

The amendments in today's final rule do not make those effects any more stringent, and in some respects, they make it easier for a manufacturer to comply with them. Specifically, by allowing the use of a single driveline sensor to control rear wheel speeds and allowing wheels on tag axles to lock during testing, vehicle manufacturers will have more flexibility to comply with the requirements of this rule and, as a result, costs could be reduced.

B. Regulatory Flexibility Act

NHTSA has also considered the effects of both this final rule and the original final rule under the Regulatory Flexibility Act. I hereby certify that it will not have a significant economic impact on a substantial number of small entities. Accordingly, the agency has not prepared a final regulatory flexibility analysis.

NHTSA concluded that the March 1995 final rule had no significant impact on a substantial number of small entities. Thus, today's final rule, which could potentially reduce costs associated with the March 1995 final rule, will not have a significant economic impact on a substantial number of small entities.

C. National Environmental Policy Act

NHTSA has analyzed this rulemaking action for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action will not have any significant impact on the quality of the human environment.

D. Executive Order 12612 (Federalism)

NHTSA has analyzed this action under the principles and criteria in Executive Order 12612. The agency has determined that this notice does not have sufficient Federalism implications to warrant the preparation of a Federalism Assessment. No State laws will be affected.

E. Civil Justice Reform

This final rule does not have any retroactive effect. Under 49 U.S.C. 30103, whenever a Federal motor vehicle safety standard is in effect, a State may not adopt or maintain a safety standard applicable to the same aspect of performance which is not identical to the Federal standard, except to the extent that the State requirement imposes a higher level of performance and applies only to vehicles procured for the State's use. 49 U.S.C. 30161 sets forth a procedure for judicial review of final rules establishing, amending or revoking Federal motor vehicle safety standards. That section does not require

submission of a petition for reconsideration or other administrative proceedings before parties may file suit in court.

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles, Rubber and rubber products, Tires.

In consideration of the foregoing, the agency is amending Standard No. 105, *Hydraulic Brake Systems* in Title 49 of the Code of Federal Regulations at Part 571 as follows:

PART 571—[AMENDED]

1. The authority citation for Part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30166, delegation of authority at 49 CFR 1.50. CFR 1.50.

2. Section 571.105 is amended by adding the definitions of "motor home" and "tandem axle" in S4 and by revising S5.5.1, to read as follows:

§ 571.105 Standard No. 105; Hydraulic and electric brake systems.

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S4. Definitions.

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Motor home means a motor vehicle with motive power that is designed to provide temporary residential accommodations, as evidenced by the presence of at least four of the following facilities: cooking; refrigeration or ice box; self-contained toilet; heating and/or air conditioning; a potable water supply system including a faucet and a sink; and a separate 110–125 volt electric power supply and/or an LP gas supply.

* * * * *

Tandem axle means a group of two or more axles placed in close arrangement one behind the other with the center lines of adjacent axles not more than 72 inches apart.

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S5.5.1 Each vehicle with a GVWR greater than 10,000 pounds, except for any vehicle with a speed attainable in 2 miles of not more than 33 mph, shall be equipped with an antilock brake system that directly controls the wheels of at least one front axle and the wheels of at least one rear axle of the vehicle. On each vehicle with a GVWR greater than 10,000 pounds but not greater than 19,500 pounds and motor homes with a GVWR greater than 10,000 pounds but not greater than 22,500 pounds manufactured before March 1, 2001, the antilock brake system may also directly control the wheels of the rear drive axle by means of a single sensor in the driveline. Wheels on other axles of the

vehicle may be indirectly controlled by the antilock brake system.

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Issued on: February 23, 1998.

Ricardo Martinez,
Administrator.

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018–AC63

Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Five Freshwater Mussels and Threatened Status for Two Freshwater Mussels From the Eastern Gulf Slope Drainages of Alabama, Florida, and Georgia

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The Fish and Wildlife Service (Service) determines five freshwater mussels, the fat threeridge (*Amblema neisleri*), shinyrayed pocketbook (*Lampsilis subangulata*), Gulf moccasinshell (*Medionidus penicillatus*), Ochlockonee moccasinshell (*Medionidus simpsonianus*), and oval pigtoe (*Pleurobema pyriforme*) to be endangered species, and two freshwater mussels, the Chipola slabshell (*Elliptio chipolaensis*) and purple bankclimber (*Elliptoideus sloatianus*) to be threatened species under the Endangered Species Act of 1973, as amended (Act). These mussels are endemic to eastern Gulf Slope streams draining the Apalachicola Region of southeast Alabama, southwest Georgia, and north Florida. Their center of distribution is the Apalachicola-Chattahoochee-Flint (ACF) River basin of southeast Alabama, southwest Georgia, and northwest Florida, and the Ochlockonee River system of southwest Georgia and northwest Florida. They are currently known from restricted portions of from one to four independent river systems. These species inhabit stable sandy and gravelly substrates in medium-sized streams to large rivers, often in areas swept free of silt by the current. The abundance and distribution of the seven mussel species decreased historically from habitat loss associated with reservoir construction, channel construction and maintenance, and

erosion. These habitat changes have resulted in significant extirpations (localized loss of populations), restricted and fragmented distributions, and poor recruitment of young.

DATES: Effective: April 15, 1998.

ADDRESSES: The complete administrative file for this rule is available for inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Jacksonville Field Office, 6620 Southpoint Drive South, Suite 310, Jacksonville, Florida 32216.

FOR FURTHER INFORMATION CONTACT: Dr. Michael M. Bentzien at the above address, or 904/232-2580, ext. 106.

SUPPLEMENTARY INFORMATION:

Background

Introduction

The fat threeridge, shinyrayed pocketbook, Gulf moccasinshell, Ochlockonee moccasinshell, oval pigtoe, Chipola slabshell, and purple bankclimber are freshwater mussels of the family Unionidae found only in eastern Gulf Slope streams draining the Apalachicola Region, defined as streams from the Escambia to the Suwannee river systems, and occurring in southeast Alabama, southwest Georgia, and north Florida (Butler 1989). The Apalachicola Region is known for its high level of endemism, harboring approximately 30 species of endemic (found only in the region) mussels (Butler 1989). The Region drains primarily the Coastal Plain Physiographic Province. Only the headwaters of the Flint and Chattahoochee rivers, in the Apalachicola-Chattahoochee-Flint (ACF) River system, occur above the Fall Line in the Piedmont Physiographic Province in west-central Georgia.

The decline of some of the species included in this rule was evident decades ago. The fat threeridge, oval pigtoe, Chipola slabshell, and purple bankclimber were considered rare, but locally abundant, in the 1950's (Clench and Turner 1956). The Gulf moccasinshell, oval pigtoe, and purple bankclimber were recognized in a list of rare species in 1970 (Athearn 1970), and the fat threeridge was added to the list of regionally rare mussels a year later (Stansbery 1971a).

General Biology

Freshwater mussel adults are filter-feeders, positioning themselves in substrates to facilitate siphoning of the water column for oxygen and food (Kraemer 1979). Their food includes primarily detritus, plankton, and other microorganisms (Fuller 1974).

As a group, freshwater mussels are extremely long-lived, with life spans of up to 130 years for certain species (Neves and Moyer 1988, Bauer 1992). Life spans of these seven species are unknown. Based on the longevity of a congener of the fat threeridge (the threeridge [*Amblema plicata*]; Stansbery 1971b), the longevity of thick-shelled species (Stansbery 1961), and the large size attained by the fat threeridge and purple bankclimber (see "Species Accounts" in this section), the latter two species probably have long lifespans.

Freshwater mussels generally have separate sexes. The age of sexual maturity is variable (Gordon and Layzer 1989), usually requiring from three (Zale and Neves 1982) to nine (Smith 1979) years, and may be sex dependent (Smith 1979). Males expel sperm into the water column, while females draw in the sperm with the in-current water flow (Gordon and Layzer 1989). Spawning appears to be temperature dependent (Zale and Neves 1982, Bruenderman and Neves 1993), but may also be influenced by stream flow (Hove and Neves 1994). Fertilization rates are dependent on spatial aggregation of reproductive adults (Downing *et al.* 1993). Fertilization takes place inside the shell; the fertilized eggs develop into larvae called glochidia. After an incubation period, mature glochidia are expelled into the water column and must come into contact with specific species of fish whose gills and fins they temporarily parasitize (Gordon and Layzer 1989).

The shinyrayed pocketbook utilizes largemouth bass (*Micropterus salmoides*) and spotted bass (*M. punctulatus*) as primary host fishes. The latter species appears to have been introduced into the ACF River system (Lee *et al.* 1980). The Gulf moccasinshell utilizes the brown darter (*Etheostoma edwini*) and blackbanded darter (*E. nigrofasciata*); the sailfin shiner (*Pteronotropis hypselopterus*) serves as the host fish for the oval pigtoe (O'Brien 1996). Glochidia for the purple bankclimber transformed on mosquitofish (*Gambusia holbrooki*) and blackbanded darter, but these species were not considered by O'Brien (1996) to be the primary hosts for this mussel.

Host fishes for the fat threeridge, Ochlockonee moccasinshell, and Chipola slabshell are unknown. The lampsiline Ochlockonee moccasinshell probably uses darters as host fish, as does its congeners, the Alabama moccasinshell (*Medionidus acutissimus*) (W.R. Haag, U.S. Forest Service, pers. comm.), Cumberland moccasinshell (*M. conradicus*) (Zale and Neves 1982), and Gulf moccasinshell

(O'Brien 1996). Several host fish families have been identified for the threeridge, a congener of the fat threeridge, and include eight species of centrarchids (the sunfish family) (Fuller 1974, Hoggarth 1992). Centrarchids have also been determined to be fish hosts for species of *Elliptio* (Fuller 1974, Hoggarth 1992), and may also serve as host for the Chipola slabshell and possibly the purple bankclimber, which, genetically, is very similar to *Elliptio* spp. (M. Mulvey, Savannah River Ecology Laboratory, pers. comm.). Minnows (Cyprinidae) may serve as hosts for the fat threeridge and Chipola slabshell.

The complex life cycle of mussels increases the probability that weak links in their life history will preclude successful reproduction and recruitment (Neves 1993). Egg formation and fertilization are critical phases in the life history; mussels may fail to form eggs (Downing *et al.* 1989), or have incomplete fertilization (Matteson 1948). Fertilization success has been shown to be strongly correlated with spatial aggregation, which either influences the rate of egg formation, improves fertilization rates of individuals, or both (Downing *et al.* 1993).

Status Survey

These seven mussels were considered to be potential candidates for listing in 1989 (see Previous Federal Actions section). The Service requested its former National Fisheries Research Center (now the Florida-Caribbean Science Center of Biological Resources Division of the U.S. Geological Survey (USGS), subsequently referred to as "Center") in Gainesville, Florida, to survey these species in 1991. The Center surveyed for mussels in both the ACF (324 sites) and Ochlockonee (77 sites) river systems from 1991 to 1993. Information gathered during the status survey was summarized by Butler (1993). Three criteria were used to select status survey sampling sites—(1) to obtain a thorough and even coverage of the basins, (2) to survey sites where, based on suitable habitat, there was a maximum chance of finding one or more of the target species; and (3) to resurvey as many of the historical sites as possible. The survey was designed to estimate species distributions and population status, not to determine all existing populations.

Numerous sites were surveyed in every major river in these watersheds. Every major tributary was also sampled, and generally at least one sample was taken on other sizable tributaries in these river systems. A total of 183

mainstem, 189 tributary, and 39 reservoir sites were sampled in the ACF and Ochlockonee River systems. Additional sites were collected in the Santa Fe River system (Suwannee River system; three sites) and in Econfinia Creek (Bay County, Florida; six sites). Highway bridge crossings and boat ramps were often used to provide direct access to sampling sites and to sections of river to be sampled by boat.

The survey technique generally used was hand-picking or grubbing, which involves a methodical search of the substrate for siphons or partially exposed specimens, trails, or other signs. Low-visibility conditions require crawling or lying down on the bottom, and feeling for shells by running fingers through the substrate. SCUBA and/or snorkeling were used at about two-thirds of the study sites, supplemented by hand-picking in shallow water at most sites. Over 95 percent of the collection sites were sampled by four or more people, spending an average of two hours total effort per sampling site. All habitat types at each site were sampled for mussels, but efforts focused on habitats likely to support the target species.

The Center surveyed 150 to 250 meters (m) (492 to 820 feet (ft)) of a stream reach at most sites. A primary goal was to collect at each site until there was a high probability that all species occurring there were found. Small streams were surveyed from bank to bank and were sampled for longer linear distances than large rivers. Shoals with high habitat complexity were surveyed more intensively and over longer distances than slackwater sites with little variation in substrate. Sites where mussels were uncommon or where only a few common species were present were sampled for a shorter time and distance. Information important for establishing baseline mussel population status at each site was recorded either in the field or during laboratory analyses, including stream characteristics (e.g., width, depth, water clarity, substrate), species present, number of live and dead specimens per species, length of each live mussel, reproductive condition of female specimens, and condition of dead shells. Most of these specimens were retained for voucher material, and temporarily stored at the Center in Gainesville, Florida. After studies unrelated to the status survey are conducted, the material will be donated to the mollusk collection of an appropriate museum for curation.

Over 2,300 historical records for mussels in the ACF and Ochlockonee River systems were also gathered from

eight United States museums with significant mussel holdings. For the purposes of the survey, a historical collection was any collection made prior to the status survey (before 1991). Of 300 known historical sites for all mussel species from the ACF and Ochlockonee River systems, 250 are identifiable to a specific locality, and 108 harbored one or more of the seven species. Of the 108 sites with at least one of the species, 100 were in the ACF River system and eight in the Ochlockonee River system. The ACF River system historical sites include the following—Flint River system—39 sites, Chipola River system—31 sites, Chattahoochee River system—20 sites, and Apalachicola River system—10 sites. Additional information on historical mussel populations was gathered from the scientific literature, unpublished technical reports, and field records and notes of various collectors.

Previously unknown sites of occurrence for most of the species were discovered during the status survey in the ACF and Ochlockonee River systems. The Service believes that historic populations of these mussels occupied most or all available habitat, and that habitat for all seven species has declined. The newly discovered sites, therefore, represent previously unsampled sites. This accounts for the purple bankclimber being located at more sites during the status survey than it was known from historically (see "Species Accounts" below in this section). Since mussels are long-lived, these recently discovered populations have probably existed for at least the past century, as only a few generations would have elapsed from that time until the present.

Species Accounts

Fat Threeridge—*Amblema Neisleri* (Lea, 1858)

The fat threeridge is a medium-sized to large, subquadrate, inflated, solid, and heavy shelled mussel that reaches a length of 102 millimeters (mm) (4.0 inches (in)). Older, larger individuals are so inflated that their width approximates their height. The umbos are in the anterior quarter of the shell. The dark brown to black shell is strongly sculptured with seven to eight prominent horizontal parallel ridges. Internally, there are two subequal pseudocardinal teeth in the left valve and typically one large and one small tooth in the right valve. The nacre is bluish white to light purplish and very iridescent. The Service considers *Unio neislerii* Lea, 1858 to be a synonym of *Amblema neislerii*. This taxon was

incorrectly assigned to the genera *Quadrula* and *Crenodonta* by Simpson (1914) and Clench and Turner (1956), respectively. Subsequent investigators (e.g., Turgeon *et al.* 1988) have correctly placed the fat threeridge in the genus *Amblema*.

The fat threeridge was described from the Flint River, Macon County, Georgia. This species, endemic to the ACF River system, historically occurred in the mainstems of the Flint, Apalachicola, and lower Chipola rivers (Clench and Turner 1956, Butler 1993). Clench and Turner (1956) indicated that this species was generally rare, but locally abundant. In the Chipola River system, van der Schalie (1940) reported 17 specimens from two sites (average of 8.5 per site). Clench and Turner (1956) documented ten to 15 mussels per m (0.9 to 1.4 mussels per ft) square over a 200 m (656 ft) stretch of Dead Lake (Chipola River) shoreline.

For the status survey, 86 sites were sampled within the historical range of the fat threeridge, including eight of the 12 (67 percent) known historical sites. The fat threeridge was found at six of the 86 (7 percent) sampled sites, three each on the Apalachicola and lower Chipola rivers. Only one of the eight (13 percent) historical sites still had live individuals. An average of 6.4 live individuals were found per site.

No live fat threeridge mussels have been found since 1981 in the Flint River; the species is apparently extirpated from Georgia. Apparently common in Dead Lake in 1967 (H.G. Lee, amateur malacologist, pers. comm.), this species was not found live there in 1974 (W.H. McCullagh, amateur malacologist, pers. comm.), nor during the status survey.

