DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2011–0049; MO 92210–0–0009]

Endangered and Threatened Wildlife and Plants; Partial 90-Day Finding on a Petition To List 404 Species in the Southeastern United States as Endangered or Threatened With Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of petition finding and initiation of status review.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a partial 90-day finding on a petition to list 404 species in the southeastern United States as endangered or threatened under the Endangered Species Act of 1973, as amended (Act). Based on our review, we find that for 374 of the 404 species, the petition presents substantial scientific or commercial information indicating that listing may be warranted. Therefore, with the publication of this notice, we are initiating a status review of the 374 species to determine if listing is warranted. To ensure that the review is comprehensive, we are soliciting scientific and commercial information regarding these 374 species. Based on the status reviews, we will issue 12-month findings on the petition, which will address whether the petitioned action is warranted, as provided in section 4(b)(3)(B) of the Act. Of the 30 other species in the petition, 1 species—Alabama shad—has had a 90-day finding published by the National Marine Fisheries Service, and 18 species are already on the Service's list of candidate species or are presently the subject of proposed rules to list. We have not yet made a finding on the remaining 11 species, but anticipate doing so no later than September 30, 2011.

DATES: To allow us adequate time to conduct a status review, we request that we receive information on or before November 28, 2011. The deadline for submitting an electronic comment using the Federal eRulemaking Portal (see **ADDRESSES** section below) is 11:59 p.m. Eastern Standard Time on this date. After November 28, 2011, you must submit information directly to the Regional Office (see **FOR FURTHER INFORMATION CONTACT** section below). Please note that we may not be able to address or incorporate information that we receive after the above requested date.

ADDRESSES: You may submit information by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal: *http://www.regulations.gov.* In the Enter Keyword or ID box, enter Docket No. FWS–R4–ES–2011–0049, which is the docket number for this action. Then click on the Search button.

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, *Attn:* FWS–R4–ES–2011–0049; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We will not accept e-mail or faxes. We will post all information received on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see Request for Information section below for more details).

FOR FURTHER INFORMATION CONTACT: Janet Mizzi, Chief, Division of Endangered Species, Ecological Services, Southeast Regional Office, U.S. Fish and Wildlife Service, 1875 Century Blvd., Atlanta, GA 30345; by telephone at 404–679–7169; or by facsimile at 404–679–7081. If you use a telecommunications device for the deaf (TDD), please call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Request for Information

When we make a finding that a petition presents substantial information indicating that a species may be warranted for listing, we are required to promptly review the status of the species (status review). For the status reviews to be complete and based on the best available scientific and commercial information, we request information on the 374 species from governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning the status of the species. We seek information on:

(1) The species' biology, range, and population trends, including:

(a) Habitat requirements for feeding, breeding, and sheltering;

(b) Genetics and taxonomy;

(c) Historical and current range, including distribution patterns;

(d) Historical and current population levels, and current and projected trends; and

(e) Past and ongoing conservation measures for the species, its habitat, or both.

(2) The factors that are the basis for making a listing determination for a species under section 4(a) of the Act (16 U.S.C. 1531 *et seq.*), which are:

(a) The present or threatened destruction, modification, or curtailment of its habitat or range;

(b) Overutilization for commercial, recreational, scientific, or educational purposes;

(c) Disease or predation;

(d) The inadequacy of existing regulatory mechanisms; or

(e) Other natural or manmade factors affecting its continued existence.

(3) The potential effects of climate change on the species and their habitat.

If, after the status review, we determine that listing any of these species is warranted, it is our intent to propose critical habitat under section 4 of the Act, to the maximum extent prudent and determinable at the time we propose to list the species. Therefore, we also request data and information on:

(1) What may constitute ''physical or biological features essential to the conservation of the species,'' within the geographical range currently occupied by the species;

(2) Where these features are currently found;

(3) Whether any of these features may require special management considerations or protection;

(4) Specific areas outside the geographical area occupied by the species that are ''essential for the conservation of the species;'' and

(5) What, if any, critical habitat you think we should propose for designation if the species is proposed for listing, and why such habitat meets the requirements of section 4 of the Act.

Please include sufficient information with your submission (such as scientific journal articles, other supporting publications, or data) to allow us to verify any scientific or commercial information you include.

Submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your information concerning the status reviews or the 404 species by one of the methods listed in the **ADDRESSES** section. If you submit information via *http://www.regulations.gov,* your entire submission—including any personal

identifying information—will be posted on the Web site. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov.*

Information and supporting documentation that we received and used in preparing this finding is available for you to review at *http://www.regulations.gov,* or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Southeast Ecological Services Regional Office (see **FOR FURTHER INFORMATION CONTACT**).

Background

Section 4(b)(3)(A) of the Act requires that we make a finding on whether a petition to list, delist, or reclassify a species presents substantial scientific or commercial information indicating that a petitioned action may be warranted. We are to base this finding on information found in the petition, supporting information submitted with the petition, and information otherwise available in our files. To the maximum extent practicable, we are to make this finding within 90 days of our receipt of the petition, and publish our notice of this finding promptly in the **Federal Register**.

Our standard for substantial scientific or commercial information within the Code of Federal Regulations (CFR) with regard to a 90-day petition finding is ''that amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted'' (50 CFR 424.14(b)). If we find that substantial scientific or commercial information was presented, we are required to promptly conduct a species status review, which we subsequently summarize in our 12-month finding.

Petition History

On April 20, 2010, we received, via electronic mail, a petition from the Center for Biological Diversity (CBD), Alabama Rivers Alliance, Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council, West Virginia Highlands Conservancy, Tierra Curry, and Noah Greenwald (referred to below as the CBD petition) to list 404 aquatic, riparian, and wetland species from the southeastern United States as endangered or threatened species and to designate critical habitat concurrent with listing under the Act. The petition clearly identified itself as a petition, was dated, and included the identification information required at 50 CFR 424.14(a). On April 21, 2010, via electronic mail to Noah Greenwald at CBD, we acknowledged receipt of the petition. On May 10, 2010, the Southeast Region of the Service, to which the petition had been assigned, provided additional formal written acknowledgement of receipt of the petition.

The petitioners developed an initial list of species by searching NatureServe for species that ''occur in the twelve states typically considered the Southeast, occur in aquatic, riparian, or wetland habitats and appeared to be imperiled.'' Species were considered imperiled if they were classified as G1 or G2 by NatureServe, near threatened or worse by the International Union for Conservation of Nature (IUCN), or a species of concern, threatened, or endangered by the American Fisheries Society.

NatureServe conservation status ranks range from critically imperiled (1) to demonstrably secure (5). Status is assessed and documented at three distinct geographic scales: Global (G), national (N), and subnational (S) (i.e., state/province/municipal). Subspecies are similarly assessed with a subspecific (T) numerical assignment. Assessment by NatureServe of any species as being critically imperiled (G1), imperiled (G2), or vulnerable (G3) does not constitute a recommendation by NatureServe for listing under the Act. NatureServe status assessment procedures have different criteria, evidence requirements, purposes, and taxonomic coverage than government lists of endangered and threatened species, and therefore these two types of lists should not be expected to coincide. For example, an important factor in many legal listing processes is the extent to which a species is already receiving protection of some type—a consideration not included in the NatureServe conservation status ranks. Similarly, the IUCN and American Fisheries Society do not apply the same criteria to their ranking determinations as those encompassed in the Act and its implementing regulations.

On May 7, 2010, the Service received correspondence from the Southeastern Fishes Council, dated May 2, 2010, with an explanation of its involvement in formulation of the petition. The Council was contacted by CBD, which solicited the Council's involvement in the preparation of the subject petition. The Southeastern Fishes Council's members provided expertise in review of the CBD's list of fishes in the draft petition.

On May 27, 2010, the Freshwater Mollusk Conservation Society submitted a letter to the Regional Director, Fish and Wildlife Service, Southeast Region, in support of the CBD petition's inclusion of a large number of freshwater mollusks. On September 1, 2010, and again on October 1, 2010, CBD forwarded to the Regional Director, Service, Southeast Region, a letter of support for the subject petition from 35 conservation organizations.

The CBD submitted supplemental comments and information on October 6, 2010, in support of protecting the Panama City crayfish (*Procambarus econfinae*) under the Act. On December 13, 2010, we received a second petition, from Wild South, to list the Carolina hemlock (*Tsuga caroliniana*), as endangered and to designate its critical habitat. We acknowledged receipt of the petition in a letter dated December 20, 2010, and identified it as a second petition for the same species' as *Tsuga caroliniana* was one of the species identified in the CBD petition.

The CBD petition included 404 species for which the petitioners requested listing as endangered or threatened under the Act, and designation of critical habitat concurrent with the listing. It is our practice to evaluate all species petitioned for listing for the potential need to emergency list the species under the emergency provisions of the Act at section 4(b)(7) and as outlined at 50 CFR 424.20. We have carefully considered the information provided in the petition and in our files and have determined that emergency listing is not indicated for any of the 404 species in the petition.

The petition included 18 species that were already on the Service's list of candidate species at the time of receipt of the petition, including five that have since been proposed to be listed as endangered. A candidate species is one for which we have on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions. We may identify a species as a candidate for listing based on an evaluation of its status that we conducted on our own initiative, or as a result of making a finding on a petition to list a species that listing is warranted but precluded by other higher priority listing actions. Of the 404 species that are the subjects of the petition, 18 had already been placed on the candidate list as a result of our own review and evaluation. These include: sicklefin redhorse (*Moxostoma sp.* 2 (the

2 refers to one of two species within the genus that have not yet been officially classified)), laurel dace (*Phoxinus saylori*) ((currently proposed for listing as endangered (June 24, 2011; 75 FR 36035)), spectaclecase (*Cumberlandia monodonta*) ((currently proposed for listing as endangered (January 19, 2011; 76 FR 3392)), narrow pigtoe (*Fusconaia escambia*), round ebonyshell (*Fusconaia rotulata*), southern sandshell (*Hamiota australis*), sheepnose (*Plethobasus cyphyus*) ((currently proposed for listing as endangered (January 19, 2011; 76 FR 3392)), fuzzy pigtoe (*Pleurobema strodeanum*), southern kidneyshell (*Ptychobranchus jonesi*), rabbitsfoot (*Quadrula cylindrica cylindrica*), tapered pigtoe (*Fusconaia burkei*), Choctaw bean (*Villosa choctawensis*), rayed bean (*Villosa fabalis*) ((currently proposed for listing as endangered (November 2, 2010; 75 FR 67552)), black mudalia (*Elimia melanoides*), Coleman cave beetle (*Pseudanophthalmus colemanensis*), Black Warrior waterdog (*Necturus alabamensis*), and Yadkin River goldenrod (*Solidago plumosa*). We proposed to list the snuffbox (*Epioblasma triquetra*) as endangered on November 2, 2010 (75 FR 67552).

We conduct a review of all candidate species annually to ensure that a proposed listing is justified for each species, and reevaluate the relative listing priority number assigned to each species. We also evaluate the need to emergency list any of these species, particularly species with high priorities. Through this annual review we also add new candidate species and remove those that no longer warrant listing. This review and reevaluation ensure that we focus conservation efforts on those species at greatest risk first.

Because we have already made the equivalent of a 90-day and a 12-month finding on the species listed above, and they have already been identified as warranting listing, including five that we have proposed to list as endangered, we find the petition provides substantial scientific or commercial information indicating that these species may be warranted for listing.

The CBD petition includes one species, the Alabama shad (*Alosa alabamae*), that falls under the jurisdiction of the NMFS. According to the 1974 Memorandum of Understanding regarding jurisdictional responsibilities and listing procedures between the Service and NMFS, the NMFS has jurisdiction over species which either (1) Reside the majority portion of their lifetimes in marine waters, or (2) are species which spend part of their lifetimes in estuarine waters, if the majority portion of the remaining time (the time which is not spent in estuarine waters) is spent in marine waters. Based on this definition, NMFS has jurisdiction for the Alabama shad, and, accordingly, NMFS provided a letter to the Service, dated April 30, 2010, proposing to evaluate the subject petition, for the Alabama shad only, for the purpose of the 90-day finding and any required subsequent listing action. The NMFS published the 90-day finding for the Alabama shad on February 17, 2011 (76 FR 9320), and in that document announced its finding that the petition did not present substantial scientific or commercial information indicating that listing may be warranted for the Alabama shad.

Previous Federal Actions

A large number of the petitioned species have previously been considered for listing under the Act and were at one time or another assigned status as a category 1, 2, or 3C candidate species. A category 1 candidate species was one for which the Service had substantial information on hand to support the biological appropriateness of proposing to list as endangered or threatened, and for which development and publication of such a proposal was anticipated. A category 2 candidate species was one for which there was some evidence of vulnerability, but for which additional biological information was needed to support a proposed rule to list as endangered or threatened. A category 3C candidate was one that was proven to be more widespread than was previously believed and/or those that were not subject to any identifiable threats. These categories were discontinued in 1996 (December 5, 1996; 61 FR 64481) in favor of maintaining a list that only represented those species for which we have on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions.

The Service was previously petitioned to list two of the subject petitioned species, the Say's spiketail dragonfly (February 15, 1994) and the orangefin madtom (October 6, 1983), as endangered species. We published 90-day findings for Say's spiketail dragonfly on October 26, 1994 (59 FR 53776), and the orangefin madtom on January 16, 1984 (49 FR 1919), respectively, and 12-month findings on July 17, 1995 (60 FR 36380), and July 18, 1985 (50 FR 29238), respectively. Similarly, we previously proposed to list as endangered the Barrens topminnow (December 30, 1977; 42 FR 65209). However, that proposal was never finalized.

TABLE 1—PREVIOUS FEDERAL REGISTER NOTICES ADDRESSING THE PETITIONED SPECIES

FR Citation	Publication date	Action
74 FR 57804	11/9/2009	Endangered and Threatened Wildlife and Plants (ETWP): Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice on Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions; Proposed Rule.
61 FR 64481	12/5/1996	ETWP; Notice of Final Decision on Identification of Candidates for Listing as Endangered or Threatened.
61 FR 7596	02/28/1996	ETWP; Review of Plant and Animal Taxa That Are Candidates for Listing as Endangered or Threatened Species; Proposed Rule.
60 FR 36380	7/17/1995	ETWP; 12-Month Finding for a Petition To List the Say's Spiketail Dragonfly as Endangered.
59 FR 58982	11/15/1994	ETWP; Animal Candidate Review for Listing as Endangered or Threatened Species; Notice of Review.
59 FR 53776	10/26/1994	ETWP; 90-Day Finding for a Petition To List the Say's Spiketail Dragonfly as Endangered.
58 FR 51144	9/30/1993	ETWP; Review of Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review.
56 FR 58664	11/21/1991	ETWP; Annual Description of Progress on Listing Actions and Findings on Recycled Petitions.
56 FR 58804	11/21/1991	ETWP; Review of Animal Taxa for Listing as Endangered or Threatened Species; Notice of Review.
55 FR 17475	4/25/1990	ETWP; Annual Description of Progress on Listing Actions and Findings on Recycled Petitions.

TABLE 1—PREVIOUS FEDERAL REGISTER NOTICES ADDRESSING THE PETITIONED SPECIES—Continued

FR Citation	Publication date	Action
55 FR 6184	2/21/1990	ETWP; Review of Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review.
54 FR 554	1/6/1989	ETWP; Review of Animal Taxa for Listing as Endangered or Threatened Species; Notice of Review.
53 FR 52746	12/29/1988	ETWP; Findings on Pending Petitions and Description of Progress on Listing Actions.
53 FR 25511	7/7/1988	ETWP; Findings on Pending Petitions and Description of Progress on Listing Actions.
52 FR 24312	6/30/1987	ETWP; Findings on Pending Petitions and Description of Progress on Listing Actions.
51 FR 996	1/09/1986	ETWP; Findings on Pending Petitions and Description of Progress on Listing Actions.
50 FR 39526	9/27/1985	ETWP; Review of Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review.
50 FR 37958	9/18/1985	ETWP; Review of Vertebrate Wildlife.
50 FR 29238	7/18/1985	12-Month Finding on a Petition To List the Orangefin Madtom.
50 FR 19761	5/10/1985	ETWP; Findings on Pending Petitions and Description of Progress on Listing Actions.
49 FR 21664	5/22/1984	ETWP; Review of Invertebrate Wildlife for Listing as Endangered or Threatened Species.
49 FR 2485	1/20/1984	ETWP; Findings on Pending Petitions and Description of Progress on Listing Actions.
49 FR 1919	1/16/1984	ETWP; 90-Day Finding on a Petition To List the Orangefin Madtom.
48 FR 53640	11/28/1983	ETWP; Supplement to Review of Plant Taxa for Listing as Endangered or Threatened Species.
47 FR 58454	12/30/1982	ETWP; Review of Vertebrate Wildlife for Listing as Endangered or Threatened Species; Notice of Review.
45 FR 82480	12/15/1980	ETWP; Review of Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review.
44 FR 70796	12/10/1979	ETWP; Notice of Withdrawal of That Portion of Our June 16, 1976, Proposed Rule That Has Not Yet Been Finalized.
44 FR 44418	7/27/1979	ETWP; Reproposal of Critical Habitat for the Barrens Topminnow.
44 FR 12382	3/6/1979	ETWP; Withdrawal of Proposed Critical Habitat for the Barrens Topminnow.
43 FR 21702	5/19/1978	ETWP; Proposed Endangered Status and Critical Habitat for Two Species of Turtles (Key Mud Turtle and Plymouth Red-bellied Turtle).
43 FR 17909	4/26/1978	ETWP; Final Rule and Summary of General Comments Received in Response to a Proposal To List Some 1700 U.S. Vascular Plants.
42 FR 65209	12/30/1977	ETWP; Proposed Endangered Status for the Barrens Topminnow.
41 FR 24524	6/16/1976	ETWP; Proposed Endangered Status for Some 1700 U.S. Vascular Plants.
40 FR 27824	7/1/1975	Acceptance of Smithsonian Report As a Petition To List Taxa Named Therein Under Section 4(b)(2) of the Act and Intention To Review the Status of Those Plants.

Species Information

The petition identified 404 aquatic, riparian, and wetland species from the southeastern United States as needing protection under the Act. This list included 15 amphibians, 6 amphipods, 18 beetles, 3 birds, 4 butterflies, 9 caddisflies, 83 crayfish, 14 dragonflies, 48 fish, 1 springfly, 1 fairy shrimp, 2 isopods, 4 mammals, 1 moth, 48 mussels, 6 non-vascular plants, 13 reptiles, 44 snails, 8 stoneflies, and 76 vascular plants. Of these 404 species, 374 species are addressed in this finding (listed in Table 2 in the *Summary of Threats as Identified in the Petition* section below). We have not yet made a finding on the following 11 species: South Florida rainbow snake (*Farancia erytrogramma seminola*), Sarah's hydroptila caddisfly (*Hydroptila sarahae*), Rogue Creek hydroptila caddisfly (*Hydroptila okaloosa*), Florida brown checkered summer sedge (*Polycentropus floridensis*), Florida fairy shrimp (*Dexteria floridana*), Ouachita creekshell (*Villosa arkansasensis*), crystal darter (*Crystallaria asprella*), spotted darter (*Etheostoma maculatum*), Florida bog frog (*Rana okaloosae*), Greensboro burrowing crayfish (*Cambarus catagius*), and Blood River crayfish (*Orconectes burri*).

The nature of this petition finding, that is, the large number of species evaluated, necessitates our limiting a discussion of species information to a general one; only where there is a clarification necessary do we provide specific species information below.

The petition identified 15 amphibians and requested that they be added to the List of Endangered and Threatened Wildlife (List). Thirteen of these are subjects of this finding, including the following: Streamside salamander (*Ambystoma barbouri*), one-toed amphiuma (*Amphiuma pholeter*), hellbender (*Cryptobranchus alleganiensis*), Cumberland dusky salamander (*Desmognathus abditus*), seepage salamander (*Desmognathus aeneus*), Chamberlain's dwarf salamander (*Eurycea chamberlaini*), Oklahoma salamander (*Eurycea tynerensis*), Tennessee cave salamander (*Gyrinophilus palleucus*), West Virginia spring salamander (*Gyrinophilus subterraneus*), Georgia blind salamander (*Eurycea wallacei,* formerly known as, and identified by petitioners as, *Haideotriton wallacei*), Neuse River waterdog (*Necturus lewisi*), Gulf hammock dwarf siren (*Pseudobranchus striatus lustricolus*), and patch-nosed salamander (*Urspelerpes brucei*). The Black Warrior waterdog (*Necturus alabamensis*) is already on the Service's candidate species list. The seepage salamander, Oklahoma salamander, Tennessee cave salamander, West Virginia Spring salamander, Georgia blind salamander, Neuse River waterdog, hellbender, and Gulf hammock dwarf siren were previous C2 candidates for Federal listing, until that category was discontinued in 1996.

