

**Establishment of a monitoring program for freshwater mussels  
in the Chattooga River, SC and GA**



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Project Proposal  
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## Background

In 2004, the Francis Marion-Sumter National Forest (FMSNF) requested assistance from the USDA Forest Service, Southern Research Station, Center for Aquatic Technology Transfer (CATT) with design of a long-term monitoring program for freshwater mussels in the Chattooga River watershed. The stated goal of the FMSNF is to detect trends in mussel populations, focusing on *Alasmidonta varicosa* (brook floater or swollen wedgemussel). The Savannah River drainage is the southern range extent for *A. varicosa*, which is a Federal Species of Concern (a species that may or may not be listed in the future; formerly Category 2 candidate species or species under consideration for listing for which there is insufficient information to support listing), and species of State Concern in South Carolina. Previous mussel surveys in the Chattooga River watershed have documented live specimens of three species: *A. varicosa*, *Elliptio angustata*, and *Elliptio producta* (Alderman 2002, Alderman 2004). We also found relic shell material of *Elliptio complanata* (Appendix B, site 3) and *Corbicula fluminea* (Appendix A, site 1) while examining potential sample sites for this monitoring program. The upstream extent of *A. varicosa* was near the confluence with Warwoman Creek at Earls Ford. *Elliptio* species have been documented as far upstream as the Highway 28 bridge.

The Chattooga River watershed drains approximately 180,000 acres with 122,000 acres under Federal Management in the FMSNF in South Carolina, Nantahala National Forest in North Carolina, and Chattahoochee-Oconee National Forest in Georgia (Figure 1). In 1974 Congress designated 57 miles of the Chattooga River as Wild and Scenic River. The FMSNF administers river uses associated with the Chattooga Wild and Scenic River Corridor (Thomas 2004). The watershed is popular for a number of uses, including fishing, hiking, and horseback riding and contains sections of world-class whitewater rafting and kayaking.

In November 2004, biologists from the CATT, FMSNF, and the Regional Office visited several sites in the Chattooga River watershed to determine a cost-effective approach for a long-term mussel monitoring program. Several factors favor the establishment of a monitoring program:

- The target species is easy to identify,
- There are several good river access points at boat landings and trail crossings,
- Mussels in shoal areas can be found easily with viewing buckets and snorkel gear.

However, the following factors limit certain aspects of the program:

- Personnel, budget, and time constraints will preclude thorough excavation and processing of substrate samples necessary to estimate population characteristics such as recruitment and length-frequency distributions,

- Deep pools and river reaches between access points cannot be sampled economically due to the need for scuba equipment and difficulty of navigation on the river,
- It is not possible to differentiate *Elliptio angustata* and *Elliptio producta* consistently.

Given the information available from previous inventories and the above considerations, we propose the following monitoring program for mussels in the Chattooga River.

## Monitoring Program Methods

### Objective

- Determine if there is a significant change in mussel density estimates for *Alasmidonta varicosa* and *Elliptio spp.*, as determined using quadrat inventories, between 2005 and 2010 in study area of the Chattooga River

### Target Species

- *Alasmidonta varicosa*
- *Elliptio angustata*, *E. producta*, and *E. complanata* (combined as *Elliptio spp.*)

### Study Area

- Downstream extent: Camp Creek at confluence with Chattooga River; Upstream extent: 708 bridge upstream of confluence with King Creek; road S884 (in Georgia) crossing on the West Fork Chattooga River

### Access Points

Site Number	Site Name	Parking	Hike Time (minutes)
01	Camp Creek	755, Turkey Ridge Rd., at 755F	20
02	Long Creek	755, Turkey Ridge Rd., end	40
03	Woodall Shoals	757, Woodall Shoals Rd, end	5
04	Highway 76 Bridge	Highway 76 at bridge	5
05	Thriffts Ferry	795, end	6
06	Fall Creek	769, end	10
07	Buckeye Branch	723, end	6
08	Sandy Ford	721A, end	5
09	Islands	721 at 721C on parking loop	20
10	Earls Ford/Warwoman Creek	721, end	5
11	Adeline Branch	779, Low Water Bridge Rd., pull-off	6
12	Highway 28 Wildlife Area	Highway 28, viewing area	1
13	Highway 28 Bridge	Highway 28, GA side of bridge	1
14	Lick Log Creek	50, Nicholson Ford Road, end	20
15	708 Bridge	708 bridge, on shoulder	1
16	S884 bridge (West Fork Chattooga)	86, Overflow Cr. Rd, at bridge	1

### Study Design

- Up to 16 permanent sample sites chosen based on access
- At each site, employ systematic sampling design consisting of 3 randomly located arrays of 0.25 m<sup>2</sup> quadrats
- Quadrats will be searched visually using viewing bucket or snorkel gear and with light disturbance of substrate; no comprehensive excavation of substrate and subsequent estimates of recruitment or length-frequency distributions will be undertaken

Permanent sample sites will be located in shallow stream reaches near land access points. Only stream sites that can be sampled by viewing bucket or snorkel gear (i.e. wadeable areas) will be sampled to eliminate need for scuba equipment. Because of difficulty of navigation on the Chattooga, no efforts will be made to sample sites accessible only by water. To facilitate precise relocation of sites for future sampling, site locations will be documented thoroughly with written descriptions, measurements, site drawings, digital photographs, and GPS points.

Mussel density will be estimated at each site using systematic sampling with three random starts (Strayer and Smith 2003). Each random start will represent a single sample consisting of a systematic grid array of 0.25 m<sup>2</sup> quadrats. Total sampling effort at each site will depend on the size of the site and will be determined so as to sample 2.5% of total wadeable area at the site. Total wadeable area will be measured for each site prior to conducting mussel sampling so that sample locations can be determined in advance.

Individual quadrats will be sampled by searching the substrate visually before and after light disturbance of the surface of the substrate by hand. Light disturbance increases the chances of finding mussels buried just below the surface or covered with a thin layer of sediment. Because some mussels may be buried deeply in the substrate, this method is assumed to miss some unknown fraction of mussels present at any given site. Further, very small mussels are often missed by visual inspection of the substrate, so this method will also likely underestimate abundance of juveniles. Complete excavation of quadrats and processing substrate across a series of graded sieves is necessary to eliminate these two sources of bias. However, excavation of substrate is very time-consuming and is not feasible for many routine monitoring programs. With regard to the stated goals of the FMSNF, sampling a larger number of sites using a method with acknowledged sources of bias is preferable to obtaining more detailed and less biased estimates at one or a few sites. All live mussels will be measured and returned to the substrate. Relic shells will be collected and returned to the lab.

This sampling program is designed to assess most effectively changes over time *at the level of the entire river reach* designated as the study area. In this approach, some sites may decline, others may increase, and others may stay the same, but we are interested primarily in the overall state of the resource throughout the river. The basic analytical approach is to use a paired t-test to assess differences in mussel density at time a and time b, using as pairs, observations at each site at the two times (Strayer and Smith 2003). It may also be possible to examine each site individually, depending on how many mussels are encountered. However, in interpreting site-specific changes, it will always be difficult to tease apart natural changes from non-natural ones and the real strength of this approach is to make a river-wide assessment.

## **Literature Cited**

Alderman, J. M. 2002. Freshwater mussel survey, Chattahoochee-Oconee National Forests. Final Report to the Chattahoochee-Oconee National Forest, Contract Number 43-435H-1-0118.

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Bogen, A. E., and J. M. Alderman. 2004. Workbook and key to the freshwater bivalves of South Carolina.

Strayer, D. L., and D. R. Smith. 2003. A guide to sampling freshwater mussel populations. American Fisheries Society, Monograph 8, Bethesda, Maryland.

Thomas, J. 2004. Summary of the revised land and resource management plan; final environmental impact statement. Sumter National Forest, Columbia, South Carolina.