The smallest live fat threeridge found during the survey was 43 mm (1.7 in) long. Richardson and Yokley (1996) found evidence of juvenile fat threeridge at a site in the lower Apalachicola River thought to have the best extant population of this species (J. Brim Box, USGS, pers. comm.), where it was the second most common mussel species encountered. Three fat threeridges under 50 mm (2.0 in) in length were found employing total substratum removal from six 0.25 m (2.7 ft) square quadrats. Richardson and Yokley (1996) stated that the smallest specimens had fewer than the five presumed annual growth rings that might be indicative of juveniles. A fresh dead individual measured 24 mm (0.9 in) in length and had two to three growth rings. In 1996, three live specimens ranging from 40 to 50 mm (1.6 to 2.0 in) in length were located in the same bed (C.A. O'Brien, USGS, pers. comm.). These data

indicate that the fat threeridge is experiencing limited recruitment at the site representing its best known population.

Shinyrayed Pocketbook—*Lampsilis subangulata* (Lea, 1840)

The shinyrayed pocketbook is a medium-sized species that reaches approximately 85 mm (3.3 in) in length. The shell is subelliptical, with broad, somewhat inflated umbos and a rounded posterior ridge. The shell is fairly thin but solid. The surface is smooth and shiny, light yellowish brown with fairly wide, bright emerald green rays over the entire length of the shell. Older individuals may appear much darker brown with obscure raying. Female specimens are more inflated postbasally, whereas males appear to be more pointed posteriorly. Internally, the pseudocardinal teeth are double and fairly large and erect in the left valve, and one large tooth and one spatulate tooth in the right valve. The nacre is white, with some individuals exhibiting a salmon tint in the vicinity of the umbonal cavity. The Service recognizes *Unio subangulatus* Lea, 1840 and *Unio kirklandianus* Wright, 1897 as synonyms of *Lampsilis subangulata*.

The shinyrayed pocketbook was described from the Chattahoochee River, Columbus, Georgia. Historically, this mussel occurred in mainstems and tributaries throughout the ACF River system, and in larger streams of the Ochlockonee River system (Clench and Turner 1956, Butler 1993). Van der Schalie (1940) found this species to be generally rare, but locally abundant, documenting 94 specimens at eight Chipola River system sites (average of 11.8 per site).

During the status survey, 380 sites within the historical range of the shinyrayed pocketbook were sampled, including 28 of 54 (52 percent) known historical sites. Live individuals were found at 23 of the sample sites, including one site in a Chattahoochee River tributary in Alabama, 13 sites (12 on tributaries) in the Flint River system, one locality in the Chipola River, and eight sites (seven mainstem) in the upper half of the Ochlockonee River system. An average of 2.9 live individuals were found per site. Live individuals were located at six (21 percent) of the historical sites. This species has apparently been eliminated from all but one site in the Chattahoochee River system in Alabama, and from much of the Chipola River system.

During unrelated studies subsequent to the completion of the status survey, ten additional sites for the shinyrayed

pocketbook were located in the ACF River system. Eight of these new occurrences were from five Flint River tributaries; one each occurred in tributaries of the Chattahoochee and Chipola rivers (Butler and Brim Box 1995, J. Brim Box, USGS, pers. comm.). The latter two records represent streams where the species had not been previously collected. The Flint River system records include one stream where the species had never been collected (a small tributary of a stream where live specimens were found during the status survey), and another stream where it was found during the status survey as a single dead shell; the remaining sites are in tributaries where it was found live during the status survey.

The smallest shinyrayed pocketbook specimen recorded during the status survey in the Ochlockonee River system, possibly an older juvenile, measured 41 mm (1.6 in) in length. In the ACF River system, the three smallest specimens, measuring 55 to 57 mm (2.17 to 2.24 in) in length, were gravid females. In 1995, four live, apparently juvenile, specimens from 30 to 40 mm (1.2 to 1.6 in) in length were located in a Flint River tributary (C.A. O'Brien, USGS, pers. comm.). O'Brien (1996) sampled the largest known bed of this species for juveniles. An 18 m (59.1 ft) by 8 m (26.2 ft) area had 37 adult shinyrayed pocketbooks (average of 2.1 per m square). Whole substratum removal of 54 0.25 m (2.7 ft) square quadrats within this bed yielded no juveniles of this species. The density of shinyrayed pocketbooks at the four other sites, where quantitative work conducted subsequent to the status survey yielded specimens, never exceeded 0.08 specimens per meter square (J. Brim Box, USGS, pers. comm.).

Gulf Moccasinshell—*Medionidus penicillatus* (Lea, 1857)

The Gulf moccasinshell is a small mussel that reaches a length of about 55 mm (2.2 in), is elongate-elliptical or rhomboidal and fairly inflated, and has relatively thin valves. The ventral margin is nearly straight or slightly rounded. The posterior ridge is rounded to slightly angled and intersects the end of the shell at the base line. Females tend to have the posterior point above the ventral margin and are somewhat more inflated. Sculpturing consists of a series of thin, radially-oriented plications along the length of the posterior slope. The remainder of the surface is smooth and yellowish to greenish brown with fine, typically interrupted green rays. The left valve

has two stubby pseudocardinal and two arcuate lateral teeth. The right valve has one pseudocardinal and one lateral tooth. Nacre color is smoky purple or greenish and slightly iridescent at the posterior end. The Service recognizes *Unio penicillatus* Lea, 1857 and *Unio kingi* Wright, 1900 as synonyms of *Medionidus penicillatus*.

The recent taxonomic history of *Medionidus* species in the Apalachicola Region is complex. In the Chipola River system, van der Schalie (1940) recorded two species of *Medionidus*—*M. kingi* and *M. penicillatus*. Clench and Turner (1956) synonymized *M. kingi* and two other nominal species, the Ochlockonee moccasinshell and Suwannee moccasinshell (*M. walkeri* [Wright, 1897]) under the Gulf moccasinshell, an arrangement also followed by Burch (1975). Johnson (1970) erroneously reported both the Gulf moccasinshell and Suwannee moccasinshell from the ACF River system and the Suwannee moccasinshell from the Ochlockonee and Suwannee rivers as well. Johnson (1977) recognized the validity of the Gulf moccasinshell, Ochlockonee moccasinshell, and Suwannee moccasinshell from Apalachicola Region streams based on shell characters. The validity of the three allopatrically distributed Apalachicola Region *Medionidus* species is also recognized by Turgeon *et al.* (1988).

The Gulf moccasinshell was described from three sites in the ACF River system in Georgia—the Chattahoochee River near Columbus and near Atlanta, and the Flint River near Albany. The historical ACF River system distribution included tributaries and mainstems of the Flint, Chattahoochee, and Chipola rivers, and the mainstem Apalachicola River. More western localities in the Apalachicola Region included Econfinia Creek (Bay County, northwest Florida), the Choctawhatchee River system, and the Yellow River (Johnson 1977; Butler 1989, 1993). Clench and Turner (1956) considered this species rare, but locally abundant. Van der Schalie (1940) reported 166 specimens from 11 sites, including 130 from two sites in the Chipola River system, an average of 15.1 per site.

During the status survey, 330 sites within the historic range of the Gulf moccasinshell were sampled, including 13 of 31 (42 percent) known historical sites. This species was found at eight sites (two percent), including only one of the historical sites. It was found at seven sites (including one mainstem site) in the middle Flint River system, and at one Econfinia Creek site. An average of 1.4 live individuals was

found per site. All Alabama populations of the Gulf moccasinshell appear to be extirpated, and no specimens were found in the Chipola River system during the status survey. The species has not been collected in the Choctawhatchee River system since the early 1930's and in the Yellow River since 1963 (Williams and Butler 1994).

Six new sites for the Gulf moccasinshell from tributaries of the ACF River system were found subsequent to the status survey (Butler and Brim Box 1995, J. Brim Box, USGS, pers. comm.). Three sites were streams from which this species had never been found (one tributary each in the Chattahoochee, Flint, and Chipola rivers), two were streams (both Flint River system) where this species was found live during the status survey, and one site was a stream in the Chattahoochee River system where a single dead shell had been located during the status survey.

Densities of Gulf moccasinshells at two sites where quantitative work was conducted were under 0.4 specimens per meter square (J. Brim Box, USGS, pers. comm.). All specimens located during and subsequent to the status survey were adults; no specimens less than 50 mm (2.2 in) were located.

Ochlockonee Moccasinshell—*Medionidus Simpsonianus* Walker, 1905

The Ochlockonee moccasinshell is a small species, generally under 55 mm (2.2 in) in length. It is slightly elongate-elliptical in outline, the posterior end obtusely rounded at the shell's median line and the ventral margin broadly curved. The posterior ridge is moderately angular and covered in its entire length with well developed, irregular ridges. Sculpture may also extend onto the disk below the ridge. Surface texture is smooth. The color is light brown to yellowish green, with dark green rays formed by a series of connected chevrons or undulating lines across the length of the shell. Internal characters include thin straight lateral teeth and compressed pseudocardinal teeth. There are two laterals and two pseudocardinals in the left valve and one lateral and one pseudocardinal in the right valve. The nacre is bluish white. A summary of the taxonomic history of the genus *Medionidus* follows the Gulf moccasinshell description above.

The Ochlockonee moccasinshell was described from the Ochlockonee River, Calvary, Grady County, Georgia. This Ochlockonee River system endemic was known historically from the mainstem and the Little River (Johnson 1977, Butler 1993). Museum records for this

species sometimes numbered in the dozens of individuals at sites above Talquin Reservoir.

During the status survey, eight sites were sampled within the historic range of the Ochlockonee moccasinshell, including three of six (50 percent) known historical sites. Live individuals were found at two sites (one specimen at each site); one of these was a historic site. Another specimen was located in 1995 (J. Brim Box, USGS, pers. comm.) at a site previously sampled during the status survey. Only three live individuals are known to have been collected since 1974 despite concerted efforts by numerous investigators; none were juveniles.

Oval Pigtoe—*Pleurobema Pyriforme* (Lea, 1857)

The oval pigtoe is a small to medium-sized species that attains a length of about 60 mm (2.4 in). The shell is suboviform compressed, with a shiny smooth epidermis. The periostracum is yellowish, chestnut, or dark brown, rayless, and with distinct growth lines. The posterior slope is biangulate and forms a blunt point on the posterior margin. The umbos are slightly elevated above the hingeline. As is typical of the genus, no sexual dimorphism is displayed in shell characters. Internally, the pseudocardinal teeth are fairly large, crenulate, and double in both valves. The lateral teeth are somewhat shortened, arcuate, and double in each valve. Nacre color varies from salmon to bluish white and is iridescent posteriorly. Variation in this species has led to the description of various nominal species. The Service currently recognizes *Unio pyriformis* Lea, 1857, *Unio modicus* Lea, 1857, *Unio bulbosus* Lea, 1857, *Unio amabilis* Lea, 1865, *Unio reclusum* Wright, 1898, *Unio harperi* Wright, 1899, and *Pleurobema simpsoni* Vanatta, 1915 as synonyms of *Pleurobema pyriforme*.

The oval pigtoe was described from the Chattahoochee River, near Columbus, Georgia. Historically, this species was one of the most widely distributed and common mussels endemic to the Apalachicola Region. It occurred throughout the mainstems and several tributaries of both the Flint and Chipola River systems, in the lower Chattahoochee River mainstem and several of its tributaries, in the Apalachicola River mainstem, and in the upper portion of the Ochlockonee River system. The oval pigtoe was also known from a single Suwannee River mainstem site and the confluent Santa Fe River system, and in Econfin Creek (Clench and Turner 1956, Butler 1993). Once a species of localized abundance

(Clench and Turner 1956), oval pigtoe populations sometimes numbered in the hundreds (van der Schalie 1940). In the Chipola River system, van der Schalie (1940) reported 470 specimens from 9 sites (an average of 52.2 per site).

During the status survey, 410 sites were sampled within the historic range of this species, including 20 of 50 (40 percent) known historical sites. The oval pigtoe was found at 24 (6 percent) of the sample sites, including seven of the historic sites, with an average of 5.2 live individuals per site. The species was found at one mainstem site and seven tributary sites in the Flint River system, six mainstem Chipola River sites, six mainstem sites and one tributary site in the upper Ochlockonee River system, one site in the New River (upper Santa Fe River system), and two sites in Econfin Creek. The oval pigtoe has apparently been extirpated from the Chattahoochee River system in Alabama and much of the Chipola River system.

Subsequently, five new occurrences of the oval pigtoe were located in three ACF River system tributaries. One occurrence was from a stream in the Chipola River system not previously known to have harbored this species. The other four occurrences were in two streams (two sites in each stream), that are tributaries to the Chattahoochee and Flint rivers where the species had been recorded during the status survey (Butler and Brim Box 1995; J. Brim Box, USGS, pers. comm.).

Oval pigtoe density at the five new sites never exceeded 0.4 specimens per meter square (J. Brim Box, USGS, pers. comm.). The smallest individual collected during or subsequent to the status survey was 26 mm (1.0 in) in length, indicating that juveniles were not present in these collections.

Chipola Slabshell—*Elliptio Chipolaensis* Walker, 1905

The Chipola slabshell is a medium-sized species reaching a length of about 85 mm (3.3 in). The shell is ovate to subelliptical, somewhat inflated and with the posterior ridge starting out rounded, but flattening to form a prominent biangulate margin. The surface is smooth and chestnut colored. Dark brown coloration may appear in the umbonal region and the remaining surface may exhibit alternating light and dark bands. The umbos are prominent, well above the hingeline. Internally, the umbonal cavity is rather deep. The lateral teeth are long, slender, and slightly curved; two in the left and one in the right valve. The pseudocardinal teeth are compressed and crenulate; two in the left and one in the right valve. Nacre color is salmon, becoming more

intense dorsally and somewhat iridescent posteriorly.

The Chipola slabshell was described from the Chipola River, Florida. Clench and Turner (1956) restricted the type locality to the Chipola River, 1.6 km (1.0 mi) north of Marianna, Jackson County, Florida. This species was considered to be a Chipola River system endemic, occurring in the mainstem from the vicinity of Dead Lake upstream and in a few of its larger tributaries, all in Florida (van der Schalie 1940, Clench and Turner 1956). However, a historical record recently brought to light has been verified from a small tributary of the Chattahoochee River in extreme southeast Alabama (Butler 1993). Van der Schalie (1940) documented 31 specimens from six sites in the Chipola River system (an average of 5.2 per site).

During the status survey, 33 sites within the historical range of this species on the Chipola River were sampled, including 12 of 16 (75 percent) known historical sites. Live individuals were found at five sites (15 percent), including one historical site. An average of 3.7 live individuals was found per site. Live individuals were located at one of the 12 historic resurveyed sites. Populations from Spring Creek (middle Chipola River system) and the Chattahoochee River system apparently have been extirpated, with the latter loss resulting in the extirpation of the Chipola slabshell from Alabama.

No live specimens appeared to be juveniles, as the smallest live individual was 47 mm (1.9 in) in length. The Chipola slabshell has one of the most restricted ranges of any Apalachicola Region mussel. However, it appears to be more tolerant of soft sediments than other species included in this rule, has potentially more habitat available than channel-dwelling species, and may co-occur with more silt-tolerant species in stream bank habitats with slower currents.

Purple Bankclimber—*Elliptoideus Sloatianus* (Lea, 1840)

The purple bankclimber is a large, heavy-shelled, strongly sculptured mussel reaching lengths of 200 mm (8.0 in). A well-developed posterior ridge extends from the umbos to the posterior ventral margin of the shell. The posterior slope and the disk just anterior to the posterior ridge are sculptured by several irregular ridges that vary greatly in development. Umbos are low, extending just above the dorsal margin of the shell. Internally, there is one pseudocardinal tooth in the right valve and two in the left valve. The lateral teeth are very thick and slightly curved. Nacre color is whitish near the center of

the shell becoming deep purple towards the margin, and very iridescent posteriorly. The Service recognizes *Unio sloatianus* Lea, 1840, *Unio atromarginatus* Lea, 1840, *Unio aratus* Conrad, 1849, and *Unio plectophorus* Conrad, 1950 as synonyms of *Elliptoideus sloatianus*.

Elliptoideus sloatianus was included in the genus *Elliptio* until Frierson (1927) erected the subgenus *Elliptoideus* based on the presence of glochidia in all four gills instead of two gills, a characteristic of the genus *Elliptio*. Clench and Turner (1956) overlooked the work of Frierson (1927), placing the species under *Elliptio*. Subsequent investigators (e.g., Turgeon *et al.* 1988) have correctly assigned this species to the monotypic genus *Elliptoideus*.

