

## The Herpetofauna of Conservation Lands along the Altamaha River, Georgia

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**Abstract** - The Altamaha River region of southeastern Georgia is widely recognized for its biodiversity and conservation value for imperiled species. Even so, intensive amphibian and reptile surveys have never been conducted in this area. From 2008 to 2016, we conducted herpetofaunal surveys at 13 conservation lands located along the Altamaha River and along the lower reaches of a main tributary, the Ocmulgee River. We used a variety of field methods including visual encounter surveys, turtle trapping, frog-call surveys, drift fences, and surveys for snakes at *Gopherus polyphemus* (Gopher Tortoise) burrows. From these data, combined with a review of the published literature and a search of relevant museum collections, we determined that conservation and other nearby lands along the Altamaha River support a diverse herpetofauna of 100 species, including 41 amphibian species (18 salamander and 23 frog and toad species) and 59 reptile species (1 crocodylian, 11 lizard, 33 snake, and 14 turtle species). Seventeen species (12 reptile and 5 amphibian species) that are either federally listed, state-listed, or tracked as special concern by the Georgia Department of Natural Resources have been documented here, and sandhills along the Altamaha River support significant populations of Gopher Tortoises, *Drymarchon couperi* (Eastern Indigo Snake), and *Crotalus adamanteus* (Eastern Diamond-backed Rattlesnake). Biogeographically, the Altamaha River is a notable influence on the distributions of many amphibians and reptiles. High species richness, including many declining species, underscores the Altamaha River's importance to conservation, and future efforts should focus on long-term monitoring of imperiled species and effective management of conservation lands.

### Introduction

Species lists may be developed through long-term accumulation of records or by intense general collecting over a relatively short period, with long periods (usually in the scales of years) needed to sample complex, diverse communities (Heyer et al. 1994). Developing site-specific lists of species is an important first step to conducting long-term monitoring and/or research on specific populations and communities (Tuberville et al. 2005). Significantly, knowledge of species present at a particular site can assist in directing conservation efforts and habitat management goals. Over long periods of time, with consistent effort, species lists can be used as a simple means of monitoring plant and animal communities by identifying general patterns in species occurrence without the intensive effort required for other monitoring techniques (Droege et al. 1998, Roberts et al. 2007).

The Altamaha River, formed by the confluence of the Oconee and Ocmulgee Rivers, flows 220 km through the Coastal Plain of southeastern Georgia before

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emptying into the Atlantic Ocean near Darien, GA. The Altamaha is the largest free-flowing river on the east coast of the United States, with the lower Ocmulgee and the entire Altamaha River main stem flowing unimpounded for a distance of about 480 km (Reese and Baxter 2007). The Altamaha watershed drains a huge portion of Georgia (>3.6 million ha, 23% of the state), and the river discharges 378,000 L of fresh water into the Atlantic Ocean every second (Wharton 1978). A forested swampy floodplain, up to 8 km wide and encompassing an estimated 68,800 ha, buffers the Altamaha River main stem (Edwards et al. 2013).

An inventory of the Altamaha River watershed conducted by The Nature Conservancy (TNC) in the 1990s documented 120 rare or endangered plant and animal species (Dallmeyer and Ray 2012). Natural communities in the river floodplain include some of the best remaining examples of bottomland hardwood forests and cypress–tupelo swamps in Georgia (Edwards et al. 2013, Wharton 1978). In recognition of its beauty, uniqueness, biodiversity, and conservation value, TNC placed the Altamaha River on their list of “The 75 Last Great Places” (Edwards et al. 2013). Within the last several decades, more than 40,000 ha along the Altamaha River have been purchased and protected as conservation lands (Dallmeyer and Ray 2012, Edwards et al. 2013).

Although the Altamaha River region is known to support substantial biodiversity, very little has been published specific to its herpetofauna, other than partial species lists or distribution records (Schlimm 2013, Wharton 1978, Williamson and Moulis 1994). To address this need, we conducted field inventories at a series of protected conservation lands located along the lower Altamaha River (i.e., the main stem Altamaha and the last ~30 km of the Ocmulgee). The goals of our study were to provide contemporary species lists for these sites while contributing locality records for populations of listed and imperiled species. Additionally, given the overall size of our study area and the fact that the Altamaha River is of known biogeographic importance to freshwater and terrestrial taxa (Liu et al. 2006, Page and Burr 2011), we anticipated that our surveys would reveal biogeographic patterns or distribution anomalies for some taxa.

### **Field-site Description**

We conducted field surveys at 13 conservation sites (Wildlife Management Areas [WMAs], natural areas, and private ecological preserves) located in the Altamaha River region of southern Georgia (Table 1, Fig. 1). Study sites varied from ~1000 ha to ~12,000 ha (mean size = 4300 ha). The borders of 9 of these sites follow the main stem of the Altamaha River. The other 4 sites are located in the lower portion of the Ocmulgee River drainage and border 2 major tributaries to the Altamaha River—the Ocmulgee River and the Little Ocmulgee River (Fig. 1). In 2 cases, we surveyed conservation sites that were contiguous with each other (Penholoway WMA and Sansavilla WMA; Orianna Indigo Snake Preserve and Horse Creek WMA), and we combined amphibian/reptile occurrence data for these sites.

Table 1. Thirteen conservation sites in the Altamaha River region of southern Georgia that were surveyed from 2008 to 2016 for amphibian and reptile species using a variety of standard herpetological sampling techniques (Foster 2012). Habitat types (following Edwards et al. 2013): 1 = sandhills and river dunes, 2 = dry upland longleaf woodlands, 3 = dry evergreen oak woodlands, 4 = mesic slope forests/deciduous hardwood forests, 5 = pine flatwoods, 6 = small stream floodplain forests, 7 = seepage swamps/herb bogs/shrub bogs, 8 = cypress-gum ponds and depression marshes, 9 = bottomland hardwood forests, 10 = cypress-tupelo river swamps, 11 = riverbanks and levees, 12 = tidal swamps, 13 = maritime hammocks. Survey methods: visual encounter surveys (VS), drift fences with pitfall/funnel traps (DF), turtle trapping (hoop nets) (TH), turtle trapping (crab-wire traps) (TC), snake surveys at Gopher Tortoise burrows (GS), river edge snorkel/wade surveys (RS), anuran-call surveys (AS), minnow traps/aquatic funnel traps (AT), dipnet surveys (DS), road-cruising (RC), amphibian-reptile bioblitzes (BB). Surveys were conducted in a variety of habitats over multiple years.

