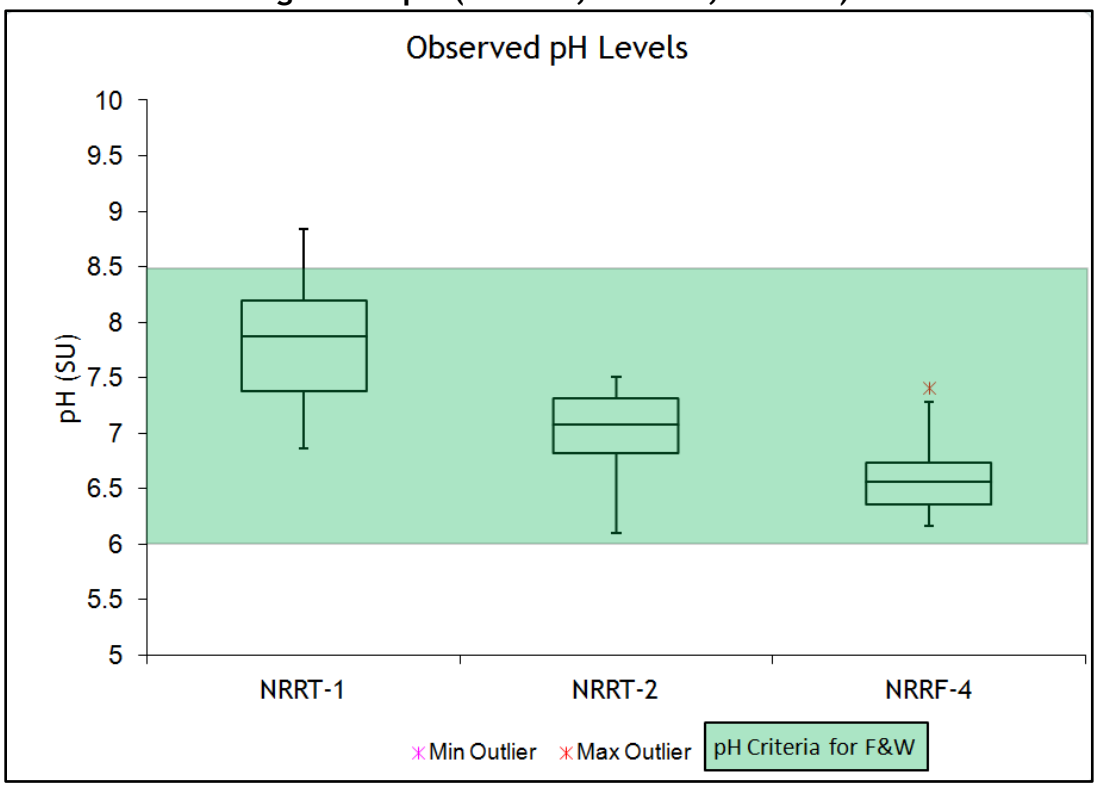


Figure 3: Dissolved Oxygen (NRRT-1, NRRT-2, NRRF-4)

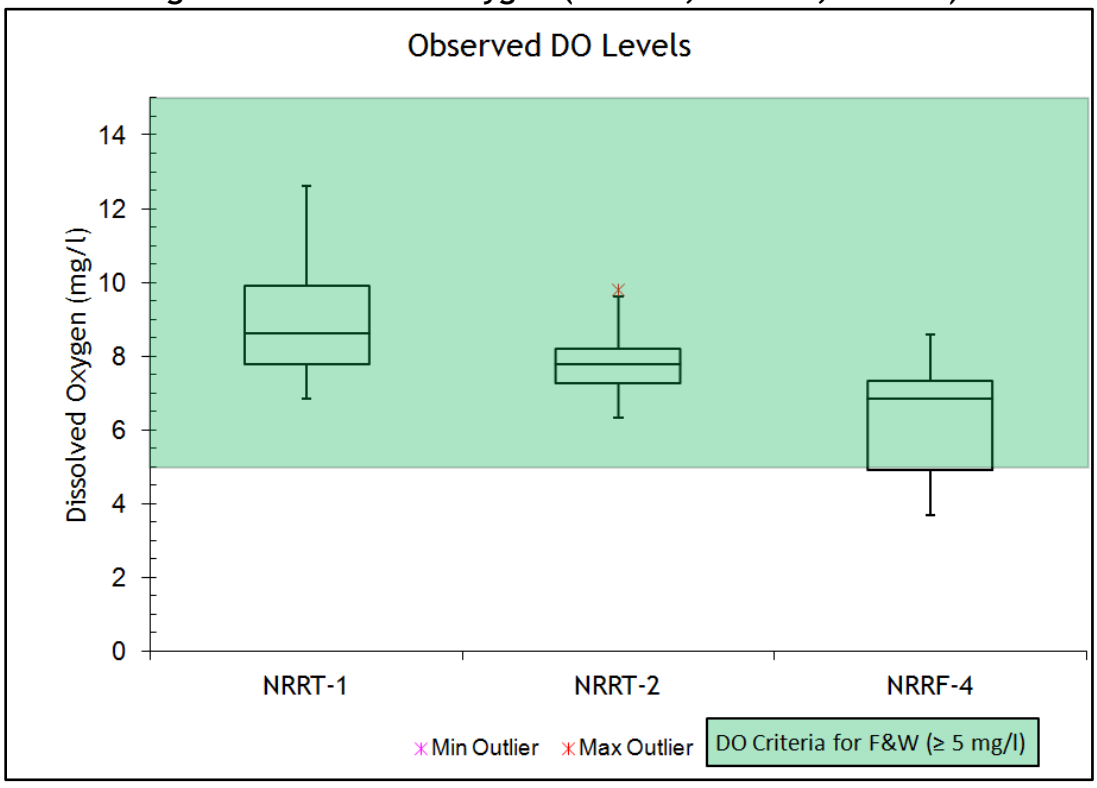


Figure 4: Specific Conductivity (NRRT-1, NRRT-2, NRRF-4)

