

Connect
Cobb



Northwest Transit Corridor
Environmental Assessment

Appendix C

Aquatic Species Report

Protected Aquatic Species Survey Report

Cobb and Fulton Counties

Connect Cobb Northwest Transit Corridor

Under Contract With:
Kimley-Horn and Associates, Inc.
2 Sun Court, Suite 220
Norcross, Georgia 30092

Prepared By:
Edwards-Pitman Environmental, Inc.
1250 Winchester Parkway
Suite 200
Smyrna, Georgia 30080

December 2014

Report Author: 
Martin Melville
Aquatic Ecologist

Table of Contents

1.0	INTRODUCTION	
1.1	Study Location and Purpose	1
1.2	Background Information	2
2.0	SURVEY PROTOCOLS/METHODOLOGY	12
3.0	RESULTS/DISCUSSION	
3.1	Site Conditions and Water Quality	14
3.2	Biological Survey	26
3.3	Summary	27
4.0	QUALIFICATIONS STATEMENT	
4.1	Qualifications	30

FIGURES

Figures 1A-M Project Location
Figures 2A-J Aquatic Survey Limits

TABLES

Table 1	Federal and State Protected Aquatic Species Targeted for the Survey
Table 2	Water Quality Summary
Table 3	Fish Summary
Table 4	Crayfish Summary
Table 5	Mollusk Summary

APPENDICES

Appendix A	References
Appendix B	Protected Species Information
Appendix C	USFWS Site Condition Data Forms
Appendix D	Site Photographs
Appendix E	USGS Stream Gage Information
Appendix F	Fish Photographs
Appendix G	Crayfish Photographs
Appendix H	Mollusk Photographs

1.0 INTRODUCTION

1.1 Study Location and Purpose

This report documents the results of an aquatic survey and the potential impacts on federally and state protected crayfish, fish, and mussels associated with the Arterial Rapid Transit (ART) service and associated improvements on United States Highway (US) 41/Cobb Parkway (see Figures 1A-M – Project Location Map). This project is located within the Etowah River watershed, [Hydrologic Unit Code (HUC)8: 03150104], Chattahoochee River, middle upper watershed (HUC8: 03130002), and the Chattahoochee River, upper watershed (HUC8: 03130001). The Chattahoochee River, upper watershed (HUC8: 03130001) and the Chattahoochee River, middle upper watershed (HUC8: 3130002) are designated as priority watersheds by the United States Environmental Protection Agency (USEPA).

The proposed project includes ART service and associated improvements on US 41/Cobb Parkway, as described below. The term ART is descriptive of a system that would operate on arterial roads and is now a common term for similar transit systems. The majority of the ART system would operate on fixed guideway (from the cities of Kennesaw to Cumberland), would have continuing service to the existing Metropolitan Atlanta Rapid Transit Authority (MARTA) Arts Center Station on existing roads, and would begin at the terminus station at Kennesaw State University (KSU) near the intersection of Chastain Road and Frey Road.

The alignment is routed as follows from Kennesaw State Station:

- Continues north on Frey Road in mixed traffic where it crosses Interstate (I)-75 on the proposed Skip Spann Connector to Busbee Drive (construction of the Skip Spann Connector is underway and scheduled to be completed in 2016);
- Continues south on Busbee Drive to George Busbee Parkway, where it travels past Town Center and Barrett Parkway to the proposed South Barrett Reliever Phases 2 and 3;
- Continues on the proposed South Barrett Reliever, which includes one dedicated lane for ART vehicles and one general purpose lane in each direction. The alignment then continues on dedicated guideway on Barrett Lakes Boulevard until US 41/Cobb Parkway. Transitions to center-running dedicated guideway (one lane in each direction) on US 41/Cobb Parkway between Greers Chapel Road and Cumberland Boulevard;
- Continues on Cumberland Boulevard in center-running dedicated lanes, one in each direction, between US 41/Cobb Parkway and Akers Mill Road;
- Transitions to side-running dedicated bus lanes on either side of Akers Mill Road from Cumberland Boulevard to I-75;

- Accesses I-75 southbound and operates in existing High Occupancy Vehicle (HOV) lanes, exiting at US 41/Northside Drive. No improvements will be made on I-75 as part of the proposed project;
- Operates in mixed traffic on US 41/Northside Drive. No improvements will be made to Northside Drive as part of the proposed project;
- Turns east onto 17th Street and uses the existing side-running dedicated bus lanes, crossing I-75/I-85 and turning onto Spring Street in mixed traffic. No improvements will be made to 17th Street or Spring Street as part of the proposed project; and
- Continues south on Spring Street and turns east onto 14th Street, then north onto West Peachtree Street to the existing MARTA Arts Center Station, all in mixed traffic. No improvements will be made to Spring Street, 14th Street, or West Peachtree Street as part of the proposed project.

In total, the length of the proposed project is 25.3 miles from the City of Kennesaw to the existing MARTA Arts Center Station. Of this length, 13.2 miles (52.2 percent) is in fixed guideway and 12.1 miles (47.8 percent) is in mixed traffic. In addition to the 14 stations to be added for ART, it is anticipated that the existing MARTA Arts Center Station would be modified with the addition of bus bays/platforms to accommodate ART vehicles.

The proposed transit station locations include KSU, Town Center, Barrett Lakes Boulevard, White Circle, Battlefield, WellStar Kennestone, Allgood Road, North Loop/White Water, Big Chicken/Roswell Road, University, Dobbins Air Reserve Base, Windy Hill Road, Cumberland North, Cumberland South, and MARTA Arts Center Station. The Northside Parkway/Paces Ferry, Howell Mill Road, BeltLine, Millennium Gate, Atlantic Station stations are proposed future stations and are not part of the proposed project.

The United States Fish and Wildlife Service (USFWS) and the Georgia Department of Natural Resources (GADNR) Nongame Conservation Section (NCS) listed occurrences of federally protected fish, mollusks and crayfish for Cobb and Fulton Counties. For purposes of this report, the phrase “federally protected” refers to all aquatic species listed by the USFWS for protection under the Endangered Species Act.

1.2 Background Information

The USFWS Information, Planning, and Conservation System website (IPaC) (USFWS 2014) and GADNR website listed occurrences of federally and state protected mollusks, fish, and non-burrowing crayfish for Cobb and Fulton Counties (GADNR 2014a), Etowah River watershed, (HUC8:03150104) (GADNR 2014b), and the Chattahoochee River, upper watershed (HUC8: 03130001) (GADNR 2014b) are in Table 1 and discussed in the following paragraphs. The GADNR-NCS records indicates one

federally protected fish, the Cherokee darter (*Etheostoma scotti*), one state protected mussel, the delicate spike (*Elliptio arctata*), and one state protected crayfish, the Chattahoochee crayfish (*Cambarus howardi*) as occurring within a 3.0 mile radius of the proposed project. A copy of the letter received on July 1, 2013 from the GADNR-NCS is enclosed in Appendix B – Protected Species Information.

Aquatic species listed with the Chattahoochee River, middle upper watershed (HUC8:03130002) were omitted from the descriptions below and Table 1 due to the lack of perennial streams that occurred within the portion of the proposed project. The Gulf moccasinshell (*Medionidus penicillatus*), oval pigtoe (*Pleurobema pyriforme*), and the purple bankclimber (*Elliptoideus sloatianus*) were also omitted in the descriptions below and Table 1 because these species do not occur within the Chattahoochee River, upper watershed (HUC8: 03130001) or the Etowah River watershed (HUC8: 03150104).

Species' name, legal status (state and federal), habitat requirements, species range (historical and present), and element occurrence data for the target species of concern are presented below.

Etowah Darter (*Etheostoma etowahae*) – Federally Endangered, State Endangered

The Etowah darter is approximately 7.0 centimeters (2.76 inches) long and has a compressed body with eight broad blotches marking the dorsum and up to 11 indistinct dark bars along the sides. A close relative of the greenbreast darter (*Etheostoma jordani*) and lipstick darter (*Etheostoma chuckwachatte*), the Etowah darter is distinguished by the absence of red spots along the sides or the lack of orange on the lips. Males have red banding in the dorsal and caudal fins, and bluish coloration on the lower sides of the head and on the pectoral, pelvic, and anal fins. Preferred habitat is riffles with moderate to strong current over gravel and cobble substrates.

This species is endemic to the Etowah River system upstream from Allatoona Reservoir (Coosa River system). Etowah darters occur in the main channel of the Etowah River and in larger tributaries to the river. This species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Amber Darter (*Percina antesella*) – Federally Endangered, State Endangered

The amber darter is approximately 7.5 centimeters (2.95 inches) long and is distinguished by the placement of its first dorsal saddle, which is located anteriorly to the spiny dorsal fin. The sides are marked with small brown blotches, and the ventral side is light in color. The fins are clear, with faint banding on the dorsal, pectoral, and caudal fins. Breeding males develop tubercles on the caudal peduncle and on the anal, caudal, pectoral, and pelvic fins. The amber darter inhabits the main channel of the

Etowah and Conasauga rivers and larger tributaries. They prefer riffle habitats with moderate to swift currents, over gravel and cobble substrate, with patches of sand and riverweed (*Podostemum ceratophyllum*). They are rarely found in shallow, low velocity microhabitats or in areas with significant siltation.

Historically, this species is endemic to the upper Coosa River Basin in Georgia and southeastern Tennessee. Collection efforts in the Etowah River system have discovered eight locations with populations in the Etowah River above the Allatoona Reservoir and in the lower portion of Sharp Mountain Creek. The amber darter has been collected in the lower portion of Shoal Creek and just above the area influenced by Allatoona Reservoir. In addition, the amber darter occurs in the upper reaches of the Conasauga River near Dalton, Georgia. This species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Cherokee Darter (*Etheostoma scotti*) – Federally Threatened, State Threatened

The Cherokee darter is distinguished by the color pattern of the breeding male's dorsal fins. The entire spiny dorsal fin is brick red with a black band at the base. The soft dorsal fin is also brick red; however, the color is not as intense. The anal and caudal fins are turquoise. This species has a rounded snout, a distinct dark bar beneath the eye, and seven to eight dorsal and lateral blotches that may fuse together. An adult Cherokee darter can reach a length of approximately 4.1 to 6.6 centimeters (1.6 to 2.6 inches). Cherokee darters typically inhabit small to medium-sized streams with gravel and cobble substrates.

The Cherokee darter is endemic to the Etowah River system in Georgia. Currently, this protected fish species is known to inhabit an estimated 20 small tributary systems to the Etowah River. Populations of Cherokee darters exhibit a fragmented pattern of disjunct populations, above and below the Allatoona Reservoir. The USFWS (2014) and GADNR (2014a) lists this species as occurring in Cobb and Fulton Counties and in the Etowah River watershed (HUC8: 03150104) (GADNR 2014b). The GADNR-NCS also has 13 occurrence records of the Cherokee darter ranging from approximately a 0.2 to 3.0 mile radius of the proposed project.

Finelined Pocketbook (*Hamiota altilis*) – Federally Threatened, State Threatened

The finelined pocketbook is a medium-sized mussel with a maximum length of 10.1 centimeters (4.0 inches). It is sub-oval, and the females have a pointed posterior margin. The periostracum is yellowish to dark brown with fine rays on the posterior half and white nacre. The finelined pocketbook lives in small streams to large rivers in sandy to muddy sand substrates or gravel shoals with moderate current.

The finelined pocketbook's historic range included the Tombigbee and Alabama rivers and their tributaries in Alabama, Georgia, Mississippi, and Tennessee. Very localized populations still exist in these systems, but most are restricted to small creeks. In Georgia, the finelined pocketbook is currently known from the upper Conasauga River and from a recent collection from a tributary to the Etowah River in Polk County. Recent collections in the upper Tallapoosa River in Alabama suggest that this species may occur in the Tallapoosa River in Haralson County. However, the finelined pocketbook has not been collected from the Etowah, Oostanaula, and Conasauga River drainages since 1998 (IUCN 2014). This species is listed as only occurring within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Shinyrayed Pocketbook (*Hamiota subangulata*) – Federally Endangered, State Endangered

The shinyrayed pocketbook has a subelliptical shell that is approximately 8.25 centimeters (3.25 inches) long in adults. The shell is light yellowish-brown with emerald green rays. The nacre is white with occasional salmon tinting. This species inhabits clean sand or silty sand substrates in areas of slow to moderate current in medium-sized creeks and rivers.

This species was originally described from the Chattahoochee River in Columbus, Georgia and occurred widely throughout the lower Chattahoochee/Apalachicola, Flint, and Ochlockonee River systems. The species was also found in the Chipola River system in Alabama and Florida. In Georgia, the known occurrences are limited to a few locations in the Chattahoochee River and its tributaries, a few Ochlockonee River sites, and several Flint River system sites - primarily tributaries. The USFWS IPaC (2014) and GADNR (2014a) lists this species as occurring in Fulton County and within the Chattahoochee River, upper watershed (HUC8: 03130001) (GADNR 2014b).

Holiday Darter (*Etheostoma brevirostrum*) – State Endangered

The holiday darter is a fish species reaching approximately 5.8 centimeters (2.3 inches) in length and is characterized by an extremely blunt snout. The sides are marked with nine to 10 dark blotches, and the first dorsal fin has a red window anteriorly. These blotches become green bars interspersed with red on breeding males. The dorsal fin of breeding males has blue marginal bands and broad red submarginal bands. Males also have a red band on the blue-green anal fin, and a dark bar that extends below each eye.

Holiday darters are usually found in medium-sized streams where they may inhabit moderate to swift currents around cobble and boulders. This species is endemic to the upper Coosa River system of Georgia, Alabama, and southeastern Tennessee. In Georgia, the holiday darter occurs only in the upper

Conasauga River, Coosawattee River, and Etowah River systems and their tributaries. This species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Freckled Darter (*Percina lenticula*) – State Endangered

The freckled darter is a fish that can reach a maximum length of 20.0 centimeters (7.0 inches). The freckled darter has at least 77 scales on the lateral line, about eight dark blotches and smaller spots along the sides, eight dorsal blotches, and three spots at the base of the caudal fin. Males have one to two rows of enlarged, toothed scales on the belly. There may be a dark teardrop beneath the eye, and the fins are darkly banded. A basal black spot characteristically occurs at the front of the second dorsal fin. Neither males nor females develop bright coloration during the spawning season.

This darter is found in large streams in riffles and runs with swift currents over rocky substrates or around large woody debris. It may occupy relatively deep portions of riffles and runs. The freckled darter occurs in Gulf of Mexico tributaries from the Pearl River drainage east to the Mobile River drainage in Louisiana, Mississippi, Alabama, and Georgia. In Georgia, this species is known from isolated localities in the Etowah River and Conasauga River. This species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Rock Darter (*Etheostoma rupestre*) – State Rare

The rock darter is a fish that can reach a maximum length of 8.4 centimeters (3.4 inches). The rock darter is characterized by its six squared shaped dorsal saddles and the six to nine markings on the sides that can either represent blotches or vertical bars.

The rock darter is found in large streams in riffles and runs with swift currents over rocky substrates. It is often associated with riverweed. The rock darter is endemic to the Mobile Basin in Mississippi, Alabama, Georgia, and a small portion of Tennessee. In Georgia, most records are from the Conasauga and Etowah Rivers, but the rock darter is also known from the Coosawattee River and Oostanaula River systems. This species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Bridled Darter (*Percina kusha*) – State Endangered

The bridled darter is a fish that has a slender shape and can reach a maximum length of 7.5 centimeters (3.0 inches). It has eight to 11 black oval blotches that fuse into a lateral stripe, which terminates into a square shaped spot that extends to the base of the caudal fin. The upper sides and dorsum are pale brown with irregular darker brown markings and the first dorsal fin has a narrow black edge and a black basal band. Bridled darters prefer large creeks and small, clear rivers. They generally are found in flowing

pools and runs over a variety of substrate types, including sand, gravel, cobble, boulder, and bedrock. This species is often associated with cover, such as aquatic vegetation or woody debris or detritus.

The bridled darter is endemic to the Coosa River system in Georgia and Tennessee (primarily in Georgia). Three primary populations are known in Georgia from the upper Conasauga River and its tributaries; Talking Rock Creek; and the upper Etowah River and its tributaries. This species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Coosa Chub (*Macrhybopsis* sp. 1) – State Endangered

The Coosa chub is a fish that can reach a maximum length of 6.2 centimeters (2.3 inches). It is characterized by its large eyes and its subterminal mouth with a barbel at the corner of each jaw. The body is silver with a pink or purplish hue and black speckles that form a weak developed lateral stripe. Coosa chubs are found in large streams and rivers with swift current over gravel or cobble substrate often associated with riverweed.

The Coosa chub is endemic to the Mobile Basin and only occurs above the Fall Line in the Coosa River, Tallapoosa River, and Cahaba River systems. In Georgia, this species occurs in the Ridge and Valley and Piedmont Physiographic Provinces in the Conasauga River, Coosawattee River, and Etowah River systems. This species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Lined Chub (*Hybopsis lineapunctata*) – State Rare

The lined chub is a fish that can reach a maximum length of 6.2 centimeters (2.3 inches). It is characterized by its subterminal mouth with a barbel at the corner of each jaw. The body has a dark lateral stripe that ends into a distinct lateral stripe. The upper half of the body is yellow to golden and is bordered by a pale white area on the rear half of the body. Lined chubs are usually found in pools in small to medium-sized streams and near the shoreline in sections of rivers with moderate current.

The lined chub is endemic to the Coosa and Tallapoosa River systems. The species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Frecklebelly Madtom (*Noturus munitus*) – State Endangered

The frecklebelly madtom is a fish that can reach a maximum length of 9.9 centimeters (3.9 inches). This species is characterized by yellow and brown coloration and four dark saddles on a yellow dorsum. It has black pigment speckles on its sides, belly, and barbels. The pectoral spines have six to 10 well-developed

serrations along the posterior edge. This fish is found in small to large rivers in fast to moderate current. It prefers areas with boulders, cobbles, and coarse gravel with clumps of riverweed.

The frecklebelly madtom occurs in the Mobile River and Pearl River drainages. In Georgia, this species has been found in the Etowah River upstream from Allatoona Reservoir and in the upper Conasauga River in Murray and Whitfield Counties. This species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

River Redhorse (*Moxostoma carinatum*) – State Rare

The river redhorse is a large, heavy-bodied sucker, attaining a total length of 75.0 centimeters (29.5 inches). It is differentiated from other suckers by its large molariform pharyngeal teeth, bright red coloration in the dorsal and caudal fin, and an attenuated upper caudal fin lobe. Body coloration is brassy olive. Breeding males develop large tubercles on the snout, anal, and caudal fins. They will also develop a dark lateral stripe, above it a tan stripe, then another dark stripe, and finally a tan or pale dorsum. Often there will be a dark mask on the head. These colors will quickly vanish when the fish is disturbed. There are 13 to 14 dorsal fin rays, and the lateral line usually has 42 to 44 scales. They inhabit medium to large rivers and streams and may be found in riffle, runs, and pools. Adults stay in the swiftest part of the stream, in deeper runs, and do not tolerate silty, muddy habitats.

In Georgia, the river redhorse is known historically to be in the Etowah and Coosawattee Rivers in the upper Coosa River system. Other populations are known to be in the upper Mobile River drainage tributaries (Conasauga, Oostanaula, Coosawattee, and Tallapoosa River systems). In addition, populations are known to be in Brasstown Creek in the Hiawassee River system. The species is only listed within the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Bluestripe Shiner (*Cyprinella callitaenia*) – State Rare

The bluestripe shiner is characterized by a deep blue stripe along the side and ending with a dark spot on the base of the caudal fin. Small black blotches are apparent near the tip of the first dorsal ray and middle of the second dorsal ray. The body is deep, with a subterminal mouth. It is distinguished from the Ocmulgee shiner (*Cyprinella callisema*) by a crescent shaped line of black specs from eye to mouth. The bluestripe shiner inhabits large tributaries, reservoirs, and rivers with slow moving to moderate currents and sand-cobble substrates. Typically, the bluestripe shiner does not inhabit soft substrate streams. Specific habitat and spawning requirements of the bluestripe shiner has made it vulnerable to excessive sedimentation, storm water and urban runoff, chemical spills, municipal and industrial waste discharges, and other point and non-point water pollution sources.

The blueshiner is endemic to the Apalachicola River, Chattahoochee River, and Flint River drainage basins. According to the GADNR “Protected Animals of Georgia” (GADNR 1999) publication, current population trends in Georgia suggest that occurrences are generally confined to the lower Flint River basin, as well as the lower Chattahoochee River basin, generally below the West Point Lake Reservoir. The GADNR (2014a) lists this species as occurring in Cobb and Fulton Counties and within the Chattahoochee River, upper watershed (HUC8: 03130001) (GADNR 2014b).

Highscale Shiner (*Notropis hypsilepis*) – State Rare

The highscale shiner is a slender, compressed minnow, characterized by large eyes set up high on the head, a small subterminal mouth, and a blunt snout. Its dorsum is pale yellow, with the uppermost scales darkly outlined. Another distinct characteristic is the wedge shaped caudal spot that is separated from the lateral stripe. The maximum standard length is approximately 5.1 centimeters (2.0 inches). They spawn in late spring/early summer. Highscale shiners are found in tributary streams near confluences with larger rivers. They inhabit runs and pools over sand and bedrock substrates.

Highscale shiners occur in the Chattahoochee and Flint River systems of Georgia and Alabama, from the headwaters of these systems to just below the Fall Line. It is also found in a tributary of the upper Tallulah River (Savannah River drainage). The GADNR (2014a) lists this species as occurring in Cobb and Fulton Counties and within the Chattahoochee River, upper watershed (HUC8: 03130001) (GADNR 2014b).

Halloween Darter (*Percina crypta*) – State Threatened

The Halloween darter reaches a maximum length of 13.0 centimeters (5.1 inches). This species is distinguished by seven to 13 dark lateral bars, seven rectangular dorsal saddles, and a broad stripe under the eye. This species closely resembles the common blackbanded darter (*Percina nigrofasciata*), which occurs sympatrically with the Halloween darter. These species can be distinguished by the spacing in the dorsal saddles. The Halloween darter has dorsal saddles spaced closely together, separated at most by the width of the saddle; whereas, the saddle separation on the blackbanded darter is usually by more than one saddle width. This species spawns during April and May. This species prefers riffles or shoals in mainstem rivers and large streams.

The Halloween darter occurs in the Flint River and Chattahoochee River mainstems and their larger tributaries in Georgia and Alabama. In Georgia, populations are known from the Chattahoochee River, upper watershed, the Flint River, upper watershed (upstream of Lake Blackshear), and the Flint River,

lower watershed (between Lake Blackshear and Lake Seminole). This species is only listed as occurring within the Chattahoochee River, upper watershed (HUC8: 03130001) (GADNR 2014b).

Delicate Spike (*Elliptio arctata*) – State Endangered

The delicate spike is a small, freshwater mussel that measures less than 8.0 centimeters (3.2 inches) in length. The shell is thin and elliptical or oval-shaped. The periostracum is dull yellowish-green in young specimens and dark brown in older specimens. The surface is often marked with green rays. The nacre is dirty white or purplish in appearance. Adult mussels are typically sessile and are found in sand, cobble, or gravel bottoms of large creeks and rivers with moderate to strong currents.

Historically, this species was found in Atlantic Slope drainages from North Carolina to the Savannah River in Georgia. It was also found within the Appalachian River system and Alabama-Coosa River systems of Georgia, Florida, Alabama, and Tennessee. However, this species is fairly rare and has possibly been extirpated from portions of its historical range. In Georgia, it may be found in portions of the Flint, Chattahoochee, and Conasauga Rivers. The GADNR (2014a) lists this species as occurring in Cobb and Fulton Counties and within the Chattahoochee River, upper watershed (HUC8: 03130001) (GADNR 2014b). The GADNR-NCS has a historic occurrence record of the delicate spike approximately 1.0 mile southeast of the proposed project within the Chattahoochee River.

Etowah Crayfish (*Cambarus fasciatus*) – State Threatened

The Etowah crayfish is a moderately-sized crayfish that reaches a maximum length of 7.5 centimeters (3.0 inches). It generally has a brownish color on its carapace and claws while the segments of its abdomen have pale centers and red rear edges. The rostrum narrows anteriorly and has small points on either side of the tip. The claws often get large and have a gap between the fingers. The Etowah crayfish usually is found underneath rocks in moderate to swift current and is often associated with woody debris or detritus.

It is endemic to the Etowah River system and is known primarily from upstream of Allatoona Dam. The records of this species are from the Piedmont Physiographic Province. This species is only listed as occurring in the Etowah River watershed (HUC8: 03150104) (GADNR 2014b).

Chattahoochee Crayfish (*Cambarus howardi*) – State Threatened

The Chattahoochee crayfish has a lavender-brown to forest green carapace that is decorated with red markings on the dorsal surface. The telson (middle portion of the tail) is bluish green and fades to a pinkish cream color near the end of the tail. The uropods (right and left portions of the tail) are pinkish

tan. The eyes are small to medium-sized. The rostrum lacks spines and tubercles (small bumps). The rostrum margins converge from the base to the tip to form a distinctive triangle shape. The carapace usually measures between 2.0 and 3.8 centimeters (0.8-1.5 inches) in length. The narrowest portion of the areola is adorned with three to six small spots or pits. It is found amongst rocks in riffle areas of rapidly flowing streams.

The Chattahoochee crayfish has a limited range within the Chattahoochee River watershed in Georgia to Halawakee Creek in Lee County, Alabama. The GADNR (2014a) lists this species as occurring in Cobb and Fulton Counties and within the Chattahoochee River, upper watershed (HUC8: 03130001) (GADNR 2014b). The GADNR-NCS also has several occurrence records (four current and historic records from 0.4 to 1.0 mile in proximity, and also from within Rottenwood Creek) of the Chattahoochee crayfish within a three mile radius of the proposed project.

Additional resources were used for background information on the distribution, ecology, and identification of freshwater mollusks and fish. These resources included a review of unionid collection records for Georgia (source: museum databases); mussel specimens borrowed from the Cleveland Museum of Natural History; the University of Florida Malacology Collection; the Freshwater Mollusk Collection at Auburn University; Systematics and Zoogeography of the Unioniacean Mollusks of the Coosa River drainage of Alabama, Georgia, and Tennessee (Hurd 1974); Freshwater Unionacean Clams (Mollusca: Pelecypoda) of North America (Burch 1975); Handbook of Darters (Page 1983); North American Freshwater Snails (Burch 1989); A Field Guide to Freshwater Fishes of North America North of Mexico (Page and Burr 1991); Field Guide to Freshwater Mussels of the Midwest (Cumings and Mayer 1992); *Etheostoma (Ulocentra) scotti* (Osteichthyes: Percidae), a New Darter from the Etowah River System in Georgia (Bauer et al. 1995); Fishes of Alabama and the Mobile Basin (Mettee et al. 1996); Protected Species Inventory and Identification in the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint River Basins (Ziewitz et al. 1997); Freshwater Mussels (Unionidae) of Selected Reaches of the Main Channel of Rivers in the Coosa drainage of Georgia (Williams and Hughes 1998); The Freshwater Mussels of Tennessee (Parmalee and Bogan 1998); Protected Animals of Georgia (GADNR 1999); Prioritizing Streams for Buffer Preservation and Restoration in the Etowah River Basin (Freeman and Wegner 2000); The Fishes of Tennessee (Etnier and Starnes 2001); Fishes of Alabama (Boschung and Mayden 2004); Alabama Wildlife, Volume Two: Imperiled Aquatic Mollusks and Fishes (Mirachi 2004); Standard Operating Procedures for Conducting Bio-monitoring on Fish Communities in the Piedmont Ecoregion of Georgia (GADNR 2005); Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Five Endangered and Two Threatened Mussels in Four Northeast Gulf of Mexico drainages; Final Rule (USFWS 2007); Freshwater Mussels of Alabama and the Mobile Basin

in Georgia, Mississippi, and Tennessee (Williams et. al., 2008); Fishes of Georgia (Straight et al. 2010); Georgia Department of Natural Resources: Nongame Conservation Section Biotics Database: County and HUC8 watersheds (GADNR 2014a and GADNR 2014b); Recovery Plan for Endangered Fat Threeridge (*Amblema neislerii*), Shinyrayed Pocketbook (*Lampsilis subangulata*), Gulf Moccasinshell (*Medionidus penicillatus*), Ochlockonee Moccasinshell (*Medionidus simpsonianus*), Oval Pigtoe (*Pleurobema pyriforme*), Threatened Chipola Slabshell (*Elliptio chipolaensis*), and the Purple Bankclimber (*Elliptoides sloatianus*) (USFWS 2003); The Crayfish of Georgia (Hobbs 1981); and NatureServe (2014).

2.0 SURVEY PRTOCOLS/METHODOLOGY

Aquatic surveys were conducted on October 22nd, 23rd, 24th, 25th, 27th, 28th, 29th, 30th, 31st, 2014 and November 3rd, 2014 by Edwards-Pitman Environmental, Inc. (EPEI) aquatic ecologists Martin Melville and Ryan Niccoli and ecologist Rick Filer. The proposed project is located within an urban area of Cobb and Fulton Counties, Georgia and is located within the Piedmont Physiographic Province of Georgia. The elevations throughout the project corridor ranged from 805 feet to 1,180 feet above mean sea level (msl).

Survey Area

This survey was conducted using the 2008 final aquatic survey protocol (USFWS 2008) and Georgia Department of Transportation (GDOT) Scope of Work for Aquatic Surveys (2012) for streams and rivers with water depths that are conducive to wading. The recommended distance for such streams is 900 feet upstream and 300 feet downstream of the road crossings for wadeable streams. Due to limited access S-12, and S-15 were not surveyed the full 1,200 feet, these streams were either piped under commercial buildings or ponded within the 1,200 feet survey reach. Figures 2A-J – Aquatic Survey Limits illustrates the length and distance of the survey.

Site Conditions and Water Quality

Habitat characteristics (i.e., sediment, riparian condition, and water condition, etc.) were assessed through visual inspection and recorded on USFWS Site Conditions Field Data Sheets (Appendix C). Water depths and stream widths were directly measured. A sketch was made of the surveyed stream to show important stream characteristics, the locations of protected species, and other pertinent information. In addition, photographs of the streams were taken (Appendix D – Site Photographs).

Water temperature and dissolved oxygen (DO) were collected using a YSI DO 200 meter. Conductivity was measured using a YSI EC 300 meter. The pH of the water was measured using an Oakton

Waterproof pH Testr 1. A LaMotte Model 2020 Turbidimeter provided turbidity measurements. Water quality data were collected in-stream and used to assess potential impacts to habitat quality and determine if the water was within the state water quality standards.

Fish Survey

No suitable habitat was observed for the amber darter and Etowah darter in streams that occurred within the Etowah River watershed (HUC8: 03150104); therefore, the fish survey was conducted using a Smith-Root Electrofisher (GDOT 2012). The fish survey was conducted from downstream to upstream. The lowest possible electrofishing settings were used to avoid injury to fish.

The fish survey methodology followed the fish biomonitoring surveys proposed by GADNR Wildlife Resources Division of Fisheries Management Section (GADNR 2005). Fish were identified in the field and released back in the water when possible. Voucher specimens (one or two individuals) per species for individuals that could not be identified in the field were returned to the EPEI aquatics laboratory for verification or identification.

Crayfish Survey

The crayfish survey coincided with the fish survey, which was conducted in a downstream to upstream zigzag pattern using a Smith-Root Electrofisher. The lowest possible electrofishing settings were used to avoid injury to crayfish. Additionally, a hand-held dip net also was used to collect crayfish by placing the net downstream of larger rocks, lifting the rocks, and herding the crayfish into the dip net. Crayfish were identified in the field and released back into the water when possible. Crayfish (one to two individuals per species) that could not be conclusively identified in the field were returned to the EPEI aquatics laboratory for verification or identification.

Mollusk Survey

The survey was conducted in accordance with the Freshwater Mussel Survey Protocol for the Southeastern Atlantic Slope and Northeastern Gulf drainages in Florida and Georgia (USFWS 2008). The area was surveyed from downstream to upstream in a zigzag pattern. The visibility within the stream allowed for both visual and tactile techniques to be employed. The shoreline, exposed sand bars, and dry portions of the stream were visually searched for relic shells deposited by high flows or animals.

3.0 RESULTS/DISCUSSION

3.1 Site Conditions and Water Quality

Of the 26 perennial streams that occur within the project corridor, the following 16 perennial streams were surveyed for federal and state protected aquatic species and are described below: S-3 (Alt), S-1a, S-4, S-5, S-7, S-8, S-9, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19, and S-20. The remaining 10 perennial streams did not have suitable habitat for federal and state protected aquatic species and are described below: S-1 (Alt), S-2 (Alt), S-4 (Alt), S-5 (Alt), S-1, S-2, S-3, S-6, S-10, and S-11. Perennial streams within the survey corridor are illustrated on Figures 1A-M – Project Location Map. Perennial streams that were surveyed for protected aquatic species are shown on Figures 2A-J – Aquatic Survey Limits.

The following streams were located within the Etowah River watershed (HUC8: 03150104):

S-1 (Alt)

S-1 (Alt) is a tributary to Noonday Creek that originates north and flows south within the project area. S-1 (Alt) is an impaired, perennial waterway with approximately 1-to 10-foot wetted width with 1-to 3-foot high stable banks. The water depth was approximately 6 inches to 3 feet on October 22, 2014. The substrate consists of gravel (25%), silt (25%), fine sand (15%), coarse sand (15%), medium sand (10%), and cobble (10%). This section of S-1 (Alt) has poor sinuosity and the streambed is primarily dominated by shallow runs and riffles with the exception of the ponded areas downstream. The riparian buffer consists of natural forests (<25 feet wide), residential properties, and commercial properties. No survey was conducted on S-1 (Alt) due to stagnant flow conditions and heavy sedimentation which is not suitable habitat for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-1 (Alt) are as follows: water temperature was 16.6 Celsius (°C); DO was 7.85 mg/L; conductivity was 122.6 µS; specific conductance was 146.2 µS/cm; pH was 7.69 standard units; and turbidity was 6.1 Nephelometric Turbidity Units (NTU) (Table 2 – Water Quality Summary).

S-2 (Alt)

S-2 (Alt) is a tributary to Noonday Creek that originates from the west and flows east under US 41. S-2 (Alt) is an impaired, perennial waterway with approximately 15-to 25-foot wetted width with 2-to 6-foot high stable banks. The water depth was approximately 1 to 2 feet on October 22, 2014. The substrate consists of silt (25%), fine sand (25%), coarse sand (25%), and medium sand (25%). This section of S-2

(Alt) has poor sinuosity and the instream habitat is primarily dominated by shallow runs and slow moving pools due to a series of beaver dams creating stagnant flow conditions. The riparian buffer consists of natural forests (25 to 75 feet wide) and commercial properties. No survey was conducted on S-2 (Alt) due to stagnant flow conditions caused by beaver activity which is not suitable habitat for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-2 (Alt) are as follows: water temperature was 16.1 °C; DO was 6.55 mg/L; conductivity was 90.7 µS; specific conductance was 95.9 µS/cm; pH was 7.30 standard units; and turbidity was 8.4 Nephelometric Turbidity Units (NTU) (Table 2 – Water Quality Summary).

S-3 (Alt)

S-3 (Alt) (Noonday Creek) originates from the south and flows north under US 41. S-3 (Alt) is a somewhat impaired, perennial waterway with approximately 3-to 10-foot wetted width with 3-to 6-foot high unstable banks. The water depth was approximately 1 to 3 feet on October 22, 2014. The substrate consists of gravel (15%), silt (10%), clay (5%), fine sand (20%), coarse sand (20%), and medium sand (30%). The riparian buffer consists of a forested wetland buffer (25 to 150 feet wide) surrounded by commercial properties. The upstream section of S-3 (Alt) has poor sinuosity, and is dominated by shallow runs and riffles with very few pools. This stream was surveyed for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-3 (Alt) are as follows: water temperature was 14.9°C; DO was 8.32 mg/L; conductivity was 104.7 µS; specific conductance was 131.6 µS/cm; pH was 7.70 standard units; and turbidity was 5.1 NTU (Table 2 – Water Quality Summary).

S-4 (Alt)

S-4 (Alt) is a tributary to Noonday Creek that originates from a pipe east and flows west into S-3 (Alt). S-4 (Alt) is an impaired, perennial waterway with approximately 4-to 6-foot wetted width with 6-to 10-foot high stable banks. The water depth was approximately 1 to 2 inches on October 23, 2014. The substrate was dominated by rip-rap (100%). The riparian buffer consists of a cleared right-of-way (ROW) and commercial properties. This section of S-4 (Alt) has poor sinuosity and only flows for approximately 75 feet before it flows into S-3 (Alt). No survey was conducted on S-4 (Alt) due to the majority of this stream being piped under several commercial properties and during drought conditions this stream could potentially go dry due to its small size. It is also impacted by surrounding land use and the substrate is

comprised completely of rip-rap, which does not provide suitable habitat for protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-4 (Alt) are as follows: water temperature was 14.7 °C; DO was 7.22 mg/L; conductivity was 96.4 µS; specific conductance was 105.7 µS/cm; pH was 7.50 standard units; and turbidity was 4.7 NTU (Table 2 – Water Quality Summary).

S-5 (Alt)

S-5 (Alt) is a tributary to Noonday Creek that originates southeast and flows northwest into S-4 (Alt) outside of the survey area. S-5 (Alt) is an impaired, perennial waterway with approximately 1-to 2-foot wetted width with 2-to 3-foot high stable banks. The water depth was approximately 1 to 6 inches on October 23, 2014. The substrate consists of gravel (5%), silt (40%), fine sand (30%), and coarse sand (25%). The riparian buffer consists of a cleared ROW and commercial properties. This section of S-5 (Alt) has poor sinuosity and only flows for approximately 500 feet before it's piped under several commercial properties and Barrett Parkway. No survey was conducted on S-5 (Alt) due to stagnant flow conditions, a large portion of the stream being piped, and during drought conditions this stream could potentially go dry due to its small size.

The water quality data recorded during the survey of S-5 (Alt) are as follows: water temperature was 14.5 °C; DO was 6.22 mg/L; conductivity was 121.2 µS; specific conductance was 130.4 µS/cm; pH was 7.50 standard units; and turbidity was 5.9 NTU (Table 2 – Water Quality Summary).

S-1

S-1 originates from an open water and flows south into S-1a. S-1 is an impaired, perennial waterway with approximately 1-to 3-foot wetted width with 3-to 5-foot high stable banks. The water depth was approximately 6 inches to 2 feet on October 23, 2014. The substrate consists of silt (20%), clay (30%), fine sand (20%), coarse sand (20%), and medium sand (10%). The riparian buffer consists of a forested buffer (25 to 150 feet wide) surrounded by commercial properties. This section of S-1 has moderate sinuosity and the streambed is dominated by shallow runs. S-1 was not surveyed due to the majority of the substrate consisting of unstable substrates, heavy sedimentation, lack of riffle habitat, stagnant flow, the presence of a pond upstream, and was too small for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-1 are as follows: water temperature was 14.7 °C; DO was 8.03 mg/L; conductivity was 163.7 µS; specific conductance was 191.3 µS/cm; pH was 7.25 standard units; and turbidity was 5.3 NTU (Table 2 – Water Quality Summary).

S-1a

S-1a (Noonday Creek) originates east and flows west under George Busbee Parkway. S-1a is a somewhat impaired, perennial waterway with approximately 20-to 60-foot wetted width with 4-to 8-foot high stable banks. The water depth was approximately 1 to 4 feet on October 23, 2014. The substrate consists of gravel (10%), silt (30%), fine sand (20%), medium sand (20%), and coarse sand (20%). The riparian buffer consists of a forested buffer (25 to 150 feet wide) with a pedestrian trail that paralleled S-1a on the north bank. This section of S-1a has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-1a are as follows: water temperature was 14.5 °C; DO was 8.11 mg/L; conductivity was 178.1 µS; specific conductance was 195.6 µS/cm; pH was 7.30 standard units; and turbidity was 5.6 NTU (Table 2 – Water Quality Summary).

S-2

S-2 originates from a detention pond and flows north. S-2 is a fully impaired perennial waterway with approximately 2-to 4-foot wetted width with 3-to 8-foot high stable banks. The water depth was approximately 1 to 6 inches on October 24, 2014. The substrate consists of gravel (10%), coarse sand (30%), and a concrete flume (60%). The riparian buffer consists of commercial properties. This section of S-2 has poor sinuosity and the streambed consists of shallow runs. S-2 was not surveyed due to the majority of the substrate consisting of a concrete flume, which is not suitable habitat for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-2 are as follows: water temperature was 16.2 °C; DO was 6.41 mg/L; conductivity was 145.8 µS; specific conductance was 151.2 µS/cm; pH was 7.50 standard units; and turbidity was 3.2 NTU (Table 2 – Water Quality Summary).

S-3

S-3 originates south and flows under Barrett Lakes Drive towards S-2. S-3 is a fully impaired, perennial waterway with approximately 1-to 3-foot wetted width with 1-to 5-foot high stable banks. The water depth was approximately 1 to 6 inches on October 24, 2014. The substrate consists of gravel (30%), fine

sand (5%), coarse sand (10%), medium sand (10%), and cobble (45%). The riparian buffer consists of a forested buffer (10 to 25 feet wide) that's surrounded by residential and commercial properties. This section of S-3 is moderately sinuous and the streambed consists of shallow riffles and runs with some pools. S-3 was not surveyed due to the small size, trickle flow, and it becomes intermittent before it reaches a pipe culvert which does not provide suitable habitat for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-3 are as follows: water temperature was 16.5°C; DO was 7.01 mg/L; conductivity was 111.2 µS; specific conductance was 116.5 µS/cm; pH was 7.60 standard units; and turbidity was 4.8 NTU (Table 2 – Water Quality Summary).

S-4

S-4 originates west and flows east under US 41 and connects with S-5. S-4 is a somewhat impaired, perennial waterway with approximately 2-to 4-foot wetted width with 2-to 6-foot high stable banks. The water depth was approximately 1 to 3 feet on October 24, 2014. The substrate consists of silt (20%), fine sand (15%), medium sand (15%), coarse sand (15%), clay marl (20%), and cobble (15%). The riparian buffer consists of a small forested buffer (<25 feet wide) surrounded by commercial properties and a cleared ROW. This section of S-4 has poor sinuosity and the streambed is primarily dominated by shallow riffles and runs. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-4 are as follows: water temperature was 14.7 °C; DO was 8.37 mg/L; conductivity was 110.2 µS; specific conductance was 135.9 µS/cm; pH was 7.89 standard units; and turbidity was 5.3 NTU (Table 2 – Water Quality Summary).

S-5

S-5 (which is a continuation of S-4) is a tributary to Noonday Creek that originates after S-4 crosses US 41 and flows east. S-5 is a somewhat impaired, perennial waterway with approximately 1-to 5-foot wetted width with 1-to 5-foot high stable banks. The water depth was approximately 6 inches to 2 feet on October 24, 2014. The substrate consists of silt (20%), clay marl (20%), fine sand (15%), coarse sand (15%), medium sand (15%), and cobble (15%). The riparian buffer consists of a forested buffer (>150 feet wide) with a cleared ROW at the road crossing. This section of S-5 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-5 are as follows: water temperature was 14.8 °C; DO was 8.35 mg/L; conductivity was 110.2 µS; specific conductance was 136.9 µS/cm; pH was 7.90 standard units; and turbidity was 4.9 NTU (Table 2 – Water Quality Summary).

S-6

S-6 originates south of US 41 and flows north into a pond. S-6 is a somewhat impaired, perennial waterway with approximately 1-to 3-foot wetted width with 1-to 2-foot high stable banks. The water depth was approximately 6 inches to 1-foot on October 27, 2014. The substrate consists of silt (60%), coarse sand (10%), medium sand (15%), fine sand (10%), and cobble (5%). The riparian buffer consists of a forested buffer (>150 feet wide) downstream of the US 41 crossing. Upstream of the US 41 crossing consists of vegetated buffer (>100 feet) that is primarily kudzu (*Pueraria lobata*). This section of S-6 has moderate sinuosity and the streambed consists of shallow riffles and runs with some pools. Approximately 400 feet downstream of the US 41 crossing, S-6 becomes intermittent which is not suitable habitat for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-6 are as follows: water temperature was 14.1 °C; DO was 8.42 mg/L; conductivity was 54.0 µS; specific conductance was 68.2 µS/cm; pH was 8.21 standard units; and turbidity was 5.3 NTU (Table 2 – Water Quality Summary).

S-7

S-7 originates north of Canton Road and flows northeast under the I-75 crossing. S-7 is an impaired, perennial waterway with approximately 1-to 3-foot wetted width with 2-to 8-foot high stable banks. The water depth was approximately 6 inches to 1 foot on October 27, 2014. The substrate consists of gravel (10%), silt (20%), fine sand (20%), coarse sand (25%), and medium sand (25%). The riparian buffer consists of a forested buffer (25 feet to 150 feet wide) that was surrounded by commercial properties. This section of S-7 has poor sinuosity and the streambed consists of shallow runs with very few riffles and pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-7 are as follows: water temperature was 15.3 °C; DO was 6.97 mg/L; conductivity was 406.9 µS; specific conductance was 499.0 µS/cm; pH was 7.14 standard units; and turbidity was 4.3 NTU (Table 2 – Water Quality Summary).

The following streams were located within the Chattahoochee River, upper watershed (HUC8: 03130001):

S-8

S-8 (Sope Branch) originates north and flows south into S-9 (Sope Creek). S-8 is a somewhat impaired, perennial waterway with approximately 4-to 10-foot wetted width with 6-to 10-foot high stable banks. The water depth was approximately 1 to 3 feet on October 25, 2014. The substrate consists of a concrete flume (20%), gravel (15%), fine sand (20%), medium sand (10%), coarse sand (20%) and cobble (15%). The riparian buffer consists of commercial properties. This section of S-8 has poor sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-8 are as follows: water temperature was 12.6 °C; DO was 9.22 mg/L; conductivity was 36.4 µS; specific conductance was 45.2 µS/cm; pH was 8.01 standard units; and turbidity was 6.3 NTU (Table 2 – Water Quality Summary).

S-9

S-9 (Sope Creek) originates southwest and flows northeast under US 41. S-9 is a somewhat impaired, perennial waterway with approximately 10-to 25-foot wetted width with 3-to 10-foot high stable banks. The water depth was approximately 1 to 3 feet on October 25, 2014. The substrate consists of a concrete flume (10%), gravel (25%), silt (20%), fine sand (10%), medium sand (10%), coarse sand (20%) and cobble (5%). The riparian buffer consists of a forested buffer (25 to 75 feet wide) that was surrounded by commercial properties. This section of S-9 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-9 are as follows: water temperature was 12.9 °C; DO was 7.66 mg/L; conductivity was 151.9 µS; specific conductance was 148.6 µS/cm; pH was 7.88 standard units; and turbidity was 5.9 NTU (Table 2 – Water Quality Summary).

S-10

S-10 originates southwest and flows northeast under US 41. S-10 is a fully impaired, perennial waterway with approximately 1-to 2-foot wetted width with 6-to 10-foot high stable banks. The water depth was approximately 6 inches to 1 foot on October 27, 2014. The substrate consists of rip-rap (100%). The riparian buffer consists of commercial and residential properties. This section of S-10 has poor sinuosity

and the streambed is primarily dominated by shallow riffles. S-10 was not surveyed due to the small size, trickle flow, rip-rap substrate, and is piped approximately 100 feet downstream of US 41 which is not suitable habitat for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-10 are as follows: water temperature was 15.9 °C; DO was 6.01 mg/L; conductivity was 41.2 µS; specific conductance was 48.9 µS/cm; pH was 7.01 standard units; and turbidity was 5.0 NTU (Table 2 – Water Quality Summary).

S-11

S-11 originates south out of a pipe under US 41 and flows north to S-10. S-11 is a fully impaired, perennial waterway with approximately 1-to 2-foot wetted width with 1-to 9-foot high stable banks. The water depth was approximately 1 to 6 inches on October 27, 2014. The substrate consists of rip-rap (80%), gravel (5%), fine sand (5%), coarse sand (5%), and medium sand (5%). The riparian buffer consists of commercial and residential properties. This section of S-11 has poor sinuosity and the streambed is primarily dominated by shallow riffles. S-11 was not surveyed due to the small size, rip-rap substrate, and trickle flow which is not suitable habitat for the protected aquatic species targeted for this survey.

The water quality data recorded during the survey of S-11 are as follows: water temperature was 15.5 °C; DO was 6.75 mg/L; conductivity was 53.7 µS; specific conductance was 60.5 µS/cm; pH was 7.14 standard units; and turbidity was 4.1 NTU (Table 2 – Water Quality Summary).

S-12

S-12 originates northwest and flows east under US 41. S-12 is a somewhat impaired, perennial waterway with approximately 10-to 25-foot wetted width with 2-to 6-foot high stable banks. The water depth was approximately 1 to 5 feet on October 28, 2014. The substrate consists of gravel (5%), silt (20%), fine sand (20%), medium sand (20%), coarse sand (20%), and cobble (15%). The riparian buffer consists of a forested buffer (25 to 75 feet wide) that was surrounded by commercial properties. This section of S-12 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-12 are as follows: water temperature was 16.8 °C; DO was 7.83 mg/L; conductivity was 76.6 µS; specific conductance was 91.4 µS/cm; pH was 7.60 standard units; and turbidity was 4.2 NTU (Table 2 – Water Quality Summary).

S-13

S-13 originates south and flows north into S-12. S-13 is a somewhat impaired, perennial waterway with approximately 5-to 12-foot wetted width with 3-to 8-foot high unstable banks. The water depth was approximately 6 inches to 2 feet on October 28, 2014. The substrate consists of gravel (10%), clay (10%), clay marl (10%), fine sand (20%), medium sand (15%), coarse sand (20%), bedrock (5%), and cobble (10%). The riparian buffer consists of a forested buffer (25 to 75 feet wide) that had a cleared ROW on the east bank near the confluence of S-12. This section of S-13 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-13 are as follows: water temperature was 12.6 °C; DO was 7.13 mg/L; conductivity was 122.1 µS; specific conductance was 135.7 µS/cm; pH was 7.40 standard units; and turbidity was 5.9 NTU (Table 2 – Water Quality Summary).

S-14

S-14 (Poor House Creek) originates west and flows northeast under US 41. S-14 is a somewhat impaired, perennial waterway with approximately 6-to 15-foot wetted width with 1-to 8-foot high unstable banks. The water depth was approximately 1 to 4 feet on October 29, 2014. The substrate consists of gravel (15%), silt (15%), fine sand (20%), medium sand (15%), coarse sand (20%), and cobble (15%). The riparian buffer consists of a forested buffer (10 to 25 feet wide) that was surrounded by commercial properties. This section of S-14 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey. The survey ended at a pipe, and as such the survey did not extend 900 feet downstream of the roadway crossing.

The water quality data recorded during the survey of S-14 are as follows: water temperature was 16.8 °C; DO was 8.04 mg/L; conductivity was 73.3 µS; specific conductance was 94.0 µS/cm; pH was 7.65 standard units; and turbidity was 6.4 NTU (Table 2 – Water Quality Summary).

S-15

S-15 originates north from a pipe and flows south into a pond. S-15 is a fully functional perennial waterway with approximately 2-to 8-foot wetted width with 3-to 9-foot high unstable banks. The water depth was approximately 6 inches to 1-foot on October 31, 2014. The substrate consists of gravel (25%), silt (25%), fine sand (15%), medium sand (15%), coarse sand (10%), and cobble (10%). The riparian buffer consists of a small forested buffer (<10 feet wide) on the west bank that was surrounded by

commercial properties. The riparian buffer on the east bank consists of a cleared ROW. This section of S-15 has poor sinuosity and the streambed is primarily dominated by shallow riffles and runs before it flows into a pond. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-15 are as follows: water temperature was 16.6 °C; DO was 7.57 mg/L; conductivity was 54.0 µS; specific conductance was 64.3 µS/cm; pH was 7.39 standard units; and turbidity was 3.4 NTU (Table 2 – Water Quality Summary).

S-16

S-16 (Poplar Creek) originates west and flows east under US 41. S-16 is a fully functional perennial waterway with approximately 10-to 30-foot wetted width with 2-to 8-foot high unstable banks. The water depth was approximately 6 inches to 3 feet on October 30, 2014. The substrate consists of gravel (25%), fine sand (15%), medium sand (10%), coarse sand (15%), bedrock (10%), and cobble (25%). The riparian buffer consists of a forested buffer (10 to 75 feet wide) that was surrounded by commercial and residential properties. This section of S-16 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-16 are as follows: water temperature was 16.9 °C; DO was 7.89 mg/L; conductivity was 101.9 µS; specific conductance was 120.5 µS/cm; pH was 7.66 standard units; and turbidity was 4.7 NTU (Table 2 – Water Quality Summary).

S-17

S-17 originates south and flows north into S-16. S-17 is a somewhat impaired, perennial waterway with approximately 3-to 10-foot wetted width with 4-to 6-foot high unstable banks. The water depth was approximately 3 to 10 inches on October 30, 2014. The substrate consists of gravel (20%), silt (20%), fine sand (15%), medium sand (15%), coarse sand (20%), and cobble (10%). The riparian buffer consists of a forested buffer that varied from (25 to 75 feet wide) that was surrounded by commercial properties. This section of S-17 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-17 are as follows: water temperature was 16.5 °C; DO was 8.00 mg/L; conductivity was 101.7 µS; specific conductance was 119.3 µS/cm; pH was 7.76 standard units; and turbidity was 5.6 NTU (Table 2 – Water Quality Summary).

S-18

S-18 (Nancy Creek) originates north and flows south under West Paces Ferry Road. S-18 is a somewhat impaired, perennial waterway with approximately 10-to 35-foot wetted width with 5-to 10-foot high unstable banks. The water depth was approximately 1 to 3 feet on October 31, 2014. The substrate consists of gravel (5%), silt (10%), fine sand (15%), medium sand (15%), coarse sand (15%), bedrock (25%), and cobble (15%). The riparian buffer consists of a forested buffer (75 to 150 feet wide) that was surrounded by commercial properties. This section of S-18 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-18 are as follows: water temperature was 12.4 °C; DO was 9.27 mg/L; conductivity was 100.5 µS; specific conductance was 132.4 µS/cm; pH was 7.93 standard units; and turbidity was 5.3 NTU (Table 2 – Water Quality Summary).

S-19

S-19 originates east of Northside Parkway and flows southwest under I-75 into S-18. S-19 is a somewhat impaired, perennial waterway with approximately 3-to 10-foot wetted width with 1-to 2-foot high unstable banks. The water depth was approximately 6 inches to 2 feet on October 31, 2014. The substrate consists of gravel (20%), silt (10%), fine sand (15%), medium sand (20%), coarse sand (15%), bedrock (10%), and cobble (10%). The riparian buffer consists of a forested buffer (25 to 150 feet wide) that was surrounded by residential properties. This section of S-19 has moderate sinuosity and the streambed is primarily dominated by shallow riffles and runs with a few pools. This stream was surveyed for the protected aquatic species targeted in this survey.

The water quality data recorded during the survey of S-19 are as follows: water temperature was 11.3 °C; DO was 9.20 mg/L; conductivity was 103.6 µS; specific conductance was 133.5 µS/cm; pH was 7.82 standard units; and turbidity was 4.8 NTU (Table 2 – Water Quality Summary).

S-20

S-20 originates south of I-75 and flows north under I-75. S-20 is a somewhat impaired, perennial waterway with approximately 1-to 3-foot wetted width with 1-to 2-foot high unstable banks. The water depth was approximately 6 inches to 2 feet on November 3, 2014. The substrate consists of a concrete flume (20%), gravel (10%), silt (20%), fine sand (15%), medium sand (10%), coarse sand (10%), bedrock (10%), and cobble (5%). The riparian buffer consists of residential and commercial properties. No survey was conducted upstream of the I-75 crossing because this section was dry at the time of the

survey. Downstream of the I-75 crossing a brief crayfish survey was performed due to the presence of flow over some areas of bedrock and cobble substrates.

The water quality data recorded during the survey of S-20 are as follows: water temperature was 12.5 °C; DO was 9.11 mg/L; conductivity was 112.2 µS; specific conductance was 140.3 µS/cm; pH was 7.80 standard units; and turbidity was 7.0 NTU (Table 2 – Water Quality Summary).

The most pertinent gaging station for the streams in the Etowah River watershed (HUC8: 03150104) in this survey is the US Geological Survey (USGS) gaging station on the Noonday Creek (02392950) at Hawkins Store Road, near Woodstock, in Cobb County, Georgia. This gaging station indicated that Noonday Creek was at or below the median daily flow value for that site on the dates of the survey. The last significant rainfall recorded at this gaging station was approximately 0.10 inches and it occurred over a five day period from October 29, 2014 to November 2, 2014 (Appendix E – USGS Stream Gage Information) (USGS 2014).

The most pertinent gaging station for the streams in the Chattahoochee River, upper watershed (HUC8: 03130001) in this survey is the US Geological Survey (USGS) gaging station on Rottenwood Creek (02335910) at Interstate Parkway North, near Smyrna, in Cobb County, Georgia. This gaging station indicated that Rottenwood Creek was at, below, or just above the median daily flow value for that site on the dates of the survey. The last significant rainfall recorded at this gaging station was less than 0.15 inches and it occurred over a four day period from October 29, 2014 to November 1, 2014 (Appendix E – USGS Stream Gage Information) (USGS 2014).

