

Freshwater Mussel & Fish Survey Report

Replacement of Bridge No. 245
East Buies Creek on SR 2054
TIP # B-5711
Harnett County, North Carolina

WBS Element # 45665.1.1



East Buies Creek during the survey efforts

Prepared For:



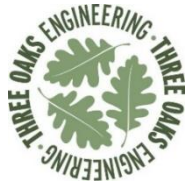
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May 23, 2016

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1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) proposes to replace bridge No. 245 over East Buies Creek on SR 2054 in Harnett County (Appendix A, Figure 1). The project will impact East Buies Creek of the Cape Fear River basin. The Federally Endangered Cape Fear Shiner (*Notropis mekistocholas*) is listed by the U.S. Fish and Wildlife Service (USFWS) for Harnett County. Additionally, the Atlantic Pigtoe (*Fusconaia masoni*) is listed as State Endangered by the North Carolina Wildlife Resources Commission and is being considered for listing by USFWS. Atlantic Pigtoe occurs in Harnett County.

According to the NC Natural Heritage Program database (NCNHP 2015), accessed April 22, 2016, the nearest element occurrence (EO) for Cape Fear Shiner is located in Neills Creek approximately 7.5 river miles (RM) west of the study area. This historical EO is approximately 10 RM in length. It was first observed in August 1962 and was last observed in December 1986. The nearest EO for Atlantic Pigtoe is located in the Cape Fear River approximately 5.5 RM west of the study area. This historical EO is approximately 1.2 RM in length. It was first observed in 1969 and last observed in June 1990.

As part of the federal permitting process that requires an evaluation of potential project-related impacts to federally protected species, Three Oaks Engineering (3Oaks) was contracted by NCDOT to conduct freshwater fish surveys targeting the Cape Fear Shiner and mussel surveys targeting Atlantic Pigtoe.

2.0 WATERS IMPACTED

East Buies Creek is located in the Upper Cape Fear River subbasin of the Cape Fear River Basin (HUC# 03030004). East Buies Creek flows approximately 1 RM from the subject bridge to Buies Creek. Buies Creek flows approximately 1.4 RM to the Cape Fear River.

2.1. 303(d) Classification

East Buies Creek is not on the North Carolina Department of Environmental Quality (NCDEQ, formerly NC Department of Environment and Natural Resources, NCDENR) - Division of Water Resources 2014 303(d) list of impaired streams. The nearest 303(d) listed stream is the Cape Fear River downstream of the subject bridge (NCDENR 2014). It is impaired based due to high copper levels (Figure 3).

2.2. NPDES discharges

The closest permitted NPDES discharge is on the Cape Fear River (USEPA 2016); Angier Wastewater Treatment Plant (NPDES Permit # NC0082597) is approximately 2.1 miles west of the study area. There are also several general stormwater permits in the vicinity and the Harnett County Regional Water Treatment Plan (NPDES Permit # NC0007684) upstream on the Cape Fear River (Figure 3).

3.0 TARGET FEDERALLY PROTECTED SPECIES DESCRIPTIONS

3.1. *Notropis mekistocholas* (Cape Fear Shiner)

3.1.1. *Characteristics*

The Cape Fear Shiner is a small, moderately stocky Cyprinid described by Snelson (1971). The fish's body is flushed pale silvery yellow, with a black band running along the side. The fins are yellowish and somewhat pointed. The upper lip is black, and the lower lip bears a thin black bar along its margin.

The Cape Fear Shiner is distinguished from all other *Notropis* by having an elongated alimentary tract with two convolutions crossing the intestinal bulb. This is believed to be an adaptation for herbivorous feeding, although the species is known to be omnivorous based on gut content analysis (Snelson 1971, USFWS 1988). This adaptation is believed to be useful in that when insectivorous fish populations are high and animal material is correspondingly low, the Cape Fear Shiner is able to thrive by shifting to herbivorous feeding habits (USFWS 2011).

The Cape Fear Shiner is usually found in low numbers in schools with other shiner species such as Highfin Shiner (*Notropis altipinnis*), Swallowtail Shiner (*Notropis procne*), White Shiner (*Luxilus albeolus*), Sandbar Shiner (*Notropis scepticus*), Spottail Shiner (*Notropis hudsonius*), Comely Shiner (*Notropis amoenus*), Satinfin Shiner (*Cyprinella analostana*), and Whitefin Shiner (*Cyprinella nivea*) (Pottern 2009).

