

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS-R4-ES-2018-0092;
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RIN 1018-BC28

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

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), list two North Carolina species, the Carolina madtom (*Noturus furiosus*) as endangered, and the Neuse River waterdog (*Necturus lewisi*) as threatened, under the Endangered Species Act of 1973 (Act), as amended. We also issue a rule under section 4(d) of the Act for the Neuse River waterdog, to provide for the conservation of this species. In addition, we designate critical habitat for both species under the Act. For the Carolina madtom, approximately 257 river miles (mi) (414 river kilometers (km)) fall within 7 units of critical habitat in Durham, Edgecombe, Franklin, Granville, Halifax, Johnston, Jones, Nash, Orange, Vance, Warren, and Wilson Counties, North Carolina. For the Neuse River waterdog, approximately 779 river mi (1,254 river km) fall within 18 units of critical habitat in Craven, Durham, Edgecombe, Franklin, Granville, Greene, Halifax, Johnston, Jones, Lenoir, Nash, Orange, Person, Pitt, Wake, Warren, Wayne, and Wilson Counties, North Carolina. This rule extends the Act's protections to these species and their designated critical habitats.

DATES: This rule is effective July 9, 2021.

ADDRESSES: This final rule is available on the internet at <http://www.regulations.gov>. Comments and materials we received, as well as some supporting documentation we used in preparing this rule, are available for public inspection at <http://www.regulations.gov>. All of the comments, materials, and documentation that we considered in this rulemaking are available at <http://www.regulations.gov> at Docket No. FWS-R4-ES-2018-0092.

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 <http://www.regulations.gov> at Docket No. FWS-R4-ES-2018-0092, and at the Raleigh Ecological Services Field Office (<https://www.fws.gov/raleigh>; street address provided above). Any additional tools or supporting information that we developed for this critical habitat designation will also be available at the Fish and Wildlife Service website and Field Office identified above, and may also be included in the preamble and 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 919-816-6408. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800-877-8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if we determine that a species is 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 one 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. Whenever any species is listed as a threatened species, the Secretary shall issue such regulations as he or she deems necessary and advisable to provide for the conservation of such species. In addition, the Secretary may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1) of the Act for endangered species. 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. This final rule: (1) Lists the Carolina madtom as endangered, (2) designates critical habitat for the Carolina madtom, (3) lists the Neuse River waterdog as threatened, (4) issues a rule under section 4(d) of the Act for the Neuse River waterdog, and (5) designates critical habitat for the Neuse River waterdog.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species because of 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 the 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). The Carolina madtom is also impacted by predation from flathead catfish (Factor C). There are no existing regulatory mechanisms that ameliorate or reduce these threats such that the species do 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 maximum extent prudent and determinable. Section 3(5)(A) 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 protections; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Section 4(b)(2) of the Act states that the Secretary shall designate 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.

Economic analysis. In accordance with section 4(b)(2) of the Act, we prepared an economic analysis of the impacts of designating critical habitat for the Carolina madtom and the Neuse River waterdog. We published the announcement of, and solicited public comments on, the draft economic analyses (84 FR 23644; May 22, 2019). We received no comments on the draft economic analyses and adopted the draft economic analyses as final.

Peer review and public comments. During the proposed rule stage, we sought the expert opinions of 11 appropriate specialists regarding the species status assessment report. We received responses from five specialists, which informed our determinations. Information we received from peer review is incorporated into this final rule. We also considered all comments and information we received from the public during two comment periods.

Previous Federal Actions

Please refer to the proposed listing and critical habitat rule (84 FR 23644; May 22, 2019) for the Carolina madtom and Neuse River waterdog, and the document reopening the May 22, 2019, proposed rule's public comment period (85 FR 45839; July 30, 2020), for detailed descriptions of previous Federal actions concerning these species.

Supporting Documents

Species status assessment (SSA) teams prepared SSA reports for the Carolina madtom and Neuse River waterdog. The SSA teams were composed of Service biologists, in consultation with other species experts. The SSA reports each 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 the species. The SSA reports and other materials relating to this rule can be found on the Service's Southeast Region website 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**).

Summary of Changes From the Proposed Rule

This final rule incorporates several changes to our proposed rule (84 FR 23644; May 22, 2019) based on the comments we received. These changes are summarized in the document that reopened the proposed rule's public comment (85 FR 45839; July 30, 2020), as well as below under Summary of Comments and Recommendations. Minor, nonsubstantive changes and corrections are made throughout this rule in response to comments. Based on these comments, we also incorporate as appropriate new information into our SSA reports, including updated survey information. However, the information we received during the public comment period on the proposed rule did not change our determination that the

Carolina madtom is an endangered species and the Neuse River waterdog is a threatened species.

We received substantive comments on the proposed rule issued under section 4(d) of the Act ("4(d) rule") for the Neuse River waterdog and the critical habitat designations for both species. We have made changes to this rule as a result of the public comments we received. We modified the language in the Neuse River waterdog 4(d) rule for each exception for incidental take. In summary, we modified the exception for species restoration efforts by State wildlife agencies to include monitoring, which is necessary to determine the success of captive propagation and stocking efforts; for channel restoration projects to add language that would require surveys for and relocation of Neuse River waterdogs observed prior to commencement of restoration action; for bank stabilization projects to add a requirement that appropriate "native" vegetation, including woody and herbaceous species appropriate for the region and habitat, be used for stabilization; and for forestry-related actions to reflect alternative language provided by the North Carolina Forest Service (NCFS) (see (28) *Comment* under Summary of Comments and Recommendations, below). In terms of critical habitat, for the Carolina madtom, we updated ownership information for the Eno River critical habitat (Unit 4), we modified the occupancy determination from unoccupied to occupied for critical habitat Unit 6 (Contentnea Creek) based on new data for the species (see (8) *Comment* under Summary of Comments and Recommendations, below). For the Neuse River waterdog, we added two occupied critical habitat units (Unit 3—Bens Creek and Unit 18—Tuckahoe Swamp) and modified to add or remove areas to/from five units (Unit 1—Upper Tar River, Unit 4—Fishing Creek Subbasin, Unit 6—Middle Tar River Subbasin, Unit 10—Middle Creek, and Unit 17—Trent River) of the critical habitat designation, for a total of 779 miles, an increase of 41 miles from the proposed designation.

As indicated in the document that reopened the proposed rule's public comment (85 FR 45839; July 30, 2020), we have also changed the way in which the provisions of the 4(d) rule for the Neuse River waterdog will appear at 50 CFR 17.43(f). Specifically, we no longer set forth a blanket statement applying all prohibitions and provisions of 50 CFR 17.31 and 17.32 to the Neuse River waterdog. Instead, we set forth specific prohibitions and exceptions to those prohibitions in the 4(d) rule, but the

substance of the prohibitions and the exceptions to those prohibitions, as included in the May 22, 2019, proposed rule (84 FR 23644), has not changed.

Summary of Comments and Recommendations

In the proposed rule published on May 22, 2019 (84 FR 23644), and in the document published on July 30, 2020 (85 FR 45839) that reopened the comment period on the May 22, 2019, proposed rule, we requested that all interested parties submit written comments on the proposals. We also contacted appropriate Federal and State agencies, scientific experts and organizations, and other interested parties and invited them to comment on the proposals. Newspaper notices inviting general public comment were published in the Raleigh News and Observer on June 3, 2019, and on August 9, 2020. We did not receive any requests for a public hearing. All substantive information provided during the comment periods has either been incorporated directly into the final determinations or is addressed below. For topics we received comments on during both comment periods (e.g., the forestry exception language in the 4(d) rule), we identify whether the comments were received as part of the initial comment period (May 22–July 22, 2019) or the reopened comment period (July 30–August 31, 2020).

Peer Reviewer Comments

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 peer review of the SSA reports. We sent the Carolina madtom SSA report to six independent peer reviewers and the Neuse River waterdog SSA to five independent peer reviewers; all peer reviewers had expertise that included familiarity with Carolina madtom or Neuse River waterdog and their habitats, biological needs, and threats. We received responses from four of the peer reviewers for the Carolina madtom and one of the peer reviewers for the Neuse River waterdog.

We reviewed all comments we received from the peer reviewers for substantive issues and new information regarding the information contained in the SSA reports. The peer reviewers generally concurred with our methods and conclusions, and provided additional information, clarifications, and suggestions to improve the final SSA reports. Peer reviewer comments are addressed in the following summary

and were incorporated into the SSA reports as appropriate.

Carolina Madtom

(1) *Comment:* One peer reviewer mentioned that predation by flathead catfish is likely a dominant threat to the Carolina madtom but appears minimally considered as a habitat factor in the SSA report. The commenter suggested that in addition to physical habitat attributes, biotic factors may in many cases (including this case) be critically important. This important habitat influence could be emphasized more in the SSA report.

Our Response: Data on the distribution, abundance, or predation pressure on madtoms for flathead catfish in either the Neuse or Tar River basins are not available; therefore, we could not explicitly include flathead catfish as a metric. Section 4.4 of the SSA report describes the significant threat that flathead catfish pose to the Carolina madtom, as does the overall viability summary for the species.

(2) *Comment:* One peer reviewer suggested that we make a strong statement concerning the endemism of the Tar-Neuse ecosystem and what a unique crucible of evolution it has been, as manifested in several endemic species, including the Carolina madtom, Tar River spinymussel (*Parvaspina steinstansana*), pinewoods shiner (*Lythrurus matutinus*), Neuse River waterdog, and others. The uniqueness of the overall ecosystem cannot be overemphasized, and the mutual benefits derived from the listing of any of the endemic organisms has appeal.

Our Response: We note the endemism of the Carolina madtom to the Tar and Neuse river systems in chapter 3 of the SSA report. While listing and critical habitat designation under the Act only apply to the species under consideration, we acknowledge that protections derived from implementing the Act are beneficial to the overall habitat and other organisms that co-occur with the Carolina madtom. However, benefits that listing a species under the Act may have on the overall ecosystem is not a factor for consideration when determining whether a species warrants listing under the Act.

(3) *Comment:* One peer reviewer commented that the SSA report suggests that instream habitat, water flow, and invasive fish are the main factors influencing madtom populations, and it is unclear how any of these factors are attributable to Confined Animal Feeding Operations (CAFOs). There is no direct linkage provided in the SSA report.

Our Response: Multiple sections in the SSA report state that the main habitat elements that influence Carolina madtom condition are water quality (CAFOs are a part of this, as are National Pollutant Discharge Elimination System (NPDES) discharges, as they contribute to identified impaired streams), water quantity, connectivity (potentially affected by CAFOs located within floodplains), instream habitat (also affected by CAFOs when runoff overwhelms instream flows), and predation by flathead catfish. Section 4.2 of the SSA report details the effects of CAFOs on the habitats within the madtom's range (Service 2021a, pp. 35–36).

(4) *Comment:* One peer reviewer expressed disappointment that the Service did not reference materials provided via email in July 2016, stating that the SSA report has a slanted viewpoint, has cherry-picked negative impacts associated with forest management, and only focuses on those in the analysis.

Our Response: The material provided to us in July 2016 has been cited directly in the revised forestry section (section 4.3) of the SSA report (Service 2021a, pp. 36–40). We note that the very first sentence in this section of the SSA report states that a forested landscape provides ideal conditions for aquatic ecosystems. In the SSA report and in this final rule, we also note that silvicultural activities, when performed according to strict forest practices guidelines (FPGs) or best management practices (BMPs), can retain adequate conditions for aquatic ecosystems. However, we also note that, when FPGs/BMPs are not implemented or inadequate implementation occurs, these forestry activities can also “cause measurable impacts” (NCASI 2015, p. 1) and contribute to the myriad of stressors facing aquatic systems in the Southeast (Service 2021a, p. 37). In addition, we note that one major, albeit temporary, BMP failure, a harvest that is non-compliant with BMPs or FPGs, or failure to maintain a BMP, can cause enough sedimentation to smother nests and/or cause enough stress to have irreversible impacts to Carolina madtom populations.

(5) *Comment:* One peer reviewer recommended that the Service solicit a representative of the agriculture community to participate in the peer review of the SSA report. The peer reviewer noted that both the Neuse and Tar-Pamlico River basins have a substantial amount of agricultural operations and it may be beneficial for all parties to understand how that type

of land use may play a role in supporting future species conservation needs.

Our Response: We sought peer review from an agriculture expert in the North Carolina Department of Agriculture for the Neuse River waterdog SSA report (which has very similar analysis of agricultural operations as the Carolina madtom SSA report). However, we did not receive a response to our request.

Neuse River Waterdog

(6) *Comment:* One peer reviewer had questions about the occupancy metrics and whether detection probabilities were incorporated into the estimates of occupancy, as well as the time periods that the survey efforts represented in order to better understand the underlying analyses presented in the SSA report.

Our Response: We added detection probability information into the SSA report (Service 2021b, p. 19) and note that for the original analysis, site occupancy indicates a minimum, naïve occupancy (*i.e.*, detection probabilities were not incorporated into the initial estimates). We are currently working with North Carolina State University to perform an in-depth occupancy analysis for Neuse River waterdog; however, this analysis has not been completed, and the resulting information is not available for incorporation. We also note that the time periods and replicated methodologies for the survey efforts are also described in section 3.3.1 of the SSA report (Service 2021b, p. 19).

State Agency Comments

We received comments from three State agencies, the North Carolina Wildlife Resources Commission (NCWRC), the North Carolina Forest Service (NCFS), and the Virginia Department of Forestry (VDOF). Because we received several comments from both NCFS and VDOF and from the public regarding forestry considerations, we have integrated NCFS/VDof comments and responses under *Public Comments*, below.

Carolina Madtom

(7) *Comment:* The NCWRC provided a thorough review of the SSA report and included many comments updating data and interpretations. The partner review suggested that we revise the document to include the Trent River Subbasin within the greater Neuse River basin, based on the hydrologic unit categorization, to avoid confusion.

Our Response: Nearly all data revisions and interpretations were incorporated into the revised SSA report. In section 3.1 of the SSA report,

we describe why we separated the Trent River Subbasin: “Because of salt water influence, the habitats in the Trent River system are isolated from the Neuse River and its tributaries; therefore, we consider the Trent River system as a separate basin (*i.e.*, population), even though it is technically part of the larger Neuse River Basin” (Service 2021a, p. 9).

(8) *Comment*: The NCWRC provided a new record during the public comment period in 2019, of a Carolina madtom collected from Contentnea Creek near NC 42 in July 2018.

Our Response: While we included this reach in proposed critical habitat, the May 22, 2019, proposed rule (84 FR 23644) considered Contentnea Creek to be unoccupied, with the last known record from 2007. With this 2018 record, we consider the Contentnea Creek critical habitat unit to be occupied. Therefore, we have updated the designated critical habitat to reflect that Unit 6—Contentnea Creek is occupied for the Carolina madtom. We revised the critical habitat designation to address this comment in our July 30, 2020, document reopening the May 22, 2019, proposed rule’s public comment period (85 FR 45839).

Neuse River Waterdog

(9) *Comment*: The NCWRC provided a thorough review of the SSA report and included many comments updating data and interpretations. The partner review indicated concern about how current occupancy was summarized (*i.e.*, that the species currently occupies 73 percent of its historical range), indicating that the recent survey efforts suggest a 50 percent decline in occupied sites from the surveys done in the early 1980s.

Our Response: Data revisions and interpretations were incorporated into the revised SSA report. We note that current occupancy versus the occupancy of historical range at the species level is summarized by watershed (or hydrologic unit) occupancy within MUs rather than by individual site occupancy. This difference likely accounts for the apparent discrepancy noted by the commenter. The SSA report includes details about changes at the site level, as well as the overall watershed, to provide as complete a picture as possible of changes from historical times to the present day (Service 2021b, p. v).

(10) *Comment*: The NCWRC provided several new records for Neuse River waterdog during the public comment period in 2019, including records in Middle Creek (Johnston County), Tuckahoe Swamp (Jones County), Tar

River (Granville County), and Fishing Creek (Nash County).

Our Response: We included these new records and updated five critical habitat units (Unit 1—Upper Tar River, Unit 4—Fishing Creek Subbasin, Unit 6—Middle Tar River Subbasin, Unit 10—Middle Creek, and Unit 17—Trent River). We revised Unit 1 to add 3.7 miles (6 km) of the Upper Tar River based on a 2018 observation provided by NCWRC of Neuse River waterdog. We revised Unit 4 to add 20 miles (32.3 km) of Fishing Creek based on a 2019 observation provided by NCWRC of Neuse River waterdog. We revised Unit 6 to add 11 miles (17.8 km) of the upper reach of the Tar River based on a 2019 observation by a permitted private consultant of Neuse River waterdog. We revised Unit 10 to add 23.2 miles (37.4 km) of Middle Creek based on two 2018 observations provided by NCWRC of Neuse River waterdog. These revisions were part of our July 30, 2020, document reopening the May 22, 2019, proposed rule’s public comment period (85 FR 45839).

Public Comments

During the initial comment period, we received 83 public comments on the proposed rule, and during the reopened comment period, we received 16 public comments. A majority of the comments supported the listing determinations and critical habitat designations, none opposed the designations, and some included suggestions on how we could refine or improve the 4(d) rule for the Neuse River waterdog and the critical habitat designations for both species. All substantive information provided to us during the comment periods has been incorporated directly into this final rule or is addressed below. For topics for which we received comments during both comment periods (*e.g.*, the forestry exception language in the 4(d) rule), we identify whether the comments were received during the initial comment period (May 22–July 22, 2019) or the reopened comment period (July 30–August 31, 2020).

(11) *Comment*: One commenter indicated that the Service should consider forestry BMPs as part of the overall conservation benefit for the species, and account for these beneficial actions in any threat analysis.

Our Response: Forested watersheds contribute to the current condition of each species and have been factored in as a positive factor (*i.e.*, benefit) under the “Connectivity” habitat element as described in chapter 3 of each species’ SSA report. We also note that forestry activities were not carried forward as a primary threat for our future condition

analyses because the future condition analyses focused on the main threats (urbanization and climate change) that are predicted to affect the species’ future condition.

(12) *Comment*: One commenter stated that the proposed rule does not present evidence that forest management is contributing elevated levels of sediment to streams occupied by the Neuse River waterdog and Carolina madtom.

Our Response: Sediment is one of the most frequently cited water quality concerns associated with forestry operations and is one of the top causes of river and stream impairment in the United States (EPA 2017, p. 3). Sedimentation is one of the primary stressors to aquatic fauna, including the Neuse River waterdog and Carolina madtom (Service 2021ab, chapter 4). Forestry practices can alter the natural sediment balance and lead to increased rates of sediment input, resulting in increased concentrations of sediment in the water body and increased deposition of sediment on the stream bottom. The forest industry recognizes that harvest and management practices cause sedimentation, which is why they have BMPs, or practices that are used to minimize water pollution from sedimentation. BMP implementation rates are generally high, and in the Neuse and Tar-Pamlico River basins, overall BMP implementation rates are approximately 88 to 90 percent (Coats 2017, p. 38). While we do not know the exact location of all forestry operations in the Neuse and Tar-Pamlico River basins (see maps from North Carolina Forest Service (NCFS) 2018, p. 43), lack of BMP implementation was approximately 10 to 12 percent for sites assessed in those watersheds from 2012–2016; identified risks to water quality were most often attributed to improper BMPs for Streamside Management Zones (SMZs) and stream crossings (Coats 2017, pp. 8–9), which likely contributed sedimentation to habitats in the systems that the waterdog and madtom occupy.

(13) *Comment*: To provide additional information about compliance, one commenter described the process for when a “significant risk to water quality” is observed during BMP implementation inspections. They indicated that the presence of a significant risk triggers further investigation by State agency inspectors that leads to collaborative efforts among State agencies, the forest landowner, logger, and/or contractor to perform corrective measures to remedy the issue. After a reasonable period of time, a follow-up site evaluation is made to assess compliance with the

recommended measures. Willful noncompliance with State agency recommendations typically results in a referral to the appropriate regulatory agency for enforcement action.

Our Response: We acknowledge the protocols in place to remedy water quality violations. We recommend that the Service be included in the agencies notified if water quality violations occur to habitats occupied by the Neuse River waterdog or Carolina madtom.

(14) *Comment:* During the initial comment period, one commenter noted that within the range of the Neuse River waterdog and Carolina madtom, North Carolina BMPs require a minimum SMZ width of 50 feet on each side of the stream, and referenced chapter 4 (SMZs and Riparian Buffers) of the NCFS's BMP manual.

Our Response: Our review of the NCFS's BMP Manual indicates that 50-foot buffers are part of the Tar-Pamlico and Neuse riparian buffer rules; however, recent correspondence with the NCFS clarifies that forest harvesting is allowed in all zones of the 50-foot buffer (see chapter 02 of title 15A of the North Carolina Administrative Code (NCAC) at section 02B .0612 (15A NCAC 02B .0612); NCFS 2020, p.1).

(15) *Comment:* One commenter noted that the Federal Highway Administration (FHWA) has not consulted with the Service regarding the Carolina madtom or Neuse River waterdog, or analyzed impacts to the species before pursuing construction of the project in Wake/Johnston Counties.

Our Response: While this comment is outside the scope of this rulemaking, the FHWA/North Carolina Department of Transportation (NCDOT) re-initiated section 7 consultation/conference with a revised biological assessment for the Complete 540 project dated July 2019. The Service issued a revised biological opinion (BO) for the Complete 540 project on October 15, 2019. This BO primarily concerned the dwarf wedgemussel (*Alasmidonta heterodon*), yellow lance (*Elliptio lanceolata*), Atlantic pigtoe (*Fusconaia masoni*), and proposed critical habitat for the Atlantic pigtoe. However, we also concurred that the project may affect, but is not likely to adversely affect, the Neuse River waterdog. This conclusion was based primarily on the fact that repeated surveys never found the species anywhere near the action area, and the closest record was 5 to 6 miles downstream in Swift Creek. FHWA/NCDOT determined the project would have no effect on the Carolina madtom since the species is not currently considered present in or near the action area. Therefore, there was no

consultation/conference for the Carolina madtom.

(16) *Comment:* When the Service proposes critical habitat for these species, it should take into consideration the economic benefits of protecting habitat for the species, including ecosystem services, the protection of clean water, the reduced cost of water treatment for drinking water supplies, and public health benefits.

Our Response: As noted in the draft economic analysis (DEA), the primary intended benefit of critical habitat is to support the conservation of endangered and threatened species, such as the Carolina madtom and Neuse River waterdog. In order to quantify and monetize direct benefits of the designation, information would be needed to determine both the incremental change in the probability of madtom or waterdog conservation expected to result from the critical habitat designation and the public's willingness to pay for such beneficial changes. The conclusion was that additional project modifications to avoid adverse modification of critical habitat for either the Carolina madtom or Neuse River waterdog are not anticipated. Analysis of ecosystem services, such as clean water, or broad benefits of ecosystem services to human populations that may result from critical habitat designations are generally outside the scope of economic considerations for the designation of Carolina madtom and Neuse River waterdog critical habitat, primarily because the uncertainties associated with monetary quantification of these benefits are large.

(17) *Comment:* One commenter suggested that the Service consider the protection of these species to be an environmental justice issue. The commenter provided the U.S. Environmental Protection Agency (EPA) definitions of "environmental justice" (*i.e.*, the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies), "fair treatment" (*i.e.*, no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies), and "meaningful involvement" (*i.e.*, people have an opportunity to participate in decisions about activities that may affect their environment and/or health; the public's contribution can influence the regulatory agency's decision; their

concerns will be considered in the decision making process; and the decision makers seek out and facilitate the involvement of those potentially affected). The commenter further stated that protecting these species and their habitats is an environmental justice imperative, and would have positive benefits for public health and well-being in the Coastal Plain of North Carolina and beyond.

Our Response: For listing actions, the Act requires that we make determinations "solely" on the basis of the best available scientific and commercial data available (16 U.S.C. 1533(b)(1)(A)). Still, we recognize the indirect benefits, including the aesthetic, recreational, and overall health benefits of listing species and designating critical habitat, that this rule may provide for all human communities surrounding and including the habitats that both species occupy.

Neuse River Waterdog

(18) *Comment:* One commenter stated that the Neuse River waterdog should be listed as endangered because of the threat of climate change.

Our Response: As described below in *Neuse River Waterdog: Status Throughout All of Its Range* and in *Neuse River Waterdog: Status Throughout a Significant Portion of Its Range*, we considered whether the Neuse River waterdog is presently in danger of extinction throughout all or a significant portion of its range and determined that endangered status is not appropriate for the species' entire range or for a portion of its range. 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 or a significant portion of its range.

(19) *Comment:* Several commenters indicated that they support the listing of the Neuse River waterdog (and Carolina madtom), as well as the designation of critical habitat to protect and recover both species. However, while they supported the listing and designation of critical habitat, they opposed the 4(d) rule, stating that it would severely limit the effectiveness of other conservation

measures and reduce the likelihood of survival and recovery. One commenter mentioned that the proposed exceptions in the 4(d) rule concerning silviculture practices are an inappropriate and unlawful use of a 4(d) rule and that the Service's proposal to provide for the conservation needs of these sensitive aquatic species via "BMPs" and Sustainable Forestry Initiative/Forest Stewardship Council/American Tree Farm System certification standards is not a serious one. The commenters indicated that the proposed 4(d) rule fails to set forth a protective regulation that provides for the specific conservation needs of the Carolina madtom and Neuse River waterdog.

Our Response: Section 4(d) of the Act states that the Secretary shall issue such regulations as he or she deems necessary and advisable to provide for the conservation of species listed as threatened. Section 4(d) of the Act provides the Secretary with wide latitude of discretion to select and promulgate appropriate regulations tailored to the specific conservation needs of the threatened species. As described below under II. Final Rule Issued Under Section 4(d) of the Act for the Neuse River Waterdog, the provisions of our 4(d) rule will promote conservation of the Neuse River waterdog by encouraging management of the landscape in ways that meet both land management considerations and the conservation needs of the Neuse River waterdog. The prohibitions and exceptions to the prohibitions identified in the 4(d) rule are considered necessary and advisable for the conservation of the Neuse River waterdog.