3.2 Biological Survey

Fish Survey

Over 5000 fish were collected consisting of 21 species during the surveys. No federal or state protected fish species that occur within the Etowah River watershed (HUC8: 03150104) were collected during the surveys; however, suitable habitat was observed within S-1a for the lined chub (pools with sandy substrates in small to medium-sized streams). None of the following federal and state protected fish species that occur within the Etowah River watershed (HUC8: 03150104) were collected nor was their preferred habitat observed during the surveys: Etowah darter, Cherokee darter, amber darter, holiday darter, rock darter, Coosa chub, river redhorse, frecklebelly madtom, bridled darter, and the freckled darter due to their small size [S-3 (Alt) S-4, S-5, and S-7], heavy sedimentation (S-1a), and the absence of riverweed.

No federal or state protected fish species that occur within the Chattahoochee River, upper watershed (HUC8: 03130101) were collected during the surveys; however, suitable habitat was observed within S-18 (pools over bedrock substrate) and the confluences of S-12/S-13 and S-16/S-17 for the highscale shiner. Suitable habitat was also observed for the bluestripe shiner in S-18 due to the strong flow over bedrock substrate. No Halloween darters or their preferred habitat (large rivers) were observed within the streams that occur within the Chattahoochee River, upper watershed (HUC8: 03130101) during the surveys. No suitable habitat for protected aquatic species listed in the Chattahoochee River, upper watershed (HUC8: 03130001) was observed within S-8, S-9, S-10, S-11, S-14, S-15, S-19, S-20. A summary of the fish collected is presented in Table 3 and Appendix F – Fish Photographs.

Crayfish Survey

Three species of crayfish (204 individuals) were collected during the surveys. The state threatened Chattahoochee crayfish was collected in S-15 and S-16. No Chattahoochee crayfish were collected in the following streams, but suitable habitat (riffles with moderate to strong current) is present within S-8, S-12, S-13, S-14, S-17, S-18, and S-19. No suitable habitat was observed within S-20 due to the lack of water upstream of the I-75 crossing. No Etowah crayfish or their suitable habitat (rocky substrate within swiftly flowing areas) were observed in S-3 (Alt), S-1a, S-4/S-5, and S-7. A summary of the crayfish collected is presented in Table 4 and Appendix G – Crayfish Photographs.

Mollusk Survey

No native mussels were collected during the surveys. The invasive Asiatic clam (*Corbicula fluminea*) was observed within S-3 (Alt), S-1a, S-8, S-12, S-13, S-14, S-16, S-17, S-18, and S-19. Asiatic clams are not specifically collected or counted during mollusk surveys. No suitable habitat was observed for the finelined pocketbook in S-3 (Alt), S-1a, S-4, S-5, and S-7. No suitable habitat was observed for the shinyrayed pocketbook or delicate spike in S-8, S-9, S-12, S-13, S-14, S-16, S-17, S-18, and S-19. This determination is based upon the lack of any relict or live mussels and the presence of sediment accumulating within the interstitial spaces of the limited stable substrate that is present. A summary of the mollusks collected is presented in Table 5 and Appendix H – Mollusk Photographs.

3.3 Summary

Three federally protected fish (Etowah darter, amber darter, and Cherokee darter), two federally protected mollusks (shinyrayed pocketbook and finelined pocketbook), eleven state protected fish (bridled darter, Coosa chub, frecklebelly madtom, freckled darter, holiday darter, Halloween darter, bluestripe shiner, rock darter, lined chub, highscale shiner, and river redhorse), one state protected mollusk (delicate spike)

and two state protected crayfish (Etowah crayfish and Chattahoochee crayfish) were the target species for the proposed project.

No Etowah darters or their suitable habitat were observed during surveys due to heavy sedimentation that filled the interstitial spaces of the cobble and gravel substrates within the survey reaches within streams S-3 (Alt), S-1a, S-4, S-5, and S-7. Therefore, the proposed project would have no effect on the Etowah darter or its appropriate habitat.

No amber darters or their suitable habitat were observed during the S-3 (Alt), S-1a, S-4, S-5, and S-7 surveys due to their small size and the absence of riverweed in perennial streams. Therefore, the proposed project would have no effect on the amber darter or its appropriate habitat.

No Cherokee darters or their suitable habitat was observed due to heavy sedimentation present in S-3 (Alt), S-1a, S-4, S-5, and S-7. Furthermore, Cherokee darters are believed to be extirpated from the Noonday Creek drainage due to the loss of necessary gravel and riffle habitat from silt and sedimentation (The Thalweg 2007). Therefore, the proposed project would have no effect on the Cherokee darter or its appropriate habitat.

The finelined pocketbook was not observed during the aquatic survey. The absence of any live or relict native mussels within S-3 (Alt), S-1a, S-4, S-5, and S-7 indicates the lack of suitable habitat for this mussel within this project area. Additionally, there has been no recent documented occurrence of the finelined pocketbook within the Etowah River and its tributaries. Therefore, the proposed project would have no effect on the finelined pocketbook or its appropriate habitat.

The shinyrayed pocketbook was not observed during the aquatic survey. The absence of any live or relict native mussels within S-8, S-9, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19, and S-20 indicates the lack of suitable habitat for this mussel within this survey area. Therefore, the proposed project would have no effect on the shinyrayed pocketbook or its appropriate habitat.

No holiday darters or their suitable habitat were observed during the S-3 (Alt), S-1a, S-4, S-5 and S-7 surveys due to heavy sedimentation that filled the interstitial spaces of the cobble and gravel substrates within the survey reaches. Additionally, this species is only known from the upper Etowah River and its direct tributaries. Therefore, the proposed project would have no effect on the holiday darter or its appropriate habitat.

No rock darters or their suitable habitat were observed during the S-3 (Alt), S-1a, S-4, S-5, and S-7 surveys due to the absence of riverweed and strong to moderate current. Therefore, the proposed project would have no effect on the rock darter or its appropriate habitat.

No lined chubs were collected in the S-3 (Alt), S-1a, S-4, S-5, and S-7; however, suitable habitat (pools in small to medium-sized streams with sandy substrates) was observed in S-1a. No suitable habitat was observed in S-4, S-5, S-3 (Alt) and S-7 due to the primary habitat consisting of shallow runs. Special provisions should be implemented in S-1a to avoid impacting lined chub and their suitable habitat during construction. Construction should be limited from May through June during the spawning period and enhanced erosion control should be applied. If these special provisions are implemented, the proposed project would have no significant adverse effect on the lined chub or its suitable habitat.

No river redhorses or their suitable habitat were observed during the S-3 (Alt), S-1a, S-4, S-5, and S-7 surveys. River redhorses inhabit mainstem reaches of rivers and large streams and are mostly collected in areas of swift current. Perennial streams S-3 (Alt), S-1a, S-4, S-5, and S-7 are too small and lack the appropriate current. Therefore, the proposed project would have no effect on the river redhorse or its appropriate habitat.

No highscale shiners were observed during the aquatic survey; however, suitable habitat was observed during the aquatic surveys at the confluences of S-12/S-13 and S-16/S-17. Suitable habitat was also observed in S-18 due to runs and pools over bedrock substrate. No suitable habitat was present in S-8, S-9, S-14, S-15, S-19 or S-20. Based upon the implementation of special provisions in S-18 and the confluences of S-12/S-13 and S-16/S-17 (i.e., no instream construction from April through June during the spawning period and enhanced erosion control), the recommended determination for the proposed project would have no significant adverse effect on the highscale shiner or its appropriate habitat.

No Coosa chubs or their suitable habitat were observed during surveys due to their small size and the absence of riverweed in perennial streams in S-3 (Alt), S-1a, S-4, S-5, and S-7. Therefore, the proposed project would have no effect on the Coosa chub or its appropriate habitat.

No frecklebelly madtoms or their suitable habitat were observed during surveys due to their small size and the absence of riverweed in perennial streams in S-3 (Alt), S-1a, S-4, S-5, and S-7. Therefore, the proposed project would have no effect on the frecklebelly madtom or its appropriate habitat.

No bridled darters or their suitable habitat were observed during the S-3 (Alt), S-1a, S-4, S-5, and S-7 surveys due to heavy sedimentation. Additionally, this species is only known from the upper Etowah River and its direct tributaries. Therefore, the proposed project would have no effect on the bridled darter or its appropriate habitat.

No freckled darters or their suitable habitat were observed during the S-3 (Alt), S-1a, S-4, S-5, and S-7 surveys due to heavy sedimentation that filled the interstitial spaces of the cobble and gravel substrates within the survey reaches. The freckled darter typically inhabits larger streams with swift current with rocky substrates or large woody debris. The streams surveyed within the Etowah River watershed range from headwater perennial streams to medium-sized perennial streams and are not large enough to harbor freckled darters. Therefore, the proposed project would have no effect on the freckled darter or its appropriate habitat.

No Halloween darters or suitable habitat were observed during the aquatic survey. Halloween darters inhabit mainstem reaches of rivers and are mostly collected in areas of swift current. Perennial streams S-8, S-9, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19 and S-20 are too small and lack the appropriate current. The recommended determination for the proposed project would have no effect on the Halloween darter or its appropriate habitat.

No bluestripe shiners or their suitable habitat were observed during the S-8, S-9, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19 and S-20 surveys. Bluestripe shiners inhabit mainstem reaches of rivers and large streams and are mostly collected in areas of swift current. Perennial streams S-8, S-9, S-12, S-13, S-14, S-17, and S-19 are too small and lack the appropriate current. However, suitable habitat (moderate to strong flow over bedrock and boulder substrates) was observed during the aquatic survey in S-18. Based upon the implementation of special provisions in S-18 (i.e., no instream construction from April through August during the spawning period and enhanced erosion control), the proposed project would have no significant adverse effect on the bluestripe shiner or its appropriate habitat.

No delicate spikes or their suitable habitat were observed during the S-8, S-9, S-12, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19, and S-20 surveys due to heavy sedimentation that filled the interstitial spaces of the cobble and gravel substrates within the survey reaches. Therefore, the proposed project would have no effect on the delicate spike or its appropriate habitat.

No Etowah crayfish or their suitable habitat (rocky substrate within swiftly flowing areas) were observed in S-3 (Alt), S-1a, S-4, S-5, and S-7. Therefore, the proposed project would have no effect on the Etowah crayfish or its appropriate habitat.

Chattahoochee crayfish were collected during the S-15 and S-16 surveys. No Chattahoochee crayfish were collected but suitable habitat (riffles with moderate to strong current) is present within the following streams: S-8, S-9, S-12, S-13, S-14, S-17, S-18, and S-19. No suitable habitat was observed in S-20 due to the dry stream conditions upstream of the I-75 crossing, which is an indicator that the rest of this stream could potentially go dry. Based upon the implementation of special provisions in S-8, S-9, S-12, S-13, S-14, S-15, S-16, S-17, S-18, and S-19 (i.e., enhanced erosion control), the proposed project would have no significant adverse effect on the Chattahoochee crayfish or its appropriate habitat.

4.0 QUALIFICATIONS STATEMENT

4.1 Qualifications

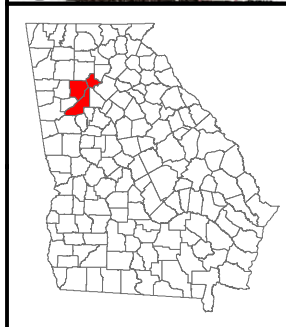
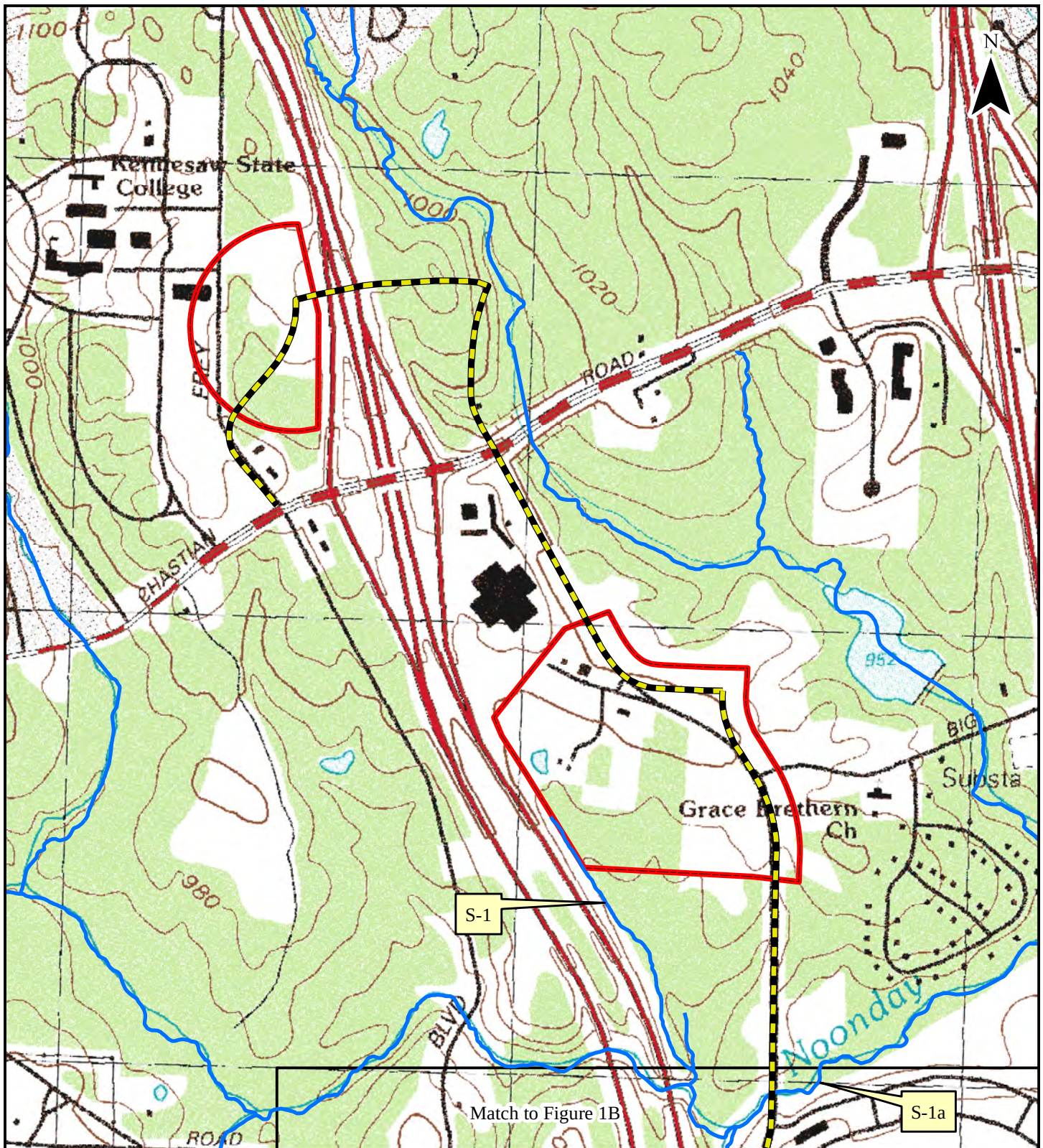
Martin Melville, Ryan Niccoli, and Rick Filer participated in the field surveys. Mr. Melville was the lead ecologist on this survey and has over 13 years of experience conducting aquatic surveys, including fish and mussel surveys, across the southeast. He holds the appropriate state (29-WBH-10-118) and federal (TE063179-4) permits for sampling in Georgia.

Mr. Melville was responsible for the field species identifications, voucher species identifications, and writing the aquatic report. He has approximately 13 years consulting experience, and 11 years working extensively on GDOT projects conducting aquatic surveys and ecology studies. Mr. Melville has a B.S. in Fisheries Science (2003) and a M.S. in Biology (2006) from Tennessee Technological University.

Mr. Ryan Niccoli was responsible for the initial species identification and writing the aquatic report. He has over five years of experience conducting mixed wildlife surveys for the Virginia Department of Game and Inland Fisheries. Mr. Niccoli has a B.S. in Environmental Studies (2008) and an M.S. in Environmental Sciences (2009) with a concentration in Ecology from Virginia Commonwealth University.

Mr. Filer has approximately 14 years of experience in conducting wetland and stream delineations and federal and state protected animal and plant species surveys within Georgia. He has approximately 16 years of environmental consulting experience. Mr. Filer has a B.S. in Biology from Kennesaw State University.

FIGURES



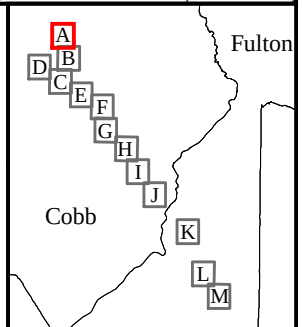
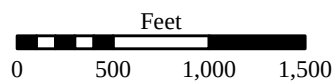
Legend

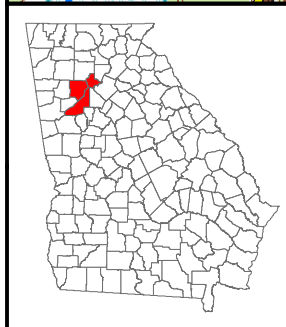
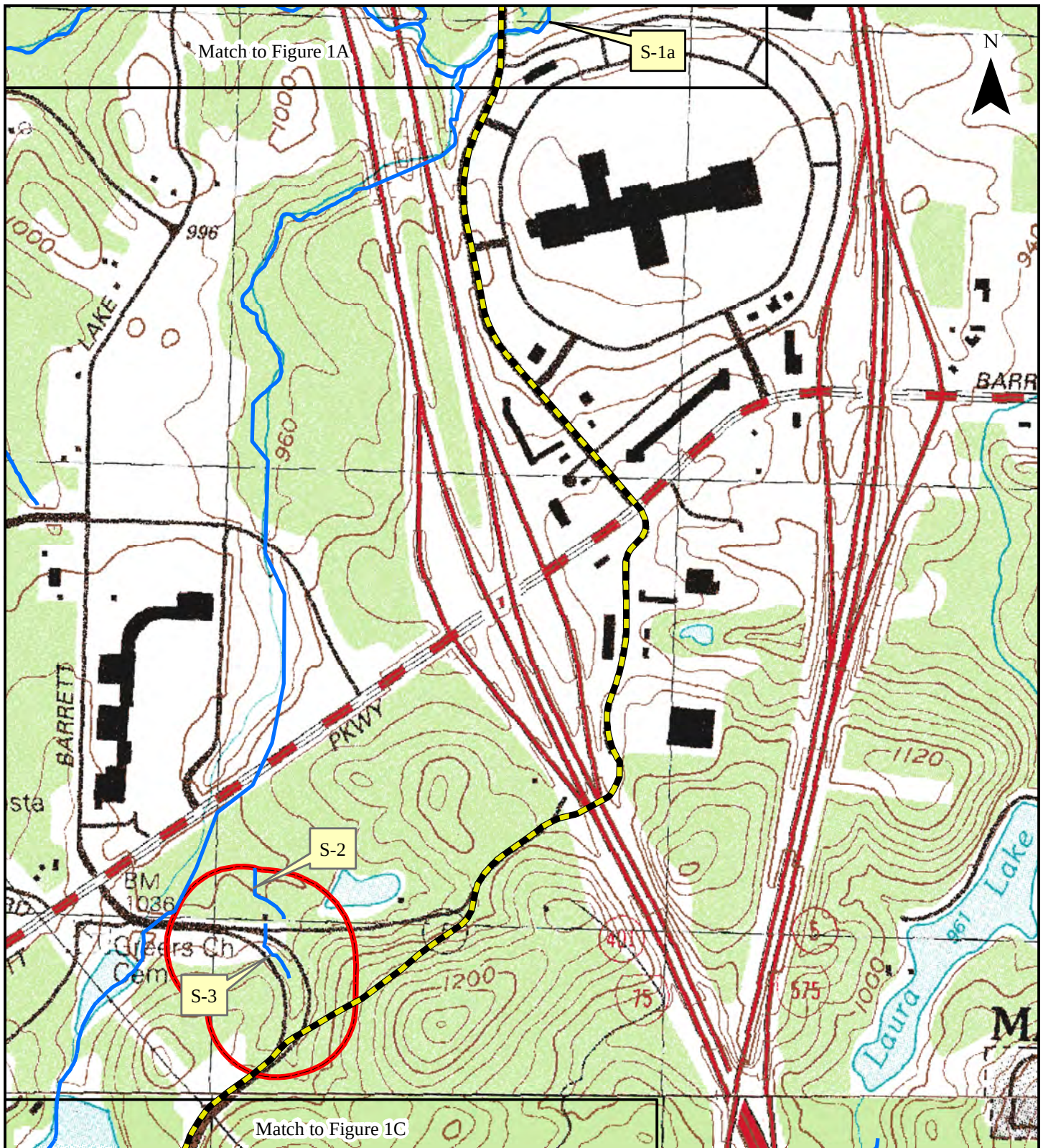
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1A Project Location Map

Connect Cobb
Cobb and Fulton Counties





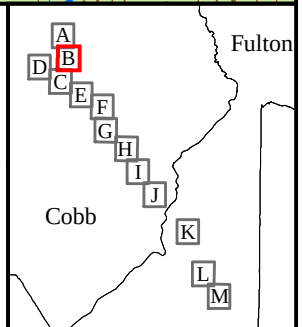
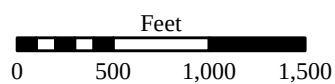
Legend

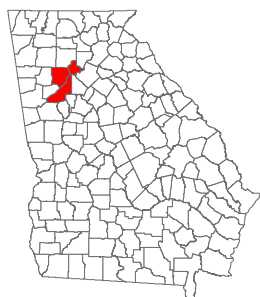
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1B Project Location Map

Connect Cobb
Cobb and Fulton Counties





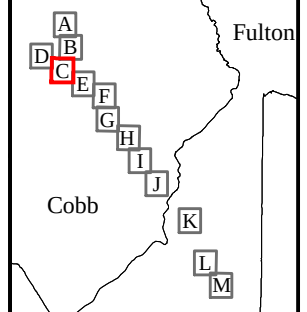
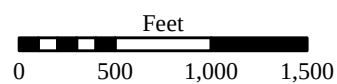
Legend

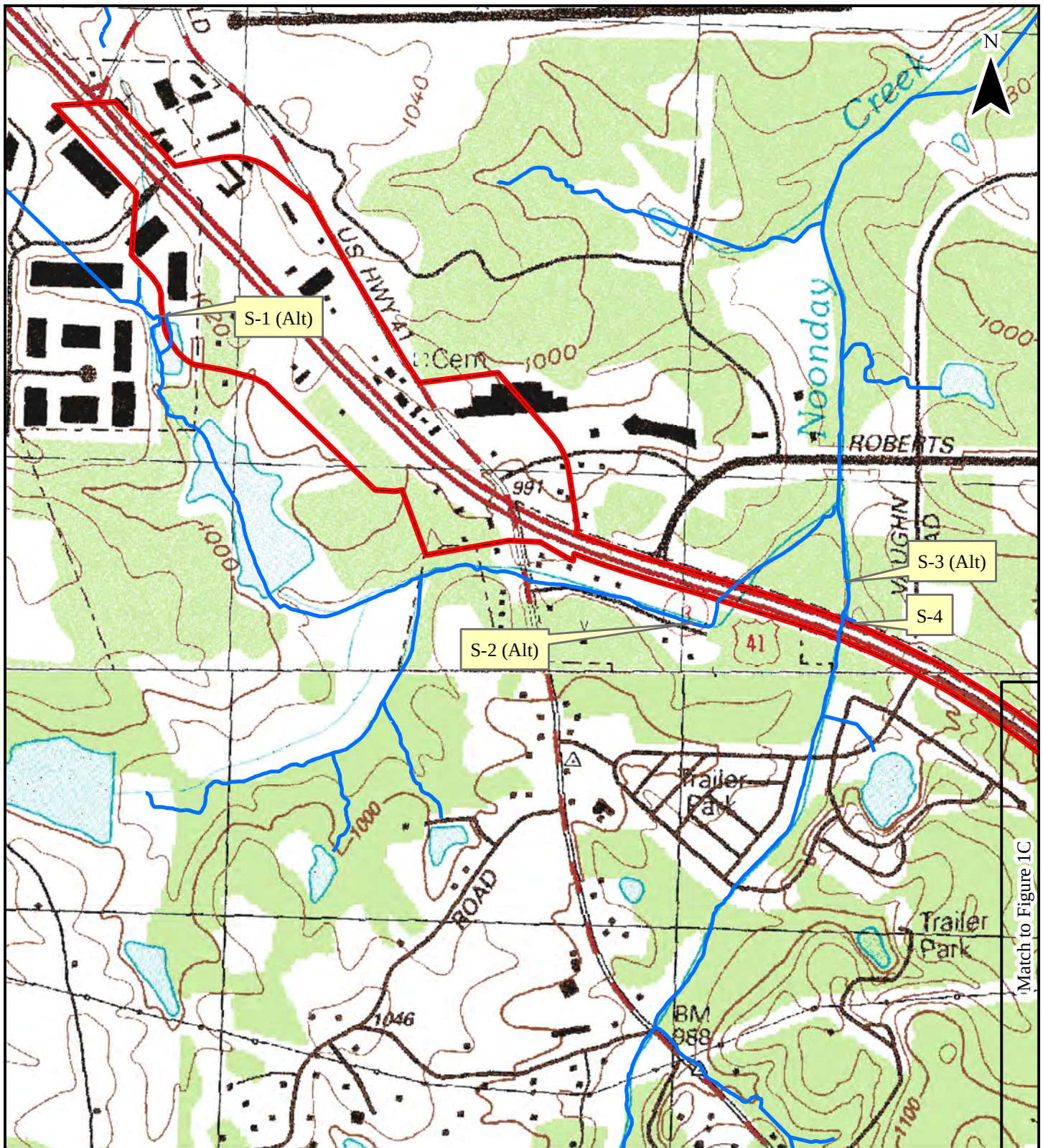
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

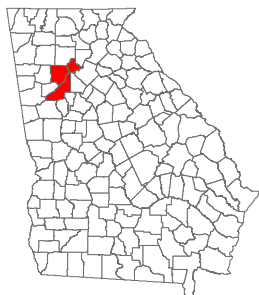
Figure 1C Project Location Map

Connect Cobb
Cobb and Fulton Counties





Match to Figure 1C



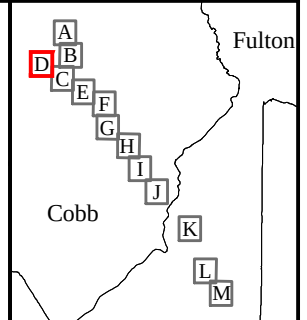
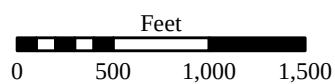
Legend

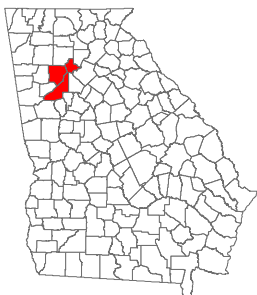
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1D Project Location Map

Connect Cobb
Cobb and Fulton Counties





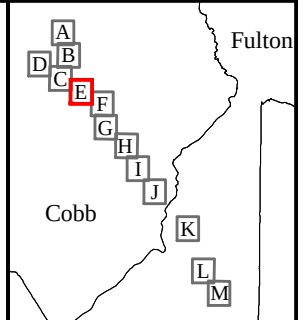
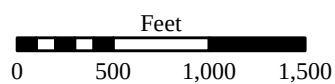
Legend

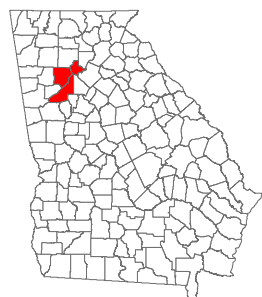
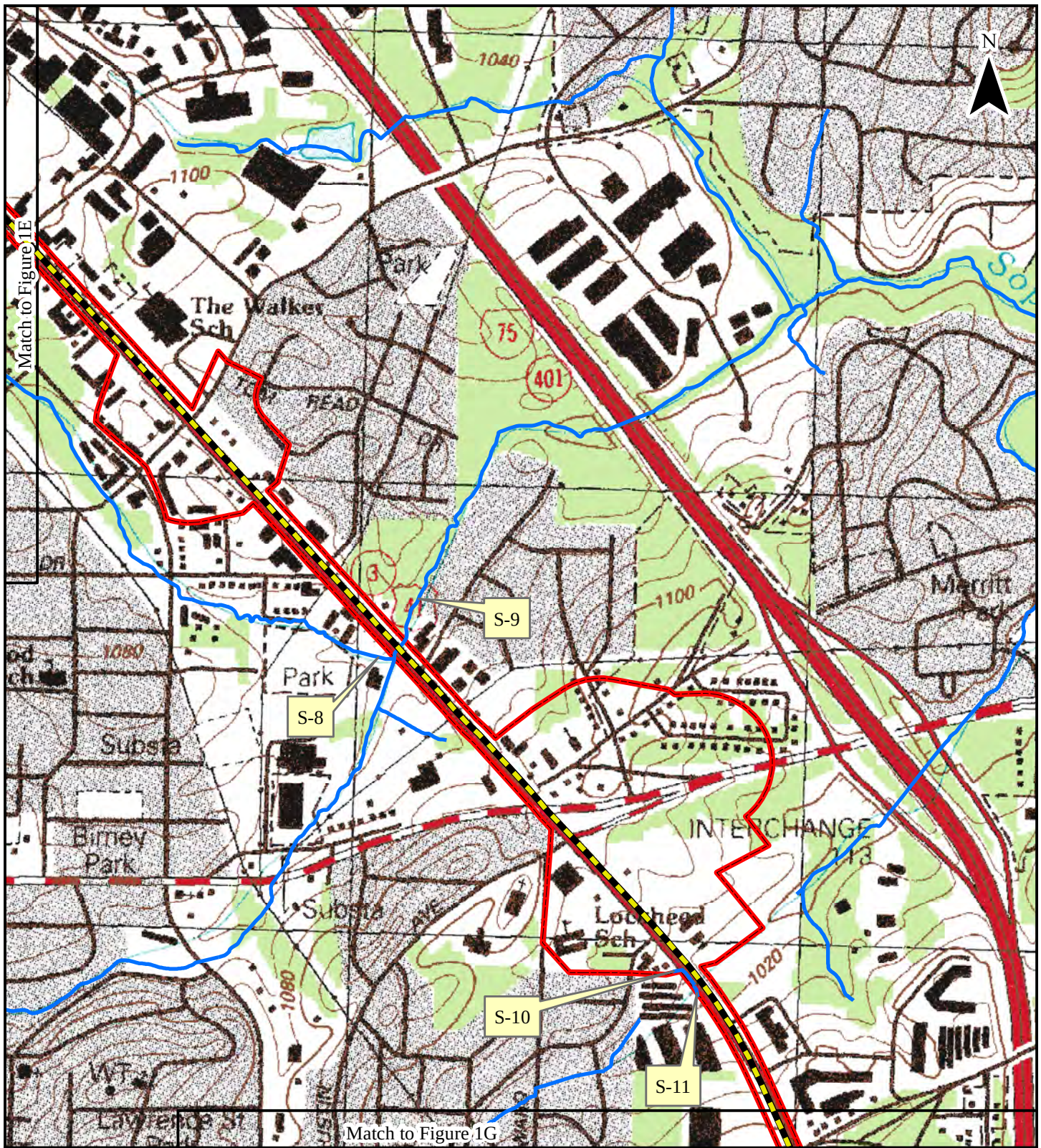
-  Alignment
-  Cobb Streams
-  Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1E Project Location Map

Connect Cobb
Cobb and Fulton Counties





Legend

- Alignment
- Cobb Streams
- Survey Areas

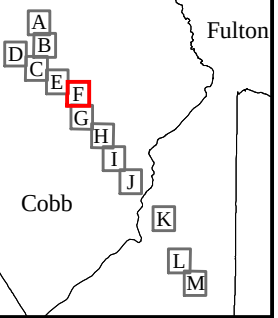
Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

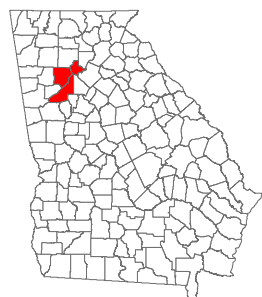
Figure 1F
Project Location Map

Connect Cobb
Cobb and Fulton Counties

Feet

0 500 1,000 1,500





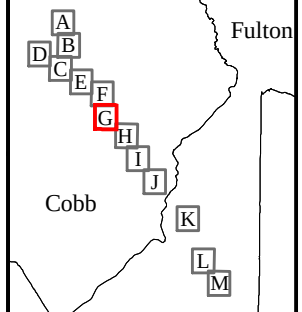
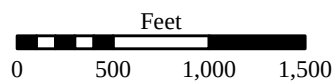
Legend

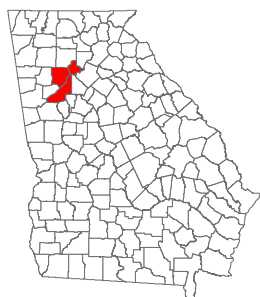
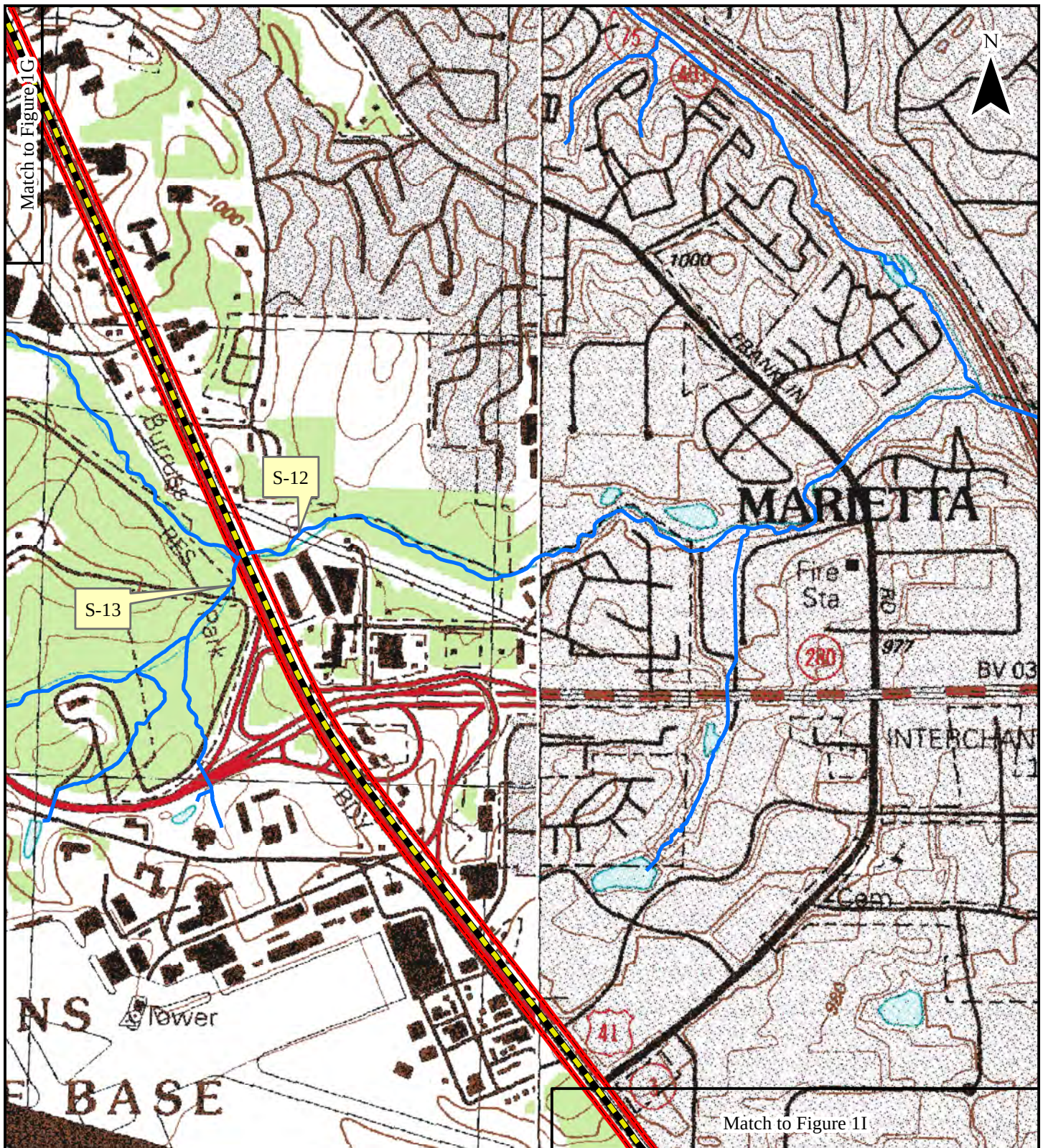
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1G Project Location Map

Connect Cobb
Cobb and Fulton Counties





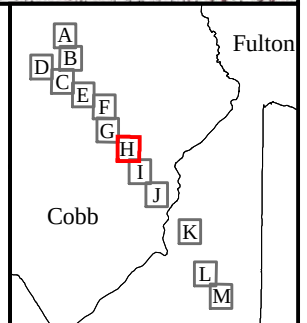
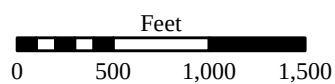
Legend

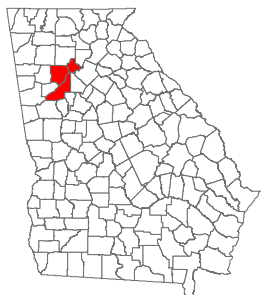
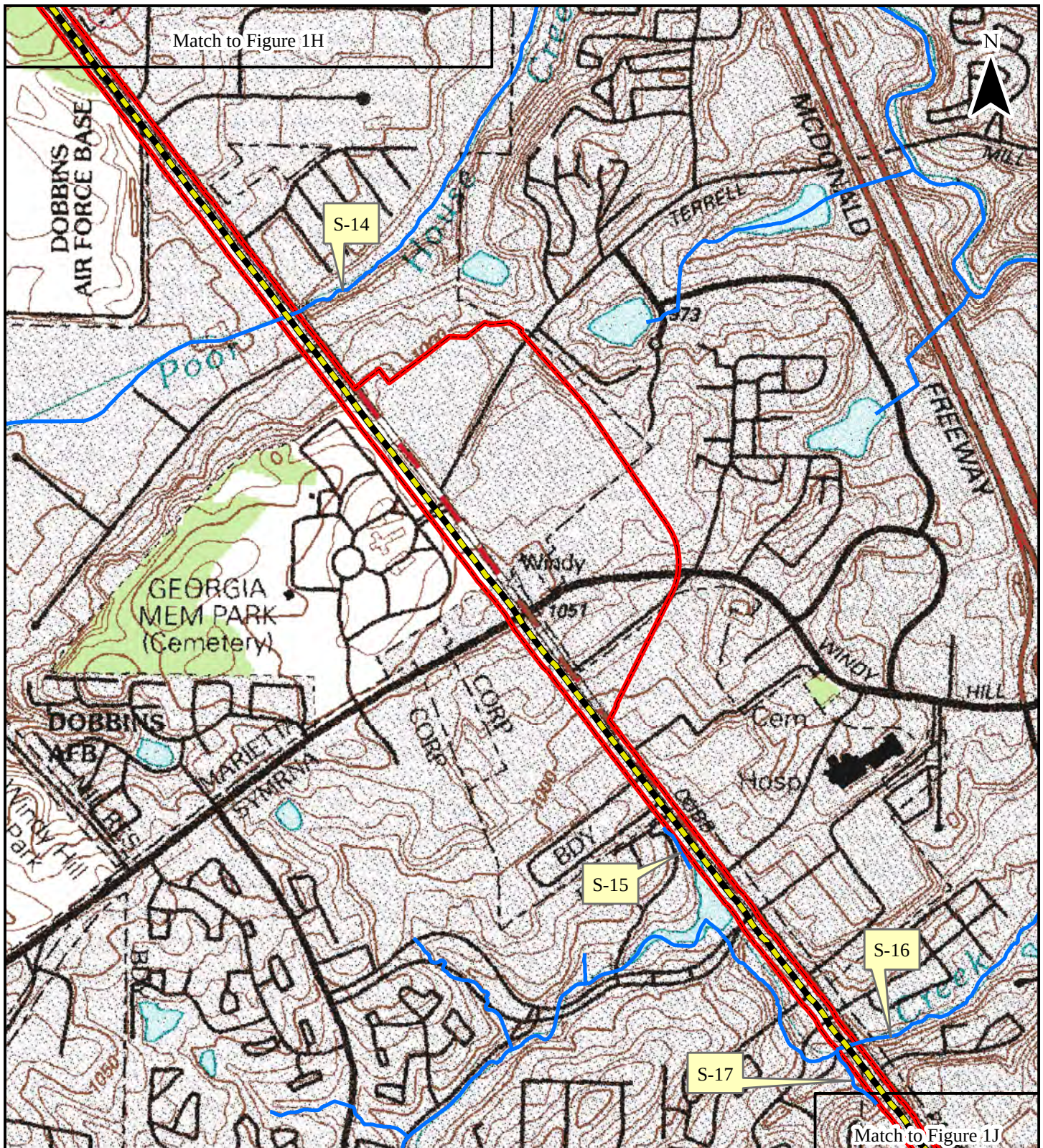
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1H Project Location Map

Connect Cobb
Cobb and Fulton Counties





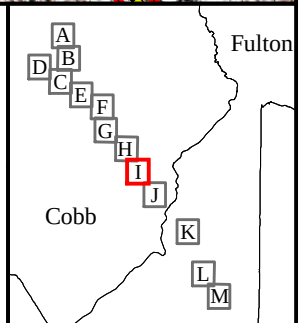
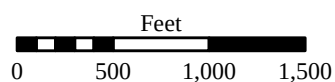
Legend

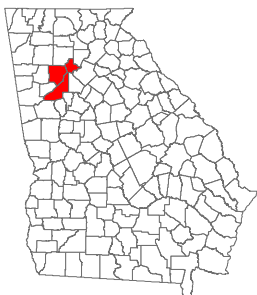
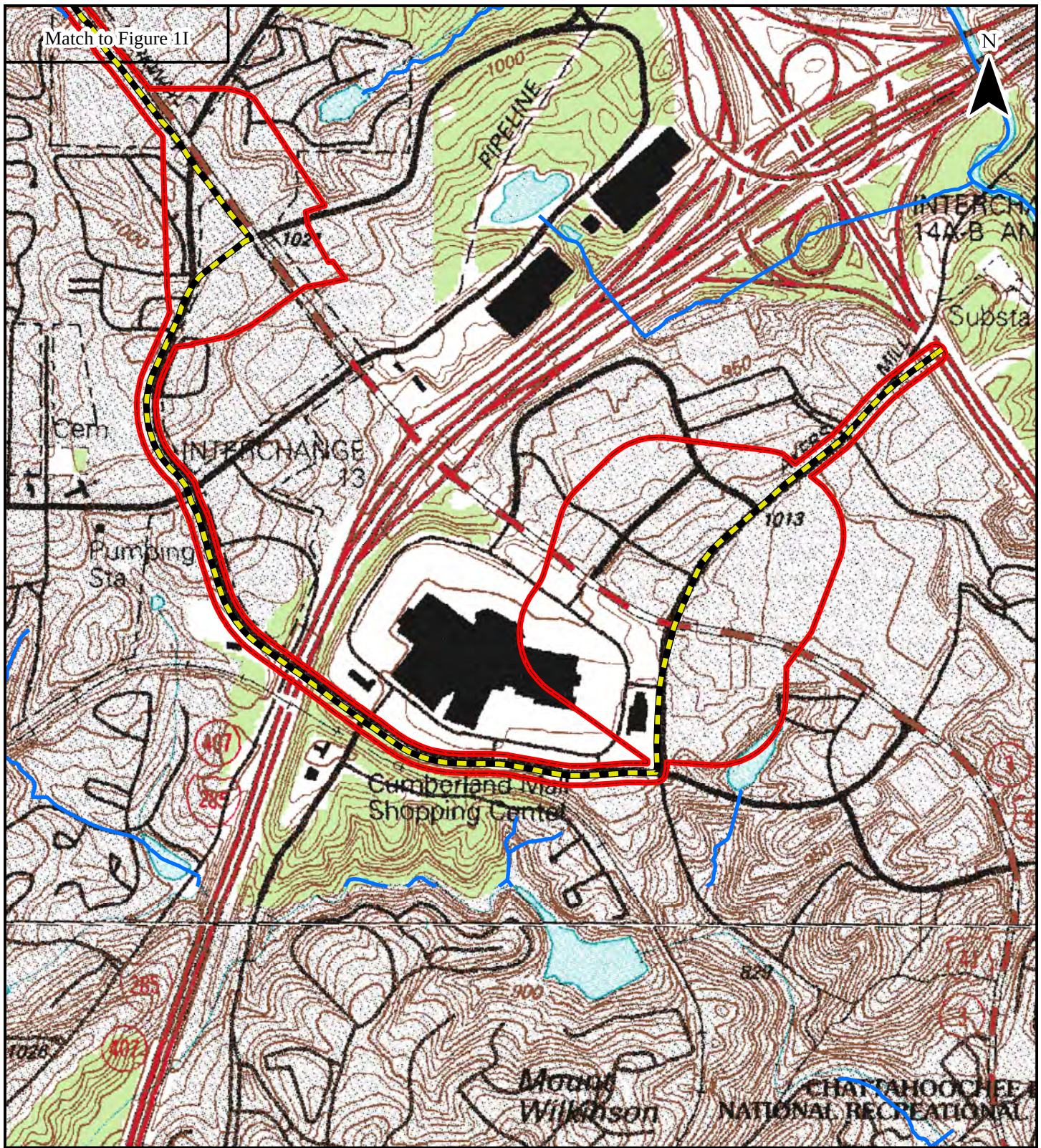
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1I Project Location Map

Connect Cobb
Cobb and Fulton Counties





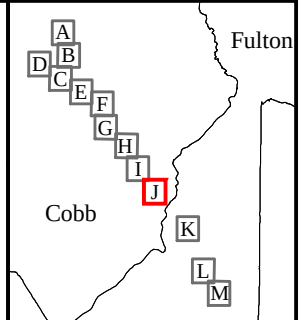
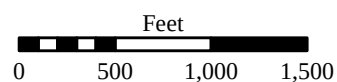
Legend

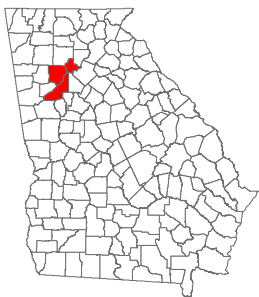
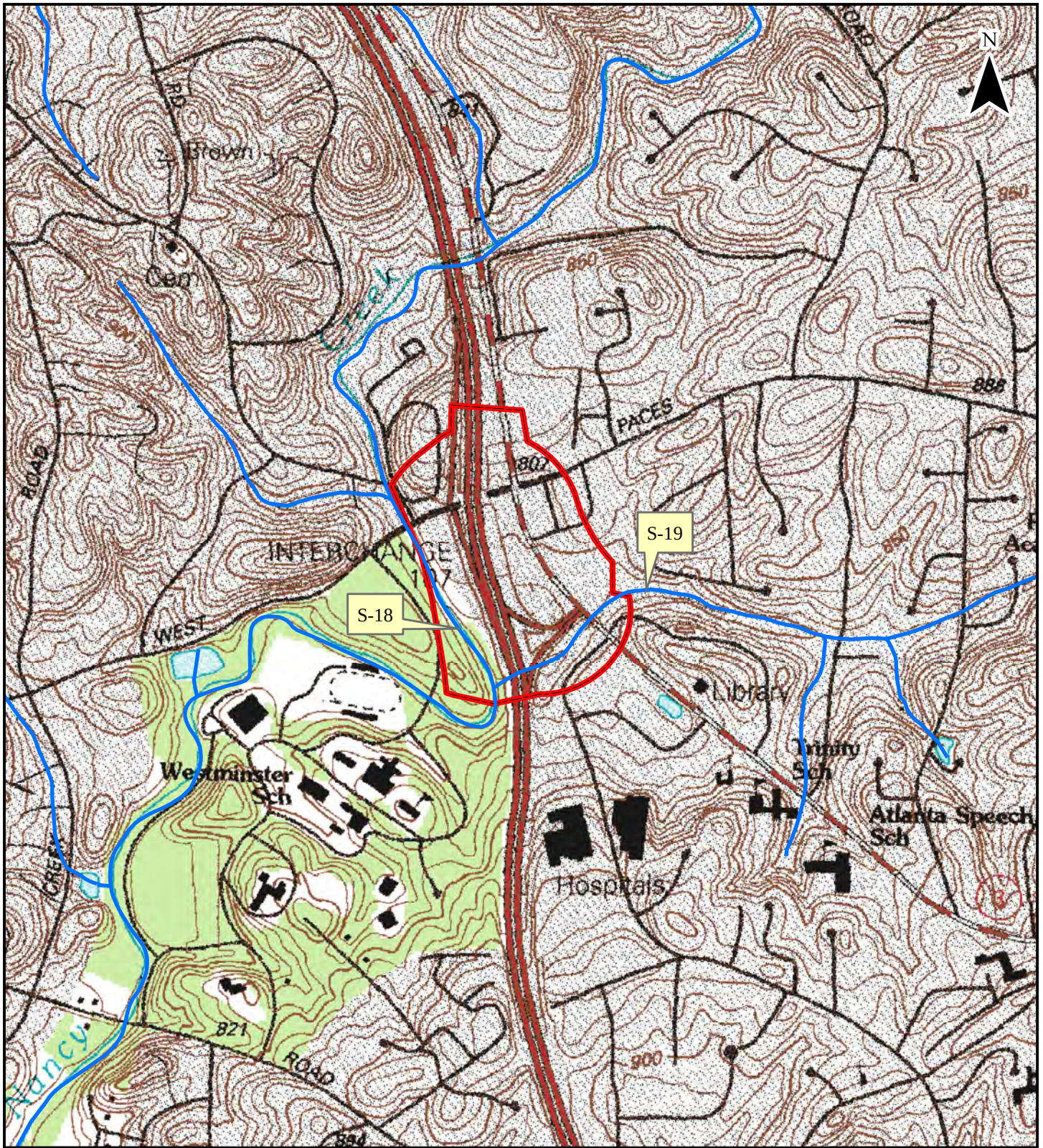
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1J Project Location Map

Connect Cobb
Cobb and Fulton Counties





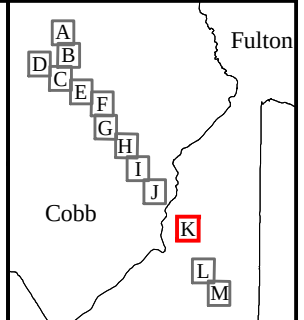
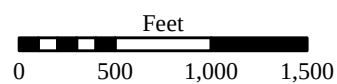
Legend

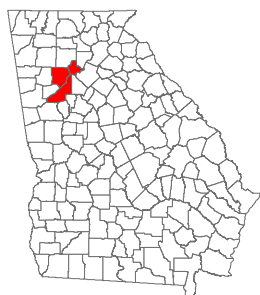
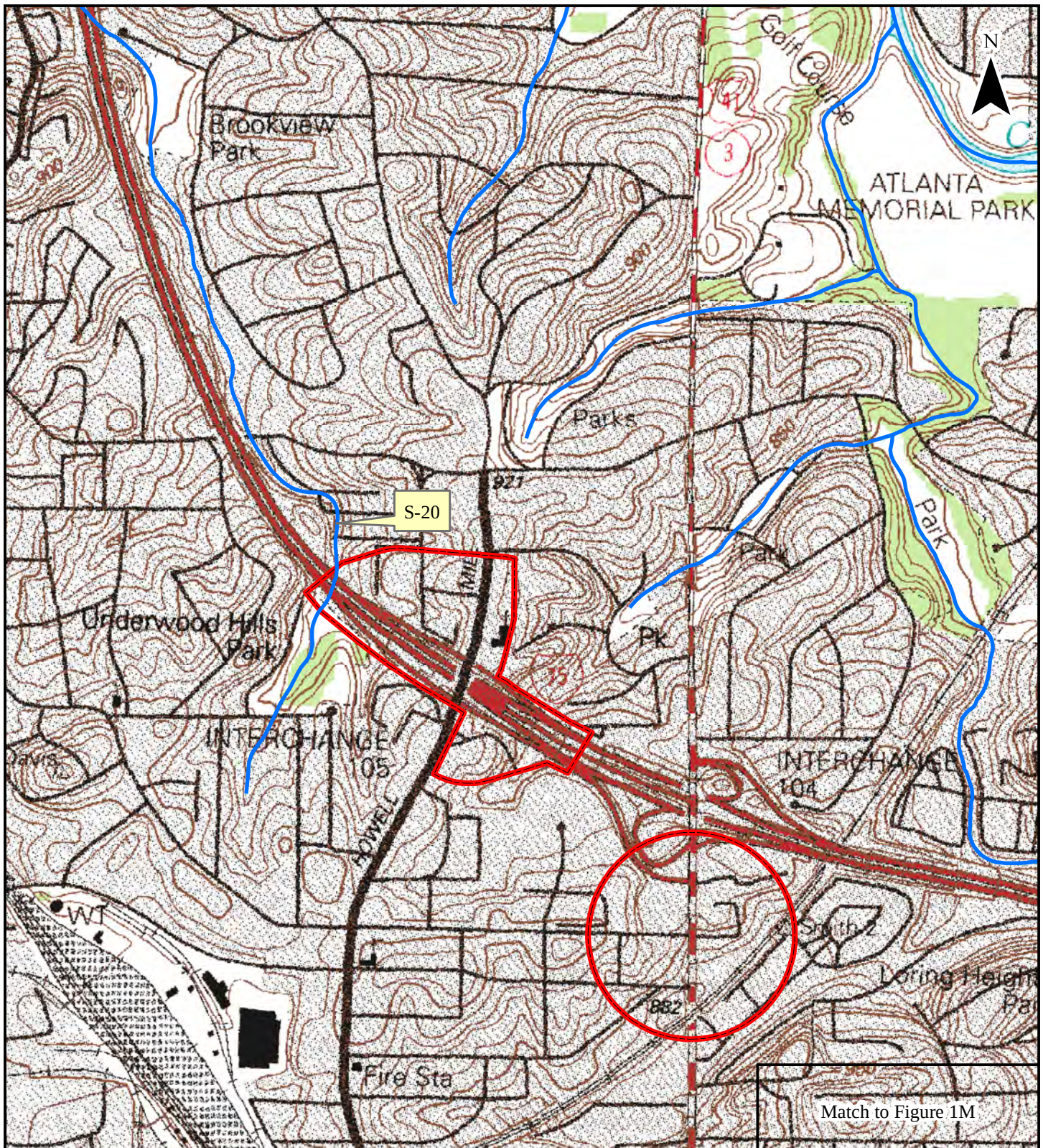
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1K Project Location Map

Connect Cobb
Cobb and Fulton Counties





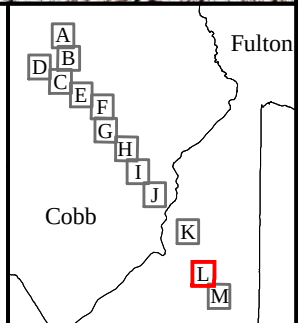
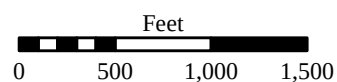
Legend

