



DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2018–0092; 4500030113]

RIN 1018–BC28

Endangered and Threatened Wildlife and Plants; Threatened Species Status With Section 4(d) Rule for Neuse River Waterdog and Endangered Species Status for Carolina Madtom and Proposed Designations of Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list two North Carolina species, the Neuse River waterdog (*Necturus lewisi*) and the Carolina madtom (*Noturus furiosus*), as endangered or threatened under the Endangered Species Act of 1973, as amended (Act). The Neuse River waterdog is an aquatic salamander. The Carolina madtom is a freshwater fish. After review of the best available scientific and commercial information, we find that listing both species is warranted. Accordingly, we propose to list the Neuse River waterdog as a threatened species with a rule issued under section 4(d) of the Act (“4(d) rule”) and the Carolina madtom as an endangered species under the Act. If we finalize this rule as proposed, it would add these species to the List of Endangered and Threatened Wildlife and extend the Act’s protections to both species. We also propose to designate critical habitat for both species under the Act. In total, approximately 738 river miles (1,188 river kilometers) in 16 units in North Carolina fall within the boundaries of

the proposed critical habitat designation for the Neuse River waterdog. Approximately 257 river miles (414 river kilometers) in 7 units in North Carolina are being proposed as critical habitat for the Carolina madtom. Finally, we announce the availability of a draft economic analysis of the proposed critical habitat designations.

DATES: We will accept comments received or postmarked on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES**, below) must be received by 11:59 p.m. Eastern Time on the closing date.

We must receive requests for public hearings, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

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

(1) *Electronically:* Go to the Federal eRulemaking Portal:

<http://www.regulations.gov>. In the Search box, enter FWS–R4–ES–2018–0092, which is the docket number for this rulemaking. Then, in the Search panel on the left side of the screen, under the Document Type heading, check the Proposed Rules box to locate this document. You may submit a comment by clicking on “Comment Now!”

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R4–ES–2018–0092, U.S. Fish and Wildlife Service, MS: BPHC, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

We request that you send comments only by the methods described above. We will post all comments on <http://www.regulations.gov>. This generally means that we will

post any personal information you provide us (see *Public Comments*, below, for more information).

Availability of supporting materials: For the critical habitat designation, the coordinates or plot points or both from which the maps are generated are included in the administrative record and are available at <https://www.fws.gov/southeast/>, at <http://www.regulations.gov> under Docket No. FWS–R4–ES–2018–0092, and at the Raleigh Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). Any additional tools or supporting information that we may develop for the critical habitat designation will also be available at the Service website and Field Office set out above, and may also be included in the preamble and/or at <http://www.regulations.gov>.

FOR FURTHER INFORMATION CONTACT: Pete Benjamin, Field Supervisor, U.S. Fish and Wildlife Service, Raleigh Ecological Services Field Office, 551F Pylon Drive, Raleigh, NC 27606; telephone 919–856–4520; or facsimile 919–856–4556.

Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Supporting Documents

A species status assessment (SSA) team prepared SSA reports for the Neuse River waterdog and the Carolina madtom. The SSA team was composed of Service and North Carolina Wildlife Resources Commission biologists, in consultation with other species experts. The SSA reports represent a compilation of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present,

and future factors (both negative and beneficial) affecting each species. Both SSA reports underwent independent peer review by scientists with expertise in fish or amphibian biology, habitat management, and stressors (factors negatively affecting the species) to the species. The SSA reports and other materials relating to this proposal can be found on the Southeast Region website at <https://www.fws.gov/southeast/> and at <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092.

Executive Summary

Why we need to publish a rule. Under the Act, if we determine that a species may be an endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposal in the *Federal Register* and make a determination on our proposal within 1 year. To the maximum extent prudent and determinable, we must designate critical habitat for any species that we determine to be an endangered or threatened species under the Act. Listing a species as an endangered or threatened species and designation of critical habitat can only be completed by issuing a rule.

What this document does. We propose the listing of the Neuse River waterdog as a threatened species with a rule under section 4(d) of the Act and the Carolina madtom as an endangered species under the Act, and we propose the designation of critical habitat for both species.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species based on any of five factors: (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. We have determined that habitat degradation (Factor A), resulting from the cumulative impacts of land use change and associated watershed-level effects on water quality, water quantity, habitat connectivity, and instream habitat suitability, poses the largest risk to future viability of both species. This stressor is primarily related to habitat changes: the buildup of fine sediments, the loss of flowing water, instream habitat fragmentation, and impairment of water quality, and it is exacerbated by the effects of climate change (Factor E). There are no existing regulatory mechanisms that are adequate to reduce these threats so that the species does not warrant listing (Factor D).

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary) to designate critical habitat concurrent with listing to the extent prudent and determinable. Section 4(b)(2) of the Act states that the Secretary will make the designation on the basis of the best available scientific data after taking into consideration the economic impact, the impact on national security, and any other relevant impact of specifying any particular area as critical habitat. Section 3(5) of the Act defines critical habitat as (i) the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed if such areas are essential to the conservation of the species.

Peer Review. In accordance with our joint policy on peer review published in the *Federal Register* on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we sought the expert opinions of 13 appropriate specialists regarding the SSA reports, which informed this proposed rule. The purpose of peer review is to ensure that the science behind our listing determinations, the critical habitat designations, and 4(d) rule are based on scientifically sound data, assumptions, and analyses. The peer reviewers have expertise in the biology, habitat, and stressors to the species.

Information Requested

Public Comments

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other concerned governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

- (1) The species' biology, range, and population trends, including:
 - (a) Biological or ecological requirements of these species, including 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 these species, their habitats, or both.

(2) Factors that may affect the continued existence of the species, which may include habitat modification or destruction, overutilization, disease, predation, the inadequacy of existing regulatory mechanisms, or other natural or manmade factors.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to these species and existing regulations that may be addressing those threats.

(4) Additional information concerning the historical and current status, range, distribution, and population size of these species, including the locations of any additional populations of either species.

(5) Information on activities that are necessary and advisable for the conservation of the Neuse River waterdog to include in a 4(d) rule for the species. The Service is proposing such measures that are necessary and advisable for the conservation of the species, and will evaluate ideas provided by the public in considering the prohibitions we should include in the 4(d) rule.

(a) Additional provisions the Service may wish to consider for a 4(d) rule in order to conserve, recover, and manage the Neuse River waterdog, such as the best management practices used in agriculture.

(6) The reasons why we should or should not designate habitat as “critical habitat” under section 4 of the Act including whether there are threats to the species from human activity, the degree of which can be expected to increase due to the designation,

and whether that increase in threat outweighs the benefit of designation such that the designation of critical habitat may not be prudent.

(7) Specific information on:

(a) The amount and distribution of Neuse River waterdog or Carolina madtom habitat;

(b) What areas, that were occupied at the time of listing and that contain the physical or biological features essential to the conservation of the species, should be included in the designation and why;

(c) Special management considerations or protection that may be needed in critical habitat areas we are proposing, including managing for the potential effects of climate change; and

(d) What areas not occupied at the time of listing are essential for the conservation of the species and why.

(8) Land use designations and current or planned activities in the subject areas and their possible impacts on proposed critical habitat.

(9) Any probable economic, national security, or other relevant impacts of designating any area that may be included in the final designation, and the benefits of including or excluding areas that may be impacted.

(10) Information on the extent to which the description of probable economic impacts in the draft economic analysis is a reasonable estimate of the likely economic impacts.

(11) Whether any specific areas we are proposing for critical habitat designation should be considered for exclusion under section 4(b)(2) of the Act, and whether the

benefits of potentially excluding any specific area outweigh the benefits of including that area under section 4(b)(2) of the Act.

(12) Whether we could improve or modify our approach to designating critical habitat in any way to provide for greater public participation and understanding, or to better accommodate public concerns and comments.

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

Please note that 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, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or a threatened species must be made “solely on the basis of the best scientific and commercial data available.”

You may submit your comments and materials concerning this proposed rule by one of the methods listed in **ADDRESSES**. We request that you send comments only by the methods described in **ADDRESSES**.

If you submit information via <http://www.regulations.gov>, your entire submission—including any personal identifying information—will be posted on the website. 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>.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on <http://www.regulations.gov>, or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Raleigh Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Public Hearing

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received by the date specified above in **DATES**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the *Federal Register* and local newspapers at least 15 days before the hearing.

Previous Federal Actions

On April 20, 2010, we received a petition from Center for Biological Diversity and others to list 404 aquatic species in the southeastern United States, including the Neuse River waterdog and the Carolina madtom. In response to the petition, we completed a partial 90-day finding on September 27, 2011 (76 FR 59836), in which we stated that the petition contained substantial information that listing may be warranted for both species. We conducted a status review for each species. This proposed listing rule also constitutes our 12-month petition findings for the two species.

I. Proposed Listing Determination

Background

Neuse River Waterdog

A thorough review of the taxonomy, life history, and ecology of the Neuse River waterdog (*Necturus lewisi*) is presented in the SSA Report Version 1.1.

The Neuse River waterdog is a permanently aquatic salamander species endemic to the Tar-Pamlico and Neuse River drainages in North Carolina. The species occurs in riffles, runs, and pools in medium to large streams and rivers with moderate gradient in both the Piedmont and Coastal Plain physiographic regions. Neuse River waterdogs are from an ancient lineage of permanently aquatic salamanders in the genus *Necturus*, one of three species of *Necturus* in North Carolina.

Neuse River waterdogs have a reddish brown skin with black spots, reaching up to 9 inches (in) in length as adults. Their underside is brownish grey, and they have external bushy dark red gills. They eat large aquatic arthropods, any aquatic and terrestrial invertebrates, and even some vertebrates like small fish. Like most waterdogs, they are opportunistic feeders who lie in wait for a small organism to swim or float by. All prey are ingested whole, and larger items are sometimes regurgitated and then re-swallowed.

Neuse River waterdogs are found in streams ranging from larger headwater streams in the Piedmont to coastal streams up to the point of saltwater intrusion. None have been found in lakes or ponds. They are usually found in streams wider than 15 meters (m), deeper than 100 centimeters (cm), and with a main channel flow rate greater than 10cm/second. Further, they need clean, flowing water characterized by high

dissolved oxygen concentrations. The preferred habitats vary with the season, temperature, dissolved oxygen content, flow rate and precipitation; however, the waterdogs maintain home retreat areas under rocks, in burrows, or under substantial cover in backwater or eddy areas.

Longevity of Neuse River waterdogs is not known; however, their close relative *N. maculosus* may live for 30+ years. Like many long-lived animals, breeding is delayed until a minimum body size is reached and they tend to grow slowly. Generation time for Neuse River waterdogs is 10–15 years. They breed once per year, with mating in the fall or winter and spawning in the spring. Females lay a clutch of about 25–90 eggs under large rocks with sand and gravel beneath them and then guard the rudimentary nest.

Carolina madtom

A thorough review of the taxonomy, life history, and ecology of the Carolina madtom (*Noturus furiosus*) is presented in the SSA Report.

The Carolina madtom is a moderate-sized catfish with a short, chunky body and a distinct color pattern of three dark saddles and a wide black stripe along its side.

Furiosus means “mad” or “raging,” as the Carolina madtom is the most strongly armed of the North American catfishes with stinging spines containing a potent poison in their pectoral fins. They are found in medium to large flowing streams of moderate gradient in both the Piedmont and Coastal Plain physiographic regions in the Neuse and Tar River basins. Suitable instream habitats are described as riffles, runs, and pools with current, and during the warm months the madtoms are found in or near swift current at depths of 1 to 3 feet (.3 to .9 meters). Stream bottom substrate composition is important for benthic Carolina madtoms; leaf litter, sand, gravel, and small cobble are all common substrates

associated with the species, although it is most often found over sand mixed with pea-sized gravel and leaf litter. During the breeding season, Carolina madtoms shift to areas of moderate to slow flow with abundant cover used for nesting.

The nesting season extends from about mid-May to late July. Nest sites are often found under or in relic freshwater mussel shells, under large pieces of water-logged tree bark, or in discarded beverage bottles and cans partially buried on the stream bottom. The female produces about 80 to 300 eggs, and the male guards the nest until the eggs hatch. Clutch sizes average 152 larvae, and life expectancy for these fish is at least 4 years.

The Carolina madtom is a bottom-dwelling insectivore that feeds primarily during the night, with peaks at dawn and dusk. More than 95 percent of the food organisms in the Carolina madtom stomachs were larval midges, mayflies, caddisflies, dragonflies, and beetle larvae (Burr et al. 1989, p. 78).

Summary of Biological Status and Threats

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations in title 50 of the Code of Federal Regulations (50 CFR part 424) set forth the procedures for determining whether a species is an “endangered species” or a “threatened species.” The Act defines an endangered species as a species that is “in danger of extinction throughout all or a significant portion of its range,” and a threatened species as a species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The Act requires that we determine whether any species

is an “endangered species” or a “threatened species” because of any of the following factors:

(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.

These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on a species’ continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on individuals of the species, as well as other actions or conditions that may ameliorate any negative effects or may have positive effects.

We use the term “threat” to refer in general to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term “threat” includes actions or conditions that have a direct impact on individuals (direct impacts), as well as those that affect individuals through alteration of their habitat or required resources (stressors). The term “threat” may encompass—either together or separately—the source of the action or condition or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an “endangered species” or a “threatened species.” In determining whether a species meets either definition, we must evaluate all

identified threats by considering the expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species—such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an “endangered species” or a “threatened species” only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

In our determination, we correlate the threats acting on the species to the factors in section 4(a)(1) of the Act. The SSA reports document the results of our comprehensive biological status review for each species, including an assessment of the potential stressors to the species. They do not represent a decision by the Service on whether the species should be proposed for listing as an endangered or threatened species under the Act. They do, however, provide the scientific basis that informs our regulatory decisions, which involves the further application of standards within the Act and its implementing regulations and policies. The following is a summary of the key results and conclusions from the SSA reports; the full SSA reports can be found on the Southeast Region website at <https://www.fws.gov/southeast/> and at <http://www.regulations.gov> under Docket No. FWS–R4–ES–2018–0092.

Summary of Analysis

To assess Neuse River waterdog and Carolina madtom viability, we used the three conservation biology principles of resiliency, representation, and redundancy (together, the 3 Rs) (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years); representation supports the ability of the species to adapt over time to long-term changes in the environment (for example, climate changes); and redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, hurricanes). In general, the more redundant and resilient a species is and the more representation it has, the more likely it is to sustain populations over time, even under changing environmental conditions. Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

The SSA process can be categorized into three sequential stages. During the first stage, we used the 3Rs to evaluate individual species' life-history needs. The next stage involved an assessment of the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences. This process used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We utilize this information to inform our regulatory decision.

Neuse River Waterdog

To evaluate the current and future viability of the Neuse River waterdog, we assessed a range of conditions to allow us to consider the species' resiliency, representation, and redundancy. For the purposes of this assessment, populations were delineated using the three river basins that Neuse River waterdogs have historically occupied (i.e., Tar-Pamlico, Neuse, and Trent River basins). Because the river basin level is at a very coarse scale, populations were further delineated using Management Units (MUs). MUs were defined as one or more HUC10 (hydrologic unit code) watersheds that species experts identified as most appropriate for assessing population-level resiliency.

To assess resiliency, we analyzed MU occupancy over time and site occupancy over time ("population factors") as well as four habitat elements that were determined in our analysis of the species' needs to have the most influence on the species: water quality, water quantity, substrate, and habitat connectivity ("habitat elements"). We then assessed the overall condition of each population. Overall population condition rankings were determined by combining the two population factors and four habitat elements. For a more detailed explanation of the condition categories, see Table 1, below.

Representation for the Neuse River waterdog can be described in terms of the size and range of the river systems it inhabits (medium streams to large rivers in three river basins), and physiographic variability (Piedmont and Coastal Plain). High redundancy for Neuse River waterdog is defined as multiple resilient populations (inclusive of multiple, resilient MUs) distributed throughout the species' historical range. That is, highly resilient populations, coupled with a relatively broad distribution, have a positive relationship to species-level redundancy.

Table 1. Population and habitat characteristics used to create condition categories for resiliency assessment for Neuse River waterdog (MU = Management Unit; HUC10 = hydrologic unit code; ARA = active river area).

Condition Category	Population Factors		Habitat Elements			
	MU Occupancy	Site Occupancy	Water Quality	Water Quantity	Connectivity	Instream Habitat (Substrate)
High	<10% decline or a positive increase in occupied HUC10s over time	<10% decline in site occupancy over time	Very few (if any) known impairment or contaminant problems (<5 miles impaired streams; no major discharges, <10 non-major discharges)	Optimal flowing water conditions to remove fine sediments, allow for food delivery, and maximize reproduction; no known flow issues; isolated low flow/drought periods; not flashy flow regime	Very little (if any) known habitat fragmentation issues (<10 dams per MU; avg # of Road Crossings <300 per MU)	Predominantly natural (>70% forested) ARA; <6% impervious surfaces in HUC10 watershed
Moderate	11-30% decline in occupied HUC10s over time	11-30% decline in site occupancy over time	Impairment or contaminants known to be an issue, but not at a level to put population at risk of being eliminated (5-50 miles impaired streams; 1-3 major discharges; 10-25 non-major discharges)	Water flow not sufficient to consistently remove fine sediments, drying conditions which could impact both food delivery and successful reproduction; moderate flow issues, including 3 to 4 years of consecutive drought or moderately flashy flows	Some habitat fragmentation issues (10-30 dams per MU; Avg # of Road Crossings 300-500 per MU)	20-70% forested ARA; 6-15% impervious surfaces in HUC10 watershed
Low	31-70% decline in occupied HUC10s over time	31-70% decline in site occupancy over time	Impairment or contaminants at levels high enough to put the population at risk of being eliminated (>50 miles impaired streams; >4 major discharges; 25+ non-major discharges)	Water not flowing - either inundated or dry; severe flow issues; more than 4 consecutive years of drought; flashy flow regime	Habitat severely fragmented (30+ dams in MU; 500+ Avg Road Crossings per MU)	<20% forested ARA; >15% impervious surfaces in HUC10 watershed
Very Low	>70% decline in occupied HUC10s over time	>70% decline in site occupancy over time	Impairment or contaminant at levels that cannot support species survival	Flow conditions do not support species survival	Habitat extremely fragmented and unable to support species survival	Instream habitat unable to support species survival
∅	Total Loss	Total Loss	N/A	N/A	N/A	N/A

Current Condition of Neuse River Waterdog

The historical range of the Neuse River waterdog included 3rd and 4th order streams and rivers in the Tar, Neuse, and Trent drainages (basins), with documented historical distribution in 40 HUC10s in 9 MUs across the 3 populations. Currently, the Neuse River waterdog is extant in all nine identified MUs; however, within those MUs, it is presumed extirpated from 35 percent (14/40) of the historically occupied HUC10s, and another 25 percent of the streams are in low or very low condition. Of the nine occupied MUs, two (22%) are estimated to have high resiliency, three (33%) moderate resiliency, and four (45%) low resiliency. At the population level, one of three populations (Tar) is estimated to have moderate resiliency, and two (Neuse and Trent) are estimated to have low resiliency.

We estimated that the Neuse River waterdog currently has moderate adaptive potential, primarily due to ecological representation in three river basins and two physiographic regions. The species retains nearly all of its known River Basin variability; however, the variability within the basins is reduced compared to historical distribution. In addition, compared to historical occupancy, the species currently retains moderate Physiographic Variability in the Coastal Plain (87%) and in the Piedmont (67%). However, the Piedmont has experienced significant declines in occupancy, with nearly half of the MUs losing species occurrence. Of the 16 historically occupied Piedmont HUC10s, 7 are no longer occupied, and 9 have experienced loss.

The range of the Neuse River waterdog has always been very narrow, limited to the Tar, Trent, and Neuse River drainages. Within the identified representation areas (i.e., river basins), the species retains redundancy in terms of occupied HUC10s within

the Tar River population (82%) and the Neuse River population (70%), although 67 percent of redundancy has been lost in the Trent River population. Overall, the species has lost 27 percent (11 out of 40 historically occupied HUC10s) of its redundancy across its narrow, endemic range.

Carolina Madtom

To evaluate the current and future viability of the Carolina madtom, we assessed a similar range of conditions as described above for Neuse River waterdog to allow us to consider the species' resiliency, representation, and redundancy. We assessed resiliency for the Carolina madtom using population factors (MU occupancy over time, approximate abundance, and recruitment) and habitat elements (water quality, water quantity, habitat connectivity, and instream substrate). Populations were delineated using the same three river basins that Carolina madtoms have historically occupied, namely the Tar-Pamlico, Neuse, and Trent River basins. As with the waterdog, populations were further delineated using MUs, again defined as one or more HUC10 watersheds that species experts identified as the most appropriate unit for assessing population-level resiliency. Resiliency is characterized, and overall population condition rankings and habitat condition rankings were determined, in the same way as for the waterdog.

Representation for the Carolina madtom can be described in terms of River Basin Variability (Tar, Trent, and Neuse River basins) and Physiographic Variability (eastern Piedmont and Coastal Plain). We assessed Carolina madtom redundancy by first evaluating occupancy within each of the hydrologic units (i.e., HUC10s) that constitute MUs, and then we evaluated occupancy at the MU and ultimately the population level.

Current Condition of Carolina Madtom

The historical range of the Carolina madtom included three populations, one in each of the same three river basins in North Carolina as the Neuse River waterdog. The results of surveys conducted from 2011 to 2016 suggest that the currently occupied range of the Carolina madtom includes four MUs from two populations, corresponding to the Tar and Neuse River basins; however, only one population (Tar) has multiple documented occurrences within the past 5 years. The species has been extirpated from the southern portion of its range, including a large portion of the Neuse River basin and the entire Trent River basin. The Carolina madtom currently occupies 8 of the 31 historically occupied HUC10s (with “currently” defined as the observation of at least one specimen from 2011 to 2016), 7 of which are in the Tar River Basin and 1 in the Neuse River Basin. At the population level, the overall current condition (= resiliency) was estimated to be moderate for the Tar population, very low for the Neuse population, and likely extirpated for the Trent population.

We estimated that the Carolina madtom currently has low adaptive potential due to limited representation in two river basins and two physiographic regions. The species retains 33 percent of its known River Basin variability, considering greatly reduced variability observed in the Neuse River population. In addition, compared to historical occupancy, the species currently retains very limited physiographic variability in the Coastal Plain (14%) and moderate variability in the Piedmont (56%).

The range of the Carolina madtom has always been very narrow, limited to the Tar, Trent, and Neuse River drainages. Within the identified representation areas, the species retains redundancy within the Tar River population (3 MUs currently extant);

however, it has no redundancy (only 1 MU extant in the Neuse River population and no redundancy (extirpated) in the Trent River population. Overall, the species has lost 64 percent of its redundancy across its narrow, endemic range.

Risk Factors for Neuse River Waterdog and Carolina Madtom

A multitude of natural and anthropogenic factors may impact the status of species within aquatic systems. Generally, these factors can be categorized as either environmental stressors (e.g., development, agriculture practices, or forest management) or systematic changes (e.g., climate change, invasive species, dams or other barriers). The largest threats to the future viability of the Neuse River waterdog and Carolina madtom involve habitat degradation from stressors influencing the four habitat elements: water quality, water quantity, instream habitat, and habitat connectivity. All of these factors are exacerbated by the effects of climate change. A brief summary of these primary stressors is presented below; for a full description of these stressors, refer to chapter 4 of the SSA report for each species.

Environmental Stressors

Development and Pollution

Development refers to urbanization of the landscape, including (but not limited to) land conversion for urban and commercial use, infrastructure (roads, bridges, utilities), and urban water uses (water supply reservoirs, wastewater treatment, etc.). The effects of urbanization may include alterations to water quality, water quantity, and habitat (both in-stream and stream-side) (Service 2018, p. 40).

