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Endangered and Threatened Wildlife and Plants; Endangered Status for the Altamaha Spinymussel and Designation of Critical Habitat; Final Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2008–0107; 92210 1111 0000–B2]

RIN 1018–AV88

Endangered and Threatened Wildlife and Plants; Endangered Status for the Altamaha Spinymussel and Designation of Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service, list the Altamaha spinymussel (*Elliptio spinosa*), a freshwater mussel endemic to the Altamaha River drainage of southeastern Georgia, as an endangered species under the Endangered Species Act of 1973, as amended (Act), and designate approximately 237.4 kilometers (km) (147.5 miles (mi)) of mainstem river channel as critical habitat in Appling, Ben Hill, Coffee, Jeff Davis, Long, Montgomery, Tattnall, Telfair, Toombs, Wayne, and Wheeler Counties, Georgia. This final rule will implement the Federal protections provided by the Act.

DATES: This rule becomes effective on November 10, 2011.

ADDRESSES: This final rule and final economic analysis are available on the Internet at *http://www.regulations.gov.* Comments and materials received, as well as supporting documentation used in preparing this final rule, are available for public inspection, by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Georgia Ecological Services Office, 105 Westpark Dr., Suite D, Athens, GA 30606; telephone 706–613–9493; facsimile 706–613–6059.

FOR FURTHER INFORMATION CONTACT: Sandra Tucker, Field Supervisor, U.S. Fish and Wildlife Service, Georgia Ecological Services Office (see **ADDRESSES** above). If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION: This document consists of: (1) A final rule to list the Altamaha spinymussel (*Elliptio spinosa*) as endangered; and (2) a final rule to designate critical habitat for this species.

Previous Federal Actions

Federal actions for this species prior to October 6, 2010, are outlined in our proposed rule (75 FR 61664), which was published on that date. Publication of the proposed rule opened a 60-day comment period, which closed on December 6, 2010. We reopened the comment period from May 12, 2011, through June 13, 2011, in order to announce the availability of and receive comments on a draft economic analysis (DEA), and to extend the comment period on the proposed listing and designation (76 FR 27629).

Public Comments

We received comments from the public on the proposed listing action and proposed critical habitat designation, and, in this rule, we respond to these issues in a single comments section. Below, we present the listing analysis first, followed by the analysis for designation of critical habitat.

Background

Species Description

The Altamaha spinymussel (*Elliptio spinosa*) is a freshwater mussel in the family Unionidae, endemic to (found only in) the Altamaha River drainage of southeastern Georgia. The Altamaha River is formed by the confluence of the Ocmulgee and Oconee rivers and lies entirely within the State of Georgia. The species was described by I. Lea in 1836 from a site near the mouth of the Altamaha River in Darien, Georgia (Johnson 1970, p. 303).

This species reaches a shell length of approximately 11.0 centimeters (cm) (4.3 inches (in)). The shell is subrhomboidal or subtriangular in outline and moderately inflated. As the name implies, the shells of these animals are adorned with one to five prominent spines. These spines may be straight or crooked, reach lengths from 1.0 to 2.5 cm (0.39 to 0.98 in), and are arranged in a single row that is somewhat parallel to the posterior ridge. In young specimens, the outside layer or covering of the shell (periostracum) is greenish-yellow with faint greenish rays, but as the animals get older, they typically become a deep brown, although some raying may still be evident in older individuals. The interior layer of the shell (nacre) is pink or purplish (Johnson 1970, p. 303).

Life History and Habitat

Adult freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and other microorganisms from the water column. For the first several months, juvenile mussels employ pedal (foot) feeding, extracting bacteria, algae, and detritus from the sediment (Yeager 1994, pp. 217–221; Cope *et al.* 2008, p. 457).

Although the life history of the Altamaha spinymussel has not been studied, the life histories of other mussels in the *Elliptio* genus have been. Internal fertilization results in the female brooding the larvae (glochidia), which when mature are released. To ensure survival, glochidia must come into contact with a specific host fish or fishes to develop into juvenile mussels. Other mussels in the genus *Elliptio* are broadcast releasers, which may release conglutinates that resemble insect larvae. This reproductive strategy depends on clear water during the time of the year when mussels release their glochidia (Hartfield and Hartfield 1996, p. 375). The Altamaha spinymussel is thought to reproduce in late spring and release glochidia by May or June (Johnson 2004, p. 2; Bringolf 2011, pers. comm.). The host fish of the Altamaha spinymussel is currently unknown. Furthermore, juvenile age classes of other mussels are commonly found during surveys; however, no spinymussel recruitment has been evident in surveys conducted since 1990 (Keferl 2008, pers. comm.; Wisniewski 2008, pers. comm.). Research to develop a better understanding of the natural history and the reasons for a lack of recruitment in the species is continuing.

This spinymussel is known only from Georgia in Glynn, Ben Hill, McIntosh, Telfair, Tattnall, Long, Montgomery, Toombs, Wheeler, Appling, Jeff Davis, Coffee, and Wayne Counties. This spinymussel is considered a ''big river'' species; is associated with stable, coarse-to-fine sandy sediments of sandbars, sloughs, and mid-channel islands; and appears to be restricted to swiftly flowing water (Sickel 1980, p. 12). Johnson (1970, p. 303) reported Altamaha spinymussels buried approximately 5.1 to 10.2 cm (2.0 to 4.0 in) below the substrate surface.

Species Distribution and Status

The historical range of the Altamaha spinymussel was restricted to the Coastal Plain portion of the Altamaha River and the lower portions of its three major tributaries, the Ohoopee, Ocmulgee, and Oconee Rivers (Johnson 1970, p. 303; Keferl 2001, pers. comm.). Large-scale, targeted surveys for the mussel have been conducted since the 1960s (Keferl 1993, p. 299). Recent surveys have revealed a dramatic decline in recruitment, the number of populations, and number of individuals within populations throughout the species' historic range (Stringfellow and Gagnon 2001, pp. 1–2; Keferl 1995, pp.

3–6; Keferl 2008 pers. comm.; Wisniewski 2006, pers. comm.).

Ohoopee River

In a survey of the Ohoopee River, Keferl (1981, pp. 12–14) found at least 30 live specimens of the Altamaha spinymussel at seven of eight collection sites, in thinly scattered beds, in the lower 8 kilometers (km) (5 miles (mi)) of the river. Spinymussels were not found higher in the watershed, presumably because there are insufficient flows to support this species. By the early 1990s, however, only two live specimens were found at the same sites (Keferl 1995, pp. 3–6; Keferl 2008 pers. comm.; Wisniewski 2006, pers. comm.). Stringfellow and Gagnon (2001, pp. 1–2) resurveyed these sites using techniques similar to those used by Keferl (1981, p. 12), but did not find any live Altamaha spinymussels in the Ohoopee River. Therefore, the species is currently either extirpated from the Ohoopee River or present in such low numbers that it is undetectable.

Ocmulgee River

The Altamaha spinymussel is known from the Ocmulgee River from its confluence with the Oconee River upstream to Red Bluff in Ben Hill County (approximately 110 km/68.3 mi). Early collecting efforts in the Ocmulgee River near Lumber City yielded many live Altamaha spinymussels. In 1962, Athearn made a single collection of 40 live spinymussels downstream of U.S. Highway 341 near Lumber City (Johnson *et al.* 2008, Athearn database). Researchers collected 19 and 21 live individuals, respectively, during two surveys at Red Bluff (Thomas and Scott 1965, p. 67). In 1986, Stansbery collected 11 live individuals at the U.S. Highway 441 Bridge near Jacksonville, Georgia (Wisniewski 2006, pers. comm.).

The lower Ocmulgee River was surveyed by Keferl in the mid 1990s, during 2000–2001 (Cammack *et al.* 2001, p. 11; O'Brien 2002, p. 2), and in 2004 (Dinkins 2004, pp. 1–1 and 2–1). Over 90 sites have been surveyed since 1993, many of which were repeatedly surveyed, resulting in a total of 19 live Altamaha spinymussels detected at 10 sites, distributed from Jacksonville downstream to the Oconee River confluence.

Oconee River

There are few historical records of Altamaha spinymussels from the Oconee River. Athearn collected 18 spinymussels, including 5 juveniles, at a site in Montgomery County near Glenwood in the late 1960s (Johnson *et al.* 2008, Athearn database). The species has not been collected there since and is probably extirpated from the Oconee River system (Keferl 2008, pers. comm.). In 1995, as part of a dam relicensing study, 41 sites between Lake Sinclair and Dublin were surveyed (EA Engineering 1995, pp. 1–1, 3–1, 3–2, 4–2, and 4–3). One hundred forty-four hours of search time yielded 118 live mussels, but no Altamaha spinymussels. Compared to the other portions of its range, the Oconee River has not been extensively surveyed, in part because the entire mussel fauna of this river appears to be sparse.

Altamaha River

Most surveys for Altamaha spinymussels have been conducted in the Altamaha River. Although methodological differences preclude accurate comparison of mussel abundances over time, there is evidence that higher abundances of Altamaha spinymussels occurred in the Altamaha River historically. Early surveys at the U.S. Route 301 crossing documented 20 individuals in 1963, 7 in 1965, and 43 in 1970. Sickel sampled seven sites downstream of the U.S. Route 1 bridge in 1967. Sixty spinymussels were collected in one 500-square meters (m^2) (5382-square feet (ft^2)) site, and an additional 21 spinymussels were collected in a 400-m^2 (4306-ft^2) (Sickel 1980, p. 11; Wisniewski 2006, pers. comm.) site. One site had five live spinymussels, two sites had one each, and two sites had no Altamaha spinymussels.

From 1993 to 1996, Keferl surveyed 164 sites on the mainstem of the Altamaha River between the Ocmulgee-Oconee River confluence and the Interstate 95 crossing near the river's mouth (approximately 189 km/117 mi.). A total of 63 live Altamaha spinymussels were collected from 18 of these sites, located between the Oconee River and U.S. Route 301 (116 km/72 mi); however, no Altamaha spinymussels were collected below U.S. Route 301 (73 km/45 mi), suggesting absence or extreme rarity in the reach between U.S. Route 301 and the river's mouth (approximately 73 km (45 mi)). In addition, 10 of these sites were clustered within a 4-km (2-mi) reach upstream of the U.S. Route 301 crossing near Jesup; the remaining eight sites were isolated by long distances of habitat with no or sub-detectable numbers of live spinymussels.

O'Brien (2002, pp. 3–4) surveyed 30 sites on the Altamaha River from the confluence of the Ocmulgee and Oconee Rivers downstream to U.S. Route 301 during 2001, including the 18 known Altamaha spinymussel sites, reported by Keferl, within the reach. She collected a total of six live individuals from five different sites and freshly dead shells from two additional sites.

In 2003 and 2004, researchers surveyed 25 sites to collect specimens for host-fish trials (Albanese 2005, pers. comm.). Live Altamaha spinymussels were detected at only four sites. Five of the seven sites documented by O'Brien and all four sites documented during the host-fish surveys were clustered within a short reach (15 km/24 mi) of the Altamaha River just upstream of the U.S. Route 301 crossing near Jesup, Georgia.

To summarize, researchers were able to find 60 Altamaha spinymussels at a single site on the Altamaha River in 1967; in contrast, the largest number of Altamaha spinymussels observed from a single site on the Altamaha River during the 1990s or 2000s was nine (Albanese 2005, pers. comm.).

Summary of Basin-Wide Population Estimates

In 1994, researchers spent 128 search-hours throughout the Altamaha Basin to find 41 spinymussels (Keferl 1995, p. 3). From 1997 through 2006, researchers searched 233 sites throughout the basin to document 34 spinymussels in more than 550 hours of searching (Wisniewski 2006, pers. comm.); from 2007 to 2009, only 23 spinymussels were found from more than 110 sites (Wisniewski 2009, pers. comm.). In summary, the Altamaha spinymussel is considered extirpated from two rivers in its historical range, the Ohoopee (15 km (9 mi)) and Oconee Rivers (45 km (28 mi)), as well as the lower 73 km (45 mi) of the Altamaha River (Table 1). Since 1997, despite extensive survey efforts made by several different researchers, only 57 spinymussels have been observed from 7 sites in the Ocmulgee (110 km (68 mi)) and 15 sites in the upper Altamaha (116 km (72 mi)) combined, and while individual spinymussels have been found scattered throughout this stretch of river, most of these sites have been clustered in the 10 km (6 mi) immediately north of the U.S. Route 301 crossing.

TABLE 1—DECLINE IN RANGE OF THE ALTAMAHA SPINYMUSSEL

River reach	Historically occupied (linear km/mi)	Current habitat	Percent of historical range lost
Ohoopee	15 km/9 mi	Not seen since 1997	4
Oconee	45 km/28 mi	Not seen since 1968	12.5
Ocmulgee	110 km/68.3 mi	Widely scattered	0
Upper Altamaha	116 km/72 mi	Widely scattered individuals	0
Lower Altamaha	73 km/45 mi	Not seen since 1970	20
Total	359 km/222 mi	226 km/140 mi	36.5

Using Georgia Department of Natural Resources (GDNR)'s database, which included many of the surveys mentioned above, Wisniewski *et al.* (2005, p. 2) conducted a test for a temporal change in sites occupied in the Ocmulgee and Altamaha Rivers between the early 1990s and the early 2000s. Live Altamaha spinymussels were detected at 24 of 241 sites (10 percent) sampled before 2000 and at 14 of 120 sites (12 percent) sampled after 2000. Although the percentage of sites occupied is not indicative of a decline, an analysis of 39 sites sampled during both time periods, of which the spinymussel was initially present in 13 of the 39 sites, indicated that the spinymussel was lost from significantly more sites (11 sites) than it colonized (3 sites) between the early 1990s and early 2000s (Wisniewski *et al.* 2005, p. 2). This test is imprecise because the failure to detect Altamaha spinymussels when present could result in both false colonizations (species missed during early surveys but detected in recent survey) and false extirpations (species detected during early survey but missed during recent survey). Thus, although the exact number of extirpations and colonizations between the two time periods may not be accurate, the much higher number of extirpations is suggestive of a decline over this time period.

Summary of Comments and Recommendations

During the open comment periods for the proposed rule (75 FR 61664) and draft economic analysis, we requested that all interested parties submit comments or information concerning the proposed listing and designation of critical habitat for the Altamaha spinymussel. We contacted all appropriate State and Federal agencies (including the State of Georgia, from whom we directly requested comments), county governments, elected officials, scientific organizations, and other interested parties and invited them to comment. Articles concerning the proposed rule and inviting public comment were published by the Associated Press, The Brunswick News and the Florida Times Union. An article was also published by the Center for Biological Diversity.

During the comment periods, we received a total of 79 comments. We received comments supporting the listing of the Altamaha spinymussel from the Georgia Department of Natural Resources–Wildlife Resources Division, the U.S. Army Corps of Engineers, three environmental groups, and 70 individuals including 9 letters and 65 postcards. We received two requests for an extension of the open comment period and notified requestors that the comment period would reopen for the Notice of Availability of the Draft Economic Analysis, published on May 12, 2011. We received no requests for, and therefore did not hold, a public hearing.

Peer Review

In accordance with our peer review policy published in the **Federal Register** on July 1, 1994 (59 FR 34270), we requested the opinions of four knowledgeable individuals with expertise on freshwater mollusks, the Altamaha River Basin, and conservation biology principles. The purpose of peer review is to ensure that the designation is based on scientifically sound data, assumptions, and analyses, including input of appropriate experts and specialists. We received written responses from three of the peer reviewers.

Peer reviewers stated that: (1) The proposal included a thorough and accurate review of the available scientific and commercial data on this mussel and its habitats; (2) the best available scientific data documented substantial declines in its abundance and distribution; and (3) the data supported the proposed listing as endangered with the designation of approximately 237.4 km (147.5 mi) of critical habitat. Two peer reviewers provided additional details and correction about the life history of the spinymussel, one of these reviewers also provided specific recommendations for the primary constituent elements (PCEs). The information provided by the reviewers has been incorporated into the appropriate sections of this final rule or is addressed in the comments below.

We reviewed all comments received for substantive issues and new data regarding the spinymussel, its critical habitat, and the draft economic analysis. Written comments received during the comment periods are addressed in the following summary. For readers' convenience, we have combined similar comments into single comments and responses.

Peer Reviewer Comments

(1) Comment: Water quality standards set by the State of Georgia are based on water quality criteria established by the U.S. Environmental Protection Agency (EPA) for protection of aquatic life, not humans. Mussels are not currently represented in datasets used by EPA for derivation of water quality criteria. If adopted, the proposed criteria for ammonia will be the first to include mussel sensitivity data. Therefore, the statement that many of the standards may not be protective of mussels is accurate.

Our response: We agree, and have incorporated this information into the Physical or Biological Features Section to reflect this comment. Also see Comment 4 below.

(2) Comment: Dissolved Oxygen (DO) concentrations of 33.1 mg/L appear unusually high for a river segment with no dams. It seems appropriate to exclude this value as described by reporting the 10th and 90th percentiles for DO.

Our response: After reviewing the data, we found three data points to be exceptionally high. All three were taken from the same timeframe with the same device, which suggests that the device may not have been calibrated correctly. These three data points have been thrown out, and the concentration range has been recalculated to 0.42–

20.3 mg/l. The benefit of using the 10th and 90th percentiles is that it allows us to exclude the outliers from the data that may be due to device errors.

(3) Comment: Populations of several fish species, particularly anadromous fishes (*e.g.* striped bass (*Morone saxatilis*), Atlantic and shortnose sturgeon (*Acipenser oxyrinchus* and *A. brevirostrum*), American shad (*Alossa sapidissima*), and other herrings), have declined substantially in recent decades. Host trials for spinymussels with 10 species of fish from six families (Centrarchidae, Cyprinidae, Ictaluridae, Moronidae, Acipenseridae, Catostomidae) have been conducted. Unfortunately, none of these trials have produced juvenile spinymussels.

Our response: We agree. One of the largest gaps in knowledge of this species is host fish information. Presence of suitable host fish in the basin is critical for survival of this species. Evaluation of habitat suitability for the spinymussel would be greatly enhanced with knowledge of the host fish occurrence and distribution; suitable habitat must also be present for the host fish(es). Though all 85 fish species native to the Altamaha Basin are still present, populations of several fish species have declined substantially compared to historic numbers. Host fish have been identified for other members of the genus *Elliptio,* and these species should provide a starting point for the spinymussel. Identification of suitable host fish is also critical for development of a propagation program. Laboratory culture of juveniles would allow for a potential population augmentation program and/or could be used to produce organisms for toxicity testing purposes. The Service has incorporated this information into the Physical or Biological Features Section to reflect this comment.

(4) Comment: EPA has recently (2009) proposed to revise the chronic water quality value for ammonia (at pH 8 and 25 C) from 1.2 mg/L to 0.26 mg/L. This value is calculated to protect 95% of aquatic species. Because ammonia toxicity data have not been generated for the Altamaha spinymussel it is prudent for the Service to consider a lower PCE value for ammonia such as 0.22 mg N/L as indicated in the proposal.

Our response: We agree. We believe the value chosen for the PCE for ammonia is well supported, which is why it is being adopted by EPA (Newton *et al.* 2003, p. 2556 and Wang *et al.* 2007, pp. 2041–2043).

(5) Comment: The commenter recommends adding criteria for copper, nickel, and pyrene. Copper toxicity to early life stages of unionids has been reported as low as 6.8 ug/L in a 96-hr test at a water hardness of 177 mg/L (Wang *et al.* 2007, p. 2043). Hardness buffers metal toxicity by reducing bioavailability of metal ions. Hardness values are much lower (20–40 mg/L) in the Altamaha, thus toxicity would be expected at even lower copper concentrations. Chronic criteria should be substantially lower than this acute value.

Nickel toxicity has been reported for juvenile unionids at 190 ug/L in a 96-hr test with soft water (hardness <50 mg/L). Acute and chronic nickel criteria should be lower than 190 ug/L (no citation provided).

Pyrene is a polycyclic aromatic hydrocarbon (PAH) that may be associated with pulp and paper mills among other industrial and urban sources. This PAH is toxic to unionid glochidia (24 h LC50) at 2.63 ug/L in the presence of UV light (no citation provided). Chronic criteria for persistent, bioaccumulative compounds like PAHs should be substantially lower than acute toxicity values.

Our response: The Service routinely consults with other federal agencies regarding the effects of their actions, and uses the best science available. Given the complex and unique conditions inherent in individual consultations, as well as at different times of year and areas of the river, we believe it would not be prudent to set standards for these compounds at this time because temperature, life stage, and other unknowns may have substantial impact on their toxicity (*e.g.,* temperature and copper interaction). Where surrogate science was available and appropriate to establish general guidelines for water quality, it was applied in this manner. However, we do not have sufficient data to develop water quality criteria for copper, nickel, and pyrene at the level of specificity suggested by the commenter.

Comments From the State

Section 4(i) of the Act states, ''the Secretary shall submit to the State agency a written justification for his failure to adopt regulations consistent with the agency's comments or petition.'' Comments received from the State regarding the proposal to designate critical habitat for the Altamaha spinymussel are addressed below.