Development and refinement of forest management BMPs has resulted in substantial improvements to forestry's impacts on water quality in recent decades, and the reduced risks of these practices to water quality justify the Service's inclusion of a 4(d) exception for forestry for the Neuse River waterdog. North Carolina Forestry BMPs, properly implemented, protect water quality and help conserve aquatic species, including the Neuse River waterdog.

The Service has determined that the Carolina madtom meets the definition of an endangered species, and the Act does not allow issuance of a 4(d) rule for a species listed as endangered.

(20) *Comment:* Several comments we received during the reopened comment period (July 30–August 31, 2020), including from the NCFS, indicated the Service did not explain or justify the necessity for a two-zoned SMZ. SMZs wider than those already recommended by State forestry BMPs within the

geographic range of Neuse River waterdog, or the application of SMZs related to Virginia and North Carolina trout waters to waters where the Neuse River waterdog occurs. Some comments further suggested that references to trout rules or BMPs beyond those already required within the range of Neuse River waterdog would be confusing and challenging to implement. Several such comments further questioned any additional conservation benefits that SMZs wider than those currently recommended in State BMPs would provide.

Our Response: It was the Service's intent to provide additional discussion and explanation for the exception under 4(d) resulting from incidental take from certain forestry practices, based on comments received on the May 22, 2019, proposed rule (84 FR 23644). During that comment period, we received several comments stating that the proposed 4(d) rule language, referring to "highest standard BMPs" was too vague or confusing. By referring to BMPs related to trout waters (specifically SMZs), it was the Service's intent to use a frame of reference that would be familiar to forest landowners and managers for species sensitive to sedimentation and thermal effects on stream waters to better explain how the exception would apply, but not to apply those particular parameters. Comments that mentioned trout rules seemed to be referring to the preamble language, rather than the regulation text. The proposed regulation text outlined BMPs, but did not include references to trout. However, we understand that the references to trout waters in the preamble has caused confusion for multiple reasons, in part because the Neuse River waterdog occurs in a region different from trout, and it was not clearly stated how the Neuse River waterdog is similarly sensitive to sedimentation (a primary factor responsible for the derivation of BMPs specific to trout waters). There was also confusion as a result of multiple other regulations and recommended practices that already exist in the Neuse and Tar watersheds where the species occurs (*i.e.*, riparian buffer rules and North Carolina's FPGs) and for which the NCFS maintains a BMP manual with recommended practices for meeting compliance with FPGs. The concerns of the commenters have been carefully considered and addressed by revising the 4(d) rule to specify the habitat management goals necessary to provide for the breeding, feeding, and sheltering needs of the Neuse River waterdog, rather than prescribing a particular

management practice with which to achieve necessary habitat protection (*e.g.*, we removed the two-zoned SMZs of variable width; see II. Final Rule Issued Under Section 4(d) of the Act for the Neuse River Waterdog, below, for revisions).

(21) *Comment:* A couple of commenters stated that SMZs are part of a suite of BMPs and that they should not be proposed alone, indicating that we should include mention of all BMPs in the exception for incidental take.

Our Response: We agree with this comment and note that the Service proposed the exception under section 4(d) for incidental take from certain forestry practices to include multiple State-approved BMPs, highlighting considerations for SMZs because of their importance to stream habitat, along with considerations for stream crossings, skid trails, and access roads. However, during both comment periods, commenters have demonstrated particular concern over that portion of the proposed exception on forestry SMZs. As noted in the previous response, we have revised this exception for incidental take under section 4(d) by removing the requirement of a two-zoned SMZ; the revision now includes exceptions for take associated with practices following forestry BMPs so that it will not add confusion and will be more practical to implement along with existing FPGs and State-recommended BMPs, while also promoting conservation of Neuse River waterdog and its habitat.

(22) *Comment:* We received many comments stating that State-approved BMPs are sufficient for the protection of the Neuse River waterdog because BMP implementation rates are high. They indicate that because BMP implementation rates are high, we should provide an exception for incidental take for all State-approved BMPs.

Our Response: We agree that when used and properly implemented, BMPs can offer a substantial improvement to water quality compared to forestry operations where BMPs are not properly implemented; it is for this reason that the Service has included an exception for incidental take for forest management that adheres to BMPs in the 4(d) rule for the Neuse River waterdog. The commenters provided information that indicates rates of forestry BMP implementation across the Southeast, and the nation, are generally high. We agree but assert that forest management is not risk-free for wildlife or water quality. Some studies focused on the effects of silvicultural activities on aquatic salamanders have found that

logging-related sedimentation can reduce larval and adult abundance (Lowe et al. 2004, p. 167; Moseley et al. 2008, pp. 303–305), or have synergistic impacts on populations when combined with other stressors (e.g., predatory fishes; Lowe et al. 2004, pp. 167–170), and that wide (~100 ft (30 m)) riparian buffers are needed to offer similar protection as unharvested sites, while narrow (~30 ft (9 m)) buffers had similar effects on salamanders as no buffer at all (Peterman & Semlitch 2009, pp. 10–13). The most recent survey of BMP implementation in North Carolina showed that implementation rates—while averaging 84 percent Statewide and averaging 88–90 percent in the Neuse and Tar-Pamlico River basins—did vary among regions within the State, and they varied with respect to the type of BMP being evaluated (Coats 2017, pp. 8–41). The NCFS reported that BMPs were not applied or properly implemented in 4,584 opportunities in their assessments, and that 30 percent of these cases posed a risk to water quality (Coats 2017, p. 8). The NCFS also reported that 74 percent of all identified risks to water quality were associated with the lack of application or improper implementation of BMPs related to stream crossings (average implementation rate = 79 percent; range 72–83 percent), SMZs (average implementation rate = 86 percent; range 72–91 percent), and post-harvest rehabilitation of a site (average implementation rate = 71 percent; range 53–83 percent) (Coats 2017, pp. 8, 9, 18–19, 26–34). Such incidents of improperly implemented or unused BMPs and their associated risks to water quality and habitat are important to acknowledge in the context of rare, imperiled species, where any one particular localized event may result in further imperilment of a population and set back recovery of the species. Accordingly, we cannot assume that BMPs will unequivocally be implemented.

Development and refinement of BMPs has resulted in substantial improvements to forestry's impacts on water quality in recent decades and has created a culture of water stewardship in the forest landowner community, making this stakeholder group an important ally in the conservation of imperiled species. The reduced risks to water quality justify the Service's inclusion of an exception for incidental take associated with forestry BMPs in the 4(d) rule for the Neuse River waterdog, and the remaining presence of risk supports the need to specify conditions required for the exception to

apply. Incidental take associated with forest management activities in the range of Neuse River waterdog that do not meet the conditions of the exception in the 4(d) rule may still occur via consultation with the Service under section 7, or a conservation agreement under section 10, of the Act.

Because BMPs in North Carolina are voluntary, existing BMPs will be sufficient for the protection of the Neuse River waterdog if, and only if, they are widely implemented in watersheds where the species occurs and are implemented appropriately such that all forest management operations maintain compliance with North Carolina's FPGs and achieve management goals related to conserving and maintaining suitable habitat for the Neuse River waterdog (which closely mirror the FPG requirements). North Carolina Forestry BMPs, properly implemented, protect water quality and help conserve aquatic species, including the Neuse River waterdog. Forest landowners who properly implement those BMPs are helping conserve the waterdog, and this 4(d) rule is an incentive for all landowners to properly implement BMPs to avoid any take implications. Further, those forest landowners who are third-party-certified to a credible forest management standard are providing audited certainty that BMP implementation is taking place across the landscape; thus, the exception for incidental take in the 4(d) rule will apply to their forestry activities.

(23) Comment: Some of the comments about BMPs being sufficient (see *(24) Comment*, above) further suggested that assessments of water quality using aquatic insects as indicators confirm that BMPs are protective of water quality and habitat for aquatic species. Therefore, BMPs are sufficient for protecting Neuse River waterdogs as well.

Our Response: Much of the literature shared by commenters on the effectiveness of BMPs for protecting aquatic species and their habitats relies on aquatic macroinvertebrate assessments, mostly of aquatic insects. While they are a common rapid field assessment method for monitoring or measuring water quality, current scientific information does not support the assumption made by several commenters that presence or recovery of insects is a proxy for suitable habitat recovery after disturbance (i.e., a sedimentation event) for aquatic salamanders like the Neuse River Waterdog, or a proxy for recolonization of waterdogs after such a disturbance. While reliance on effects to aquatic insect communities is a useful rapid

assessment tool for water quality, there is a gap in the best available science about how that resilience relates to comparatively long-lived vertebrates, such as salamanders (e.g., Neuse River waterdog). Some research comparing how macroinvertebrate assessments relate to those of other taxa (e.g., amphibians, fishes, or zooplankton) indicates that they do not correspond well in evaluations of watershed land use or anthropogenic effects on water quality and water resources (e.g., Brazner et al. 2007, pp. 625–627; Kovalenko et al. 2019, entire; Herlihy et al. 2020, entire). Further, some studies recommend using assessments from multiple taxa to better evaluate the response of biological integrity in streams to anthropogenic activities (Herlihy et al. 2020, p. 10; Hughes et al. 2000, pp. 437–440). Since aquatic amphibians are long-lived and exhibit a high degree of site fidelity, these taxa may be a more reliable indicator of stream condition than macroinvertebrates or fishes (Welsh and Ollivier 1998, pp. 1128–1129). The risks of water quality impacts to many taxa highlighted the utility of aquatic insect assessments for evaluating forestry BMPs, along with the need for research on forestry BMP effectiveness for the protection of taxa other than aquatic insects (Warrington et al. 2017, entire).

Most aquatic insects are not considered rare species, and immigration by aquatic insects back into an affected stream reach may be facilitated by downstream drift or other mechanisms, including the adult winged flight stage, which allows immigration from other nearby waterbodies or from downstream reaches. The Neuse River waterdog is a rare, obligate aquatic salamander with different ecological requirements and a decades-long lifespan, compared to the shorter lifespan and aquatic larval phase of macroinvertebrate insects typically emphasized in assessments (e.g., aquatic phases ranging less than 1 to 2 years for many mayflies (Ephemeroptera; Voshell 2002, p. 270); 1 to 2 years for many stoneflies (Plecoptera; Voshell 2002, p. 310); less than 1 to 2 years for most caddisflies (Trichoptera; Voshell 2002, p. 375)). Extirpation of the Neuse River waterdog from a stream reach after an impact to the population (e.g., a sedimentation event that kills eggs or renders leaf packs unsuitable as foraging habitat) would have lasting consequences, and recolonization can be hampered by factors that are less problematic for non-rare aquatic insect species, such as instream barriers to migration, distance to the next

population, permanent or long-term alteration of streambed habitat that reduces its suitability for supporting the species (e.g., filling of habitat crevices used for nesting and home range retreats with fine sediments), and a much longer generation time than most insects (approximately 6 years; Service 2021b, p.7).

(24) *Comment:* Some commenters stated that the Service did not provide evidence that the Neuse River waterdog is a sensitive species, and at least one commenter stated that failure to describe its sensitivity or similarity to trout sensitivity is arbitrary and capricious.

Our Response: As discussed above, the Act requires that we make determinations solely on the basis of the best available scientific and commercial data available (16 U.S.C. 1533(b)(1)(A)). In making these determinations, we consider the ecological requirements of the species and how they are affected by the various factors. We included several details related to the ecological requirements of the Neuse River waterdog (e.g., flow, dissolved oxygen), referenced the SSA report, and included a summary of risk factors to the species in the proposed rule published on May 22, 2019 (84 FR 23644). We further provided information in the document published on July 30, 2020 (85 FR 45839), including statements on the effects of sedimentation (e.g., “Highly turbid, silted stream water can clog the external gills of waterdogs, and can also decrease the stream’s insect population, an important source of food (Service 2021b, p. 8)” (85 FR 45839, July 30, 2020, p. 85 FR 45843)). The commenters may not have realized that the July 30, 2020, document presenting revisions to the proposed rule was not a complete reproposal; it presented only the substantive proposed revisions to the May 22, 2019, proposed rule. However, the concerns of the commenters have been carefully considered and addressed by removing references to trout and revising the final rule and SSA report to include more detailed information about the Neuse River waterdog, its habitat requirements, and sensitivity to threats, particularly sedimentation, using the best available scientific information about this species and relevant information from related species (i.e., gilled, aquatic salamanders). These revisions provide evidence and justification that the Neuse River waterdog is a sensitive species in need of protection from risk factors that threaten survival, persistence, and habitat.

(25) *Comment:* A few commenters highlighted proposed or final rules for

other aquatic species that they say indicate a Service precedent for accepting State-approved forestry BMPs as sufficient for protection of a species (i.e., they appear as an exception to the take prohibition) in a 4(d) rule. They indicated this precedent should apply to the 4(d) rule for Neuse River waterdog. Two related comments expressed concern that this rule would set a precedent not founded in the best available scientific information, if finalized with forest management requirements in the 4(d) exceptions that exceed State-recommended BMPs for the areas in which the Neuse River waterdog occurs.

Our Response: First, 4(d) rules for threatened species are intended to establish species-specific regulations to provide for the conservation of a threatened species, and may incentivize beneficial actions for the species and reduce the regulatory burden on forms of take that are compatible with the conservation of the species. The 4(d) rules provide protection necessary and advisable to conserve the Neuse River waterdog by outlining prohibitions for the protection of the species, and if appropriate, any exceptions from the prohibitions. The species-specific nature of the rules indicates they do not set a precedent for other species. It may be practical to consider implications of how 4(d) rules are implemented for species that have overlapping geographic ranges and habitat needs, but we do not agree with the premise that any 4(d) rule sets a precedent for another species. Second, several of the comments referenced language that was not provided in the context of discussions for threatened species and a 4(d) rule and is irrelevant in this context. For example, commenters referenced language that refers to Alabama’s forestry BMPs in the Summary of Factors Affecting the Species discussion in the final rule listing the Black Warrior waterdog (*Necturus alabamensis*) as endangered (83 FR 257, January 3, 2018, see p. 83 FR 263). Other comments we received referred to language for critical habitat designation—not for species listing and 4(d) rules—that listed BMPs among activities that can ameliorate threats to critical habitat. Comments also referenced the pearl darter (*Percina aurora*), a species listed as threatened in 2017 when the blanket 4(d) rule applied, extending all endangered species protections to threatened species; that listing rule (82 FR 43885; September 20, 2017) included silviculture with BMPs among actions unlikely to result in a violation of the

Act’s section 9, and it also listed poor silviculture among the factors affecting the species. Finally, some comments referenced the trispot darter (*Etheostoma trisella*), which is a threatened species with a species-specific 4(d) rule that includes an exception to the incidental take prohibitions for take associated with silviculture. The final 4(d) rule for the trispot darter (85 FR 61614; September 30, 2020) includes an exception for incidental take resulting from silviculture practices and forest management activities. Conditions of this exception include requirements for implementing State BMPs for SMZs, stream crossings, and forest roads, among others; removal of logging debris from channels; and a temporal window that only allows for the exception outside of that species’ spawning season (i.e., the exception only applies for a portion of the year). Although the trispot darter final 4(d) rule is the most relevant among the commenters’ examples (i.e., a threatened species with a 4(d) rule exception for silviculture), the Service is required to make the listing determination for the Neuse River waterdog based on the best available science and develop a species-specific 4(d) rule based on what is necessary and advisable to provide for the conservation of this particular species. The Service’s offices operate within discrete geographic regions, in part, to facilitate partnerships with State and other Federal agencies, Tribal communities, industry, and other nongovernmental organizations in their work area; through these partnerships, we are well poised to consider existing local environmental rules, local environmental conditions, and other factors, and to tailor the management needs of species. Prohibitions and exceptions for a threatened species outlined in its 4(d) rule are specific to the considerations for that particular species.

The species-specific nature of 4(d) rules is inherently resistant to precedent setting, because the Service must consider the needs of the species being listed as threatened and issue regulations deemed necessary and advisable to provide for the conservation of that species. The proposed 4(d) rule for the Neuse River waterdog did not prescribe management restrictions; rather, it outlined prohibitions (e.g., take) to ensure the species and its habitat are not adversely affected, and exceptions to those prohibitions for incidental take resulting from activities that are not expected to adversely affect the species, and may

provide conservation benefits. The 4(d) exceptions provide specific information on the conditions required for being excepted from incidental take; they do not prohibit other forms of silvicultural management. Those activities not falling within the stated exceptions simply would require consultation with the Service under section 7, or a conservation agreement under section 10, of the Act. The 4(d) rule's exceptions, including the conditions necessary to meet those exceptions, are intended to provide some relief from regulatory burden, while avoiding adverse impacts to the species and adverse modification of the species' habitat.

(26) Comment: Several commenters requested that the Service revise the proposed 4(d) rule to remove language referring to BMPs we find necessary for the conservation of the Neuse River waterdog and to only reference State-approved BMPs without addition or modification.

Our Response: The Service's regulations typically do not refer to non-Federal rules, regulations, or guidance because doing so would result in an "incorporation by reference," which means that the referenced non-Federal document would be considered a de facto Federal regulation, and each time that non-Federal document is updated or revised, we would have to go through rulemaking to update our regulations. Regulatory references are typically restricted to existing conservation regulatory requirements for species under another Federal statute or international agreement (e.g., Marine Mammal Protection Act (MMPA; 16 U.S.C. 1361 *et seq.*); Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES; 27 U.S.T. 1087)). State-approved BMPs for forestry are not species conservation regulatory requirements. Furthermore, the North Carolina Forestry BMP manual does not represent a law or requirement; it is a set of recommended practices for achieving compliance with North Carolina's FPGs, and the manual is subject to change. In fact, the NCFS has recently proposed revisions to the BMP manual (Gerow 2020, pers. comm.); this highlights the need to provide specific information for the conservation of a species in the text of the regulation. The Act guides the Service to establish a species-specific 4(d) rule for threatened species, including language stating the prohibitions and potential exceptions for the protection of the species.

(27) Comment: During the reopened comment period (July 30–August 31, 2020), several commenters submitted

form letters using identical language stating that compliance with North Carolina's BMPs should be sufficient to protect a landowner from prosecution for an illegal take of the Neuse River waterdog.

Our Response: Illegal take of a species under protection of the Act is always prohibited. Take is only allowed by individuals who have appropriate permits or whose activities are covered by exceptions for incidental take; 50 CFR 17.3 defines "incidental taking" as any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. The 4(d) rule for the Neuse River waterdog applies all of the Act's section 9 take prohibitions, with certain exceptions from those prohibitions, including incidental take associated with four activity categories (species recovery by State agencies, channel restoration projects, bank stabilization projects, and silvicultural practices and forest management activities). To meet the 4(d) rule exception, maximum and proper implementation of State-approved BMPs is required and will ensure the excepted activity will avoid any take implications. However, we emphasize that illegal take (*i.e.*, activities not covered by an exception or by consultation with the Service) is prohibited.

(28) Comment: During the reopened comment period (July 30–August 31, 2020), two commenters, including the NCFS and VDOF, offered alternative language for the entirety of the silvicultural component of the proposed 4(d) rule. They noted that this alternative language was drafted with the intent of applicability in targeted watersheds of the eastern Piedmont and Upper Coastal Plain regions of North Carolina. The alternative language states an exception to the take prohibitions for: Forestry-related activities, including silvicultural practices, forest management work, and fire control tactics, that achieve all of the following: (1) Establish a streamside management zone alongside the margins of each occupied waterway; (2) restrain visible sedimentation caused by the forestry-related activity from entering the occupied waterway; (3) maintain groundcover within the streamside management zone of the occupied waterway, and promptly re-establish groundcover if disturbed; (4) limit installation of new vehicle or equipment crossings of the occupied waterway to only where necessary for the forestry-related activity. Such crossings must have erosion and sedimentation control measures installed to divert surface

runoff away and restrain visible sediment from entering the waterway, allow for movement of aquatic organisms within the waterway, and have groundcover applied and maintained through completion of the forestry-related activity; (5) prohibit the use of tracked or wheeled vehicles for reforestation site preparation within the streamside management zone of the occupied waterway; (6) prohibit locating log decks, skid trails, new roads, and portable mill sites in the streamside management zone of the occupied waterway; (7) prohibit obstruction and impediment of the flow of water, caused by direct deposition of debris or soil by the forestry-related activity, within the occupied waterway; (8) maintain shade over the occupied waterway similar to that observed prior to the forestry-related activity; and (9) prohibit discharge of any solid waste, petroleum, pesticide, fertilizer, or other chemical into the occupied waterway.

Our Response: The Service agrees with the comment and has revised the 4(d) rule language to reflect these suggested changes for the forestry exception. We recognize forestry management that implements State-approved BMPs protects water quality, and we realize that, in order to meet specific goals, flexibility is needed with regard to which BMPs are used during management. This final 4(d) rule provides practitioners the flexibility to choose which BMPs to use in their forestry activities while providing for the conservation of the species. We emphasize here that we deemed those revisions necessary because of concerns about confusion and challenging implementation related to multiple sets of forestry-related rules and guidelines already in place within the geographic region of Neuse River waterdog. As revised, this exception to incidental take prohibition, when properly implemented, will promote forestry management activities while also providing for the conservation the Neuse River waterdog.

(29) Comment: One commenter recommended that the Service remove references to silviculture being a potential source of pollution in the description of critical habitat units, indicating that the forestry sector in general believes that, although statements about silvicultural runoff as a source of pollution may have had some credence a generation or more ago, the advent of BMPs, their proven effectiveness, and their high implementation rates call for the elimination of these statements, and those similar to it, in a modern 4(d) rule.

Our Response: The Service acknowledges that there are multiple sources of sedimentation and other pollutants; we have removed the statements about silvicultural runoff as a source of pollution and replaced it with language about management activities that will benefit habitat for the species in the description of critical habitat units. In addition, we agree that the best available science indicates that proper implementation of forestry BMPs reduces negative effects on water quality outcomes compared to historical silvicultural practices or those that do not apply or properly implement BMPs. Although BMPs generally are implemented at high rates, they are not universally applied or always properly implemented, and forest management activities can still contribute to sediment pollution in a watershed. As noted in our response to (22) *Comment*, above, the most recent assessment of BMP implementation by the NCFS reported that the majority of risks to water quality identified during the assessment were associated with forest managers' failure to use or properly apply BMPs related to SMZs, stream crossings, and post-harvest restoration (Coats 2017, pp. 8–34). Moreover, as noted in our response to (23) *Comment*, above, metrics for BMP effectiveness are often associated with responses of macroinvertebrate insects; while such metrics are useful, there is no evidence to support that insect metrics capture the responses of benthic vertebrates, such as the Neuse River waterdog, to the effects of sedimentation on their habitat. One study examining the effects of silvicultural practices on salamanders reported that larval salamander abundance was negatively associated with stream embeddedness, as a result of sedimentation, at the reach scale, and overall, larval salamander abundance decreased with increasing harvested timber volume and increased with time after harvests (Moseley et al. 2008, pp. 303–305).

I. Final Listing Determinations

Background

Carolina Madtom

A thorough review of the taxonomy, life history, and ecology of the Carolina madtom is presented in the SSA report (Service 2021a, pp. 5–8).

The Carolina madtom (*Noturus furiosus*) 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 1.0 to 3.0 feet (0.3 to 0.9 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).

Neuse River Waterdog

A thorough review of the taxonomy, life history, and ecology of the Neuse River waterdog is presented in the SSA report (Service 2021b, pp. 5–10).

The Neuse River waterdog (*Necturus lewisi*) is a permanently aquatic salamander species endemic to the Neuse and Tar-Pamlico 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*, and one of three species of *Necturus* in North Carolina. Similar to the endangered Black Warrior waterdog (*Necturus alabamensis*) and several other permanently aquatic salamanders with similar life history and ecology, stream bottom substrate composition is also important for Neuse River

waterdogs: Gravel, cobble, or coarse sand substrates, with ample cover, that are free of fine sediments are commonly associated with the species.

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, 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 10 cm per 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. As with other permanently aquatic salamanders, when interstitial spaces between substrates become compacted or filled with fine sediment, the amount of available foraging habitat and protective cover for salamanders is reduced, resulting in population declines (83 FR 257; January 3, 2018).

The longevity of Neuse River waterdogs is not known; however, their close relative *N. maculosus* may live for 30 or more 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 to 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, typically under large rocks with sand and gravel beneath them, or under similar cover (e.g., logs, holes in banks) in coastal rivers where rocky habitat is limited, and then guard the rudimentary nest.

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and its implementing 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.

The Act does not define the term “foreseeable future,” which appears in the statutory definition of “threatened species.” Our implementing regulations at 50 CFR 424.11(d) set forth a framework for evaluating the foreseeable future on a case-by-case basis. The term “foreseeable future” extends only so far into the future as the Services can reasonably determine that both the future threats and the species’ responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make reliable predictions. “Reliable” does not mean “certain”; it means sufficient to provide a reasonable degree of confidence in the prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

It is not always possible or necessary to define foreseeable future as a particular number of years. Analysis of the foreseeable future uses the best scientific and commercial data available and should consider the timeframes applicable to the relevant threats and to the species’ likely responses to those threats in view of its life-history characteristics. Data that are typically relevant to assessing the species’ biological response include species-specific factors such as lifespan, reproductive rates or productivity, certain behaviors, and other demographic factors.

Our proposed rule described “foreseeable future” as the extent to which we can reasonably rely on predictions about the future in making determinations about the future conservation status of the species. The Service since codified its understanding of foreseeable future in 50 CFR 424.11(d) (84 FR 45020). In those regulations, we explain the term “foreseeable future” extends only so far into the future as the Service can reasonably determine that both the future threats and the species’ responses to those threats are likely. The Service will describe the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species’ life-history characteristics, threat-projection timeframes, and environmental

variability. The Service need not identify the foreseeable future in terms of a specific period of time. These regulations did not significantly modify the Service’s interpretation; rather they codified a framework that sets forth how the Service will determine what constitutes the foreseeable future based on our long-standing practice. Accordingly, though regulations do not apply to the final rule for the Carolina madtom and Neuse River waterdog because they were proposed prior to their effective date, they do not change the Service’s assessment of foreseeable future for the Carolina madtom and Neuse River waterdog as contained in our proposed rule and in this final rule.