3.1.2. *Distribution and Habitat Requirements*

The Cape Fear Shiner is most often found in rocky pools, runs, and riffles with substrates containing gravel, cobble, and/or boulder components. These areas are typical of streams in the Carolina Slatebelt and Raleigh Belt with wide, shallow sections, an open forest canopy, and abundant American water willow (*Justicia americana*), riverweed (*Podostemum* sp.), stream mosses (*Fontinalis* sp.), and filamentous algae. The species may be found in lower-gradient sections of rivers with sand dominated substrate, but usually only in low numbers, presumably as they move between more rocky sections (Pottern 2009). Gravel substrate has been shown to be important for Cape Fear Shiner in feeding and spawning (USFWS 2011). In comparing shiner density with substrate type, Howard (2003) found low shiner density in areas with less gravel availability.

Endemic to the upper Cape Fear River Basin in the Central Piedmont region of North Carolina, Cape Fear Shiner occupies the tributaries and mainstems of the Cape Fear, Deep, Haw and Rocky Rivers in Chatham, Harnett, Lee, Moore, and Randolph counties. Specifically, the current known range extends from SR 1545 (Chicken Bridge Rd) of the Haw River in Chatham County and from Coleridge Dam on the Deep River in Randolph County downstream to Erwin on the mainstem Cape Fear River. Including major tributaries such as the Rocky River, this is a range of approximately 135 RM (Pottern 2009). The lower five miles of the Rocky River and the Deep River between High Falls and Coleridge area are known to have the highest densities of the minnow. The species is known to occupy tributaries to these mainstem rivers, but is typically only found within two miles of the confluence (Pottern 2009).

3.1.3. Threats to Species

Three main conservation threats for the Cape Fear Shiner have been identified: (1) alteration of flow regimes; (2) pollution from anthropogenic sources; and (3) introduction of non-native predators (USFWS 2011). Additionally, the restricted range and small population sizes make this species vulnerable to catastrophic events (USFWS 1988). Catastrophic events may consist of natural events such as flooding or drought, as well as human influenced events such as toxic spills associated with highways, railroads, or industrial-municipal complexes.

Habitat alteration resulting from multiple dam construction projects in the Cape Fear system is likely the most significant factor that contributed to the species decline (USFWS 1988). Upper Cape Fear River Basin dams alter flows and sediment transport and impound key habitat elements critical to the Cape Fear Shiner. These impoundments fragment the species' population and limit genetic exchange, which can increase vulnerability to catastrophic events (USFWS 2011).

Water quality has been identified by Howard (2003) to be a limiting factor for Cape Fear Shiner. Caged shiners in the Haw River saw significant reduction in survival and growth, which was associated with higher concentrations of metals (cadmium, copper, zinc, mercury, lead) and organic contaminants (PAH, PCB, DDT, chlordane) in tested tissues as well as in Haw River water and sediments. Sedimentation resulting from poor agricultural practices or construction projects threatens habitat by smothering key rocky substrates or submerged aquatic vegetation areas.

New predator species introductions could negatively affect the Cape Fear Shiner. Hewitt et al. (2009) noted introductions of Roanoke Bass (*Ambloplites cavifrons*) and Flathead Catfish (*Pylodictis olivaris*) into the upper Cape Fear River Basin could result in a decline of the Cape Fear Shiner within its range.

3.2. *Fusconaia masoni* (Atlantic Pigtoe)

3.2.1. Species Characteristics

The Atlantic Pigtoe was described by Conrad (1834) from the Savannah River in Augusta, Georgia. Although larger specimens exist, the Atlantic Pigtoe seldom exceeds 50 mm in length. Except in headwater stream reaches, where specimens may be elongated, this species is tall relative to its length. The hinge ligament is relatively short and prominent. The periostracum is normally brownish, has a parchment texture, and young individuals may have greenish rays across the entire shell surface. The posterior ridge is biangulate. The interdentum in the left valve is broad and flat. The anterior half of the valve is thickened compared with the posterior half, and, when fresh, nacre in the anterior half of the shell tends to be salmon colored, while nacre in the posterior half tends to be more iridescent. The shell has full dentation. In addition to simple papillae, branched and arborescent papillae are often seen on the incurrent aperture. Salmon colored demibranchs in females is often seen during the spawning season. When fully gravid, females use all 4 demibranchs to brood glochidia (VDGIF 2014).

3.2.2. *Distribution and Habitat Requirements*

The Atlantic Pigtoe range extends from the Ogeechee River Basin in Georgia north to the James River Basin in Virginia (Johnson 1970). The general pattern of distribution indicates that the species is currently limited to headwater areas of drainages, and most populations are represented by few individuals. In North Carolina, it was once found in every major river Atlantic Slope river basin with the exception of the Waccamaw. With the exception of the Tar River, it has not been found in the mainstem of these rivers in recent years (Savidge et al. 2011). It is listed as Endangered in Georgia, South Carolina and North Carolina, and as Threatened in Virginia. It has a NatureServe rank of G2 (imperiled).