Chamberlain's dwarf salamander is given a NatureServe global ranking of G5; however, its status in Georgia is S1, indicating it is considered critically imperiled in that State. The streamside salamander is given the G4 conservation status by NatureServe; however, it is considered critically imperiled (S1) in West Virginia, imperiled (S2) in Tennessee, and vulnerable (S3) in Indiana. The one-toed amphiuma maintains a global G3 ranking by NatureServe; however, it is also considered critically imperiled by NatureServe in Mississippi, Alabama,

and Georgia, and vulnerable in Florida. The Tennessee cave salamander maintains a NatureServe global ranking of G2 with State rankings of S2 (AL and TN) and S1 (GA). The hellbender maintains a NatureServe global ranking of G3. Its State status ranges from S1 to S3. The subspecies *bishopi,* or Ozark hellbender, was proposed for Federal listing as endangered on September 8, 2010 (75 FR 54561). The Cumberland dusky salamander and Georgia blind salamander each have a NatureServe conservation status of imperiled (G2), with State rankings varying from possibly extirpated, to critically imperiled, to imperiled. The seepage salamander, Oklahoma salamander, and Neuse River waterdog each have a NatureServe global conservation ranking of G3, with individual State rankings of S1 to S3. The West Virginia spring salamander and patch-nosed salamander each have a NatureServe conservation ranking of G1. The Gulf hammock dwarf siren is given a NatureServe global ranking of T1. The dwarf siren has not been documented since its description in 1951.

The petition identified six amphipods and requested that they be added to the List, including the following: Florida cave amphipod (*Crangonyx grandimanus*), Hobbs cave amphipod (*Crangonyx hobbsi*), Cooper's cave amphipod (Stygobromus cooperi), tidewater amphipod (*Stygobromus indentatus*), Morrison's cave amphipod (*Stygobromus morrisoni*), and minute cave amphipod (*Stygobromus parvus*).

These six amphipods are each assigned a NatureServe Global ranking of either G2 or G3, indicating they are considered imperiled or vulnerable across their entire range. Cooper's cave amphipod, tidewater amphipod, Morrison's cave amphipod and the minute cave amphipod were each previous Service category 2 candidate species for listing (species for which there was some evidence of vulnerability, but for which additional biological information was needed to support a proposed rule to list as endangered or threatened).

The petition identified 18 beetles and requested that they be added to the List. Seventeen of these are included in this finding, including the following: Cobblestone tiger beetle (*Cincindela marginipennis*), Avernus cave beetle (*Pseudanophthalmus avernus*), Little Kennedy cave beetle (*Pseudanophthalmus cordicollis*), New River Valley cave beetle (*Pseudanophthalmus egberti*), Cumberland Gap cave beetle (*Pseudanophthalmus hirsutus*), Hubbard's cave beetle (*Pseudanophthalmus hubbardi*), Hubricht's cave beetle (*Pseudanophthalmus hubrichti*), Crossroad's cave beetle (*Pseudanophthalmus intersectus*), Madden's cave beetle (*Pseudanophthalmus limicola*), Dry Fork Valley cave beetle (*Pseudanophthalmus montanus*), Natural Bridge cave beetle (*Pseudanophthalmus pontis*), South Branch Valley cave beetle (*Pseudanophthalmus potomaca*), overlooked cave beetle (*Pseudanophthalmus praetermissus*), Saint Paul cave beetle (*Pseudanophthalmus sanctipauli*), silken cave beetle (*Pseudanophthalmus sericus*), Thomas's cave beetle (*Pseudanophthalmus thomasi*), and Maiden Spring cave beetle (*Pseudanophthalmus virginicus*). The Coleman's cave beetle (*Pseudanophthalmus colemanensis*) is already a Federal candidate species.

These cave beetles are locally endemic to small cave systems in Virginia, West Virginia, and Tennessee. Sixteen of them are afforded a NatureServe ranking of G1, with a population size of 1,000 or fewer, and many have not been documented since their description. One cave beetle, the South Branch Valley cave beetle, has a slightly wider range and is afforded a NatureServe ranking of G3. All of these beetles were previous category 2 candidates for Federal listing, until that category was discontinued in 1996.

The petition identified three birds and requested that they be added to the List, including the following: MacGillivray's seaside sparrow (*Ammodrammus maritimus macgillivraii*), Florida sandhill crane (*Grus canadensis pratensis*), and black rail (*Laterallus jamaicensis*). MacGillivray's seaside sparrow and the Florida sandhill crane are given a NatureServe ranking of T2, while the black rail is more widely distributed and given a NatureServe ranking of G4. The black rail is a previous category 2 candidate species.

The petition identified four butterflies and requested that they be added to the List, including the following: Linda's roadside-skipper (*Amblyscirtes linda*), Duke's skipper (*Euphyes dukesi calhouni*), Palatka skipper (*Euphyes pilatka klotsi*), and rare skipper (*Problema bulenta*). Linda's roadside skipper and the rare skipper are afforded a NatureServe ranking of G2. Duke's and Palatka's skippers are afforded NatureServe rankings of T2 and T1, respectively. The rare skipper was previously considered a category 2 candidate, until that category was discontinued by the Service in 1996.

The petition identified nine caddisflies and requested that they be added to the List. Six of these are included in this finding, including the following: Logan's agarodes caddisfly (*Agarodes logani*), Sykora's hydroptila caddisfly (*Hydroptila sykorae*), Morse's little plain brown sedge (*Lepidostoma morsei*), little oecetis longhorn caddisfly (*Oecetis parva*), Setose cream and brown mottled microcaddisfly (*Oxyethira setosa*), and three-toothed triaenodes caddisfly (*Triaenodes tridontus*).

Of these caddisflies, two are assigned a NatureServe ranking of G1, and four are assigned a G2. There is very little known about these species except that they appear to be very narrow endemics. The little oecetis longhorn caddisfly and three-toothed triaenodes caddisfly are previous category 2 candidate species.

The petition identified 83 crayfish and requested that they be added to the List. Eighty-one of these are included in this finding: Bayou Bodcau crayfish (*Bouchardina robisoni*), Dougherty Plain cave crayfish (*Cambarus cryptodytes*), Obey crayfish (*Cambarus obeyensis*), cypress crayfish (*Cambarellus blacki*), least crayfish (*Cambarellus diminutus*), angular dwarf crawfish (*Cambarellus lesliei*), Big South Fork crayfish (*Cambarus bouchardi*), New River crayfish (*Cambarus chasmodactylus*), Chauga crayfish (*Cambarus chaugaensis*), Coosawattae crayfish (*Cambarus coosawattae*), slenderclaw crayfish (*Cambarus cracens*), Conasauga blue burrower (*Cambarus cymatilis*), Grandfather Mountain crayfish (*Cambarus eeseeohensis*), Elk River crayfish (*Cambarus elkensis*), Chickamauga crayfish (*Cambarus extraneus*), Etowah crayfish (*Cambarus fasciatus*), Little Tennessee crayfish (*Cambarus georgiae*), Piedmont blue burrower (*Cambarus harti*), spiny scale crayfish (*Cambarus jezerinaci*), Alabama cave crayfish (*Cambarus jonesi*), Greenbrier cave crayfish (*Cambarus nerterius*), Hiwassee headwater crayfish (*Cambarus parrishi*), pristine crayfish (*Cambarus pristinus*), Chattooga River crayfish (*Cambarus scotti*), beautiful crayfish (*Cambarus speciosus*), Broad River spiny crayfish (*Cambarus spicatus*), lean crayfish (*Cambarus strigosus*), blackbarred crayfish (*Cambarus unestami*), Big Sandy crayfish (*Cambarus veteranus*), Brawley's Fork crayfish (*Cambarus williami*), mimic crayfish (*Distocambarus carlsoni*), Broad River burrowing crayfish (*Distocambarus devexus*), Newberry burrowing crayfish (*Distocambarus youngineri*), burrowing bog crayfish (*Fallicambarus burrisi*), speckled burrowing crayfish

(*Fallicambarus danielae*), Jefferson County crayfish (*Fallicambarus gilpini*), Ouachita burrowing crayfish (*Fallicambarus harpi*), Hatchie burrowing crayfish (*Fallicambarus hortoni*), slenderwrist burrowing crayfish (*Fallicambarus petilicarpus*), Saline burrowing crayfish (*Fallicambarus strawni*), Crested riverlet crayfish (*Hobbseus cristatus*), Oktibbeha riverlet crayfish (*Hobbseus orconectoides*), Tombigbee riverlet crayfish (*Hobbseus petilus*), Yalobusha riverlet crayfish (*Hobbseus yalobushensis*), Calcasieu crayfish (*Orconectes blacki*), Coldwater crayfish (*Orconectes eupunctus*), Yazoo crayfish (*Orconectes hartfieldi*), Tennessee cave crayfish (*Orconectes incomptus*), Sucarnoochee River crayfish (*Orconectes jonesi*), Kisatchie painted crayfish (*Orconectes maletae*), Mammoth Spring crayfish (*Orconectes marchandi*), Appalachian cave crayfish (*Orconectes packardi*), Shelta cave crayfish (*Orconectes sheltae*), Chowanoke crayfish (*Orconectes virginiensis*), Hardin crayfish (*Orconectes wrighti*), Orlando cave crayfish (*Procambarus acherontis*), Coastal flatwoods crayfish (*Procambarus apalachicolae*), Silver Glen Springs crayfish (*Procambarus attiguus*), Jackson Prairie crayfish (*Procambarus barbiger*), Mississippi flatwoods crayfish (*Procambarus cometes*), bigcheek cave crayfish (*Procambarus delicatus*), Panama City crayfish (*Procambarus econfinae*), Santa Fe cave crayfish (*Procambarus erythrops*), spinytail crayfish (*Procambarus fitzpatricki*), Orange Lake cave crayfish (*Procambarus franzi*), Big Blue Springs cave crayfish (*Procambarus horsti*), lagniappe crayfish (*Procambarus lagniappe*), coastal lowland cave crayfish (*Procambarus leitheuseri*), Florida cave crayfish (*Procambarus lucifugus*), Alachua light-fleeing cave crayfish (*Procambarus lucifugus alachua*), Florida cave crayfish (*Procambarus lucifugus lucifugus*), Shutispear crayfish (*Procambarus lylei*), Miami cave crayfish (*Procambarus milleri*), Putnam County cave crayfish (*Procambarus morrisi*), Woodville Karst cave crayfish (*Procambarus orcinus*), pallid cave crayfish (*Procambarus pallidus*), Black Creek crayfish (*Procambarus pictus*), bearded red crayfish (*Procambarus pogum*), regal burrowing crayfish (*Procambarus regalis*), Irons Fork burrowing crayfish (*Procambarus reimeri*), and spider cave crayfish (*Troglocambarus maclanei*).

The petition identified the Florida cave crayfish twice in its list of 404 species, once at the species level, *Procambarus lucifugus,* and once at the subspecific level, *Procambarus lucifugus lucifugus.* We include both in this finding with the intent that a further status review will assess the status at both the species and subspecies levels.

We received an amended petition from CBD providing supplemental comments in support of listing the Panama City crayfish. The petition identified threats from habitat loss and degradation, predation, overharvest from collections for use as fishing bait, drought, its limited range and isolated distribution, pollution from pesticides and fertilizers, invasive species of introduced crayfish, and the inadequacy of existing regulatory mechanisms. The Panama City crayfish only occurs in Bay County, Florida, where it is considered a species of special concern by the State of Florida. The Service has worked with the State and the St. Joe Company to develop a Candidate Conservation Agreement with Assurances, but the Agreement has not been finalized.

Almost all of the petitioned crayfish are restricted to narrow ranges encompassing small cave or stream systems, which places them in the G1 or G2 NatureServe ranking due to their restricted ranges. Two exceptions to this are the Woodville Karst cave crayfish (*Procambarus orcinus*), which receives a G3 ranking, and the regal burrowing crayfish (*Procambarus regalis*), which is given a G2G3 ranking. Their narrow ranges make these crayfish vulnerable to any event that would result in habitat degradation. A number of the crayfish (26) were previously considered category 2 candidates until that category was discontinued by the Service in 1996.

The petition identified 14 dragonflies and requested that they be added to the List, including the following: Say's spiketail (*Cordulegaster sayi*), Cherokee clubtail (*Gomphus consanguis*), Tennessee clubtail (*Gomphus sandrius*), Septima's clubtail (*Gomphus septima*), Westfall's clubtail (*Gomphus westfalli*), purple skimmer (*Libellula jesseana*), Mountain River cruiser (*Macromia margarita*), southern snaketail (*Ophiogomphus australis*), Edmund's snaketail (*Ophiogomphus edmundo*), Appalachian snaketail (*Ophiogomphus incurvatus*), Calvert's emerald (*Somatochlora calverti*), Texas emerald (*Somatochlora margarita*), Ozark emerald (*Somatochlora ozarkensis*), and yellow-sided clubtail (*Stylurus potulentus*).

The Service was previously (February 15, 1994) petitioned to list the Say's spiketail dragonfly as an endangered species. We published a 90-day finding on October 26, 1994 (59 FR 53776) indicating that because the species was already a category 2 candidate for listing we would proceed with a full status review. The 12-month finding was published on July 17, 1995 (60 FR 36380). The Service found that listing the species was not warranted but retained the designation of the Say's spiketail as a category 2 candidate species. An additional eight of the petitioned dragonflies held previous designations of category 2 candidate species, including the Cherokee clubtail, Tennessee clubtail, Septima's clubtail, Westfall's clubtail, Mountain River cruiser, Edmund's snaketail, Appalachian snaketail, and the Texas emerald. The NatureServe global ranking of the petitioned dragonflies ranges from G1, critically imperiled, to G3, vulnerable.

The petition identified 47 fish (not including the Alabama shad (*Alosa alabamae*), which has already been the subject of a 90-day finding by NMFS) to be added to the List. Forty-three of these are included in this finding, including the following: Northern cavefish (*Amblyopsis spelaea*), bluestripe shiner (*Cyprinella callitaenia*), Altamaha shiner (*Cyprinella xaenura*), Carolina pygmy sunfish (*Elassoma boehlkei*), Ozark chub (*Erimystax harryi*), Warrior darter (*Etheostoma bellator*), holiday darter (*Etheostoma brevirostrum*), ashy darter (*Etheostoma cinereum*), Barrens darter (*Etheostoma forbesi*), smallscale darter (*Etheostoma microlepidum*), candy darter (*Etheostoma osburni*), paleback darter (*Etheostoma pallididorsum*), egg-mimic darter (*Etheostoma pseudovulatum*), striated darter (*Etheostoma striatulum*), Shawnee darter (*Etheostoma tecumsehi*), Tippecanoe darter (*Etheostoma tippecanoe*), trispot darter (*Etheostoma trisella*), Tuscumbia darter (*Etheostoma tuscumbia*), Barrens topminnow (*Fundulus julisia*), robust redhorse (*Moxostoma robustum*), popeye shiner (*Notropis ariommus*), Ozark shiner (*Notropis ozarcanus*), peppered shiner (*Notropis perpallidus*), rocky shiner (*Notropis suttkusi*), saddled madtom (*Noturus fasciatus*), Carolina madtom (*Noturus furiosus*), orangefin madtom (*Noturus gilberti*), piebald madtom (*Noturus gladiator*), Ouachita madtom (*Noturus lachneri*), frecklebelly madtom (*Noturus munitus*), Caddo madtom (*Noturus taylori*), Chesapeake logperch (*Percina bimaculata*), coal darter (*Percina brevicauda*), Halloween darter (*Percina crypta*), bluestripe darter (*Percina cymatotaenia*), bridled darter (*Percina*

kusha), longhead darter (*Percina macrocephala*), longnose darter (*Percina nasuta*), bankhead darter (*Percina sipsi*), sickle darter (*Percina williamsi*), broadstripe shiner (*Pteronotropis euryzonus*), bluehead shiner (*Pteronotropis hubbsi*), and blackfin sucker (*Thoburnia atripinnis*). The NatureServe global ranking of these fish ranges from G1 to G4.

Since receipt of the CBD petition, the laurel dace was proposed for listing as endangered (75 FR 36035; June 24, 2010). The sicklefin redhorse has already been found to be warranted for listing and is a current Federal candidate species.

On December 30, 1977, the Barrens topminnow was proposed for listing as endangered with critical habitat (42 FR 65209). On March 6, 1979, the critical habitat portion of the proposal was withdrawn due to the procedural and substantive changes made to the Act in 1978 (44 FR 12382). On July 27, 1979, the Service published a reproposal of critical habitat for the Barrens topminnow (44 FR 44418). A final listing was never published, and the species was subsequently classified as a category 2 candidate for Federal listing until that category was discontinued in 1996.

On October 6, 1983, the Service was petitioned to list the orangefin madtom and a substantial finding was published on January 16, 1984 (49 FR 1919). On completion of the status review on October 12, 1984, a 12-month finding was made that listing the orangefin madtom was warranted but precluded by other efforts to revise the Lists. This finding was announced in a July 18, 1985, **Federal Register** notice (50 FR 29238). The species remained a candidate species until its removal from the candidate list in 1996.

In addition to the above species, 24 of the petitioned fish were at one time candidates for listing under the Act. The peppered shiner, paleback darter, and Ouachita madtom were category 1 candidates (47 FR 58454). However, they were subsequently removed from the candidate list. Twenty-one of the petitioned fish were category 2 candidates for listing, including the following: Northern cavefish, bluestripe shiner, Carolina pygmy sunfish, Warrior darter, holiday darter, ashy darter, Barrens darter, candy darter, egg-mimic darter, striated darter, trispot darter, Tuscumbia darter, robust redhorse, Ozark shiner, Carolina madtom, frecklebelly madtom, Caddo madtom, bluestripe darter, longhead darter, longnose darter, and Halloween darter.

In 1995, the Service entered into a cooperative voluntary partnership, the Robust Redhorse Conservation Committee, to conserve the robust redhorse through a Memorandum of Understanding between State and Federal resource agencies, private industry, and the conservation community. In 2002, the Service entered into a Robust Redhorse Candidate Conservation Agreement with Assurances with the Georgia Department of Natural Resources and the Georgia Power Company to restore the species to the Ocmulgee River.

The petition identified one springfly, the Blueridge springfly (*Remenus kirchneri*), and one moth, the Louisiana eyed silkmoth (*Automeris louisiana*), and requested that they be added to the List. These species hold NatureServe global rankings of G2.

The petition identified four mammals and requested that they be added to the List, including the following: Sherman's short-tailed shrew (*Blarina carolinensis shermani*), Pine Island oryzomys or marsh rice rat (*Oryzomys palustris,* pop. 1), Sanibel Island oryzomys or marsh rice rat (*Oryzomys palustris,* pop. 2), and insular cotton rat (*Sigmodon hispidus insulicola*). All four of these mammals are afforded a ranking of G1 or T1 by NatureServe. The insular cotton rat was previously a category 2 candidate species but was removed from the candidate list in 1996 when the category was discontinued.

The petition identified two isopods and requested that they be added to the List: The *Caecidotea cannula* (no common name) and Rye Cove isopod (*Lirceus culveri*). These isopods are given NatureServe rankings of G2 (*Caecidotea cannula*) and G1 (Rye Cove isopod). Both species were former category 2 candidates for listing, until that category was discontinued in 1996.

The petition identified 48 mussels and requested that they be added to the List. Thirteen species of mussels identified in the petition are not evaluated in this finding; twelve have previously been found by the Service to warrant listing, and one, the Ouachita creekshell (Villosa arkansasensis) has not yet been evaluated. Thirty-five of the petitioned species are included in this finding, including the following: Altamaha arcmussel (*Alasmidonta arcula*), southern elktoe (*Alasmidonta triangulata*), brook floater (*Alasmidonta varicosa*), Apalachicola floater (*Anodonta heardi*), rayed creekshell (*Anodontoides radiatus*), western fanshell (*Cyprogenia aberti*), southern lance (*Elliptio ahenea*), Alabama spike (*Elliptio arca*), delicate spike (*Elliptio arctata*), brother spike (*Elliptio fraterna*), yellow lance (*Elliptio lanceolata*), St. Johns elephant ear (*Elliptio monroensis*), inflated spike (*Elliptio purpurella*), Tennessee pigtoe (Pleuronaia *barnesiana*), Atlantic pigtoe (*Fusconaia masoni*), longsolid (*Fusconaia subrotunda*), Waccamaw fatmucket (*Lampsilis fullerkati*), Tennessee heelsplitter (*Lasmigona holstonia*), green floater (*Lasmigona subviridis*), Cumberland moccasinshell (*Medionidus conradicus*), Suwannee moccasinshell (*Medionidus walkeri*), round hickorynut (*Obovaria subrotunda*), Alabama hickorynut (*Obovaria unicolor*), Canoe Creek pigtoe (*Pleurobema athearni*), Tennessee clubshell (*Pleurobema oviforme*), Warrior pigtoe (*Pleurobema rubellum*), pyramid pigtoe (*Pleurobema rubrum*), inflated floater (*Pyganodon gibbosa*), Tallapoosa orb (*Quadrula asperata archeri*), salamander mussel (*Simpsonaias ambigua*), purple lilliput (*Toxolasma lividus*), Savannah lilliput (*Toxolasma pullus*), Alabama rainbow (*Villosa nebulosa*), Kentucky creekshell (*Villosa ortmanni*), and Coosa creekshell (*Villosa umbrans*).