## **Appendix A: Sample Site Locations**

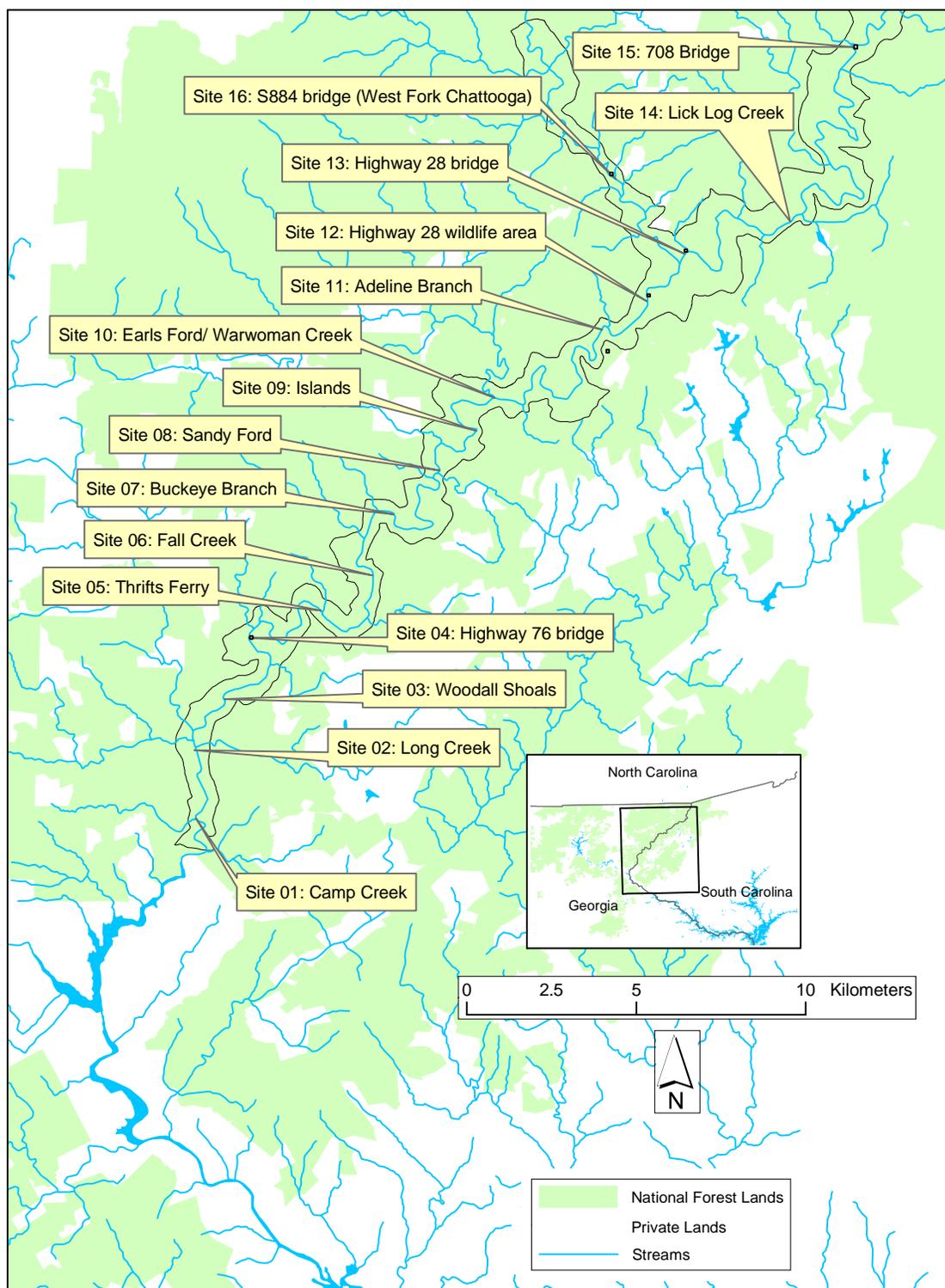


Figure 1. Location of access points to shoal area sample sites on the Chattooga River and West Fork Chattooga River. Chattahoochee-Oconee National Forest (GA) and Francis Marion-Sumter National Forest (SC) shown in green, National Wild and Scenic River Corridor outlined in black.

Corrected GPS coordinates for sample sites on the Chattooga River. Recorded in UTM Zone 17, NAD27, meters.

Site Number	Site Name	GPS Location	Easting (X)	Northing (Y)
01	Camp Creek	Gravel bar at middle of site	287401.3215	3849544.460
02	Long Creek	Confluence with Long Creek	287411.8456	3851696.563
03	Woodall Shoals	Upstream end of bedrock rapids, downstream of site	288256.1653	3853125.554
04	Highway 76 Bridge	Middle of site, on beach area	289053.3170	3854986.340
05	Thriffs Ferry	None recorded		
06	Fall Creek	Middle of site, at small creek bed in on right	292607.3215	3856902.123
07	Buckeye Branch	On bedrock at end of trail	293263.1608	3858353.980
08	Sandy Ford	End of trail	294660.0919	3859903.642
09	Islands	Most upstream set of islands on quad map	295272.4041	3861207.418
10	Earls Ford/Warwoman Creek	Middle of site, on beach	296262.2902	3861960.793
11	Adeline Branch	Riffle/run downstream of Adeline Branch confluence	299434.6452	3863976.365
12	Highway 28 Wildlife Area	Center of first riffle downstream of parking area	300759.6063	3864858.312
13	Highway 28 Bridge	Downstream side of bridge	301873.3351	3866256.373
14	Lick Log Creek	Downstream of confluence with Lick Log, in riffle	305065.9557	3867327.492
15	708 Bridge	Middle of bridge	306805.6262	3872269.258
16	S884 bridge (West Fork Chattooga)	Confluence with Overflow Creek	299793.6763	3868509.002

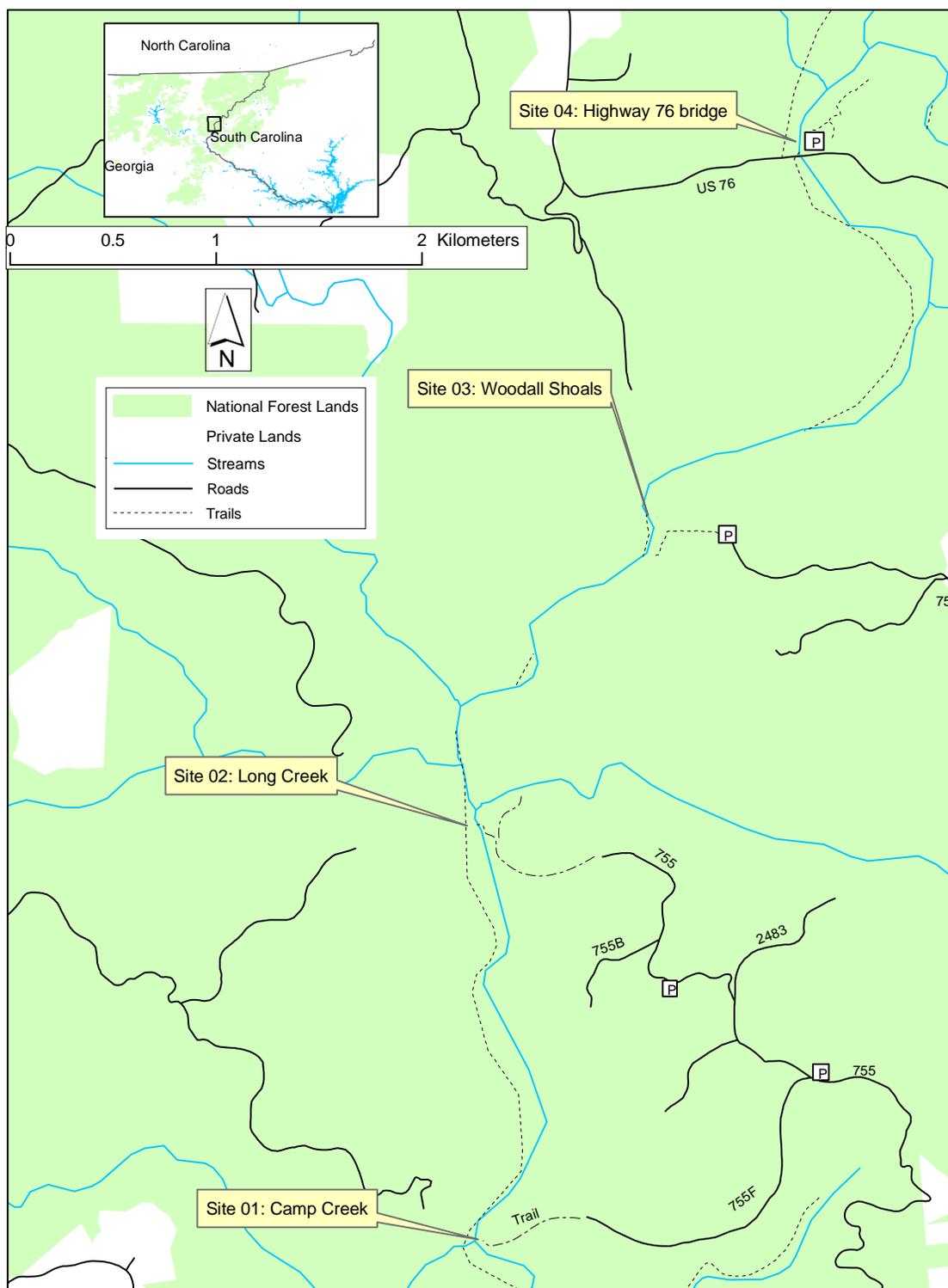


Figure 2. Location of sites 01 – 04: Camp Creek, Long Creek, Woodall Shoals, and Highway 76 access points on the Chattooga River.

**Site Number:** 01

**Site Name:** Camp Creek

**Quadrangle:** Rainy Mountain

**Road Access:** From Seneca take 76, 20 mi. Left on 96 (Damascus Rd.) at Long Creek Fire Dept., 0.9 mi. Right on 102 (Battle Creek Rd.), 1.8 mi. Right on Turkey Ridge Rd. (easy to miss gravel road), 2.2 mi. Park at 755F on left.

**Trail Access:** Walk roadbed to river (closed 1/3 of way to the river no turn around), Camp Creek on left side of Chattooga River (looking upstream). 20 min walk.