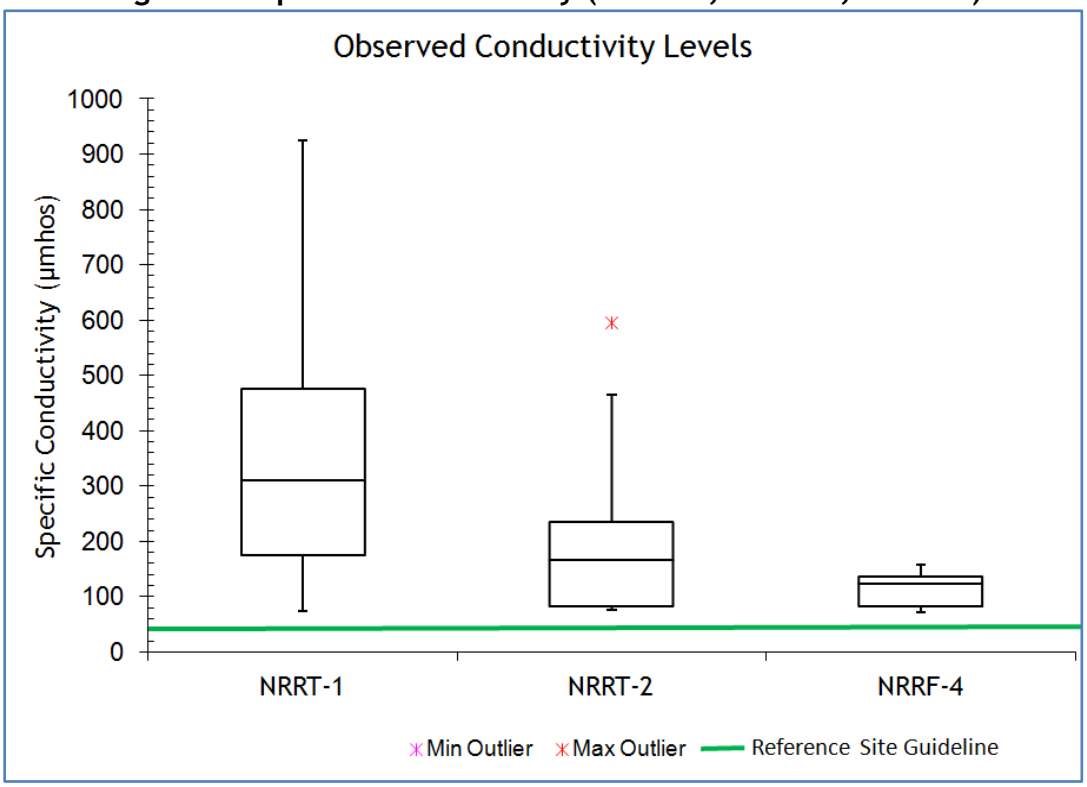


Figure 5: Total Suspended Solids (NRRT-1, NRRT-2, NRRF-4)

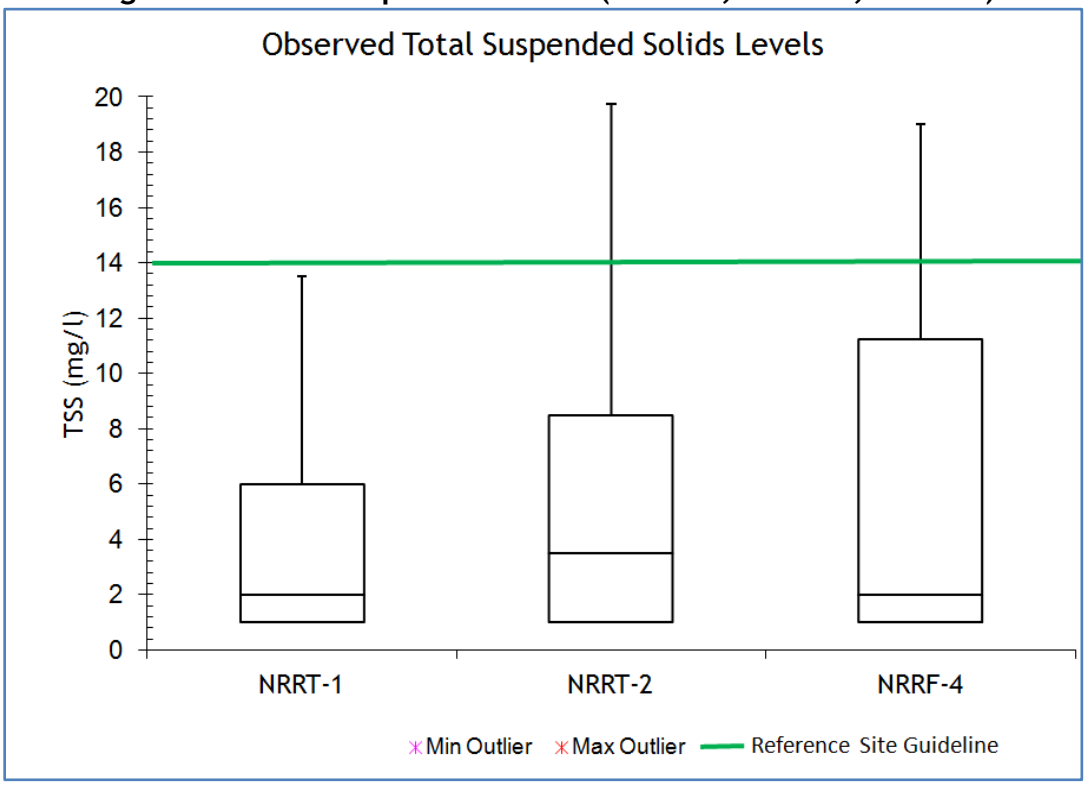
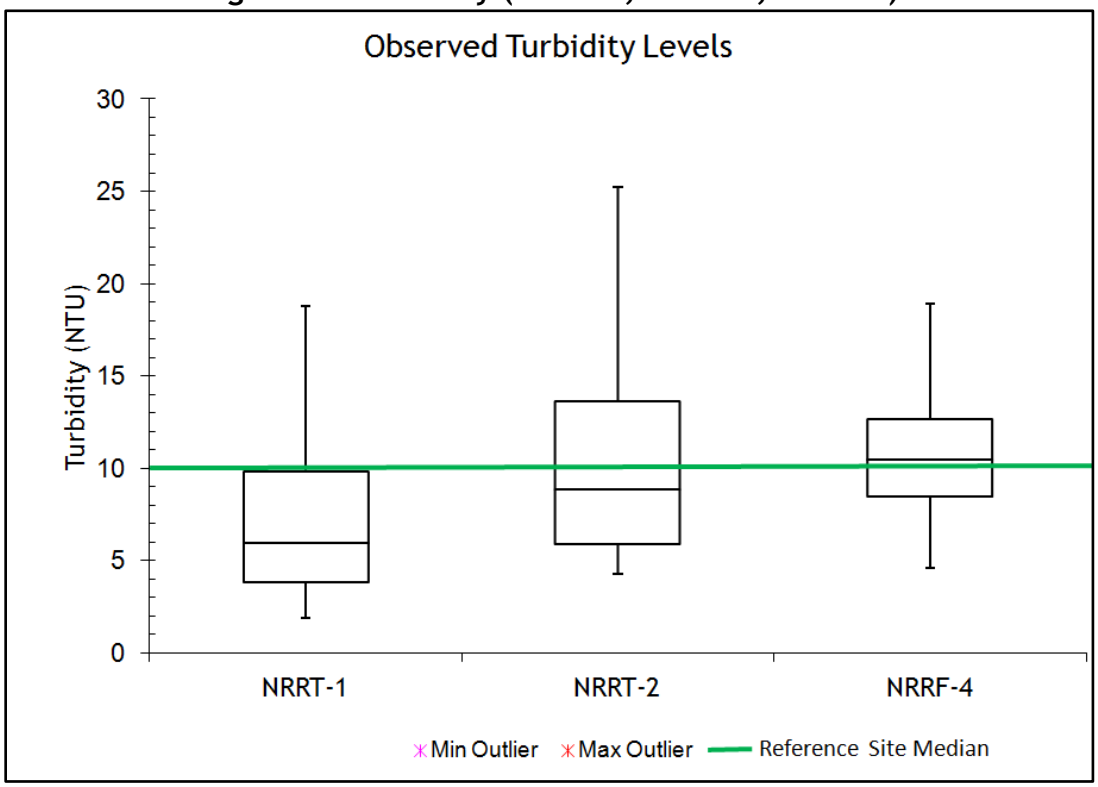


Figure 6: Turbidity (NRRT-1, NRRT-2, NRRF-4)



4.2.1.3 Macroinvertebrate Assessment

Macroinvertebrate assessments are typically conducted in accordance with ADEM's basin rotation sampling plan, where Alabama's river basins are divided into 5 groups. Each year, resources and sampling efforts are concentrated in one basin group for intensive monitoring. These focused efforts, including macroinvertebrate and habitat assessments, were conducted in the Black Warrior Basin in 2007 and 2012. Macroinvertebrate assessments were performed at the following stations: NRRT-1, NRRT-2, and NRRF-4. Based on the 2013 multi-habitat bioassessment indices developed for wadeable streams in the Southwestern Appalachian Ecoregion, NRRF-4 was rated as "fair." NRRT-1 (Ecoregion 65i) and NRRT-2 (Ecoregion 68f) have drainage areas of 223 and 154, respectively. The wadeable index mentioned above does not apply to larger riffle-run streams, so a special index for streams with larger drainage areas (DA > 75 mi²) was developed. Based on this index, both NRRT-1 and NRRT-2 graded "fair" with respect to macroinvertebrate community health.