Urbanization increases the amount of impervious surfaces. “Impervious surface” refers to all hard surfaces like paved roads, parking lots, roofs, and even highly

compacted soils like sports fields. Impervious surfaces prevent the natural soaking of rainwater into the ground and slow seepage into streams. Instead, the rainwater accumulates and flows rapidly into storm drains, which drain as runoff to local streams. This degrades stream habitat in three ways: water quantity (high flow during storms), water quality (pollutants washing into streams), and increased water temperatures due to the surfaces heating the water.

Concentrations of contaminants, including nitrogen, phosphorus, chloride, insecticides, polycyclic aromatic hydrocarbons, and personal care products, increase with urban development (Giddings et al. 2009, p. 2; Bringolf et al. 2010, p. 1,311). Water infrastructure development, including water supply, reclamation, and wastewater treatment, results in several pollution point discharges to streams.

A major result of urbanization is road development. By its nature, road development increases impervious surfaces as well as land clearing and habitat fragmentation. Roads are generally associated with negative effects on the biotic integrity of aquatic ecosystems, including changes in surface water temperatures and patterns of runoff; sedimentation; and adding heavy metals (especially lead), salts, organics, ozone, and nutrients to stream systems (Trombulak and Frissell 2000, p. 18). These changes affect stream-dwelling organisms such as the Carolina madtom and Neuse River waterdog by displacing them from once-preferred habitats, as well as increasing exposure and assimilation of pollutants that can result in growth defects, decreased immune response, and even death. In addition, a possible major impact of road development is improperly constructed culverts at stream crossings. These culverts act as barriers, either because flow through the culvert varies significantly from the rest of the

stream or because the culvert ends up being perched, so that aquatic organisms such as these species cannot pass through them.

Carolina madtoms prefer clean water with permanent flow and are not tolerant of siltation and turbidity. Benthic fish, such as the madtom, have disproportionate rates of imperilment and extirpation due to pollution because stream bottoms are often the first habitats affected. Furthermore, the Carolina madtom is classified as an “intolerant” species according to the NC Division of Water Resources, meaning the species is most affected by environmental perturbations (NCDWR 2013, p. 19).

All three of the river basins within the range of the Carolina madtom are affected by development, from an average of 7 percent in the Tar River Basin to an average of 13 percent in the Neuse River Basin (based on the 2011 National Land Cover Data). For example, the Neuse River Basin contains one-sixth of the entire State’s human population, indicating heavy development pressure on the watershed. The Middle Neuse MU contains 182 impaired stream miles, 9 major discharges, 272 minor discharges, and nearly 4,000 road crossings, all affecting the quality of the habitat for both species. The Middle Neuse is also 31 percent developed, with nearly 8 percent impervious surface, which changes natural streamflow, reduces appropriate stream habitat, and decreases water quality throughout the MU. For complete data on all of the populations, refer to appendices A and D of the SSA reports.

Agricultural Practices: The main impacts to the Neuse River waterdog and Carolina madtom from agricultural practices, not following best management practices (BMPs) for conservation, are caused by nutrient and chemical pollution and by water pumping for irrigation. Fertilizers and animal manure, which are both rich in nitrogen

and phosphorus, are the primary sources of nutrient pollution from agricultural sources. Excess nutrients impact water quality when it rains or when water and soil containing nitrogen and phosphorus wash into nearby waters or leach into the water table or groundwater. Confined animal feeding operations and feedlots can cause degradation of aquatic ecosystems, primarily because of manure management issues. Fertilized soils, manure, and livestock can be significant sources of nitrogen-based compounds like ammonia and nitrogen oxides. Ammonia can be harmful to aquatic life if large amounts are deposited to surface waters. For fish like the Carolina madtom, excess ammonia can cause a number of problems, including alteration of metabolism, injury to gill tissue, and reduced growth rates. Extreme levels of ammonia can cause death.

Excessive water withdrawal or water withdrawal done illegally (without the necessary permit, during dry times of year), may cause impacts to the amount of water available to downstream sensitive areas during low flow months, resulting in dewatering of channels and displacement of fish and aquatic salamanders, leading in turn to desiccation and death. According to the 2011 National Land Cover Data, all of the watersheds within the range of the Carolina madtom and Neuse River waterdog are affected by agricultural land uses, most with 25 percent or more of the watershed having been converted for agricultural use.

Forest Management: Silvicultural activities, when performed according to strict forest practices guidelines (FPGs) or BMPs, can retain adequate conditions for aquatic ecosystems; however, when FPGs/BMPs are not followed, these practices can also contribute to the myriad of stressors facing aquatic systems in the Southeast, including North Carolina. Both small- and large-scale forestry activities have been shown to have a

significant impact upon the physical, chemical, and biological characteristics of adjacent small streams (Service 2018, p. 41). The clearing of large areas of forested wetlands and riparian systems can eliminate shade provided by forest canopies, exposing streams to more sunlight and increasing the in-stream water temperature. The increase in stream temperature and light after deforestation alters the macroinvertebrate and other aquatic species richness and abundance composition in streams. As stated above, both the Neuse River waterdog and Carolina madtom are sensitive to changes in temperature, and sustained temperature increases will stress and possibly lead to mortality for these species.

Forestry activities often include the construction of logging roads through the riparian zone, and this can directly degrade nearby stream environments. Roads can cause point-source pollution and sedimentation, as well as sedimentation traveling downstream into more sensitive habitats. These effects lead to stress and mortality for both species, as discussed in “*Development*,” above. While BMPs are widely adhered to, they were not always common practice. The most recent surveys of Southeastern U.S. States show that the average implementation rate is at 92 percent, so while improper implementation is rare, it can have drastic negative effects on sensitive aquatic species. Further, many forestry activities do not require a permit for wetland or stream fill.

Systematic Changes

Climate Change: Aquatic systems are encountering changes and shifts in seasonal patterns of precipitation and runoff as a result of climate change. While both of these species have evolved in habitats that experience seasonal fluctuations in discharge, global weather patterns (e.g., El Niño or La Niña) can have an impact on the normal

regimes. Even during naturally occurring low flow events, amphibians and fish either become stressed because they exert significant energy to move to deeper waters or they may succumb to desiccation. Because low flows in late summer and early fall are stress-inducing, droughts during this time of year result in an increase in stress and, potentially, an increased rate of mortality.

Droughts have impacted all river basins within the range of both species, from an “abnormally dry” ranking for North Carolina in 2001 on the Southeast Drought Monitor scale to the highest ranking of “exceptionally dry” for the entire range of both species in 2002 and 2007. The 2015 drought data indicated that the entire Southeast was under conditions ranging from “abnormally dry” to “moderate drought” or “severe drought.” These data are from the first week in September, which as noted above is a very sensitive time for drought to be affecting both species. The Middle Neuse tributaries of the Neuse River basin had consecutive drought years in the period 2005–2012, indicating sustained stress on the species over a long period of time. Amphibians and fish have limited refugia from disturbances such as droughts and floods, and they are completely dependent on specific water temperatures to complete their physiological requirements. Changes in water temperature lead to stress, increased mortality, and also increase the likelihood of extinction for both species. Increases in the frequency and strength of storm events, which are caused by climate change, alter stream habitat, either directly via channelization or clearing of riparian areas or indirectly via high streamflows that reshape the channel and cause sediment erosion. The large volumes and velocity of water, combined with the extra debris and sediment entering streams following a storm, stress,

displace, or kill Neuse River waterdogs and Carolina madtoms, as well as the host species on which the latter depend.

Invasive Species: There are many areas across North Carolina where invasive species have invaded aquatic communities; are competing with native species for food, light, or breeding and nesting areas; and are impacting biodiversity. The flathead catfish is an invasive species that may have an impact on Neuse River waterdog and Carolina madtom distribution. The flathead catfish is an apex predator, known to influence native fish populations, including predation on benthic fishes, including madtoms, and it occurs in both the Neuse and Tar River basins. It is not known whether or not this fish also preys on waterdogs, but it is speculated that Neuse River waterdog inactivity during warmer months is in part due to the avoidance of large, predatory fishes (Braswell 2005, p. 870).

Hydrilla (*Hydrilla verticillata*), an invasive aquatic plant, alters stream habitat, decreases flows, and contributes to sediment buildup in streams (NCANSMPC 2015, p. 57). High sedimentation can cause suffocation and reduce stream flow necessary for madtom survival. Hydrilla occurs in several watersheds where both species occur, and has been recently documented from the Neuse system and the Tar River. While there are no data to indicate that hydrilla currently has population-level effects on these two species, its spread is expected to increase in the future.

Dams and Barriers: Extinction of some North American freshwater fish can be traced to impoundment and inundation of riffle habitats in all major river basins of the central and eastern United States. Upstream of dams, the change from flowing to impounded waters, increased depths, increased buildup of sediments, decreased dissolved

oxygen, and the drastic alteration in resident fish populations can threaten the survival of fish and aquatic salamanders and their overall reproductive success. Downstream of dams, fluctuations in flow regimes, minimal releases and scouring flows, seasonal dissolved oxygen depletion, reduced or increased water temperatures, and changes in fish assemblages can also threaten the survival and reproduction of many aquatic species. Dams have also been identified as causing genetic segregation or isolation in river systems—resident fish can no longer move freely through different habitats and may become genetically isolated from other fish populations throughout the river. Even improperly constructed culverts at stream crossings can act as significant barriers, and have some similar effects as dams on stream systems. Fluctuating flows through the culvert can vary significantly from the rest of the stream, preventing fish passage and scouring downstream habitats. If a culvert ends up being perched above the stream bed, aquatic organisms cannot pass through it. All of the MUs containing Neuse River waterdogs and Carolina madtom populations have been impacted by dams, with as few as 11 dams in the Contentnea Creek MU to 287 dams in the Middle Neuse MU.

Energy Production and Mining: The Neuse River waterdog and its habitat face impacts from oil and gas production, coal power, hydropower, and the use of biofuels. Coal mined from other States is used for energy production in North Carolina. Damage to fish and wildlife from exposure to coal ash slurry ranges from physiological, developmental, and behavioral toxicity to major population- and community-level changes. Coal-combustion residue contamination of aquatic habitats can result in the accumulation of metals and trace elements in larval amphibians, including arsenic, cadmium, chromium, copper, mercury, lead, selenium, and vanadium, potentially leading

to developmental, behavioral, and physiological effects (Rowe et al. 2002, entire). As recently as October 2016, Neuse River waterdogs in the Neuse River were exposed to coal ash slurry when Hurricane Matthew caused inundation of coal ash storage ponds. Coal-fired power plants pump large volumes of water to produce electricity and aquatic organisms such as larval waterdogs can be pulled in and killed unless measures are sufficient to keep organisms from being impacted. After water is used for electricity production, it is returned to surface waters, but the temperature can be considerably higher than the temperature of the stream, reducing the ability of the species to spawn.

Hydropower as a domestic energy source is becoming more prevalent in North Carolina, including areas where the Neuse River waterdog occurs. Like other impoundments, streams and rivers impounded by hydropower dams are changed from lotic systems to lentic systems, fragmenting habitats and disrupting movements and migrations of fish and other aquatic organisms like the Neuse River waterdog. Downstream water quality can also suffer from low dissolved oxygen levels and altered temperatures. In addition, hydropower generation can significantly change flow regimes downstream of hydropower dams, and can affect other riverine processes, such as sediment transport, nutrient cycling, and woody debris transport.

Potential impacts to both species from oil and gas extraction are numerous; they include water quality and water quantity impacts, riparian habitat fragmentation and conversion, increased sand mining (used in oil and gas extraction), and increased road and utility corridors. While oil and gas extraction currently does not, and likely will not, occur in the Tar River Basin due to lack of subsurface shale deposits, impacts from shale gas extraction could occur in the Neuse River Basin (Service 2018, p. 46). Future

impacts from oil and gas exploration and production are certain, as North Carolina has recently begun to allow fracking operations to drill for natural gas State-wide.

Synergistic Effects

In addition to individually impacting the species, it is likely that several of the above summarized risk factors are acting synergistically or additively on both species. The combined impact of multiple stressors is likely more harmful than a single stressor acting alone. For example, in the Middle Neuse MU, there are 182 miles of impaired streams. They have low benthic-macroinvertebrate scores, low dissolved oxygen, low pH, and contain *Escherichia coli* (also known as *E. coli*). There are 9 major and 272 minor discharges within this MU, along with 287 dams, almost 4,000 road crossings, and droughts recorded for 3 consecutive years in 2008–2010. For example, if a small but improperly installed culvert at a road crossing prevents fish from moving up or downstream, the fish would not be able to escape to deeper areas of the stream during droughts. Similarly, a discharge into a stream has more impact on aquatic species if there are no precipitation events immediately following to help flush the system. These combinations of stressors on the sensitive aquatic species in this habitat likely impact both species more severely in combination than any one factor alone.

In our analysis of the factors affecting both of these species, we found that there are no existing regulatory mechanisms that adequately address threats to both species such that they do not warrant listing under the Act (Factor D). We found no evidence of population- or species-level impacts from overutilization for commercial, recreational, scientific, or educational purposes (Factor B). Nor was there any evidence to support that there are impacts due to disease or predation (Factor C).

Conservation Actions

The Service and State wildlife agencies are working with numerous partners to provide technical guidance and offering conservation tools to meet both species and habitat needs in aquatic systems in North Carolina. Land trusts are targeting key parcels for acquisition; Federal, State, and university biologists are surveying and monitoring species occurrences; and recently there has been increased interest in efforts to consider captive propagation and species population restoration via augmentation, expansion, and reintroduction efforts. However, some of these programs are in their infancy, and none covers enough area to provide species-level protection at a scale such that the species would not warrant listing under the Act.

Future Scenarios

For the purpose of this assessment, we define viability as the ability of the species to sustain populations in the wild over time. To address uncertainty associated with the degree and extent of potential future stressors and their impacts on species' requisites, the 3Rs were assessed using four plausible future scenarios. These scenarios were based, in part, on the results of urbanization and climate models that predict changes in habitat used by the Neuse River waterdog and the Carolina madtom. We devised scenarios by eliciting expert information on the primary stressors, urbanization and climate change. The models that were used to forecast both of these factors projected 50 years into the future. Using the best available data to forecast plausible future scenarios allows the Service to determine if a species may become an endangered species in the foreseeable future. Relatively long life spans, well-developed downscaled climate models specific to the region, and good growth data available for the Southeast region provide some

confidence in the range of outcomes predicted over 50 years. Beyond that timeframe, there is too much uncertainty in threats that will be occurring on the landscape and how the species may respond to those threats. For more detailed information on these models and their projections, please see the SSA reports (Service, 2017).

In scenario one, the “Status Quo” scenario, factors that influence current populations of the Neuse River waterdog and the Carolina madtom were assumed to follow current trends over the 50-year time horizon. Climate models predict that, if emissions continue at current rates, the Southeast will experience an increase in low flow (drought) events (IPCC 2013, p. 7). Likewise, this scenario assumed the ‘business as usual’ pattern of urban growth, which predicts that urbanization will continue to increase rapidly (Terando et al. 2014, p. 1). This continued growth in development means increases in impervious surfaces, increased variability in streamflow, channelization of streams or clearing of riparian areas, and other negative effects explained above under “*Development.*” The “Status Quo” scenario also assumed that current conservation efforts would remain in place but that no new actions would be taken.

In scenario two, the “Pessimistic” scenario, factors that negatively influence Neuse River waterdog and the Carolina madtom populations get worse; reflecting Climate Model RCP8.5 (Wayne 2013, p. 11), effects of climate change are expected to be magnified beyond what is experienced in the “Status Quo” scenario. These predicted effects include extreme heat, more storms and flooding, and exacerbated drought conditions (IPCC 2013, p. 7). Based on the results of the SLEUTH BAU model (Terando et al. 2014, entire), urbanization in the relevant watersheds could expand to triple the amount of developed area, resulting in large increases of impervious surface cover and,

potentially, consumptive water use. Increased urbanization and climate change effects are likely to result in increased impacts to water quality, water flow, and habitat connectivity, and we predict that there is limited capacity for species restoration under this scenario.

Scenario three is labeled the “Optimistic” scenario, and factors that influence population and habitat conditions of the Neuse River waterdog and the Carolina madtom are expected to be somewhat improved. Reflecting Climate Model RCP2.6 (Wayne 2013, p. 11), climate change effects are predicted to be minimal under this scenario and would not include increased temperatures, and storms or droughts are as set forth in the “Status Quo” and “Pessimistic” scenario predictions. Urbanization is also predicted to have less impact in this scenario, as reflected by effects that are slightly lower than BAU model predictions (Terando et al. 2014; Table 5-1). Because water quality, water flow, and habitat impacts are predicted to be less severe in this scenario as compared to others, it is expected that the species will maintain or have a slightly positive response. Targeted permanent protection of riparian areas is a potential conservation activity that could benefit these species, and current efforts are considered successful as part of the Optimistic Scenario.

In scenario four, the “Opportunistic” scenario, those landscape-level factors (e.g., development and climate change) that are influencing populations of the Neuse River waterdog and the Carolina madtom get moderately worse, reflecting Climate Change Model RCP4.5 (Wayne 2013, p. 11) and SLEUTH BAU (Terando et al. 2014; Table 5-1). Effects of climate change are expected to be moderate, resulting in some increased impacts from heat, storms, and droughts (IPCC 2013, p. 7). Urbanization in this scenario

reflects the moderate BAU SLEUTH levels, indicating approximately double the amount of developed area compared to current levels. Overall, it is expected that the synergistic impacts of changes in water quality, flow, and habitat connectivity will negatively affect both species, although current land conservation efforts will benefit the species in some watersheds.

Determination

Neuse River Waterdog

The historical range of the Neuse River Waterdog likely included all 3rd and 4th order streams and rivers throughout the Tar, Neuse, and Trent drainages, with documented historical distribution in nine MUs within three populations. Of those nine occupied MUs, two (22%) are estimated to have high resiliency, two (22%) moderate resiliency, and five (56%) low resiliency. Scaling up from the MU to the population level, one of three populations (the Tar population) was estimated to have moderate resiliency, and two (the Neuse and Trent populations) were characterized by low resiliency. In short, 60 percent of streams that were once part of the species' range are estimated to be in low condition or likely extirpated. The species is known to occupy streams in two physiographic regions, but it has lost physiographic representation with an estimated 43 percent loss in Piedmont watersheds and an estimated 13 percent loss in Coastal Plain watersheds.

The Neuse River waterdog faces threats from declines in water quality, loss of stream flow, riparian and instream fragmentation, and deterioration of instream habitats (Factor A). These threats are expected to be exacerbated by continued urbanization

(Factor A) and effects of climate change (Factor E). Given current and future decreases in resiliency, populations become more vulnerable to extirpation from stochastic events, in turn, resulting in concurrent losses in representation and redundancy. The range of plausible future scenarios of Neuse River waterdog habitat conditions and population factors suggest reduced viability into the future. Under Scenario 1, the “Status Quo” option, a loss of resiliency, representation, and redundancy is expected. Under this scenario, we predicted that no MUs would remain in high condition, two in moderate condition, four in low condition, and three MUs would be likely extirpated. Redundancy would be reduced to four MUs in the Tar Population and two in the Neuse Population. Representation would also be reduced, primarily with reduced variability in the Piedmont and Coastal Plain.

Under scenario two, the “Pessimistic” option, we predicted substantial losses of resiliency, representation, and redundancy. Redundancy would be reduced to four MUs in one population, and the resiliency of that population is expected to be low. Several (5) MUs were predicted to be extirpated, and, of the remaining four MUs, all would be in low condition. All measures of representation are predicted to decline under this scenario, leaving remaining Neuse River waterdog populations underrepresented in river basin and physiographic variability.

Under scenario three, the “Optimistic” option, we predicted slightly higher levels of resiliency, representation, and redundancy than was estimated under the Status Quo or Pessimistic options. Three MUs would be in high condition, one in moderate condition, and the remaining five would be in low condition. Despite predictions of population persistence in the Neuse and Trent River Basins, these populations are expected to retain

only low levels of resiliency, thus levels of representation are also predicted to decline under this scenario.

Finally, under scenario four, the “Opportunistic” option, we predicted reduced levels of resiliency, representation, and redundancy. One MU would be in high condition, three would be in moderate condition, three in low condition, and two would be likely extirpated. Redundancy would be reduced with the loss of the Trent population. Under the Opportunistic scenario, representation is predicted to be reduced with 67 percent of formerly occupied river basins remaining occupied and with reduced variability in the Piedmont and Coastal Plain Physiographic Regions. Both the optimistic and opportunistic scenarios were determined to be “unlikely” in the analysis, while the most likely scenarios were status quo and pessimistic. Under either of these more likely scenarios, resiliency is low in most of the remaining populations, many populations are likely extirpated so that redundancy and representation are significantly reduced. This expected reduction in both the number and distribution of resilient populations is likely to make the species vulnerable to catastrophic disturbance.

Table 2. Predicted Neuse River waterdog population conditions under each of four plausible scenarios.

	Future Scenarios of Population Conditions				
	Current	#1 Status Quo	#2 Pessimistic	#3 Optimistic	#4 Opportunistic
Populations: Management Units					
Tar: Upper Tar	Low	Likely Extirpated	Likely Extirpated	Low	Likely Extirpated
Tar: Middle Tar	Moderate	Low	Low	High	Moderate
Tar: Lower Tar	High	Moderate	Low	High	Moderate
Tar: Sandy-Swift	High	Moderate	Low	High	High
Tar: Fishing Ck	Low	Low	Low	Moderate	Moderate
Neuse: Upper Neuse	Low	Likely Extirpated	Likely Extirpated	Low	Low
Neuse: Middle Neuse	Low	Low	Likely Extirpated	Low	Low
Neuse: Lower Neuse	Moderate	Low	Likely Extirpated	Low	Low
Trent	Low	Likely Extirpated	Likely Extirpated	Low	Likely Extirpated

Carolina madtom

The historical range of the Carolina madtom included 3rd and 4th order streams and rivers in the Tar, Neuse, and Trent drainages, with documented historical distribution in 11 MUs within 3 former populations, the Tar, Neuse, and Trent. The Carolina madtom is presumed extirpated from 64 percent (7) of the historically occupied MUs. Of the four MUs that remain occupied, one is estimated to have high resiliency, one with moderate resiliency, one with low resiliency, and one with very low resiliency. Scaling up from the MU to the population level, the Tar population is estimated to have moderate resiliency, the Neuse population is characterized by very low resiliency, and the Trent population is presumed to be extirpated. Of streams that were once part of the species’ range, 82 percent are estimated to be in low condition or likely extirpated. Once known to occupy streams in two physiographic regions, the species has also lost substantial physiographic representation with an estimated 44 percent loss in Piedmont watersheds and an estimated 86 percent loss in Coastal Plain watersheds.

Estimates of current resiliency for Carolina madtom are low, as are estimates for representation and redundancy. The Carolina madtom faces a variety of ongoing threats from declines in water quality, loss of stream flow, riparian and instream fragmentation,

and deterioration of instream habitats (Factor A). This species also faces the threat of predation from the invasive flathead catfish (Factor C). These threats are expected to be exacerbated by continued urbanization (Factor A) and climate change (Factor E). Given current rates of resiliency, populations are vulnerable to extirpation from stochastic events, in turn, resulting in concurrent losses in representation and redundancy.

The Act defines an endangered species as any species that is “in danger of extinction throughout all or a significant portion of its range” and a threatened species as any species “that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.” We considered whether the Neuse River waterdog and the Carolina madtom meet either of these definitions, and find that Neuse River waterdog meets the definition of a threatened species, and Carolina madtom meets the definition of an endangered species.