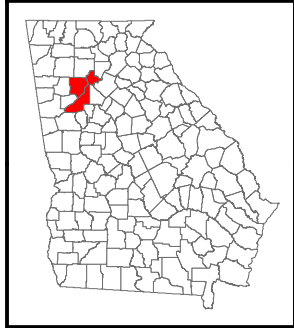
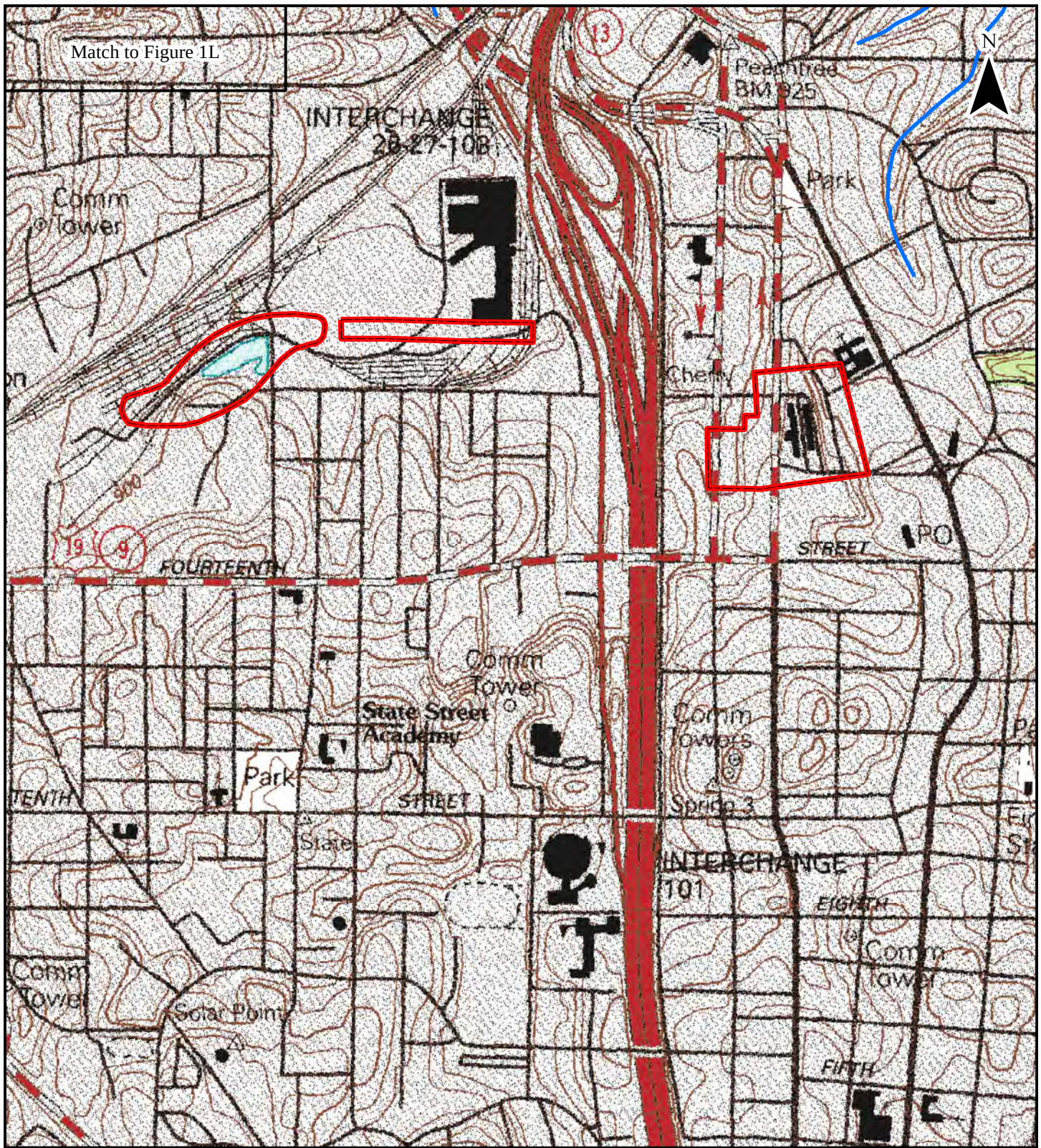
- Alignment
- Cobb Streams
- Survey Areas

Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

Figure 1L Project Location Map

Connect Cobb
Cobb and Fulton Counties





Legend

- Alignment
- Cobb Streams
- Survey Areas

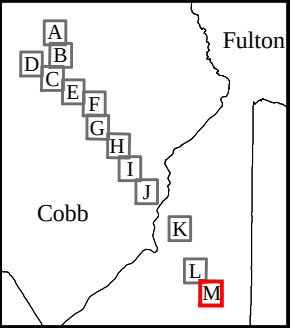
Source: Kennesaw, Marietta, Northwest Atlanta, Sandy Springs, GA Quadrangle (USGS 7.5' Series, Topographic)

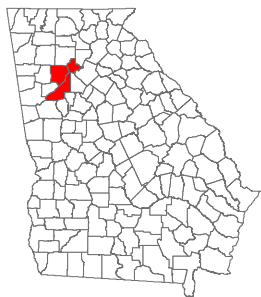
Figure 1M
Project Location Map

Connect Cobb
 Cobb and Fulton Counties

Feet

0 500 1,000 1,500





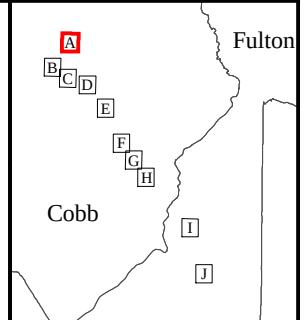
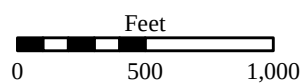
Legend

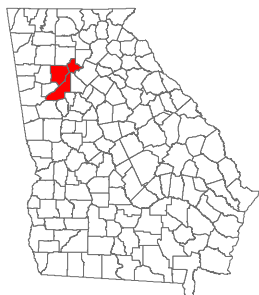
- ▶ Streams
- - - Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2A Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





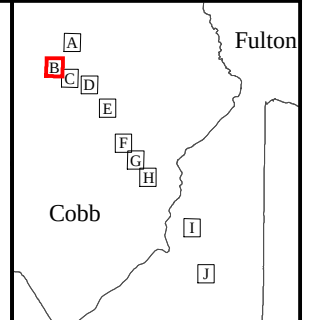
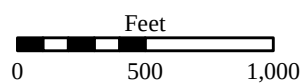
Legend

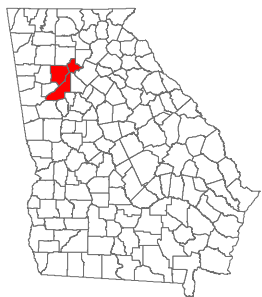
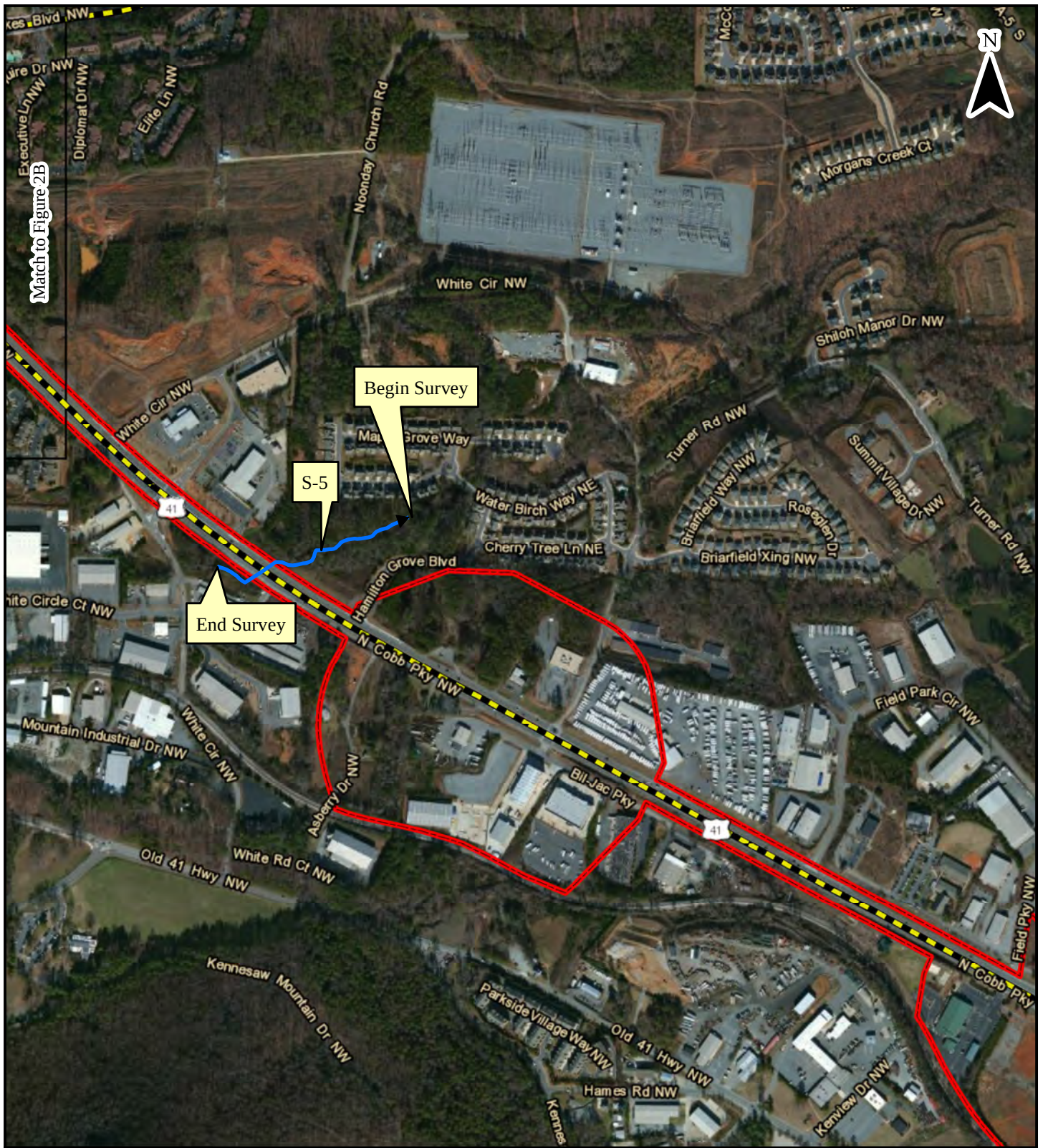
- ▶ Streams
- — — Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2B Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





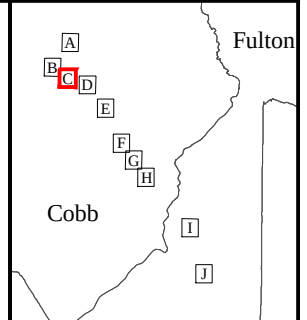
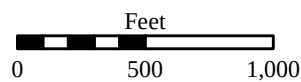
Legend

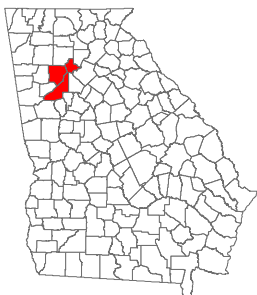
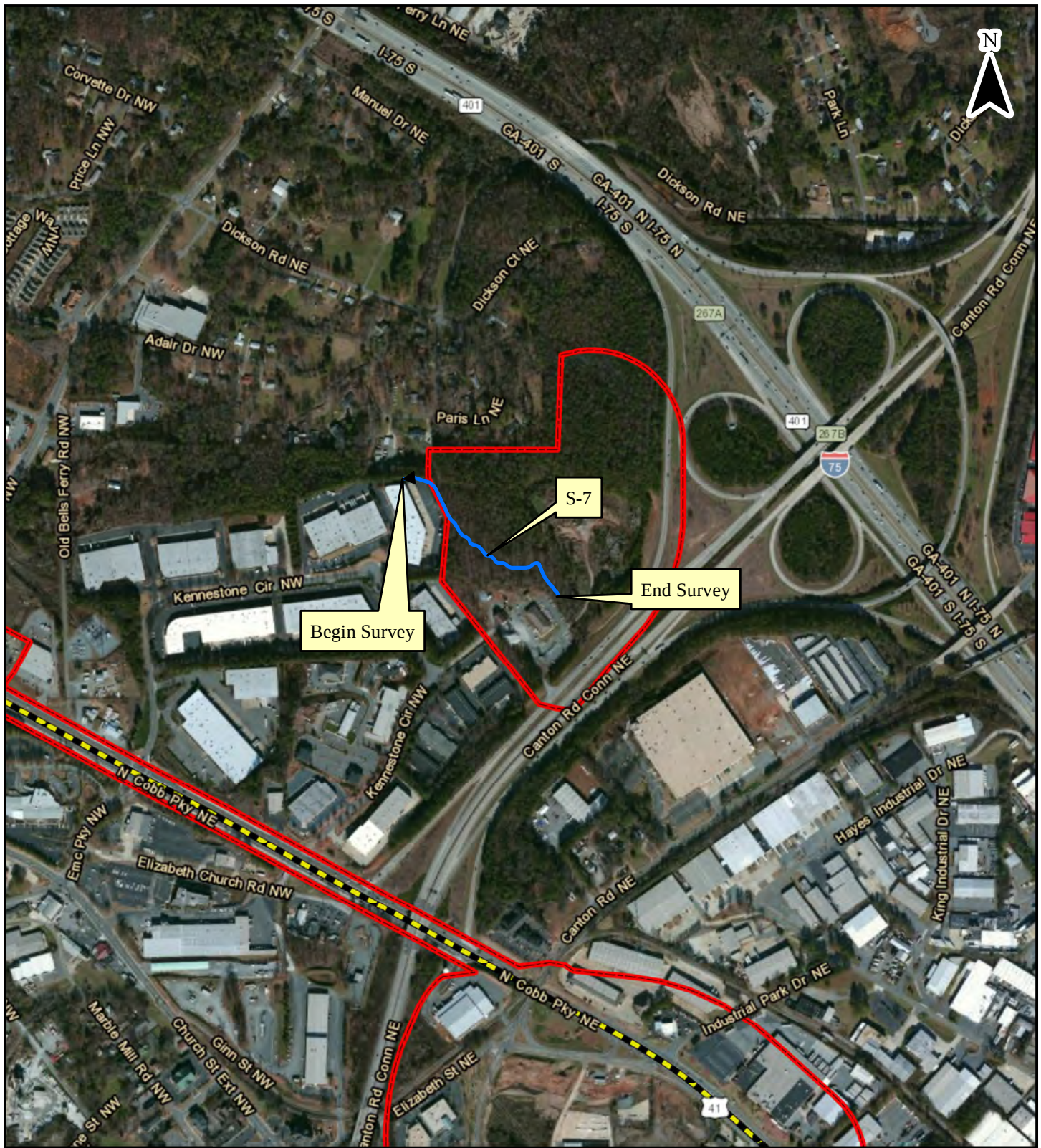
- ▶ Streams
- - - Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2C Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





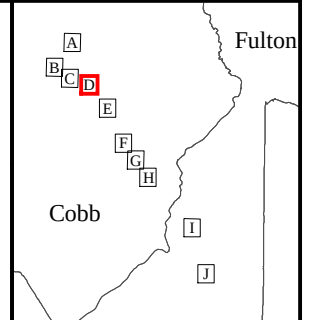
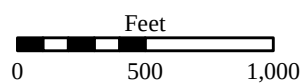
Legend

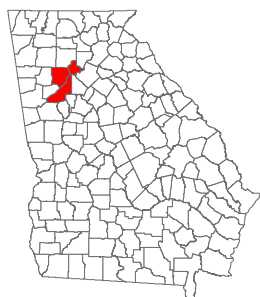
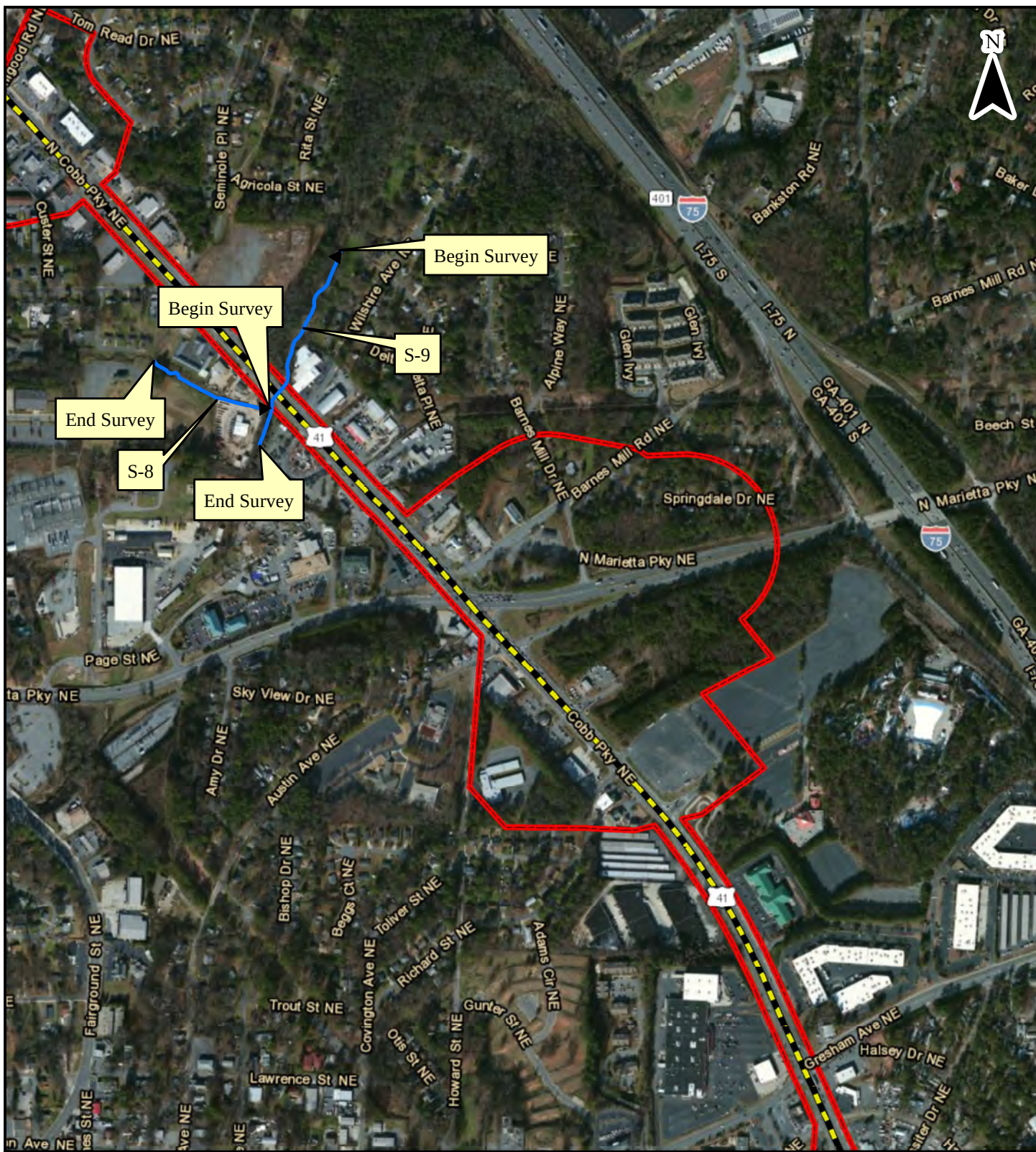
- Streams
- Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2D Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





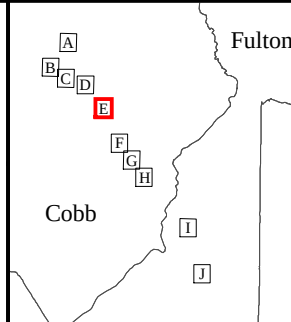
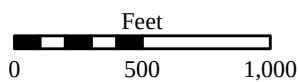
Legend

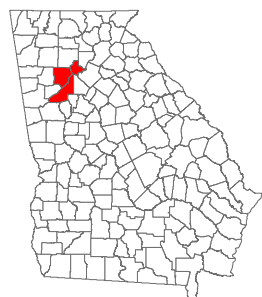
- Streams
- Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2E Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





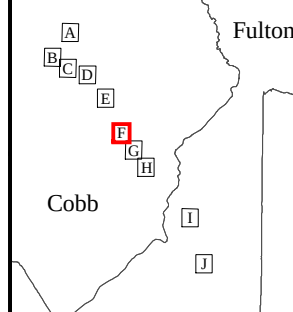
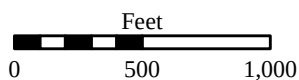
Legend

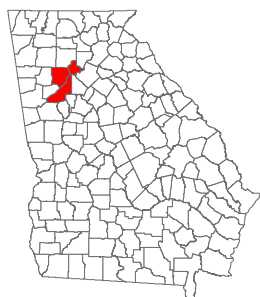
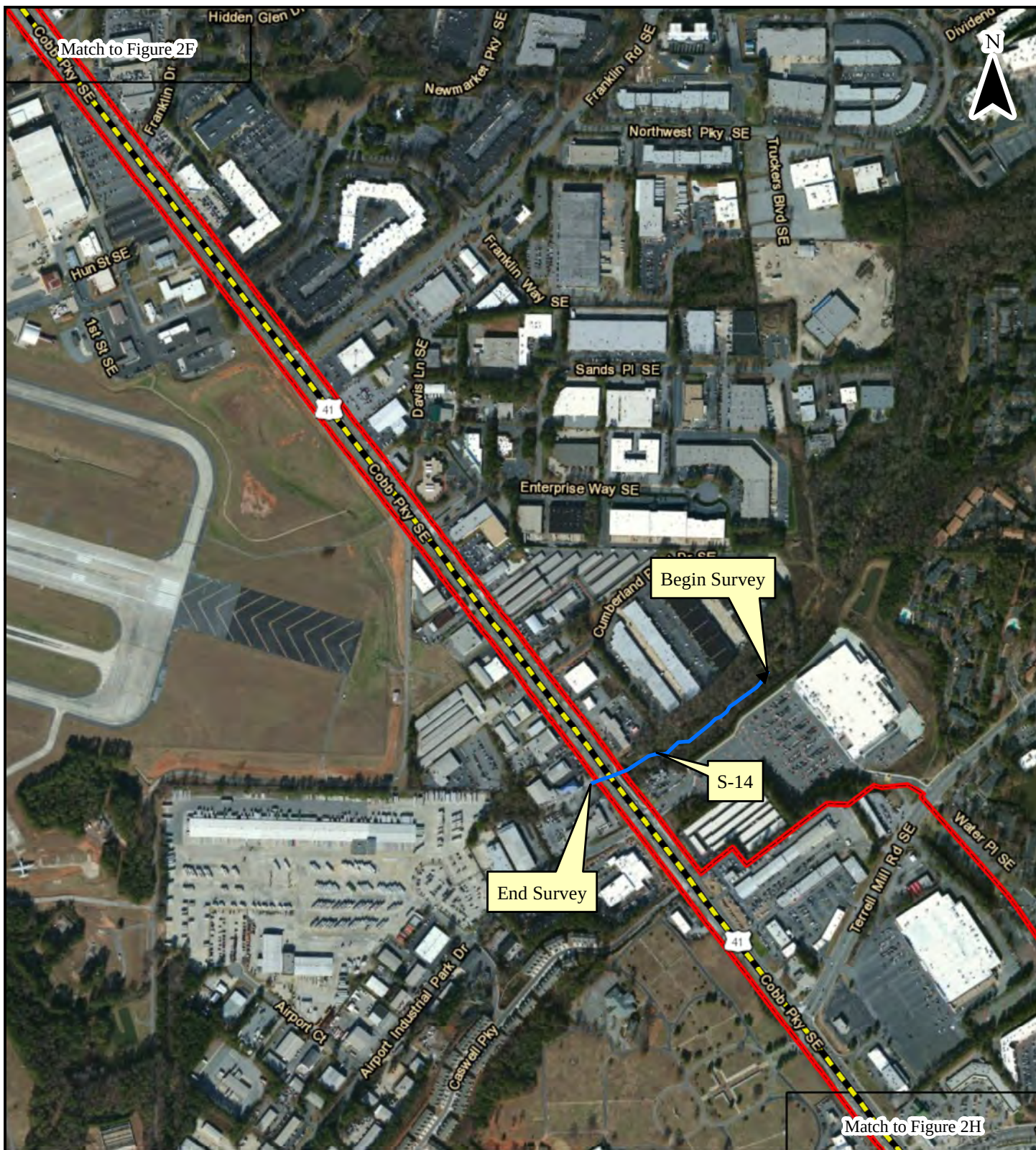
- ▶ Streams
- - - Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2F Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





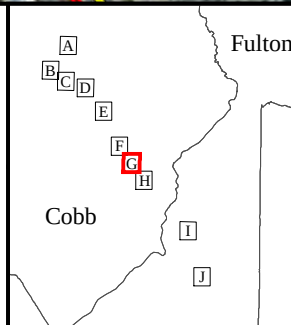
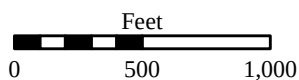
Legend

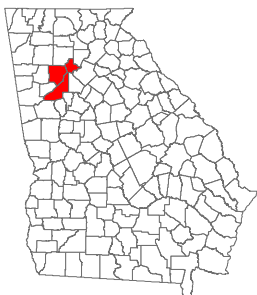
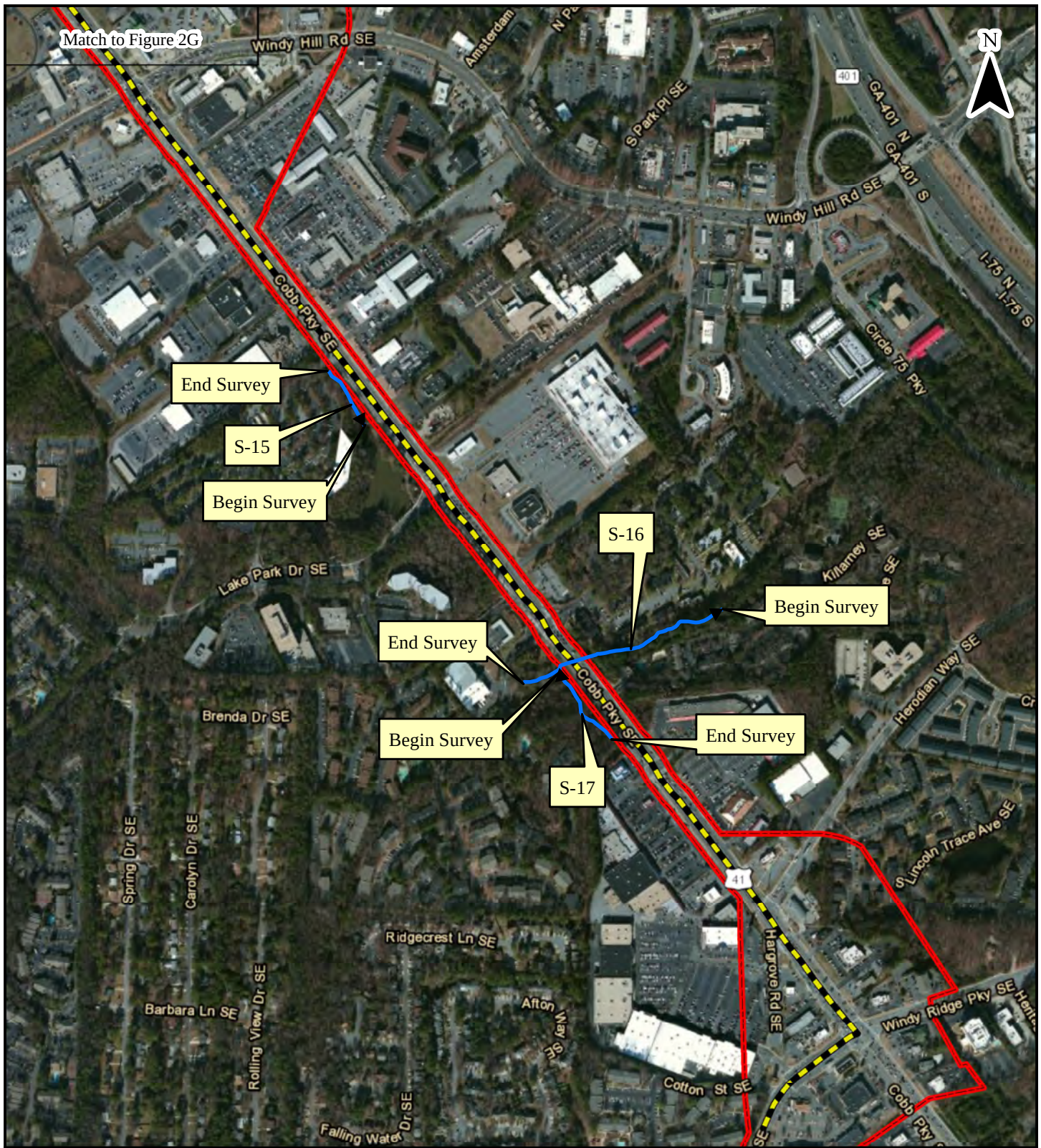
- ▶ Streams
- - - Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2G Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





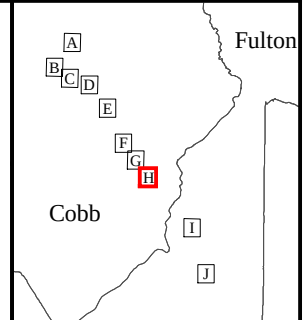
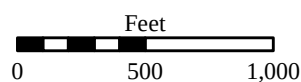
Legend

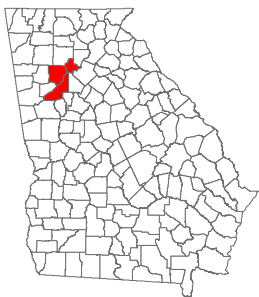
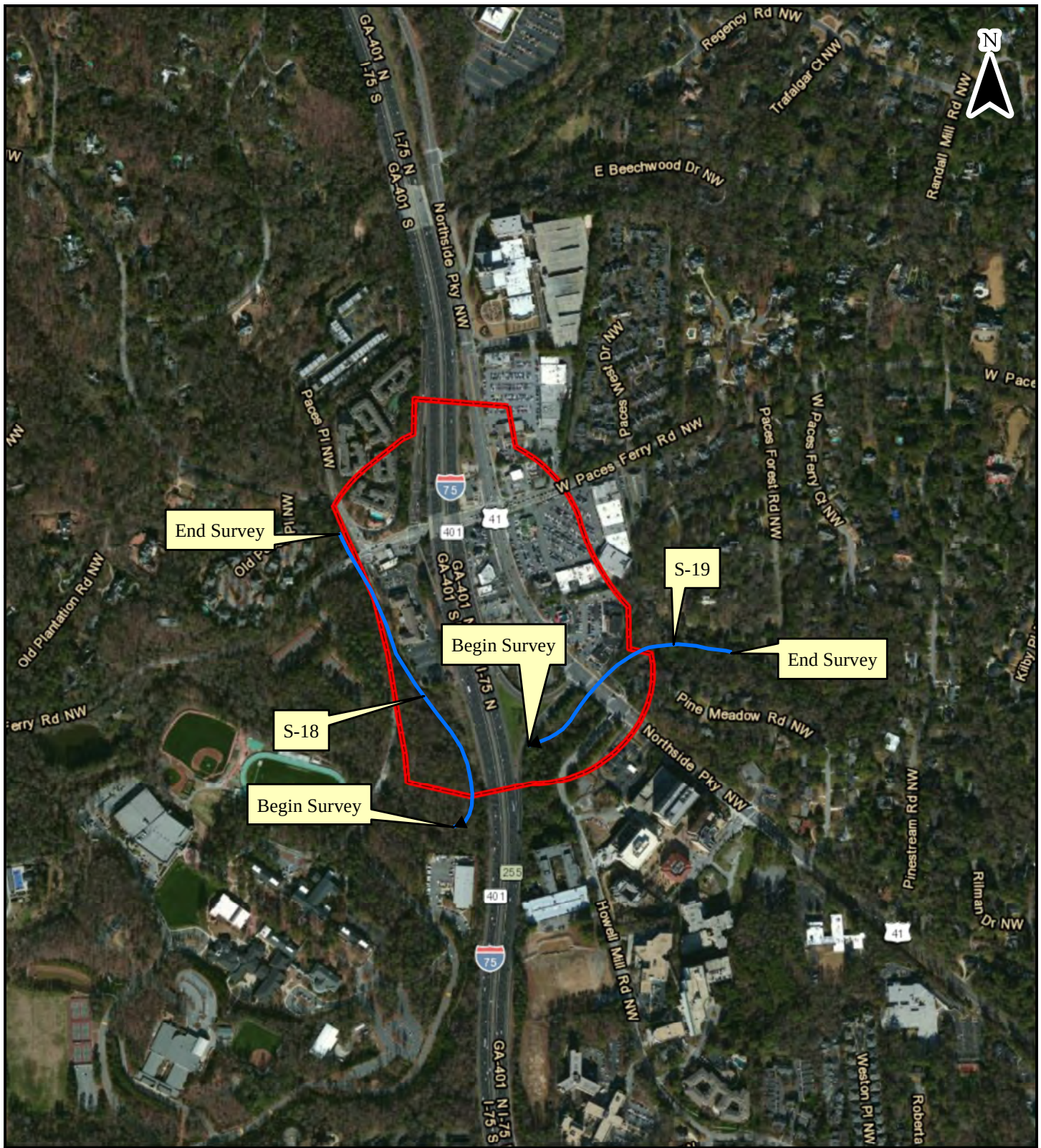
- ▶ Streams
- - - Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2H Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





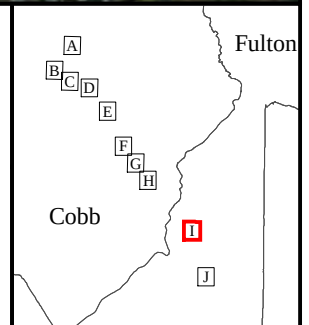
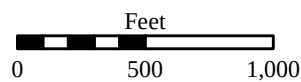
Legend

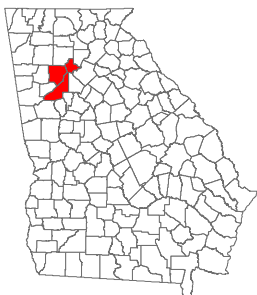
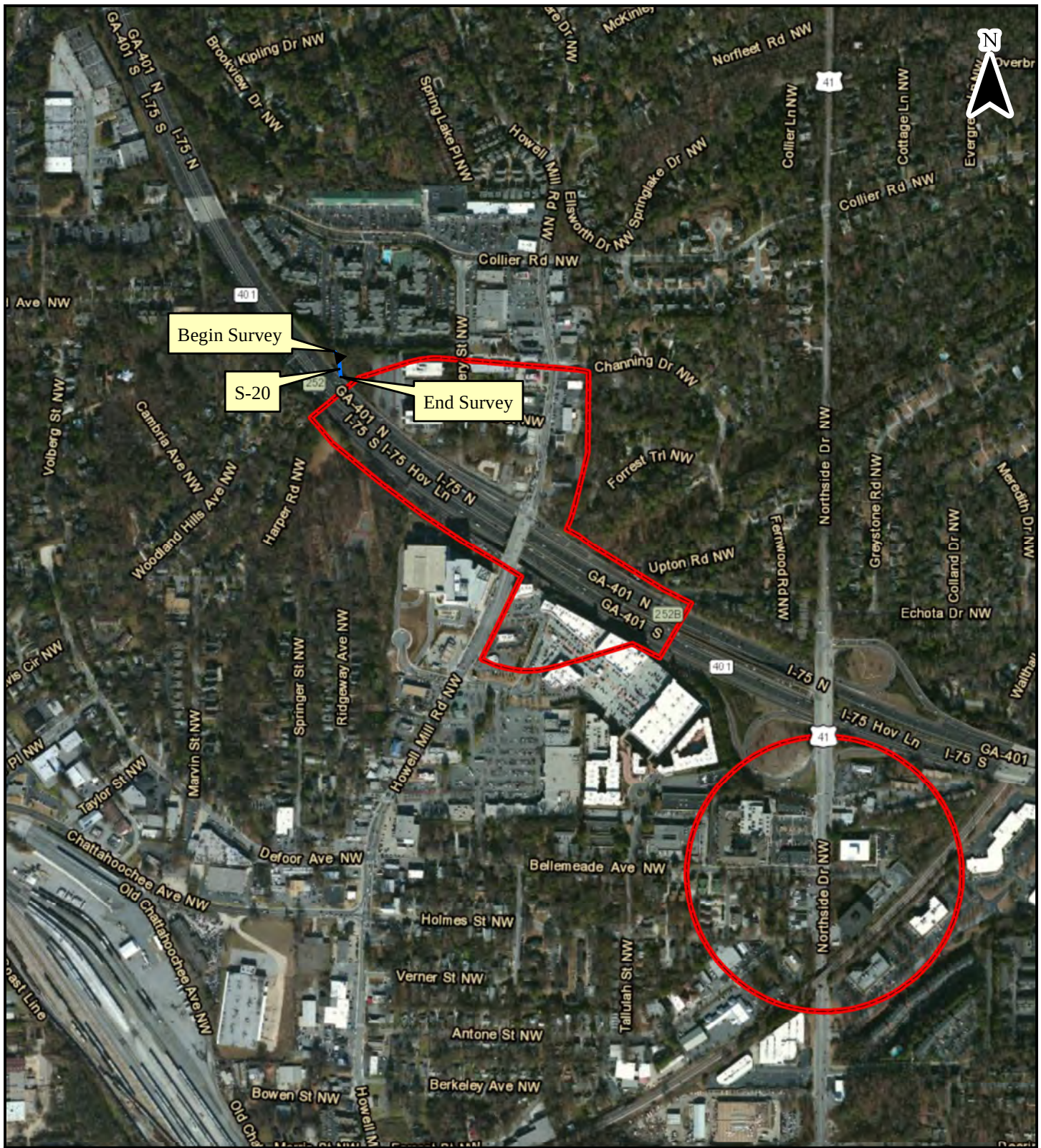
- ▶ Streams
- - - Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2I Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties





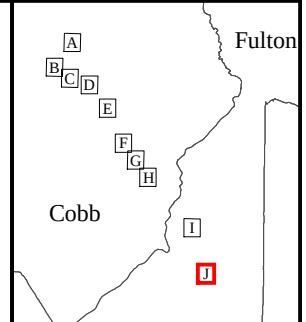
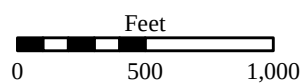
Legend

- Streams
- Alignment
- Survey Areas

Source: ESRI World Imagery

Figure 2J Aquatic Survey Limits

Connect Cobb
Cobb and Fulton Counties



TABLES

Table 1. Federal and State Protected Aquatic Species Targeted for the Survey

Endangered, Threatened, Rare, or Extirpated Aquatic Species				
Common Name	Scientific Name	Federal Status	State Status	Collected
Chattahoochee crayfish ^{3,4,5,7}	<i>Cambarus howardi</i>	None	T	Yes
Bluestripe shiner ^{3,4,5}	<i>Cyprinella callitaenia</i>	None	R	No
Delicate spike ^{3,4,5,7}	<i>Elliptio arcata</i>	None	E	No
Shinyrayed pocketbook ^{2,4,5}	<i>Hamiota subangulata</i>	E	E	No
Highscale shiner ^{3,4,5}	<i>Notropis hypsilepis</i>	None	T	No
Halloween darter ⁵	<i>Percina crypta</i>	None	T	No
Etowah crayfish ⁶	<i>Cambarus fasciatus</i>	None	T	No
Holiday darter ⁶	<i>Etheostoma brevirostrum</i>	None	E	No
Etowah darter ⁶	<i>Etheostoma etowahae</i>	E	E	No
Rock darter ⁶	<i>Etheostoma rupestre</i>	None	R	No
Cherokee darter ^{1,2,3,4,6,7}	<i>Etheostoma scotti</i>	T	T	No
Finelined pocketbook ⁶	<i>Hamiota altilis</i>	T	T	No
Lined chub ⁶	<i>Hybopsis lineapunctata</i>	None	R	No
Coosa chub ⁶	<i>Macrhybopsis sp. 1</i>	None	E	No
Amber darter ⁶	<i>Percina antesella</i>	E	E	No
Bridled darter ⁶	<i>Percina kusha</i>	None	E	No
Freckled darter ⁶	<i>Percina lenticula</i>	None	E	No
River redhorse ⁶	<i>Moxostoma carinatum</i>	None	R	No
Frecklebelly madtom ⁶	<i>Noturus munitus</i>	None	E	No

E = endangered

T = threatened

R = rare

¹USFWS Web site for Cobb County (accessed 2014)

²USFWS Web site for Fulton County (accessed 2014)

³GADNR Web site for Cobb County (accessed 2014)

⁴GADNR Web site for Fulton County (accessed 2014)

⁵GADNR Web site for Chattahoochee River, Upper Watershed (HUC8: 03130001)

⁶GADNR Web site for Etowah River Watershed (HUC8: 03150104)

⁷GADNR Letter (July 1, 2013)

Connect Cobb

Cobb and Fulton Counties

December 2014

Table 2. Water Quality Summary

Crossing	Hydrologic Unit Code (HUC8)	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS)	Specific Conductance (µS/cm)	pH	Turbidity (NTU)
S-1 (Alt)	03150104	16.6	7.85	122.6	146.2	7.69	6.1
S-2 (Alt)	03150104	16.1	6.55	90.7	95.9	7.30	8.4
S-3 (Alt)	03150104	14.9	8.32	104.7	131.6	7.70	5.1
S-4 (Alt)	03150104	14.7	7.22	96.4	105.7	7.50	4.7
S-5 (Alt)	03150104	14.5	6.22	121.2	130.4	7.50	5.9
S-1	03150104	14.7	8.03	163.7	191.3	7.25	5.3
S-1a	03150104	14.5	8.11	178.1	195.6	7.30	5.6
S-2	03150104	16.2	6.41	145.8	151.2	7.50	3.2
S-3	03150104	16.5	7.01	111.2	116.5	7.60	4.8
S-4	03150104	14.7	8.37	110.2	135.9	7.89	5.3
S-5	03150104	14.8	8.35	110.2	136.9	7.90	4.9
S-6	03150104	14.1	8.42	54.0	68.2	8.21	5.3
S-7	03150104	15.3	6.97	406.9	499.0	7.14	4.3
S-8	03130001	12.6	9.22	36.4	45.2	8.01	6.3
S-9	03130001	12.9	7.66	151.9	148.6	7.88	5.9
S-10	03130001	15.9	6.01	41.2	48.9	7.01	5.0
S-11	03130001	15.5	6.75	53.7	60.5	7.14	4.1
S-12	03130001	16.8	7.83	76.6	91.4	7.60	4.2
S-13	03130001	12.6	7.13	122.1	135.7	7.40	5.9
S-14	03130001	16.8	8.04	73.3	94.0	7.65	6.4
S-15	03130001	16.6	7.57	54.0	64.3	7.39	3.4
S-16	03130001	16.9	7.89	101.9	120.5	7.66	4.7
S-17	03130001	16.5	8.00	101.7	119.3	7.76	5.6
S-18	03130001	12.4	9.27	100.5	132.4	7.93	5.3
S-19	03130001	11.3	9.20	103.6	133.5	7.82	4.8
S-20	03130001	12.5	9.11	112.2	140.3	7.80	7.0

Table 3. Fish Summary

CROSSING	COMMON NAME	SCIENTIFIC NAME	QUANTITY	PRESERVED	CONSERVATION STATUS
S-3 (Alt)	Bluegill	<i>Lepomis macrochirus</i>	>100	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	29	0	None
	Alabama hogsucker	<i>Hypentelium etowanum</i>	15	0	None
	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
	Eastern mosquitofish	<i>Gambusia holbrooki</i>	>100	0	None
	Coosa banded sculpin	<i>Cottus carolinae zopherus</i>	31	0	None
	Largemouth bass	<i>Micropterus salmoides</i>	2	0	None
	Largescale stoneroller	<i>Campostoma oligolepis</i>	>100	0	None
	Green sunfish	<i>Lepomis cyanellus</i>	11	0	None
S-1a	Bluegill	<i>Lepomis macrochirus</i>	>100	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	45	0	None
	Alabama hogsucker	<i>Hypentelium etowanum</i>	27	0	None
	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
	Eastern mosquitofish	<i>Gambusia holbrooki</i>	>100	0	None
	Coosa banded sculpin	<i>Cottus carolinae zopherus</i>	8	0	None
	Largescale stoneroller	<i>Campostoma oligolepis</i>	>100	0	None
	Green sunfish	<i>Lepomis cyanellus</i>	14	0	None
S-4	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
S-5	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
S-7	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
S-8	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
	Southern studfish	<i>Fundulus stellifer</i>	12	0	None
	White sucker	<i>Catostomus commersoni</i>	9	0	None
	Alabama hogsucker	<i>Hypentelium etowanum</i>	22	0	None

Table 3. Fish Summary

S-9	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	56	0	None
	Alabama hogsucker	<i>Hypentelium etowanum</i>	39	0	None
	White sucker	<i>Catostomus commersonii</i>	4	0	None
	Southern studfish	<i>Fundulus stellifer</i>	11	0	None
	Largescale stoneroller	<i>Campostoma oligolepis</i>	>100	0	None
S-12	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
	Green sunfish	<i>Lepomis cyanellus</i>	48	0	None
	Yellow bullhead	<i>Ameiurus natalis</i>	7	0	None
	Bluefin stoneroller	<i>Campostoma pauciradii</i>	>100	0	None
	Alabama hogsucker	<i>Hypentelium etowanum</i>	29	0	None
	Bluegill	<i>Lepomis macrochirus</i>	>100	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	41	0	None
	Brown bullhead	<i>Ameiurus nebulosus</i>	7	0	None
	Snail bullhead	<i>Ameiurus brunneus</i>	2	0	None
	White sucker	<i>Catostomus commersonii</i>	29	0	None
S-13	Bluegill	<i>Lepomis macrochirus</i>	>100	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	29	0	None
	Snail bullhead	<i>Ameiurus brunneus</i>	3	0	None
	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
	White sucker	<i>Catostomus commersonii</i>	11	0	None
S-14	Bluegill	<i>Lepomis macrochirus</i>	82	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	22	0	None
	Alabama hogsucker	<i>Hypentelium etowanum</i>	53	0	None
	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
	Green sunfish	<i>Lepomis cyanellus</i>	17	0	None
	White sucker	<i>Catostomus commersonii</i>	8	0	None
	Bluefin stoneroller	<i>Campostoma pauciradii</i>	>100	0	None

Table 3. Fish Summary

S-15	None	None	0	0	None
S-16	Creek chub	<i>Semotilus atromaculatus</i>	>100	0	None
	Yellow bullhead	<i>Ameiurus natalis</i>	28	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	47	0	None
	Bluefin stoneroller	<i>Campostoma pauciradii</i>	>100	0	None
	Green sunfish	<i>Lepomis cyanellus</i>	53	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
S-17	Blackbanded darter	<i>Percina nigrofasciata</i>	8	0	None
	Yellow bullhead	<i>Ameiurus natalis</i>	3	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	44	0	None
	Bluefin stoneroller	<i>Campostoma pauciradii</i>	>100	0	None
S-18	Red shiner	<i>Cyprinella lutrensis</i>	>100	0	None
	Spottail shiner	<i>Notropis hudsonius</i>	>100	0	None
	Brown bullhead	<i>Ameiurus nebulosus</i>	13	0	None
	Bluefin stoneroller	<i>Campostoma pauciradii</i>	>100	0	None
	Longjaw minnow	<i>Notropis amplamala</i>	63	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	>100	0	None
	Redbreast sunfish	<i>Lepomis auritus</i>	>100	0	None
	Bluegill	<i>Lepomis macrochirus</i>	>100	0	None
	White sucker	<i>Catostomus commersonii</i>	14	0	None
	Largemouth bass	<i>Micropterus salmoides</i>	3	0	None
S-19	Red shiner	<i>Cyprinella lutrensis</i>	61	0	None
	Spottail shiner	<i>Notropis hudsonius</i>	>100	0	None
	Longjaw minnow	<i>Notropis amplamala</i>	24	0	None
	Blackbanded darter	<i>Percina nigrofasciata</i>	77	0	None
	Blacktail shiner	<i>Cyprinella venusta</i>	18	0	None
	Yellow bullhead	<i>Ameiurus natalis</i>	3	0	None
	Bluefin stoneroller	<i>Campostoma pauciradii</i>	>100	0	None
	Weed shiner	<i>Notropis texanus</i>	7	0	None
S-20	None	None	0	0	None

Table 4. Crayfish Summary

STREAM	COMMON NAME	SCIENTIFIC NAME	QUANTITY	PRESERVED	CONSERVATION STATUS
S-3 (Alt)	White tubercled crayfish	<i>Procambarus spiculifer</i>	15	None	None
S-1a	White tubercled crayfish	<i>Procambarus spiculifer</i>	28	None	None
S-4	White tubercled crayfish	<i>Procambarus spiculifer</i>	4	None	None
S-5	White tubercled crayfish	<i>Procambarus spiculifer</i>	3	None	None
S-7	White tubercled crayfish	<i>Procambarus spiculifer</i>	7	None	None
S-8	White tubercled crayfish	<i>Procambarus spiculifer</i>	2	None	None
S-9	White tubercled crayfish	<i>Procambarus spiculifer</i>	34	None	None
S-12	White tubercled crayfish	<i>Procambarus spiculifer</i>	17	None	None
S-13	White tubercled crayfish	<i>Procambarus spiculifer</i>	5	None	None
S-14	White tubercled crayfish	<i>Procambarus spiculifer</i>	15	None	None
S-15	Chattahoochee crayfish	<i>Cambarus howardi</i>	4	None	ST
	Variable crayfish	<i>Cambarus latimanus</i>	3	None	None
S-16	White tubercled crayfish	<i>Procambarus spiculifer</i>	25	None	None
	Chattahoochee crayfish	<i>Cambarus howardi</i>	3	None	ST
S-17	White tubercled crayfish	<i>Procambarus spiculifer</i>	11	None	None
S-18	White tubercled crayfish	<i>Procambarus spiculifer</i>	19	None	None
S-19	White tubercled crayfish	<i>Procambarus spiculifer</i>	7	None	None
S-20	White tubercled crayfish	<i>Procambarus spiculifer</i>	2	None	None

ST = State Threatened

Table 5. Mollusk Summary

STREAM	COMMON NAME	SCIENTIFIC NAME	QUANTITY	PRESERVED	CONSERVATION STATUS
S-3 (Alt)	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-1a	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-4	None	None	0	0	None
S-5	None	None	0	0	None
S-7	None	None	0	0	None
S-8	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-9	None	None	0	0	None
S-12	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-13	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-14	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-15	None	None	0	0	None
S-16	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-17	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-18	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-19	Asiatic clam	<i>Corbicula fluminea</i>	>100	>100	None
S-20	None	None	0	0	None

APPENDICES

Appendix A

References

REFERENCES

- Atlanta Journal-Constitution. 2003. Endangered Etowah: Growth troubles its waters development, tourism could imperil north Georgia river. http://www.etowahhpc.org/background/press/2003_07_13_ajc.htm
- Bauer, B.H., D.A. Etnier, and N.M. Burkhead. 1995. *Etheostoma (Ulocentra) scotti* (Osteichthyes: Percidae), a New Darter from the Etowah River System in Georgia. Alabama Museum of Natural History Bulletin No. 17.
- Boschung, H.T., and R.L. Mayden. 2004. Fishes of Alabama. Smithsonian Books, Washington.
- Burch, J.B. 1975. Freshwater Unionacean Clams (Mollusca: Pelycypoda) of North America. Malacological Publications, Hamburg, Michigan.
- Burch, J.B. 1989. North American Freshwater Snails. Malacological Publications. Hamburg, Michigan.
- Cummings, K.S. and C.A. Mayer. 1992. Field Guide to Freshwater Mussels of the Midwest. Manual 5. Illinois Natural History Survey, Champaign, Illinois.
- Etnier, D. A., and W. C. Starnes. 2001. The Fishes of Tennessee. The University of Tennessee Press, Knoxville, Tennessee.
- Freeman, B.J., and S. Wenger. 2000. Prioritizing Streams for Buffer Preservation and Restoration in the Etowah River Basin. University of Georgia Institute of Ecology. Prepared for the US Fish and Wildlife Service, Athens, Georgia.
- Georgia Department of Natural Resources. 1999. Protected Animals of Georgia. Wildlife Resources Division, Nongame Wildlife Section, Natural Heritage Program, Social Circle, Georgia.
- Georgia Department of Natural Resources. 2005. Standard Operating Procedures for Conducting Bio-monitoring on Fish Communities in the Piedmont Ecoregion of Georgia (Draft). Wildlife Resources Division, Fisheries Section, Atlanta, Georgia.
- Georgia Department of Natural Resources. 2009a. Georgia Rules and Regulations for Water Quality Control, Chapter 391-3-6.03- Water Use Classifications and Water Quality Standards (amended February 18, 2009). Environmental Protection Division, Water Protection Branch, Atlanta, Georgia.
- Georgia Department of Natural Resources. 2009b. Rare Species Profiles. www.georgiawildlife.com/node/2223/. Accessed November 2014
- Georgia Department of Natural Resources. 2014a. Nongame Conservation Section Biotics Database: County. Wildlife Resources Division, Social Circle.; Available at <http://www.georgiawildlife.com> (Accessed: November 2014).
- Georgia Department of Natural Resources. 2014b. Nongame Conservation Section Biotics Database: HUC8 Watersheds. Wildlife Resources Division, Social Circle.; Available at <http://www.georgiawildlife.com> (Accessed: November 2014).
- Georgia Department of Transportation. 2012. Scope of Work for Aquatic Surveys. Office of Environmental Services, Atlanta, Georgia.

- Hobbs, H.H., Jr. 1981. The Crayfishes of Georgia. Smithsonian Contributions to Zoology, Number 318, Smithsonian Institution Press, Washington, DC.
- Hurd, J.C. 1974. Systematics and Zoogeography of the Unioniaccean Mollusks of the Coosa River Drainage of Alabama, Georgia, and Tennessee. Ph. D, Dissertation. Auburn University. Auburn, Alabama.
- International Union for Conservation of Nature. 2014. The IUCN Red List of Threatened Species. International Union for Conservation of Nature, Red List. <http://www.iucnredlist.org/details/11250/0>.
- Mettee, M.F., P.E. O'Neil, and J.M. Pierson. 1996. Fishes of Alabama and the Mobile Basin. Oxmoor House, Inc., Birmingham, Alabama.
- Mirarchi, R.E., J.T. Garner, M.F. Mettee, and P.E. O'Neil. 2004. Alabama Wildlife, Volume Two: Imperiled Aquatic Mollusks and Fishes. Published for, and in cooperation with Alabama Department of Conservation and Natural Resources, Division of Wildlife and Fisheries and Auburn University's School of Forestry and Wildlife Sciences and The Alabama Agricultural Experiment Station. University of Alabama Press, Tuscaloosa, Alabama.
- NatureServe. 2014. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>.
- Page, L.M., and B.M. Burr. 1991. A Field Guide to Freshwater Fishes of North America North of Mexico. Houghton Mifflin Company, Boston, Massachusetts.
- Page, L.M., 1983. Handbook of Darters. TFH Publications, Inc. Neptune, New Jersey.
- Parmalee, P.W., and A.E. Bogan. 1998. The Freshwater Mussels of Tennessee. The University of Tennessee Press, Knoxville, Tennessee.
- Straight, C.A., B. Albanese, and B.J. Freeman. 2010. Fishes of Georgia Web site, Georgia Museum of Natural History; <http://fishesofgeorgia.uga.edu>
- The Thalweg. 2007. Cobb County Watershed Steward Program. <http://watershed.cobbcountyga.gov/pdfFiles/winter07.pdf>
- United States Environmental Protection Agency. 1986. Quality Criteria for Water. EPA 440/5-86-001. Office of Water, Regulations and Standards, Washington, DC.
- United States Fish and Wildlife Service. 2003. Recovery plan for Endangered Fat Threeridge (*Amblema neislerii*), Shinyrayed Pocketbook (*Lampsilis subangulata*), Gulf Moccasinshell (*Medionidus penicillatus*), Ochlockonee Moccasinshell (*Medionidus simpsonianus*), Oval Pigtoe (*Pleurobema pyriforme*), and Threatened Chipola Slabshell (*Elliptio chipolaensis*), and Purple Bankclimber (*Elliptoides sloatianus*). Atlanta, Georgia.
- United States Fish and Wildlife Service. 2007. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Five Endangered and Two Threatened Mussels in Four Northeast Gulf of Mexico Drainages; Final Rule. 50 CFR 17, Federal Register (November 15, 2007), Vol. 72, No. 220, Pages 64285-64340.
- United States Fish and Wildlife Service. 2008. Freshwater Mussel Protocol for the Southeastern Atlantic Slope and Northeastern Gulf Drainages in Florida and Georgia.

United States Fish and Wildlife Service. 2014. Information, Planning and Conservation (IPaC) web site; <http://ecos.fws.gov/ipac/>

United States Geologic Survey. 2014. USGS Current Water Data for Georgia. <http://water.usgs.gov/realtime.html>.

Williams, J.D. and M.H. Hughes. 1998. Freshwater Mussels (Unioidea) of Selected Reaches of the Main Channel of Rivers in the Coosa Drainage of Georgia, U.S. Geological Survey report to U.S. Army Corps of Engineers, Mobile District. pp 21.

Williams, J.D., A.E. Bogan, and J.T. Garner. 2008. Freshwater Mussels of Alabama and the Mobile Basin in Georgia, Mississippi, and Tennessee. The University of Alabama Press, Tuscaloosa, Alabama.

Ziewitz, J.W., B.K. Luprek, J.W. Kasbohm, and G.A. Carmody. 1997. Protected Species Inventory and Identification in the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint River Basins. Volume 1: Summary Report, Appendices A-C. U.S. Fish and Wildlife Service, Division of Ecological Services, Panama City, Florida.

Appendix B

Protected Species Information



U.S. Fish and Wildlife Service

Trust Resources List

This resource list is to be used for planning purposes only — it is not an official species list.

Endangered Species Act species list information for your project is available online and listed below for the following FWS Field Offices:

Georgia Ecological Services Field Office
105 WESTPARK DRIVE
WESTPARK CENTER SUITE D
ATHENS, GA 30606
(706) 613-9493

Project Counties:

Cobb, GA

Project Type:

Stream / Waterbody / Canals / Levees / Dikes

Endangered Species Act Species List ([USFWS Endangered Species Program](#)).

There are a total of 3 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fishes may appear on the species list because a project could cause downstream effects on the species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section below for critical habitat that lies within your project area. Please contact the designated FWS office if you have questions.

Species that should be considered in an effects analysis for your project:

Fishes	Status		Has Critical Habitat	Contact
Cherokee darter (<i>Etheostoma scotti</i>) Population: Entire	Threatened	species info		Georgia Ecological Services Field Office
Flowering Plants				



Trust Resources List

Little amphianthus (<i>Amphianthus pusillus</i>)	Threatened	species info		Georgia Ecological Services Field Office
Mammals				
northern long-eared Bat (<i>Myotis septentrionalis</i>) Population:	Proposed Endangered	species info		Georgia Ecological Services Field Office

Critical habitats within your project area:

There are no critical habitats within your project area.

