Fiscal Note for Proposed Endangered/Threatened/Special Concern Species Rule Amendments for the Wildlife Resources Commission

Rule Amendments: 15A NCAC 10I .0103 Endangered Species Listed
15A NCAC 10I .0104 Threatened Species Listed
15A NCAC 10I .0105 Special Concern Species Listed

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Impact Summary:
State Government: Yes
Local Government: Yes
Private Impact: Yes
Substantial Impact: No

Authority: G.S. 113-134, 113-333

Background

The wildlife resources of the State belong to the people of the State as a whole, including the enjoyment of these resources (G.S. 113-131(a)). The Wildlife Resources Commission (WRC) is tasked with the conservation of wildlife resources of the State (G.S. 143-239). This responsibility includes managing, as equitably as possible, the various competing interests regarding these resources, including the use and take of such resources (G.S. 113-131.1(a)). The statutes governing wildlife resources are found in Chapter 113, Subchapter IV of the General Statutes, and WRC has been granted rulemaking authority to implement the provisions of these statutes (G.S. 113-134).

As part of its mission, WRC adopts and publishes an endangered species list, a threatened species list and a list of special concern species, as required by G.S. 113-333. Lists are amended from time to time, in response to public proposals or as the Commission deems necessary. The WRC conducts investigations of its wild animals, as defined in G.S. 113-331, to determine whether the state listings need to be adjusted to accomplish the objectives of managing wildlife resources through sound conservation. The WRC also adopts and implements conservation programs for endangered, threatened and special concern species to limit, regulate, or prevent the taking, collection, or sale of protected species (G.S. 113-333). The management goal with any state listing is to ensure the stability of a species for long term viability.

The process for updating the state listing is a multi-year, transparent process defined by science-based decision making. Per G.S. 113-335, the Nongame Wildlife Advisory Committee (NWAC) is the panel of experts from scientific disciplines who review scientific evidence and submit their state listing recommendations to the Commission. The Commission is required by G.S. 113-334 to consider the recommendations while examining relevant data and factual information. The proposed changes to the state listings are based on actual data and the status of each species population as proposed by the North Carolina Species Assessment Tool, and detailed in the Wildlife Action Plan (http://www.ncwildlife.org/plan).

A summary of the proposed rule amendments is below, with the full text included in Appendix A.

I. Introduction and Purpose of Rule Change

The endangered, threatened and special concern species lists (hereinafter, referred to as the protected species list or state list), identify nongame wild animals to be protected and conserved, so conservation techniques can be developed for them, and their population numbers are enhanced. An endangered species is one whose continued existence has been determined to be in jeopardy in the state. A threatened species is one who is likely to become endangered within the foreseeable future throughout all, or at least a significant portion of its range. And a special concern species has been determined to need monitoring. All species on the protected species list are native or once-native species of North Carolina.

The proposed changes to the list are necessary to ensure the continued viability of North Carolina's nongame wildlife diversity by promoting conservation priorities. After review of 40 species in a report from the Scientific Council approved by NWAC, the WRC recommends adding 10 species, removing 6 species (for a net addition of four species), changing the status of 6 species, and making common and/or scientific name changes for 17 species on the protected species list. The proposed list highlights species that meet the definition of endangered, threatened, or special concern. A complete list of proposed changes and summarized data on each species can be found in Appendix B.

The proposed changes to the state listing include an additional 3 species to be listed as endangered, 3 species to be listed as threatened, and 8 species to be listed as special concern. Overall, there will be 39 changes to the 15A NCAC 10I – Endangered and Threatened Species Rules due to additions, removals, shifting of species between lists, and name changes. The goal of these listing changes is to provide active and appropriate conservation for these species including research, land conservation, monitoring, and habitat restoration. When a species is experiencing a threat and/or decline in population, the state listing status can provide additional funding opportunities and research priority to assist in the recovery and population viability.

Adding a species to the protected species list establishes protection from direct take, encourages partners to request funding for species-specific projects, assists in identifying quality habitat that the agency would like to conserve, and informs partners of ecologically significant habitats so they can work to minimize impacts and focus their conservation efforts. Additionally, this information plays a large role in identifying and prioritizing multi-state and regional

conservation needs as well as long-term monitoring programs and minimizes the likelihood of federal listing for that species.

II. Fiscal Impacts - Costs[1]

State Impact

The proposed amendments to the 10I Rules are anticipated to have a minimal economic impact to the state.