The purple bankclimber was described from the Chattahoochee River in Georgia. The type locality was restricted to the Chattahoochee River at Columbus, Georgia, by Clench and Turner (1956). In the ACF River system, the purple bankclimber was historically found throughout the mainstem and in a few of the largest tributaries in the Flint River system, in the vicinity of Dead Lake on the lower Chipola River mainstem (although not reported by van der Schalie (1940)), and along the mainstems of the Apalachicola and Chattahoochee rivers. The species occurred in the lower two-thirds of the mainstem of the Ochlockonee River, and in the Little River (Clench and Turner 1956, Butler 1993).

During the status survey, 222 sites were sampled within the historic range of the purple bankclimber, including 14 of 27 (53 per cent) known historic sites. Live individuals were found at 41 (18 percent) sites, with an average of 54 individuals per site. The purple bankclimber was found at six of the 14 historical sites. The species was found at 17 mainstem sites and one tributary site on the lower two-thirds of the Flint River, at five sites in the Apalachicola River, and at 18 sites on the Ochlockonee River mainstem, mostly above Talquin Reservoir. Having been extirpated from the Chipola and Chattahoochee rivers, no extant populations occur in Alabama. Its range in the Flint and Ochlockonee River systems also has been reduced.

It is uncertain if purple bankclimber populations are successfully recruiting young. Two specimens <70 mm (2.8 in) in length were collected from the Ochlockonee River during the survey; they were 53 mm (2.1 in) and 59 mm (2.3 in) in length. Based upon the large size attained by this species, both were possibly juveniles. The smallest specimen found during the survey in

the ACF River system was 76 mm (3.0 in) in length, a size that possibly represents a juvenile. Richardson and Yokley (1996) took six 0.25 meter (2.7 ft) square total substratum removal quadrat samples at a site below Jim Woodruff Dam in the Apalachicola River where the purple bankclimber was abundant, being the second most commonly encountered species. No specimens smaller than 133 mm (5.2 in) were found, indicating a lack of recruitment at this site.

Previous Federal Action

The fat threeridge, shinyrayed pocketbook, oval pigtoe, and purple bankclimber first appeared as category 2 species in the Service's notices of review for animal candidates that were published on January 6, 1989 (54 FR 554) and on November 21, 1991 (56 FR 58804). At that time, a category 2 species was one that was being considered for possible addition to the Federal List of Endangered and Threatened Wildlife. Designation of category 2 species was discontinued in the February 28, 1996, **Federal Register** notice (61 FR 7596) (see also Issue 103 in the "Summary of Comments and Recommendations" section). The Service determined that these four species plus the Gulf moccasinshell, Ochlockonee moccasinshell, and Chipola slabshell qualified as candidate species at the time of proposal for listing. A candidate species is a species for which the Service has sufficient information to propose it for protection under the Act. All seven species have been recommended for conservation status by Williams *et al.* (1992a) and Williams and Butler (1994).

On November 18, 1993, the Service notified by mail (72 letters) potentially affected Federal and State agencies, local governments, and interested individuals that a status review was being conducted for these seven species. Ten comments were received. The Florida Division Office of the Federal Highway Administration stated that no bridge replacement projects were currently planned in northwest Florida, and that any future bridge replacement projects were not anticipated to affect these species, based on the localized and short-term impacts associated with these activities. The Federal Energy Regulatory Commission stated that they license twelve hydroelectric developments in the study area, and that issues concerning these species should be coordinated with the Office of Hydropower Licensing. The Fayette County, Georgia, Board of Commissioners expressed concern with the Service's belief that impoundments

had played such a major role in the demise of these species. The Alachua County, Florida, Environmental Protection Department indicated that none of the seven species were known or suspected to occur in that county. The Florida Game and Fresh Water Fish Commission expressed concern with how their plan to dredge the mouths of several silted in streams along the Apalachicola River to improve access for striped bass (*Morone saxatilis*) might affect these mussels. The Georgia Department of Natural Resources had questions concerning the distribution of these mussels, and sent a copy of regulations addressing the commercial harvest of mussels in Georgia. The Florida Natural Areas Inventory supported Federal listing of these species, and indicated that a portion of the Econfina Creek watershed where the Gulf moccasinshell and oval pigtoe occur is on a list for land purchase by the State of Florida. Three individuals with knowledge of freshwater mussels supported Federal listing of these species.

The processing of this final rule conforms with the Service's final listing priority guidance published in the **Federal Register** on December 5, 1996 (61 FR 64475). The guidance clarifies the order in which the Service will process rulemakings during fiscal year 1997. The guidance calls for giving highest priority to handling emergency situations (Tier 1) and second highest priority (Tier 2) to resolving the listing status of the outstanding proposed listings. This rule falls under Tier 2. Presently, there are no pending Tier 1 actions in Region 4 and this is the Region's last outstanding Tier 2 action. Additionally, the guidance states that "effective April 1, 1997, the Service will concurrently undertake all of the activities presently included in Tiers 1, 2, and 3" (61 FR 64480). In a **Federal Register** notice published on October 23, 1997 (62 FR 55628), the guidance was extended beyond FY 1997 until such time as new guidance is published.

In the development of this final rule, the Service has conducted an internal review of a draft of this rule and other Service-generated information. Based on this review, the Service has determined that there is no new information that would substantively affect these listing decisions and that additional public comment is not warranted.

Summary of Comments and Recommendations

In the August 3, 1994, proposed rule (59 FR 39524), and through associated notifications, all interested parties were requested to submit factual reports and

information that might contribute to the development of a final rule. Appropriate Federal and State agencies, county governments, scientific organizations, and interested parties were contacted by letter dated August 18, 1994, and were requested to comment. Legal notices were published in the following newspapers—the *Albany Herald*, Albany, Georgia, on August 20, 1994; the *Atlanta Journal-Constitution*, Atlanta, Georgia, on August 21, 1994; the *Columbus Ledger-Enquirer*, Columbus, Georgia, on August 21, 1994; the *Macon Telegraph*, Macon, Georgia, on August 20, 1994; the *Thomasville Times-Enterprise*, Thomasville, Georgia, on August 19, 1994; the *Gainesville Sun*, Gainesville, Florida, on August 18, 1994; the *Jackson County Floridan*, Marianna, Florida, on August 21, 1994; the *Tallahassee Democrat*, Tallahassee, Florida, on August 21, 1994; and the *News-Herald*, Panama City, Florida, on August 22, 1994.

In response to twelve formal requests during the first public comment period, the Service scheduled five public hearings in the three-State area within the historical range of these seven species. Prior to the hearings, the Service held five public informational meetings at the same sites as the public hearings. A notice of public meetings, public hearings, and reopening of the comment period was published in the **Federal Register** on December 12, 1994 (59 FR 63987), and in legal notices in the following newspapers—the *Albany Herald*, Albany, Georgia on January 6, 1995; the *Atlanta Journal-Constitution*, Atlanta, Georgia on January 8, 1995; the *Columbus Ledger-Enquirer*, Columbus, Georgia on January 5, 1995; the *Dothan Eagle*, Dothan, Alabama on January 7, 1995; the *Montgomery Advertiser*, Montgomery, Alabama on January 5, 1995; the *Tallahassee Democrat*, Tallahassee, Florida on January 6, 1995; the *Jackson County Floridan*, Marianna, Florida on January 8, 1995; and the *Fayette News*, Fayetteville, Georgia, on January 11, 1995. The comment period for the proposal closed on February 10, 1995.

Public meetings were held at the Fayette County High School in Fayetteville, Georgia on January 5, 1995; at Chipola Junior College in Marianna, Florida on January 9, 1995; at the Opera House in Dothan, Alabama on January 10, 1995; at the Albany Civic Center in Albany, Georgia on January 11, 1995; and at the Convention and Trade Center in Columbus, Georgia on January 12, 1995. Public hearings were held at the same facilities in Fayetteville, Georgia on January 19, 1995; Dothan, Alabama on January 23, 1995; Marianna, Florida

on January 24, 1995; Albany, Georgia on January 25, 1995; and Columbus, Georgia, on January 26, 1995.

In a **Federal Register** notice dated April 24, 1995 (60 FR 20072), the Service reopened the comment period on this proposal until May 5, 1995, to allow for consideration of numerous comments received after the previous deadline (February 10, 1995) and to provide an opportunity for further comment. Legal notices were published in the following newspapers—the *Albany Herald*, Albany, Georgia on April 21, 1995; the *Atlanta Journal-Constitution*, Atlanta, Georgia on April 24, 1995; the *Columbus Ledger-Enquirer*, Columbus, Georgia on April 21, 1995; the *Dothan Eagle*, Dothan, Alabama on April 26, 1995; the *Montgomery Advertiser*, Montgomery, Alabama on April 22, 1995; the *Tallahassee Democrat*, Tallahassee, Florida on April 23, 1995; the *Jackson County Floridan*, Marianna, Florida on April 26, 1995; and the *Fayette News*, Fayetteville, Georgia on April 26, 1995.

During the April 10, 1995, to April 26, 1996, listing moratorium, studies involving some of these proposed species were conducted in the ACF River system. To accept this new information, the Service published a notice in the **Federal Register** (61 FR 36020) on July 9, 1996, reopening the comment period until July 26, 1996. Legal notices were published in the following newspapers—the *Albany Herald*, Albany, Georgia on July 14, 1996; the *Atlanta Journal-Constitution*, Atlanta, Georgia on July 17, 1996; the *Columbus Ledger-Enquirer*, Columbus, Georgia on July 14, 1996; the *Dothan Eagle*, Dothan, Alabama on July 14, 1996; the *Montgomery Advertiser*, Montgomery, Alabama on July 14, 1996; the *Tallahassee Democrat*, Tallahassee, Florida on July 14, 1996; the *Jackson County Floridan*, Marianna, Florida on July 14, 1996; and the *Fayette News*, Fayetteville, Georgia on July 14, 1996.

The Service received hundreds of written comments and many oral statements presented at the public hearings and received during the comment periods. All pertinent comments have been considered in the formulation of this final rule. The proposed listings were supported by the U.S. Forest Service, the Environmental Protection Agency (EPA), and the States of Alabama (Department of Conservation and Natural Resources) and Florida (Department of Environmental Protection and Game and Fresh Water Fish Commission [FGFWFC]). The congressional delegations of the three States opposed the proposed listings. The following is

a summary of the comments, concerns, and questions (referred to as "Issues" for the purposes of this summary) and the Service's response to each. Comments of similar content have been grouped together.

Issue 1: Numerous commenters thought that the status survey was insufficient to make listing determinations for these seven species. Issues of concern included sampling methodologies, specimens collected, sites sampled, interpretation of historical data, whether sampling for juveniles had been adequate, and evidence of recent reproduction and recruitment. Other issues raised included the need for quantitative sampling, the percentage of historical sites sampled, how historical sites were selected for sampling, the evidence for the decline of these species, whether newly discovered sites represented new colonization by these mussels, and the reproductive viability of remaining populations.

Response: Explanations of sampling methodology, specimens collected, sites sampled, and analysis of historical data have been included under "Status Survey" and "Species Accounts" in the Background section. Other issues associated with the status survey are discussed below.

Quantitative sampling is not essential to determine the status of rare riverine mussel species (Miller and Payne 1988). Mussel populations are often distributed non-randomly (Downing and Downing 1992). Even where habitats appear to be uniform, mussels tend to be distributed unevenly (Downing 1991). For these reasons, random transect-type quantitative sampling is less efficient than choosing sites based on criteria such as available habitat (G.L. Warren, FGFWFC, *in litt.* 1995).

The Service compiled 300 historical site records from the ACF and Ochlockonee River systems; 108 of these sites had records of one or more of these proposed species. Research into historical mussel collections since the status survey was completed has yielded additional historical sites not reported in Butler (1993). The percentage of historical sites in the ACF and Ochlockonee River systems resurveyed for the seven species during the status survey ranged from 40 to 75 percent, while the percentages of resurveyed historical sites in the ACF and Ochlockonee River systems that still supported live specimens of the seven species ranged from eight to 43 percent. Detailed analyses of these data are presented under "Status Survey" and "Species Accounts" in the "Background" section. Many historical

sites had been visited more than once by other researchers or collectors prior to the status survey. If evidence indicated the species had disappeared from a historical site, and there was little probability of currently finding it, survey efforts were not expended there.

The Service believes the newly discovered sites do not represent newly colonized sites, but sites that have existed historically but have not been previously sampled by collectors (see "Status Survey" under Background).

The fat threeridge, shinyrayed pocketbook, Gulf moccasinshell, and oval pigtoe were historically considered rare, but widespread and locally abundant (Clench and Turner 1956). Mussel populations were decimated in the Chattahoochee River in the vicinity of Columbus, Georgia, by the early part of this century (Clench and Turner 1956). The river-dependent mussel species along the entire Chattahoochee River mainstem now appear to be extirpated (Butler 1993).

Determination of sexual maturity in these species would require sectioning to locate mature gametes; determining age would require sectioning the shells (Neves and Moyer 1988); this was not within the scope or intent of the status survey. The Service considered shells to represent juveniles if they were less than one-quarter of the maximum size for each species. Based on the adult sizes typical of these seven mussel species, very few juvenile specimens were located during the status survey. While substrate samples were not taken, the survey biologists located thousands of smaller species of bivalves and snails. These included the ubiquitous Asian clam (*Corbicula fluminea*), pleurocerid (*Elimia* spp.) and other snails, and the iridescent lilliput (*Toxolasma paulus*), a mussel species rarely exceeding 32 mm (1.25 in) in total length. The Service believes that if significant recruitment was occurring in the seven species, more juvenile and small shells would have been located.

Juveniles were also represented in some museum collections. Specimens of purple bankclimber as small as 26 mm (1.0 in) in length were represented in museum collections while the smallest specimen located during the status survey was 53 mm (2.1 in). The occurrence of juvenile specimens in museum collections substantiated population viability and indicated recent reproduction at the time the historical collection was made.

Richardson and Yokley (1996) employed total substratum removal of six 0.25 m (2.7 ft) quadrats at each of three sites. They found three juvenile individuals of the fat threeridge in the

lower Apalachicola River, but no evidence of recruitment of the purple bankclimber below Jim Woodruff Dam on the same river. These two species were both common and represented the second most abundant species at their respective sites. The fat threeridge population sampled is the largest known (J. Brim Box, USGS, pers. comm.). These data indicate that the fat threeridge is experiencing limited recruitment, but that there is no evidence of recruitment in the purple bankclimber at these sites.

Brim Box and Dorazio (in press) took 2,867 substrate core samples (representing a composite 4.23 m (45.5 ft) square) for mussels at 30 sites in the ACF system. No specimens of any of the 7 species in this rule were located in the 2,867 core samples, although juveniles of a few common species were found. Brim Box and Dorazio (in press) also took 2,867 0.25 m (2.7 ft) square quadrat samples, without total substratum removal, for mussels. No juveniles of the seven species were found.

Richardson and Yokley (1996) stated that their work demonstrated that unequivocal evidence of recruitment can be found with minimal sampling effort. However, most literature on this subject demonstrates that the collection of juveniles is a low probability event (Kat 1982, Neves and Widlak 1987, Stansbery 1995). Quadrat sampling has consistently been determined to be inadequate for rare species (Neves *et al.* 1980, Kovalak *et al.* 1986, Neves and Odum 1989). The extreme patchiness of mussel distributions makes quantitative surveys expensive, time consuming, and not the best method to determine the population status of rare species (Miller and Payne 1988). The large number of substratum samples necessary to confirm recent recruitment is also disruptive to the stable benthic habitat essential to these and other riverine species (A.E. Bogan, North Carolina State Museum, pers. comm.).

Issue 2: Several commenters said that the author of the proposed rule stated in a published paper that major portions of the Apalachicola and Ochlockonee rivers were "virtually unsurveyed."

Response: What that statement referred to was that few historical sampling sites existed on the Apalachicola and lower Ochlockonee rivers at that time (Butler 1989). Subsequent surveys on the Apalachicola (35 sites) and Ochlockonee River (24 sites) mainstems have provided adequate information to evaluate the status of the species considered in this rule.

Issue 3: A few respondents asserted that comparing historical survey sites

with status survey sites is difficult because of differing collection techniques and the dynamic nature of streams (what was suitable habitat decades ago could now be very unsuitable due to various factors). One commenter urged the Service to use collection methods employed by early collectors to thoroughly sample streams.

Response: The Service agrees that there may have been changes in habitat suitability over time. To compensate for this factor, Center biologists surveyed upstream and downstream of historical sites. While streams are dynamic, the proportions of riffle, run, and pool habitats remain fairly constant. Based on human influences over the past two centuries, the Service believes that available habitat for these mussels has diminished significantly (see Factor A in the "Summary of Factors Affecting the Species" section).