Because the comments of one peer reviewer (a State of Georgia employee) were adopted by the State, we are including them in our response to State comments. The State supports the designation of critical habitat for the occupied reaches of the Altamaha and Ocmulgee rivers as proposed, including the exclusion of the Altamaha River between U.S. Route 1 and the upper property boundary of Moody Forest Natural Area from proposed critical habitat. Georgia concurs with the Service that the designation of critical habitat in only the currently occupied reaches of the Altamaha and Ocmulgee Rivers would not adequately conserve the Altamaha spinymussel because this range is connected in a linear pattern that could be destroyed by a single event in the Ocmulgee, flowing downstream into the Altamaha. Therefore, the proposed designation of critical habitat in at least one additional tributary that historically harbored the Altamaha spinymussel is necessary to conserve the species.

(6) Comment: One item that appears to be poorly supported is the considerable discussion found within the *Summary of Factors Affecting the Species* regarding contaminants in sediments of the Oconee River as primary threats. In the proposed rule the Service included extensive text on heavy metal toxicity due to kaolin mining/processing as a threat to unionids in the Oconee River Basin. The Service should also include extensive text regarding the presence and operations of Lake Sinclair.

Our response: The effects of contaminants in sediment in the Oconee River and the entire Altamaha Basin are not well understood. However, it is clear that contaminants in sediment are a threat to mussel fauna in the Southeast and are, therefore, a potential threat to the spinymussel that must be evaluated in the Threats Assessment (Cope 2008, pp. 452–459). Currently there are no data to describe the sensitivity of the spinymussel to environmental stressors such as temperature, dissolved oxygen, and contaminants, but tolerances to stressors can be inferred from other mussel species. The effects of these stressors on mussel fauna are often interconnected. Standardized ASTM (American Society for Testing and Materials) guidelines are currently available for toxicity tests with early life stages (glochidia and juveniles) of freshwater mussels. As a result, toxicity and thermal tolerance data are being generated for a growing number of unionid species. The Service considers contaminants in sediment a potential threat to the spinymussel throughout its range. The nearest reservoir is approximately 120 km (75 miles) from the historic range of the spinymussel and approximately 165 km (103 mi.) from occupied habitat, thus, the effects of hypolimnetic discharges are not considered a threat to the Altamaha spinymussel (also see Comment 7 and

Factor E. Other Natural and Man Manmade Factors Affecting Its Continued Existence).

(7) Comment: The Oconee River downstream of Lake Sinclair was generalized as having sparse mussel populations. The proposal strongly suggests that this is a result of contaminants but does not allude to any effects due to the presence of a major dam and hydroelectric generation facility located at Lake Sinclair. Numerous published studies have recognized reservoirs and hydroelectric generation facilities as one of the leading reasons for declines and extinctions of unionids throughout North America.

Our response: The Oconee River downstream of Lake Sinclair to U.S. Route 280 is poorly surveyed for mussels. Available surveys had described the mussel fauna as depauperate (EA Engineering 1995, pp. 1–1, 3–1, 3–2, 4–2, and 4–3). Typically, habitats immediately downstream of dams are unsuitable for unionids due to the highly erosive nature of the substrates during channel forming events (*e.g.,* spring floods), which scour substrates and deposit those benthic organisms occupying these habitats elsewhere. Additionally, eroding substrates are often deposited upon downstream habitats where unionids occur and thus impede their mobility and their ability to siphon or reproduce. Generally, the effects of reservoir operations on river channels are greatest closest to dams and gradually decline as rivers flow downstream. This effect is observed in the Oconee River, which has a deeply entrenched channel near Dublin, Georgia, upstream of the historic range of the spinymussel. Conversely, the Oconee River downstream of U.S. Route 280 near Mt. Vernon (within the historic range of the spinymussel), has a wider, less entrenched channel with good floodplain connectivity, gentle bank slope, and riparian buffers. Mussel fauna diversity greatly increases in the lower portion of the Oconee, suggesting that the habitat is not degraded by dam operations. While the dam at Lake Sinclair certainly has a profound effect on the ecology of the Oconee River, it is 75 miles from the historic range of the spinymussel and, therefore, was not considered a threat (see Factor E. Other Natural and Man Manmade Factors Affecting Its Continued Existence).

(8) Comment: The inclusion of the Lower Oconee River as critical habitat would more adequately conserve the Altamaha spinymussel than the inclusion of the Ohoopee River, as the Oconee River is a much larger watershed and would be less vulnerable to dewatering during periods of extreme drought, which will likely become more frequent in the future. The Oconee River from U.S. 280 in Mt. Vernon downstream to its confluence with the Altamaha River should be designated as an unoccupied stream reach proposed for critical habitat.

Our response: We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated critical habitat area is unimportant or may not be required for recovery of the species. The Service agrees that it is essential for the conservation of the species that one of the unoccupied tributaries to the Altamaha be included as critical habitat to avoid a linear distribution that might be vulnerable to a single catastrophic event. The Service has determined that only one of the unoccupied rivers is essential. In deciding which of the two rivers to include as critical habitat we looked at all historic records of spinymussel. In the Oconee River, the only record of spinymussels was from a single collection in 1968. The spinymussel has not been seen in the Oconee from any other locations or at any other time and is now considered extirpated from this river. Conversely, spinymussels have been found from multiple locations over several decades in the Ohoopee and were found as recently as 1997. Keferl referred to the Ohoopee as a possible refugia for the species endemic to the Altamaha, including the spinymussel (Keferl 1981, p. 15). Furthermore, the Oconee has many human-induced threats that are not well understood, including: Kaolin mining, agriculture, and municipal water treatment. The Ohoopee has fewer inputs of point source pollution within this basin; however, this river is impacted by municipal water treatment, drought, and, during low flows, vehicle traffic in the river bed. Drought is a natural event which mussel species have evolved to survive. Vehicle traffic in the river bed could be more easily managed than the potential threats to the Oconee, which may need extensive study to be understood. In determining which river would best serve to protect the spinymussel, the Service chose the Ohoopee because it was known to be inhabited by the spinymussel more recently, it was considered high-quality habitat (habitat that includes multiple PCEs), and manmade impacts should be easier to manage.

(9) Comment: The continued declines of the Altamaha spinymussel are likely exacerbated by density-dependence in which too few individuals exist to adequately repopulate the basin at observable levels.

Our response: We agree, and consider this to be the most serious threat faced by this mussel (for further explanation see Factor E. Other Natural and Man Manmade Factors Affecting Its Continued Existence and Determination).

Public Comments

(10) Comment: In the proposed rule, the Service has not adequately considered the cost to other Federal agencies and how the listing might impact civil works programs such as dredging for commercial navigation or ecosystem restoration on the Altamaha, Oconee, and Ocmulgee Rivers.

Our response: The Act and our regulations at 50 CFR 424.11(b) prohibit us from considering the possible economic impacts associated with listing a species. However, we do take into consideration economic impacts associated with designating critical habitat in accordance with section 4(b)(2) of the Act. Under section 7 of the Act, the U.S. Army Corps of Engineers (Corps) will need to consult with us for activities that may affect the Altamaha spinymussel or its critical habitat. We have broadly defined activities that may affect, destroy or adversely modify critical habitat below (see *Application of the ''Adverse Modification'' Standard,* below), and will work with the Corps to ensure that the best available information is used when they consult with us. Our final economic analysis (Industrial Economics, Inc. 2011, pp. ES–2, ES–3, ES–4) found that there would be only marginal incremental administrative costs associated with this critical habitat designation. Incremental administrative costs are costs that would occur only as a result of the critical habitat designation, which are above and beyond costs associated with listing the species (*i.e.,* baseline costs). The economic analysis projects approximately $37,100 of total incremental impacts (over the next 30 years (2011–2040)) using a seven percent discount rate), as the result of critical habitat designation for the Altamaha spinymussel.

In order to estimate the cost of consultation the Service contacted the National Marine Fisheries Service (NMFS) to see how many consultations they conduct for the shortnose sturgeon

in the Altamaha River. NMFS biologists informed us that they average less than one formal consultation on the Altamaha annually and would estimate that they would conduct three formal consultations annually if critical habitat were designated for this species (Bolden 2011, pers. comm.). Because a listed species already occurs in these rivers, the Altamaha spinymussel listing and critical habitat designation would not be likely to prompt a large increase in the need for consultation or the associated costs to the Corps.

(11) Comment: The proposal contains considerable speculation as to the possible causes for reduced populations of the Altamaha spinymussel but provides no substantive detail or analysis concerning the relative importance of factors contributing to the supposed primary stressors, sedimentation and contaminants.

Our response: The Service has monitored the decline of the spinymussel since it first became a candidate species in 1984. Since that time the Service and the State have funded numerous efforts to develop a better understanding of the natural history of this species. Unfortunately, the low numbers of this species have made it difficult to study; therefore, we have analyzed the threats to this species using the best available science on surrogate species. The natural history of this species is likely very similar to other species in the family Unionidae, and it is reasonable to assume that similar threats will affect this species in a similar manner. Each threat is discussed in detail in the Summary of Factors Affecting the Species and is summarized in the Determination sections. A Threats Matrix detailing our best understanding of the relative importance has been developed and has been provided to the commenter. A copy of the Threats Matrix is on file and available upon request. We have also clarified the relative importance of specific threats, as needed, within the Threats Analysis of this rule.

(12) Comment: The proposed rule misrepresents the (EPA's) Total Maximum Daily Load (TMDL) program and the impaired waters identification process and erroneously suggests that the current regulatory process is inadequate and will not afford protection to the spinymussel. The proposed rule implies or states directly that current regulatory water quality management tools are inadequate to protect existing spinymussel populations.

Our response: The completion of and compliance with a TMDL removes a stream from the 303(d) list (list of impaired waterbodies). However, as stated, the stream is then placed on the 305(b) list of impaired streams with a completed TMDL whether or not water quality conditions improve. Furthermore, several waterbodies have been removed from the 303(d) list upon completion of a TMDL, only to return to the 303(d) list due to additional violations. This indicates that while the TMDL program can improve water quality in streams, it does not prevent water quality violations from occurring, which could have a deleterious effect on the Altamaha spinymussel.

(13) Comment: The proposed rule provides little or no justification for the water quality metrics (primary constituent elements, or PCEs) that are suggested as ''necessary for normal behavior, growth, and viability at all life stages.''

Our response: In developing the parameters for the water quality PCE, we used the best available information to create specific guidelines (considering mussel life stage and interactions with variables such as temperature) including temperature, dissolved oxygen, ammonia, pH, and cadmium. How we derived these criteria is explained below. Conversely, there are many possible toxicity issues for which we do not believe there is sufficient information to develop water quality standards that would be protective of the spinymussel at this time (see also response to Comment 5).

Temperature PCE

We believe that the maximum temperature and the maximum daily temperature fluctuation criteria identified in PCE 3 are supported by the best available data generated from direct temperature measurements of the Altamaha River, as well as comparisons to three temperature gauge stations on the Savannah River, which is similar in size, hydrology, and proximity (Wisniewski 2011, pers. comm.). Therefore, a maximum temperature of 32.6 °C with no more than a 2 °C daily fluctuation appears justified. See the Physical or Biological Features discussion to see how these were derived.

Dissolved Oxygen PCE

Comments suggesting that dissolved oxygen in bottom layers of critical habitat may be lower than the PCE are not appropriate because spinymussels are found in the mainstem river in areas of moving water that does not stratify. Therefore, the water should be well-mixed and dissolved oxygen should be consistent throughout the water column.

Ammonia PCE

For ammonia, 1.5 mg N/L is the criteria maximum concentration (CMC) and 0.22 mg N/L is the criteria continuous concentration (CCC). A review of mussel ammonia literature indicates that at least some juvenile mussels are sensitive to ammonia at concentrations as low as 0.093 mg NH3/L in 10-d assays (Newton *et al.* 2003, p. 2556) and 0.37 mg N/L in 28-d tests (Wang *et al.* 2007, pp. 2041–2043). EPA did not include all mussel toxicity test data in derivation of the proposed criteria (2009) because some tests did not use 'standardized' methods (Bringolf 2011, pers. comm.). The Service considered all available mussel ammonia toxicity data in deriving PCEs. The Service arrived at the ammonia PCE values as a compromise between the mussel toxicity literature and the proposed EPA criteria. There are no ammonia toxicity data available for spinymussel, therefore, we believe this to be the most valid approach for establishing a standard.

pH PCE

The Service attempted to determine the 'central range' of pH values in the Altamaha River by generating the 10th and 90th percentiles (the point at which 10% and 90%, respectively, of the observed values fell) of pH. Because the causes of the decline of the spinymussel remain unidentified, and no data are available regarding the optimal pH for this species, it is reasonable to designate a PCE for critical habitat that does not include the extremes of any water quality parameter (Bringolf 2011, pers. comm.). Critical habitat must be supportive of the species, and it is reasonable to assume that extremes of any parameter could be detrimental to this species. Critical habitat PCEs should incorporate the most stable habitats.

Cadmium PCE

Mussel toxicity to cadmium (Cd) is reported to occur at concentrations as low as 16 µg/L in 96-h tests with juveniles (Wang *et al.* 2010, pp. 2056–2057). The Cd criteria for Georgia are 1 µg/L (CMC) and 0.15 µg/L (CCC). However, the commenter suggests that the Cd concentrations required to cause toxicity are 2000 to 13,000 times greater than GA water quality criteria (1 ug/L). The Cd concentration that caused acute toxicity with juvenile mussels is only 16 times higher than the Georgia Cd criteria. Therefore, it is not prudent to assume that Cd is not a significant contributor to decline in spinymussel populations. Early life stages are

generally more sensitive than adults; therefore, PCEs were established based on a survey of all published mussel early-life-stage toxicity data since 1992.

Comment (14): Climate change models do not provide information that is appropriate for making management decisions regarding the Altamaha spinymussel.

Our response: The Service agrees that it would not be appropriate to use climate change models to make management decisions regarding the Altamaha spinymussel. However, the Service acknowledges that climate change could alter the severity of storms and droughts, which could affect spinymussels in the future (See Factor E. Other Natural and Man Manmade Factors Affecting Its Continued Existence, also see the discussion under Critical Habitat, Background).

Comment (15): The Service should consider that factors unrelated to habitat, such as invasive species, may be the most important limiting factor for the Altamaha spinymussel.

Our response: While invasive species may be affecting the Altamaha spinymussel (either directly or indirectly), there is little, if any, information to support that invasive species are the most important limiting factor affecting the Altamaha spinymussel or other mussels native to the Altamaha or Atlantic Slope of Georgia. The flathead catfish (*Pylodictis olivaris*) was likely introduced into the Altamaha River during the 1970s or 1980s, and populations began to greatly increase during the 1990s. Flathead catfish may predate the host fish for the Altamaha spinymussel and other native unionids (see discussion under Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence). However, despite the introduction of this piscivorous (fish eating) fish, most fish and mollusk species known from the Altamaha Basin as well as the remainder of the Atlantic Slope of Georgia, where the flathead catfish has been introduced, appear to be extant and relatively abundant. Similar trends occur in the nearby Flint River Basin where the flathead catfish has been introduced. Despite the introduction of this species and the highly altered nature of the Flint River, mussel species composition is similar to those experienced prior to the introduction of the flathead catfish (Wisniewski 2011, pers. comm.).

The competition between the Asian clam (*Corbicula fluminea*) and native unionids has been examined, but results have been contradictory. Yeager *et al.* (2000, pp. 256–258) suggested that high densities of Asian clam may negatively influence unionid recruitment. However, Vaughn and Spooner (unpublished data, p. 5) indicated that Asian clam densities were generally lower when populations of native unionids were dense, but increased with declining populations of native unionids. Gardner *et al.* (1976, pp. 122–124) hypothesized that the decline in bivalve populations in the Altamaha River co-occurred with the invasion of *Corbicula;* they also admit that ''a combination of factors probably was responsible for the success of *Corbicula* and the decline of other bivalves in the Altamaha River.'' It is likely that the apparent declines in the densities of Altamaha spinymussels are a result of a variety of factors, some of which may be attributed to invasive species. The extent to which they are adversely affected by flathead catfish and Asian clam is currently unknown.

Comment (16): The Service should recognize that suspended solids from biological wastewater treatment plants are often comprised largely of organic matter and that such solids would not be expected to contribute to sedimentation.

Our response: The Service concurs with this comment; we have no information that suspended solids are a threat to the spinymussel at this time.

Comment (17): Sediment issues in the southeastern United States are complicated by a legacy of poor agricultural practices during the 1800s and early 1900s, which raises questions about sources of sediment problems and the relative magnitudes of different sediment sources today. Silvicultural activities generally have only a small, short-lived impact on water quality, especially when compared with other land uses.

Our response: We agree that the primary source of sedimentation is legacy sediment and that silvicutural activities have a small and short-lived impact on water quality (see Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range). Legacy sediment migrating through the floodplains of the Altamaha Basin is likely one of the most severe threats to the spinymussel. As an example, in Murder Creek, a tributary of the Oconee River, over 1.6 m (5.3 ft) of legacy sediment was observed (Jackson *et al.* 2005, p. 1). Much of the eroded sediment was believed to remain in valley storage or in transport as bedload in Georgia's Piedmont streams (Jackson *et al.* 2005, p. 3). Based upon estimates of inputs from various sources and exports via total suspended solids and bedload, sediment exports were greater than sediment inputs. It is assumed that the remainder of the sediment came from excavation and mobilization of stored valley sediments, principally through lateral migration of stream channels and bank erosion (Jackson *et al.* 2005, pg 10). Legacy sediment is an ongoing threat as it moves downstream covering suitable habitat.

Comment (18): The Service should consider that implementation rates for forestry best management practices are high nationally and in Georgia, including the Altamaha River Basin.

Our response: We agree that the rates of implementation for forestry BMPs are high and consider sediment from silvicultural activities to be a small and short-lived impact.

Comment (19): When properly implemented, forestry BMPs protect water quality and habitat for the Altamaha spinymussel. BMPs are critical in mitigating water quality degradation from silviculture, and when appropriately implemented and maintained, are very effective in controlling nonpoint sources of pollution. Because of the overwhelming body of research related to BMPs and their effectiveness for protecting water quality and aquatic habitat, it is not surprising that the Service has recognized in previous regulatory proposals that BMPs are an important component of conservation strategies for freshwater mussels.

Our Response: The Service agrees that BMPs are protective of water quality and mussel habitat, and that industrial forestry activities generally do a good job of implementing BMPs. However, some harvesting operations fail to use BMPs adequately, and localized impacts can and do occur.

Comment (20): The Georgia Forestry Commission's BMP education and monitoring programs are effective at encouraging implementation of forestry BMPs and provide ''reasonable assurance'' that forestry BMPs are implemented effectively in Georgia.

Our response: We generally agree with this comment, particularly on industrial forests. However, there are individual exceptions, with compliance reported by the Georgia Forestry Commission at around 95 percent.

Comment (21): Sustainable forestry certification programs require participants to meet or exceed forestry BMPs and help ensure high rates of BMP implementation.

Our response: The Service agrees that the sustainable forestry program is one of the most effective programs to ensure BMPs are properly implemented.

Comment (22): Preliminary sampling of direct tributaries in forested watersheds within the Altamaha River

Basin suggests that mussel communities are diverse and abundant. The role of lakes in supporting the mussel community within the basin is not known, but could be significant and should be explored further.

Our response: We believe that floodplain lakes within the Altamaha Basin are of little importance to the Altamaha spinymussel as they do not have habitat to sustain the species. Dinkins (2007, p. 4) provides support for this by stating, ''species typically found in the river where the substrate has a dominant sand matrix and/or slight to moderate current during normal flow conditions (*e.g., Elliptio spinosa, Lampsilis dolabraeformis*) were not present in Cogden Lake.'' Cogden Lake is a floodplain lake in the Basin. The Altamaha spinymussel is typically found in association with protected areas around sand bars, in medium to coarse hard-packed sand, with rather swift current near gently sloping, soft banks with its distribution greatly restricted to these habitats (Meador 2009 p. 52, Sickel 1980, pp. 10–11; Wisniewski 2008, p. 2). In general, floodplain lakes within the Altamaha River Basin exhibit habitats that are not conducive to the survival of the Altamaha spinymussel as these habitats typically have little or no flow and silty or muddy substrates.

In conclusion, there is not sufficient evidence to support the existence of potential populations of the Altamaha spinymussel in these floodplain lakes or tributaries.

Comment (23): The summary paragraph within Factor A, *The present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range,* is over-reaching and contains speculative language. Inferences that enforcement of laws and regulations may be subverted to economic interests and citing pending investigations by nongovernmental environmental groups (such as Riverkeepers) should not be relied on as the best scientific information available and are highly speculative regarding impacts to mussels and their habitat.

Our response: The Service considers the best scientific and commercial information available when making listing decisions, and Riverkeepers have provided extensive and detailed field notes concerning water quality violations. Few of these notes were considered sufficient enough to include in this rule; however, the Altamaha Riverkeeper has successfully brought three cases to court (*Altamaha Riverkeeper* v. *Amercord, Inc.,* No. CV 300–042 (S.D. Ga) (Order on Motion for Partial Summary Judgment, Mar. 15, 2001); *Altamaha Riverkeeper* v. *City of Lumber City,* CV–300–043 (S.D. Ga); *Altamaha Riverkeepers* v *City of Cochran,* 162 F. Supp. 2d 1368 (M.D. Ga. 2001)) regarding water quality standard violations (see Factor A discussion below for more detail). We consider these court findings to be relevant information related to enforcement of laws and regulations within the watershed.