Table 6: Results for Macroinvertebrate Assessments Conducted May 2012

NRRT-1	NRRT-2	NRRF-4
Fair	Fair	Fair

4.2.1.4 Habitat Assessment

Habitat assessments are typically conducted during the same station visit when macroinvertebrate assessments are preformed. Reach characteristics and habitat conditions are graded based on several categories such as instream habitat, sediment deposition, stream sinuosity, bank stability, riparian buffer, and so on. Each of these categories is subdivided into subcategories that are graded based on individual reach characteristics and stream type (e.g. glide pool versus riffle, high gradient versus low gradient). Finally, each scores for individual categories are compiled into one overall score on a 100-point scale. Below are the results for the habitat assessments conducted for stations NRRT-1, NRRT-2, and NRRF-4 in May 2012.

Table 7: Habitat Assessment Results – NRRT-1 (May 2012)

Table 3. Results of the habitat assessment conducted on North R at NRRT-1, May 2, 2012. Macroinvertebrates were also collected.

Habitat Assessment	%Maximum Score	Rating
RR		
Instream Habitat Quality	74	Optimal >65
Sediment Deposition	81	Optimal >65
Sinuosity	90	Optimal >84
Bank and Vegetative Stability	73	Sub-optimal (60-74)
Riparian Buffer	90	Optimal >89
Habitat Assessment Score	**192**	
% Maximum Score	**80**	Optimal >65

Table 8: Habitat Assessment Results – NRRT-2 (May 2012)

Table 3. Results of the habitat assessment conducted on North R at NRRT-2, May 3, 2012. Macroinvertebrates were also collected.

Habitat Assessment	%Maximum Score	Rating
RR		
Instream Habitat Quality	74	Optimal >70
Sediment Deposition	90	Optimal >70
Sinuosity	83	Sub-optimal (65-84)
Bank and Vegetative Stability	70	Sub-optimal (60-74)
Riparian Buffer	90	Optimal >89
Habitat Assessment Score	**196**	
% Maximum Score	**82**	Optimal >70

Table 9: Habitat Assessment Results – NRRF-4 (May 2012)

Table 3. Results of the habitat assessment conducted on North R at NRRF-4, May 3, 2012. Macroinvertebrates were also collected.

Habitat Assessment	%Maximum Score	Rating
RR		
Instream Habitat Quality	68	Sub-optimal (59-70)
Sediment Deposition	78	Optimal >70
Sinuosity	85	Optimal >84
Bank and Vegetative Stability	64	Sub-optimal (60-74)
Riparian Buffer	58	Marginal (50-69)
Habitat Assessment Score	**170**	
% Maximum Score	**71**	Optimal >70

4.2.2 Nutrients Listing Data & Results

4.2.2.1 Nutrient Narrative Water Quality Criteria

The assessment process of the narrative criteria as it applies to nutrients basically mirrors the assessment process conducted for siltation and habitat impairments shown in 14. Please reference those results for conventional water quality parameters, macroinvertebrate assessments, and habitat assessments. In addition to those analyses, nutrient levels for station NRRT-1, NRRT-2, and NRRF-4 were also compared with ecoregional reference sites. Note that NRRT-1 is in Ecoregion 65i (Fall Line Hills), while NRRT-2 and NRRF-4 are in Ecoregion 68f (Shale Hills). As such, the ecoregional guidelines vary by station and are denoted on the following graphs by different benchmark lines. Following are illustrations displaying the observed nutrient levels versus their respective ecoregional guidelines.

Figure 7: Chlorophyll-a (NRRT-1, NRRT-2, NRRF-4)

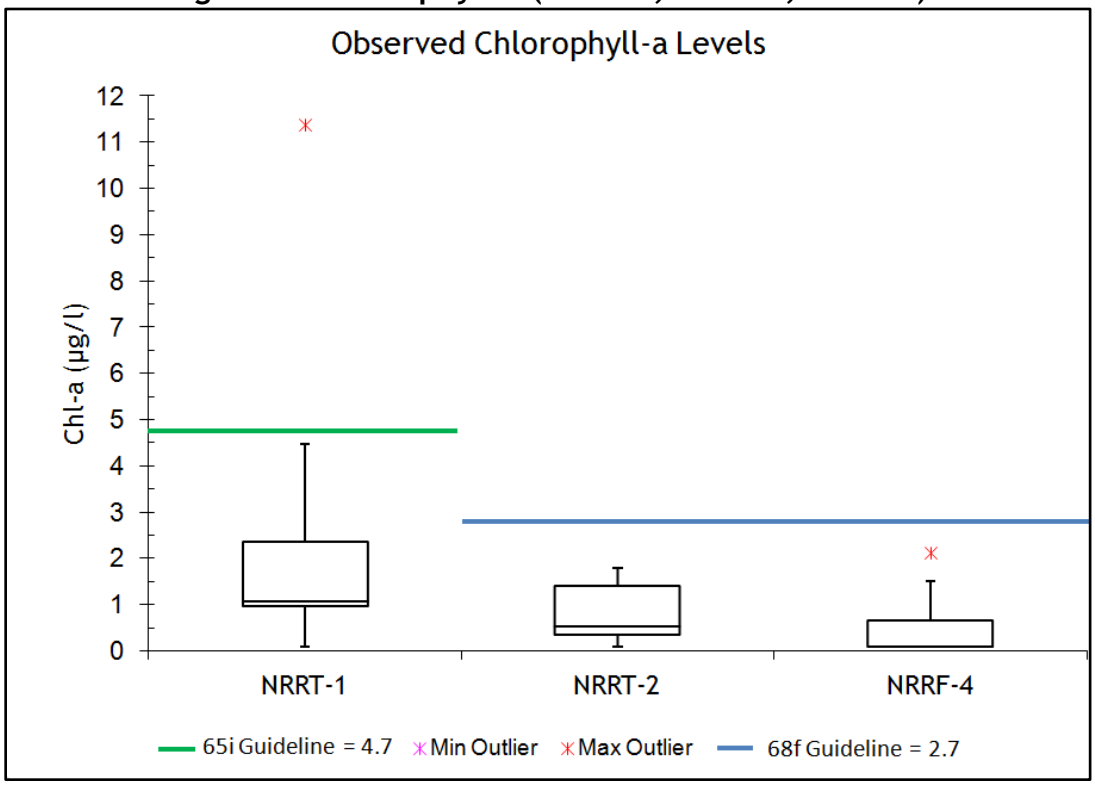


Figure 8: Total Kjeldahl Nitrogen (NRRT-1, NRRT-2, NRRF-4)