Analytical Framework

The SSA reports document the results of our comprehensive biological review of the best scientific and commercial data regarding the status of each species, including an assessment of the potential threats to each species. The SSA report does 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. It does, however, provide the scientific basis that informs our regulatory decisions, which involve 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 at Docket No. FWS-R4-ES-2018-0092 and on <http://www.regulations.gov>.

To assess viability of Carolina madtom and Neuse River waterdog, we used the three conservation biology principles of resiliency, redundancy, and representation (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), redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation supports the ability of the species to adapt over time to long-term changes in the environment (for example, climate changes). In general, the more resilient and redundant 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 evaluated the 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 process involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences. Throughout all of these stages, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We use this information to inform our regulatory decision.

Summary of Biological Status and Threats

In this discussion, we review the biological condition of each species and its resources, and the threats that influence each species' current and future condition, in order to assess the species' overall viability and the risks to that viability.

Carolina Madtom

To evaluate the current and future viability of the Carolina madtom, we considered a range of conditions to allow us to assess the species' resiliency, representation, and redundancy. We assessed resiliency for the Carolina madtom using population factors (Management Unit (MU) occupancy over time, approximate abundance, and recruitment) and habitat elements (water quality, water quantity, habitat connectivity, and instream substrate). For the purposes of this assessment, populations were delineated using the same three river basins that Carolina madtoms have historically occupied, namely the Tar, Neuse, and Trent River basins. Populations were further delineated using MUs, defined as one or more hydrologic unit code (HUC) 10 watersheds that species experts identified as the most appropriate unit for assessing population-level resiliency. To assess resiliency, we analyzed population factors as well as habitat elements that were determined in our analysis of the species' needs to have the most influence on the species. 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 the SSA report (Service 2021a, pp. 15–19).

Metrics that speak to a species' adaptive potential, such as genetic and ecological variability, can be used to assess representation. Representation for the Carolina madtom can be described in terms of ecological variation seen in 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 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 streams and rivers in the Tar-Pamlico, Neuse, and Trent basins, with documented historical distribution in 31 HUC10s in 11 MUs across the three populations (see Table 1, below). The results of surveys conducted from 2011 to 2018 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 9 of the 31 historically occupied HUC10s (with "currently" defined as the observation of at least one specimen from 2011 to 2018), 7 of which are in the Tar River basin and 2 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.

TABLE 1—POPULATION AND MANAGEMENT UNIT (MU) NAMING FOR CAROLINA MADTOM

Population/management unit
Tar:
Upper Tar.
Middle Tar.
Lower Tar.
Fishing Creek Subbasin.
Sandy-Swift.
Neuse:
Upper Neuse.
Middle Neuse.
Lower Neuse.
Little River.
Contentnea Creek.

TABLE 1—POPULATION AND MANAGEMENT UNIT (MU) NAMING FOR CAROLINA MADTOM—Continued

Population/management unit
Trent:
Trent.

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 percent) and moderate variability in the Piedmont (56 percent).

The range of the Carolina madtom has always been very narrow, limited to the Tar, Neuse, and Trent River drainages. Within the identified representation areas, the species retains redundancy within the Tar River population (three MUs currently extant); however, it has limited redundancy (two MUs extant) in the Neuse River population and no redundancy (extirpated) in the Trent River population. Overall, the species has lost 55 percent of its redundancy across its narrow, endemic range.

Neuse River Waterdog

To evaluate the current and future viability of the Neuse River waterdog, we assessed a similar range of conditions as described above for Carolina madtom to allow us to consider the species' resiliency, representation, and redundancy. As with the madtom, populations were delineated using the three river basins that Neuse River waterdogs have historically occupied (*i.e.*, Tar-Pamlico, Neuse, and Trent River basins). "Tar-Pamlico" refers to the lower portion of the Tar River basin, which includes the Pamlico River. Because the river basin level is at a very coarse scale, populations were further delineated using MUs. MUs were defined as one or more HUC10 watersheds that species experts identified as most appropriate for assessing population-level resiliency. Resiliency is characterized, and overall population condition rankings and habitat condition rankings were determined, similarly as for the madtom.

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). Redundancy for the Neuse River waterdog is defined as multiple highly 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.

Current Condition of Neuse River Waterdog

The historical range of the Neuse River waterdog included third and fourth order sized streams and rivers in the Tar-Pamlico, Neuse, and Trent basins, with documented historical distribution in 40 HUC10s in nine MUs across the three populations (see Table 2, below). Currently, the Neuse River waterdog is extant in all nine identified MUs; however, within those MUs, it is presumed extirpated from 35 percent (14 out of 40) of the historically occupied HUC10s, and another 25 percent of the streams are in low or very low condition. Of the nine MUs, two (22 percent) are estimated to have high resiliency, three (33 percent) moderate resiliency, and four (45 percent) low resiliency. At the population level, one of three populations (Tar-Pamlico) is estimated to have moderate resiliency, and two (Neuse and Trent) are estimated to have low resiliency.

TABLE 2—POPULATION AND MANAGEMENT UNIT (MU) NAMING FOR NEUSE RIVER WATERDOG

Population/management unit
Tar: Upper Tar. Middle Tar. Lower Tar. Sandy-Swift. Fishing Creek Subbasin.
Neuse: Upper Neuse. Middle Neuse. Lower Neuse.
Trent: Trent.

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 percent) and in the Piedmont (67 percent). However, the Piedmont has experienced significant declines in occupancy, with nearly half of the MUs losing species occurrences. Of the 16 historically occupied Piedmont HUC10s, 7 are no longer occupied, and 9 have experienced loss.

Like the madtom, the range of the Neuse River waterdog has always been very narrow, limited to the Tar-Pamlico, 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-Pamlico River population (82 percent) and the Neuse River population (70 percent), but 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.

Factors Influencing Viability of Neuse River Waterdog and Carolina Madtom

Several 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 Carolina madtom and Neuse River waterdog 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.

Development and Pollution

Development refers to urbanization of the landscape, and the effects of urbanization may include alterations to water quality, water quantity, and habitat (both instream and streamside) (Service 2021ab, p. 40). Urbanization increases the amount of impervious surfaces, such as 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 (sediment and pollutants washing into streams), and increased water temperatures due to the surfaces heating the water. Sedimentation, including short-term storm events, has been shown to reduce survival (Honeycutt et al. 2016, pp. 766–767), limit juvenile abundance (Bendik and Dries 2018, pp. 5916–5920), reduce body size (Gray et al. 2004, p. 719), or result in a significant decline in aquatic salamander density in streams (Welsh and Ollivier 1998, pp. 1123–1128; Welsh et al. 2019, pp. 7–10). Concentrations of contaminants, including nitrogen, phosphorus, salts, 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.

Increasing urbanization results in more 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 common impact of road development is improperly constructed culverts at stream crossings. These culverts act as barriers, either because stream 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 and Neuse River waterdogs prefer clean water with permanent flow and are not tolerant of siltation and turbidity. Benthic vertebrates, such as the madtom and waterdog, have disproportionate rates of imperilment and extirpation due to pollution because stream bottoms are often the first habitats affected, particularly by sedimentation. Sedimentation increases embeddedness of stream substrates, making it more difficult for madtoms or salamanders to

burrow (Unger et al. 2020, pp. 121–122) and leaving them more exposed (e.g., to predation). Excess sedimentation influences nest site selection and reduces habitat availability (Guy et al. 2004, pp. 80–82, 85) and is related to a reduction in current distribution of salamanders compared to historical occupancy of sites (Quinn et al. 2013, pp. 78, 81–82). Furthermore, the Carolina madtom is classified as an “intolerant” species according to the North Carolina Division of Water Resources (NCDWR), meaning the species is most affected by environmental perturbations (NCDWR 2013, p. 19). Fine sediments can influence the survival, distribution, and abundance of Neuse River waterdog by “reduc[ing] the availability of food and cover, and hinder[ing] reproduction by smothering nests and eggs” (Braswell and Ashton 1985, p. 28).

All three of the river basins within the range of the Carolina madtom and Neuse River waterdog 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). 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 occur from water pumping for irrigation and when best management practices (BMPs) for conservation are not followed, causing sedimentation, and nutrient and chemical pollution. Sedimentation can fill interstitial spaces of streambed substrates, altering habitat suitability of nesting and retreat sites for madtoms and waterdogs; it can coat leaf litter, diminishing or destroying waterdog foraging habitat; and it can smother and kill eggs. Sedimentation from agriculture has been linked to reduced body size in salamanders and other amphibians (Gray 2002, pp. 23–34, 48, 105; Gray et al. 2004, pp. 719, 727).

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 and may cause direct effects to the species (e.g., death resulting from hypoxia), 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 when concentrated in surface waters. For madtoms and waterdogs, 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 permanently aquatic salamanders, leading in turn to potential 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 or if they fail, these practices can also contribute to the myriad of stressors facing aquatic systems in the Southeast, including North Carolina. Both small- and large-scale clearing of forests have been shown to have a significant impact upon the physical, chemical, and biological characteristics of adjacent small streams (Allan 1995, pp. 324–327; Valente-Neto 2015, p. 116). Clearcutting and harvests in riparian systems can eliminate shade provided by forest canopies, exposing streams to more sunlight and increasing the instream water temperature (Swift and Messer 1971, p. 111; Hewlett and Forston 1982, p. 983; GB Rishel 1982, p. 112; Lynch et al. 1984, p. 161; Allan

1995, p. 325; Keim and Shoenholtz 1999, p. 197; Carroll et al. 2004, p. 275; B.D. Clinton 2011, p. 979; Caldwell et al. 2014, p. 3). The increase in stream temperature and light after deforestation alters the macroinvertebrate and other aquatic species richness and abundance composition in streams (Wenger 1999, p. 35; Caldwell et al. 2014, p. 3). 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 can 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 sensitive habitats. These effects lead to stress and mortality for both species, as discussed above under “Development and Pollution,” and as reported in studies of forestry-related sedimentation effects on survival of aquatic vertebrates (Lowe et al. 2004, entire; Moseley et al. 2008, entire; Peterman & Semlitsch 2009, entire). While BMPs are presently widely adhered to, they were not always common practice, and implementation is not perfect. The most recent surveys of the Neuse and Tar-Pamlico River basins show that the average BMP implementation rate is approximately 88 to 90 percent (Coats 2017, p. 38). Accordingly, while improper implementation is uncommon, failure to implement or inadequate implementation can have negative effects on sensitive aquatic species. Further, the most recent assessment of forestry BMPs in North Carolina reported that improperly implemented BMPs associated with streamside management zones and stream crossings were frequently associated with risks to water quality (Coats 2017, p. 9).

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 (*Pylodictis olivaris*) is an invasive species that most likely impacts Carolina madtom distribution and may also have an impact on Neuse River waterdog 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-Pamlico River basins. It is not known whether 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, contributes to sediment buildup in streams, and can serve as a vector for a neurotoxic cyanobacteria known to affect other vertebrates (e.g., fishes, turtles, waterbirds, and their predators). High sedimentation can cause suffocation, reduce stream flow necessary for madtom and waterdog survival, smother eggs, and degrade leaf pack foraging habitat by causing prey items to abandon them. 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 and control or eradication is difficult.

Red swamp crayfish (*Procambarus clarkii*) is an invasive crayfish species native to the southern Mississippi River drainage in the Gulf Coastal Plain and Florida panhandle to Mexico. Establishment of nonnative populations in eastern North Carolina are likely from release from aquaculture or from the aquarium trade (Nagy et al. 2020, unpaginated). Red swamp crayfish are physical ecosystem engineers, constructing extensive burrows that can collapse stream banks and cause erosion. They are prolific opportunistic omnivores, and they not only outcompete native crayfish but also other native animals, including amphibians like Neuse River waterdog, by reducing their densities in their habitat. Recent surveys have found that when red swamp crayfish are present, Neuse River waterdogs are not (Braswell, Hall, and Humphries 2020, pers. comm.).

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 species can no longer move freely through different habitats and may become genetically isolated from other populations throughout the river. Improperly constructed culverts at stream crossings also 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 aquatic species 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. Contamination of aquatic habitats by coal-combustion residue 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 2021b, 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 Statewide.

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. Tributaries in 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 and 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.

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 instance, effects of sedimentation and predatory fishes on large aquatic salamanders have been found, in which larvae were more affected by predatory fishes and adults were more affected by sedimentation, suggesting that persistence of salamanders was especially threatened in streams with both stressors (Lowe et al. 2004, pp. 164, 167–170). As an example, within Carolina madtom and Neuse River waterdog habitat, there are 182 miles of impaired streams in the Middle Neuse MU. They have low benthic-macroinvertebrate scores, low dissolved oxygen, and low pH, and they 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. 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 than any one factor alone.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA reports, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. Our assessment of the current and future conditions encompasses and incorporates the threats individually and cumulatively. Our current and future condition assessment is iterative because it accumulates and evaluates the effects of all the factors that may be influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative effects analysis.

Conservation Actions

The Service and State wildlife agencies are working with numerous partners to provide technical guidance and offer 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 there has been increased interest in efforts for captive propagation and species population restoration via augmentation, expansion, and reintroduction efforts, especially for the Carolina madtom. However, some of these programs are in their infancy, and currently none provides 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, resiliency, redundancy, and representation 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 Carolina madtom and the Neuse River waterdog. We developed scenarios by eliciting expert information on two main stressors, urbanization and climate change, that will impact the species in the future. The models that were used to forecast both 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 species' life spans, well-developed downscaled climate models specific to the region, and adequate human population 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 2021ab, chapter 5).

In the first scenario, the “Status Quo” scenario, factors that influence current populations of the Carolina madtom and the Neuse River waterdog 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’ (BAU) 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 and Pollution.” The “Status Quo” scenario also assumed that current conservation efforts would remain in place but that no new actions would be taken.

In the second scenario, the “Pessimistic” scenario, factors that negatively influence Neuse River waterdog and the Carolina madtom populations get worse; reflecting Climate Model representative concentration pathway (RCP) 8.5 (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 (slope, land use, exclusion, urban, transportation, and hillshade) 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.

In the third scenario, labeled the “Optimistic” scenario, 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 RCP 2.6 (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 would have slightly positive responses. 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 the fourth scenario, 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 RCP 4.5 (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 SLEUTH BAU 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, water flow, and habitat connectivity will negatively affect both species, although current land

conservation efforts will benefit the species in some watersheds.

Future Conditions of the Carolina Madtom and Neuse River Waterdog

For details regarding the predicted future under each scenario, see chapter 6 of the SSA reports for each species (Service 2021ab).

Estimates of future resiliency for the Carolina madtom are low, as are estimates for representation and redundancy. Similarly, estimates of future resiliency for the Neuse River waterdog are moderate to low, as are estimates for representation and redundancy. Both species face a variety of risks from declines in water quality, loss of stream flow, riparian and instream fragmentation, and deterioration of instream habitats, and the madtom is particularly susceptible to predation from the invasive flathead catfish. These risks, which are expected to be exacerbated by urbanization and climate change, were important factors in our assessment of the future viability of the Carolina madtom and Neuse River waterdog. Given losses of resiliency, populations become more vulnerable to extirpation, resulting in concurrent losses in representation and redundancy. Predictions of Carolina madtom habitat conditions and population factors suggest possible extirpation in one of two currently extant populations. The one population predicted to remain extant (Tar) is expected to be characterized by low occupancy and abundance. Predictions of Neuse River waterdog habitat conditions and population factors suggest possible extirpation in two of three currently extant populations. Similar to the madtom, the one waterdog population predicted to remain extant (Tar-Pamlico) is expected to be characterized by low occupancy and abundance in the future.

Determinations of Carolina Madtom and Neuse River Waterdog Status

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of “endangered species” or “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 a species meets the definition of “endangered species” or “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.

Carolina Madtom: Status Throughout All of Its Range

The historical range of the Carolina madtom included third and fourth 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 55 percent (6) of the historically occupied MUs. Of the five MUs that remain occupied, one is estimated to have high resiliency, one with moderate resiliency, two 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 current conditions as assessed in the Carolina madtom SSA report show that 55 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. The one moderately resilient population (Tar) was determined not to be sufficient for the species to withstand catastrophic events, nor is it sufficient to enable the species to maintain adaptive capacity. Therefore 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. Because the species is already in danger of extinction throughout its range, a threatened status is not appropriate.

Carolina Madtom: Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. We have determined that the Carolina madtom is in danger of extinction throughout all of its range, and accordingly, did not undertake an analysis of any significant portions of its range. Because we have determined that the Carolina madtom warrants listing as endangered throughout all of its range, our determination is consistent with the decision in *Center for Biological Diversity v. Everson*, 2020 WL 437289 (D.D.C. Jan. 28, 2020), in which the court vacated the aspect of the Final Policy on Interpretation of the Phrase “Significant Portion of Its Range” in the Endangered Species Act’s Definitions of “Endangered Species” and “Threatened Species” (79 FR 37578; July 1, 2014) that provided the Service does not undertake an analysis of significant portions of a species’ range if the species warrants listing as threatened throughout all of its range.

Carolina Madtom Determination of Status

Our review of the best available scientific and commercial information indicates that the Carolina madtom meets the Act’s definition of an endangered species. Therefore, we are listing the Carolina madtom as an endangered species in accordance with sections 3(6) and 4(a)(1) of the Act.

Neuse River Waterdog: Status Throughout All of Its Range

The historical range of the Neuse River waterdog likely included all third and fourth order streams and rivers throughout the Tar-Pamlico, Neuse, and Trent drainages, with documented historical distribution in nine MUs within three populations. Of those nine occupied MUs, two (22 percent) are estimated to have high resiliency, two (22 percent) moderate resiliency, and five (56 percent) low resiliency. Scaling up from the MU to the population level, one of three populations (the Tar population) is estimated to have moderate resiliency, and two (the Neuse and Trent populations) are 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 would be in moderate condition, four would be 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. Five 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 were 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 would be 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, 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.

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we predict that the population and habitat factors used to determine the resiliency, representation, and redundancy for the Neuse River waterdog will continue to decline. Thus, after assessing the best available information, we conclude that the Neuse River waterdog is not currently in danger of extinction, but is likely to become in danger of extinction within the foreseeable future throughout all of its range.

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 reliably predict both the future threats and the species' responses to those threats over 50 years as presented in the models of predicted urbanization and climate change.

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. Accordingly, we find the Neuse River waterdog warrants listing as threatened because it is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Neuse River Waterdog: Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. The court in *Center*

for Biological Diversity v. Everson, 2020 WL 437289 (D.D.C. Jan. 28, 2020) (*Center for Biological Diversity*), vacated the aspect of the Final Policy on Interpretation of the Phrase "Significant Portion of Its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species" (79 FR 37578; July 1, 2014) that provided that the Service does not undertake an analysis of significant portions of a species' range if the species warrants listing as threatened throughout all of its range. Therefore, we proceed to evaluate whether the species is endangered in any significant portion of its range—that is, whether there is any portion of the species' range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion. Depending on the case, it might be more efficient for us to address the "significance" question or the "status" question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

Following the court's holding in *Center for Biological Diversity*, we now consider whether there are any significant portions of the species' range where the species is in danger of extinction now (*i.e.*, endangered). In undertaking this analysis for Neuse River waterdog, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered.

For the Neuse River waterdog, we considered whether the threats are geographically concentrated in any portion of the species' range at a biologically meaningful scale. We examined the following threats: Declines in water quality, loss of stream flow, riparian and instream fragmentation, deterioration of instream habitats, and cumulative effects. We found a concentration of threats in the Trent River basin and the Upper and Middle Neuse River portions of the Neuse River waterdog's range. The species has experienced declines throughout its range, but most notably in the Piedmont portions of the upper and Middle Neuse River basin and the southern portion of its range, the Trent River basin.

The Neuse River waterdog population in the Trent has experienced a 67 percent decline in redundancy, with overall very low resiliency currently.

Agriculture practices and CAFOs, numerous in the southeastern coastal plain of North Carolina, particularly in the Trent River basin, contribute to poor water quality and fragmented or deteriorated instream habitats, influencing resiliency of Neuse River waterdogs in this portion of the range.

The waterdog populations in the Upper and Middle Neuse basin also exhibit current low resiliency with only a 10 to 30 percent probability of species' persistence. Exceptionally high development pressure from the expanding Triangle Region of central North Carolina has contributed to declines in water quality, loss of stream flow, fragmentation of riparian and instream habitats, and overall deterioration of instream habitat for the Neuse River waterdog.

Since these management units have seen populations reduced to very low condition, this circumstance—in combination with the other threats acting on the species throughout its range—may indicate that there is a concentration of threats in these basins such that the species may be in danger of extinction in these portions of the range.

Small, isolated populations often exhibit reduced levels of genetic variability, which diminishes the species' capacity to adapt and respond to environmental changes, thereby decreasing the probability of long-term persistence. Small populations may experience reduced reproductive vigor, for example, due to inbreeding depression. Isolated individuals may have difficulty reproducing. The problems associated with small population size and vulnerability to random demographic fluctuations or natural catastrophes are further magnified by synergistic interactions with other threats, such as those discussed above. Based on our review of information and the synergistic effects of threats exacerbated by the very low-condition populations in the Trent, Upper Neuse, and Middle Neuse basins, we find that there is information that the populations in these basins may be in danger of extinction.

Because we have determined that the Trent, Upper Neuse, and Middle Neuse basins are portions of the range that may be in danger of extinction, we next evaluate whether those portions of the range may be significant. As an initial note, the Service's most recent definition of "significant" within agency policy guidance has been invalidated by court order (see *Desert Survivors v. Dep't of the Interior*, No. 16-cv-01165 (N.D. Cal. Aug. 24, 2018)). Therefore, for purposes of this analysis,

the Service is evaluating potentially significant portions of the range by applying any reasonable definition of “significant” in terms of its biological importance. Factors we considered in the “significance” analysis were: (1) Whether the portion is large geographically or in its contribution to resiliency, redundancy, and representation relative to the remainder of the range; (2) whether the portion contains high-quality habitat relative to the remainder of the range; (3) whether the portion constitutes high-value or unique habitat for the species; or (4) whether the portion contains habitat that is essential to the life history, and therefore the overall conservation, of the species.

We examined the first question of whether these portions could be significant portions of the Neuse River waterdog’s range by examining their contribution to the resiliency, redundancy, and representation of the species. We determined that the Trent MU contains 1 out of 20 occupied HUC10 watersheds identified in the SSA report; thus, the Trent represents approximately 5 percent of the geographical range of the species. Similarly, the Upper Neuse MU contains 1 out of 20 HUC10 watersheds, or approximately 5 percent of the range as well. The Middle Neuse MU contains 4 out of 20 HUC10 watersheds, or approximately 20 percent of the geographical range. Currently, these areas individually or together (representing approximately 30 percent) represent a small portion of the waterdog’s geographical range. Because these units collectively have few healthy populations, they are not currently contributing in an important way to the species’ overall resiliency.

Neuse River waterdog populations are distributed over two physiographic regions in three river basins, and we considered geographic range as a surrogate for geographic variation and proxy for potential local adaptation and adaptive capacity. The Piedmont streams in the upper and middle Tar and upper and middle Neuse river basins contain similar features and instream habitats as those of the Coastal Plain streams in the lower Tar-Pamlico, lower Neuse, and Trent River basins. There are no data indicating genetic or morphological differentiation between the three river basins for the species. Further, the waterdog occurs in similar aquatic habitats and does not use unique observable environmental or behavioral characteristics attributable to any of the basins. Therefore, it exhibits similar basin-scale use of habitat.

At a management unit level, the Trent, Upper Neuse, and Middle Neuse MUs occur in stream habitat comprised of similar substrate types to the other MUs where the Neuse River waterdog performs the important life-history functions of breeding, feeding, and sheltering, and occurs in areas with water quality sufficient to sustain these essential life-history traits. The Trent, Upper Neuse, and Middle Neuse do not act as a refugia for the species or as an important spawning ground. Since the waterdog occurs in similar aquatic habitats, the Trent, Upper Neuse, and Middle Neuse exhibit similar habitat use as populations in the remainder of the range. Therefore, there is no unique, observable environmental usage or behavioral characteristics attributable to just the Trent, Upper Neuse, and Middle Neuse MUs.

Overall, we found no substantial information that would indicate the Trent, Upper Neuse, or Middle Neuse are portions of the range that may be significant in terms of their overall contribution to the species’ resiliency, redundancy, and representation, or that they may be significant in terms of high-quality habitat or habitat that is otherwise important for the species’ life history. As a result, we determined there is no portion of the Neuse River waterdog’s range that constitutes a significant portion of the range. This is consistent with the courts’ holdings in *Desert Survivors v. Department of the Interior*, No. 16–cv–01165–JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d, 946, 959 (D. Ariz. 2017). Accordingly, we determine that the species is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Determination of Neuse River Waterdog Status

Our review of the best available scientific and commercial information indicates that the Neuse River waterdog meets the Act’s definition of a threatened species. Therefore, we are listing the Neuse River waterdog as a threatened species in accordance with sections 3(20) 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. Section 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 identifies recovery criteria for review of when a species may be ready for reclassification from endangered to threatened (“downlisting”) or removal from protected status (“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 outline, draft recovery plan, and the final recovery plan will be available on our website (<http://www.fws.gov/endangered>), 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.

Following publication of this final rule, 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 will be eligible for Federal funds to implement management actions that promote the protection or recovery of the Carolina madtom and Neuse River waterdog. Information on our grant programs that are available to aid species recovery can be found at: <http://www.fws.gov/grants>.

Please let us know if you are interested in participating in recovery efforts for the Carolina madtom and Neuse River waterdog. Additionally, we invite you to submit any new information on this 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 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)(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 any endangered or threatened 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.