Comment (24): Two comments supported additional critical habitat including the entire historic range of the spinymussel, as well as, associated dry lands and wetlands.

Our response: We believe the occupied and unoccupied areas we are designating as critical habitat adequately represent the geographical areas essential for the conservation of the species. See our response to Comment 8.

Comment (25): Why was the area around Plant Hatch excluded from Critical Habitat designation?

Our response: We did not include the section of the Altamaha River between US Route 1 and the upper property boundary of Moody Forest Natural Area from proposed critical habitat because it does not contain the physical or biological features essential to the conservation of the species. Dredging operations and thermal stress in the vicinity of Edwin I. Hatch Nuclear Plant have altered the habitat quality so that the PCEs are not present in this river reach. Habitat within this reach is generally unstable, consisting of coarse, mobile sand.

Summary of Factors Affecting the Species

Section 4 of the Act and its implementing regulations (50 CFR part 424) set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1) of the Act. The five listing factors are: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Bogan (1993, pp. 599–600 and 603–605) linked the decline and extinction of bivalves to a wide variety of threats including siltation, industrial pollution, municipal effluents, modification of stream channels, impoundments, pesticides, heavy metals, invasive species, and the loss of host fish. The Altamaha spinymussel lives within a large river drainage exposed to a variety of landscape uses. Habitat and water quality for the Altamaha spinymussel face degradation from a number of sources. Primary among these are threats from sedimentation and contaminants within the streams that the spinymussel inhabits.

Sickel (1980, p. 12) characterized the habitat of the Altamaha spinymussel as coarse-to-fine-grain sandbars, and suggested that this may make the Altamaha spinymussel susceptible to adverse effects from sediment (siltation). Sediments deposited on the stable sandbars required by the Altamaha spinymussel could make sandbars unstable, result in suffocation, or simply change the texture of the substrate, making them unsuitable for the species. Sedimentation, including siltation from surface runoff, has been implicated as a factor in water quality impairment in the United States and has contributed to the decline of mussel populations in streams throughout the country (Ellis 1936, pp. 39–41; Coon *et al.* 1977, p. 284; Marking and Bills 1979, pp. 209–210; Wilber 1983, pp. 25–57; Dennis 1984, pp. 207–212; Aldridge *et al.* 1987, pp. 25–26; Schuster *et al.* 1989, p. 84; Wolcott and Neves 1991, pp. 1–6; Houp 1993, p. 96; Bogan 1993, pp. 603–605; Waters 1995, pp. 53–77; Richter *et al.* 1997, p. 1084).

Specific impacts on mussels from sediments include reduced feeding and respiratory efficiency, disrupted metabolic processes, reduced growth rates, increased substrata instability, and the physical smothering of mussels (Ellis 1936, pp. 39–41; Stansbery 1970, p. 10; Markings and Bills 1979, pp. 209–210; Kat 1982, p. 124; Aldridge *et al.* 1987, pp. 25–26; Hartfield and Hartfield 1996, p. 375; Brim Box and Mossa 1999, pp. 99–102; TNC 2004, p. 4; Cope 2008, pp. 452–459). Many southeastern streams have increased turbidity levels due to siltation (van der Schalie 1938, p. 56). Since turbidity is a limiting factor that impedes the ability of sight-feeding fishes to forage (Burkhead and Jenkins 1991, pp. 324–325), turbidity within the Altamaha River Basin during the times that Altamaha spinymussels

attempt to reproduce may reduce the ability of the host fish to find glochidia, and may contribute to the decline of the spinymussel by reducing its efficiency at infecting the fish hosts necessary for reproduction. In addition, sediment can eliminate or reduce the recruitment of juvenile mussels (Brim Box and Mossa 1999, pp. 101–102), interfere with feeding activity (Dennis 1984, pp. 207–212), and act as a vector in delivering contaminants to streams (Salomons *et al.* 1987, p. 28).

From 1700 to 1970, agricultural practices in the Southern Piedmont physiographic province resulted in extreme soil erosion, removing more than 17.8 cm (7 in.) of soil across the landscape (Trimble 1974, p. 1). The Ocmulgee, Oconee, and Ohoopee rivers all drain through the Piedmont and were directly affected by this erosion and resulting sedimentation. In 1938, van der Schalie (p. 56) reported the Altamaha River as being yellow in color, due to the large amount of suspended silt originating from intensive farming and road construction occurring in the headwaters. The sediment from these practices moved into stream channels and valleys, covering most of the original bottomlands (Trimble 1974, p. 26) and is now referred to as legacy sediment (Jackson *et al.* 2005, pg. 3). As a result, stream profiles have been dramatically altered with unstable sediment deposits being dissected and streams being incised with entrained sediment migrating downstream to be deposited in stream channels and floodplains (Trimble 1974, pp. 116–121; Jackson *et al.* 2005, pg 1). The GDNR, Environmental Protection Division (EPD 2007, p. iii) reported to EPA that approximately 75 percent of the average sediment load in the Altamaha River Basin resulted from row crops and that it contributed an average sediment load of 1 ton per acre per year. The EPD concluded that this sediment is probably a legacy of past land use. The mobilization of legacy sediments, principally through lateral migration of stream channels and bank erosion is an ongoing threat as it moves downstream covering suitable habitat (Jackson *et al.* 2005, p. 10). Large -scale sediment movement and deposition may result in increased embeddedness, which would generally decrease habitat quality (Bringolf 2011, pers. comm.). The degree to which rocks (gravel, cobble, and boulders) and snags are covered or sunken into the silt, sand, or mud of the stream bottom is a measure of embeddedness, and is a parameter evaluated in the riffles and runs of streams (also see Our Response to Comment 17). Although it is the historical, anthropogenic land use that created the legacy sediment, the volume of legacy sediment still migrating through the Altamaha River Basin is a significant threat to the spinymussel.

Studies of the fish populations in the Altamaha River Basin were conducted in 2000 by the GDNR Wildlife Resources Division (WRD). The Index of Biotic Integrity (IBI) and modified Index of Well-Being (IWB) rate fish populations as being in Excellent, Good, Fair, Poor, or in Very Poor condition, and were applied by the WRD to identify impaired fish populations in the Altamaha River. Stream segments with fish populations rated as Poor or Very Poor were listed as Biota Impacted. A lack of fish habitat due to stream sedimentation was generally the cause of a low IBI score.

Five Mile Creek (14.5 km/9 mi), Bullard Creek (12.8 km/8 mi), and Jacks Creek (14.5 km/9 mi) were rated as ''Very Poor'' and placed on the State of Georgia's 303(d) list of impaired waters due to a significant impact on fish (EPD 2007a, pp. 1–2). These three streams eventually feed into the mainstem of the Altamaha River via larger channels. As sediment moves through the basin, habitat is periodically buried. WRD recommends that there be no net increase in sediment delivered to the impaired stream segments so that these streams will recover over time (EPD 2007a, p. 26). Agriculture and roads were identified as the major sources of sediment with silviculture, mining sites, grazing, and urban development also contributing nonpoint sources of sediment (EPD 2007a, p. 9). Agriculture, including row crops, poultry farms, and pastures, constitute 15.5 percent of the land cover in the Piedmont and 32.7 percent of the land cover in the Coastal Plain (GDNR 2005, pp. 97, 132).

In addition to agriculture, there are numerous sources of sediment within the Altamaha River Basin, including silviculture, unpaved roads, kaolin mines, and construction sites. A threat assessment conducted by TNC (2004, p. 9) listed sediment from urban, industrial, and nonpoint sources (NPSs) as a threat to the spinymussel. The EPD (2007, p. v) reported that, while historical row crop-based land use contributes the majority of sediment in the Altamaha River (75 percent), that among other sources, approximately 17.3 percent of the total sediment load is from roads; 4.3 percent from grasses and wetlands; 1.5 percent from urban lands; and 1.0 percent from quarries, strip mines, and gravel pits. In addition, estimates of the contribution from construction could not be obtained, but could represent a comparatively high sediment load on a per -acre basis (EPD 2007, p. v).

Industrial forest management is practiced on approximately 8,000 hectares (40,000 acres) or 33 percent of the floodplain of the Altamaha River (TNC 1997, p. 19). Typical forest management regimes in the Altamaha River Basin use timber harvest methods and conduct other activities that result in ground disturbances. These ground disturbances can result in transport of sediment to streams during and after precipitation events. In addition, forest management operations often require miles of unpaved roads to extract timber and to provide access for management activities. The majority of sediment from forestry occurs from roads and site preparation activities (EPD 2007a, p. 11). These roads, in conjunction with existing unpaved county roads that are prevalent throughout the Altamaha River Basin, contribute to sediment loading in streams after precipitation events. Through an agreement with the EPD, the Georgia Forestry Commission (GFC) is responsible for implementing the use of Best Management Practices (BMPs) to reduce erosion and sediment from activities related to forestry, such as timber harvest, haul road construction, stream crossings, stream side management zones, site preparation, and reforestation. However, the Erosion and Sediment Control Act (O.C.G.A. 12–7–1) exempts commercial forestry activities from the need to acquire permits and meet the minimum requirements of that act (Georgia's BMPs for Forestry 2009, p. 64). Therefore, compliance with BMPs is voluntary and is dependent on education about BMPs to reduce sediment from reaching the Altamaha River (EPD 2007a, p. 28) (also see our Response to Comments 18, 19, 20 and 21), but appears to be high.

A number of kaolin mines are located along the Fall Line, a geologic land form that separates the Piedmont and Coastal Plain physiographic provinces, within the Oconee and Ocmulgee River Basins. The operation of these mines and their supporting infrastructure, including haul roads and settling ponds, have the potential to increase downstream sediment loads if adequate erosion control measures are not maintained to stabilize areas subjected to mining-associated ground disturbances (Lasier 2004, p. 139).

In addition, sediment can act as a vector in delivering contaminants (such as heavy metals, ammonia, chlorine, numerous organic compounds) to streams (Salomons *et al.* 1987, p. 28; TNC 2004, p. 9). Because spinymussels are filter-feeders and bury themselves in

the substrate, they are exposed to metals dissolved in water, contained within suspended particles, and deposited in bottom substrates (Naimo 1995, p. 341). Cope *et al.* (2008, pp. 452–459) described potential routes of a variety of contaminants absorbed by mussels in various stages of their lifecycle. Contaminants contained in point and nonpoint discharges can degrade water and substrate quality and adversely impact, if not destroy, mussel populations (Horne and McIntosh 1979, pp. 127–132; McCann and Neves 1992, pp. 80–87; Havlik and Marking 1987, p. 14).

Contaminants associated with industrial and municipal effluents may cause decreased oxygen, increased acidity, and other water chemistry changes that may be lethal to mussels, particularly during the highly sensitive early life stages (Sheehan *et al.* 1989, pp. 139–140; Keller and Zam 1991, pp. 541–543; Bogan 1993, pp. 603–604; Goudreau *et al.* 1993, pp. 216–227; TNC 2004, pp. 8–9). Exposure to sublethal levels of toxic metals can alter growth, filtration efficiency, enzyme activity, and behavior (Naimo 1995, pp. 341, 354). In laboratory experiments, mussels suffered mortality when exposed to 16 ug/L, 96-h EC50 cadmium (Wang *et al.* 2010), 0.093 mg N/L, 10-d LC50 ammonia (Newton *et al.* 2003), 39 ug/L, 96-h LC50 chromium (Keller and Zam 1991), 16 ppm arsenic trioxide, 6.8 ug/L, 96-h EC50 copper (Wang *et al.* 2007), and 151 ug/L, 96-h EC50, hardness ~45 mg/L zinc (Wang *et al.* 2010); however, effects depend upon the length of exposure and mussel life stage (Havlik and Marking 1987, p. 1). The adults of certain species may tolerate short-term exposure (Keller 1993, p. 701), but low levels of some metals may inhibit glochidial attachment in others (Huebner and Pynnönen 1992, p. 2353; Jacobson *et al.* 1993, pp. 881–882) likely due to toxicity to glochidia. Mussel recruitment may be reduced in habitats with low but chronic heavy metal and other toxicant inputs (Yeager *et al.* 1994, p. 217; Naimo 1995, pp. 347 and 351–352; Ahlstedt and Tuberville 1997, p. 75). Researchers found that several heavy metals were found to have toxic effects at different levels and duration of exposure; however, no toxicity studies have been conducted specifically on the Altamaha spinymussel (Havlik and Marking 1987, p. 3; Naimo 1995, p. 341; Keller and Lydy 1997, p. 4). Furthermore, differences between controlled laboratory experiments and field conditions (with multiple and unknown variables) make it difficult to predict how contaminants affect wild populations (Wisniewski 2008, pers. comm.).

From 2000 to 2008, many stream segments in the Altamaha Basin have been listed on the State's 303(d) list of impaired waters for a variety of reasons. Once a stream segment is listed as impaired, the State must complete a plan to address the issue causing the impairment; this plan is called a Total Maximum Daily Load (TMDL). Completion of the plan is generally all that is required to remove the stream segment from the 303(d) list and does not mean that water quality has changed. Once the TMDL is completed, the stream segment may be placed on the 305(b) list of impaired streams with a completed TMDL. Many of these stream segments have appeared repeatedly on the 303(d) list. The Ohoopee River and Little Ohoopee River have been listed on nearly every report for almost every violation. Other stream segments that have repeatedly been identified on the 303(d) list from 2000 until 2008 include Big Cedar Creek, Doctors Creek, Jacks Creek, Milligan Creek, Oconee Creek, Pendleton Creek, Rocky Creek, Sardis Creek, Swift Creek, Tiger Creek, and Yam Gandy Creek. This demonstrates a chronic threat, from multiple sources of pollution, scattered across the basin.

In 2000, the Altamaha River was listed on the 303(d) list of impaired waters due to excessive mercury levels in fish tissue. In 2002, EPA Region 4 established a TMDL for mercury levels for the Altamaha River from its confluence of the Oconee and Ocmulgee Rivers to Penholloway Creek (149.5 km/92.9 mi) including Appling, Jeff Davis, Long, Tattnall, Tombs, and Wayne Counties. This river segment is entirely within the current or historic range of the spinymussel with four National Pollutant Discharge Elimination System (NPDES) permitted facilities, including:

- Rayonier Inc.-Jesup (67 million gallons per day (MGD));
- Edwin I. Hatch Nuclear Power Plant (Plant Hatch) (43.4 MGD);
- Jesup Water Pollution Control Plant (WPCP) (2.5 MGD); and
- Glennville WPCP (0.88 MGD) (EPA 2002a, pp. 1–5).

This 149.5-km (92.9-mi) segment of the Altamaha River, from the confluence of the Oconee and Ocmulgee Rivers to Penholloway Creek, was removed from the 303(d) list in 2002 because the TMDL was completed; it is currently listed as a stream supporting its designated use (fishing).

In 2000, EPD added 23 stream segments, totaling 411.9 km (256 mi), to the 303(d) list for not meeting dissolved oxygen standards (EPD 2002, p. 1). All of these segments are within tributaries to the Altamaha River within the range of the spinymussel. Between 2000 and 2001, there were nine NPDES permitted discharges with effluent limits for oxygen -consuming substances identified in the Altamaha River Basin watershed above the 23 stream segments listed (EPD 2002, p. 11). Nonpoint source runoff from natural sources contributed oxygen-demanding pollutants (EPD 2002, p. 12). Upon completion of a TMDL in 2002, these river segments were removed from the 303(d) list.

In 2006, EPD listed 18 stream segments totaling 280 km (174 mi) as impaired due to fecal coliform bacteria in excess of water quality standards (EPD 2007c, pp. 1–2). All of these stream segments are tributaries to the Altamaha River within the current or historic range of the species. Between 2005 and 2006, there were 10 municipal wastewater treatment plants that discharged more than 0.1 MGD, along with four confined animal feed operations that were considered sources of fecal coliform. Nonpoint sources include wildlife, livestock grazing, livestock access to streams, application of manure to pastureland and cropland, leaking sanitary sewer lines, leaking septic systems, land application systems (6 in the basin), and landfills (43 in the basin) (EPD 2007c, pp. 10–16). Even after the completion of the TMDL, six of these stream segments remain on the 303(d) list.

In 2008, EPD listed 583 km (362 mi.) of tributaries to the Altamaha River to the 305(b)/303(d) list of impaired waters, and all of these stream segments have completed TMDLs (EPD 2008 pp. A–130–A–134). The draft 2010 305(b)/303(d) list of impaired waters for the Altamaha River included all of the stream segments from the 2008 list and added an additional 48 km (30 mi). These are all tributaries to the Altamaha or Ohoopee Rivers within the current or historic range of the Altamaha spinymussel. These stream segments are listed as impaired for a variety of reasons (*e.g.,* dissolved oxygen, fecal coliform, and mercury levels within fish tissue). All of these river segments, such as the Ohoopee River (including the historic range of the spinymussel), have TMDLs but are still considered impaired.

More than 161 km (100 mi) of the Ohoopee River and its tributaries were added to the 303(d) list in 2000 due to excessive mercury levels in fish tissue. The primary source of mercury is believed to be deposition of atmospheric mercury. During 1998–1999, there were seven municipal wastewater treatment

facilities (EPA 2002b, pp. 1–3) and as many as 170 sources of air emissions in the watershed (EPA 2002b, p. 18). These sources of mercury impacted all of the extirpated range of the spinymussel on the Ohoopee River, which is a major tributary to the Altamaha River. A TMDL was established in 2002; however, based on additional information gathered since 2002, EPA will begin revising needed load reductions in 2011 (EPA 2002b, p. 2). These segments of the Ohoopee remain on the 303(d) list.

In 2006, EPD added five stream segments, totaling 64.3 km (40 mi), within the Ohoopee drainage to the 303(d) list for not meeting dissolved oxygen standards (EPD 2007b, p. 1). All of these segments are within the range of the spinymussel. During 2004–2005, there were eight NPDES permitted discharges with effluent limits for oxygen-consuming substances identified in the Altamaha River Basin watershed (EPD 2007b, p. 10). There were four animal feeding lots and six wastewater land application operations that were identified as sources of oxygen-demanding nutrients. Nonpoint source runoff from forestry, row crop agriculture, pastureland, urban development, and natural sources also contribute oxygen-demanding pollutants (EPD 2007b, pp. 13–15). Upon completion of a TMDL in 2007, these five river segments were removed from the 303(d) list.

In addition, there have been illegal effluent discharges into the Ohoopee that may have an adverse impact on the Altamaha spinymussel. For instance, the wastewater treatment discharge from Rogers State Prison enters the Ohoopee River approximately 10 km (6 mi) upstream of the largest historical population of Altamaha spinymussels known in the Ohoopee River. The Altamaha Riverkeeper reported fecal coliform discharges from the prison that exceeded the prison's NPDES permit (Holland 2002, pers. comm.).

The Altamaha Riverkeeper, a conservation group that works to maintain the quality of the Altamaha River system, has discovered a number of illegal discharges that could impact the Altamaha spinymussel. In 2001, a court found that Amercord Inc. had violated its NPDES permit multiple times at its Lumber City tire plant by discharging quantities of cyanide, copper, zinc, and lead into the Ocmulgee River in excess of permit limitations (*Altamaha Riverkeeper* v. *Amercord, Inc.,* No. CV 300–042 (S.D. Ga.) (Order on Motion for Partial Summary Judgment, Mar. 15, 2001)). In a second case, following allegations of discharges into the Ocmulgee River from Lumber City's waste treatment pond in excess of its NPDES permit, Lumber City agreed to implement several short- and long-term wastewater treatment improvements, which are expected to protect a population of Altamaha spinymussels (*Altamaha Riverkeeper* v. *City of Lumber City,* CV–300–043 (S.D. Ga.)). The Altamaha Riverkeeper also discovered that from July 1995 to April 2001, the City of Cochran's waste treatment pond had discharged in violation of its NPDES permit (*Altamaha Riverkeepers* v. *City of Cochran,* 162 F. Supp. 2d 1368, 1369–70 (M.D. Ga. 2001)). The City had been releasing ferric sulfate (used to treat fecal coliform) into Jordan Creek, a tributary of the Ocmulgee River approximately 80 km (50 mi) upstream of known populations of Altamaha spinymussels.

Sediment in the Oconee River carries toxic loads of heavy metals presumably discharged from municipal wastewater treatment plants and kaolin-mining settling ponds (Lasier 2004, pp. 139–140, 144–151). Wastewater treatment plants and kaolin mines often employ settling ponds to allow pollutants to settle and turbidity to decrease. Copper sulfate and aluminum sulfate are often used as algaecides, to reduce algae blooms, and as flocculants to force precipitation of turbid waters and, in water treatment processes, to improve the sedimentation or filterability of small particles.