Site	Area (ha)	Dominant habitat types	Survey methods	Georgia counties	Survey dates
Alligator Creek WMA <sup>A</sup>	3457	1, 2, 3, 5, 6, 7, 8, 10, 11	VS, DF, TC, GS, RS, AS, DS, RC	Wheeler	2008–2012, 2015
Altama Plantation WMA	1674	1, 2, 3, 4, 5, 6, 7, 10, 12, 13	VS, TC, GS, AS, DS	Glynn	2008, 2016
Altamaha WMA	12,387	1, 3, 4, 5, 7, 9, 10, 11, 12, 13	VS, TC, GS, RS, AS, DS, RC	McIntosh	2013–2016
Big Hammock WMA	2795	1, 3, 5, 8, 9, 10, 11	VS, GS, RS, AS, DS, RC, BB	Tattnall	2008–2016
Bullard Creek WMA	3908	2, 4, 5, 9, 10, 11	VS, RS, AS, DS	Appling, Jeff Davis	2008–2016
Flat Tub WMA	2546	2, 4, 5, 7, 9, 10, 11	VS, GS, RS, AS, DS	Coffee, Jeff Davis	2008–2016
Griffin Ridge WMA	2756	1, 3, 5, 8, 9, 10, 11	VS, TC, GS, RS, AS, DS, RC, BB	Long	2008–2016
Horse Creek WMA	3017	2, 4, 5, 8, 9, 10, 11	VS, TH, TC, GS, RS, AS, DS, BB	Telfair	2008–2016
Moody Forest Natural Area	1801	2, 4, 5, 6, 7, 9, 10, 11	VS, TH, TC, GS, RS, AS, DS, RC, BB	Appling	2008–2016
Orienne Indigo Snake Preserve	1023	1, 2, 4, 5, 7, 9, 10, 11	VS, DF, TH, TC, GS, RS, AS, AT, DS, BB	Telfair	2008–2016
Penholway Swamp WMA	4415	2, 4, 5, 6, 7, 8, 9, 10, 11	VS, GS, RS, AS, RC	Wayne	2008–2016
Sansavilla WMA	6781	2, 4, 5, 6, 7, 8, 9, 10, 11	VS, GS, RS, AS, DS, RC	Glynn, Wayne	2008–2016
Townsend WMA	11,648	1, 3, 4, 5, 7, 8, 9, 10, 11	VS, TC, GS, RS, AS, AT, DS, RC, BB	Long, McIntosh	2008–2016

<sup>A</sup>Surveys at Alligator Creek WMA included ~2200 ha of well-managed land on private property adjacent to the WMA.

## Methods

From January 2008 through September 2016, we surveyed individual sites on 5–20 dates annually; some sites were surveyed in fewer years (Table 1). We used a wide variety of standard herpetological sampling techniques, including visual encounter surveys (turning surface cover, inspecting logjams and brush piles, checking rotten logs and snags, etc.), drift fences with pitfall and/or funnel traps, turtle trapping with conventional hoop net traps, turtle trapping with modified crab-wire traps, snake surveys at *Gopherus polyphemus* (Gopher Tortoise) burrows, wading surveys of river-edge habitats, anuran-call surveys, sampling wetlands with aquatic minnow traps or funnel traps, dipnet surveys, and road-cruising (Table 1; see Heyer et al. 1994 and Foster 2012 for detailed descriptions of most of the above methods). We used custom-made crab-wire turtle traps that measured approximately 61.0 cm x 61.0 cm x 47.0 cm and were made of 16-gauge galvanized steel-mesh wire coated with black polyvinyl chloride. These traps are effective in capturing small emydid (e.g., *Clemmys guttata* [Spotted Turtle]) and kinosternid turtles (Chandler et al., in press). We conducted cool-season snake surveys at tortoise burrows, targeting *Drymarchon couperi* (Eastern Indigo Snake) and *Crotalus adamanteus* (Eastern Diamond-backed Rattlesnake), by visiting sandhill habitats supporting tortoise populations from November–March and searching for basking snakes and shed skins (Bauder et al. 2017). In addition to the above survey methods, we organized bioblitz events at some of our study sites, wherein participants divided into teams and surveyed intensively over 2–3-day periods in an effort to document as many amphibian and reptile taxa as possible (Table 1). In addition

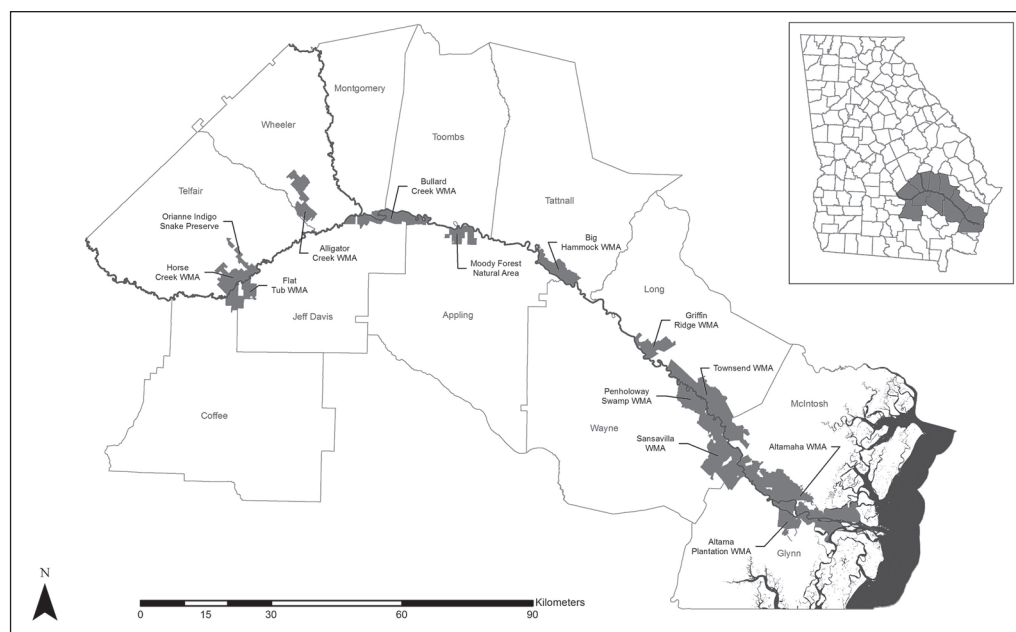


Figure 1. Conservation sites along the Altamaha River, GA, and the lower Ocmulgee River, GA, that were sampled for herpetofauna using a variety of techniques from 2008 to 2016.

to surveys of the 13 primary survey sites, we conducted visual encounter surveys targeting a semi-aquatic viper, *Agkistrodon piscivorus* (Cottonmouth), at floodplain swamps located along the entire length of the Altamaha River.

We attempted to survey all representative habitats present at each study site (Table 1). We placed an emphasis on the following habitats: (1) the main stem of the major river systems that served as study site boundaries (Altamaha, Little Ocmulgee, and Ocmulgee rivers); (2) habitats within the floodplains of these river systems, including bottomland hardwood forests, *Taxodium distichum* (L.) Rich. (Bald Cypress)–*Nyssa aquatica* L. (Water Tupelo) swamps and sloughs, and oxbow lakes; (3) perennial, mucky springs and seepage areas located at the base of sandhills or in ravines associated with north-facing bluffs; (4) isolated, depressional wetlands (e.g., *Taxodium ascendens* Brongn. [Pond Cypress], *Nyssa sylvatica* Marshall [Black Gum], and *Ilex myrtifolia* Walter [Myrtle Dahoon] wetlands) embedded in pine uplands (pine flatwoods, sandhills); and (5) *Pinus palustris* Mill. (Longleaf Pine)–*Aristida stricta* Michaux (Wiregrass) flatwoods and sandhills.

A notable weakness of wildlife surveys, and herpetological surveys in particular, is that some species present on-site may elude detection because of low activity levels, low abundance, and/or clandestine life histories (e.g., fossorial species) (Mazerolle et al. 2007, O'Donnell and Semlitsch 2015). Thus, survey effort and seasonality of surveys has a profound effect on survey completeness, especially with regard to cryptic species that occur at low densities or are distributed in habitats that are hard to sample (Foster 2012). Considering this, we conducted surveys year-round and scheduled surveys such that they coincided with individual species' phenology and with weather and soil-moisture conditions optimal for amphibian and reptile activity.