**GPS:** at gravel bar

**Length (m):** 56 m

**Width (m):** 7m

**Bank (looking upstream):** NA

**Comments:**

755F looks drivable but is not, hike down roadbed about 20 min to reach Chattooga, Camp Creek immediately across stream. Site 56 m long with Camp Creek at 25 m. Found 1 relic *A. varicosa* and 1 relic *Corbicula fluminea*.

**Drawing:**



**Site 01, Camp Creek**  
**Pictures:**



looking downstream from upstream end of site



looking upstream from downstream end of site

**Site Number:** 02

**Site Name:** Long Creek

**Quadrangle:** Rainy Mountain

**Road Access:**

Same as site 01 except continue to end of 755 (Turkey Ridge Rd.). Park at loop just after 2483, 0.6 mi past 755F.

**Trail Access:**

Hike 15 min past loop, pass 755B, hit another small turn around, take trail into scenic area on right. Several hundred meters before trail hits Long Creek take left downhill on steep footpath. Total 40 min hike from parking area.

**GPS:** At confluence with Long Creek

**Length (m):** NA

**Width (m):** NA

**Bank (looking upstream):** NA

**Comments:**

River flooded and running brown after heavy rain. No site selected. Choose upstream or downstream of Long Creek falls this summer. No relics found.

**Drawing:** NA

**Site 02, Long Creek**  
**Pictures:**



looking upstream, Long Creek confluence on right, 15m high falls to right on Long Creek  
note: river flooded, no site selected here yet

**Site Number:** 03

**Site Name:** Woodall Shoals

**Quadrangle:** Rainy Mountain

**Road Access:** From 755. Left on 102, 1.5 mi. Left on 538 (Orchard Rd.) pass Chattooga River Resort, 2 mi. Left on 757 (Woodall Shoals Rd.-gravel), fork at 1.4 mi - stay right, downhill, total 2.3 mi. to big parking loop.

**Trail Access:** Trail to left of kiosk, 5 minute walk down trail. Climb over bedrock upstream of trail to access shoal area on right side of stream – couldn't get there today, flooded

**GPS:** Yes, at rapids, downstream of site – water too high to get to shoal area we visited last winter

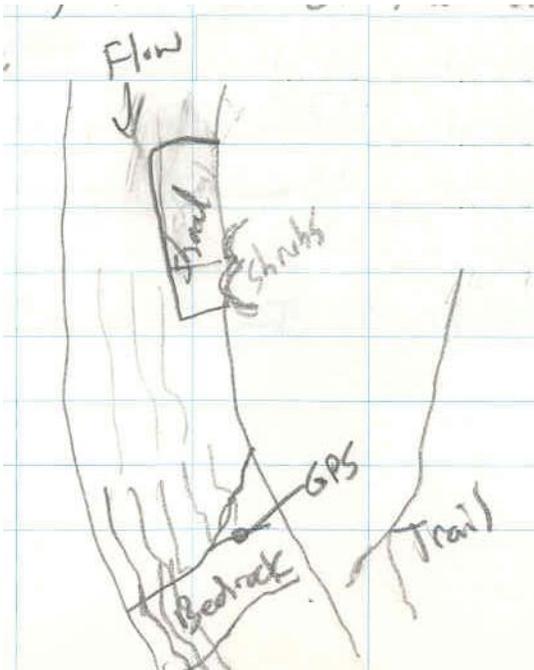
**Length (m):** NA

**Width (m):** NA

**Bank (looking upstream):** Right

**Comments:** Site starts upstream of bedrock on right. Toads copulating in potholes in class 6 rapids bedrock. Lots of trillium on trail down. Found 4 relic *A. varicosa* and 5 relic *Elliptio*.

**Drawing:**



**Site 03, Woodall Shoals**  
**Pictures:**



looking upstream from bedrock in rapids, shoal area is on the right where rocks and shrubs protrude out into river

**Site Number:** 04

**Site Name:** Highway 76 Bridge

**Quadrangle:** Rainy Mountain

**Road Access:** From 757 (Woodall Shoals Road). Left on 538 (Orchard Rd.), 0.3 mi. Left on 76, 2.3 mi to parking area with facilities - bathroom, picnic area - on right.

**Trail Access:** Paved trail to the river comes to center of shoal area, 5 min walk

**GPS:** Yes, center of reach

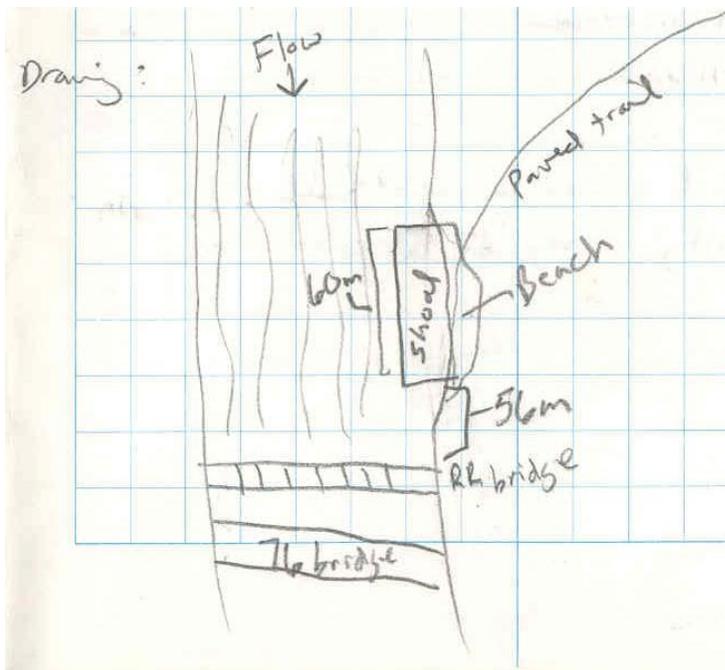
**Length (m):** 60 m measured

**Width (m):** 8-10 m estimated

**Bank (looking upstream):** Right

**Comments:** Start 56 m upstream of metal railroad bridge, sandy area on right here. Site upstream of 76 bridge. Found 1 relic *A. varicosa* and 3 *Elliptio*.

**Drawing:**



**Site 04, Highway 76 Bridge**  
**Pictures:**



looking downstream from upstream end of site, note metal railroad bridge in background



looking upstream from downstream end of site, note beach area on right

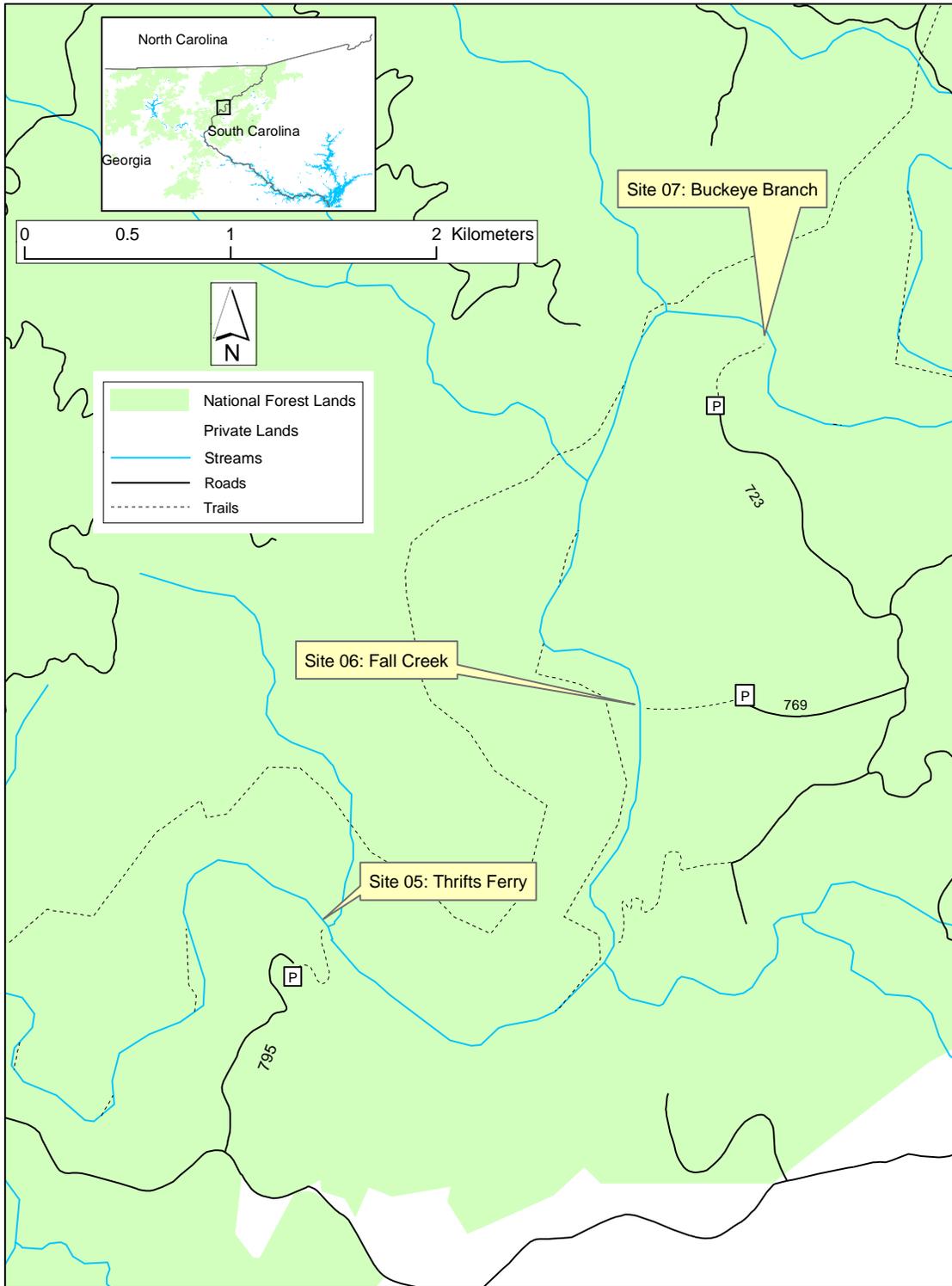


Figure 3. Location of sites 05 – 07: Thrifts Ferry, Fall Creek, Buckeye Branch, and Sandy Ford access points on the Chattooga River.