It is unlawful, unless granted specific authorization, for an individual to take, possess, transport, sell, barter, trade, exchange, export or give away any species listed in 15A NCAC 10I .0103 - .0105.[2] To enforce this law, WRC requires all new wildlife enforcement officers to participate in an agency training that includes a one-day review of regulations and field identification specifically for nongame and state listed species. This training includes 8 hours of information on the illegal pet trade, collection, and food market, and teaches officers accurate species identification. Additionally, routine refresher trainings are offered, which include information on nongame species that may have had an increased number of unlawful activities, and any changes that have been made to the protected species lists. Though new training materials will need to be developed to incorporate the proposed changes to the 10I Rules, the materials are produced in-house, and staff time anticipated for completion of this task is at most, 2 hours. This expense will be a one-time cost to the agency of $82 ($41[3]/hr x 2 hrs = $82).

In the field, enforcement officers track their time spent patrolling for unlawful activity involving nongame species, including listed species. Based on officer activity logs from fiscal year (FY) 2019 and FY 2020, less than one percent of each officer's time is spent on nongame specific activities.[4] These activities include routine patrols for violations, responding to wildlife vs. human interactions and complaints, assisting biologists with complaints, following leads from citizens, and investigating actual crimes. Over the past two fiscal years, this activity accounted for an average of 5,854 hours/FY. There are over 1,000 nongame species in NC and two hundred and fifty (250) nongame are state listed as of FY 2020. For the purpose of estimating additional costs to the agency from the net 4 newly listed species, it is assumed that about one fourth of the 5,854 hours, 1,464 hours (5,854 hrs/4 = 1,464 hours) spent patrolling in the last two fiscal years was specific to listed species. While it is not anticipated that the addition of 10 new species to the protected species list will have much impact on officer time because many of the new species reside in habitats that are already patrolled, the potential exists for increased illegal activity involving these species. Currently, patrol time and time spent addressing any illegal activity, are estimated to cost the agency $48,312/FY ($33/hr x 1,464 hrs/FY). If there is an increase in illegal activity, this cost could increase. However, it is not possible to predict the potential change in illegal activity at this time.

Additionally, each person convicted of unlawful activities associated with a species on the protected species list is guilty of a Class I misdemeanor. A typical court case for a listed species requires approximately 11 hours of officer time. Based on the available data, the agency incurs a

[1] All hourly rates for agency staff herein reflect total compensation.
[2] G.S. 113-337. Unlawful acts; penalties.
[3] Represents the total compensation of NCWRC staff.
[4] Personal correspondence with law enforcement staff 2/2021.

cost of $363 per court case ($33/hr x 11 hrs/case = $363 case). However, the agency is not able to predict the number of instances involving illegal take that will go to court because of changes to the protected species list though the number of cases per year is typically less than 5.

Once a species is added to the protected species list, a conservation plan must be developed (G.S. 113-333(b)). These plans detail the restoration and management actions that the agency recommends to secure recovery of the species. Many of these species co-exist in the same habitat and as such, will benefit from the conservation efforts of other species. With this in mind, the species added to the state list may not be additive work per se but will be absorbed into current conservation efforts. For those species not cohabitating with currently listed species, new management plans will be developed. Based on the proposed listings (adding 10 to the lists and removing six), A net of 4 species will require new management plans, at an estimated cost to the agency of $16,400 ($41/hr[5] x 100 hrs/plan = $4100/plan; $4100/plan x 4 plans = $16,400). It is estimated that it will take the agency 12 months to develop these plans.

Recovery efforts for a species in decline may be implemented by the agency regardless of listing status. However, these management techniques will be included in a management plan (required if listed) and could range from monitoring to population augmentation. If a species requires monitoring and data collection, insignificant costs for staff time and supplies may be incurred at an estimated cost of $200 to $1000 per species. Monitoring costs would be low because, depending on the species, sampling efforts are not typically exclusive, and minimal time, effort, and supplies would be needed for collection of any additional data. On the other hand, if a more intensive management effort were required, for example the head-start restoration effort currently being implemented for the gopher frog, estimated costs could be close to $850,000 over a 10-year period.[6] However, we must note that these conservation actions would likely occur even if the species were not on the Protected Animal Lists. Although the Wildlife Action Plan summarizes recovery techniques for priority species, the conservation plans will provide more specific details by species[7]

Any individual who wishes to collect a nongame species for research purposes is required to obtain a collection license[8]. Collection of a listed species also requires an endangered species permit. Staff review endangered species permit applications before they are issued. This review requires approximately 2 hours to complete, at a cost to the agency of $82 per permit ($41/hr x 2 hrs/permit = $82/permit). Listing or uplisting a species increases the likelihood that researchers will target those species, but the agency is not able to predict how many new permits will be requested.