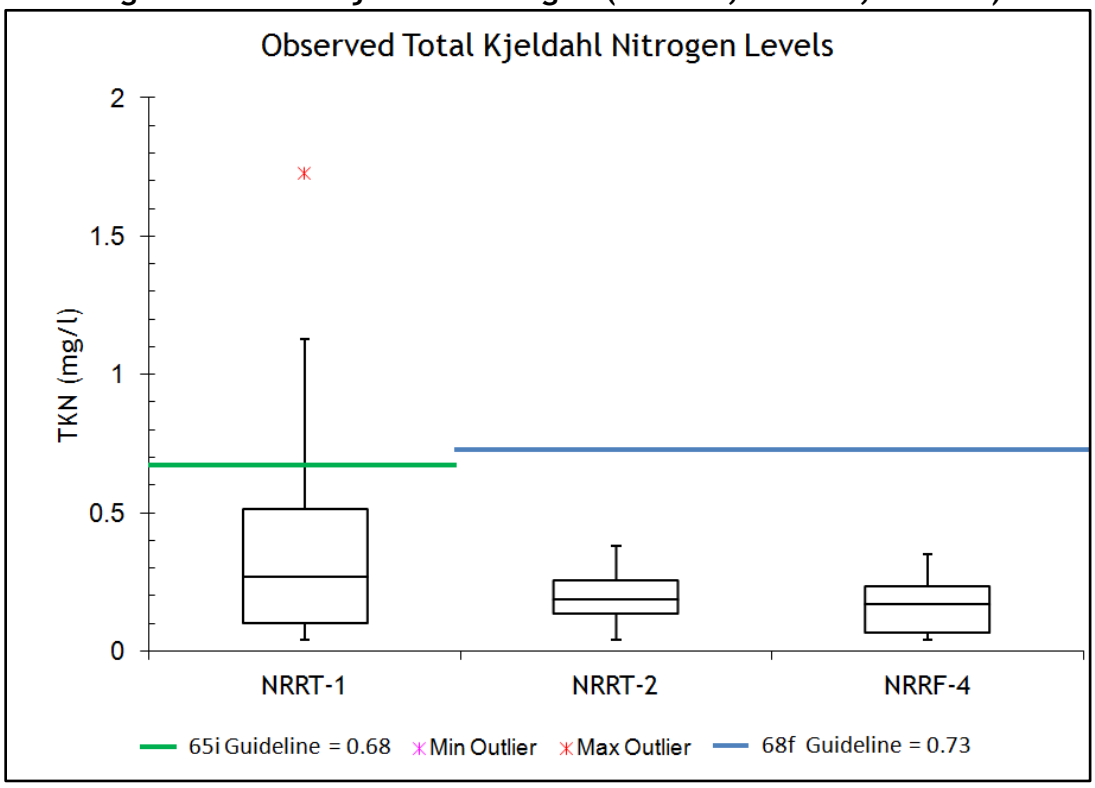


Figure 9: Ammonia-Nitrogen (NRRT-1, NRRT-2, NRRF-4)

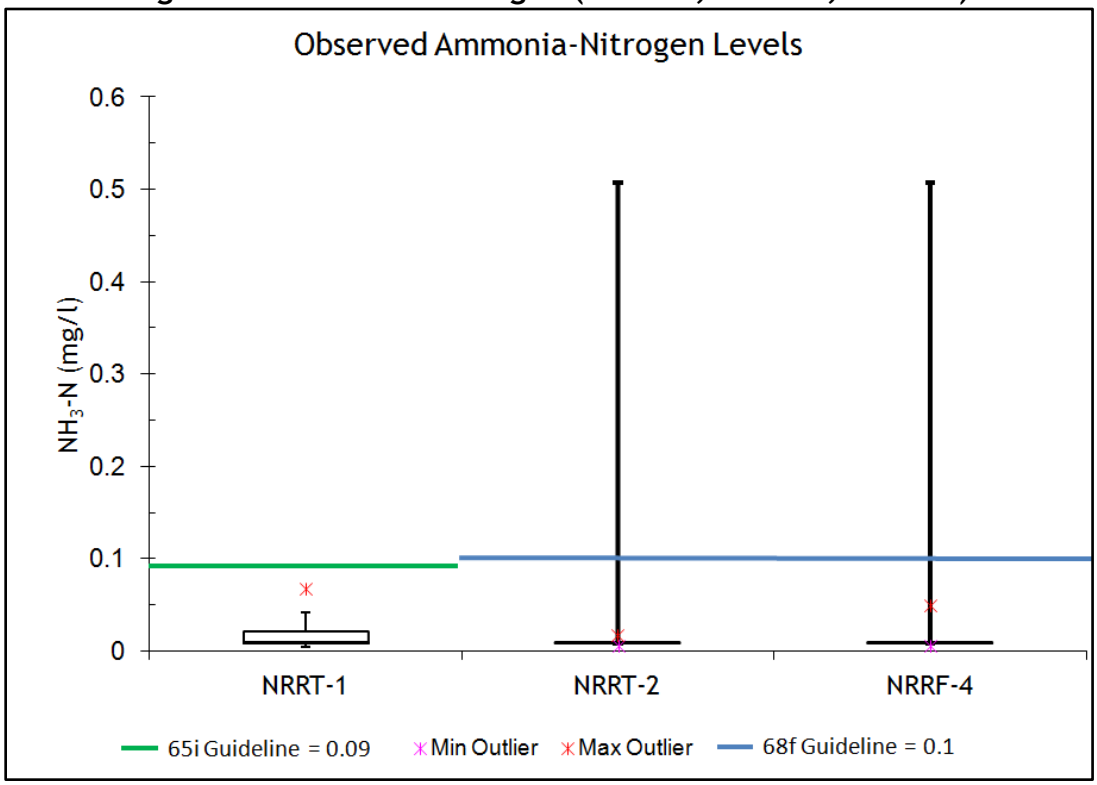


Figure 10: Nitrates + Nitrites (NRRT-1, NRRT-2, NRRF-4)

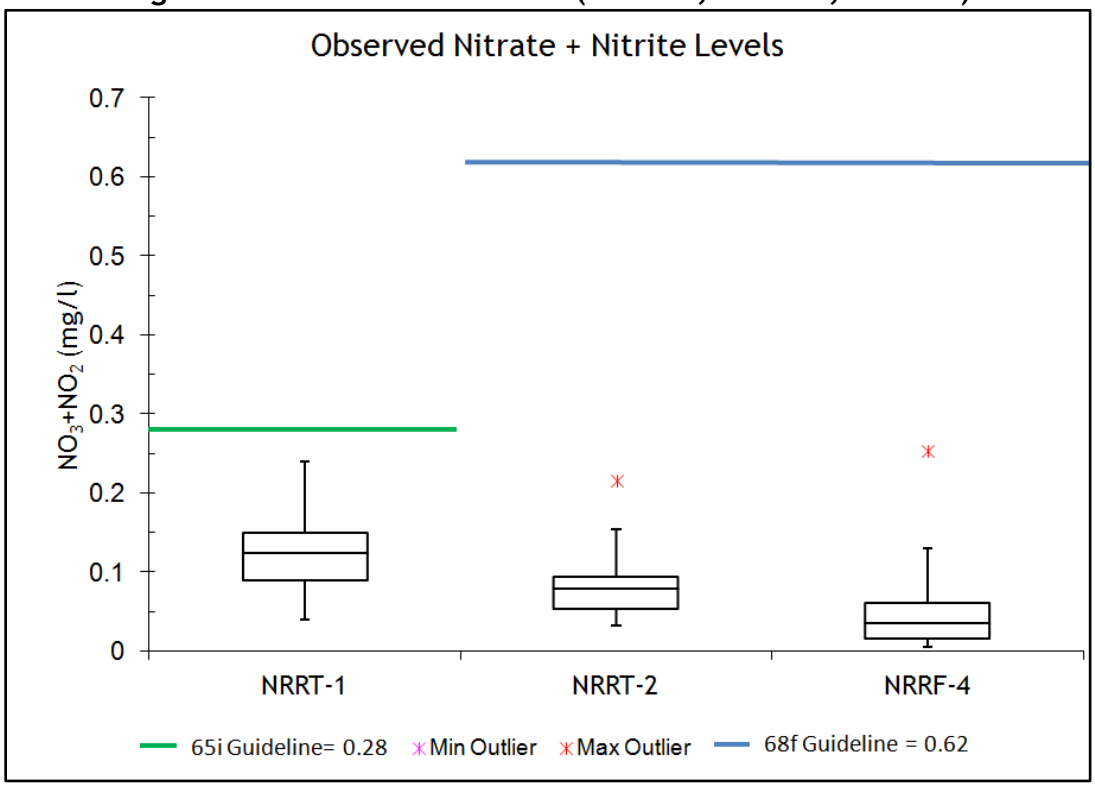


Figure 11: Total Phosphorus (NRRT-1, NRRF-4)