Neuse River waterdog. Our analysis of the species’ current and future conditions, as well as the conservation efforts discussed above, show that the population and habitat factors used to determine the resiliency, representation, and redundancy for Neuse River waterdog will continue to decline so it is likely to become in danger of extinction throughout all or a significant portion of the range within the foreseeable future.

First, we considered whether the Neuse River waterdog is presently in danger of extinction and determined that proposing endangered status is not appropriate. The current conditions as assessed in the Neuse River waterdog SSA report show that the species exists in nine MUs over three different populations (river systems) over a majority (65 percent) of the species’ historical range. The Neuse River waterdog still exhibits representation across both physiographic regions, and extant populations remain

across the range. In short, while the primary threats are currently acting on the species and many of those threats are expected to continue into the future, we did not find that the species is currently in danger of extinction throughout all of its range. However, according to our assessment of plausible future scenarios, the species is likely to become an endangered species in the foreseeable future throughout all of its range. Fifty years was considered “foreseeable” in this case because it included projections from both available models, and Neuse River waterdogs are a long-lived and slow-growing species. We can reasonably rely on the future of 50 years as presented in the models of predicted urbanization and climate change, and predict how those threats will affect the status of the species over that timeframe.

As discussed above, the range of plausible future scenarios of Neuse River waterdog habitat conditions and population factors suggest reduced viability into the future. Both the optimistic and opportunistic scenarios were determined to be “unlikely” in the analysis, while the most likely scenarios were status quo and pessimistic. Under either of these more likely scenarios, resiliency is low in most of the remaining populations, and many populations are likely extirpated so that redundancy and representation are significantly reduced. This expected reduction in both the number and distribution of resilient populations is likely to make the species vulnerable to catastrophic disturbance.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that the Neuse River waterdog is likely to become an endangered species within the foreseeable future throughout its range, we find it unnecessary

to proceed to an evaluation of potentially significant portions of the range. Where the best available information allows the Services to determine a status for the species rangewide, that determination should be given conclusive weight because a rangewide determination of status more accurately reflects the species' degree of imperilment and better promotes the purposes of the statute. Under this reading, we should first consider whether listing is appropriate based on a rangewide analysis and proceed to conduct a "significant portion of its range" analysis if, and only if, a species does not qualify for listing as either endangered or threatened according to the "all" language. We note that the court in *Desert Survivors v. Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), did not address this issue, and our conclusion is therefore consistent with the opinion in that case.

Therefore, on the basis of the best available scientific and commercial information, we are proposing to list the Neuse River waterdog as a threatened species across its entire range in accordance with sections 3 and 4(a)(1) of the Act.

Carolina madtom. The current conditions as assessed in the Carolina madtom SSA report show that 64 percent of the management units over three populations (river systems) are presumed extirpated. The Carolina madtom currently has two of three remaining populations, but one of those populations (Neuse) is characterized by "very low" resiliency. Once known to occupy streams in two physiographic regions, the species has also lost substantial physiographic representation with an estimated 44 percent loss in Piedmont watersheds and an estimated 86 percent loss in Coastal Plain watersheds. Resiliency, redundancy, and representation are all at levels that put the species at risk of extinction throughout its range now. We conclude that the species is

currently in danger of extinction throughout all of its range. We find that a threatened species status is not appropriate for the Carolina madtom because the threats are ongoing currently and are expected to continue or worsen into the future. Because the species is already in danger of extinction throughout its range, a threatened status is not appropriate.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that the Carolina madtom is in danger of extinction throughout its range, we find it unnecessary to proceed to an evaluation of potentially significant portions of the range. Where the best available information allows the Services to determine a status for the species rangewide, that determination should be given conclusive weight because a rangewide determination of status more accurately reflects the species' degree of imperilment and better promotes the purposes of the statute. Under this reading, we should first consider whether listing is appropriate based on a rangewide analysis and proceed to conduct a "significant portion of its range" analysis if, and only if, a species does not qualify for listing as either endangered or threatened according to the "all" language. We note that the court in *Desert Survivors v. Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), did not address this issue, and our conclusion is therefore consistent with the opinion in that case.

Therefore, on the basis of the best available scientific and commercial information, we propose to list the Carolina madtom as an endangered species across its entire range in accordance with sections 3 and 4(a)(1) of the Act.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness and conservation by Federal, State, Tribal, and local agencies; private organizations; and individuals. The Act encourages cooperation with the States and other countries, and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan also identifies recovery criteria for review of when a

species may be ready for reclassification from endangered to threatened (“downlisting”) or removal from the List of Endangered and Threatened Wildlife or Plants (“delisting”), and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outlines, draft recovery plans, and the final recovery plans will be available on our website (<http://www.fws.gov/angered>), or from our Raleigh Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands. If these species are listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of North Carolina would be eligible for Federal funds to implement management actions that promote the protection or recovery of the Neuse River waterdog

and Carolina madtom. Information on our grant programs that are available to aid species recovery can be found at: <http://www.fws.gov/grants>.

Although the Neuse River waterdog and Carolina madtom are only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for these species. Additionally, we invite you to submit any new information on these species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402.

Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Federal agency actions within the species' habitat that may require conference or consultation or both as described in the preceding paragraph may include, but are not limited to, management and any other landscape-altering activities on Federal lands

administered by the Service, U.S. Forest Service, and National Park Service; issuance of section 404 Clean Water Act (33 U.S.C. 1251 et seq.) permits by the U.S. Army Corps of Engineers; and construction and maintenance of roads or highways by the Federal Highway Administration.

II. Proposed Rule Issued Under Section 4(d) of the Act for the Neuse River Waterdog

Background

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to threatened wildlife. Under section 4(d) of the Act, the Secretary has the discretion to issue such regulations as he deems necessary and advisable to provide for the conservation of threatened species. The Secretary also has the discretion to prohibit, by regulation with respect to any threatened species of fish or wildlife, any act prohibited under section 9(a)(1) of the Act. The same prohibitions of section 9(a)(1) of the Act, codified at 50 CFR 17.31, make it illegal for any person subject to the jurisdiction of the United States to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these) threatened wildlife within the United States or on the high seas. In addition, it is unlawful to import; export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally.

In accordance with section 4(d) of the Act, the regulations implementing the Act include a provision that generally applies to threatened wildlife the same prohibitions and exceptions that apply to endangered wildlife (50 CFR 17.31(a), 17.32). However, for any threatened species, the Service may instead develop a protective regulation that is specific to the conservation needs of that species. Such a regulation would contain all of the protections applicable to that species (50 CFR 17.31(c)); this may include some of the general prohibitions and exceptions under 50 CFR 17.31 and 17.32, but would also include species-specific protections that may be more or less restrictive than the general provisions at 50 CFR 17.31. For the reasons discussed below, the Service has determined to develop a specific rule under section 4(d) for the Neuse River waterdog.

Proposed 4(d) Rule

Under this proposed 4(d) rule, all prohibitions and provisions of section 9(a)(1) of the Act would apply to the Neuse River waterdog, except that the following actions would not be prohibited:

(1) Species restoration efforts by State wildlife agencies, including collection of broodstock, tissue collection for genetic analysis, captive propagation, and subsequent stocking into currently occupied and unoccupied areas within the historical range of the species.

(2) Channel restoration projects that create natural, physically stable, ecologically functioning streams (or stream and wetland systems) that are reconnected with their groundwater aquifers. These projects can be accomplished using a variety of methods, but the desired outcome is a natural channel with low shear stress (force of water moving

against the channel); bank heights that enable reconnection to the floodplain; a reconnection of surface and groundwater systems, resulting in perennial flows in the channel; riffles and pools composed of existing soil, rock, and wood instead of large imported materials; low compaction of soils within adjacent riparian areas; and inclusion of riparian wetlands. Second- to third-order, headwater streams reconstructed in this way would offer suitable habitats for the Neuse River waterdog and contain stable channel features, such as pools, glides, runs, and riffles, which could be used by the species for spawning, rearing, growth, feeding, migration, and other normal behaviors.

(3) Bank stabilization projects that use bioengineering methods to replace pre-existing, bare, eroding stream banks with vegetated, stable stream banks, thereby reducing bank erosion and instream sedimentation and improving habitat conditions for the species. Following these bioengineering methods, stream banks may be stabilized using live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), live fascines (live branch cuttings, usually willows, bound together into long, cigar-shaped bundles), or brush layering (cuttings or branches of easily rooted tree species layered between successive lifts of soil fill). These methods would not include the sole use of quarried rock (rip-rap) or the use of rock baskets or gabion structures.

(4) Silviculture practices and forest management activities that:

(a) Implement highest standard best management practices (BMPs), particularly for Streamside Management Zones, stream crossings, and forest roads; and

(b) Comply with forest practice guidelines related to water quality standards, or comply with Sustainable Forestry Initiative/Forest Stewardship Council/American Tree

Farm System certification standards for both forest management and responsible fiber sourcing.

These BMPs are publicly available on websites for these organizations, and can currently be found below:

<http://www.ncasi.org/Downloads/Download.ashx?id=10204>

<http://reports.oah.state.nc.us/>

<https://us.fsc.org/download.fsc-us-forest-management-standard-v1-0.95.htm>

<https://www.treefarmssystem.org/certification-american-tree-farm-standards>

These actions and activities may have some minimal level of mortality, harm, or disturbance to the Neuse River waterdog, but are not expected to adversely affect the species' conservation and recovery efforts. In fact, we expect they would have a net beneficial effect on the species. Across the species' range, instream habitats have been degraded physically by sedimentation and by direct channel disturbance. The activities exempted from prohibition in this rule will correct some of these problems, creating more favorable habitat conditions for the species. These provisions are necessary because, absent protections, the species is likely to become in danger of extinction in the foreseeable future. Additionally, these provisions are advisable because the species needs active conservation to improve the quality of its habitat. By exempting some of the general prohibitions of section 9(a)(1), these provisions can encourage cooperation by landowners and other affected parties in implementing conservation measures. This will allow for use of the land while at the same time ensuring the preservation of suitable habitat and minimizing impact on the species.

We may issue permits to carry out otherwise prohibited activities involving threatened wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.32. With regard to threatened wildlife, a permit may be issued for the following purposes: for scientific purposes, to enhance propagation or survival, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

It is our policy, as published in the *Federal Register* on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing.

Based on the best available information, the following activities may potentially result in a violation of section 9 of the Act for Carolina madtoms and the proposed 4(d) rule above for Neuse River waterdog; this list is not comprehensive:

- (1) Unauthorized handling or collecting of the species;
- (2) Destruction or alteration of the species' habitat by discharge of fill material, dredging, snagging, impounding, channelization, or modification of stream channels or banks;
- (3) Destruction of riparian habitat directly adjacent to stream channels that causes significant increases in sedimentation and destruction of natural stream banks or channels;

(4) Discharge of pollutants into a stream or into areas hydrologically connected to a stream occupied by the species;

(5) Diversion or alteration of surface or ground water flow; and

(6) Pesticide/herbicide applications in violation of label restrictions.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Raleigh Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

III. Proposed Critical Habitat Designation

Background

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

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

(a) Essential to the conservation of the species, and

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

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

Our regulations at 50 CFR 424.02 define the geographical area occupied by the species as: An area that may generally be delineated around species' occurrences, as determined by the Secretary (i.e., range). Such areas may include those areas used throughout all or part of the species' life cycle, even if not used on a regular basis (e.g.,

migratory corridors, seasonal habitats, and habitats used periodically, but not solely by vagrant individuals).

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

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) of the Act would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal action agency and the landowner is not to restore or recover the species, but to implement

reasonable and prudent alternatives to avoid destruction or adverse modification of critical habitat.

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features (1) which are essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, critical habitat designations identify, to the extent known using the best scientific and commercial data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical or biological features within an area, we focus on the specific features that support the life-history needs of the species, including but not limited to, water characteristics, soil type, geological features, prey, vegetation, symbiotic species, or other features. A feature may be a single habitat characteristic, or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity.

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. We will determine whether unoccupied areas are essential for the conservation of the species by considering the life-history, status, and conservation needs

of the species. This will be further informed by any generalized conservation strategy, criteria, or outline that may have been developed for the species to provide a substantive foundation for identifying which features and specific areas are essential to the conservation of the species and, as a result, the development of the critical habitat designation. For example, an area currently occupied by the species but that was not occupied at the time of listing may be essential to the conservation of the species and may be included in the critical habitat designation.

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

When we are determining which areas should be designated as critical habitat, our primary source of information is generally the information from the SSA report and information developed during the listing process for the species. Additional information sources may include any generalized conservation strategy, criteria, or outline that may have been developed for the species; the recovery plan for the species; articles in peer-reviewed journals; conservation plans developed by States and counties; scientific status

surveys and studies; biological assessments; other unpublished materials; or experts' opinions or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act; (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species; and (3) section 9 of the Act's prohibitions on taking any individual of the species, including taking caused by actions that affect habitat. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of this species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts if new information available at the time of these planning efforts calls for a different outcome.

Prudency Determination

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12), require that the Secretary shall designate critical habitat at the time the species is determined to be an endangered or threatened species to the maximum extent prudent and determinable. Our regulations (50 CFR 424.12(a)(1)) state that the designation of critical habitat is not prudent when one or both of the following situations exist:

(1) The species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of threat to the species, or

(2) Such designation of critical habitat would not be beneficial to the species. In determining whether a designation would not be beneficial, the factors the Service may consider include but are not limited to: Whether the present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or whether any areas meet the definition of "critical habitat."

As discussed above, we did not identify any imminent threat of take attributed to collection or vandalism for either the Neuse River waterdog or the Carolina madtom, and there is no indication that identification and mapping of critical habitat is likely to initiate any such threats. Therefore, in the absence of finding that the designation of critical habitat would increase threats to the species, if there are benefits to the species from a critical habitat designation, a finding that designation is prudent is appropriate.

The potential benefits of designation may include: (1) Triggering consultation under section 7 of the Act, in new areas for actions in which there may be a Federal nexus where it would not otherwise occur because, for example, it is unoccupied; (2)

focusing conservation activities on the most essential features and areas; (3) providing educational benefits to State or county governments or private entities; and (4) preventing people from causing inadvertent harm to the protected species. Because designation of critical habitat would not likely increase the degree of threat to these species and may provide some measure of benefit, designation of critical habitat is prudent for both the Neuse River waterdog and Carolina madtom.

Critical Habitat Determinability

Having determined that designation is prudent, under section 4(a)(3) of the Act we must find whether critical habitat for both species is determinable. Our regulations at 50 CFR 424.12(a)(2) state that critical habitat is not determinable when one or both of the following situations exist:

- (i) Data sufficient to perform required analyses are lacking, or
- (ii) The biological needs of the species are not sufficiently well known to identify any area that meets the definition of “critical habitat.”

When critical habitat is not determinable, the Act allows the Service an additional year to publish a critical habitat designation (16 U.S.C. 1533(b)(6)(C)(ii)).

We reviewed the available information pertaining to the biological needs of both species and habitat characteristics where the species are located. We find that this information is sufficient for us to conduct both the biological and economic analyses required for the critical habitat determination. Therefore, we conclude that the designation of critical habitat is determinable for the Neuse River waterdog and Carolina madtom.

Physical or Biological Features

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

- (1) Space for individual and population growth and for normal behavior;
- (2) Food, water, air, light, minerals, or other nutritional or physiological requirements;
- (3) Cover or shelter;
- (4) Sites for breeding, reproduction, or rearing (or development) of offspring; and
- (5) Habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species.

The features may also be combinations of habitat characteristics and may encompass the relationship between characteristics or the necessary amount of a characteristic needed to support the life history of the species. In considering whether features are essential to the conservation of the species, the Service may consider an appropriate quality, quantity, and spatial and temporal arrangement of habitat characteristics in the context of the life-history needs, condition, and status of the species. We derive the specific physical or biological features essential for Neuse River waterdog and Carolina madtom from studies of both species' habitat, ecology, and life history. The

primary habitat elements that influence resiliency of both species include water quality, water quantity, substrate, and habitat connectivity. A full description of the needs of individuals, populations, and the species is available from the SSA reports; the individuals' needs are summarized below in Tables 3 and 4.

Table 3. Life history and resource needs of the Neuse River waterdog.

Life Stage	Resources and/or circumstances needed for INDIVIDUALS to complete each life stage	Resource Function (BFSD*)	Information Source
Egg/Embryo - May–June	<ul style="list-style-type: none"> • Clean, flowing water with moderate current (~10–50 cm/sec) • Sexually mature males and females (~6 years old) • Appropriate spawning temperatures (8–22 °C) • Nest sites (large flat rocks with gravel bottoms) • Adequate flow for oxygenation (7–9 ppm DO) 	B	<ul style="list-style-type: none"> - Pudney et al. 1985, p. 54 - Cooper and Ashton 1985, p. 5 - Braswell and Ashton 1985, p. 21 - Ashton 1985, p. 95
Hatchling - late summer	<ul style="list-style-type: none"> • Clean, non-turbid, flowing water (~10–50 cm/sec) • Adequate food availability 	B, S	<ul style="list-style-type: none"> - Cooper and Ashton 1985, p. 5
Post-hatchling Larvae - 1–2 inches long	<ul style="list-style-type: none"> • Clean, flowing water (~10–50 cm/sec) • Adequate food availability (opportunistic feeding; primarily invertebrates) 	F, S	<ul style="list-style-type: none"> - Ashton 1985, p. 95
Juveniles - Up to 5.5–6.5 years; 2–4 inches long	<ul style="list-style-type: none"> • Clean, flowing water (~10–50 cm/sec) • Adequate food availability (primarily invertebrates) • Cover (large rocks/boulders, outcrops, burrows) for retreat areas 	F, S	<ul style="list-style-type: none"> - Ashton 1985, p. 95 - Braswell 2005, p. 867
Adults - 6–30+ years - 5–9 inches long	<ul style="list-style-type: none"> • Clean, flowing water deeper than 100 cm with flows 10–50 cm/sec • Streams >15m wide • High dissolved oxygen (7–9 ppm) • Appropriate substrate (hard clay bottom with 	F, S, D	<ul style="list-style-type: none"> - Braswell and Ashton 1985, pp. 13, 22, 28 - Ashton 1985, p. 95 - Braswell 2005,

	leaf litter, gravel, cobble) <ul style="list-style-type: none"> • Little to no siltation • Adequate food availability (aquatic and terrestrial invertebrates) • Cover (large rocks/boulders, outcrops, burrows) for retreat areas 		p. 868
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*B= Breeding, F=Feeding, S=Sheltering, D=Dispersal

Table 4. Life history and resource needs of the Carolina madtom.

Life Stage	Resources and/or circumstances needed for INDIVIDUALS to complete each life stage	Resource Function (BFSD*)	Information Source
Egg/Embryo - May–July	<ul style="list-style-type: none"> • Clear, flowing water • Sexually mature males and females • Appropriate spawning temperatures • Nest sites (rocks, bottles, shells, cobble) • Adequate flow for oxygenation 	B	- Burr et al. 1989, p. 75
Hatchling - late summer	<ul style="list-style-type: none"> • Clear, flowing water • Cohesive schooling behavior to avoid predation 	B, S	- Burr et al. 1989, p. 78
Juveniles - 2–3 years; >2.5 inches long	<ul style="list-style-type: none"> • Clear, flowing water • Adequate food availability (midges, caddisflies, mayflies, etc.) • Cover (shells, bottles, cans, tires, woody debris, etc.) 	F, S	- Burr et al. 1989, p. 78
Adults - 3+ years - >4 inches long	<ul style="list-style-type: none"> • Clear, flowing water 1 to 3 feet deep • Appropriate substrate (leaf litter, sand, gravel, cobble) • Adequate food availability (midges, caddisflies, mayflies, etc.) • Cover (shells, bottles, cans, tires, woody debris, etc.) 	F, S, D	- Burr et al. 1989, p. 63 - Midway et al. 2010, p. 326

* B=breeding; F=feeding; S=sheltering; D=dispersal

Summary of Essential Physical or Biological Features

In summary, we derive the specific physical or biological features essential to the conservation of Neuse River waterdog from studies of this species' habitat, ecology, and life history as described above. Additional information can be found in the SSA Report (Service 2018) available on <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092. We have determined that the following physical or biological features are essential to the conservation of Neuse River waterdog:

(1) Suitable substrates and connected instream habitats, characterized by geomorphically stable stream channels and banks (i.e., channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of native aquatic fauna (such as, stable riffle-run-pool habitats that provide flow refuges consisting of silt-free gravel, small cobble, coarse sand, and leaf litter substrates) as well as abundant cover and burrows used for nesting.

(2) Adequate flows, or a hydrologic flow regime (which includes the severity, frequency, duration, and seasonality of discharge over time), necessary to maintain instream habitats where the species is found and to maintain connectivity of streams with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the waterdog's habitat, food availability, and ample oxygenated flow for spawning and nesting habitat.

(3) Water quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.

(4) Invertebrate and fish prey items, which are typically hellgrammites, crayfish, mayflies, earthworms, snails, beetles, centipedes, slugs, and small fish.

We derive the specific physical or biological features essential to the conservation of Carolina madtom from studies of this species' habitat, ecology, and life history as described above. Additional information can be found in the SSA Report (Service 2018) available on <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092. We have determined that the following physical or biological features are essential to the conservation of Carolina madtom:

(1) Suitable substrates and connected instream habitats, characterized by geomorphically stable stream channels and banks (i.e., channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of native fish (such as stable riffle-run-pool habitats that provide flow refuges consisting of silt-free gravel, small cobble, coarse sand, and leaf litter substrates) as well as abundant cover used for nesting.

(2) Adequate flows, or a hydrologic flow regime (which includes the severity, frequency, duration, and seasonality of discharge over time), necessary to maintain instream habitats where the species is found and to maintain connectivity of streams with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the fish's habitat, food availability, and ample oxygenated flow for spawning and nesting habitat.

(3) Water quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain

natural physiological processes for normal behavior, growth, and viability of all life stages.

(4) Aquatic macroinvertebrate prey items, which are typically dominated by larval midges, mayflies, caddisflies, dragonflies, and beetle larvae.

Special Management Considerations or Protection

When designating critical habitat, we assess whether the specific areas within the geographical area occupied by the species at the time of listing contain features that are essential to the conservation of the species and which may require special management considerations or protection. The features essential to the conservation of the Neuse River waterdog and Carolina madtom may require special management considerations or protections to reduce the following threats: (1) Urbanization of the landscape, including (but not limited to) land conversion for urban and commercial use, infrastructure (roads, bridges, utilities), and urban water uses (water supply reservoirs, wastewater treatment, etc.); (2) nutrient pollution from agricultural activities that impact water quantity and quality; (3) significant alteration of water quality; (4) improper forest management or silviculture activities that remove large areas of forested wetlands and riparian systems; (5) dams, culverts, and utility pipe installation that creates barriers to movement; (6) impacts from invasive species; (7) changes and shifts in seasonal precipitation patterns as a result of climate change; and (8) other watershed and floodplain disturbances that release sediments or nutrients into the water.

Management activities that could ameliorate these threats include, but are not limited to: use of BMPs designed to reduce sedimentation, erosion, and bank side

destruction; protection of riparian corridors and leaving sufficient canopy cover along banks; moderation of surface and ground water withdrawals to maintain natural flow regimes; increased use of stormwater management and reduction of stormwater flows into the systems; and reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water.

Criteria Used To Identify Critical Habitat

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. In accordance with the Act and our implementing regulations at 50 CFR 424.12(b), we review available information pertaining to the habitat requirements of the species and identify specific areas within the geographical area occupied by the species at the time of listing and any specific areas outside the geographical area occupied by the species to be considered for designation as critical habitat.