We developed a hypothetical species list for the Altamaha River region (Appendix 1) by consulting range maps in current herpetological references (e.g., Jensen et al. 2008, Powell et al. 2016). We did not include *Malaclemys terrapin* (Schoepff) (Diamond-backed Terrapin), a coastal species, or sea turtle species on this list. With respect to taxonomy, we follow Crother (2012), except that we recognize *Pseudemys floridana* (Coastal Plain Cooter) as a full species. A number of other herpetologists currently recognize this form as a full species (e.g., Guyer et al. 2015, Jensen et al. 2008, Powell et al. 2016), and we do so because this species is morphologically distinguishable from *Pseudemys concinna* (River Cooter) in our study area.

To locate additional and historic herpetofaunal records for our study sites, we reviewed the published literature, conducted a search of relevant museum collections, and interviewed local herpetologists and natural resource managers (with the Georgia Department of Natural Resources, TNC, and the US Fish and Wildlife Service) who had personal field experience with some or all of our study sites. To locate literature records, we consulted Jensen et al. (2008), Schlimm (2013), and Williamson and Moulis (1994). To locate museum records, we searched the following museum collections: Auburn University (AUM), Florida State University (FSU), Georgia Museum of Natural History (GMNH), Georgia Southern

University (GSU), Georgia Southwestern State University (GSWSU), Florida Museum of Natural History (FMNH), and Valdosta State University (VSU). Other major museum collections were searched as recently as 1994 by Williamson and Moulis (1994). To document a species occurrence at a particular site, for specimens representing range extensions or county records and for records of rare or listed taxa, we deposited voucher specimens (or photographs) in museum collections including the Georgia Museum of Natural History (GMNH), Georgia Southern University (GSU), the Florida Museum of Natural History (FMNH), and the North Carolina State Museum of Natural Sciences (NCSM) (see Supplementary File 1, available online at <http://www.eaglehill.us/SENAonline/suppl-files/s16-2-S2350-Stevenson-s1>, and, for BioOne subscribers, at <http://dx.doi.org/10.1656/S2350.s1>).

## Results and Discussion

### Species richness

Our hypothetical amphibian and reptile species list for the Altamaha River region of southern Georgia totaled 106 species and was comprised of 45 amphibian species (21 salamander and 24 frog and toad species) and 61 reptile species (1 crocodylian, 14 turtle, 12 lizard, and 34 snake species) (Appendix 1). Overall, for the 13 conservation land sites that we surveyed as part of this study, we documented (including museum records) 36 amphibian species (13 salamander and 23 frog and toad species) and 57 reptile species (1 crocodylian, 14 turtle, 10 lizard, and 32 snake species) (Appendix 1). From our field work in other parts of the Altamaha River region (outside of the 13 conservation land sites) and from museum specimens, we located records for an additional 5 salamander species, 1 lizard species, and 1 snake species within 5 km of the Altamaha River main stem or its floodplain (Appendix 1). We failed to document, or locate museum records for, 4 amphibian and 2 reptile species from our hypothetical species list. No introduced species were found at any of our survey sites.

The total number of species we documented from conservation lands varied from 49 to 75, with the greatest species richness recorded at Orianne Indigo Snake Preserve/Horse Creek WMA (75), Moody Forest Natural Area (71), and Big Hammock WMA (70) (Fig. 2). We documented 55 new county records and several range extensions during this study (e.g., Butler et al. 2012; Jensen et al. 2011; Stevenson et al. 2009a, 2011). Our study demonstrates that the species richness for the Altamaha River region is high, both overall and at individual conservation sites. Other Coastal Plain sites in Georgia known to support comparable or higher diversity of amphibians and reptiles include the Okefenokee National Wildlife Refuge (88 species; Smith et al. 2006a; L. Smith, Joseph W. Jones Ecological Research Center at Ichauway, pers. comm.); Fort Stewart Military Installation (97 species; Stevenson 1999); and Joseph W. Jones Ecological Research Center at Ichauway (86 species, Smith et al. 2006b; L. Smith, Joseph W. Jones Ecological Research Center at Ichauway, pers. comm.). We suspect that additional field work, particularly surveys using drift fences, would document additional amphibian and reptile species from some of the 13 conservation lands. The results of our inventory may have overlooked



difficult-to-find species like fossorial snakes and salamanders, glass lizards, and other clandestine species.

During our 2008–2016 surveys, we recorded all 14 turtle species expected from the region, including 12 freshwater turtle species. We documented River Cooter populations in the main stems of the lower Oconee and lower Ocmulgee rivers, and throughout the Altamaha River main stem as far downstream as Fort Barrington, McIntosh/Wayne counties (Stevenson et al. 2012). Previously, this turtle was unreported from the Altamaha River proper (Ward and Jackson 2008). We documented *Sternotherus minor* (Loggerhead Musk Turtle) at 6 of 11 (54%) survey sites and found this species elsewhere in the Altamaha River main stem as far downstream as Jesup, Wayne/Long counties, where the species is currently abundant (D.J. Stevenson, unpubl. data). Downstream of Jesup, we found only a single example of this mollusk-eating turtle, at Townsend WMA in Long County. We suspect the Loggerhead Musk Turtle population may have declined (downstream of Jesup) in association with declines of native pearly mussels (Unionidae) from this section of the Altamaha River (Meador 2008; J. Wisniewski, Georgia DNR, Social Circle, GA, pers. comm.). Although the Altamaha River supports large turtle populations, a diverse turtle fauna, and is located within a southeastern United States Turtle Priority Area (Buhlmann et al. 2009), its freshwater turtle fauna has never been intensively studied. We recommend the initiation of long-term monitoring programs at select freshwater sites throughout the Altamaha drainage.