FWS National Wildlife Refuges ([USFWS National Wildlife Refuges Program](#)).

There are no refuges found within the vicinity of your project.

FWS Migratory Birds ([USFWS Migratory Bird Program](#)).

The protection of birds is regulated by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. For more information regarding these Acts see: <http://www.fws.gov/migratorybirds/RegulationsandPolicies.html>.

All project proponents are responsible for complying with the appropriate regulations protecting birds when planning and developing a project. To meet these conservation obligations, proponents should identify potential or existing project-related impacts to migratory birds and their habitat and develop and implement conservation measures that avoid, minimize, or compensate for these impacts. The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).

For information about Birds of Conservation Concern, go to:

<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html>.



Trust Resources List

To search and view summaries of year-round bird occurrence data within your project area, go to the Avian Knowledge Network Histogram Tool links in the Bird Conservation Tools section at: <http://www.fws.gov/migratorybirds/CCMB2.htm>.

For information about conservation measures that help avoid or minimize impacts to birds, please visit: <http://www.fws.gov/migratorybirds/CCMB2.htm>.

Migratory birds of concern that may be affected by your project:

There are **14** birds on your Migratory birds of concern list. The underlying data layers used to generate the migratory bird list of concern will continue to be updated regularly as new and better information is obtained. User feedback is one method of identifying any needed improvements. Therefore, users are encouraged to submit comments about any questions regarding species ranges (e.g., a bird on the USFWS BCC list you know does not occur in the specified location appears on the list, or a BCC species that you know does occur there is not appearing on the list). Comments should be sent to [the ECOS Help Desk](#).

Species Name	Bird of Conservation Concern (BCC)	Species Profile	Seasonal Occurrence in Project Area
American bittern (<i>Botaurus lentiginosus</i>)	Yes	species info	Wintering
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Yes	species info	Year-round
Blue-winged Warbler (<i>Vermivora pinus</i>)	Yes	species info	Breeding
Brown-headed Nuthatch (<i>Sitta pusilla</i>)	Yes	species info	Year-round
Chuck-will's-widow (<i>Caprimulgus carolinensis</i>)	Yes	species info	Breeding
Fox Sparrow (<i>Passerella iliaca</i>)	Yes	species info	Wintering
Kentucky Warbler (<i>Oporornis formosus</i>)	Yes	species info	Breeding
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	Yes	species info	Year-round
Prairie Warbler (<i>Dendroica discolor</i>)	Yes	species info	Breeding
Prothonotary Warbler (<i>Protonotaria citrea</i>)	Yes	species info	Breeding
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	Yes	species info	Year-round



Trust Resources List

Rusty Blackbird (<i>Euphagus carolinus</i>)	Yes	species info	Wintering
Wood Thrush (<i>Hylocichla mustelina</i>)	Yes	species info	Breeding
Worm eating Warbler (<i>Helmitheros vermivorum</i>)	Yes	species info	Breeding

NWI Wetlands ([USFWS National Wetlands Inventory](#)).

The U.S. Fish and Wildlife Service is the principal Federal agency that provides information on the extent and status of wetlands in the U.S., via the National Wetlands Inventory Program (NWI). In addition to impacts to wetlands within your immediate project area, wetlands outside of your project area may need to be considered in any evaluation of project impacts, due to the hydrologic nature of wetlands (for example, project activities may affect local hydrology within, and outside of, your immediate project area). It may be helpful to refer to the USFWS National Wetland Inventory website. The designated FWS office can also assist you. Impacts to wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes. Project Proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate [U.S. Army Corps of Engineers District](#).

Data Limitations, Exclusions and Precautions

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery and/or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Exclusions - Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and



Trust Resources List

nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Precautions - Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

The following wetland types intersect your project area in one or more locations:

Wetland Types	NWI Classification Code	Total Acres
Freshwater Emergent Wetland	PEM1Ah	7.3887
Freshwater Emergent Wetland	PEM1Fb	2.075
Freshwater Emergent Wetland	PEM1Fh	12.4184
Freshwater Emergent Wetland	PEM1F	50.8563
Freshwater Emergent Wetland	PEM1C	9.1114
Freshwater Emergent Wetland	PEM1A	14.26
Freshwater Emergent Wetland	PEM1Fx	0.7849
Freshwater Emergent Wetland	PEM1Ch	13.3295
Freshwater Emergent Wetland	PEM1Ad	4.4582
Freshwater Emergent Wetland	PEM1Cd	8.2275
Freshwater Forested/Shrub Wetland	PSS1Ch	15.1238
Freshwater Forested/Shrub Wetland	PFO1Ah	14.8236
Freshwater Forested/Shrub Wetland	PSS1/4A	2.3822
Freshwater Forested/Shrub Wetland	PSS1Fx	1.5523
Freshwater Forested/Shrub Wetland	PSS1Ah	23.8785
Freshwater Forested/Shrub Wetland	PFO1Cd	5.6949
Freshwater Forested/Shrub Wetland	PFO1Ch	1.8021



Trust Resources List

Freshwater Forested/Shrub Wetland	PSS1Fh	3.6959
Freshwater Forested/Shrub Wetland	PFO1/4A	8.1039
Freshwater Forested/Shrub Wetland	PFO5G	1.3304
Freshwater Forested/Shrub Wetland	PFO1/SS1C	7.8903
Freshwater Forested/Shrub Wetland	PFO1B	3.5298
Freshwater Forested/Shrub Wetland	PFO1C	335.5281
Freshwater Forested/Shrub Wetland	PSS1A	226.647
Freshwater Forested/Shrub Wetland	PFO1A	885.5472
Freshwater Forested/Shrub Wetland	PSS1C	42.8554
Freshwater Forested/Shrub Wetland	PFO1F	14.12
Freshwater Forested/Shrub Wetland	PSS1F	60.033
Freshwater Pond	PUBEx	1.1969
Freshwater Pond	PUBHx	103.4749
Freshwater Pond	PAB3Fh	0.8362
Freshwater Pond	PUBGh	2.6306
Freshwater Pond	PUBGx	4.8979
Freshwater Pond	PUBH	18.5837
Freshwater Pond	PAB4Gx	0.419
Freshwater Pond	PUBHh	1191.1912
Freshwater Pond	PUBFh	2.0529
Lake	L1UBHh	2601.0307
Lake	L2USCh	3.8206
Other	PUSAh	17.5736
Other	PUSCx	1.0598
Riverine	R2UBH	307.3679
Riverine	R2USA	2.0828



U.S. Fish and Wildlife Service

Trust Resources List

This resource list is to be used for planning purposes only — it is not an official species list.

Endangered Species Act species list information for your project is available online and listed below for the following FWS Field Offices:

Georgia Ecological Services Field Office
105 WESTPARK DRIVE
WESTPARK CENTER SUITE D
ATHENS, GA 30606
(706) 613-9493

Project Counties:

Fulton, GA

Project Type:

Stream / Waterbody / Canals / Levees / Dikes

Endangered Species Act Species List ([USFWS Endangered Species Program](#)).

There are a total of 5 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fishes may appear on the species list because a project could cause downstream effects on the species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section below for critical habitat that lies within your project area. Please contact the designated FWS office if you have questions.

Species that should be considered in an effects analysis for your project:

Clams	Status		Has Critical Habitat	Contact
Gulf moccasinshell (<i>Medionidus penicillatus</i>)	Endangered	species info	Final designated critical habitat	Georgia Ecological Services Field Office
Oval pigtoe (<i>Pleurobema pyriforme</i>)	Endangered	species info	Final designated critical habitat	Georgia Ecological Services Field Office



Trust Resources List

Purple bankclimber (<i>Elliptioideus sloatianus</i>)	Threatened	species info	Final designated critical habitat	Georgia Ecological Services Field Office
Shinyrayed pocketbook (<i>Lampsilis subangulata</i>)	Endangered	species info	Final designated critical habitat	Georgia Ecological Services Field Office
Fishes				
Cherokee darter (<i>Etheostoma scotti</i>) Population: Entire	Threatened	species info		Georgia Ecological Services Field Office

Critical habitats within your project area:

There are no critical habitats within your project area.

FWS National Wildlife Refuges ([USFWS National Wildlife Refuges Program](#)).

There are no refuges found within the vicinity of your project.

FWS Migratory Birds ([USFWS Migratory Bird Program](#)).

The protection of birds is regulated by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. For more information regarding these Acts see: <http://www.fws.gov/migratorybirds/RegulationsandPolicies.html>.

All project proponents are responsible for complying with the appropriate regulations protecting birds when planning and developing a project. To meet these conservation obligations, proponents should identify potential or existing project-related impacts to migratory birds and their habitat and develop and implement conservation measures that avoid, minimize, or compensate for these impacts. The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).



Trust Resources List

For information about Birds of Conservation Concern, go to:

<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html>.

To search and view summaries of year-round bird occurrence data within your project area, go to the Avian Knowledge Network Histogram Tool links in the Bird Conservation Tools section at: <http://www.fws.gov/migratorybirds/CCMB2.htm>.

For information about conservation measures that help avoid or minimize impacts to birds, please visit:

<http://www.fws.gov/migratorybirds/CCMB2.htm>.

Migratory birds of concern that may be affected by your project:

There are **14** birds on your Migratory birds of concern list. The underlying data layers used to generate the migratory bird list of concern will continue to be updated regularly as new and better information is obtained. User feedback is one method of identifying any needed improvements. Therefore, users are encouraged to submit comments about any questions regarding species ranges (e.g., a bird on the USFWS BCC list you know does not occur in the specified location appears on the list, or a BCC species that you know does occur there is not appearing on the list). Comments should be sent to [the ECOS Help Desk](#).

Species Name	Bird of Conservation Concern (BCC)	Species Profile	Seasonal Occurrence in Project Area
American bittern (<i>Botaurus lentiginosus</i>)	Yes	species info	Wintering
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Yes	species info	Year-round
Blue-winged Warbler (<i>Vermivora pinus</i>)	Yes	species info	Breeding
Brown-headed Nuthatch (<i>Sitta pusilla</i>)	Yes	species info	Year-round
Chuck-will's-widow (<i>Caprimulgus carolinensis</i>)	Yes	species info	Breeding
Fox Sparrow (<i>Passerella iliaca</i>)	Yes	species info	Wintering
Kentucky Warbler (<i>Oporornis formosus</i>)	Yes	species info	Breeding
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	Yes	species info	Year-round
Prairie Warbler (<i>Dendroica discolor</i>)	Yes	species info	Breeding



Trust Resources List

Prothonotary Warbler (<i>Protonotaria citrea</i>)	Yes	species info	Breeding
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	Yes	species info	Year-round, Breeding
Rusty Blackbird (<i>Euphagus carolinus</i>)	Yes	species info	Wintering
Wood Thrush (<i>Hylocichla mustelina</i>)	Yes	species info	Breeding
Worm eating Warbler (<i>Helmitheros vermivorum</i>)	Yes	species info	Breeding

NWI Wetlands ([USFWS National Wetlands Inventory](#)).

The U.S. Fish and Wildlife Service is the principal Federal agency that provides information on the extent and status of wetlands in the U.S., via the National Wetlands Inventory Program (NWI). In addition to impacts to wetlands within your immediate project area, wetlands outside of your project area may need to be considered in any evaluation of project impacts, due to the hydrologic nature of wetlands (for example, project activities may affect local hydrology within, and outside of, your immediate project area). It may be helpful to refer to the USFWS National Wetland Inventory website. The designated FWS office can also assist you. Impacts to wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes. Project Proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate [U.S. Army Corps of Engineers District](#).

Data Limitations, Exclusions and Precautions

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery and/or field work. There



Trust Resources List

may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Exclusions - Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Precautions - Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

The following wetland types intersect your project area in one or more locations:

Wetland Types	NWI Classification Code	Total Acres
Freshwater Emergent Wetland	PEM1Cx	1.1127
Freshwater Emergent Wetland	PEM1Ah	3.193
Freshwater Emergent Wetland	PEM1Fh	27.8602
Freshwater Emergent Wetland	PEM1F	13.0285
Freshwater Emergent Wetland	PEM1C	37.0741
Freshwater Emergent Wetland	PEM1A	7.5964
Freshwater Emergent Wetland	PEM1Ch	29.1123
Freshwater Emergent Wetland	PEM1Ad	1.4193
Freshwater Emergent Wetland	PEM1Cd	2.8535
Freshwater Forested/Shrub Wetland	PSS1Ch	29.4802
Freshwater Forested/Shrub Wetland	PFO1Ah	9.5144
Freshwater Forested/Shrub Wetland	PSS1Cd	1.63
Freshwater Forested/Shrub Wetland	PSS1Fx	0.8794



Trust Resources List

Freshwater Forested/Shrub Wetland	PSS1Ah	6.2547
Freshwater Forested/Shrub Wetland	PFO1Ch	5.4234
Freshwater Forested/Shrub Wetland	PSS1Cx	3.0884
Freshwater Forested/Shrub Wetland	PSS1Fh	67.9234
Freshwater Forested/Shrub Wetland	PSS1Ax	3.3478
Freshwater Forested/Shrub Wetland	PSS1/3A	1.8271
Freshwater Forested/Shrub Wetland	PSS1/3C	9.1882
Freshwater Forested/Shrub Wetland	PSS1Fb	1.7973
Freshwater Forested/Shrub Wetland	PFO1/4A	28.0233
Freshwater Forested/Shrub Wetland	PFO1/4C	19.7435
Freshwater Forested/Shrub Wetland	PFO1/EM1A	12.45
Freshwater Forested/Shrub Wetland	PSS1B	0.5997
Freshwater Forested/Shrub Wetland	PFO1B	10.0854
Freshwater Forested/Shrub Wetland	PSS1A	332.1409
Freshwater Forested/Shrub Wetland	PFO1C	355.2566
Freshwater Forested/Shrub Wetland	PFO1A	1633.4786
Freshwater Forested/Shrub Wetland	PSS1C	85.224
Freshwater Forested/Shrub Wetland	PFO1F	46.3064
Freshwater Forested/Shrub Wetland	PSS1F	58.5504
Freshwater Pond	PUBFx	0.674
Freshwater Pond	PUBHx	85.1735
Freshwater Pond	PAB3Fh	0.8252
Freshwater Pond	PUBGx	2.7446
Freshwater Pond	PUBH	0.3304
Freshwater Pond	PUBF	2.5997
Freshwater Pond	PUBHh	1075.1543



Trust Resources List

Freshwater Pond	PUBFh	2.1803
Lake	L1UBHx	28.2382
Lake	L2AB3Hh	75.182
Lake	L1UBHh	391.734
Lake	L2AB3H	7.6497
Lake	L2USCh	2.9836
Other	PUSAh	22.318
Other	PUSCh	2.6762
Other	PUSCx	1.4088
Riverine	R2UBH	1158.719

GADNR Nongame Conservation Section Biotics Database - Cobb and Fulton Counties, Georgia					
County	Scientific Name Used at NatureServe	Common Name Used at GA-DNR	Federal Protection Status Under ESA	Georgia Protection Status	Last Observed Date
Cobb	Cambarus howardi	Chattahoochee Crayfish	None	T	6/10/2010
Cobb	Cyprinella callitaenia	Bluestripe Shiner	None	R	5/7/2001
Cobb	Elliptio arctata	Delicate Spike	None	E	1992-PRE
Cobb	Etheostoma scotti	Cherokee Darter	LT	T	6/22/2010
Cobb	Medionidus penicillatus	Gulf Moccasinshell	LE	E	1977
Cobb	Notropis hypsilepis	Highscale Shiner	None	R	10/24/1977
Fulton	Cambarus howardi	Chattahoochee Crayfish	None	T	10/14/2012
Fulton	Cyprinella callitaenia	Bluestripe Shiner	None	R	12/5/2001
Fulton	Elliptio arctata	Delicate Spike	None	E	1992-PRE
Fulton	Etheostoma scotti	Cherokee Darter	LT	T	2002-SPR
Fulton	Hamiota subangulata	Shinyrayed Pocketbook	LE	E	1960-PRE
Fulton	Medionidus penicillatus	Gulf Moccasinshell	LE	E	1977
Fulton	Notropis hypsilepis	Highscale Shiner	None	R	6/15/1995

Georgia Department of Natural Resources. 2014. Nongame Conservation Section Biotics Database. Wildlife Resources Division, Social Circle.; Available at <http://www.georgiawildlife.com> (Accessed November 20, 2014)

LE =Listed as endangered, LT =Listed as threatened, C = Candidate species, E = Listed as endangered, T = Listed as threatened, R = Listed as rare, and U = Listed as unusual

GADNR Nongame Conservation Section Biotics Database - Chattahoochee River, Upper Watershed (HUC8: 03130001) and Etowah River Watershed (HUC8: 03150104)

Watershed	Watershed HUC8 Code	Species Name Used at NatureServe	Common Name Used at GA-DNR	Federal Protection Status Under ESA	Georgia Protection Status	Last Observed Date
Chattahoochee River, Upper	03130001	Cambarus howardi	Chattahoochee Crayfish	None	T	5/9/2011
Chattahoochee River, Upper	03130001	Cyprinella callitaenia	Bluestripe Shiner	None	R	9/24/2013
Chattahoochee River, Upper	03130001	Elliptio arcata	Delicate Spike	None	E	1992-PRE
Chattahoochee River, Upper	03130001	Hamiota subangulata	Shinyrayed Pocketbook	LE	E	1960-PRE
Chattahoochee River, Upper	03130001	Notropis hypsilepis	Highscale Shiner	None	R	6/23/2003
Chattahoochee River, Upper	03130001	Percina crypta	Halloween Darter	None	T	11/13/2010
Etowah River	03150104	Cambarus fasciatus	Etowah Crayfish	None	T	8/28/2013
Etowah River	03150104	Etheostoma brevirostrum	Holiday Darter	None	E	10/22/2009
Etowah River	03150104	Etheostoma etowahae	Etowah Darter	LE	E	8/27/2013
Etowah River	03150104	Etheostoma rupestre	Rock Darter	None	R	8/26/2013
Etowah River	03150104	Etheostoma scotti	Cherokee Darter	LT	T	8/27/2013
Etowah River	03150104	Hamiota altalis	Finelined Pocketbook	LT	T	9/18/2013
Etowah River	03150104	Hybopsis lineapunctata	Lined Chub	None	R	7/18/2011
Etowah River	03150104	Lioplax cyclostomaformis	Cylindrical Lioplax	LE	None	1858
Etowah River	03150104	Macrhybopsis sp. 1	Coosa Chub	None	E	10/12/2012
Etowah River	03150104	Moxostoma carinatum	River Redhorse	None	R	8/16/2000
Etowah River	03150104	Noturus munitus	Frecklebelly Madtom	None	E	10/4/2009
Etowah River	03150104	Percina antesella	Amber Darter	LE	E	10/4/2009
Etowah River	03150104	Percina kusha	Bridled Darter	None	E	3/26/2008
Etowah River	03150104	Percina lenticula	Freckled Darter	None	E	8/7/2009

Georgia Department of Natural Resources. 2014. Nongame Conservation Section Biotics Database. Wildlife Resources Division, Social Circle.; Available at <http://www.georgiawildlife.com> (Accessed November 20, 2014)

LE =Listed as endangered, LT =Listed as threatened, C = Candidate species, E = Listed as endangered, T = Listed as threatened, R = Listed as rare, and U = Listed as unusual



MARK WILLIAMS
COMMISSIONER

DAN FORSTER
DIRECTOR

July 1, 2013

Abigail Moleta
Kimley-Horn and Associates, Inc.
2 Sun Court
Suite 450
Norcross, GA 30092

Subject: Known occurrences of natural communities, plants and animals of highest priority conservation status on or near Connect Cobb/ Northwest Atlantic Corridor, Fulton County and Cobb County, Georgia

Dear Ms. Moleta:

This is in response to your request of May 17, 2013. According to our records, within a three-mile radius of the project area, there are the following Natural Heritage Database occurrences:

Point 1 (-84.65443, 34.07970; NAD27):

- US *Etheostoma scotti* (Cherokee Darter) approx. 1.0 mi. N of site in Clarke Creek and Unnamed Tributaries
- US *Etheostoma scotti* (Cherokee Darter) approx. 1.0 mi. NE of site in Clarke Creek and Unnamed Tributaries
- US *Etheostoma scotti* (Cherokee Darter) approx. 1.0 mi. NW of site in Clarke Creek and Unnamed Tributaries
- US *Etheostoma scotti* (Cherokee Darter) approx. 1.5 mi. W of site in Tanyard Creek
- US *Etheostoma scotti* (Cherokee Darter) approx. 2.0 mi. S of site in Proctor Creek
- US *Etheostoma scotti* (Cherokee Darter) [HISTORIC] approx. 2.0 mi. NW of site in Clarke Creek
- Greenspace [Cobb County] approx. 1.0 mi. SW of site

Point 2 (-84.60951, 34.06682; NAD27):

- US *Etheostoma scotti* (Cherokee Darter) 0.2 mi. NW of site in Clarke Creek and Unnamed Tributaries
- US *Etheostoma scotti* (Cherokee Darter) approx. 1.0 mi. N of site in Clarke Creek and Unnamed Tributaries
- US *Etheostoma scotti* (Cherokee Darter) approx. 1.0 mi. NW of site in Clarke Creek and Unnamed Tributaries
- US *Etheostoma scotti* (Cherokee Darter) approx. 1.5 mi. SW of site in Proctor Creek
- US *Etheostoma scotti* (Cherokee Darter) approx. 3.0 mi. N of site in Kellogg Creek and Unnamed Tributaries

Point 3 (-84.58956, 34.05149; NAD27),
No Natural Heritage Database occurrences.

Point 4 (-84.60920, 34.01121; NAD27):

- Calystegia catesbeiana* ssp. *sericata* (Silky Bindweed) approx. 1.5 mi. SE of site
- US *Etheostoma scotti* (Cherokee Darter) approx. 2.0 mi. W of site in Butler Creek
- US *Etheostoma scotti* (Cherokee Darter) approx. 2.5 mi. NW of site in Butler Creek Unnamed Tributary

Point 5 (-84.56096, 33.99779; NAD27)

- Arabis missouriensis* (Missouri Rockcress) approx. 2.5 mi. SW of site
- GA *Draba aprica* (Sun-loving Draba) approx. 2.5 mi. SW of site
- Plethodon websteri* (Webster's Salamander) approx. 2.0 mi. SW of site
- Pycnanthemum curvipes* (Stone Mountain Mint) approx. 2.0 mi. SW of site
- US *Symphyotrichum georgianum* (Georgia Aster) [EXTIRPATED?] approx. 1.5 mi. W of site
- Zanthoxylum americanum* (Northern Prickly-ash) approx. 1.5 mi. SW of site
- KENNESAW MOUNTAIN NATIONAL BATTLEFIELD PARK [NATIONAL PARK SERVICE] approx. 1.0 mi. SW of site

Point 6 (-84.52327, 33.96550; NAD27):

- GA *Cambarus howardi* (Chattahoochee Crayfish) [HISTORIC?] 0.4 mi. E of site in Sope Creek
- US *Platanthera integrilabia* (Monkeyface Orchid) [EXTIRPATED] approx. 2.0 mi. NE of site
- Greenspace [Cobb County] 0.5 mi. N of site

Point 7 (-84.49706, 33.93674; NAD27):

- Pituophis melanoleucus melanoleucus* (Northern Pine Snake) approx. 1.5 mi. W of site
- Greenspace [Cobb County] approx. 0.5 mi. S of site

Point 8 (-84.46715, 33.88042; NAD27):

- GA *Ammodramus henslowii* (Henslow's Sparrow) approx. 1.5 mi. N of site
- GA *Cambarus howardi* (Chattahoochee Crayfish) in Rottenwood Creek
- GA *Cambarus howardi* (Chattahoochee Crayfish) approx. 1.0 mi. SE of site in the Chattahoochee River
- GA *Cambarus howardi* (Chattahoochee Crayfish) in Rottenwood Creek
- GA *Elliptio arcata* (Delicate Spike) [HISTORIC] approx. 1.0 mi. SE of site in the Chattahoochee River
- GA *Fothergilla major* (Mountain Witch-alder) approx. 2.0 mi. NE of site
- Melanthium latifolium* (Broadleaf Bunchflower) [EXTIRPATED?] approx. 0.5 mi. S of site
- GA *Nestronia umbellula* (Indian Olive) approx. 1.5 mi. NE of site
- GA *Nestronia umbellula* (Indian Olive) [HISTORIC] approx. 0.5 mi. S of site
- Nyctanassa violacea* (Yellow-crowned Night-heron) [2001-05-12] approx. 1.0 mi. N of site

Quadrula infucata (Sculptured Pigtoe) [HISTORIC] approx. 1.0 mi. SE of site in the Chattahoochee River

GA *Schisandra glabra* (Bay Star-vine) approx. 1.0 mi. E of site

GA *Schisandra glabra* (Bay Star-vine) approx. 1.5 mi. SE of site

GA *Schisandra glabra* (Bay Star-vine) approx. 1.0 mi. NE of site

GA *Schisandra glabra* (Bay Star-vine) "X" [EXTIRPATED] approx. 2.0 mi. NE of site

Greenspace [Cobb County] approx. 2.0 mi. SW of site

CHATTAHOOCHEE RIVER NATIONAL RECREATION AREA [NATIONAL PARK SERVICE] approx. 1.0 mi. E of site

Point 9 (-84.43023, 33.84654; NAD27):

GA *Schisandra glabra* (Bay Star-vine) approx. 1.5 mi. SW of site

US *Symphyotrichum georgianum* (Georgia Aster) [HISTORIC?] approx. 3.0 mi. SW of site

Point 10 (-84.38883, 33.79237; NAD27):

GA *Falco peregrinus* (Peregrine Falcon) approx. 2.0 mi. S of site

GA *Schisandra glabra* (Bay Star-vine) approx. 1.0 mi. E of site

GA *Schisandra glabra* (Bay Star-vine) approx. 2.0 mi. E of site

Greenspace [Fulton County] approx. 2.0 mi. NE of site

* Entries above proceeded by "US" indicates species with federal status (Protected, Candidate or Partial Status). Species that are federally protected in Georgia are also state protected; "GA" indicates Georgia protected species.

Recommendations:

We have no records of high priority species or habitats within the project area. Recent surveys have confirmed the presence of the federally listed fish species, *Etheostoma scotti* (Cherokee Darter) in several creeks near the project site. Historically, there was also known to have been the federally listed plant, *Symphyotrichum georgianum* (Georgia Aster) within three miles of the proposed project. The Endangered Species Act states that taking or harming of a listed species is prohibited. We recommend all requestors with projects located near federally protected species consult with the United States Fish and Wildlife Service. For southeast Georgia, please contact Strant Colwell (912-265-9336, ext.30 or Strant_Colwell@fws.gov). In southwest Georgia, please contact John Doesky (706-544-6030 or John_Doesky@fws.gov). In north Georgia, please contact Robin Goodloe (706-613-9493, ext.221 or Robin_Goodloe@fws.gov).

We are concerned about streams and other habitats that could be impacted by the proposed road improvement project. We recommend that stringent erosion control practices be used during construction activities and that vegetation is re-established on disturbed areas as quickly as possible. Silt fences and other erosion control devices should be inspected and maintained until soil is stabilized by vegetation. Please use natural vegetation and grading techniques (e.g. vegetated swales, turn-offs, vegetated buffer strips) that will ensure that the road or ROW does not serve as a conduit for storm water or pollutants into the water during or after construction.

These measures will help protect water quality in the vicinity of the project as well as in downstream areas.

Disclaimer:

Please keep in mind the limitations of our database. The data collected by the Nongame Conservation Section comes from a variety of sources, including museum and herbarium records, literature, and reports from individuals and organizations, as well as field surveys by our staff biologists. In most cases the information is not the result of a recent on-site survey by our staff. Many areas of Georgia have never been surveyed thoroughly. Therefore, the Nongame Conservation Section can only occasionally provide definitive information on the presence or absence of rare species on a given site. Our files are updated constantly as new information is received. **Thus, information provided by our program represents the existing data in our files at the time of the request and should not be considered a final statement on the species or area under consideration.**

If you know of populations of highest priority species that are not in our database, please fill out the appropriate data collection form and send it to our office. Forms can be obtained through our web site (<http://www.georgiawildlife.com/node/1376>) or by contacting our office. If I can be of further assistance, please let me know.

Sincerely,



Katrina Morris
Environmental Review Coordinator

Data Available on the Nongame Conservation Section Website

- Georgia protected plant and animal profiles are available on our website. These accounts cover basics like descriptions and life history, as well as threats, management recommendations and conservation status. Visit <http://www.georgiawildlife.com/node/2721>.
- Rare species and natural community information can be viewed by Quarter Quad, County and HUC8 Watershed. To access this information, please visit our GA Rare Species and Natural Community Information page at: <http://www.georgiawildlife.com/conservation/species-of-concern?cat=conservation>.
- Downloadable files of rare species and natural community data by quarter quad and county are also available. They can be downloaded from: <http://www.georgiawildlife.com/node/1370>.

Appendix C

USFWS Site Condition Data Forms

100 - 0001 = 100 - 0005

S-1 AIT

Site Number: S-1 AIT Field Number: S-1 AIT		Time Beg:	Date: 10/22/14																																
Watershed/Drainage: Ftwah River Watershed		End:	State: Georgia																																
Waterbody: tributary to Noan Day Creek		Latitude: 34.006815	Long: -84.608555																																
Location: US 41		Stream Order:	Stream Type:																																
Gage Station: Noan Day Creek - 02392950		Surveyor(s): RW, MM																																	
Determining RSA	Distance upstream: Distance downstream: 900	Survey Technique	Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																
Instream Features Quantitative		Water Quality																																	
Please specify all units of measurement		Water Temp: 16.6°C																																	
% Canopy Cover: 80% Wetted Width: 1-10'		Dissolved Oxygen: 7.85 mg/L																																	
Surface Velocity (at thalweg): 75 cm/s		Conductivity: 122.6 µmhos/cm																																	
Water Depth (at thalweg): 6-3'		pH: 7.69 Other: T-6.1																																	
Bank Height (rt/lt): 1-3' Bank Angle (rt/lt): ~120°		303d Listed: ☐ yes ☒ no																																	
Channel Alteration: ☒ No ☐ Yes		Designated Use:																																	
Describe:		Violated Criteria:																																	
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion		Heavy Rain in past 7 days: Yes ☐ No ☒																																	
☐ Concrete ☐ Rip-rap ☐ Other: Extent:		Air Temperature: Est. ☐ Act. ☐																																	
Substrate composition (% est.): Gravel 55 Silt 28 Clay		Survey Weather Conditions: Scattered showers ☐																																	
Clay Marl Fine sand 15 Coarse s. 16 Medium s. 10		Heavy rain ☐ Clear/sunny ☒																																	
Boulder Bedrock Cobble 10		Steady rain ☐ % Cloud cover																																	
Channel Stability (Check one box for each column):																																			
Deposition/Aggradation		Incision/Degradation																																	
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools																																	
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools																																	
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools																																	
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools																																	
Impoundments:		Fish Passage:																																	
☐ None ☐ yes (Describe):		Blocked? ☐ yes ☒ no																																	
		Describe:																																	
		Fish Presence:																																	
		☐ Absent ☐ Rare ☐ Common ☐ Abundant																																	
		Woody Material:																																	
		☒ None/infreq. ☒ Moderate ☐ Extensive																																	
Rt* Buffer width(ft):		Road Type:																																	
☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+		☐ Paved ☐ Unpaved																																	
Lt* Buffer width(ft):		Name (if known): SR 41																																	
☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+		Crossing Type:																																	
Landuse Characterization: (100 feet to either side of the stream)		☒ Pipe culvert ☐ Box culvert ☐ Bridge ☐ Paved box culvert																																	
<table border="1"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td>20</td> <td>20</td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td>40</td> <td>40</td> <td>%</td> </tr> <tr> <td>Industrial</td> <td>40</td> <td>40</td> <td>%</td> </tr> </tbody> </table>			Rt Bk	Lt Bk	%	Natural Forest	20	20	%	Silviculture			%	Pasture			%	Agricultural			%	Residential			%	Commercial	40	40	%	Industrial	40	40	%	Local Non-Point Source Pollution Potential:	
	Rt Bk	Lt Bk	%																																
Natural Forest	20	20	%																																
Silviculture			%																																
Pasture			%																																
Agricultural			%																																
Residential			%																																
Commercial	40	40	%																																
Industrial	40	40	%																																
		☒ No evidence ☐ Slight																																	
		☐ Moderate potential ☐ Obvious sources																																	
		☐ Livestock access																																	
		Describe:																																	
Notes		Floodplain Access:																																	
		None ☐ Rt* ☐ Lt* ☐																																	
		Partial ☒ Full ☐																																	
		Bank Erosion:																																	
		☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting																																	

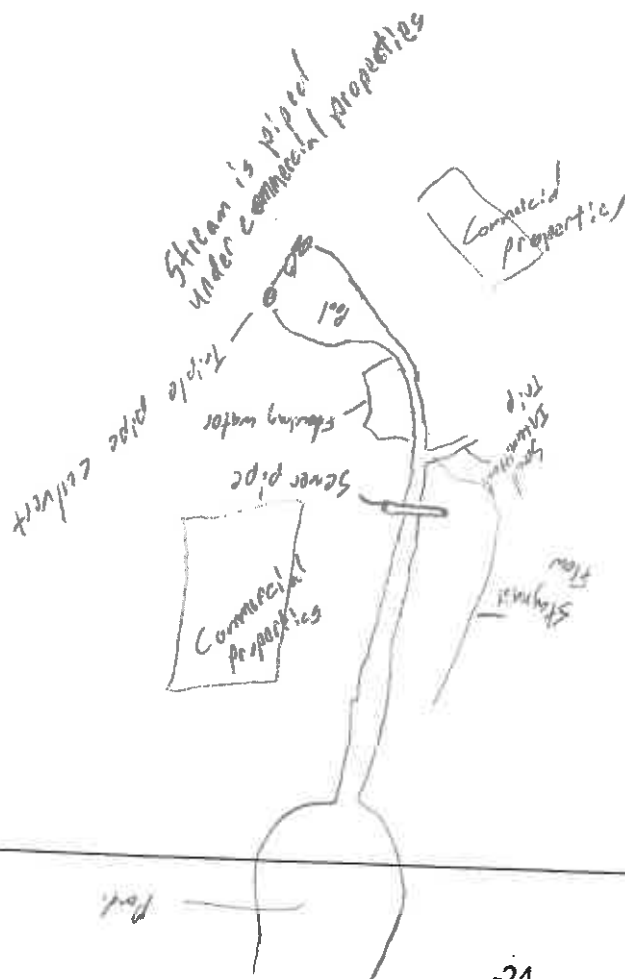
S-1 ALT

List of other aquatic species observed, including invasive species, and their abundance:

No survey required due to stagnant flow conditions and heavy sedimentation

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



52 Alt

Site Number: 52 ALT		Field Number: 52 ALT		Time Beg:		Date: 10/22/14	
Watershed/Drainage: Flowing		End:		Latitude: 34.001626		State: 6A	
Waterbody: Inlet to Noondog Cr		Stream Order:		Longitude: -84.595164		Stream Type:	
Location: US 41		Surveyor(s): MM & RN					
Gage Station: Noondog Creek - 02392950		Distance upstream: 300		Distance downstream: 900		Tactile Only ☐	
Determine if:		Survey Technique:		Tactile With Snorkel ☐		Tactile With SCUBA ☐	
Instream Features Quantitative				Water Quality			
Please specify all units of measurement							
% Canopy Cover: 0-60		Wetted Width: 15-25		Water Temp: 16.1 °C		Water Clarity	
Surface Velocity (at thalweg): < 5 cm/s				Dissolved Oxygen: 6.55 mg/L		☐ Clear	
Water Depth (at thalweg): 1-4 ft				Conductivity: 90.7 95.9		☐ Slightly turbid	
Bank Height (rt/lt): 2 to 6 ft		Bank Angle (rt/lt): 90/90		pH: 7.3 Other: 7-8.4		☒ Turbid	
303d Listed: ☐ yes ☒ no		Designated Use:				☐ Opaque	
Violated Criteria:		Heavy Rain in past 7 days:		Yes ☐ No ☒			
Air Temperature:		Est. ☐ Act. ☐		Survey Weather Conditions:		Scattered showers ☐	
Heavy rain ☐		Clear/sunny ☒		Steady rain ☐		% Cloud cover: ☐	
Channel Alteration: ☒ No ☐ Yes				Describe:			
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion				Concrete ☐ Rip-rap ☐ Other: ☐			
Substrate composition (% est.): Gravel ☐ Silt 25 Clay ☐				Clay Marl ☐ Fine sand 25 Coarse s. 25 Medium s. 25			
Boulder ☐ Bedrock ☐ Cobble ☐							
Channel Stability (Check one box for each column):							
Deposition/Aggradation		Incision/Degradation		Impoundments:			
Excellent		Large, fresh deposits absent		☐ None ☒ yes (Describe):		Several beaver dams present	
Good		Large, fresh deposits uncommon		Fish Passage:		Fish Presence:	
Fair		Large, fresh deposits common		Blocked? ☐ yes ☒ no		Describe:	
Poor		Large, fresh deposits very common		Woody Material:		None/intreq. ☐ Moderate ☒ Extensive ☐	
High number of deep pools		No mass-wasting or significant erosion of banks					
Channel slightly entrenched		High number of deep pools					
Some bank erosion apparent, no mass wasting		Channel slightly/moderately entrenched					
Moderate number of deep pools		Active bank erosion, potential mass-wasting					
Channel moderately-highly entrenched		Low/moderate number of deep pools					
Active bank erosion, frequent mass-wasting		Channel moderately-highly entrenched					
Low/moderate number of deep pools		Active bank erosion, frequent mass-wasting					
Channel moderately-highly entrenched		Few, if any, deep pools					
Land Use Characterization:		(100 feet to either side of the stream)		Road Type:			
Facing US		Facing US		Paved ☒ Unpaved ☐		Name (if known): 4541	
Natural Forest		30 60 %		Crossing Type:		Pipe culvert ☐ Box culvert ☒	
Silviculture		40 40 %		Bridge ☐ Paved box culvert ☐			
Pasture				Local Non-Point Source Pollution Potential:		No evidence ☒ Slight ☐	
Agricultural				Moderate potential ☐ Obvious sources ☐		Livestock access ☐	
Residential				Describe:			
Commercial							
Industrial							
Notes				Floodplain Access:			
				None ☐ Partial ☒ Full ☐		Bank Erosion:	
						Non-eroding ☐ Active Erosion ☒ Mass-wasting ☐	

S-2 Alt

Field

Number: 5-2 Alt

Date: 10-22-14

County: Cobb

Locality: US - 41

Surveyors: MM RW

[illegible]

**= Male, female, undetermined

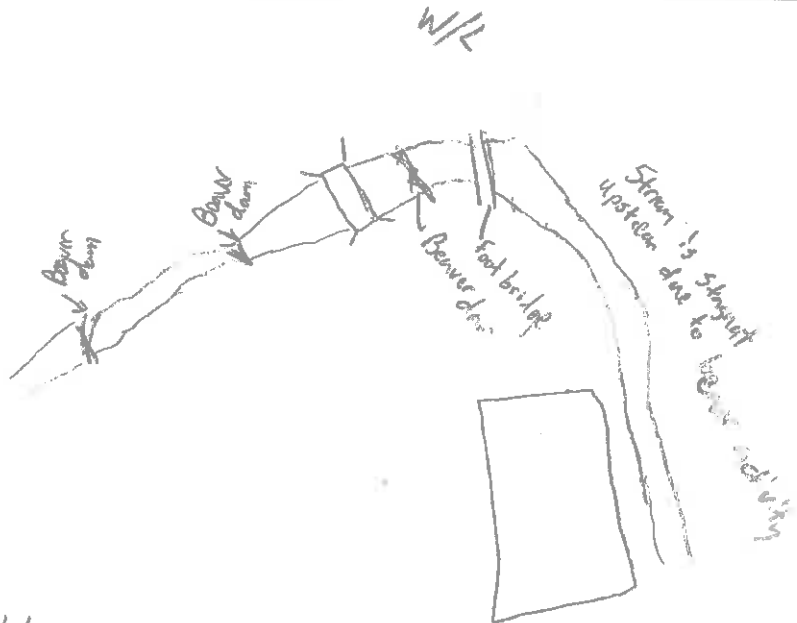
Alt 5-2

List of other aquatic species observed, including invasive species, and their abundance:

no survey conducted

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



Habitat
conditions are very
poor due to stagnant flow
condition from beaver dams,
No survey is required for federal
and state protected aquatic species

53 (ALT)

Site Number: <u>S-3 Alt</u> Field Number: <u>S-3 Alt</u> Time Beg: _____ Date: <u>10/22/14</u>																																	
Watershed/Drainage: <u>Etowah River</u> End: _____ State: <u>GA</u>																																	
Waterbody: <u>Noondag Creek</u> Latitude: <u>34.001018</u> Long: <u>-84.593927</u>																																	
Location: <u>US 41</u> Stream Order: _____ Stream Type: _____																																	
Gage Station: <u>Noondag Creek 02392950</u> Surveyor(s): <u>mm, w</u>																																	
Determining Distance upstream: <u>300</u> Distance downstream: <u>900</u>																																	
Survey Technique: _____ Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																	
Instream Features: Quantitative																																	
Please specify all units of measurement % Canopy Cover: <u>0-75</u> Wetted Width: <u>3-10 ft</u> Surface Velocity (at thalweg): <u>75 cm/s</u> Water Depth (at thalweg): <u>1-3 ft</u> Bank Height (rt/lr): <u>3 to 6</u> Bank Angle (rt/lr): <u>100/100</u>																																	
Water Quality																																	
Water Temp: <u>14.9 °C</u> Dissolved Oxygen: <u>8.32 mg/L</u> Conductivity <u>104.7</u> $\mu S/cm$ - <u>131.6</u> pH <u>7.70</u> Other: <u>T-5.1</u> 303d Listed: ☐ yes ☐ no																																	
Designated Use: Violated Criteria: Heavy Rain in past 7 days: Yes ☐ No ☒ Air Temperature: _____ Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☐ Clear/sunny ☒ % Cloud cover: _____ Heavy rain ☐ Steady rain ☐																																	
Instream Features: Qualitative																																	
Channel Alteration: ☒ No ☐ Yes Describe: _____ Shoring Structures: ☐ None ☐ Limerock ☐ Gabion ☐ Concrete ☒ Rip-rap ☐ Other: _____ Extent: <u>30 ft</u> Substrate composition (% est.): Gravel <u>15</u> Silt <u>10</u> Clay <u>5</u> Clay Marl _____ Fine sand <u>20</u> Coarse s. <u>20</u> Medium s. <u>30</u> Boulder _____ Bedrock _____ Cobble _____																																	
Channel Stability (Check one box for each column):																																	
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Deposition/Aggradation</th> <th>Incision/Degradation</th> <th>Impoundments:</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>Large, fresh deposits absent High number of deep pools ☐</td> <td>No mass-wasting or significant erosion of banks Channel slightly entrenched High number of deep pools ☐</td> <td>☒ None ☐ yes (Describe): _____</td> </tr> <tr> <td>Good</td> <td>Large, fresh deposits uncommon Moderate number of deep pools ☐</td> <td>Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched Moderate number of deep pools ☐</td> <td> Fish Passage: Blocked? ☐ yes ☒ no Describe: _____ Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant </td> </tr> <tr> <td>Fair</td> <td>Large, fresh deposits common Low-moderate number of deep pools ☐</td> <td>Active bank erosion, potential mass-wasting Channel moderately-highly entrenched Low-moderate number of deep pools ☒</td> <td rowspan="2"> Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive </td> </tr> <tr> <td>Poor</td> <td>Large, fresh deposits very common Few, if any, deep pools ☐</td> <td>Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched Few, if any, deep pools ☐</td> </tr> </tbody> </table>			Deposition/Aggradation	Incision/Degradation	Impoundments:	Excellent	Large, fresh deposits absent High number of deep pools ☐	No mass-wasting or significant erosion of banks Channel slightly entrenched High number of deep pools ☐	☒ None ☐ yes (Describe): _____	Good	Large, fresh deposits uncommon Moderate number of deep pools ☐	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched Moderate number of deep pools ☐	Fish Passage: Blocked? ☐ yes ☒ no Describe: _____ Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant	Fair	Large, fresh deposits common Low-moderate number of deep pools ☐	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched Low-moderate number of deep pools ☒	Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive	Poor	Large, fresh deposits very common Few, if any, deep pools ☐	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched Few, if any, deep pools ☐													
	Deposition/Aggradation	Incision/Degradation	Impoundments:																														
Excellent	Large, fresh deposits absent High number of deep pools ☐	No mass-wasting or significant erosion of banks Channel slightly entrenched High number of deep pools ☐	☒ None ☐ yes (Describe): _____																														
Good	Large, fresh deposits uncommon Moderate number of deep pools ☐	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched Moderate number of deep pools ☐	Fish Passage: Blocked? ☐ yes ☒ no Describe: _____ Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant																														
Fair	Large, fresh deposits common Low-moderate number of deep pools ☐	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched Low-moderate number of deep pools ☒	Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																														
Poor	Large, fresh deposits very common Few, if any, deep pools ☐	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched Few, if any, deep pools ☐																															
Stream Bank Characterization																																	
Rt* Buffer width(ft): ☐ 10-25 ☐ 25-75 ☒ 78-150 ☐ 150+ Lt* Buffer width(ft): ☐ 10-25 ☒ 25-75 ☐ 78-150 ☐ 150+																																	
Landuse Characterization: (100 feet to either side of the stream) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td></td> <td><u>70</u></td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td><u>100</u></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td></td> <td><u>30</u></td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </tbody> </table>			Rt Bk	Lt Bk	%	Natural Forest		<u>70</u>	%	Silviculture	<u>100</u>		%	Pasture			%	Agricultural			%	Residential			%	Commercial		<u>30</u>	%	Industrial			%
	Rt Bk	Lt Bk	%																														
Natural Forest		<u>70</u>	%																														
Silviculture	<u>100</u>		%																														
Pasture			%																														
Agricultural			%																														
Residential			%																														
Commercial		<u>30</u>	%																														
Industrial			%																														
Road Type: ☒ Paved ☐ Unpaved Name (if known): <u>US 41</u> Crossing Type: ☐ Pipe culvert ☒ Box culvert ☐ Bridge ☐ Paved box culvert																																	
Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe: _____																																	
Floodplain Access:																																	
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt*</th> <th>Lt*</th> <th>Bank Erosion:</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>☒</td> <td>☒</td> <td>☐ Non-eroding</td> </tr> <tr> <td>Partial</td> <td>☐</td> <td>☐</td> <td>☒ Active Erosion</td> </tr> <tr> <td>Full</td> <td>☐</td> <td>☐</td> <td>☐ Mass-wasting</td> </tr> </tbody> </table>			Rt*	Lt*	Bank Erosion:	None	☒	☒	☐ Non-eroding	Partial	☐	☐	☒ Active Erosion	Full	☐	☐	☐ Mass-wasting																
	Rt*	Lt*	Bank Erosion:																														
None	☒	☒	☐ Non-eroding																														
Partial	☐	☐	☒ Active Erosion																														
Full	☐	☐	☐ Mass-wasting																														
Notes																																	

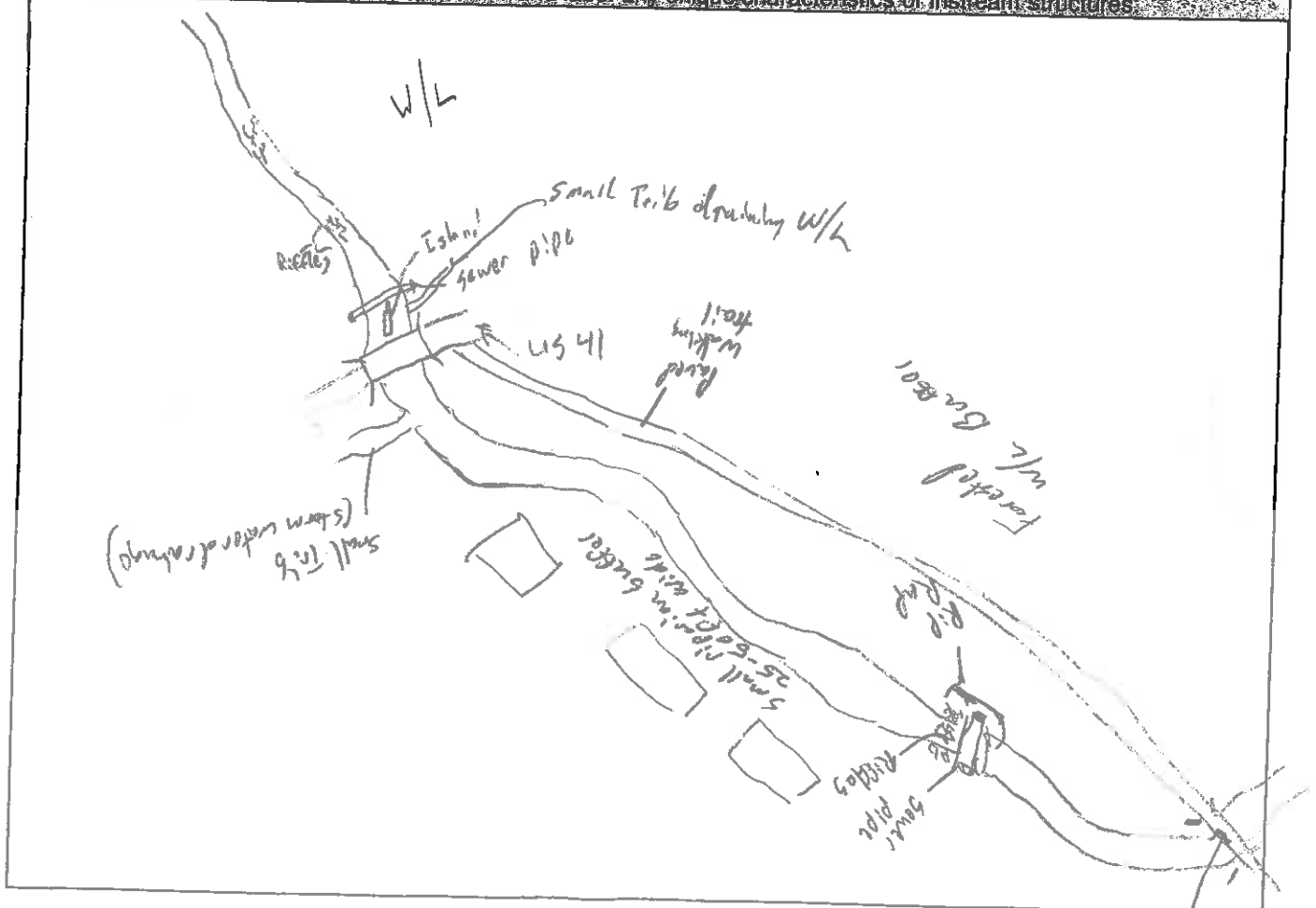
53 ALT

List of other aquatic species observed, including invasive species, and their abundance:

Blues: 11 - 7100	Eastern mosquitofish - 7100	White tabeeted Crayfish - 15
redbreast - 7100	Cossey sculpin - 31	Corbicula - 7100
Blackbanded darter - 29	largemouth stoneroller - 7100	
Alabama darters - 15	Green sunfish - 11	
Creek chub - 7100	largemouth bass - 2	

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



S-4-AH

Site Number: <u>S-4A11</u> Field Number: _____		Time Beg: _____ End: _____		Date: <u>10/23/14</u>	
Watershed/Drainage: <u>Etowah</u>		Latitude: <u>34.001109</u>		State: <u>GA</u>	
Waterbody: <u>Tr. 6 to Nantuxy Cr</u>		Stream Order: _____		Long: <u>-84.592212</u>	
Location: <u>US 41</u>		Surveyor(s): <u>MM & RN</u>		Stream Type: _____	
Gage Station: <u>Noondy creek 02392950</u>					
Distance upstream: <u>756 ft</u>		Tactile Only ☐ Tactile With Snorkel ☐			
Distance downstream: _____		Tactile With SCUBA ☐			
Instream Features Quantitative			Water Quality		
Please specify all units of measurement					
% Canopy Cover: <u>0</u>		Wetted Width: <u>4-6 ft</u>		Water Temp: <u>14.7 °C</u>	
Surface Velocity (at thalweg): <u>< 5 cfs</u>				Dissolved Oxygen: <u>7.22</u> mg/L	
Water Depth (at thalweg): <u>1-2"</u>				Conductivity <u>96.4</u> SC-105.7	
Bank Height (rt/lt): <u>6-10 ft</u>		Bank Angle (rt/lt): <u>70/90</u>		pH <u>7.5</u> Other: <u>1-4.7</u>	
Channel Alteration: ☒ No ☐ Yes			303d Listed: ☐ yes ☐ no		
Describe: _____			Designated Use: _____		
Shoring Structures: ☐ None ☐ Limerock ☐ Gabion			Violated Criteria: _____		
☐ Concrete ☒ Rip-rap ☐ Other: _____ Extent: <u>50 ft</u>			Heavy Rain in past 7 days: Yes ☐ No ☒		
Substrate composition (% est.): Gravel _____ Silt _____ Clay _____			Air Temperature: _____ Est. ☐ Act. ☐		
Clay Marl _____ Fine sand _____ Coarse s. _____ Medium s. _____			Survey Weather Conditions: Scattered showers ☐		
Boulder _____ Bedrock _____ Cobble <u>100 Rip Raps</u>			Heavy rain ☐ Clear/sunny ☒		
Channel Stability (Check one box for each column):			Steady rain ☐ % Cloud cover _____		
Deposition/Aggradation		Incision/Degradation		Impoundments:	
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools		☒ None ☐ yes (Describe): _____	
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools		Fish Passage: Blocked? ☐ yes ☒ no	
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools		Fish Presence: ☐ Absent ☒ Rare ☐ Common ☐ Abundant	
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools		Woody Material: ☒ None/infreq. ☐ Moderate ☐ Extensive	
Rt* Buffer width(ft):		Landuse Characterization: (100 feet to either side of the stream)			
☒ 10-25		Fachy OS			
☐ 25-75		Natural Forest			
☐ 78-150		Silviculture			
☐ 150+		Pasture			
Lt* Buffer width(ft):		Agricultural			
☒ 10-25		Residential Road			
☐ 25-75		Commercial			
☐ 78-150		Industrial			
☐ 150+					
Notes		Road Type: ☐ Paved ☐ Unpaved			
		Name (if known): <u>No X-ing</u>			
		Crossing Type: ☐ Pipe culvert ☒ Box culvert			
		☐ Bridge ☐ Paved box culvert			
		Local Non-Point Source Pollution Potential:			
		☐ No evidence ☐ Slight			
		☐ Moderate potential ☐ Obvious sources			
		☐ Livestock access			
		Describe: _____			
		Floodplain Access:		Bank Erosion:	
		None ☐ Rt* ☐ Lt* ☐		☐ Non-eroding	
		Partial ☐		☐ Active Erosion	
		Full ☐		☐ Mass-wasting	

5-4 AM

Field

Date: 10/23/14

Locality: US 41

Surveyors: MM RN

No survey was conducted

**= Male, female, undetermined

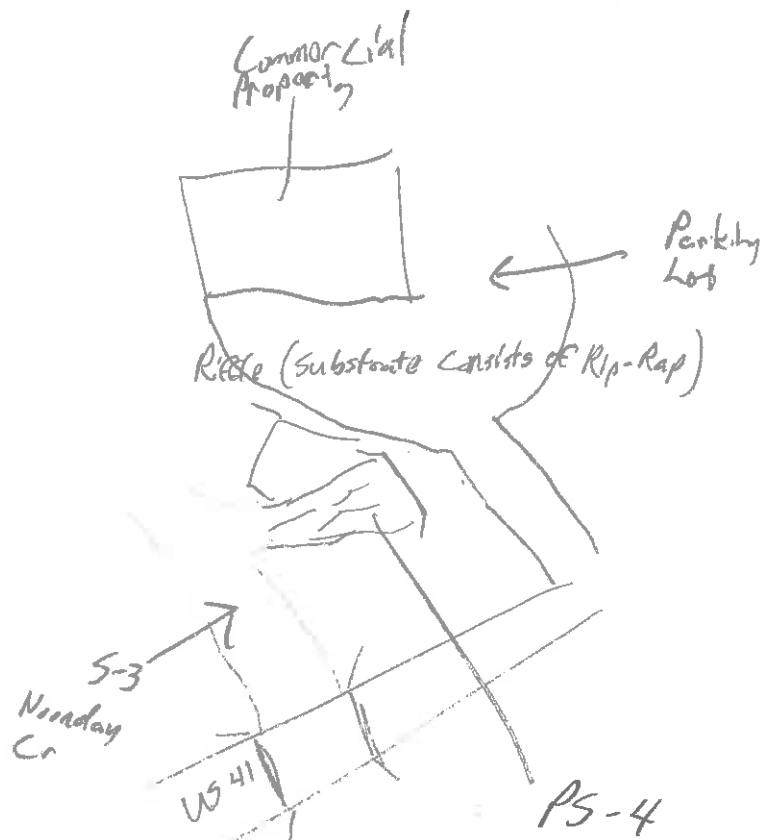
PS-4 ALT

List of other aquatic species observed, including invasive species, and their abundance:

No survey was conducted due to PS-4 being heavily impacted by the surrounding land use. No suitable habitat is present for Federal state protected aquatic fish, mussels, and crayfish.