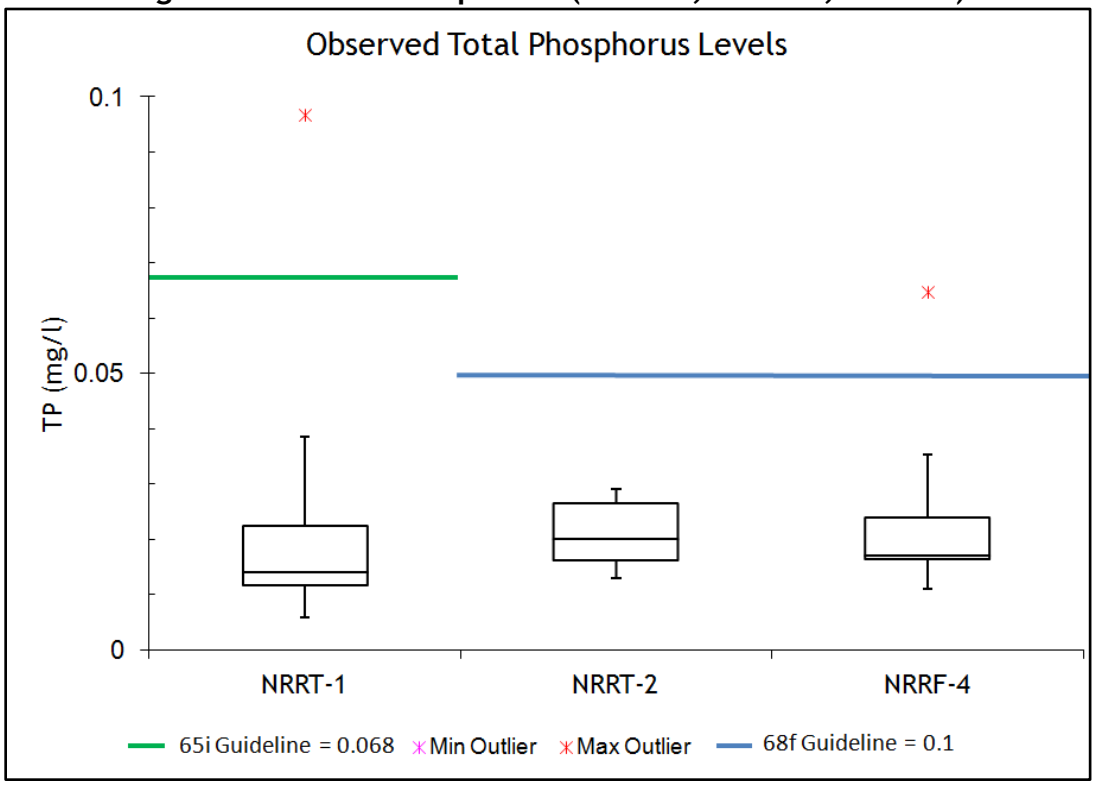


Figure 12: Diurnal Data (NRRT-1, June 2012)

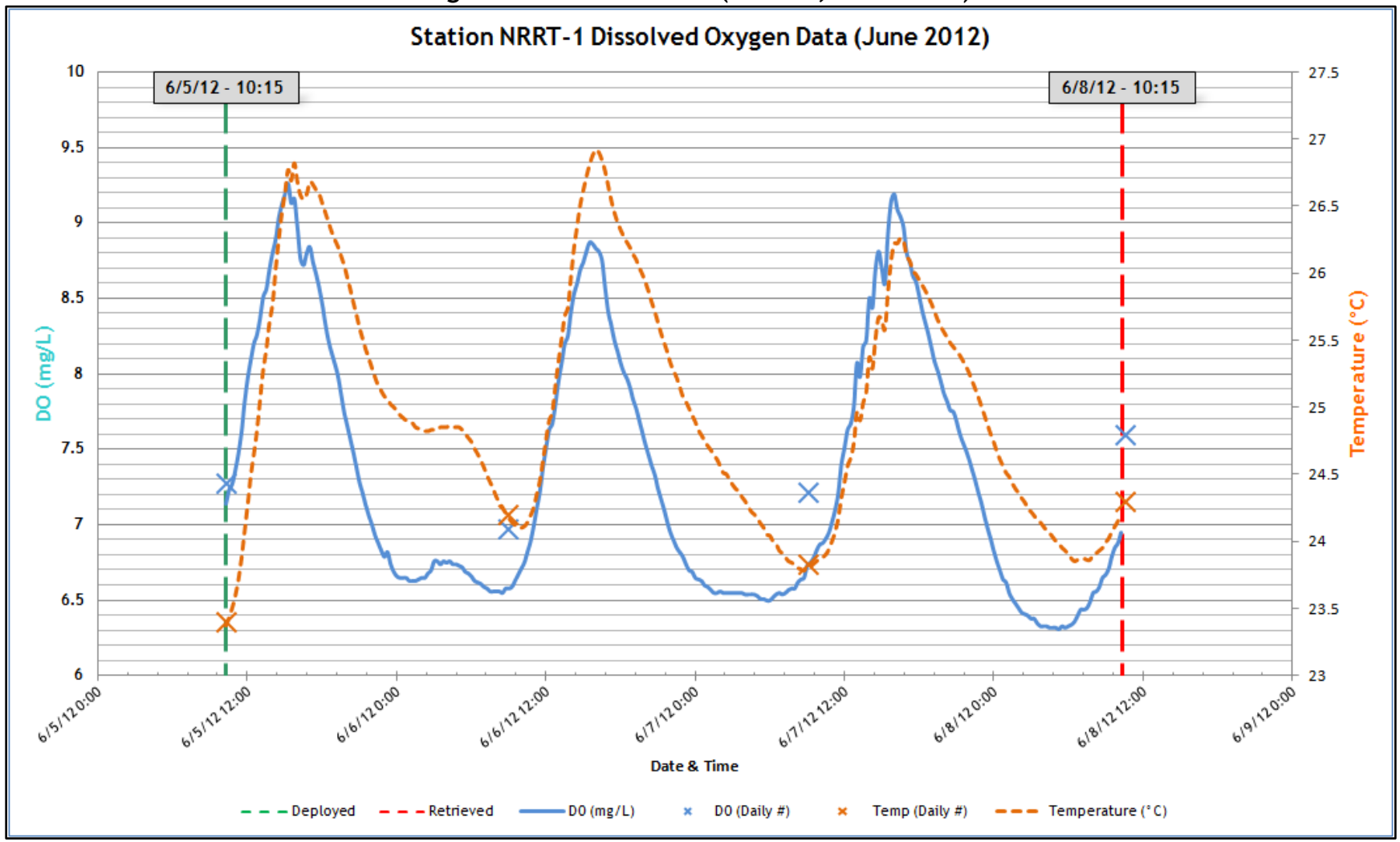


Figure 13: Diurnal Data (NRRT-2, June 2012)