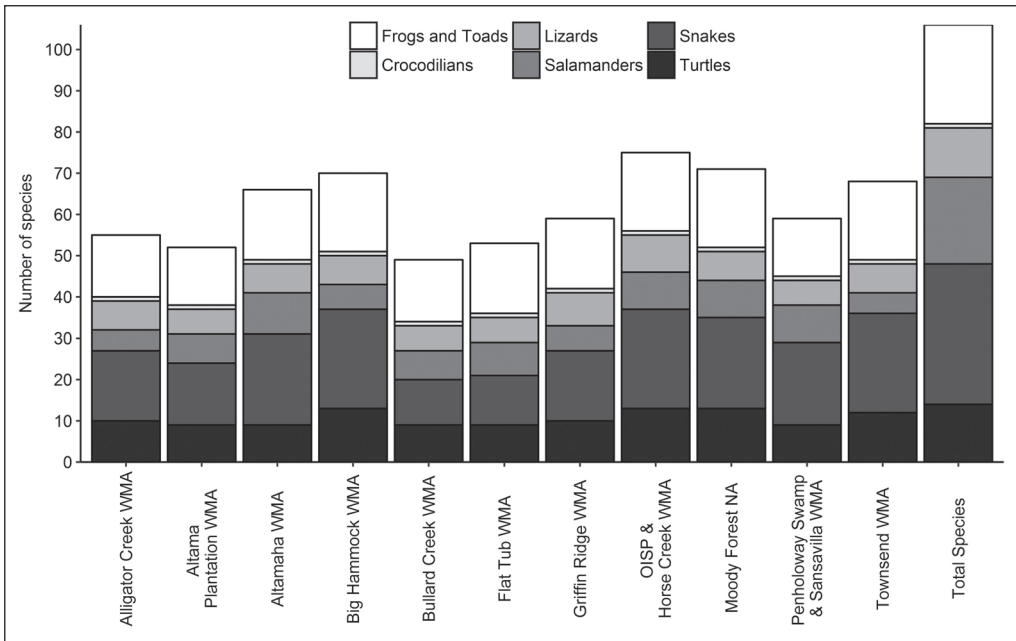


Figure 2. Species richness at 13 conservation sites along the Altamaha River, GA, that were surveyed from 2008 to 2016. Herpetofaunal observations were pooled for Orianne Indigo Snake Preserve (OISP)/Horse Creek WMA and for Penholoway Swamp/Sansavilla WMA because these sites share a border with each other. The “total species” bar represents the maximum number of species that potentially occur in this region.

Despite targeting seepage habitats, we were only able to document *Pseudotriton ruber* (Red Salamander) at 2 of 11 (18%) survey sites. In the Coastal Plain, this species inhabits perennial, mucky spring-seepage habitats located at the base of xeric sandhills or in ravines associated with north-facing bluffs (Means 2000, Stevenson et al. 2009c). An Altamaha River bluff (located near Jesup, Wayne County; not one of our survey sites) known to harbor a population of Red Salamanders is the southeastern-most site known for this species (Williamson and Moulis 1994). Perennial seepages, locally distributed environments in the Coastal Plain, typically support a high diversity and biomass of salamanders (Means 2000, Stevenson et al. 2009c), and we encourage natural resource managers in the Altamaha River region to actively identify and safeguard these habitats where they occur on protected lands.

Intriguingly, we recorded Cottonmouths from only 5 of 11 (45%) survey sites, and we were unable to document this species from alluvial river swamps along most of the length of the Altamaha River main stem, despite additional survey effort. In the Altamaha River floodplain, except for 2 sites (both significantly altered wetlands) in Long County, we routinely observed Cottonmouths only from the southeastern-most stretches of the Altamaha River system in Glynn and McIntosh counties (Fig. 3). Here, we found (or compiled records for) Cottonmouths from river swamps, tidal marshes, and other wetland habitats (including on Chapney, Butler, and Lewis islands) from about river-km 48 east to the coast. The only credible Cottonmouth records obtained by our interviews were from this area. In

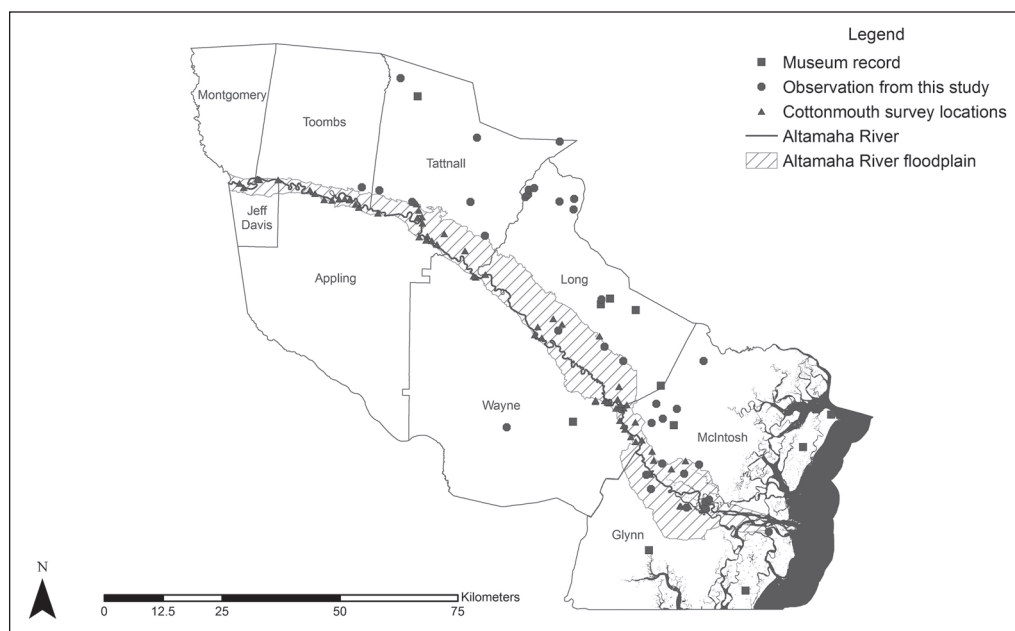


Figure 3. *Agkistrodon piscivorus* (Cottonmouth) observations and museum records for the Altamaha River region of southeastern Georgia. Survey sites were sampled for Cottonmouths on a minimum of 10 dates from 2008 to 2016. Study observations outside of the Altamaha River floodplain were made by the authors from 2000 to 2016 via chance encounters.



contrast, we documented 1–3 species of watersnakes (*Nerodia* spp.) in river swamp habitats at all of our survey sites and throughout the region (Appendix 1; Stevenson and Stackhouse 2012).

In the Coastal Plain of southeastern Georgia (including sites proximal the Altamaha River) and northern Florida, Cottonmouths have been recorded from coastal marshes, blackwater creek swamps, isolated depressional wetlands (cypress ponds, gum ponds, Carolina bays) embedded in mesic pine flatwoods, and grassy roadside ditches, among other wetland habitats (Erwin et al. 2016; Gibbons and Semlitsch 1991; Williamson and Moulis 1979, 1994; Wolfe et al. 1988). Dorcas and Gibbons (2008) mention that Cottonmouths are very common in many areas of Georgia and describe them as the “classic venomous snake of southern river swamps”. Cottonmouths are prone to utilize vegetated shorelines with abundant basking objects and congregate around receding waters in swampy floodplains where prey is concentrated (Palmer and Braswell 1995, Trauth et al. 2004), and we regularly focused our surveys on these microhabitats when searching for Cottonmouths at Altamaha River floodplain sites.

We believe that a recent Altamaha River drainage-wide decline of Cottonmouth populations is unlikely, and, considering the intensity and duration of our survey efforts, we feel it is unlikely that we overlooked the species. Instead, we conclude that Cottonmouths are indeed absent (or extraordinarily rare) from much of the Altamaha River and its floodplain. We posit that a perpetual instability (i.e., dramatically fluctuating water levels driven by large annual pulses in flow; frequent flooding and then drying) of aquatic habitats in the Altamaha River floodplain may be responsible, at least in part, for the absence of Cottonmouths. Regular scouring of the floodplain may remove graminaceous vegetation (i.e., snake cover) from the margins of sloughs in the floodplain and/or influence distribution of prey. The presence of moving water in the floodplain may in some way deter Cottonmouth presence (Wharton 1978). The apparent lack of Cottonmouth populations at many floodplain swamps along the Altamaha River merits further study.