Lasier (2004, pp. 150–151) reported ''abnormally'' high levels of chromium, copper, mercury, and zinc in the lower Oconee river that would indicate a ''significant'' impact to the quality of sediment and pore water (the water in contact with the river bottom, and the water in which mussels reside). TNC (2004, p. 9) found water quality and sediment quality reflected ''significant'' inputs of pollution with concentrations of heavy metals (including cadmium, copper, chromium, lead, and zinc) at levels above regional and national concentrations. Shoults-Wilson (2008, pp. 86–92) sampled sites throughout the Altamaha River Basin to evaluate the presence of heavy metals in the water column and in the sediment and compared the bioaccumulation of heavy metals by Asian clams to *E. hopetonensis* (an Altamaha River endemic). Sampling of sites upstream and downstream of potential point sources of heavy metals demonstrated ''significantly'' elevated bioaccumulation of cadmium, copper, and mercury below inputs from kaolin processing, as well as elevated zinc and chromium below Plant Hatch, the Rayonier pulp mill in Jesup, Georgia, and the Amercord tire facility. Mussels in the Altamaha River Basin may accumulate trace elements from the fine fraction of sediment as well as the water column.

The cumulative effects of effluent from wastewater treatment plants and kaolin mines on Altamaha spinymussel habitat have not been quantified; however, mussels appear to be among the most intolerant organisms to heavy metals (Keller and Zam 1991, p. 545), and several heavy metals are lethal, even at relatively low levels (Havlik and Marking 1987, p. 3). Most metals are persistent in the environment, remaining available for uptake, transportation, and transformation by organisms until they are removed from the river (Hoover 1978, pp. 28–38; Lasier 2004, p. 140) through processes such as washing out to sea, leaching through the soil, or being taken up by an organism that is then removed from the river.

In areas of heavy agricultural use in the Southeast, surface runoff can move pesticides, including malathion and other insecticides, into surface water (McPherson *et al.* 2003, pp. 1–2). Stream ecosystems are negatively impacted when nutrients are added at concentrations that cannot be assimilated (TNC 2004, p. 7). The effects of pesticides on mussels may be particularly profound, potentially altering metabolic activities or resulting in delayed mortality (Fuller 1974, pp. 252–253; Havlik and Marking 1987, pp. 9–11; Moulton *et al.* 1996, pp. 132–136); commonly used pesticides have been directly implicated in a North Carolina mussel die-off (Fleming *et al.* 1995, pp. 877–879). The Oconee, Ocmulgee, and Ohoopee River systems contain significant acreage in cotton and onion farming. Malathion, one of the most important pesticides used in cotton farming, inhibits physiological activities of mussels (Kabeer *et al.* 1979, pp. 71–72) and may decrease the ability of mussels to respire and obtain food. Malathion toxicity (24 h LC50) has been reported as low as 8 mg/L for glochidia of *Lampsilis siliquoidea* and other unionid species (Keller and Ruessler 1997, p. 1).

The operations of Plant Hatch, located on the Altamaha River in Appling County, may pose a threat to the Altamaha spinymussel. On September 14, 2001, the Service received Joint Public Notice 940003873 from the Corps, Savannah District, describing a project to expand and maintain Plant Hatch's intake basin within the Altamaha River. Implementation of this permit authorized annual dredging of

the plant intake basin and authorized removing 33,965 cubic meters (44,424 cubic yards) of material biannually from the intake basin. While the amount of material removed annually is generally far less than the amount permitted (Dodd 2008, pers. comm.), annual dredging could negatively impact the Altamaha spinymussel by decreasing channel stability (creating a potential head cut), altering sediment transport dynamics, increasing sedimentation and turbidity downstream during dredging operations, and decreasing habitat quality for host fishes. It is unknown how far downstream these impacts extend.

Impacts to aquatic fauna through entrainment of potential host fishes and thermal discharges may also occur. Plant Hatch takes in water to create steam, and then uses the steam to generate electricity. Following a cooling process, the water is returned to the river, and although it has been cooled, the water temperature is warmer than the ambient temperature of the river. Plant Hatch has made substantial efforts to reduce thermal discharges through the construction of cooling towers that have significantly reduced the thermal plume. However, thermal discharges could still negatively impact the Altamaha spinymussel from heat stress; higher water temperatures can increase the sensitivity of mussels to certain pollutants (Augspurger *et al.* 2003, p. 2574). Pandolfo *et al.* (2010, pp. 693–698) also reported that high water temperatures can increase the sensitivity of early life stages of mussels to copper). These effects would be exacerbated during years of low rainfall, when less water would be available to dissipate the heat of the Plant Hatch effluent. Plant Hatch also monitors fish entrainment, so if the host fish of the spinymussel was known, management efforts could be made to reduce the potential of this impact.

In summary, the loss and modification of habitat is a significant threat to the Altamaha spinymussel. Degradation from sedimentation and contaminants threatens the habitat and water quality necessary to support the Altamaha spinymussel. Sediment from unpaved roads, kaolin mines, past and current agriculture practices, silviculture, and construction sites within the Altamaha River Basin can suffocate Altamaha spinymussels and make stable sandbars required by Altamaha spinymussels unstable or change the texture of the substrate, rendering them unsuitable for the species. Contaminants associated with industrial and municipal effluents (*e.g.,* heavy metals, ammonia, chlorine, numerous organic compounds) may cause decreased oxygen, increased acidity, and other water chemistry changes that are lethal to mussels, particularly the highly sensitive early life stages of mussels; exposure to sublethal levels of toxic metals can alter growth, filtration efficiency, enzyme activity, and behavior. As a result we have determined that the present or threatened destruction, modification, or curtailment of the Altamaha spinymussel's habitat or range is a threat to the continued existence of the Altamaha spinymussel throughout its range.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The Altamaha spinymussel is not a commercially valuable species, nor are the streams that it inhabits subject to commercial mussel harvesting activities. However, this species has been actively sought for scientific and private collections (Keferl 2008, pers. comm.); such activity may increase if the species becomes rarer. Overcollection may have been a localized factor in the decline of this species, particularly in the Ohoopee River where a 1986 collection consisted of at least 30 live individuals (Keferl 2008, pers. comm.). Although the GDNR can regulate the number of mussels collected with a Scientific Collection Permit, the localized distribution and small size of known populations renders them extremely vulnerable to overzealous recreational or scientific collecting. However, we have no specific information indicating that overcollection is currently a threat or that overcollecting may occur in the future.

Therefore, we find that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to the Altamaha spinymussel at this time.

C. Disease or Predation

Diseases of freshwater mussels are poorly known, and we have no specific information indicating that disease occurs within Altamaha spinymussel populations or poses a threat. Juvenile and adult mussels are preyed upon by some invertebrate species (particularly as newly metamorphosed juveniles), parasites (for example, nematodes, trematodes, and mites), a few vertebrate species (for example, otter, raccoon, and turtles) and some fish. However, we have no evidence of any specific declines in the Altamaha spinymussel due to predation.

In summary, diseases and predation of freshwater mussels remain largely unstudied and are not considered a threat to the Altamaha spinymussel.

D. The Inadequacy of Existing Regulatory Mechanisms

The Altamaha spinymussel is listed as a high-priority species by the State of Georgia (GDNR 2005, p. 135) and has recently been listed as Endangered under Georgia's Endangered Wildlife Act (EWA). Under the EWA, it is unlawful to intentionally harm, disturb, or sell a protected animal, unless authorized, or to cause the destruction of habitat of protected animals on State-owned lands. The EWA specifically states, however, that rules and regulations promulgated under the EWA shall not impede construction of any nature. Thus, protection under the EWA prevents unlawful capture or killing of the listed species, but does not prevent habitat changes that lead to population loss.

Sources of nonpoint-source pollution include timber operations (see Our Response to Comments 18, 19, 20 and 21), clearing of riparian vegetation, urbanization, road construction, and other practices that allow sediment to enter streams (TNC 2004, p. 13). Although BMPs for sediment and erosion control are often recommended or required by local ordinances for construction projects, compliance, monitoring, and enforcement of these recommendations are often poorly implemented. Furthermore, Georgia's Erosion and Sediment Control Act exempts commercial forestry activities from the need to acquire permits and meet the minimum requirements of the Erosion and Sediment Control Act (Georgia's BMPs for Forestry 2009, p. 64). While compliance rates are high in the state, compliance with BMPs is voluntary and is dependent on education on proper implementation of BMPs to reduce sediment from reaching the Altamaha River (EPD 2007a, p. 28). Although historical row crop-based land use contributes the majority of sediment to the Altamaha River, other sources continue to contribute to the total sediment load (See discussion under Factor A).

Point-source discharges within the range of the Altamaha spinymussel have been reduced since the inception of the Federal Clean Water Act (33 U.S.C. 1251 *et seq.*), but this may not provide adequate protection for filter-feeding organisms that can be impacted by extremely low levels of contaminants. Municipal wastewater plants continue to discharge large amounts of effluent and, in some circumstances, in excess of permitted levels (see discussion under Factor A). There is no specific

information on the sensitivity of the Altamaha spinymussel to common industrial and municipal pollutants, and very little information on other freshwater mollusks. Current State and Federal regulations regarding pollutants are assumed to be protective of freshwater mollusks; however, this species may be more susceptible to some pollutants than test organisms commonly used in bioassays. For example, several recent studies have suggested that EPA's criteria for ammonia may not be protective of freshwater mussels (Augspurger *et al.* 2003, p. 2571; Newton *et al.* 2003, pp. 2559–2560; Mummert *et al.* 2003, pp. 2548–2552). New ammonia criteria have been proposed by EPA (2009) that would be more protective of unionids. Wang *et al.* (2007a, p. 2036, 2007b, p. 2048, 2010, p. 2053) have also reported toxicity data for unionid early life stages for chlorine, metals and ammonia. In a review of the effects of eutrophication on mussels, Patzner and Muller (2004, p. 329) noted that stenoecious (narrowly tolerant) species disappear as waters become more eutrophic. They also refer to studies that associate increased levels of nitrate with the decline and absence of juvenile mussels (Patzner and Muller 2004, pp. 330–333). Other studies have also suggested that early life stages of mussels are sensitive to inorganic chemicals such as chlorine, metals, and ammonia (Keller and Zam 1991, pp. 543–545; Goudreau *et al.* 1993, p. 221; Naimo 1995, pp. 354–355). Therefore, it appears that a lack of adequate research and data prevents existing regulations, such as the Clean Water Act (administered by EPA and the Corps), from being fully utilized or effective.

In summary, some regulations exist that protect the species and its habitat; however, these regulations enforced by the State provide little direct protection of Altamaha spinymussel and only if protection of the spinymussel will not inhibit economic development. Nonpoint-source pollution is not regulated, and the Clean Water Act does not adequately protect the habitat from degradation caused by point-source pollutants. As described under Factor A, there have been a number of recent illegal effluent discharges into the Altamaha River Basin, in excess of permit limits, that may have impacted the Altamaha spinymussel, and other investigations are pending (*Altamaha Riverkeeper* v. *Amercord, Inc.,* No. CV 300–042 (S.D. Ga) (Order on Motion for Partial Summary Judgment, Mar. 15, 2001); *Altamaha Riverkeeper* v. *City of Lumber City,* CV–300–043 (S.D. Ga); (*Altamaha Riverkeepers* v *City of Cochran,* No. CV–447–2)). Thus, existing regulations are not effective at protecting the spinymussel and its habitat from sedimentation and lethal contaminants. Therefore, we find the existing regulatory mechanisms are inadequate to ameliorate the current threats to the Altamaha spinymussel throughout its range.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Withdrawal of surface water within the Altamaha Basin for thermoelectric power generation, public water supplies, commercial industrial uses, and agriculture has a dramatic effect on flow rates (TNC 2004, p. 8). No major dams are located on the Altamaha River system within the known historical range of the Altamaha spinymussel, and the nearest reservoir is approximately 165 km (102.5 mi) from occupied habitat. However, the dams that form Sinclair Reservoir on the Oconee River and Jackson and Tobesofkee Reservoirs in the Ocmulgee River Basin can influence downstream mussels and their populations through changes in flows that result from electrical power generation and water storage (TNC 2004, p. 6) (see Our Response to Comment 7). Within the Altamaha River Basin, 1,149 MGD was withdrawn for thermoelectric power generation in 1990 (Marella and Fanning 1990, pp. 14–17); water withdrawals of this magnitude can cause drastic flow reductions and alterations that may strand mussels on sandbars, resulting in mortality of individuals and harm to populations. Laurens County, Georgia, which includes the City of Dublin, withdrew 2.64 MGD for public water supplies, 12.79 MGD for commercial industrial use, and 5.57 MGD for agricultural uses in 1990 (Marella and Fanning 1990, p. 16). In 1990, the total amount of surface water withdrawn from the Altamaha River Basin was approximately 1,315 MGD (Marella and Fanning 1990, p. 61). This information regarding water withdrawals dates back to 1990, which is the most recent comprehensive effort to study water withdrawals from this watershed. As development pressures continue to grow, water withdrawals are expected to increase.

Drought conditions were prevalent in Georgia between 1998 and 2002, and again in 2007 and 2008, which may have negatively affected the Altamaha spinymussel. Georgia averages 127 cm (50 in) of precipitation annually (U.S. Geological Survey 1986, p. 195; GDNR 2005, p. 41) but received less than 102 cm (40 in) of precipitation annually during recent droughts in 2000, 2002, and 2007 (Knaak and Joiner 2007, pp. 1–2). The Ohoopee River and many other streams in the basin suffered reduced flow rates, and the Ohoopee River was reported to have low water levels with an estimated average depth of 15 cm (6 in) in the main channel during summer surveys (Stringfellow and Gagnon 2001, p. 3) when normal channel depth is several feet or more. Normally, mussels will bury themselves in the river bottom as a mechanism to survive a drought, but many mussels may have died from desiccation during this prolonged drought (Keferl 2008, pers. comm.). Although the effects of the drought on the Altamaha spinymussel have not been quantified, mussel declines as a direct result of drought have been documented (Golladay *et al.* 2004, p. 494; Haag and Warren 2003, p. 1165). Furthermore, there is a growing concern that climate change may lead to increased frequency of severe storms and droughts (Golladay *et al.* 2004, p. 504; McLaughlin *et al.* 2002, p. 6074; Cook *et al.* 2004, p. 1015) (see Comment 14). Reduction in local water supplies due to drought is also compounded by increased human demand and competition for surface and ground water resources for power production, irrigation, and consumption (Golladay *et al.* 2004, p. 504).

In addition, low flow conditions provide access to the river margins and channels for all-terrain vehicles (ATV) and four-wheel drive vehicles (TNC 2004, p. 12; Stringfellow and Gagnon 2001, p. 3). During a survey in 2001, Stringfellow and Gagnon (2001, p. 3) observed heavy ATV and four-wheel drive vehicle traffic and high levels of erosion near bridges and homes. They encountered several groups of ATV users, 2 to 12 persons per group, riding in the river channel. Because water levels were so low, ATV use of the stream extended to all portions of the channel, including pools, runs, and dried sandbars. Observations on the Ohoopee River during low flow in October of 2006 revealed extensive ATV traffic that destroyed mussel beds (Rickard 2006, personal observation). These vehicles may directly crush mussels and may also destabilize stream banks and increase sedimentation rates, burying mussels or impairing feeding, respiration, metabolism, and reproductive success (Stringfellow and Gagnon 2001, p. 3).

Nonindigenous species such as the flathead catfish and the Asian clam have been introduced to the Altamaha Basin and may be adversely affecting the Altamaha spinymussel. Flathead catfish are fast-growing fish that are dominant predators in river systems and are usually exclusively piscivorous in their

adult stage (Bourret *et al.* 2008, p. 413; Sakaris *et al.* 2006, p. 867). Since its introduction outside its native range, the flathead catfish has altered the composition of native fish populations through predation (Bourett *et al.* 2008, p. 413; Sakaris *et al.* 2006, p. 867; Sea Grant, 2006, p. 2; Pine *et al.* 2005, p. 902). Flatheads were introduced to the Altamaha Basin in the 1970s (USGS 2009, unpaginated).

Although the host fish or fishes of the Altamaha spinymussel have not been identified, in other native freshwater mussels, various centrarchids (sunfish), ictalurids (catfish), and catostomids (suckers) have been identified as hosts of the larvae. Other species of mussels in the genus *Elliptio* are known to parasitize various species of *Etheostoma* and *Percina* (darters), and other stream-adapted fish species (Haag and Warren 2003, p. 80). Flatheads introduced in the Altamaha River eliminated bullhead catfish (*Ameiurus sp.*) and caused an 80 percent decline in redbreast sunfish (*Lepomis auritus*) (Sea Grant 2006, p. 2); centrarchids and ictalurids were dominant prey items (Sakaris 2006, p. 867). Other potential centrachid host fish such as the largemouth bass (*Micropterus salmoides*) and bluegill (*L. macrochirus*) have all suffered population declines (Harrison 2001, pers. comm.), as well as the robust redhorse (*Moxostoma robustum*), shortnose sturgeon (*Acipenser brevirostrum*), and shad (*Alosa sapidissima*) (TNC 2004, p. 5). Some of these declines may be attributable, at least in part, to flathead catfish (TNC 2004, p.5). If one or more of these species is the host fish for the Altamaha spinymussel, the spinymussel's breeding success and recruitment could be reduced by the presence of flathead catfish (Keferl 2001, pers. comm).

Asian clams were observed in the Altamaha River in 1971, and are believed to have been introduced in the Ocmulgee River in 1968 or 1969 (Gardner 1976, p. 117). Surveys have found large numbers of Asian clams in the Altamaha Basin for more than 25 years (Gardner *et al.* 1976, pp. 118–124; Stringfellow and Gagnon 2001, p. 2; O'Brien, pers. comm., 2001). The invasion of Asian clams in the Altamaha River has been accompanied by drastic declines in populations of native mussels, although it is unknown if the clams competitively excluded the mussels or simply colonized their habitat when they declined due to other factors (Gardner 1976, p. 124). Asian clams may pose a direct threat to native species through competition for available resources (space, minerals, or food), resulting in decline or local extirpation (Williams *et al.* 1993, p. 7; Bogan 1993, p. 605).

The linear nature of the Altamaha spinymussel's habitat, reduced range, and very small population size make this species vulnerable to random detrimental or catastrophic events. Small, isolated populations may experience decreased demographic viability (population birth and death rates, immigration and emigration rates, and sex ratios), increased susceptibility of extinction from stochastic environmental factors (*e.g.,* weather events, disease), and an increased threat of extinction from genetic isolation and subsequent inbreeding depression and genetic drift. Surviving populations of spinymussels are small (see summary of Basin-wide Population Estimates), extremely localized, and vulnerable to habitat modification, toxic spills, progressive degradation from contaminants (see discussions under Factors A and D), and natural catastrophic changes to their habitats (for example, flood scour and drought). Low numbers of individuals may also increase inbreeding and reduce genetic diversity (Lynch 1996, pp. 493–494) (see Our Response to Comment 9).

In summary, a variety of natural and manmade factors currently threatens the Altamaha spinymussel. Withdrawal of surface water within the Altamaha Basin for thermoelectric power generation, public water supplies, commercial industrial uses, and agriculture can cause drastic flow reductions and alterations that may strand mussels on sandbars, resulting in mortality of individuals and harm to populations. Recurring drought and water withdrawal, combined with impacts of off-road vehicles, has reduced flows and destabilized stream banks required to support this mussel. Nonindigenous species, such as flathead catfish and the Asian clam, have potentially adversely impacted populations of the spinymussel's host fish, thereby affecting recruitment, and may directly impact the spinymussel through competition for resources. Lastly, because the Altamaha spinymussel populations are so small and isolated, any factor (*i.e.,* habitat change or natural and manmade factors) that results in a decline in habitat or individuals may be problematic for the long-term recovery of this species. Therefore, we have determined that other natural and manmade factors are threats to the continued existence of the Altamaha spinymussel throughout its range.

Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Altamaha spinymussel. Section 3 of the Act defines an ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range'' and a ''threatened species'' as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' As described in detail above, the species is currently at risk throughout all of its range due to ongoing threats of habitat destruction and modification (Factor A), inadequacy of existing regulatory mechanisms (Factor D), and other natural or manmade factors affecting its continued existence (Factor E). This species' extremely small and isolated populations make it particularly susceptible to extinction at any time due to threats described under Factors A, D, and E.

The Altamaha spinymussel has been observed at only 22 sites since 2000, despite extensive survey efforts made by several different researchers. Most of these sites are clustered geographically within short reaches of the lower Ocmulgee River and the Altamaha River upstream of U.S. Route 301, and there are long reaches with no or undetectable numbers of Altamaha spinymussels separating these groups of sites. Meador (2009, p. 51) attempted to estimate abundance of Altamaha spinymussel in the mainstem Altamaha, but was unable to capture, tag, and recapture sufficient individuals for an assessment. Recent surveys of the Ohoopee River and the analysis presented by Wisniewski *et al.* (2005) suggest that the species may still be declining. Finally, the comparatively low numbers of Altamaha spinymussels collected during recent surveys of the Altamaha and Ocmulgee Rivers further suggests that this species has declined substantially from historical levels. To summarize, researchers were able to find 60 Altamaha spinymussels at a single site on the Altamaha River in 1967; in contrast, the largest number of Altamaha spinymussels observed from a single site on the Altamaha River during the 1990s or 2000s was nine (Albanese 2005, pers. comm.).