Explain/describe any deviations from protocol:

Include sketch map using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected. Indicate and label any unique characteristics or instream structures.



55 - A14

Site Number: <u>55 ALT</u> Field Number: <u>55 ALT</u> Time Beg: _____ End: _____		Date: <u>10/23/19</u> State: <u>GA</u>																														
Watershed/Drainage: <u>Etowah</u>		Latitude: <u>33.996834</u>																														
Waterbody: <u>Trail to Nounded Cr</u>		Stream Order: _____																														
Location: <u>US 41 near the intersection of Nounded Cr</u>		Surveyor(s): <u>MM, EW</u>																														
Gage Station: <u>Barrett Pkwy - Nounded Cr</u>		Stream Type: _____																														
Determining RSA	Distance upstream: _____ Distance downstream: <u>700 ft</u>	Survey Technique	Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐ <u>N/A</u>																													
Instream Features Quantitative		Water Quality																														
Please specify all units of measurement		Water Temp: <u>14.5</u> °C																														
% Canopy Cover: <u>0</u> Wetted Width: <u>1-2'</u>		Dissolved Oxygen: <u>6.2</u> mg/L																														
Surface Velocity (at thalweg): _____		Conductivity <u>121.2</u> <u>130.4</u>																														
Water Depth (at thalweg): <u>1.0"</u>		pH <u>7.5</u> Other: <u>T-5.9</u>																														
Bank Height (rt/lt): <u>2-3'</u> Bank Angle (rt/lt): <u>150°</u>		303d Listed: ☐ yes ☒ no																														
Instream Features Qualitative		Designated Use: _____																														
Channel Alteration: ☒ No ☐ Yes		Violated Criteria: _____																														
Describe: _____		Heavy Rain in past 7 days: Yes ☐ No ☒																														
Shoring Structures: ☐ None ☐ Limerock ☐ Gabion		Air Temperature: _____ Est. ☐ Act. ☐																														
☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____		Survey Weather Conditions: Scattered showers ☐																														
Substrate composition (% est.): Gravel <u>5</u> Silt <u>40</u> Clay _____		Heavy rain ☐ Clear/sunny ☒																														
Clay Marl _____ Fine sand <u>30</u> Coarse s. <u>25</u> Medium s. _____		Steady rain ☐ % Cloud cover _____																														
Boulder _____ Bedrock _____ Cobble _____																																
Channel Stability (Check one box for each column):																																
Deposition/Aggradation		Incision/Degradation																														
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools																														
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools																														
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools																														
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☒ Few, if any, deep pools																														
Impoundments: ☒ None ☐ yes (Describe): _____																																
Fish Passage: Blocked? ☐ yes ☒ no Describe: _____		Fish Presence: ☐ Absent ☒ Rare ☐ Common ☐ Abundant																														
Woody Material: ☒ None/infreq. ☐ Moderate ☐ Extensive																																
Riparian Features Quantitative		Stream Road Crossing																														
Rt* Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+	Landuse Characterization: (100 feet to either side of the stream) <u>Facing 05</u> Natural Forest <table border="1" style="display: inline-table;"><tr><td>Rt Bk</td><td>Lt Bk</td><td>%</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>	Rt Bk	Lt Bk	%																												Road Type: ☐ Paved ☐ Unpaved
Rt Bk	Lt Bk	%																														
Lt* Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+	Pasture <table border="1" style="display: inline-table;"><tr><td>Rt Bk</td><td>Lt Bk</td><td>%</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>	Rt Bk	Lt Bk	%																												Name (if known): <u>N. King</u>
Rt Bk	Lt Bk	%																														
	Agricultural <u>cleared</u> <table border="1" style="display: inline-table;"><tr><td>Rt Bk</td><td>Lt Bk</td><td>%</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>	Rt Bk	Lt Bk	%																												Crossing Type: ☒ Pipe culvert ☐ Box culvert ☐ Bridge ☐ Paved box culvert
Rt Bk	Lt Bk	%																														
	Residential <u>R-0-W</u> <table border="1" style="display: inline-table;"><tr><td>Rt Bk</td><td>Lt Bk</td><td>%</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>	Rt Bk	Lt Bk	%																												Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access
Rt Bk	Lt Bk	%																														
Notes		Describe: _____																														
		Floodplain Access: Rt* ☐ Lt* ☐ None ☐ Partial ☐ Full ☒																														
		Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting																														

Mussel Measurement Data Sheet

Field

Number: S-S Alt

Date: 10/23/14

County: Cobb

Locality: US 41 near Barrett Pkwy

Surveyors: MM, RN

*= Optional

**= Male, female, undetermined

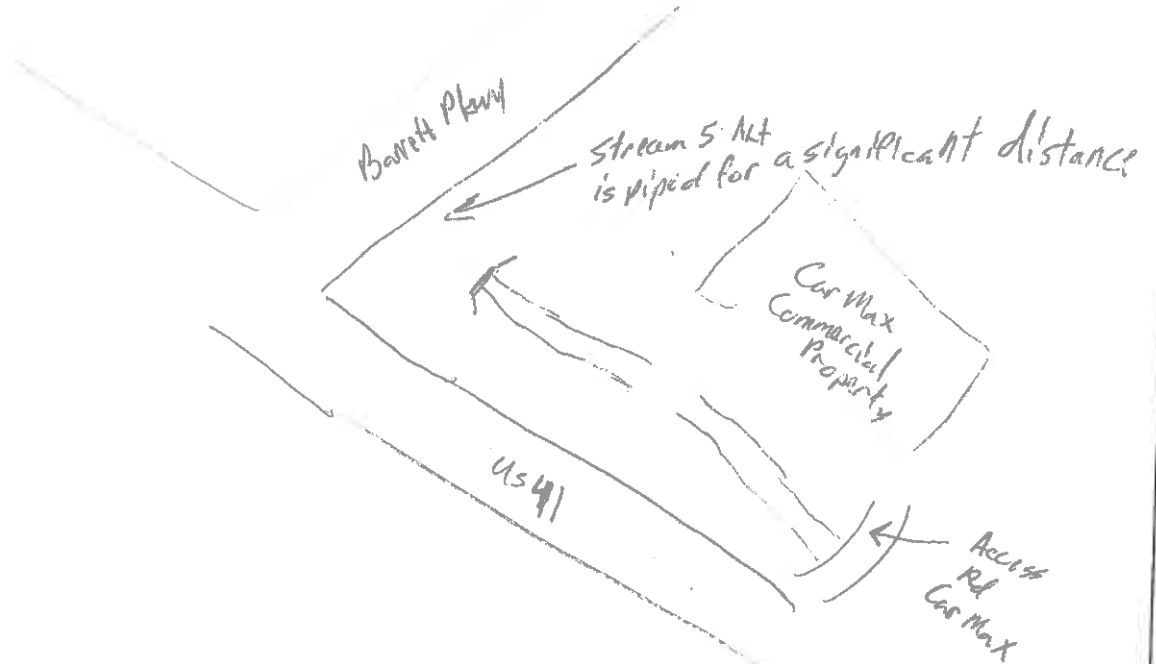
SS-Alt

List of other aquatic species observed, including invasive species, and their abundance:

No survey - stream was piped for a significant distance. Flow was stagnant and appeared intermittent at the time of our survey

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



51

Site Number: <u>51</u>		Field Number: <u>5-1</u>		Time Beg: _____		Date: <u>10/23/14</u>	
Watershed/Drainage: <u>Etowah</u>		End: _____		Latitude: <u>34.027908</u>		State: <u>GA</u>	
Waterbody: <u>trib to Noonday</u>		Location: <u>Near I-76 & Busbee Pkwy</u>		Stream Order: _____		Long: <u>-84.573483</u>	
Gage Station: <u>Noonday Creek / 02392950</u>		Surveyor(s): <u>mm, RJ</u>		Stream Type: _____			
Distance upstream: <u>1000</u>		Distance downstream: _____		Tactile Only ☐		Tactile With Snorkel ☐	
Tactile With SCUBA ☐						<u>N/A</u>	
Instream Features: Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: <u>14.7</u> °C			
% Canopy Cover: <u>0-90</u> Wetted Width: <u>1-3 ft</u>				Dissolved Oxygen: <u>8.03</u> mg/L			
Surface Velocity (at thalweg): <u>< 5 cfs</u>				Conductivity <u>163.7</u> μ S/cm - 191.3			
Water Depth (at thalweg): <u>6 inches to 2 ft</u>				pH <u>7.25</u> Other: <u>T-5.3</u>			
Bank Height (rt/lt): <u>3-5 ft</u> Bank Angle (rt/lt): <u>90/180</u>				303d Listed: ☐ yes ☐ no			
Channel Alteration: ☒ No ☐ Yes				Designated Use: _____			
Describe: _____				Violated Criteria: _____			
Shoring Structures: ☐ None ☐ Limerock ☐ Gabion				Heavy Rain in past 7 days: Yes ☐ No ☒			
☐ Concrete ☒ Rip-rap ☐ Other: _____ Extent: <u>30 ft</u>				Air Temperature: _____ Est. ☐ Act. ☐			
Substrate composition (% est.): Gravel _____ Silt <u>20</u> Clay <u>30</u>				Survey Weather Conditions: Scattered showers ☐			
Clay Marl _____ Fine sand <u>20</u> Coarse s. <u>20</u> Medium s. <u>10</u>				Heavy rain ☐ Clear/sunny ☒			
Boulder _____ Bedrock _____ Cobble _____				Steady rain ☐ % Cloud cover _____			
Channel Stability (Check one box for each column):							
Deposition/Aggradation		Incision/Degradation		Impoundments:			
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools	☐ None ☒ yes (Describe): <u>Deflation Point Upstream</u>				
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools	Fish Passage: ☒ yes ☐ no				
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools	Fish Presence: ☐ Absent ☒ Rare ☐ Common ☐ Abundant				
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☒ Few, if any, deep pools	Describe: <u>Bad downstream</u>				
Woody Material:							
☐ None/infreq. ☐ Moderate ☐ Extensive							
Rt* Buffer width(ft):				Landuse Characterization:			
☐ 10-25 ☒ 25-75 ☐ 78-150				(100 feet to either side of the stream)			
☐ 150+				Facing <u>lt</u>			
Lt* Buffer width(ft):				Rt Bk Lt Bk			
☐ 10-25 ☐ 25-75 ☒ 78-150 ☐ 150+				Natural Forest <u>50</u> <u>100</u> %			
				Silviculture _____ %			
				Pasture _____ %			
				Agricultural _____ %			
				Residential _____ %			
				Commercial <u>50</u> _____ %			
				Industrial _____ %			
Notes							
Road Type: ☐ Paved ☐ Unpaved							
Name (if known): <u>No x-ing just a paved walking trail</u>							
Crossing Type: ☒ Pipe culvert ☐ Box culvert ☐ Bridge ☐ Paved box culvert							
Riparian Features (Qual):							
Local Non-Point Source Pollution Potential:							
☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access							
Describe: _____							
Floodplain Access:							
None ☐ Rt* ☒ Lt* ☒ Full ☐							
Bank Erosion:							
☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting							

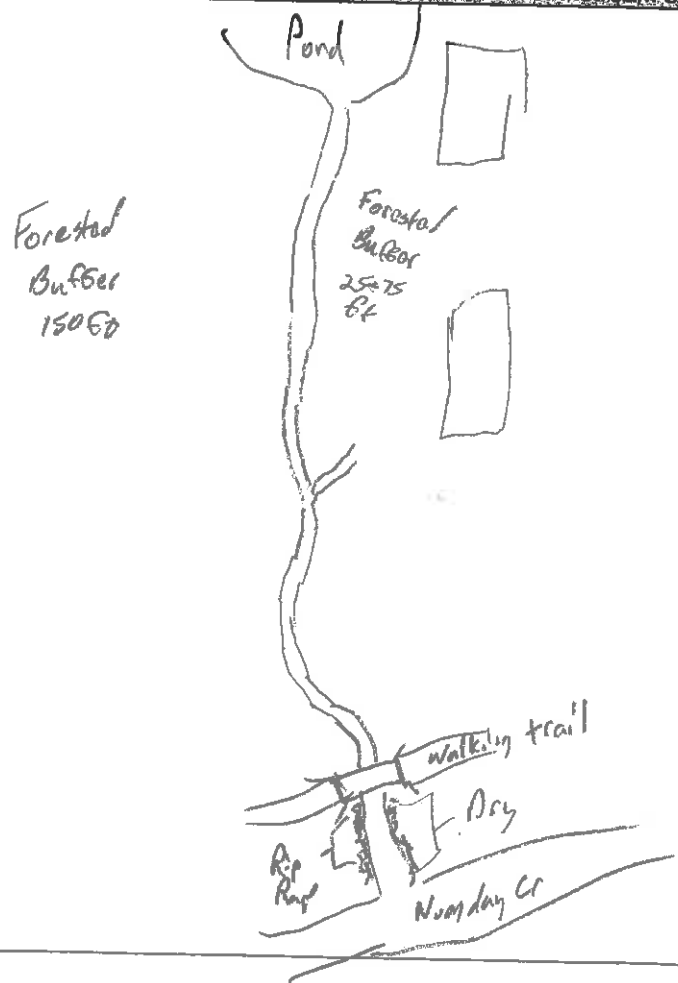
51

List of other aquatic species observed, including invasive species, and their abundance:

Habitat is very poor due to heavy sedimentation, lack of riffles, and stagnant flow conditions in many areas. Additionally a detention pond is located upstream. No survey conducted.

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected. Indicate and label any unique characteristics or instream structures.



S-1a

Site Number: S-1a		Field Number: S1a		Time Beg:		Date: 10/28/14	
Watershed/Drainage: Etowah River				End:		State: GA	
Waterbody: Noondag Creek				Latitude: 34.021000		Long: -84.567750	
Location:				Stream Order:		Stream Type:	
Gage Station: Noondag Creek 02392950		Surveyor(s): RJ, mm					
Determining RSA		Distance upstream: 300 Distance downstream: 500		Survey Technique:		Tactile Only ☒ Tactile With Snorkel ☐ Tactile With SCUBA ☐	
Instream Features Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: 14.5 °C		Water Clarity	
% Canopy Cover: 6-80% Wetted Width: 20.60				Dissolved Oxygen: 8.4 mg/L		☐ Clear	
Surface Velocity (at thalweg): 75 cfs				Conductivity 178.1 SC-195.6		☒ Slightly turbid	
Water Depth (at thalweg): 1-4'				pH 7.3 Other: T-5.6		☐ Turbid	
Bank Height (rt/lt): 4-9 Bank Angle (rt/lt): 90-100°				303d Listed: ☐ yes ☐ no		☐ Opaque	
Channel Alteration: ☒ No ☐ Yes				Designated Use:			
Describe:				Violated Criteria:			
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion				Heavy Rain in past 7 days: Yes ☐ No ☒			
☐ Concrete ☐ Rip-rap ☐ Other: Extent:				Air Temperature: 72°F Est. ☒ Act. ☐			
Substrate composition (% est.): Gravel 10 Silt 30 Clay				Survey Weather Conditions: Scattered showers ☐			
Clay Mari Fine sand 20 Coarse s. 10 Medium s. 20				Heavy rain ☐ Clear/sunny ☒			
Boulder Bedrock Cobble				Steady rain ☐ % Cloud cover 60			
Channel Stability (Check one box for each column):							
Deposition/Aggradation				Incision/Degradation			
Excellent	Large, fresh deposits absent High number of deep pools		No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools		Impoundments: ☐ None ☐ yes (Describe):		Fish Passage: Blocked? ☐ yes ☒ no Describe:
Good	Large, fresh deposits uncommon Moderate number of deep pools		Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools		Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant		
Fair	Large, fresh deposits common Low-moderate number of deep pools		Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools		Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive		
Poor	Large, fresh deposits very common Few, if any, deep pools		Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☒ Few, if any, deep pools				
Rt Buffer width(ft): ☐ 10-25 ☐ 25-75 ☒ 78-150 ☐ 150+				Landuse Characterization: (100 feet to either side of the stream)			
Lt Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+				Road Type: ☒ Paved ☐ Unpaved			
				Name (if known): Brasbas Ferry			
				Crossing Type: ☐ Pipe culvert ☐ Box culvert ☒ Bridge ☐ Paved box culvert			
				Riparian Features Qual:			
				Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access			
				Describe:			
Notes				Floodplain Access:			
				None ☐ Rt* ☐ Lt* ☐			
				Partial ☒ ☒			
				Full ☐ ☐			
				Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting			

page ____ of ____

Field

Number: 51A

Date: 10/23/14

County: Cobb

Locality: *Bushes Pkwy and Noondy Cr*

Surveyors: MM & RN

***= Optional**

**= Male, female, undetermined

5-19

Redbreast sunfish - 7100

bluegill sunfish - 7100

Alabama hogsgedac - 27

blackbanded darker - 45

Green sunfish - 14

E Mosquitofish - 7100

large scale stone roller - 7100

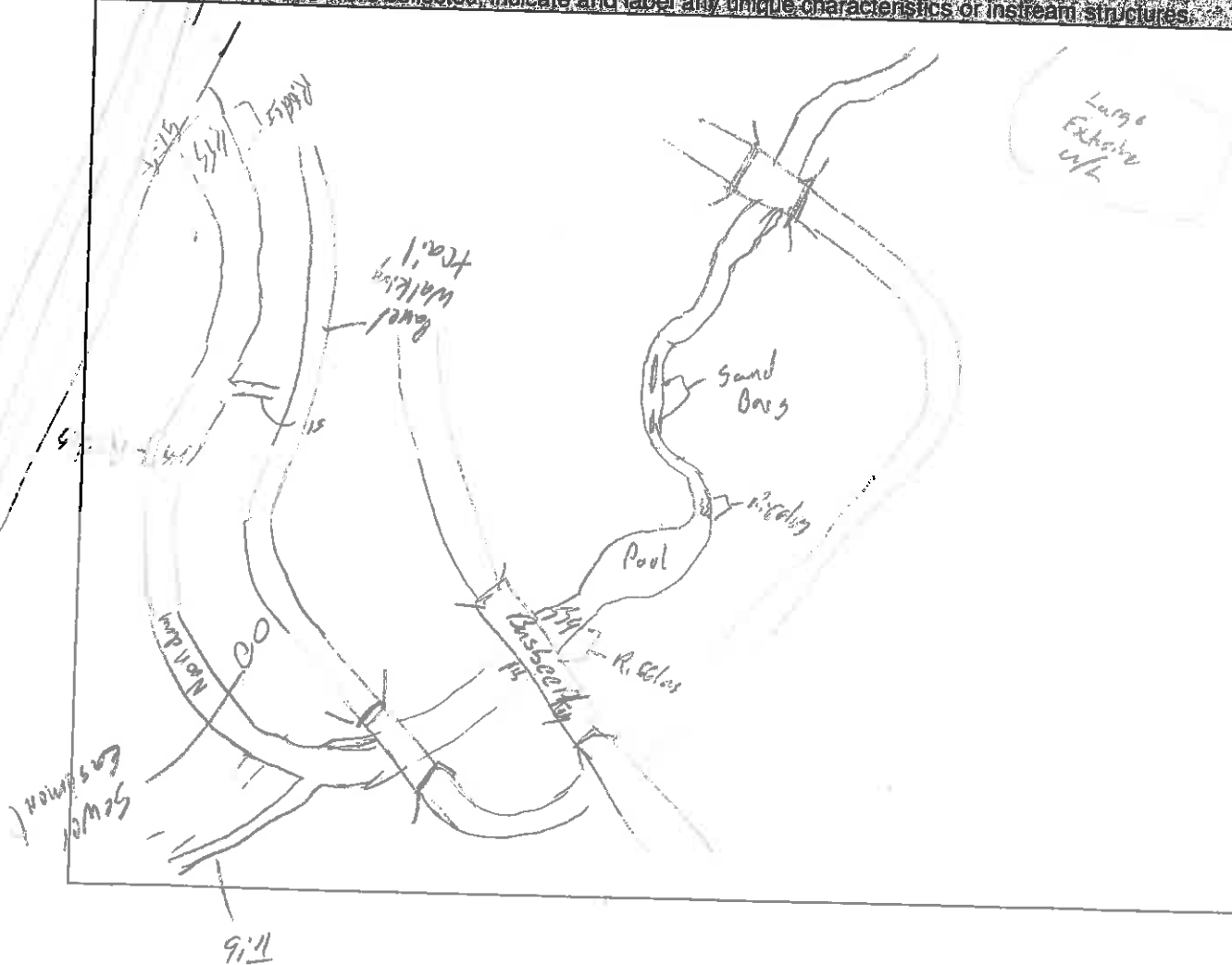
Coars banded sculpin - 8

Crook chub - 7100

White throated crayfish - 28

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



5-2

Site Number: 5-2 Field Number: 5-2		Time Beg: Date: 10/24/14																																	
Watershed/Drainage: Etowah		State: GA																																	
Waterbody: tributary to Noonday Cr		Long: -84.573277																																	
Location: Shiloh Valley Dr		Stream Type:																																	
Gage Station: Noonday Creek 02392950		Surveyor(s): MM & RN																																	
Determining Distance upstream: 300 Distance downstream: 500		Survey Technique: Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																	
Instream Features: Quantitative Please specify all units of measurement % Canopy Cover: 40-80 Wetted Width: 2-45 ft Surface Velocity (at thalweg): < 5 cfs Water Depth (at thalweg): 1 inch to 6 inches Bank Height (rt/lr): 3-8 ft Bank Angle (rt/lr): 90-110		Water Quality Water Temp: 16.2 °C Dissolved Oxygen: 6.41 mg/L Conductivity: 145.8 SC 151.2 pH: 7.5 Other: T- 3.2 303d Listed: ☐ yes ☐ no Designated Use: Violated Criteria: Heavy Rain in past 7 days: Yes ☐ No ☐ Air Temperature: Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☐ Heavy rain ☐ Clear/sunny ☐ Steady rain ☐ % Cloud cover: 10																																	
Channel Alteration: ☐ No ☒ Yes Describe: Concrete Flume Shoring Structures: ☒ None ☐ Limerock ☐ Gabion ☐ Concrete ☐ Rip-rap ☐ Other: Extent:		Substrate composition (% est.): Gravel: 10 Silt: Clay: Clay Marl: Fine sand: Coarse s.: 30 Medium s.: Boulder: Bedrock: Cobble: 60% concrete flume																																	
Channel Stability (Check one box for each column):																																			
Deposition/Aggradation Excellent: Large, fresh deposits absent High number of deep pools Good: Large, fresh deposits uncommon Moderate number of deep pools Fair: Large, fresh deposits common Low-moderate number of deep pools Poor: Large, fresh deposits very common Few, if any, deep pools		Incision/Degradation No mass-wasting or significant erosion of banks Channel slightly entrenched High number of deep pools Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched Moderate number of deep pools Active bank erosion, potential mass-wasting Channel moderately-highly entrenched Low-moderate number of deep pools Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched Few, if any, deep pools																																	
Impoundments: ☒ None ☐ yes (Describe):		Fish Passage: Blocked? ☐ yes ☒ no Describe:																																	
Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant		Woody Material: ☒ None/infreq. ☐ Moderate ☐ Extensive																																	
Relative Features: Quantitative Rt* Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 75-150 ☐ 150+ Lt* Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 75-150 ☐ 150+		Landuse Characterization: (100 feet to either side of the stream) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td>100</td> <td>100</td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </tbody> </table>			Rt Bk	Lt Bk	%	Natural Forest			%	Silviculture			%	Pasture			%	Agricultural			%	Residential			%	Commercial	100	100	%	Industrial			%
	Rt Bk	Lt Bk	%																																
Natural Forest			%																																
Silviculture			%																																
Pasture			%																																
Agricultural			%																																
Residential			%																																
Commercial	100	100	%																																
Industrial			%																																
Notes 		Road Type: ☒ Paved ☐ Unpaved Name (if known): Crossing Type: ☒ Pipe culvert ☐ Box culvert ☐ Bridge ☐ Paved box culvert																																	
Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe:		Floodplain Access: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt*</th> <th>Lt*</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Partial</td> <td>☒</td> <td>☒</td> </tr> <tr> <td>Full</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>			Rt*	Lt*	None	☐	☐	Partial	☒	☒	Full	☐	☐																				
	Rt*	Lt*																																	
None	☐	☐																																	
Partial	☒	☒																																	
Full	☐	☐																																	
Bank Erosion: ☒ Non-eroding ☐ Active Erosion ☐ Mass-wasting																																			

Mussel Measurement Data Sheet

page ____ of ____

Field

Number: 5-2

Date: 10/24/14

County: Cobb

Locality: Shiloh Valley Dr

Surveyors: MM RW

[illegible]

***= Optional**

**= Male, female, undetermined

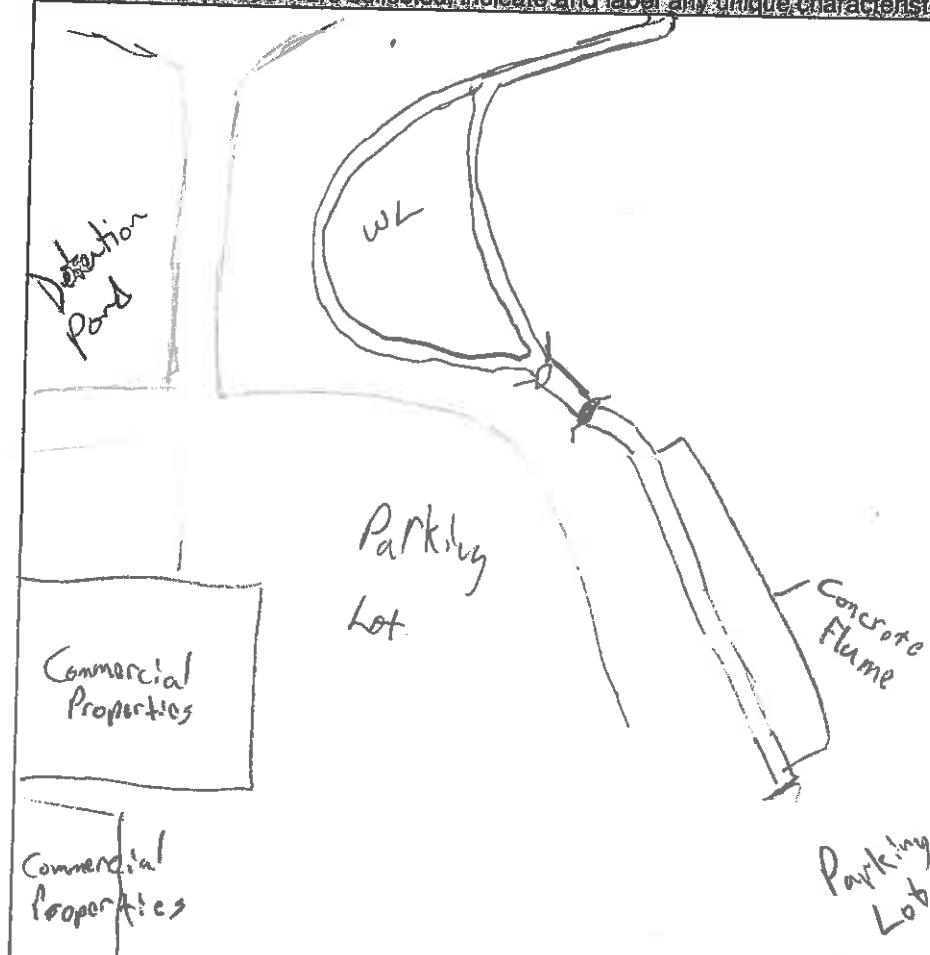
G-2

List of other aquatic species observed, including invasive species, and their abundance:

No suitable habitat for Federal & state protected species due to the Concrete Flume and sediment from surrounding land use

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



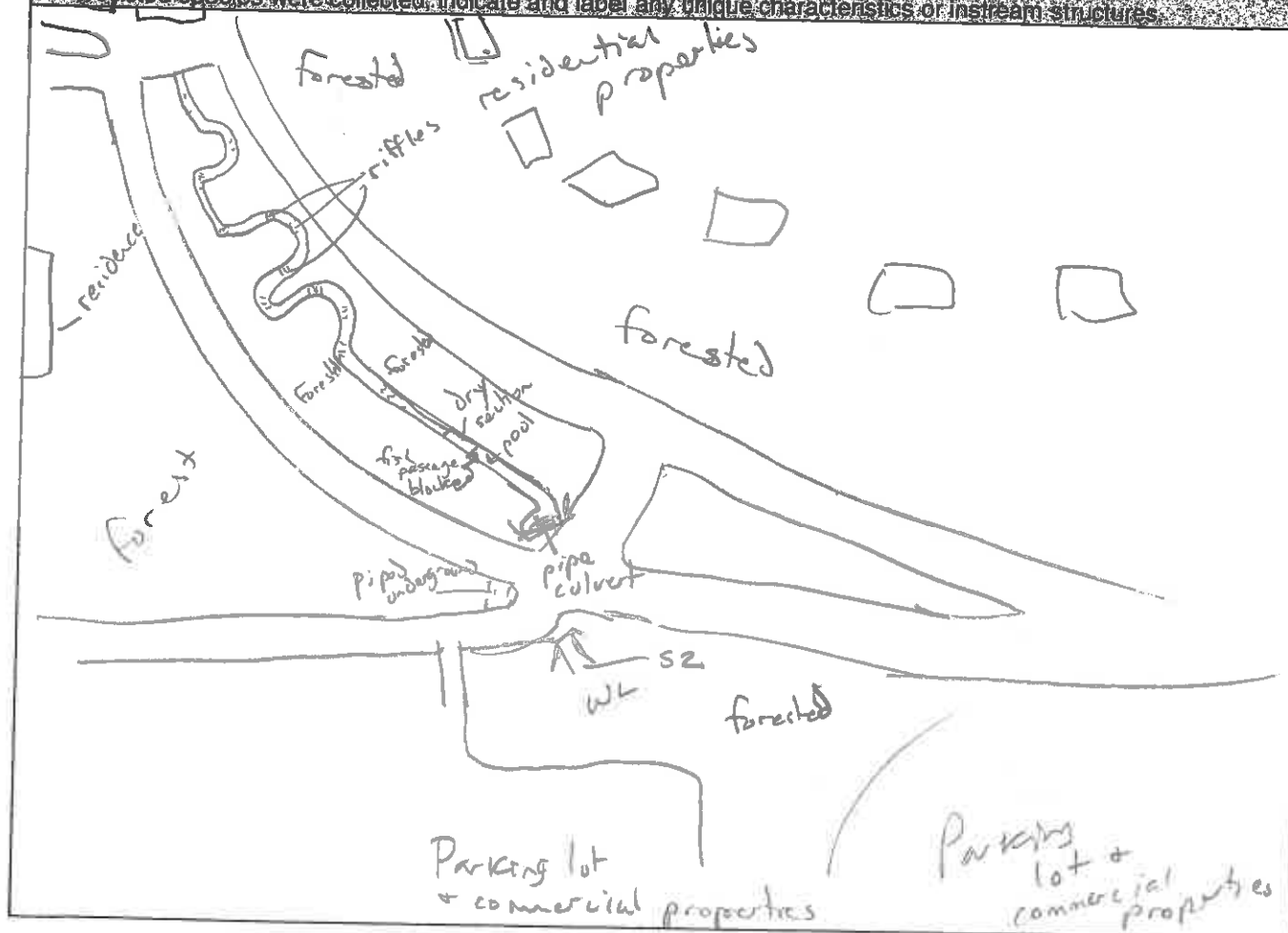
✗ Not
Too
Scale

List of other aquatic species observed, including invasive species, and their abundance:

fish passage was blocked just upstream of pipe culvert
no fish survey was conducted, no crayfish survey conducted
no survey was conducted due to the small stream size, trickle flow, sediment filling
in the interstitial spaces of the cobble substrate and becomes intermittent.

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected. Indicate and label any unique characteristics or instream structures.



54

Site Number: 5-4		Field Number: 3-4		Time Beg: _____		Date: 10/24/14	
Watershed/Drainage: Etowah River		End: _____		Latitude: 33.98848		State: GA	
Waterbody: tributary to Noonday Cr		Stream Order: _____		Long: -84.57498		Stream Type: _____	
Location: US 41		Surveyor(s): M.M., RW		Gage Station: Noonday creek 02392450			
Determining Distance upstream: 300		Survey Distance downstream: _____		Tactile Only ☐		Tactile With Snorkel ☐	
Tactile With SCUBA ☐							
Instream Features: Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: 14.7 °C			
% Canopy Cover: 0-80% Wetted Width: 2-4'				Dissolved Oxygen: 8.31 mg/L			
Surface Velocity (at thalweg): 75 cfs				Conductivity 110.2 spc/35.9			
Water Depth (at thalweg): 1-3'				pH 7.89 Other: T-5.3			
Bank Height (rt/lt): 2-6' Bank Angle(rt/lt): 90-100				303d Listed: ☐ yes ☒ no			
Channel Alteration: ☒ No ☐ Yes				Designated Use: _____			
Describe: _____				Violated Criteria: _____			
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion				Heavy Rain in past 7 days: Yes ☐ No ☒			
☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____				Air Temperature: _____ Est. ☐ Act. ☐			
Substrate composition (% est.): Gravel _____ Silt 50 Clay _____				Survey Weather Conditions: Scattered showers ☒			
Clay Marl 20 Fine sand 15 Coarse s. 15 Medium s. 15				Heavy rain ☐ Clear/sunny ☒			
Boulder _____ Bedrock _____ Cobble 15				Steady rain ☐ % Cloud cover 20			
Channel Stability (Check one box for each column):							
Deposition/Aggradation				Incision/Degradation			
Excellent	Large, fresh deposits absent		No mass-wasting or significant erosion of banks		☒ None ☐ yes (Describe): _____		
	High number of deep pools		Channel slightly entrenched		Fish Passage: Blocked? ☐ yes ☒ no		
Good	Large, fresh deposits uncommon		Channel slightly entrenched		Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant		
	Moderate number of deep pools		Channel moderately-highly entrenched		Describe: _____		
Fair	Large, fresh deposits common		Active bank erosion, potential mass-wasting		☒ Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive		
	Low-moderate number of deep pools		Channel moderately-highly entrenched				
Poor	Large, fresh deposits very common		Active bank erosion, frequent mass-wasting				
	Few, if any, deep pools		Channel moderately-highly entrenched				
Riparian Features: Quantitative							
Rt* Buffer width(ft):		Landuse Characterization: (100 feet to either side of the stream)		Road Type: ☒ Paved ☐ Unpaved			
☒ 10-25				Name (if known): SR 41			
☐ 25-75				Crossing Type: ☐ Pipe culvert ☒ Box culvert			
☐ 78-150				☐ Bridge ☐ Paved box culvert			
☐ 150+				Local Non-Point Source Pollution Potential:			
Lt* Buffer width(ft):				☒ No evidence ☐ Slight			
☒ 10-25				☐ Moderate potential ☐ Obvious sources			
☐ 25-75				☐ Livestock access			
☐ 78-150				Describe: _____			
☐ 150+				Floodplain Access: Rt* ☐ Lt* ☐			
				Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting			
Notes							

page ____ of ____

Number: _____

Date: _____

Locality:

Surveyors: MM & RN

 $x = 1.10$

***= Optional**

**= Male, female, undetermined

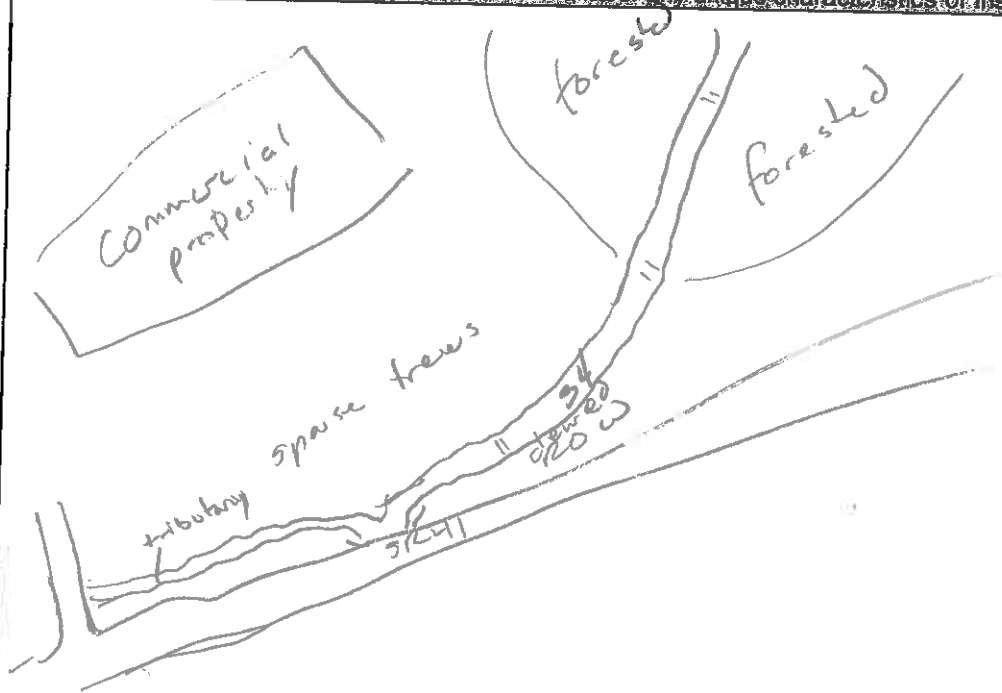
54

List of other aquatic species observed, including invasive species, and their abundance:

Creek chub 7100
White tubenosed crayfish 4

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



55

Site Number: <u>3-5</u> Field Number: <u>3-5</u>		Time Beg: _____ End: _____		Date: <u>10/24/14</u>																																	
Watershed/Drainage: <u>Etoah River</u>		Latitude: <u>33.98873</u>		State: <u>GA</u>																																	
Waterbody: <u>tributary to Noondag cr</u>		Longitude: <u>-84.57471</u>		Stream Type: _____																																	
Location: <u>US 41</u>		Stream Order: _____		Surveyor(s): <u>mm, pn</u>																																	
Gage Station: <u>Noondag Creek 0239 2950</u>																																					
Determining Distance upstream: _____ Distance downstream: <u>900</u>		Survey Technique: _____		Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																	
Please specify all units of measurement % Canopy Cover: <u>0-80</u> Wetted Width: <u>1-5'</u> Surface Velocity (at thalweg): <u>75 cfs</u> Water Depth (at thalweg): <u>6"-2'</u> Bank Height (rt/lr): <u>1-5'</u> Bank Angle (rt/lr): <u>90-120</u>			Water Quality Water Temp: <u>14.8 °C</u> Dissolved Oxygen: <u>8.3 mg/L</u> Conductivity <u>110.2</u> spec 136.1 pH <u>7.9</u> Other: <u>T-4.9</u> 303d Listed: ☐ yes ☒ no																																		
Channel Alteration: ☒ No ☐ Yes Describe: _____ Shoring Structures: ☐ None ☐ Limerock ☐ Gabion ☒ Concrete ☐ Rip-rap ☐ Other: <u>s</u> Extent: <u>partial rip rap</u> Substrate composition (% est.): Gravel _____ Silt <u>20</u> Clay _____ Clay Marl <u>20</u> Fine sand <u>15</u> Coarse s. <u>15</u> Medium s. <u>15</u> Boulder _____ Bedrock _____ Cobble <u>15</u>			Designated Use: _____ Violated Criteria: _____ Heavy Rain in past 7 days: Yes ☐ No ☒ Air Temperature: _____ Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☐ Heavy rain ☐ Clear/sunny ☒ Steady rain ☐ % Cloud cover <u>20</u>																																		
Channel Stability (Check one box for each column):																																					
Deposition/Aggradation		Incision/Degradation		Impoundments:																																	
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools	☒ None ☐ yes (Describe): _____																																		
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly/moderately entrenched ☒ Moderate number of deep pools	Fish Passage: Blocked? ☐ yes ☒ no Describe: _____																																		
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools	Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant																																		
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools	Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																																		
Riparian Features Quantitative																																					
Rt* Buffer width(ft): _____ ☐ 10-25 ☐ 25-75 ☐ 78-150 ☒ 150+ Lt* Buffer width(ft): _____ ☐ 10-25 ☐ 25-75 ☐ 78-150 ☒ 150+		Landuse Characterization: (100 feet to either side of the stream)																																			
		<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td><u>100</u></td> <td><u>60</u></td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture <u>Cleared field</u></td> <td></td> <td><u>40</u></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </tbody> </table>					Rt Bk	Lt Bk	%	Natural Forest	<u>100</u>	<u>60</u>	%	Silviculture			%	Pasture <u>Cleared field</u>		<u>40</u>	%	Agricultural			%	Residential			%	Commercial			%	Industrial			%
	Rt Bk	Lt Bk	%																																		
Natural Forest	<u>100</u>	<u>60</u>	%																																		
Silviculture			%																																		
Pasture <u>Cleared field</u>		<u>40</u>	%																																		
Agricultural			%																																		
Residential			%																																		
Commercial			%																																		
Industrial			%																																		
Road Type: ☒ Paved ☐ Unpaved Name (if known): <u>SE 41</u> Crossing Type: ☐ Pipe culvert ☒ Box culvert ☐ Bridge ☐ Paved box culvert																																					
Riparian Features Qualitative		Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe: _____																																			
Notes		Floodplain Access: Rt* ☐ Lt* ☐ None ☐ Partial ☒ Full ☐ Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting																																			

Mussel Measurement Data Sheet

page ____ of ____

Field

Number: 5-5

Date: 10/24/14

County: Cobb

Locality: US 41

Surveyors: MM, RW

[illegible]

*= Optional

**= Male, female, undetermined

photos
67
68

56

Site Number: <u>S-6</u> Field Number: <u>S-6</u> Time Beg: _____ Date: <u>10/27/12</u>		End: _____ State: <u>GA</u>																																	
Watershed/Drainage: <u>Etowah River</u>		Latitude: <u>33.987452</u>																																	
Waterbody: <u>tributary to Noonday Cr</u>		Long: <u>84.572242</u>																																	
Location: <u>US 41</u>		Stream Order: _____																																	
Gage Station: <u>Noonday Creek 02392950</u>		Surveyor(s): <u>mmr</u>																																	
Determining Distance upstream: <u>300</u> PSA Distance downstream: <u>500</u>		Survey Technique: _____ Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																	
Instream Features Quantitative Please specify all units of measurement % Canopy Cover: <u>0-80%</u> Wetted Width: <u>1-3'</u> Surface Velocity (at thalweg): <u>7.5 ft/s</u> Water Depth (at thalweg): <u>6"-1'</u> Bank Height (rt/lr): <u>1-2'</u> Bank Angle (rt/lr): <u>90-120</u>		Water Quality Water Temp: <u>14.1 °C</u> Dissolved Oxygen: <u>8.4 mg/L</u> Conductivity: <u>54.0 µS/cm</u> pH: <u>8.21</u> Other: <u>7-5.3</u> 303d Listed: ☐ yes ☒ no Designated Use: _____ Violated Criteria: _____ Heavy Rain in past 7 days: Yes ☐ No ☒ Air Temperature: _____ Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☐ Heavy rain ☐ Clear/sunny ☒ Steady rain ☐ % Cloud cover: _____																																	
Channel Alteration: ☒ No ☐ Yes Describe: _____ Shoring Structures: ☒ None ☐ Limerock ☐ Gabion ☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____ Substrate composition (% est.): Gravel _____ Silt <u>60</u> Clay _____ Clay Marl _____ Fine sand <u>10</u> Coarse s. <u>10</u> Medium s. <u>15</u> Boulder _____ Bedrock _____ Cobble <u>5</u>		Channel Stability (Check one box for each column): <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Deposition/Aggradation</th> <th>Incision/Degradation</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>Large, fresh deposits <u>absent</u> High number of deep pools</td> <td>No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools</td> </tr> <tr> <td>Good</td> <td>Large, fresh deposits <u>uncommon</u> Moderate number of deep pools</td> <td>Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools</td> </tr> <tr> <td>Fair</td> <td>Large, fresh deposits <u>common</u> Low-moderate number of deep pools</td> <td>Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools</td> </tr> <tr> <td>Poor</td> <td>Large, fresh deposits <u>very common</u> Few, if any, deep pools</td> <td>Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☒ Few, if any, deep pools</td> </tr> </tbody> </table>			Deposition/Aggradation	Incision/Degradation	Excellent	Large, fresh deposits <u>absent</u> High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools	Good	Large, fresh deposits <u>uncommon</u> Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools	Fair	Large, fresh deposits <u>common</u> Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools	Poor	Large, fresh deposits <u>very common</u> Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☒ Few, if any, deep pools																	
	Deposition/Aggradation	Incision/Degradation																																	
Excellent	Large, fresh deposits <u>absent</u> High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools																																	
Good	Large, fresh deposits <u>uncommon</u> Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools																																	
Fair	Large, fresh deposits <u>common</u> Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools																																	
Poor	Large, fresh deposits <u>very common</u> Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☒ Few, if any, deep pools																																	
Impoundments: ☒ None ☐ yes (Describe): _____ Fish Passage: ☐ Blocked? ☐ yes ☒ no Describe: _____ Fish Presence: ☐ Absent ☐ Rare ☐ Common ☐ Abundant Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																																			
Buffer Characterization: Rt* Buffer width(ft): ☐ 10-25 ☐ 25-75 ☒ 78-150 ☐ 150+ Lt* Buffer width(ft): ☐ 10-25 ☐ 25-75 ☒ 78-150 ☐ 150+		Landuse Characterization: (100 feet to either side of the stream) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td><u>80</u></td> <td><u>80</u></td> <td>%</td> </tr> <tr> <td>Silviculture <u>Kudzu</u></td> <td><u>20</u></td> <td><u>20</u></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </tbody> </table>			Rt Bk	Lt Bk	%	Natural Forest	<u>80</u>	<u>80</u>	%	Silviculture <u>Kudzu</u>	<u>20</u>	<u>20</u>	%	Pasture			%	Agricultural			%	Residential			%	Commercial			%	Industrial			%
	Rt Bk	Lt Bk	%																																
Natural Forest	<u>80</u>	<u>80</u>	%																																
Silviculture <u>Kudzu</u>	<u>20</u>	<u>20</u>	%																																
Pasture			%																																
Agricultural			%																																
Residential			%																																
Commercial			%																																
Industrial			%																																
Notes 		Road Crossing Road Type: ☒ Paved ☐ Unpaved Name (if known): <u>SR 41</u> Crossing Type: ☐ Pipe culvert ☒ Box culvert ☐ Bridge ☐ Paved box culvert Riparian Features: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe: _____ Floodplain Access: Rt* ☐ Lt* ☒ None ☐ Partial ☒ Full ☐ Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting																																	

page_____ of _____

S-6

10/27/14

Locality: DS 41

Surveyors: mm, rw

**= Male, female, undetermined

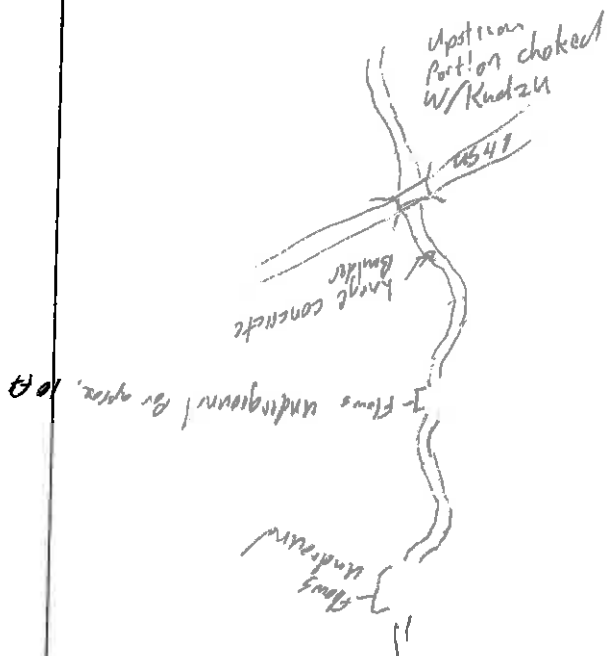
5-6

List of other aquatic species observed, including invasive species, and their abundance:

To small and the flow becomes intermittent downstream of the crossing.

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



photos
69-71

57

Site Number: <u>S-7</u> Field Number: <u>S-7</u>		Time Beg: _____ End: _____		Date: <u>10/27/94</u>	
Watershed/Drainage: <u>Etowah River</u>		Latitude: <u>33.982692</u>		State: _____	
Waterbody: <u>tributary to Noonday cr</u>		Stream Order: _____		Long: <u>-84.547363</u>	
Location: <u>Canton Rd connector</u>		Surveyor(s): <u>mm</u>		Stream Type: _____	
Gage Station: <u>Noonday Creek 02392950</u>					
Determining PSA		Distance upstream: <u>1200</u>		Survey Technique	
		Distance downstream: _____		Tactile Only ☐ Tactile With Snorkel ☐	
				Tactile With SCUBA ☐	
Instream Features Quantitative			Water Quality		
Please specify all units of measurement			Water Temp: <u>15.3°C</u>		
% Canopy Cover: <u>60-80%</u> Wetted Width: <u>1-3'</u>			Dissolved Oxygen: <u>6.97 mg/L</u>		
Surface Velocity (at thalweg): <u>75 cfs</u>			Conductivity <u>406 µS</u> <u>52.499</u>		
Water Depth (at thalweg): <u>6"-1'</u>			pH <u>7.4</u> Other: <u>7.4, 3</u>		
Bank Height (rt/lt): <u>2-8'</u> Bank Angle (rt/lt): <u>90-120°</u>			303d Listed: ☐ yes ☒ no		
Channel Alteration: ☒ No ☐ Yes			Designated Use:		
Describe: _____			Violated Criteria:		
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion			Heavy Rain in past 7 days: Yes ☐ No ☐		
☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____			Air Temperature: _____ Est. ☐ Act. ☐		
Substrate composition (% est.): Gravel <u>10</u> Silt <u>2</u> Clay _____			Survey Weather Conditions: Scattered showers ☐		
Clay Marl _____ Fine sand <u>20</u> Coarse s. <u>25</u> Medium s. <u>25</u>			Heavy rain ☐ Clear/sunny ☒		
Boulder _____ Bedrock _____ Cobble _____			Steady rain ☐ % Cloud cover _____		
Channel Stability (Check one box for each column):					
Deposition/Aggradation		Incision/Degradation		Impoundments:	
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools	☐ None ☐ yes (Describe): _____		
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools	Fish Passage: Blocked? ☐ yes ☒ no		
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools	Fish Presence: ☐ Absent ☐ Rare ☐ Common ☐ Abundant		
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☒ Few, if any, deep pools	Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive		
Riparian Features Quantitative			Site Road Crossing		
Rt* Buffer width(ft):		Landuse Characterization: (100 feet to either side of the stream)		Road Type: ☐ Paved ☐ Unpaved	
☐ 10-25				Name (if known): <u>NO X-1m</u>	
☒ 25-75				Crossing Type: ☐ Pipe culvert ☐ Box culvert	
☐ 78-150				☐ Bridge ☐ Paved box culvert	
☐ 150+				Riparian Features Qual: _____	
Lt* Buffer width(ft):				Local Non-Point Source Pollution Potential:	
☐ 10-25				☒ No evidence ☐ Slight	
☐ 25-75				☐ Moderate potential ☐ Obvious sources	
☐ 78-150				Describe: _____	
☒ 150+					
Notes					
			Floodplain Access:		
			Rt* ☐ Lt* ☐		
			None ☐ Partial ☒ Full ☐		
			Bank Erosion:		
			☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting		

page ____ of ____

Number: 5 - 7

Date: 10/27/14

County: Cobb

Locality: Canton Rd

Surveyors: MM RJ

[illegible]

**= Male, female, undetermined

57

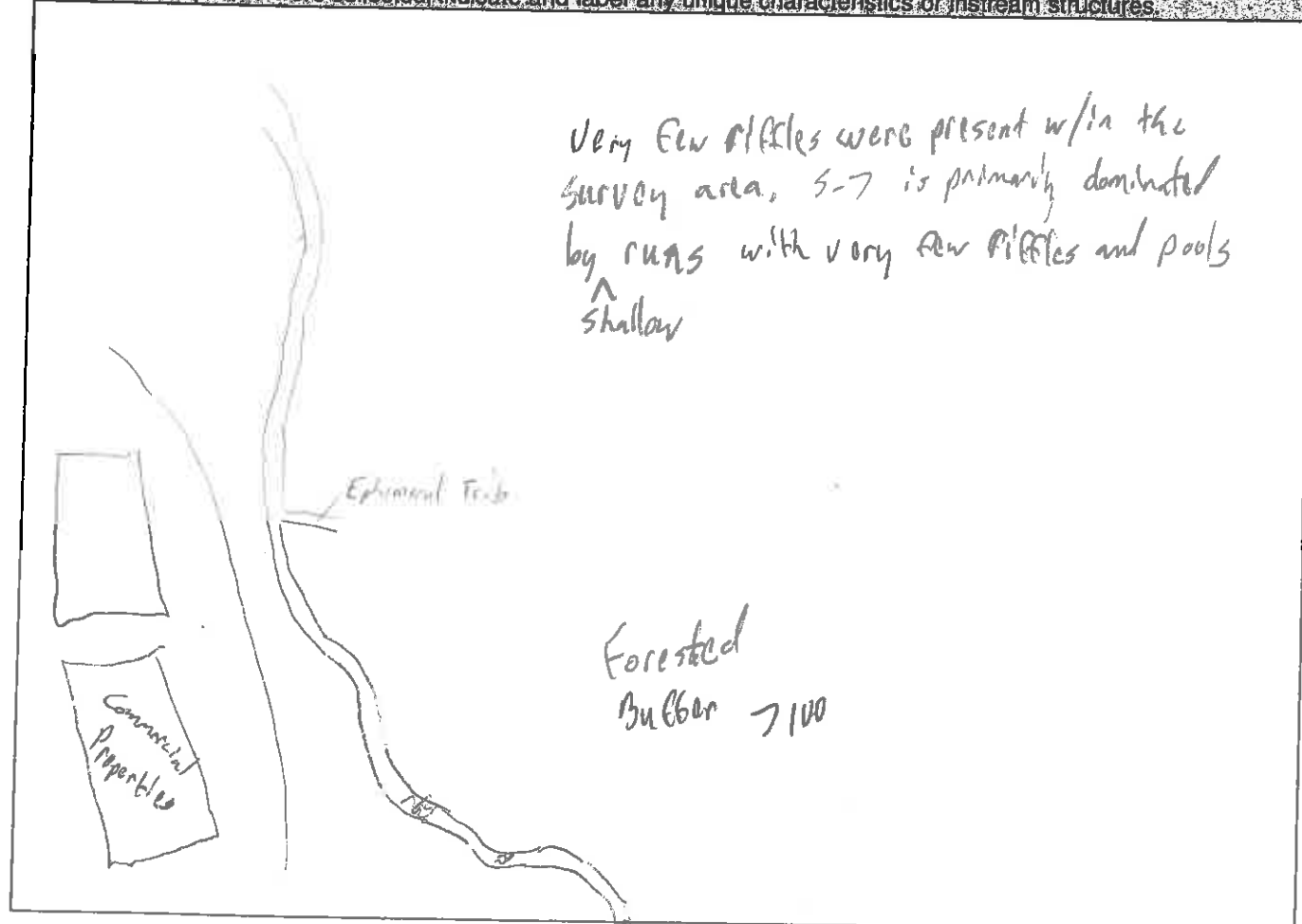
List of other aquatic species observed, including invasive species, and their abundance:

Crook chub - >100

white tubercled chafish - 7

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



34-38

Stream # 8

Site Number:		Field Number:		Time Beg:		Date: 10/25/14	
Watershed/Drainage: Choptank River Upper		End:		Latitude: 33.963124		State: GA	
Waterbody: Sope Branch		Stream Order:		Longitude: -84.531801		Stream Type:	
Location: US 41		Surveyor(s): MM & RF		Gage Station: Rollerwood Creek 02335910			
Distance upstream:		Distance downstream: 700 ft		Tactile Only ☐		Tactile With Snorkel ☐	
Tactile With SCUBA ☐							
Instream Features: Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: 12.6°C			
% Canopy Cover: 20% Wetted Width: 4-10'				Dissolved Oxygen: 9.27 mg/L			
Surface Velocity (at thalweg): 75 cfs				Conductivity: 36.4 µS/cm			
Water Depth (at thalweg): 1'-3'				pH: 8.01 Other: T-6.3			
Bank Height (rt/lr): 6-10' Bank Angle (rt/lr): 90°				303d Listed: ☐ yes ☒ no			
Designated Use:				Violated Criteria:			
Heavy Rain in past 7 days: Yes ☐ No ☐				Air Temperature: Est. ☐ Act. ☐			
Survey Weather Conditions: Scattered showers ☐				Heavy rain ☐ Clear/sunny ☒			
Steady rain ☐ % Cloud cover: _____							
Channel Alteration: ☐ No ☒ Yes							
Describe: Contains w/in concrete channel							
Shoring Structures: ☐ None ☐ Limerock ☐ Gabion							
☒ Concrete ☐ Rip-rap ☐ Other: _____ Extent: 50 to 75 ft							
Substrate composition (% est.): Gravel 15 Silt _____ Clay _____							
Clay Marl _____ Fine sand 20 Coarse s. 20 Medium s. 10							
Boulder _____ Bedrock _____ Cobble 15 Concrete flow 20							
Channel Stability (Check one box for each column):							
Deposition/Aggradation		Incision/Degradation		Impoundments: ☐ None ☐ yes (Describe):			
Excellent	Large, fresh deposits absent	No mass-wasting or significant erosion of banks		Fish Passage: ☐ Blocked? ☐ yes ☒ no			
Good	Large, fresh deposits uncommon	Channel slightly entrenched		Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant			
Fair	Large, fresh deposits common	Channel moderately-highly entrenched		Describe: _____			
Poor	Large, fresh deposits very common	Active bank erosion, potential mass-wasting		Woody Material: ☒ None/infreq. ☐ Moderate ☐ Extensive			
	Few, if any, deep pools	Channel moderately-highly entrenched					
Rt* Buffer width(ft):				Road Type: ☒ Paved ☐ Unpaved			
Landuse Characterization: (100 feet to either side of the stream)				Name (if known): Pickering Lot crosses stream			
Natural Forest				Crossing Type: ☒ Pipe culvert ☐ Box culvert			
Silviculture				☐ Bridge ☐ Paved box culvert			
Pasture				Local Non-Point Source Pollution Potential:			
Agricultural				☒ No evidence ☐ Slight			
Residential				☐ Moderate potential ☐ Obvious sources			
Commercial				Describe: _____			
Industrial							
Notes:				Floodplain Access: Rt* ☒ Lt* ☒			
				Bank Erosion: ☐ Non-eroding ☐ Active Erosion ☐ Mass-wasting			

Photos 35, 36, 37, 38

page of

Number: _____

Date: _____

County:

Local

Surveyors:

Surveyors: MM RF

*= Optional

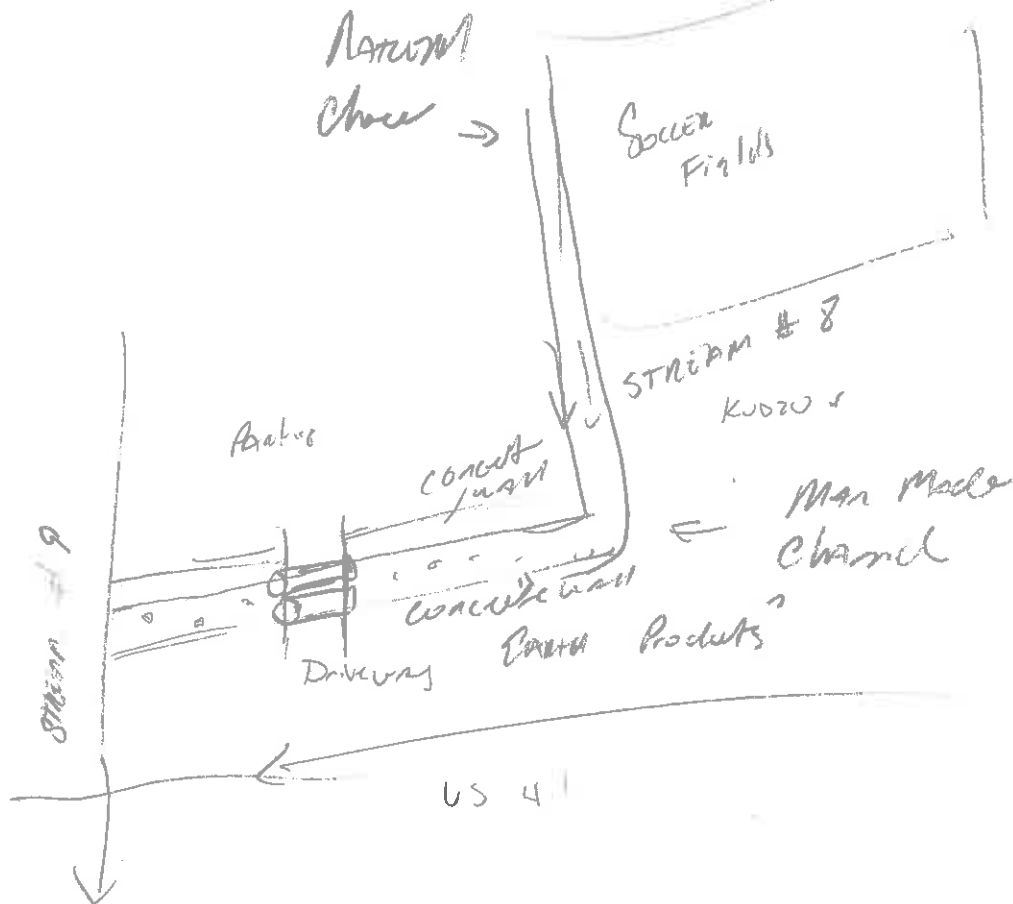
-23-

List of other aquatic species observed, including invasive species, and their abundance:

Crest chub - 7100 Southcuthick - 12 White tubenosed crayfish - 2
 Redbreast - 7100
 White sucker - 9
 AL hogsucker - 22

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected. Indicate and label any unique characteristics or instream structures.