### Imperiled species

Our surveys of Altamaha River conservation lands documented the federally listed Eastern Indigo Snake and 4 other species that are state-listed in Georgia (*Lithobates capito* [Gopher Frog], Gopher Tortoise, Spotted Turtle, and *Heterodon simus* [Southern Hog-nosed Snake]) (Table 2). For example, we documented the Spotted Turtle at 5 of 11 (45%) survey sites, generally inhabiting blackwater creek swamps and seepage slope swamps. This species has never been documented from alluvial river swamps along the lower Ocmulgee River or the Altamaha River (Stevenson et al. 2015). Additionally, we recorded 1 amphibian (*Desmognathus auriculatus* [Southern Dusky Salamander]) and 7 reptile species (2 lizard [*Ophisaurus attenuatus* (Slender Glass Lizard), *Plestiodon egregius* (Mole Skink)] and 5 snake species [Eastern Diamond-backed Rattlesnake, *Farancia erytrogramma* (Rainbow Snake), *Micrurus fulvius* (Harlequin Coralsnake), *Pituophis melanoleucus* (Pinesnake), *Rhadinaea flavilata* (Pine Woods Littersnake)]) that

are tracked as species of special concern by the Georgia Department of Natural Resources (Table 2).

We documented Eastern Indigo Snakes at 8 of 11 (73%) survey sites and Eastern Diamond-backed Rattlesnakes (a declining, species of special concern) at 10 of 11 sites (91%). In south Georgia, adult Eastern Indigo Snakes are semi-migratory and have very large home ranges that include xeric sandhills (where they overwinter in

Table 2. Amphibian and reptile species of conservation concern in the Altamaha River region of southern Georgia (rare = RA, threatened = TH, candidate = CA, unusual = UN). Species that do not have official state or federal status are listed as species of special concern (SOC) by the Georgia Department of Natural Resources. Some species were documented on 1 or more of 13 conservation sites by surveys conducted from 2008 to 2016, whereas others are known from historic records for this region. Species with no historic or current records may occur or have occurred in this region as their ranges overlap the region (Jensen et al. 2008, Powell et al. 2016).

Species	Federal status	State status	# of conservation sites with		Total # of conservation sites with records
			pre-2008 records	records from 2008–2016	
<b>Anurans</b>					
<i>Lithobates capito</i>		RA	1	1	2
<i>Lithobates virgatipes</i> <sup>A</sup>		SOC			0
<b>Salamanders</b>					
<i>Ambystoma cingulatum</i> <sup>A</sup>	TH	TH			0
<i>Ambystoma tigrinum</i> <sup>B</sup>		SOC			0
<i>Notophthalmus perstriatus</i> <sup>A</sup>	CA	TH			0
<i>Desmognathus auriculatus</i>		SOC	1		1
<i>Stereochilus marginatus</i> <sup>B</sup>		SOC			0
<i>Necturus punctatus</i> <sup>A</sup>		SOC			0
<i>Pseudobranchius striatus</i> <sup>B</sup>		SOC			0
<b>Lizards</b>					
<i>Ophisaurus attenuatus</i>		SOC	1	1	2
<i>Ophisaurus compressus</i> <sup>B</sup>		SOC			0
<i>Ophisaurus mimicus</i> <sup>A</sup>		RA			0
<i>Plestiodon egregius</i>		SOC		2	2
<b>Snakes</b>					
<i>Crotalus adamanteus</i>		SOC	2	11	11
<i>Drymarchon couperi</i>	TH	TH	4	9	9
<i>Farancia erytrogramma</i>		SOC	1	5	6
<i>Heterodon simus</i>		TH	1	1	1
<i>Micrurus fulvius</i>		SOC	1	7	7
<i>Pituophis melanoleucus</i>		SOC		5	5
<i>Rhadinaea flavilata</i>		SOC	1		1
<i>Seminatrix pygaea</i> <sup>A</sup>		SOC			0
<b>Turtles</b>					
<i>Clemmys guttata</i>		UN		5	5
<i>Gopherus polyphemus</i>	CA	TH	5	11	11

<sup>A</sup>Species that occur on the hypothetical species list for the region but have not been documented anywhere within 5 km of the Altamaha River main stem.

<sup>B</sup>Species that were not documented from the 13 conservation land sites but are known from within 5 km of the Altamaha River main stem based on museum records.

Gopher Tortoise burrows [Diemer and Speake 1983; Stevenson et al. 2003, 2009b]) as well as lower, wetter habitats (pine flatwoods, swamps) used by foraging snakes during the warmer months (Hyslop et al. 2014). Longleaf Pine–Wiregrass sandhill habitats located on xeric sand ridges and other well-drained soils along the Ocmulgee and Altamaha Rivers support notably large Gopher Tortoise populations (over 250 adults) present at 5 of 11 (45%) survey sites (M. Elliott, Georgia DNR, Social Circle, GA, pers. comm.). The especially large home ranges of Eastern Indigo Snakes (~1400 ha for some adult males in southern Georgia) have led experts to classify this snake as an “umbrella species” (Hyslop 2007, Hyslop et al. 2014).

A number of other amphibian and reptile taxa endemic to Longleaf Pine habitats, all of which have or are currently experiencing population declines (Jensen et al. 2008, Means 2006), were not found by our surveys (e.g., *Ophisaurus mimicus* [Mimic Glass Lizard], *Notophthalmus perstriatus* [Striped Newt], and *Ambystoma cingulatum* [Frosted Flatwoods Salamander]) or were found at only 1–2 sites (e.g., Gopher Frog and Southern Hog-nosed Snake). Many of the survey properties either lacked isolated depressional wetlands (breeding habitat for the Gopher Frog, Striped Newt, and Frosted Flatwoods Salamander), or depressional wetlands on-site had been significantly and adversely impacted by drought, long-term fire suppression, and, historically, commercial forestry activities. These impacts diminished habitat suitability and may have led to the extirpation of these amphibian species at these sites, if they were ever present (Bishop and Haas 2005, Chandler et al. 2016, Means and Means 2005). We recommend that isolated and depressional wetlands be a focus of restoration and management actions to improve the quality of these often overlooked habitats.

Protecting large landscapes ( $\geq 2000$  ha), with intact corridors and naturally functioning uplands and wetlands will conserve Eastern Indigo Snakes while also providing habitat for a broad diversity of other plant and animal species (Hyslop 2007). At this time, the Ocmulgee–Altamaha region of southern Georgia is considered a significant population stronghold for Gopher Tortoises, Eastern Indigo Snakes, and Eastern Diamond-backed Rattlesnakes (M. Elliott, pers. comm.; Enge et al. 2013; Stohlgren et al. 2015). We encourage continued monitoring of these species at these conservation land sites and throughout the Altamaha region to detect population trends through time (e.g., Bauder et al. 2017).

Despite intensive visual encounter survey efforts seeking the species, our surveys did not document the Southern Dusky Salamander (a declining species of special concern) from any of the Altamaha conservation lands. In southern Georgia, this species and *Stereochilus marginatus* (Many-lined Salamander), also not documented by our study, are most commonly associated with muck-floored, acidic blackwater creek swamps, a wetland habitat different from the alluvial swamps fringing the main stem of the Altamaha River (Graham et al. 2010, Means 2000, Stevenson and Stackhouse 2012). Blackwater creek swamp habitats were not widespread on most of our survey sites, although we did locate potentially suitable habitat on Altamaha WMA in McIntosh County, for which there is a historic museum record for Southern Dusky Salamander. A specimen has recently been collected

from a blackwater creek swamp that is a tributary of the Altamaha River, outside of our survey area (Beamer and Lamb 2008, Graham et al. 2010).