**Site Number:** 05

**Site Name:** Thrifts Ferry

**Quadrangle:** Rainy Mountain

**Road Access:** From Orchard Rd. Left on 76, 1.3 mi. Right on 795 (gravel), 0.6 mi to parking loop.

**Trail Access:** Trail to right of kiosk. 6 min. hike to boat landing area.

**GPS:** None

**Length (m):** NA

**Width (m):** NA

**Bank (looking upstream):** NA

**Comments:**

Water too high to pick site. Lots of deep slow water, may need to move up or downstream. Found 1 relic *Elliptio*. Small tributary comes in upstream of boat landing, may be workable area.

**Drawing:** NA

**Site 05, Thrifts Ferry**  
**Pictures:**



looking upstream at boat landing area on right, tail comes to boat landing, no site selected here yet

**Site Number:** 06

**Site Name:** Fall Creek

**Quadrangle:** Rainy Mountain

**Road Access:** From 795. Left on 76, 0.9 mi. Left on 196 at Chattooga River Adventures, 2.0 mi. Left on Falls Creek Rd. (gravel), 0.3 mi. Left on 722, 2.3 mi. Left on 769, 0.5 mi to loop parking area.

**Trail Access:** 10 min. hike down trail.

**GPS:** At creek bed on right, middle of site

**Length (m):** 70 m measured

**Width (m):** 8-10 estimated

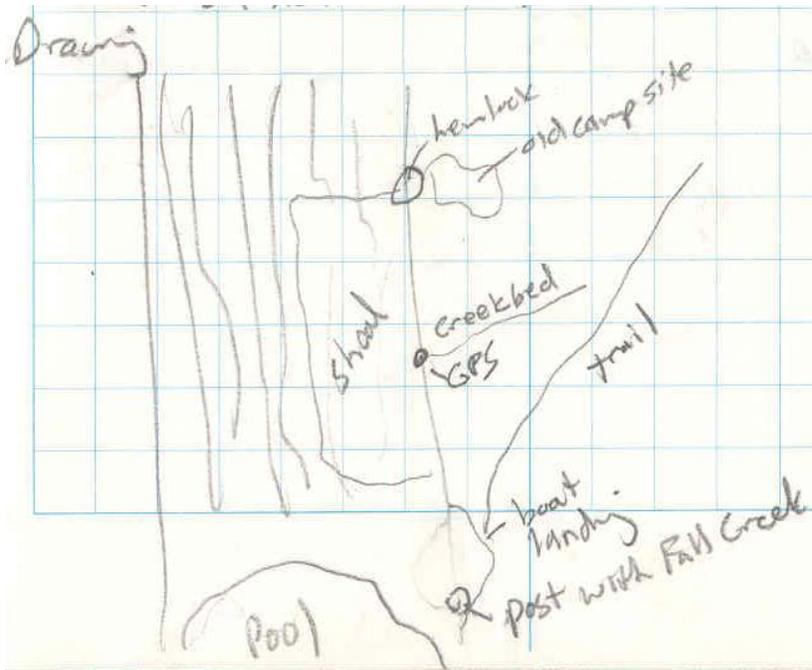
**Bank (looking upstream):** Right

**Comments:**

**\*\*Serious pine beetle damage, do not try to hike in on a windy day. Wear hard hats.\*\***

Start site 32 m upstream of Falling Creek log post sign at downstream end of landing. Small creek bed at 32 m 1.0 m wide in on right. End at big hemlock on right bank. No relics found.

**Drawing:**



**Site 06, Falls Creek**  
**Pictures:**



looking downstream from upstream end of site, shoal on left in photo



looking upstream from downstream end of site, note post in lower left – says Falls Creek Tr., shoal on right in photo

**Site Number:** 07

**Site Name:** Buckeye Branch

**Quadrangle:** Rainy Mountain

**Road Access:** From 769. Left on 722, 0.3 mi. Left on 723, 0.9 mi. to loop.

**Trail Access:** 6 minutes down very steep trail.

**GPS:** Yes on bedrock, right bank at trail end

**Length (m):** NA

**Width (m):** NA

**Bank (looking upstream):** NA

**Comments:** Trail ends at corner pool will need to move site upstream or downstream of here. No relics found here.

**Drawing:** NA

**Site 07, Buckeye Branch**  
**Pictures:**



end of trail, no site selected here yet

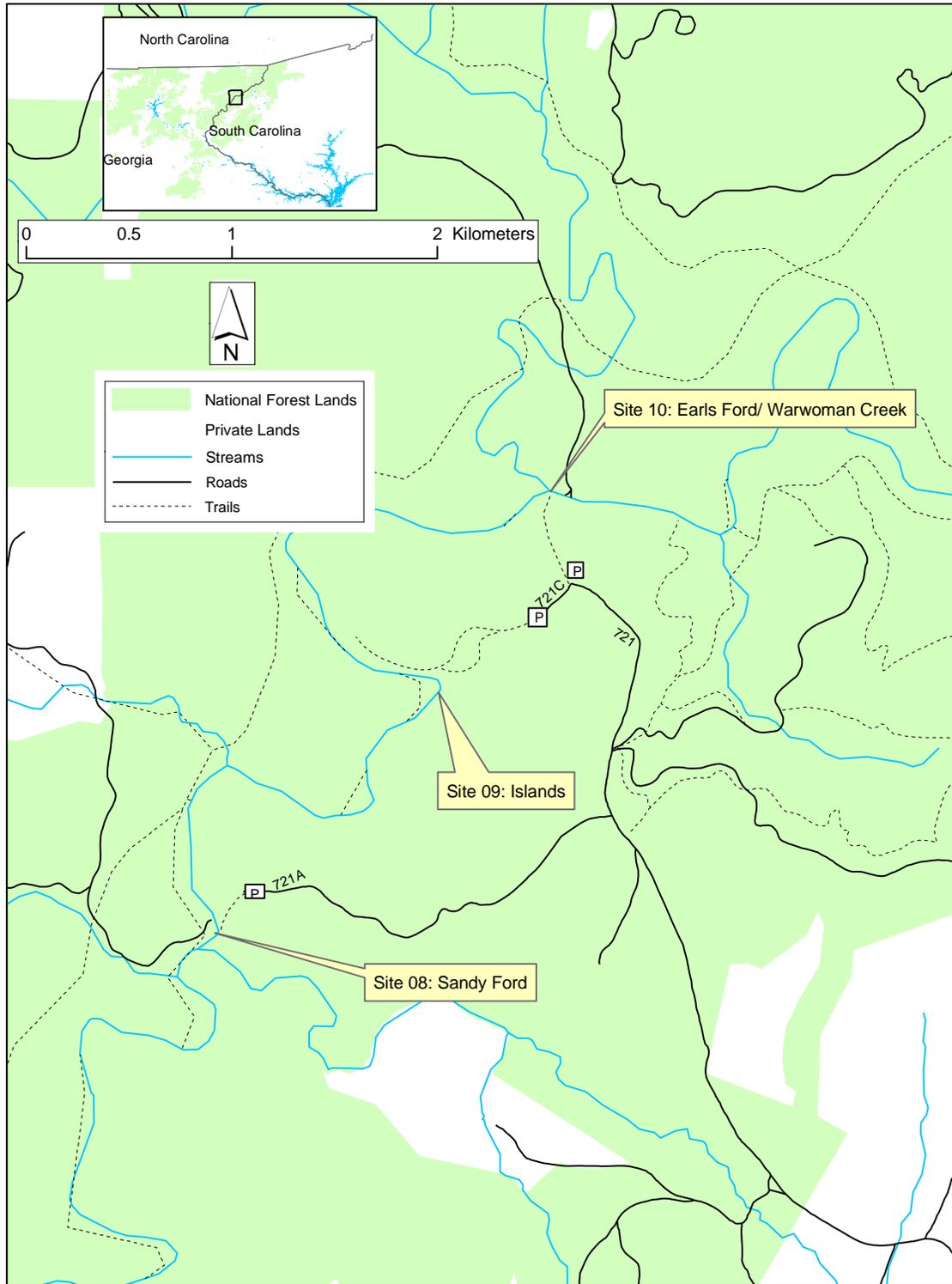


Figure 4. Location of sites 08 – 10: Sandy Ford, Islands, and Earls Ford/Warwoman Creek access points on the Chattooga River.