Agency staff currently review development projects from other state and local agencies to determine the effects of those projects on state-listed species. Though 10 new species will be listed in Rule, no additional costs to the WRC or any other agencies are anticipated, as neither process, review protocol nor staffing, will be changed. However, because new species are being added, agency staff will be asked for scientific expertise on proposed projects during the permit review process to assist in understanding any anticipated impacts the project could have on these newly listed species. There is no way for the agency to predict which projects will be affected,

[5] Represents the total compensation of NCWRC staff.
[6] Costs obtained from staff – based on Gopher frog recovery efforts 1/2021.
[7] NC Wildlife Action Plan (ncwildlife.org/plan)
[8] 15A NCAC 10I .0102

but this review requires approximately 4 hours of staff time per project and would cost an estimated $164 ($41/hr x 4 hrs/project = $164/project).

The WRC jointly administers the Wildlife Conservation Lands Program with local County Tax Assessors. This program is a property tax deferral program for private landowners who manage their property to conserve identified priority wildlife habitats and listed species.[9] Established in 2008, the program has provided the opportunity for 497 landowners in 53 counties across the state to conserve and manage 5,402 acres of land for the benefit of North Carolina priority wildlife species.[10] Landowners who identify priority habitats or species on their land may voluntarily enter into a Wildlife Habitat Conservation Agreement with the WRC, provided that they have a minimum of 20 contiguous acres of qualifying habitat and have owned the property for a minimum of 5 years. The WRC provides free technical guidance and develops the required management plans free of charge for interested landowners to submit to their county offices. Additionally, the WRC is available to assist the County in site audits for those currently enrolled and answer questions. While the agency cannot accurately estimate the number of new landowners who will be eligible and want to participate in the program, the estimated cost to the agency is $656 per project ($41/hr x 16 hrs/project = $656/project).

Private Impact

The proposed amendments to the 10I Rules are expected to have minimal private impacts. Per G.S. 113-337(a)(1), it is unlawful to take any animal on the protected species list. Because all the proposed species are nongame, the changes are not anticipated to impact hunting, fishing or trapping.

Any individual who wishes to collect a species on the protected animal list is required to obtain an endangered species permit. There is a $10 fee for the endangered species permit, but the project scope must be submitted and approved by agency staff and requires that the applicant supply the following information: project description, dates for the project, list of expertise and names of any individuals who will be assisting in collection. Depending on the species, restrictions are often placed on the project to minimize stress to a listed species. Additionally, individuals operating under endangered species permits are required to submit their project data annually if they wish to renew their collection permit(s). These data are valuable to the agency and assist in minimizing additional stresses on the species.

The agency issued 135 endangered species permits in 2020.[11] Though the agency is unable to predict the exact number of permits that will be issued for the newly listed species, private individuals who wish to collect or study species on the protected list will incur a minimal cost of $10 per year to do so. Of the species being added to the protected species list, all may be of scientific research interest, thus requiring an endangered species permit and a collection license for study. However, it is important to note that the agency has not received any wildlife collectors permit request for these particular species to date. There is no way for the agency to estimate the potential cost without knowing what research will be conducted on these newly listed species.

[9] Personal correspondence with Regulated Activities and Permitting Section staff 3/3/2021.
[10] Personal correspondence with agency staff 2/15/2021
[11] Personal correspondence with Regulated Activities and Permitting Section staff 3/3/2021.

Though 10 new species will be added to the protected species list (along with 6 removals), these additions cannot affect the use or development of any private property per G.S. 113-333(c). However, developers will be required to assess projects for any potential impacts to listed species as part of the permit application process for development. All currently available species data are available from the North Carolina Natural Heritage Program website for a fee of $100 per project or $600 for unlimited use[12]. Data are currently available for all 10 of these newly listed species, so the cost of obtaining the data would be up to the developer.

In cases where there are intended (illegal take) and/or unintended (environmental) impacts to wildlife, individuals may be cited for the disturbance and charged a replacement cost for the species lost. The replacement cost for an endangered species is $4,960, a threatened species is $4,313, and a special concern species is $54.[13] The penalty issued by the court could also include the cost of investigations and court fees. The agency has no way to estimate these costs as they vary by case.

III. Fiscal Impacts - Benefits

State Impact

With a mission of wildlife conservation, WRC biologists often work to predict decline of a species, as it is much easier to proactively put restoration and recovery management in place than it is when the species is close to extinction. Additionally, wildlife species have diverse life histories which can heavily influence recovery efforts. As such, efforts made in year one may not be apparent until several years later. Due to these factors, early recognition of a species in decline and tiered state listing can provide for proactive, biologically sound management that ensures the conservation and wise use of nongame resources, minimizes risk of federal listing, which can put restrictions on private land, and fosters partnerships with local, state, and federal entities to manage wildlife resources.