The current distribution of both species is much reduced from their historical distributions. We anticipate that recovery will require continued protection of existing populations and habitat, as well as ensuring there are adequate numbers of Neuse River waterdogs and Carolina madtoms in stable populations and that these populations occur over a wide geographic area. This strategy will help to ensure that catastrophic events, such as the effects of hurricanes (e.g., flooding that causes excessive sedimentation, nutrients, and debris to disrupt stream ecology), cannot simultaneously affect all known populations. Rangewide recovery considerations, such as maintaining existing genetic

diversity and striving for representation of all major portions of the species' current range, were considered in formulating this proposed critical habitat.

Sources of data for this proposed critical habitat include multiple databases maintained by NC State University, the NC Wildlife Resources Commission, and the NC Natural Heritage Program and numerous survey reports on streams throughout the species' range (see SSA report). We have also reviewed available information that pertains to the habitat requirements of this species. Sources of information on habitat requirements include studies conducted at occupied sites and published in peer-reviewed articles, agency reports, and data collected during monitoring efforts (Service 2018).

Areas Occupied at the Time of Listing

Neuse River Waterdog

We identified stream channels that currently support populations of Neuse River waterdog. We defined "currently" as stream channels with observations of the species from 2010 to the present. Due to the breadth and intensity of survey effort done for amphibians throughout the known range of the species, it is reasonable to assume that streams with no positive surveys since 2010 should not be considered occupied for the purpose of our analysis.

Specific occupied habitat areas were delineated based on Natural Heritage Element Occurrences (EOs) following NatureServe's occurrence delineation protocol for freshwater fish (NatureServe 2018). These EOs provide habitat for Neuse River waterdog subpopulations and are large enough to be self-sustaining over time, despite fluctuations in local conditions. The EOs contain stream reaches with interconnected waters so that waterdogs can move between areas, at least during certain flows or

seasons.

Based on this information, we consider the following subbasins to be currently occupied by the species at the time of proposed listing: Upper, Middle, and Lower Tar River subbasins, Sandy-Swift Creek, Fishing Creek subbasin, Upper, Middle, and Lower Neuse River subbasins, and the Trent River (see *Unit Descriptions*, below). The proposed critical habitat designation does not include all streams known to have been occupied by the species historically; instead, it includes only the occupied streams within the historical range that have also retained the physical or biological features that will allow for the maintenance and expansion of existing populations.

Carolina Madtom

We identified stream channels that currently support populations of Carolina madtom. As with the Neuse River waterdog, we defined “current” as stream channels with observations of the species from 2010 to the present. Due to the breadth and intensity of survey effort done for freshwater fish throughout the known range of the species, it is reasonable to assume that streams with no positive surveys since 2010 should not be considered occupied for the purpose of our analysis.

Specific habitat areas were delineated based on Natural Heritage Element Occurrences (EOs) following NatureServe’s occurrence delineation protocol for freshwater fish (NatureServe 2018). These EOs provide habitat for Carolina madtom subpopulations and are large enough to be self-sustaining over time, despite fluctuations in local conditions. The EOs contain stream reaches with interconnected waters so that fish can move between areas, at least during certain flows or seasons.

We consider the following streams to be occupied by the species at the time of proposed listing: Upper Tar, Fishing Creek, Sandy-Swift Creek, and the Little River (see *Unit Descriptions*, below). The proposed critical habitat designation does not include all streams known to have been occupied by the species historically; instead, it includes only the occupied streams within the historical range that have also retained the physical or biological features that will allow for the maintenance and expansion of existing populations.

Areas Outside the Geographic Area Occupied at the Time of Listing

We are not proposing to designate any areas outside the geographical area currently occupied by the Neuse River waterdog because we did not find any unoccupied areas that were essential for the conservation of the species. The protection of the nine currently occupied management units across the physiographic representation of the range would sufficiently reduce the risk of extinction, by improving the resiliency of populations in these currently occupied streams to increase viability to the point that the protections of the Act are no longer necessary.

We are proposing three currently unoccupied units for the Carolina madtom that we determined to be essential for the conservation of the species. Carolina madtoms have been completely extirpated from the Trent River basin, four of the five Neuse River units, and two of the five Tar River basin management units. There is currently only one occupied management unit currently remaining in the Neuse River basin, and that population was found to be in “very low” condition in our resiliency analysis. Having at least three resilient populations in both the Tar and Neuse River basins and at least one population in the Trent River basin is essential for the conservation of the Carolina

madtom. Accordingly, we propose to designate one unoccupied unit in the Trent River basin and two in the Neuse River basin. Because there are already three populations in the Tar River basin, we do not consider an unoccupied unit in this basin to be essential for the species' conservation.

General Information on the Maps of the Proposed Critical Habitat Designation

The proposed critical habitat designation is defined by the map or maps, as modified by any accompanying regulatory text, presented at the end of this document under **Proposed Regulation Promulgation**. We include more detailed information on the boundaries of the proposed critical habitat designation in the discussion of individual units below. We will make the coordinates or plot points or both on which each map is based available to the public on <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092, and at the field office responsible for the designation (see **FOR FURTHER INFORMATION CONTACT**, above).

When determining proposed critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features necessary for Neuse River waterdog or Carolina madtom. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this proposed rule have been excluded by text in the proposed rule and are not proposed for designation as critical habitat. Therefore, if the critical habitat is finalized as proposed, a Federal action involving these lands would not trigger section 7 consultation under the Act with respect to critical habitat and the

requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat.

Proposed Critical Habitat Designation

Neuse River Waterdog

We are proposing to designate approximately 738 river mi (1,188 river km) in 16 units in North Carolina as critical habitat for the Neuse River waterdog. All of the units are currently occupied by the species and contain some or all of the physical and biological features essential to the conservation of the species. All units may require special management considerations or protection to address habitat degradation resulting from the cumulative impacts of land use change and associated watershed-level effects on water quality, water quantity, habitat connectivity, and instream habitat suitability. These stressors are primarily related to habitat changes: the buildup of fine sediments, the loss of flowing water, instream habitat fragmentation, and impairment of water quality; these are all exacerbated by climate change. Table 5 shows the name, land ownership of the riparian areas surrounding the units, and approximate river miles of the proposed designated units for the Neuse River waterdog. Because all streambeds are navigable waters, the actual critical habitat units are all owned by the State of North Carolina.

Table 5. Proposed critical habitat units for the Neuse River waterdog.

Critical Habitat Unit	Riparian Ownership	River Miles (Kilometers)
Unit 1. TAR1–Upper Tar River	Private; Easements	8.6 (13.8)
Unit 2. TAR2–Upper Fishing Creek	Private; Easements	10.5 (16.9)
Unit 3. TAR3a–Fishing Creek Subbasin	Private; Easements; State	62.8 (101)

Unit 4. TAR3b–Sandy/Swift Creek	Private; Easements; State	68.3 (110)
Unit 5. TAR3c–Middle Tar River Subbasin	Private; Easements; State	100 (161)
Unit 6. TAR3d–Lower Tar River Subbasin	Private; Easements; State	60.6 (97.5)
Unit 7. NR1–Eno River	Private; Easements; State	41.5 (66.8)
Unit 8. NR2–Flat River	Private; Easements	17.4 (28)
Unit 9. NR3–Middle Creek	Private; Easements; Local	7.6 (12.2)
Unit 10. NR4–Swift Creek	Private	23.4 (37.7)
Unit 11. NR5a–Little River	Private; Easements	89.6 (144)
Unit 12. NR5b–Mill Creek	Private; Easements	19 (30.6)
Unit 13. NR5c–Middle Neuse River	Private; State; Easements	40 (64.4)
Unit 14. NR6–Contentnea Creek/Lower Neuse River Subbasin	Private; Easements	117 (188.3)
Unit 15. NR7–Swift Creek (Lower Neuse)	Private; Easements	10 (16)
Unit 16. TR1–Trent River	Private	62 (100)
Total		738 (1,188)

Note: Area sizes may not sum due to rounding.

Tar Population

Unit 1: TAR1–Upper Tar River

Unit 1 consists of 8.6 river mi (13.8 river km) of the Upper Tar River in Granville County from approximately SR1004 (Old NC 75) downstream to NC 96. The riparian land adjacent to this unit is primarily privately owned (86%), with several conservation parcels or easements (14%).

Unit 2: TAR2–Upper Fishing Creek

Unit 2 consists of 10.5 river mi (16.9 river km) of Upper Fishing Creek in Warren County. This unit extends from SR1118 (No Bottom Drive) downstream to NC58. The riparian land adjacent to the unit is primarily privately owned (94%) with several conservation parcels or easements (6%).

Unit 3: TAR3a–Fishing Creek Subbasin

Unit 3 consists of approximately 63 river mi (101 river km) of lower Little Fishing Creek approximately 1.6 miles (2.6 km) upstream of SR1214 (Silvertown Rd) downstream to the confluence with Fishing Creek, and including the mainstem of Fishing Creek to the confluence with the Tar River in Halifax, Nash, and Edgecombe Counties. The riparian land adjacent to the unit includes private land (91%), several conservation parcels (6%), and State Game Lands (3%).

Unit 4: TAR3b–Sandy/Swift Creek

Unit 4 consists of an approximately 68-river-mi (110-river-km) segment of Sandy Creek downstream of SR 1451 (Leonard Road) to the confluence with the Tar River, including Red Bud Creek downstream of the Franklin/Nash county line to the confluence with Swift Creek. This unit is located in Franklin, Nash, and Edgecombe Counties. The riparian land adjacent to this unit includes private lands (97%), conservation parcels (1%), and State Game Lands (2%).

Unit 5: TAR3c–Middle Tar River Subbasin

Unit 5 consists of an approximately 100-river-mi (161-river-km) segment of the Middle Tar River from the confluence with Cedar Creek downstream to the confluence with Fishing Creek, including Stony Creek below SR1300 (Boddies' Millpond Rd), downstream to the confluence with the Tar River. This unit is located in Franklin, Nash, and Edgecombe Counties. The riparian land adjacent to this unit is nearly all private lands (99%), with less than 1% conservation parcels, local parks, and a research station.

Unit 6: TAR3d–Lower Tar River Subbasin

Unit 6 consists of approximately 60 river mi (96.6 river km) in the Lower Tar River Subbasin from the confluence with Fishing Creek downstream to the confluence with Barber Creek near SR1533 (Port Terminal Road). This includes portions of Town Creek below NC111 to the confluence with the Tar River, Otter Creek below SR1251 to the confluence with the Tar River, and Tyson Creek below SR1258 to the confluence with the Tar River. This unit is located in Edgecombe and Pitt Counties. The riparian land adjacent to this unit consists of private land (97%), conservation parcels (2.5%), and State Game Lands (0.5%).

Neuse Population

Unit 7: NR1–Eno River

Unit 7 consists of approximately 41.5 river mi (66.8 river km) of the Eno River from NC86 downstream to the inundated portion of Falls Lake in Orange and Durham Counties. The riparian land adjacent to this unit includes private lands (61%), State Park Lands (25%), local government conservation parcels (12%), and State Game Lands (2%).

Unit 8: NR2–Flat River

Unit 8 is a 17.4-river-mi (28-river-km) segment of the Flat River from SR1739 (Harris Mill Road) downstream to the inundated portion of Falls Lake, located in Person and Durham Counties. The riparian land adjacent to this unit consists of some private land (49%) and extensive conservation parcels (51%), including demonstration forest, recreation areas, and State Game Lands.

Unit 9: NR3–Middle Creek

Unit 9 is a 7.6-river-mi (12.2-river-km) stretch of Middle Creek from Southeast Regional Park downstream to the Interstate 40 crossing, located in Wake and Johnston

Counties. The riparian land adjacent to this unit is predominantly privately owned (92%) with a few conservation parcels (8%).

Unit 10: NR4–Swift Creek (Middle Neuse)

Unit 10 is a 23.35-river-mi (37.6-river-km) stretch of Swift Creek from NC42 downstream to the confluence with the Neuse River, located in Johnston County. The riparian land adjacent to this unit is entirely privately owned.

Unit 11: NR5a–Little River

Unit 11 is an 89.6-river-mi (144.2-river-km) segment of the Little River from near NC96 downstream to the confluence with the Neuse River, including Buffalo Creek from NC39 to the confluence with Little River, located in Franklin, Wake, Johnston, and Wayne Counties. The riparian land adjacent to this unit is predominantly privately owned (90%) with some (10%) local municipal conservation parcels (Little River Reservoir).

Unit 12: NR5b–Mill Creek

Unit 12 is an 18.7-river-mi (30-river-km) segment of Mill Creek from upstream of US701 downstream to the confluence with the Neuse River located in Johnston and Wayne Counties. The riparian land adjacent to this unit is predominantly privately owned (95%) with some conservation parcels (5%).

Unit 13: NR5c–Middle Neuse River

Unit 13 is a 39.8-river-mi (64-river-km) segment of the Middle Neuse River from the confluence with Mill Creek downstream to the Wayne/Lenoir County line, located in Wayne County. The riparian land adjacent to this unit includes privately owned land (92%), conservation parcels (0.95%), State Park land (7%), and the Seymour Johnson Air

Force Base (0.05%). The 2 miles of river segment located on the land owned by the Air Force Base is exempt from critical habitat under section 4(a)(3) of the Act (see *Exemptions*, below).

Unit 14: NR6–Contentnea Creek/Lower Neuse River Subbasin

Unit 14 is an approximately 117-river-mi (188.3-river-km) reach, including Contentnea Creek from NC581 downstream to its confluence with the Neuse River, Nahunta Swamp from the Wayne/Greene County line to the confluence with Contentnea Creek, and the Neuse River from the confluence with Contentnea Creek to the confluence with Pinetree Creek, located in Greene, Wilson, Wayne, Lenoir, Pitt, and Craven Counties. The riparian land adjacent to this unit is nearly all privately owned land (99%), with <1% conservation parcels.

Unit 15: NR7–Swift Creek

Unit 15 is a 10.13-river-mi (16.3-river-km) reach of Swift Creek from SR1931 (Beaver Camp Rd) downstream to SR1440 (Streets Ferry Rd) located in Craven County. The riparian land adjacent to this unit is nearly all privately owned (99%) with some conservation parcels (1%).

Trent Population

Unit 16: TR1–Trent River

Unit 16 is a 62-river-mi (100-river-km) reach that includes Beaver Creek from SR1316 (McDaniel Fork Rd) to the confluence with the Trent River, and Trent River from the confluence with Poplar Branch downstream to SR1121 (Oak Grove Rd) crossing at the Marine Corps Cherry Point property, in Jones County. The riparian land adjacent to this unit is entirely privately owned.

Carolina Madtom

We are proposing to designate approximately 257 river miles (414 river kilometers) in 7 units in North Carolina as critical habitat for the Carolina madtom. Four of the units are currently occupied by the species and contain some or all of the physical and biological features essential to the conservation of the species. Three of the units are unoccupied but are essential to the conservation of the species. All units proposed may require special management considerations or protection to address habitat degradation resulting from the cumulative impacts of land use change and associated watershed-level effects on water quality, water quantity, habitat connectivity, and instream habitat suitability. These stressors are primarily related to habitat changes: the buildup of fine sediments, the loss of flowing water, instream habitat fragmentation, and impairment of water quality; these are all exacerbated by climate change. Table 6 shows the name, land ownership of the riparian areas surrounding the units, and approximate river miles of the proposed designated units for the Carolina madtom. Because all streambeds are navigable waters, the actual critical habitat units are all owned by the State of North Carolina.

Table 6. Proposed critical habitat units for the Carolina madtom.

Critical Habitat Unit	Occupied at the Time of Listing	Riparian Ownership	Length of Unit in River Miles (Kilometers)
Unit 1. TAR1–Upper Tar River	Yes	Private	26 (42)
Unit 2. TAR2–Sandy/Swift Creek	Yes	Private; Easements	66 (106)
Unit 3. TAR3–Fishing	Yes	Private;	86 (138)

Creek Subbasin		Easements; State	
Unit 4. NR1–Upper Neuse River Subbasin (Eno River)	No	Easements; State; Private	20 (32)
Unit 5. NR2–Little River	Yes	Private; Easements	28 (45)
Unit 6. NR3–Contentnea Creek	No	Private	15 (24)
Unit 7. TR1–Trent River	No	Private	15 (24)
Total			257 (414)

Note: Area sizes may not sum due to rounding.

Tar Population

Unit 1: TAR1–Upper Tar River

Unit 1 consists of 26 river mi (42 river km) of the Upper Tar River, from the confluence with Sand Creek to the confluence with Sycamore Creek, in Granville, Vance, and Franklin Counties. Unit 1 is occupied by the species and contains all of the physical and biological features essential to the conservation of the species. The riparian land adjacent to the river is entirely privately owned.

Unit 2: TAR2–Sandy/Swift Creek

Unit 2 consists of 66 river mi (106 river km) of Sandy and Swift Creeks, located downstream from NC561 to the confluence with the Tar River, in Edgecombe, Vance, Warren, Halifax, Franklin, and Nash Counties. This unit is occupied and contains all of the physical and biological features necessary for the conservation of the species. The riparian land adjacent to this unit is predominantly privately owned (96%), with conservation parcels (2%) and State Game Lands (2%).

Unit 3: TAR3–Fishing Creek Subbasin

Unit 3 consists of approximately 86 river mi (138 river km), including Fishing Creek from the confluence with Hogpen Branch to the confluence with the Tar River, and

Little Fishing Creek from Medoc Mountain Road (SR1002) to the confluence with Fishing Creek, located in Edgecombe, Warren, Halifax, Franklin, and Nash Counties. This unit is occupied by the species and contains all of the physical and biological features necessary for the conservation of the species. The riparian land adjacent to the unit is divided between privately owned parcels (89%), State Game Lands and State Park land (5%), and conservation parcels (6%).

Neuse River Population

Unit 4: NR1–Upper Neuse River Subbasin (Eno River)

Unit 4 consists of approximately 20 river mi (32 river km) of the Upper Neuse River extending from Eno River State Park downstream of NC70 to the confluence with Cabin Creek near Falls Lake impoundment, located in Orange and Durham Counties. This unit is not occupied by the species. There is one historical record of Carolina madtoms in this unit from 1961, but followup surveys in 2011 were not able to find any individuals. Although it is unoccupied, it does contain all of the physical and biological features necessary for the conservation of the species. This unit is itself essential for the conservation of the species because it will provide for population expansion and resiliency in portions of known historical habitat that is necessary to increase the resiliency, redundancy, and representation to increase viability of the species. Riparian land adjacent to the unit is almost entirely (95%) within State Park Lands, local government conservation parcels, and State Game Lands.

Unit 5: NR2–Little River

Unit 5 consists of 28 river mi (45 river km) of the Upper and Lower Little River from NC42 to Johnston/Wayne County line, located in Johnston County. This unit is

occupied and contains all of the physical and biological features necessary for the conservation of the species. The riparian land adjacent to the unit is predominantly privately owned (99%) with some (1%) State Conservation ownership.

Unit 6: NR3–Contentnea Creek

Unit 6 consists of approximately 15 river mi (24 river km) of Contentnea Creek from Buckhorn Reservoir to Wiggins Mill Reservoir, located in Wilson County. This unit is not occupied by the species. The last known documentation of the species was in 2007. Although it is unoccupied, it does contain all of the physical and biological features necessary for the conservation of the species. This unit itself is essential for the conservation of the species because it will provide for population expansion and resiliency in portions of known historical habitat that is necessary to increase the resiliency, redundancy, and representation to increase viability of the species. The riparian land adjacent to this unit is entirely privately owned.

Trent Population

Unit 7: TR1–Trent River

Unit 7 consists of approximately 15 river mi (24 river km) of the Trent River between the confluence with Cypress Creek and Beaver Creek, in Jones County. This unit is unoccupied by the species. The last known documentation of the species here was in 1986. Although it is unoccupied, it does contain all of the physical and biological features necessary for the conservation of the species. This unit itself is essential for the conservation of the species because it will provide for population expansion and resiliency in portions of known historical habitat that is necessary to increase the

resiliency, redundancy, and representation to increase viability of the species. All of the riparian land adjacent to this unit is privately owned.

Exemptions

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

The Sikes Act Improvement Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete an integrated natural resources management plan (INRMP) by November 17, 2001. An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the base. Each INRMP includes:

- (1) An assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species;
- (2) A statement of goals and priorities;
- (3) A detailed description of management actions to be implemented to provide for these ecological needs; and
- (4) A monitoring and adaptive management plan.

Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108-136) amended the Act to limit areas eligible for designation as critical habitat. Specifically,

section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) provides that: “The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 670a of this title [the Sikes Act; 16 U.S.C. 670a], if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.”

We consult with the military on the development and implementation of INRMPs for installations with listed species. We analyze INRMPs developed by military installations located within the range of proposed critical habitat designations to determine if they meet the criteria for exemption from critical habitat under section 4(a)(3) of the Act.

We have identified one area within the proposed critical habitat designation that consists of Department of Defense lands with a completed, Service-approved INRMP. The Seymour Johnson Air Force Base (SJAFB) is located in Goldsboro, North Carolina, on 3,220 acres. SJAFB is federally owned land that is managed by the Air Force and is subject to all Federal laws and regulations. The SJAFB INRMP covers fiscal years 2015–2020, and serves as the principal management plan governing all natural resource activities on the installation. Among the goals and objectives listed in the INRMP is prohibiting the introduction of exotic species, the preparation of a fish and wildlife management plan, the enforcement of game laws, the conservation of wildlife and migratory waterfowl, licenses and permits, regulating the use of chemical toxicants for controlling nuisance species, the protection of endangered and threatened species, and

allowing public access to military property. Management actions that benefit the Neuse River waterdog include: analyze the adequacy of existing stormwater facilities and BMPs; collect effluent data from each drainage basin within the context of an ecosystem goal for surface and ground water discharges from SJAFB to make it easier to evaluate the scientific, ecological, and economic value of current and proposed BMPs; collect seasonal and annual data concerning stormwater runoff and nonpoint source pollution to evaluate the contribution and water quality of stormwater runoff from SJAFB to the surrounding watersheds; address watershed protection and enhancement of water quality, and regulate the amounts of water used in future landscaping and grounds maintenance activities, including the use of herbicides, pesticides, and fertilizers; and the application of appropriate stormwater management practices.

Two miles (3.2 km) of Unit 13 (NR5c–Middle Neuse River) are located within the area covered by this INRMP. Based on the above considerations, and in accordance with section 4(a)(3)(B)(i) of the Act, we have determined that the identified streams are subject to the SJAFB INRMP and that conservation efforts identified in the INRMP will provide a benefit to the Neuse River waterdog. Therefore, streams within this installation are exempt from critical habitat designation under section 4(a)(3) of the Act. We are not including approximately 2 river mi (3.2 km) of habitat in this proposed critical habitat designation because of this exemption.

Consideration of Impacts Under Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that the Secretary shall designate and make revisions to critical habitat on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant

impact of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such area as critical habitat will result in the extinction of the species. In making that determination, the statute on its face, as well as the legislative history, are clear that the Secretary has broad discretion regarding which factor(s) to use and how much weight to give to any factor. As discussed below, we are not proposing to exclude any areas from critical habitat. However, the final decision on whether to exclude any areas will be based on the best scientific data available at the time of the final designation, including information obtained during the comment period and information about the economic impact of designation.