These mussels have NatureServe rankings ranging from G1, critically imperiled, to G3, vulnerable, with one mussel, the round hickorynut, having a ranking of G4, apparently stable. The Atlantic pigtoe, Waccamaw fatmucket, Tennessee heelsplitter, green floater, Suwannee moccasinshell, Tennessee clubshell, warrior pigtoe, salamander mussel, purple lilliput, Savannah lilliput, and Kentucky creekshell, are previous category 2 candidates for listing, but were removed when the category was discontinued in 1996.

The snuffbox (*Epioblasma triquetra*) and rayed bean (*Villosa fabalis*) were proposed for listing as endangered on November 2, 2010 (75 FR 67552). The spectaclecase (*Cumberlandia monodonta*) and sheepnose (*Plethobasus cyphyus*) were proposed as endangered on January 19, 2011 (76 FR 3392). The other eight are current candidates for Federal listing and subjects of a draft proposed rule to list, including the narrow pigtoe (*Fusconaia escambia*), round ebonyshell (*Fusconaia rotulata*), southern sandshell (*Hamiota australis*), fuzzy pigtoe (*Pleurobema strodeanum*), southern kidneyshell (*Ptychobranchus jonesi*), rabbitsfoot (*Quadrula cylindrica cylindrica*), tapered pigtoe (*Fusconaia burkei*), and Choctaw bean (*Villosa choctawensis*).

The petition identified six non-vascular plants and requested that they be added to the List of Endangered and Threatened Plants, including the following: *Fissidens appalachensis* (Appalachian fissidens moss), *Fissidens hallii* (Hall's pocket moss), *Megaceros aenigmaticus* (hornwort), *Phaeophyscia*

leana (Lea's bog lichen), *Plagiochila caduciloba* (Gorge leafy liverwort), and *Plagiochila sharpii* ssp. *sharpii* (Sharp's leafy liverwort). The NatureServe Global ranking for these plants ranges from G2, imperiled (*Fissidens appalachensis, Fissidens hallii, Phaeophyscia leana,* and *Megaceros aenigmaticus*), to G3, vulnerable (*Plagiochila caduciloba*), to T3, vulnerable (*Plagiochila sharpii* ssp. *sharpii*). *Plagiochila caduciloba* and *Plagiochila sharpii* ssp. *sharpii* held prior Federal category 2 candidate status, but were removed from that list when we discontinued use of the category 2 and 3C lists in 1996.

The petition identified 13 reptiles and requested that they be added to the List. Twelve of these are subjects of this finding, including the following: Kirtland's snake (*Clonophis kirtlandii*), western chicken turtle (*Deirochelys reticularia miaria*), Florida keys mole skink (*Eumeces egregius egregius*), Barbour's map turtle (*Graptemys barbouri*), Escambia map turtle (*Graptemys ernsti*), Pascagoula map turtle (*Graptemys gibbonsi*), black-knobbed map turtle (*Graptemys nigrinoda*), Alabama map turtle (*Graptemys pulchra*), Lower Florida Keys striped mud turtle (*Kinosternon baurii,* pop. 1), Florida Panhandle Florida red-bellied turtle (*Pseudemys nelsoni,* pop. 1), northern red-bellied cooter (*Pseudemys rubriventris*), and Lower Florida Keys eastern ribbonsnake (*Thamnophis sauritus,* pop. 1).

The Kirtland's snake, Barbour's map turtle, Escambia map turtle, and Pascagoula map turtle have a NatureServe conservation status of G2, with State rankings varying from possibly extirpated, to S1, to S2. The black-knobbed map turtle has a NatureServe ranking of G3. The Alabama map turtle has a NatureServe ranking of G4, but State rankings vary from S1 to S3. The Florida Keys mole skink and Lower Florida Keys eastern ribbonsnake are given a NatureServe global ranking of T1. The western chicken turtle is considered secure by NatureServe with a global ranking of T5. The Lower Florida Keys striped mud turtle and the Florida Panhandle population of the Florida red-bellied turtle are given a T2 NatureServe ranking. We proposed to list the striped mud turtle as endangered on May 19, 1978 (43 FR 21702) but never finalized the listing. The species was placed on the category 2 candidate list on December 30, 1982 (47 FR 58454). The northern red-bellied cooter is given a NatureServe ranking of G4 or apparently stable with State rankings ranging from S2 (imperiled) to S5 (stable). In addition to the striped mud turtle, Kirtland's snake, Florida Keys mole skink, and Barbour's map turtle were each prior Federal category 2 candidate species. The black-knobbed map turtle was a prior category 3C candidate species (taxa that were proven to be more widespread than was previously believed and/or those that were not subject to any identifiable threat).

The petition identified 44 snails and requested that they be added to the List, of which 43 are subjects of this finding, including the following: Manitou cavesnail (*Antrorbis breweri*), Blue Spring hydrobe snail (*Aphaostracon asthenes*), freemouth hydrobe snail (*Aphaostracon chalarogyrus*), Wekiwa hydrobe snail (*Aphaostracon monas*), dense hydrobe snail (*Aphaostracon pycnus*), Clifton Spring hydrobe snail (*Aphaostracon theiocrenetum*), acute elimia (*Elimia acuta*), mud elimia (*Elimia alabamensis*), ample elimia (*Elimia ampla*), Lilyshoals elimia (*Elimia annettae*), spider elimia (*Elimia arachnoidea*), princess elimia (*Elimia bellacrenata*), walnut elimia (*Elimia bellula*), prune elimia (*Elimia chiltonensis*), cockle elimia (*Elimia cochliaris*), cylinder elimia (*Elimia cylindracea*), nodulose Coosa River snail (*Elimia lachryma*), round-rib elimia (*Elimia nassula*), caper elimia (*Elimia olivula*), engraved elimia (*Elimia perstriata*), compact elimia (*Elimia showalteri*), elegant elimia (*Elimia teres*), cobble elimia (*Elimia vanuxemiana*), Ichetucknee siltsnail (*Floridobia mica*), Enterprise siltsnail (*Floridobia monroensis*), pygmy siltsnail (*Floridobia parva*), Ponderosa siltsnail (*Floridobia ponderosa*), Wekiwa siltsnail (*Floridobia wekiwae*), spiny riversnail (*Io fluvialis*), Arkansas mudalia (*Leptoxis arkansasensis*), spotted rocksnail (*Leptoxis picta*), smooth mudalia (*Leptoxis virgata*), knobby rocksnail (*Lithasia curta*), helmet rocksnail (*Lithasia duttoniana*), Ocmulgee marstonia (*Marstonia agarhecta*), beaverpond marstonia (*Marstonia castor*), Ozark pyrg (*Marstonia ozarkensis*), magnificant rams-horn (*Planorbella magnifica*), corpulent hornsnail (*Pleurocera corpulenta*), shortspire hornsnail (*Pleurocera curta*), skirted hornsnail (*Pleurocera pyrenella*), domed ancylid (*Rhodacme elatior*), and reverse pebblesnail (*Somatogyrus alcoviensis*).

These 43 snails each maintain a NatureServe ranking of either G1, critically imperiled, or G2, imperiled. Several are previous Federal category 2 candidates, including the magnificent rams-horn, beaverpond marstonia, Ocmulgee marstonia, and the skirted hornsnail, until that category was discontinued in 1996.

The petition identified eight stoneflies and requested that they be added to the List, including the following: Virginia stone (*Acroneuria kosztarabi*), Sevier snowfly (*Allocapnia brooksi*), Smokies snowfly (*Allocapnia fumosa*), Karst snowfly (*Allocapnia cunninghami*), Tennessee forestfly (*Amphinemura mockfordi*), Louisiana needlefly (*Leuctra szczytkoi*), Smokies needlefly (*Megaleuctra williamsae*), and lobed roachfly (*Tallaperla lobata*). The Virginia stone and Karst snowfly are assigned a NatureServe global ranking of G1, critically imperiled. The Sevier snowfly, Smokies snowfly, Tennessee forestfly, Louisiana needlefly, Smokies needlefly, and lobed roachfly are assigned NatureServe global rankings of G2.

Lastly, the petition identified 76 vascular plants and requested that they be added to the List of Endangered and Threatened Plants, of which 75 are included in this finding, including the following: *Aeschynomene pratensis* (meadow joint-vetch), *Alnus maritima* (seaside alder), *Amorpha georgiana* var. *georgiana* (Georgia leadplant or Georgia indigo bush), *Arnoglossum diversifolium* (variable-leaved Indian-plantain), *Balduina atropurpurea* (purple balduina or purple disk honeycombhead), *Baptisia megacarpa* (Apalachicola wild indigo), *Bartonia texana* (Texas screwstem), *Boltonia montana* (Doll's daisy), *Calamovilfa arcuata* (rivergrass), *Carex brysonii* (Bryson's sedge), *Carex impressinervia* (impressed-nerved sedge), *Coreopsis integrifolia* (ciliate-leaf tickseed), *Croton elliottii* (Elliott's croton), *Elytraria caroliniensis* var. *angustifolia* (narrowleaf Carolina scalystem), *Encyclia cochleata* var. *triandra* (Clam-shell orchid), *Epidendrum strobiliferum* (Big Cypress epidendrum), *Eriocaulon koernickianum* (small-headed pipewort), *Eriocaulon nigrobracteatum* (black-bracked pipewort), *Eupatorium paludicola* (a thoroughwort), *Eurybia saxicastellii* (Rockcastle wood-aster), *Fimbristylis perpusilla* (Harper's fimbristylis), *Forestiera godfreyi* (Godfry's privet), *Hartwrightia floridan* (Hartwrightia), *Helianthus occidentalis* ssp. *plantagineus* (Shinner's sunflower), *Hexastylis speciosa* (Harper's heartleaf), *Hymenocallis henryae* (Henry's spider-lily), *Hypericum edisonianum* (Edison's ascyrum), *Hypericum lissophloeus* (smooth-barked St. John's-wort), *Illicium parviflorum* (yellow anisetree), *Isoetes hyemalis* (winter or evergreen quillwort), *Isoetes microvela* (thin-wall quillwort), *Lilium iridollae* (panhandle lily), *Lindera subcoriacea* (bog spicebush), *Linum westii* (West's flax),

Lobelia boykinii (Boykin's lobelia), *Ludwigia brevipes* (Long Beach seedbox), *Ludwigia spathulata* (spathulate seedbox), *Ludwigia ravenii* (Raven's seedbox), *Lythrum curtissii* (Curtis's loosestrife), *Lythrum flagellare* (lowland loosestrife), *Macbridea caroliniana* (Carolina birds-in-a-nest), *Marshallia grandiflora* (Large-flowered Barbara's-buttons), *Minuartia godfreyi* (Godfrey's stitchwort), *Najas filifolia* (narrowleaf naiad), *Nufar lutea* ssp. *sagittifolia* (Cape Fear spatterdock or yellow pond lily), *Nufar lutea* ssp. *ulvacea* (West Florida cow-lily), *Nyssa ursina* (Bear tupelo or dwarf blackgum), *Oncidium undulatum* (Cape Sable orchid), *Physostegia correllii* (Correll's false dragonhead), *Potamogeton floridanus* (Florida pondweed), *Potamogeton tennesseensis* (Tennessee pondweed), *Ptilimnium ahlesii* (Carolina bishopweed), *Rhexia parviflora* (small-flower meadow-beauty), *Rhexia salicifolia* (panhandle meadow-beauty), *Rhynchospora crinipes* (hairy-peduncled beakbush), *Rhynchospora thornei* (Thorne's beakbush), *Rudbeckia auriculata* (eared coneflower), *Rudbeckia heliopsidis* (sun-facing coneflower), *Salix floridana* (Florida willow), *Sarracenia purpurea* var. *montana* (mountain purple pitcherplant), *Sarracenia rubra ssp. gulfensis* (Gulf sweet pitcherplant), *Sarracenia rubra* ssp. *wherryi* (Wherry's sweet pitcherplant), *Schoenoplectus hallii* (Hall's bulrush), *Scuttelaria ocmulgee* (Ocmulgee skullcap), *Sideroxylon thornei* (swamp buckhorn or Georgia bully), *Solidago arenicola* (southern racemose goldenrod), *Sporobolus teretifolius* (wire-leaved dropseed), *Stellaria fontinalis* (water stitchwort), *Symphyotrichum puniceum* var. *scabricaule* (rough-stemmed aster), *Thalictrum debile* (southern meadowrue), *Trillium texanum* (Texas trillium), *Tsuga caroliniana* (Carolina hemlock), *Vicia ocalensis* (Ocala vetch), *Waldsteinia lobata* (lobed barren-strawberry), and *Xyris longisepala* (Kral's yellow-eyed grass). One of the species petitioned, *Solidago plumosa* (Yadkin River goldenrod), is already a current Federal candidate species and is, therefore, not considered in this finding.

On December 11, 2010, the Service received a second petition from Wild South to list *Tsuga caroliniana* (Carolina hemlock) as endangered under the Act and to designate critical habitat. On December 20, 2010, we provided a response to the petitioners acknowledging receipt of the petition and identifying it as a supplementary petition as *Tsuga caroliniana* was also included in the CBD petition to list 404 southeastern U.S. species. Wild South provided additional information on the species' life history, status and threats.

Of the 75 vascular plants identified above, 46 held previous Federal candidate status, prior to 1996 and the discontinuance of the category 2 and 3C classifications. These include the following: *Alnus maritima* (seaside alder), *Amorpha georgiana* var. *georgiana* (Georgia leadplant or Georgia indigo bush), *Balduina atropurpurea* (purple balduina or purple disk honeycombhead), *Baptisia megacarpa* (Apalachicola wild indigo), *Bartonia texana* (Texas screwstem), *Calamovilfa arcuata* (rivergrass), *Carex impressinervia* (impressed-nerved sedge), *Croton elliottii* (Elliott's croton), *Elytraria caroliniensis* var. *angustifolia* (narrowleaf Carolina scalystem), *Eriocaulon koernickianum* (small-headed pipewort), *Fimbristylis perpusilla* (Harper's fimbristylis), *Hartwrightia floridan* (Hartwrightia), *Hexastylis speciosa* (Harper's heartleaf), *Hymenocallis henryae* (Henry's spider-lily), *Hypericum edisonianum* (Edison's ascyrum), *Hypericum lissophloeus* (smooth-barked St. John's-wort), *Illicium parviflorum* (yellow anisetree), *Lilium iridollae* (panhandle lily), *Lindera subcoriacea* (bog spicebush), *Linum westii* (West's flax), *Lobelia boykinii* (Boykin's lobelia), *Lythrum curtissii* (Curtis's loosestrife), *Lythrum flagellare* (lowland loosestrife), *Macbridea caroliniana* (Carolina birds-in-a-nest), *Marshallia grandiflora* (Large-flowered Barbara's-buttons), *Minuartia godfreyi* (Godfrey's stitchwort), *Najas filifolia* (narrowleaf naiad), *Nufar lutea* ssp. *ulvacea* (West Florida cow-lily), *Nyssa ursina* (Bear tupelo or dwarf blackgum), *Physostegia correllii* (Correll's false dragonhead), *Potamogetan floridanus* (Florida pondweed), *Rhexia parviflora* (small-flower meadow-beauty), *Rhexia salicifolia* (panhandle meadow-beauty), *Rhynchospora crinipes* (hairy-peduncled beakbush), *Rhynchospora thornei* (Thorne's beakbush), *Rudbeckia auriculata* (eared coneflower), *Rudbeckia heliopsidis* (sun-facing coneflower), *Salix floridana* (Florida willow), *Sarracenia rubra* ssp. *wherryi* (Wherry's sweet pitcherplant), *Scuttelaria ocmulgee* (Ocmulgee skullcap), *Sporobolus teretifolius* (wire-leaved dropseed), *Stellaria fontinalis* (water stitchwort), *Thalictrum debile* (southern meadowrue), *Trillium texanum* (Texas trillium), *Vicia ocalensis* (Ocala vetch), *Waldsteinia lobata* (lobed barren-strawberry), and *Xyris longisepala* (Kral's yellow-eyed grass). The NatureServe global ranking of these 75 species ranges from subspecies T1, to T2, to T3 status and species G1, to G2, to G3, and G4.

Evaluation of Information for This Finding

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations at 50 CFR 424 set forth the procedures for adding a species to, or removing a species from, the Lists of Endangered and Threatened Wildlife and Plants (Lists). A species may be determined to be endangered or threatened due to one or more of the five factors described in section 4(a)(1) of the Act:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

Listing actions may be warranted based on any of the above factors, singly or in combination.

In considering what factors might constitute threats, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to a factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine how significant a threat it is. If the threat is significant, it may drive or contribute to the risk of extinction of the species such that the species may warrant listing as endangered or threatened as those terms are defined by the Act. This does not necessarily require empirical proof of a threat. The combination of exposure and some corroborating evidence of how the species is likely impacted could suffice. The mere identification of factors that could impact a species negatively may not be sufficient to compel a finding that listing may be warranted. The information shall contain evidence sufficient to suggest that these factors may be operative threats that act on the species to the point that the species may meet the definition of endangered or threatened under the Act.

In making this 90-day finding, we evaluated whether information regarding threats to the 374 species, as presented in the petition and other information available in our files, is substantial, thereby indicating that

listing any of the species in the petitioned action may be warranted. Our evaluation of this information is presented below. Our review of the species varied significantly depending on the amount of information presented in the petition and the amount of information available in our files. Because so little information was available in our files for many of these rare, locally endemic species, the information below summarizes only the information in the petition, unless noted otherwise.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range

The petition states that all species, except for one (*Oncidium undulatum,* Cape Sable orchid) identified in the petition are threatened by the present or threatened destruction, modification, or curtailment of their habitat or range. According to the petition, aquatic and riparian habitats in the Southeast have been extensively degraded by direct alterations of waterways such as impoundment, diversion, dredging and channelization, and draining of wetlands, and by land-use activities such as development, agriculture, logging, and mining (Benz and Collins 1997; Shute *et al.* 1997). More than one-third of the petitioned species have experienced drastic range reductions, and up to a 90 percent range loss for many of the petitioned mussels and snails (Pyne and Durham 1993; Neves *et al.* 1997; NatureServe 2008). According to the petition, because many of the aquatic species in the Southeast are very narrow endemics or have experienced a dramatic range reduction, remaining populations are now susceptible to extinction from even relatively minor habitat losses (Herrig and Shute 2002).

The petition asserts that habitat loss and degradation are driving the decline of reptiles, mollusks, and other aquatic taxa. Buhlman and Gibbons (1997) found that 36 percent of analyzed imperiled aquatic reptiles are threatened because of the ''continuing, cumulative abuse sustained by river systems,'' and that at least 22 southeastern reptile taxa have declined due to degradation of rivers and streams. Habitat degradation and fragmentation is also asserted to be the primary cause of imperilment for southeastern mollusks (Neves *et al.* 1997; Lysne *et al.* 2008); mammals (Harvey and Clark 1997); fish (Warren *et al.* 1997); and plants (Stein *et al.* 2000).

Physical Alteration of Aquatic Habitats

Impoundment

According to the petition, nearly half of the petitioned species are threatened by impoundment, including 83 percent of the fishes and 67 percent of the mollusks. Dams modify habitat and aquatic communities both upstream and downstream of the impoundment (Winston *et al.* 1991; Mulholland and Lenat 1992; Soballe *et al.* 1992). Upstream of dams, habitat is flooded and in-channel conditions change from flowing to still water, with increased depth, decreased levels of dissolved oxygen, and increased sedimentation. Sedimentation alters substrate conditions by filling in interstitial spaces between rocks, which provide habitat for many species (Neves *et al.* 1997). Downstream of dams, flow regime fluctuates (with resulting fluctuations in water temperature and dissolved oxygen levels), the substrate is scoured, and downstream tributaries are eroded (Schuster 1997; Buckner *et al.* 2002). Negative ''tailwater'' effects on habitat extend many kilometers downstream (Neves *et al.* 1997). Dams fragment habitat of aquatic species by blocking corridors for migration and dispersal, resulting in population isolation and heightened susceptibility to extinction (Neves *et al.* 1997). Dams also preclude aquatic organisms from escaping polluted waters and accidental spills (Buckner *et al.* 2002).

As of the early 1990s, there were 144 major reservoirs in the Southeast, including 26 in Tennessee, 19 each in Alabama and North Carolina, and 17 in Kentucky (Soballe *et al.* 1992). There are 36 dams on the mainstem and major tributaries of the Tennessee River (Neves *et al.* 1997), resulting in the impoundment of more than 20 percent of the Tennessee River and its major tributaries (Shute *et al.* 1997). The Tennessee and Cumberland River drainages have approximately 70 major dams and reservoirs (Buckner *et al.* 2002). Waterways in Alabama have also been extensively impounded, with 16 major lock and dam structures on six rivers, 21 hydroelectric power dams, and over 20 public water supply impoundments (Buckner *et al.* 2002). The Coosa and Tallapoosa Rivers in Georgia and Alabama have been ranked among the most imperiled rivers in the nation due to damming (Buckner *et al.* 2002).