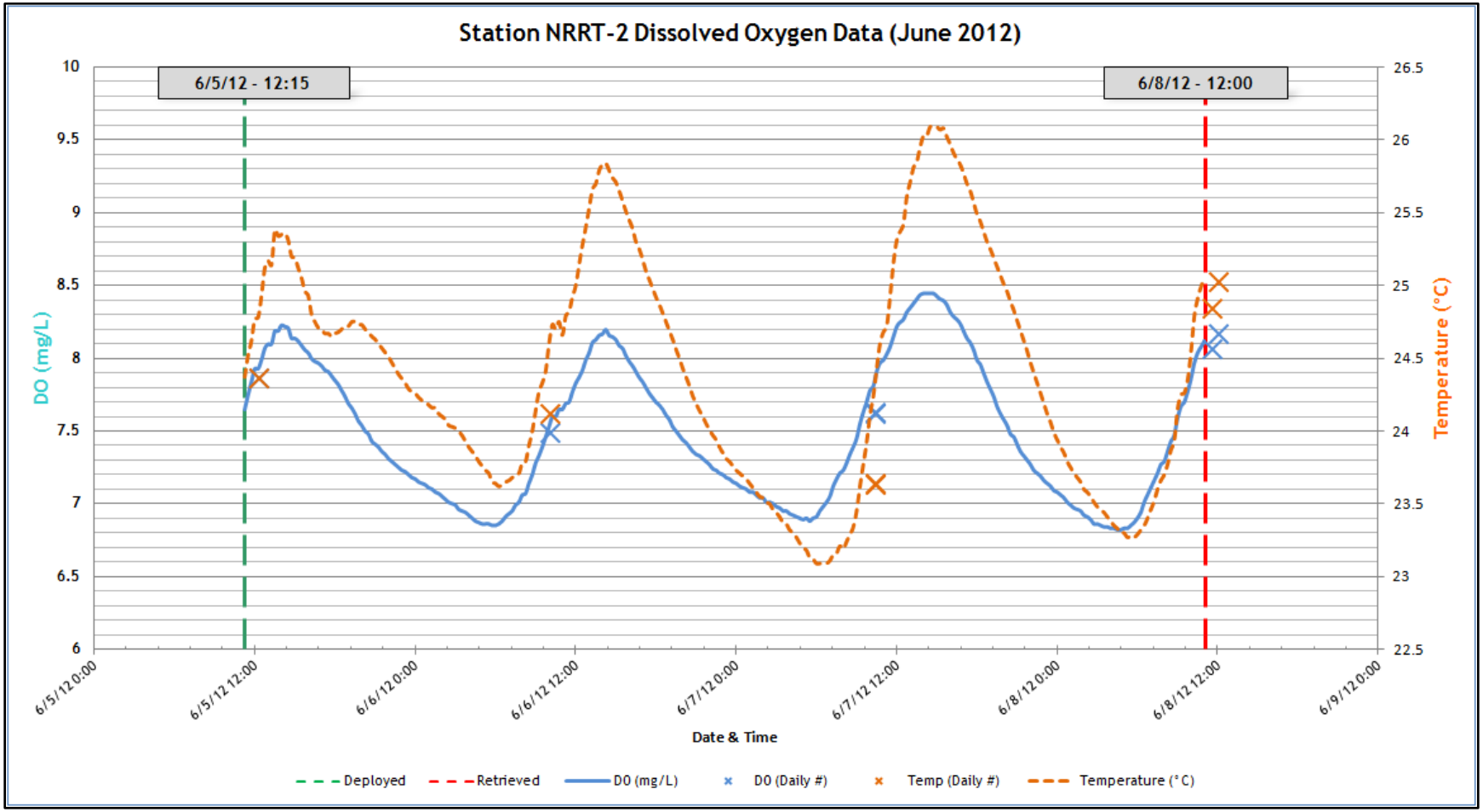
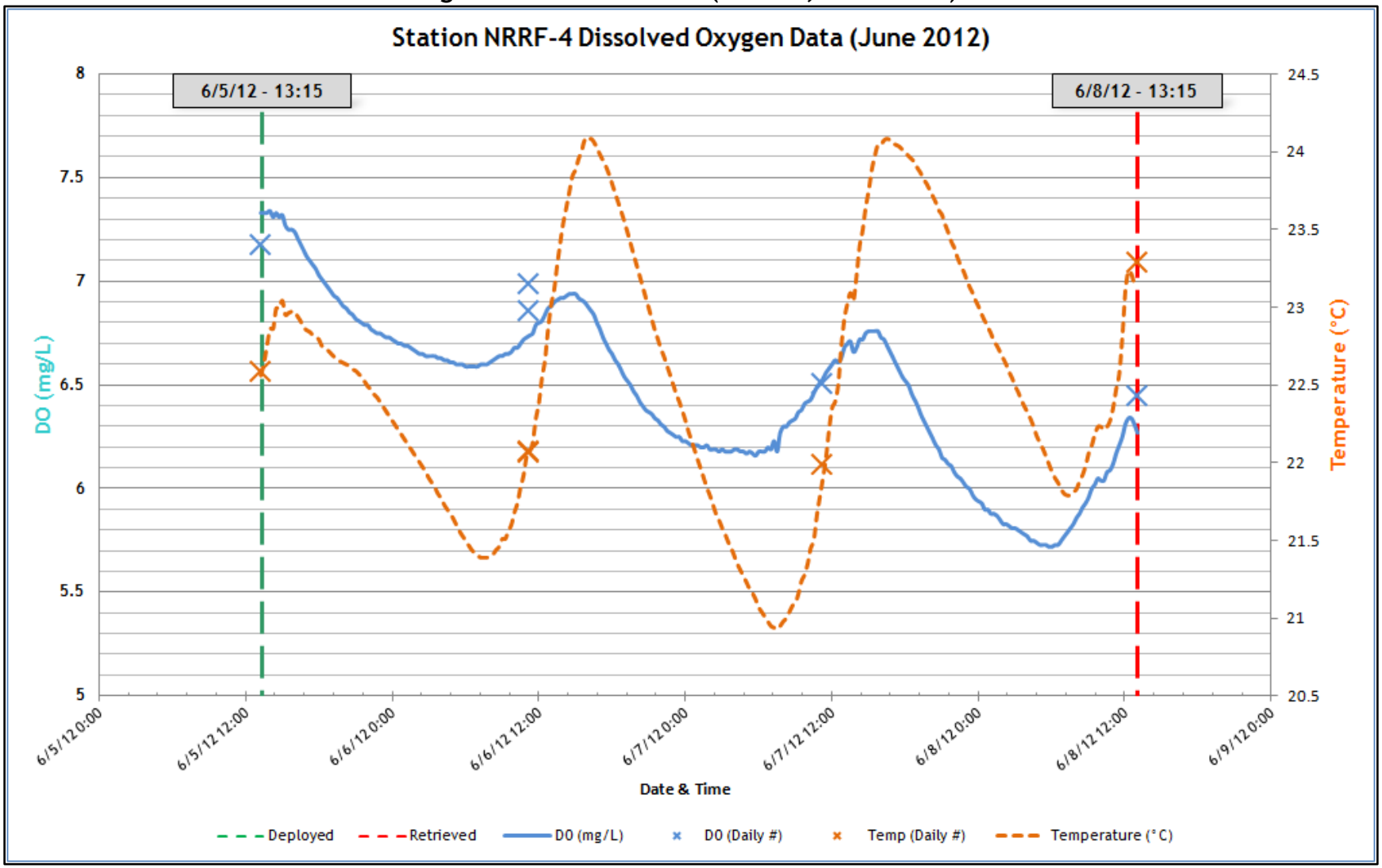


Figure 14: Diurnal Data (NRRF-4, June 2012)



5.0 SUMMARY & CONCLUSIONS

5.1 Conventional Water Quality Parameters Results

Water temperature, pH, and dissolved oxygen data collected at NRRT-1, NRRT-2, and NRRF-4 were consistent with the numeric water quality criteria for the *Fish & Wildlife* use classification. Conductivity was elevated at station NRRT-1 and slightly elevated at stations NRRT-2 and NRRF-4. Total suspended solids (TSS) levels were below the ecoregional guidelines at all three stations. Typically, turbidity is measured on an individual measurement basis, but median values at all three stations were below the ecoregional guidelines.