Stream #9

39-66

Site Number: <u>S-9</u> Field Number: <u>S-9</u> Time Beg: _____		Date: <u>10/25/11</u>																																	
Watershed/Drainage: <u>Chattahoochee River, Upper</u> End: _____		State: <u>GA</u>																																	
Waterbody: <u>Sage Creek</u>		Latitude: <u>33.963312</u>																																	
Location: <u>US 41</u>		Long: <u>84.531846</u>																																	
Gage Station: <u>Rottenwood Creek 02335910</u>		Stream Order: _____																																	
Surveyor(s): <u>ALA RN</u>		Stream Type: _____																																	
Determining Distance upstream: <u>700</u> Distance downstream: <u>900</u>		Survey Technique: _____ Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																	
Instream Features: Quantitative Please specify all units of measurement. % Canopy Cover: <u>100% est</u> Wetted Width: <u>10-25</u> Surface Velocity (at thalweg): <u>75 cfs</u> Water Depth (at thalweg): <u>1-3 ft</u> Bank Height (rt/lt): <u>3-10</u> Bank Angle (rt/lt): <u>90/60</u>		Water Quality Water Temp: <u>12.9</u> °C Dissolved Oxygen: <u>7.6</u> mg/L Conductivity: <u>151.9</u> μ S/cm @ 25°C pH: <u>7.88</u> Other: <u>T-5.9</u> 303d Listed: ☒ yes ☐ no Designated Use: _____ Violated Criteria: _____ Heavy Rain in past 7 days: Yes ☐ No ☐ Air Temperature: _____ Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☒ Heavy rain ☐ Clear/sunny ☐ Steady rain ☐ % Cloud cover: _____																																	
Channel Alteration: ☐ No ☒ Yes Describe: <u>Very slight</u> Shoring Structures: ☐ None ☐ Limerock ☐ Gabion ☒ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____ Substrate composition (% est.): Gravel <u>25</u> Silt <u>20</u> Clay _____ Clay Marl _____ Fine sand <u>10</u> Coarse s. <u>20</u> Medium s. <u>10</u> Boulder _____ Bedrock _____ Cobble <u>5</u> <u>Carrollton 10</u>		Channel Stability (Check one box for each column): <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Deposition/Aggradation</th> <th>Incision/Degradation</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>Large, fresh deposits absent High number of deep pools</td> <td>No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools</td> </tr> <tr> <td>Good</td> <td>Large, fresh deposits uncommon Moderate number of deep pools</td> <td>Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools</td> </tr> <tr> <td>Fair</td> <td>Large, fresh deposits common Low-moderate number of deep pools</td> <td>Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools</td> </tr> <tr> <td>Poor</td> <td>Large, fresh deposits very common Few, if any, deep pools</td> <td>Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools</td> </tr> </tbody> </table>			Deposition/Aggradation	Incision/Degradation	Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools	Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools	Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools	Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools																	
	Deposition/Aggradation	Incision/Degradation																																	
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools																																	
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools																																	
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools																																	
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools																																	
Impoundments: ☒ None ☐ yes (Describe): _____ Fish Passage: Blocked? ☐ yes ☒ no Describe: _____ Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																																			
Buffer Features: Quantitative R ⁺ Buffer width (ft): ☐ 10-25 ☒ 25-75 ☐ 75-150 ☐ 150+ L ⁺ Buffer width (ft): ☐ 10-25 ☒ 25-75 ☐ 75-150 ☐ 150+		Landuse Characterization: (100 feet to either side of the stream) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td><u>60</u></td> <td><u>50</u></td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td><u>40</u></td> <td><u>50</u></td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </tbody> </table>			Rt Bk	Lt Bk	%	Natural Forest	<u>60</u>	<u>50</u>	%	Silviculture			%	Pasture			%	Agricultural			%	Residential			%	Commercial	<u>40</u>	<u>50</u>	%	Industrial			%
	Rt Bk	Lt Bk	%																																
Natural Forest	<u>60</u>	<u>50</u>	%																																
Silviculture			%																																
Pasture			%																																
Agricultural			%																																
Residential			%																																
Commercial	<u>40</u>	<u>50</u>	%																																
Industrial			%																																
Notes: <u>US 41 on each bank w/ narrow</u> <u>750' on each bank w/ narrow</u> <u>Fe 1638</u>		Road Type: ☒ Paved ☐ Unpaved Name (if known): <u>US 41</u> Crossing Type: ☐ Pipe culvert ☒ Box culvert ☐ Bridge ☐ Paved box culvert Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe: _____ Floodplain Access: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>R⁺</th> <th>L⁺</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Partial</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Full</td> <td>☒</td> <td>☒</td> </tr> </tbody> </table> Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting			R ⁺	L ⁺	None	☐	☐	Partial	☐	☐	Full	☒	☒																				
	R ⁺	L ⁺																																	
None	☐	☐																																	
Partial	☐	☐																																	
Full	☒	☒																																	

page ____ of ____

5-9

10 / 25 / 14

Cobb

US 41

mm (2)

**= Male, female, undetermined

photos
73
74
77

S-10

Site Number: <u>S-10</u>		Field Number: <u>S-10</u>		Time Beg: _____		Date: <u>10/27/14</u>	
Watershed/Drainage: <u>Chattahoochee River, upper</u>		End: _____		Latitude: <u>33.956701</u>		State: <u>GA</u>	
Waterbody: <u>tributary to Sage Cr</u>		Location: <u>US 41</u>		Stream Order: _____		Long: <u>-84.524319</u>	
Gage Station: <u>Potters Creek 02335910</u>		Surveyor(s): <u>MML & RA</u>		Stream Type: _____			
Determining Distance upstream: _____		Survey Technique: <u>W/A</u>		Tactile Only ☐		Tactile With Snorkel ☐	
PSA Distance downstream: _____				Tactile With SCUBA ☐			
Instream Features Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: <u>15.9 °C</u>		Water Clarity	
% Canopy Cover: <u>0</u> Wetted Width: <u>1-2 ft</u>				Dissolved Oxygen: <u>6.01 mg/L</u>		☒ Clear	
Surface Velocity (at thalweg): <u>< 5 cfs</u>				Conductivity <u>71.2 SC48.9</u>		☐ Slightly turbid	
Water Depth (at thalweg): <u>6 inches to 1 ft</u>				pH <u>7.01</u> Other: <u>T-5.0</u>		☐ Turbid	
Bank Height (r/l/r): <u>6-10 ft</u> Bank Angle (r/l/r): <u>100/100</u>				303d Listed: ☐ yes ☒ no		☐ Opaque	
Instream Features Qualitative				Designated Use:			
Channel Alteration: ☒ No ☐ Yes				Violated Criteria:			
Describe: _____				Heavy Rain in past 7 days: Yes ☐ No ☒			
Shoring Structures: ☐ None ☐ Limerock ☐ Gabion				Air Temperature: <u>75 °F</u> Est. ☒ Act. ☐			
☐ Concrete ☒ Rip-rap ☐ Other: _____ Extent: <u>75 ft</u>				Survey Weather Conditions: Scattered showers ☐			
Substrate composition (% est.): Gravel _____ Silt _____ Clay _____				Heavy rain ☐ Clear/sunny ☒			
Clay Marl _____ Fine sand _____ Coarse s. _____ Medium s. _____				Steady rain ☐ % Cloud cover _____			
Boulder _____ Bedrock _____ Cobble _____ <u>Rip Rap 100</u>							
Channel Stability (Check one box for each column):				Impoundments: ☒ None ☐ yes (Describe): _____			
Deposition/Aggradation		Incision/Degradation		Fish Passage: ☒ Blocked? ☐ yes ☒ no		Fish Presence: ☐ Absent ☒ Rare ☐ Common ☐ Abundant	
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools		Describe: _____			
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools					
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools					
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools		Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive			
Riparian Features Quantitative				Site Road			
Rt* Buffer width(ft): <u>Each 05</u>		Landuse Characterization: (100 feet to either side of the stream)		Road Type: ☐ Paved ☒ Unpaved			
☐ 10-25		Natural Forest		Name (if known): <u>No Xing</u>			
☐ 25-75		Silviculture		Crossing Type: ☒ Pipe culvert ☐ Box culvert			
☐ 78-150		Pasture		☐ Bridge ☐ Paved box culvert			
☐ 150+		Agricultural		Riparian Features Qual: _____		Local Non-Point Source Pollution Potential:	
Lt* Buffer width(ft): <u>Each 100</u>		Residential		☐ No evidence ☐ Slight		☐ Moderate potential ☐ Obvious sources	
☐ 10-25		Commercial		☐ Livestock access		Describe: _____	
☐ 25-75		Industrial					
☐ 78-150							
☐ 150+							
Notes				Floodplain Access:		Bank Erosion:	
				None ☐ Rt* ☐ Lt* ☐		☐ Non-eroding	
				Partial ☐		☐ Active Erosion	
				Full ☐		☐ Mass-wasting	

page ____ of ____

Date: 10/27/14

Locality: US 41

Surveyors: mm 125

*= Optional
**= Male, female, undetermined

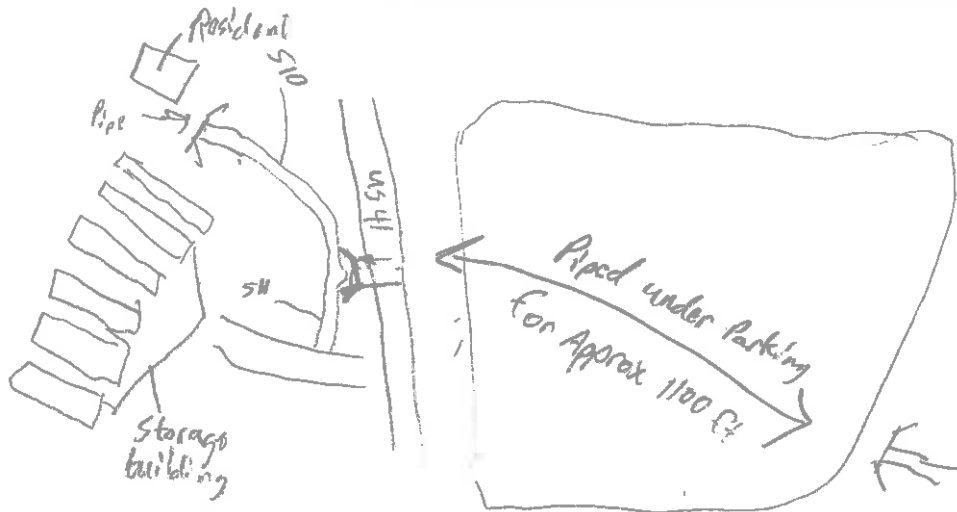
5-10

List of other aquatic species observed, including invasive species, and their abundance:

No suitable habitat due to low flow conditions and most of the stream area was piped underground. No suitable habitat is present for federal and state protected species.

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



photos
72
75
76
77
511

Site Number: <u>511</u>		Field Number: <u>511</u>		Time Beg: _____		Date: <u>10/27/14</u>																																	
Watershed/Drainage: <u>Chattahoochee Rvr, Upper</u>		End: _____		State: <u>GA</u>																																			
Waterbody: <u>trib to Sape cr</u>		Latitude: <u>33.956518</u>		Long: <u>-84.506981</u>																																			
Location: <u>US 41</u>		Stream Order: _____		Stream Type: _____																																			
Gage Station: <u>Rottenwood Creek 02335910</u>		Surveyor(s): <u>MW DW</u>																																					
Determining PSA Distance upstream: <u>100 ft</u> Distance downstream: _____		Survey Technique _____		Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																			
Instream Features Quantitative Please specify all units of measurement % Canopy Cover: <u>0</u> Wetted Width: <u>1-2</u> Surface Velocity (at thalweg): <u>29.4</u> Water Depth (at thalweg): <u>1-6"</u> Bank Height (rt/lt): <u>1-9 ft</u> Bank Angle (rt/lt): <u>110-120</u>				Water Quality Water Temp: <u>35</u> °C Dissolved Oxygen: <u>6.7</u> mg/L Conductivity: <u>33.7</u> µS/cm pH: <u>7.14</u> Other: <u>5-4.1</u> 303d Listed: ☐ yes ☒ no																																			
Channel Alteration: ☒ No ☐ Yes Describe: _____ Shoring Structures: ☐ None ☐ Limerock ☐ Gabion ☐ Concrete ☒ Rip-rap ☐ Other: _____ Extent: _____ Substrate composition (% est.): Gravel <u>5</u> Silt _____ Clay _____ Clay Marl _____ Fine sand <u>5</u> Coarse s. <u>5</u> Medium s. <u>5</u> Boulder _____ Bedrock _____ Cobble <u>80</u> Rip rap				Designated Use: _____ Violated Criteria: _____ Heavy Rain in past 7 days: Yes ☐ No ☒ Air Temperature: _____ Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☐ Heavy rain ☐ Clear/sunny ☒ Steady rain ☐ % Cloud cover _____																																			
Channel Stability (Check one box for each column): <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Deposition/Aggradation</th> <th>Incision/Degradation</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>Large, fresh deposits <u>absent</u> High number of deep pools</td> <td>No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools</td> </tr> <tr> <td>Good</td> <td>Large, fresh deposits <u>uncommon</u> Moderate number of deep pools</td> <td>Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☒ Moderate number of deep pools</td> </tr> <tr> <td>Fair</td> <td>Large, fresh deposits <u>common</u> Low-moderate number of deep pools</td> <td>Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools</td> </tr> <tr> <td>Poor</td> <td>Large, fresh deposits <u>very common</u> Few, if any, deep pools</td> <td>Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools</td> </tr> </tbody> </table>					Deposition/Aggradation	Incision/Degradation	Excellent	Large, fresh deposits <u>absent</u> High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools	Good	Large, fresh deposits <u>uncommon</u> Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☒ Moderate number of deep pools	Fair	Large, fresh deposits <u>common</u> Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools	Poor	Large, fresh deposits <u>very common</u> Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools	Impoundments: ☐ None ☐ yes (Describe): _____ Fish Passage: ☐ Blocked? ☐ yes ☒ no Describe: _____ Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																				
	Deposition/Aggradation	Incision/Degradation																																					
Excellent	Large, fresh deposits <u>absent</u> High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools																																					
Good	Large, fresh deposits <u>uncommon</u> Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☒ Moderate number of deep pools																																					
Fair	Large, fresh deposits <u>common</u> Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools																																					
Poor	Large, fresh deposits <u>very common</u> Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools																																					
Riparian Features Quantitative Rt* Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+ Lt* Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+				Landuse Characterization: (100 feet to either side of the stream) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Residential <u>city</u></td> <td><u>20</u></td> <td><u>20</u></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td><u>80</u></td> <td></td> <td>%</td> </tr> <tr> <td>Industrial <u>Road</u></td> <td></td> <td><u>80</u></td> <td>%</td> </tr> </tbody> </table>					Rt Bk	Lt Bk	%	Natural Forest				Silviculture				Pasture				Agricultural				Residential <u>city</u>	<u>20</u>	<u>20</u>	%	Commercial	<u>80</u>		%	Industrial <u>Road</u>		<u>80</u>	%
	Rt Bk	Lt Bk	%																																				
Natural Forest																																							
Silviculture																																							
Pasture																																							
Agricultural																																							
Residential <u>city</u>	<u>20</u>	<u>20</u>	%																																				
Commercial	<u>80</u>		%																																				
Industrial <u>Road</u>		<u>80</u>	%																																				
Notes 				Site Road Crossing Road Type: ☐ Paved ☐ Unpaved Name (if known): _____ Crossing Type: ☐ Pipe culvert ☐ Box culvert ☐ Bridge ☐ Paved box culvert Riparian Features Qual: _____ Local Non-Point Source Pollution Potential: ☐ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe: _____ Floodplain Access: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt*</th> <th>Lt*</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Partial</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Full</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table> Bank Erosion: ☐ Non-eroding ☐ Active Erosion ☐ Mass-wasting					Rt*	Lt*	None	☐	☐	Partial	☐	☐	Full	☐	☐																				
	Rt*	Lt*																																					
None	☐	☐																																					
Partial	☐	☐																																					
Full	☐	☐																																					

page_____ of _____

Surveyors: mm RN

**= Male, female, undetermined

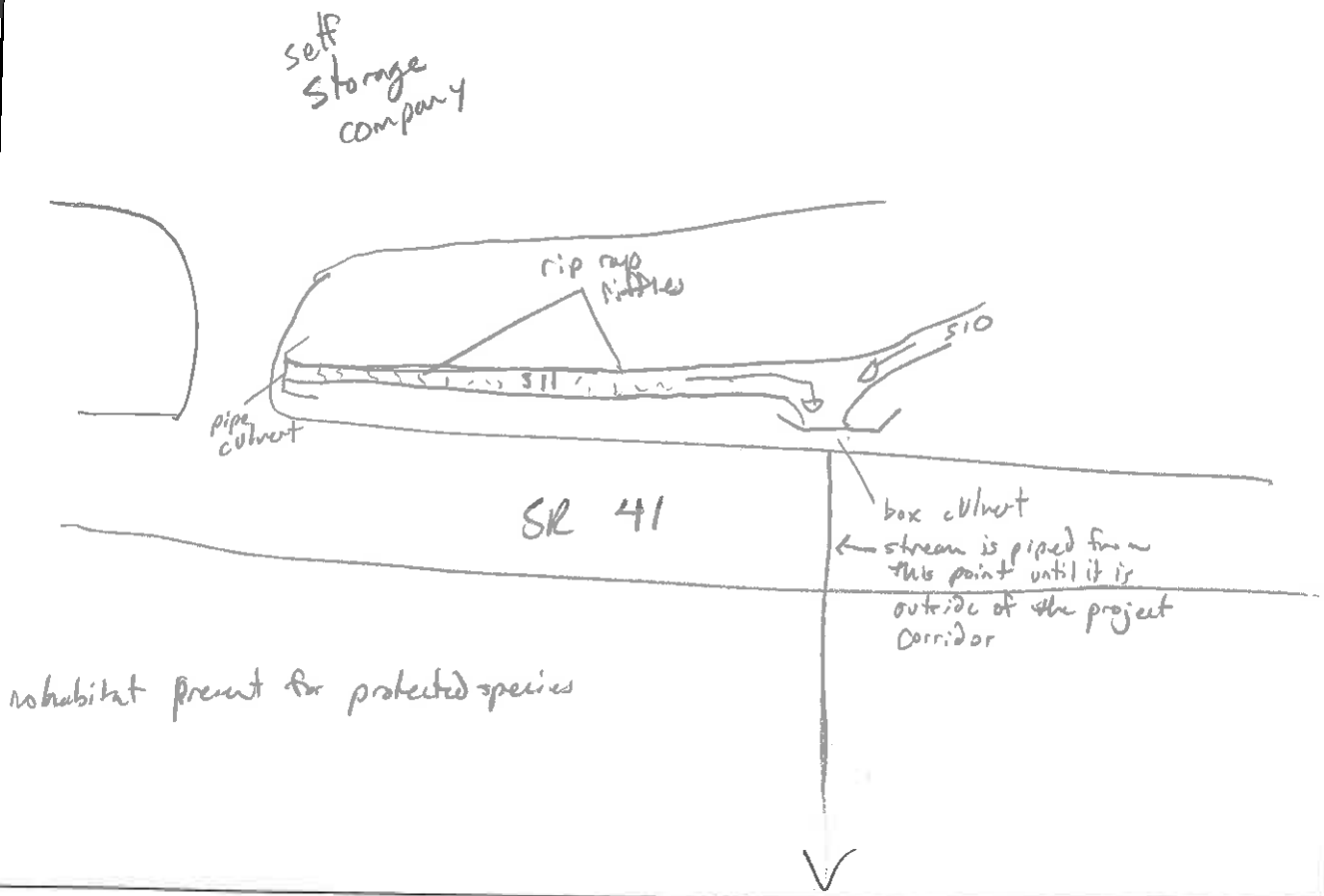
S 11

List of other aquatic species observed, including invasive species, and their abundance:

Stream flows for approx 100ft and flows into a culvert under US41.
No suitable habitat was observed due to the majority of the substrate consists of rip rap. Water depth was approx 1-6 inches and will potentially go dry during the winter months.

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



78-145
+
147

512

Site Number: <u>512</u>		Field Number: <u>312</u>		Time Beg: _____		Date: <u>10/28/14</u>	
Watershed/Drainage: <u>Chattahoochee R. upper</u>		End: _____		State: <u>GA</u>		Long: <u>-84.506981</u>	
Waterbody: <u>512 Rottenwood Cr.</u>		Latitude: <u>33.925570</u>		Stream Order: _____		Stream Type: <u>Perennial</u>	
Location: <u>US 41</u>		Gage Station: <u>Rottenwood Cr. 02335910</u>		Surveyor(s): _____			
Determining RSA		Distance upstream: <u>200</u>		Survey Technique		Tactile Only ☐	
		Distance downstream: <u>1000</u>				Tactile With Snorkel ☐	
						Tactile With SCUBA ☐	
Instream Features Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: <u>16.5°C</u>			
% Canopy Cover: <u>0-90</u> Wetted Width: <u>10-25</u>				Dissolved Oxygen: <u>7.83 mg/L</u>			
Surface Velocity (at thalweg): <u>75 cm</u>				Conductivity <u>76.6</u> <u>spc</u> <u>91.4</u>			
Water Depth (at thalweg): <u>11-5'</u>				pH <u>7.60</u> Other: <u>7.2-7.6</u>			
Bank Height (rt/lr): _____ Bank Angle (rt/lr): <u>90-120</u>				303d Listed: ☒ Yes ☐ No			
Channel Alteration: ☐ No ☐ Yes				Designated Use:			
Describe: _____				Violated Criteria:			
Shoring Structures: ☐ None ☐ Limerock ☐ Gabion				Heavy Rain in past 7 days: Yes ☐ No ☐			
☐ Concrete ☐ Rip-rap ☒ Other: <u>drilling</u> Extent: <u>~150' down</u>				Air Temperature: <u>70</u> Est. ☐ Act. ☐			
Substrate composition (% est.): Gravel <u>2</u> Silt <u>20</u> Clay _____				Survey Weather Conditions: Scattered showers ☐			
Clay Marl _____ Fine sand <u>20</u> Coarse s. <u>20</u> Medium s. <u>20</u>				Heavy rain ☐ Clear/sunny ☐			
Boulder _____ Bedrock _____ Cobble <u>16</u>				Steady rain ☐ % Cloud cover <u>10</u>			
Channel Stability (Check one box for each column):							
Deposition/Aggradation				Incision/Degradation			
Excellent	Large, fresh deposits absent High number of deep pools		No mass-wasting or significant erosion of banks Channel slightly entrenched ☒ High number of deep pools		Impoundments: ☒ None ☐ yes (Describe):		
Good	Large, fresh deposits uncommon Moderate number of deep pools		Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools		Fish Passage: Blocked? ☒ yes ☐ no		
Fair	Large, fresh deposits common Low-moderate number of deep pools		Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools		Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant		
Poor	Large, fresh deposits very common Few, if any, deep pools		Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☒ Few, if any, deep pools		Describe: <u>Culvert has created a plunge pool</u>		
Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive							
Riparian Features Quantitative				Site Road Crossing			
Rt* Buffer width(ft):		Landuse Characterization: (100 feet to either side of the stream)		Road Type: ☐ Paved ☐ Unpaved			
☐ 10-25		Facing <u>NS</u>		Name (if known): <u>SR 41</u>			
☒ 25-75		Natural Forest		Crossing Type: ☐ Pipe culvert ☒ Box culvert			
☐ 78-150		Silviculture		☐ Bridge ☐ Paved box culvert			
☐ 150+		Pasture		Riparian Features Qual:		Local Non-Point Source Pollution Potential:	
Lt* Buffer width(ft):		Agricultural		☒ No evidence		☐ Slight	
☐ 10-25		Residential		☐ Moderate potential		☐ Obvious sources	
☒ 25-75		Commercial		☐ Livestock access		Describe: _____	
☐ 78-150		Industrial					
☐ 150+							
Notes				Floodplain Access:			
				None ☐ Rt* ☐ Lt* ☐			
				Partial ☒ ☐ ☒			
				Full ☐ ☐ ☐			
				Bank Erosion:			
				☐ Non-eroding			
				☒ Active Erosion			
				☐ Mass-wasting			

page ____ of ____

Number: 5-12

Date: 10/28/14

County: Cobb

Locality: US 41

Surveyors: MM & RN

* = Optional
** = Male, female, undetermined

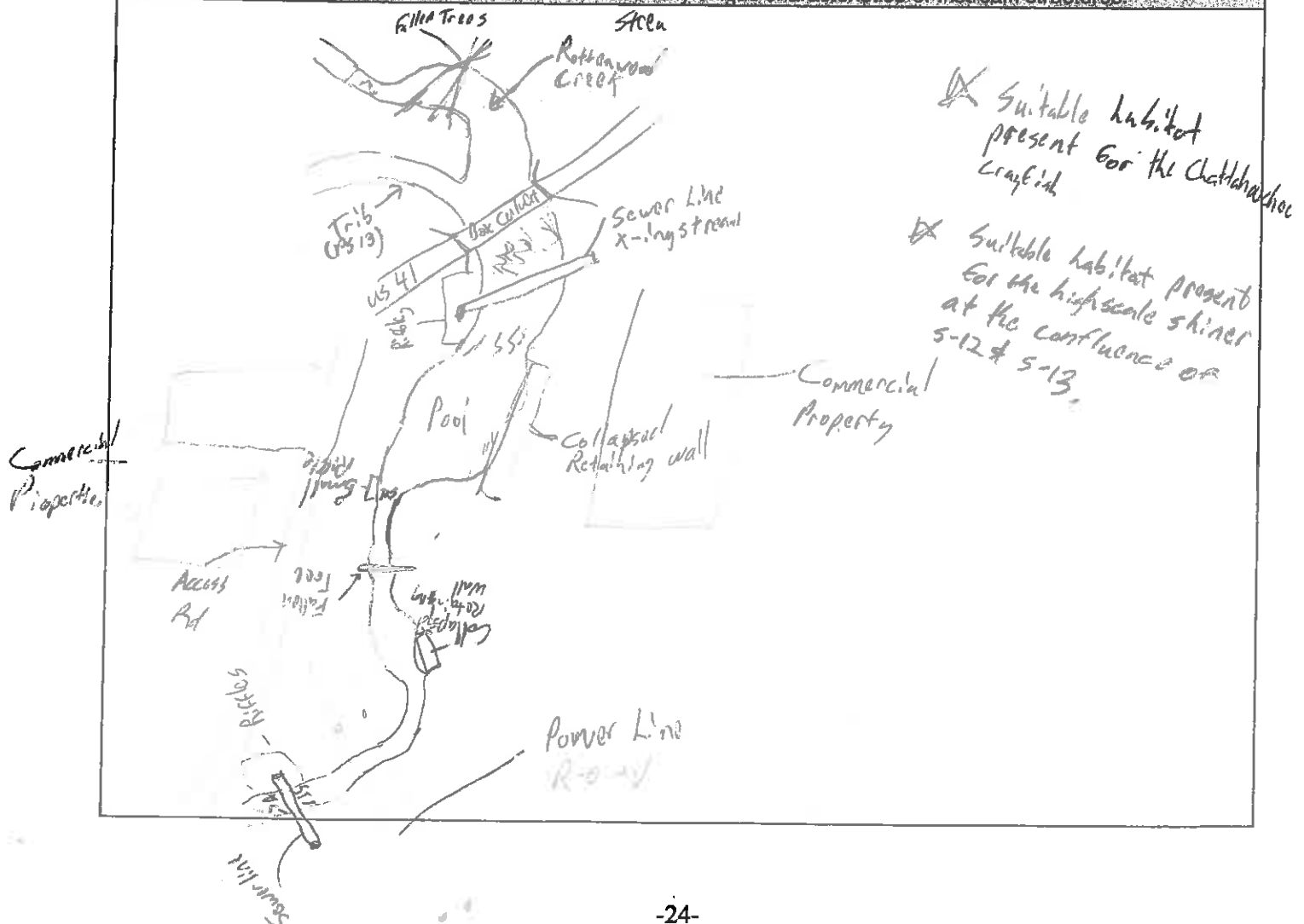
5-12

List of other aquatic species observed, including invasive species, and their abundance:

Creek chub - 7100	bluegill stone roller - 7100	Brown bullhead - 7
Redbreast - 7100	AL hogsucker - 29	Small bullhead 2
Green Sunfish - 48	Bluegill - 7100	white tubed crayfish - 17
Yellow bullhead - 7	blackbanded darter - 41	
	whitesucker - 29	

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



5-13

Site Number: 13		Field Number:		Time Beg:		Date: 10/25/14	
Watershed/Drainage: Chattahoochee River, Upper		End:		Latitude: 33.925178		State: GA	
Waterbody: trib to Rottenwood Cr		Stream Order:		Longitude: -84.507220		Stream Type:	
Location: US 41		Surveyor(s): MM & RN					
Gage Station: Rottenwood Cr 0233 5910							
Determining Distance upstream: 1000		Survey Technique:		Tactile Only ☐		Tactile With Snorkel ☐	
Distance downstream:				Tactile With SCUBA ☐			
Instream Features Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: 12.6 °C			
% Canopy Cover: 60-70 Wetted Width: 5.12				Dissolved Oxygen: 7.13 mg/L			
Surface Velocity (at thalweg): 75 cfs				Conductivity 122.1 μ S 135.7			
Water Depth (at thalweg): 6' - 25'				pH 7.4 Other: 5.5			
Bank Height (rt/lr): 3-6 Bank Angle (rt/lr): 90/90				303d Listed: ☐ yes ☐ no			
Channel Alteration: ☒ No ☐ Yes				Designated Use:			
Describe:				Violated Criteria:			
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion				Heavy Rain in past 7 days: Yes ☐ No ☒			
☐ Concrete ☐ Rip-rap ☐ Other: Extent:				Air Temperature: 73°F Est. ☐ Act. ☒			
Substrate composition (% est.): Gravel 10 Silt 10 Clay 10				Survey Weather Conditions: Scattered showers ☐			
Clay Marl 10 Fine sand 20 Coarse s. 20 Medium s. 15				Heavy rain ☐ Clear/sunny ☐			
Boulder 10 Bedrock 5 Cobble 10				Steady rain ☐ % Cloud cover 10			
Channel Stability (Check one box for each column):							
Deposition/Aggradation		Incision/Degradation		Impoundments:			
Excellent		Large, fresh deposits absent		☒ None ☐ yes (Describe):			
		High number of deep pools					
Good		Large, fresh deposits uncommon		Fish Passage: Blocked? ☐ yes ☒ no			
		Moderate number of deep pools		Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant			
Fair		Large, fresh deposits common		Describe:			
		Low-moderate number of deep pools					
Poor		Large, fresh deposits very common		Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive			
		Few, if any, deep pools					
Riparian Features Quantitative				Site Specific			
Rt* Buffer width(ft):		Landuse Characterization:		Road Type: ☐ Paved ☐ Unpaved			
☐ 10-25		(100 feet to either side of the stream)		Name (if known): No X-119			
☒ 25-75		Natural Forest		Crossing Type: ☐ Pipe culvert ☐ Box culvert			
☐ 75-150		Silviculture		☐ Bridge ☐ Paved box culvert			
☐ 150+		Pasture		Local Non-Point Source Pollution Potential:			
Lt* Buffer width(ft):		Agricultural		☒ No evidence ☐ Slight			
☐ 10-25		Residential		☐ Moderate potential ☐ Obvious sources			
☒ 25-75		Commercial		Describe:			
☐ 75-150		Industrial					
☐ 150+		Notes		Floodplain Access:			
				None ☐ Rt* ☐ Lt* ☐			
				Partial ☒ Full ☐			
				Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting			

page ____ of ____

Field
Number: S-13

Date: 10/28/14

Locality: US 41

Surveyors: MM & RN

* = Optional
** = Male, female, undetermined

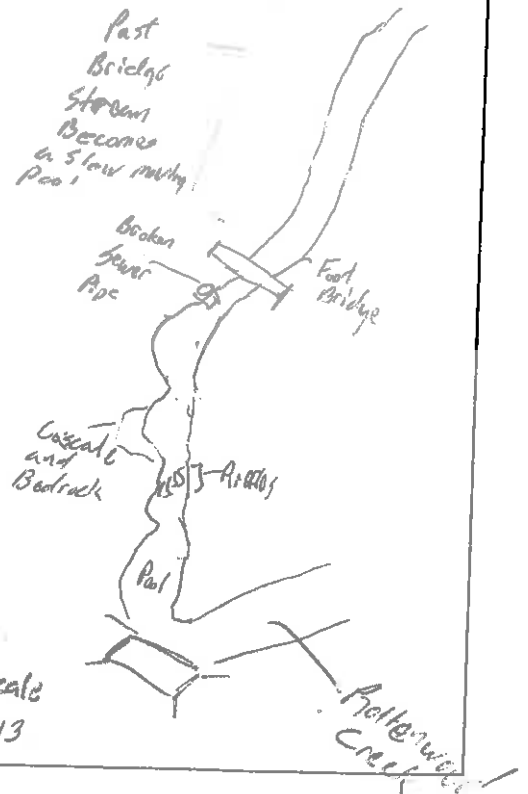
List of other aquatic species observed, including invasive species, and their abundance:

Redbreast - 7100	small bullhead - 3	White tubed crayfish - 5
Bluegill - 7100	blackbanded darter - 29	
Crook chub - 7100	White sucker - 11	

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.

* Suitable
Habitat is present
for the Chattahoochee Crayfish
near the confluence of
* Suitable habitat present for the highscale
shiner at the confluence of 5-12 + 5-13



Site Number: <u>5-14</u>		Field Number: <u>14</u>		Time Beg: _____ End: _____		Date: <u>10/29/14</u>	
Watershed/Drainage: <u>Chattahoochee River, Upper</u>				Latitude: <u>33.908796</u>		State: <u>GA</u>	
Waterbody: <u>Poorhouse Creek</u>				Longitude: <u>-84.492840</u>		Stream Type: <u>rer</u>	
Location: <u>4541</u>				Stream Order: _____			
Gage Station: <u>Bottomwood Creek 02335910</u>				Surveyor(s): <u>MM/RN</u>			
Distance upstream: <u>300</u>		Distance downstream: <u>700</u>		Tactile Only ☐		Tactile With Snorkel ☐	
				Tactile With SCUBA ☐			
Channel Features Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: <u>16.8</u> °C			
% Canopy Cover: <u>0-60</u>		Wetted Width: <u>6-15 ft</u>		Dissolved Oxygen: <u>8.04</u> mg/L		Water Clarity	
Surface Velocity (at thalweg): <u>75 cfs</u>				Conductivity <u>73.3</u> SC-54.0		☐ Clear	
Water Depth (at thalweg): <u>1.46 ft</u>				pH <u>7.65</u> Other: <u>T-6.4</u>		☒ Slightly turbid	
Bank Height (rt/lt): <u>1-86 ft</u>		Bank Angle (rt/lt): <u>90/60</u>		303d Listed: ☐ yes ☐ no		☐ Turbid	
						☐ Opaque	
Channel Alteration: ☒ No ☐ Yes				Designated Use:			
Describe: _____				Violated Criteria:			
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion				Heavy Rain in past 7 days: Yes ☐ No ☒			
☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____				Air Temperature: <u>70 F</u> Est. ☐ Act. ☐			
Substrate composition (% est.): Gravel <u>15</u> Silt <u>15</u> Clay _____				Survey Weather Conditions: Scattered showers ☒			
Clay Marl _____ Fine sand <u>20</u> Coarse s. <u>20</u> Medium s. <u>15</u>				Heavy rain ☐ Clear/sunny ☐			
Boulder _____ Bedrock _____ Cobble <u>15</u>				Steady rain ☐ % Cloud cover _____			
Channel Stability (Check one box for each column):							
Deposition/Aggradation		Incision/Degradation		Impoundments: ☒ None ☐ yes (Describe): _____			
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools		Fish Passage: ☒ Blocked? ☒ yes ☐ no			
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools		Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant			
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools		Describe: <u>Culvert creates barrier</u>			
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools		Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive			
Land Use Characterization:				Road Type: ☒ Paved ☐ Unpaved			
(100 feet to either side of the stream)				Name (if known): <u>4541</u>			
Rt Bk Lt Bk				Crossing Type: ☐ Pipe culvert ☒ Box culvert ☐ Paved box culvert			
Natural Forest		<u>20</u> <u>20</u> %					
Silviculture							
Pasture							
Agricultural							
Residential							
Commercial		<u>20</u> <u>20</u> %					
Industrial							
Notes:				Local Non-Point Source Pollution Potential:			
				☒ No evidence ☐ Slight			
				☐ Moderate potential ☐ Obvious sources			
				☐ Livestock access			
				Describe: _____			
				Floodplain Access:			
				None ☐ Rt ☐ Lt ☐			
				Partial ☐			
				Full ☐			
				Bank Erosion:			
				☐ Non-eroding			
				☐ Active Erosion			
				☐ Mass-wasting			

page ____ of ____

Number: 14

Date: 10/29/14

County: Colo

Locality: 45 41

Surveyors: *MM & RN*

*= Optional

**= Male, female, undetermined

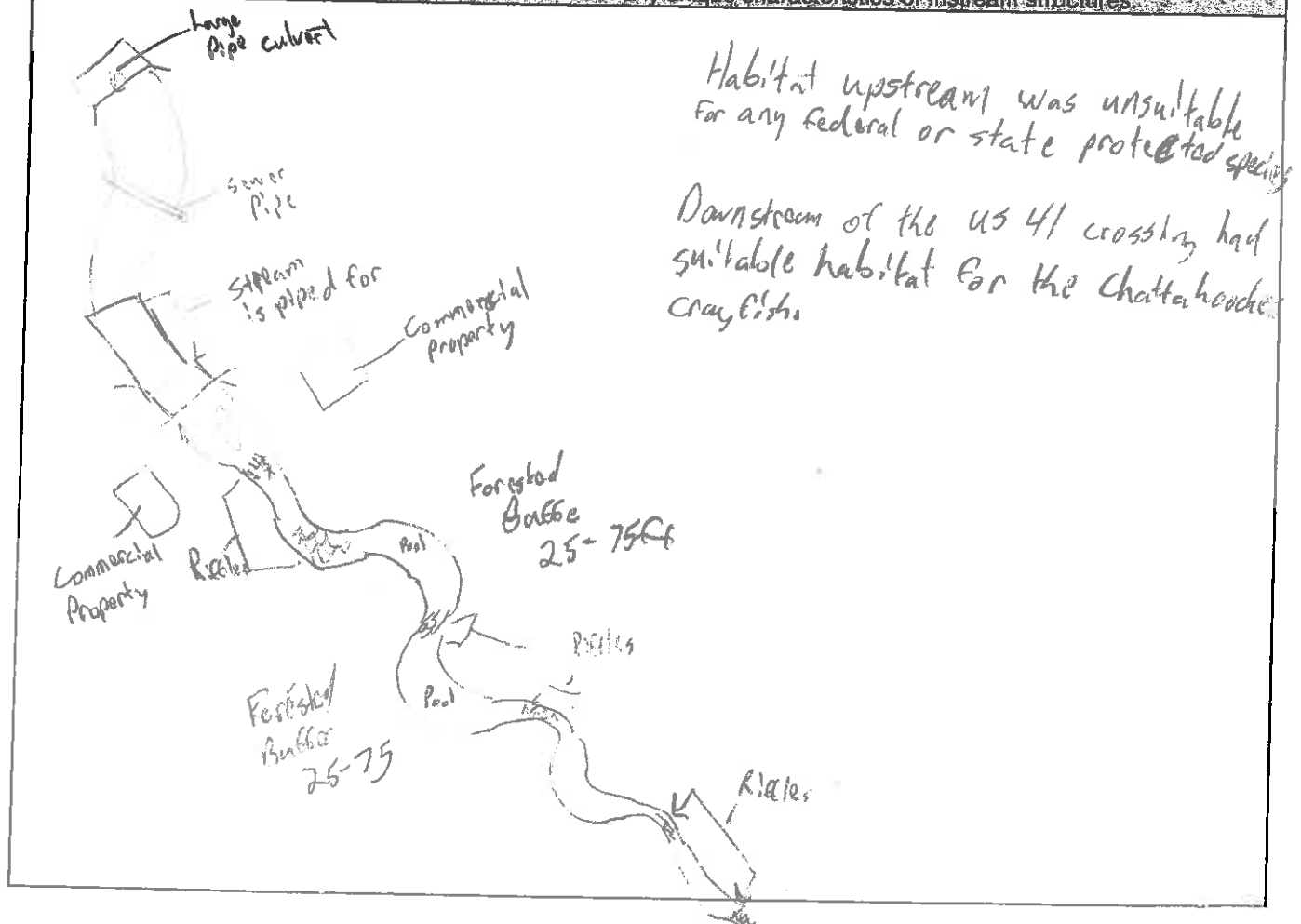
5-14

List of other aquatic species observed, including invasive species, and their abundance:

Redbreast - 7100	Bluegill - 82	white tubenosed crayfish - 15
Creek chub - 7100	Ark hogsucker - 53	
Green sunfish - 17	black banded darter - 22	
Bluegill stoneroller - 7100	white sucker - 8	

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



5-15

227
218-234

Site Number: <u>5-15</u>		Field Number:		Time Beg:		Date: <u>10/3/14</u>																																	
Watershed/Drainage: <u>Chattahoochee River, Upper</u>		End:		Latitude: <u>33.898224</u>		State: <u>GA</u>																																	
Waterbody:		Stream Order:		Longitude: <u>-84.483428</u>		Stream Type:																																	
Location: <u>VS 41</u>		Surveyor(s): <u>mm rw</u>		Gage Station: <u>Rothwood Cr 02335910</u>																																			
Distance upstream: <u>700 ft</u>		Distance downstream:		Tactile Only ☐		Tactile With Snorkel ☐																																	
Tactile With SCUBA ☐																																							
Instream Features: Quantitative				Water Quality																																			
Please specify all units of measurement				Water Temp: <u>16.6 °C</u>																																			
% Canopy Cover: <u>0-40%</u> Wetted Width: <u>2-8'</u>				Dissolved Oxygen: <u>7.57 mg/L</u>																																			
Surface Velocity (at thalweg): <u>75 cfs</u>				Conductivity <u>54.0</u> <u>sc 64.3</u>																																			
Water Depth (at thalweg): <u>6"-1'</u>				pH <u>7.39</u> Other: <u>T- 3.4</u>																																			
Bank Height (rt/lt): <u>3'-9'</u> Bank Angle (rt/lt): <u>90-120</u>				303d Listed: ☐ yes ☒ no																																			
Instream Features: Qualitative				Designated Use:																																			
Channel Alteration: ☒ No ☐ Yes				Violated Criteria:																																			
Describe:				Heavy Rain in past 7 days: Yes ☐ No ☒																																			
Shoring Structures: ☐ None ☐ Limerock ☐ Gabion				Air Temperature: Est. ☐ Act. ☐																																			
☐ Concrete ☐ Rip-rap ☐ Other: Extent:				Survey Weather Conditions: Scattered showers ☐																																			
Substrate composition (% est.): Gravel <u>25</u> Silt <u>25</u> Clay <u>15</u>				Heavy rain ☐ Clear/sunny ☐																																			
Clay Marl <u>15</u> Fine sand <u>15</u> Coarse s. <u>10</u> Medium s. <u>15</u>				Steady rain ☐ % Cloud cover <u>40</u>																																			
Boulder <u>10</u> Bedrock <u>10</u> Cobble <u>10</u>																																							
Channel Stability (Check one box for each column):																																							
Deposition/Aggradation				Incision/Degradation																																			
Excellent	Large, fresh deposits absent		No mass-wasting or significant erosion of banks		Impoundments: ☐ None ☐ yes (Describe):																																		
	High number of deep pools		Channel slightly entrenched		Fish Passage: Blocked? ☐ yes ☒ no																																		
Good	Large, fresh deposits uncommon		Some bank erosion apparent, no mass wasting		Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant																																		
	Moderate number of deep pools		Channel slightly-moderately entrenched		Describe: <u>large drop off at CDWRT</u>																																		
Fair	Large, fresh deposits common		Active bank erosion, potential mass-wasting		☒ Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																																		
	Low-moderate number of deep pools		Channel moderately-highly entrenched																																				
Poor	Large, fresh deposits very common		Active bank erosion, frequent mass-wasting																																				
	Few, if any, deep pools		Channel moderately-highly entrenched																																				
	☐ Few, if any, deep pools		☐ Few, if any, deep pools																																				
Land Use Characterization:				Road Type: ☒ Paved ☐ Unpaved																																			
(100 feet to either side of the stream)				Name (if known): <u>Entrance to Lakeland Park</u>																																			
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> <tr> <td>Native Forest</td> <td><u>100</u></td> <td></td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td></td> <td><u>100</u></td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </table>					Rt Bk	Lt Bk	%	Native Forest	<u>100</u>		%	Silviculture			%	Pasture			%	Agricultural			%	Residential			%	Commercial		<u>100</u>	%	Industrial			%	Crossing Type: ☒ Pipe culvert ☐ Box culvert ☐ Bridge ☐ Paved box culvert			
	Rt Bk	Lt Bk	%																																				
Native Forest	<u>100</u>		%																																				
Silviculture			%																																				
Pasture			%																																				
Agricultural			%																																				
Residential			%																																				
Commercial		<u>100</u>	%																																				
Industrial			%																																				
RT Buffer width(ft): ☐ 10-25 ☐ 25-75 ☐ 75-150 ☐ 150+				Local Non-Point Source Pollution Potential: ☐ No evidence ☒ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access																																			
LT Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 75-150 ☐ 150+				Describe: Floodplain Access: <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th></th> <th>RT</th> <th>LT</th> </tr> <tr> <td>None</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Partial</td> <td>☒</td> <td>☒</td> </tr> <tr> <td>Full</td> <td>☐</td> <td>☐</td> </tr> </table>					RT	LT	None	☐	☐	Partial	☒	☒	Full	☐	☐																				
	RT	LT																																					
None	☐	☐																																					
Partial	☒	☒																																					
Full	☐	☐																																					
Notes				Bank Erosion:																																			
				☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting																																			

page of

Number: 15

Date: 10/31/14

County: 46 Cañon

Locality: MS 41

Surveyors: *MMI & RN*

***= Optional**

**= Male, female, undetermined

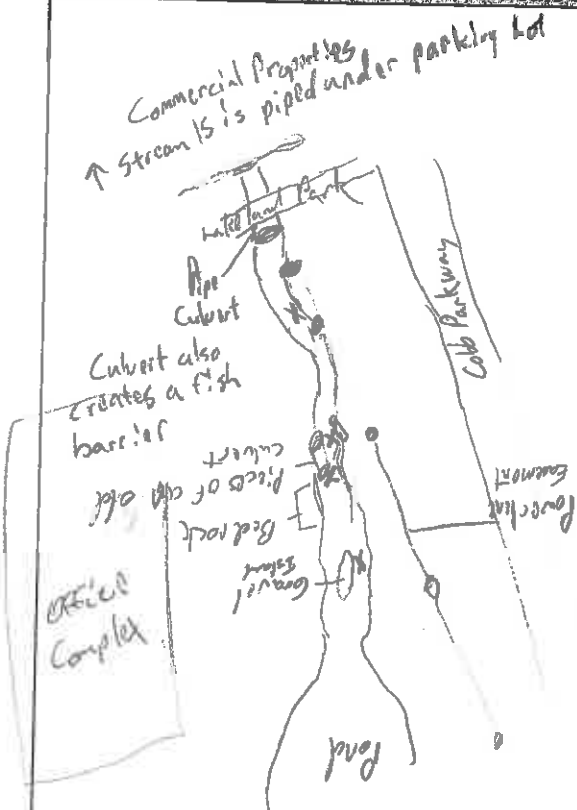
5-15

List of other aquatic species observed, including invasive species, and their abundance:

Chattahoochee crayfish - 4
Variable crayfish - 3

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



No suitable habitat for
state protected fish species or
federal and state protected mussels.

X Suitable habitat is present for
Chattahoochee crayfish

X = Chattahoochee Crayfish
Collection locations

S-16

photos
180, 183 - 217

Site Number: 16		Field Number: S-16		Time Beg: _____		Date: 10/30/14																																	
Watershed/Drainage: Chattahoochee River, Upper		End: _____		State: _____		Long: -84.474397																																	
Waterbody: Poplar creek		Latitude: 33.894284		Stream Order: _____		Stream Type: Perennial																																	
Location: US 41		Gage Station: Rottenwood Cr 02335910		Surveyor(s): m m, m m																																			
Determining Distance upstream: 700 Distance downstream: 900		Survey Tactile Only ☒ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																					
Instream Features Quantitative Please specify all units of measurement % Canopy Cover: 60-80% Wetted Width: 10-30ft Surface Velocity (at thalweg): 75 cfs Water Depth (at thalweg): 6'-3' Bank Height (rt/lt): 2-6 Bank Angle(rt/lt): 70-110				Water Quality Water Temp: 6.9 °C Dissolved Oxygen: 7.8 mg/L Conductivity: 101.9 µS/cm pH: 7.66 Other: T-4.7 303d Listed: ☐ yes ☒ no																																			
Channel Alteration: ☒ No ☐ Yes Describe: _____ Shoring Structures: ☒ None ☐ Limerock ☐ Gabion ☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____ Substrate composition (% est.): Gravel 25 Silt _____ Clay _____ Clay Marl _____ Fine sand 15 Coarse s. 15 Medium s. 10 Boulder _____ Bedrock 10 Cobble 25				Designated Use: Violated Criteria: _____ Heavy Rain in past 7 days: Yes ☐ No ☐ Air Temperature: _____ Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☐ Heavy rain ☐ Clear/sunny ☐ Steady rain ☐ % Cloud cover 80-90%																																			
Channel Stability (Check one box for each column): <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Deposition/Aggradation</th> <th>Incision/Degradation</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>Large, fresh deposits absent High number of deep pools</td> <td>No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools</td> </tr> <tr> <td>Good</td> <td>Large, fresh deposits uncommon Moderate number of deep pools</td> <td>Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☒ Moderate number of deep pools</td> </tr> <tr> <td>Fair</td> <td>Large, fresh deposits common Low-moderate number of deep pools</td> <td>Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools</td> </tr> <tr> <td>Poor</td> <td>Large, fresh deposits very common Few, if any, deep pools</td> <td>Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools</td> </tr> </tbody> </table>					Deposition/Aggradation	Incision/Degradation	Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools	Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☒ Moderate number of deep pools	Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools	Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools	Impoundments: ☐ None ☐ yes (Describe): _____ Fish Passage: Blocked? ☐ yes ☒ no Describe: _____ Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																				
	Deposition/Aggradation	Incision/Degradation																																					
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools																																					
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☒ Moderate number of deep pools																																					
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools																																					
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools																																					
Riparian Features Quantitative Rt* Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+ Lt* Buffer width(ft): ☒ 10-25 ☐ 25-75 ☐ 78-150 ☐ 150+				Landuse Characterization: (100 feet to either side of the stream) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td>55</td> <td>55</td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td>25</td> <td>25</td> <td>%</td> </tr> <tr> <td>Commercial</td> <td>20</td> <td>20</td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </tbody> </table>					Rt Bk	Lt Bk	%	Natural Forest	55	55	%	Silviculture			%	Pasture			%	Agricultural			%	Residential	25	25	%	Commercial	20	20	%	Industrial			%
	Rt Bk	Lt Bk	%																																				
Natural Forest	55	55	%																																				
Silviculture			%																																				
Pasture			%																																				
Agricultural			%																																				
Residential	25	25	%																																				
Commercial	20	20	%																																				
Industrial			%																																				
Road Type: ☒ Paved ☐ Unpaved Name (if known): SR 41 Crossing Type: ☐ Pipe culvert ☒ Box culvert ☐ Bridge ☐ Paved box culvert				Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe: _____																																			
Notes 				Floodplain Access: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt*</th> <th>Lt*</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Partial</td> <td>☒</td> <td>☒</td> </tr> <tr> <td>Full</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table> Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting					Rt*	Lt*	None	☐	☐	Partial	☒	☒	Full	☐	☐																				
	Rt*	Lt*																																					
None	☐	☐																																					
Partial	☒	☒																																					
Full	☐	☐																																					

page ____ of ____

Number: 5-16

Date: 10/30/14

County: Cash

Locality: us 4/

Surveyors: *MM & RN*

*= Optional
**= Male, female, undetermined

5-16

List of other aquatic species observed, including invasive species, and their abundance:

Creek chub - 7100

Yellow bullhead - 28

Green sunfish - 53

redbreast sf - 7100

Blackbanded darter - 47

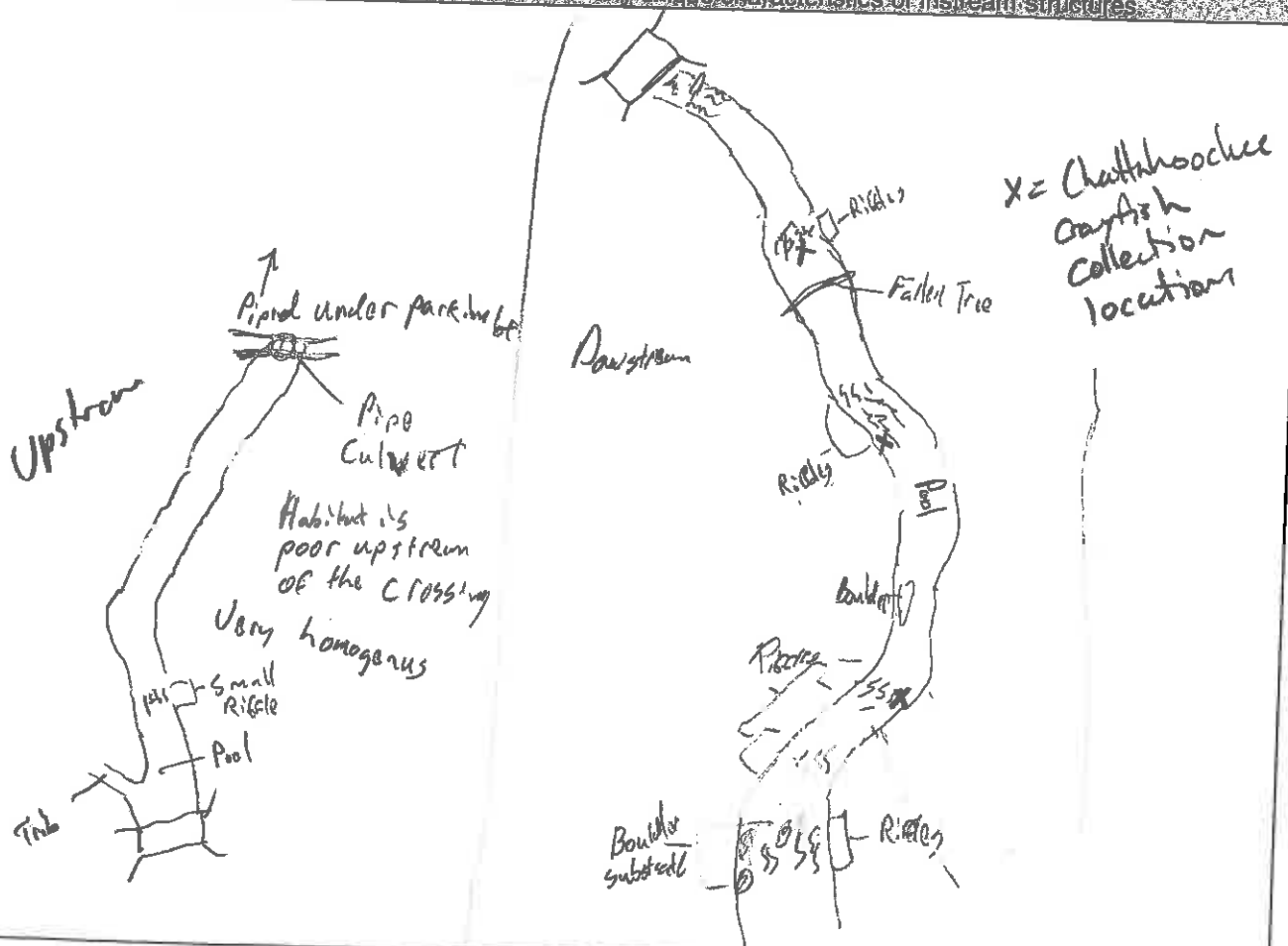
Bluefin shineroller - 7100

Chattahoochee crayfish - 3

White tubenosed crayfish - 25

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected. Indicate and label any unique characteristics or instream structures.