The petition asserts that, in addition to rivers, damming of streams and springs is also extensive throughout the Southeast (Etnier 1997; Morse *et al.* 1997; Shute *et al.* 1997). Noss *et al.* (1995) reports that practically every stream in the Mississippi Alluvial Plain has been channelized, levied, or hydrologically altered. Small streams on private lands are regularly dammed to create ponds for cattle, for irrigation, for recreation, and for fishing, with significant ecological effects due to the sheer abundance of these structures (Morse *et al.* 1997).

In Florida and other Southeast States, impoundment of large coastal tributaries has severely curtailed fish spawning runs (Gilbert 1992). Impoundment blocks migratory routes of fish and covers spawning habitat with silt (Etnier 1997). According to the petitioners, dams and the resultant substrate changes have imperiled disproportionately high numbers of benthic fishes (Warren *et al.* 1997).

Changes in the fish community jeopardize the survival of mussels because mussels are dependent on host fish to successfully reproduce, with some species of mussels being dependent on specific species of fish (Bogan 1993, 1996). If the fish species upon which a mussel is dependent to host its larvae goes extinct, then the mussel becomes ''functionally extinct,'' even when there are surviving long-lived individuals (Bogan 1993). Impoundments can also separate mussel populations from host fish populations, resulting in the eventual extinction of the mussel species (Bogan 1993, 1996). The loss of mussels can in turn negatively affect fish, because some species of fish use empty mussel shells as nest sites (Bennett *et al.* 2008).

The petition claims that impoundments are also one of the primary reasons for the decline in crustaceans in the Southeast (Schuster 1997), in aquatic insects (Herrig and Shute 2002), and in forest-associated bird species, particularly for species with narrow niches and low tolerance to disturbance (Dickson 2007).

Dredging and Channelization

According to the petition, dredging and channelization are extensively employed throughout the Southeast for flood control, navigation, sand and gravel mining, and conversion of wetlands into croplands (Neves *et al.* 1997; Herrig and Shute 2002). Many rivers are continually dredged to maintain shipping channels (Abell *et al.* 2002). Dredging and channelization modify and destroy habitat for aquatic species by destabilizing the substrate, increasing erosion and siltation, removing woody debris, decreasing habitat heterogeneity, and stirring up contaminants that settle onto the substrate (Hart and Fuller 1974; Williams *et al.* 1993; Buckner *et al.*

2002; Bennett *et al.* 2008). Channelization can also lead to headcutting, sedimentation, and actual removal of mussels from their beds during dredging operations (Hart and Fuller 1974; Williams *et al.* 1993).

The petition also claims that dredging and channelization also threaten imperiled fish, reptiles, crustaceans, and other species. Dredging removes woody debris, which provides cover and nest locations for fish such as the frecklebelly madtom (Bennett *et al.* 2008). Flood control projects and channel maintenance operations in Mississippi threaten aquatic species in the Yazoo Basin (Jackson *et al.* 1993), including the petitioned Yazoo crayfish. Dredging and channelization are also known to be the primary reason for imperilment of southeastern crustaceans (Schuster 1997), and to contribute to the decline of southeastern turtles (Buhlmann and Gibbons 1997). Many of the imperiled turtle species, including the highly imperiled map turtles, are threatened by the removal of woody debris, on which they depend for basking.

Water Development and Diversion and Decreased Water Availability

According to the petition, in the Southeast, demands for freshwater for electricity production, irrigation, agriculture, and industrial and residential development are increasing (Herrig and Shute 2002; Hutson *et al.* 2005; Lysne *et al.* 2008). Limited water supply is already a source of conflict in Tennessee, Alabama, and Georgia in particular, where rapidly growing metropolitan areas such as Atlanta, Birmingham, and Nashville have drastically increased the demand for water for residential and industrial uses (Buckner *et al.* 2002). The construction of numerous large Confined Animal Feeding Operations throughout the Southeast has led to an increased demand for inter-basin water transfers (Buckner *et al.* 2002). Increasing drought due to global climate change is expected to exacerbate the threat of limited water availability to aquatic and riparian species in southeastern States (Karl *et al.* 2009). Water demands to support gas-fired steam plants for electricity generation have increased in the Southeast. These plants require millions of gallons of water per day, and return only roughly one-fifth of that water back to the waterways, and even this water tends to be thermally polluted and may be inadequate to meet the dissolved oxygen needs of aquatic species (Buckner *et al.* 2002).

The petition also asserts that surface diversion of streams threatens southeastern aquatic species (Etnier 1997; Abell *et al.* 2000; Buckner *et al.* 2002; Herrig and Shute 2002), and that an increasing threat to southeastern species is the growing practice of damming small headwater streams to supply water for municipalities (Buckner *et al.* 2002). Water withdrawals reduce base flows, decreasing habitat availability for aquatic species, and the reduced water volume also increases the concentration of pollutants, posing another threat to species (Abell *et al.* 2000; Herrig and Shute 2002).

According to the petition, in addition to rivers and streams, many southeastern springs have been drastically altered to supply water for human uses (Etnier 1997). Spring development and diversion can alter flow regime and water quality parameters, lead to substrate disturbance and erosion, and alter the substance and composition of vegetative cover with resultant effects on freshwater fauna (Shepard 1993; Frest and Johannes 1995; Frest 2002). An additional threat to southeastern species is groundwater overdraft (pumpage of groundwater in excess of safe yields), which threatens spring flow and species that are dependent on consistent spring flow conditions (Strayer 2006). The petitioners also assert that the dewatering of groundwater systems in the Southeast threatens rare species of isopods, amphipods, fish, crayfish, and amphibians that are dependent on stable spring and cave environments (Herrig and Shute 2002).

Loss of Wetlands

According to the petition, through the mid-1980s, wetlands were lost in the Southeast as a rate of over 385,000 acres per year (Hefner and Brown 1984). In Florida alone, more than 9 million acres of wetlands had been lost by that time (Cerulean 1991). In Arkansas 6 million acres of Mississippi Delta wetlands had been converted to agricultural use by the mid-1980s (Smith *et al.* 1984). In the Lower Mississippi Valley Region, more than one-third of existing wetlands were destroyed from 1950 to 1970 (Mitsch and Gosselink 1986), with over 185,000 acres of wetlands continuing to be lost annually through the mid-1980s in this region (Tiner 1984). In Tennessee, up to 90 percent of upland wetlands on the Highland Rim have been destroyed, as have more than 90 percent of Appalachian bogs in the Blue Ridge Province (Pyne and Durham 1993). The destruction of pocosins (evergreen shrub bogs) has been extensive throughout the Southeast, with greater than 90 percent loss in Virginia, nearly 70 percent loss in North Carolina, and nearly 70 percent loss on the Southeastern Coastal Plain (Noss *et al.* 1995).

The petition asserts that loss, degradation, and fragmentation of wetland habitat have negatively affected numerous southeastern freshwater species, and natural wetland habitats continue to be lost, placing more species at risk (Dodd 1990; Benz and Collins 1997; Semlitsch and Bodie 1998; Herrig and Shute 2002). Vegetated permanent wetlands are among the most jeopardized habitats in the Southeast, with the result that fish families that are dependent on these habitats are disproportionately imperiled, such as the pygmy sunfishes (Etnier and Starnes 1991; Cubbage and Flather 1993; Dickson and Warren 1994; Warren *et al.* 1994). According to petitioners, wetland destruction has also destroyed habitat for many bird species (Dickson 1997); aquatic reptile species that depend on standing water habitats (Herrig and Shute 2002),; and amphibians (LaClaire 1997), such as the Gulf Hammock dwarf siren (Amphibia Web 2009). Because many reptile and amphibian populations exist as metapopulations that rely on habitat connectivity to maintain genetic structure and provide recolonization opportunities in the event of localized extirpations, habitat fragmentation and isolation threaten their regional persistence by cutting off opportunities for migration and dispersal and by magnifying the likelihood of inbreeding depression and reproductive failure due to random environmental perturbation (Buhlmann and Gibbons 1997; Semlitsch and Bodie 1998).

Land Use Activities That Decrease Watershed Integrity

The petition asserts that southeastern aquatic species are threatened not only by direct physical alteration of waterways, but also by activities in the watershed that directly or indirectly degrade aquatic habitats such as residential, commercial, and industrial development; agriculture; logging; mining; alteration of natural fire regime; and recreation. Land use activities can alter water chemistry, flow, temperature, and nutrient and sediment transport, and can interfere with normal watershed functioning (Folkerts 1997).

Residential and Industrial Development and Human Population Growth

According to the petition, development threatens two-thirds of the petitioned species. The primary threat to the petitioned dragonfly, the purple skimmer, is lakeshore development. The Waccamaw fatmucket, a petitioned

mussel, is threatened primarily by increasing development in its watershed. Also, according to the petition, the Carolina pygmy sunfish, Chauga crayfish, and many other petitioned species are also threatened primarily by development.

The human population nearly doubled in the Southeast between 1970 and 2000 (Folkerts 1997). Southeastern states continued to experience significant human population growth from 2000 to 2007, with the population of Georgia increasing by 17 percent, Florida by 14 percent, North Carolina by 13 percent, South Carolina by 10 percent, Virginia by 9 percent, and Tennessee by 8 percent (U.S. Census Bureau 2009). Metropolitan areas in the Southeast are among the fastest growing in the nation (Dodd 1997).

Population growth threatens biodiversity through an increased demand for food, water, and other resources. The strong geographic focus of development around freshwaters concentrates human ecological impacts on freshwater ecosystems more than on any other part of the landscape (Strayer 2006). Throughout the Southeast, increased development is creating water supply problems, stressing available water resources, and polluting aquatic habitats (Seager *et al.* 2009). Global climate change is expected to lead to fluctuating water supplies in the Southeast, and in conjunction with increasing human demand for freshwater, to place many aquatic at heightened risk of extinction (Karl *et al.* 2009).

The petition asserts that urbanization and residential, commercial, and industrial development threaten aquatic species in both direct and indirect ways. Habitat is directly lost and fragmented through land conversion and through water withdrawal and diversion (Benz and Collins 1997). Predation increases as populations of pets and synanthropic species ecologically associated with humans increase (Marzluff *et al.* 2001). Point-source pollution from industry and runoff from parking lots, roofs, roads, and lawns degrade water quality and have lethal and sub-lethal effects on aquatic species. Urban runoff is associated with declines in macroinvertebrate diversity and with decreased mussel growth rates, and urban land use classes are associated with impairment of fish and macroinvertebrate communities (Soucek *et al.* 2003; Carlisle *et al.* 2008). Amphibians and reptiles are particularly threatened by development. Siltation and leachate from road runoff can be lethal to larval amphibians and other aquatic organisms (Dodd 1997). The construction of roads increases mortality and leads to population isolation and the disruption of the metacommunity structure on which the long-term population persistence of many herptile species depends (Buhlman and Gibbons 1997). Noise and light from roads and developments can interfere with behavior patterns and disrupt breeding and feeding activities, particularly for amphibians (Dodd 1997). Amphibian species' richness is lower in urbanized areas, as many species cannot persist in urbanized sites (Delis 1993; Herrig and Shute 2002).

According to the petition, habitat loss and degradation due to development is generally permanent and poses an increasing threat to southeastern aquatic species. Folkerts (1997) reports that particularly in the Southeast, development threatens aquatic species more than in other areas due to lax enforcement of environmental laws in the region.

Recreation

According to the petition, the increased human population is increasing the demand for recreational developments and activities. Housing developments, strip malls, and resorts are being constructed in very rural areas, and small towns are now burgeoning in previously undeveloped areas in the Southeast including, the Knoxville-Chattanooga suburban corridor, on the Cumberland Plateau, in the Cahaba River headwaters outside Birmingham, and in the Mobile-Tensaw Delta (Buckner *et al.* 2002). Many rapidly developing small communities are constructing dams on headwater streams, often in areas that were recently remote and inaccessible, with resultant impacts on aquatic species (Buckner *et al.* 2002). The development of housing and recreational facilities on lakeshores and in riparian areas results in the degradation of water quality and aquatic habitat (Tennessen 1997). For example, Morse *et al.* (1997) report the loss of rare stonefly species in a stream in North Carolina following the development of summer homes.

The petition asserts that recreational developments and activities threaten aquatic species by fostering air and water pollution, litter, and potentially high densities of recreationists (Houston 1971; White and Bratton 1980). Recreation can cause trampling of organisms and vegetation (Little 1975). Local habitat changes caused by trampling include simplification of vegetation and soil compaction, which can result in overall loss of habitat diversity (Speht 1973; Liddle 1975). Off-road vehicle use can lead to severe degradation of aquatic and riparian habitats through trampling of organisms, destruction of vegetation, erosion, and degraded water quality (Wuerthner 2007). According to the petitioners, off-road vehicle use threatens imperiled mussels (Hanlon and Levine 2004) and reptiles (Herrig and Shute 2002). Southeastern aquatic species are also alleged by the petitioners to be threatened by other forms of motorized recreation, such as motorized boats and jet skis, which cause oil and gas contamination and bank erosion (Buckner *et al.* 2002). Garber and Burger (1995) also document the extirpation of a turtle population in a protected area due to occasional poaching.

Decreased water quality, trampling, or other recreational impacts purportedly threaten 22 percent of the petitioned species including the Bigcheek cave crayfish, Blue Spring hydrobe snail, and small-flower meadow-beauty.

Logging

The petition asserts that southeastern aquatic and riparian species are threatened by the loss of forests and the negative effects of these losses on water quality and aquatic habitats that result from logging activities and canopy removal. The Southeast now supplies nearly 70 percent of the nation's pulp and paper products (Buckner *et al.* 2002). According to Folkerts (1997), the rate of deforestation in the Southeast at that time exceeded that of any tropical area of comparable size. The Tennessee, Cumberland, and Mobile basins have experienced a drastic increase in large clearcutting operations and chip mills, with 1.2 million acres of forest being cut annually to supply 150 regional chip mills, two-thirds of which have been built since the 1980s (Buckner *et al.* 2002). In the area surrounding Great Smoky Mountain National Park, the rate of logging doubled from 1980 to 1990 (Folkerts 1997). Of the 70 million acres of longleaf pine forest which once covered over 40 percent of the Southeastern Coastal Plain, only 1 to 2 percent remains, and the remnant acreage is fragmented and ''poorly-managed'' (Noss *et al.* 1995; Dodd 1997). Clearcutting on the Coastal Plain has affected ''virtually every aquatic habitat in the area'' (Folkerts 1997).

According to the petition, logging has many direct and indirect negative effects on aquatic biota across taxa. Erosion from poor forestry practices degrades water quality (Williams *et al.* 1993). Increased sedimentation from logging can suffocate aquatic snails and their eggs, preclude their ability to feed, and extirpate populations (Frest and Johannes 1993). Increased

sedimentation is also harmful to freshwater mussels (Neves *et al.* 1997). Clearcutting and conversion of deciduous forests to pine plantations increases sedimentation and reduces the input of large woody debris and leaf litter into streams, which are necessary to provide microhabitat and food for aquatic organisms (Morse *et al.* 1997; Herrig and Shute 2002). Clearcutting can lead to the disappearance of caddisflies and mayflies, with ramifications at higher levels of the food web (Morse *et al.* 1997). Amphibian diversity and abundance is reduced by clearcutting and the conversion of deciduous forests to pine plantations (Dodd 1997; Herrig and Shute 2002). Aquatic-breeding amphibians, which depend on ephemeral ponds or which are dependent on forested habitats to complete their life cycle or both, are particularly threatened by logging activities (Dodd 1997). Herbicides used after timber harvests also negatively affect amphibians and other aquatic organisms (Dodd 1997; Herrig and Shute 2002).

According to the petition, 51 percent of the petitioned species are threatened by logging. Logging is the primary threat to the newly discovered patch-nosed salamander, and to many of the petitioned crayfishes, including the Irons Fork burrowing crayfish, Kisatchie painted crayfish, and pristine crayfish. The petitioners assert that logging also threatens the petitioned dragonflies, including Westfall's clubtail and the Ozark emerald.

Agriculture and Aquaculture

According to the petition, southeastern aquatic species are also threatened by the loss and degradation of habitat due to poor agricultural practices. Intensive agriculture began in the Southeast in the 1930s, and agriculture continues to extensively impact southeastern aquatic ecosystems (Neves *et al.* 1997). The petitioners assert that agriculture in the Southeast has a tremendous impact on aquatic habitats both due to the extent of farmland and to farming practices (Buckner *et al.* 2002; Herrig and Shute 2002). In the Tennessee, Cumberland, and Mobile River basins, for example, farms cover nearly half the landscape. Throughout the Southeast, fields are commonly plowed to the edges of waterways, causing sedimentation and bank collapse and facilitating the runoff of fertilizers and pesticides (Buckner *et al.* 2002). Both traditional farming practices and confined animal feeding operations contribute to water quality degradation and the imperilment of indigenous biota in the Southeast through erosion, sedimentation, and chemical and nutrient pollution from point and non-point sources (Patrick 1992; Morse *et al.* 1997; Neves *et al.* 1997; Herrig and Shute 2002).

According to the petition, 50 percent of the petitioned species are threatened by conversion of their habitat to agricultural use or by agricultural runoff, including the striated darter, Logan's agarodes caddisfly, Sevier snowfly, and Tennessee clubtail. Agricultural land uses have been associated with impairment of fish and macroinvertebrate communities (Herrig and Shute 2002), communities of freshwater mollusks (Williams *et al.* 1993; Neves *et al.* 1997), and threats to imperiled amphibians (Herrig and Shute 2002).

Many of the petitioned species are allegedly threatened from confined animal feeding operations (CAFOs), including the Carolina madtom, corpulent hornsnail, and the Neuse River waterdog. Confined animal feeding operations and feedlots have caused extensive degradation of southeastern aquatic ecosystems (Neves *et al.* 1997; Buckner *et al.* 2002; Mallin and Cahoon 2003). The number of CAFOs in the Southeast has increased drastically since 1990, as livestock production has undergone extensive industrialization (Buckner *et al.* 2002; Mallin and Cahoon 2003). Alabama and Arkansas are now the nation's leading poultry producers, with Florida, Georgia, and Kentucky also among the top 10 States for poultry production (U.S. Census Bureau 2009). Poultry CAFOs are also abundant in North Carolina, Mississippi, and Virginia (Mallin and Cahoon 2003). There are extensive swine CAFOs in the North Carolina Coastal Plain, and North Carolina is now the nation's second largest pork producer (Mallin and Cahoon 2003; U.S. Census Bureau 2009). Confined animal feeding operations threaten aquatic species both because of the vast amounts of fresh water necessary to support their operation and due to pollution (Buckner *et al.* 2002). Confined animal feeding operations house thousands of animals and produce a large amount of waste, which enters the environment either by being directly discharged into streams or constructed ditches, stored in open lagoons, or applied to fields in wet or dry form (Buckner *et al.* 2002; Mallin and Cahoon 2003; Orlando *et al.* 2004). Confined animal feeding operation wastes contain nutrients, pharmaceuticals, and hormones, and result in eutrophication (a choking of waters by excessive algae growth which has been stimulated by fertilizers or sewage) of waterways, toxic blooms of algae and dinoflagellates, and endocrine disruption in downstream wildlife (Mallin and Cahoon 2002; Orlando *et al.* 2004).

Both livestock holding lots and landscape grazing degrade habitats in the Southeast, according to the petitioners (Buckner *et al.* 2002; Herrig and Shute 2002). Several southeastern States produce large amounts of cattle and horses feeding them via both grazing and holding lots (Buckner *et al.* 2002; U.S. Census Bureau 2009). Livestock are generally allowed to wade directly into streams, trampling habitat and resulting in erosion and nutrient contamination (Buckner *et al.* 2002). The effects of livestock grazing on stream and riparian ecosystems are well documented and include negative effects on water quality and quantity, channel morphology, hydrology, soils, instream and streambank vegetation, and aquatic and riparian wildlife (Belsky *et al.* 1999). According to Frest (2002), snails and their habitats are harmed through direct trampling, soil compaction, erosion, water siltation and pollution, and drying up of springs and seeps. The petitioners claim that 14 percent of the petitioned species are threatened by grazing, including the Virginia stone (stonefly), Barrens darter, Cherokee clubtail (dragonfly), and many plants, including the eared coneflower.

The petition alleges that aquaculture poses an additional threat to aquatic species in the Southeast. According to Tucker and Hargreaves (2003), catfish farming is the largest aquaculture enterprise in the United States, with 95 percent of production occurring in Alabama, Arkansas, Louisiana, and Mississippi. Similarly, crayfish farming in Louisiana is the nation's second largest aquaculture enterprise, with over 49,000 hectares of crayfish ponds (Holdich 1993). According to the petitioners, aquaculture threatens aquatic habitats through habitat conversion; the withdrawal, diversion, or impoundment of natural waterways to support operations; and the release of effluent to waterbodies (Naylor *et al.* 2001). Water quality degradation threatens southeastern aquatic insect populations (Herrig and Shute 2002). Impoundments and diversions alter water chemistry and flow, and can be detrimental to native mollusks and fishes (Morse *et al.* 1997; Neves *et al.* 1997). The construction of shrimp farms in wetlands and estuaries also destroys and degrades habitat for native aquatic species (Hopkins *et al.* 1995).