### Biogeography

The Altamaha River is a significant barrier to, or influence on, the distributions of a number of amphibian and reptile species, as well as a number of other taxa (e.g., fish [Page and Burr 2011], crayfish [Hobbs 1981], and the periodical cicada *Magicicada tredecim* (Walsh and Riley) [Hinkle et al. 2012]). Our surveys and review of museum records revealed that 5 salamander, 3 frog, 1 turtle, and 4 snake species have ranges that, in the Atlantic Coastal Plain of Georgia, do not extend south of the Altamaha River (and its associated floodplain) (Table 3). Some of these species (e.g., *Ambystoma tigrinum* [Eastern Tiger Salamander] and *Agkistrodon contortrix* [Copperhead]) are undocumented from the south side of the Altamaha River main stem. Four of these amphibian species (*Ambystoma maculatum* [Spotted Salamander], *Desmognathus conanti* [Spotted Dusky Salamander], *Pseudacris feriarum* [Upland Chorus Frog], and *Acris crepitans* [Eastern Cricket Frog]) have ranges that extend from the Piedmont into the Atlantic Coastal Plain of southeastern Georgia, following the Altamaha River drainage (including the Oconee and

Table 3. Amphibian and reptile species whose ranges are influenced by the Altamaha River drainage in southern Georgia.

Species	Range extends into Coastal Plain of southeastern GA along the Altamaha R.	Altamaha R. is the southeastern-most extent of range in the Atlantic Coastal Plain	In Georgia, species is absent from north of the Altamaha R. to the Savannah R.
<b>Amphibians</b>			
<i>Acris crepitans</i>	X	X	
<i>Ambystoma tigrinum</i> <sup>A</sup>		X	
<i>Ambystoma maculatum</i>	X	X	
<i>Desmognathus conanti</i>	X	X	
<i>Hyla avivoca</i>		X	
<i>Necturus punctatus</i>		X	
<i>Pseudacris feriarum</i>	X	X	
<i>Pseudotriton ruber</i> <sup>B</sup>		X	
<b>Reptiles</b>			
<i>Agkistrodon contortrix</i>		X	
<i>Nerodia erythrogaster</i> <sup>C</sup>		X	
<i>Pseudemys concinna</i>		X	
<i>Rhadinaea flavilata</i>			X
<i>Storeria dekayi</i>		X	

<sup>A</sup>A 2015 *A. tigrinum* record for 3.3 km N of the main stem of the Altamaha River, Wheeler County, GA (GMNH 50939) is one of the few for this taxa within the Altamaha River drainage.

<sup>B</sup>We examined a *P. ruber* specimen (SSM 9474, now GSU 20029) from the Satilla River drainage (Coffee Co., GA) catalogued by Williamson and Moulis (1994) and reclassified it as a *P. montanus* (Mud Salamander).

<sup>C</sup>There is a single literature record for this species south of the Altamaha River in the Satilla River drainage (Neill 1946).

Ocmulgee Rivers) (Table 3). All of these amphibians occupy riparian corridors of mesic bottomland forest that fringe (and are within the floodplains of) these river systems, and we documented all of these species as far southeast (i.e., downstream) along the Altamaha River as Baxley (Appling County) or Jesup (Wayne County), but not beyond (Jensen et al. 2011; Stevenson et al. 2009a, 2011). The Appling/Wayne counties region coincides with the inland-most portion of the Lower Coastal Plain (located near Jesup), demarcated by the Wicomico Terrace, the oldest Pleistocene shoreline (elevation ~30 m and ~1.5 million years old) (Gore and Witherspoon 2013, Wharton 1978).

There are several species whose ranges only partially overlap the Altamaha River drainage. The Pine Woods Littersnake, a Coastal Plain species ranging from North Carolina to Louisiana, including much of Florida, was documented from only 1 (9%) survey site. This species has never been documented anywhere in Georgia north of the Altamaha River (i.e., between the Altamaha River and the Savannah River) despite being known from adjacent South Carolina, and from southeastern Georgia south of the Altamaha River. Intensive efforts, including on a public land (Fort Stewart) north of the Altamaha that contains extensive suitable habitat (Stevenson 1999, Williamson and Moulis 1979), have been unsuccessful in finding this species. The southernmost range extent of *Necturus punctatus* (Dwarf Waterdog) is purported to be the Altamaha River drainage (Jensen et al. 2008). In actuality, the species has never been verified from the main stem of the Altamaha River or from any of its Lower Coastal Plain tributaries. Our efforts to record this salamander were unsuccessful, and we suspect that water temperatures (too warm) may influence this species' southernmost distribution.

## Conclusions

The Altamaha River region of Georgia supports an impressive herpetofaunal assemblage, including many rare and declining species. We documented many species at a suite of conservation lands throughout the region, and these sites support some of the best remaining habitats in the Coastal Plain of southeastern Georgia. Despite high species richness and habitat quality, few studies have focused on this region of the state, and there is little or no long-term monitoring for most species. We believe that this region of Georgia is of significant conservation value, and we encourage additional habitat management/restoration and research to ensure that it remains a hotspot for biodiversity.

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**Appendix 1.** Amphibian and reptile species known or with the potential to occur in the Altamaha River region of southern Georgia. Methods used to document species: 1 = found by this survey, 2 = found by this survey; voucher specimen deposited in museum collection, 3 = literature record from Schlimm (2013), 4 = personal communication to authors, 5 = museum specimen, collected pre-2000, 6 = museum specimen, collected post-2000. Abbreviations for each area (and individuals who supplied information for that area through personal communications): AC = Alligator Creek WMA; AP = Altama Plantation WMA (A. Day, M. Elliott, R. Horan, M. Stoddard); A = Altamaha WMA (R. Horan, M. Stoddard); BH = Big Hammock WMA (A. Day, W. Vaigneur); BC = Bullard Creek WMA (M. Elliott); FT = Flat Tub WMA (M. Elliott); GR = Griffing Ridge WMA (D. Beamer, J. Jensen); HC/OIS = Horse Creek WMA and Orianna Indigo Snake Preserve; MF = Moody Forest NA (J. Beane, C. Martin, P. Moler); PS/S = Penholoway Swamp WMA and Sansavilla WMA (J. Evans); and T = Townsend WMA (M. Elliott, J. Jensen).