**Site Number:** 08

**Site Name:** Sandy Ford

**Quadrangle:** Whetstone

**Road Access:** From 722. Left on 196, 3.8 mi. Left on 193 (Earls Ford Rd.) turns to gravel (road 721) 1.8 mi., keep going straight, horse camp at 2.7 mi., at 3.0 mi left on 721A, 1.5 mi. to parking loop.

**Trail Access:** 5 min. hike down easy trail end up directly across from beach on GA side, Sandy Ford

**GPS:** Yes, at trail end

**Length (m):** NA

**Width (m):** NA

**Bank (looking upstream):** NA

**Comments:** Will have to go up or downstream for access or access from GA side. On outside of bend here though it may be shallow enough during low water. No relics found here.

**Drawing:** NA

**Site 08, Sandy Ford**  
**Pictures:**



looking across river to GA side, note sandy beach with road on GA side, car camping on GA side, no site selected here yet

**Site Number:** 09

**Site Name:** Islands

**Quadrangle:** Whetstone

**Road Access:** No good access. From 721A. Left on 721, 0.7mi, big turnaround area on left with 721C coming off back side of loop.

**Trail Access:** Hike 721C past first camping area, pile of rocks to camping area with two sets of tank traps. Take trail over set of tank traps to left (not right). Follow drainage downhill to creek. Follow trail along creek to river. Bail-off trail to right where creek hits river. Easy 20 minute hike. Vegetation thick around creek but hike upstream and it opens. Mostly deep fast water until next island/rapids upstream. No relics found. May be able to work right bank during low flows. Tough site!

**GPS:** Yes, at islands/rapids to upper islands

**Length (m):** NA

**Width (m):** NA

**Bank (looking upstream):** NA

**Comments:** May want to use as reserve site. Hard to find and not many good shoal areas. No relics found here.

**Drawing:** NA

**Site 09, Islands**  
**Pictures:**



looking upstream at island in middle of channel, possible site on right in photo

**Site Number:** 10

**Site Name:** Earls Ford/Warwoman

**Quadrangle:** Satolah

**Road Access:** From 721A. Left on 721, 0.8mi.

**Trail Access:** 5 minute hike down trail to large sandy beach area directly across stream from Warwoman Creek confluence.

**GPS:** Yes, at midpoint of shoal

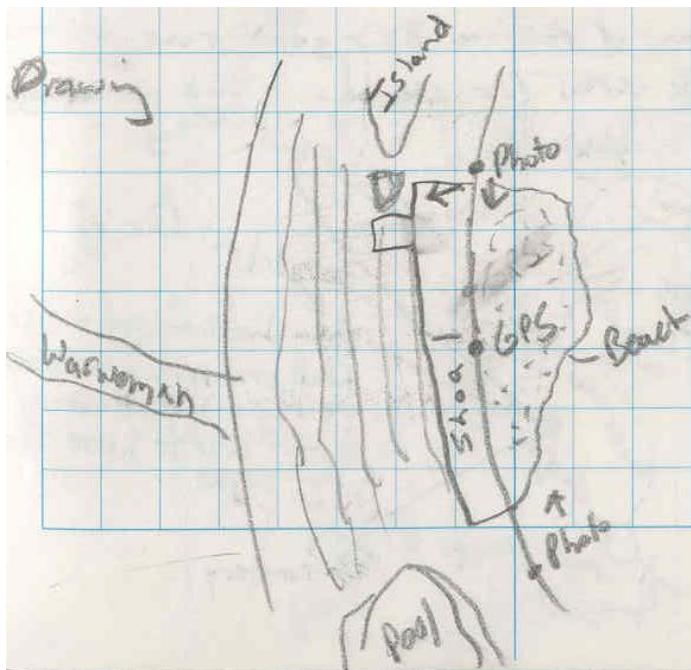
**Length (m):** 80 m measured

**Width (m):** 8-10 m estimated

**Bank (looking upstream):** Right

**Comments:** Start at downstream end of sandbar, end at island. Two relic *Elliptio* found.

**Drawing:**



**Site 10, Earls Ford/Warwoman**  
**Pictures:**



looking downstream from upstream end of site, shoal on left in photo



looking upstream from downstream end of site, note beach on right, Warwoman Creek confluence on left, shoal along beach in photo

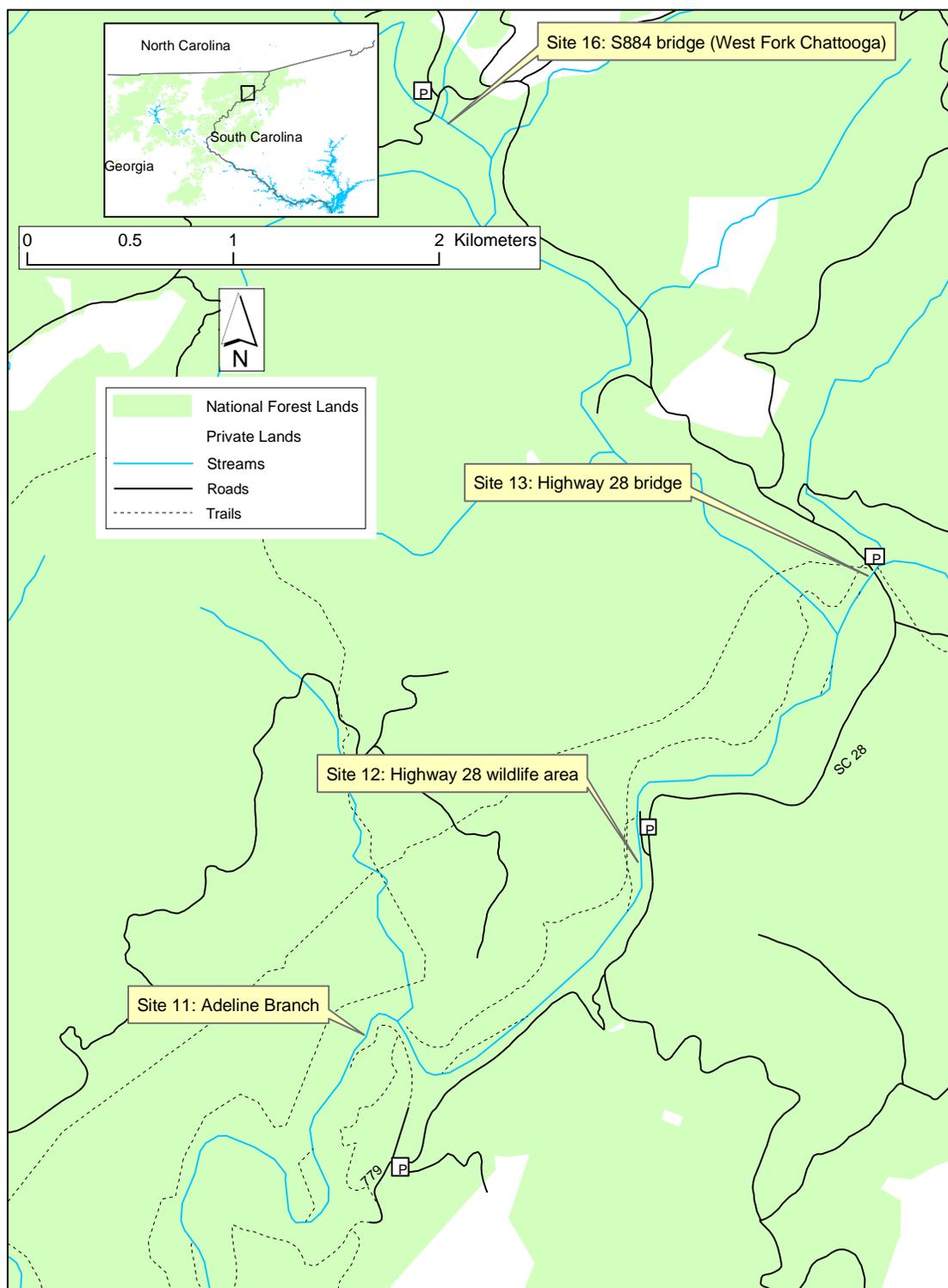


Figure 5. Location of sites 11 – 13 and 16: Camp Big Shoals, Highway 28 wildlife area and Highway 28 bridge access points on the Chattooga River, and S884 bridge access point on the West Fork Chattooga River.

**Site Number:** 11

**Site Name:** Adeline Branch

**Quadrangle:** Satolah

**Road Access:** From Seneca: Take 28W (14.6 mi to 193/28 intersection at Trading Post), 23 mi. Left on Low Water Bridge Rd., 1.1 mi to small pull-off on right at intersection with road to left going uphill and straight going downhill (779).

**Trail Access:** Take trail on right just before intersection. Easy 6 minute hike down trail to horse camp area on right. Go into horse camp and take footpath out back of camp area, around bend in river. May be an orange flag hanging in trees here marking GPS site.