Mining and Oil and Gas Development

According to the petition, mining for coal, gravel, limestone, phosphate, iron, and other raw materials poses a dire threat to many aquatic species in the Southeast (Dodd 1997; Buckner 2002), and 29 percent of the petitioned species are threatened by mining and oil and gas development. Extensive strip mining for coal occurs in West Virginia, Kentucky, Virginia, Tennessee, and Alabama (Dodd 1997). As of 2004, more than 1.1 million acres of land in Appalachia were undergoing active mining operations (Loveland *et al.* 2003), and the EPA projects that from 1992 to 2013, 761,000 acres of Appalachian forest will be lost to surface coal mining (Pomponio 2009). Up to 23 percent of the land area of some counties in Kentucky and West Virginia has been permitted for surface coal mining (U.S. Government Accountability Office 2009). Mining increases the potential for extreme flooding events, and reclamation does not restore pre-mining hydrologic characteristics or ecological functions (Townsend *et al.* 2009).

Mining often occurs directly through streams or ponds, and mine wastes are pushed directly into streams and rivers (Dodd 1997; EPA 2005). From 1992 to 2002, more than 1,200 miles of Appalachian streams were buried or degraded by mountaintop removal coal mining (EPA 2005). This figure does not incorporate the thousands of miles of downstream reaches that have been substantially degraded by sedimentation and chemical pollution from coal mining (Palmer and Bernhardt 2009; Pomponio 2009; Palmer *et al.* 2010). According to the petitioners, in the Clinch and Powell watersheds of southwestern Virginia, where the highest concentration of imperiled species in the continental United States occurs (Stein *et al.* 2000), there were 287 active coal-mining point source discharges as of 2002 (Diamond *et al.* 2002), which are degrading habitat for imperiled species (Ahlstedt *et al.* 2005). The petitioners allege that 30 of the petitioned species are specifically threatened by mountaintop removal.

Coal mining negatively impacts aquatic species through direct habitat destruction, decreased water availability, variations in flow and thermal gradients, and chronic and acute pollution of surface and ground water (FWS 1996; Neves *et al.* 1997; Houp 1993; Pond *et al.* 2008; Palmer and Bernhardt 2009; Pomponio 2009; Wood 2009; Palmer *et al.* 2010). Pollution from mining adversely impacts invertebrates and vertebrates, and leads to less diverse and more pollution-tolerant species (Naimo 1995; Cherry *et al.* 2001; EPA 2005; Lemly 2009; Pomponio 2009). The petitioners allege that surface coal mining and associated road building increase human access to imperiled species, which can lead to poaching and contribute to the spread of invasive species (FWS 1996). Surface coal mining also causes long-term changes in land use and local ecology, and threatens the long-term viability of populations due to habitat fragmentation (FWS 1996).

The petition alleges that coal mining negatively impacts diatoms (a major group of algae) and macroinvertebrates (Serveiss 2001; Locke *et al.* 2006; Carlisle *et al.* 2008; Pond *et al.* 2008), amphibian diversity and abundance (EPA 2005; Wood 2009; Palmer and Bernhardt 2009), and the index of fish biotic integrity (Diamond and Serveiss 2001). The petition states that coal mining is also reported to cause reproductive failure in riparian birds (Lemly 1985; Ohlendorf 1989).

According to the petition, other forms of mining and oil and gas development are also causing severe degradation of aquatic habitats: In-stream gravel mining and rock removal fragment and destroy habitat for aquatic insects, crayfish, mussels, and fish (Buckner *et al.* 2002); and sand and gravel mining have been associated with both on- and off-site mussel extirpation (Hartfield 1993), and with decreased downstream mussel growth rates (Yokley 1976). The petitioners allege that many species are threatened by sand and gravel mining, including the cobblestone tiger beetle, bluestripe darter, hellbender (salamander), and many mussels and snails. Historic phosphate and iron mines resulted in precipitous declines in mussel populations (Ortmann 1924). Mining of industrial minerals such as kaolin, mica, and feldspar also results in loss and degradation of habitat for aquatic species (Tennessee Valley Authority 1971; EPA 1977; Duda and Penrose 1980). The petition alleges that kaolin mining threatens the petitioned mussel, the Alabama spike, and the petitioned fish, the robust redhorse, and that oil and gas development threatens many of the petitioned mussels.

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

The petition stated that all 15 amphibians petitioned (13 of which are subjects of this finding) were threatened by overutilization for commercial, recreational, scientific, or educational purposes; in addition this factor threatens 1 beetle (Cobblestone tiger beetle), 2 birds (Florida sandhill crane and black rail), 1 butterfly (rare skipper), 1 crayfish (Big Blue Springs Cave crayfish), 2 dragonflies (Septima's clubtail and Appalachian snaketail), 5 fish (northern cavefish, Carolina pygmy sunfish, robust redhorse, orangefin madtom, and bluehead shiner), 6 mussels (brook floater, brother spike, Suwannee moccasinshell, Tennessee clubshell, warrior pigtoe, and pyramid pigtoe), 11 reptiles (Kirtland's snake, western chicken turtle, Florida Keys mole skink, Barbour's map turtle, Escambia map turtle, Pascagoula map turtle, black-knobbed map turtle, Alabama map turtle, striped mud turtle—lower Florida Keys, Florida red-bellied turtle—Florida panhandle, and northern red-bellied cooter), and 7 vascular plants (*Baptisia megacarpa, Epidendrum strobiliferum, Hymenocallis henryae, Illicium parviflorum, Lilium iridollae, Oncidium undulatum, and Sarracenia purpurea* var. *montana*).

The petition alleges overutilization is the primary threat for the hellbender salamander, which is commonly killed by fishermen. Collection for the pet trade threatens a few of the petitioned fishes, crayfishes, and amphibians. Historical overuse greatly threatened many of the petitioned mussels, fishes, and the Florida sandhill crane. Throughout the Southeast, reptiles are exploited for use as pets or food, or are killed for recreational purposes, which may all cause significant population declines. The petitioners allege that many southeastern turtle species, such as the Florida red-bellied turtle, Pascagoula map turtle, Barbour's map turtle, and black-knobbed map turtle, are threatened by over-collection because they are commonly harvested for food, the pet trade, or recreation. Several southeastern turtle species are being driven to extinction by unregulated commercial harvest. The petition alleges that the States of Arkansas, Kentucky, Georgia, Louisiana, and Tennessee allow unlimited harvest of freshwater turtles. The international trade in turtles for use as food, as pets, or in traditional medicine is extensive and largely unregulated (Buhlman and Gibbons 1997; Sarma 1999). Records indicate that the trade in live turtles from the United States to China is thousands of tons per year. The Tennessee Wildlife Resources Agency reports that more than 25,000 turtles were reported as harvested in Tennessee from 2006 to 2007. Overutilization of imperiled turtle species is especially problematic because the reproductive

success of long-lived reptile species is dependent on high adult survivorship, and population declines occur when adults are harvested (Brooks *et al.* 1991; Heppell 1998; Pough *et al.* 1998; Congdon *et al.* 1993, 1994).

Over-collection and recreational killing are also a threat to some southeastern snake and lizard species (Gibbons *et al.* 2000; Herrig and Shute 2002). The Kirtland's snake, and the Florida Keys mole skink are all threatened by over collection (NatureServe 2008).

The petition alleges that southeastern mussels are also threatened by overutilization, although to a lesser extent than in the past (Neves *et al.* 1997). The harvest of southeastern mussels for commercial purposes is well documented (Anthony and Downing 2001; Williams *et al.* 2008). Mussels are collected for their pearls, meat, and shells, and many populations of mussels have been depleted by harvest in the last 200 years (Strayer 2006). Although mussel fisheries targeted abundant species, the historical bycatch of rare species was likely substantial (Strayer 2006). Mussel collections declined by mid-century, but a resurgence in the commercial harvest has occurred since the 1960s to supply nucleus seeds for the cultured pearl trade (Ward 1985; Williams *et al.* 1993). In 1991 and 1992, 570 tons of shells were harvested from the Wheeler Reservoir on the Tennessee River (Williams *et al.* 2008). Most harvested mussels are common species, but bycatch remains a threat to native mussels.

Imperiled native mussels are threatened not only by the amount of harvest, but also by the method used to collect shells, which when conducted non-selectively, can result in substantial bycatch of non-target species and juveniles (Williams *et al.* 1993). Although unwanted mussels are thrown back, Sickel (1989) found that mortality of undersized mussels that are thrown back may be as high as 50 percent. Very rare species of mussels are also threatened by over-collection from shell collectors and biologists for biological collections. Overutilization for biological collections may have contributed significantly to the decline of the Suwannee moccasinshell (NatureServe 2008).

Other southeastern taxa are also threatened by overexploitation, including fish, amphibians, crayfish, butterflies, and plants. Amphibians are threatened by over-collection for use as food, for the pet trade, and for the biological and medicinal supply markets (Dodd 1997; Amphibia Web 2009). Southeastern fish and crayfishes are vulnerable to overutilization. Crayfishes are threatened by collection for use as bait or food (Herrig and Shute 2002). The Carolina pygmy sunfish (*Elassoma boelhkei*) is threatened by over-collection for the pet trade (NatureServe 2008). Collection of invertebrates for bait or the pet trade can deplete populations (Strayer 2006). Collection also threatens the rare skipper (*Problema bulenta*) (NatureServe 2008). White *et al.* (2002) documented the removal of an entire population of Panhandle lily (*Lilium iridollae*) from the Conecuh National Forest by horticultural collectors.

The petition alleges that the impacts of overutilization compound the threats facing imperiled southeastern species whose populations have already been reduced due to habitat loss or other factors. Overutilization may drive species that are already struggling to survive to extinction.

Factor C. Disease or Predation

The petition stated that disease or predation threatened 11 amphibians addressed in this finding (streamside salamander, one-toed amphiuma, hellbender, Cumberland dusky salamander, seepage salamander, Chamberlain's dwarf salamander, Oklahoma salamander, Tennessee cave salamander, West Virginia Spring salamander, Georgia blind salamander, and Neuse River waterdog), 3 birds (MacGillivray's seaside sparrow, Florida sandhill crane, and black rail), 8 fish (Carolina pygmy sunfish, candy darter, paleback darter, Shawnee darter, Barrens topminnow, robust redhorse, Carolina madtom, and bluehead shiner), 1 mammal (Sherman's short-tailed shrew), 6 mussels (Tennessee heelsplitter, Cumberland moccasinshell, Tennessee clubshell, Tennessee pigtoe, purple lilliput, and Savannah lilliput), 6 reptiles (Kirtland's snake, Barbour's map turtle, Escambia map turtle, Pascagoula map turtle, Florida red-bellied turtle, and northern red-bellied cooter), and 6 vascular plants (*Lilium iridollae* (Panhandle lily), *Najas filifolia* (narrowleaf naiad), *Rudbeckia auriculata* (eared coneflower), *Schoenoplectus hallii* (Hall's bulrush), *Sideroxylon thornei* (swamp buckhorn or Georgia bully), Tsuga *caroliniana* (Carolina hemlock)).

Disease

According to the petition, the spread of disease has contributed to the decline of aquatic species globally and in the southeastern United States (Daszak *et al.* 1999; Corser 2000; Gibbons *et al.* 2000; Cunningham *et al.* 2003). Amphibians, in particular, have been decimated by the spread of disease (Kiesecker *et al.* 2004). Numerous diseases are contributing to amphibian declines, including infections of fungi (*Batrachochytrium dendrobatidis* ''chytrid''; *Saprolegnia*), ranavirises, iridovirises, mesomycetozoea, protozoa, helminthes, and undescribed diseases (Dodd 1997; Daszak *et al.* 1999; Briggs *et al.* 2005; Davis *et al.* 2007; Peterson *et al.* 2007). Chytrid fungus affects not only frogs but has also now been reported in both aquatic and terrestrial salamanders (Davidson *et al.* 2003; Cummer *et al.* 2005; Padgett-Flohr and Longcore 2007). The decline of map turtles, musk turtles, snapping turtles, and pond turtles is partially attributable to disease (Dodd 1988; Buhlmann and Gibbons 1997). Southeastern freshwater fishes are also threatened by diseases, which are being spread by aquaculture operations and in shipments between fish hatcheries (Kautsky *et al.* 2000; Naylor *et al.* 2001; Strayer 2006; Green and Dodd 2007).

The petition alleges that other threats exacerbate the vulnerability of southeastern aquatic fauna to disease and population decline. The hellbender, which is threatened by both habitat loss and overuse, is also threatened by disease. Reptile declines have also been attributed to disease (Diemer Berish *et al.* 2000; Gibbons *et al.* 2000). In freshwater fishes, stress-related diseases are prevalent in polluted rivers, where chronic, sub-lethal pollution has increased the susceptibility of organisms to infection (Moyle and Leidy 1992).

Predation

According to the petition, predation threatens several of the petitioned species, including reptiles, amphibians, birds, plants, fishes, crayfishes, and mollusks. Heavy predation of turtle nests by raccoons can be a primary factor limiting recruitment of imperiled turtle populations (Browne and Hecnar 2007). At least two of the petitioned bird species are threatened by predation. MacGillivray's seaside sparrow is threatened by predation from rice rats (Post and Greenlaw 1994). The black rail is threatened from predation from various species during high tides, when the rails are forced away from cover (Evans and Page 1986). Two of the petitioned plant species are threatened by predation. Hall's bulrush is threatened by predation from mute swans and Canada geese (McKenzie *et al.* 2007). The Panhandle lily is threatened by predation from cattle grazing and potentially by insect herbivory (Barrows 1989). Southeastern fishes, amphibians, and crayfishes are

threatened by predation from native and nonnative fishes and crayfishes (NatureServe 2008). The streamside salamander is threatened by predation from fish, flatworms, and water snakes (Petranka 1983; AmphibiaWeb 2009). Predation can contribute heavily to the decline of imperiled mussels because of their restricted distributions and small population sizes (NatureServe 2008, Rock pocketbook species account). Imperiled southeastern mussels are threatened by predation from fishes, muskrats, raccoons, otter, mink, turtles, and some birds (Neves and Odom 1989; Parmalee 1967; Snyder and Snyder 1969). A number of fish species, including catfishes (*Ictalurus* ssp. and *Amieurus* ssp.) and freshwater drum (*Aplodinotus grunniens*) consume large numbers of unionid mussels at certain life stages (NatureServe 2008). As populations of imperiled mussels continue to decline, predation becomes an increasing threat. For example, the only viable population of the Savannah lilliput in North Carolina is threatened by predation from raccoons (Hanlon and Levine 2004). According to the petition, the petitioned fish, Barrens topminnow, is threatened by predation from introduced mosquitofish.

Disease and predation, alone and in conjunction with other factors, pose serious threats to the survival of many of the petitioned species and are magnified by other environmental stressors such as habitat loss, pollution, invasive species, and climate change (Gibbons *et al.* 2000; Pounds *et al.* 2006).

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The petition states that inadequate regulatory mechanisms threaten all the petitioned species, with the following five exceptions: Linda's roadside-skipper, least crayfish, Broad River spiny crayfish, Chowanoke crayfish, and Tallapoosa orb.

Inadequacy of Existing Federal Regulatory Mechanisms

According to the petition, the Federal Clean Water Act (CWA) (33 U.S.C. 1251 *et seq.*) provides a basic level of water quality protection for imperiled southeastern species, but is inadequate to ensure their continued survival. Pollution from point and non-point sources is causing ongoing degradation of water quality, current water quality standards are not effectively protecting sensitive species or sensitive developmental stages of species, and loss of stream and wetland habitat continues. The Environmental Protection Agency (EPA) and individual States regulate point sources of pollution under the National Pollution Discharge Elimination System (NPDES), under which point sources are licensed and maximum pollutant discharge concentrations are set. The NPDES system is not adequate to protect the petitioned species from the negative effects of pollution because permits may be issued with few restrictions, cumulative effects of all the point sources within a watershed are not taken into consideration when permits are issued, and State governments often lack the resources or political will to monitor and enforce permits (Buckner *et al.* 2002).

The petition claims that existing regulations are also inadequate to protect aquatic species from non-point sources of pollution such as agricultural, residential, and urban runoff. Agricultural runoff accounts for over 70 percent of impaired U.S. river kilometers, yet is largely exempt from permitting requirements (Neves *et al.* 1997). Existing regulatory mechanisms are also inadequate to protect southeastern aquatic species from accidental spills from retention ponds, which are used to store wastes from agriculture, coal-fired power plants, coal mining, and other activities (Herrig and Shute 2002), and to prevent the continued loss of stream and wetland habitat from fills. In Appalachia, from 1992 to 2002, the EPA permitted the filling of more than 1,200 miles of headwater streams for surface coal mining activities (EPA 2005). The permitted filling of streams for surface coal mining is causing permanent downstream pollution and loss of biodiversity (Neves *et al.* 1997; Pond *et al.* 2008; Pomponio 2009; Wood 2009; Palmer *et al.* 2010).

The permitted filling of wetlands is also ongoing. While section 404 of the CWA sets as a goal no net loss of wetlands, this is not a required outcome of permit decisions (Connolly *et al.* 2005). In fiscal year 2003, the U.S. Army Corps of Engineers issued 4,035 permits for the destruction of natural wetlands, while denying only 299 permits (Connolly *et al.* 2005). Lost wetlands are required to be replaced by mitigation wetlands, but mitigation wetlands often differ in structure, function, and community composition from the natural wetlands that are destroyed (Holland *et al.* 1995). Mitigation requirements are also not strictly enforced. Mitigation is rarely effective in preserving biodiversity (Cabbage *et al.* 1993; Water Environment Federation 1993). Many species of amphibians, reptiles, and insects require both wetland and upland habitat to complete their life cycles, and wetland protection criteria do not protect the upland habitats these species need to survive (Dodd 1997).

The petition alleges that the Surface Mining Control and Reclamation Act of 1977 (SMCRA) (30 U.S.C. 1201 *et seq.*) does not adequately protect aquatic species due to increased demands for coal, lax enforcement of environmental laws, and deference to economic development over species' protection. Sedimentation from active mines is a primary contributor to the decline of mollusks due to water quality degradation, shell erosion, and reproductive failure (Anderson 1989; Houp 1993; Neves *et al.* 1993). Reclamation required under SMCRA is not rigorously enforced (Ward 2009), and even when reclamation is conducted, it has not resulted in the restoration of pre-mining hydrologic characteristics or ecological functions (Townsend *et al.* 2009).

The petition alleges that management of National Wildlife Refuges, National Recreation Areas, National Forests, and Wild and Scenic Rivers fails to adequately protect the petitioned species for a variety of reasons, including lack of fiscal resources, threats from climate change, invasive species, recreation, poaching, and conflicting resource mandates (such as timber production and recreation).

Inadequacy of Existing State Regulatory Mechanisms

According to the petition, some of the petitioned species are listed as endangered or threatened by State fish, wildlife, and game departments, but State endangered and threatened species designations generally do not provide species with meaningful regulatory protections or with any habitat protection. Many of the species petitioned are classified as Species of Conservation Priority or Species of Greatest Conservation Need under State Wildlife Action Plans or Wildlife Conservation Strategies. These documents provide a framework for conservation, but are not regulatory documents and do not contain mandatory or enforceable provisions to protect species or their habitats. Further, the implementation of conservation strategies is dependent on the cooperation of resource managers and stakeholders, making their implementation and effectiveness uncertain.

State conservation priorities and initiatives are also sharply limited by funding, with charismatic and game species generally receiving the majority of resources, and the focus generally

being on vertebrates, which makes these priorities and initiatives inadequate to protect imperiled invertebrate species. Additionally, some States have regulations to protect some wildlife from direct take, but these regulations are not comprehensive, are generally poorly enforced, and are not adequate to protect wildlife from other threats (FWS 1997).

Other Regulatory Mechanisms and Protections

According to the petition, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) conveys some degree of protection to a few of the petitioned species listed under it, but it is inadequate to ensure their continued survival. For example, highly sought-after species such as rare map turtles are threatened by the international pet trade despite being protected under CITES (NatureServe 2008). Likewise, habitat preserves alone are insufficient to protect imperiled species. While habitat protection is an essential component of species' preservation, threats from a host of other factors, including climate change, poaching, pollution, and genetic isolation due to lack of habitat connectivity, influence habitat conditions and the success of the preservation efforts.

Land Ownership Patterns

The majority of land in the Southeast is privately owned. Private land use is either not regulated or only loosely regulated throughout much of the region (Buckner *et al.* 2002). According to the petition, most southeastern forests are in private ownership, and forestry best management practices to control erosion and protect aquatic resources are not mandated or voluntarily followed in the majority of southeastern forests. In addition, extensive clearcutting and poor logging practices threaten aquatic resources due to sedimentation, landslides, and degraded water quality (Buckner *et al.* 2002).