Species	Wildlife Management Area, Natural Area, or Preserve												
	AC	AP	A	BH	BC	FT	GR	HC/OIS	MF	PS/S	T		
<b>Anurans</b>													
<i>Anaxyrus terrestris</i> (Bonnaterre) (Southern Toad)	1	1, 5	1, 5	1	1	1	1	1, 3	1, 3, 6	1	1, 3		
<i>Anaxyrus quercicus</i> (Holbrook) (Oak Toad)	1		4	1	4	4				1	1, 3		
<i>Gastrophryne carolinensis</i> (Holbrook) (Eastern Narrow-mouthed Toad)	1	1, 5	1	1, 5	1	1	1	1, 3	1, 3	1	1, 3		
<i>Pseudacris crucifer</i> (Wied-Neuwied) (Spring Peeper)	1	1	1	1	1	1	1, 5	1	1	1	1, 5		
<i>Pseudacris nigrita</i> (Le Conte) (Southern Chorus Frog)			1	1, 6		1		1	1	1	1		
<i>Pseudacris feriarum</i> (Baird) (Upland Chorus Frog)				1, 6	2			2	1, 6				
<i>Pseudacris ocularis</i> (Bosc and Daudin) (Little Grass Frog)	1	1, 5	1	1	1	1	1, 5	1, 6	1	1	1		
<i>Pseudacris ornata</i> (Holbrook) (Ornate Chorus Frog)		5						2					
<i>Acris crepitans</i> Baird (Eastern Cricket Frog)	1	1, 5	1	2	2	1		2	1, 6				
<i>Acris gryllus</i> (Le Conte) (Southern Cricket Frog)	1	1, 5	1	1	1	1	1, 5	1, 3	1, 3	1	1, 5		
<i>Hyla avivoca</i> Viosca (Bird-voiced Treefrog)			2	1	1	1	1	2	1		1		
<i>Hyla chrysocelis</i> Cope (Cope's Gray Treefrog)			1	1	1	1	1	1	1		1		
<i>Hyla squirella</i> Bosc (Squirrel Treefrog)	1	1	1	1	1	1	1	1	1	1	1		
<i>Hyla femoralis</i> Bosc (Pine Woods Treefrog)	1	4	1	1	1	1	1	1, 3	1, 3	1	1, 3		
<i>Hyla gratiosa</i> Le Conte (Barking Treefrog)	1			1				1, 3	3	1	1		
<i>Hyla cinerea</i> (Schneider) (Green Treefrog)	1	1	1, 5	1	1	1	1	1	1, 3, 6	1	1		
<i>Scaphiopus holbrookii</i> (Harlan) (Eastern Spadefoot)	2			1				1, 3	3		2, 3		
<i>Lithobates sphencephalus</i> (Cope) (Southern Leopard Frog)	1	1, 5	1, 5	1, 5	1	2	1	1, 3	1, 3, 6	1	1, 3		
<i>Lithobates capito</i> (Le Conte) (Gopher Frog)	2										5		
<i>Lithobates catesbeianus</i> (Shaw) (American Bullfrog)	1	1, 5	1	1	1, 5	1	1	1	1, 3	1	1		
<i>Lithobates clamitans</i> (Latreille) (Green Frog)	1	1	1, 5	1	1	1	1, 5	2	1, 3, 6	1	1		

Wildlife Management Area, Natural Area, or Preserve

Species	AC	AP	A	BH	BC	FT	GR	HC/OIS	MF	PS/S	T
<i>Lithobates heckscheri</i> (Wright) (River Frog)			1	1	2		1		1, 6		1
<i>Lithobates grylio</i> (Stejneger) (Pig Frog)		2, 5	1, 5				5				
<i>Lithobates virgatipes</i> (Cope) (Carpenter Frog) <sup>A</sup>											
<b>Salamanders</b>											
<i>Ambystoma cingulatum</i> Cope (Frosted Flatwoods Salamander) <sup>A</sup>											
<i>Ambystoma opacum</i> (Gravenhorst) (Marbled Salamander)		1	1	1	2	1	5	1, 3	1, 6		
<i>Ambystoma maculatum</i> (Shaw) (Spotted Salamander)					1, 5	2		1	2		
<i>Ambystoma talpoideum</i> (Holbrook) (Mole Salamander) <sup>B</sup>											
<i>Ambystoma tigrinum</i> (Green) (Eastern Tiger Salamander) <sup>B</sup>											
<i>Amphiuma means</i> Garden (Two-toed Amphiuma)	2	2	1		2	2		1	4	1	1
<i>Notophthalmus perstriatus</i> (Bishop) (Striped Newt) <sup>A</sup>											
<i>Notophthalmus viridescens</i> (Rafinesque) (Eastern Newt)		2	1	1	2	1	1, 5	1	1, 6	2, 5	
<i>Desmognathus auriculatus</i> (Holbrook) (Southern Dusky Salamander)			5								
<i>Desmognathus conanti</i> Rossmann (Spotted Dusky Salamander) <sup>B</sup>											
<i>Eurycea cirrigera</i> (Green) (Southern Two-lined Salamander)			1	1	1	1	4	1	1, 6	1	1
<i>Eurycea guttolineata</i> (Holbrook) (Three-lined Salamander)	1		2		5	1			1, 6	1	
<i>Eurycea quadridigitata</i> (Holbrook) (Dwarf Salamander)	1	1	1	1, 5	1	1	1, 5	1	1, 6	1, 5	1
<i>Plethodon ocmulgee</i> Highton (Ocmulgee Slimy Salamander)	1	1	1	1		1	1	1	1, 3, 6	1, 5	1
<i>Pseudotriton montanus</i> Baird (Mud Salamander)		2								2	
<i>Pseudotriton ruber</i> (Latreille) (Red Salamander)	2							1			
<i>Stereochilus marginatus</i> (Hallowell) (Many-lined Salamander) <sup>B</sup>											
<i>Necturus punctatus</i> (Gibbes) (Dwarf Waterdog) <sup>A</sup>											
<i>Pseudobranchius striatus</i> (Le Conte) (Dwarf Siren) <sup>B</sup>											
<i>Siren intermedia</i> Barnes (Lesser Siren)		1	1, 5	1, 5			1	1	1	2	2
<i>Siren lacertina</i> Osterdam (Greater Siren)		2	1, 5								
<b>Crocodilians</b>											
<i>Alligator mississippiensis</i> (Daudin) (American Alligator)	1	1	1, 5	1	1	2	1	1	1	1	1, 5