Consideration of Economic Impacts

Section 4(b)(2) of the Act and its implementing regulations require that we consider the economic impact that may result from a designation of critical habitat. To assess the probable economic impacts of a designation, we must first evaluate specific land uses or activities and projects that may occur in the area of the critical habitat. We then must evaluate whether a specific critical habitat designation may restrict or modify specific land uses or activities for the benefit of the species and its habitat within the areas proposed. We then identify which conservation efforts may be the result of the species being listed under the Act versus those attributed solely to the designation of critical habitat. The probable economic impact of a proposed critical habitat designation is analyzed by comparing scenarios both “with critical habitat” and “without critical

habitat.” The “without critical habitat” scenario represents the baseline for the analysis, which includes the existing regulatory and socioeconomic burden imposed on landowners, managers, or other resource users potentially affected by the designation of critical habitat (e.g., under the Federal listing as well as other Federal, State, and local regulations). The baseline, therefore, represents the costs of all efforts attributable to the listing of the species under the Act (i.e., conservation of the species and its habitat incurred regardless of whether critical habitat is designated). The “with critical habitat” scenario describes the incremental impacts associated specifically with the designation of critical habitat for the species. The incremental conservation efforts and associated impacts would not be expected without the designation of critical habitat for the species. In other words, the incremental costs are those attributable solely to the designation of critical habitat, above and beyond the baseline costs. These are the costs we use when evaluating the benefits of inclusion and exclusion of particular areas from the final designation of critical habitat should we choose to conduct a discretionary 4(b)(2) exclusion analysis.

For this proposed designation, we developed an incremental effects memorandum (IEM) for each species considering the probable incremental economic impacts that may result from this proposed designation of critical habitat. The information contained in our IEMs was then used to develop a screening analysis of the probable effects of the designation of critical habitat for both species (IEc, 2018, entire). The purpose of the screening analysis is to filter out the geographic areas in which the critical habitat designation is unlikely to result in probable incremental economic impacts. In particular, the screening analysis considers baseline costs (i.e., absent critical habitat designation)

and includes probable economic impacts where land and water use may be subject to conservation plans, land management plans, best management practices, or regulations that protect the habitat area as a result of the Federal listing status of the species. The screening analysis filters out particular areas of critical habitat that are already subject to such protections and are, therefore, unlikely to incur incremental economic impacts. Ultimately, the screening analysis allows us to focus our analysis on evaluating the specific areas or sectors that may incur probable incremental economic impacts as a result of the designation. This screening analysis, combined with the information contained in our IEM, constitutes our draft economic analysis (DEA) of the proposed critical habitat designations for the Carolina madtom and Neuse River waterdog, and is summarized in the narrative below.

Executive Orders (E.O.s) 12866 and 13563 direct Federal agencies to assess the costs and benefits of available regulatory alternatives in quantitative (to the extent feasible) and qualitative terms. Consistent with the E.O. regulatory analysis requirements, our effects analysis under the Act may take into consideration impacts to both directly and indirectly affected entities, where practicable and reasonable. If sufficient data are available, we assess to the extent practicable the probable impacts to both directly and indirectly affected entities. As part of our screening analysis, we considered the types of economic activities that are likely to occur within the areas likely affected by the proposed critical habitat designation. In our August 10, 2018, IEM, we first identified probable incremental economic impacts associated with each of the following categories of activities: (1) Federal lands management (National Park Service, U.S. Forest Service, Department of Defense); (2) agriculture; (3) forest

management/silviculture/timber; (4) development; (5) recreation; (6) restoration activities; and (7) transportation. Additionally, we considered whether the activities have any Federal involvement. Critical habitat designation generally will not affect activities that do not have any Federal involvement; under the Act, designation of critical habitat only affects activities conducted, funded, permitted, or authorized by Federal agencies. If we list the species as proposed in the listing portion of this document, under section 7 of the Act, Federal agencies would be required to consult with the Service on activities they fund, permit, or implement that may affect the species.

In our IEM, we attempted to clarify the distinction between the effects that would result from the species being listed and those attributable to the critical habitat designation (i.e., difference between the jeopardy and adverse modification standards) for the Carolina madtom and Neuse River waterdog. Because the designation of critical habitat is being proposed concurrently with the listing, it has been our experience that it is more difficult to discern which conservation efforts are attributable to the species being listed and those which would result solely from the designation of critical habitat. However, the following specific circumstances in this case help to inform our evaluation: (1) The essential physical or biological features identified for critical habitat are the same features essential for the life requisites of the species, and (2) any actions that would result in sufficient harm or harassment to constitute jeopardy to either species would also likely adversely affect the essential physical or biological features of critical habitat. The IEM outlines our rationale concerning this limited distinction between baseline conservation efforts and incremental impacts of the designation of critical habitat for the species. This evaluation of the incremental effects has been used as the basis to evaluate

the probable incremental economic impacts of this proposed designation of critical habitat.

The proposed critical habitat designation for the Neuse River waterdog totals approximately 738 river miles (1,188 river km), all of which are currently occupied by the species. In these areas, any actions that may affect the species or its habitat would likely also affect proposed critical habitat, and it is unlikely that any additional conservation efforts would be required to address the adverse modification standard over and above those recommended as necessary to avoid jeopardizing the continued existence of the species. Therefore, the only additional costs that are expected in all of the proposed critical habitat designation are administrative costs, due to the fact that this additional analysis will require time and resources by both the Federal action agency and the Service.

The proposed critical habitat designation for the Carolina madtom totals approximately 257 river miles (414 river km), most of which is currently occupied by the species, but with three unoccupied units. In the occupied areas, any actions that may affect the species or its habitat would likely also affect proposed critical habitat, and it is unlikely that any additional conservation efforts would be required to address the adverse modification standard over and above those recommended as necessary to avoid jeopardizing the continued existence of the species. Therefore, the only additional costs that are expected in the occupied proposed critical habitat designation are administrative costs, due to the fact that this additional analysis will require time and resources by both the Federal action agency and the Service. Three of the proposed Carolina madtom critical habitat units (NR1, NR3, and TR1) are unoccupied. Two of these units (NR1 and

NR3) overlap entirely with river miles proposed as critical habitat for Neuse River waterdog. The third unoccupied unit (TR1) overlaps partially with proposed Neuse River waterdog critical habitat, but includes approximately 7 river miles that do not overlap (representing approximately three percent of the Carolina madtom critical habitat). However, these river miles are located in a remote area where future section 7 consultations are not anticipated.

It is believed that, in most circumstances, these costs would not reach the threshold of “significant” under E.O. 12866. For the critical habitat designations for both species, we anticipate a maximum of 115 section 7 consultations annually at a total incremental cost of approximately \$270,000 per year.

As we stated earlier, we are soliciting data and comments from the public on the DEA, as well as all aspects of the proposed rule and our required determinations. See **ADDRESSES**, above, for information on where to send comments.

Exclusions

Exclusions Based on Economic Impacts

Under section 4(b)(2) of the Act, we consider the economic impacts of specifying any particular area as critical habitat. As discussed above, we prepared an analysis of the probable economic impacts of the proposed critical habitat designation and related factors. Based on the draft analysis, the Secretary does not propose to exercise his discretion to exclude any areas from the final designation based on economic impacts. However, during the development of a final designation, we will consider any additional economic impact information we receive during the public comment period, which may

result in areas being excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

Exclusions Based on National Security Impacts or Homeland Security Impacts

Under section 4(b)(2) of the Act, we consider whether there are lands owned or managed by the Department of Defense or Department of Homeland Security where a national security impact might exist. In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for both species are not owned or managed by the Department of Defense or Department of Homeland Security, and, therefore, we anticipate no impact on national security (but see **Exemptions**, above). Consequently, the Secretary does not propose to exercise his discretion to exclude any areas from the final designation based on impacts on national security.

Exclusions Based on Other Relevant Impacts

Under section 4(b)(2) of the Act, we consider any other relevant impacts, in addition to economic impacts and impacts on national security. We consider a number of factors, including whether there are permitted conservation plans covering the species in the area such as Habitat Conservation Plans (HCPs), safe harbor agreements, or candidate conservation agreements with assurances, or whether there are non-permitted conservation agreements and partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at the existence of Tribal conservation plans and partnerships and consider the government-to-government relationship of the United States with Tribal entities. We also consider any social impacts that might occur because of the designation.

In preparing this proposal, we have determined that there are currently no HCPs or other management plans for the Carolina madtom or Neuse River waterdog, and the proposed designation does not include any Tribal lands or trust resources. Accordingly, the Secretary does not propose to exercise his discretion to exclude any areas from the final designation based on other relevant impacts.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action that is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat.

We published a final regulation with a new definition of destruction or adverse modification on February 11, 2016 (81 FR 7214). Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not

limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features.

If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Examples of actions that are subject to the section 7 consultation process are actions on State, Tribal, local, or private lands that require a Federal permit or that involve some other Federal action. Federal agency actions within the species' habitat that may require conference or consultation or both include management and any other landscape-altering activities on Federal lands administered by the Army National Guard; issuance of section 404 Clean Water Act (33 U.S.C. 1251 et seq.) permits by the U.S. Army Corps of Engineers; and construction and maintenance of roads or highways by the Federal Highway Administration. Federal actions not affecting listed species or critical habitat, and actions on State, Tribal, local, or private lands that are not federally funded or authorized, do not require section 7 consultation.

As a result of section 7 consultation, we document compliance with the requirements of section 7(a)(2) through our issuance of:

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

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

When we issue a biological opinion concluding that a project is likely to jeopardize the continued existence of a listed species and/or destroy or adversely modify critical habitat, we provide reasonable and prudent alternatives to the project, if any are

identifiable, that would avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat. We define “reasonable and prudent alternatives” (at 50 CFR 402.02) as alternative actions identified during consultation that:

(1) Can be implemented in a manner consistent with the intended purpose of the action,

(2) Can be implemented consistent with the scope of the Federal agency’s legal authority and jurisdiction,

(3) Are economically and technologically feasible, and

(4) Would, in the Service Director’s opinion, avoid the likelihood of jeopardizing the continued existence of the listed species and/or avoid the likelihood of destroying or adversely modifying critical habitat.

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

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

Application of the “Adverse Modification” Standard

The key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species. Activities that may destroy or adversely modify critical habitat are those that result in a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of the Carolina madtom or Neuse River waterdog. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of the species or that preclude or significantly delay development of such features. As discussed above, the role of critical habitat is to support physical or biological features essential to the conservation of a listed species and provide for the conservation of the species.

Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal action that may destroy or adversely modify such habitat, or that may be affected by such designation. Activities that may affect critical habitat, when carried out, funded, or authorized by a Federal agency, should result in consultation for the Carolina madtom or Neuse River waterdog. These activities include, but are not limited to:

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

by decreasing or altering flows to levels that would adversely affect their ability to complete their life cycles.

(2) Actions that would significantly alter water chemistry or temperature. Such activities could include, but are not limited to, release of chemicals (including pharmaceuticals, metals, and salts), biological pollutants, or heated effluents into the surface water or connected groundwater at a point source or by dispersed release (non-point source). These activities could alter water conditions to levels that are beyond the tolerances of the species and result in direct or cumulative adverse effects to these individuals and their life cycles.

(3) Actions that would significantly increase sediment deposition within the stream channel. Such activities could include, but are not limited to, excessive sedimentation from livestock grazing, road construction, channel alteration, timber harvest, off-road vehicle use, and other watershed and floodplain disturbances. These activities could eliminate or reduce the habitat necessary for the growth and reproduction of both species by increasing the sediment deposition to levels that would adversely affect their ability to complete their life cycles.

(4) Actions that would significantly increase the filamentous algal community within the stream channel. Such activities could include, but are not limited to, release of nutrients into the surface water or connected groundwater at a point source or by dispersed release (non-point source). These activities can result in excessive filamentous algae filling streams and reducing habitat for both species, degrading water quality during their decay, and decreasing oxygen levels at night from their respiration to levels below the tolerances of the species.

(5) Actions that would significantly alter channel morphology or geometry. Such activities could include, but are not limited to, channelization, impoundment, road and bridge construction, mining, dredging, and destruction of riparian vegetation. These activities may lead to changes in water flows and levels that would degrade or eliminate the two species and/or their habitats. These actions can also lead to increased sedimentation and degradation in water quality to levels that are beyond the tolerances of the species.

(6) Actions that result in the introduction, spread, or augmentation of nonnative aquatic species in occupied stream segments, or in stream segments that are hydrologically connected to occupied stream segments, even if those segments are occasionally intermittent, or introduction of other species that compete with or prey on either species. Possible actions could include, but are not limited to, stocking of nonnative fishes, stocking of sport fish, or other related actions. These activities can introduce parasites or disease, and can result in direct predation, or affect the growth, reproduction, and survival, of both species.

Required Determinations

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

- (1) Be logically organized;
- (2) Use the active voice to address readers directly;

- (3) Use clear language rather than jargon;
- (4) Be divided into short sections and sentences; and
- (5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

Executive Order 13771

This proposed rule is not an Executive Order (E.O.) 13771 (“Reducing Regulation and Controlling Regulatory Costs”) (82 FR 9339, February 3, 2017) regulatory action because this rule is not significant under E.O. 12866.

Regulatory Planning and Review (Executive Orders 12866 and 13563)

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget will review all significant rules. OIRA has determined that this rule is not significant.

Executive Order 13563 reaffirms the principles of E.O. 12866 while calling for improvements in the nation's regulatory system to promote predictability, to reduce uncertainty, and to use the best, most innovative, and least burdensome tools for achieving regulatory ends. The executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. E.O. 13563 emphasizes further that regulations must be based on the best

available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this rule in a manner consistent with these requirements.

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

Under the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq.*), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA; 5 U.S.C. 801 *et seq.*), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the RFA to require Federal agencies to provide a certification statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

According to the Small Business Administration, small entities include small organizations such as independent nonprofit organizations; small governmental jurisdictions, including school boards and city and town governments that serve fewer than 50,000 residents; and small businesses (13 CFR 121.201). Small businesses include manufacturing and mining concerns with fewer than 500 employees, wholesale trade entities with fewer than 100 employees, retail and service businesses with less than \$5 million in annual sales, general and heavy construction businesses with less than \$27.5 million in annual business, special trade contractors doing less than \$11.5 million in

annual business, and agricultural businesses with annual sales less than \$750,000. To determine if potential economic impacts to these small entities are significant, we considered the types of activities that might trigger regulatory impacts under this designation as well as types of project modifications that may result. In general, the term “significant economic impact” is meant to apply to a typical small business firm’s business operations.

The Service’s current understanding of the requirements under the RFA, as amended, and following recent court decisions, is that Federal agencies are only required to evaluate the potential incremental impacts of rulemaking on those entities directly regulated by the rulemaking itself, and, therefore, are not required to evaluate the potential impacts to indirectly regulated entities. The regulatory mechanism through which critical habitat protections are realized is section 7 of the Act, which requires Federal agencies, in consultation with the Service, to ensure that any action authorized, funded, or carried out by the agency is not likely to destroy or adversely modify critical habitat. Therefore, under section 7, only Federal action agencies are directly subject to the specific regulatory requirement (avoiding destruction and adverse modification) imposed by critical habitat designation. Consequently, it is our position that only Federal action agencies would be directly regulated if we adopt the proposed critical habitat designation. There is no requirement under the RFA to evaluate the potential impacts to entities not directly regulated. Moreover, Federal agencies are not small entities. Therefore, because no small entities would be directly regulated by this rulemaking, the Service certifies that, if promulgated, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small entities.

In summary, we have considered whether the proposed designation would result in a significant economic impact on a substantial number of small entities. For the above reasons and based on currently available information, we certify that, if promulgated, the proposed critical habitat designation will not have a significant economic impact on a substantial number of small business entities. Therefore, an initial regulatory flexibility analysis is not required.

Energy Supply, Distribution, or Use—Executive Order 13211

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare Statements of Energy Effects when undertaking certain actions. In our economic analysis, we did not find that the designation of this proposed critical habitat will significantly affect energy supplies, distribution, or use. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

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

(1) This proposed rule would not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or tribal governments, or the private sector, and includes both “Federal intergovernmental mandates” and “Federal private sector mandates.” These terms are defined in 2 U.S.C. 658(5)–(7). “Federal intergovernmental mandate” includes a regulation that “would impose an enforceable duty upon State, local, or tribal governments” with two exceptions. It excludes “a condition of Federal

assistance.” It also excludes “a duty arising from participation in a voluntary Federal program,” unless the regulation “relates to a then-existing Federal program under which \$500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority,” if the provision would “increase the stringency of conditions of assistance” or “place caps upon, or otherwise decrease, the Federal Government’s responsibility to provide funding,” and the State, local, or tribal governments “lack authority” to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; Aid to Families with Dependent Children work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. “Federal private sector mandate” includes a regulation that “would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.”

The designation of critical habitat does not impose a legally binding duty on non-Federal Government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions do not destroy or adversely modify critical habitat under section 7. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary

Federal aid program, the Unfunded Mandates Reform Act would not apply, nor would critical habitat shift the costs of the large entitlement programs listed above onto State governments.

(2) We do not believe that this proposed rule would significantly or uniquely affect small governments because the lands being proposed for critical habitat designation are owned by the State of North Carolina. These government entities do not fit the definition of “small governmental jurisdiction.” Therefore, a Small Government Agency Plan is not required.

Takings—Executive Order 12630

In accordance with E.O. 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we have analyzed the potential takings implications of designating critical habitat for Neuse River waterdog and Carolina madtom in takings implications assessments. The Act does not authorize the Service to regulate private actions on private lands or confiscate private property as a result of critical habitat designation. Designation of critical habitat does not affect land ownership, or establish any closures or restrictions on use of or access to the designated areas. Furthermore, the designation of critical habitat does not affect landowner actions that do not require Federal funding or permits, nor does it preclude development of habitat conservation programs or issuance of incidental take permits to permit actions that do require Federal funding or permits to go forward. However, Federal agencies are prohibited from carrying out, funding, or authorizing actions that would destroy or adversely modify critical habitat. A takings implications assessment has been completed for both species and concludes that, if adopted, this designation of critical habitat for

Neuse River waterdog and Carolina madtom does not pose significant takings implications for lands within or affected by the designation.

Federalism—Executive Order 13132

In accordance with E.O. 13132 (Federalism), this proposed rule does not have significant Federalism effects. A federalism summary impact statement is not required. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of this proposed critical habitat designation with, appropriate State resource agencies. From a federalism perspective, the designation of critical habitat directly affects only the responsibilities of Federal agencies. The Act imposes no other duties with respect to critical habitat, either for States and local governments, or for anyone else. As a result, the proposed rule does not have substantial direct effects either on the States, or on the relationship between the national government and the States, or on the distribution of powers and responsibilities among the various levels of government. The proposed designation may have some benefit to these governments because the areas that contain the features essential to the conservation of the species are more clearly defined, and the physical or biological features of the habitat necessary to the conservation of the species are specifically identified. This information does not alter where and what federally sponsored activities may occur. However, it may assist State and local governments in long-range planning because they no longer have to wait for case-by-case section 7 consultations to occur.

Where State and local governments require approval or authorization from a Federal agency for actions that may affect critical habitat, consultation under section 7(a)(2) of the Act would be required. While non-Federal entities that receive Federal

funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency.

Civil Justice Reform—Executive Order 12988

In accordance with Executive Order 12988 (Civil Justice Reform), the Office of the Solicitor has determined that the rule does not unduly burden the judicial system and that it meets the requirements of sections 3(a) and 3(b)(2) of the Order. We have proposed designating critical habitat in accordance with the provisions of the Act. To assist the public in understanding the habitat needs of the species, this proposed rule identifies the elements of physical or biological features essential to the conservation of the species. The proposed areas of designated critical habitat are presented on maps, and the proposed rule provides several options for the interested public to obtain more detailed location information, if desired.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain information collection requirements, and a submission to the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.) is not required. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act

(NEPA), need not be prepared in connection with listing a species as an endangered or threatened species under the Act. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244).

It is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses pursuant to NEPA in connection with designating critical habitat under the Act. This determination is discussed in the October 1983 *Federal Register* document just mentioned. This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County v. Babbitt*, 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)).

Government-to-Government Relationship with Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes. As we have already discussed, there are no tribal lands in the proposed critical habitat designation, or that will be otherwise affected by the proposed listing.

References Cited

A complete list of references cited in the SSA Report is available on the Internet at <http://www.regulations.gov> and upon request from the Raleigh Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this proposed rule are the staff members of the Fish and Wildlife Service's Species Assessment Team and the Raleigh Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

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

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

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

AUTHORITY: 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

2. Amend § 17.11(h) by adding entries for “Waterdog, Neuse River” in alphabetical order under AMPHIBIANS and “Madtom, Carolina” in alphabetical order under FISHES to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* * * * *				
AMPHIBIANS				
* * * * *				
Waterdog, Neuse River	<i>Necturus lewisi</i>	Wherever found	T	[<i>Federal Register</i> citation when published as a final rule] 50 CFR 17.43(f) ^{4d} 50 CFR 17.95(d) ^{CH}
* * * * *				
FISHES				
* * * * *				
Madtom, Carolina	<i>Noturus furiosus</i>	Wherever found	E	[<i>Federal Register</i> citation when published as a final rule] 50 CFR 17.95(e) ^{CH}
* * * * *				

3. Amend § 17.43 by adding paragraph (f) to read as follows:

§17.43 Special rules—amphibians.

* * * * *

(f) Neuse River waterdog (*Necturus lewisi*).

(1) *Prohibitions.* Except as noted in paragraph (a)(2) of this section, all prohibitions and provisions of §§ 17.31 and 17.32 apply to the Neuse River waterdog.

(2) *Exceptions from prohibitions.* Incidental take of the Neuse River waterdog will not be considered a violation of the Act if the take results from any of the following activities:

(i) Species restoration efforts by State wildlife agencies, including collection of broodstock, tissue collection for genetic analysis, captive propagation, and subsequent stocking into currently occupied and unoccupied areas within the historical range of the species.

(ii) Channel restoration projects that create natural, physically stable, ecologically functioning streams (or stream and wetland systems) that are reconnected with their groundwater aquifers. These projects can be accomplished using a variety of methods, but the desired outcome is a natural channel with low shear stress (force of water moving against the channel); bank heights that enable reconnection to the floodplain; a reconnection of surface and groundwater systems, resulting in perennial flows in the channel; riffles and pools composed of existing soil, rock, and wood instead of large imported materials; low compaction of soils within adjacent riparian areas; and inclusion of riparian wetlands. Second- to third-order, headwater streams reconstructed in this way would offer suitable habitats for the Neuse River waterdog and contain stable channel features, such as pools, glides, runs, and riffles, which could be used by the species for spawning, rearing, growth, feeding, migration, and other normal behaviors.

(iii) Bank stabilization projects that use bioengineering methods to replace pre-existing, bare, eroding stream banks with vegetated, stable stream banks, thereby reducing bank erosion and instream sedimentation and improving habitat conditions for the species. Following these bioengineering methods, stream banks may be stabilized using live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), live fascines (live branch cuttings, usually willows, bound together into long, cigar-shaped bundles), or brush layering (cuttings or

branches of easily rooted tree species layered between successive lifts of soil fill). These methods would not include the sole use of quarried rock (rip-rap) or the use of rock baskets or gabion structures.

(iv) Silviculture practices and forest management activities that:

(A) Implement highest standard best management practices, particularly for Streamside Management Zones, stream crossings, and forest roads; and

(B) Comply with forest practice guidelines related to water quality standards, or comply with Sustainable Forestry Initiative/Forest Stewardship Council/American Tree Farm System certification standards for both forest management and responsible fiber sourcing.

4. Amend § 17.95 by:

a. Adding to paragraph (d) an entry for “Neuse River waterdog (*Necturus lewisi*)” in the same alphabetical order as the species appears in the table in § 17.11(h), to read as set forth below; and

b. Adding to paragraph (e) an entry for “Carolina madtom (*Noturus furiosus*)” in the same alphabetical order as the species appears in the table in §17.11(h), to read as set forth below:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(d) *Amphibians.*

* * * * *

NEUSE RIVER WATERDOG (*NECTURUS LEWISI*)

(1) Critical habitat units are depicted for Craven, Durham, Edgecombe, Franklin, Granville, Greene, Halifax, Johnston, Jones, Lenoir, Nash, Orange, Person, Pitt, Wake, Warren, Wayne, and Wilson Counties, North Carolina, on the maps below.