Carolina Madtom

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered wildlife. The prohibitions of section 9(a)(1) of the Act, codified at 50 CFR 17.21, 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) endangered 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 species listed as an endangered species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to employees of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22. With regard to endangered wildlife, a permit may be issued for the following purposes: For scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities. 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 listing on proposed and ongoing activities within the range of the listed species. At this time, we are unable to identify specific activities that would not be considered to result in a violation of section 9 of the Act because the Carolina madtom occurs in a variety of habitat conditions across its range and it is likely that site-specific conservation measures may be needed for activities that may directly or

indirectly affect the species. Based on the best available information, the following activities may potentially result in a violation of section 9 of the Act if they are not authorized in accordance with applicable law; this list is not comprehensive:

- (1) Unauthorized handling or collecting of the species;
- (2) Destruction/alteration of the species' habitat by discharge of fill material, draining, ditching, tiling, pond construction, stream channelization or diversion, or diversion or alteration of surface or ground water flow into or out of the wetland (*i.e.*, due to roads, impoundments, discharge pipes, stormwater detention basins, etc.);
- (3) Activities that result in direct or indirect destruction of riparian habitat;
- (4) Modification of the channel or water flow of any stream or removal or destruction of emergent aquatic vegetation in any body of water in which the Carolina madtom is known to occur;
- (5) Discharge of chemicals or fill material into any waters in which the Carolina madtom is known to occur; and
- (6) Pesticide 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**).

Neuse River Waterdog

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 listing on proposed and ongoing activities within the range of a listed species. The discussion below regarding protective regulations under section 4(d) of the Act complies with our policy.

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

Section 4(d) of the Act contains two sentences. The first sentence states that the Secretary shall issue such regulations as he or she deems necessary and advisable to provide for the conservation of species listed as threatened. The U.S. Supreme Court has noted that statutory language like "necessary and advisable" demonstrates a large degree of deference to the agency

(see *Webster v. Doe*, 486 U.S. 592 (1988)). Conservation is defined in the Act to mean the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Additionally, the second sentence of section 4(d) of the Act states that the Secretary may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1), in the case of fish or wildlife, or section 9(a)(2), in the case of plants. Thus, the combination of the two sentences of section 4(d) provides the Secretary with wide latitude of discretion to select and promulgate appropriate regulations tailored to the specific conservation needs of the threatened species. The second sentence grants particularly broad discretion to the Service when adopting the prohibitions under section 9.

The courts have recognized the extent of the Secretary's discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, courts have upheld rules developed under section 4(d) as a valid exercise of agency authority where they prohibited take of threatened wildlife, or include a limited taking prohibition (see *Alsea Valley Alliance v. Lautenbacher*, 2007 U.S. Dist. Lexis 60203 (D. Or. 2007); *Washington Environmental Council v. National Marine Fisheries Service*, 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002)). Courts have also upheld 4(d) rules that do not address all of the threats a species faces (see *State of Louisiana v. Verity*, 853 F.2d 322 (5th Cir. 1988)). As noted in the legislative history when the Act was initially enacted, "once an animal is on the threatened list, the Secretary has an almost infinite number of options available to him with regard to the permitted activities for those species. He may, for example, permit taking, but not importation of such species, or he may choose to forbid both taking and importation but allow the transportation of such species" (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

Exercising this authority under section 4(d), we have developed a rule that is designed to address the Neuse River waterdog's specific threats and conservation needs. Although the statute does not require the Service to make a "necessary and advisable" finding with respect to the adoption of specific prohibitions under section 9, we find that this rule as a whole satisfies the requirement in section 4(d) of the Act to issue regulations deemed necessary and advisable to provide for

the conservation of the Neuse River waterdog. As discussed above under Summary of Biological Status and Threats, we have concluded that the Neuse River waterdog is likely to become in danger of extinction within the foreseeable future primarily due to habitat degradation from stressors influencing water quality, water quantity, instream habitat, and habitat connectivity. The provisions of this 4(d) rule will promote conservation of the Neuse River waterdog by encouraging management of the landscape in ways that meet both land management considerations and the conservation needs of the Neuse River waterdog. The provisions of this rule are one of many tools that the Service will use to promote the conservation of the Neuse River waterdog.

Provisions of the 4(d) Rule

This 4(d) rule will provide for the conservation of the Neuse River waterdog by prohibiting the following activities, except as otherwise authorized or permitted: Importing or exporting; take; possession and other acts with unlawfully taken specimens; delivering, receiving, transporting, or shipping in interstate or foreign commerce in the course of commercial activity; or selling or offering for sale in interstate or foreign commerce.

Import/export, possession, transportation, sale, and commerce are of concern for many aquatic amphibians, primarily because rare, strange-looking amphibians with frilly external gills (like the Neuse River waterdog) are highly sought after in the global pet trade. Regulating these activities will help protect the Neuse River waterdog from exploitation.

As discussed above under Summary of Biological Status and Threats, habitat degradation from stressors influencing water quality, water quantity, instream habitat, and habitat connectivity are affecting the status of the Neuse River waterdog. A range of activities have the potential to affect the Neuse River waterdog, including development, pollution, agricultural practices, land conversion, incompatible forest management, invasive species, dams and barriers, and energy production and mining. Regulating incidental take associated with these activities will help preserve the species' remaining populations, slow its rate of decline, and decrease synergistic, negative effects from other threats.

Under the Act, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Some of these provisions have

been further defined in regulations at 50 CFR 17.3. Take can result knowingly or otherwise, by direct and indirect impacts, intentionally or incidentally. Regulating incidental take will help preserve the species' remaining populations, slow their rate of decline, and decrease synergistic, negative effects from other threats. Protecting the Neuse River waterdog from direct forms of take, such as physical injury or killing, whether incidental or intentional, will help preserve and recover the species. Therefore, we prohibit intentional take of Neuse River waterdog, including, but not limited to, capturing, handling, trapping, collecting, or other activities. Also, as discussed above under Summary of Biological Status and Threats, habitat degradation from stressors influencing water quality, water quantity, instream habitat, and habitat connectivity are affecting the status of the Neuse River waterdog. Across the species' range, stream and water quality have been degraded physically by sedimentation, pollution, contaminants, impoundments, channelization, destruction of riparian habitat, and loss of riparian vegetation due to development, agricultural practices, land conversion, incompatible forest management, invasive species, dams and barriers, and energy production and mining. Other habitat or hydrological alteration, such as ditching, draining, stream diversion, or diversion or alteration of surface or ground water flow, into or out of the stream, will impact the habitat of the species. Therefore, we prohibit incidental take of the Neuse River waterdog by destroying, altering, or degrading the habitat in the manner described above. Regulating incidental take associated with these activities will help preserve Neuse River waterdog populations, slow the rate of population decline, and decrease synergistic, negative effects from other stressors.

During both public comment periods, the Service received numerous comments on the exception for incidental take resulting from silvicultural practices and forest management activities (see Summary of Comments and Recommendations, above). North Carolina's forestry best management practices (BMPs), when properly implemented, protect water quality and help conserve aquatic species, including the Neuse River waterdog. Forest landowners who properly implement those BMPs are helping conserve the waterdog, and this 4(d) rule is an incentive for all landowners to properly implement them

to avoid any take implications. Further, those forest landowners who are third-party-certified to a credible forest management standard are providing audited certainty that BMP implementation is taking place across the landscape.

To address any uncertainty regarding which silvicultural and forest management BMPs will satisfy this exception for incidental take resulting from silvicultural practices and forest management activities, our regulations specify the conditions that must be met. We revised our section 4(d) language to clarify that the BMPs must result in protection of the habitat features that provide for the breeding, feeding, sheltering, and dispersal needs of the Neuse River waterdog, which will provide for the conservation of the species. In waterbodies that support listed aquatic species, a wider SMZ is more effective at reducing sedimentation, maintaining lower water temperatures through shading, and introducing food (such as leaves and insects) into the food chain (VADF 2011, p. 37). Ninety percent of the food in forested streams comes from bordering vegetation (NCWRC 2002, p. 6; USFWS 2006, p. 6; Stewart et al. 2000, p. 210; USFWS 2020ab, p. 10). Neuse River waterdogs require cool, well-oxygenated water, and a clean stream bottom (USFWS 2020ab, p. 10). A lack of these features limits the number of waterdogs a stream can support. Aquatic habitat and suitable water temperature can be maintained even during logging operations when streamside vegetation is left intact (VADF 2011, p. 37). The exception for incidental take associated with these activities seeks to ensure these characteristics are maintained for the conservation of the Neuse River waterdog.

Under this final 4(d) rule, all prohibitions and provisions of section 9(a)(1) of the Act apply to the Neuse River waterdog, except that incidental take resulting from the following actions will 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, and follow-up monitoring.

(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 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. Prior to restoration action, surveys to determine presence of Neuse River waterdog must be performed, and if located, waterdogs must be relocated prior to project implementation.

(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 native species live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), native species live fascines (live branch cuttings, usually willows, bound together into long, cigar shaped bundles), or native species brush layering (cuttings or branches of easily rooted tree species layered between successive lifts of soil fill). Native species vegetation includes woody and herbaceous species appropriate for the region and habitat conditions. These methods will not include the sole use of quarried rock (rip-rap) or the use of rock baskets or gabion structures.

(4) Forestry-related activities, including silvicultural practices, forest management activities, and fire control tactics, that implement State-approved BMPs. In order for this exception to apply to forestry-related activities, these BMPs must achieve all of the following:

(a) Establish a streamside management zone alongside the margins of each waterway.

(b) Restrain visible sedimentation caused by the forestry-related activity from entering the waterway.

(c) Maintain native groundcover within the streamside management zone of the waterway, and promptly re-

establish native groundcover if disturbed.

(d) Limit installation of vehicle or equipment crossings of the waterway to only where necessary for the forestry-related activity. Such crossings must:

(i) Have erosion and sedimentation control measures installed to divert surface runoff away and restrain visible sediment from entering the waterway;

(ii) Allow for movement of aquatic organisms within the waterway; and

(iii) Have native groundcover applied and maintained through completion of the forestry-related activity.

(e) Prohibit the use of tracked or wheeled vehicles for reforestation site preparation within the streamside management zone of the waterway.

(f) Prohibit locating log decks, skid trails, new roads, and portable mill sites in the streamside management zone of the waterway.

(g) Prohibit obstruction and impediment of the flow of water within the waterway, caused by direct deposition of debris or soil by the forestry-related activity.

(h) Maintain shade over the waterway similar to that observed prior to the forestry-related activity.

(i) Prohibit discharge of any solid waste, petroleum, pesticide, fertilizer, or other chemical into the waterway.

We reiterate that these actions and activities may have some minimal level of take of the Neuse River waterdog, but are unlikely to negatively impact the species' conservation and recovery efforts. To the contrary, 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 in the 4(d) rule will correct some of these problems, creating more favorable habitat conditions for the species.

We may issue permits to carry out otherwise prohibited activities, including those described above, 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.

The Service recognizes the special and unique relationship with our State

natural resource agency partners in contributing to conservation of listed species. State agencies often possess scientific data and valuable expertise on the status and distribution of endangered, threatened, candidate, and at-risk species of wildlife and plants. State agencies, because of their authorities and their close working relationships with local governments and landowners, are in a unique position to assist the Service in implementing all aspects of the Act. In this regard, section 6 of the Act provides that the Service shall cooperate to the maximum extent practicable with the States in carrying out programs authorized by the Act. Therefore, any qualified employee or agent of a State conservation agency that is a party to a cooperative agreement with the Service in accordance with section 6(c) of the Act, who is designated by his or her agency for such purposes, will be able to conduct activities designed to conserve the Neuse River waterdog that may result in otherwise prohibited take without additional authorization.

Nothing in this 4(d) rule will change in any way the recovery planning provisions of section 4(f) of the Act, the consultation requirements under section 7 of the Act, or the ability of the Service to enter into partnerships for the management and protection of the Neuse River waterdog. However, interagency cooperation may be further streamlined through planned programmatic consultations for the species between Federal agencies and the Service.

III. Critical Habitat

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 Federal agency would be required to consult with the Service under section 7(a)(2) of the Act. However, even if the Service were to conclude that the proposed activity would result in destruction or adverse modification of the critical habitat, the Federal action agency and the landowner are not required to abandon the proposed activity, or to restore or recover the species; instead, they must 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 that this rule follows (based on the May 22, 2019, publication date of the proposed rule), 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 based on 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 other 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) the prohibitions found in section 9 of the Act. 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.

On August 27, 2019, we published a final rule in the **Federal Register** (84 FR 45020) to amend our regulations concerning the procedures and criteria we use to designate and revise critical habitat. That rule became effective on September 26, 2019, but, as stated in under **DATES** in that rule, the amendments it sets forth apply to "rules for which a proposed rule was published after September 26, 2019." We published our proposed critical habitat designations for the Carolina madtom and Neuse River waterdog on May 22, 2019 (84 FR 23644); therefore, the amendments set forth in the August 27, 2019, final rule at 84 FR 45020 do not apply to this final designation of critical habitat for the Carolina madtom and Neuse River waterdog.

Prudency Determination

While the implementing regulations (50 CFR 424.12) of section 4(a)(3) of the Act, as amended, have recently been amended, the proposed rule that led to this final rule published before the new regulations were implemented; therefore, we are operating under the older implementing regulations that 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."

In our SSA report and the proposed listing determination for the Carolina madtom and Neuse River waterdog, we determined that the present or threatened destruction, modification, or curtailment of habitat or range is a threat to both the Carolina madtom and Neuse River waterdog and that those threats in some way can be addressed by section 7(a)(2) consultation measures. Accordingly, such a designation could

be beneficial to the species. Therefore, because none of the circumstances enumerated in our regulations at 50 CFR 424.12(a)(1) has been met and because there are no other circumstances the Secretary has identified for which this designation of critical habitat would be not prudent, we have determined that the designation of critical habitat is prudent for the Carolina madtom and the Neuse River waterdog.

Critical Habitat Determinability

Having determined that designation is prudent, under section 4(a)(3) of the Act we must find whether critical habitat for the Carolina madtom and Neuse River waterdog 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 the species and habitat characteristics where both species are located. This and other information represent the best scientific data available and led us to conclude that the designation of critical habitat is determinable for the Carolina madtom and Neuse River waterdog.

Physical or Biological Features Essential to the Conservation of the Species

In accordance with section 3(5)(A)(i) of the Act and regulations at 50 CFR 424.12(b), in determining which areas we will designate as critical habitat from within the geographical area occupied by the species at the time of listing, we consider the physical or biological features that are essential to the conservation of the species and that may require special management considerations or protection. The regulations at 50 CFR 424.02 were amended after the publication of the May 22, 2019, proposed rule; see 84 FR 45020 (August 27, 2019). For this rule, we define "physical or biological features essential to the conservation of the species" as the features that support the life-history needs of the species, including, but not limited to, water characteristics, soil type, geological features, sites, 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. For example, physical features essential to the conservation of the species might include gravel of a particular size required for spawning, alkali soil for seed germination, protective cover for migration, or susceptibility to flooding or fire that maintains necessary early-successional habitat characteristics. Biological features might include prey species, forage grasses, specific kinds or ages of trees for roosting or nesting, symbiotic fungi, or a particular level of nonnative species consistent with conservation needs of the listed species. The features may also be combinations of habitat characteristics and may encompass the relationship between characteristics or the necessary amount of a characteristic essential 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. These characteristics include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing (or development) of offspring; and habitats that are protected from disturbance.

Summary of Essential 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 to the conservation of Carolina madtom from studies of this species' habitat, ecology, and life history as described above. The primary habitat elements that influence resiliency of both species include water quality, water quantity, substrate, and habitat connectivity. Additional information can be found in the SSA report (Service 2021a) available on <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092. The Carolina madtom's individual needs are summarized below in Table 3.

TABLE 3—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.) 	F, S	—Burr et al. 1989, p. 78.
Adults—3+ years—>4 inches long.	<ul style="list-style-type: none"> • Cover (shells, bottles, cans, tires, woody debris, etc.). • 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.

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 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.

(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.

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. The primary habitat elements that influence resiliency of both species include water quality, water quantity, substrate, and habitat connectivity. Additional information can be found in the SSA report (Service 2021b) available on <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092. The Neuse River waterdog's individual needs are summarized below in Table 4.

TABLE 4—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	—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	—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	—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	—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 leaf litter, gravel, cobble) • Little to no siltation • Adequate food availability (aquatic and terrestrial invertebrates) • Cover (large rocks/boulders, outcrops, burrows) for retreat areas 	F, S, D	—Braswell and Ashton 1985, pp. 13, 22, 28. —Ashton 1985, p. 95. —Braswell 2005, p. 868.

* B = Breeding, F = Feeding, S = Sheltering, D = Dispersal.

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.

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 which 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 Carolina madtom and Neuse River waterdog 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 and sedimentation from agricultural activities that impact water quantity and quality; (3) significant alteration of water quality; (4) improper forest management or clearcuts in riparian areas; (5) culvert and pipe installation

that create 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 eliminate visible sedimentation, erosion, and bank side destruction; protection of riparian corridors and retention of 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; modernization of waste water treatment; 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 critical habitat designation.

Sources of data for these critical habitat designations include multiple databases maintained by North Carolina (NC) State University, the NC Wildlife

Resources Commission, and the NC Natural Heritage Program, as well as numerous survey reports on streams throughout the species' range (see SSA reports). We have also reviewed available information that pertains to the habitat requirements of these 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 2021ab).

Areas Occupied at the Time of Listing **Carolina Madtom**

We identified stream channels up to bankfull height that currently support populations of the Carolina madtom. We defined "current" as stream channels with observations of the species from 2010 to the present, as described in the SSA report and supported by the species' life history and habitat stability over time (Service 2021a, p. 10). Due to the breadth and intensity of survey effort done for freshwater fishes 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. However, this does not preclude the possibility of detecting the species in other locations upon subsequent surveys. For example, we received new data from the NCWRC indicating that one of the previously proposed unoccupied units (Contentnea Creek, Unit 6) has been confirmed to be occupied by the species.

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. In 2018, we learned that a live Carolina madtom was observed in Contentnea Creek, thus changing the occupancy of that stream to currently occupied.

We consider the following streams to be occupied by the species at the time of listing: Upper Tar, Fishing Creek, Sandy-Swift Creek, Contentnea Creek, and the Little River (see the unit descriptions under Final Critical Habitat Designation, below). The 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.

Neuse River Waterdog

We identified stream channels up to bankfull height that currently support populations of the Neuse River waterdog. As with the Carolina madtom, we defined "currently" as stream channels with observations of the species from 2010 to the present, as described in the SSA report and supported by the species' life history and habitat stability over time (Service 2021b, p. 14). 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. However, this does not preclude the possibility of detecting the species in other locations upon subsequent surveys.

Specific occupied habitat areas were delineated based on Natural Heritage EOs following NatureServe's occurrence delineation protocol for aquatic species (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 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 the unit descriptions under Final Critical Habitat Designation, below). The 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 designating two 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, three of the five Neuse River units, and two of the five Tar River basin management units. There are currently only two occupied management units remaining in the Neuse River basin, and those populations were found to be in “low” and “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 resilient population in the Trent River basin is essential for the conservation of the Carolina madtom because the unoccupied unit in the Neuse will contribute to redundancy and resiliency of that population, and the unoccupied Trent unit will add resiliency, redundancy, and representation where there currently are none in that population through propagation and reintroduction. Accordingly, we are designating one unoccupied unit in the Trent River basin and one 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.

We are not designating 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 MUs across the physiographic representation of the range will sufficiently reduce the risk of extinction, and by improving the resiliency of populations in these currently occupied streams, viability may increase to the point that the protections of the Act would no longer be necessary.

Critical Habitat Maps

Critical habitat for these aquatic species includes only stream channels up to bankfull height, where the stream base flow is contained within the channel. When determining 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 the Carolina madtom and Neuse River waterdog. 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 rule have been excluded by text in the rule and are not included for designation as critical habitat.

Therefore, 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.

We are designating as critical habitat lands that we have determined are occupied at the time of listing (*i.e.*, currently occupied) and that contain one or more of the physical or biological features that are essential to support life-history processes of the species. For the Carolina madtom, we have determined that both occupied and unoccupied areas are necessary to ensure the conservation of the species. Therefore, we have also identified and designated as critical habitat unoccupied areas that are essential for the conservation of the Carolina madtom.

Units are designated based on one or more of the physical or biological features being present to support Carolina madtom or Neuse River waterdog life-history processes. Some units contain all of the identified physical or biological features and support multiple life-history processes. Some units contain only some of the physical or biological features necessary to support the Carolina madtom’s or Neuse River waterdog’s particular use of that habitat.

The 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 Regulation Promulgation. We include more detailed information on the boundaries of the 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 at <http://www.regulations.gov> under Docket No. FWS-R4-ES-2018-0092, at <http://www.fws.gov/southeast>, and at the Raleigh Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**, above).

Final Critical Habitat Designation

Carolina Madtom

We are designating approximately 257 river miles (414 river kilometers) in 7 units in North Carolina as critical habitat for the Carolina madtom. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the Carolina madtom. Five of the units are currently occupied by the species and contain some or all of the physical or biological features essential to the conservation of the species. Two of the units are unoccupied but are 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 designated units for the Carolina madtom. Since all streambeds are navigable waters, the actual critical habitat units are all owned by the State of North Carolina.

TABLE 5—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 Creek Subbasin	Yes	Private; Easements; State	86 (138)
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	Yes	Private	15 (24)

TABLE 5—CRITICAL HABITAT UNITS FOR THE CAROLINA MADTOM—Continued

Critical habitat unit	Occupied at the time of listing	Riparian ownership	Length of unit in river miles (kilometers)
Unit 7. TR1—Trent River	No	Private	15 (24)
Total	257 (414)

Note: Area sizes may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for the Carolina madtom, below.

Tar Population

Unit 1: TAR1—Upper Tar River

Unit 1 consists of 26 mi (42 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 or biological features essential to the conservation of the species. The riparian land adjacent to the river is entirely privately owned.

Special management considerations or protection may be required within this unit to address a variety of threats. Excessive amounts of nitrogen and phosphorus run off the land, or are discharged, into the waters, causing excessive growth of vegetation and leading to extremely low levels of dissolved oxygen. Based on 2014 data, seven stream reaches totaling approximately 38 miles (61.1 km) are “impaired” (as identified on the State’s Clean Water Act section 303d list) in this basin. Indicators of impairment are low dissolved oxygen and low benthic-macroinvertebrate assessment scores, and the entire basin is classified as Nutrient Sensitive Waters (NCDEQ 2016, pp. 115–117). There are 102 non-major NPDES discharges, including several package wastewater treatment plants (WWTPs) and biosolids facilities, and 3 major NPDES discharges (Oxford WWTP, Louisburg WWTP, and Franklin County WWTP) in this unit; with expansion of these facilities, or addition of new wastewater discharges, an additional threat to habitat exists in this unit. Special management focused on agricultural and forestry BMPs, implementing highest levels of wastewater treatment practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 2: TAR2—Sandy/Swift Creek

Unit 2 consists of 66 mi (106 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 or biological features essential to the conservation of the species. The riparian land adjacent to this unit is predominantly privately owned (96 percent), with some conservation parcels (2 percent) and State Game Lands (2 percent).

Special management considerations or protection may be required within this unit to address a variety of threats. Excessive amounts of nitrogen and phosphorus run off the land, or are discharged, into the waters, causing excessive growth of vegetation and leading to extremely low levels of dissolved oxygen; one stream reach totaling approximately 5 miles (8 km) is impaired in this unit. Special management focused on agricultural and forestry BMPs, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 3: TAR3—Fishing Creek Subbasin

Unit 3 consists of approximately 86 mi (138 km), including Fishing Creek from the confluence with Hoppen 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 or biological features essential to the conservation of the species. The riparian land adjacent to the unit is divided between privately owned parcels (89 percent), State Game Lands and State Park land (5 percent), and conservation parcels (6 percent).

Special management considerations or protection may be required within this unit to address a variety of threats. Excessive amounts of nitrogen and phosphorus run off the land, or are discharged, into the waters, causing excessive growth of vegetation and leading to extremely low levels of dissolved oxygen. Special management focused on agricultural and forestry

BMPs, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Neuse River Population

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

Unit 4 consists of approximately 20 mi (32 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 follow-up surveys in 2011 were not able to find any individuals. Although it is unoccupied, it does contain all of the physical or biological features essential for the conservation of the species. This unit is itself essential for the conservation of the species because it will provide for population expansion through propagation and reintroduction efforts, and will provide for resiliency in portions of known historical habitat that is necessary to increase the viability (resiliency, redundancy, and representation) of the species. Riparian land adjacent to the unit is almost entirely (79 percent) within State Park Lands, local government conservation parcels, and State Game Lands.

Unit 5: NR2—Little River

Unit 5 consists of 28 mi (45 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 or biological features essential for the conservation of the species. The riparian land adjacent to the unit is predominantly privately owned (99 percent) with some (1 percent) State Conservation ownership.

Special management considerations or protection may be required within this unit to address a variety of threats. Four stream reaches totaling approximately 17 miles are impaired in the Little River. The designation of impairment is based primarily on low

benthic-macroinvertebrate assessment scores, low pH, and low dissolved oxygen. There are 32 non-major and no major NPDES discharges in this unit. Special management considerations in this unit include retrofitting stormwater systems, eliminating direct stormwater discharges, increasing and protecting existing open space, and maintaining connected riparian corridors.

Unit 6: NR3—Contentnea Creek

Unit 6 consists of approximately 15 mi (24 km) of Contentnea Creek from Buckhorn Reservoir to Wiggins Mill Reservoir, located in Wilson County. This unit is occupied by the species, and contains all of the physical or biological features essential for the conservation of the species. The riparian land adjacent to this unit is entirely privately owned.

Special management considerations or protection may be required within this unit to address a variety of threats. Two stream reaches totaling approximately 21 miles are impaired in Contentnea Creek. The designation of impairment is based primarily on low benthic-macroinvertebrate assessment scores. There are 3 major and 77 non-

major NPDES discharges in this unit. Special management considerations in this unit include retrofitting stormwater systems, eliminating direct stormwater discharges, increasing and protecting existing open space, and maintaining connected riparian corridors.

Trent Population

Unit 7: TR1—Trent River

Unit 7 consists of approximately 15 mi (24 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, this unit does contain all of the physical or biological features essential for the conservation of the species. This unit itself is essential for the conservation of the species because it will provide for population expansion through propagation and reintroduction, and will provide for resiliency in portions of known historical habitat that is necessary to increase the viability (resiliency, redundancy, and representation) of the species. All of the riparian land adjacent to this unit is privately owned.