**GPS:** Yes, at run/riffle downstream of Adeline Branch

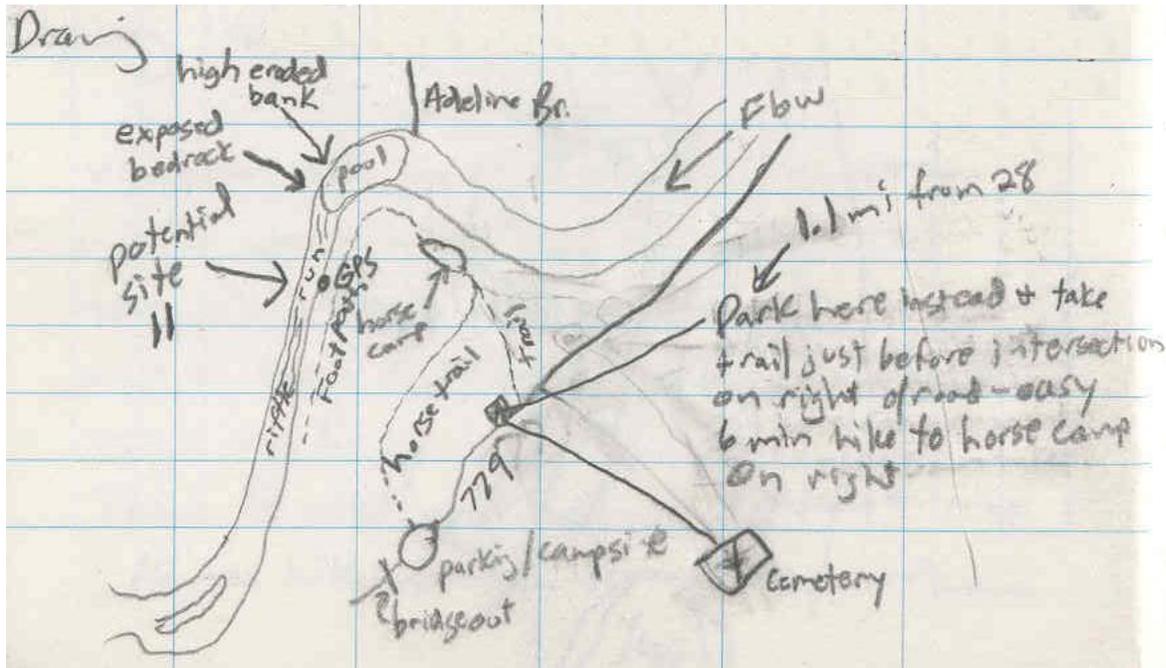
**Length (m):** could easily set up 50-70m long reach

**Width (m):** 10 m at least

**Bank (looking upstream):** Right

**Comments:** Good runs and riffle area for sites here. Look for orange flag. No relics found

**Drawing:**



**Site 11, Adeline Branch**

**Pictures:**



looking slightly upstream just after bend in river downstream of horse camp, note bedrock and high exposed bank on opposite shore, look for orange flagging here – may be gone, no site selected here yet

**Site Number:** 12

**Site Name:** Highway 28 Wildlife Area

**Quadrangle:** Satolah

**Road Access:** From Low Water Bridge Road, left on 28, 0.4 mi. Turn left into paved parking lot with toilets.

**Trail Access:** From downstream end of parking lot go 15-30 m downstream to run/riffle area and set up site.

**GPS:** Yes, center of riffle area downstream of parking

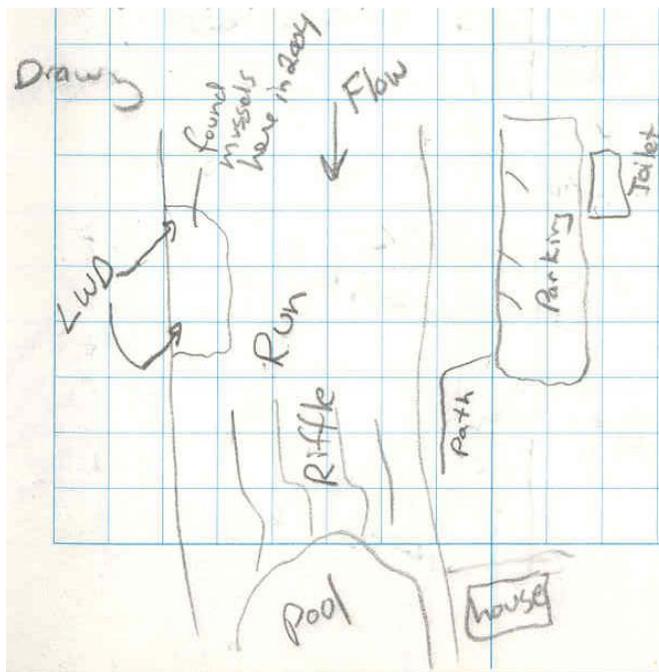
**Length (m):** 50 m estimated

**Width (m):** 8 m estimated

**Bank (looking upstream):** Left, found mussels here in 2004

**Comments:** Private land just downstream of here. Lots of bedrock. Look for areas with other substrate too but also search cracks in bedrock. No relics found.

**Drawing:**



**Site 12, Highway 28 Wildlife Area**  
**Pictures:**



looking upstream, note woody debris on opposite bank, found mussels in debris area in 2004, establish site in this area

**Site Number:** 13

**Site Name:** Highway 28 Bridge

**Quadrangle:** Satolah

**Road Access:** From Wildlife Parking Area, left on 28, 1.6 mi. Cross into GA, parking on right.

**Trail Access:** Can hike ditch on downstream side of bridge, 1 minute to river.

**GPS:** Yes, downstream side of bridge

**Length (m):** 50 m estimated

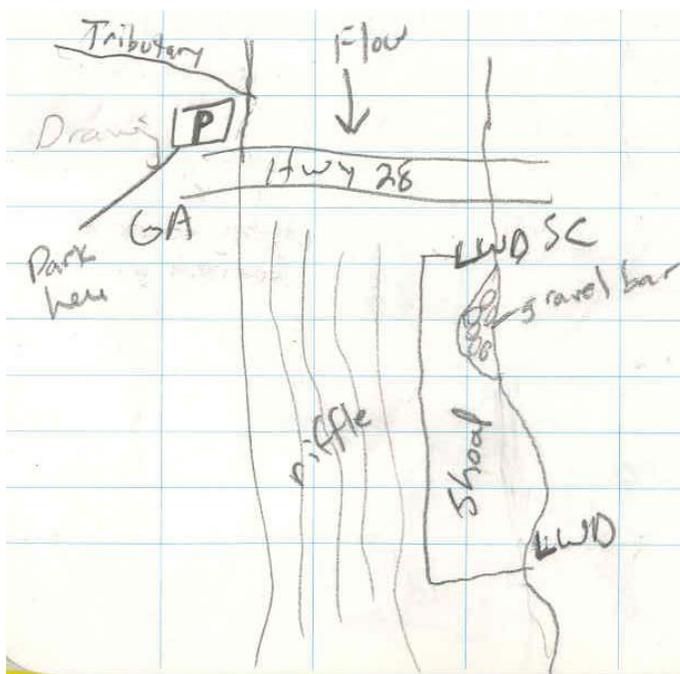
**Width (m):** 10 m estimated

**Bank (looking upstream):** Right

**Comments:** Found mussels along right bank near gravel bar downstream of bridge on SC side in 2004. Shallow enough to wade across entire channel. No relics found.

**\*\*Proceed to site 16, S884 Bridge next.\*\***

**Drawing:**



**Site 13, Highway 28 Bridge**  
**Pictures:**



looking downstream from GA side under Highway 28 bridge, note gravel bar on left in photo, found mussels there in 2004



close-up of gravel bar where site should be established

**Site Number:** 16 (visit after site 13)

**Site Name:** S884 Bridge (West Fork Chattooga)

**Quadrangle:** Satolah

**Road Access:** From Highway 28 bridge. West on 28 into Georgia, 2.1 mi. Left on Warwoman Rd. towards Clayton, 0.1 mi. Right on Overflow Creek Road (FS86), parking on immediate left.

**Trail Access:** 1 minute hike from parking area across road to downstream side of bridge.

**GPS:** At confluence of Overflow Creek and W. Fork Chattooga just downstream of S884 bridge (Warwoman Creek Rd.)

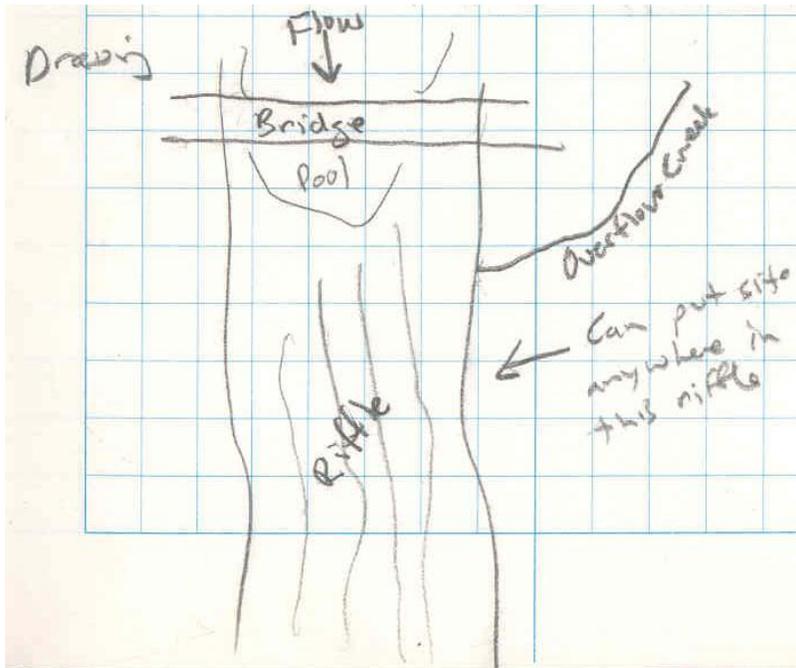
**Length (m):** 50 m estimated

**Width (m):** 10 m estimated

**Bank (looking upstream):** Right

**Comments:** Long riffle area starts downstream of confluence with Overflow Creek, tributary in on right downstream of bridge (1 m wide), could wade across Chattooga here. May be able to span entire channel with samples. No relics found here.