517

photos 181 + 182

Site Number: <u>5-17</u>		Field Number: <u>5-17</u>		Time Beg: _____		Date: <u>10/30/14</u>																																	
Watershed/Drainage: <u>Chattahoochee River upper</u>		End: _____		Latitude: <u>33.893874</u>		State: <u>GA</u>																																	
Waterbody: <u>Trk to 5-16</u>		Stream Order: _____		Longitude: <u>-84.479419</u>		Long: <u>-84.479419</u>																																	
Location: <u>US41</u>		Surveyor(s): <u>MMW</u>		Stream Type: <u>Perennial</u>																																			
Gage Station: <u>Rothwood Cr 02335910</u>																																							
Determining Distance upstream: _____ Distance downstream: <u>500 ft</u>		Survey Technique: _____		Tactile Only ☒		Tactile With Snorkel ☐ Tactile With SCUBA ☐																																	
Instream Features: Quantitative Please specify all units of measurement % Canopy Cover: <u>20-80%</u> Wetted Width: <u>3-10</u> Surface Velocity (at thalweg): <u>75 LPS</u> Water Depth (at thalweg): <u>3-10 inches</u> Bank Height (rt/lt*): <u>4 ft - 6 ft</u> Bank Angle (rt/lt*): <u>90/90</u>				Water Quality Water Temp: <u>16.5 °C</u> Dissolved Oxygen: <u>3.09 mg/L</u> Conductivity: <u>101.7 µS/cm</u> <u>119.3</u> pH: <u>7.76</u> Other: <u>5.6</u> 303d Listed: ☐ yes ☒ no																																			
Channel Alteration: ☒ No ☐ Yes Describe: _____ Shoring Structures: ☒ None ☐ Limerock ☐ Gabion ☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____ Substrate composition (% est.): Gravel <u>20</u> Silt <u>20</u> Clay _____ Clay Marl _____ Fine sand <u>15</u> Coarse s. <u>20</u> Medium s. <u>15</u> Boulder _____ Bedrock _____ Cobble <u>10</u>				Designated Use: _____ Violated Criteria: _____ Heavy Rain in past 7 days: Yes ☐ No ☒ Air Temperature: _____ Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☐ Heavy rain ☐ Clear/sunny ☐ Steady rain ☐ % Cloud cover: <u>80-90%</u>																																			
Channel Stability (Check one box for each column): <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Deposition/Aggradation</th> <th>Incision/Degradation</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td>Large, fresh deposits absent High number of deep pools</td> <td>No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools</td> </tr> <tr> <td>Good</td> <td>Large, fresh deposits uncommon Moderate number of deep pools</td> <td>Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools</td> </tr> <tr> <td>Fair</td> <td>Large, fresh deposits common Low-moderate number of deep pools</td> <td>Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools</td> </tr> <tr> <td>Poor</td> <td>Large, fresh deposits very common Few, if any, deep pools</td> <td>Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools</td> </tr> </tbody> </table>					Deposition/Aggradation	Incision/Degradation	Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools	Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools	Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools	Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools	Impoundments: ☒ None ☐ yes (Describe): _____ Fish Passage: Blocked? ☒ yes ☐ no Describe: <u>Phage pool at culvert near</u> Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																				
	Deposition/Aggradation	Incision/Degradation																																					
Excellent	Large, fresh deposits absent High number of deep pools	No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools																																					
Good	Large, fresh deposits uncommon Moderate number of deep pools	Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☐ Moderate number of deep pools																																					
Fair	Large, fresh deposits common Low-moderate number of deep pools	Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☒ Low-moderate number of deep pools																																					
Poor	Large, fresh deposits very common Few, if any, deep pools	Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools																																					
Buffer Characterization: (100 feet to either side of the stream) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td><u>100</u></td> <td><u>100</u></td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </tbody> </table>					Rt Bk	Lt Bk	%	Natural Forest	<u>100</u>	<u>100</u>	%	Silviculture			%	Pasture			%	Agricultural			%	Residential			%	Commercial			%	Industrial			%	Road Type: ☐ Paved ☐ Unpaved Name (if known): <u>No crossing stream is piped upstream approx 600 ft from confluence</u> Crossing Type: ☒ Pipe culvert ☐ Box culvert ☐ Paved box culvert ☐ Bridge			
	Rt Bk	Lt Bk	%																																				
Natural Forest	<u>100</u>	<u>100</u>	%																																				
Silviculture			%																																				
Pasture			%																																				
Agricultural			%																																				
Residential			%																																				
Commercial			%																																				
Industrial			%																																				
Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe: _____				Floodplain Access: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt*</th> <th>Lt*</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Partial</td> <td>☒</td> <td>☒</td> </tr> <tr> <td>Full</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>					Rt*	Lt*	None	☐	☐	Partial	☒	☒	Full	☐	☐																				
	Rt*	Lt*																																					
None	☐	☐																																					
Partial	☒	☒																																					
Full	☐	☐																																					
Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting																																							

page ____ of ____

Number: 5-17

Date: 16/30/14

County: Cobleskill

Locality: us 41

Surveyors: *MM & RN*

***= Optional**

**= Male, female, undetermined

S 17

List of other aquatic species observed, including invasive species, and their abundance:

Blackknite darter - 8

white tubed c-rayfish - 11

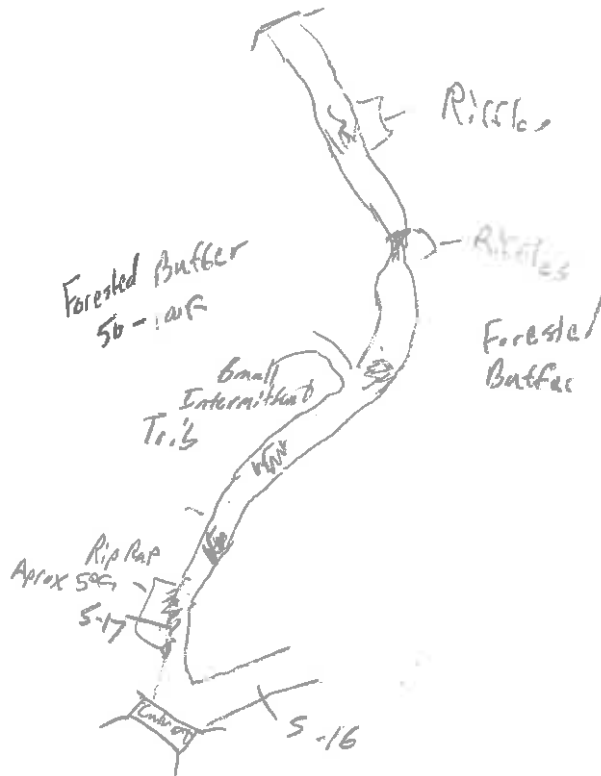
Yellow bullhead - 3

redbreast - 44

Blue fish stone roller - 700

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



518

Site Number: <u>5-18</u> Field Number: <u>5-18</u> Time Beg: _____ End: _____		Date: <u>10/31/14</u> State: <u>GA</u>																																	
Watershed/Drainage: <u>Chattahoochee River Upper</u>		Latitude: <u>33.847294</u> Long: <u>-84.4388</u>																																	
Waterbody: <u>Nancy Cr</u>		Stream Order: _____																																	
Location: <u>1-75 & Paces Ferry</u>		Stream Type: _____																																	
Gage Station: <u>Rothwood Cr 02335910</u>		Surveyor(s): <u>mm, w</u>																																	
Determining Distance upstream: _____ Distance downstream: <u>1200 ft</u>		Survey Technique: _____ Tactile Only ☒ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																	
Instream Features Quantitative Please specify all units of measurement % Canopy Cover: <u>20-60%</u> Wetted Width: <u>10-35'</u> Surface Velocity (at thalweg): <u>7-6 f/s</u> Water Depth (at thalweg): <u>1-3 ft</u> Bank Height (rt/lr): <u>5-10'</u> Bank Angle (rt/lr): <u>90-110</u>		Water Quality Water Temp: <u>12.4 °C</u> Dissolved Oxygen: <u>9.27 mg/L</u> Conductivity <u>100.5</u> <u>spc 132.4</u> pH <u>7.93</u> Other: <u>T-5.3</u> 303d Listed: ☐ yes ☒ no Designated Use: _____ Violated Criteria: _____																																	
Channel Alteration: ☒ No ☐ Yes Describe: _____ Shoring Structures: ☒ None ☐ Limerock ☐ Gabion ☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____ Substrate composition (% est.): Gravel <u>5</u> Silt <u>10</u> Clay _____ Clay Marl _____ Fine sand <u>15</u> Coarse s. <u>15</u> Medium s. <u>15</u> Boulder _____ Bedrock <u>25</u> Cobble <u>15</u>		Heavy Rain in past 7 days: Yes ☐ No ☒ Air Temperature: _____ Est. ☐ Act. ☐ Survey Weather Conditions: Scattered showers ☐ Heavy rain ☐ Clear/sunny ☐ Steady rain ☐ % Cloud cover <u>40</u>																																	
Channel Stability (Check one box for each column):																																			
Deposition/Aggradation Excellent Large, fresh deposits absent High number of deep pools Good Large, fresh deposits uncommon Moderate number of deep pools Fair Large, fresh deposits common Low-moderate number of deep pools Poor Large, fresh deposits very common Few, if any, deep pools		Incision/Degradation No mass-wasting or significant erosion of banks Channel slightly entrenched ☐ High number of deep pools Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched ☒ Moderate number of deep pools Active bank erosion, potential mass-wasting Channel moderately-highly entrenched ☐ Low-moderate number of deep pools Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched ☐ Few, if any, deep pools																																	
		Impoundments: ☒ None ☐ yes (Describe): _____ Fish Passage: Blocked? ☐ yes ☒ no Describe: _____ Fish Presence: ☐ Absent ☐ Rare ☒ Common ☐ Abundant Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																																	
Rt* Buffer width(ft): ☐ 10-25 ☐ 25-75 ☒ 78-150 ☐ 150+ Lt* Buffer width(ft): ☐ 10-25 ☐ 25-75 ☐ 78-150 ☒ 150+		Landuse Characterization: (100 feet to either side of the stream) <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt Bk</th> <th>Lt Bk</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Natural Forest</td> <td>100</td> <td>80</td> <td>%</td> </tr> <tr> <td>Silviculture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Pasture</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Agricultural</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Residential</td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>Commercial</td> <td></td> <td>20</td> <td>%</td> </tr> <tr> <td>Industrial</td> <td></td> <td></td> <td>%</td> </tr> </tbody> </table>			Rt Bk	Lt Bk	%	Natural Forest	100	80	%	Silviculture			%	Pasture			%	Agricultural			%	Residential			%	Commercial		20	%	Industrial			%
	Rt Bk	Lt Bk	%																																
Natural Forest	100	80	%																																
Silviculture			%																																
Pasture			%																																
Agricultural			%																																
Residential			%																																
Commercial		20	%																																
Industrial			%																																
Notes _____ _____ _____		Road Type: ☒ Paved ☐ Unpaved Name (if known): <u>W Paces Ferry</u> Crossing Type: ☐ Pipe culvert ☐ Box culvert ☒ Bridge ☐ Paved box culvert Local Non-Point Source Pollution Potential: ☒ No evidence ☐ Slight ☐ Moderate potential ☐ Obvious sources ☐ Livestock access Describe: _____ Floodplain Access: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Rt*</th> <th>Lt*</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>☐</td> <td>☐</td> </tr> <tr> <td>Partial</td> <td>☒</td> <td>☒</td> </tr> <tr> <td>Full</td> <td>☐</td> <td>☐</td> </tr> </tbody> </table> Bank Erosion: ☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting			Rt*	Lt*	None	☐	☐	Partial	☒	☒	Full	☐	☐																				
	Rt*	Lt*																																	
None	☐	☐																																	
Partial	☒	☒																																	
Full	☐	☐																																	

page ____ of ____

Number: 5-18

Date: 10/31/14

County: Franklin

Locality: West Pass Ferry & I-75

Surveyors: MM & RN

***= Optional**

-23-

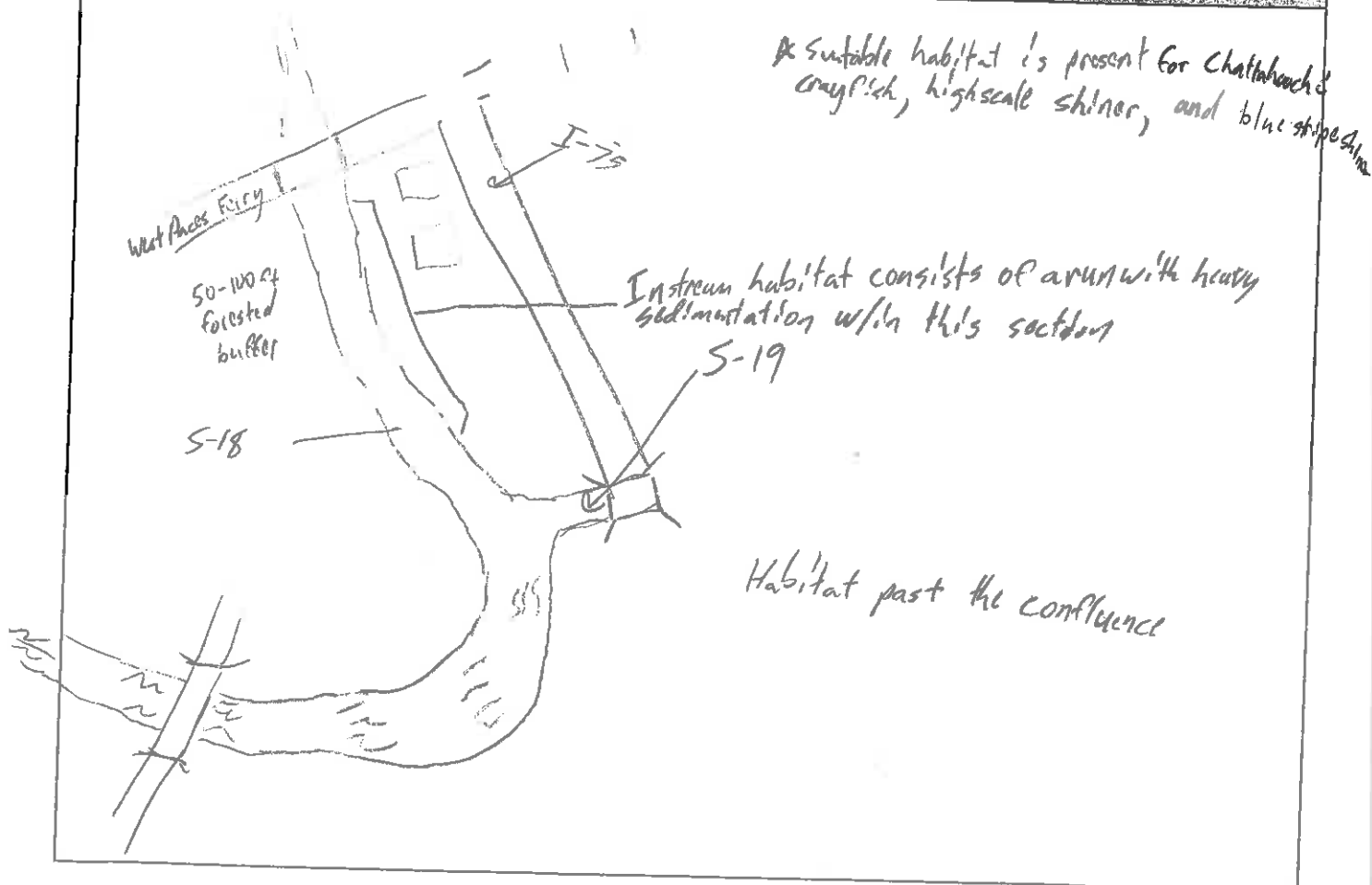
518

List of other aquatic species observed, including invasive species, and their abundance:

Red shiner - 7100	longjaw minnow - 63	Largemouth bass - 3
Spottail shiner - 2100	blackchinned darter - 7100	white tubenosed clayfish - 19
Brown bullhead - 13	Redbreast Sunfish - 7100	
blueflashed roller - 7100	bluegill - 7100	
	white sucker - 14	

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



* Not to scale

519

Site Number: <u>19</u>		Field Number: <u>S-19</u>		Time Beg: _____		Date: <u>10/31/14</u>	
Watershed/Drainage: <u>Chattahoochee River Upper</u>		End: _____		Latitude: <u>33.845784</u>		State: _____	
Waterbody: _____		Stream Order: _____		Longitude: <u>-84.428834</u>		Stream Type: <u>Parental</u>	
Location: <u>E-25</u>		Surveyor(s): <u>mm, rn</u>		Gage Station: <u>Rothwood Cr 02335910</u>			
Determining Distance upstream: _____		Distance downstream: <u>1200</u>		Tactile Only ☐		Tactile With Snorkel ☐	
PSA _____		Survey Technique _____		Tactile With SCUBA ☐			
Instream Features Quantitative				Water Quality			
Please specify all units of measurement				Water Temp: <u>11.3</u> °C			
% Canopy Cover: <u>40-80%</u> Wetted Width: <u>3-10'</u>				Dissolved Oxygen: <u>9.20</u> mg/L			
Surface Velocity (at thalweg): <u>25.8</u>				Conductivity <u>108.6</u> μ S/cm 133.5			
Water Depth (at thalweg): <u>6"-2'</u>				pH <u>7.82</u> Other: <u>T-4.8</u>			
Bank Height (rt/lt): <u>1-2'</u> Bank Angle(rt/lt): <u>90-120</u>				303d Listed: ☐ yes ☒ no			
Channel Alteration: ☒ No ☐ Yes				Designated Use:			
Describe: _____				Violated Criteria:			
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion				Heavy Rain in past 7 days: Yes ☐ No ☒			
☐ Concrete ☐ Rip-rap ☐ Other: _____ Extant: _____				Air Temperature: _____ Est. ☐ Act. ☐			
Substrate composition (% est.): Gravel <u>20</u> Silt <u>10</u> Clay _____				Survey Weather Conditions: Scattered showers ☐			
Clay Marl _____ Fine sand <u>15</u> Coarse s. <u>15</u> Medium s. <u>20</u>				Heavy rain ☐ Clear/sunny ☐			
Boulder _____ Bedrock <u>10</u> Cobble <u>10</u>				Steady rain ☐ % Cloud cover: <u>40</u>			
Channel Stability (Check one box for each column):							
Deposition/Aggradation				Incision/Degradation			
Excellent	Large, fresh deposits absent		No mass-wasting or significant erosion of banks		Impoundments: ☒ None ☐ yes (Describe): _____		
	High number of deep pools		Channel slightly entrenched		Fish Passage:		
			High number of deep pools ☐		Blocked? ☐ yes ☒ no		
Good	Large, fresh deposits uncommon		Some bank erosion apparent, no mass wasting		Fish Presence:		
	Moderate number of deep pools		Channel slightly-moderately entrenched		☐ Absent		
			Moderate number of deep pools ☒		☐ Rare		
Fair	Large, fresh deposits common		Active bank erosion, potential mass-wasting		☒ Common		
	Low-moderate number of deep pools		Channel moderately-highly entrenched		☐ Abundant		
			Low-moderate number of deep pools ☐		Woody Material:		
Poor	Large, fresh deposits very common		Active bank erosion, frequent mass-wasting		☐ None/infreq.		
	Few, if any, deep pools		Channel moderately-highly entrenched		☒ Moderate		
			Few, if any, deep pools ☐		☐ Extensive		
Riparian Features Quantitative				Stream Road Crossing			
Rt* Buffer width(ft):		Landuse Characterization:		Road Type: ☒ Paved ☐ Unpaved			
☐ 10-25		(100 feet to either side of the stream)		Name (if known): <u>175 and SR 41</u>			
☒ 25-75				Crossing Type: ☐ Pipe culvert ☒ Box culvert			
☐ 78-150				☐ Bridge ☐ Paved box culvert			
☐ 150+				Local Non-Point Source Pollution Potential:			
Lt* Buffer width(ft):				☒ No evidence ☐ Slight			
☐ 10-25				☐ Moderate potential ☐ Obvious sources			
☒ 25-75				Describe: _____			
☐ 78-150				Floodplain Access:		Bank Erosion:	
☐ 150+				None ☐ Rt* ☐ Lt* ☒		☐ Non-eroding	
				Partial ☒		☒ Active Erosion	
				Full ☐		☐ Mass-wasting	
Notes							

page ____ of ____

Number: 5-19

Date: 10/31/14

County: Fallón

Locality: T-75

Surveyors: *mm + RN*

***= Optional**

-23-

509

List of other aquatic species observed, including invasive species, and their abundance:

Redshiner - 61

Yellow bullhead - 3

White tubenosed crayfish - 7

Spottail shiner - 7100

Bluefin stone roller - 7100

Longjaw minnow - 24

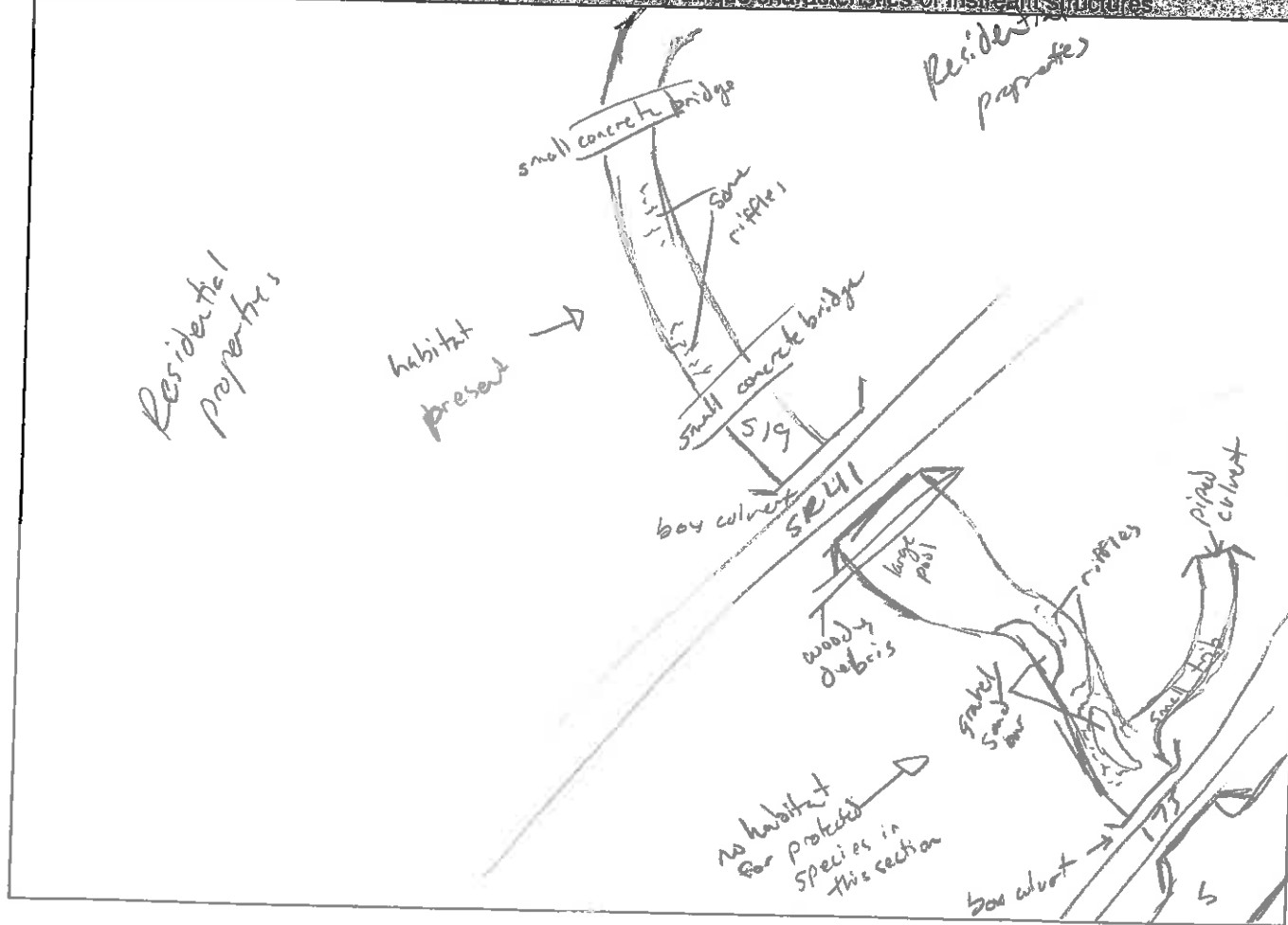
Weed shiner - 7

Blackbanded darter - 77

Black tail shiner - 18

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



5-20

Site Number: 20		Field Number: 5-20		Time Beg: _____		Date: 11/3/14																																																								
Watershed/Drainage: Chattahoochee River, Upper		End: _____		State: GA		Long: -84.416421																																																								
Waterbody: _____		Latitude: 33.807083		Stream Order: _____		Stream Type: _____																																																								
Location: I 75		Gage Station: Fotherwood Creek 0233910		Surveyor(s): MM, R																																																										
Determining RSA		Distance upstream: _____ Distance downstream: _____		Survey Technique		Tactile Only ☐ Tactile With Snorkel ☐ Tactile With SCUBA ☐																																																								
Instream Features: Quantitative				Water Quality																																																										
Please specify all units of measurement				Water Temp: 12.5 °C																																																										
% Canopy Cover: 0-100% Wetted Width: 1-3'				Dissolved Oxygen: 9.11 mg/L																																																										
Surface Velocity (at thalweg): 45 cfs				Conductivity 112.3 spc 140.3																																																										
Water Depth (at thalweg): 6" Z'				pH 7.80 Other: T-7.0																																																										
Bank Height (rt/lr): 1-2' Bank Angle (rt/lr): 90-120°				303d Listed: ☐ yes ☒ no																																																										
Designated Use:				Violated Criteria:																																																										
Channel Alteration: ☐ No ☒ Yes				Heavy Rain in past 7 days: Yes ☐ No ☒																																																										
Describe: downstream partially concrete flume				Air Temperature: _____ Est. ☐ Act. ☐																																																										
Shoring Structures: ☒ None ☐ Limerock ☐ Gabion				Survey Weather Conditions: Scattered showers ☐																																																										
☐ Concrete ☐ Rip-rap ☐ Other: _____ Extent: _____				Heavy rain ☐ Clear/sunny ☒																																																										
Substrate composition (% est.): Gravel 10 Silt 20 Clay _____				Steady rain ☐ % Cloud cover _____																																																										
Clay Marl _____ Fine sand 15 Coarse s. 10 Medium s. 10																																																														
Boulder _____ Bedrock 10 Cobble 5 concrete flume 20																																																														
Channel Stability (Check one box for each column):																																																														
Deposition/Aggradation				Incision/Degradation																																																										
Excellent	Large, fresh deposits absent High number of deep pools		No mass-wasting or significant erosion of banks Channel slightly entrenched High number of deep pools		Impoundments: ☐ None ☐ yes (Describe): _____																																																									
Good	Large, fresh deposits uncommon Moderate number of deep pools		Some bank erosion apparent, no mass wasting Channel slightly-moderately entrenched Moderate number of deep pools		Fish Passage: Blocked? ☐ yes ☒ no																																																									
Fair	Large, fresh deposits common Low-moderate number of deep pools		Active bank erosion, potential mass-wasting Channel moderately-highly entrenched Low-moderate number of deep pools		Fish Presence: ☒ Absent ☐ Rare ☐ Common ☐ Abundant																																																									
Poor	Large, fresh deposits very common Few, if any, deep pools		Active bank erosion, frequent mass-wasting Channel moderately-highly entrenched Few, if any, deep pools		Woody Material: ☐ None/infreq. ☒ Moderate ☐ Extensive																																																									
Rt* Buffer width(ft):				Road Type: ☒ Paved ☐ Unpaved																																																										
Landuse Characterization: (100 feet to either side of the stream)				Name (if known): I-75																																																										
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>10-25</td> <td>Facing OS</td> <td>Rt Bk</td> <td>Lt Bk</td> <td>%</td> </tr> <tr> <td>25-75</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>75-150</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>150+</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="5">Natural Forest</td> </tr> <tr> <td colspan="5">Silviculture</td> </tr> <tr> <td colspan="5">Pasture</td> </tr> <tr> <td colspan="5">Agricultural Recreation</td> </tr> <tr> <td colspan="5">Residential</td> </tr> <tr> <td colspan="5">Commercial</td> </tr> <tr> <td colspan="5">Industrial</td> </tr> </table>				10-25	Facing OS	Rt Bk	Lt Bk	%	25-75					75-150					150+					Natural Forest					Silviculture					Pasture					Agricultural Recreation					Residential					Commercial					Industrial					Crossing Type: ☐ Pipe culvert ☒ Box culvert ☐ Bridge ☐ Paved box culvert			
10-25	Facing OS	Rt Bk	Lt Bk	%																																																										
25-75																																																														
75-150																																																														
150+																																																														
Natural Forest																																																														
Silviculture																																																														
Pasture																																																														
Agricultural Recreation																																																														
Residential																																																														
Commercial																																																														
Industrial																																																														
Lt* Buffer width(ft):				Local Non-Point Source Pollution Potential:																																																										
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>10-25</td> <td></td> <td></td> <td></td> <td>%</td> </tr> <tr> <td>25-75</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>75-150</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>150+</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="5">No evidence</td> </tr> <tr> <td colspan="5">Moderate potential</td> </tr> <tr> <td colspan="5">Livestock access</td> </tr> <tr> <td colspan="5">Slight</td> </tr> <tr> <td colspan="5">Obvious sources</td> </tr> </table>				10-25				%	25-75					75-150					150+					No evidence					Moderate potential					Livestock access					Slight					Obvious sources					Describe: _____													
10-25				%																																																										
25-75																																																														
75-150																																																														
150+																																																														
No evidence																																																														
Moderate potential																																																														
Livestock access																																																														
Slight																																																														
Obvious sources																																																														
Notes				Floodplain Access:																																																										
				<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>None</td> <td>Rt*</td> <td>Lt*</td> </tr> <tr> <td>Partial</td> <td>☒</td> <td>☒</td> </tr> <tr> <td>Full</td> <td>☐</td> <td>☐</td> </tr> </table>				None	Rt*	Lt*	Partial	☒	☒	Full	☐	☐																																														
None	Rt*	Lt*																																																												
Partial	☒	☒																																																												
Full	☐	☐																																																												
				Bank Erosion:																																																										
				☐ Non-eroding ☒ Active Erosion ☐ Mass-wasting																																																										

Mussel Measurement Data Sheet

Field

Number: 5 - 20

Date: 11/3/14

County: Fulton

Locality: 1 75

Surveyors: mm RN

***= Optional**

**= Male, female, undetermined

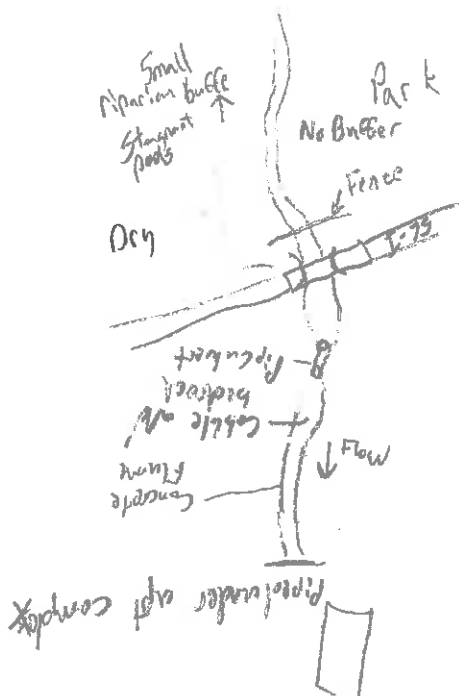
5-20

List of other aquatic species observed, including invasive species, and their abundance:

White tabeared crayfish - 2

Explain/describe any deviations from protocol:

Include sketch map, using back of page if necessary. Include north arrow, flow directions, label any locations where listed species were collected, indicate and label any unique characteristics or instream structures.



No suitable habitat for Federal and state protected aquatic due to the surrounding land use because of some flow downstream of the crossing a brief crayfish survey was conducted. After the survey it was determined that no suitable habitat was present for the Chattahoochee crayfish.

Appendix D

Site Photographs



Photograph 1. Representative upstream view of S-1 (Alt).



Photograph 2. Representative downstream view of S-1 (Alt).



Photograph 3. Upstream view of S-2 (Alt).



Photograph 4. Downstream view of S-2 (Alt).



Photograph 5. Upstream view of S-3 (Alt).



Photograph 6. Downstream view of S-3 (Alt).



Photograph 7. Representative view of S-4 (Alt).



Photograph 8. Representative view of S-5 (Alt).



Photograph 9. Representative view of S-1.



Photograph 10. Upstream view of S-1a.



Photograph 11. Downstream view of S-1a.



Photograph 12. Representative view of S-2.



Photograph 13. Representative view of S-3.



Photograph 14. Representative view of S-4.



Photograph 15. Upstream view of S-5 at United States Highway (US) 41 crossing.



Photograph 16. Representative upstream view of S-5.



Photograph 17. Upstream view of S-6.



Photograph 18. Downstream view of S-6.



Photograph 19. Representative view of S-7.



Photograph 20. Representative view of S-8.



Photograph 21. Upstream view of S-9.



Photograph 22. Downstream view of S-9.



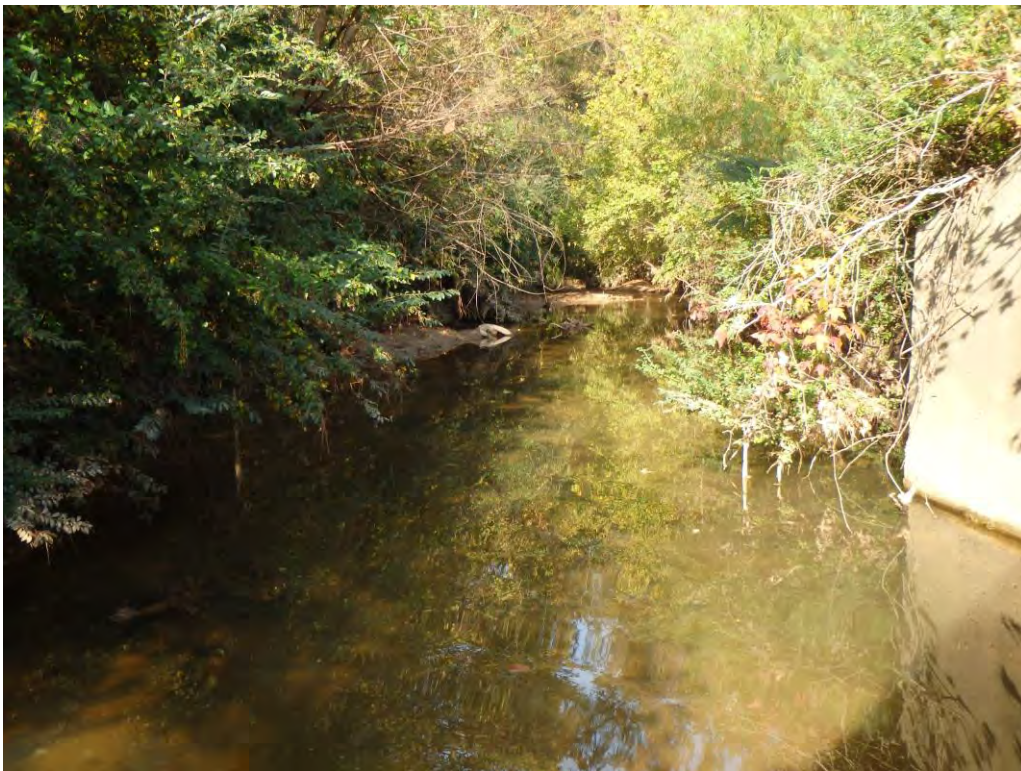
Photograph 23. Upstream view of S-10.



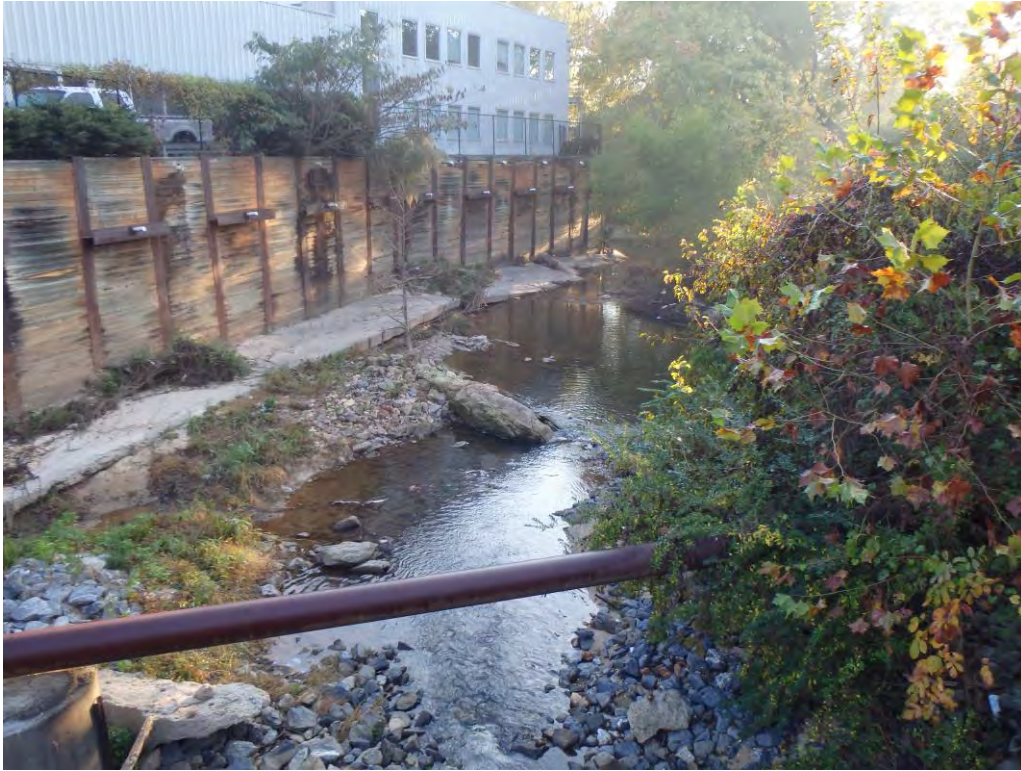
Photograph 24. Downstream view of S-10.



Photograph 25. Representative downstream view of S-11.



Photograph 26. Upstream view of S-12.



Photograph 27. Downstream view of S-12.



Photograph 28. Representative view of S-13.



Photograph 29. Upstream view of S-14.



Photograph 30. Downstream view of S-14.



Photograph 31. Representative view of S-15.



Photograph 32. Upstream view of S-16.



Photograph 33. Downstream view of S-16.



Photograph 34. Downstream view of S-17.



Photograph 35. Representative view of S-18.



Photograph 36. Representative view of S-19.



Photograph 37. Representative view of S-20.

Appendix E

USGS Stream Gage Information



[USGS Home](#)
[Contact USGS](#)
[Search USGS](#)

National Water Information System: Web Interface

USGS Water Resources

Data Category:

Current Conditions ▼

Geographic Area:

Georgia ▼

GO

Click to hide News Bulletins

- Try our new [Mobile-friendly water data site](#) from your mobile device!
- [Full News](#) 

Click to hide state-specific text

- [USGS Water Resources of Georgia](#): the place to start for all USGS water information in Georgia.
- Sign up for [South Atlantic Water Science Center - Georgia E-mail Notices](#): publication releases, gage shutdown notifications, and so forth
- [NEW Statewide Rainfall Map](#)
- Sign up for [custom Water Alerts by text or email](#)

USGS 02392950 NOONDAY CREEK AT HAWKINS STORE RD, NR WOODSTOCK,GA

PROVISIONAL DATA SUBJECT TO REVISION

Available data for this site

Time-series: Current/Historical Observations ▼

GO

Click to hide station-specific text



The USGS operation and maintenance of this real-time streamgage is funded in cooperation with Cobb County Water System.

This station managed by the USGS Atlanta Field Office.

Available Parameters

- ☐ All 3 Available Parameters for this site
- ☒ 00065 Gage height
- ☒ 00060 Discharge
- ☒ 00045 Precipitation

Available Period

2007-10-01 2014-12-04
 2007-10-01 2014-12-04
 2009-10-07 2014-12-04

Output format

- ☒ Graph
☐ Graph w/ stats
☐ Graph w/o stats
☐ Graph w/ (up to 3) parms
☐ Table
☐ Tab-separated

Days (20)[Summary of all available data for this site](#)

GO

[Instantaneous-data availability statement](#)

-- or --

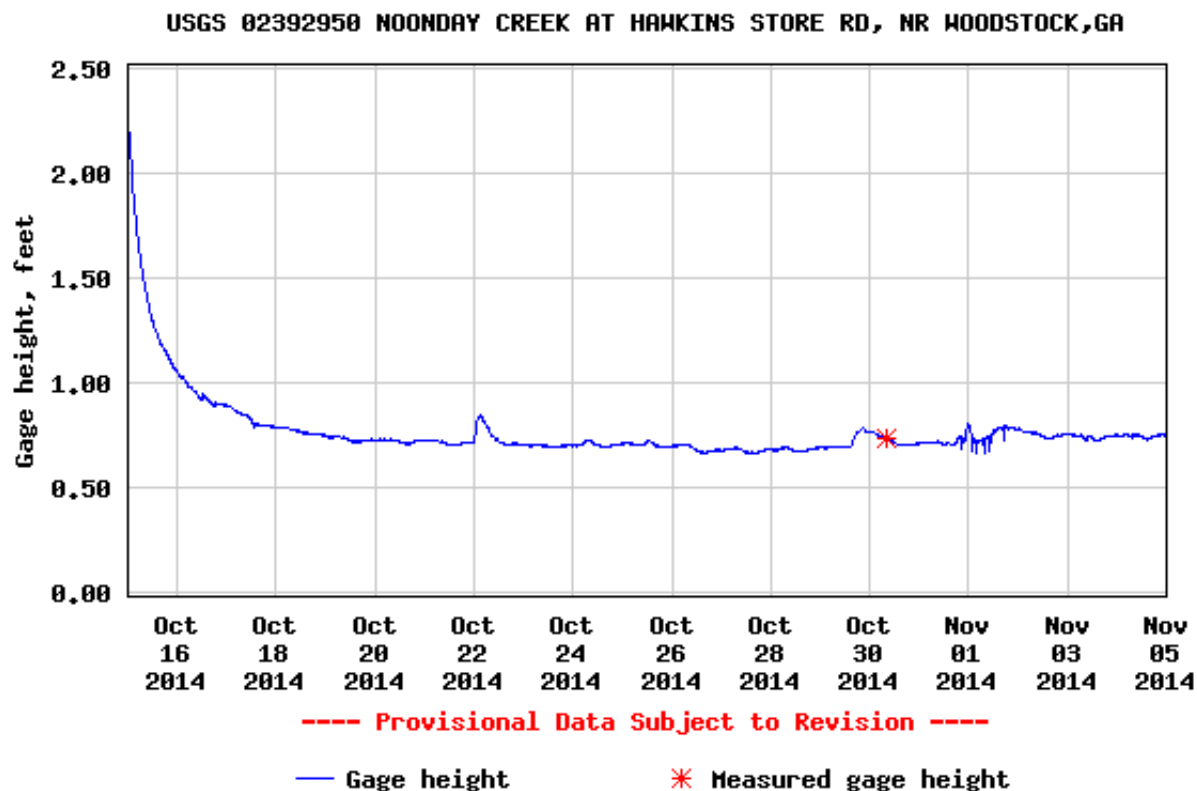
Begin date

2014-10-15

Gage height, feet**End date**

2014-11-04

Most recent instantaneous value: 0.81 12-04-2014 12:30 EST



Add up to 2 more sites and replot for "Gage height, feet"

?

Add site numbers

[Note](#)

Enter up to 2 site numbers separated by a comma. A site number consists of 8 to 15 digits

GO

Create [presentation-quality](#) / [stand-alone](#) graph. [Subscribe to](#)

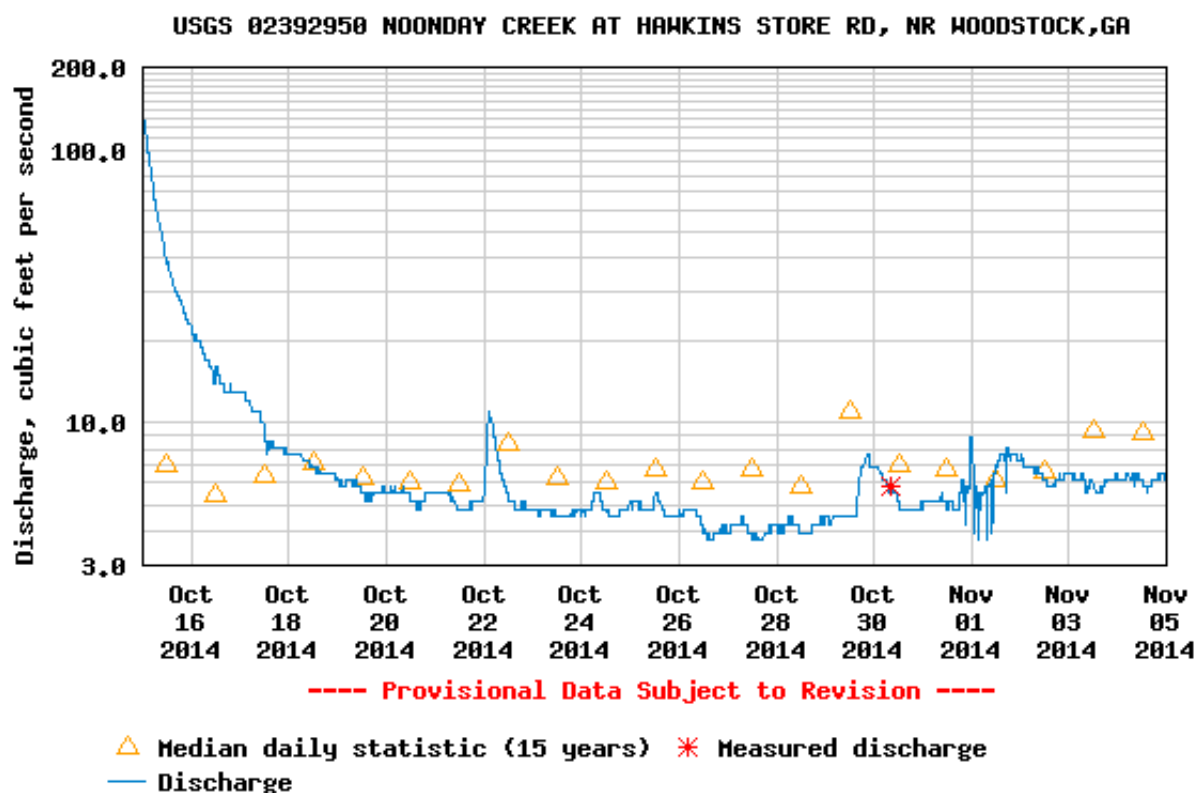
[?](#)

[WaterAlert](#)

[Share this graph](#) |

Discharge, cubic feet per second

Most recent instantaneous value: 8.9 12-04-2014 12:30 EST



Add up to 2 more sites and replot for "Discharge, cubic feet per second"

[?](#)

Add site numbers

[Note](#)

Enter up to 2 site numbers separated by a comma. A site number consists of 8 to 15 digits

GO

Create [presentation-quality](#) / [stand-alone](#) graph. [Subscribe to](#)

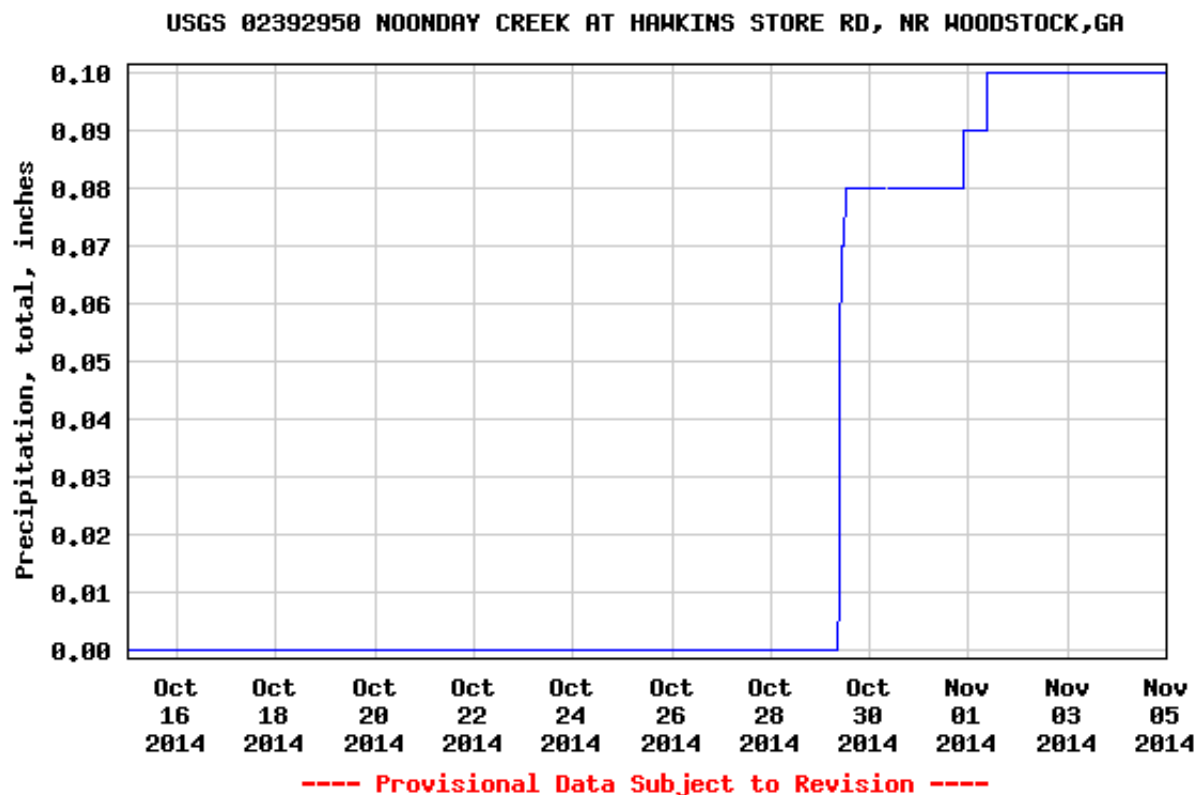
[?](#)

[WaterAlert](#)

[Share this graph](#) |

Precipitation, total, inches

Most recent instantaneous value: 0.00 12-04-2014 12:30 EST



Add up to 2 more sites and replot for "Precipitation, total, inches"

[?](#)

Add site numbers

[Note](#)

Enter up to 2 site numbers separated by a comma. A site number consists of 8 to 15 digits

Create [presentation-quality](#) / [stand-alone](#) graph. Subscribe to

[?](#)[WaterAlert](#)[Share this graph](#) |

[Questions about sites/data?](#)

[Feedback on this web site](#)

[Automated retrievals](#)

[Help](#)

[Data Tips](#)

[Explanation of terms](#)

[Subscribe for system changes](#)

[News](#)

[Accessibility](#)

[Plug-Ins](#)

[FOIA](#)

[Privacy](#)

[Policies and Notices](#)

[U.S. Department of the Interior](#) | [U.S. Geological Survey](#)

Title: USGS Current Conditions for Georgia

URL: <http://waterdata.usgs.gov/ga/nwis/uv?>



Page Contact Information: [Georgia Water Data Support Team](#)

Page Last Modified: 2014-12-04 13:10:34 EST

1.99 1.64 sdww02



[USGS Home](#)
[Contact USGS](#)
[Search USGS](#)

National Water Information System: Web Interface

USGS Water Resources

Data Category:

Current Conditions ▼

Geographic Area:

Georgia ▼

GO

Click to hide News Bulletins

- Try our new [Mobile-friendly water data site](#) from your mobile device!
- [Full News](#) 

Click to hide state-specific text

- [USGS Water Resources of Georgia](#): the place to start for all USGS water information in Georgia.
- Sign up for [South Atlantic Water Science Center - Georgia E-mail Notices](#): publication releases, gage shutdown notifications, and so forth
- [NEW Statewide Rainfall Map](#)
- Sign up for [custom Water Alerts by text or email](#)

USGS 02335910 ROTTENWOOD CR AT INTERSTATE N PKWY, NR SMYRNA, GA

PROVISIONAL DATA SUBJECT TO REVISION

Available data for this site

Time-series: Current/Historical Observations ▼

GO

Click to hide station-specific text



The USGS operation and maintenance of this real-time streamgage is funded in cooperation with Cobb County Water System.

This station managed by the USGS Atlanta Field Office.