Neuse River Waterdog

We are designating approximately 779 miles (1,254 kilometers) in 18 units in North Carolina as critical habitat for the Neuse River waterdog. The critical habitat areas described below constitute our current best assessment of areas that meet the definition of critical habitat, and all units are considered currently occupied by the species. Those 18 units are: (1) Upper Tar River, (2) Upper Fishing Creek, (3) Bens Creek, (4) Fishing Creek Subbasin, (5) Sandy/Swift Creek, (6) Middle Tar River Subbasin, (7) Lower Tar River Subbasin, (8) Eno River, (9) Flat River, (10) Middle Creek, (11) Swift Creek, (12) Little River, (13) Mill Creek, (14) Middle Neuse River, (15) Contentnea Creek/Lower Neuse River Subbasin, (16) Swift Creek (Lower Neuse), (17) Trent River, and (18) Tuckahoe Swamp. Table 6 shows the name, land ownership of the riparian areas surrounding the units, and approximate river miles of the designated units for the Neuse River waterdog. Where appropriate, Table 6 also notes the previous number for units for which the numbering has changed.

TABLE 6—CRITICAL HABITAT UNITS FOR THE NEUSE RIVER WATERDOG

[All units are occupied]

Critical habitat unit	Riparian ownership	River miles (Kilometers)	Previous unit numbering
Unit 1. TAR1—Upper Tar River	Private; Easements	12.3 (19.8)	Unit 1: TAR1.
Unit 2. TAR2—Upper Fishing Creek	Private; Easements	10.5 (17)	Unit 2: TAR2.
Unit 3. TAR3—Bens Creek	Private	2 (3.2)	New Unit.
Unit 4. TAR4a—Fishing Creek Subbasin	Private; Easements; State	82.8 (133.3)	Unit 3: TAR3a.
Unit 5. TAR4b—Sandy/Swift Creek	Private; Easements; State	72.5 (116.8)	Unit 4: TAR3b.
Unit 6. TAR4c—Middle Tar River Subbasin	Private; Easements; State	111 (179)	Unit 5: TAR3c.
Unit 7. TAR4d—Lower Tar River Subbasin	Private; Easements; State	59.9 (96.3)	Unit 6: TAR3d.
Unit 8. NR1—Eno River	Private; Easements; State	43.9 (70.6)	Unit 7: NR1.
Unit 9. NR2—Flat River	Private; Easements	15.2 (24.5)	Unit 8: NR2.
Unit 10. NR3—Middle Creek	Private; Easements; Local	30.8 (49.6)	Unit 9: NR3.
Unit 11. NR4—Swift Creek	Private	24 (38.6)	Unit 10: NR4.
Unit 12. NR5a—Little River	Private; Easements	90.8 (146.1)	Unit 11: NR5a.
Unit 13. NR5b—Mill Creek	Private; Easements	20.8 (33.5)	Unit 12: NR5b.
Unit 14. NR5c—Middle Neuse River	Private; State; Easements	43.2 (69.5)	Unit 13: NR5c.
Unit 15. NR6—Contentnea Creek/Lower Neuse River Subbasin.	Private; Easements	114.8 (184.8)	Unit 14: NR6.
Unit 16. NR7—Swift Creek (Lower Neuse)	Private; Easements	10.3 (16.5)	Unit 15: NR7.
Unit 17. TR1—Trent River	Private	32.5 (52.4)	Unit 16: TR1.
Unit 18. TR2—Tuckahoe Swamp	Private	2 (3.2)	New Unit.
Total	779 (1,254)	

Note: Distances may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for Neuse River waterdog, below.

Tar Population

Unit 1: TAR1—Upper Tar River

Unit 1 consists of 12.3 miles (19.8 km) of the Tar River in Granville County from approximately SR1004 (Old NC 75) downstream to SR1622 (Cannady's Mill Road). We revised Unit 1 to add 3.7

miles (6 km) of the Upper Tar River based on a 2018 observation of Neuse River waterdog provided by NCWRC. The riparian land adjacent to this unit is primarily privately owned (80 percent), with several conservation parcels or easements (20 percent). The unit contains all of the physical or

biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Excessive amounts of nitrogen and phosphorus run off the land, or are discharged, into the waters, causing excessive growth of vegetation and leading to extremely low levels of dissolved oxygen. Based on 2014 data, seven stream reaches totaling approximately 38 miles (61.1 km) are impaired in this basin. Indicators of impairment are low dissolved oxygen and low benthic-macroinvertebrate assessment scores, and the entire basin is classified as Nutrient Sensitive Waters (NCDEQ 2016, pp. 115–117). There are 102 non-major NPDES discharges, including several package WWTPs and biosolids facilities, and 3 major NPDES discharges (Oxford WWTP, Louisburg WWTP, and Franklin County WWTP) in this unit; with expansion of these facilities, or addition of new wastewater discharges, an additional threat to habitat exists in this unit. Special management focused on agricultural and forestry BMPs, implementing highest levels of wastewater treatment practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 2: TAR2—Upper Fishing Creek

Unit 2 consists of 10.5 mi (16.9 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 percent) with several conservation parcels or easements (6 percent). This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Excessive amounts of nitrogen and phosphorus run off the land or are discharged into the waters, causing excessive growth of microscopic or macroscopic vegetation and leading to extremely low levels of dissolved oxygen. Special management focused on agricultural and forestry BMPs, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 3: TAR3—Bens Creek

Unit 3 consists of 2 miles (3.2 km) of Bens Creek in Warren County, North Carolina. The designated area begins

approximately one mile upstream and ends approximately one mile downstream of SR1509 (Odell-Littleton Road). The addition of this unit is based on a 2019 observation of Neuse River waterdog provided by NCWRC. The riparian areas on either side of the river are privately owned. The unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required to address excess sediment and pollutants that enter the creek and serve as indicators of other forms of pollution such as bacteria and toxins, reducing water quality for the species. Sources of these types of sediment and pollution are likely agricultural and silvicultural runoff. Special management focused on agricultural and forestry BMPs, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 4: TAR4a—Fishing Creek Subbasin

Revised Unit 4 consists of 82.8 miles (133.3 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 from the Warren/Halifax County line to the confluence with the Tar River in Edgecombe County. The revision of Unit 4 (previously Unit 3) adds 20 miles (32.3 km) of Fishing Creek based on a 2019 observation of Neuse River waterdog provided by NCWRC. The riparian land adjacent to the unit includes private land (86 percent), several conservation parcels (6 percent), and State game lands (8 percent). The unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Excessive amounts of nitrogen and phosphorus run off the land, or are discharged, into the waters, causing excessive growth of vegetation and leading to extremely low levels of dissolved oxygen. Special management focused on agricultural and forestry BMPs, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 5: TAR4b—Sandy/Swift Creek

Unit 5 consists of an approximately 72.5 mi (116.8 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 Warren, Franklin, Nash, and Edgecombe Counties. The riparian land adjacent to this unit includes private lands (97 percent), conservation parcels (1 percent), and State Game Lands (2 percent). This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Excessive amounts of nitrogen and phosphorus run off the land or are discharged into the waters, causing excessive growth of microscopic or macroscopic vegetation and leading to extremely low levels of dissolved oxygen; there is one “impaired” stream reach totaling approximately 5 miles (8 km) in this unit. Special management focused on agricultural and forestry BMPs, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 6: TAR4c—Middle Tar River Subbasin

Revised Unit 6 (previously Unit 5) consists of 111 miles (179 km) of the Middle Tar River from upstream of Highway 401 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. We revised Unit 6 (previously Unit 5) to add 11 miles (17.8 km) of the upper reach of the Tar River based on a 2019 observation of Neuse River waterdog provided by a permitted private consultant. The riparian land adjacent to this unit is nearly all private lands (99 percent), with less than 1 percent conservation parcels, local parks, and a research station. The unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Excessive amounts of nitrogen and phosphorus run off the land or are discharged into the waters, causing too much growth of microscopic or macroscopic vegetation and leading to extremely low levels of dissolved oxygen. As a result, there are six impaired stream reaches totaling approximately 32 miles in the unit. Expansion or addition of new wastewater discharges are also a threat to habitat in this unit. Special

management focused on use of agricultural and forestry BMPs, implementation of highest levels of treatment of wastewater practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 7: TAR4d—Lower Tar River Subbasin

Unit 7 consists of approximately 59.9 mi (96.3 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 percent), conservation parcels (2.5 percent), and State Game Lands (0.5 percent). This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required to address excess sediment and pollutants that enter the creek and serve as indicators of other forms of pollution such as bacteria and toxins, reducing water quality for the species. Special management focused on use of agricultural and forestry BMPs, implementation of highest levels of treatment of wastewater practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Neuse Population

Unit 8: NR1—Eno River

Unit 8 consists of approximately 43.9 mi (70.6 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 percent), State Park Lands (25 percent), local government conservation parcels (12 percent), and State Game Lands (2 percent). This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Large quantities of nutrients (especially nitrogen) contributed by fertilizers and animal waste washed from lawns, urban

developed areas, farm fields, and animal operations are impacting aquatic ecosystems in this unit. More than 300 permitted point-source sites discharge wastewater into streams and rivers in the basin. Development is also impacting areas along the Upper Neuse River. Special management considerations in this unit include using the highest available wastewater treatment technologies, retrofitting stormwater systems, eliminating direct stormwater discharges, increasing open space, maintaining connected riparian corridors, and treating invasive species (like hydrilla).

Unit 9: NR2—Flat River

Unit 9 is a 15.2-mi (24.5-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 percent) and extensive conservation parcels (51 percent), including demonstration forest, recreation areas, and State Game Lands. This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Large quantities of nutrients (especially nitrogen) contributed by fertilizers and animal waste washed from lawns, urban developed areas, farm fields, and animal operations are impacting aquatic ecosystems in this unit. Permitted point-source sites discharge wastewater into streams and rivers in the basin. Development is also impacting areas in the Upper Neuse River basin, including the Flat River. Special management considerations in this unit include using the highest available wastewater treatment technologies, retrofitting stormwater systems, eliminating direct stormwater discharges, increasing open space, maintaining connected riparian corridors, and treating invasive species (like hydrilla).

Unit 10: NR3—Middle Creek

Revised Unit 10 consists of 30.8 miles (49.6 km) of Middle Creek from Southeast Regional Park downstream to the confluence with Swift Creek in Wake and Johnston Counties, North Carolina. We revised Unit 10 to add 23.2 miles (37.4 km) of Middle Creek based on two 2018 observations of Neuse River waterdog provided by NCWRC. The riparian land adjacent to this unit is predominantly privately owned (91 percent) with a few conservation parcels, including the local park (9

percent). The unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Large quantities of nutrients (especially nitrogen) contributed by fertilizers and animal waste washed from lawns, urban developed areas, and farm fields are impacting aquatic ecosystems in this unit. Several hundred permitted point-source sites discharge wastewater into streams and rivers in the basin. Development is also impacting areas in Middle Creek. Special management focused on use of agricultural and forestry BMPs, implementation of highest levels of treatment of wastewater practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 11: NR4—Swift Creek

Unit 11 is a 24-mi (38.6-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. This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Large quantities of nutrients (especially nitrogen) contributed by fertilizers and animal waste washed from lawns, urban developed areas, farm fields, and animal operations are impacting aquatic ecosystems in this unit. Several hundred permitted point-source sites discharge wastewater into streams and rivers in the basin. Development is also impacting areas throughout Swift Creek. Special management considerations in this unit include using the highest available wastewater treatment technologies, retrofitting stormwater systems, eliminating direct stormwater discharges, increasing open space, and maintaining connected riparian corridors.

Unit 12: NR5a—Little River

Unit 12 is a 90.8-mi (146.1-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 percent) with some (10 percent) local municipal conservation parcels (Little River Reservoir). This unit contains all

of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Four stream reaches totaling approximately 17 miles are impaired in the Little River. The designation of impairment is based primarily on low benthic-macroinvertebrate assessment scores, low pH, and low dissolved oxygen. There are 32 non-major and no major NPDES discharges in this unit. Special management considerations in this unit include retrofitting stormwater systems, eliminating direct stormwater discharges, increasing and protecting existing open space, and maintaining connected riparian corridors.

Unit 13: NR5b—Mill Creek

Unit 13 is a 20.8-mi (33.5-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 percent) with some conservation parcels (5 percent). This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required to address excess sediment and pollutants that enter the creek and serve as indicators of other forms of pollution such as bacteria and toxins, reducing water quality for the species. Special management focused on use of agricultural and forestry BMPs, implementation of highest levels of treatment of wastewater practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 14: NR5c—Middle Neuse River

Unit 14 is a 43.2-mi (69.5-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 percent), conservation parcels (0.95 percent), State Park land (7 percent), and the Seymour Johnson Air Force Base (0.05 percent). 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). This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Large quantities of nutrients (especially nitrogen) contributed by fertilizers and animal waste washed from lawns, urban developed areas, farm fields, and animal operations are impacting aquatic ecosystems in this unit. More than 300 permitted point-source sites discharge wastewater into streams and rivers in the basin. Development is also impacting areas along the Middle Neuse River. Special management focused on use of agricultural and forestry BMPs, implementation of highest levels of treatment of wastewater practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 15: NR6—Contentnea Creek/Lower Neuse River Subbasin

Unit 15 is an approximately 114.8-mi (184.8-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 percent), with <1 percent conservation parcels. This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required within this unit to address a variety of threats. Two stream reaches totaling approximately 21 miles are impaired in Contentnea Creek, with 55 impaired stream miles in the entire unit. The designation of impairment is based primarily on low benthic-macroinvertebrate assessment scores, low pH, and low dissolved oxygen. There are 9 major and 195 non-major NPDES discharges in this unit. Special management considerations in this unit include retrofitting stormwater systems, eliminating direct stormwater discharges, increasing and protecting existing open space, and maintaining connected riparian corridors.

Unit 16: NR7—Swift Creek (Lower Neuse)

Unit 16 is a 10.3-mi (16.5-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 percent) with some conservation parcels (1 percent). This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required to address excess sediment and pollutants that enter the creek and serve as indicators of other forms of pollution such as bacteria and toxins, reducing water quality for the species. Special management focused on use of agricultural and forestry BMPs, implementation of highest levels of treatment of wastewater practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Trent Population

Unit 17: TR1—Trent River

Revised Unit 17 consists of 32.5 miles (52.4 km) of 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 the SR1121 (Oak Grove Rd) crossing at the Marine Corps Cherry Point property, in Jones County. This unit was decreased to not include land owned by the Marine Corps at its Air Station (MCAS) Cherry Point Oak Grove Outlying Landing Field. The base's integrated natural resources management plan (INRMP) includes implementing ecosystem management practices that support the conservation and management of at-risk herpetofauna species, including Neuse River waterdog, known to occur at MCAS Cherry Point (Tetra Tech 2012, p. C–10). The riparian land adjacent to this unit is privately owned. This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required to address excess sediment and pollutants that enter the river and serve as indicators of other forms of pollution such as bacteria and toxins, reducing water quality for the species. Special management focused on use of agricultural and forestry BMPs, implementation of highest levels of treatment of wastewater practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Unit 18: TR2—Tuckahoe Swamp

Unit 18 consists of 2 miles (3.2 km) of Tuckahoe Swamp in Jones County, North Carolina. The designated area

begins upstream of SR1142 (Weyerhaeuser Road) to the confluence with the Trent River. The riparian areas on either side of the river are privately owned. This unit contains all of the physical or biological features essential for the conservation of the species.

Special management considerations or protection may be required to address excess sediment and pollutants that enter the river and serve as indicators of other forms of pollution such as bacteria and toxins, reducing water quality for the species. Special management focused on use of agricultural and forestry BMPs, implementation of highest levels of treatment of wastewater practicable, maintenance of forested buffers, and connection of protected riparian corridors will benefit habitat for the species in this unit.

Effects of Critical Habitat Designation

Section 7 Consultation

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.

We published a final rule revising the definition of destruction or adverse modification on August 27, 2019 (84 FR 44976). Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

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 (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat—and actions on State, Tribal, local, or private lands that are not federally funded, authorized, or carried out by a Federal agency—do not require section 7 consultation.

As a result of section 7 consultation, we generally 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 set forth requirements for Federal agencies to reinitiate consultation on previously reviewed actions in several instances, including 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 as a whole for the conservation of the Carolina madtom or Neuse River waterdog. 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 violate section 7(a)(2) of the Act by destroying or adversely modifying such habitat, or that may be affected by such designation.

Activities that the Service may, during a consultation under section 7(a)(2) of the Act, find are likely to destroy or adversely modify critical habitat 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 Carolina madtom and Neuse River waterdog by decreasing or altering flows to levels that would adversely affect the species’ abilities 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 Carolina madtoms and Neuse River waterdogs 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, incompatible forestry activities, 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 the Carolina madtom and Neuse River waterdog by increasing the sediment deposition to levels that would adversely affect the species' abilities 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 the Carolina madtom and Neuse River waterdog, degrading water quality during algal decay, and decreasing oxygen levels at night from algal respiration to levels below the tolerances of the fish or amphibian.

(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 Carolina madtom and Neuse River waterdog 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 Carolina madtom or Neuse River waterdog.

(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 the Carolina madtom or Neuse River waterdog. Possible actions could include, but are not limited to, stocking of nonnative fishes or other related actions. These activities can introduce parasites or disease to fish and amphibians; result in direct predation; or affect the growth, reproduction, and survival of madtoms and waterdogs.

Finally, we note that for any of the six categories of actions outlined above, we and the relevant Federal agency may find that the agency's anticipated

actions affecting critical habitat may be appropriate to consider programmatically in section 7 consultation. Programmatic consultations can be an efficient method for streamlining the consultation process, addressing an agency's multiple similar, frequently occurring, or routine actions expected to be implemented in a given geographic area. Programmatic section 7 consultation can also be conducted for an agency's proposed program, plan, policy, or regulation that provides a framework for future proposed actions. We are committed to responding to any agency's request for a programmatic consultation, when appropriate and subject to the approval of the Service Director, as a means to streamline the regulatory process and avoid time-consuming and inefficient multiple individual consultations.

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 INRMP prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.

We consult with the military on the development and implementation of INRMPs for installations with listed species. We analyzed INRMPs developed by military installations located within the ranges of the critical habitat designations for the Carolina madtom and Neuse River waterdog to determine if they meet the criteria for exemption from critical habitat under section 4(a)(3) of the Act. The following areas are Department of Defense (DoD) lands with completed, Service-approved INRMPs within the critical habitat designation for the Neuse River waterdog.

Approved INRMPs

We identified two areas within the critical habitat designation that consists of DoD lands with a completed, Service-approved INRMP. They are the Seymour Johnson Air Force Base (SJAFOB), which is located on 3,220 acres in Goldsboro, North Carolina, and the Marine Corps Air Station Cherry Point Oak Grove Outlying Landing Field (MCAS Cherry Point OLF), which is located near Pollocksville, in Jones County, North Carolina.

SJAFOB is federally owned land that is managed by the Air Force and is subject to all Federal laws and regulations. The SJAFOB INRMP was updated in September 2020, covers fiscal years 2021–2026, 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 SJAFOB 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 apply appropriate stormwater management practices.

Two miles (3.2 km) of Unit 14 (NR5c—Middle Neuse River) for the Neuse River waterdog 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 the Neuse River waterdog's critical habitat designation because of this exemption.

For the MCAS Cherry Point OLF, Unit 17 (Trent River) was decreased to exempt land owned by the Marine Corps. The base's INRMP includes a program for at-risk herpetofauna including establishment of a monitoring program, conducting surveys in high-probability habitat for new occurrences, collection of GIS location data, and implementation of ecosystem management practices that support the conservation and management of at-risk herpetofauna species, including the Neuse River waterdog, known to occur at MCAS Cherry Point (Tetra Tech 2012, p. C-10). Additional protection for at-risk herpetofauna known to occur at MCAS Cherry Point would be provided through NEPA-initiated individual project review and agency consultation, as necessary (Tetra Tech 2012, p. C-10). Based on these considerations, and in accordance with section 4(a)(3)(B)(i) of the Act, we have determined that 1.1 miles (2 km) of the Trent River is subject to the MCAS Cherry Point OLF 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 1.1 miles (2 km) of stream habitat in the Neuse River waterdog's 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 or she determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he or she 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 the determination to exclude a particular area, 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.

We describe below the process that we undertook for taking into consideration each category of impacts and our analyses of the relevant impacts. In this final rule, we have not considered any areas for exclusion from critical habitat.

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 consider economic impacts of a designation, we prepared an incremental effects memorandum (IEM) and screening analysis which, together with our narrative and interpretation of effects, constitute our final economic analysis (FEA) of the critical habitat designation and related factors (IEC 2018, entire). The analysis, dated September 14, 2018, was made available for public review from May 22, 2019, through July 22, 2019 (84 FR 23644). The DEA addressed probable economic impacts of critical habitat designation for the Carolina madtom and Neuse River waterdog. Following the close of the comment period, we reviewed and evaluated all information submitted during the comment period that may pertain to our consideration of the probable incremental economic impacts of this critical habitat designation. Additional information relevant to the probable incremental economic impacts of critical habitat designation for the Carolina madtom and Neuse River waterdog is summarized below.

The critical habitat designation for the Neuse River waterdog totals

approximately 779 river miles (1,254 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 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 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 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 two unoccupied units. In the occupied areas, any actions that may affect the species or its habitat would likely also affect 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 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. Two of the Carolina madtom critical habitat units (Unit 4: NR1 and Unit 7: TR1) are unoccupied. One of these units (NR1) overlaps entirely with river miles designated as critical habitat for the Neuse River waterdog. The second unoccupied unit (TR1) overlaps partially with Neuse River waterdog critical habitat, but includes approximately 7 river miles that do not overlap (representing approximately 3 percent of the Carolina madtom's designated critical habitat). However, these river miles are located in a remote area where future section 7 consultations are not anticipated.

Our analysis shows that these costs would not reach the threshold of "significant" under E.O. 12866 (IEC 2018, entire). 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.

Exclusions Based on Economic Impacts

As discussed above, the Service considered the economic impacts of the critical habitat designation, and the

Secretary is not exercising her discretion to exclude any areas from this designation of critical habitat for the Carolina madtom or Neuse River waterdog based on economic impacts. A copy of the IEM and screening analysis with supporting documents may be obtained by contacting the Raleigh Ecological Services Field Office (see **ADDRESSES**) or by downloading from the internet at <http://www.regulations.gov>.

Exclusions Based on Impacts on National Security and Homeland Security

Section 4(a)(3)(B)(i) of the Act (see Exemptions, above) may not cover all DoD lands or areas that pose potential national-security concerns (e.g., a DoD installation that is in the process of revising its INRMP for a newly listed species or a species previously not covered). If a particular area is not covered under section 4(a)(3)(B)(i), national-security or homeland-security concerns are not a factor in the process of determining what areas meet the definition of "critical habitat." Nevertheless, when designating critical habitat under section 4(b)(2), the Service must consider impacts on national security, including homeland security, on lands or areas not covered by section 4(a)(3)(B)(i). Accordingly, we will always consider for exclusion from the designation areas for which DoD, Department of Homeland Security, or another Federal agency has requested exclusion based on an assertion of national-security or homeland-security concerns. We have determined that, other than the land exempted under section 4(a)(3)(B)(i) of the Act based upon the existence of an approved INRMP (see Exemptions, above), the lands within the designation of critical habitat for Carolina madtom or Neuse River waterdog are not owned or managed by the DoD or Department of Homeland Security, and, therefore, we anticipate no impact on national security. Consequently, the Secretary is not exercising her 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 final rule, we determined that there are currently no permitted conservation plans or other non-permitted conservation agreements or partnerships for the Carolina madtom or Neuse River waterdog, and the final critical habitat designations do not include any Tribal lands or trust resources. We anticipate no impact on Tribal lands, partnerships, or permitted or non-permitted plans or agreements from this critical habitat designation. Accordingly, the Secretary is not exercising her discretion to exclude any areas from the final designation based on other relevant impacts.

Required Determinations

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 (OMB) will review all significant rules. OIRA has determined that this rule is not significant.

Executive Order (E.O.) 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 whether 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.

Under the RFA, as amended, and as understood in light of recent court decisions, Federal agencies are required to evaluate only the potential incremental impacts of rulemaking on those entities directly regulated by the rulemaking itself; in other words, the RFA does not require agencies 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 will be directly regulated by this 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 will be directly regulated by this rulemaking, the Service certifies that this critical habitat designation will not have a significant economic impact on a substantial number of small entities and a regulatory flexibility analysis is not required.

Energy Supply, Distribution, or Use—Executive Order 13211

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. OMB has provided guidance for implementing this E.O. that outlines nine outcomes that may constitute “a significant adverse effect” when compared to not taking the regulatory action under consideration. The economic analysis finds that none of these criteria is relevant to this analysis. Thus, based on information in the economic analysis, energy-related impacts associated with Carolina madtom or Neuse River waterdog conservation activities within critical habitat are not expected. As such, the designation of critical habitat is not expected to 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 rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, 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 does not apply, nor does critical habitat shift the costs of the large entitlement programs listed above onto State governments.

(2) We do not believe that this rule will significantly or uniquely affect small governments because most of the lands adjacent to the streams being designated as critical habitat are owned by private landowners. These entities do not fit the definition of “small governmental jurisdiction.” The 148 miles (238 km) for the Neuse River

waterdog and 91 miles (146 km) for the Carolina madtom of riparian habitat owned by Federal, State, or local governments that we are designating as critical habitat in this rule are either lands managed for conservation or lands already developed. Consequently, we do not believe that the critical habitat designation will significantly or uniquely affect small government entities. As such, 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 the Carolina madtom and Neuse River waterdog in a takings implications assessment. 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 concludes that the designations of critical habitat for Carolina madtom and Neuse River waterdog do 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 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 the critical habitat designation with, the appropriate State resource agencies. We did not receive comments from the States. 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 rule does not have substantial direct effects either on the State, or on the relationship between the national government and the State, or on the distribution of powers and responsibilities among the various levels of government. The 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 these local governments in long-range planning (because these local governments 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) will 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 are designating critical habitat in accordance with the provisions of the Act. To assist the public in understanding the habitat needs of the species, this rule identifies the elements of physical or biological features essential to the conservation of the species. The designated areas of critical habitat are presented on maps, and the 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.)