The Atlantic Pigtoe occurs in medium size streams to large rivers, but has experienced major declines throughout its entire range. The preferred habitat is a substrate composed of gravel and coarse sand, usually at the base of riffles, however, it can be found in a variety of other substrates and habitat conditions.

3.2.3. *Threats to Species*

The cumulative effects of several factors, including sedimentation, point and non-point discharge, and stream modifications (impoundments, channelization, etc.) have contributed to the decline of this species throughout its range. All of the populations are generally small in numbers and restricted to short reaches of isolated streams. The low numbers of individuals and the restricted range of most of the surviving populations make them extremely vulnerable to extirpation from a single catastrophic event or activity, much like the endangered Dwarf Wedgemussel (DWM, *Alasmodonta heterodon*, Strayer et al. 1996). Catastrophic events may consist of natural events such as flooding or drought, as well as human influenced events such as toxic spills associated with highways, railroads, or industrial-municipal complexes.

Siltation resulting from substandard land-use practices associated with activities such as agricultural, forestry and land development has been recognized as a major contributing factor to degradation of mussel populations. Siltation has been documented to be extremely detrimental to mussel populations by degrading substrate and water quality, increasing potential exposure to other pollutants, and by direct smothering of mussels (Ellis 1936, Marking and Bills 1979). Sediment accumulations of less than one inch have been shown to cause high mortality in most mussel species (Ellis 1936). In Massachusetts, a bridge construction project decimated a population of the DWM because of accelerated sedimentation and erosion (Smith 1981).

Sewage treatment effluent has been documented to significantly affect the diversity and abundance of mussel fauna (Goudreau et al. 1988). Goudreau et al. (1988) found that recovery of mussel populations may not occur for up to two miles below points of chlorinated sewage effluent.

The impact of impoundments on freshwater mussels has been well documented (USFWS 1992a, Neves 1993). Construction of dams transforms lotic habitats into lentic habitats, which results in changes in aquatic community composition. The changes associated with inundation adversely affect both adult and juvenile mussels as well as fish community structure, which could eliminate

possible fish hosts for upstream transport of glochidia. Muscle Shoals on the Tennessee River in northern Alabama, once the richest site for naiads (mussels) in the world, is now at the bottom of Wilson Reservoir and covered with 19 feet of muck (USFWS 1992b). Large portions of all of the river basins within the Atlantic Pigtoe's range have been impounded and this could be a major factor contributing to the decline of the species (Master 1986).

The introduction of exotic species such as the Asian Clam (*Corbicula fluminea*) and Zebra Mussel (*Dreissena polymorpha*) has also been shown to pose significant threats to native freshwater mussels. The Asian Clam is now established in most of the major river systems in the United States (Fuller and Powell 1973) including those streams still supporting populations of the Atlantic Pigtoe. Concern has been raised over competitive interactions for space, food and oxygen with this species and native mussels, possibly at the juvenile stages (Neves and Widlak 1987, Alderman 1995). The Zebra Mussel, native to the drainage basins of the Black, Caspian and Aral Seas, is an exotic freshwater mussel that was introduced into the Great Lakes in the 1980s and has rapidly expanded its range into the surrounding river basins, including those of the South Atlantic slope (O'Neill and MacNeill 1991). This species competes for food resources and space with native mussels, and is expected to contribute to the extinction of at least 20 freshwater mussel species if it becomes established throughout most of the eastern United States (USFWS 1992b). The Zebra Mussel is not currently known from any river supporting Atlantic Pigtoe, nor the Cape Fear River Basin.

3.3. Survey Efforts

Surveys were conducted by 3Oaks personnel Tom Dickinson (Permit # 16-ES00343), Chris Sheats, and Nancy Scott on April 19, 2016.

3.4. Stream Conditions at Time of Survey: East Buies Creek

The survey reach consisted of a series of beaver (*Castor canadensis*) impounded pools and lotic sequences of riffle, run, and pool between the impounded sections. Where it was defined, the channel ranged from 9-22 feet (ft) wide with stable streambanks that ranged from 1 to 3 ft high. Substrate was dominated by sand and pebble with areas of mud, silt, gravel, cobble, and bedrock. Streambanks consisted of clay, silt, and root mats. A wide forested buffer surrounded the surveyed reach.

3.4.1. Fish Surveys

Three Oaks conducted electro-fishing and dip net surveys in East Buies Creek in an approximately 1,640-ft (500 meters) reach, 1,312 ft (400 meters) downstream to 328 ft (100 meters) upstream, of the bridge crossing. All habitat types in the survey reach (riffle, run, pool, slack-water, etc.) were sampled, with special attention given to transition areas between habitat types where fish congregate in response to the instream sampling efforts.