Issue 4: One malacologist (mussel expert) asked if it would be possible to time-code the map symbols in the status survey report so that the distribution found in this study could be distinguished from that of earlier collections.

Response: The distributional data could be time-coded; however, time-coding collections was not essential to determine the status of the seven mussels.

Issue 5: Two malacologists suggested that some of these species have always been rare according to the literature, and that population declines could not be proven. One respondent questioned how many of the species existed historically compared to now.

Response: Van der Schalie (1940) gathered data on Chipola River mussels from collections taken between 1915 to 1918 and included actual numbers of mussels from various sites in the drainage. A comparison of this historical data with the status survey results indicates a significant reduction in the numbers of at least two species in the Chipola River. Historically, 470 oval pigtoe specimens were collected from nine sites (an average of 52 per site) in the Chipola River versus 35 specimens collected from six sites (an average of six per site) during the status survey. Historically, 166 specimens of the Gulf moccasinshell were known taken from eleven sites (an average of 15 per site) versus no specimens collected in the status survey.

Clench and Turner (1956) indicated that some species (e.g., the fat threeridge and oval pigtoe) were rare and only locally abundant. They documented 10 to 15 specimens/meter (0.9 to 1.4 specimens/ft) square of fat threeridge over a 200 m (656 ft) stretch of Dead

Lake (Chipola River). The fat threeridge apparently disappeared over 20 years ago in Dead Lake and was not found live there during the status survey. Except for the purple bankclimber, which is abundant at a few sites, these species are now rare range-wide and are not abundant at any known sites (see "Species Accounts" in the "Background" section).

Issue 6: Two respondents stated that Federal listing of the purple bankclimber was not warranted because the species was abundant at some sites in the lower Flint and upper Ochlockonee rivers. One of these individuals further stated that he was confident that juveniles of this species were common.

Response: The purple bankclimber is the most abundant of the seven mussels; however, no additional information on purple bankclimber abundance or recruitment was provided to the Service by these commenters. Recent sampling efforts on the Apalachicola River (Richardson and Yokley 1996) located only large individuals, indicating a lack of recruitment in this species.

Issue 7: One commenter indicated that the Gulf moccasinshell still exists at several sites in the Chipola River system.

Response: Van der Schalie (1940) reported 166 Gulf moccasinshells taken from eleven sites (an average of 15 specimens per site) in the Chipola River system, but none were located during the status survey. The Service received information on a recently discovered population in Baker Creek, in the Chipola River system, after publication of the proposal (see "Species Accounts" in the "Background" section), but the commenter provided no specific location or other information.

Issue 8: Several commenters questioned the Service's statements regarding impoundments, including status survey efforts in impoundments, impact of impoundments upon these species, and the purple bankclimber's tolerance of impoundments.

Response: Much riverine habitat in the ACF system has been converted to slack-water impoundments, particularly in the Chattahoochee River; however, verifiable pre-impoundment records of these species are uncommon (see Factor A in the "Summary of Factors Affecting the Species" section). Museum records confirm that some of the Ochlockonee River mussel fauna was inundated and lost at the upper end of Talquin Reservoir. Many historical collections came from the Chattahoochee River in the vicinity of Columbus, Georgia. Although exact locality data is generally lacking, several impoundments in this

reach of river permanently reduced available riverine habitat for mussels.

During the status survey, 39 reservoir sites were surveyed; none of the seven species were found in permanently impounded river reaches. None of these species are known to successfully reproduce and recruit under impoundment conditions. The reference to the purple bankclimber's tolerance of impounded conditions was based on a mussel relocation project funded by the U.S. Army Corps of Engineers (Corps). Purple bankclimbers from the Apalachicola River survived twelve months in laboratory tanks at the USGS research facility in Gainesville, Florida (Hamilton *et al.* 1996). However, the mussels were maintained in flow-through tanks with currents. The experiment does not indicate that the purple bankclimber can survive and reproduce under impounded conditions.

Issue 9: Two commenters questioned the expertise of the Center biologists who carried out the status survey.

Response: The project leader of the status survey has 20 years experience with mussel research and surveys. The field leader has an M.S. degree in aquatic sciences and seven years field experience in aquatic biology. Field biologists, with one exception, had education in aquatic biology ranging from the B.S. to Ph.D. level. Two scientists associated with the project have published scientific papers on mussel surveys and endangered species. The Service believes that all individuals involved in the survey were well qualified.

Issue 10: One commenter questioned the adequacy of the sampling done by the status survey biologists, noting that various status survey field notes (e.g., the water was too cold, too turbid, or too deep) indicated that sampling was inadequate and that portions of the field data should be discarded.

Response: The survey biologists employed the most appropriate sampling techniques based upon the habitat conditions present at each site. When high water precluded sampling, sites were usually revisited in lower water conditions to sample. The Service believes that the information gathered during field work is reliable and supports the determinations made in this rule.

Issue 11: One commenter assumed that when the survey biologists checked a mussel for the presence of mature glochidia the mussel was stressed or even killed. Another respondent questioned the Service's recording of laboratory data, noting that an entire collection of over one hundred

individuals of a common species was comprised of all females.

Response: During the status survey, some voucher mussels were preserved and brought to the laboratory for analysis, including inspection for glochidia. Most of the specimens were returned unharmed to the substrate from which they were collected. The species referred to by the respondent as consisting of only females were members of the genus *Elliptio*. This genus does not exhibit obvious external differences between the sexes; glochidia must either be present or gonadal tissues sectioned to determine sex. Laboratory notes on this collection stated that glochidia were not present (or "NP" on the data sheets) for any individual. The commenter apparently misconstrued "NP" as meaning "female, glochidia not present." Although their sex could not be determined, it is likely that both sexes were represented in the sample.

Issue 12: Some respondents contended that the Service had not sampled the Escambia, Yellow, and Choctawhatchee rivers, where there were historical records of two of these species.

Response: There is one historical record of the Gulf moccasinshell in the Yellow River (1963) and four records from the Choctawhatchee River in the 1930's. The Service examined over 30 collections taken from these watersheds over the past few decades. The Gulf moccasinshell did not occur in any of these collections. The Service believes this species is extirpated from the Yellow and Choctawhatchee River systems.

Clench and Turner (1956) confused the shinyrayed pocketbook with the southern sandshell (*Lampsilis australis*) and erroneously stated that the shinyrayed pocketbook's range included the Choctawhatchee River. Johnson (1970), Heard (1979), and Williams and Butler (1994) clarified the range of the shinyrayed pocketbook as comprising only the ACF and Ochlockonee River systems. There are no records of any of the seven species from the Escambia River system. Collections made by the Center between 1993 and 1995 in this drainage corroborate this information.

Issue 13: One respondent commented that the Service's diving regulations precluded divers from collecting in navigable river channels, thus making it impossible to assess mussel populations there.

Response: Service diving regulations do not preclude sampling in navigable channels. Many dives using SCUBA were made in navigable channels during the status survey, and the Service

believes that mussel populations in such areas were adequately sampled.

Issue 14: One commenter stated that \$27,000 was not adequate to conduct the status survey for the seven proposed mussels.

Response: The Service's Jacksonville, Florida, Field Office provided \$27,000 in initial funding and \$12,000 during the survey. Total expenditures for the status survey were over \$110,000. The Service believes the status survey was adequate to determine the status of these species.

Issue 15: Various commenters were concerned that the scientific data associated with the status survey were not subjected to proper peer review.

Response: The information supporting these determinations was extensively peer reviewed according to Service policy (see paragraph following the Service's response to Issue 107 in the "Summary of Comments and Recommendations" section for a discussion of peer review).

Issue 16: Several respondents stated that any decision to list these species should be deferred until data is available on habitat requirements, fish hosts, and threats to the mussels and their host fish.

Response: Although such data will be important in recovery for these species, they are not required under the listing factors under section 4(a) of the Act. To delay these listings until such data become available might preclude the species from being listed until recovery becomes less likely or extinction occurs.

Issue 17: As gravid specimens were sometimes documented, some commenters questioned the Service's use of the term "lack of reproductive viability" in the proposed rule.

Response: In the proposed rule, the Service stated that there was little evidence to suggest that populations of the seven mussel species were reproductively viable. This statement was based on the fact that no known juveniles were collected during the status survey. In this final rule, the Service has used the phrase "lack of recruitment" in its discussions of mussel reproductive status. This term more accurately defines the current status of these mussels.

Issue 18: Several commenters thought that the Service had failed to determine potential host fish status, contending that missing hosts may be the primary cause of their decline. Two malacologists stated that if their fish hosts were gone, the mussels were "functionally extinct"; a third asked that if this were so, why spend time and effort listing them?

Response: As discussed under "Reproductive Biology" in the "Background" section, the fish hosts for some of these species are not currently known. Without specific host fish information, it would be premature to spend considerable efforts and funding on fish sampling. Population and distribution information of potential host fish is not necessary to justify listing these species.

Loss or depletion of fish host populations may be a primary factor in declines of some of the seven mussels. A loss of riverine habitat has probably also affected fish populations (see Factor A in the "Summary of Factors Affecting the Species" section).

If some of these seven mussel species are "functionally extinct," recovery may still be possible by restoration of required fish host populations to the ecosystem. Regardless of the environmental factors responsible for the decline of these mussels, if one or more of the listing criteria are met, section 4 of the Act requires that the species be listed.

Issue 19: One commenter was not convinced that mussels were important, while numerous malacologists and other commenters stated that mussels serve as excellent water quality indicators and barometers of aquatic ecosystem health.

Response: Section 2(a) of the Act recognizes that species have intrinsic values (*i.e.*, aesthetic, ecological, educational, historical, recreational, and scientific) to the nation, and the section 4 listing criteria do not require other justifications. However, mussels are of demonstrable value to man. Their longevity, relative immobility, and filter feeding habits make them among the best available indicators of environmental quality in aquatic systems. Mussels are highly susceptible to sedimentation and pollutants and provide an early warning of the deterioration of water and habitat quality. They accumulate heavy metals and other contaminants in their tissues and shells, serving as effective test organisms for contaminants studies.

Native Americans and early settlers fed extensively on mussels, as shown by the large deposits of shell material in middens (Parmalee *et al.* 1982). In the first half of this century, mussels supported a large pearl button industry in the United States (McGregor and Gordon 1992). The cultured pearl industry harvests thousands of tons of shell from eastern rivers (Baker 1993), and cultured pearls are a multi-billion dollar global industry. Mussels are important organisms for biological studies, particularly because of their diverse methods of attracting host fish.

Mussels serve an important ecological function by filtering excess nutrients from the water, improving water clarity so sunlight may promote rooted aquatic vegetation growth, thereby increasing habitat complexity and species diversity. Several vertebrate species, including mammals, birds, turtles, and fish feed regularly on mussels (Fuller 1974). Their shells provide substrate diversity and a place for many types of invertebrates to colonize. This function is particularly important in homogenous sandy coastal plain rivers where hard surfaces are rare.

Issue 20: Two malacologists questioned the Service's statements regarding the impacts of various human activities on the mussels, whereas other malacologists thought that their imperilment was easily documented given the extensive available literature. Others questioned the use of personal communications and subjective terms (e.g., maybe, unknown) in the proposed rule and at public meetings.

Response: Additional references documenting Service conclusions have been added in this final rule (see "Background" and "Summary of Factors Affecting the Species" sections). The Service believes it appropriate to consider reliable unpublished reports, non-literature documentation, and personal communications with experts in making listing determinations.

Issue 21: Several commenters thought that natural factors (e.g., floods) and not just the factors of human origin, should be considered in the species' imperilment.

Response: Natural factors were considered in terms of threats to these species (see Factors C and E in the "Summary of Factors Affecting the Species" section).

Issue 22: Two commenters questioned the Service's statement concerning lack of adequate flushing on the Ochlockonee River to rid the channel of silt and detritus below Talquin Reservoir.

Response: One survey site in the Ochlockonee River below Talquin Reservoir had silt and detritus deposits extending from bank to bank. Under normal conditions, these materials are confined to slackwater areas, where they settle out in low or no-flow conditions. Low flow releases from Talquin Reservoir may be contributing to this situation.

Issue 23: One commenter stated that these species' lack of reservoir tolerance may be incorrect, and that it was possible that mussels had not had enough time to reestablish themselves in the newly created benthic habitat

created by Chattahoochee River impoundments.

Response: There is no evidence that any of these seven mussels can successfully reproduce and recruit under impoundment conditions. Their habitat requirements generally consist of stable substrates, usually gravel, and other rocky materials in stream channels with currents. Habitat conditions created in impounded rivers consist of softer sediments (i.e., silt, mud, sand) and minimal currents (except at reservoir heads). Impoundments also change other physical and chemical characteristics of rivers (see Factor A in the "Summary of Factors Affecting the Species" section).

Issue 24: Numerous commenters maintained that the results of a Corps-sponsored study on mussel translocation were relevant to the proposed listings, and that the comment period should have been extended until study results were available for public scrutiny.

Response: The Corps investigated the feasibility of translocating four mussel species, including the purple bankclimber, in the Apalachicola River below Jim Woodruff Dam (Hamilton *et al.* 1996). This study will not provide additional information on the status of these species and does not justify further extension of the comment period.

Issue 25: Several respondents stated that the Service cannot prove which, if any, human activities actually affect mussels. Conversely, a few malacologists stated that determining the direct relationship of these impacts would be a waste of research time and taxpayer dollars.

Response: Although the precise role of the factors causing the decline of these species will never be known, there is information available on how human activities affect these and other species of mussels (see "Background" section and Factor A in the "Summary of Factors Affecting the Species" section).

Issue 26: A few malacologists questioned the rationale for distinguishing between endangered and threatened; one of them criticized the lack of criteria for making such distinctions. One malacologist wondered how the Service determined that the narrowly distributed Chipola slabshell was threatened and not endangered. They also wondered at what point information was sufficient to list a species.

Response: The Act defines an endangered species as a species threatened with extinction throughout all or a significant portion of its range, and a threatened species as a species in

danger of becoming endangered throughout all or a significant portion of its range within the foreseeable future. The decision to propose a species as endangered or threatened is based solely on the best scientific and commercial data available after conducting a review of the status of the species. For the application of these definitions to the seven mussels in general, and the Chipola slabshell in particular, see "Summary of Factors Affecting the Species" and "Species Accounts," respectively.

Issue 27: One commenter stated that these seven species were imperiled in 1970, and if the species are still extant, these listings are long overdue.

Response: The Service believes that the status survey was essential to determine the current status of these species before proposing them for listing. The Service carries out status surveys and listing actions, subject to a priority system published in the **Federal Register** on September 21, 1983 (48 FR 43098), and contingent on the availability of funding, personnel, and supportive information.

Issue 28: Several commenters thought that the Service had overstated potential commercial utilization and take by biological supply companies of two species, that Georgia harvest regulations aiding in conservation had been understated, and that mussel identification training courses were needed.

Response: Much of the commercial shell harvest in the southeast now takes place in west Tennessee and north Alabama. Although shells from the ACF River system are of poor quality, some have been included in shell shipments (J. Brim Box, USGS, pers. comm.). Demand for shell in recent years has pushed prices high enough that collectors have searched widely for unexploited shellbeds. The fat threeridge and purple bankclimber are so similar to the more common threeridge and washboard (*Megaloniais nervosa*) that take is a potential problem. Training and the development of educational materials will be considered as tasks when the recovery plan is prepared for these species.

The Service agrees that the practice of dissecting mussels in introductory laboratory courses is no longer widespread. However, large species, such as the fat threeridge and purple bankclimber, may still be collected for this purpose (see factor B under "Summary of Factors Affecting the Species").

Regulation of commercial harvest in Georgia has changed since the proposed rule was drafted; this has been

addressed in the final rule (see Factor D in the "Summary of Factors Affecting the Species" section for discussion of State regulations affecting these species).

Issue 29: One commenter thought it was inappropriate for Service staff to recommend that no mussels should be harvested from the ACF and Ochlockonee River systems when some of the seven species were abundant.

Response: Although some of these species occur in large numbers at a few sites, the Service believes the current status of the species does not justify a harvest.

Issue 30: One commenter stated that much field data is gathered by amateurs, and the Service should recognize the value of this information. Two malacologists thought that we overestimated the number of shell clubs and amateurs, and accordingly overstated their threat to these species from collecting.

Response: The Service acknowledges the significant role amateur malacologists have played in the development of our current knowledge of freshwater mussels. Most early mussel collections, including most of the type material used to describe these seven species, were collected by amateur naturalists. Amateurs continue to make important contributions to the knowledge of mussels. The Service agrees that the potential threat from shell club collectors is minimal (see Factor C in the "Summary of Factors Affecting the Species" section).