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 the National Environmental Policy Act in connection with listing species and designating critical habitat under the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County v. Babbitt*, 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)).

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (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. We have identified no Tribal interests that will be affected by this rule.

References Cited

A complete list of references cited in this rule 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 rule are the staff members of the U.S. 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.

Regulation Promulgation

Accordingly, we 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), the List of Endangered and Threatened Wildlife, by:

■ a. Adding an entry for “Waterdog, Neuse River” in alphabetical order under AMPHIBIANS; and

■ b. Adding an entry for “Madtom, Carolina” in alphabetical order under FISHES.

The additions read as set forth below.

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
*	*	*	*	*
Amphibians				

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* * * * *	* * * * *	* * * * *	* * * * *	* * * * *
Waterdog, Neuse River ...	<i>Necturus lewisi</i>	Wherever found	T	86 FR [INSERT Federal Register PAGE WHERE THE DOCUMENT BEGINS], June 9, 2021; 50 CFR 17.43(f); ^{4d} 50 CFR 17.95(d). ^{CH}
Fishes				
* * * * *	* * * * *	* * * * *	* * * * *	* * * * *
Madtom, Carolina	<i>Noturus furiosus</i>	Wherever found	E	86 FR [INSERT FEDERAL REGISTER PAGE WHERE THE DOCUMENT BEGINS], June 9, 2021; 50 CFR 17.95(e). ^{CH}
* * * * *	* * * * *	* * * * *	* * * * *	* * * * *

■ 3. Amend § 17.43 by adding paragraph (f) to read as set forth below:

§ 17.43 Special rules—amphibians.

* * * * *

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

(1) *Prohibitions.* The following prohibitions that apply to endangered wildlife also apply to the Neuse River waterdog. Except as provided under paragraph (f)(2) of this section and §§ 17.4 and 17.5, it is unlawful for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit, or cause to be committed, any of the following acts in regard to this species:

(i) Import or export, as set forth at § 17.21(b) for endangered wildlife.

(ii) Take, as set forth at § 17.21(c)(1) for endangered wildlife.

(iii) Possession and other acts with unlawfully taken specimens, as set forth at § 17.21(d)(1) for endangered wildlife.

(iv) Interstate or foreign commerce in the course of commercial activity, as set forth at § 17.21(e) for endangered wildlife.

(v) Sale or offer for sale, as set forth at § 17.21(f) for endangered wildlife.

(2) *Exceptions from prohibitions.* In regard to this species, you may:

(i) Conduct activities as authorized by a permit under § 17.32.

(ii) Take, as set forth at § 17.21(c)(2) through (c)(4) for endangered wildlife.

(iii) Take, as set forth at § 17.31(b).

(iv) Take incidental to an otherwise lawful activity caused by:

(A) 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, and follow-up monitoring.

(B) 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 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. Prior to restoration action, surveys to determine presence of Neuse River waterdog must be performed, and if located, waterdogs must be relocated prior to project implementation.

(C) 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 native species live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), native species live fascines (live branch cuttings, usually willows, bound together into long, cigar shaped bundles), or native species brush layering (cuttings or branches of easily rooted tree species layered between successive lifts of soil fill). Native species vegetation includes woody and herbaceous species appropriate for the

region and habitat conditions. These methods will not include the sole use of quarried rock (rip-rap) or the use of rock baskets or gabion structures.

(D) Forestry-related activities, including silvicultural practices, forest management work, and fire control tactics, that implement State-approved best management practices. In order for this exception to apply to forestry-related activities, these best management practices must achieve all of the following:

(1) Establish a streamside management zone alongside the margins of each waterway.

(2) Restrain visible sedimentation caused by the forestry-related activity from entering the waterway.

(3) Maintain native groundcover within the streamside management zone of the waterway, and promptly re-establish native groundcover if disturbed.

(4) Limit installation of vehicle or equipment crossings of the waterway to only where necessary for the forestry-related activity. Such crossings must:

(i) Have erosion and sedimentation control measures installed to divert surface runoff away and restrain visible sediment from entering the waterway;

(ii) Allow for movement of aquatic organisms within the waterway; and

(iii) Have native groundcover applied and maintained through completion of the forestry-related activity.

(5) Prohibit the use of tracked or wheeled vehicles for reforestation site preparation within the streamside management zone of the waterway.

(6) Prohibit locating log decks, skid trails, new roads, and portable mill sites in the streamside management zone of the waterway.

(7) Prohibit obstruction and impediment of the flow of water within the waterway, caused by direct deposition of debris or soil by the forestry-related activity.

(8) Maintain shade over the waterway similar to that observed prior to the forestry-related activity.

(9) Prohibit discharge of any solid waste, petroleum, pesticide, fertilizer, or other chemical into the waterway.

(v) Possess and engage in other acts with unlawfully taken wildlife, as set forth at § 17.21(d)(2) for endangered wildlife.

■ 4. Amend § 17.95 by:

■ a. Adding to paragraph (d) an entry for “Neuse River Waterdog (*Necturus lewisi*)” following the entry for “Black Warrior Waterdog (*Necturus alabamensis*)”; and

■ b. Adding to paragraph (e) an entry for “Carolina Madtom (*Noturus furiosus*)” following the entry for “Conasauga Logperch (*Percina jenkinsi*)”.

The additions read as follows.

§ 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 in this entry.

(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,

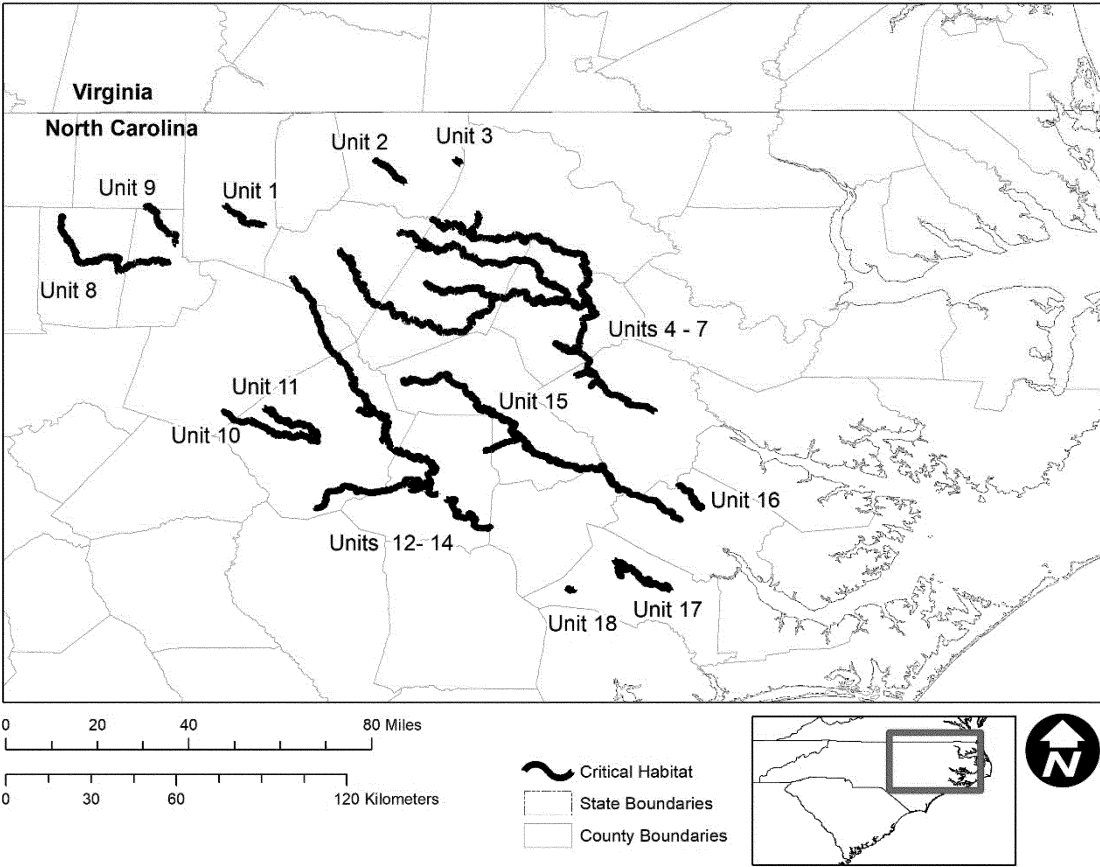
beetles, centipedes, slugs, and small fish.

(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 July 9, 2021.

(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:

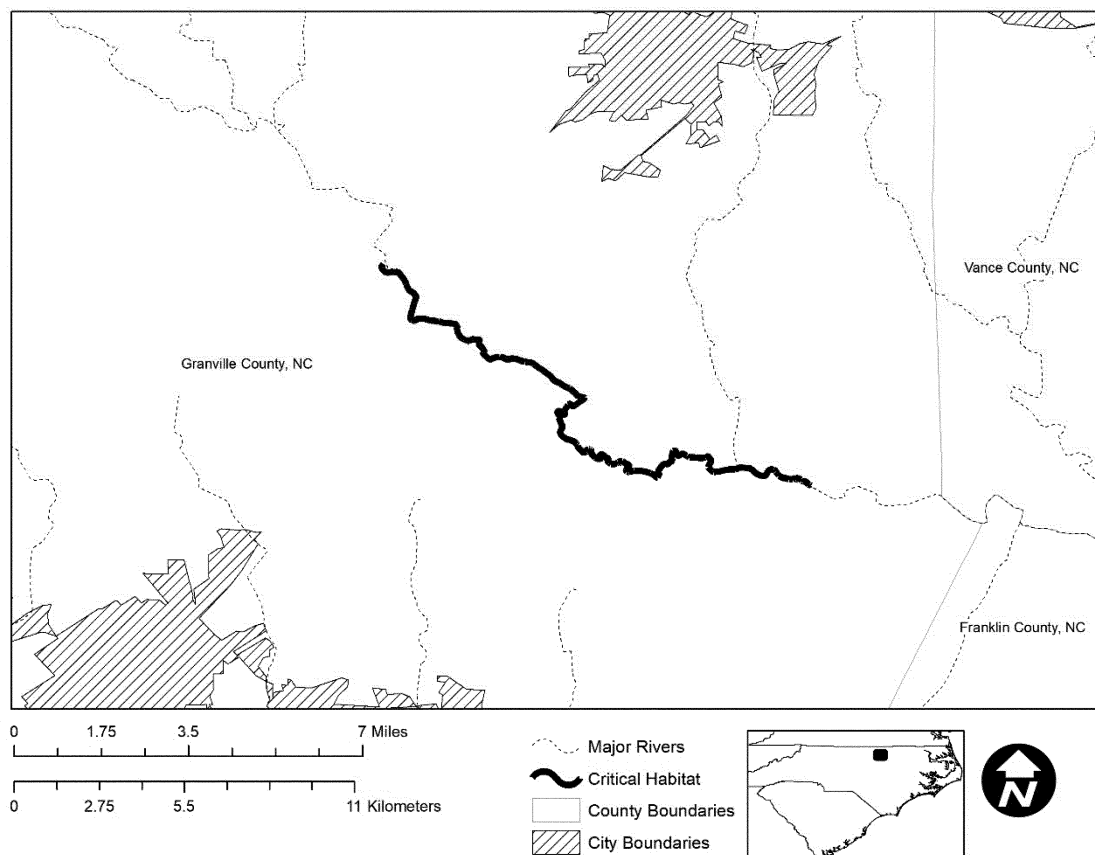
Index Map of Critical Habitat Units for Neuse River Waterdog



(6) Unit 1: TAR1–Upper Tar River, Granville County, North Carolina.
(i) This unit consists of 12.3 river miles (19.8 river kilometers) of the

Upper Tar River from approximately SR1004 (Old NC 75) downstream to SR1622 (Cannady’s Mill Road). Unit 1

includes stream habitat up to bankfull height.
(ii) Map of Unit 1 follows:

Map of Unit 1: TAR1 - Upper Tar River Critical Habitat Unit for Neuse River Waterdog

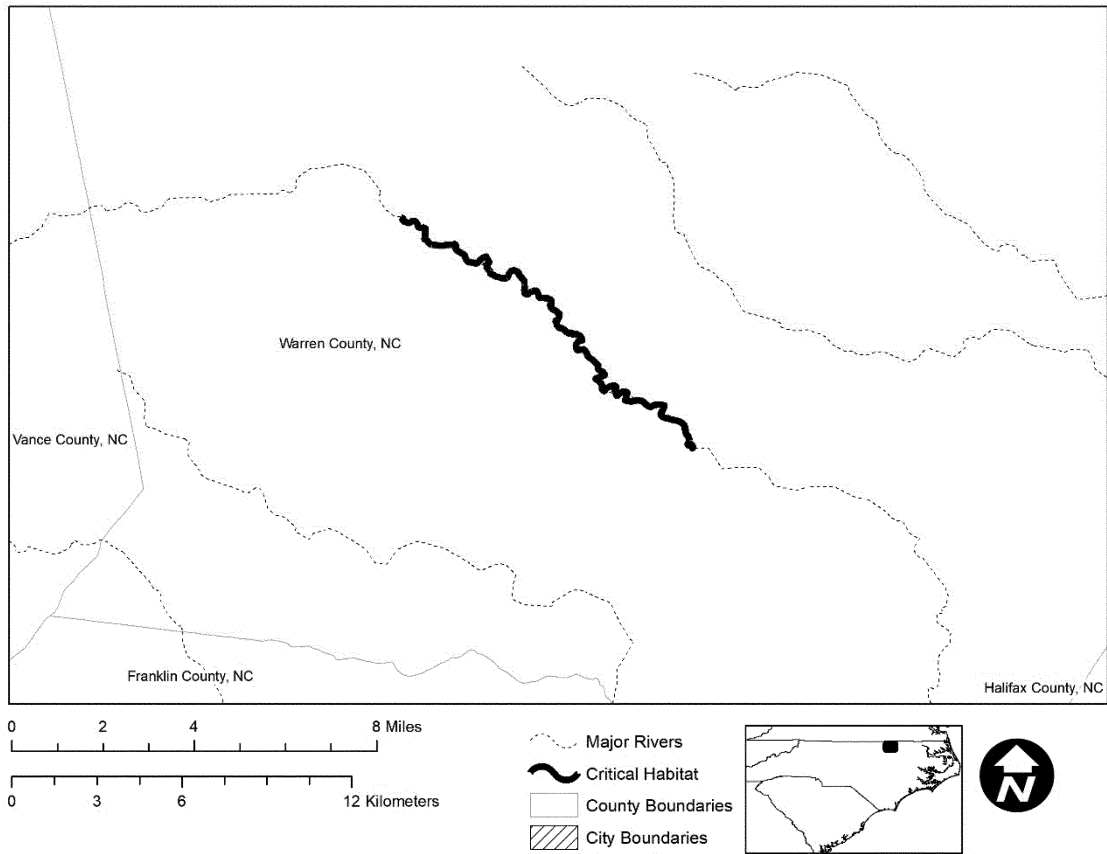
(7) Unit 2: TAR2—Upper Fishing Creek, Warren County, North Carolina.

(i) This unit consists of 10.5 miles (17 kilometers) of Upper Fishing Creek from SR1118 (No Bottom Drive) downstream

to NC58. Unit 2 includes stream habitat up to bankfull height.

(ii) Map of Unit 2 follows:

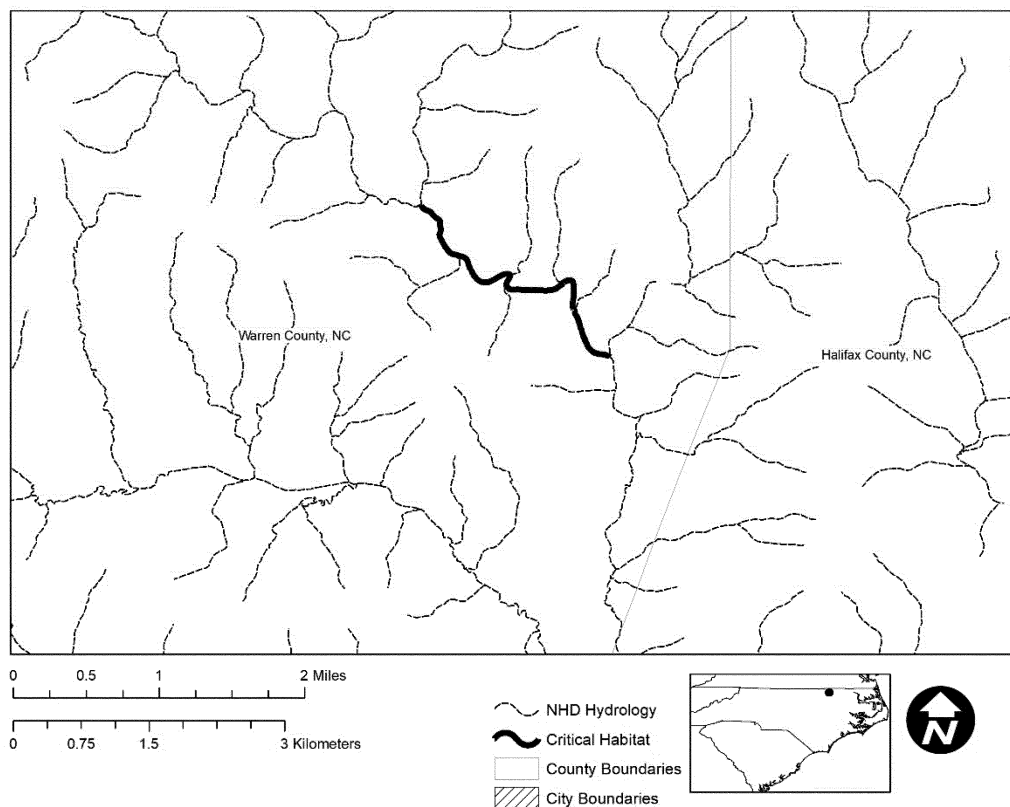
Map of Unit 2: TAR2 - Upper Fishing Creek Critical Habitat Unit for Neuse River Waterdog



- (8) Unit 3: TAR3–Bens Creek, Warren County, North Carolina.

(i) This unit consists of 2 miles (3.2 km) of Bens Creek beginning
- approximately one mile upstream and ending approximately one mile downstream of SR1509 (Odell-Littleton
- Road). Unit 3 includes stream habitat up to bankfull height.

(ii) Map of Unit 3 follows:

Map of Unit 3: TAR3 - Ben's Creek Critical Habitat Unit for Neuse River Waterdog

(9) Unit 4: TAR4a—Fishing Creek Subbasin, Edgecombe, Halifax, Nash, and Warren Counties, North Carolina; Unit 5: TAR4b—Sandy/Swift Creek, Edgecombe, Franklin, Nash, and Warren Counties, North Carolina; Unit 6: TAR4c—Middle Tar River Subbasin, Edgecombe, Franklin, and Nash Counties, North Carolina; and Unit 7: TAR4d—Lower Tar River Subbasin, Edgecombe and Pitt Counties, North Carolina.

(i) Units 4, 5, 6, and 7 include stream habitat up to bankfull height.

(ii) Unit 4 consists of 82.8 miles (133.3 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 from the Warren/Halifax County line to the confluence with the Tar River in Edgecombe County.

(iii) Unit 5 consists of 72.5 miles (116.8 kilometers) 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.

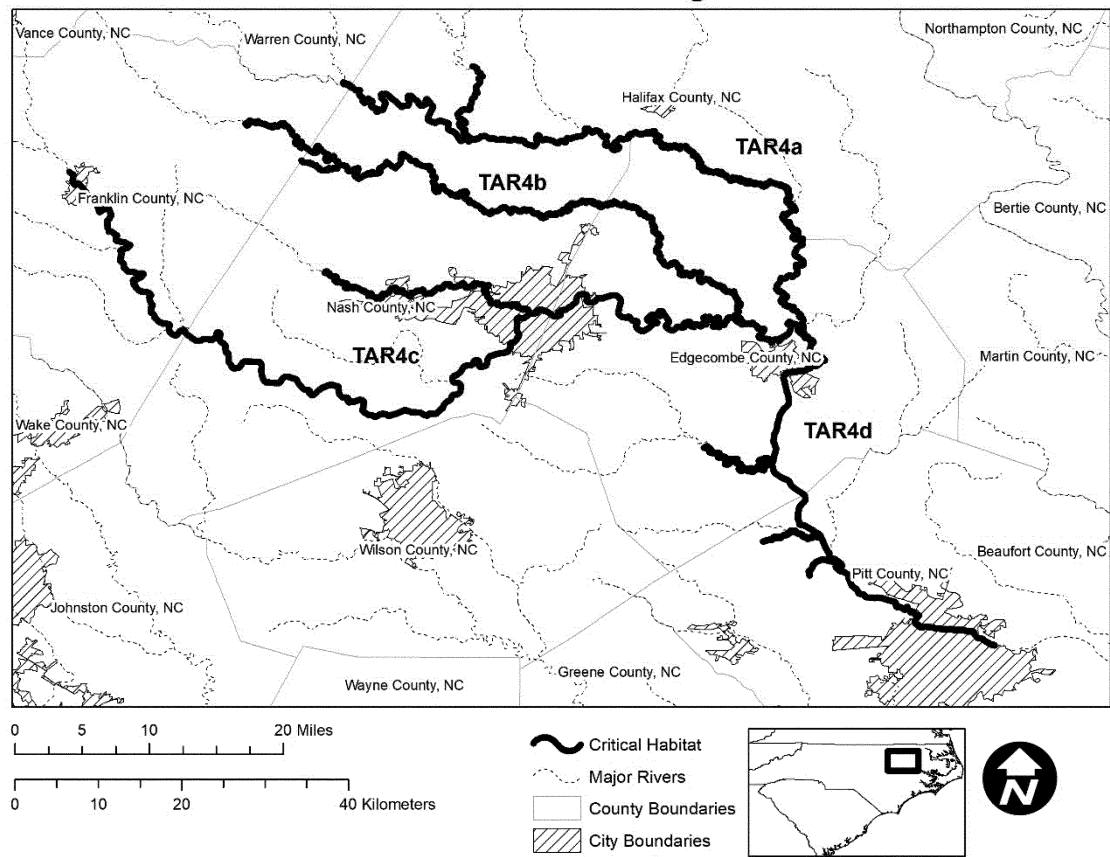
(iv) Unit 6 consists of 111 miles (179 kilometers) of the Middle Tar River from upstream of Highway 401 downstream to the confluence with Fishing Creek, including Stony Creek below SR1300

(Boddies' Millpond Rd), downstream to the confluence with the Tar River.

(v) Unit 7 consists of 59.9 miles (96.3 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.

(vi) Map of Units 4, 5, 6, and 7 follows:

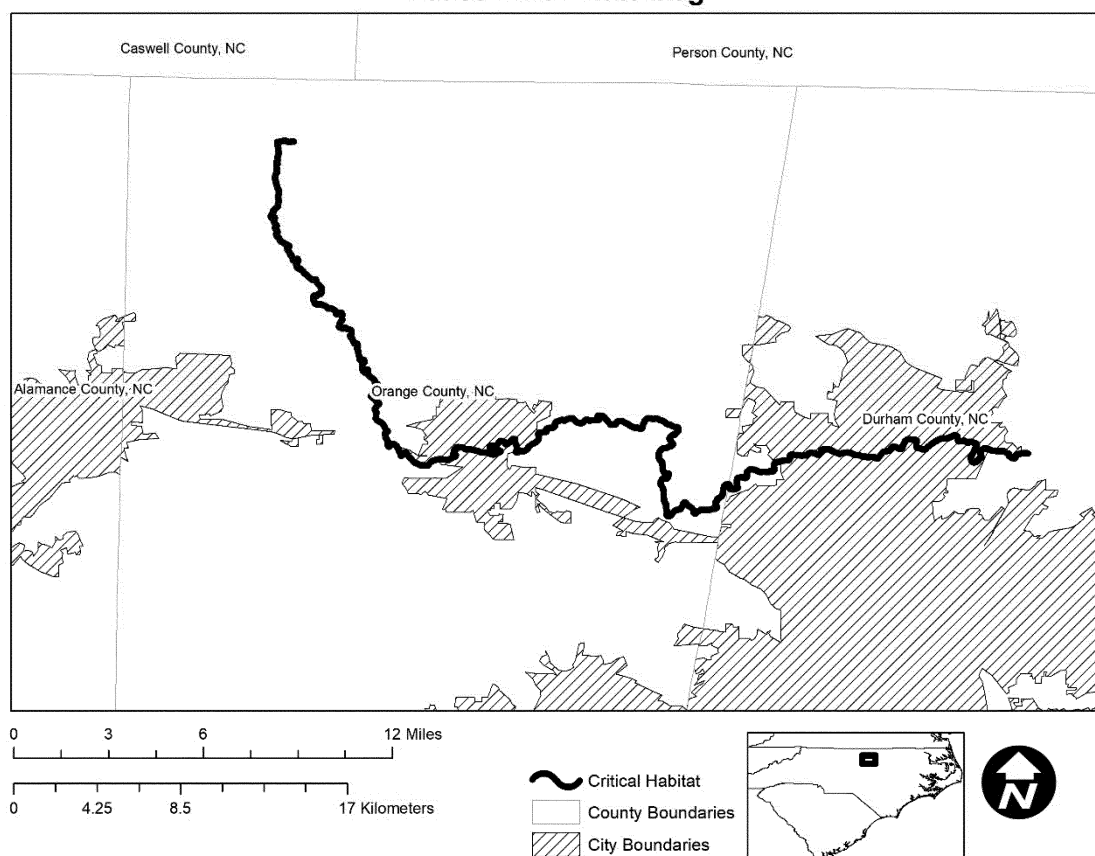
Map of Units 4 - 7: TAR4 - Middle/Lower Tar River Subbasins Critical Habitat Units for Neuse River Waterdog



- (10) Unit 8: NR1–Eno River, Durham and Orange Counties, North Carolina.
- (i) This unit consists of 43.9 miles (70.6 kilometers) of the Eno River from NC86 downstream to the inundated portion of Falls Lake. Unit 8 includes stream habitat up to bankfull height.