Relative abundance reported was estimated using the following criteria:

- (VA) Very abundant > 30 collected at survey station
- (A) Abundant: 16-30 collected at survey station
- (C) Common: 6-15 collected at survey station
- (U) Uncommon: 3-5 collected at survey station
- (R) Rare: 1-2 collected at survey station

It should be noted that relative abundances of particular species can be affected by survey methodologies and site conditions. Thus some species, particularly those that are found in deeper pools and runs and those that can seek cover quickly, may be under-represented at a sample site. Electro-fishing and netting times also vary depending on daily survey conditions and other variables, making direct site comparisons difficult.

The survey efforts utilized one Smith-Root LR-24 backpack electro-fishing unit and dip-nets. A total of 412 electro-shocking seconds were spent during which the 10 species in Table 1 were located. While appropriate habitat was present, the target Cape Fear Shiner was not found.

Table 1. Fish survey results in East Buies Creek

Scientific Name	Common Name	Relative Abundance
<i>Anguilla rostrata</i>	American Eel	R
<i>Centrarchus macropterus</i>	Flier	R
<i>Erimyzon oblongus</i>	Creek Chubsucker	A
<i>Esox americanus</i>	Redfin Pickerel	C
<i>Lepomis auritus</i>	Redbreast Sunfish	U
<i>Lepomis gulosus</i>	Warmouth	R
<i>Lepomis macrochirus</i>	Bluegill	U
<i>Lepomis microlophus</i>	Redear Sunfish	U
<i>Notemigonus crysoleucas</i>	Golden Shiner	A
<i>Percina crassa</i>	Piedmont Darter	R

3.4.2. Mussel Surveys

Mussel surveys were conducted from approximately 1,312 ft (400 meters) downstream of the respective bridge crossing to approximately 328 ft (100 meters) upstream of the crossing for a distance of approximately 1,640 ft (500 meters) (Figure 1). Areas of appropriate habitat were searched, concentrating on the stable habitats preferred by the target species. The survey team spread out across the creek into survey lanes. Visual surveys were conducted using glass bottom view buckets (bathyscopes). Tactile methods were employed, particularly in streambanks under submerged rootmats. All freshwater bivalves were recorded and returned to the substrate. Timed survey efforts provided Catch Per Unit Effort (CPUE) data for each species. Relative abundance for freshwater snails and freshwater clam species were estimated using the following criteria:

- (VA) Very abundant > 30 per square meter
- (A) Abundant 16-30 per square meter
- (C) Common 6-15 per square meter
- (U) Uncommon 3-5 per square meter
- (R) Rare 1-2 per square meter
- (P-) Ancillary adjective “Patchy” indicates an uneven distribution of the species within the sampled site.

3.5. Results

A total of 4.75 person hours of survey time were spent in the reach, with relic shells of two species of freshwater mussel, the Eastern Elliptio (*Elliptio complanata*) and Florida Pondhorn (*Unio merus caroliniana*) being found (Table 1). The only other mollusk species found during the survey was the aquatic snail Pointed Campeloma (*Campeloma decisum*).

Table 2. CPUE for Freshwater Mussels in East Buies Creek

Scientific Name	Common Name	# live	Abundance/ CPUE
Freshwater Mussels			CPUE
<i>Elliptio complanata</i>	Eastern Elliptio	~	~
<i>Unio merus caroliniana</i>	Florida Pondhorn	~	~
Freshwater Snails and Clams			Relative Abundance
<i>Campeloma decisum</i>	Pointed Campeloma	~	P-C

4.0 DISCUSSION/CONCLUSIONS

The results indicate that the study area supports a freshwater fish fauna of common species. While the relic shell evidence found indicate that the area once supported a freshwater mussel fauna, fluctuating inundation by beaver dams is limiting occupation. Neither the Cape Fear Shiner nor Atlantic Pigtoe were found during the surveys.

Based on these survey results, impacts are unlikely to occur in the study area. Strict adherence to erosion control standards should minimize the potential for any adverse impacts to occur. Biological conclusions on potential impacts from the project are provided below.

Biological Conclusion Cape Fear Shiner: No Effect

The USFWS is the regulating authority for Section 7 Biological Conclusions and as such, it is recommended that they be consulted regarding their concurrence with the finding of this document.

While the Atlantic Pigtoe is not currently federally protected and no biological conclusion is necessary at the time of the writing of this report, if the species were to receive federal protection an appropriate biological conclusion is as follows:

Biological Conclusion Atlantic Pigtoe: No Effect

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APPENDIX A

Figures