The remaining small spinymussel populations are threatened by a variety of factors that are expected to persist indefinitely and impact, or have the potential to impact, remaining spinymussel habitat. These factors include siltation, industrial pollution, municipal effluents, modification of

stream channels, pesticides, heavy metals, invasive species, loss of host fish, water withdrawal, recurring drought, and loss of genetic viability. In addition, as described under Factor D, existing regulatory mechanisms are inadequate to ameliorate the current threats to the Altamaha spinymussel and its habitat. We believe the remaining small, isolated populations of spinymussels are not large enough to be resilient against any of the above factors acting on the species itself or its habitat. Furthermore, we believe these threats, particularly the threats to populations resulting from habitat degradation, small population size, and drought, are current and are projected to continue into the future. If the present trends that negatively affect the species and its limited and restricted habitat continue, the Altamaha spinymussel is in immediate danger of extinction throughout all of its range; therefore, proposing threatened status is not appropriate.

We find that the Altamaha spinymussel is presently in danger of extinction throughout its entire range, based on the immediacy and magnitude of the threats described above. Based on our analysis, we have no reason to believe that the negative population trends for the Altamaha spinymussel will improve, nor will the effects of current threats acting on the species be ameliorated in the foreseeable future. Therefore, we are listing the Altamaha spinymussel as an endangered species throughout all of its range.

Furthermore, because we find that the Altamaha spinymussel is endangered throughout all of its range, there is no reason to consider its status in a significant portion of its range. Consequently, we are listing the Altamaha spinymussel as an endangered species under the Act.

Critical Habitat

Background

Critical habitat is defined in section 3 of the Act as:

(i) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features

(I) Essential to the conservation of the species and

(II) Which may require special management considerations or protection; and

(ii) Specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which the measures provided under the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the prohibition against Federal agencies carrying out, funding, or authorizing the destruction or adverse modification of critical habitat. Section 7(a)(2) requires consultation on Federal actions that may affect critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner seeks or requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) of the Act would apply, but even in the event of a destruction or adverse modification finding, the Federal action agency's and the applicant's obligation is not to restore or recover the species, but to implement reasonable and prudent alternatives to avoid destruction or adverse modification of critical habitat.

For inclusion in a critical habitat designation, the habitat within the geographical area occupied by the species at the time it was listed must contain the physical or biological features essential to the conservation of the species, and be included only if those features may require special management considerations or protection. Critical habitat designations identify, to the extent known using the best scientific and commercial data available, habitat areas that provide essential life-cycle needs of the species (areas on which are found the physical or biological features essential for the conservation of the species). Under the Act and regulations at 50 CFR 424.12, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed only when we determine that those areas are essential for the conservation of the species and that designation limited to those areas occupied at the time of listing would be inadequate to ensure the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific and commercial data available. Further, our Policy on Information Standards Under the Endangered Species Act (published in the **Federal Register** on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658)), and our associated Information Quality Guidelines, provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat.

When we are determining which areas we should designate as critical habitat, our primary source of information is generally the information developed during the listing process for the species. Additional information sources may include articles in peer-reviewed journals, conservation plans developed by States and counties, scientific status surveys and studies, biological assessments, or other unpublished materials and expert opinion or personal knowledge.

Habitat is often dynamic, and species may move from one area to another over time. In particular, we recognize that climate change may cause changes in the arrangement of occupied habitat river reaches. Climate change may lead to increased frequency and duration of severe storms and droughts (Golladay *et al.* 2004, p. 504; McLaughlin *et al.* 2002, p. 6074; Cook *et al.* 2004, p. 1015). Drought conditions in 2000–2001 and 2007–2008 greatly reduced the habitat of the spinymussel in the Ohoopee River and rendered the populations vulnerable to anthropogenic disturbances, such as water extraction and vehicles within the riverbed (Keferl 2008, pers. comm.; Stringfellow and Gagnon 2001, p. 3).

The information currently available on the effects of global climate change and increasing temperatures does not make sufficiently precise estimates of the location and magnitude of the

effects. Nor are we currently aware of any climate change information specific to the habitat of the Altamaha spinymussel that would indicate what areas may become important to the species in the future. Therefore, we were unable to determine what additional areas, if any, may be appropriate to include in the critical habitat for this species. Furthermore, we recognize that designation of critical habitat may not include all of the habitat areas we may eventually determine, based on scientific data not now available to the Service, that are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be required for recovery of the species.

Areas that are important to the conservation of the species, but are outside the critical habitat designation, will continue to be subject to conservation actions we implement under section 7(a)(1) of the Act. These areas are also subject to the regulatory protections afforded by the section 7(a)(2) jeopardy standard, as determined on the basis of the best available scientific information at the time of the agency action. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts if new information available to these planning efforts calls for a different outcome.

Methods

As required by section 4(b) of the Act, we used the best scientific data available in determining occupied areas that contain the features that are essential to the conservation of the Altamaha spinymussel, and unoccupied areas that are essential for the conservation of the Altamaha spinymussel.

We have reviewed the available information pertaining to historical and current distribution, life history, and habitat requirements of this species. Our sources included: Peer-reviewed scientific publications; unpublished survey reports; unpublished field observations by the Service, State, and other experienced biologists; and notes and communications from qualified biologists or experts.

Physical or Biological Features

In accordance with sections 3(5)(A)(i) and 4(b)(1)(A) of the Act and regulations at 50 CFR 424.12, in determining which areas within the geographical area occupied at the time of listing to designate as critical habitat, we consider the physical or biological features essential to the conservation of the species which may require special management considerations or protection. These include, but are not limited to:

(1) Space for individual and population growth and for normal behavior;

(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;

(3) Cover or shelter;

(4) Sites for breeding, reproduction, and rearing of offspring; and

(5) Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distribution of a species.

We consider the physical or biological features to be the primary constituent elements (PCEs) laid out in the appropriate quantity and spatial arrangement essential for the conservation of the species. We derive the PCEs from the biological needs of the species as described in the Background section of this proposal. Unfortunately, little is known of the specific habitat requirements for the Altamaha spinymussel other than that they require flowing water, stable river channels, and adequate water quality. Altamaha spinymussel mussel larvae also require a currently unknown fish host for development to juvenile mussels. To identify the physical or biological needs of the species, we have relied on current conditions at locations where the species survives, the limited information available on this species and its close relatives, and factors associated with the decline and extirpation of these and other aquatic mollusks from extensive portions of the Altamaha River Basin.

Space for Individual and Population Growth and for Normal Behavior

The Altamaha spinymussel is historically associated with the main stem of the Altamaha River and its larger tributaries (greater than 500 cubic feet per second (cfs) Mean Monthly Discharge (MMD)), and does not occur in smaller tributaries. Spinymussels are generally associated with stable, coarse-to-fine sandy sediments of sandbars, sloughs, and mid-channel islands, and they appear to be restricted to swiftly flowing water (Sickel 1980, p. 12). Sandbars, sloughs, and mid-channel islands provide space for the spinymussel and also provide cover, shelter, and sites for breeding, reproduction, and growth of offspring. Sandbars, sloughs, and mid-channel islands are dynamic habitats formed and maintained by water quantity, channel slope, and sediment input to the system through periodic flooding, which maintains connectivity and interaction with the flood plain. Changes in one or more of these parameters can result in channel degradation or channel aggradation, with serious effects to mollusks. Therefore, we believe that stream channel stability and floodplain connectivity are essential to the conservation of the Altamaha spinymussel.

Water

The Altamaha spinymussel is a riverine-adapted species that depends upon adequate water flow and is not found in ponds or lakes. Continuously flowing water is a habitat feature associated with all surviving populations of this species. Flowing water maintains the river bottom, sandbars, sloughs, and mid-channel islands habitat where this species is found, transports food items to the sedentary juvenile and adult life stages of the Altamaha spinymussel, removes wastes, and provides oxygen for respiration for this species.

The ranges of standard physical and chemical water quality parameters (such as temperature, dissolved oxygen, pH, and conductivity) that define suitable habitat conditions for the Altamaha spinymussel have not been investigated. However, as relatively sedentary animals, mussels must tolerate the full range of such parameters that occur naturally within the streams where they persist. Both the amount (flow) and the physical and chemical conditions (water quality) where this species currently exists vary widely according to season, precipitation events, and seasonal human activities within the watershed. Conditions across their historical ranges vary even more due to geology, geography, and differences in human population densities and land uses. In general, the species survives in areas where the magnitude, frequency, duration, and seasonality of water flow is adequate to maintain stable sandbar, slough, and mid-channel-island habitats (for example, sufficient flow to remove fine particles and sediments without causing degradation), and where water quality is adequate for year-round survival (for example, moderate to high levels of dissolved oxygen, low to moderate input of nutrients, and

relatively unpolluted water and sediments). Therefore, adequate water flow and water quality (as defined below) are essential to the conservation of the Altamaha spinymussel.

It is apparent that heat stress from increased water temperature makes mussels more sensitive to contaminants. A growing body of literature is addressing the acute thermal tolerance of mussels, (Pandolfo *et al* 2009, p. 347; 2010a, p. 959; 2010b, p. 691). Pandolfo *et al.* (2010a, p. 959) reported upper lethal temperatures for early life stages of 8 species of unionid mussels and the average median lethal temperature (LT50) was 31.6 °C. Pandolfo *et al.* (2009, p. 347) reported a measurable physiological indicator of stress (*i.e.,* increased heart rate) in juvenile mussels exposed to temperatures as little as 3 °C above ambient (*i.e.* 30 °C). Pandolfo *et al.* (2010b, p. 691) clearly demonstrated an interaction between temperature and sensitivity to copper in juveniles of three mussel species: fatmucket (*Lampsilis siliquoidia*), pink heelsplitter (*Potamilus alatus*), and black sandshell (*Ligumia recta*). In short, mussels exposed to copper were less able to withstand thermal stress. Clearly stressors do not occur in isolation and more multiple-stressor research is desperately needed. Because thermal tolerance data do not exist for spinymussel or other Altamaha mussel species, we are left to use the best available data to approximate spinymussel thermal tolerance, and we believe this to be the most valid approach for establishing a thermal PCE for spinymussel. Pandolfo *et al.* (2010a, p. 959) indicates that the lowest 48-hr LT50 (median lethal temperature) was 33.8 °C.

In addition to physiological stress due to temperature itself, temperature greatly influences the form (and thereby the toxicity) of other compounds, most notably ammonia. Higher temperatures result in a shift from the nontoxic ammonium ion (NH_4^+) to the highly toxic ammonia ion (NH_3). Ammonia may be one of the primary limiting factors in reaches of river downstream from point and nonpoint sources of nitrogen such as municipal wastewater treatment facilities and agricultural fields, among others (Bringolf 2011, pers. comm.).

These rivers (in the Altamaha Basin), like most Atlantic Slope drainages in Georgia receive a majority of their water through overland flow and runoff whereas streams in the southwestern part of Georgia receive a large proportion of their water though groundwater discharges, which have greater influences on stream flows and temperatures. Additionally, streams in the southwestern part of Georgia are greatly affected by agricultural withdrawals, which can reduce or eliminate the volume of groundwater being discharged into waters in this part of the state and thus affect water temperatures in these creeks and rivers more than waters in other basins. The Altamaha River in the historical and current range of the Altamaha spinymussel is largely forested and rural and exhibits those conditions most similar to the Savannah River gauge near Port Wentworth (02198840). Unlike the Savannah River near the gauge in Augusta (02197000), the Altamaha River Basin in the area that is designated as critical habitat is more than 165 km (103 miles) from the nearest reservoir and thus the effects of hypolimnetic discharges are not considered a threat to the Altamaha spinymussel. (Layzer and Madison 1995, pp. 340–344; Watters 2000, p. 265; Wisniewski 2011, pers. comm.).

The water quality metrics PCE was derived using data collected from the Altamaha River and its tributaries within the historical range of the Altamaha spinymussel. Temperature measurements collected throughout the Altamaha, Ocmulgee, and Oconee rivers in this area ranged from 8.6 °C to 32.6 °C (47.5 to 90.7 °F). Observations of historical United States Geological Survey (USGS) gauge data at several sites on the Altamaha River near Jesup indicated that the maximum water temperature observed between 1974 and 1984 was 32 °C (89.7 °F) (Dyar and Alhadef 1997, p. 26). Since none of the USGS gauge stations on the Altamaha River or its major tributaries include recent temperature data, we downloaded daily stream temperature data from the USGS gauge stations found on the nearby Savannah River, which is similar to the Altamaha River in size and its location within the Coastal Plain physiographic province of Georgia. Three gauge stations on the Savannah River collect temperature data: Savannah River at Augusta (02197000), Savannah River near Port Wentworth, upstream of Interstate 95 (02198840), and Savannah River at Port Wentworth (02198920). At the gauge station in Augusta, the maximum water temperature recorded in the 323 days within the day period of record (4/21/2010–3/9/2011) was 24.8 °C (76.6 °F) and the maximum daily water temperature fluctuation was 5.7 °C (42.3 °F). The maximum water temperature recorded in the 3,835 days within the period of record (10/13/1999–3/9/2011) for the Savannah River near Port Wentworth was 31.7 °C (89.1 °F) with a maximum daily water temperature fluctuation of 2.1 °C (35.8 °F). The maximum water temperature recorded in the 3,883 days within the period of record (11/5/1999–3/9/2011) for the Savannah River at GA highway 25 in Port Wentworth was 32.4 °C (90.3 °F) with a maximum daily water temperature fluctuation of 3.7 °C (38.7 °F).

Although the maximum daily water fluctuations of the Savannah River at Augusta (02197000) and the Savannah River at Port Wentworth (02198920) are greater than the daily temperature fluctuation recommended in the PCEs of the Altamaha spinymussel listing proposal, it is important to note that these sites are located in or immediately downstream of major industrial/urban areas or dams which likely contribute to the greater daily fluctuations in water temperatures. Furthermore, temperatures on the Savannah River in Augusta are influenced by hypolimnetic discharges from Clarks Hill Reservoir and New Savannah Bluff Lock and Dam, which are located immediately upstream of the USGS gauge station. Therefore, water temperatures at the Savannah River gauge (02198840) upstream of Port Wentworth, which is located in a densely forested and rural area and well downstream of any potential hypolimnetic discharges are likely more similar to those temperatures and fluctuations observed in the Altamaha River (Wisniewski 2011, pers. comm.).

A natural flow regime that includes periodic flooding and maintains connectivity and interaction with the flood plain is critical for the exchange of nutrients, spawning activities for potential host fish, and sand bar maintenance. In 2007, persistent severe drought conditions throughout the southeastern United States created record low discharges (streamflow) in the Altamaha River at the U.S. Geological Survey (USGS) gauge station in Doctortown, Georgia. During the driest portions of the 2006–2009 drought period, the lowest discharges observed were 25 percent of the MMD for the 77-year period of record for the Doctortown gauge. Despite record low flows, native unionids (mussels) appeared to persist throughout most of the Lower Altamaha River Basin.

The numeric standards for pollutants and water quality parameters (for example, dissolved oxygen, pH, heavy metals) have been adopted by the State of Georgia under the Clean Water Act (33 U.S.C. 1251 *et seq.*). Water quality standards set by the State of Georgia are based on water quality criteria

established by EPA for protection of aquatic life. That said, mussels are not currently represented in datasets used by EPA for derivation of water quality criteria. Some of these standards (particularly organic and heavy metal contaminants) may not adequately protect Altamaha spinymussels, or are not being appropriately measured, monitored, or achieved in some reaches (see discussions under Factors A and D). While Georgia's pH criterion is a range of 6.0 to 8.5 under the adopted State standards, data compiled by the GDNR indicate that pH at 159 sites in the Altamaha River Basin averaged 6.9 and ranged from 4.9 to 9.1, which means many sites are outside of the range adopted by the State. Potential contaminants such as ammonia may be more lethal at pH levels at the edges of the observed range. Therefore, we removed outliers from this data set by generating the 10th and 90th percentiles for pH, which were 6.1 to 7.7 standard units. These levels are likely more representative of natural pH levels associated with the Altamaha River Basin and would likely reduce lethal contaminant associations between other chemicals in the watershed.

Current Georgia TMDLs for waters supporting warm-water fishes require a daily average dissolved oxygen (DO) concentration of 5.0 mg/l and a minimum of 4.0 mg/l. The mean DO concentration of 217 measurements made in known spinymussel sites throughout the Altamaha River Basin was 8.7 mg/l and ranged from 0.42 mg/l to 20.3 mg/l. The 10th and 90th percentiles for DO were 4.3 and 9.7 mg/l, which are similar to the observations of Golladay *et al.* (2004, pp. 501–503). A daily average DO concentration of 5.0 mg/l and a minimum DO concentration of 4.0 mg/l should provide adequate protection for the Altamaha spinymussel.

Other factors that can potentially alter water quality are droughts and periods of low-flow, nonpoint-source runoff from adjacent land surfaces (for example, excessive amounts of nutrients, pesticides, and sediment), and random spills or unregulated discharge events. This could be particularly harmful during drought conditions when flows are depressed and pollutants are more concentrated. Adequate water quality is essential for normal behavior, growth, and viability during all life stages of the Altamaha spinymussel.

Food

Unionid mussels, such as the Altamaha spinymussel, filter algae, detritus, and bacteria from the water column (Williams *et al.* 2008, p. 67). Although the life history of the Altamaha spinymussel has not been studied, the life histories of other mussels in the *Elliptio* genus indicate that adult freshwater mussels are filter-feeders, siphoning phytoplankton, diatoms, and other microorganisms from the water column. For the first several months, juvenile mussels employ pedal (foot) feeding, extracting bacteria, algae, and detritus from the sediment (Yeager *et al.* 1994, pp. 217–221; Cope *et al.* 2008, p. 457). Food availability and quality for the Altamaha spinymussel in sandbars, sloughs, and mid-channel-island habitats are affected by habitat stability, floodplain connectivity, flow, and water quality.

Sites for Breeding, Reproduction, or Rearing

Freshwater mussels require a host fish for transformation of larval mussels (glochidia) to juvenile mussels (Williams *et al.* 2008, p. 68); therefore, the presence of the appropriate host fish is essential to the conservation of the Altamaha spinymussel. The specific fish host(s) for the Altamaha spinymussel is unknown; however, other species of mussels in the genus *Elliptio* are known to parasitize various species of *Etheostoma, Percina,* and other stream-adapted fish species (Haag and Warren 2003, p. 80). Eighty-five fish species representing 22 families are native to the Altamaha River Basin. Five families account for 65 percent of the native fish species in the Altamaha River Basin. The family Cyprinidae comprises 20 percent of the fish species, while Centrarchidae, Catostomidae, Ictaluridae, and Percidae comprise 15 percent, 12 percent, 11 percent, and 8 percent of the species, respectively. These families are known to be suitable hosts for most unionids in North America. All 85 species native to the Altamaha River Basin are still present within the basin; however, populations of several fish species, particularly anadromous fishes (*e.g.,* striped bass, Atlantic and shortnose sturgeon, American shad and other herrings), have declined substantially in recent decades and, if used as hosts, may be related to declines in Altamaha spinymussel abundance. Host trials with 10 species of fish from six families (Centrarchidae, Cyprinidae, Ictaluridae, Moronidae, Acipenseridae, Catostomidae) did not produce any juvenile Altamaha spinymussels (R. Bringolf 2010, pers. comm.).

Juvenile Altamaha spinymussels require stable sandbar, slough, and mid-channel-island habitats for growth and survival. Excessive sediments or dense growth of filamentous algae can expose juvenile mussels to entrainment or predation and be detrimental to the survival of juvenile mussels (Hartfield and Hartfield 1996, pp. 372–374). Geomorphic instability can result in the loss of interstitial habitats and juvenile mussels due to scouring or deposition (Hartfield 1993, pp. 372–373). Therefore, stable sandbar, slough, and mid-channel-island habitats with low to moderate amounts of filamentous algae growth are essential to the conservation of the Altamaha spinymussel.

Periodic floodplain connectivity that occurs during wet years provides habitats for spawning and foraging activities to fishes requiring floodplain habitats for successful reproduction and recruitment to adulthood. Barko *et al.* (2006, pp. 252–256) found several fish species benefited from the resource exploitation of floodplain habitats that were not typically available for use during hydrologically normal years. Furthermore, Kwak (1988, pp. 243–247) and Slipke *et al.* (2005, p. 289) indicated that periodic inundation of floodplain habitats increased successful fish reproduction, which leads to increased availability of native host fishes for unionid reproduction. However, Rypel *et al.* (2009, p. 502) indicated that unionids tended to exhibit minimal growth during high flow years. Therefore, optimal flooding of these habitats would not be too frequent and should occur at similar frequencies to that of the natural hydrologic regime of the Altamaha River.

Primary Constituent Elements (PCEs) for the Altamaha Spinymussel

Based on the above needs and our current knowledge of the life history, biology, and ecology of the species, we have determined that the Altamaha spinymussel's PCEs are:

(1) Geomorphically stable river channels and banks (channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with stable sandbar, slough, and mid-channel-island habitats of coarse-to-fine sand substrates with low to moderate amounts of fine sediment and attached filamentous algae.