(ii) Map of Unit 8 follows:

Map of Unit 8: NR1 - Eno River Subbasin Critical Habitat Unit for Neuse River Waterdog



(11) Unit 9: NR2—Flat River, Durham and Person Counties, North Carolina.

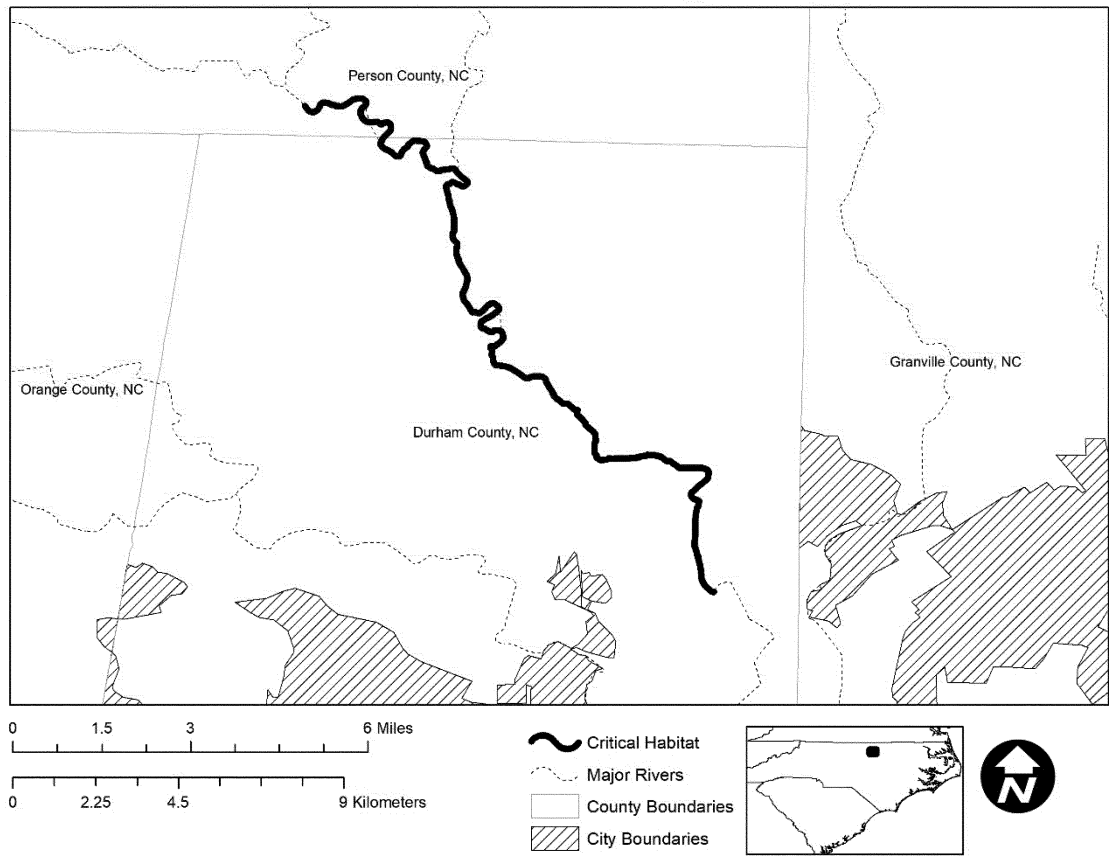
(i) This unit consists of 15.2 miles (24.5 kilometers) of the Flat River from

SR1739 (Harris Mill Road) downstream to the inundated portion of Falls Lake.

Unit 9 includes stream habitat up to bankfull height.

(ii) Map of Unit 9 follows:

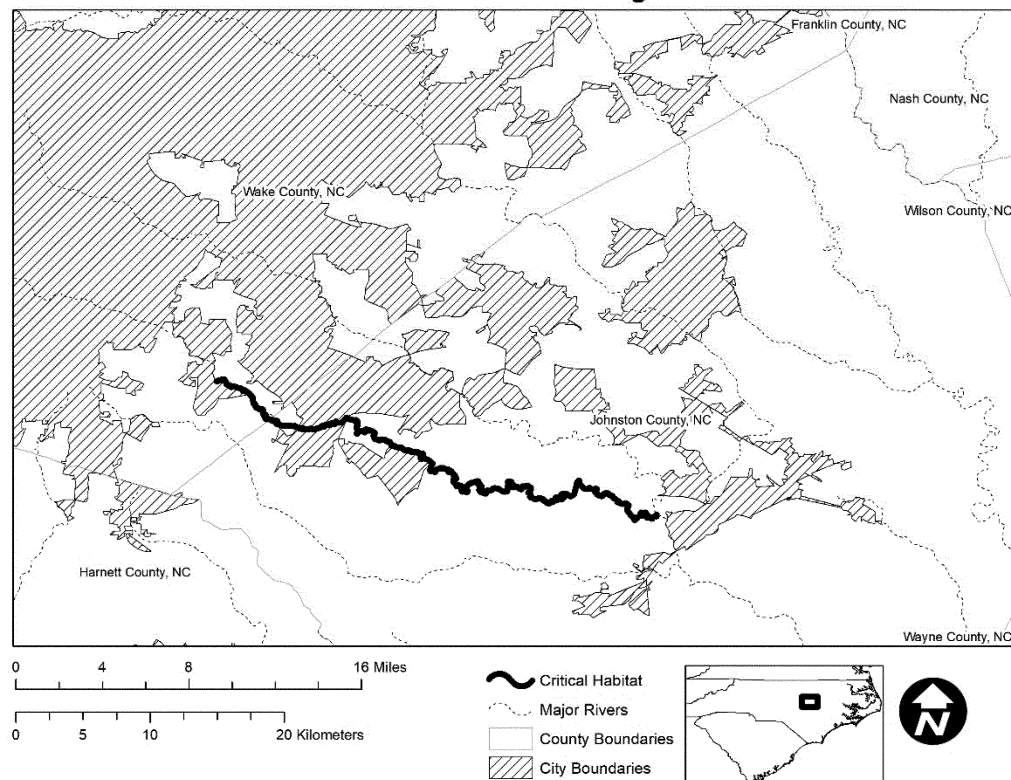
Map of Unit 9: NR2 - Flat River Subbasin Critical Habitat Unit for Neuse River Waterdog



- (12) Unit 10: NR3–Middle Creek, Johnston and Wake Counties, North Carolina.
- (i) This unit consists of 30.8 miles (49.6 km) of Middle Creek from Southeast Regional Park downstream to the confluence with Swift Creek. Unit 10 includes stream habitat up to bankfull height.

(ii) Map of Unit 10 follows:

**Map of Unit 10: NR3 - Middle Creek Subbasin Critical Habitat Unit for
Neuse River Waterdog**



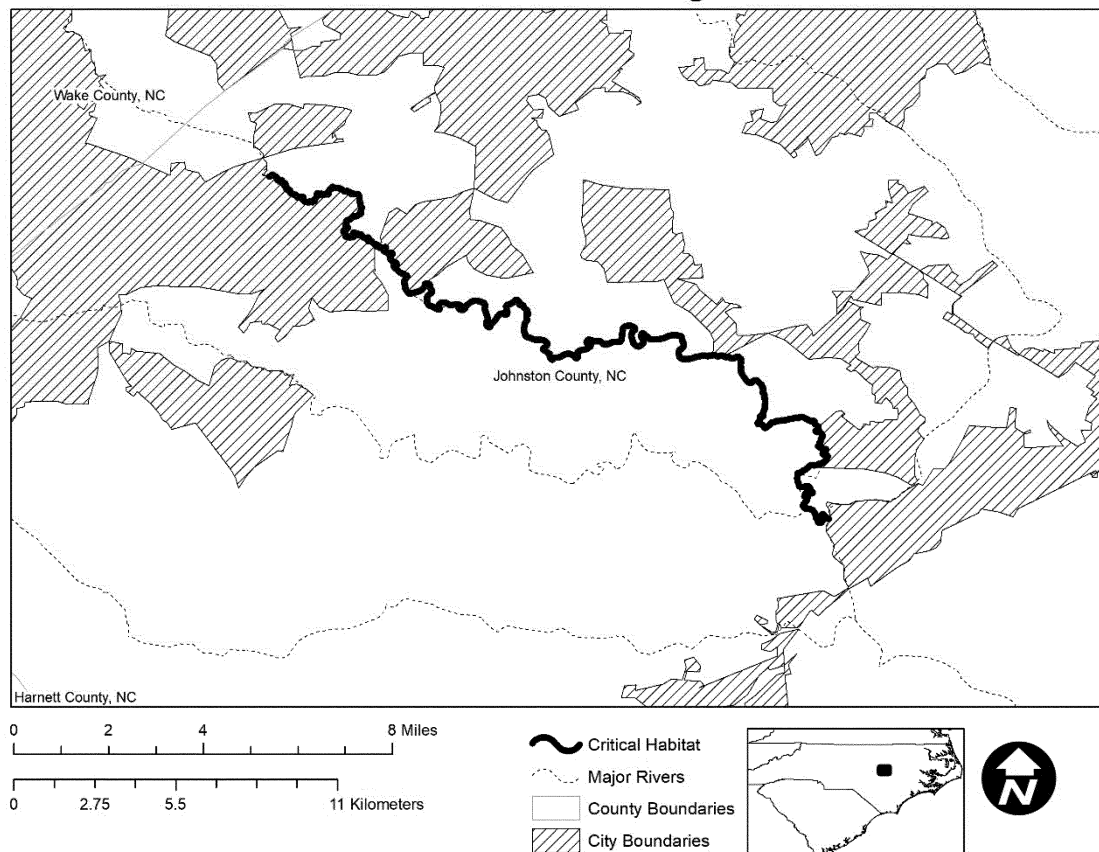
(13) Unit 11: NR4–Swift Creek,
Johnston County, North Carolina.

(i) This unit consists of 24 miles (38.6 kilometers) of Swift Creek from NC42 downstream to the confluence with the

Neuse River. Unit 11 includes stream habitat up to bankfull height.

(ii) Map of Unit 11 follows:

**Map of Unit 11: NR4 - Swift Creek Subbasin Critical Habitat Unit for
Neuse River Waterdog**



(14) Unit 12: NR5a–Little River, Franklin, Johnston, Wake, and Wayne Counties, North Carolina; Unit 13: NR5b–Mill Creek, Johnston and Wayne Counties, North Carolina; and Unit 14: NR5c–Middle Neuse River, Wayne County, North Carolina.

(i) Units 12, 13, and 14 include stream habitat up to bankfull height.

(ii) Unit 12 consists of 90.8 miles (146.1 kilometers) of the Little River from near NC96 in Wake County downstream to the confluence with the Neuse River, including Buffalo Creek from NC39 to the confluence with the Little River.

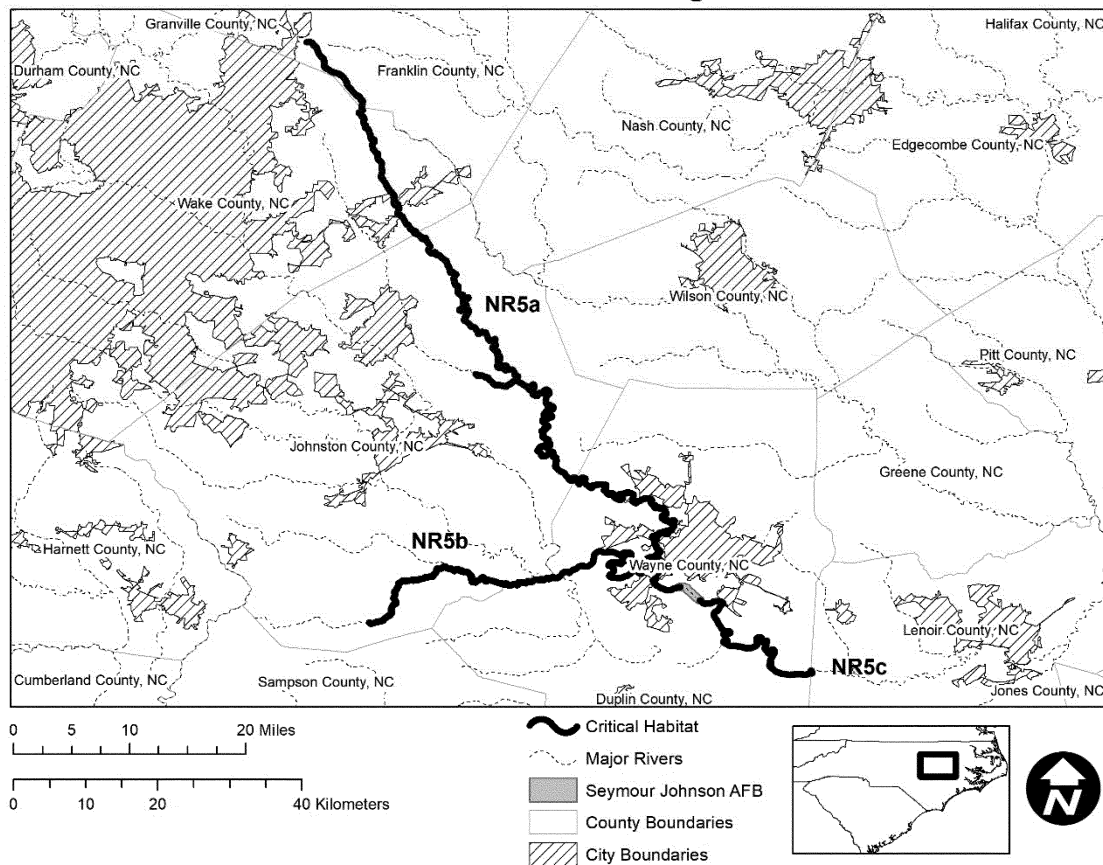
(iii) Unit 13 consists of 20.8 miles (33.5 kilometers) of Mill Creek from

upstream of US701 downstream to the confluence with the Neuse River.

(iv) Unit 14 consists of 43.2 miles (69.5 kilometers) of the Middle Neuse River from the confluence with Mill Creek downstream to the Wayne/Lenoir County line.

(v) Map of Units 12, 13, and 14 follows:

Map of Units 12 - 14 : NR5 - Middle Neuse River Subbasins Critical Habitat Units for Neuse River Waterdog



(15) Unit 15: NR6—Contentnea Creek/ Lower Neuse River Subbasin, Craven, Greene, Lenoir, Pitt, Wayne, and Wilson Counties, North Carolina.

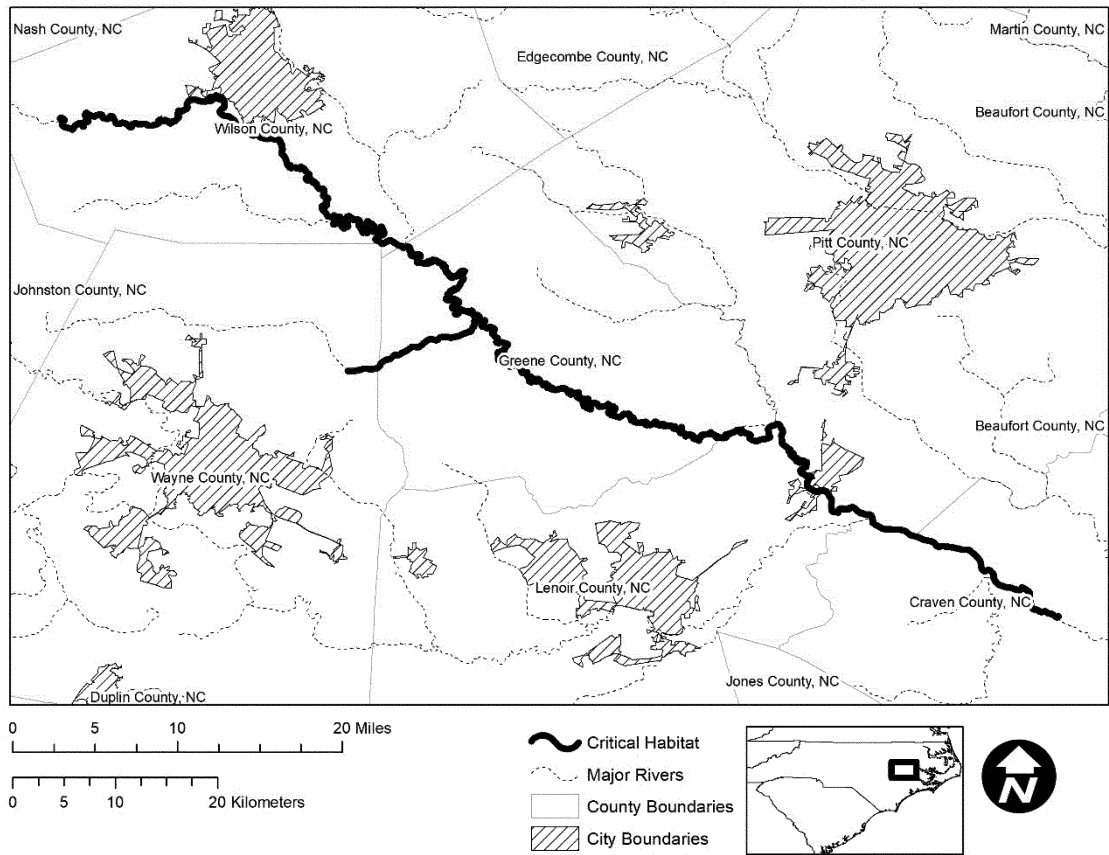
(i) This unit consists of 114.8 miles (184.8 kilometers) of Contentnea Creek

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 15 includes stream habitat up to bankfull height.

(ii) Map of Unit 15 follows:

Map of Unit 15: NR6 - Contentnea Creek/Lower Neuse River Subbasin
Critical Habitat Unit for Neuse River Waterdog



(16) Unit 16: NR7–Swift Creek (Lower Neuse), Craven County, North Carolina.

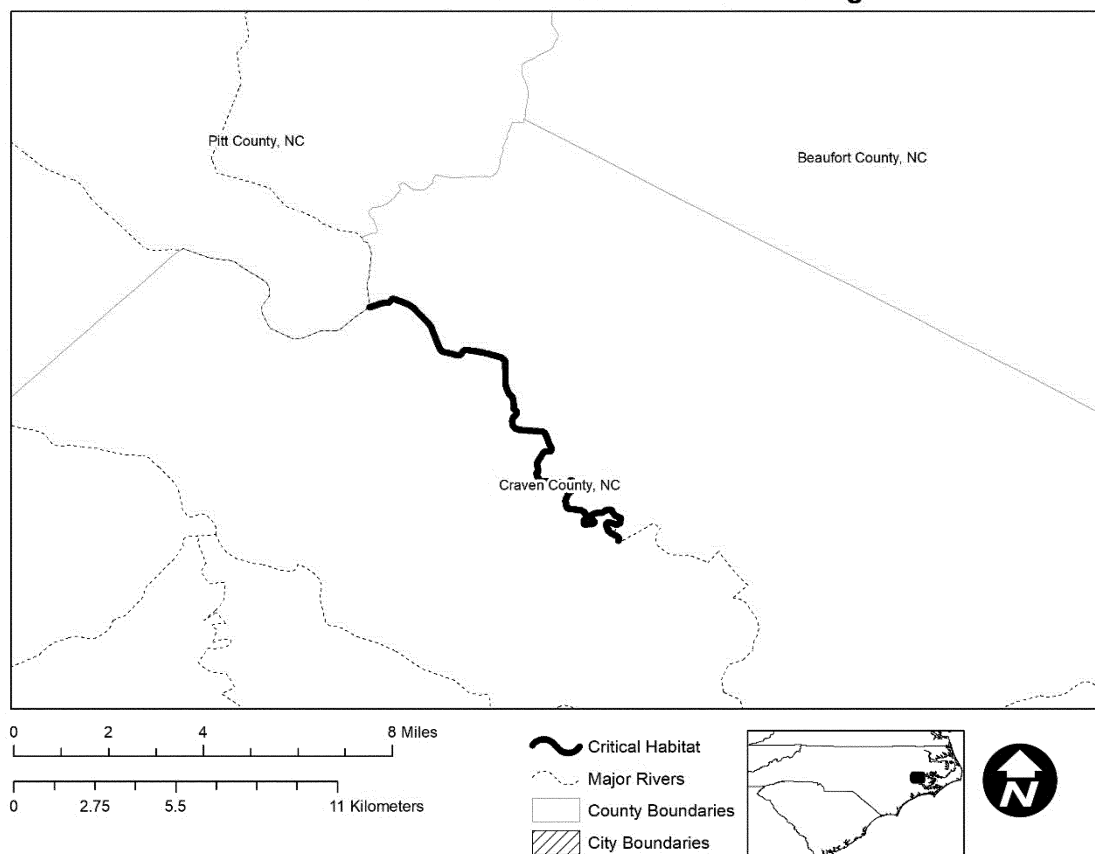
(i) This unit consists of 10.3 miles (16.5 rier kilometers) of Swift Creek

from SR1931 (Beaver Camp Rd) downstream to SR1440 (Streets Ferry

Rd). Unit 16 includes stream habitat up to bankfull height.

(ii) Map of Unit 16 follows:

**Map of Unit 16: NR7 - Swift Creek (Lower Neuse)
Critical Habitat Unit for Neuse River Waterdog**



(17) Unit 17: TR1—Trent River, Jones County, North Carolina.

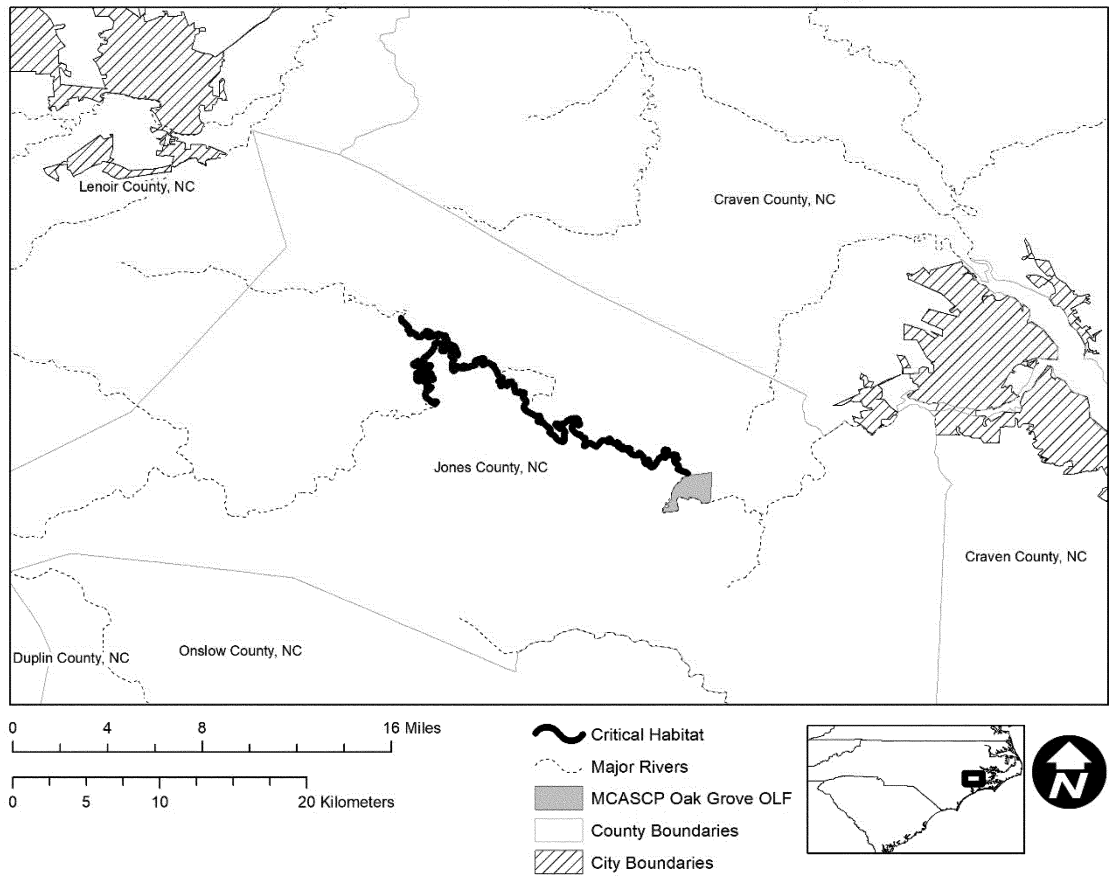
(i) This unit consists of 32.5 miles (52.4 kilometers) of Beaver Creek from SR1316 (McDaniel Fork Rd) to the

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 17 includes stream habitat up to bankfull height.