Factor E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

The petition states that other natural or manmade factors, including pollution, global climate change, drought, invasive species, and synergies between multiple threats, threatened 13 of 15 amphibians, 1 amphipod (tidewater amphipod), 1 beetle (Avernus cave beetle), 3 birds (MacGillivray's seaside sparrow, Florida sandhill crane, and black rail), 4 butterflies (Linda's roadside-skipper, Duke's skipper, Palatka skipper, and rare skipper), 2 caddisflies (Morse's little plain brown sedge and setose cream and brown mottled microcaddisfly), 43 of 83 crayfish, 3 dragonflies (Cherokee clubtail, Septima's clubtail, Appalachian snaketail), 43 of 47 fish, 3 mammals (Pine Island oryzomys or marsh rice rat, Sanibel Island oryzomys or marsh rice rat, insular cotton rat), 1 moth (Louisiana eyed silkmoth), 35 of 48 mussels, 3 non-vascular plants (*Fissidens appalachensis* (Appalachian fissidens moss), *Fissidens hallii* (Hall's pocket moss), and *Phaeophyscia leana* (Lea's bog lichen)), 9 reptiles (Kirtland's snake, western chicken turtle, Florida Keys mole skink, Escambia map turtle, Pascagoula map turtle, black-knobbed map turtle, Alabama map turtle, striped mud turtle, northern red-bellied cooter), 27 of 44 snails, 1 stonefly (Smokies needlefly), and 31 of 76 vascular plants.

Pollution

According to the petition, pollution threatens two-thirds of the petitioned species, including 81 percent of the wildlife. Southeastern waterways are degraded by point and non-point source pollution from a variety of sources including agriculture, forestry, urban and suburban development, coal mining, and coal combustion wastes. Non-point source pollution, or runoff, is difficult to document, but its impact on aquatic species is both pervasive and persistent (Schuster 1997). Non-point source pollution is the most common factor adversely impacting the nation's fish communities, with more than 80 percent of fish negatively affected (Judy *et al.* 1982). Both non-point and point source pollution are pushing southeastern aquatic species towards extinction by carrying sediments, contaminants, nutrients, and other pollutants into waterways.

Sedimentation, Contamination, and Nutrient Loading

The petition alleges sedimentation is one of the primary causes of habitat degradation in southeastern waterways (Neves *et al.* 1997). Sedimentation and siltation result from a variety of activities including agriculture, forestry, development, and mining, with silt reaching the waterways during both ground-disturbing activities and storm events (FWS 2000). Suspended sediments threaten the entire aquatic community, from fish to invertebrates to birds.

In the Southeast, sedimentation is responsible for nearly 40 percent of fish imperilment problems (Etnier 1997). It both directly and indirectly adversely affects fish. Suspended sediments cut and clog gills and interfere with respiration. Sedimentation blocks light penetration, which interferes with feeding for species like minnows and darters, which feed by sight (Etnier and Starnes 1993). For species that feed by flipping over rocks and consuming the disturbed insects, sedimentation increases the embeddedness of rocks, making them more difficult to move and decreasing habitat suitability for aquatic invertebrate prey (Etnier and Starnes 1993). Sedimentation also interferes with feeding behavior for nocturnal feeders like catfish and imperiled madtoms, which catch aquatic insects by relying on the sensitivity of their barbells and on chemoreceptors, both of which are negatively affected by sedimentation (Todd 1973; Buckner *et al.* 2002). Benthic species require specific substrate conditions for spawning, feeding, and cover, all of which are degraded by sedimentation (Etnier and Starnes 1993; Warren *et al.* 1997). When sedimentation fills in the crevices between and beneath rocks, it decreases the availability of cover for resting and predator evasion (Herrig and Shute 2002). Madtoms, darters, suckers, and some minnows deposit their eggs on or near the substrate, and sedimentation interferes with their reproduction both by decreasing habitat suitability and by directly smothering eggs. Benthic fishes are also negatively affected by toxins stored in sediments (Reice and Wohlenberg 1993). Ultimately, excessive sedimentation can eliminate fish species from an area by rendering their habitat unsuitable (FWS 2000).

Similarly, excessive sedimentation has strong, persistent, negative effects on freshwater invertebrates (Strayer 2006). Siltation is one of the primary factors implicated in the decline of freshwater mollusks (Williams *et al.* 1993). Suspended sediments have both direct and indirect negative effects on mollusks. Sedimentation clogs the gills of mollusks and can cause suffocation (FWS 2000). Sedimentation reduces feeding efficiency both by interfering with respiration of filter feeders and by coating algae, which snails scrape from rocks (FWS 2000). Decreased visibility due to sedimentation can interfere with mussel reproduction by making it difficult for host fishes to detect glochidia (Neves *et al.* 1997). Sedimentation also reduces substrate suitability (Herrig and Shute 2002).

The petition also alleges that aquatic insects are threatened by excessive sediment levels. Stoneflies (*Plecoptera*) and mayflies (*Ephemeroptera*) are intolerant of siltation and disappear from impacted streams (Morse *et al.* 1997). Increased siltation impacts the

ability of dragonflies and damselflies to survive (Morse *et al.* 1997). Caddisflies, which require spaces among rocks for shelter and stable surfaces for grazing, are also negatively impacted by siltation (Morse *et al.* 1997). Sedimentation and other pollutants from mountaintop-removal coal mining operations are extirpating aquatic macroinvertebrate communities. In some streams that drain mountaintop-removal operations, entire orders of *Plecoptera* and *Ephemeroptera* have been extirpated (Wood 2009). Sedimentation is also negatively impacting rare ground-water inhabiting species of isopods and amphipods (Herrig and Shute 2002).

According to the petition, in addition to sediments, contaminants such as heavy metals, pesticides, and persistent organic pollutants threaten aquatic species. In a nationwide assessment of streambed sediment contaminants, the EPA found that 43 percent of sediments are probably associated with harmful effects on aquatic life or human health, and that 6 to 10 percent of streambed sediment is sufficiently contaminated to cause significant lethality to benthic organisms (EPA 2004b). Southeastern rivers are laden with a variety of toxic chemicals, with the lower Mississippi River receiving contaminants from half the continent (Folkerts 1997). Contaminants have both lethal and sub-lethal negative effects on aquatic species and may interfere with immunity, growth, and reproduction (Colborn *et al.* 1993; Gibbons *et al.* 2000). Selenium contamination from surface coal mining is causing teratogenic (developmental malformations) deformities in larval fish (Palmer *et al.* 2010). The negative effects of many contaminants will persist for centuries (Folkerts 1997).

Aquatic species are threatened both by chronic low-level contaminant pollution and acute exposure from accidental spills. For example, in 2009, a wastewater spill from a coal mine on the West Virginia-Pennsylvania border killed all the fish, salamanders, and mussels in 35 miles of 38-mile-long Dunkard Creek (Hopey 2009). Endemic species are particularly at high risk from accidental spills. Because many aquatic species exist only in small, isolated populations, a single spill event could drive a species to extinction.

The petition alleges that contaminants threaten all taxa of aquatic species. Declines in many fish species are attributed to chronic, sub-lethal pollution, which causes reduced growth, reduced reproductive success, and increased risk of death from stress-related diseases (Moyle and Leidy 1992). Cave fishes and other species that are directly dependent on groundwater levels are disproportionately threatened by contaminants that become concentrated if there is a reduction in the volume of springflow (Herrig and Shute 2002). Chemoreception in blind cave fishes can be disrupted by contaminants from surface aquifer recharge areas (Herrig and Shute 2002). Chronic low-level exposure to contaminants may be preventing the recovery of imperiled species of mollusks (FWS 1997). Juvenile mussels are sensitive to heavy metals and other pollutants (Naimo 1995; Neves *et al.* 1997). Amphibians are particularly sensitive to contaminants as all life stages are sensitive to toxins (AmphibiaWeb 2009). Many substances can be toxic to amphibians including heavy metals, pesticides, phenols, fertilizers, road salt, mining waste, and chemicals in runoff (Dodd 1997). Changes in pH can adversely affect amphibian eggs and larvae, and can inhibit growth and feeding in adults (Dodd 1997). Amphibians are threatened by accidental and intentional pesticide treatments.

Contaminants negatively impact aquatic species at the level of individuals, populations, and species. Fish, turtles, and other aquatic animals assimilate pesticides, heavy metals, and other persistent pollutants into their tissues (Buhlman and Gibbons 1997; de Solla and Fernie 2004). Animals at higher levels of the food chain can accumulate considerable levels of toxins. Significant concentrations of numerous contaminants have been detected in southeastern freshwater turtles including pesticides such as: aldrin, chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, endrin, mirex, nonachlor, and toxaphene; and metals such as: Aluminum, barium, cadmium, chromium, cobalt, copper, iron, lead, mercury, molybdenum, nickel, strontium, and zinc (Meyers-Schöne and Walton 1994). Contaminant exposure can disrupt normal endocrine functioning, threatening reproduction and survival (Colborn *et al.* 1993). Turtles exposed to polychlorinated biphenyls (PCBs) have exhibited sex reversal and abnormal gonadal development, and alligators exposed to various contaminants have shown altered testosterone levels and gonadal abnormalities (Guillette *et al.* 1994, 1995). Water snakes in wetlands that have been contaminated with coal ash exhibit altered metabolic activity (Hopkins *et al.* 1999). Endocrine disruption caused by contaminants can lead to demographic shifts in aquatic reptile populations (Gibbons *et al.* 2000). Bioaccumulation of contaminants has contributed to the decline of map turtles, musk turtles, snapping turtles, and pond turtles (Buhlmann and Gibbons 1997).

The petition alleges that nutrient loading also threatens southeastern aquatic species. Excessive nitrates and phosphates entering waterways from point and non-point sources can lead to algal blooms, eutrophication, and depleted dissolved oxygen, which can be lethal to aquatic organisms (Mallin and Cahoon 2003). Some algal blooms are toxic and can cause direct mortality. The toxic dinoflagellates (*Pfiesteria piscicida* and *P. shumwayae*) have bloomed downstream of CAFOs in the Neuse, New, and Pamlico River estuaries in North Carolina (Mallin and Cahoon 2003). Even at sub-lethal levels, nutrient loading threatens aquatic species via many mechanisms. For example, excessive phosphate levels, especially in combination with the herbicide atrazine, have been shown to increase nematode infections in amphibians, leading to amphibian deformities (Johnson and Sutherland 2003; Rohr *et al.* 2008).

Sources of Nutrients, Contaminants, Sediments, and Other Pollutants

The petition claims that agriculture, forestry, urban and industrial development, coal mining and processing, and coal combustion all contribute to nutrient loading, contaminants, sediments, and other pollutants that make their way into southeastern waterways. In the Southeast, agricultural fields are commonly plowed to the edge of rivers and streams, which results in erosion and stream bank collapse and deposits tons of soil into waterways annually. Agricultural runoff carries sediment, pesticides, fertilizers, animal wastes, pathogens, salts, and petroleum particles into waterways.

The petition claims that atrazine is the most commonly detected pesticide in U.S. waters and is pervasively found in surface waters of the southern States, with the chemical being detected in every watershed sampled (EPA 2007; Wu *et al.* 2009). According to the petition, concentrations of atrazine in various southeastern waterways exceed levels harmful to non-vascular plants and aquatic biota (U.S. EPA 2007; Wu *et al.* 2009). The toxic and endocrine-disrupting effects of atrazine are well established (Wu *et al.* 2009) and include detrimental reproductive effects.

According to the petition, animal holding lots and CAFOs produce animal wastes that may be discharged directly into streams applied to agricultural

fields, or stored in lagoons (Buckner *et al.* 2002). These wastes contain enormous amounts of nitrogen and phosphorus, and these nutrients enter the environment and contribute to the eutrophication of waterbodies via runoff, via volatilization of ammonia, or by percolating into groundwater (Mallin and Cahoon 2003). Extreme weather events, lax management, and lagoon ruptures have led to acute pollution events from CAFOs, which have resulted in fish kills and algal blooms (Mallin and Cahoon 2003). Decaying carcasses from these operations also produce a significant source of nutrient pollution. In addition to nutrient loading, CAFOs release pharmaceuticals (growth promoters and antibiotics) and hormones (estrogens and androgens) into aquatic habitats (Orlando *et al.* 2004). These have led to endocrine disruption in female turtles (Irwin *et al.* 2001), and disruption of the reproductive biology of fathead minnows (*Pimephales promelas*) (Orlando *et al.* 2004).

The petition asserts that wastewater from aquacultural facilities also contributes significant amounts of sediments, nutrients, pharmaceuticals, and pathogens to southeastern aquatic habitats (Tacon and Forster 2003). Catfish farms, trout farms, and shrimp and crayfish ponds all release nutrients to aquatic habitats when they are drained or flushed during large rain events (Tucker and Hargreaves 2003; Morse *et al.* 1997; Holdich 1993).

According to the petition, pollution from forestry and silviculture affects the Mobile Basin. Logging and effluent from pulp mills contribute sediments and herbicides to waterways, degrading habitat for aquatic organisms. Erosion from deforestation and poor forestry practices increases silt loading and makes stream bottoms unstable, both of which threaten mollusks and other aquatic organisms (Williams *et al.* 1993). Herbicides used to kill hardwoods and herbaceous vegetation may be harmful to amphibians and other species (Dodd 1997), and some herbicides are toxic to algae and interfere with aquatic ecology (Austin *et al.* 1991).

Urban and industrial development is also cited in the petition as contributing to pollution of southeastern aquatic habitats. Point source pollution from manufacturing sites, power plants, and sewage treatment plants is a major cause of aquatic habitat degradation (Morse *et al.* 1997). Non-point source pollution in the form of runoff from urban and industrial areas contributes sediment, contaminants, nutrients, and other pollutants that can be harmful to aquatic organisms and their habitats, including petroleum particles, highway salts, silt, fertilizers, pesticides, surfactants, and pet wastes (Neves *et al.* 1997; Buckner *et al.* 2002).

The petition states that coal mining and processing are a major source of pollution in West Virginia, Kentucky, Tennessee, Virginia, Alabama, and Georgia. Contaminants from coal mining and processing include sediments, metals, hydraulic fluids, frothing agents, modifying reagents, pH regulators, dispersing agents, flocculants, and media separators (Ahlstedt *et al.* 2005). Sediments, heavy metals, and other pollutants from mining are one of the causal factors in mussel declines (Houp 1993; Neves *et al.* 1997; Locke *et al.* 2006). Heavy metals, including aluminum, cadmium, copper, iron, manganese, mercury, selenium, sulfate, and zinc, are released into the environment and act as metabolic poisons in freshwater species (Earle and Callaghan 1998), and cause weight loss, altered enzyme activity and filtration rates, and behavioral modifications (Naimo 1995). The effects of metals on mussel feeding, growth, and reproduction can result in significant consequences for mussel populations, and Naimo (1995) concludes that the chronic, low-level exposure to toxic metals is partially responsible for the widespread decline in species diversity and population density of freshwater mussels. Selenium is particularly prevalent in coal effluents and is associated with deformities and reproductive failure in aquatic species (Lemly 2009; Pomponio 2009).

The petition also asserts that pollution, including sediments, metals, acids, and other substances, in drainage from abandoned mined lands negatively impacts aquatic species in a variety of ways from acute toxicity to physical impacts from solid precipitants (Cherry *et al.* 2001; Soucek *et al.* 2003). Surface waters receiving mine discharge commonly have extremely low pH levels, below 3.0, with toxic impacts extending several miles downstream (Soucek *et al.* 2003).

Coal combustion produces nitric and sulfuric acids, mercury, and coal ash, that all negatively impact aquatic species (Fleischer *et al.* 1993). Nitric and sulfuric acids released from coal-fired power plants cause acidification of water bodies. Streams and lakes in Great Smoky Mountains National Park and elsewhere have been degraded by acid precipitation (Morse *et al.* 1997). Phytoplankton is negatively affected by acidification, which has ramifications throughout the food web (Dodd 1997). Acid precipitation harms caddisflies and stoneflies (Morse *et al.* 1997). The petition claims that several of the petitioned insects, including the Smokies snowfly and Smokies needlefly, are threatened by acid deposition. Acidity in aquatic habitats can also result in direct amphibian mortality, and plays a major role in limiting amphibian distribution (Dodd 1997).

Coal combustion also releases mercury into the environment. Atmospheric deposition of mercury is responsible for the contamination of most waterways. In a U.S. Geological Survey study that examined mercury in fish, sediments, and water drawn from 291 rivers and streams, detectable mercury contamination was found in every single fish sampled (Scudder *et al.* 2009). The highest concentrations among all sampled sites occurred in fish from blackwater coastal-plain streams draining forested lands or wetlands in Louisiana, Georgia, Florida, and North and South Carolina, and from basins in the west with gold or mercury mines or both. Mercury levels in fish at over 70 percent of the sites exceeded the levels of concern for the protection of fish eating-mammals.

The combustion of coal produces over 129 million tons of solid waste, or coal ash, annually (Eilperin 2009). Coal ash contains concentrated levels of chlorine, zinc, copper, arsenic, lead, selenium, mercury, and other toxic contaminants, and improper storage of coal combustion waste has resulted in pollution of ground and surface waters (EPA 2007b). There are 44 coal ash ponds in Kentucky alone. Hopkins *et al.* (1999) reported behavioral, developmental, and metabolic abnormalities in amphibians and reptiles in wetlands that have been contaminated with coal combustion waste in South Carolina.

Global Climate Change and Drought

According to the petition, global climate change threatens all of the petitioned species. Climate models project both continued warming in all seasons across the Southeast, and an increase in the rate of warming (Karl *et al.* 2009). The warming in air and water temperatures will create stress for fish and wildlife. Increasing water temperatures and declining dissolved oxygen levels in streams, lakes, and shallow aquatic habitats will lead to fish kills and loss of aquatic species diversity (Folkerts 1997; Karl *et al.* 2009). Climate change will alter the distribution of native plants and animals and will lead to the local loss of imperiled species and the

displacement of native species by invasives (Karl *et al.* 2009).

Climate change will increase both the incidence and severity of droughts and major storm events in the Southeast (Karl *et al.* 2009). The percentage of the Southeast region experiencing moderate to severe drought has already increased over the past 3 decades (Karl *et al.* 2009). The threat to aquatic ecosystems posed by drought is magnified both by climate change and by human population growth. Decreased water availability coupled with human population growth will further stress natural systems. Drought, and increased evaporation and evapotranspiration due to warmer temperatures, will lead to decreased groundwater recharge and potential saltwater intrusion in shallow aquifers in many parts of the Southeast, further exacerbating threats to aquatic organisms (Karl *et al.* 2009).

Intense drought and increasing temperatures resulting from climate change will cause the drying of water bodies and the local or global extinction of riparian and aquatic species (Karl *et al.* 2009). Declines of mollusks as a direct result of drought have already been documented (Golladay *et al.* 2004; Haag and Warren 2008). Populations of amphibians dependent on consistent rainfall patterns for breeding, such as those that breed in temporary ponds, could be extirpated by drought (Dodd 1997). Amphibian declines are already linked to climate change globally (Pounds *et al.* 2006) and in the southeastern United States (Daszak *et al.* 2005).

The warming climate will likely cause ecological zones to shift upward in latitude and altitude, and species' persistence will depend upon, among other factors, their ability to disperse to suitable habitat (Peters and Darling 1985). Human modifications to waterways, such as dams, and changes to the landscape, including extensive development, will make dispersal of species to more suitable habitat difficult to impossible (Strayer 2006; Buhlman and Gibbons 1997; FWS 2009). Many species of freshwater invertebrates are likely to go extinct due to climate change (Strayer 2006). Freshwater mussels and snails are capable of moving only short distances and are unlikely to be able to adjust their ranges in response to climatic shifts (FWS 2009). The petitioners allege that deteriorating habitat conditions and obstacles to dispersal place all of the petitioned species at risk of extinction due to global climate change.

According to the petition, several of the coastal petitioned species are threatened by sea level rise and increased storm intensity resulting from global climate change, including the Florida Keys mole skink, MacGillivray's seaside sparrow, and Louisiana eyed silkmoth.

Invasive Species

The petition alleges that invasive species are a major threat to native aquatic plants and animals in the Southeast, and a known threat for 96 of the petitioned species. Invasive species negatively affect native species through competition, predation, and disease introduction. Introduced Asian carp, which are used to control trematodes in catfish ponds, have become established in rivers throughout the Mississippi Basin, where they consume native mollusks and compete for resources with native fishes (Naylor *et al.* 2001). There are at least 30 species of invasive fish in the Tennessee and Cumberland River basins, including carp, alewife, rainbow and brown trout, striped bass, yellow perch, nonnative forms of muskellunge, and walleye (Etnier 1997). Nonnative mosquitofish (*Gambusia holbrooki*) have been widely introduced for vector control and now compete with native species for resources (Buckner *et al.* 2002). Game fish, such as trout and bass, have been widely introduced and prey on native fish, invertebrates, and amphibians (Herrig and Shute 2002; Kats and Ferrer 2003; Strayer 2006). Native fish fauna in southern Florida have been displaced by tropical species, and more than 60 indigenous southeastern fish species have been introduced to drainages where they are not native (Warren Jr. *et al.* 1997).