(2) Within these areas, the physical or biological features essential to the conservation of Neuse River waterdog consist of the following components:

(i) Suitable substrates and connected instream habitats, characterized by geomorphically stable stream channels and banks (i.e., channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of native aquatic fauna (such as, stable riffle-run-pool habitats that provide flow refuges consisting of silt-free gravel, small cobble, coarse sand, and leaf litter substrates) as well as abundant cover and burrows used for nesting.

(ii) Adequate flows, or a hydrologic flow regime (which includes the severity, frequency, duration, and seasonality of discharge over time), necessary to maintain instream habitats where the species is found and to maintain connectivity of streams with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the waterdog's habitat, food availability, and ample oxygenated flow for spawning and nesting habitat.

(iii) Water quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.

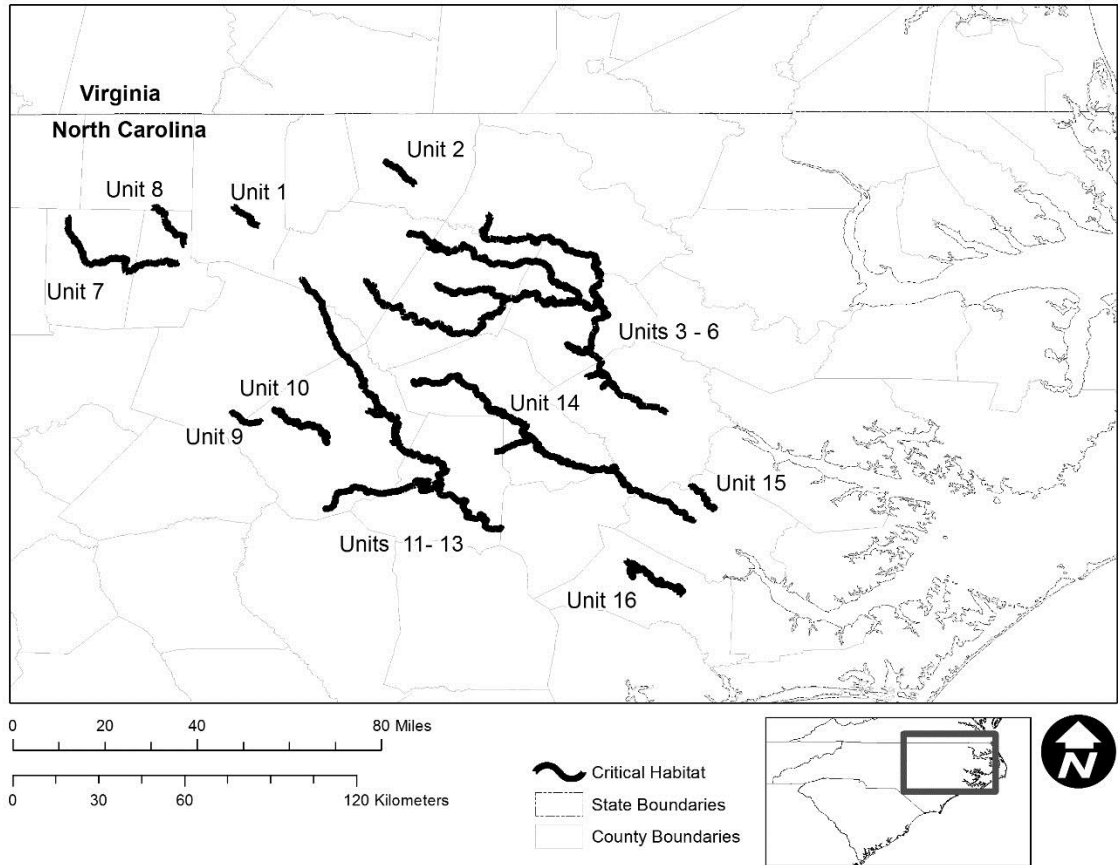
(iv) Invertebrate and fish prey items, which are typically hellgrammites, crayfish, mayflies, earthworms, snails, beetles, centipedes, slugs, and small fish.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on [EFFECTIVE DATE OF THE FINAL RULE].

(4) *Critical habitat map units.* Data layers defining map units were created by overlaying Natural Heritage Element Occurrence data and U.S. Geological Survey (USGS) hydrologic data for stream reaches. The hydrologic data used in the critical habitat maps were extracted from the USGS 1:1M scale nationwide hydrologic layer (https://nationalmap.gov/small_scale/mld/lnethyd.html) with a projection of EPSG:4269 - NAD83 Geographic. The North Carolina Natural Heritage program's species presence data were used to select specific stream segments for inclusion in the critical habitat layer. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which each map is based are available to the public at <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092 and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) *Note:* Index map follows:

Index Map of Critical Habitat Units for Neuse River Waterdog



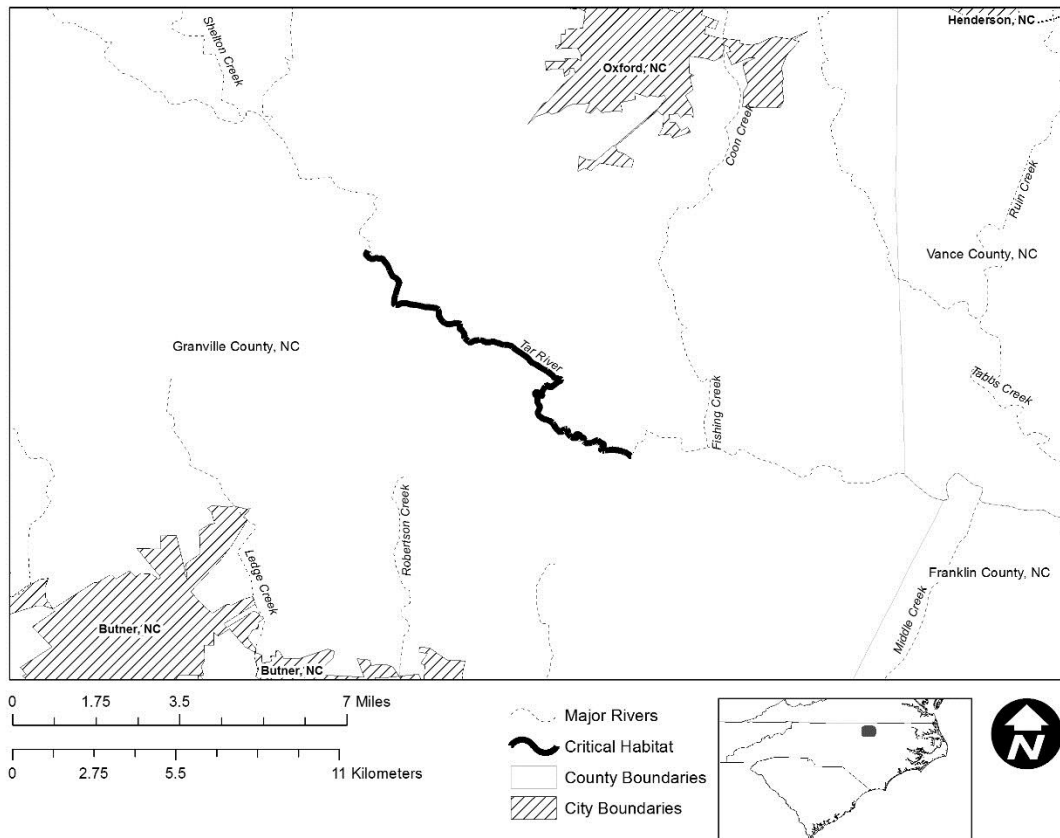
(6) Unit 1: TAR1–Upper Tar River, Granville County, North Carolina.

(i) This unit consists of 8.6 river miles (13.8 river kilometers) of occupied habitat in the Upper Tar River from approximately SR1004 (Old NC 75) downstream to NC 96.

Unit 1 includes stream habitat up to bank full height.

(ii) Map of Unit 1 follows:

Map of Unit 1 - Upper Tar River Critical Habitat Unit for Neuse River Waterdog

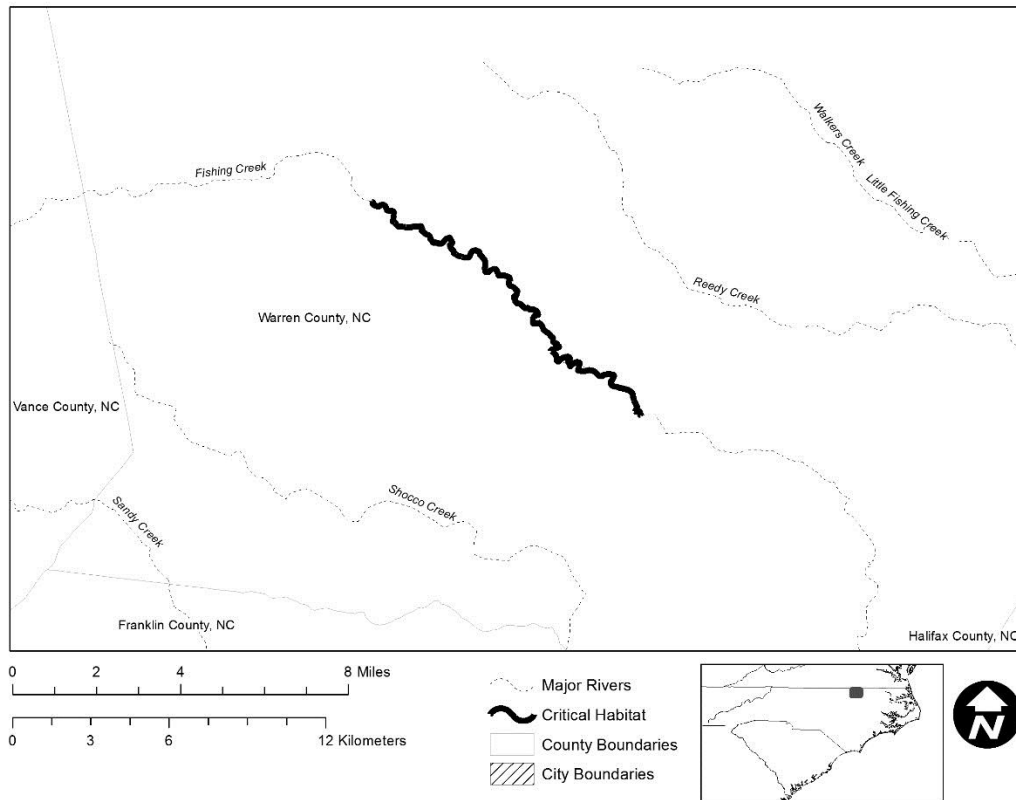


(7) Unit 2: TAR2–Upper Fishing Creek, Warren County, North Carolina.

(i) This unit consists of 10.5 river miles (16.9 river kilometers) of habitat in Upper Fishing Creek from SR1118 (No Bottom Drive) downstream to NC58. Unit 2 includes stream habitat up to bank full height.

(ii) Map of Unit 2 follows:

Map of Unit 2 - Upper Fishing Creek Critical Habitat Unit for Neuse River Waterdog



(8) Unit 3: TAR3a–Fishing Creek Subbasin, Edgecombe, Halifax, and Nash Counties, North Carolina; Unit 4: TAR3b–Sandy/Swift Creek, Edgecombe, Franklin, and Nash Counties, North Carolina; Unit 5: TAR3c–Middle Tar River Subbasin, Edgecombe, Franklin, and Nash Counties, North Carolina; and Unit 6: TAR3d–Lower Tar River Subbasin, Edgecombe and Pitt Counties, North Carolina. Units 3, 4, 5, and 6 include stream habitat up to bank full height.

(i) Unit 3 consists of 63 river miles (101 river kilometers) of habitat in lower Little Fishing Creek approximately 1.6 miles (2.6 km) upstream of SR1214 (Silvertown Rd) downstream to the confluence with Fishing Creek, and including the mainstem of Fishing Creek to the confluence with the Tar River.

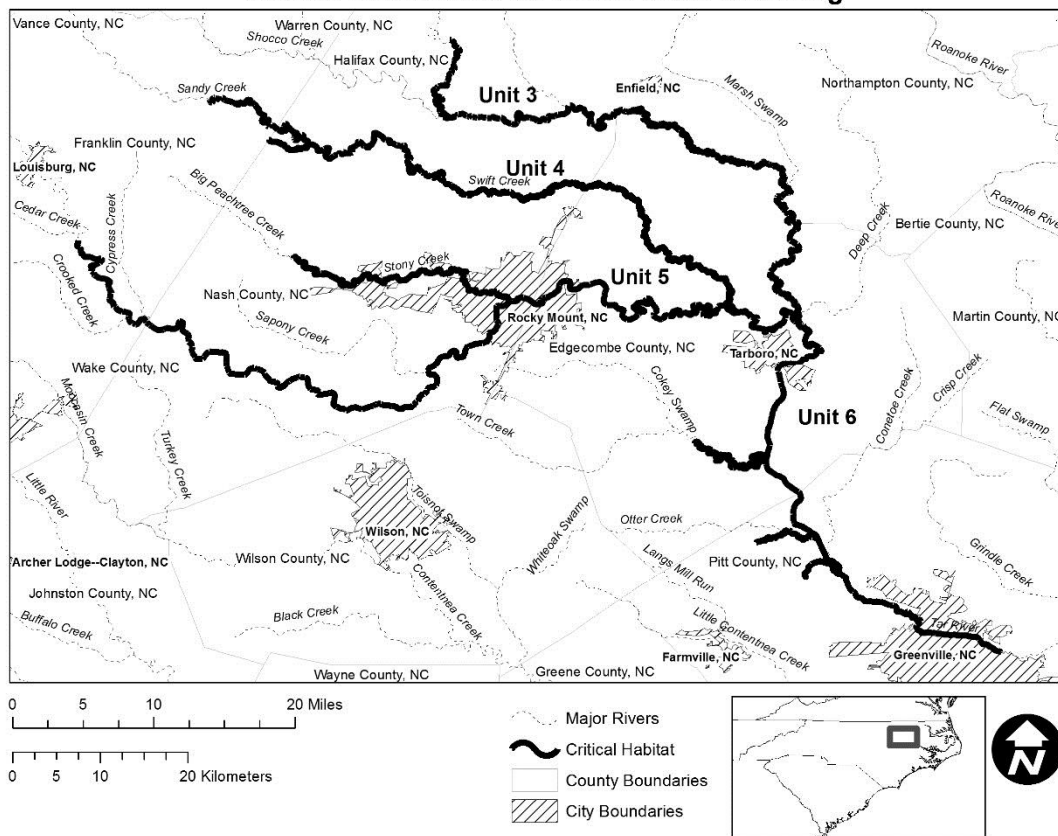
(ii) Unit 4 consists of 68 river miles (110 river kilometers) of habitat in Sandy Creek downstream of SR 1451 (Leonard Road) to the confluence with the Tar River, including Red Bud Creek downstream of the Franklin/Nash county line to the confluence with Swift Creek.

(iii) Unit 5 consists of approximately 100 river miles (161 river kilometers) of the Middle Tar River from the confluence with Cedar Creek downstream to the confluence with Fishing Creek, including Stony Creek below SR1300 (Boddies' Millpond Rd), downstream to the confluence with the Tar River.

(iv) Unit 6 consists of approximately 60 river miles (96.6 river kilometers) in the Lower Tar River Subbasin from the confluence with Fishing Creek downstream to the confluence with Barber Creek near SR1533 (Port Terminal Road). This unit includes portions of Town Creek below NC111 to the confluence with the Tar River, Otter Creek below SR1251 to the confluence with the Tar River, and Tyson Creek below SR1258 to the confluence with the Tar River.

(v) Map of Units 3, 4, 5, and 6 follows:

**Map of Units 3 - 6 - Middle/Lower Tar River Subbasin
Critical Habitat Unit for Neuse River Waterdog**

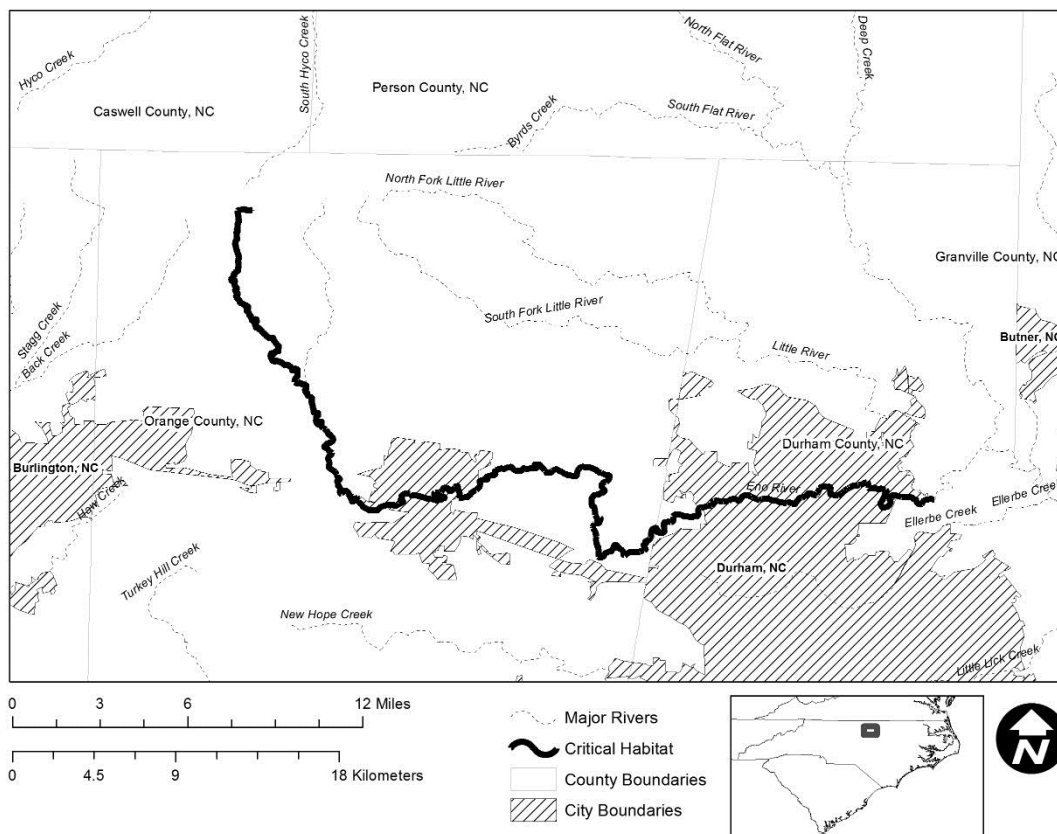


(9) Unit 7: NR1–Eno River, Durham and Orange Counties, North Carolina.

(i) This unit consists of approximately 41.5 river miles (66.8 river kilometers) of habitat in the Eno River from NC86 downstream to the inundated portion of Falls Lake. Unit 7 includes stream habitat up to bank full height.

(ii) Map of Unit 7 follows:

Map of Unit 7 - Eno River Critical Habitat Unit for Neuse River Waterdog

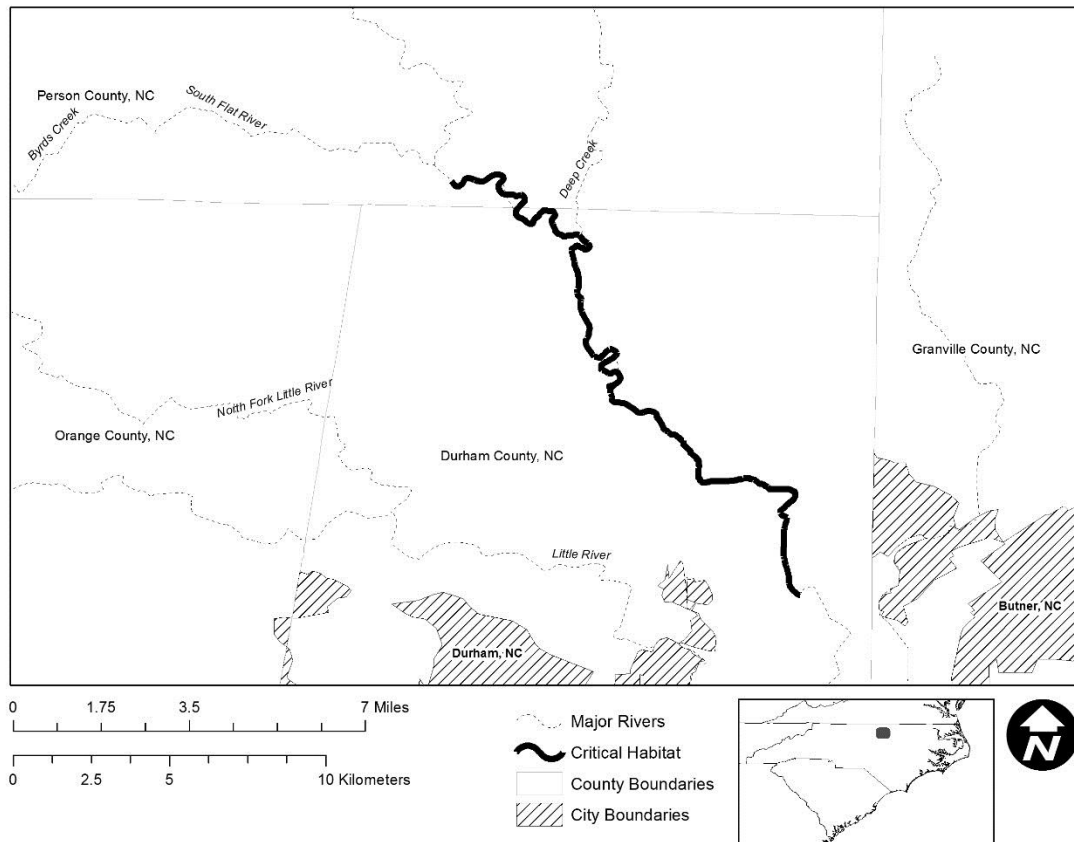


(10) Unit 8: NR2–Flat River, Durham and Person Counties, North Carolina.

(i) This unit consists of 17.4 river miles (28 river kilometers) of habitat in the Flat River from SR1739 (Harris Mill Road) downstream to the inundated portion of Falls Lake. Unit 8 includes stream habitat up to bank full height.

(ii) Map of Unit 8 follows:

Map of Unit 8 - Flat River Critical Habitat Unit for Neuse River Waterdog

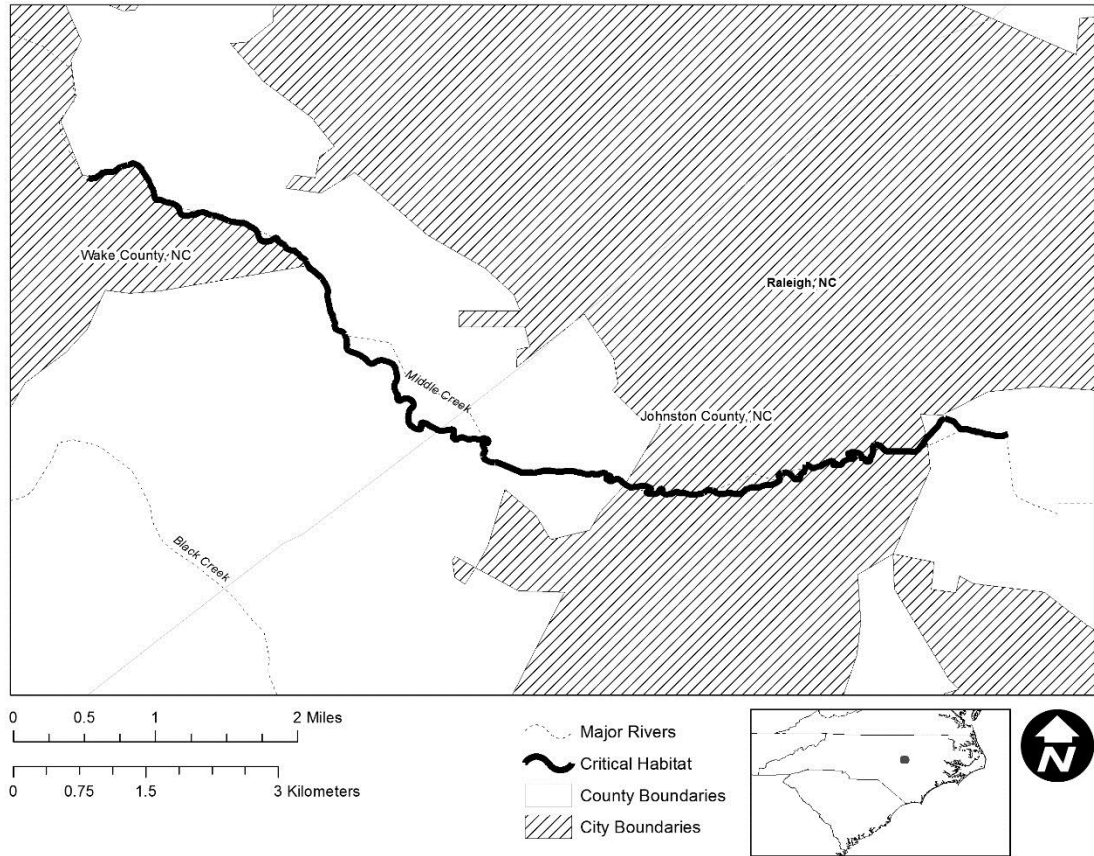


(11) Unit 9: NR3–Middle Creek, Johnston and Wake Counties, North Carolina.