Available Parameters

- ☐ All 3 Available Parameters for this site
- ☒ 00065 Gage height
- ☒ 00060 Discharge
- ☒ 00045 Precipitation

Available Period

2007-10-01 2014-12-04
 2007-10-01 2014-12-04
 2007-10-01 2014-12-04

Output format

- ☒ Graph
☐ Graph w/ stats
☐ Graph w/o stats
☐ Graph w/ (up to 3) parms
☐ Table
☐ Tab-separated

Days (20)[Summary of all available data for this site](#)

GO

[Instantaneous-data availability statement](#)

-- or --

Begin date

2014-10-15

Gage height, feet**End date**

Most recent instantaneous value: 2.26 12-04-2014 12:00 EST

2014-11-04

USGS 02335910 ROTTENWOOD CR AT INTERSTATE N PKWY, NR SMYRNA, GA



----- Provisional Data Subject to Revision -----

Add up to 2 more sites and replot for "Gage height, feet"

[?](#)

Add site numbers

[Note](#)

Enter up to 2 site numbers separated by a comma. A site number consists of 8 to 15 digits

GO

Create [presentation-quality](#) / [stand-alone](#) graph. Subscribe to

[?](#)

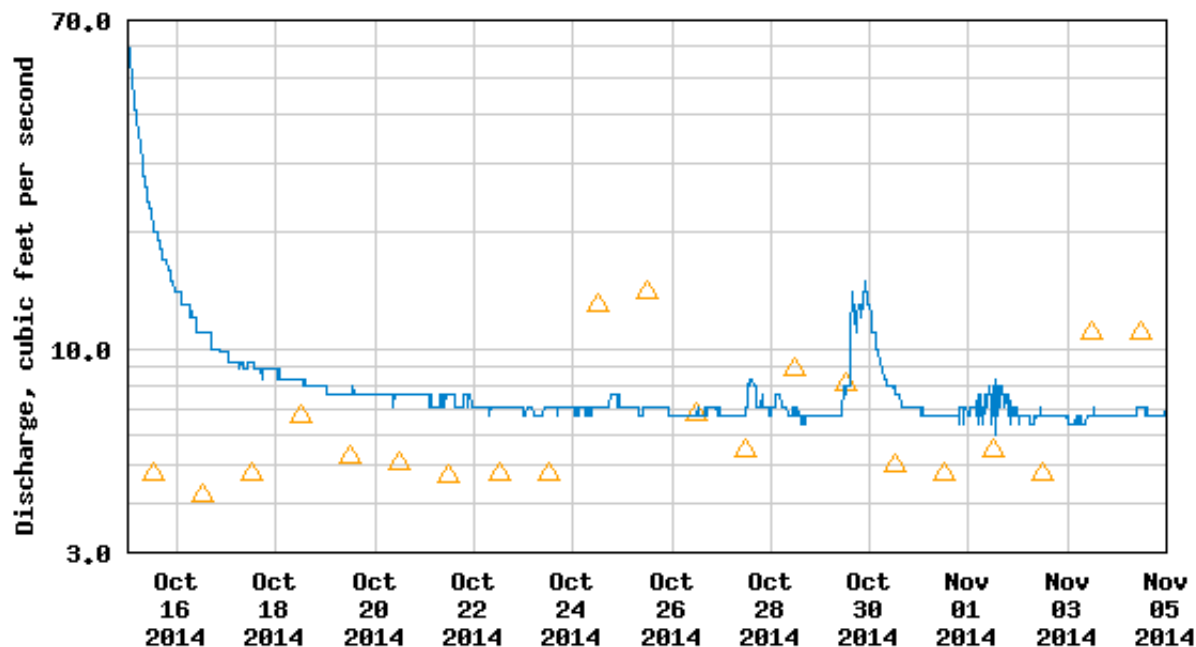
[WaterAlert](#)

[Share this graph](#) |

Discharge, cubic feet per second

Most recent instantaneous value: 9.8 12-04-2014 12:00 EST

USGS 02335910 ROTTENWOOD CR AT INTERSTATE N PKWY, NR SMYRNA, GA



----- Provisional Data Subject to Revision -----

△ Median daily statistic (6 years) — Discharge

Add up to 2 more sites and replot for "Discharge, cubic feet per second"

[?](#)

Add site numbers

[Note](#)

Enter up to 2 site numbers separated by a comma. A site number consists of 8 to 15 digits

GO

Create [presentation-quality](#) / [stand-alone](#) graph. Subscribe to

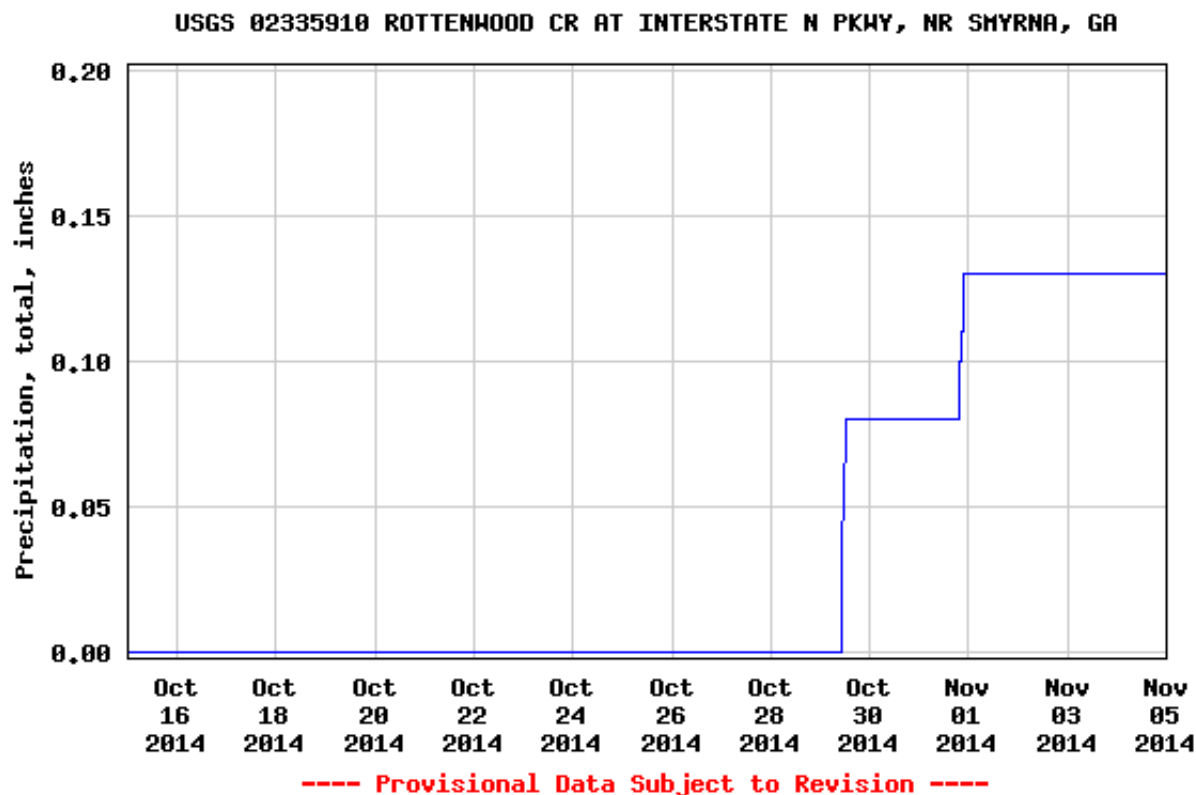
[?](#)

[WaterAlert](#)

[Share this graph](#) |

Precipitation, total, inches

Most recent instantaneous value: 0.00 12-04-2014 12:00 EST



Add up to 2 more sites and replot for "Precipitation, total, inches"

[?](#)

Add site numbers

[Note](#)

Enter up to 2 site numbers separated by a comma. A site number consists of 8 to 15 digits

Create [presentation-quality](#) / [stand-alone](#) graph. Subscribe to

[?](#)[WaterAlert](#)[Share this graph](#) |

[Questions about sites/data?](#)

[Feedback on this web site](#)

[Automated retrievals](#)

[Help](#)

[Data Tips](#)

[Explanation of terms](#)

[Subscribe for system changes](#)

[News](#)

[Accessibility](#)

[Plug-Ins](#)

[FOIA](#)

[Privacy](#)

[Policies and Notices](#)

[U.S. Department of the Interior](#) | [U.S. Geological Survey](#)

Title: USGS Current Conditions for Georgia

URL: <http://waterdata.usgs.gov/ga/nwis/uv?>



Page Contact Information: [Georgia Water Data Support Team](#)

Page Last Modified: 2014-12-04 13:10:50 EST

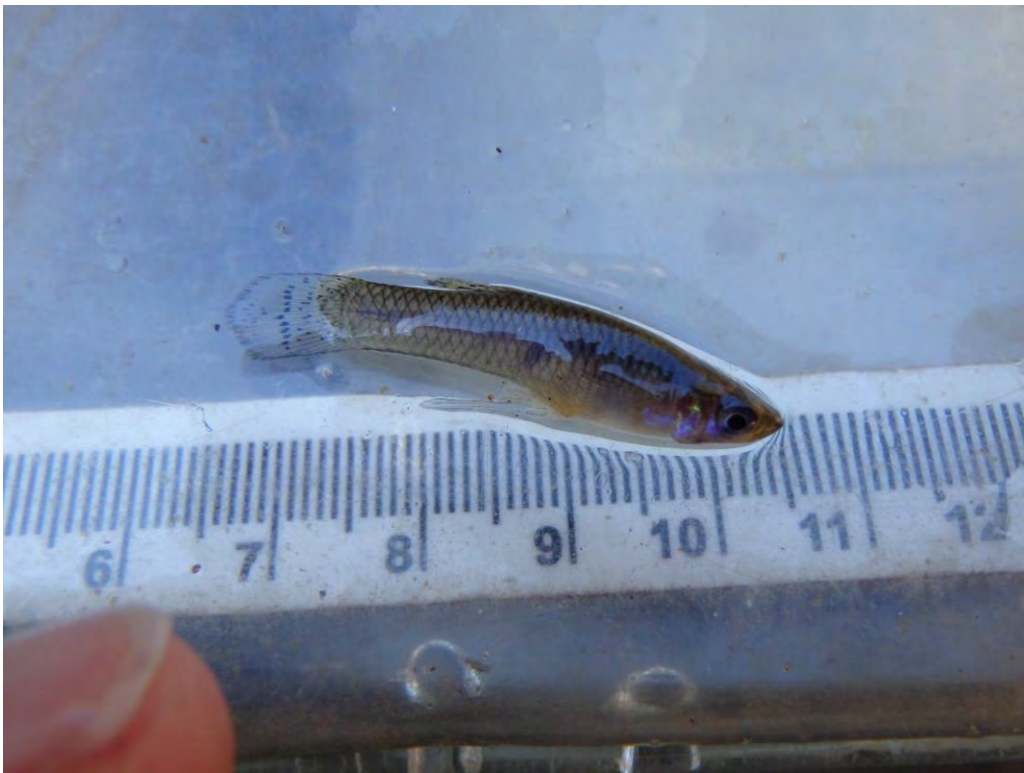
2.06 1.71 sdww01

Appendix F

Fish Photographs



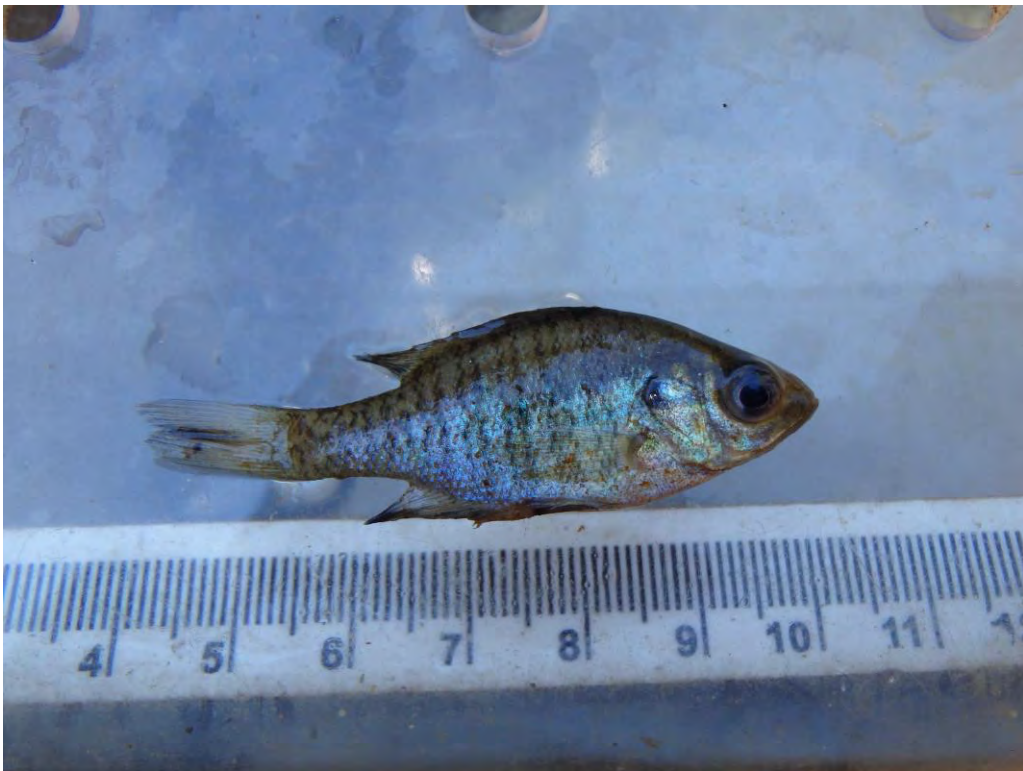
Photograph 1. Creek chub (*Semotilus atromaculatus*) collected in S-3 (Alt).



Photograph 2. Eastern mosquitofish (*Gambusia holbrooki*) collected in S-3 (Alt).



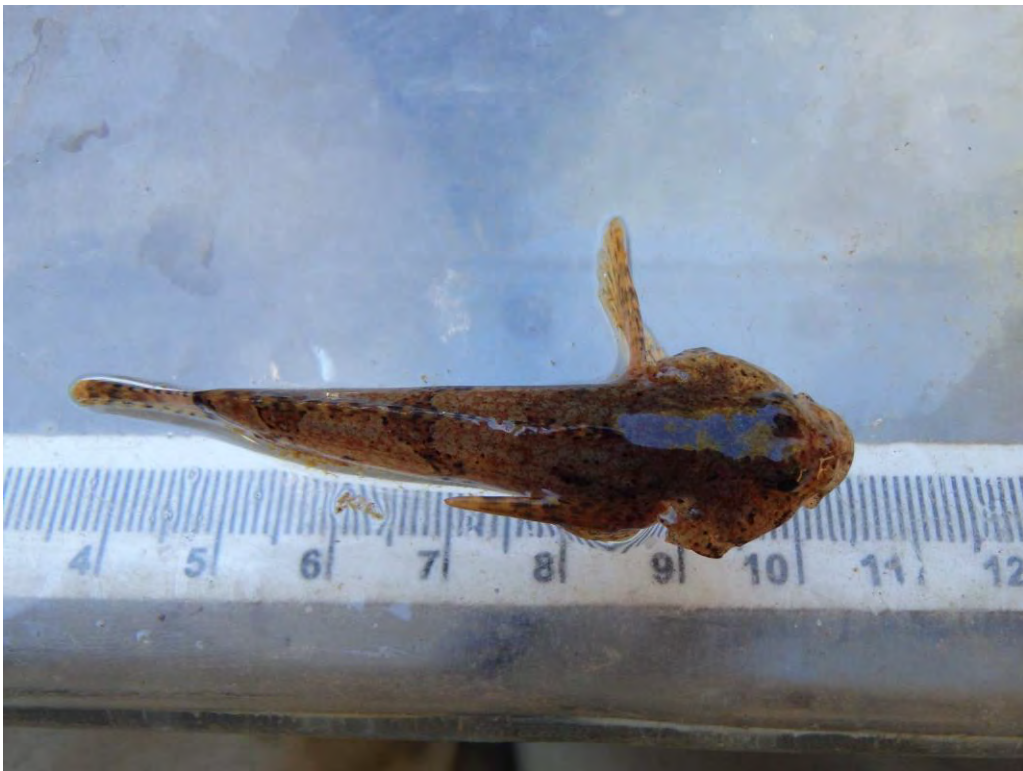
Photograph 3. Alabama hogsucker (*Hypentelium etowanum*) collected in S-3 (Alt).



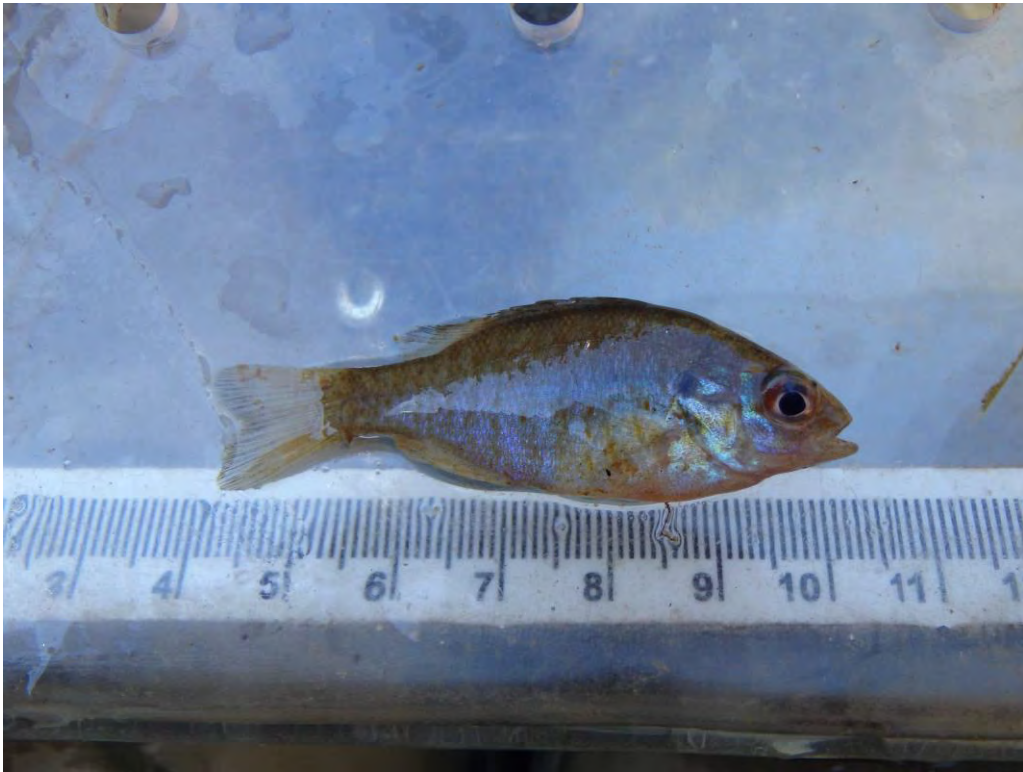
Photograph 4. Bluegill (*Lepomis macrochirus*) collected in S-3 (Alt).



Photograph 5. Blackbanded darter (*Percina nigrofasciata*) collected in S-3 (Alt).



Photograph 6. Coosa banded sculpin (*Cottus carolinae zopherus*) collected in S-3 (Alt).



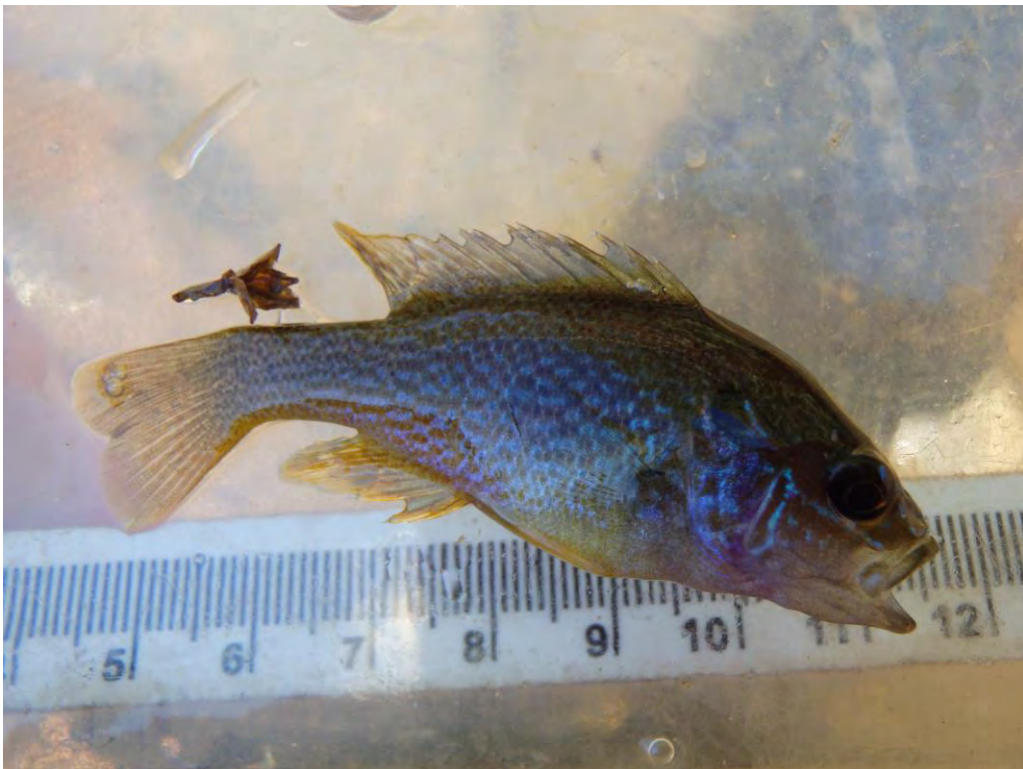
Photograph 7. Redbreast sunfish (*Lepomis auritus*) collected in S-3 (Alt).



Photograph 8. Largemouth bass (*Micropterus salmoides*) collected in S-3 (Alt).



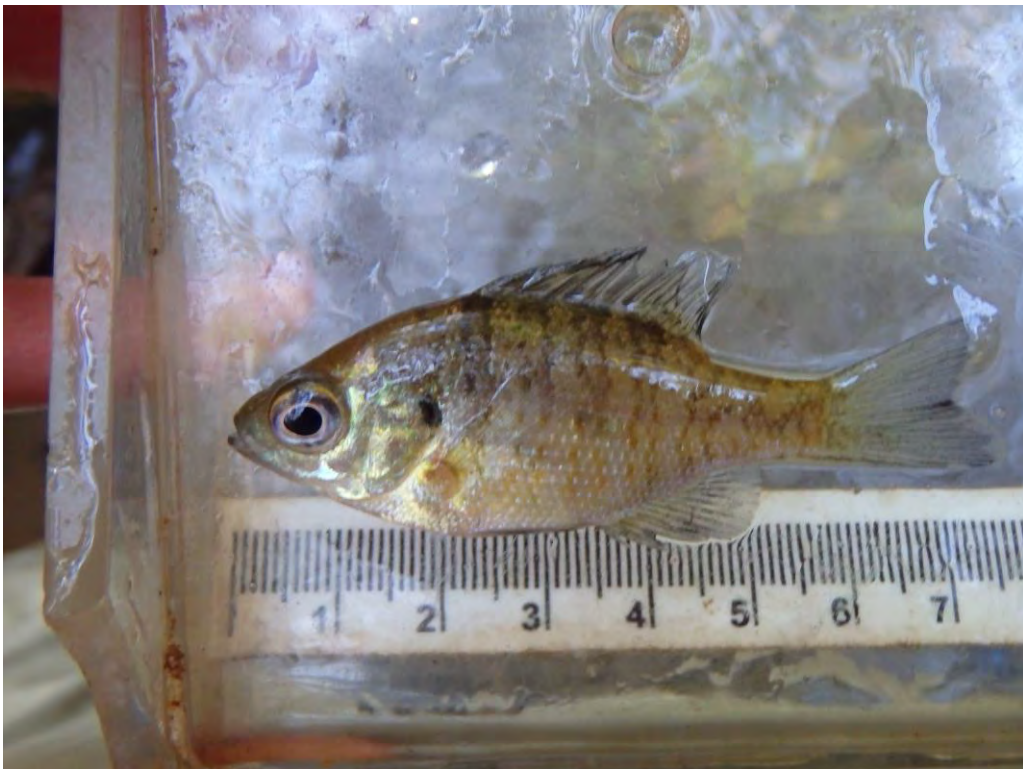
Photograph 9. Largescale stoneroller (*Campostoma oligolepis*) collected in S-3 (Alt).



Photograph 10. Green sunfish (*Lepomis cyanellus*) collected in S-3 (Alt).



Photograph 11. Redbreast sunfish collected in S-1a.



Photograph 12. Bluegill collected in S-1a.



Photograph 13. Alabama hogsucker collected in S-1a.



Photograph 14. Blackbanded darter collected in S-1a.



Photograph 15. Green sunfish collected in S-1a.



Photograph 16. Eastern mosquitofish collected in S-1a.



Photograph 17. Creek chub collected in S-1a.



Photograph 18. Largescale stoneroller collected in S-1a.



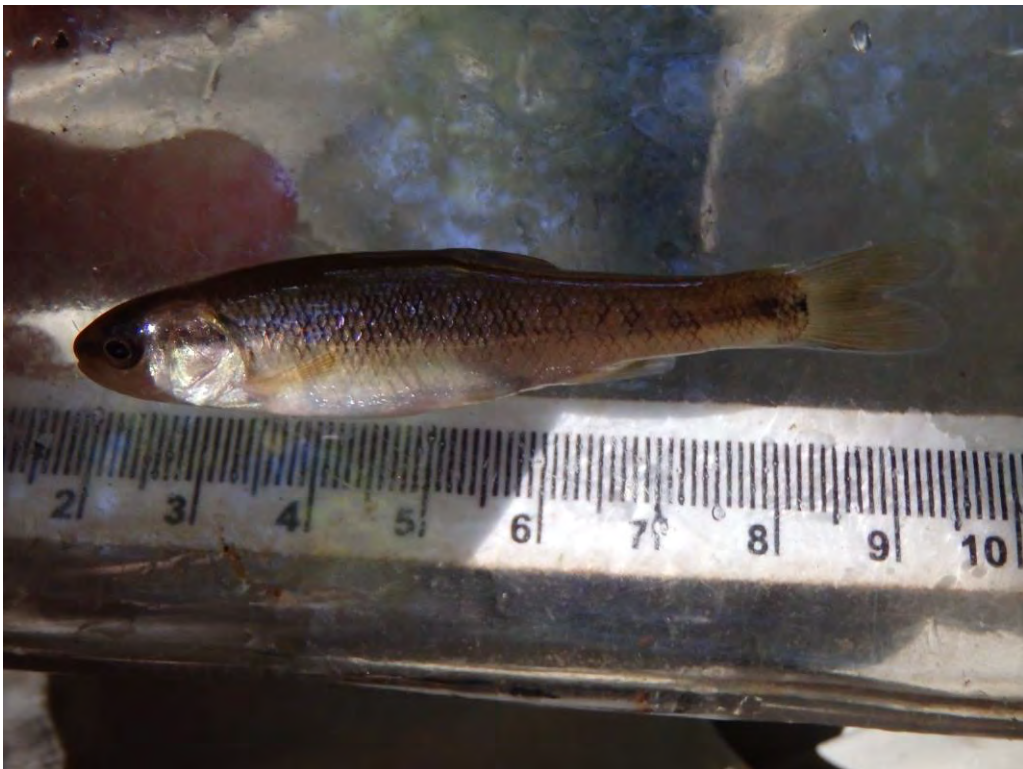
Photograph 19. Coosa banded sculpin collected in S-1a.



Photograph 20. Creek chub collected in S-4.



Photograph 21. Creek chub collected in S-5.



Photograph 22. Creek chub collected in S-7.



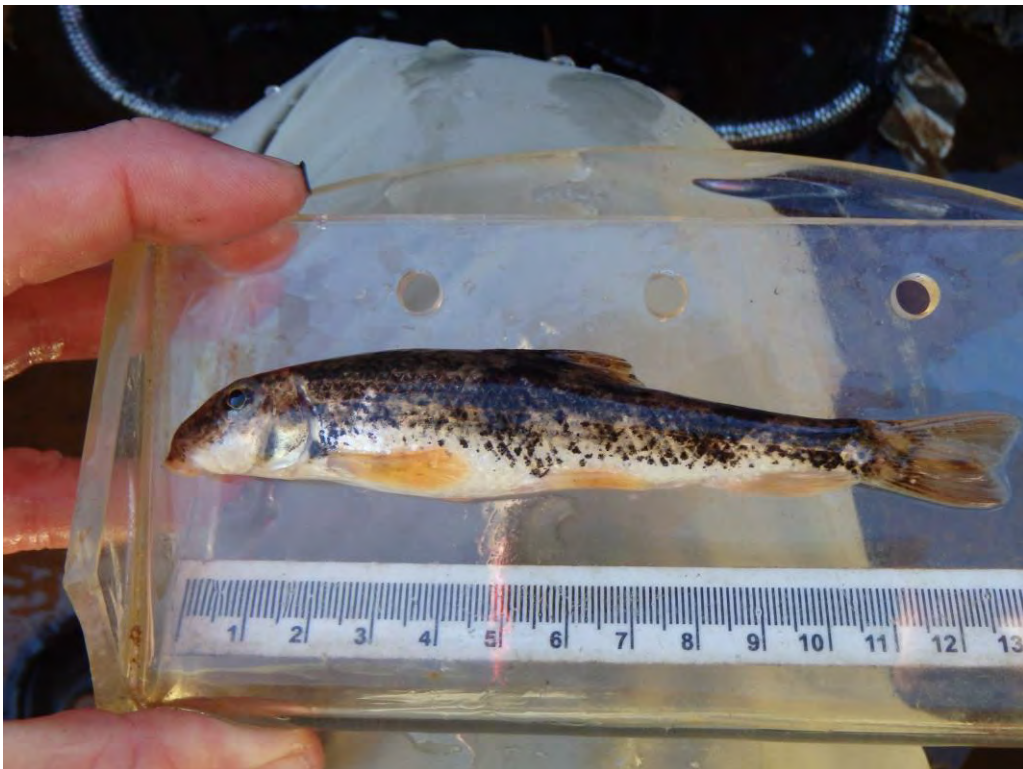
Photograph 23. Creek chub collected in S-8.



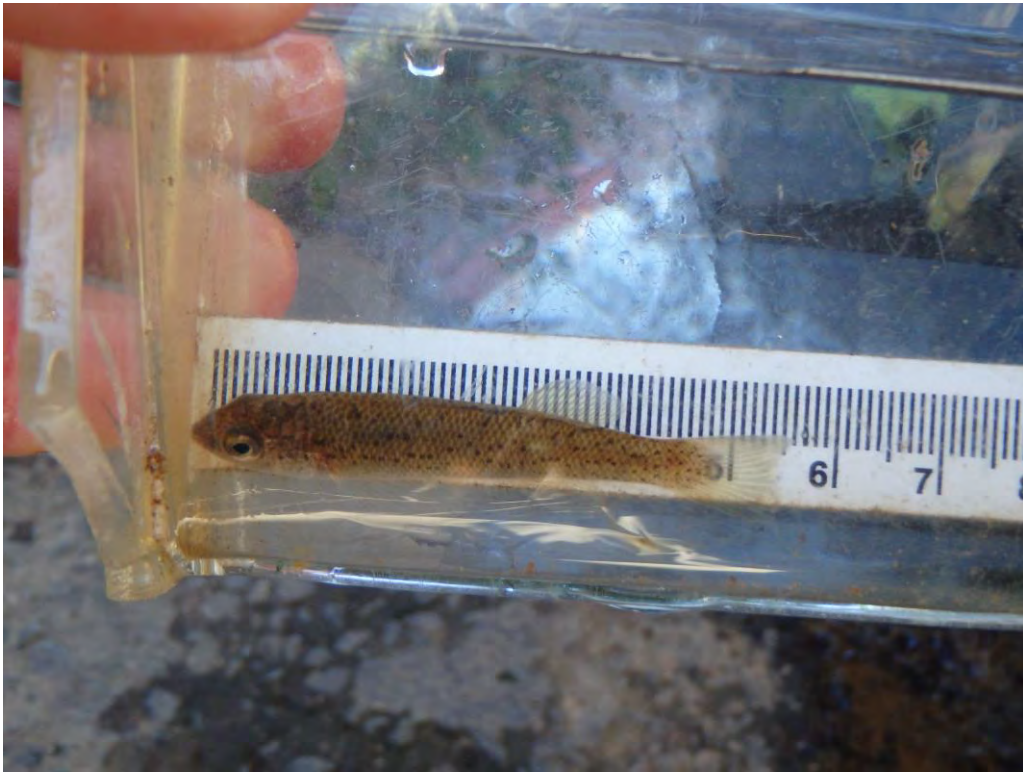
Photograph 24. Redbreast sunfish collected in S-8.



Photograph 25. White sucker (*Catostomus commersoni*) collected in S-8.



Photograph 26. Alabama hogsucker collected in S-8.



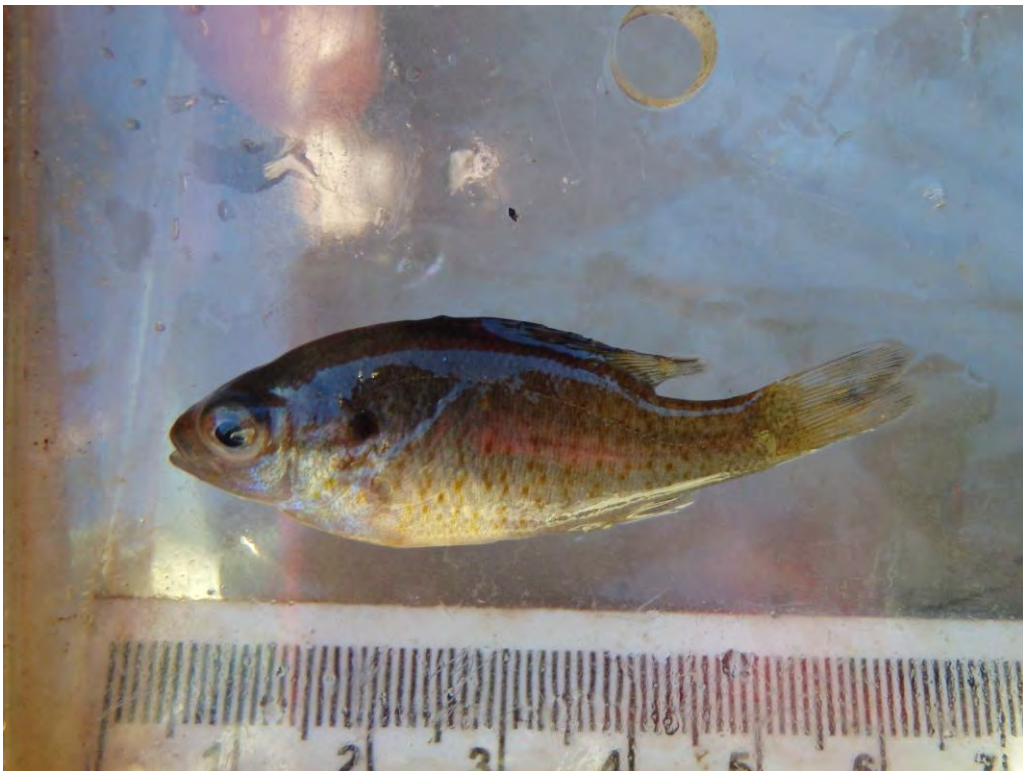
Photograph 27. Southern studfish (*Fundulus stellifer*) collected in S-8.



Photograph 28. Creek chub collected in S-9.



Photograph 29. Largescale stoneroller collected in S-9.



Photograph 30. Redbreast sunfish collected in S-9.



Photograph 31. White sucker collected in S-9.



Photograph 32. Southern studfish collected in S-9.



Photograph 33. Blackbanded darter collected in S-9.



Photograph 34. White sucker collected in S-9.



Photograph 35. Alabama hogsucker collected in S-9.



Photograph 36. Creek chub collected in S-12.



Photograph 37. Redbreast sunfish collected in S-12.



Photograph 38. Green sunfish collected in S-12.



Photograph 39. Yellow bullhead (*Ameiurus natalis*) collected in S-12.



Photograph 40. Bluefin stoneroller (*Campostoma pauciradii*) collected in S-12.



Photograph 41. Alabama hogsucker collected in S-12.



Photograph 42. Blackbanded darter collected in S-12.



Photograph 43. Bluegill collected in S-12.



Photograph 44. White sucker collected in S-12.



Photograph 45. Brown bullhead (*Ameiurus nebulosus*) collected in S-12.



Photograph 46. Snail bullhead (*Ameiurus brunneus*) collected in S-12.



Photograph 47. Redbreast sunfish collected in S-13.



Photograph 48. Bluegill collected in S-13.



Photograph 49. Creek chub collected in S-13.



Photograph 50. Snail bullhead collected in S-13.



Photograph 51. Blackbanded darter collected in S-13.



Photograph 52. White sucker collected in S-13.



Photograph 53. Redbreast sunfish collected in S-14.



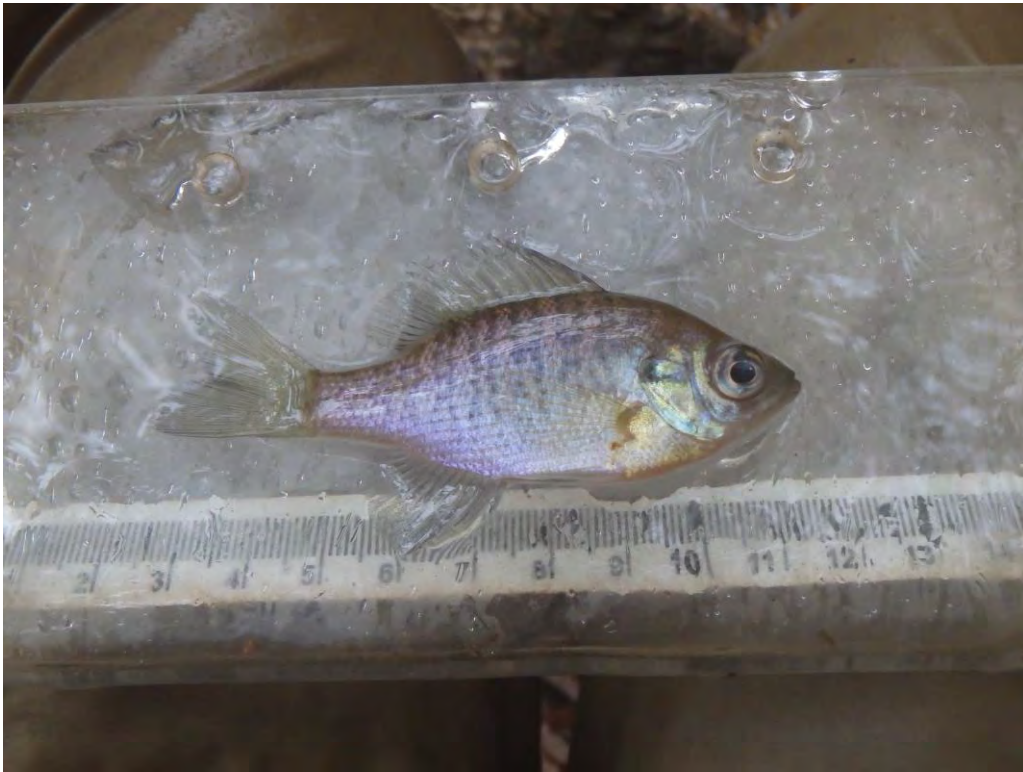
Photograph 54. Creek chub collected in S-14.



Photograph 55. Green sunfish collected in S-14.



Photograph 56. Bluefin stoneroller collected in S-14.



Photograph 57. Bluegill collected in S-14.



Photograph 58. Alabama hogsucker collected in S-14.



Photograph 59. Blackbanded darter collected in S-14.



Photograph 60. White sucker collected in S-14.



Photograph 61. Creek chub collected in S-16.



Photograph 62. Redbreast sunfish collected in S-16.



Photograph 63. Yellow bullhead collected in S-16.



Photograph 64. Green sunfish collected in S-16.



Photograph 65. Blackbanded darter collected in S-16.



Photograph 66. Bluefin stoneroller collected in S-16.



Photograph 67. Blackbanded darter collected in S-17.



Photograph 68. Yellow bullhead collected in S-17.



Photograph 69. Redbreast sunfish collected in S-17.



Photograph 70. Bluefin stoneroller collected in S-17.



Photograph 71. Red shiner (*Cyprinella lutrensis*) collected in S-18.



Photograph 72. Spottail shiner (*Notropis hudsonius*) collected in S-18.



Photograph 73. Brown bullhead collected in S-18.



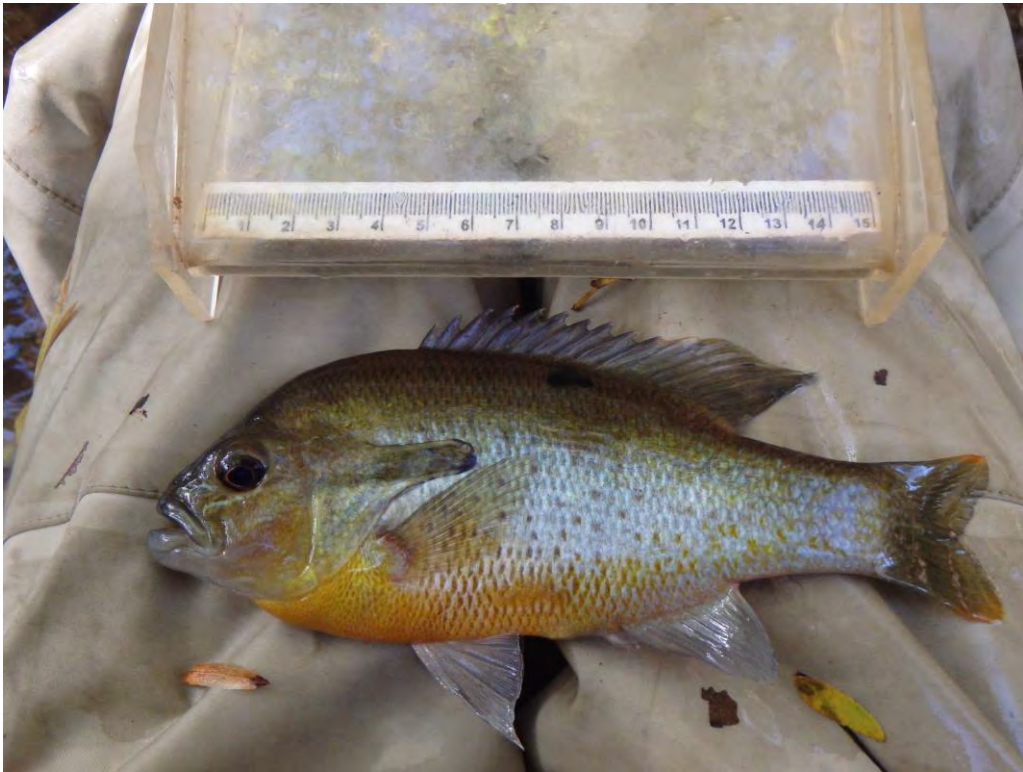
Photograph 74. Bluefin stoneroller collected in S-18.



Photograph 75. Longjaw minnow (*Notropis anoplomala*) collected in S-18.



Photograph 76. Blackbanded darter collected in S-18.



Photograph 77. Redbreast sunfish collected in S-18.



Photograph 78. Bluegill collected in S-18.



Photograph 79. White sucker collected in S-18.



Photograph 80. Largemouth bass collected in S-18.



Photograph 81. Red shiner collected in S-19.



Photograph 82. Spottail shiner collected in S-19.



Photograph 83. Longjaw minnow collected in S-19.



Photograph 84. Blackbanded darter collected in S-19.



Photograph 85. Blacktail shiner collected in S-19.



Photograph 86. Yellow bullhead collected in S-19.



Photograph 87. Bluefin stoneroller collected in S-19.



Photograph 88. Weed shiner collected in S-19.

Appendix G

Crayfish Photographs



Photograph 1. White tubercled crayfish (*Procambarus spiculifer*) collected in S-3 (Alt) (view of carapace and rostrum).



Photograph 2. White tubercled crayfish collected in S-3 (Alt) (view of the chela and rostrum).



Photograph 3. White tubercled crayfish collected in S-1a (view of carapace and rostrum).



Photograph 4. White tubercled crayfish collected in S-1a (view of the chela and rostrum).



Photograph 5. White tubercled crayfish collected in S-4 (view of carapace and rostrum).



Photograph 6. White tubercled crayfish collected in S-4 (view of the chela and rostrum).



Photograph 7. White tubercled crayfish collected in S-5 (view of carapace and rostrum).



Photograph 8. White tubercled crayfish collected in S 5 (view of the chela and rostrum).



Photograph 9. White tubercled crayfish collected in S-7 (view of carapace).



Photograph 10. White tubercled crayfish collected in S-7 (view of the chela and rostrum).



Photograph 11. White tubercled crayfish collected in S-8 (view of carapace).



Photograph 12. White tubercled crayfish collected in S-8 (view of the chela and rostrum).



Photograph 13. White tubercled crayfish collected in S-9 (view of carapace).



Photograph 14. White tubercled crayfish collected in S-9 (view of the chela and rostrum).



Photograph 15. White tubercled crayfish collected in S-12 (view of carapace).



Photograph 16. White tubercled crayfish collected in S-12 (view of the chela and rostrum).



Photograph 17. White tubercled crayfish collected in S-13 (view of carapace).



Photograph 18. White tubercled crayfish collected in S-13 (view of the chela and rostrum).



Photograph 19. White tubercled crayfish collected in S-14 (view of carapace).



Photograph 20. White tubercled crayfish collected in S-14 (view of the chela and rostrum).



Photograph 21. Chattahoochee crayfish (*Cambarus howardi*) collected in S-15 (view of carapace and rostrum).



Photograph 22. Chattahoochee crayfish collected in S-15 (view of the chela and rostrum).



Photograph 23. Variable crayfish (*Cambarus latimanus*) collected in S-15 (view of carapace).



Photograph 24. Variable crayfish collected in S-15 (view of the chela and rostrum).



Photograph 25. Chattahoochee crayfish collected in S-16 (view of carapace and rostrum).



Photograph 26. Chattahoochee crayfish collected in S-16 (view of the chela and rostrum).



Photograph 27. White tubercled crayfish collected in S-16 (view of carapace).



Photograph 28. White tubercled crayfish collected in S-16 (view of the chela and rostrum).



Photograph 29. White tubercled crayfish collected in S-17 (view of carapace).



Photograph 30. White tubercled crayfish collected in S-17 (view of the chela and rostrum).



Photograph 31. White tubercled crayfish collected in S-18 (view of carapace).



Photograph 32. White tubercled crayfish collected in S-18 (view of the chela and rostrum).



Photograph 33. White tubercled crayfish collected in S-19 (view of carapace).



Photograph 34. White tubercled crayfish collected in S-19 (view of the chela and rostrum).



Photograph 35. White tubercled crayfish collected in S-20 (view of carapace).



Photograph 36. White tubercled crayfish collected in S-20 (view of the chela and rostrum).

Appendix H

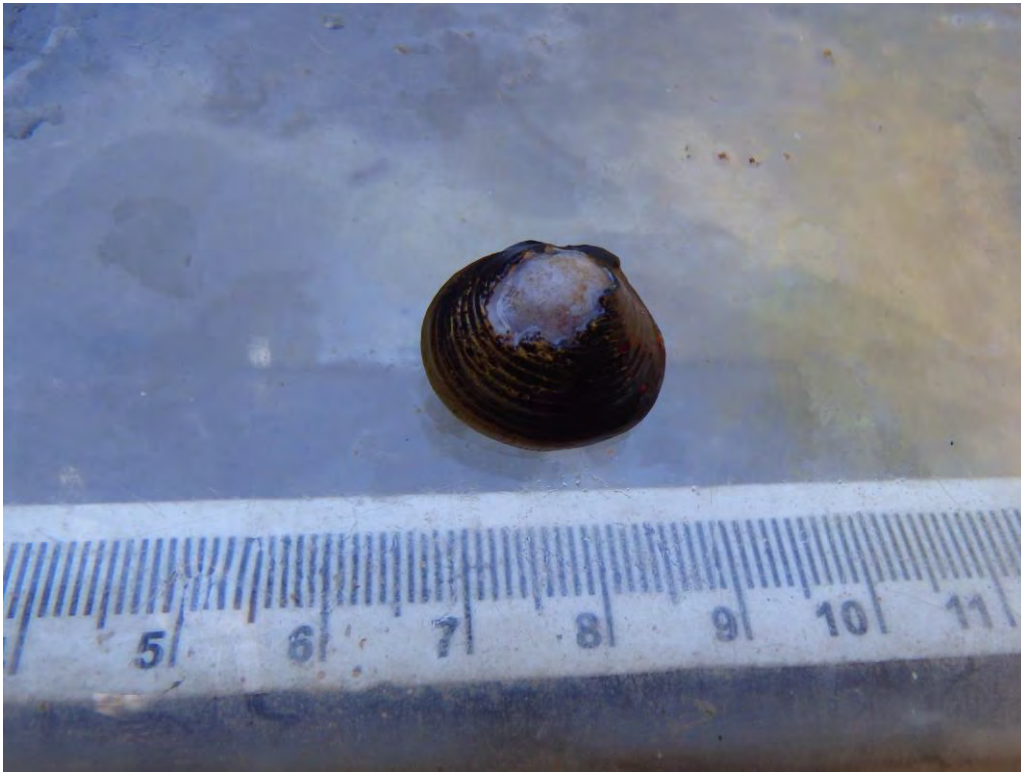
Mollusk Photographs



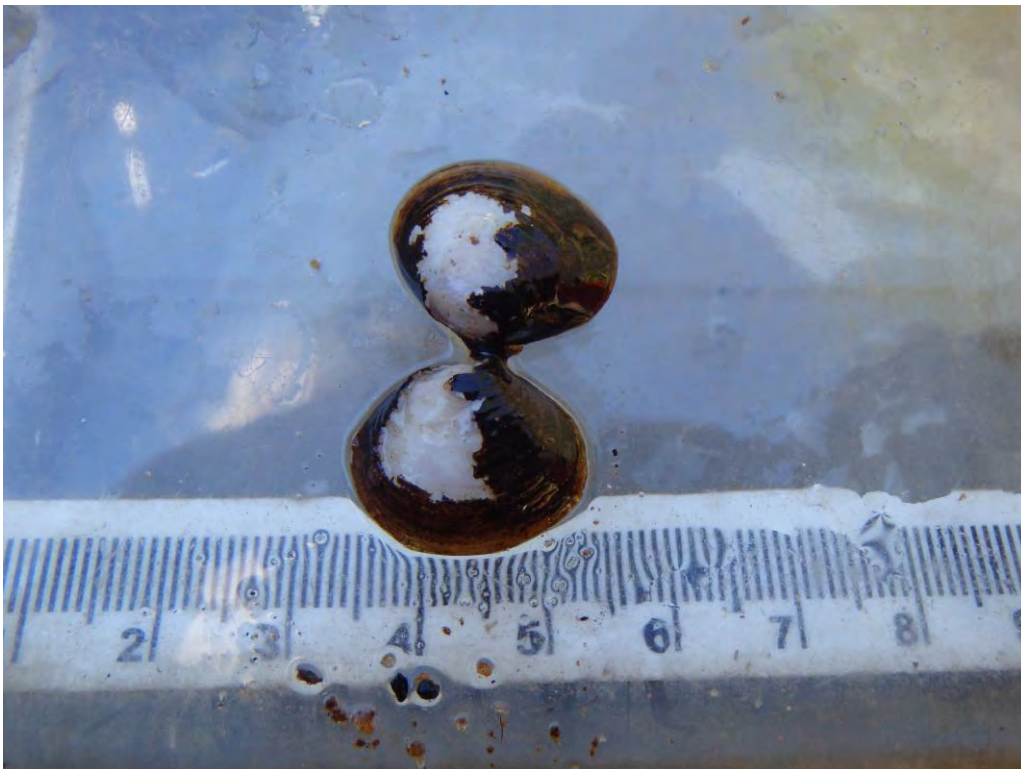
Photograph 1. Asiatic clam (*Corbicula fluminea*) collected in S-3 Alt.



Photograph 2. Asiatic clam collected in S-1a.



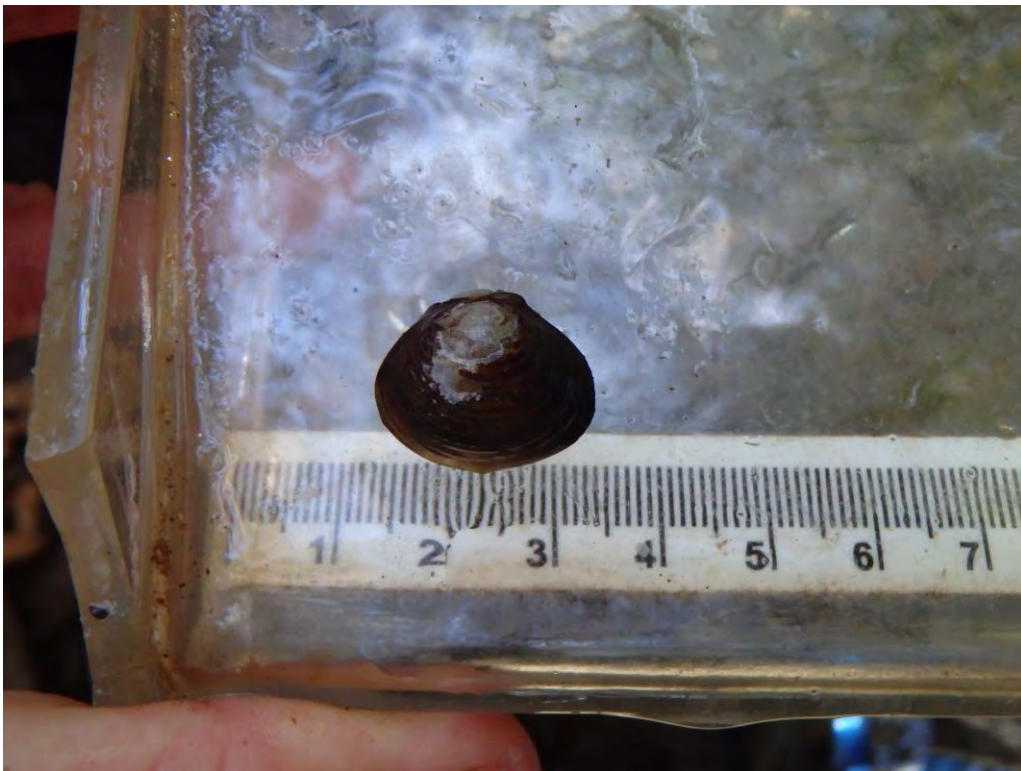
Photograph 3. Asiatic clam collected in S-8.



Photograph 4. Asiatic clam collected in S-12.



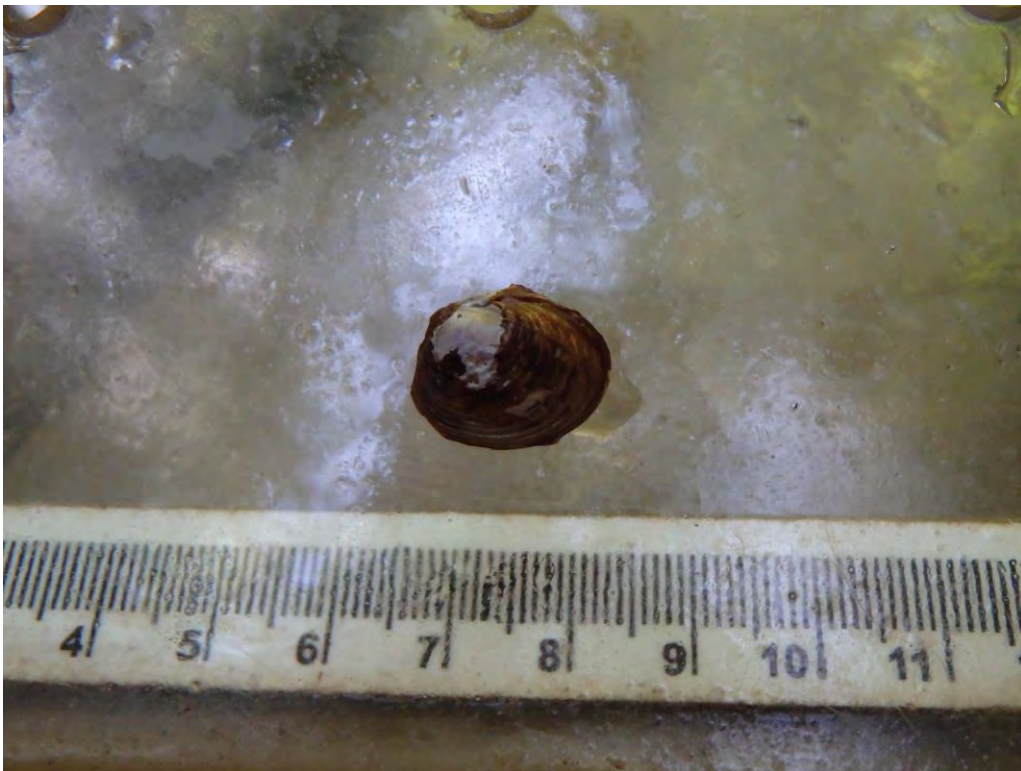
Photograph 5. Asiatic clam collected in S-13.



Photograph 6. Asiatic clam collected in S-14.



Photograph 7. Asiatic clam collected in S-16.



Photograph 8. Asiatic clam collected in S-17.



Photograph 9. Asiatic clam collected in S-18.



Photograph 10. Asiatic clam collected in S-19.