(2) A hydrologic flow regime (the magnitude, frequency, duration, and seasonality of discharge over time) necessary to maintain benthic habitats where the species are found and to maintain connectivity of rivers with the floodplain, allowing the exchange of nutrients and sediment for sand bar maintenance, food availability, and spawning habitat for native fishes.

(3) Water quality necessary for normal behavior, growth, and viability of all life stages, including specifically temperature (less than 32.6 °C (90.68 °F) with less than 2 °C (3.6 °F) daily fluctuation)), pH (6.1 to 7.7), oxygen content (daily average DO concentration of 5.0 mg/l and a minimum of 4.0 mg/l), an ammonia level not exceeding 1.5 mg N/L, 0.22 mg N/L (normalized to pH 8 and 25 °C (77 °F)), and other chemical characteristics.

(4) The presence of fish hosts (currently unknown) necessary for recruitment of the Altamaha spinymussel. The continued occurrence of diverse native fish assemblages currently occurring in the basin will serve as an indication of host fish presence until appropriate host fishes can be identified for the Altamaha spinymussel.

This final designation is designed to conserve those areas containing the PCEs in the appropriate spatial arrangement and quantity essential to the conservation of the species.

Units are designated based on sufficient PCEs present to support at least one of the species' life history functions. In this final designation, all occupied areas (Units 1, 2, and 3) contain all PCEs and support multiple life processes. The unoccupied area (Unit 4) contains PCEs 1, 2 and 4, but does not currently meet the water quality standard (see Unit 4 below).

Special Management Considerations or Protections

When designating critical habitat, we assess whether the areas within the geographical area occupied by the species at the time of listing contain features that are essential to the conservation of the species and whether those features may require special management considerations or protection. None of the critical habitat units being designated for this species have been designated as critical habitat for other species under the Act. Large areas of upland habitat adjacent to the designated critical habitat are currently protected or receive special management; 13.4 km (8.4 mi.) on both sides of the river and 75.9 km (47.0 mi) on one side of the river only are managed as conservation properties through easements with 300' buffers on many timber lands and active management on lands owned by the State and The Nature Conservancy (see Table 2). However, approximately 148 km (92 mi) have no protection. Various activities in or adjacent to each of the critical habitat units described in this final rule may affect one or more of the PCEs and may require special management considerations or protection. Some of these activities include, but are not limited to, those discussed in the ''Summary of Factors Affecting the Species,'' above. Features in all the final critical habitat units may require special management due to threats posed by land-use runoff and point- and nonpoint-source water pollution (see discussion under Factor A and Factor D). Other activities that may affect PCEs in the final critical habitat units include those listed in the ''Effects of Critical Habitat'' section below.

In summary, we find that the areas we are designating as critical habitat that were occupied at the time of listing contain the physical or biological features essential to the conservation of the Altamaha spinymussel, which may require special management considerations or protection. Special management consideration or protection may be required to eliminate, or to reduce to negligible levels, the threats affecting each unit and to preserve and maintain the essential features that the final critical habitat units provide to the Altamaha spinymussel. We are also designating areas outside the geographical area occupied by the species at the time of listing that have been determined to be essential for the conservation of the species. Additional discussions of threats facing individual sites are provided in the individual unit descriptions.

Criteria Used to Identify Critical Habitat

As required by section 4(b) of the Act, we used the best scientific data available in determining areas within the geographical area occupied by the species that contain the physical or biological features essential to the conservation of the Altamaha spinymussel (see above), and areas outside of the geographical area occupied by the species that are essential for the conservation of the species. We are designating as critical habitat all river channels that are currently occupied by the species. We are also designating a specific area not currently occupied but that was historically occupied, because we have determined (1) That the area is essential for the conservation of the Altamaha spinymussel, and (2) that designating only occupied habitat is not sufficient to conserve this species.

When determining final critical habitat boundaries, we make every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands usually lack PCEs for endangered or threatened species. Areas designated as critical habitat for the Altamaha spinymussel include only stream channels within the ordinary high-water line, and do not contain any developed areas or structures. The ordinary high-water line defines the stream channel and is the point on the stream bank where water is continuous and leaves some evidence such as erosion or aquatic vegetation.

Occupied Stream Reaches Designated as Critical Habitat

We have defined occupied habitat as those stream reaches known to be currently occupied by the Altamaha spinymussel. We used information from surveys and reports prepared by the GDNR, private contractors, and Service field records to identify the specific locations occupied by the Altamaha spinymussel.

Currently, the limited occupied habitat for this species is extremely scattered and isolated. The Altamaha spinymussel persists in scattered portions of the Altamaha and Ocmulgee Rivers (see *Population Estimates and Status* above). We have determined that all occupied areas contain features essential to the conservation of the species.

River habitats are highly dependent upon upstream and downstream channel habitat conditions for their maintenance. Therefore, where one occurrence record was known from a river reach, we considered the entire reach between the uppermost and lowermost locations as occupied habitat, as discussed below.

The Altamaha spinymussel is currently known to survive in scattered populations along 223 km (138 mi) of the Ocmulgee and upper Altamaha Rivers extending from Telfair and Ben Hill Counties to Long and Wayne Counties, Georgia, except for a 2.7-km (1.7-mi) reach of river in the vicinity of the Plant Hatch facility. From 1997 through 2009, researchers searched 336 sites throughout the basin and documented 57 Altamaha spinymussels, with all occurrences widely scattered throughout its current range. There are no known barriers to movement in this range; therefore, we consider the entire 223-km (138-mi) reach between the uppermost and lowermost collection sites for the Altamaha spinymussel as occupied habitat. In the area designated as critical habitat, boundaries extend from the nearest downstream landmark at both ends of the reach.

Unoccupied Stream Reaches Designated as Critical Habitat

In identifying unoccupied river reaches that could be essential for the conservation of the Altamaha spinymussel, we first considered the availability of potential habitat throughout the historical range that may be suitable for the survival and persistence of the species. We also eliminated from consideration free-flowing rivers or river segments without any historical records of occurrence (that is the Little Ocmulgee River and the upper portions of the Oconee and Ocmulgee Rivers). We eliminated the lower portion of the Altamaha River from consideration because of poor water quality and limited habitat availability. The lower Oconee River was initially eliminated due to poor water quality and limited habitat availability, however, recent mussel surveys have demonstrated that water quality is likely adequate for the spinymussel and suitable habitat is available. However, only one tributary is needed as critical habitat, and the lower Oconee only has one known observation of spinymussels from 1968, conversely the Ohoopee has multiple reports of spinymussel with the most recent in 1997. See our response to Comment 8.

We have identified 14.4 km (9 mi) of habitat in the Ohoopee River that is currently unoccupied by the Altamaha spinymussel and that meets the criteria for designation as critical habitat. Historical records of Altamaha spinymussel occurred in the lower portions of the Ohoopee River. Keferl (1981, p. 15) referred to the Ohoopee as a possible refuge for the Altamaha spinymussel. However, extreme drought and all-terrain vehicle disturbance appear to have extirpated the species from otherwise suitable habitat.

The unoccupied stream reach we are designating as critical habitat was historically occupied (*i.e.,* prior to 1997; see Table 1). We believe that this reach is essential for Altamaha spinymussel conservation because the range of the Altamaha spinymussel has been severely curtailed, occupied habitats are limited and isolated, and population sizes are extremely small, and the area meets the selection criteria identified below. Furthermore, the occupied habitats are contiguous, placing them at high risk of extirpation and extinction from stochastic events. The inclusion of essential unoccupied areas, in a separate tributary, will provide habitat for population reintroduction, reduce the level of stochastic threats to the species' survival, and decrease the risk of extinction for this species.

The area designated as critical habitat that is not known to be currently occupied meets all of the following criteria:

(1) It contains sufficient PCEs (for example, such characteristics as geomorphically stable channels, perennial water flows, and appropriate benthic substrates) to support life history functions of the Altamaha spinymussel;

(2) It supports diverse aquatic mollusk communities, including the presence of closely related species requiring PCEs similar to the Altamaha spinymussel; and

(3) It is adjacent to currently occupied areas where there is potential for natural dispersal and reoccupation by the Altamaha spinymussel.

(4) It is essential to the conservation of the species.

Critical Habitat Designation

We are designating four units, totaling approximately 237.4 km (147.5 mi), as critical habitat for the Altamaha spinymussel. Georgia owns navigable stream bottoms within the ordinary high-water line. All units are considered navigable and, as stated below, critical habitat is designated for the stream channel within the ordinary high-water line only. Accordingly, the State of Georgia owns the stream bottoms within all of the areas designated as critical habitat. Lands adjacent to critical habitat units are either in private ownership or conservation status. Table 2 identifies the critical habitat units, occupancy of the units, the approximate extent designated as critical habitat, and provides information on adjacent land ownership and conservation status.

TABLE 2—OCCUPANCY AND OWNERSHIP OF LANDS ADJACENT TO CRITICAL HABITAT UNITS FOR ALTAMAHA SPINYMUSSEL

Unit	Location	Occupancy	Total length km (mi)	Private km (mi)	Conservation/ private km (mi)	Conservation km (mi)
1	Ocmulgee River	Occupied	110 (68.3)	89.2 (55.4)	14.3 (8.8)	6.4 (4.0)
2A	Upper Altamaha River A	Occupied	31.4 (19.5)	2.7 (1.7)	21.6 (13.4)	7.1 (4.4)
2B	Upper Altamaha River B	Occupied	30.7 (19.1)	22.9 (14.2)	7.8 (4.9)	0 (0)
3	Middle Altamaha River	Occupied	50.9 (31.6)	18.8 (11.7)	32.1 (19.9)	0 (0)
4	Lower Ohoopee River	Unoccupied	14.4 (9.0)	14.4 (9.0)	0 (0)	0 (0)
Total			237.4 (147.5)	148 (92)	75.9 (47)	13.4 (8.4)

* Ownership is categorized by private ownership on both banks of the river (Private), conservation area on one bank and private on the other (Conservation/Private), and conservation area on both banks (Conservation).

The critical habitat units include the river channels below the ordinary high water mark. As defined in 33 CFR 329.11, the ordinary high water mark on nontidal rivers is the line on the shore established by the fluctuations of water and indicated by physical characteristics, such as a clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding areas. For each stream reach designated as a critical habitat unit, the upstream and downstream boundaries are described generally below. More precise definitions are provided in the Regulation Promulgation section at the end of this rule.

We present brief descriptions of all units and reasons why they meet the definition of critical habitat for the Altamaha spinymussel:

Unit 1: Ocmulgee River, Ben Hill, Telfair, Coffee, and Jeff Davis Counties

Unit 1 includes 110 km (68.3 mi) of the lower Ocmulgee River from the confluence of House Creek with the Ocmulgee River at Red Bluff Landing in Ben Hill and Telfair Counties, downstream to the Altamaha River (at the confluence of the Oconee and Ocmulgee Rivers, Jeff Davis and Telfair Counties). Live Altamaha spinymussels have been collected from 11 sites within Unit 1, the uppermost near Red Bluff (Thomas and Scott 1965, p. 67). Surveys

conducted since 1997 on the Ocmulgee River have yielded 19 Altamaha spinymussels from 7 sites (Cammack *et al.* 2001, p. 11; O'Brien 2002, p. 2; Dinkins 2004, pp. 1–1, 2–1). The entire reach of the Ocmulgee River that composes Unit 1 is occupied. This unit contains all of the PCEs.

The Altamaha spinymussel and its habitat may require special management considerations or protection to address changes in the existing flow regime due to activities such as impoundment, water diversion, or water withdrawal; alteration of water chemistry or water quality; and changes in streambed material composition and quality from activities that would release sediments or nutrients into the water, such as deadhead logging (instream log salvage), construction projects, livestock grazing, timber harvesting, and off-road vehicle use.

Unit 2: Upper Altamaha River, Wheeler, Toombs, Montgomery, Jeff Davis, Appling, and Tatnall Counties

Unit 2 includes a total of 62.1 km (38.6 mi) of the Altamaha River from the confluence of the Ocmulgee and Oconee Rivers (Wheeler and Jeff Davis Counties) downstream to the confluence of the Altamaha and Ohoopee Rivers (Appling and Tattnall Counties).

Unit 2A includes 31.4 km (19.5 mi) of the Altamaha River from the confluence of the Ocmulgee and Oconee Rivers to Route 1.

Unit 2B includes 30.7 km (19.1 mi) of the Altamaha River from the upstream boundary of Moody Forest to the confluence of the Altamaha and Ohoopee Rivers.

However, we are not including in this critical habitat designation a stretch of the Altamaha River from U.S. Route 1 downstream to the State-owned property of Moody Forest (2.7 km (1.7 mi)), which includes Plant Hatch. This area does not contain the PCEs necessary for the Altamaha spinymussel due to:

(1) Dredging for intake pipes at Plant Hatch, which destabilizes the river channel and banks, sandbar, slough, and mid-channel-island habitats and disrupts the movement of coarse-to-fine sand substrates with low to moderate amounts of fine sediment; and

(2) Thermal discharges from Plant Hatch that reduce water quality.

In the upper Altamaha River, historic surveys collected Altamaha spinymussels from 15 sites, while recent surveys have collected live Altamaha spinymussels from only 2 sites; dead shells have been collected from an additional 14 sites (Sickel 1980; Keferl 1995, p. 3; Cammack *et al.* 2001, p. 11, O'Brien 2002, p. 2; Wisniewski 2009, pers. comm.). The entire reach of the Altamaha River that composes Unit 2 is occupied. This unit contains all of the PCEs.

The Altamaha spinymussel and its habitat may require special management considerations or protection to address changes in the existing flow regime due to activities such as impoundment, water diversion, or water withdrawal; alteration of water chemistry or water quality; and changes in streambed material composition and quality from activities that would release sediments or nutrients into the water, such as deadhead logging (instream log salvage), construction projects, livestock grazing, timber harvesting, and off-road vehicle use.

Unit 3: Middle Altamaha River, Tattnall, Appling, Wayne, and Long Counties

Unit 3 includes approximately 50.9 km (31.6 mi) of the Altamaha River from the confluence with the Ohoopee (Tattnall and Appling Counties) downstream to U.S. Route 301 (Wayne and Long Counties). Historic and recent surveys of the middle Altamaha River have yielded live Altamaha spinymussels from 26 sites. Shell material was found at an additional 13 sites (Keferl 1981, p. 14; Keferl 1995, p. 3; Cammack *et al.* 2001, p. 11; O'Brien 2002, p. 2; Wisniewski 2009, pers. comm.). The entire reach of the Altamaha River that composes Unit 3 is occupied. This unit contains all of the PCEs.

The Altamaha spinymussel and its habitat may require special management considerations or protection to address changes in the existing flow regime due to such activities as impoundment, water diversion, or water withdrawal; alteration of water chemistry or water quality; and changes in streambed material composition and quality from activities that would release sediments or nutrients into the water, such as deadhead logging (instream log salvage), construction projects, livestock grazing, timber harvesting, and off-road vehicle use.

Unit 4: Lower Ohoopee River, Tattnall County

Unit 4 includes the lower 14.4 km (9 mi) of the Ohoopee River, from 2.2 km (1.3 mi) upstream of Tattnall County Road 191, downstream to the confluence of the Ohoopee and the Altamaha River in Tattnall County, Georgia.

The Altamaha spinymussel historically occupied this stretch of the Ohoopee River but has not been found here since the mid-1990s (Stringfellow and Gagnon 2001, pp. 1–2) and is considered extirpated. Historic collections were made from seven sites (Keferl 1981, p. 14). Keferl (1981, p. 15) considered the Ohoopee to contain excellent habitat that would serve as a refuge for declining mussel populations. This stretch of the Ohoopee River contains PCEs 1, 2, and 4 for the Altamaha spinymussel, and continues to support four species commonly associated with the presence of the Altamaha spinymussel: *Elliptio dariensis* (75 percent of sites with *E. spinosa*), *E. hopetonensis* (93 percent), *E. shepardiana* (80 percent), and *Lampsilis dolabraeformis* (90 percent). *Lampsilis splendida* was found at 72 percent of sites (Wisniewski 2009, pers. comm.). The Ohoopee does not meet state water quality standards for mercury, however, EPA will begin revising needed load reductions in 2011 (EPA 2002b, p. 2).

Critical habitat units 1, 2, and 3 are contiguous, making them very vulnerable to a catastrophic event that could eliminate all known occupied habitat for the Altamaha spinymussel. Therefore, we believe that the stream segment within this unit is essential to the conservation of the species because reestablishing the Altamaha spinymussel on a separate tributary such as the Ohoopee River would significantly reduce the impact of stochastic threats to the species' survival.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that actions they fund, authorize, or carry out are not likely to destroy or adversely modify critical habitat. Decisions by the courts of appeals for the Fifth and Ninth Circuits Courts of Appeals have invalidated our definition of ''destruction or adverse modification'' (50 CFR 402.02) (see *Gifford Pinchot Task Force* v. *U.S. Fish and Wildlife Service,* 378 F.3d 1059 (9th Cir. 2004) and *Sierra Club* v. *U.S. Fish and Wildlife Service et al.,* 245 F.3d 434, 442F (5th Cir. 2001)), and we do not rely on this regulatory definition when analyzing whether an action is likely to destroy or adversely modify critical habitat. Under the statutory provisions of the Act, we determine destruction or adverse modification on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would remain functional (or retain those physical or biological features that relate to the ability of the

area to periodically support the species) to serve its intended conservation role for the species.

If a species is listed or critical habitat is designated, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. As a result of this consultation, we document compliance with the requirements of section 7(a)(2) through our issuance of:

(1) A concurrence letter for Federal actions that may affect, but are not likely to adversely affect, listed species or critical habitat; or

(2) A biological opinion for Federal actions that may affect, and are likely to adversely affect, listed species or critical habitat.

When we issue a biological opinion concluding that a project is likely to jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat, we also provide reasonable and prudent alternatives to the project, if any are identifiable. We define ''reasonable and prudent alternatives'' at 50 CFR 402.02 as alternative actions identified during consultation that:

- Can be implemented in a manner consistent with the intended purpose of the action,
- Can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction,
- Are economically and technologically feasible, and
- Would, in the Director's opinion, avoid jeopardizing the continued existence of the listed species or destroying or adversely modifying critical habitat.

Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where we have listed a new species or subsequently designated critical habitat that may be affected and the Federal agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law). Consequently, Federal agencies may sometimes need to request reinitiation of consultation with us on actions for which formal consultation has been completed, if those actions with discretionary involvement or control may affect subsequently listed species or designated critical habitat.

Federal activities that may affect Altamaha spinymussel or its designated critical habitat require section 7 consultation under the Act. Activities on State, Tribal, local, or private lands requiring a Federal permit (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from us under section 10 of the Act) or involving some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency) are subject to the section 7 consultation process. Federal actions not affecting listed species or critical habitat, and actions on State, Tribal, local, or private lands that are not federally funded, authorized, or permitted, do not require section 7 consultations.

Application of the Jeopardy and Adverse Modification Standard

Jeopardy Standard

Prior to and following listing and designation of critical habitat, the Service applies an analytical framework for jeopardy analyses that relies heavily on the importance of the core area population (middle mainstem Altamaha) to the survival and recovery of the species. The section 7(a)(2) analysis is focused not only on these populations but also on the habitat conditions necessary to support them.

The jeopardy analysis usually expresses the survival and recovery needs of the species in a qualitative fashion without making distinctions between what is necessary for survival and what is necessary for recovery. Generally, if a proposed Federal action is incompatible with the viability of the affected core area population, inclusive of associated habitat conditions, a jeopardy finding is considered to be warranted, because of the relationship of the core area population to the survival and recovery of the species as a whole.

Adverse Modification Standard

The key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species, or would retain its current ability for the PCEs to be functionally established. Activities that may destroy or adversely modify critical habitat are those that alter the physical or biological features to an extent that appreciably reduces the conservation value of critical habitat for the Altamaha spinymussel.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal action that may destroy or adversely modify such habitat, or that may be affected by such designation.

Activities that, when carried out, funded, or authorized by a Federal agency, may affect critical habitat and, therefore, should result in consultation for the Altamaha spinymussel include, but are not limited to:

(1) Actions that would alter the geomorphology of their stream and river habitats. Such activities could include, but are not limited to, instream excavation or dredging, impoundment, channelization, and discharge of fill materials. These activities could cause aggradation or degradation of the channel bed elevation or significant bank erosion, result in entrainment or burial of these mollusks, and cause other direct or cumulative adverse effects to these species and their life cycles.

(2) Actions that would significantly alter the existing flow regime. Such activities could include, but are not limited to, impoundment, water diversion, water withdrawal, and hydropower generation. These activities could eliminate or reduce the habitat necessary for growth and reproduction of these mollusks.

(3) Actions that would significantly alter water chemistry or water quality (for example, temperature, pH, contaminants, and excess nutrients). Such activities could include, but are not limited to, hydropower discharges, or the release of chemicals, biological pollutants, or heated effluents into surface water or connected groundwater at a point source or by dispersed release (nonpoint source). These activities could alter water conditions that are beyond the tolerances of these mollusks and result in direct or cumulative adverse effects to the species and their life cycles.