**Drawing:**



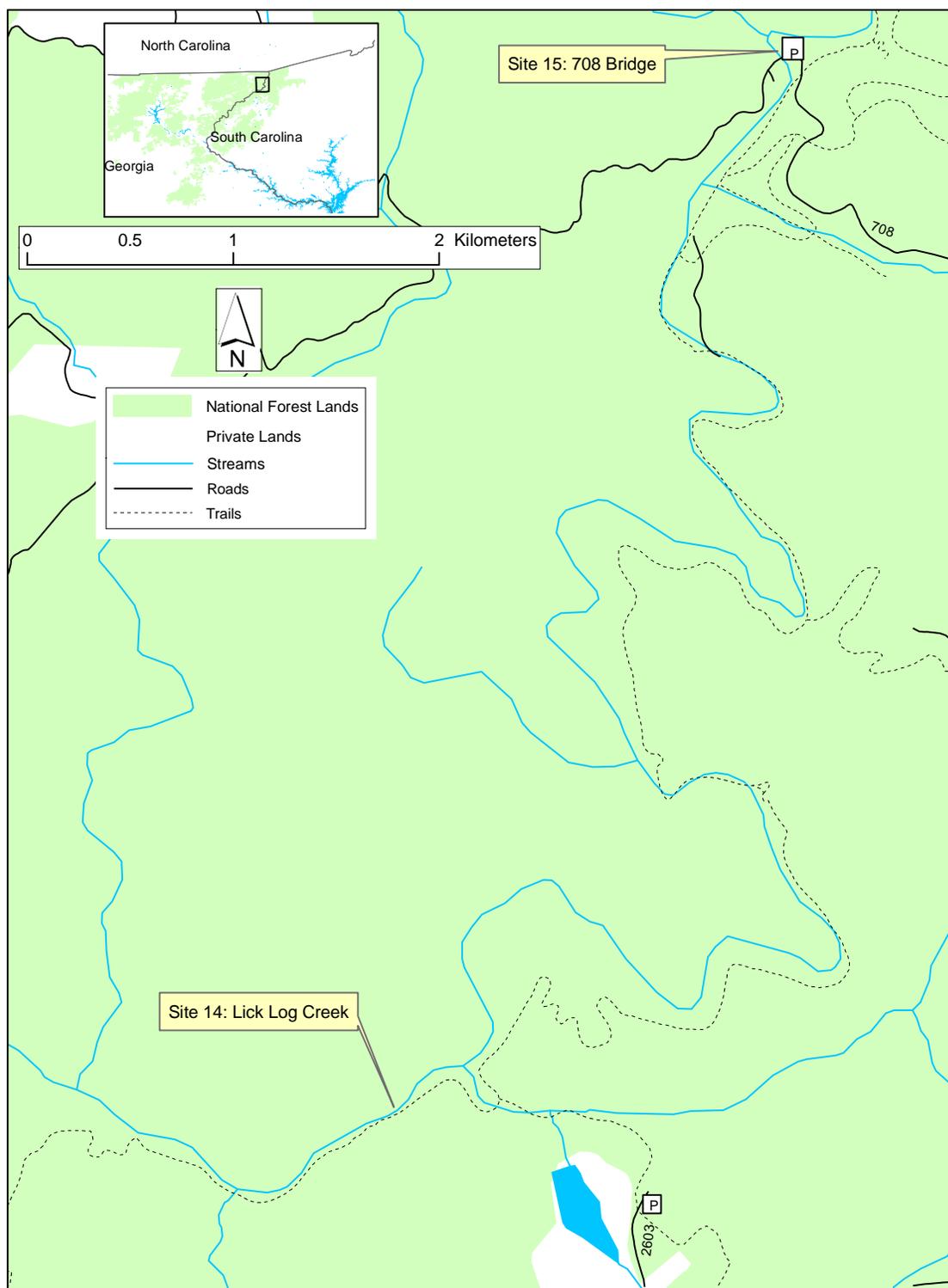


Figure 6. Location of sites 14 – 15: Lick Log Creek and 708 Bridge access points on the Chattooga River.

**Site Number:** 14

**Site Name:** Lick Log Creek

**Quadrangle:** Parking: Tamassee, Site: Satolah

**Road Access:** From 28W, right on SC45 (Village Creek Rd.), just after Mountain Rest Lake, 2.1 mi. At intersection get onto 50 (Nicholson Creek Road, gravel road), 1.9 mi to private land. Stay right at fork and right again at private drive. 0.3 mi after first fork is parking area with trail: Foothills Trail.

**Trail Access:** Hike Foothills Trail, not old roadbed, out of back of parking area. Cross two bridges. Listen for cascade/falls – need to take the trail to the left here – easy to miss this, will cross bridge just downstream of cascade. Trail will turn to left near the confluence/waterfall area. Watch for footpath to right, down steep bank into camping area and take it down to the river. 20 minute hike, not difficult.

**GPS:** Yes, at riffle

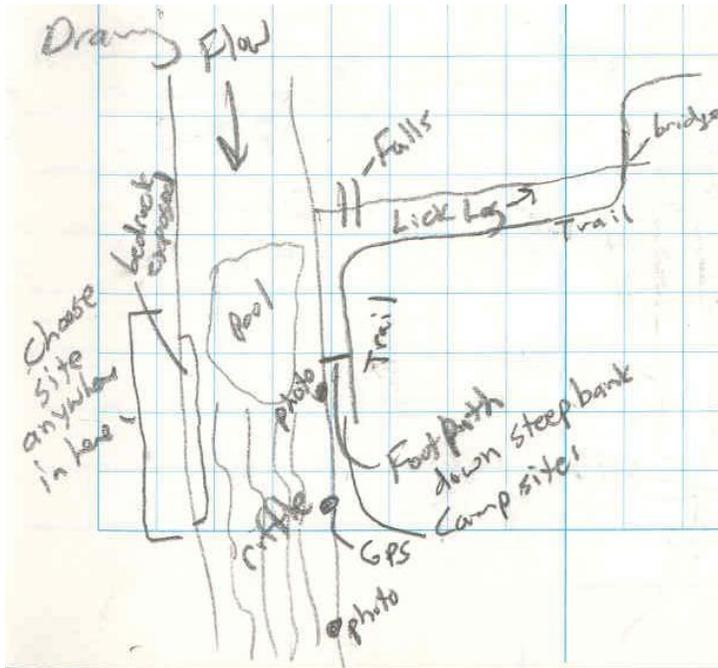
**Length (m):** 50-100 m estimated

**Width (m):** 15 m stream width estimated

**Bank (looking upstream):** Across entire channel

**Comments:** Quad map trails way off here. Use GIS map trails. No relics found here.

**Drawing:**



**Site 14, Lick Log Creek**  
**Pictures:**



looking downstream, camp site to our backs, no site selected yet



looking upstream, campsite to our backs, no site selected yet

**Site Number:** 15

**Site Name:** 708 Bridge

**Quadrangle:** Tamasee

**Road Access:** From 50 (Nicholson Creek Rd.), left onto 48, (Village Creek Rd., paved), 1.8 mi. Left on 107, 6.8 mi. Left on Burnels Ford Rd. (FS 708). Go 2.7 mi. to 708 bridge over Chattooga.