The protected animal list is the list for nongame species that need the highest level of conservation attention, and is used to guide research priorities and prioritize grant awards. Individuals must obtain an endangered species permit for listed species. While the purchase of these licenses does minimally benefit the state, the greater benefit is that individuals with an endangered species permit for scientific collection are required to submit their data to the agency before they can apply for any additional permits. This requirement that all NC projects benefit from data collected for species that need the highest level of conservation can guide conservation and decision-making. As such, all logged data are guaranteed to be accessible by the public for planning purposes.

The U.S. Fish and Wildlife Service (USFWS) routinely receives petitions from the public to initiate a 90-day finding to consider a species for federal listing. If there is a positive finding, then a 12-month process is initiated by USFWS, which can solicit state agency input. USFWS relies on state agencies to provide state-specific information on these species. Oftentimes, these species have already been considered or are on the protected species list. Because North Carolina's state listing process involves the collection of data, surveys, and monitoring, the

[12] https://ncnhde.natureserve.org/
[13] 15A NCAC 10B .0117. Replacement Costs of Wildlife Resources.

information is readily available to USFWS for their federal species status review, saving the state time and money when requested by the USFWS.

There can be significant economic benefits to avoiding federal listing of a species. The conservation value of North Carolina's state listing status may preclude the need for the species to become federally listed, which saves the state, local and private sectors both time and money. Based on 2019 endangered species state expenditure data for conservation projects specific to federally listed species, this could be a savings of anywhere from $4,600 per year (gray bat) to $48,000 per year (red-cockaded woodpecker) in state funds.[14] Additionally, avoiding federal listing may preclude the delay or cancelation of major construction projects. Any project with the potential to jeopardize the existence of a federally listed species must undergo a Section 7 consultation with the USFWS that could take anywhere from one to 10 years and cost a significant amount of money.[15] For example, the research study required for a NCDOT highway maintenance project with potential impacts to the Northern long-eared bat in the eastern USFWS region (60 NC counties) cost the state $400,000 per year for 5 years. Data were collected to help understand the species and its use of habitat to guide future conservation decisions.[16]

Research shows that wildlife watching benefits the economy. According to a 2016 USFWS report, 86 million citizens, aged 16 and older, participated in wildlife watching. This activity resulted in an estimated $156.9 billion in expenditures[17]. In addition to contributing significantly to people's enjoyment of the outdoors, wildlife watching has a substantial impact on the nation's economies. Specific to North Carolina, a 2011 USFWS and Census Bureau report indicated over 2.4 million residents and non-residents engaged in wildlife watching within the state. The almost $930 million spent in trip and equipment related expenditures substantially contributed to the state and local economies. The report stated that North Carolina had 2,432,000 recorded wildlife watchers ages 16 years and older.[18] Thus, the conservation and preservation of species can be assumed to yield substantial annual benefits to the state.

Private Impact

North Carolina residents value the opportunity to view and interact with nongame state-listed species. Individuals also value protecting these species for present and future generations, even if they will never interact with them.[19] Together, the value of wildlife viewing and related recreation and the value of maintaining biodiversity are the "non-consumptive" benefits of species protection.

The non-consumptive values of wildlife species can be estimated by measuring residents' willingness to pay for wildlife protection. Although economists and biologists have conducted many studies over the past 30 years to estimate the value of protecting threatened and endangered species, it is difficult to estimate the impact of the agency's proposed listings

[14] http://ecos.fws.gov/expenditures
[15] https://www.fws.gov/midwest/Endangered/section7/section7.html
[16] Personal correspondence with NCDOT staff 2/2017
https://connect.ncdot.gov/projects/construction/Pages/RRMan.aspx?Order=RR-33A
[17] https://www.fws.gov/wsfrprograms/Subpages/NationalSurvey/nat_survey2016.pdf
[18] http://www.census.gov/prod/2013pubs/fhw11-nc.pdf
[19] Wallmo, Kristy and Daniel Lew, 2016. A comparison of regional and national values for recovering threatened and endangered marine species in the United States. *Journal of Environmental Management,* Volume 179. Accessed at http://www.sciencedirect.com/science/article/pii/S0301479716302249

because benefits are species-specific and location specific. The agency is unaware of any value studies involving the particular species that are the subject of this rulemaking. Given the species-specific nature of the value individuals place on wildlife protection, the agency is not able to quantify the total social benefit of the proposed listing. However, the benefits are discussed below:

Science and Land Conservation

- A variety of funding opportunities exist for conserving state listed species, and include but are not limited to, the Land and Water Conservation Fund and Natural Resources Conservation Service grants. If an animal is added to the protected species list, projects that incorporate and/or provide benefit to those species receive preferential consideration for funding. Projects can be submitted by state and local governments, private organizations, and nonprofits, but overall, the implementation of these projects are a conservation benefit to North Carolina residents.