(4) Actions that would significantly alter stream bed material composition and quality by increasing sediment deposition or filamentous algal growth. Such activities could include, but are not limited to, construction projects, livestock grazing, timber harvest, off-road vehicle use, and other watershed

and floodplain disturbances that release sediments or nutrients into the water. These activities could eliminate or reduce habitats necessary for the growth and reproduction of these mollusks by causing excessive sedimentation and burial of the species or their habitats, or nutrient enrichment leading to excessive filamentous algal growth. Excessive filamentous algal growth can cause reduced night-time dissolved oxygen levels through respiration and prevent mussel glochidia from settling into stream sediments.

Exemptions and Exclusion

Application of Section 4(a)(3) of the Act

The Sikes Act Improvement Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete an integrated natural resources management plan (INRMP) by November 17, 2001. An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the base. Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108–136) amended the Act to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) now provides: ''The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.''

There are no Department of Defense lands within the critical habitat designation for this species. Therefore, there are no specific lands that meet the criteria for exemption from the designation of critical habitat under section 4(a)(3) of the Act.

Application of Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that the Secretary must designate or revise critical habitat on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such area as critical habitat will result in the extinction of the species. In making that determination, the legislative history is clear that the Secretary has broad discretion regarding which factors to use and how much weight to give to any factor.

Under section 4(b)(2) of the Act, we must consider the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. For example, we consider whether there are lands owned or managed by the Department of Defense (DOD) where a national security impact might exist. We also consider whether landowners have developed any conservation plans for the area, or whether there are conservation partnerships that would be encouraged by designation of, or exclusion of lands from, critical habitat. In addition, we look at any tribal issues, and consider the government-to-government relationship of the United States with tribal entities. We also consider the economic impacts, environmental impacts, and any social impacts that might occur because of the designation.

Under section 4(b)(2) of the Act, in considering whether to exclude a particular area from the designation, we must identify the benefits of including the area in the designation, identify the benefits of excluding the area from the designation, and determine whether the benefits of exclusion outweigh the benefits of inclusion. If, based on this analysis, we determine that the benefits of exclusion outweigh the benefits of inclusion, we can exclude the area only if such exclusion would not result in the extinction of the species.

In the proposed rule, we requested information on why any area should or should not be designated as critical habitat as provided by section 4 of the Act (16 U.S.C. 1531 *et seq.*), including whether the benefit of designation would outweigh threats to the species caused by designation such that the designation of critical habitat is prudent. In this instance, we have examined all comments submitted with respect to providing adequate protection and management for the Altamaha spinymussel. None of the comments provided sufficient information to satisfy the criteria necessary for exclusion from final critical habitat.

In preparing this final rule, we determined that the lands within the designation of critical habitat for the Altamaha spinymussel are not owned or managed by the Department of Defense, and there are no other known national security impacts expected from the designation; there are currently no conservation partnerships for the spinymussel; and the designation does not include any tribal lands or trust resources. Since the critical habitat designation includes only aquatic areas that are generally held in public trust, involves no Tribal lands, and includes no areas presently under special management or protection provided by a legally operative plan or agreement for the conservation of this mussel, we believe that, other than economics, there are no other relevant impacts to evaluate under section 4(b)(2).

Economic Analysis (EA)

We prepared an economic analysis that is consistent with the ruling of the United States Court of Appeals for the Tenth Circuit in *New Mexico Cattle Growers Ass'n* v. *United States Fish and Wildlife Service,* 248 F.3d 1277 (2001), and that was available for public review and comment during the comment period for the proposed rule. The final economic analysis is available on the Internet at *http://www.regulations.gov.* The final EA (Industrial Economics 2011) considers the potential economic effects of actions relating to the conservation of the Altamaha spinymussel, including costs associated with sections 4, 7, and 10 of the Act, and including those attributable to designating critical habitat. It further considers the economic effects of protective measures taken as a result of other Federal, State, and local laws that aid habitat conservation for the Altamaha spinymussel in essential habitat areas. The EA considers both economic efficiency and distributional effects. In the case of habitat conservation, efficiency effects generally reflect the ''opportunity costs'' associated with the commitment of resources to comply with habitat protection measures (for example, lost economic opportunities associated with restrictions on land use).

The final EA states that incremental impacts stem primarily from administrative costs of section 7 consultations, and are relatively small. Present value incremental impacts of spinymussel conservation are estimated

to be $37,100 total over the analysis timeframe (2011 to 2040), applying a seven percent discount rate. All of these impacts stem from the administrative cost of addressing adverse modification of critical habitat during section 7 consultations. Because the region is primarily rural, the Service and contacted stakeholders do not anticipate that designation of critical habitat for the spinymussel will have substantial impact on economic activity. Accordingly, a small number of section 7 consultations are expected during the analytic timeframe, most of which will occur in habitat currently occupied by the spinymussel.

The majority of the incremental impacts are related to electric power generation and transmission. Over the 30-year analytic timeframe, four hydropower plants in the region will renew their operating licenses and will, therefore, conduct section 7 consultations with the Service. In addition, this analysis assumes that the Edwin I. Hatch nuclear power plant will conduct informal section 7 consultations with the Service for periodic dredging operations, and regional utilities will conduct on average one consultation per year for construction and repair of electric power lines. In comparison, the analysis projects that relatively few section 7 consultations will be required for transportation and recreation activities.

Based on the best available information, including the prepared economic analysis, we believe that all of the four units are essential for the conservation of the spinymussel. Critical habitat aids in the conservation specifically by protecting the primary constituent elements on which the spinymussel depends. It can also result in benefits by providing information to the public, local and State governments, Federal agencies, and other entities engaged in activities or long-range planning in areas essential to the conservation of the spinymussel. Conservation of the Altamaha spinymussel and essential features of its habitats will require habitat management, protection, and restoration, which will be facilitated by knowledge of habitat locations and the physical or biological features of those habitats. We conclude that these benefits of inclusion outweigh the above-described costs of designation for all areas we are designating as critical habitat in this rule.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies; groups; and individuals. The Act provides for possible land acquisition and cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Federal activities that may affect the Altamaha spinymussel include, but are not limited to, the carrying out or the issuance of permits for reservoir construction, stream alterations, discharges, wastewater facility development, water withdrawal projects, pesticide registration, mining, and road and bridge construction. It has been the experience of the Service, however, that nearly all section 7 consultations have been resolved so that species have been protected and the project objectives have been met.

Listing the Altamaha spinymussel initiates the development and implementation of a rangewide recovery plan for the species. This plan will bring together Federal, State, and local agency efforts for the conservation of this species. Recovery plans establish a framework for agencies to coordinate their recovery efforts. The plans set recovery priorities and estimate the costs of the tasks necessary to accomplish the priorities. They also describe the site-specific actions necessary to achieve conservation and survival of each species.

Listing also will require us to review any actions on Federal lands and activities under Federal jurisdiction that may affect the Altamaha spinymussel; allow State plans to be developed under section 6 of the Act; encourage scientific investigations of efforts to enhance the propagation or survival of the species under section 10(a)(1)(A) of the Act; and promote habitat conservation plans on non-Federal lands under section 10(a)(1)(B) of the Act.

The Act and its implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt any of these), import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to possess, sell, deliver, carry, transport, or ship any wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered wildlife species under certain circumstances. Regulations governing permits are set forth at 50 CFR 17.22 and 17.23. Such permits are available for scientific purposes, to enhance the propagation or survival of the species and for incidental take in connection with otherwise lawful activities.

Under the Interagency Cooperative Policy for Endangered Species Act Section 9 Prohibitions, published in the **Federal Register** on July 1, 1994 (59 FR 34272), we identify to the maximum extent practicable those activities that would or would not constitute a violation of section 9 of the Act if the Altamaha spinymussel is listed. The intent of this policy is to increase public awareness as to the effects of this listing on future and ongoing activities within a species' range. We believe, based on the best available information that the following actions will not result in a violation of the provisions of section 9 of the Act, provided these actions are carried out in accordance with existing regulations and permit requirements:

(1) Possession, delivery, or movement, including interstate transport that does not involve commercial activity, of specimens of this species that were legally acquired prior to the addition of the Altamaha spinymussel to the Federal List of Endangered or Threatened Wildlife;

(2) Development and construction activities designed and implemented under State and local water quality regulations and implemented using

approved best management practices; and

(3) Any actions that may affect the Altamaha spinymussel that are authorized, funded, or carried out by a Federal agency (such as bridge and highway construction, pipeline construction, hydropower licensing), when the action is conducted in accordance with the consultation requirements for listed species under section 7 of the Act.

Potential activities that we believe will likely be considered a violation of section 9 of the Act if this species becomes listed, include, but are not limited to, the following:

(1) Unauthorized possession, collecting, trapping, capturing, harming, killing, harassing, sale, delivery, or movement, including interstate and foreign commerce, or attempting any of these actions, with the Altamaha spinymussel;

(2) Unlawful destruction or alteration of their habitats (such as unpermitted instream dredging, impoundment, channelization, or discharge of fill material) that impairs essential behaviors, such as breeding, feeding, or sheltering, or results in killing or injuring the Altamaha spinymussel;

(3) Discharge or water withdrawal permits that results in harm or death to any individuals of this species or that results in degradation of its occupied habitat to an extent that essential behaviors such as breeding, feeding, and sheltering are impaired; and

(4) Unauthorized discharges or dumping of toxic chemicals or other pollutants into waters supporting the Altamaha spinymussel that kills or injures or otherwise impairs essential life-sustaining requirements, such as reproduction, food, or shelter.

Other activities not identified above will be reviewed on a case-by-case basis to determine if a violation of section 9 of the Act may be likely to result from such activity. The Service does not consider the description of future and ongoing activities provided above to be exhaustive; we provide them simply as information to the public.

If you have questions regarding whether specific activities will likely violate the provisions of section 9 of the Act, contact the Georgia Ecological Services Office (see **ADDRESSES**). Requests for copies of regulations regarding listed species and inquiries about prohibitions and permits should be addressed to the U.S. Fish and Wildlife Service, Ecological Services Division, 1875 Century Boulevard, Atlanta, GA 30345 (phone 404–679–7313; fax 404–679–7081).

Required Determinations

Regulatory Planning and Review—Executive Order 12866

The Office of Management and Budget (OMB) has determined that this rule is not significant under Executive Order 12866 (E.O. 12866). OMB bases its determination upon the following four criteria:

(a) Whether the rule will have an annual effect of $100 million or more on the economy or adversely affect an economic sector, productivity, jobs, the environment, or other units of the government.

(b) Whether the rule will create inconsistencies with other Federal agencies' actions.

(c) Whether the rule will materially affect entitlements, grants, user fees, loan programs, or the rights and obligations of their recipients.

(d) Whether the rule raises novel legal or policy issues.

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq.,* as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

Small entities include small organizations, such as independent nonprofit organizations; small governmental jurisdictions, including school boards and city and town governments that serve fewer than 50,000 residents; as well as small businesses. Small businesses include manufacturing and mining concerns with fewer than 500 employees, wholesale trade entities with fewer than 100 employees, retail and service businesses with less than $5 million in annual sales, general and heavy construction businesses with less than $27.5 million in annual business, special trade contractors doing less than $11.5 million in annual business, and agricultural businesses with annual sales less than $750,000. To determine whether potential economic impacts to these small entities are significant, we consider the types of activities that might trigger regulatory impacts under this rule, as well as the types of project modifications that may result. In general, the term ''significant economic impact'' is meant to apply to a typical small business firm's business operations.

To determine if the rule could significantly affect a substantial number of small entities, we consider the number of small entities affected within particular types of economic activities (*e.g.,* housing development, grazing, oil and gas production, timber harvesting). We apply the ''substantial number'' test individually to each industry to determine if certification is appropriate. However, the SBREFA does not explicitly define ''substantial number'' or ''significant economic impact.'' Consequently, to assess whether a ''substantial number'' of small entities is affected by this designation, this analysis considers the relative number of small entities likely to be impacted in an area. In some circumstances, especially with critical habitat designations of limited extent, we may aggregate across all industries and consider whether the total number of small entities affected is substantial. In estimating the number of small entities potentially affected, we also consider whether their activities have any Federal involvement.

Designation of critical habitat only affects activities authorized, funded, or carried out by Federal agencies. Some kinds of activities are unlikely to have any Federal involvement and so will not be affected by critical habitat designation. In areas where a listed species already occurs; *e.g.,* the short-nosed sturgeon, Federal agencies already are required to consult with the National Marine Fisheries Service under section 7 of the Act on activities they authorize, fund, or carry out that may affect the sturgeon. Federal agencies also must consult with us if their activities may affect critical habitat. Designation of critical habitat, therefore, could result in an additional economic impact on small entities due to the requirement to reinitiate consultation for ongoing Federal activities (see *Application of the ''Adverse Modification'' Standard* section).

In our final economic analysis of the proposed critical habitat designation, we evaluated the potential economic effects on small business entities resulting from conservation actions

related to the listing of the Altamaha spinymussel and the proposed designation of critical habitat. The analysis is based on the estimated impacts associated with the proposed rulemaking as described in chapters 3 through 5 and appendix A of the analysis and evaluates the potential for economic impacts related to: (1) Power generation and transmission; (2) transportation; (3) other activities (agriculture, recreation and forestry); and (4) impacts to small entities and the energy industry.

According to the final EA, impacts on small entities due to this rule are expected to be modest because the incremental costs of the rule are estimated to be administrative in nature. The final EA evaluated the incremental impacts of the critical habitat designation for the Altamaha spinymussel over the next 30 years, which was determined to be the appropriate period for analysis because limited planning information is available for most activities to forecast activity levels for projects beyond a 30-year timeframe. Applying a seven percent discount rate, electric power generation and transmission is estimated to incur the largest impact at $26,700 over the next 30 years (2011–2040), overall incremental impacts associated with the designation are estimated at $37,100 over the same time period.

In summary, we considered whether this designation will result in a significant economic effect on a substantial number of small entities. Based on the above reasoning and currently available information, we concluded that this rule will not result in a significant economic impact on a substantial number of small entities. Therefore, we are certifying that the designation of critical habitat for the spinymussel will not have a significant economic impact on a substantial number of small entities, and a regulatory flexibility analysis is not required.

Energy Supply, Distribution, or Use—Executive Order 13211

Pursuant to Executive Order 13211, ''Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use,'' issued May 18, 2001, Federal agencies must prepare and submit a ''Statement of Energy Effects'' for all ''significant energy actions.'' The purpose of this requirement is to ensure that all Federal agencies ''appropriately weigh and consider the effects of the Federal Government's regulations on the supply, distribution, and use of energy.''

The Office of Management and Budget (OMB) has provided guidance for implementing E.O. 13211 that outlines nine outcomes that may constitute ''a significant adverse effect'' when compared without the regulatory action under consideration. The economic analysis finds that incremental impacts of the designation of critical habitat are the subject of the analysis under Executive Order 13211. The potential effects of this designation on power production were considered in the economic analysis. As described in Chapter 4, estimated incremental impacts to the energy industry as a result of critical habitat designation for the spinymussel are minor and administrative in nature. Therefore, the rule is not expected to affect the production, distribution, or use of energy, and none of the above criteria are relevant to this analysis.

Unfunded Mandates Reform Act

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*), the Service makes the following findings:

(a) This rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, tribal governments, or the private sector and includes both ''Federal intergovernmental mandates'' and ''Federal private sector mandates.'' These terms are defined in 2 U.S.C. 658(5)–(7). ''Federal intergovernmental mandate'' includes a regulation that ''would impose an enforceable duty upon State, local, or tribal governments'' with two exceptions. It excludes ''a condition of Federal assistance.'' It also excludes ''a duty arising from participation in a voluntary Federal program,'' unless the regulation ''relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority,'' if the provision would ''increase the stringency of conditions of assistance'' or ''place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding,'' and the State, local, or tribal governments ''lack authority'' to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; AFDC work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector, except (i) A condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.''

The designation of critical habitat does not impose a legally binding duty on non-Federal government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions do not jeopardize the continued existence of the species, or destroy or adversely modify critical habitat under section 7. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply; nor would listing these species or designating critical habitat shift the costs of the large entitlement programs listed above on to State governments.

(b) We do not believe that this rule will significantly or uniquely affect small governments because the Altamaha spinymussel only occurs in navigable waters in which the river bottom is owned by the State of Georgia. However, the adjacent upland properties are owned by private entities, the State, or Federal partners (see Table 2). As such, a Small Government Agency Plan is not required.

Takings

In accordance with Executive Order 12630 (''Government Actions and Interference with Constitutionally Protected Private Property Rights''), we have analyzed the potential takings implications of designating critical habitat for the Altamaha spinymussel in a takings implications assessment. The takings implications assessment concludes that this designation of critical habitat for the Altamaha spinymussel does not pose significant takings implications.

Federalism

In accordance with Executive Order 13132 (Federalism), the rule does not have significant Federalism effects. A Federalism assessment is not required. In keeping with Department of the Interior and Department of Commerce

policy, we requested information from, and coordinated development of this critical habitat designation with appropriate State resource agencies in Georgia. The critical habitat designation may have some benefit to this government in that the areas that contain the features essential to the conservation of the species are more clearly defined, and the PCEs of the habitat necessary to the conservation of the species are specifically identified. While making this definition and identification does not alter where and what federally sponsored activities may occur, it may assist these local governments in long-range planning (rather than waiting for case-by-case section 7 consultations to occur).

Where State and local governments require approval or authorization from a Federal agency for actions that may affect critical habitat, consultation under section 7(a)(2) would be required. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency.

Civil Justice Reform

In accordance with E.O. 12988 (Civil Justice Reform), the Office of the Solicitor has determined that the rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the Order. We are designating critical habitat in accordance with the provisions of the Act. This final rule uses standard property descriptions and identifies the PCEs within the designated areas to assist the public in understanding the habitat needs of the Altamaha spinymussel.

Paperwork Reduction Act of 1995

This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act (NEPA)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), need not be prepared in connection with regulations adopted under section 4(a)(1) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

Also, it is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses as defined by NEPA in connection with designating critical habitat under section 4(a)(3) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County* v *Babbitt,* 48 F. 3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)).

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994, ''Government-to-Government Relations with Native American Tribal Governments'' (59 FR 22951), Executive Order 13175, and the Department of Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 ''American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act'', we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes.

We have determined that there are no tribal lands occupied at the time of listing that contain the features essential for the conservation, and no tribal lands that are unoccupied areas that are essential for the conservation, of the Altamaha spinymussel. Therefore, we have not designated critical habitat for the Altamaha spinymussel on Tribal lands.

References Cited

A complete list of all references cited in this rulemaking is available upon request from the Field Supervisor, Georgia Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**) and at Docket No. FWS–R4–ES–2008–0107.

Author(s)

The primary author of this package is the staff of the Georgia Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

Accordingly, we hereby amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500; unless otherwise noted.

■ 2. Amend § 17.11(h) by adding ''Spinymussel, Altamaha'' in alphabetical order under CLAMS to the List of Endangered and Threatened Wildlife, to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*		*
CLAMS							
*	*	*	*	*	*		*
Spinymussel, Altamaha.	*Elliptio spinosa*	U.S.A. (GA)	Entire	E	796	17.95(f)	NA
*	*	*	*	*	*		*

■ 3. Amend § 17.95(f) by adding an entry for ''Altamaha spinymussel (*Elliptio spinosa*)'' after the entry for ''Georgia Pigtoe (*Pleurobema hanleyianum*)'' to read as set forth below:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(f) *Clams and Snails.*

* * * * *

Altamaha spinymussel (*Elliptio spinosa*).

(1) Critical habitat units are depicted for Appling, Ben Hill, Coffee, Jeff Davis, Long, Montgomery, Tattnall, Telfair, Toombs, Wayne, and Wheeler Counties, Georgia, on the maps below.

(2) The primary constituent elements (PCEs) of critical habitat for the Altamaha spinymussel are the habitat components that provide:

(i) Geomorphically stable river channels and banks (channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with stable sandbar, slough, and mid-channel-island habitats of coarse-to-fine sand substrates with low to moderate amounts of fine sediment and attached filamentous algae.

(ii) A hydrologic flow regime (the magnitude, frequency, duration, and seasonality of discharge over time) necessary to maintain benthic habitats where the species are found and to maintain connectivity of rivers with the floodplain, allowing the exchange of nutrients and sediment for sand bar maintenance, food availability, and spawning habitat for native fishes.

(iii) Water quality necessary for normal behavior, growth, and viability of all life stages, including specifically temperature (less than 32.6 °C (90.68 °) with less than 2 °C (3.6 °F) daily fluctuation), pH (6.1 to 7.7), oxygen content (daily average DO concentration of 5.0 mg/l and a minimum of 4.0 mg/l), an ammonia level not exceeding 1.5 mg N/L, 0.22 mg N/L (normalized to pH 8 and 25 °C (77 °F)), and other chemical characteristics.

(iv) The presence of fish hosts (currently unknown) necessary for recruitment of the Altamaha spinymussel. The continued occurrence of diverse native fish assemblages currently occurring in the basin will serve as an indication of host fish presence until appropriate host fishes can be identified for the Altamaha spinymussel.

(3) Critical habitat does not include manmade structures existing on the effective date of this rule and not containing one or more of the PCEs, such as buildings, bridges, aqueducts, airports, and roads, and the land on which such structures are located.