Issue 31: Two malacologists commented that the Service may have taken an alarmist view with the proposal. One malacologist believed the Service was proposing to list aquatic snails that were abundant and unthreatened, and doubted the data used to support the listing of the mussels.

Response: Based on the best available scientific and commercial data and peer review, the Service believes that listing under the Act is appropriate for these species (see "Summary of Factors Affecting the Species" section).

Issue 32: A few respondents stated that the taxonomy of these species deserved further attention as the taxonomy of some species in the region was unresolved, and speculated that we may have been confused regarding which species we actually proposed.

Response: Although the genetics of various mussel genera in the Apalachicola Region are little known (Butler 1989), the species included in this final rule have been recognized by the malacological community for nearly

a century. All meet the Act's definition of "species."

Issue 33: One commenter wanted to know why one mussel species addressed in the status survey report was omitted from the proposed rule.

Response: The status survey included the round washboard (*Megaloniaia boykiniana*). In December 1993, the Service learned of molecular genetics studies (Mulvey *et al.* in press) indicating that the round washboard might be conspecific with the widespread and common washboard. Based on this taxonomic uncertainty, this species was not proposed for listing. The same study, however, confirmed that the fat threeridge (*Amblema neisleri*) was a distinct species from the threeridge (*A. plicata*).

Issue 34: One commenter suggested that mussel populations in the relatively pristine, undisturbed Econfinia Creek should be thriving because conditions for mussels are optimal.

Response: Econfinia Creek retains high water quality, but has been altered by Deer Point Reservoir on the lower portion of the creek. Although Gulf moccasinshell and oval pigtoe populations survive in this stream, the populations appear to be small. Other factors may explain why these two species occur in small numbers. Econfinia Creek represents the western-most stream within the historical range of the oval pigtoe, and the Gulf moccasinshell's western-most extant population. Peripheral populations in a species' range are often small and scattered.

Issue 53: One malacologist stated that Clench and Turner's (1956) survey of Apalachicola Region streams referred to the mussel fauna as being depauperate, whereas the Service claimed that the region was well known for its high level of endemism.

Response: Clench and Turner (1956) stated "* * * [the mussel] fauna of [the Apalachicola Region] has been derived from the west, is depauperate (not rich in species), and must be fairly old." When compared to adjacent drainages to the west (e.g., Mobile Basin) and north (e.g., Tennessee River system), the fauna is relatively low in species diversity. However, the Apalachicola Region has many endemic species (see "Introduction" in the Background section). About 30 of the 60 mussel species known from the region are endemic (Butler 1989, Williams and Butler 1994).

Issue 54: Two malacologists suggested that disease and predators are not threats to these mussels, and unless information is otherwise available,

references to these factors should be deleted.

Response: Factor C ("Disease or Predation") in the "Summary of Factors Affecting the Species" section notes that there is no specific information available on how disease and predation affect these mussels.

Issue 55: One commenter believed that mussels were more common than indicated in the proposed rule, because hundreds, if not thousands, of mussels are eaten by muskrats in the vicinity of his property on the Chattahoochee River.

Response: No populations of these seven species currently occur in the Chattahoochee River. The mussels in question may be the Asian clam (*Corbicula fluminea*), a well-known food of muskrats, or reservoir-tolerant native mussels.

Issue 56: One commenter questioned the relationship between mussel populations and habitat quality.

Response: Many mussels require water free from excessive levels of sediments and contaminants (Fuller 1974, Havlik and Marking 1987). As benthic inhabitants, they are readily affected by sedimentation, and as filter feeders, they are highly susceptible to various contaminants (see Factor A in the "Summary of Factors Affecting the Species" section).

Issue 57: Two malacologists questioned these mussels' decline when other species in the same habitat had viable populations. Another commenter thought the Service assumed that all seven mussels had similar reproductive characteristics.

Response: Species occurring in the same habitat typically have differences in life histories or ecological requirements (e.g., in the case of mussels, different host fishes) that permit them to coexist. These species would not be expected to respond in the same way to ecological stress. The specific reproductive biologies of the seven mussels is largely unknown, but would not be expected to be the same.

Issue 58: One commenter thought these mussels were always rare, and thus served a limited ecosystem function, and further stated that the Asian clam could fill their niche, thus minimizing a potential chain reaction from loss of the mussels in the ecosystem.

Response: Historical information indicates that some of these species were once locally abundant; the purple bankclimber still occurs abundantly at a few sites. The introduced Asian clam has been common in Apalachicola Region rivers since 1960 (Schneider 1967) (see Factor E in the "Summary of

Factors Affecting the Species" section). Although the Asian clam may have become an increasingly important food for some predators (e.g., the muskrat), the long-term ecological consequences of its colonization are unknown.

Issue 59: One respondent stated that data were not provided to substantiate claims that the Asian clam may be responsible for the imperilment of the Ochlockonee moccasinshell.

Response: Sickel (1973) and Bass and Hitt (1974) indicate that Asian clam populations are dense in the ACF River system. This final rule contains additional information on how Asian clams may be impacting these seven species (see Factor E in the "Summary of Factors Affecting the Species" section).

Issue 60: Several malacologists predicted that the exotic zebra mussel (*Dreissena polymorpha*) will inevitably increase the probability of extinction for the seven species based upon the impacts of this non-native species in midwestern river systems.

Response: If the zebra mussel invades the ACF system, it may be a serious threat to these species (see Factor E in the "Summary of Factors Affecting the Species" section).

Issue 61: One commenter stated there is scientific evidence that certain dredging, navigation, waste water discharges, silvicultural, and agricultural activities may actually benefit filter feeders through nutrient enrichment, flow regime modification, and temperature modulation.

Response: The commenter provided no specific references. The Service believes significant changes in water quality, including large increases in sediments, decrease in flow due to impoundments, and nutrient increases, have been generally detrimental to the native mussel fauna (Weber 1981, Sheehan *et al.* 1989, Goudreau *et al.* 1993).

Issue 62: One commenter stated that, in certain parts of the world, mussels were used to clean up toxic waste waters, and wondered why these species seemed to be more susceptible to toxins when all they had to cope with were agricultural runoff and waste water treatment plant effluents. The individual wanted to know what chemicals were the most toxic to mussels.

Response: Mussels are filter feeders that continually pass large volumes of water through their bodies. Mussels take in heavy metals and other contaminants and store them in their tissues or incorporate them into their shells. This allows them to effectively filter pollutants from water, but only if the

species' toxicity threshold is not exceeded or its reproductive capacity is not impaired.

Cadmium may be the most toxic heavy metal to mussels (Havlik and Marking 1987). Other heavy metals, ammonia, and chlorine also appear to be particularly toxic to mussels, especially in the early life stages.

Issue 63: Several respondents questioned the mussel listings if many of their populations are non-viable. If so, not only was recovery impossible, but the Service should not have expended funds for mussel surveys.

Response: These mussel populations have been significantly reduced in numbers and now exist only as fragmented populations in altered habitats (see "Species Accounts" in the "Background" section). Although some populations may not be viable, this does not preclude listing. Such populations could be augmented with juveniles produced through artificial propagation or with reproducing adults from another population.

Issue 64: Several respondents stated that because the Service's recovery record was poor, additional species should not be listed. Another implied that the proposal did not contain data needed to effect recovery or predict the species' recovery potential.

Response: A species' recovery potential is not a factor in making a listing determination. Most endangered and threatened species reached that status over many decades due to habitat loss and other complex causes. Recovery of these species should not be expected to be rapid or easy. Recovery planning and implementation occur following a species' listing, as required by section 4(f) of the Act.

Issue 65: A few malacologists thought that it was the Service's responsibility to see that life history studies on these species and research on the well-being of river ecosystems should be conducted.

Response: In preparing the recovery plan for these species, the Service will consider the need for such research and incorporate it in the plan as appropriate.

Issue 66: Numerous commenters believed these listings would significantly impact economies of the three States. One respondent stated that the Service had "juggled" the numbers regarding section 7 consultations to mislead the public.

Response: Based on its experiences with the Act and listed mussels, the Service does not believe the listing of these species will have a significant effect on the economy of the three States where they occur. A 1992 General Accounting Office audit found that 99.9

percent of all projects (18,211) that were reviewed under the Act between 1988 and 1992 went forward unchanged or with only minor modifications. Only six projects were halted due to endangered species considerations.

Issue 67: Numerous respondents stated that channel maintenance and barge navigation in the ACF River system would be shut down or severely curtailed if these species were listed.

Response: Through the section 7(a)(4) conference requirement of the Act addressing species proposed for listing, the Service and the Corps have agreed on measures regarding channel maintenance operations that will avoid jeopardizing the mussel species present. These measures will continue to be implemented once the species are listed (see "Available Conservation Measures" section).

Issue 68: One respondent wanted the Service to guarantee that there would be no financial hardship to industry, or that such costs should be borne by the Service. Another wanted to know the if Service would provide assurances regarding minimal potential impacts and restrictions resulting from these listings. Several respondents requested that the Service provide an analysis of the potential economic impacts of listing these species.

Response: Under Section 4(b)(1)(A) of the Act, a listing determination must be based solely on the best scientific and commercial data available. The legislative history of this provision clearly states the intent of Congress to "ensure" that listing decisions are "* * * based solely on biological criteria and to prevent nonbiological considerations from affecting such decisions * * *" H.R. Rep. No. 97-835, 97th Cong., 2d Sess. 19 (1982). As further stated in the legislative history, "* * * economic considerations have no relevance to determinations regarding the status of species * * *". *Id.* at 20. Because the Service is specifically precluded from considering economic impacts, either positive or negative, in a final decision on a proposed listing, the Service need not consider the economic impacts of listing these species.

Issue 69: The Corps disagreed with the statement that channelization was a primary cause of habitat loss. They stated that sediment instability in maintained channels made these areas too unstable to maintain mussel communities.

Response: The impacts of channel modifications are addressed in Factor A in the "Summary of Factors Affecting the Species" section.

Issue 70: The Corps stated that turbidity from dredging is not as detrimental to benthic habitats as is runoff from streams along the Apalachicola River after thunderstorms.

Response: Regardless of origin, impacts from sedimentation, siltation, and turbidity sources may continue to be a problem in portions of the ACF River system (see Factor A in the "Summary of Factors Affecting the Species" section).

Issue 71: The Corps stated that the proposal did not provide evidence for the statement that dredging activities resuspend toxicants bound to sediments.

Response: While organochlorine insecticides were detected in less than 10 percent of sediment and tissue samples taken in the ACF River system during 1992 and 1993, such compounds were formerly widely used in the basin (Buell and Couch 1995), are persistent in the environment, toxic to aquatic life, and partitioned into both sediments and the lipid reservoir of organisms (Day 1990, Burton 1992).

Issue 72: One respondent stated that the proposals did not explain why impoundments were considered a primary cause of habitat loss. Another stated that if impoundments are implicated, dams would be required to be removed.

Response: Reservoir impacts on mussels are well documented, and there is no evidence that any of the seven species can reproduce and successfully recruit in impoundments (see Factor A in the "Summary of Factors Affecting the Species" section). Although other factors contributed to the mussels' decline, the Service believes reservoirs were a significant factor. Since few if any of these species still occur in reservoirs, dam removal is not a Service goal, nor would the Act require such an action.

Issue 73: One commenter feared that the listings would affect ACF River system water allocations under the Tri-State Water Study (TSW). The Department of Energy's Southeastern Power Administration was concerned that the mussel listings would require changes in reservoir operations that might ultimately affect power generation capabilities. Another individual thought the species were proposed at this time to impact the ongoing TSW study.

Response: The Service has no flow recommendations for these seven mussels. The listing proposal was prepared after the completion of the status survey according to normal listing priorities, and had no connection with the TSW. However, a review of potential

effects from any proposed water allocation formula will be needed (see "Available Conservation Measures" section).

Issue 74: Two malacologists stated that every human activity affecting these species and their habitats should not have been mentioned in the proposed rule; the Service should have focused on specific factors (i.e., sedimentation, suspended solids, pollution) with objective, supporting evidence.

Response: The information in the "Summary of Factors Affecting the Species" section has been revised to emphasize the factors believed most important in the decline of these mussels.

Issue 75: Some commenters disagreed with the Service's assertions regarding the inadequacy of riparian buffers, particularly for silvicultural activities. Another commenter stated that the Service overlooked the fact that the State of Georgia had a law protecting streamside buffers.

Response: The discussion of riparian buffers has been modified to incorporate these comments (see Factor A in the "Summary of Factors Affecting the Species" section).

Issue 76: Several commenters questioned the proposed rule's implication of poor silvicultural practices as contributing to the mussels' demise. One commenter feared there could be an impact to the industry, whereas others requested that data be made available to document habitat reduction as a result of these activities.

Response: Normal silvicultural activities on private lands should not be affected by these listings (see "Available Conservation Measures" section). The discussion of silvicultural activities has been clarified in this final rule (see Factor A in the "Summary of Factors Affecting the Species" section).

Issue 77: One commenter stated that timber is a long-term crop and clear-cutting leaves land generally undisturbed for 25 years or more.

Response: Although clear-cutting may be conducted on a long-term basis, best management practices for silvicultural activities are important to protect stream habitats long after such activities have occurred (see Factor A in the "Summary of Factors Affecting the Species" section).

Issue 78: One respondent stated that if the mussels were listed, subsequent recovery plans would restrict land use practices and private property rights. Another stated that if these species are listed, private individuals and businesses could be subject to sections 7, 9, and 10 of the Act.

Response: Recovery plans include reasonable actions that the Service believes necessary to bring species back to the point they no longer need protection under the Act. They do not restrict land use practices and private property rights. The recovery planning process is designed to allow potentially affected segments of the public to participate in decision making and allows the special local knowledge of affected communities to be fully considered. Draft plans are made available for public review and comment, and all affected or interested individuals and groups are encouraged to participate.

Listing will provide these species the protection of sections 7 (Federal agency actions and consultations) and 9 (prohibitions) of the Act. Section 9 "taking" exemptions are available under both sections 7 and 9. Section 7(b)(4) of the Act provides for incidental take involving Federal actions if such take is not likely to jeopardize listed species and if reasonable and prudent measures are implemented to minimize such take. For further discussion of Federal activities associated with these listings, see the "Available Conservation Measures" section.

Section 10 of the Act provides for the issuance of permits to conduct otherwise prohibited activities. Through section 10 habitat conservation planning (HCP) there is an opportunity to provide species protection and habitat conservation for non-Federal development and land use activities that may result in incidental take of a listed species. For landowners and local governments, it provides long-term assurances that their activities will be in compliance with the requirements of the Act. Biologically, it provides the Service with a tool to offset the incidental take of listed, proposed, candidate, and other species by reconciling species conservation with economic development.

Issue 79: One respondent wanted a clarification of the Service's term "poor land-use practices."

Response: Poor land-use practices in the proposed rule referred to activities that cause excessive erosion and contribute to stream sedimentation, siltation, and turbidity. These include activities such as clearing or plowing to the edge of stream banks, or carrying out upland development without adequate silt screens or erosion control.

Issue 80: Several respondents stated that the species' decline resulted from historical disturbances, and that present conditions had improved, making listing unnecessary. Another respondent realized the role of historical impacts,

but supported the listings and felt more should be done to protect the remaining populations.

Response: Historical human activities have contributed to these species' current status, and some factors may continue to threaten these mussels (see Factor A in the "Summary of Factors Affecting the Species" section). Although certain factors affecting these species have improved, continuing threats to these species qualify them for listing. Listing will provide the Act's protective and recovery measures.

Issue 81: Several respondents thought the agricultural community was being directly implicated in poor land use practices. Other respondents felt better documentation was needed concerning agricultural impacts, and believed that normal agricultural practices would be impacted from the listings.

Response: Listing of these mussels should not affect normal agricultural practices (see "Available Conservation Measures" section). Implementation of agricultural best management practices has reduced erosion in the Apalachicola Region, and the percentage of agricultural lands has declined as second-growth forest has replaced formerly cultivated lands (Couch *et al.* 1996). If best management practices are followed, the Service believes that agricultural activities will be compatible with the continued survival of these seven mussels.

Issue 82: Several respondents stated that listing the mussels would adversely impact the gravel-mining industry.

Response: Large-scale mining of stable substrate inhabited by these mussels would be detrimental to them. The mining of unsuitable habitat (i.e., unconsolidated substrates, substrates within impoundments) would not be likely to affect them. Gravel mining in the Chattahoochee River should be unaffected (see Factor A in the "Summary of Factors Affecting the Species" section).

Issue 83: One commenter feared that these listings could cause modification, significant construction cost increases, or even abandonment of existing and planned waste water treatment plants. Another commenter wanted to know what would happen to municipalities that discharged effluents into streams inhabited by these species.