(ii) Map of Unit 17 follows:

Map of Unit 17: TR1 - Trent River Subbasin
Critical Habitat Unit for Neuse River Waterdog

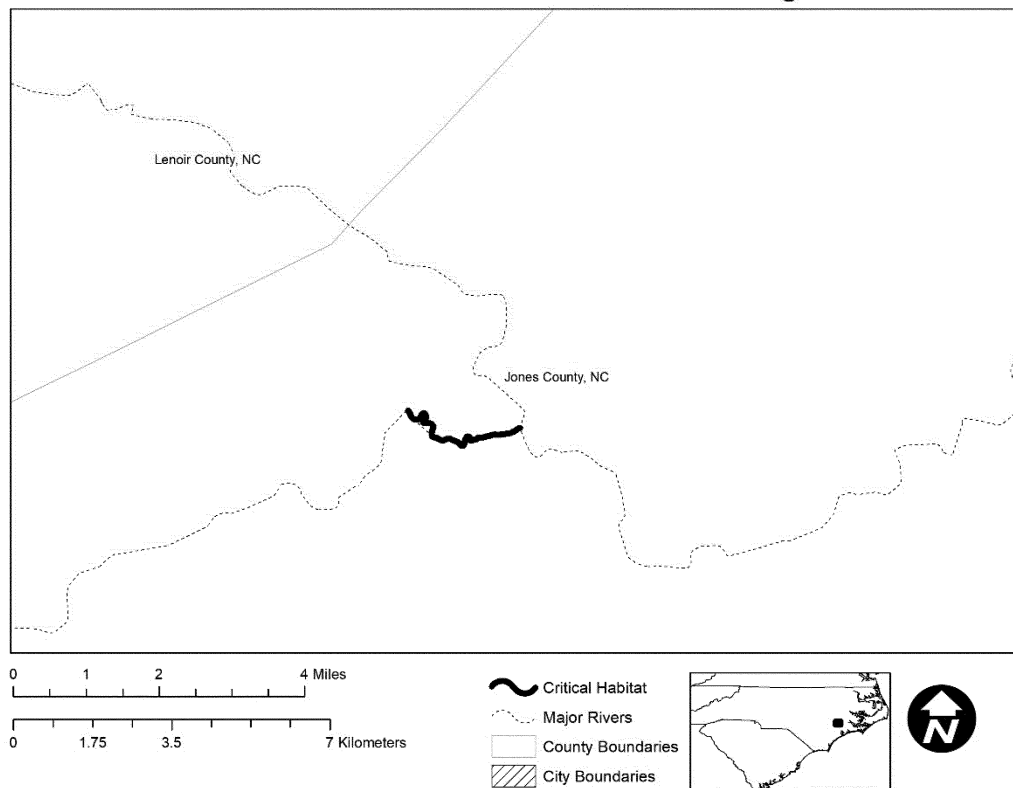


(18) Unit 18: TR2–Tuckahoe Swamp, Jones County, North Carolina.
(i) This unit consists of 2 miles (3.2 km) of Tuckahoe Swamp in Jones

County, North Carolina. Unit 18 begins upstream of SR1142 (Weyerhaeuser Road) to the confluence with the Trent

River. Unit 18 includes stream habitat up to bankfull height.
(ii) Map of Unit 18 follows:

**Map of Unit 18: TR2 - Tuckahoe Swamp
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, Johnston, Jones, Nash, Orange, Vance, Warren, and Wilson Counties, North Carolina, on the maps in this entry.

(2) Within these areas, the physical or biological features essential to the conservation of the 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.

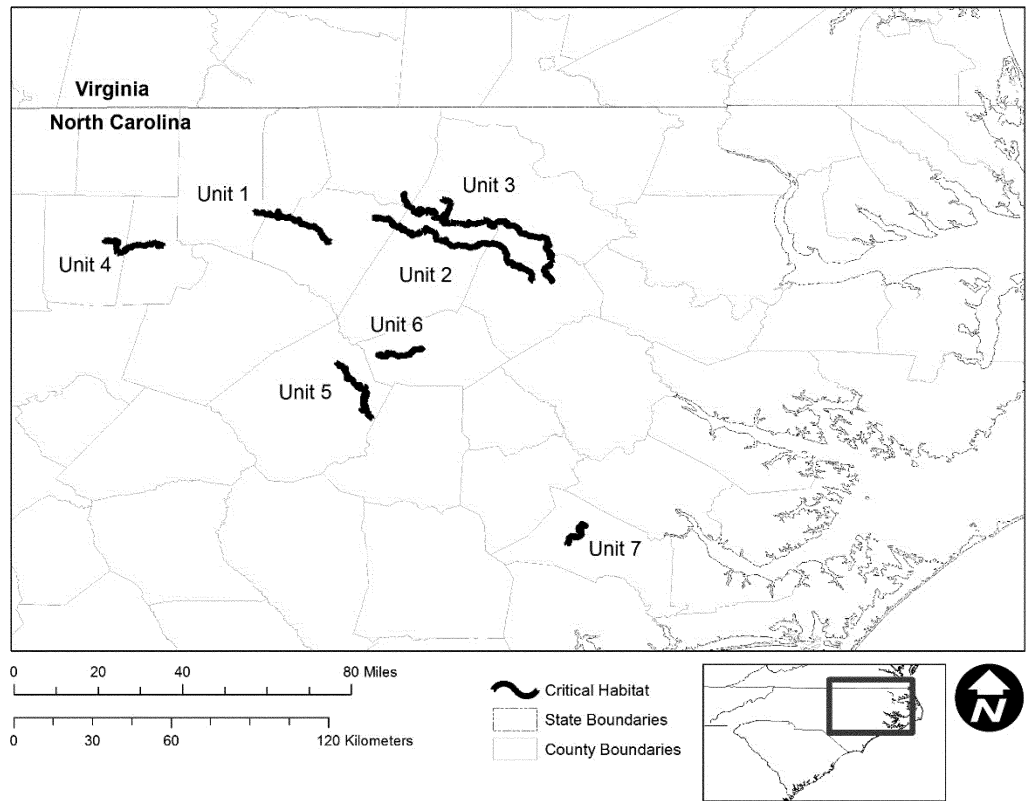
(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on July 9, 2021.

(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:

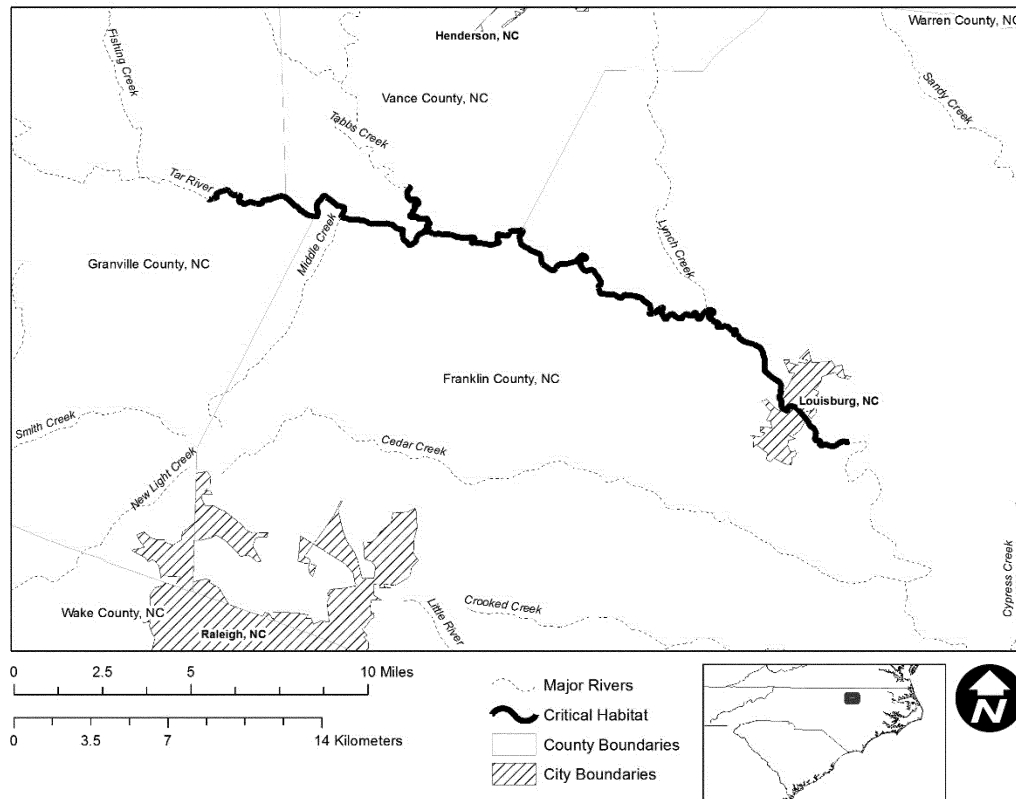
Index Map of Critical Habitat Units for Carolina Madtom



- (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 the Upper Tar River from the confluence with Sand Creek to the confluence with Sycamore Creek. Unit 1 includes stream habitat up to bankfull height.

(ii) Map of Unit 1 follows:

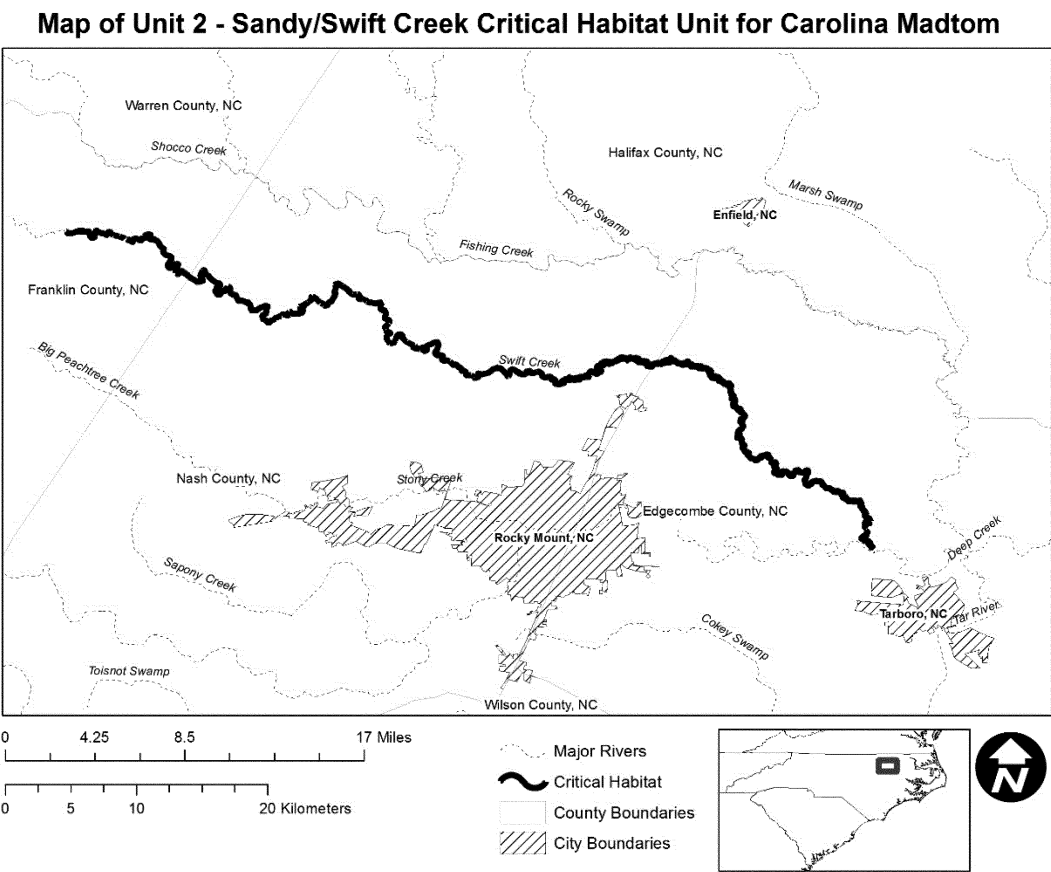
Map of Unit 1 - Upper Tar River Critical Habitat Unit for Carolina Madtom

(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 Sandy and Swift Creeks, located downstream from NC561 to the confluence with the Tar

River. Unit 2 includes stream habitat up to bankfull height.

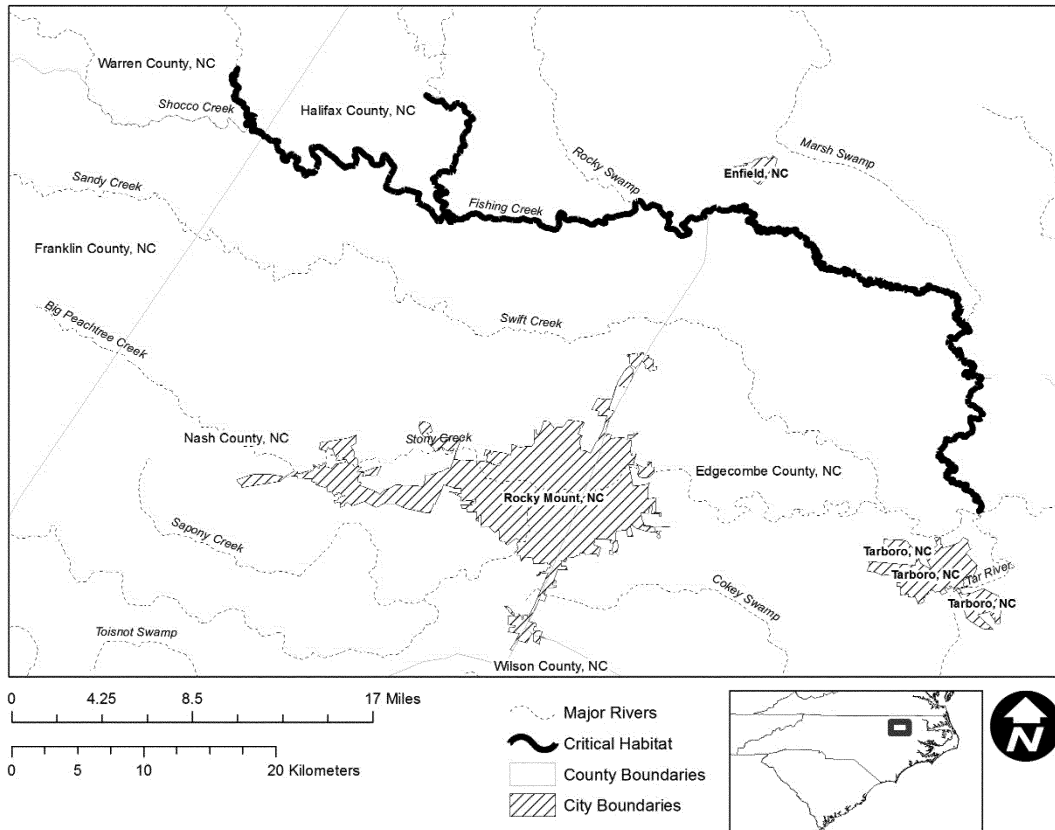
(ii) Map of Unit 2 follows:



- (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 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 bankfull height.

(ii) Map of Unit 3 follows:

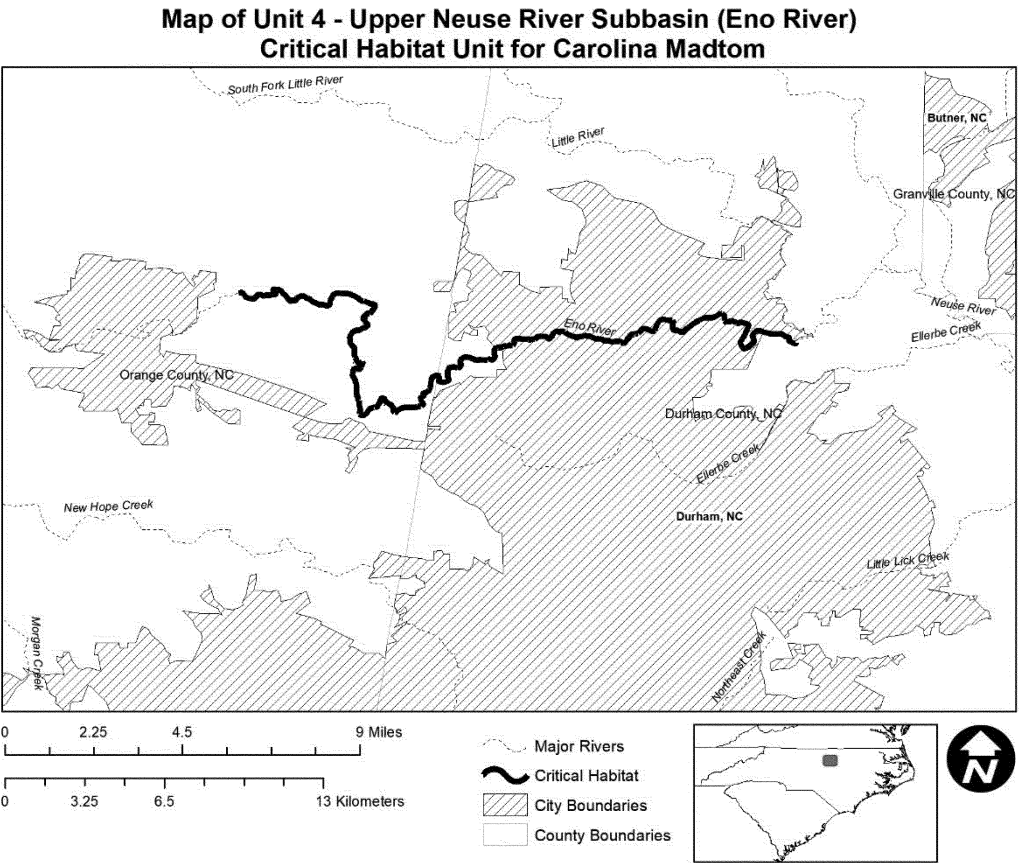
Map of Unit 3 - Fishing Creek Subbasin Critical Habitat Unit for Carolina Madtom

(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 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 bankfull height.

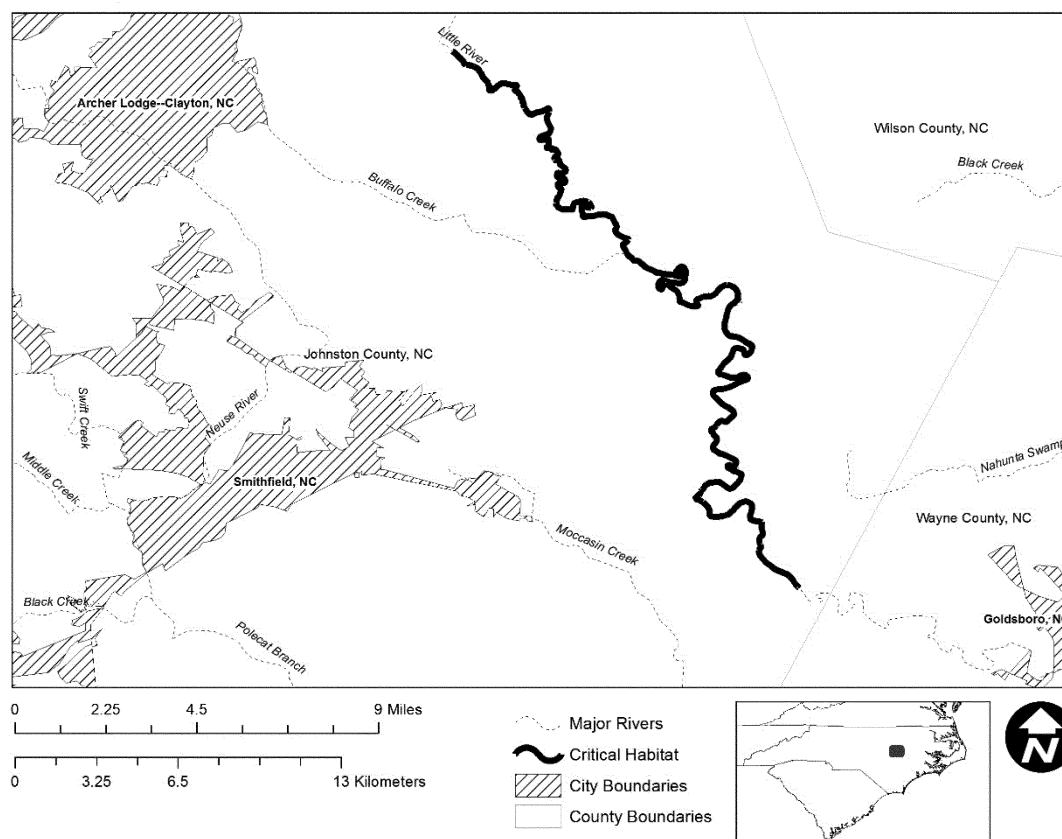
(ii) Map of Unit 4 follows:



(10) Unit 5: NR2–Little River, Johnston County, North Carolina.
(i) This unit consists of 28 river miles (45 river kilometers) of the Upper and

Lower Little River from NC42 to the Johnston/Wayne County line. Unit 5

includes stream habitat up to bankfull height.
(ii) Map of Unit 5 follows:

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

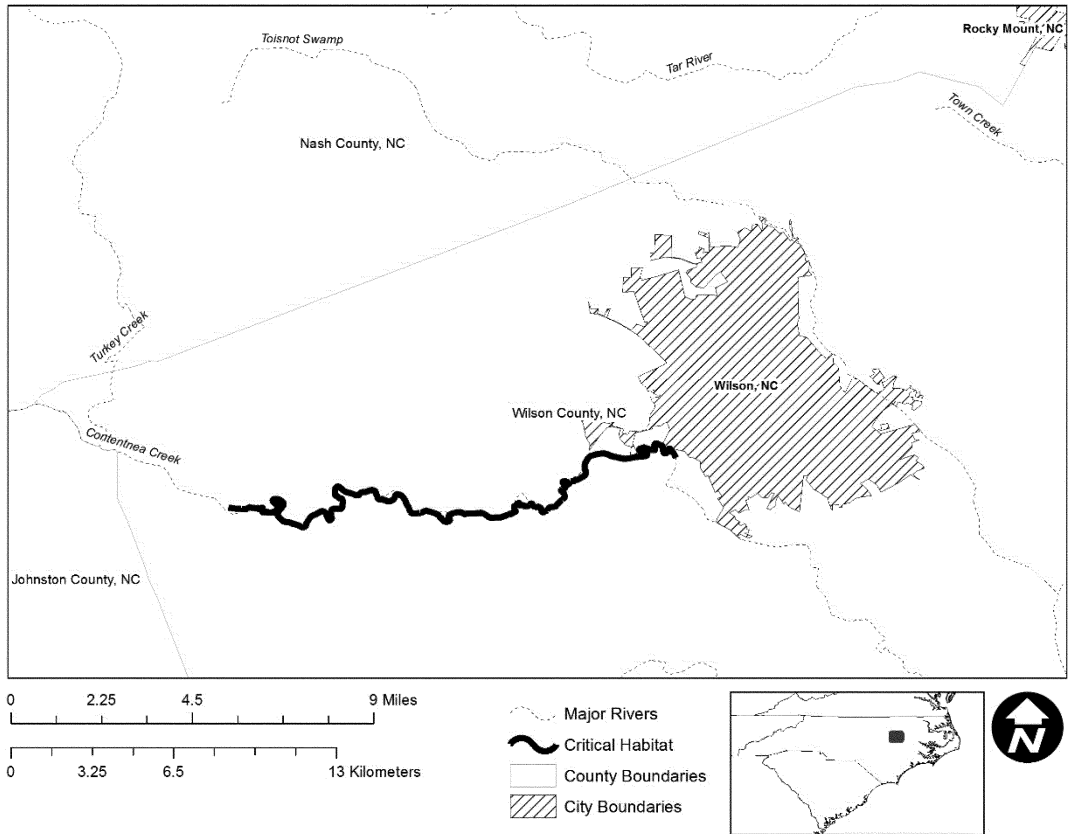
(11) Unit 6: NR3—Contentnea Creek, Wilson County, North Carolina.

(i) This unit consists of 15 river miles (24 river kilometers) of Contentnea Creek from Buckhorn Reservoir to

Wiggins Mill Reservoir. Unit 6 includes stream habitat up to bankfull height.

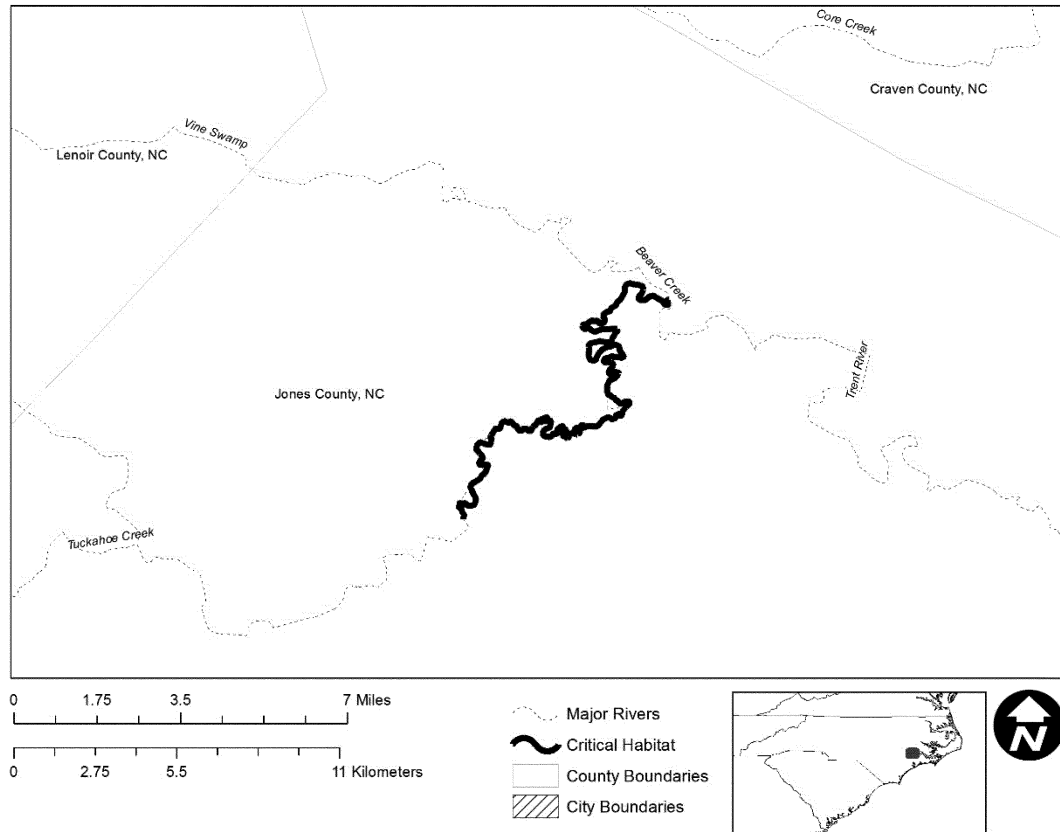
(ii) Map of Unit 6 follows:

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 the Trent River between the confluence with Cypress Creek and Beaver Creek. Unit 7 includes stream habitat up to bankfull height.

(ii) Map of Unit 7 follows:

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

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Martha Williams,

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

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