- Due to priorities set by funding sources, many projects must propose to benefit listed species, state or federal, to qualify the project for funding. Because federally listed species often cohabitate with state listed species, the entire ecosystem benefits from these types of projects and the conservation actions that listing may provoke.

- Federally listed species are protected from "taking", which includes habitat alteration resulting in harm to the species. It is estimated that approximately half of all federally listed species have at least 80 percent of their habitat on private land.[20] Restrictions and special management considerations that may be costly to landowners are required if it is believed that a proposed development project could impact a listed species. Avoided federal listing may preclude the necessity of costly management.

Ecotourism

- Research shows that society enjoys biodiversity and there are many physical and mental benefits associated with spending time outdoors.[21] Although the WRC does not actively collect data specific to ecotourism, the agency does partner and participate in surveys on willingness to pay.[22] These surveys request participants to answer questions regarding their willingness to travel to see wildlife. Also, the USFWS 2011 report indicated that North Carolina had 2,432,000 recorded wildlife watchers ages 16 years and older.[23]

- To the average recreationist, a more diverse and abundant wildlife population may increase recreation in an area. Not only may it increase experiences but also the quality of those experiences. There is no simple mechanism to estimate this benefit.

- Typically, when a species has been state listed it indicates rarity and difficulty for wildlife viewers to spot it. To wildlife enthusiasts like birders, this situation may excite challenge and increase interest in any opportunity to seek the species. The result may in turn be enhanced ecotourism to an area that has known habitat for the species.

[20] https://www.fws.gov/endangered/esa-library/pdf/landowners.pdf
[21] Sandifer, Sutton-Grier, Ward, 2015
[22] Deason, Seekamp, 2015
[23] http://insidewrc.org/div09_management/documents/FWS-021SurveyReport2011-2WildlifeWatching-FINAL.pdf.

Tax Benefit

- The proposed addition of 10 species to the protected species list may create opportunities for landowners to participate in the Wildlife Conservation Lands Program for county tax deferral. This opportunity would only be available to individuals who own priority habitat that meets the minimum requirements for participation in the program and implement land management efforts that benefit species of concern. These landowners would receive a deferred tax break from county land taxes to implement land management efforts on their property.

  This program is driven by property owners' financial situations, which vary from county to county and from landowner to landowner. Typically, participation in the Program is requested when a property's tax value is reassessed. The Program largely serves as a back-up plan for property owners looking for a tax break on property taxes. Additionally, only 1,595 (approximately 12%) of the 13,518 acres registered in the program are species-specific. Participation is usually based on the presence of qualifying habitat.

Ecological Benefit

- Although unquantifiable, the overall value added by maintaining a functional food chain cannot be overstated. Many of these species also provide natural resource benefits such as improved water quality or invasive species curtailment. When the cycle of life gets interrupted, there are ecological concerns which result in management expenses. All living things need food to survive. If their food source is limited or no longer present, they may become unhealthy or may not survive. Unhealthy wildlife can be more susceptible to disease, illness, erratic behavior, and unsafe human and wildlife interactions. All these results weigh on agency resources and time. By listing species of concern, the agency is proactively managing wildlife needs and potentially mitigating more serious negative impacts.

IV. Uncertainties

State Impact

If staff are asked to review a project with the potential to impact a listed species that has limited historical and habitat range data, staff may recommend a survey before commenting on that project. The cost of data collection is different for each species, and without knowing potential projects that will be proposed in the coming years, the agency has no way to estimate the costs to other agencies or individuals for data collection. However, the agency is able to mitigate those costs by sharing all data collected both in-house and through state endangered species permits via the Natural Heritage natural resource database (www.ncnhp.org/data).

Local Impact

The proposed changes to the protected species list have the potential to increase the number of landowners who are eligible to participate in the Wildlife Conservation Lands Program. Because this is a county property tax deferral program, landowners submit applications to the County for enrollment. The County determines the applicant's eligibility and acceptance into the program and participation is renewed annually. The proposed changes to the protected species list have

the potential to increase the number of landowners who are eligible to participate in the program, thus increasing a participating county's deferred taxes if they decide to accept a new landowner's management efforts. Counties may also incur a slight increase to the cost of program auditing to ensure the landowner is in compliance with their management plan. Unfortunately, there is no way for the agency to quantify costs, as property taxes vary by county.

The agency also assumes that there could be an increase in the number of court cases dealing with illegal take of 10 species being added to the protected species list. This would minimally impact the county court systems.