Species	Wildlife Management Area, Natural Area, or Preserve										
	AC	AP	A	BH	BC	FT	GR	HC/OIS	MF	PS/S	T
<b>Lizards</b>											
<i>Anolis carolinensis</i> (Voigt) (Green Anole)	1	1	1, 5	1, 5	1, 5	1	1, 5	2, 3	1, 3, 6	1, 5	1, 3
<i>Ophisaurus attenuatus</i> Cope (Slender Glass Lizard)											
<i>Ophisaurus compressus</i> Cope (Island Glass Lizard) <sup>B</sup>											
<i>Ophisaurus mimicus</i> Palmer (Mimic Glass Lizard) <sup>A</sup>											
<i>Ophisaurus ventralis</i> (Linnaeus) (Eastern Glass Lizard)	4	1									1
<i>Sceloporus undulatus</i> (Bosc and Daudin) (Eastern Fence Lizard)	1	1	1, 5	1, 5	1, 5	1	1	1, 3	1, 3	1	1, 3, 5
<i>Plestiodon inexpectatus</i> (Taylor) (Southeastern Five-lined Skink)	1		1, 5	1, 5		1	1	1, 3		5	1, 5
<i>Plestiodon laticeps</i> (Schneider) (Broad-headed Skink)	1	1	1, 5	1	1	1	1	1	1, 3, 6	1	1
<i>Plestiodon fasciatus</i> (L.) (Common Five-lined Skink)			5	1	2	1	1	1	1		
<i>Plestiodon egregius</i> Baird (Mole Skink)	1							1, 3			
<i>Scincella lateralis</i> (Say) (Little Brown Skink)	1	1	1, 5	1	1, 5	1	1	1, 3	1, 3	1	1, 3, 5
<i>Aspidoscelis sexlineata</i> (L.) (Six-lined Racerunner)	1	1	1	1	1	2	1	1, 3	1, 3, 6	1	1, 3
<b>Snakes</b>											
<i>Nerodia taxispilota</i> (Holbrook) (Brown Watersnake)	1		1, 6	1	2	2	1	1	1, 6	1	1
<i>Nerodia erythrogaster</i> (Forster) (Plain-bellied Watersnake)		2	1, 5	1	1	2	1	2	1, 6	1	2
<i>Nerodia fasciata</i> (L.) (Southern Watersnake)	1	1	1, 6	1	1, 5	1	1	1	1, 6	1	1
<i>Seminatrix pygaea</i> (Cope) (Black Swampsnake) <sup>A</sup>											
<i>Regina rigida</i> (Say) (Glossy Crayfish Snake)			2	4							5
<i>Rhadinaea flavilata</i> (Cope) (Pine Woods Littersnake)										5	
<i>Virginia striatula</i> (L.) (Rough Earthsnake)											
<i>Virginia valeriae</i> Baird and Girard (Smooth Earthsnake) <sup>B</sup>											
<i>Storeria dekayi</i> (Holbrook) (Dekay's Brownsnake)				2	2			2	2		
<i>Storeria occipitomaculata</i> (Storer) (Red-bellied Snake)		1						1	1, 3, 6		2, 3
<i>Thamnophis sirtalis</i> (L.) (Common Gartersnake)	1							1	1	1, 5	1
<i>Thamnophis sauritus</i> (L.) (Eastern Ribbonsnake)			5	1				1			1
<i>Farancia erythrogramma</i> (Palisot de Beauvois) (Rainbow Snake)			1, 6	2			1, 5			1	1
<i>Farancia abacura</i> (Holbrook) (Red-bellied Mudsnake)			1	1			1				
<i>Diadophis punctatus</i> Baird and Girard (Ring-necked Snake)	1	1	1	1		1			1, 6	1	5
<i>Cemophora coccinea</i> (Blumenbach) (Scarletsnake)	2							1	2	2	2
<i>Ophedryx aestivus</i> (L.) (Rough Greensnake)	1	4	6	2	1			1	1, 6	1	1



Wildlife Management Area, Natural Area, or Preserve

Species	AC	AP	A	BH	BC	FT	GR	HC/OIS	MF	PS/S	T
<i>Heterodon platirhinos</i> Latreille (Eastern Hog-nosed Snake)	1	4	1	1	2	4	1	1	1, 3	1, 5	1, 3
<i>Heterodon simus</i> (L.) (Southern Hog-nosed Snake)				2, 5							
<i>Coluber constrictor</i> L. (North American Racer)	1	1	1	1	1	1	1	1	1, 3	1	1, 3
<i>Coluber flagellum</i> Shaw (Coachwhip)	1	1	1, 5	1, 5			1, 5	1, 3	1, 3	2	1, 3
<i>Drymarchon couperi</i> (Holbrook) (Eastern Indigo Snake)	2		2	5		1	1, 5	2, 3	1, 3, 6	2, 5	1, 5
<i>Pituophis melanoleucus</i> (Daudin) (Pinesnake)	2			4		1, 6		2, 3			
<i>Pantherophis alleghaniensis</i> (Holbrook) (Eastern Ratsnake)	1	1	1, 5	1	1, 5	1	1, 5	1	1, 3, 6	1, 5	1, 3
<i>Pantherophis guttatus</i> (L.) (Red Cornsnake)	1	1	1	1	1	1	1	1	1, 6	1	1
<i>Lampropeltis getula</i> (L.) (Eastern Kingsnake)	1		1, 5	1	1	5	5	1		5	
<i>Lampropeltis elapsoides</i> (Holbrook) (Scarlet Kingsnake)	1		1, 5	1		5	5	1	1, 6		1
<i>Tanilla coronata</i> Baird and Gerard (Southeastern Crowned Snake)	1			1				2, 3	1, 3		
<i>Micrurus fulvius</i> (L.) (Harlequin Coralsnake)		2		1, 5			1	1, 6	6	2, 6	1
<i>Agkistrodon contortrix</i> (L.) (Copperhead)			1, 5					1			1
<i>Agkistrodon piscivorus</i> (Lacépède) (Cottonmouth)		2, 5	1				1	2			4
<i>Sistrurus miliarius</i> (L.) (Pygmy Rattlesnake)		1	2						6	1, 5	2
<i>Crotalus horridus</i> Linnaeus (Timber Rattlesnake)		1	2, 6							4	
<i>Crotalus adamanteus</i> (Palisot de Beauvois) (Eastern Diamond-backed Rattlesnake) <sup>c</sup>	2	4	1	1, 5	4	1	1	1	1, 3, 6	1, 5	1, 3

Turtles	AC	AP	A	BH	BC	FT	GR	HC/OIS	MF	PS/S	T
<i>Gopherus polyphemus</i> (Daudin) (Gopher Tortoise)	1	1	1	1	1	1	1	1	1	2	1
<i>Kinostemon subrubrum</i> (Lacépède) (Eastern Mud Turtle)	1	1, 5		1				1	1, 6		1, 5
<i>Kinostemon baurii</i> (Garman) (Striped Mud Turtle)		2	2	1, 5	2	1	1	1	1, 6	1	1, 5
<i>Sternotherus odoratus</i> (Latreille) (Eastern Musk Turtle)		2, 5	2	1	2	1	2	1	1, 6		2
<i>Sternotherus minor</i> (Agassiz) (Loggerhead Musk Turtle)				1	2		2	1, 5	1		2
<i>Trachemys scripta</i> (Schoeff) (Yellow-bellied Slider)	1	1	1, 6	1	1	1	1, 5	1	1	1	1
<i>Pseudemys concinna</i> (Le Conte) (River Cooter)	1			2	2	1	2	1	1	1	1, 5
<i>Pseudemys floridana</i> (Le Conte) (Coastal Plain Cooter)	1		1	1			1		1	1	1
<i>Deirochelys reticularia</i> (Latreille) (Chicken Turtle)				1				2	4	1	
<i>Terrapene carolina</i> (L.) (Eastern Box Turtle)	1	1	1	1	1	1	1	1, 5	1	1	1
<i>Clemmys guttata</i> (Schneider) (Spotted Turtle)	2	2	1, 6			2		2			

Species	Wildlife Management Area, Natural Area, or Preserve										
	AC	AP	A	BH	BC	FT	GR	HC/OIS	MF	PS/S	T
<i>Chelydra serpentina</i> (L.) (Snapping Turtle)	1	1	1	1	1	1	1	1	1, 6	1	1
<i>Apalone ferox</i> (Schneider) (Florida Softshell)	2	1	1, 5	1	1	1	1	1	1		1
<i>Apalone spinifera</i> (LeSueur) (Spiny Softshell)	2			1	2	2	1	1	1	1, 5	1

<sup>A</sup>Species on the hypothetical species list for the Altamaha River region that have not been documented from any of our conservation land survey sites or from any site within 5 km of the Altamaha River main stem.

<sup>B</sup>Species that were not documented from any of our conservation land survey sites but that are known from within 5 km of the Altamaha River main stem based on museum records.

<sup>C</sup>All records from personal communications are from 2008–2016, except the Eastern Diamond-backed Rattlesnake record for Altama Plantation WMA (2000).