Response: The Service has no information showing that current water quality standards threaten these species. At the time water quality standards for particular states are reviewed under section 402 of the Clean Water Act, the EPA will be required to consult with the Service on any standards that may affect listed species. In the course of the EPA

review of Alabama's water quality standards, the Service's biological opinion (dated October 8, 1996) resulting from consultation with EPA determined that there was not sufficient information to determine whether the standards were likely to jeopardize the continued existence of some of the listed species found in Alabama. The opinion anticipated incidental take for a number of listed species, required modification of water quality standards to protect listed species, and specified monitoring and research conditions to determine if changes in the standards were necessary. The Service anticipates that future water quality standard consultations will follow a similar approach.

Issue 84: The Corps recommended that a statement in the proposed rule regarding the prolonged release of toxic chemicals from a Department of Defense facility should be revised, and that the Service should have considered the long-term dilution factor.

Response: A facility near Albany, Georgia, discharged an estimated 3.6 billion liters (l) (0.95 billion gallons (g)) of rinse, stripping, cleaning, and plating solutions through a short canal into the Flint River from 1955 to 1977. The Corps stated that the flow rate in the Flint River provided an average dilution rate of 1:127,555 l (1:33,700 g) over the 22-year period. Many of these toxicants were heavy metals used in plating solutions. Regardless of this dilution factor, the Service believes the long-term release of this effluent likely had, and may continue to have, a chronic toxic effect on Flint River mussel populations (see Factor A in the "Summary of Factors Affecting the Species" section) and deserves additional study.

Issue 85: A few commenters questioned the threat of toxic chemical spills on highway and railway bridges over streams. Some commenters thought that any listing would hamper efforts to rebuild bridges washed out during major floods.

Response: Toxic chemical spills can occur at highway, railway, and pipeline crossings, and industrial sites (see Factor A in the "Summary of Factors Affecting the Species" section). Section 7 consultations for bridge replacements are performed on a regular basis for aquatic species throughout the southeast; occasionally, species surveys are requested prior to construction. Most such projects do not affect, or have minimal effects on, listed species. These listings are not expected to affect bridge replacement.

Issue 86: One commenter wanted to know why Federal protection was

necessary if the listings would not affect individual activities.

Response: The Act requires listing based on the five criteria in section 4(a) and does not allow for consideration of impacts, or a lack thereof, on individual activities as part of a listing decision.

Issue 87: The Corps stated that the proposal provided minimal evidence to prioritize human activities that may have affected mussel habitat.

Response: Additional information on such human activities has been provided in Factor A in the "Summary of Factors Affecting the Species" section.

Issue 88: One respondent requested information relating to cost/benefit ratios associated with recovery actions.

Response: Costs associated with implementation of recovery tasks will be estimated when the recovery plan is developed for these species. Cost/benefit ratios are not calculated in recovery plans.

Issue 89: One respondent asked what effect the listing would have on commercial fishermen.

Response: The use of these mussels for bait would be a violation of section 9 of the Act. No other effects on commercial fishermen are anticipated.

Issue 90: Several commenters believed the Service had misrepresented the science in the proposed rule, based upon an internal Service memorandum. Some individuals felt the Service had changed its position on the importance of human impacts after the proposed rule was published.

Response: The Service believes the proposed rule was scientifically sound, as was confirmed by peer review. Regardless of editing changes in the draft, the proposed rule signed by the Service Director and published in the **Federal Register** on August 3, 1994 (59 FR 39524), represented the Service's position on the various threats to the seven mussels. In formulating this final rule, the Service has considered all substantive comments and re-examined these threats (see the "Summary of Factors Affecting the Species" section).

The perception that the Service changed its position was apparently based on the description in the proposed rule of human activities (e.g. agriculture and forestry) that had impacted these species, versus the Service's explanation at public meetings that the listing would have little impact on such activities. Most of these activities are not directly regulated or monitored by the Service or other Federal agencies, and are, therefore, unlikely to be affected. Secondly, many human activities result in effects that are non-point in origin (e.g., erosion)

and are not easily attributable to a particular source. The ways in which these listings are expected to affect human activities are discussed in the "Available Conservation Measures" section below.

Issue 91: EPA requested that the Service clarify the following statement in the proposal—"Existing authorities available to protect aquatic systems, such as the Clean Water Act [CWA] administered by EPA and the [Corps], have not been fully utilized and may have led to the degradation of aquatic environments in the Southeast Region, thus resulting in a decline of aquatic species." EPA also requested that the Service identify deficiencies in their implementation of the CWA regarding State adopted narrative and numeric water quality criteria, State water use classifications by streams occupied by these species, aquatic life criteria guidance values; and National Pollutant Discharge Elimination System (NPDES) permit procedures. Several respondents questioned the need to improve regional water quality, suggesting that existing regulations are adequate to protect the species, and that poor water quality had been corrected since the passage of the CWA.

Response: Through implementation of the CWA, water quality has improved following the construction of advanced waste water treatment plants. Water quality criteria, however, were developed without specific knowledge of the tolerances of these seven mussels and previously listed mussels, which may be more sensitive than the species typically used to test waste water (Keller and Zam 1991, Keller 1993). Some mussel populations continue to decline even in areas that appear to have suitable physical habitat. Environmental factors including contaminants may still be adversely affecting the growth, reproduction, recruitment, and/or survival of these populations (see Factors A and E in the "Summary of Factors Affecting the Species" section). Little is known about the potential impacts of contaminants on fresh water mussels. Research is needed to address the lethal and sublethal effects of acute and chronic exposure to toxins for all life stages of mussels. This research will entail identifying appropriate surrogate species, devising test protocols, and conducting studies to evaluate the effectiveness of these criteria. The Service is currently working with EPA to develop a memorandum of agreement (MOA) that will address how EPA and the Service will interact relative to CWA water quality criteria, standards, and NPDES permits within the Service's Southeast Region. Until the MOA is

developed and data are available to fully evaluate the effectiveness of current national water quality standards, the Service believes it is premature to attempt, in this final rule, to address any specific deficiencies and/or inadequacies that may exist in EPA's implementation of the CWA regarding the protection of water quality.

Issue 92: One respondent questioned if the Service had complied with the National Environmental Policy Act in the development of this rule.

Response: See "National Environmental Policy Act" section.

Issue 93: A few respondents stated that current State and Federal laws, interagency regulations, permit guidelines, and voluntary programs governing land usage were sufficient to protect the mussels, and thus, questioned the need to provide additional protection when private property rights would be compromised.

Response: The Service agrees that current State and Federal laws and regulations governing land use practices, if fully implemented, provide significant protection for these species. However, the current status of these seven species meets the listing criteria of the Act. Listing will provide the additional protective and recovery provisions of the Act.

Issue 94: Several respondents stated that listing these species could be considered an unfunded mandate if State and local governmental agencies are required to expend funds to satisfy permit requirements for their protection.

Response: The Act does not mandate State participation in the recovery of listed species, but the Service recognizes and is sensitive to the fact that costs of some projects may increase as a result of these listings. However, the decision to list the species is based on biological factors regarding status and threats.

Issue 95: One respondent stated that the Service had not considered the benefits that the erosion control practices required by the U.S. Food Security Act have had on the aquatic environment.

Response: The Service agrees that these requirements have benefitted mussels by reducing silt loads in streams.

Issue 96: One respondent stated that if these species are listed, the public will not know when they are in violation of the Act until "after the fact."

Response: See the "Available Conservation Measures" section for activities the Service believes would likely constitute violations of section 9 of the Act.

Issue 97: One commenter stated that if the Service reintroduced mussel populations, the public would not know where the reintroductions occurred, or the regulatory impacts resulting from these efforts.

Response: Section 4(f)(4) of the Act requires the Service to provide public notice and an opportunity for public review and comment on all draft recovery plans. Establishment of an experimental population under section 10(j) of the Act would be done by regulation, thus, requiring the Service to identify the location of the population and provide for a public comment period. Any population determined to be an experimental population is treated as if it were listed as threatened for purposes of establishing protective regulations under section 4(d) of the Act. The special rule for the experimental population would contain the prohibitions and exceptions for that population.

Issue 98: Numerous commenters stated that the Service had limited the public's opportunity to comment on the proposal by planning public hearings outside the affected area, during the Thanksgiving holidays, and at facilities too small to accommodate the public. They also stated that comment periods were too short, that the Service might refuse to pay for public hearing facilities, or had not planned to hold public meetings.

Response: Section 4(b)(5) of the Act requires that one public hearing be held on proposed listing regulations, if requested. Meetings are discretionary and are held dependent on public interest and need. In conjunction with the proposed rule, the Service held five public information meetings followed by five public hearings in three States throughout the range of the mussels (see first part of "Summary of Comments and Recommendations" section). Meetings and hearings were scheduled to avoid holidays or other conflicts. Meeting and hearing sites contained seating well beyond the attendance needs at all events. Comments were accepted at the hearings and by mail; the comment period was opened four times, over a period of two years (59 FR 39524, 59 FR 63987, 60 FR 20072, 61 FR 36020). The Service, therefore, believes there was adequate opportunity for public comment.

Issue 99: Several commenters stated that the Service had made the determination to list these species prior to public consideration, based on the term "final rule" having been used by Service employees at a public meeting.

Response: The Service recognizes that during the proposal period, the proper

terms relating to a regulatory decision are "final decision" and "final decision document." This final rule has been prepared after full consideration of all relevant comments and information received during the comment period.

Issue 100: One respondent believed the Service had preconceived ideas and conclusions as to the species' status prior to conducting the status survey.

Response: The seven species were considered to be category 2 species prior to the status survey (see "Previous Federal Action" section), but this did not mean a decision had been made to list them. Many species for which status surveys are carried out are found not to meet the listing criteria of the Act.

Issue 101: Several respondents stated that the Service does not use good science in the listing process; one respondent stated that the listings would be arbitrary and capricious. Several respondents believed that the Service had violated the Administrative Procedure Act, the Act's "best scientific and commercial data available" standard, and Constitutional guarantees of equal protection and due process.

Response: The Service believes that this final rule incorporates the best available scientific and commercial information and complies with the Administrative Procedures Act.

Issue 102: One individual stated that he was not provided an opportunity to comment on the status survey report and the proposed rule.

Response: The comment periods, public meetings, and public hearings associated with the proposed rule (see "Previous Federal Action" section and the response to issue 98) provided extensive opportunities for interested parties to comment on or to request copies of Service documents.

Issue 103: One respondent commented that the Service was under pressure to list as many as possible of the 3,000 species on the annual notices of review.

Response: On February 28, 1996, (61 FR 7596) the Service revised its candidate species list, replacing an old system that listed nearly 4,000 "candidate" species under three separate categories (see also "Previous Federal Action" section). The old system led many people to the mistaken conclusion that the addition of thousands of species to the Federal List of Endangered and Threatened Wildlife and Plants was imminent. Under the revised list, only those species for which there is enough information to support a listing proposal are called "candidates." These were formerly known as "category 1" species. The proposal to list these seven mussels

followed the Service's normal priorities and procedures.

Issue 104: Several respondents stated that the Service already protects too many species and the country does not need any more listed species.

Response: Section 4(a) of the Act requires species to be listed based on the five listing factors. The Act sets no limit on the number of species to be recognized as endangered or threatened.

Issue 105: A few commenters stated that the Service had failed to designate critical habitat or was planning to designate critical habitat for these species. One respondent feared that designating critical habitat would halt navigation channel maintenance, whereas another thought the Service should determine the critical habitat necessary for their survival and then conduct an economic impact study.

Response: Section 4(a)(3) of the Act requires the Service to designate critical habitat to the maximum extent prudent and determinable at the time a species is listed. The Service has determined that the designation of critical habitat for these seven species is not prudent (see "Critical Habitat" section).

Issue 106: One commenter believed that any effort to delist a mussel once it was placed on the Federal list would require volumes of detailed data and be at the expense of local governments.

Response: The Act provides the same criteria to reclassify or delist species as to list them. Subsequent to a listing, section 4(f) of the Act requires the Service to develop and implement recovery plans for all listed species. Recovery plans include goals for reclassification and delisting. Section 4(c)(2) of the Act further requires the Service to review the status of listed species every five years to determine if reclassification or delisting is appropriate. There is no obligation for local governments or other parties to provide information on the status of listed species or to initiate reclassification or delisting actions.

Issue 107: One respondent claimed the Service missed the administrative deadline for publishing a final rule for these species. Based on our **Federal Register** notice of July 9, 1996, (61 FR 36021) to reopen the comment period, this commenter was unclear as to whether the mussels faced "imminent threat" on the basis of the Service statement that the proposals were a "Tier 2 priority" for listing.

Response: The congressional moratorium on final decisions on proposed listings, from April 1995 to April 1996, precluded publication of a final rule for these species by the Act's administrative deadline of August 3,

1995 (see "Previous Federal Action" section). The Service published listing priority guidance to address the backlog of listing activities as a result of the moratorium (March 11, 1996 (61 FR 9651), May 16, 1996 (61 FR 24722), September 17, 1996 (61 FR 48962), December 5, 1996 (61 FR 64475), and October 23, 1997 (62 FR 55268). The guidance assigned the processing of a final decision for these seven mussels to Tier 2 (resolving the listing status of outstanding proposed rules).

The Service also solicited the expert opinions of 60 scientists with knowledge of mussels and sampling methodologies, including most North American malacologists. They were asked to comment on the adequacy of the status survey in supporting the proposed rule. Responses were received from 37 individuals and pertinent comments were incorporated into this final rule.

Generally, the independent reviewers strongly supported the listing proposal. Many agreed with the Service's concerns about the threats to these species, including loss of riverine habitat, vulnerability of specific stages of the life histories, and impaired reproduction. Seven malacologists stated that the status survey was one of the most comprehensive studies they were aware of.

Two malacologists suggested that the Service withdraw the proposed rule and conduct further studies, but provided no specific information justifying the withdrawal of the listing proposal. However, in a written statement read at two of the public hearings, one of these malacologists stated that "the integrity of the current study is not questioned" (P. Yokley, Jr., University of North Alabama, *in litt.* 1995).

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that the fat threeridge, shinyrayed pocketbook, Gulf moccasinshell, Ochlockonee moccasinshell, and oval pigtoe should be classified as endangered species, and the Chipola slabshell and purple bankclimber should be classified as threatened species. Procedures found at Section 4(a)(1) of the Act and regulations implementing the listing provisions of the Act (50 CFR part 424) were followed. 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). These factors and their application to

the fat threeridge (*Amblema neisleri*), shinyrayed pocketbook (*Lampsilis subangulata*), Gulf moccasinshell (*Medionidus penicillatus*), Ochlockonee moccasinshell (*Medionidus simpsonianus*), oval pigtoe (*Pleurobema pyriforme*), Chipola slabshell (*Elliptio chipolaensis*), and purple bankclimber (*Elliptoideus sloatianus*) are as follows.

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

Historically, mussel faunas in the United States have declined extensively as an unintended consequence of human development (Havlik and Marking 1987, Neves 1993). The mussel fauna in much of the Apalachicola Region has been negatively impacted by impoundments, siltation, channelization, and by water pollution. The cumulative effect of these factors on the aquatic ecosystems of the ACF River basin has not been systematically evaluated; an ongoing USGS National Water Quality Assessment is currently addressing this task (Couch *et al.* 1996).

Impoundments have permanently altered a significant portion of the ACF River system, which has 16 mainstem impoundments. Impoundments affect mussels by altering current, substrate (Sickel 1981, Holland-Bartels and Waller 1987), and water chemistry (Allan and Flecker 1993, Stansbery 1995), factors which are important to riverine mussels. Lack of mussel recruitment in impoundments may be due to loss of glochidia in the substrate, attacks on glochidia by microorganisms, or the juveniles' inability to survive in silt (Ellis 1929, Scruggs 1960, Williams 1969, Fuller 1974).

The Chattahoochee River has 13 dams, including three locks and dams along its lower half; the lower mainstem is inundated for approximately 400 km (248 mi). An additional 85 km (53 mi) of mainstem habitat are impounded upstream of Atlanta, making approximately 485 km (301 mi) of the mainstem's 700 km (434 mi) total length (69 percent) impounded. The lower portions of many tributaries were permanently flooded because of these reservoirs, including a known site for the shinyrayed pocketbook in Walter F. George Reservoir (Clench and Turner 1956).

Impoundments have altered approximately 175 km (109 mi) of 600 km (372 mi), or 29 percent, of mainstem riverine habitat on the Flint River. Preimpoundment records from Seminole and Blackshear reservoirs exist for the fat threeridge and oval pigtoe (one site each), the Gulf moccasinshell and purple bankclimber

(two sites each), and the shinyrayed pocketbook (three sites) (Clench 1955, Clench and Turner 1956).