Private Impact

Lack of species-specific studies on North Carolina residents' willingness to pay for protection of listed species prevents WRC from estimating the total benefits of the proposed rules. However, a 2008 meta-analysis of studies valuing endangered, threatened, and rare species found that individuals value fish, marine mammals, and birds more highly than mammals and reptiles, as a group, and wildlife with consumption benefits are more highly valued than those with non-consumptive benefits alone.[24] The total benefits are dependent upon the consumptive uses (i.e., hunting or fishing) or non-consumptive uses (i.e., viewing) of the wildlife, the relative "charisma" of each species, the level of species endangerment, and participation in the Wildlife Conservation Lands Program.

It is also important to note that the values of the benefits created by listing 10 new species may be offset to some degree by the 6 delisted species. In their meta-analysis, Richardson and Loomis (2008) found that individuals are generally more willing to pay to prevent a species' extinction than they are to increase the population above the minimum viable level.[25] This finding suggests protecting the most-threatened species could provide greater benefits than equivalent protections for less-threatened species, all else being equal. Downlisting or delisting species could indicate to North Carolina residents that the species is less threatened, therefore reducing the value of protection measures and their associated benefits. However, downlisting or delisting a species may also reduce development restrictions and state staff time costs.

The recreational and consumptive value of a listed species reflects only the economic, not the ecological, benefits of the species. The value that North Carolina residents place on species protection is limited by our incomplete understanding of the species' ecological role.[26]

V. Economic Impact Summary

Each species is different, as are the reasons attributing to their decline. However, WRC expects the public awareness, research, and conservation efforts associated with placing a species on the

[24] Richardson, Leslie and John Loomis, 2008. The Total Economic Value of Threatened, Endangered and Rare Species: An Updated Meta-Analysis. *Ecological Economics.* Volume 68. Accessed at http://www.sciencedirect.com/science/article/pii/S0921800908004771

[25] Richardson, Leslie and John Loomis, 2008. The Total Economic Value of Threatened, Endangered and Rare Species: An Updated Meta-Analysis. *Ecological Economics.* Volume 68. Accessed at http://www.sciencedirect.com/science/article/pii/S0921800908004771

[26] Loomis, John and Douglas White, 1996. Economic Benefits of Rare and Endangered Species: Summary and Meta-Analysis. *Ecological Economics*, Volume 18. Accessed at http://www.sciencedirect.com/science/article/pii/0921800996000298

protected species list to bring about awareness and management efforts that will spur the public and private cooperation necessary to reverse the decline.

Private individuals will benefit from the proposed listings and associated conservation efforts because of the non-consumptive value of wildlife recreation opportunities and preserving biodiversity. Conservation efforts at a state level also reduce the probability of a species being federally listed, which could place restrictions on private land use and development. Private landowners may be eligible for the Wildlife Conservation Lands Program due to the newly listed species, which would make them eligible for county tax deferment. And researchers may be eligible for additional funding opportunities for these species.

Wildlife recreation benefits our state's economy. In addition, listing or uplisting a species draws additional research funding, which benefits the state in both fees collected for collection licenses necessary to study the species and scientific data from those individuals with collection licenses and endangered species permits. Data collected by the state on listed species also saves time and money associated with the required data collection for federally listed species and the potential avoidance of federal listing of state listed species. These benefits are also realized by local governments.

Although these benefits are not quantifiable with available data, the agency expects the benefits of the proposed species listings to outweigh the costs.

In estimating the economic impact of the proposed amendments to the protected species list, the agency was unable to quantify most of the identified costs, which are expected to include:

State

- Officer patrol time for newly listed species: $48,312 per fiscal year
- Officer court time for newly listed species cases: $363 per court case
- Development project review: $164/project
- Endangered species permit review: $82 per permit
- Monitoring for 10 newly listed species: $200 -$1000 per species

The cumulative State impact is estimated to be approximately: $50,921.[27]

Local

- Tax deferment for landowners in WCLP is unquantifiable.

Private

- Collection license fee for newly listed species is unquantifiable.
- Data collection prior to development projects is unquantifiable.
- Replacement costs for illegal take of newly listed species: endangered species is $4,960, a threatened species is $4,313, and a special concern species is $54

[27] This number was calculated using $200 per species for monitoring costs of the newly listed species.

- Court fees for illegal take of newly listed species is unquantifiable.

Although most of the costs are not quantifiable with available data, the agency was able to quantify training material development ($53.42) and Conservation Plan development for the 10 newly listed species ($10,684), and estimates a cost of approximately $10,737.42 in year one. Again, the agency expects the benefits of the proposed species listings to outweigh the costs.