According to the petition, freshwater mollusks are threatened both by invasive fish and invasive mollusks. The introduction of nonnative fishes such as the round goby has indirect negative effects on native mussels due to negative impacts on their host fishes (NatureServe 2009). The invasion of nonindigenous mollusks is one of the primary reasons for the decline of freshwater mussels (Williams *et al.* 1993). Invasive mussels can reach densities of thousands per square meter, outcompeting and literally covering native species (Williams *et al.* 1993).

The zebra mussel has been detected in Alabama, Arkansas, Kentucky, Louisiana, Mississippi, Tennessee, Virginia, and West Virginia (NatureServe 2009). Zebra mussels infest most major Mississippi River tributaries, including the Ohio, Tennessee, Cumberland, and Arkansas Rivers (NatureServe 2009), and are expected to spread to all the navigable rivers in the Southeast, as well as tributary reservoirs and smaller streams (Jenkinson and Todd 1997). Zebra mussels and other invasive mollusks compete with native mussels for food and space, attach to native mussels and weaken or kill them, and alter the suitability of the substrate for native species (Herrig and Shute 2002). Where zebra mussels establish large populations, they are likely to destroy native mussels and snail populations (Jenkinson and Todd 1997).

The petition alleges that native southeastern mollusks are also threatened by the invasion of the Asian clam. Asian clams spread rapidly throughout every major drainage in the South following their introduction in the 1960s. Asian clams compete with native mussels for space and food.

The petition asserts that other southeastern taxa, in addition to fish and mollusks, are also threatened by the spread of invasive species. Native crayfish are threatened by invasive mussels, which can attach to their exoskeletons, and by invasive species of crayfish and fish, which compete with and prey on native crayfish (Schuster 1997). Nonnative crayfish are commonly introduced via ''bait buckets.'' Several species of nonnative snails have also invaded the Southeast (Neves *et al.* 1993). Native amphibians are threatened by invasive fish and invasive amphibians, which can act as predators, competitors, and disease vectors (Dodd 1997). Additionally, the petition asserts that exotic cattle egrets, armadillos, and wild hogs can ''exact a substantial toll'' on amphibians (Dodd 1997). Fire ants also threaten amphibians, as they have been known to kill metamorphosing individuals (Freed and Neitman 1988).

According to the petition, many invasive plant species are wreaking havoc on aquatic habitats in the Southeast. Species such as *Myriophyllum spicatum* (Eurasian watermilfoil), *Alternanthera philoxeroides* (alligatorweed), *Hydrilla verticillata* (hydrilla), and *Eichhornia crassipies* (water hyacinth) are thriving in aquatic and wetland habitats and negatively impacting native species (Folkerts 1997; Buckner *et al.* 2002). Invasive plants displace native plants, alter substrate availability for aquatic invertebrates, and interfere with the food web (Folkerts 1997). Invasive plants threaten several of the petitioned plants, including *Baptisia megacarpa* (Apalachicola wild indigo), *Ptilimnium ahlesii* (Carolina bishopweed), and *Hexastylis speciosa* (Harper's heartleaf).

Outbreaks of invasive and native forest-destroying insects have weakened and killed trees in riparian areas and reduced nutrient inputs to aquatic

systems (Morse *et al.* 1997). The petitioned *Tsuga caroliniana* (Carolina hemlock) is threatened by hemlock woolly adelgid (*Adelges tsugae*). Streamside habitat degradation due to exotic pests also threatens aquatic insect populations in the Southeast due to altered microhabitat conditions (Herrig and Shute 2002).

Inherent Vulnerability of Small, Isolated Populations

According to the petition, 224 of the petitioned species now exist in primarily small, isolated populations, which heightens their risk of extinction. Small, isolated populations are vulnerable to extirpation due to limited gene flow, reduced genetic diversity, and inbreeding depression (Lynch 1996). Population isolation also increases the risk of extinction from stochastic genetic and environmental events, including drought, flooding, and toxic spills (FWS 2009). Habitat modification and cumulative habitat degradation from non-point source pollution are also major threats for species that exist in isolated populations. Due to blocked avenues of dispersal or limited dispersal ability, isolated populations gradually disappear as habitat conditions deteriorate (FWS 2000).

Synergies and Multiple Causes

The petition alleges that the risk of extinction for the petitioned species is heightened by synergies between threats as most species face multiple threats and these threats interact and magnify each other. Across taxa, interactions among threats place southeastern aquatic biota at increased risk of extinction. Reptiles are threatened by habitat loss and degradation, invasive species, pollution, disease and parasitism, unsustainable use, global climate change, and synergies between these factors (Gibbons *et al.* 2000). Freshwater snails are threatened by the combined effects of habitat loss, pollution, drought, and invasive species (Lydeard *et al.* 2004). Likewise, amphibians are imperiled by multiple, interacting threats. Stress from the effects of increased UV-b radiation, pollution, and climate change has made amphibians more vulnerable to the spread of disease (Gendron *et al.* 2003; Pounds *et al.* 2006). The interaction between climate change and compromised immunity due to various stressors threatens both amphibian populations and entire species (Green and Dodd 2003). Similarly, threats to freshwater fish are ''many, cumulative and interactive,'' and fish extirpation is nearly always attributable to multiple human impacts (Warren *et al.* 1997). Any factor that causes the decline of the host fishes on which mussels depend for reproduction also threatens the mussels, which themselves face multiple threats including impoundment, pollution, and invasive species (Neves *et al.* 1997). The petition claims that because of the multifaceted ecological relationships among species, the extirpation of a species can have effects that cascade throughout the community, highlighting the need to protect entire communities simultaneously.

Summary of Threats as Identified in the Petition

TABLE 2—THREATS FOR THE 374 SPECIES AS CLASSIFIED BY THE PETITIONERS

Scientific name	Common name	Taxon	Factor				
			A	B	C	D	E
Ambystoma barbouri	Streamside Salamander	Amphibian	X	X	X	X	X
Amphiuma pholeter	One-Toed Amphiuma	Amphibian	X	X	X	X	X
Cryptobranchus alleganiensis	Hellbender	Amphibian	X	X	X	X	X
Desmognathus abditus	Cumberland Dusky Salamander	Amphibian	X	X	X	X	.....
Desmognathus aeneus	Seepage Salamander	Amphibian	X	X	X	X	X
Eurycea chamberlaini	Chamberlain's Dwarf Salamander	Amphibian	X	X	X	X	X
Eurycea tynerensis	Oklahoma Salamander	Amphibian	X	X	X	X	X
Gyrinophilus palleucus	Tennessee Cave Salamander	Amphibian	X	X	X	X	X
Gyrinophilus subterraneus	West Virginia Spring Salamander	Amphibian	X	X	X	X	X
Eurycea wallacei	Georgia Blind Salamander	Amphibian	X	X	X	X	X
Necturus lewisi	Neuse River Waterdog (salamander).	Amphibian	X	X	X	X	X
Pseudobranchus striatus lustricolus.	Gulf Hammock Dwarf Siren	Amphibian	X	X	.....	X	X
Urspelerpes brucei	Patch-nosed Salamander	Amphibian	X	X	.....	X	X
Crangonyx grandimanus	Florida Cave Amphipod	Amphipod	X	.....	.....	X	.....
Crangonyx hobbsi	Hobb's Cave Amphipod	Amphipod	X	.....	.....	X	.....
Stygobromus cooperi	Cooper's Cave Amphipod	Amphipod	X	.....	.....	X	.....
Stygobromus indentatus	Tidewater Amphipod	Amphipod	X	.....	.....	X	X
Stygobromus morrisoni	Morrison's Cave Amphipod	Amphipod	X	.....	.....	X	.....
Stygobromus parvus	Minute Cave Amphipod	Amphipod	X	.....	.....	X	.....
Cicindela marginipennis	Cobblestone Tiger Beetle	Beetle	X	X	.....	X	.....
Pseudanophthalmus avernus	Avernus Cave Beetle	Beetle	X	.....	.....	X	X
Pseudanophthalmus cordicollis	Little Kennedy Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus egberti	New River Valley Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus hirsutus	Cumberland Gap Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus hubbardi	Hubbard's Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus hubrichti	Hubricht's Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus intersectus	Crossroad's Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus limicola	Madden's Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus montanus	Dry Fork Valley Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus pontis	Natural Bridge Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus potomaca	South Branch Valley Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus praetermissus.	Overlooked Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus sanctipauli	Saint Paul Cave Beetle	Beetle	X	.....	.....	X	.....
Pseudanophthalmus sericus	Silken Cave Beetle	Beetle	X	.....	.....	X	.....

TABLE 2—THREATS FOR THE 374 SPECIES AS CLASSIFIED BY THE PETITIONERS—Continued

Scientific name	Common name	Taxon	Factor				
			A	B	C	D	E
Pseudanophthalmus thomasi	Thomas's Cave Beetle	Beetle	X			X	
Pseudanophthalmus virginicus	Maiden Spring Cave Beetle	Beetle	X			X	
Ammodrammus maritimus macgillivraii.	MacGillivray's Seaside Sparrow	Bird	X		X	X	X
Grus canadensis pratensis	Florida Sandhill Crane	Bird	X	X	X	X	X
Laterallus jamaicensis	Black Rail	Bird	X	X	X	X	X
Amblyscirtes linda	Linda's Roadside-skipper	Butterfly	X				X
Euphyes dukesi calhouni	Duke's Skipper	Butterfly	X			X	X
Euphyes pilatka klotsi	Palatka Skipper	Butterfly	X			X	X
Problema bulenta	Rare Skipper	Butterfly	X	X		X	X
Agarodes logani	Logan's Agarodes Caddisfly	Caddisfly	X			X	
Hydroptila sykorae	Sykora's Hydroptila Caddisfly	Caddisfly	X			X	
Lepidostoma morsei	Morse's Little Plain Brown Sedge	Caddisfly	X			X	X
Oecetis parva	Little Oecetis Longhorn Caddisfly	Caddisfly	X			X	
Oxyethira setosa	Setose Cream and Brown Mottled Microcaddisfly.	Caddisfly	X			X	X
Triaenodes tridontus	Three-toothed Triaenodes Caddisfly.	Caddisfly	X			X	
Bouchardina robisoni	Bayou Bodcau Crayfish	Crayfish	X			X	
Cambarus cryptodytes	Dougherty Plain Cave Crayfish	Crayfish	X			X	
Cambarus obeyensis	Obey Crayfish	Crayfish	X			X	X
Cambarellus blacki	Cypress Crayfish	Crayfish	X			X	
Cambarellus diminutus	Least Crayfish	Crayfish	X				X
Cambarellus lesliei	Angular Dwarf Crayfish	Crayfish	X			X	
Cambarus bouchardi	Big South Fork Crayfish	Crayfish	X			X	X
Cambarus chasmodactylus	New River Crayfish	Crayfish	X			X	
Cambarus chaugaensis	Chauga Crayfish	Crayfish	X			X	X
Cambarus coosawattae	Coosawattae Crayfish	Crayfish	X			X	X
Cambarus cracens	Slenderclaw Crayfish	Crayfish	X			X	
Cambarus cymatilis	Conasauga Blue Burrower	Crayfish	X			X	
Cambarus eeseeohensis	Grandfather Mountain Crayfish	Crayfish	X			X	X
Cambarus elkensis	Elk River Crayfish	Crayfish	X			X	X
Cambarus extraneus	Chickamauga Crayfish	Crayfish	X			X	X
Cambarus fasciatus	Etowah Crayfish	Crayfish	X			X	X
Cambarus georgiae	Little Tennessee Crayfish	Crayfish	X			X	X
Cambarus harti	Piedmont Blue Burrower	Crayfish	X			X	X
Cambarus jezerinaci	Spiny Scale Crayfish	Crayfish	X			X	
Cambarus jonesi	Alabama Cave Crayfish	Crayfish	X			X	X
Cambarus nerterius	Greenbrier Cave Crayfish	Crayfish	X			X	X
Cambarus parrishi	Hiwassee Headwater Crayfish	Crayfish	X			X	X
Cambarus pristinus	Pristine Crayfish	Crayfish	X			X	
Cambarus scotti	Chattooga River Crayfish	Crayfish	X			X	X
Cambarus speciosus	Beautiful Crayfish	Crayfish	X			X	X
Cambarus spicatus	Broad River Spiny Crayfish	Crayfish	X				X
Cambarus strigosus	Lean Crayfish	Crayfish	X			X	
Cambarus unestami	Blackbarred Crayfish	Crayfish	X			X	X
Cambarus veteranus	Big Sandy Crayfish	Crayfish	X			X	
Cambarus williami	Brawleys Fork Crayfish	Crayfish	X			X	
Distocambarus carlsoni	Mimic Crayfish	Crayfish	X			X	X
Distocambarus devexus	Broad River Burrowing Crayfish	Crayfish	X			X	
Distocambarus youngineri	Newberry Burrowing Crayfish	Crayfish	X			X	
Fallicambarus burrisi	Burrowing Bog Crayfish	Crayfish	X			X	
Fallicambarus danielae	Speckled Burrowing Crayfish	Crayfish	X			X	X
Fallicambarus gilpini	Jefferson County Crayfish	Crayfish	X			X	X
Fallicambarus harpi	Ouachita Burrowing Crayfish	Crayfish	X			X	X
Fallicambarus hortoni	Hatchie Burrowing Crayfish	Crayfish	X			X	X
Fallicambarus petilicarpus	Slenderwrist Burrowing Crayfish	Crayfish	X			X	X
Fallicambarus strawni	Saline Burrowing Crayfish	Crayfish	X			X	X
Hobbseus cristatus	Crested Riverlet Crayfish	Crayfish	X			X	
Hobbseus orconectoides	Oktibbeha Riverlet Crayfish	Crayfish	X			X	
Hobbseus petilus	Tombigbee Riverlet Crayfish	Crayfish	X			X	
Hobbseus yalobushensis	Yalobusha Riverlet Crayfish	Crayfish	X			X	
Orconectes blacki	Calcasieu Crayfish	Crayfish	X			X	
Orconectes eupunctus	Coldwater Crayfish	Crayfish	X			X	X
Orconectes hartfieldi	Yazoo Crayfish	Crayfish	X			X	
Orconectes incomptus	Tennessee Cave Crayfish	Crayfish	X			X	
Orconectes jonesi	Sucarnoochee River Crayfish	Crayfish	X			X	X
Orconectes maletae	Kisatchie Painted Crayfish	Crayfish	X			X	
Orconectes marchandi	Mammoth Spring Crayfish	Crayfish	X			X	X
Orconectes packardi	Appalachian Cave Crayfish	Crayfish	X			X	

TABLE 2—THREATS FOR THE 374 SPECIES AS CLASSIFIED BY THE PETITIONERS—Continued

Scientific name	Common name	Taxon	Factor				
			A	B	C	D	E
Orconectes sheltae	Shelta Cave Crayfish	Crayfish	X			X	X
Orconectes virginiensis	Chowanoke Crayfish	Crayfish	X				X
Orconectes wrighti	Hardin Crayfish	Crayfish	X			X	
Procambarus acherontis	Orlando Cave Crayfish	Crayfish	X			X	
Procambarus apalachicolae	Coastal Flatwoods Crayfish	Crayfish	X			X	
Procambarus attiguus	Silver Glen Springs Crayfish	Crayfish	X			X	X
Procambarus barbiger	Jackson Prairie Crayfish	Crayfish	X			X	X
Procambarus cometes	Mississippi Flatwoods Crayfish	Crayfish	X			X	X
Procambarus delicatus	Bigcheek Cave Crayfish	Crayfish	X			X	
Procambarus econfinae	Panama City Crayfish	Crayfish	X			X	X
Procambarus erythrops	Santa Fe Cave Crayfish	Crayfish	X			X	
Procambarus fitzpatricki	Spinytail Crayfish	Crayfish	X			X	
Procambarus franzi	Orange Lake Cave Crayfish	Crayfish	X			X	X
Procambarus horsti	Big Blue Springs Cave Crayfish	Crayfish	X	X		X	
Procambarus lagniappe	Lagniappe Crayfish	Crayfish	X			X	X
Procambarus leitheuseri	Coastal Lowland Cave Crayfish	Crayfish	X			X	
Procambarus lucifugus	Florida Cave Crayfish	Crayfish	X			X	X
Procambarus lucifugus alachua	Alachua Light Fleeing Cave Crayfish.	Crayfish	X			X	X
Procambarus lucifugus lucifugus	Florida Cave Crayfish	Crayfish	X			X	X
Procambarus lylei	Shutispear Crayfish	Crayfish	X			X	
Procambarus milleri	Miami Cave Crayfish	Crayfish	X			X	
Procambarus morrisi	Putnam County Cave Crayfish	Crayfish	X			X	
Procambarus orcinus	Woodville Karst Cave Crayfish	Crayfish	X			X	
Procambarus pallidus	Pallid Cave Crayfish	Crayfish	X			X	X
Procambarus pictus	Black Creek Crayfish	Crayfish	X			X	
Procambarus pogum	Bearded Red Crayfish	Crayfish	X			X	
Procambarus regalis	Regal Burrowing Crayfish	Crayfish	X			X	
Procambarus reimeri	Irons Fork Burrowing Crayfish	Crayfish	X			X	X
Troglocambarus maclanei	Spider Cave Crayfish	Crayfish	X			X	
Cordulegaster sayi	Say's Spiketail	Dragonfly	X			X	
Gomphus consanguis	Cherokee Clubtail	Dragonfly	X			X	X
Gomphus sandrius	Tennessee Clubtail	Dragonfly	X			X	
Gomphus septima	Septima's Clubtail	Dragonfly	X	X		X	X
Gomphus westfalli	Westfall's Clubtail	Dragonfly	X			X	
Libellula jesseana	Purple Skimmer	Dragonfly	X			X	
Macromia margarita	Mountain River Cruiser	Dragonfly	X			X	
Ophiogomphus australis	Southern Snaketail	Dragonfly	X			X	
Ophiogomphus edmundo	Edmund's Snaketail	Dragonfly	X			X	
Ophiogomphus incurvatus	Appalachian Snaketail	Dragonfly	X	X		X	X
Somatochlora calverti	Calvert's Emerald	Dragonfly	X			X	
Somatochlora margarita	Texas Emerald	Dragonfly	X			X	
Somatochlora ozarkensis	Ozark Emerald	Dragonfly	X			X	
Stylurus potulentus	Yellow-sided Clubtail	Dragonfly	X			X	
Amblyopsis spelaea	Northern cavefish	Fish	X	X		X	X
Cyprinella callitaenia	Bluestripe shiner	Fish	X			X	X
Cyprinella xaenura	Altamaha Shiner	Fish	X			X	X
Elassoma boehlkei	Carolina Pygmy Sunfish	Fish	X	X	X	X	X
Erimystax harryi	Ozark chub	Fish	X			X	X
Etheostoma bellator	Warrior Darter	Fish	X			X	X
Etheostoma brevirostrum	Holiday Darter	Fish	X			X	X
Etheostoma cinereum	Ashy Darter	Fish	X			X	X
Etheostoma forbesi	Barrens Darter	Fish	X			X	X
Etheostoma microlepidum	Smallscale Darter	Fish	X			X	
Etheostoma osburni	Candy Darter	Fish	X		X	X	X
Etheostoma pallididorsum	Paleback Darter	Fish	X		X	X	X
Etheostoma pseudovulatum	Egg-mimic Darter	Fish	X			X	X
Etheostoma striatulum	Striated Darter	Fish	X			X	X
Etheostoma tecumsehi	Shawnee Darter	Fish	X		X	X	X
Etheostoma tippecanoe	Tippecanoe Darter	Fish	X			X	X
Etheostoma trisella	Trispot Darter	Fish	X			X	X
Etheostoma tuscumbia	Tuscumbia Darter	Fish	X			X	X
Fundulus julisia	Barrens Topminnow	Fish	X		X	X	
Moxostoma robustum	Robust Redhorse	Fish	X	X	X	X	X
Notropis ariommus	Popeye Shiner	Fish	X			X	
Notropis ozarcanus	Ozark Shiner	Fish	X			X	X
Notropis perpallidus	Peppered Shiner	Fish	X			X	X
Notropis suttkusi	Rocky Shiner	Fish	X			X	X
Noturus fasciatus	Saddled Madtom	Fish	X			X	X
Noturus furiosus	Carolina Madtom	Fish	X		X	X	X