5.2 Biological and Habitat Assessment Results

Macroinvertebrate assessments performed in 2012 at all three stations graded overall macroinvertebrate community health as "fair." Furthermore, the habitat assessments conducted during the same station visits graded all three stations as "optimal" for overall habitat suitability.

5.3 Nutrient Data Results

With respect to nutrients, the median of observed chlorophyll-a levels were below ecoregional guidance for Ecoregions 65i and 68f. Likewise, total Kjeldahl nitrogen (TKN) and total phosphorus (TP) concentrations were also well below the ecoregional guidelines for all three stations. Ammonia-nitrogen concentrations at all sampling locations were below the ecoregional guidelines developed for Alabama, as well the USEPA-recommended total ammonia-nitrogen guidance.

5.4 Conclusions

Based on examination of physical, chemical, and biological data collected within the impaired portion of the North River (Assessment Unit AL003160112-0411-102), ADEM has determined that impairment due to nutrients and siltation/habitat alteration does not exist and the waterbody is currently meeting applicable water quality standards. Accordingly, ADEM will not proceed with TMDL development on the North River due to "more recent or accurate data" which, in doing so, provides sufficient justification for delisting a waterbody consistent with Title 40 of the *Code of Federal Regulations* (CFR), Part 130.7(b)(6)(iv).

6.0 MONITORING SCHEDULE

ADEM uses a basin approach to water quality management that divides Alabama's 14 major river basins into five groups. Each year, ADEM's water quality monitoring resources are concentrated in one of the five basin groups. One goal of surface water quality sampling is continued monitoring of impaired. Monitoring will help further characterize practices and load reductions in impaired watershed and ensure that healthy watersheds are continuing to meet all applicable water quality standards. Monitoring will occur in each basin according to the schedule listed in Table 10 below. In addition to scheduled basin rotation sampling, beach monitoring data is collected monthly every year and other stations that are part of trend monitoring or other sampling initiatives are often sampled more frequently than the basin rotation schedule. Station DVBB-1 and MOBB-1 are categorized as coastal assessment stations and are typically sampled several times annually.

Table 10: Basin Rotation Monitoring Schedule

River Basin Group	Year to be Monitored
Chattahoochee / Chipola / Choctawhatchee / Perdido-Escambia	2014
Alabama / Coosa / Tallapoosa	2015
Escatawpa / Upper Tombigbee / Lower Tombigbee / Mobile	2016
Black Warrior / Cahaba	2017
Tennessee	2018

7.0 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 Mr. Chris Johnson at (334)271-7827 or 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 final completion of this DD and subsequent submission to EPA Region 4 for final approval.

8.0 REFERENCES

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Slack, L.J., 1987, Water quality of Lake Tuscaloosa and streamflow and water quality of selected tributaries to Lake Tuscaloosa, Alabama, 1982-86: U.S. Geological Survey, Water-Resources Investigations Report 87-4002, 64 p.

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United States Environmental Protection Agency, 1986. Quality Criteria for Water. Office of Water. EPA 440/4-91-001.

Wynn, E.A., O'Neil, P.E., McGregor, S.W., Powell, J.R., Pritchett, J.M., Ford, A.D., & Johnson, P.D., 2012, Strategic habitat and river reach units for aquatic species of conservation concern in Alabama, Geological Survey of Alabama Special Map 248.

9.0 APPENDICES

9.1 Water Quality Data

Table 11: Water Quality Data (NRRT-1)

Station ID	Visit Date	T H2O (°C)	DO (mg/l)	pH (SU)	Cond (µS/cm)	NH3 (mg/l)	NO_3-NO_2-N (mg/l)	Chl A (µg/l)	Total P (mg/l)	TKN (mg/l)	TSS mgl (mg/l)	Turbidity (NTU)
NRRT-1	6/12/08 11:30	28.16	8.38	8.26	504	0.015	0.045	1.6	0.006	0.781	1	3.32
NRRT-1	8/13/08 11:00	24.28	10.78	8.84		0.069	0.165	11.4	0.006	0.596	9	5.94
NRRT-1	10/15/08 11:40	22.63	9.74	8.58	1219	0.01	0.0394	1.34	0.028	1.73	1	1.9
NRRT-1	6/4/09 10:52	24.21	8.62	7.83	313		0.453	1			1	4.17
NRRT-1	8/5/09 11:00	27.01	8.02	8.08	329	0.006	0.123	2.37	0.022	0.208	5	10
NRRT-1	10/8/09 10:35	19.03	9	7.98	74	0.006	0.061	1	0.052	0.502	30	71.5
NRRT-1	5/13/10 10:37	20.07	8.74	7.48	198	0.021	0.119	0.36	0.013	0.08	1	5.95
NRRT-1	7/8/10 10:22	26.94	7.54	8.09	1426	0.021	0.342	3.2	0.014	0.08	1	5.81
NRRT-1	9/9/10 11:35	24.65	8.91	8.52	403.9	0.021	0.883	1.78	0.012	0.469	4	3.17
NRRT-1	5/12/11 9:05	21.95	8.65	7.82	359.8	0.005	0.094	0.97	0.009	0.107	1	3.91
NRRT-1	7/14/11 8:47	27.54	6.83	8.26	1456	0.005	0.144	3.47	0.011	0.63	1	2.58
NRRT-1	9/14/11 8:51	21.23	8.21	7.35	309.3	0.023	0.151	1.07	0.011	0.107	1	6.34
NRRT-1	4/2/12 11:10	19.95	9.06	6.86	174	0.007	0.083	0.53	0.012	0.337	1	7.46
NRRT-1	5/2/12 14:08	24.5	9.32	8.29	446.4							3.14
NRRT-1	5/8/12 11:36	23.5	8.44	7.09	186.9	0.007	0.047	0.1	0.015	0.076	6	5.36
NRRT-1	6/13/12 10:55	24.98	7.6	7.1	239.3	0.008	0.13	1.07	0.024	0.179	2	9.88
NRRT-1	7/11/12 11:15	27.41	8.59	8.43	2271	0.008	0.09	5.34	0.021	0.33	1	3.78
NRRT-1	7/25/12 13:48	30.13	7.11	7.87	491.3							3.38
NRRT-1	8/8/12 11:06	28.08	6.92	8.13	1548	0.008	0.118	1.34	0.016	0.539	2	4.2
NRRT-1	9/5/12 10:41	25.29	7.44	7.06	128.2	0.008	0.231	1.6	0.033	0.227	9	31.2
NRRT-1	10/2/12 13:03	20.43	7.86	7.17	121.7	0.008	0.15	4.27	0.037	0.084	71	62.7
NRRT-1	10/31/12 11:08	10.3	10.07	7.38	358.2	0.008	0.056	0.27	0.014	0.041	1	4.39
NRRT-1	12/4/12 12:47	11.25	11.02	8.33	485	0.008	0.09	0.1	0.013	0.084	1	3.22
NRRT-1	1/9/13 13:02	8.39	11.61	7.29	180.4	0.008	0.18	0.1	0.01	0.333	1	7.7
NRRT-1	2/5/13 12:20	8.31	11.49	7.37	161.6	0.066	0.145	0.36	0.009	0.236	5	8.6
NRRT-1	3/7/13 10:50	8.1	12.6	7.92	255	0.029	0.123	1.07	0.016	0.21	1	6.97
NRRT-1	4/4/13 10:30	11.96	11.06	7.66	146	0.06	0.13	1	0.0134	0.06	6	3.88
NRRT-1	5/9/13 10:45	16.29	10.35	7.96	162	0.02	0.123	1	0.018	0.3	4	9.75
NRRT-1	6/6/13 10:40	23.72	7.65	7.8	288	0.029	0.126	2.67	0.043	1.5	194	141
NRRT-1	7/11/13 11:15	24.54	7.73	7.69	115	0.025	0.141	5.34	0.097	0.71	111	130
NRRT-1	8/8/13 11:00	26.26	8.33	8.02	330	0.015	0.124	1.6	0.014	0.31	11	16.9
	N	31	31	31	30	28	29	29	28	28	29	31
	Min	8.10	6.83	6.86	74.00	0.01	0.04	0.10	0.01	0.04	1.00	1.90
	Max	30.13	12.60	8.84	2271.00	0.07	0.88	11.40	0.10	1.73	194.00	141.00
	Mean	21.33	8.96	7.82	489.33	0.02	0.16	1.98	0.02	0.39	16.66	18.97
	10th %-ile	10.30	7.44	7.10	127.55	0.01	0.05	0.24	0.01	0.08	1.00	3.17
	50th %-ile (Median)	23.72	8.62	7.87	311.15	0.01	0.12	1.07	0.01	0.27	2.00	5.94
	90th %-ile	27.54	11.06	8.43	1429.00	0.04	0.25	4.48	0.04	0.73	38.20	62.70
	ER Guidelines (2010):				25.80	0.09	0.28	4.73	0.07	0.68	27.50	26.21