Appendix A: Rule Changes

15A NCAC 10I .0105 SPECIAL CONCERN SPECIES LISTED

The following species of resident wildlife shall be designated as state-listed special concern species:

(1) Amphibians:

(a) Crevice salamander (Plethodon longicrus);

(b) Dwarf salamander (Eurycea quadridigitata);

(c) Dwarf black-bellied salamander (Desmognathus folkertsi);

(d) Eastern hellbender (Cryptobranchus alleganiensis alleganiensis);

(e) Four-toed salamander (Hemidactylium scutatum);

(f) Gray treefrog (Hyla versicolor);

~~(g) Longtail salamander (Eurycea longicauda longicauda);~~

~~(h)~~(g) Mole salamander (Ambystoma talpoideum);

~~(i)~~(h) Mountain chorus frog (Pseudacris brachyphona);

~~(j)~~(i) Mudpuppy (Necturus maculosus);

~~(k)~~(j) Neuse River waterdog (Necturus lewisi);

(k) Southern chorus frog (Pseudacris nigrita);

(l) Southern zigzag salamander (Plethodon ventralis); and

(m) Weller's salamander (Plethodon welleri).

(2) Birds:

(a) American oystercatcher (Haematopus palliatus);

(b) Bachman's sparrow (Peucaea aestivalis);

(c) Barn owl (Tyto alba);

(d) Black-capped chickadee (Poecile atricapillus);

~~(e) Black rail (Laterallus jamaicensis);~~

~~(f)~~(e) Black skimmer (Rynchops niger);

~~(g)~~(f) Brown creeper (Certhia americana nigrescens);

~~(h)~~(g) Cerulean warbler (Setophaga cerulea);

~~(i)~~(h) Glossy ibis (Plegadis falcinellus);

~~(j)~~(i) Golden-winged warbler (Vermivora chrysoptera);

~~(k)~~(j) Least bittern (Ixobrychus exilis);

~~(l)~~(k) Least tern (Sternula antillarum);

~~(m)~~(l) Little blue heron (Egretta caerulea);

~~(n)~~(m) Loggerhead shrike (Lanius ludovicianus);

~~(o)~~(n) Painted bunting (Passerina ciris);

~~(p)~~(o) Red crossbill (Loxia curvirostra);

~~(q)~~(p) Snowy egret (Egretta thula);

~~(r)~~(q) Tricolored heron (Egretta tricolor);

~~(s)~~(r) Vesper sparrow (Pooecetes gramineus); and

~~(t)~~(s) Wilson's plover (Charadrius wilsonia).

(3) Crustacea:

~~(a) Broad River spiny crayfish (Cambarus spicatus);~~

(b) Carolina skistodiaptomus (Skistodiaptomus carolinensis);

(c) Carolina well diacyclops (Diacyclops jeannelli putei);

(d) Chowanoke crayfish (Orconectes virginiensis);

(e) Graceful clam shrimp (Lynceus gracilicornis);

(f) Greensboro burrowing crayfish (Cambarus catagius);

(g) Hiwassee headwaters crayfish (Cambarus parrishi);

(h) Little Tennessee River crayfish (Cambarus georgiae);

(i) North Carolina spiny crayfish (Orconectes carolinensis);

(j) Oconee stream crayfish (Cambarus chaugaensis); and

(k) Waccamaw crayfish (Procambarus braswelli).

(4) Fish:

(a) American brook lamprey (Lethenteron appendix);

(b) Banded sculpin (Cottus carolinae);

(c) Blackbanded darter (Percina nigrofasciata);

(d) Bluefin killifish (Lucania goodei);

(e) Blue Ridge sculpin (Cottus caeruleomentum);

(f) Blueside darter (Etheostoma jessiae);

(g) Broadtail madtom (Noturus sp.)(Lumber River and its tributaries and Cape Fear River and its tributaries);

(h) Carolina darter (Etheostoma collis);

(i) Cutlip minnow (Exoglossum maxillingua);

(j) Freshwater drum (Aplodinotus grunniens)(French Broad River);

(k) Highfin carpsucker (Carpiodes velifer)(Cape Fear River and its tributaries);

(l) Kanawha minnow (Phenacobius teretulus);

(m) Lake sturgeon (Acipenser fulvescens);

(n) Least killifish (Heterandria formosa);

(o) Longhead darter (Percina macrocephala);

(p) Mooneye (Hiodon tergisus);

(q) Mountain madtom (Noturus eleutherus);

(r) Ohio lamprey (Ichthyomyzon bdellium);

(s) Olive darter (Percina squamata);

(t) Pinewoods darter (Etheostoma mariae);

(u) River carpsucker (Carpiodes carpio);

(v) Sandhills chub (Semotilus lumbee);

(w) Smoky dace (Clinostomus sp.)(Little Tennessee River and tributaries);

(x) Striped shiner (Luxilus chrysocephalus);

(y) Tennessee snubnose darter (Etheostoma simoterum);

(z) Thinlip chub (Cyprinella zanema)(Lumber River and its tributaries and Cape Fear River and its tributaries);

(aa) Waccamaw killifish (Fundulus waccamensis);

(bb) Wounded darter (Etheostoma vulneratum); and

(cc) Yellowfin shiner (Notropis lutipinnis)(Savannah River and its tributaries).