(i) This unit consists of 7.6 river miles (12.2 river kilometers) of habitat in the Middle Creek from Southeast Regional Park downstream to the Interstate 40 crossing. Unit 9 includes stream habitat up to bank full height.

(ii) Map of Unit 9 follows:

Map of Unit 9 - Middle Creek Critical Habitat Unit for Neuse River Waterdog



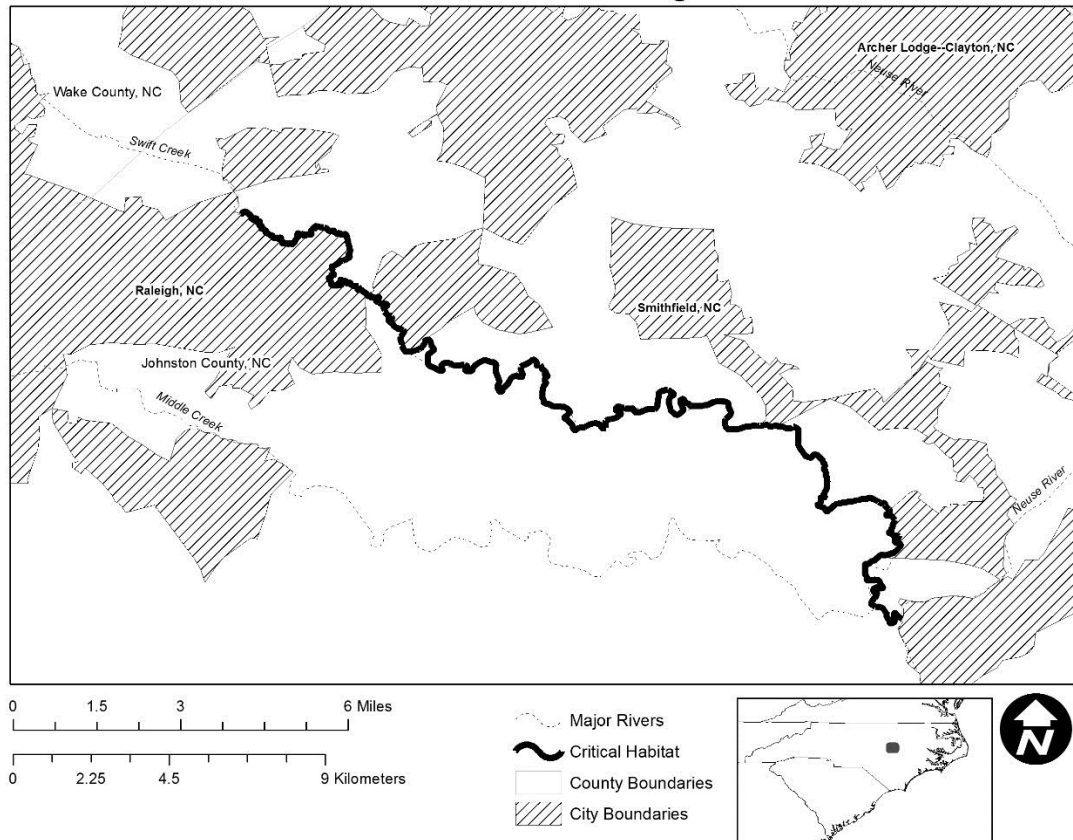
(12) Unit 10: NR4–Swift Creek, Johnston County, North Carolina.

(i) This unit consists of 23.4 river miles (37.6 river kilometers) of occupied habitat in Swift Creek from NC42 downstream to the confluence with the Neuse River.

Unit 10 includes stream habitat up to bank full height.

(ii) Map of Unit 10 follows:

Map of Unit 10 - Swift Creek (Middle Neuse) Critical Habitat Unit for Neuse River Waterdog



(13) Unit 11: NR5a–Little River, Franklin, Johnston, Wake, and Wayne Counties, North Carolina; Unit 12: NR5b–Mill Creek, Johnston and Wayne Counties, North Carolina; and Unit 13: NR5c–Middle Neuse River, Wayne County, North Carolina. Units 11, 12, and 13 include stream habitat up to bank full height.

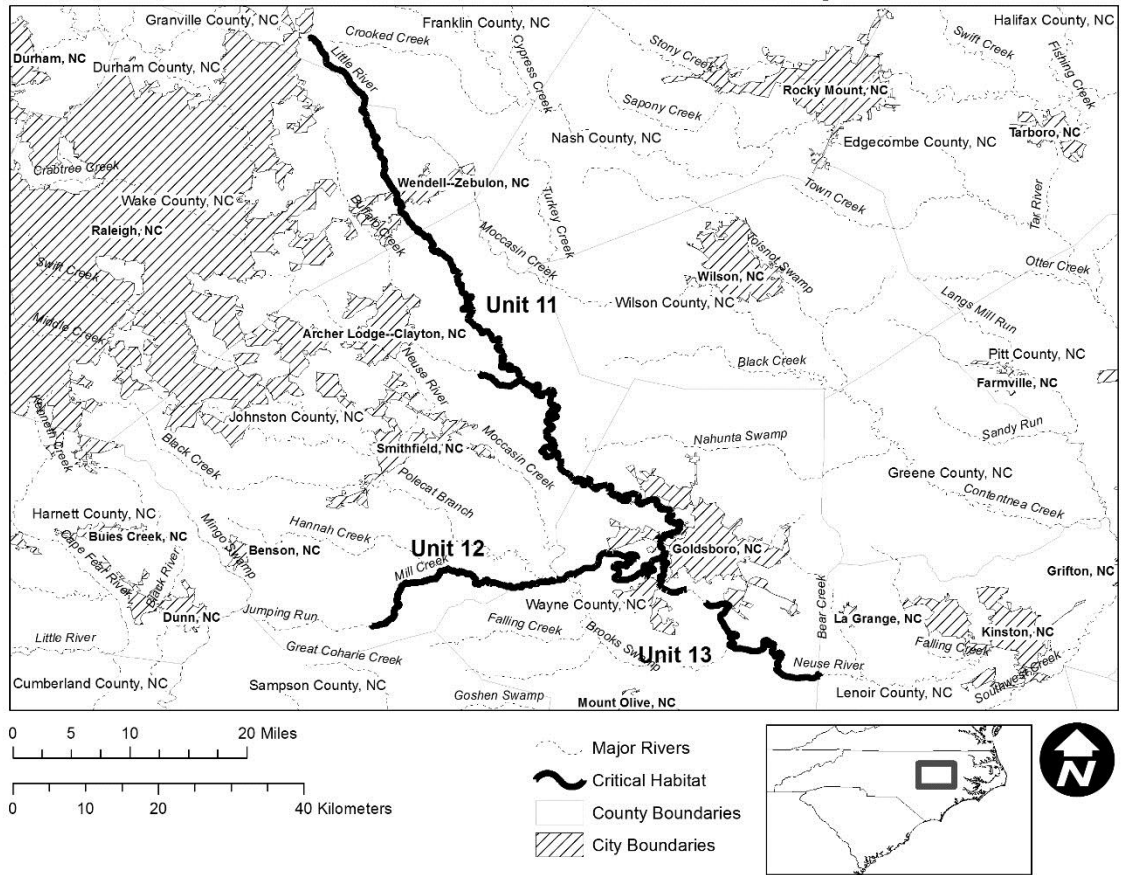
(i) Unit 11 consists of 89.6 river miles (144.2 river kilometers) of habitat in the Little River from near NC96 downstream to the confluence with the Neuse River, including Buffalo Creek from NC39 to the confluence with the Little River.

(ii) Unit 12 consists of 18.7 river miles (30 river kilometers) of Mill Creek from upstream of US701 downstream to the confluence with the Neuse River.

(iii) Unit 13 consists of 39.8 river miles (64 river kilometers) of the Middle Neuse River from the confluence with Mill Creek downstream to the Wayne/Lenoir County line.

(iv) Map of Units 11, 12, and 13 follows:

Map of Units 11 -13 - Middle Neuse River Subbasin Critical Habitat Unit for Neuse River Waterdog



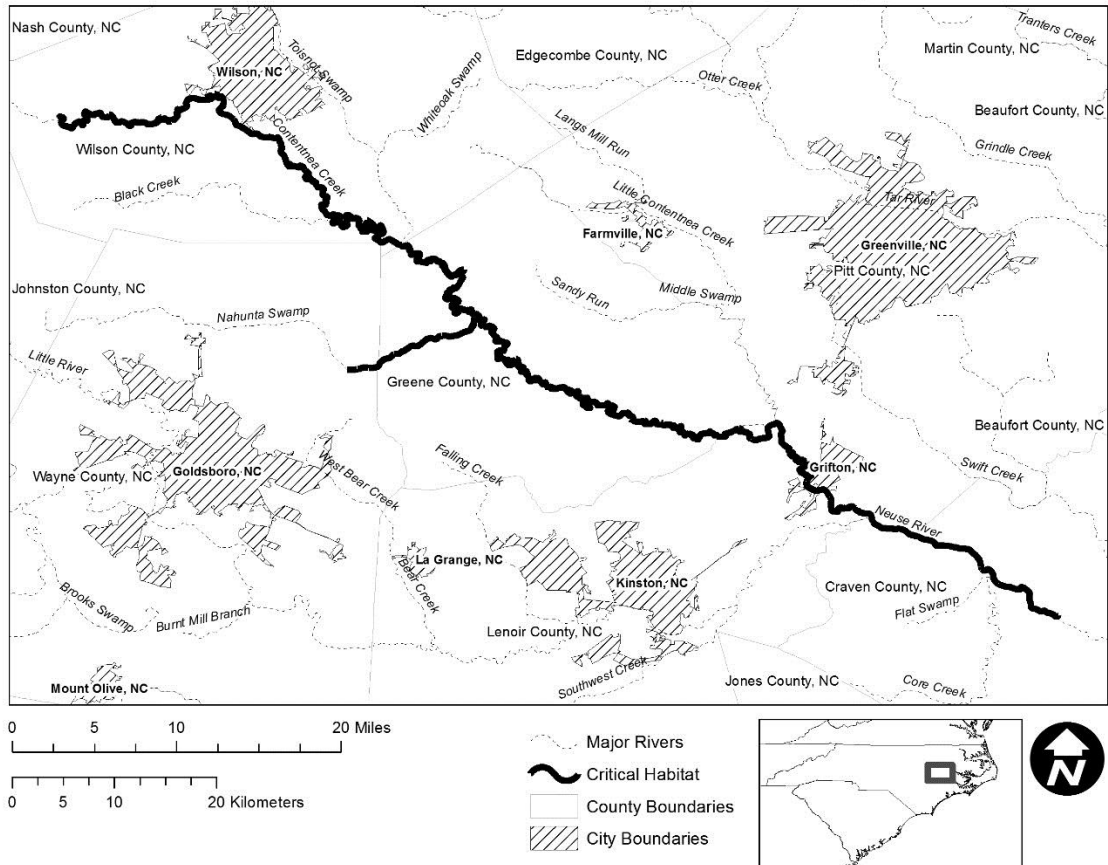
(14) Unit 14: NR6–Contentnea Creek/Lower Neuse River Subbasin, Craven, Lenoir, Pitt, Wayne, and Wilson Counties, North Carolina.

(i) This unit consists of 117 river miles (188.3 river kilometers) of habitat in the Contentnea Creek from NC581 downstream to its confluence with the Neuse River, Nahunta Swamp from the Wayne/Greene County line to the confluence with Contentnea

Creek, and the Neuse River from the confluence with Contentnea Creek to the confluence with Pinetree Creek. Unit 14 includes stream habitat up to bank full height.

(ii) Map of Unit 14 follows:

**Map of Unit 14 - Contentnea Creek/Lower Neuse River Subbasin
Critical Habitat Unit for Neuse River Waterdog**

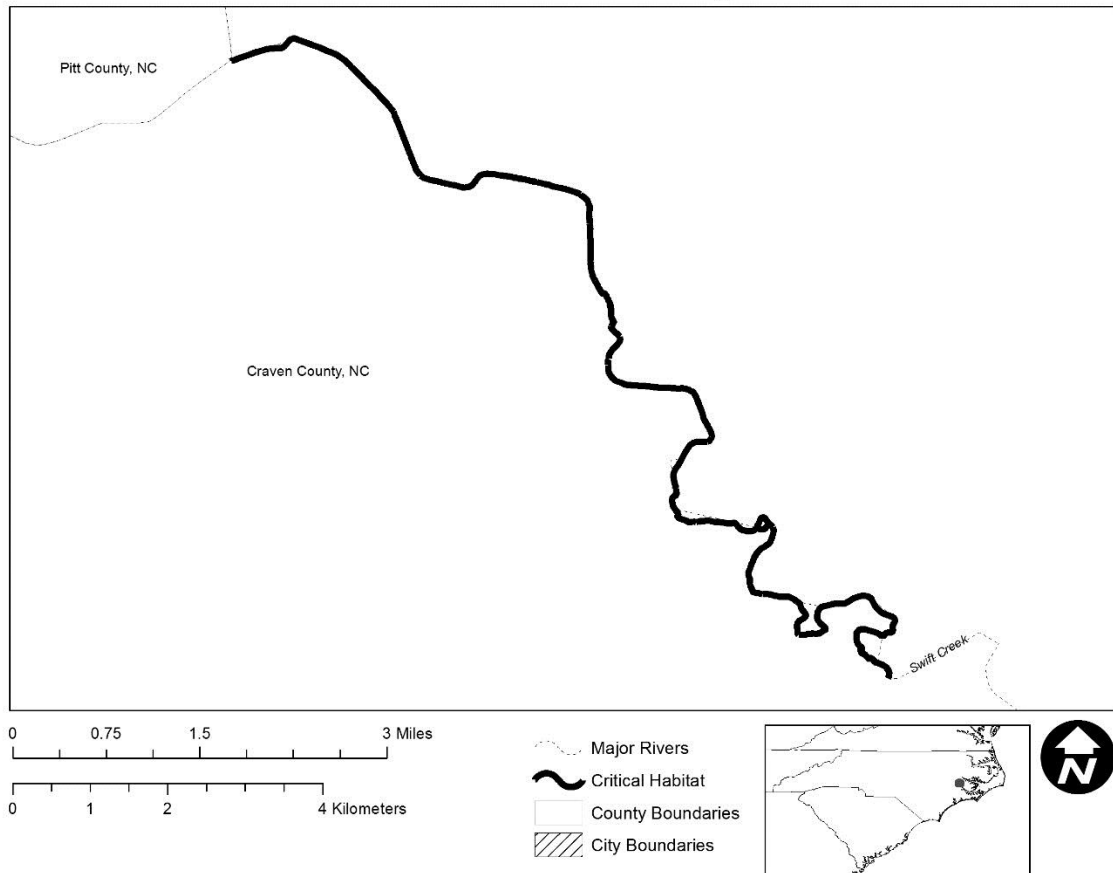


(15) Unit 15: NR7–Swift Creek, Craven County, North Carolina.

(i) This unit consists of 10 river miles (16.3 river kilometers) of habitat in Swift Creek from SR1931 (Beaver Camp Rd) downstream to SR1440 (Streets Ferry Rd). Unit 15 includes stream habitat up to bank full height.

(ii) Map of Unit 15 follows:

**Map of Unit 15 - Swift Creek (Lower Neuse) Critical Habitat Unit
for Neuse River Waterdog**

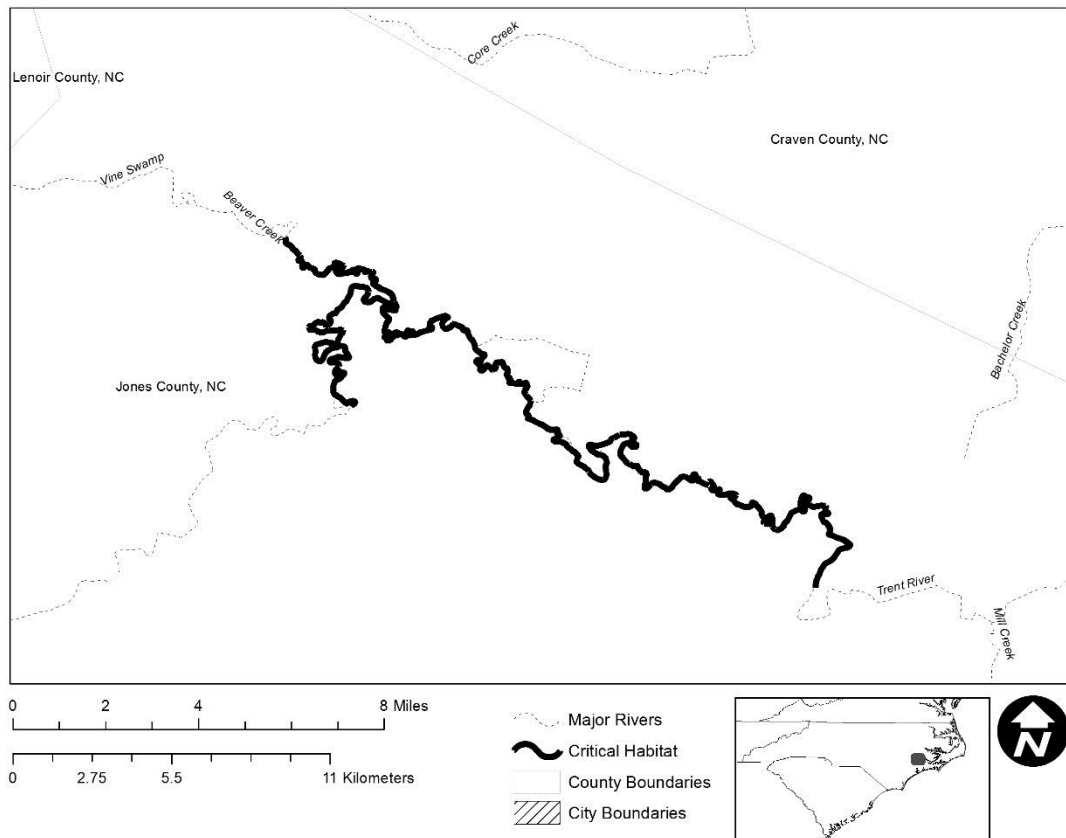


(16) Unit 16: TR1–Trent River, Jones County, North Carolina.

(i) This unit consists of 62 river miles (100 river kilometers) of habitat in Beaver Creek from SR1316 (McDaniel Fork Rd) to the confluence with the Trent River, and Trent River from the confluence with Poplar Branch downstream to SR1121 (Oak Grove Rd) crossing at the Marine Corps Cherry Point property. Unit 16 includes stream habitat up to bank full height.

(ii) Map of Unit 16 follows:

Map of Unit 16 - Trent River Subbasin Critical Habitat Unit for Neuse River Waterdog



(e) *Fishes.*

* * * * *

CAROLINA MADTOM (NOTURUS FURIOSUS)

(1) Critical habitat units are depicted for Durham, Edgecombe, Franklin, Granville, Halifax, Jones, Johnston, Nash, Orange, Vance, Warren, and Wilson Counties, North Carolina, on the maps below.

(2) Within these areas, the physical or biological features essential to the conservation of Carolina madtom consist of the following components:

(i) Suitable substrates and connected instream habitats, characterized by geomorphically stable stream channels and banks (i.e., channels that maintain lateral

dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of freshwater native fish (such as stable riffle-run-pool habitats that provide flow refuges consisting of silt-free gravel, small cobble, coarse sand, and leaf litter substrates) as well as abundant cover used for nesting.

(ii) Adequate flows, or a hydrologic flow regime (which includes the severity, frequency, duration, and seasonality of discharge over time), necessary to maintain instream habitats where the species is found and to maintain connectivity of streams with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the fish's habitat, food availability, and ample oxygenated flow for spawning and nesting habitat.

(iii) Water quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.

(iv) Aquatic macroinvertebrate prey items, which are typically dominated by larval midges, mayflies, caddisflies, dragonflies, and beetle larvae.

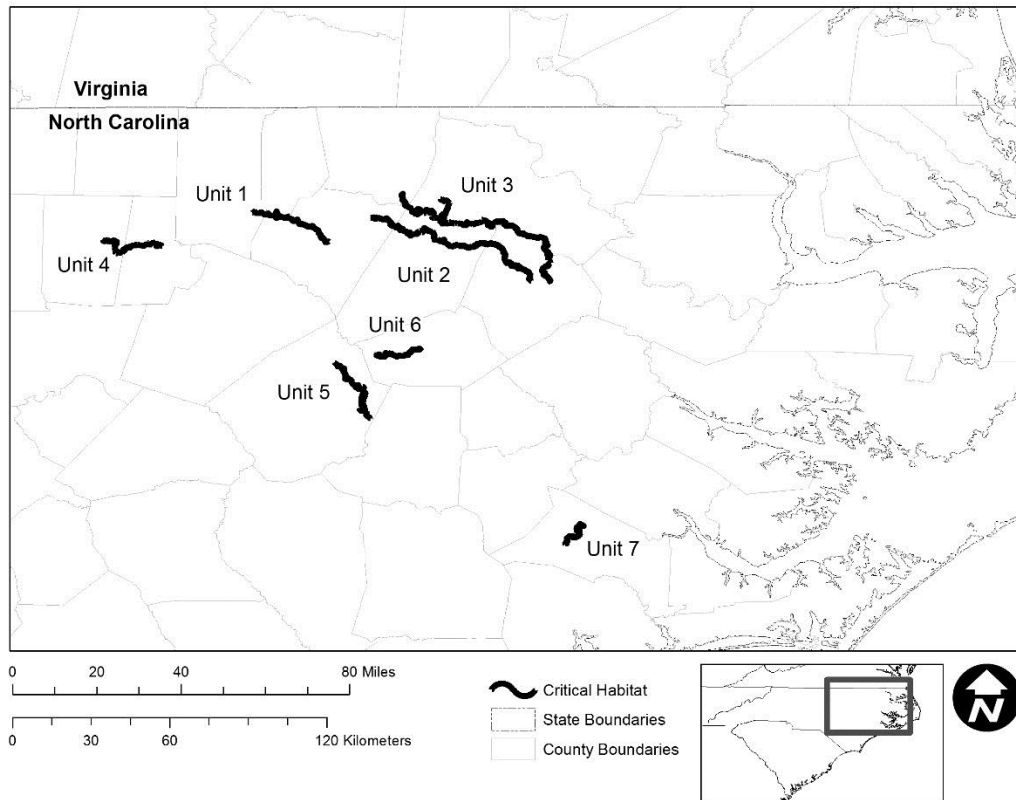
(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on [EFFECTIVE DATE OF THE FINAL RULE].