Table 12: Water Quality Data (NRRT-2)

Station ID	Visit Date	T H2O (°C)	DO (mg/l)	pH (SU)	Cond (µS/cm)	NH3 (mg/l)	NO_3-NO_2-N (mg/l)	Chl A (µg/l)	Total P (mg/l)	TKN (mg/l)	TSS mgl (mg/l)	Turbidity (NTU)
NRRT-2	4/2/12 13:43	20.12	9.13	6.79	138.4	0.007	0.055	0.36	0.013	0.076	1	10
NRRT-2	5/3/12 8:28	22.35	6.96	7.28	180.2							6.11
NRRT-2	5/8/12 13:27	22.12	7.99	6.86	167	0.007	0.073	0.53	0.028	0.154	10	26.9
NRRT-2	6/5/12 12:00	23.65	7.62	7.5	261							6.47
NRRT-2	6/13/12 12:28	25.45	7.85	3.54	210.3	0.008	0.086	0.53	0.029	0.163	3	15.7
NRRT-2	7/11/12 12:25	26.85	6.32	7.32	595	0.008	0.048	1.34	0.021	0.303	8	4.27
NRRT-2	7/25/12 15:32	31.4	6.56	7.08	80.6							8.86
NRRT-2	8/8/12 13:41	22.9	7.78	6.42	86.1	0.018	0.086	1.6	0.017	0.382	1	5.5
NRRT-2	9/5/12 12:40	26.32	8.41	7.51	475.6	0.008	0.116	0.1	0.019	0.239	4	11.5
NRRT-2	10/2/12 13:31	19.96	7.57	6.87	75.7	0.008	0.216	1.78	0.026	0.208	74	136
NRRT-2	10/31/12 13:02					0.008	0.032	0.27	0.014	0.041	1	5.62
N		10	10	10	10	8	8	8	8	8	8	11
Min		19.96	6.32	3.54	75.70	0.01	0.03	0.10	0.01	0.04	1.00	4.27
Max		31.40	9.13	7.51	595.00	0.02	0.22	1.78	0.03	0.38	74.00	136.00
Mean		24.11	7.62	6.72	226.99	0.01	0.09	0.81	0.02	0.20	12.75	21.54
10th %-ile		8.91	6.87	6.81	74.68	0.01	0.05	0.25	0.01	0.08	1.00	4.04
50th %-ile (Median)		23.28	7.70	6.98	173.60	0.01	0.08	0.53	0.02	0.19	3.50	8.86
90th %-ile		27.31	8.48	7.50	487.54	0.01	0.15	1.65	0.03	0.33	29.20	26.90
ER Guidelines (2010):					39.15	0.10	0.62	2.67	0.05	0.73	14.00	10.10

Table 13: Water Quality Data (NRRF-4)

Station ID	Visit Date	T H2O (°C)	DO (mg/l)	pH (SU)	Cond (µS/cm)	NH3 (mg/l)	NO_3-NO_2-N (mg/l)	Chl A (µg/l)	Total P (mg/l)	TKN (mg/l)	TSS mgl (mg/l)	Turbidity (NTU)
NRRF-4	4/2/12 14:48	19.71	8.59	6.65	158.3	0.007	0.013	0.1	0.011	0.076	3	10.5
NRRF-4	5/3/12 10:26	20.25	6.25	6.74	138.6							11.5
NRRF-4	5/8/12 14:37	21.34	7.27	6.35	123.7	0.007	0.084	2.14	0.024	0.155	11	29.3
NRRF-4	6/5/12 12:50	22.07	6.86	6.36	78							10.6
NRRF-4	6/13/12 13:52	24.35	6.92	6.36	86.6	0.008	0.054	0.1	0.024	0.21	1	14.4
NRRF-4	7/11/12 13:22	25	5.36	6.56	122.5	0.008	0.045	1.07	0.017	0.302	19	10.9
NRRF-4	7/26/12 7:10	26.56	3.7	6.5	74.9							8.63
NRRF-4	8/8/12 14:52	24.77	4.45	6.17	107.1	0.008	0.025	0.1	0.017	0.35	1	8.34
NRRF-4	9/5/12 13:31	26.35	4.08	6.75	140.1	0.051	0.017	0.53	0.015	0.043	1	4.63
NRRF-4	10/2/12 14:58	19.57	7.61	6.72	71.1	0.008	0.254	0.1	0.065	0.187	12	45.3
NRRF-4	10/31/12 13:59	11.12	7.4	7.41	135.6	0.008	0.005	0.1	0.017	0.041	1	7.59
N		11	11	11	11	8	8	8	8	8	8	11
Min		11.12	3.70	6.17	71.10	0.01	0.01	0.10	0.01	0.04	1.00	4.63
Max		26.56	8.59	7.41	158.30	0.05	0.25	2.14	0.07	0.35	19.00	45.30
Mean		21.92	6.23	6.60	112.41	0.01	0.06	0.53	0.02	0.17	6.13	14.70
10th %-ile		19.61	4.19	6.35	72.53	0.01	0.02	0.10	0.01	0.08	1.00	6.11
50th %-ile (Median)		22.07	6.86	6.56	122.50	0.01	0.04	0.10	0.02	0.17	2.00	10.60
90th %-ile		26.35	7.61	6.75	140.10	0.02	0.14	1.39	0.04	0.32	14.10	29.30
ER Guidelines (2010):					39.15	0.10	0.62	2.67	0.05	0.73	14.00	10.10

Table 14: Alabama's 2010 Ecoregional Guidelines

Alabama's 2010 Ecoregional Reference Guidelines																		
			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
Parameters	Basis of comparison	Result to compare	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	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)																			
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	0.2598	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	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	0.0298	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
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

9.2 Sampling Station Pictures

Picture 1: NRRT-1 (North River @ CR38) – Upstream, 06/06/2012

Picture 2: NRRT-1 (North River @ CR38) – Downstream, 06/06/2012

Picture 3: Station NRRT-2 (North River @ CR63) – Upstream, 06/06/2012

Picture 4: Station NRRT-2 (North River @ CR63) – Downstream, 06/06/2012

Picture 5: NRRF-4 (North River @ CR 30) – Upstream, 06/06/2012

Picture 6: NRRF-4 (North River @ CR 30) – Downstream, 06/06/2012