**Trail Access:** No hike, just park at bridge and go down bank

**GPS:** Yes, middle of 708 Bridge

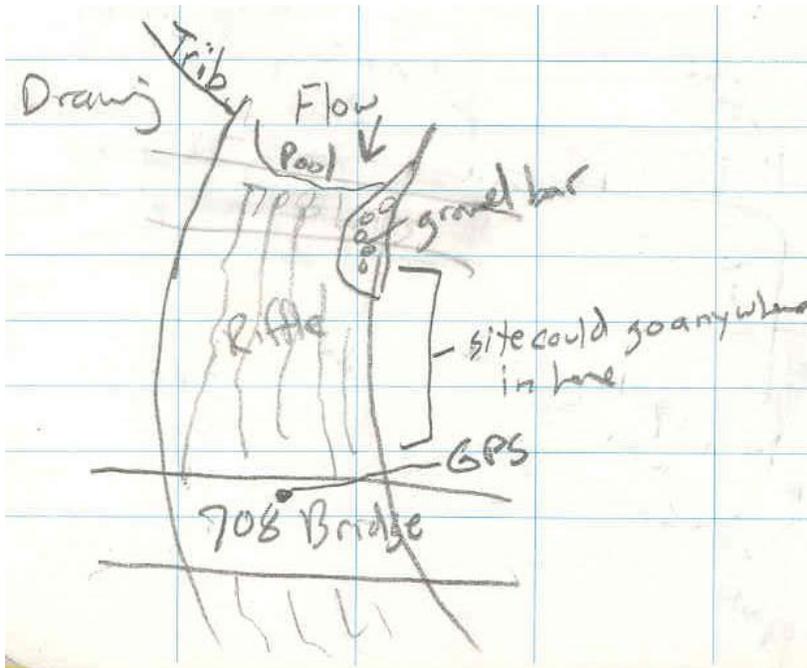
**Length (m):** 50-100 m estimated

**Width (m):** 15 m estimated

**Bank (looking upstream):** Across entire stream if needed

**Comments:** Nice riffle area upstream of 708 bridge. Could easily do a 50-100 m long site all the way across 15 m wide channel. King Creek confluence just downstream from here. No relics found.

**Drawing:**



**Site 15, 708 Bridge**  
**Pictures:**



looking downstream, 708 bridge just around corner downstream, good place to establish a site



looking upstream from 708 bridge

## **Appendix B: Mussel Reconnaissance, November 2004**

### Site 03

**Forest:** Francis Marion-Sumter

**District:** Andrew Pickens

**Stream:** Chattooga River

**Date:** 11/17/2004, 13:20

**Surveyors:** Jeanne Riley, Craig Roghair, Dan Nuckols

**Specific location:** Woodall Shoals boat launch, access via trail at end of road 757, climb up rocks for class 6 rapids to access wadeable area upstream of rapids

**Site length:** ~15 m

**Site width:** ~45 m (total stream), only searched wadeable areas from right bank to mid-stream

**Survey method:** viewing buckets

**Time surveyed:** 15 min.

**Notes:** river getting very big here, found lots of relics in sand on right bank, sandbar deposited this year below rapids 50 m x 15 m x 1.5 m deep

Species	# Live	# Relic	Live Lengths (mm)
<i>Elliptio</i> spp.*	13	12	None recorded
<i>Alasmidonta varicosa</i>	7	9	None recorded

\*Relics identified by Art Bogen 3/21/2005: *Elliptio producta* (2), *Elliptio complanata* (1)

### Site 04

**Forest:** Francis Marion-Sumter

**District:** Andrew Pickens

**Stream:** Chattooga River

**Date:** 11/16/2004, 10:30

**Surveyors:** Jeanne Riley, Leigh McDougal, Craig Roghair, Dan Nuckols

**Specific location:** upstream side of Highway 76 bridge at end of paved trail

**Site length:** ~30 m

**Site width:** ~40 m (total stream), only searched shoal areas

**Survey method:** viewing buckets

**Time surveyed:** 25 min

**Notes:** tessellated darter, bluehead chub present, not too much apparent flood damage, some sand deposition and debris stuck in trees, not all live mussels were measured

Species	# Live	# Relic	Live Lengths (mm)
<i>Elliptio</i> spp.	4	2	59, 50, 72
<i>Alasmidonta varicosa</i>	7	1	47, 60, 54, 48, 47, 42

## Site 06

**Forest:** Francis Marion-Sumter

**District:** Andrew Pickens

**Stream:** Chattooga River

**Date:** 11/17/2004, 10:50

**Surveyors:** Jeanne Riley, Craig Roghair, Dan Nuckols

**Specific location:** access via trail from parking area at end of road 769, just upstream of boat access area on right bank at end of trail

**Site length:** ~10 m

**Site width:** ~40 m (total stream), only searched small shallow area on right bank ~ 10 m wide

**Survey method:** viewing buckets

**Time surveyed:** 25 min.

**Notes:** area loaded with mussels in swift water, smaller substrate anchored by aquatic plant here, water temp 7 C, air temp 12 C

Species	# Live	# Relic	Live Lengths (mm)
<i>Elliptio</i> spp.	7	1	37, 47, 41, 52, 67, 82, 62
<i>Alasmidonta varicosa</i>	10	0	45, 56, 58, 47, 45, 35, 68, 47, 54, 47

## Site 10

**Forest:** Francis Marion-Sumter

**District:** Andrew Pickens

**Stream:** Chattooga River

**Date:** 11/17/2004, 08:50

**Surveyors:** Jeanne Riley, Craig Roghair, Dan Nuckols

**Specific location:** access via trail from Earls Ford parking area, sandy shoal directly across river from Warwoman Creek confluence

**Site length:** ~70 m

**Site width:** ~30 m (total stream), only searched shoal on right bank ~ 10 m wide

**Survey method:** viewing buckets

**Time surveyed:** 30 min

**Notes:** large sand bar on right bank, most areas too deep for wading

Species	# Live	# Relic	Live Lengths (mm)
<i>Elliptio</i> spp.	9	21	47, 55, 78, 75, 30, 60, 45, 44, 38
<i>Alasmidonta varicosa</i>	0	0	

## Site 12

**Forest:** Francis Marion-Sumter

**District:** Andrew Pickens

**Stream:** Chattooga River

**Date:** 11/16/2004, 13:00

**Surveyors:** Craig Roghair, Dan Nuckols

**Specific location:** watchable wildlife access downstream of highway 28 bridge – about 1 mile south on Highway 28

**Site length:** ~10 m

**Site width:** ~20 m (total stream width), only surveyed shoal ~ 5 m wide

**Survey method:** viewing buckets

**Time surveyed:** 25 min

**Notes:** too deep to wade in most areas, a lot of bedrock, water temp 6 C, air 10 C, not all live mussels were measured

Species	# Live	# Relic	Live Lengths (mm)
<i>Elliptio</i> spp.	10	7	67, 47, 50, 45, 61
<i>Alasmidonta varicosa</i>	0	0	

## Site 13

**Forest:** Francis Marion-Sumter

**District:** Andrew Pickens

**Stream:** Chattooga River

**Date:** 11/16/2004, 14:00

**Surveyors:** Jeanne Riley, Leigh McDougal, Craig Roghair, Dan Nuckols

**Specific location:** Downstream of Highway 28 bridge (Russel Bridge), above confluence with West Fork

**Site length:** ~25 m

**Site width:** ~15 m (total stream width)

**Survey method:** viewing buckets

**Time surveyed:** 15 min.

**Notes:** a lot of sand deposition on banks, many dead shells in debris on shore, most live mussels near banks in slower water and sandy areas, not all live mussels were measured

Species	# Live	# Relic	Live Lengths (mm)
<i>Elliptio</i> spp.	14	19	27, 34, 55, 37, 50, 45, 37, 44, 52
<i>Alasmidonta varicosa</i>	0	0	

## **Appendix C: Mussel Identification**

Mussels found in the Chattooga River include: *Alasmidonta varicosa*, members of the *Elliptio lanceolata* complex (*E. producta* and *E. angustata*), members of the *Elliptio complanata* complex (*E. complanata*), and the Asian clam (*Corbicula fluminea*). We will record counts for *A. varicosa*, *C. fluminea*, *E. lanceolata* complex, and *E. complanata* complex during the inventory.



*Alasmidonta varicosa* has orange to peach colored foot (above) vs. a white foot in *Elliptio* species (not shown)



Left to right: *E. lanceolata* complex (*E. producta*), *E. complanata* complex (*E. complanata*), and *A. varicosa*



*Alasmidonta varicosa* (top) vs. *Elliptio lanceolata* complex (bottom)



*Elliptio complanata* complex (left) vs. *Alasmidonta varicosa* (right). In the photo on the right note the inflated *A. varicosa* shell (right) vs. the compressed *Elliptio* (left)

## Identifying characteristics

From: Bogen and Alderman (2004)

### ***Elliptio lanceolata* complex: *E. producta* (Atlantic spike) and *E. angustata* (Carolina lance)**

Shell usually more than twice as long as high; in our specimens, ratio 2.0 or greater. Nacre a shade of purple. Periostracum olive to black (*E. angustata*) or reddish to greenish brown (*E. producta*) with no rays. White foot in live specimens.

### ***Elliptio complanata* complex: *Elliptio complanata* (Eastern Elliptio)**

Shell usually less than twice as long as high; in our specimens, ratio 1.7 or less. Nacre white, pink, salmon or shades of purple. Periostracum yellowish to brown or blackish, young specimens with indistinct greenish rays present, generally disappearing in older shells. White foot in live specimens.

### ***Alasmidonta varicosa* (Brook floater)**

Shell shape oblong and inflated, lack lateral teeth. Periostracum is yellowish or greenish and often has greenish rays in younger specimen, larger specimen becoming dark and rays may become obscured. Orange foot in live specimens.

### **Exotic species**

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### ***Corbicula fluminea* (Asian Clam)**

Shell is fairly small seldom exceeding 50 mm in length, very solid, ovate in young and triangular in mature specimen. Beaks are high, full, directed inward, and elevate above hinge line. Valves with cardinal teeth and two sets of serrated lateral teeth.