(4) *Critical habitat map units.* Data layers defining map units were created by overlaying Natural Heritage Element Occurrence data and U.S. Geological Survey (USGS) hydrologic data for stream reaches. The hydrologic data used in the critical

habitat maps were extracted from the USGS 1:1M scale nationwide hydrologic layer (https://nationalmap.gov/small_scale/mld/1nethyd.html) with a projection of EPSG:4269 - NAD83 Geographic. The North Carolina Natural Heritage program's species presence data were used to select specific stream segments for inclusion in the critical habitat layer. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which each map is based are available to the public at <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092 and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) *Note:* Index map follows:

Index Map of Critical Habitat Units for Carolina Madtom

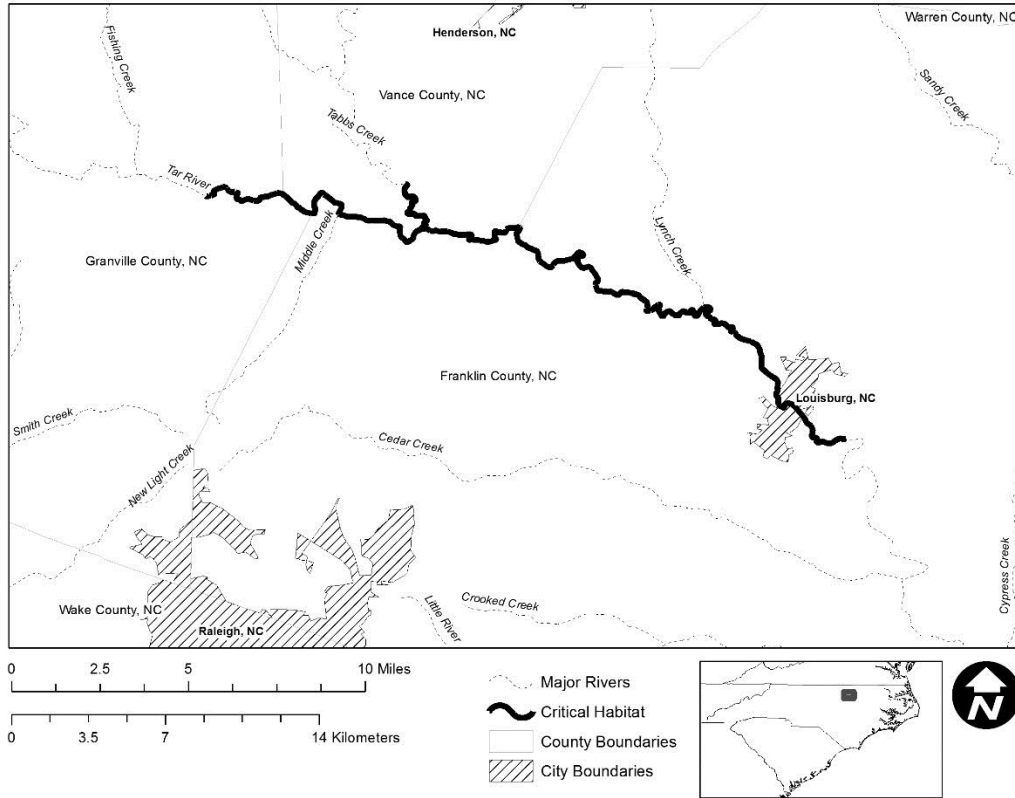


(6) Unit 1: TAR1–Upper Tar River, Franklin, Granville, and Vance Counties, North Carolina.

(i) This unit consists of 26 river miles (42 river kilometers) of habitat in the Upper Tar River from the confluence with Sand Creek to the confluence with Sycamore Creek. Unit 1 includes stream habitat up to bank full height.

(ii) Map of Unit 1 follows:

Map of Unit 1 - Upper Tar River Critical Habitat Unit for Carolina Madtom

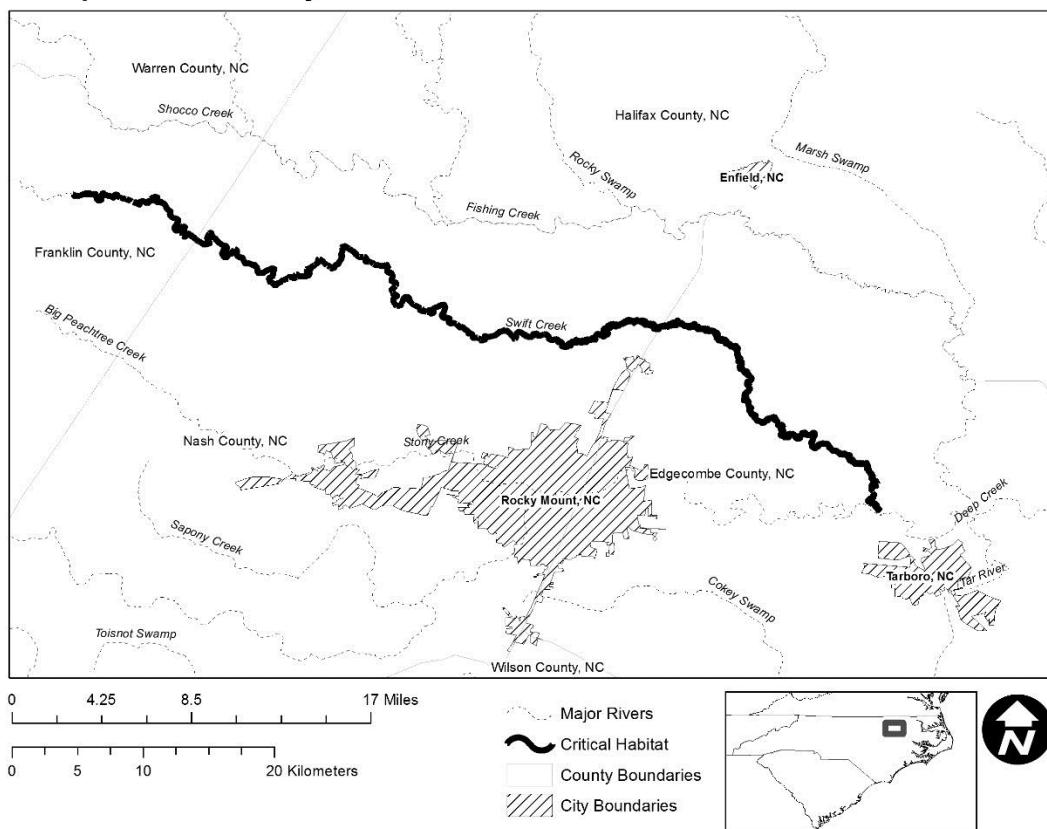


(7) Unit 2: TAR2–Sandy/Swift Creek, Edgecombe, Franklin, Halifax, Nash, Vance, and Warren Counties, North Carolina.

(i) This unit consists of 66 river miles (106 river kilometers) of occupied habitat in Sandy and Swift Creeks, located downstream from NC561 to the confluence with the Tar River. Unit 2 includes stream habitat up to bank full height.

(ii) Map of Unit 2 follows:

Map of Unit 2 - Sandy/Swift Creek Critical Habitat Unit for Carolina Madtom

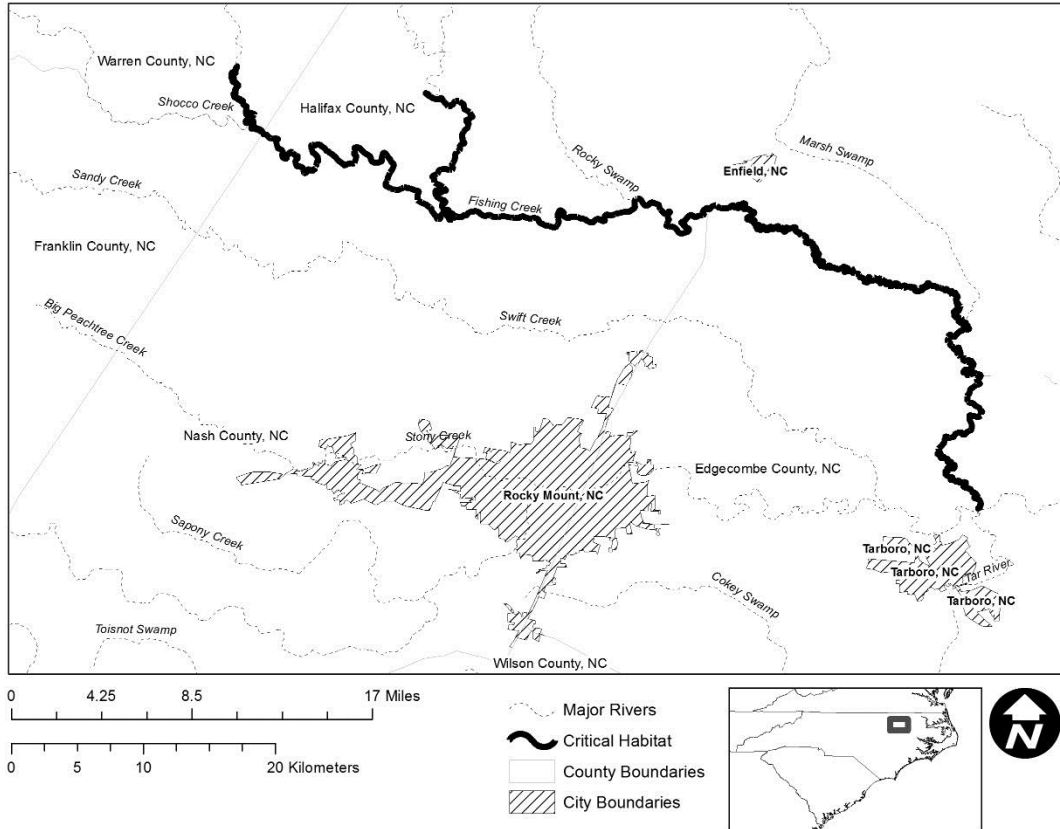


(8) Unit 3: TAR3–Fishing Creek Subbasin, Edgecombe, Franklin, Halifax, Nash, and Warren Counties, North Carolina.

(i) This unit consists of 86 river miles (138 river kilometers) of habitat in Fishing Creek from the confluence with Hogpen Branch to the confluence with the Tar River, and Little Fishing Creek from Medoc Mountain Road (SR1002) to the confluence with Fishing Creek. Unit 3 includes stream habitat up to bank full height.

(ii) Map of Unit 3 follows:

Map of Unit 3 - Fishing Creek Subbasin Critical Habitat Unit for Carolina Madtom

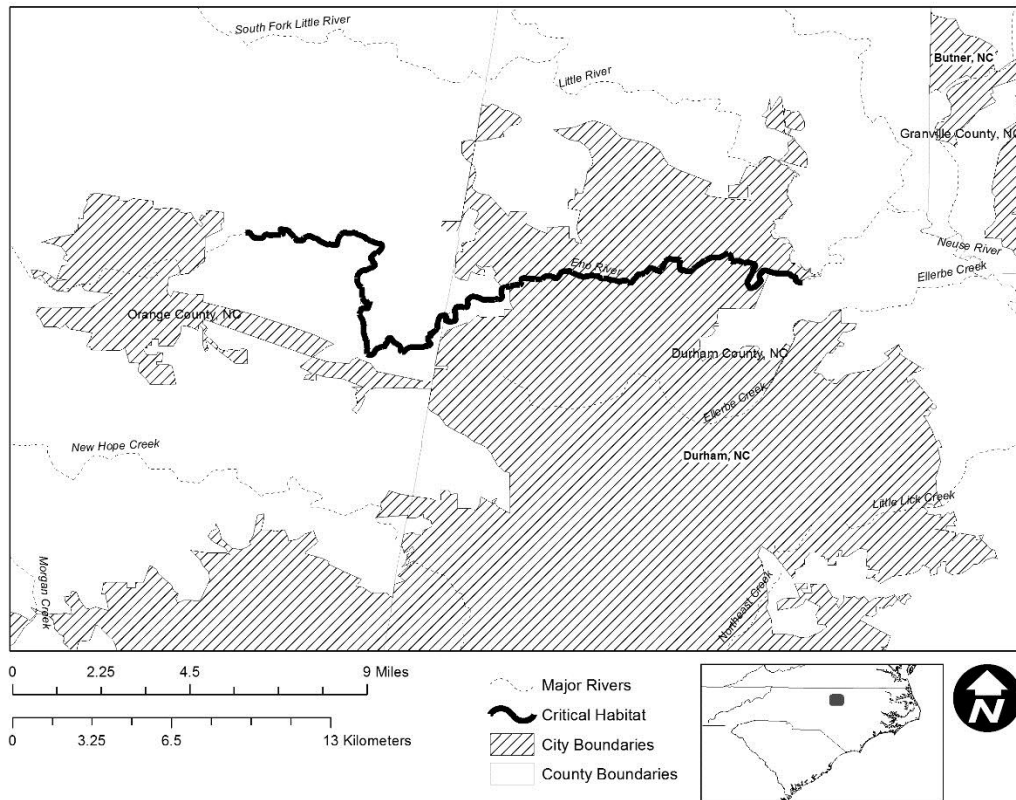


(9) Unit 4: NR1–Upper Neuse River Subbasin (Eno River), Durham and Orange Counties, North Carolina.

(i) This unit consists of 20 river miles (32 river kilometers) of habitat in the Upper Neuse River extending from Eno River State Park downstream of NC70 to the confluence with Cabin Creek near Falls Lake impoundment. Unit 4 includes stream habitat up to bank full height.

(ii) Map of Unit 4 follows:

Map of Unit 4 - Upper Neuse River Critical Habitat Unit for Carolina Madtom

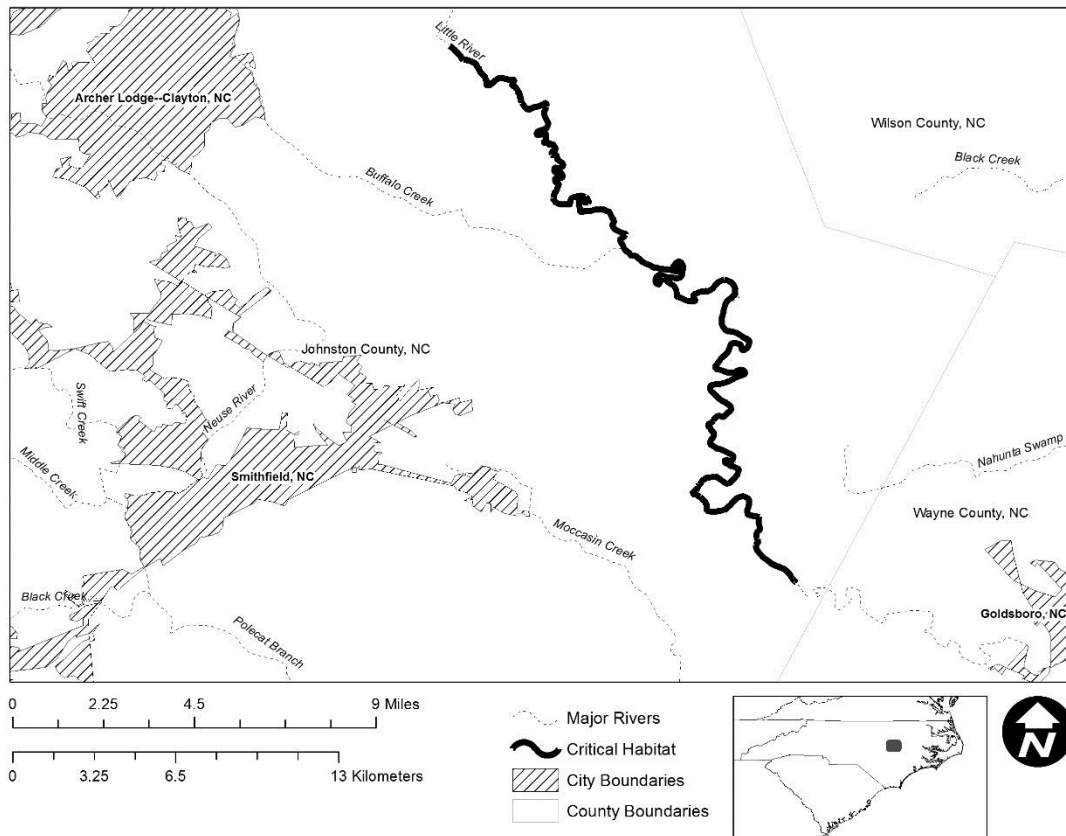


(10) Unit 5: NR2–Little River, Johnston County, North Carolina.

(i) This unit consists of 28 river miles (45 river kilometers) of habitat in the Upper and Lower Little River from NC42 to the Johnston/Wayne County line. Unit 5 includes stream habitat up to bank full height.

(ii) Map of Unit 5 follows:

Map of Unit 5 - Little River Critical Habitat Unit for Carolina Madtom

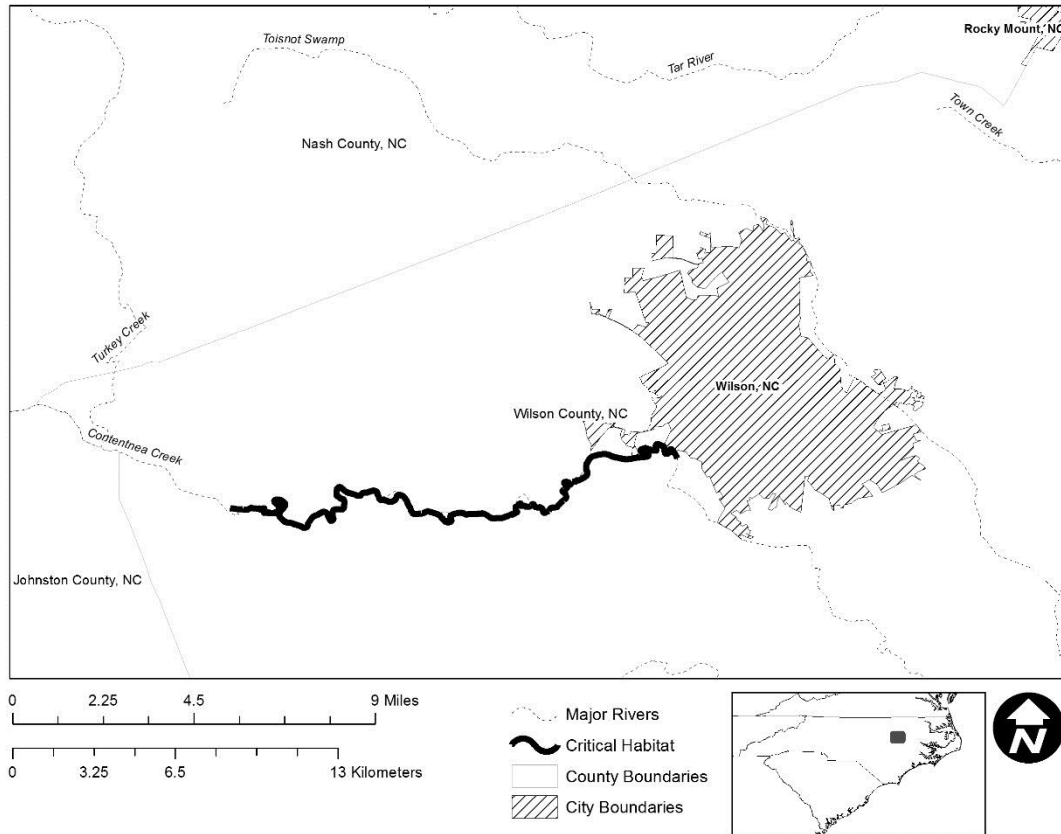


(11) Unit 6: NR3–Contentnea Creek, Wilson County, North Carolina.

(i) This unit consists of 15 river miles (24 river kilometers) of habitat in Contentnea Creek from Buckhorn Reservoir to Wiggins Mill Reservoir. Unit 6 includes stream habitat up to bank full height.

(ii) Map of Unit 6 follows:

Map of Unit 6 - Contentnea Creek Critical Habitat Unit for Carolina Madtom

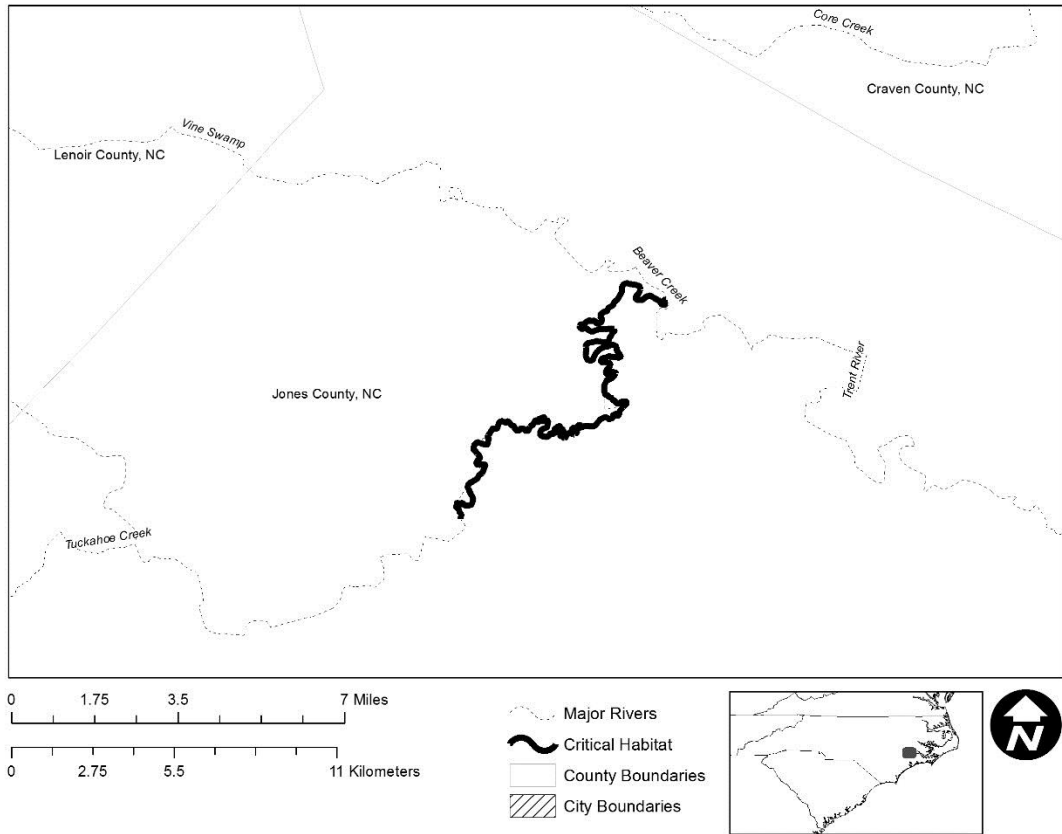


(12) Unit 7: TR1–Trent River, Jones County, North Carolina.

(i) This unit consists of 15 river miles (24 river kilometers) of unoccupied habitat in the Trent River between the confluence with Cypress Creek and Beaver Creek. Unit 7 includes stream habitat up to bank full height.

(ii) Map of Unit 7 follows:

Map of Unit 7 - Trent River Critical Habitat Unit for Carolina Madtom



* * * * *

Dated: April 2, 2019

Signed:

Margaret E. Everson
*Principal Deputy Director,
U.S. Fish and Wildlife Service,
Exercising the Authority of the Director,
U.S. Fish and Wildlife Service.*

Billing Code 4333-15

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