Talquin Reservoir inundated approximately 32 km (20 mi) of riverine habitat (of a total of 278 km [172 mi] of mainstem, or 12 percent impounded) in the middle portion of the Ochlockonee River and the lower 5 km (3 mi) of the Little River, its largest tributary. Preimpoundment records exist for four of these species from a site at the upstream end of Talquin Reservoir (Clench and Turner 1956). This impoundment may have flooded habitat for the Ochlockonee arc mussel, believed to be extinct (Williams and Butler 1994), and may block potential host fish movements for other mussels. The shinyrayed pocketbook, Ochlockonee moccasinshell, and oval pigtoe were absent downstream of the dam. Only occasional populations of the purple bankclimber were found in this portion of the river.

Populations of the shinyrayed pocketbook, Gulf moccasinshell, and purple bankclimber have been isolated due to major impoundments on the Apalachicola, Flint, and Ochlockonee rivers. Smaller impoundments on tributary streams in the region have resulted in further population isolation of some of the species.

A navigation channel is maintained on the Chattahoochee and Apalachicola rivers from Columbus, Georgia, to the Gulf Coast, a distance of approximately 325 km (200 mi), and the lower 50 km (30 mi) of the Flint River. River habitat and stable benthic substrates have been altered in significant portions of this system. None of these seven mussels occur in the navigation channels of the Chattahoochee or Flint rivers. The fat threeridge and the purple bankclimber occur in portions of the Apalachicola River that have a navigation channel. The Corps and the Service have agreed on procedures to minimize impacts to these species when navigation maintenance is carried out (see "Available Conservation Measures" section).

Many regional streams have increased turbidity levels due to siltation. These seven mussels probably attract host fishes with visual cues. Such a reproductive strategy depends on clear water. Turbidity is a limiting factor impeding sight-feeding fishes (Burkhead and Jenkins 1991), and may have contributed to the decline of these seven species.

Light to moderate levels of siltation are common in many Apalachicola Region streams with populations of these seven species, while heavy siltation has occurred in the Piedmont,

which is well known for its highly erodible soils. Most of the topsoil in the Piedmont was eroded by 1935 (Wharton 1978). Clench (1955) attributed the decline of the rich mussel fauna of the Chattahoochee River to erosion from intensive farming before the Civil War. The steep slopes characteristic of the Fall Line Hills and the Piedmont result in higher erosion rates than slopes on more level lands (Pimentel *et al.* 1995).

Couch *et al.* (1996) indicated that all parts of the ACF Basin have been subject to alteration of forest cover. They attributed severe historical erosion and sedimentation in the Blue Ridge Province to mining and logging. The Service believes that while deforestation historically represented a threat to these mussels, current silvicultural activities following best management practices are compatible with the continued existence of the species (see Available Conservation Measures' section).

Because of their sedentary characteristics, mussels are extremely vulnerable to toxic effluents (Sheehan *et al.* 1989; Goudreau *et al.* 1993). There are discharges from 137 municipal waste water treatment facilities in the ACF River basin. Although the quality of effluents has improved since the 1980's due to improved waste water treatment and a 1990 phosphate detergent ban in Georgia, two-thirds of the 938 stream miles in the Georgia portion of the ACF River basin do not meet the designated water use classifications under the requirements of the Clean Water Act (Couch *et al.* 1996).

Agricultural influences include nutrient enrichment from confined feeding of poultry and livestock (primarily in the Piedmont Province), and inputs of pesticides and fertilizers from row crop agriculture (primarily in the Coastal Plain) (Couch *et al.* 1996).

An estimated 3.6 billion liters (0.95 billion gallons) of chemical-laden rinse, stripping, cleaning, and plating solutions were discharged through a short canal into the Flint River from 1955 to 1977 at a Department of Defense facility in Albany, Georgia (P. Laumeyer, Fish and Wildlife Service, pers. comm.). The Service believes the long-term release of this effluent likely had, and may continue to have, a chronic toxic effect on Flint River mussel populations. The canal and other portions of the facility are a Superfund site.

Abandoned battery salvage operations affect water quality in the Chipola River. Concentrations of heavy metals (e.g., chromium and cadmium) in Asian clams and sediments increased in samples taken downstream from two

operations (Winger *et al.* 1985). Dead Lake, on the lower mainstem, was considered a contaminant sink. Chromium was found at levels known to be toxic to mussels (Havlik and Marking 1987) in sediment samples from Dead Lake downstream (Winger *et al.* 1985). A large population of the fat threeridge has been extirpated in Dead Lake, possibly from such contamination.

Residential development in Georgia is resulting in the conversion of farmland to subdivisions in areas relatively distant from the cities of Albany, Atlanta, and Columbus. Development and land clearing increases siltation from erosion, runoff and transport of pollutants from stormwater, and municipal waste water facility effluents. Lenat and Crawford (1994) found that in Piedmont drainages, urban catchments had higher maximum average concentrations of heavy metals than agricultural or forested catchments. Urban waterways may harbor human-produced contaminants in concentrations sufficient to significantly affect fish health (Ostrander *et al.* 1995).

Additional water supply impoundments may be planned to satisfy expanding urban and suburban demand. Any impoundments on streams that support these species may have impacts on their long-term survival. Impoundments on streams that do not harbor these species could be designed in ways to minimize or eliminate potential impacts to these mussels and their habitat downstream. Future impoundments, particularly in the metropolitan Atlanta area, could impact stream habitats where small populations of the shinyrayed pocketbook, Gulf moccasinshell, and oval pigtoe exist.

In-stream and near-stream gravel mining has occurred in various portions of the Apalachicola Region. Jenkinson (1973) recorded the shinyrayed pocketbook, oval pigtoe, Gulf moccasinshell, and ten other species in Little Uchee Creek, a tributary of the Chattahoochee River in Alabama. The creek had supported in-stream gravel mining; only a few shell fragments were found at Jenkinson's site in the status survey, although living shiny-rayed pocketbooks were found at another site in Little Uchee Creek. Gravel mining operations in the Chattahoochee River do not pose a threat to these mussels since no populations exist there now. However, where in-stream gravel operations are conducted in the vicinity of populations of these species, mussels may be displaced, crushed, or covered by bottom materials.

Some artifact and fossil collectors have used suction dredges to scour

benthic habitats in the ACF system. This can destroy mussel habitat at the collection site and resuspend silt, impacting downstream areas. In a study on the effects of suction dredging for gold on stream invertebrates, Harvey (1986) concluded that impacts from suction dredges can be expected to be more severe in streams with softer substrates (e.g., sand, gravel), as is typical for most Apalachicola Region streams.

Many of the impacts discussed above occurred in the past as unintended consequences of human development in the Apalachicola Region. Improved understanding of these consequences has led to regulatory (e.g., the Clean Water Act) and voluntary measures (e.g., best management practices for agriculture and silviculture) and improved land use practices that are generally compatible with the continued existence of these mussels. Nonetheless, the seven mussel species currently are highly restricted in numbers and distribution and show little evidence of recovering from historic habitat losses.

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

The threeridge (a relative of the fat threeridge) and the washboard (*Megalonaias nervosa*), which is superficially similar to both the fat threeridge and purple bankclimber, are heavily utilized as sources of shell for nuclei in the cultured pearl industry. The Service has been informed by commercial shell buyers that shells from the ACF River system are of poor quality. However, shell material from this area may be used as "filler" for higher quality material from elsewhere (J. Brim Box, USGS, Gainesville, Florida, pers. comm.). In the 1980's, the price of shell increased, resulting in increased competition for the harvesting of shell beds in the Apalachicola Region.

Biological supply companies have used the Flint River and possibly the Ochlockonee River as sources for large mussel specimens, including the purple bankclimber and possibly the fat threeridge, to sell to academic institutions for use in laboratory studies. The practice of dissecting mussels in introductory laboratory courses is no longer widespread, and the threat posed to large species such as the fat threeridge and purple bankclimber is probably decreasing.

Nonetheless, harvest of the fat threeridge and purple bankclimber for these purposes could decimate their remaining populations (see Factor D in this section). The increasing rarity of

these mussels potentially makes them more appealing to shell collectors. Revealing specific stream reaches harboring these species could pose a threat from collectors (see "Critical Habitat" section below).

State regulations now in effect should deter or prevent the threat from commercial collecting (see Factor D below).

C. Disease or Predation

Diseases of mussels are virtually unknown; this factor is not currently known to affect these seven species.

Juvenile and adult mussels may serve as prey for various animals, mostly fishes, turtles, birds, and mammals (Fuller 1974). The muskrat has been implicated in potentially jeopardizing recovery of federally listed mussels (Neves and Odum 1989). Although muskrats are not common within the range of these species, Piedmont populations of the shinyrayed pocketbook, Gulf moccasinshell, and oval pigtoe in the upper Flint River system may be subject to some degree of muskrat predation.

D. The Inadequacy of Existing Regulatory Mechanisms

A scientific collecting permit is required in the State of Georgia to collect mussels for scientific purposes. Commercial harvest in Georgia is allowed only for the washboard. Mechanical harvest of mussels is illegal. Commercially harvested mussels in Georgia must be large enough to not pass through a 102 mm (4.0 in) ring. The harvest season is from April 1 to August 31. Hand-picking mussels requires a resident or non-resident fishing license. Despite permit requirements, enforcement is difficult and there are no present restrictions on sites of harvest or quantity taken in Georgia. Although not a target species, the purple bankclimber is superficially similar to the commercially exploited washboard to be potentially threatened (see Factor B in this section). The fat threeridge is probably extirpated from Georgia (Butler 1993).

Mussel harvest in Florida is deemed non-profitable due to the absence of large populations of desirable species and poor shell quality, but there is potential for harvest of the fat threeridge and purple bankclimber. In July 1996, the State of Florida enacted a moratorium on commercial mussel harvest (G.L. Warren, FGFWFC, pers. comm.). Limited collection of mussels under a State permit is allowed for scientific or other non-commercial purposes. Alabama has commercial harvest guidelines, including species

size limits, restricted harvest areas, and closed seasons. Of these seven mussels, only the shinyrayed pocketbook is found in Alabama, and it is not a commercially sought species.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Because of slow growth and relative immobility, mussel recolonization of impacted river reaches is a lengthy process, achieved by dispersal of newly metamorphosed juveniles via infected host fish, passive adult movement downstream (Neves 1993), and active migration or passive movement downstream of small individuals (Kat 1982). Establishment of self-sustaining populations requires decades of immigration and recruitment, even for common species that may occur in high densities (Neves 1993). A mussel species should be considered stable only when active population recruitment is demonstrated and a significant number of viable populations exists (A.E. Bogan, North Carolina State Museum, *in litt.* 1995).

The exotic Asian clam (*Corbicula fluminea*) has invaded all of the rivers where these seven mussels occur. First reported from the Apalachicola Region about 1960 (Schneider 1967), this species may compete with native mussels for nutrients and space (Clarke 1983, 1986). Densities of Asian clams are sometimes high in Apalachicola Region streams, with estimates ranging from approximately 100/m (9/ft) square (Flint River, Sickel 1973) to over 2,100/m (195/ft) square (Santa Fe River, Bass and Hitt 1974). In some streams, the substrate has changed from homogenous silty sand or sand to one with a gravel-like component comprised of huge numbers of live and dead Asian clams.

Buttner and Heidinger (1981) estimated that an Asian clam could filter an average of 347 milliliters (12.1 ounces) of water per hour. Clarke (1983) hypothesized that at a density of 250/m (22/ft) square in a 1 m (3.3 ft) deep river flowing at 1.6 km (1 mi) per hour, Asian clams could filter 95 percent of the phytoplankton out of the water over 38 river km (24 river mi). Clarke (1986) believed the Asian clam posed a threat to the survival of the endangered Tar spiny mussel (*Elliptio steinstansana*) in North Carolina. Heard (1977) noted the disappearance of local ACF River system mussel populations concurrent with colonization of the Asian clam. Kraemer (1979) stated that the Asian clam may outcompete native mussels in altered streams.

Another introduced bivalve, the zebra mussel (*Dreissena polymorpha*), has caused the extirpation of numerous

native mussel populations and may pose a threat to these mussels in the future. Introduced into the Great Lakes in the late 1980's, this exotic species has been rapidly expanding its range in the South, but has not been reported yet from Apalachicola Region streams.

The complex life cycle of mussels increases the probability that weak links in their life history will preclude successful reproduction and recruitment (Neves 1993). Egg formation and fertilization are critical phases in the life history, because many mussels fail to form eggs (Downing *et al.* 1989) or fertilization is incomplete (Matteson 1948). Fertilization success has been shown to be strongly correlated with spatial aggregation; excessively dispersed populations may have poor success (Downing *et al.* 1993). The need for specific fish hosts and the difficulty in recolonizing areas where mussels have been decimated are other life history attributes which make them vulnerable (see "General Biology" in the "Background" section).

These seven species have been rendered vulnerable to extinction due to significant habitat loss, range restriction, and population fragmentation and size reduction. Most of their populations have been extirpated from the Piedmont portion of their historical ranges, four of five species are extirpated from Alabama, and none of the species remain in the Chattahoochee River. The restricted distribution of these seven species also makes localized populations susceptible to catastrophic events and collection.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by these seven mussels in determining to make this final rule. Based on this evaluation, the preferred action is to list the fat threeridge, shinyrayed pocketbook, oval pigtoe, Gulf moccasinshell, and Ochlockonee moccasinshell as endangered species, and the Chipola slabshell and purple bankclimber as threatened species.

The fat threeridge, shinyrayed pocketbook, oval pigtoe, Gulf moccasinshell, and Ochlockonee moccasinshell are in danger of extinction throughout all or a significant part of their range as follows:

Fat threeridge: This species historically occurred in the Flint, Apalachicola, and Chipola rivers, and is currently known from six sites on the latter two rivers. It has been extirpated from the Flint River, which included most of its historic range. It has disappeared from most of the historical sites where it was formerly found, and

only seven percent of sampled sites within the historic range still have live individuals. Limited recruitment of young appears to be occurring only at one site on the lower Apalachicola River.

Shinyrayed pocketbook: This species historically occurred in the ACF, Chipola, and Ochlockonee River systems. It now occurs at only 21 percent of the historical sites sampled, and is extirpated from the mainstems of the ACF rivers. Populations have declined significantly in the Chipola River. The species occurs at 29 sites in tributaries of the ACF rivers and the Chipola and Ochlockonee rivers. Only two sites show evidence of recruitment; however, the largest known population shows no signs of recruitment.

Gulf moccasinshell: This species historically occurred in the ACF, Chipola, Choctawhatchee, and Yellow River systems and in Econfin Creek. It is no longer present at most of the historical sites sampled, and is apparently extirpated from the Apalachicola, Choctawhatchee, and Yellow rivers. There are 13 known sites, none showing evidence of recruitment.

Ochlockonee moccasinshell: This species occurred historically only in the Ochlockonee River system. It was formerly known from eight sites. It is now known only from two sites, where there is no evidence of recruitment. Only three live individuals have been found since 1974.

Oval pigtoe: This species was historically found throughout the ACF, Chipola, Ochlockonee, and Suwannee River systems, and in Econfin Creek. It occurred at one-third of the historical sites sampled. It has been extirpated from the mainstem of the Chattahoochee River, representing a significant portion of its historical range; occurrences in the Flint and Suwannee River systems have decreased from 32 to 12. The species is currently known to occur at 26 sites, with no evidence of recruitment.

The Chipola slabshell and purple bankclimber are likely to become endangered species in the foreseeable future throughout all or a significant part of their range:

Chipola slabshell: This species occurred historically at eight sites in the Chipola River and one site in the Chattahoochee River system. It is currently known from five sites in the Chipola River. This species appears to have some tolerance of soft sediments and, therefore, has more habitat potentially available than the other species in this rule. It was, however, found only at nine percent of the sites sampled within its historic range, and

there is no current evidence of recruitment.

Purple bankclimber: This species historically occurred in the ACF, Chipola, and Ochlockonee River systems. It currently occurs in the Apalachicola, Flint, and Ochlockonee rivers, with 41 sites known. It may be extirpated from the Chattahoochee and Chipola rivers. There is some evidence of recruitment at one site in the Apalachicola River.

Critical Habitat

Critical habitat is defined in section 3 of the Act as: (i) the specific areas within the geographical area occupied by a 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) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures needed to bring the species to the point at which listing under the Act is no longer necessary.