TABLE 2—THREATS FOR THE 374 SPECIES AS CLASSIFIED BY THE PETITIONERS—Continued

Scientific name	Common name	Taxon	Factor				
			A	B	C	D	E
Noturus gilberti	Orangefin Madtom	Fish	X	X		X	X
Noturus gladiator	Piebald Madtom	Fish	X			X	X
Noturus lachneri	Ouachita Madtom	Fish	X			X	X
Noturus munitus	Frecklebelly Madtom	Fish	X			X	X
Noturus taylori	Caddo Madtom	Fish	X			X	X
Percina bimaculata	Chesapeake Logperch	Fish	X			X	X
Percina brevicauda	Coal Darter	Fish	X			X	X
Percina crypta	Halloween Darter	Fish	X			X	
Percina cymatotaenia	Bluestripe Darter	Fish	X			X	X
Percina kusha	Bridled Darter	Fish	X			X	X
Percina macrocephala	Longhead Darter	Fish	X			X	X
Percina nasuta	Longnose Darter	Fish	X			X	X
Percina sipsi	Bankhead Darter	Fish	X			X	X
Percina williamsi	Sickle Darter	Fish	X			X	X
Pteronotropis euryzonus	Broadstripe Shiner	Fish	X			X	X
Pteronotropis hubbsi	Bluehead Shiner	Fish	X	X	X	X	X
Thoburnia atripinnis	Blackfin Sucker	Fish	X			X	X
Remenus kirchneri	Blueridge Springfly	Fly	X			X	
Caecidotea cannula	None	Isopod	X			X	
Lirceus culveri	Rye Cove Isopod	Isopod	X			X	
Blarina carolinensis shermani	Sherman's Short-tailed Shrew	Mammal	X		X	X	
Oryzomys palustris pop. 1	Pine Island Oryzomys or Marsh Rice Rat.	Mammal	X			X	X
Oryzomys palustris pop.2	Sanibel Island Oryzomys or Marsh Rice Rat.	Mammal	X			X	X
Sigmodon hispidus insulicola	Insular Cotton Rat	Mammal	X			X	X
Automeris louisiana	Louisiana Eyed Silkmoth	Moth	X			X	X
Alasmidonta arcula	Altamaha Arcmussel	Mussel	X			X	X
Alasmidonta triangulata	Southern Elktoe	Mussel	X			X	X
Alasmidonta varicosa	Brook Floater	Mussel	X	X		X	X
Anodonta heardi	Apalachicola Floater	Mussel	X			X	X
Anodontoides radiatus	Rayed Creekshell	Mussel	X			X	X
Cyprogenia aberti	Western Fanshell	Mussel	X			X	X
Elliptio ahenea	Southern Lance	Mussel	X			X	X
Elliptio arca	Alabama Spike	Mussel	X			X	X
Elliptio arctata	Delicate Spike	Mussel	X			X	X
Elliptio fraterna	Brother Spike	Mussel	X	X		X	X
Elliptio lanceolata	Yellow Lance	Mussel	X			X	X
Elliptio monroensis	St. John's Elephant Ear	Mussel	X			X	X
Elliptio purpurella	Inflated Spike	Mussel	X			X	X
Fusconaia masoni	Atlantic Pigtoe	Mussel	X			X	X
Fusconaia subrotunda	Longsolid	Mussel	X			X	X
Lampsilis fullerkati	Waccamaw Fatmucket	Mussel	X			X	X
Lasmigona holstonia	Tennessee Heelsplitter	Mussel	X		X	X	X
Lasmigona subviridis	Green Floater	Mussel	X			X	X
Medionidus conradicus	Cumberland Moccasinshell	Mussel	X		X	X	X
Medionidus walkeri	Suwannee Moccasinshell	Mussel	X	X		X	X
Obovaria subrotunda	Round Hickorynut	Mussel	X			X	X
Obovaria unicolor	Alabama Hickorynut	Mussel	X			X	X
Pleurobema athearni	Canoe Creek Pigtoe	Mussel	X			X	X
Pleurobema oviforme	Tennessee Clubshell	Mussel	X	X	X	X	X
Pleurobema rubellum	Warrior Pigtoe	Mussel	X	X		X	X
Pleurobema rubrum	Pyramid Pigtoe	Mussel	X	X		X	X
Pleuronaia barnesiana	Tennessee Pigtoe	Mussel	X		X	X	X
Pyganodon gibbosa	Inflated Floater	Mussel	X			X	X
Quadrula asperata archeri	Tallapoosa Orb	Mussel	X				
Simpsonaias ambigua	Salamander Mussel	Mussel	X			X	X
Toxolasma lividus	Purple Lilliput	Mussel	X		X	X	X
Toxolasma pullus	Savannah Lilliput	Mussel	X		X	X	X
Villosa nebulosa	Alabama Rainbow	Mussel	X			X	X
Villosa ortmanni	Kentucky Creekshell	Mussel	X			X	
Villosa umbrans	Coosa Creekshell	Mussel	X			X	X
Fissidens appalachensis	Appalachian Fissidens Moss	Non-Vascular Plant	X			X	X
Fissidens hallii	Hall's Pocket Moss	Non-Vascular Plant	X			X	X
Megaceros aenigmaticus	Hornwort	Non-Vascular Plant	X			X	
Phaeophyscia leana	Lea's Bog Lichen	Non-Vascular Plant	X			X	X
Plagiochila caduciloba	Gorge Leafy Liverwort	Non-Vascular Plant	X			X	
Plagiochila sharpii ssp. *sharpii*	Sharp's Leafy Liverwort	Non-Vascular Plant	X			X	
Clonophis kirtlandii	Kirtland's Snake	Reptile	X	X	X	X	X
Deirochelys reticularia miaria	Western Chicken Turtle	Reptile	X	X		X	X

TABLE 2—THREATS FOR THE 374 SPECIES AS CLASSIFIED BY THE PETITIONERS—Continued

Scientific name	Common name	Taxon	Factor				
			A	B	C	D	E
Eumeces egregius egregius	Florida Keys Mole Skink	Reptile	X	X		X	X
Graptemys barbouri	Barbour's Map Turtle	Reptile	X	X	X	X	
Graptemys ernsti	Escambia Map Turtle	Reptile	X	X	X	X	X
Graptemys gibbonsi	Pascagoula Map Turtle	Reptile	X	X	X	X	X
Graptemys nigrinoda	Black-knobbed Map Turtle	Reptile	X	X		X	X
Graptemys pulchra	Alabama Map Turtle	Reptile	X	X		X	X
Kinosternon baurii pop. 1	Striped Mud Turtle—Lower FL Keys.	Reptile	X	X		X	X
Pseudemys nelsoni pop. 1	Florida Red-bellied Turtle—FL Panhandle.	Reptile	X	X	X	X	
Pseudemys rubriventris	Northern Red-bellied Cooter	Reptile	X	X	X	X	X
Thamnophis sauritus pop.1	Eastern Ribbonsnake—Lower FL Keys.	Reptile	X			X	
Antrorbis breweri	Manitou Cavesnail	Snail	X			X	X
Aphaostracon asthenes	Blue Spring Hydrobe Snail	Snail	X			X	X
Aphaostracon chalarogyrus	Freemouth Hydrobe Snail	Snail	X			X	
Aphaostracon monas	Wekiwa Hydrobe Snail	Snail	X			X	
Aphaostracon pycnus	Dense Hydrobe Snail	Snail	X			X	X
Aphaostracon theiocrenetum	Clifton Spring Hydrobe Snail	Snail	X			X	X
Elimia acuta	Acute Elimia	Snail	X			X	X
Elimia alabamensis	Mud Elimia	Snail	X			X	X
Elimia ampla	Ample Elimia	Snail	X			X	X
Elimia annettae	Lilyshoals Elimia	Snail	X			X	X
Elimia arachnoidea	Spider Elimia	Snail	X			X	X
Elimia bellacrenata	Princess Elimia	Snail	X			X	X
Elimia bellula	Walnut Elimia	Snail	X			X	
Elimia chiltonensis	Prune Elimia	Snail	X			X	X
Elimia cochliaris	Cockle Elimia	Snail	X			X	X
Elimia cylindracea	Cylinder Elimia	Snail	X			X	X
Elimia lachryma	Nodulose Coosa River Snail	Snail	X			X	X
Elimia nassula	Round-Rib Elimia	Snail	X			X	X
Elimia olivula	Caper Elimia	Snail	X			X	X
Elimia perstriata	Engraved Elimia	Snail	X			X	X
Elimia showalteri	Compact Elimia	Snail	X			X	X
Elimia teres	Elegant Elimia	Snail	X			X	X
Elimia vanuxemiana	Cobble Elimia	Snail	X			X	X
Floridobia mica	Ichetucknee Siltsnail	Snail	X			X	X
Floridobia monroensis	Enterprise Siltsnail	Snail	X			X	
Floridobia parva	Pygmy Siltsnail	Snail	X			X	
Floridobia ponderosa	Ponderosa Siltsnail	Snail	X			X	X
Floridobia wekiwae	Wekiwa Siltsnail	Snail	X			X	
Leptoxis arkansasensis	Arkansas Mudalia	Snail	X			X	X
Leptoxis picta	Spotted Rocksnail	Snail	X			X	X
Leptoxis virgata	Smooth Mudalia	Snail	X			X	X
Lithasia curta	Knobby Rocksnail	Snail	X			X	X
Lithasia duttoniana	Helmet Rocksnail	Snail	X			X	
Lo fluvialis	Spiny Riversnail	Snail	X			X	X
Marstonia agarhecta	Ocmulgee Marstonia	Snail	X			X	
Marstonia castor	Beaverpond Marstonia	Snail	X			X	X
Marstonia ozarkensis	Ozark Pyrg	Snail	X			X	
Planorbella magnifica	Magnificent Ram's-horn	Snail	X			X	X
Pleurocera corpulenta	Corpulent Hornsnail	Snail	X			X	X
Pleurocera curta	Shortspire Hornsnail	Snail	X			X	
Pleurocera pyrenella	Skirted Hornsnail	Snail	X			X	
Rhodacme elatior	Domed Ancylid	Snail	X			X	X
Somatogyrus alcoviensis	Reverse Pepplesnail	Snail	X			X	
Acroneuria kosztarabi	Virginia Stone	Stonefly	X			X	
Allocapnia brooksi	Sevier Snowfly	Stonefly	X			X	
Allocapnia fumosa	Smokies Snowfly	Stonefly	X			X	
Allocapnia cunninghami	Karst Snowfly	Stonefly	X			X	
Amphinemura mockfordi	Tennessee Forestfly	Stonefly	X			X	
Leuctra szczytkoi	Louisiana Needlefly	Stonefly	X			X	
Megaleuctra williamsae	Smokies Needlefly	Stonefly	X			X	X
Tallaperla lobata	Lobed Roachfly	Stonefly	X			X	
Aeschynomene pratensis	Meadow Joint-vetch	Vascular Plant	X			X	X
Alnus maritima	Seaside Alder	Vascular Plant	X			X	
Amorpha georgiana var. *georgiana*	Georgia Leadplant (GA Indigo Bush).	Vascular Plant	X			X	
Arnoglossum diversifolium	Variable-leaved Indian-Plantain	Vascular Plant	X			X	X
Balduina atropurpurea	Purple Balduina (Purpledisk honeycombhead).	Vascular Plant	X			X	

TABLE 2—THREATS FOR THE 374 SPECIES AS CLASSIFIED BY THE PETITIONERS—Continued

Scientific name	Common name	Taxon	Factor				
			A	B	C	D	E
Baptisia megacarpa	Apalachicola Wild Indigo	Vascular Plant	X	X		X	X
Bartonia texana	Texas Screwstem	Vascular Plant	X			X	
Boltonia montana	Doll's-Daisy	Vascular Plant	X			X	
Calamovilfa arcuata	Rivergrass	Vascular Plant	X			X	
Carex brysonii	Bryson's Sedge	Vascular Plant	X			X	X
Carex impressinervia	Impressed-nerved Sedge	Vascular Plant	X			X	X
Coreopsis integrifolia	Ciliate-leaf Tickseed	Vascular Plant	X			X	
Croton elliottii	Elliott's Croton	Vascular Plant	X			X	
Elytraria caroliniensis var. *angustifolia.*	Narrowleaf Carolina Scalystem	Vascular Plant	X			X	
Encyclia cochleata var. *triandra*	Clam-shell Orchid	Vascular Plant		X		X	
Epidendrum strobiliferum	Big Cypress Epidendrum	Vascular Plant	X	X		X	X
Eriocaulon koernickianum	Small-headed Pipewort	Vascular Plant	X			X	
Eriocaulon nigrobracteatum	Black-bracket Pipewort	Vascular Plant	X			X	X
Eupatorium paludicola	A Thoroughwort	Vascular Plant	X			X	X
Eurybia saxicastellii	Rockcastle Wood-Aster	Vascular Plant	X			X	X
Fimbristylis perpusilla	Harper's Fimbristylis	Vascular Plant	X			X	
Forestiera godfreyi	Godfry's Privet	Vascular Plant	X			X	X
Hartwrightia floridan	Hartwrightia	Vascular Plant	X			X	
Helianthus occidentalis ssp. *plantagineus.*	Shinner's Sunflower	Vascular Plant	X			X	
Hexastylis speciosa	Harper's Heartleaf	Vascular Plant	X			X	X
Hymenocallis henryae	Henry's Spider-lily	Vascular Plant	X	X		X	
Hypericum edisonianum	Edison's Ascyrum	Vascular Plant	X			X	
Hypericum lissophloeus	Smooth-barked St. John's-wort	Vascular Plant	X			X	
Illicium parviflorum	Yellow Anisetree	Vascular Plant	X	X		X	
Isoetes hyemalis	Winter or Evergreen Quillwort	Vascular Plant	X			X	
Isoetes microvela	Thin-wall Quillwort	Vascular Plant	X			X	X
Lilium iridollae	Panhandle Lily	Vascular Plant	X	X	X	X	
Lindera subcoriacea	Bog Spicebush	Vascular Plant	X			X	X
Linum westii	West's Flax	Vascular Plant	X			X	
Lobelia boykinii	Boykin's Lobelia	Vascular Plant	X			X	X
Ludwigia brevipes	Long Beach Seedbox	Vascular Plant	X			X	
Ludwigia spathulata	Spathulate Seedbox	Vascular Plant	X			X	
Luwigia ravenii	Raven's Seedbox	Vascular Plant	X			X	X
Lythrum curtissii	Curtis's Loosestrife	Vascular Plant	X			X	
Lythrum flagellare	Lowland Loosestrife	Vascular Plant	X			X	
Macbridea caroliniana	Carolina Birds-in-a-nest	Vascular Plant	X			X	X
Marshallia grandiflora	Large-flowered Barbara's-buttons	Vascular Plant	X			X	
Minuartia godfreyi	Godfry's Stitchwort	Vascular Plant	X			X	
Najas filifolia	Narrowleaf Naiad	Vascular Plant	X		X	X	
Nuphar lutea ssp. *sagittifolia*	Cape Fear Spatterdock or Yellow Pond Lily.	Vascular Plant	X			X	X
Nuphar lutea ssp. *ulvacea*	West Florida Cow-lily	Vascular Plant	X			X	
Nyssa ursina	Bear Tupelo or Dwarf Blackgum	Vascular Plant	X			X	X
Oncidium undulatum	Cape Sable Orchid	Vascular Plant		X		X	
Physostegia correllii	Correll's False Dragonhead	Vascular Plant	X			X	
Potamogeton floridanus	Florida Pondweed	Vascular Plant	X			X	
Potamogeton tennesseensis	Tennessee Pondweed	Vascular Plant	X			X	X
Ptilimnium ahlesii	Carolina Bishopweed	Vascular Plant	X			X	X
Rhexia parviflora	Small-flower Meadow-beauty	Vascular Plant	X			X	X
Rhexia salicifolia	Panhandle Meadow-beauty	Vascular Plant	X			X	
Rhynochospora crinipes	Hairy-peduncled Beakbush	Vascular Plant	X			X	
Rhynchospora thornei	Thorne's Beakbush	Vascular Plant	X			X	
Rudbeckia auriculata	Eared Coneflower	Vascular Plant	X		X	X	X
Rudbeckia heliopsidis	Sun-facing Coneflower	Vascular Plant	X			X	
Salix floridana	Florida Willow	Vascular Plant	X			X	X
Sarracenia purpurea var. *montana*	Mountain purple pitcherplant	Vascular Plant	X	X		X	
Sarracenia rubra ssp. *gulfensis*	Gulf Sweet Pitcherplant	Vascular Plant	X			X	
Sarracenia rubra ssp. *wherryi*	Wherry's Sweet Pitcherplant	Vascular Plant	X			X	
Schoenoplectus hallii	Hall's Bulrush	Vascular Plant	X		X	X	X
Scutellaria ocmulgee	Ocmulgee Skullcap	Vascular Plant	X			X	X
Sideroxylon thornei	Swamp Buckhorn or GA Bully	Vascular Plant	X		X	X	
Solidago arenicola	Southern Racemose Goldenrod	Vascular Plant	X			X	X
Sporobolus teretifolius	Wire-leaved Dropseed	Vascular Plant	X			X	
Stellaria fontinalis	Water Stitchwort	Vascular Plant	X			X	X
Symphyotrichum puniceum var. *scabricaule.*	Rough-stemmed Aster	Vascular Plant	X			X	
Thalictrum debile	Southern Meadowrue	Vascular Plant	X			X	X
Trillium texanum	Texas Trillium	Vascular Plant	X			X	X

TABLE 2—THREATS FOR THE 374 SPECIES AS CLASSIFIED BY THE PETITIONERS—Continued

Scientific name	Common name	Taxon	Factor				
			A	B	C	D	E
Tsuga caroliniana	Carolina Hemlock	Vascular Plant	X	.....	X	X	.....
Vicia ocalensis	Ocala Vetch	Vascular Plant	X	.....	.....	X	X
Waldsteinia lobata	Lobed Barren-strawberry	Vascular Plant	X	.....	.....	X	X
Xyris longisepala	Kral's Yellow-eyed Grass	Vascular Plant	X	.....	.....	X	.....

Factor A: Present or threatened destruction, modification or curtailment of its habitat or range.
Factor B: Overutilization for commercial, recreational, scientific, or educational purposes.
Factor C: Disease or predation.
Factor D: Inadequacy of existing regulatory mechanisms.
Factor E: Other natural or manmade factors.

Evaluation of the Information Provided in the Petition and Available in Service Files

We reviewed and evaluated 374 of 404 species in the petition, as well as the additional information contained in the second petition for the Carolina hemlock and the supplemental information provided for the Panama City crayfish. Due to the large number of species reviewed, we were only able to conduct cursory reviews of the information in our files and the literature cited in the petition. For many of the narrowly endemic species included in the 374 species, we had no additional information in our files and relied solely on the information provided in the petition and provided through NatureServe.

Finding

On the basis of our evaluation under section 4(b)(3)(A) of the Act, we determine that the petition presents substantial scientific or commercial information that listing 374 species (listed in Table 2) as endangered or threatened under the Act may be warranted. This finding is based on information provided under Factors A, B, C, D, and E. Because we have found that the petition presents substantial information indicating that listing may be warranted, we are initiating status reviews to determine whether listing these species under the Act is warranted.

In addition, we find that the petition presents substantial scientific or commercial information indicating that listing 18 species that are current candidate species or the subjects of proposed rules to list may be warranted. The 18 species (listed with details in the *Petition History* section) are sicklefin redhorse, laurel dace, spectaclecase, narrow pigtoe, round ebonyshell, southern sandshell, sheepnose, fuzzy pigtoe, southern kidneyshell, rabbitsfoot, tapered pigtoe, Choctaw bean, rayed bean, black mudalia, Coleman cave beetle, Black Warrior waterdog, Yadkin River goldenrod, and the snuffbox. As a warranted determination for listing has already been made for these species, we will not be initiating status reviews for these species at this time. Further information on the assessments for these 18 species can be found at *http://ecos.fws.gov/tess_public/*.

The ''substantial information'' standard for a 90-day finding differs from the Act's ''best scientific and commercial data'' standard that applies to a status review to determine whether a petitioned action is warranted. A 90-day finding does not constitute a status review under the Act. In a 12-month finding, we will determine whether a petitioned action is warranted after we have completed a thorough status review of the species, which is conducted following a substantial 90-day finding. Because the Act's standards for 90-day and 12-month findings are different, as described above, a substantial 90-day finding does not mean that the 12-month finding will result in a warranted finding.

We previously determined that emergency listing of any of the 404 petitioned species is not warranted. However, if at any time we determine that emergency listing of any of the species is warranted, we will initiate an emergency listing at that time.

The petitioners requested that critical habitat be designated concurrent with listing under the Act. If we determine in our 12-month finding, following the status review of the species, that listing is warranted, we will address the designation of critical habitat in the subsequent proposed rule.

References Cited

A complete list of references cited is available on the Internet at *http://www.regulations.gov* and upon request from the Southeast Ecological Services Regional Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this document are the staff members of the Southeast Region Ecological Services Offices.

Authority: The authority for this action is Section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)

Dated: September 12, 2011.

Rowan W. Gould,

Acting Director, U.S. Fish and Wildlife Service.

[FR Doc. 2011–24633 Filed 9–26–11; 8:45 am]

BILLING CODE 4310–55–P