(4) *Critical habitat unit maps.* Maps were developed from USGS 7.5 minute quadrangles, and critical habitat unit upstream and downstream limits were then identified by longitude and latitude using decimal degrees.

(5) **Note:** Index map of critical habitat units for the Altamaha spinymussel follows:

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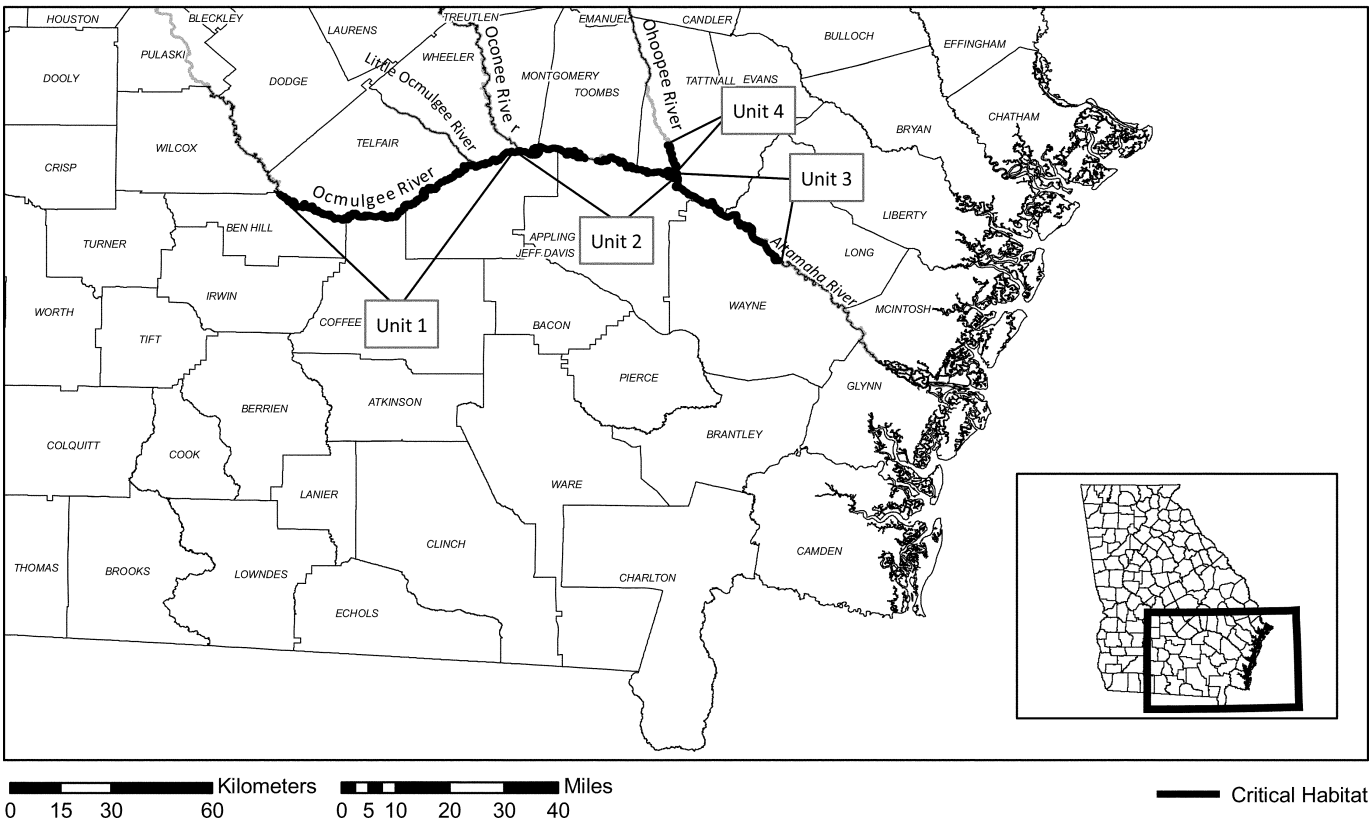
Altamaha Spinymussel (*Elliptio spinosa*) Critical Habitat in Georgia

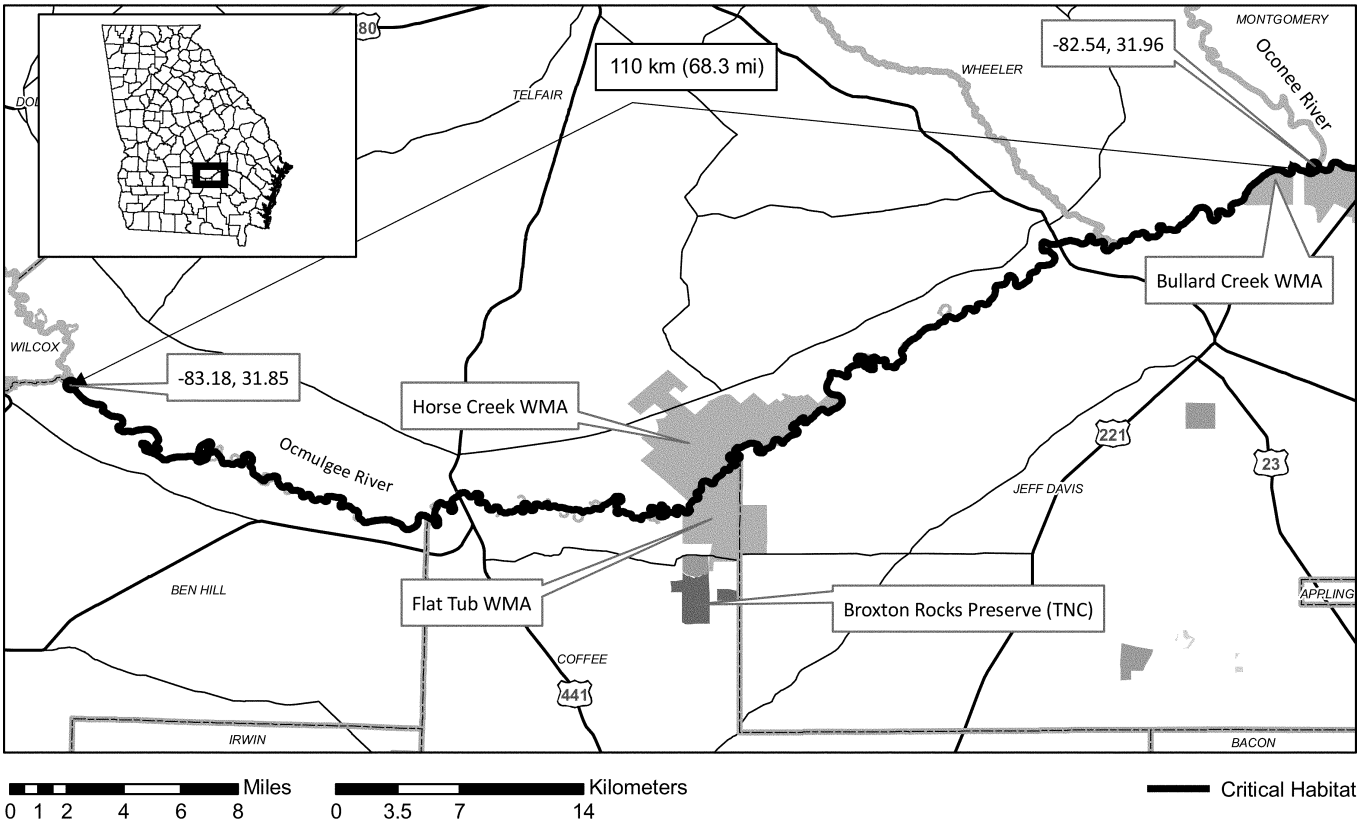


(6) *Unit 1:* Ocmulgee River, Ben Hill, Telfair, Coffee, and Jeff Davis Counties, Georgia.

(i) Unit 1 includes the channel of the Ocmulgee River from the confluence of House Creek with the Ocmulgee at Red Bluff Landing (longitude −83.18, latitude 31.85), Ben Hill and Telfair Counties, Georgia, downstream to Altamaha River (longitude −82.54, latitude 31.96), at the confluence of the Oconee and Ocmulgee Rivers, Jeff Davis and Telfair Counties, Georgia.

(ii) **Note:** Map of Unit 1 (Ocmulgee River) follows:

Unit 1 of Altamaha Spinymussel (*Elliptio spinosa*) Critical Habitat in Georgia

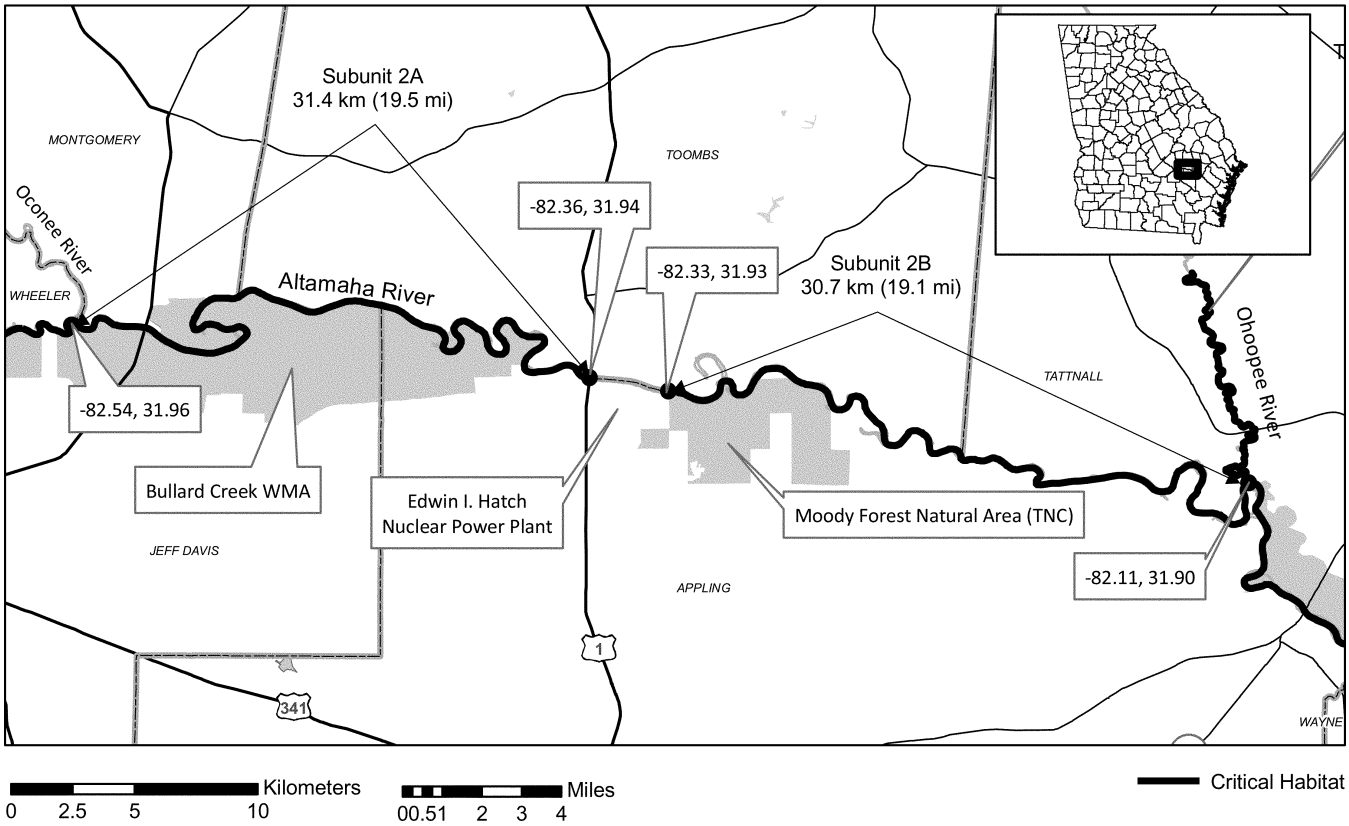


(7) *Unit 2:* Upper Altamaha River, Wheeler, Toombs, Montgomery, Jeff Davis, Appling, and Tattnall Counties, Georgia.

(i) Unit 2 includes the channel of the Altamaha River from the confluence of the Ocmulgee and Oconee Rivers (longitude −82.54, latitude 31.96), Wheeler and Jeff Davis Counties, Georgia, downstream to the US 1 crossing (longitude −82.36, latitude 31.94), and from the western edge of Moody Forest (longitude −82.33, latitude 31.93) downstream to the confluence of the Altamaha and Ohoopee Rivers (longitude −82.11, latitude 31.90), Appling and Tattnall Counties, Georgia.

(ii) **Note:** Map of Unit 2 (Upper Altamaha River) follows:

Unit 2 of Altamaha Spinymussel (*Elliptio spinosa*) Critical Habitat in Georgia

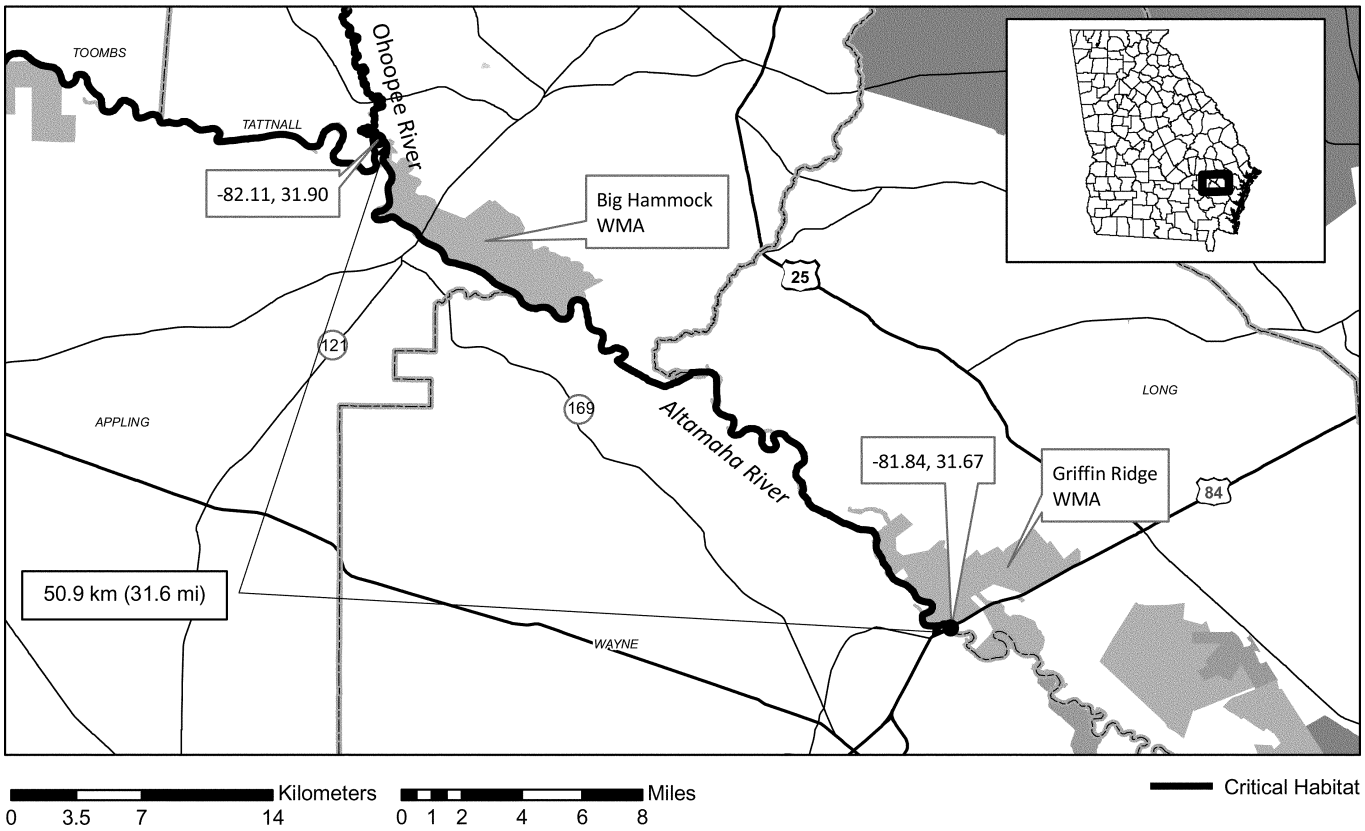


(8) *Unit 3:* Middle Altamaha River, Tattnall, Appling, Wayne, and Long Counties, Georgia.

(i) Unit 3 includes the channel of Altamaha River, extending from the confluence with the Ohoopee (longitude −82.11, latitude 31.90), Tattnall and Appling Counties, Georgia, downstream to U.S. Route 301 (longitude −81.84, latitude 31.67), Wayne and Long Counties, Georgia.

(ii) **Note:** Map of Unit 3 (Middle Altamaha River) follows:

Unit 3 of Altamaha Spinymussel (*Elliptio spinosa*) Critical Habitat in Georgia

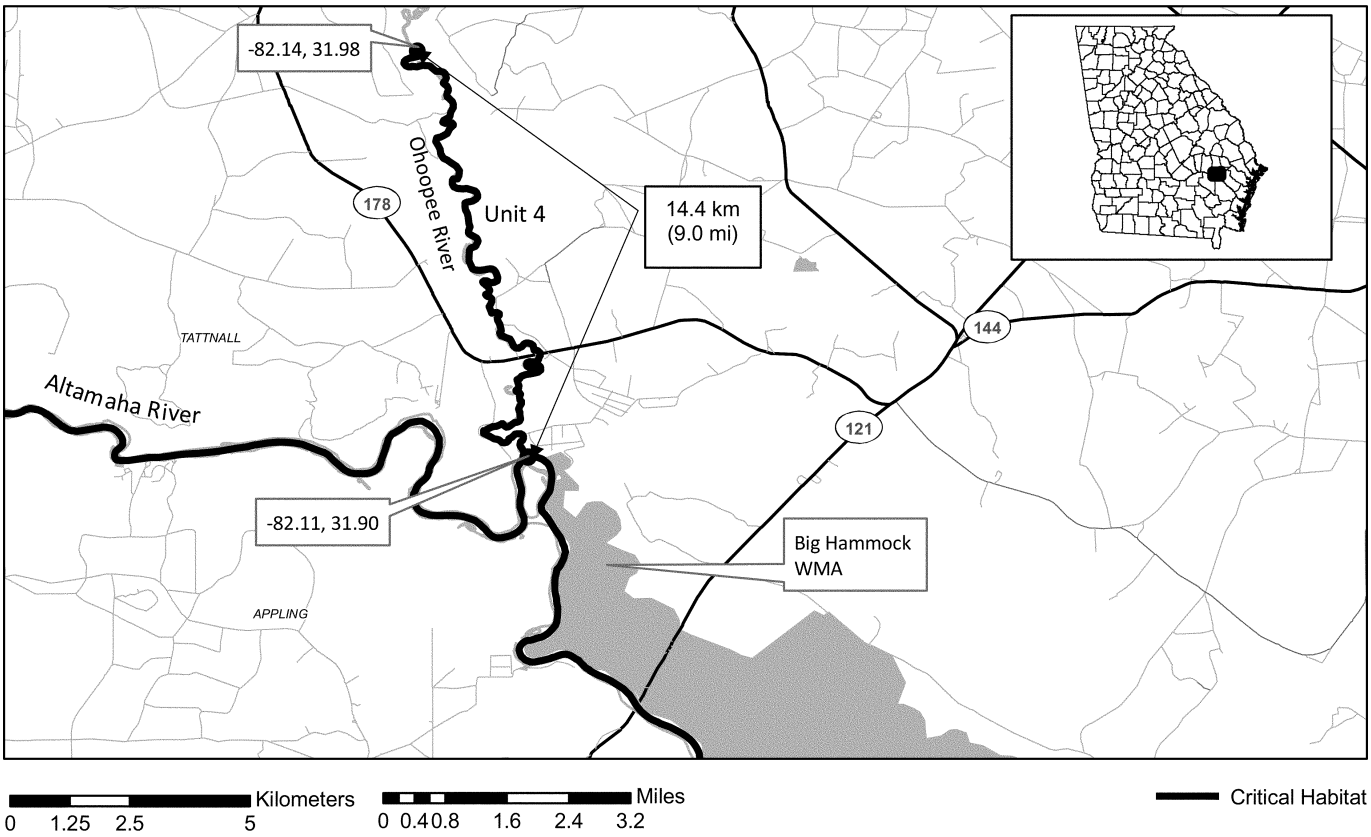


(9) *Unit 4:* Lower Ohoopee River, Tattnall County, Georgia.

(i) Unit 4 includes the channel of the Ohoopee River, starting 2.2 km (1.3 mi) upstream of Tattnall County Road 191 (longitude −82.14, latitude 31.98), Tattnall County, Georgia, downstream to the confluence of the Ohoopee River with the Altamaha River (longitude −82.11, latitude 31.90), Tattnall County, Georgia.

(ii) **Note:** Map of Unit 4 (Lower Ohoopee River) follows:

Unit 4 of Altamaha Spinymussel (*Elliptio spinosa*) Critical Habitat in Georgia



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Dated: September 23, 2011.

Eileen Sobeck,

Acting Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. 2011–25539 Filed 10–7–11; 8:45 am]

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