Section 4(a)(3) of the Act, as amended, requires that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time a species is determined to be endangered or threatened. The Service's regulations at 50 CFR 424.12(a)(1) state that designation of critical habitat is not prudent when one or both of the following situations exist: (1) The species is threatened by taking or other activity and the identification of critical habitat can be expected to increase the degree of threat to the species or (2) such designation of critical habitat would not be beneficial to the species. The Service finds that designation of critical habitat is not prudent for these species. Such a determination would result in no known benefit to these species, and designation of critical habitat could further pose a threat to them through publication of their site-specific localities.

Critical habitat designation, by definition, directly affects only Federal agency actions. Since these seven mussel species are aquatic throughout their life cycles, Federal actions that might affect these species and their habitats include those with impacts on stream channel geometry, bottom substrate composition, water quantity and quality, and stormwater runoff. Such activities would be subject to review under section 7(a)(2) of the Act,

whether or not critical habitat was designated. 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 a listed species or to destroy or adversely modify its critical habitat. The fat threeridge, shinyrayed pocketbook, Gulf moccasinshell, Ochlockonee moccasinshell, oval pigtoe, Chipola slabshell and purple bankclimber have become so restricted in distribution that any significant adverse modification or destruction of their occupied habitats would likely jeopardize their continued existence. This would also hold true as the species recovers and its numbers increase. As part of the development of this final rule, Federal and State agencies were notified of the mussels' general distributions, and they were requested to provide data on proposed Federal actions that might adversely affect the species. Should any future projects be proposed in areas inhabited by these mussels, the involved Federal agency will already have the general distributional data needed to determine if the species may be impacted by their action, and if needed, more specific distributional information would be provided. Therefore, habitat protection for these seven species can be accomplished through the section 7 jeopardy standard and there is no benefit in designating currently occupied habitat of these species as critical habitat.

Recovery of these species will require the identification of unoccupied stream and river reaches appropriate for reintroduction. The Service is currently working with the State and other Federal agencies to periodically survey and assess habitat potential of stream and river reaches for listed and candidate aquatic species within the ACF and Ochlockonee river systems and the Yellow and Santa Fe rivers. (For the Apalachicola River, for example, see the discussion under "Available Conservation Measures" below.) This process provides up-to-date information on instream habitat conditions in response to land use changes within watersheds. Information generated from surveys and assessments is disseminated through Service coordination with other agencies. The Service will work with State and Federal agencies, as well as private property owners and other affected parties, through the recovery process to identify stream reaches and potential sites for reintroduction of these species. Thus, any benefit that might be provided by designation of unoccupied

habitat as critical will be accomplished more effectively with the current coordination process and is preferable for aquatic habitats which change rapidly in response to watershed land use practices. In addition, the Service believes that any potential benefits to critical habitat designation are outweighed by additional threats to the species that would result from such designation, as discussed below.

Though critical habitat designation directly affects only Federal agency actions, this process can arouse concern and resentment on the part of private landowners and other interested parties. The publication of critical habitat maps in the **Federal Register** and local newspapers, and other publicity or controversy accompanying critical habitat designation may increase the potential for vandalism as well as other collection threats (See Factor B under "Summary of Factors Affecting the Species"). For example, in 1993 the Alabama sturgeon was proposed for endangered status with critical habitat (59 FR 33148). Critical habitat included the lower portions of the Alabama, Cahaba, and Tombigbee rivers in south Alabama. The proposal generated thousands of comments with the primary concern that the actions would devastate the economy of the State of Alabama and severely impact adjoining States. There were reports from State conservation agents and other knowledgeable sources of rumors inciting the capture and destruction of Alabama sturgeon. A primary contributing factor to this controversy was the proposed designation of critical habitat for the sturgeon.

The seven mussel species addressed in this proposal are especially vulnerable to vandalism. They all are found in shallow shoals or riffles in restricted stream and river segments and are relatively immobile and unable to escape collectors or vandals. They inhabit remote but easily accessed areas, and they are sensitive to a variety of easily obtained commercial chemicals and products. Because of these factors, vandalism or collecting could be undetectable and uncontrolled.

All known populations of these seven mussel species occur in streams flowing through private lands. One threat to all surviving populations of these seven species appears to be pollutants in stormwater runoff that originate from private land activities (see Factor A). Therefore, the survival and recovery of these mussels will be highly dependent on landowner cooperation in reducing land use impacts. Controversy resulting from critical habitat designation has been known to reduce private

landowner cooperation in the management of species listed under the Act (e.g., spotted owl, golden cheeked warbler). The Alabama sturgeon experience suggests that critical habitat designation could affect landowner cooperation within watersheds occupied by these seven mussels.

Based on the above analysis, the Service has concluded critical habitat designation would provide little additional benefit for these species beyond those that would accrue from listing under the Act.

The Service also concludes that any potential benefit from such a designation would be offset by an increased level of vulnerability to vandalism or collecting, and by a possible reduction in landowner cooperation to manage and recover these species. The designation of critical habitat for these seven mussel species is not prudent.

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 local agencies, private organizations, 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)(4) requires Federal agencies to confer informally with the Service on any action that is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, 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 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.

The Service notified Federal agencies that may have programs which could affect these species. Navigation maintenance on the Apalachicola River has the potential to impact the fat threeridge and purple bankclimber. These species are concentrated in two short reaches of the Apalachicola River that have only minimal dredging requirements. The Service and the Corps have agreed on the following criteria to address potential navigational impacts—(1) dredging and dredge material disposal can continue without further coordination with the Service in all areas where these mussels were not found during the status survey and in areas where the Corps has dredged or disposed dredge material since 1991; and (2) in areas that do not meet the first criterion, the Corps will consult further with the Service to determine if modifications of their channel maintenance activities are needed to protect the species. These further consultations may require the Corps to conduct additional mussel surveys prior to initiating channel maintenance activities. The Corps and the Service have established an effective working relationship on this issue, and will make every effort to continue navigation maintenance while protecting listed mussels. If conflict arises, potential measures for resolution include relocation of the channel alignment, disposal areas, or mussels.

A water supply reservoir is under consideration on Line Creek in the upper Flint River system, in Cowetta and Fayette counties, Georgia. This project would inundate historical habitat for the shinyrayed pocketbook and oval pigtoe. The project applicant, Fayette County, will need to secure a permit pursuant to section 404 of the CWA. In survey efforts made subsequent to the status survey, however, none of these seven species were found, and there is very little suitable habitat in the area to be affected by the proposed dam and reservoir. One live shinyrayed pocketbook was found several miles downstream of the proposed dam site, but the Service does not believe the proposed project will affect this area. Therefore, listing of this species will not affect the project.

The Corps is responsible for operating the reservoirs and channel structures in the ACF Basin for a variety of purposes, including navigation, flood control, water supply, fish and wildlife resources, recreation, and hydropower. Water allocation formulae are being developed in conjunction with an Interstate Water Compact involving the

States of Alabama, Florida, and Georgia, to provide for the needs of these States. Any allocation formula that might affect the seven mussels will require section 7 consultation between the Corps and the Service.

No other specific Federal actions were identified that would likely affect any of the species. Federal activities for which potential effects to the species would be reviewed include the issuance of permits for reservoir construction, stream alterations, waste water facility development, water withdrawal projects, pesticide registration, agricultural assistance programs, mining, road and bridge construction, Federal loan programs, water allocation, and hydropower relicensing. However, it has been the experience of the Service that nearly all section 7 consultations have been resolved so that the species has been protected and project objectives met.

The Act and implementing regulations found at 50 CFR 17.21 and 17.31 set forth a series of general prohibitions and exceptions that apply to all endangered and threatened 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, 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 is also illegal to possess, sell, deliver, carry, transport, or ship any such 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 and threatened wildlife species under certain circumstances. Regulations governing permits are at 50 CFR 17.22 and 17.32. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. For threatened species, permits also are available for zoological exhibition, educational purposes, or special purposes consistent with the purposes of the Act.

It is the policy of the Service (59 FR 34272) to identify at the time of listing, to the maximum extent practicable, those activities that would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of these listings on proposed and ongoing activities within a species'

range. During the public comment period, comments were received questioning the effect these listings would have on private landowners (see response to Issues 69, 76, and 81 in the "Summary of Comments and Recommendations" section), normal agricultural activities (see response to Issue 84), silvicultural practices (see response to Issue 79), and commercial fishing (see response to Issue 92). The Service believes, based on the best available information as outlined in the "Summary of Comments and Recommendations" section of this rule, that the aforementioned actions will not result in a violation of section 9 provided the activities are carried out in accordance with any existing regulations, permit requirements, and best management practices. The Service also believes that most other human activities will not result in a section 9 violation. These include use of the river by boaters, anglers, and other existing recreational uses.

Activities that the Service believes could potentially result in "take" of these mussels include, but are not limited to, (1) unauthorized collection or capture of the species; (2) unauthorized destruction or alteration of the species' habitat (e.g., in-stream mining, channelization, discharge of fill material); (3) violation of any discharge or water withdrawal permit; and (4) illegal discharge or dumping of toxic chemicals or other pollutants into waters supporting these species.

Activities not identified in the above two paragraphs will be reviewed on a

case-by-case basis to determine if a violation of section 9 of the Act may have occurred. The Service does not consider these lists to be exhaustive and provides them as information to the public.

Questions regarding whether specific activities will constitute a violation of section 9 should be directed to the Field Supervisor of the Service's Jacksonville, Florida Field Office (see ADDRESSES section) or the Field Supervisor of the Service's Panama City, Florida Field Office (U.S. Fish and Wildlife Service, 1612 June Avenue, Panama City, Florida 32405, telephone 904/769-0552). Requests for copies of the regulations on listed species and inquiries regarding prohibitions and permits should be addressed to the U.S. Fish and Wildlife Service, Ecological Services, 1875 Century Boulevard, Suite 200, Atlanta, Georgia 30345-3301 (404/679-7313).

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment, as defined under the authority of the NEPA of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Act. A notice outlining the Service's reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

Required Determinations

This rule does not contain collections of information that require approval by the OMB under 44 U.S.C. 3501 et seq.

References Cited

A complete list of all references cited herein, as well as others, is available upon request from the Field Supervisor (see ADDRESSES section).

Author

The primary author of this final rule is Mr. Robert S. Butler, U.S. Fish and Wildlife Service, Asheville Field Office, 160 Zillicoa Street, Asheville, North Carolina 28801 (704/258-3939).

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

Accordingly, the Service amends part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

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 section 17.11(h) by adding the following, in alphabetical order under CLAMS, to the List of Endangered and Threatened Wildlife:

§ 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	*	*	*	*	*		*
* Bankclimber, purple	* <i>Elliptioideus sloatianus</i> .	* U.S.A. (AL, FL, and GA).	* NA	* T	* 633	* NA	* NA
* Moccasinshell, Gulf	* <i>Medionidus penicillatus</i> .	* U.S.A. (AL, FL, and GA).	* NA	* E	* 633	* NA	* NA
* Moccasinshell, Ochlockonee.	* <i>Medionidus simpsonianus</i> .	* U.S.A. (FL and GA)	* NA	* E	* 633	* NA	* NA
* Pigtoe, oval	* <i>Pleurobema pyriforme</i> .	* U.S.A. (AL, FL, and GA).	* NA	* E	* 633	* NA	* NA
* Pocketbook, shinyrayed.	* <i>Lampsilis subangulata</i> .	* U.S.A. (AL, FL, and GA).	* NA	* E	* 633	* NA	* NA
* Slabshell, Chipola	* <i>Elliptio chipolaensis</i>	* U.S.A. (AL and FL)	* NA	* T	* 633	* NA	* NA

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
* Threeridge, fat	* <i>Amblema neislerii</i> ...	* U.S.A. (FL and GA)	* NA	* E	* 633	* NA	* NA
*	*	*	*	*	*		*

Dated: January 23, 1998.

Jamie Rappaport Clark,

Director, Fish and Wildlife Service.

[FR Doc. 98-6493 Filed 3-13-98; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 630

[I.D. 021998C]

North and South Atlantic Swordfish Fishery; Directed Fishery Closure

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Closure.

SUMMARY: NMFS has projected that the directed fishery quota for the second semiannual 1997 North and South Atlantic swordfish season (December 1, 1997, to May 31, 1998) will be reached on or before March 31 and April 15, 1998, respectively. Consequently, NMFS closes the directed fishery for the North Atlantic swordfish fishery effective March 31, 1998, and for the South Atlantic swordfish fishery effective April 15, 1998. The intent of this closure is to prevent overharvest of the quotas established by the International Commission for the Conservation of Atlantic Tunas (ICCAT) for the directed North and South Atlantic Swordfish Fishery.

DATES: The closure is effective at 6 p.m., local time, on March 31 through May 31, 1998, for the North Atlantic swordfish fishery, and at 6 p.m., local time, on April 15 through May 31, 1998, for the South Atlantic swordfish fishery.

FOR FURTHER INFORMATION CONTACT: Jill Stevenson, 301-713-2347, or Buck Sutter, 813-570-5447.

SUPPLEMENTARY INFORMATION: The U.S. Atlantic swordfish fishery is managed under the Fishery Management Plan for Atlantic Swordfish and its implementing regulations at 50 CFR part 630 under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (16

U.S.C. 1801 *et seq.*) and the Atlantic Tunas Convention Act (ATCA; 16 U.S.C. 971 *et seq.*). Regulations issued under the authority of ATCA carry out the recommendations of ICCAT.

The regulations governing the Atlantic swordfish fisheries at § 630.24 provide for a specified annual quota to be landed by the directed fishery. The annual quota is divided into two semiannual quotas for each of the 6-month periods, June 1 through November 30, and December 1 through May 31. NMFS is required, under § 630.25(a)(1), to monitor the catch and landings statistics and, on the basis of these statistics, to project a date when the catch will equal the quota, and to announce the closure by publication in the **Federal Register**. ICCAT delineates Atlantic swordfish stocks north and south of 5° N. lat. On October 24, 1997 (62 FR 55357), consistent with ICCAT's recommendations, NMFS established a U.S. quota for the North Atlantic swordfish fishery of 2,464 metric tons dressed weight (mt dw), established a U.S. quota for the South Atlantic swordfish fishery of 188 mt dw, and implemented the same management measures for the South Atlantic swordfish fishery as were in place for the North Atlantic swordfish fishery (i.e., logbook reporting, permitting, minimum size, transfer-at-sea, etc.).

New ICCAT Compliance Measures

In 1996, ICCAT recommended compliance measures in which member nations could be subject to restrictive trade measures and reduced quotas equal to a minimum of 125 percent of the excess harvest if North Atlantic swordfish quotas are repeatedly exceeded. These measures were recommended to be extended to the South Atlantic by ICCAT in 1997.

Closure of the North Atlantic Swordfish Fishery

The 1997 quota for the North Atlantic swordfish fishery of 2,464 mt dw is divided between the directed fishery (2,164 mt dw) and the incidental fishery (300 mt dw). The annual quota for the directed fishery is subdivided into longline/harpoon and drift gillnet quotas, with allocations of 2,121.2 and 42.8 mt dw, respectively. A final rule

issued under the Endangered Species Act closed the drift gillnet sector of the swordfish fishery until August 1, 1998, to avoid jeopardizing the continued existence of the North Atlantic right whale (62 FR 63467, December 1, 1997). The longline/harpoon quota is further divided into two equal semiannual quotas (1,060.6 mt dw) for the periods June 1 through November 30, and December 1 through May 31. Based on actual landings for December 1997 (169.5 mt dw) and January 1998 (208 mt dw), and using the highest reported landings during the period between 1995 to 1997 for February (365.8 mt dw) and March (250.8 mt dw), this would give a total of 994.2 mt dw projected through the end of March, 1998, or 90.73 percent of the quota. Based on logbook and tally sheet data from previous years, it is expected that the second semiannual North Atlantic harvest quota will be reached in mid-April, 1998. However, NMFS must account for delayed reporting and unpredictable catch levels and fishing effort to reduce the risk of exceeding U.S. swordfish quotas, which could invoke ICCAT penalties. Due to late reporting, which may take up to 6 months to correct, an additional factor of 65 mt dw is added to this estimate, giving a total of 1,059.2, or 99.86 percent of the quota. Therefore, NMFS announces that the directed North Atlantic swordfish fishery will close at 6 p.m., local time, on March 31, 1998. All swordfish in excess of the incidental catch limit must be offloaded by the time of the closure.

Closure of the South Atlantic Swordfish Fishery

The 1997 quota for the South Atlantic swordfish fishery is allocated solely to the directed longline fishery quota and is divided into two equal semiannual quotas of 94 mt, one for the period June 1 through November 30, and the other for the period December 1 through May 31, with no incidental harvest allowed following a closure of the fishery. Landings of swordfish in the South Atlantic swordfish fishery in the second semiannual season totaled 20.12 mt dw as of January, 1998. Reporting of swordfish landings by U.S.-flagged vessels in Atlantic waters south of 5° N