(5) Mammals:

(a) Allegheny woodrat (Neotoma magister);

(b) Buxton Woods white-footed mouse (Peromyscus leucopus buxtoni);

(c) Coleman's oldfield mouse (Peromyscus polionotus colemani);

(d) Eastern big-eared bat (Corynorhinus rafinesquii macrotis);

(e) Eastern small-footed bat (Myotis leibii leibii);

(f) Florida yellow bat (Lasiurus intermedius floridanus);

(g) Pungo white-footed mouse (Peromyscus leucopus easti);

(h) Southeastern bat (Myotis austroriparius);

(i) Southern rock vole (Microtus chrotorrhinus carolinensis); and

(j) Star-nosed mole (Condylura cristata parva).

(6) Mollusks:

(a) Appalachian gloss (Zonitoides patuloides);

(b) Bidentate dome (Ventridens coelaxis);

(c) Black mantleslug (Pallifera hemphilli);

(d) Blackwater ancylid (Ferrissia hendersoni);

(e) Blue-foot lancetooth (Haplotrema kendeighi);

(f) Cape Fear spike (Elliptio marsupiobesa);

(g) Clingman covert (Fumonelix wheatleyi clingmanicus);

(h) Dark glyph (Glyphyalinia junaluskana);

(i) Dwarf proud globe (Patera clarki clarki);

(j) Dwarf threetooth (Triodopsis fulciden);

(k) Fringed coil (Helicodiscus fimbriatus);

(l) Glossy supercoil (Paravitrea placentula);

(m) Great Smoky slitmouth (Stenotrema depilatum);

(n) High mountain supercoil (Paravitrea andrewsae);

(o) Honey glyph (Glyphyalinia vanattai);

(p) Lamellate supercoil (Paravitrea lamellidens);

(q) Mirey Ridge supercoil (Paravitrea clappi);

(r) Open supercoil (Paravitrea umbilicaris);

(s) Pink glyph (Glyphyalinia pentadelphia);

(t) Pod lance (Elliptio folliculata);

(u) Queen crater (Appalachina chilhoweensis);

(v) Ramp Cove supercoil (Paravitrea lacteodens);

(w) Ridged lioplax (Lioplax subcarinata);

(x) Roanoke slabshell (Elliptio roanokensis);

(y) Saw-tooth disc (Discus bryanti);

(z) Seep mudalia (Leptoxis dilatata);

(aa) Spike (Elliptio dilatata);

(bb) Spiral coil (Helicodiscus bonamicus);

(cc) Velvet covert (Inflectarius subpalliatus);

(dd) Waccamaw amnicola (Amnicola sp.);

(ee) Waccamaw siltsnail (Cincinnatia sp.); and

(ff) Wavy-rayed lampmussel (Lampsilis fasciola).

(7) Reptiles:

(a) Carolina pigmy rattlesnake (Sistrurus miliarius miliarius);

(b) Carolina swamp snake (Seminatrix pygaea paludis);

(c) Carolina watersnake (Nerodia sipedon williamengelsi);

(d) Cumberland slider (Trachemys scripta troostii);

(e) Diamondback terrapin (Malaclemys terrapin);

(f) Eastern chicken turtle (Deirochelys reticularia reticularia);

(g) Eastern smooth green snake (Opheodrys vernalis vernalis);

(h) Eastern spiny softshell (Apalone spinifera spinifera);

(i) Mimic glass lizard (Ophisaurus mimicus);

(j) Outer Banks kingsnake (Lampropeltis getula sticticeps);

(k) Stripeneck musk turtle (Sternotherus minor peltifer); and

(l) Timber rattlesnake (Crotalus horridus).

History Note: *Authority G.S. 113-134; 113-291.2; 113-292; 113-333;*
Eff. September 1, 1989;
Amended Eff. October 1, 2017; August 1, 2016; May 1, 2008; July 18, 2002; April 1, 2001; November 1, 1991; April 1, 1991; June 1, 1990.
Readopted Eff. September 1, 2021.

15A NCAC 10I .0103 ENDANGERED SPECIES LISTED

(a) The following species of resident wildlife shall be designated as federally-listed endangered species:

(1) Amphibians: None Listed At This Time.

(2) Birds:

(A) Bachman's warbler (Vermivora bachmanii);

(B) Ivory-billed woodpecker (Campephilus principalis);

~~(C) Kirtland's warbler (Setophaga kirtlandii);~~

~~(D)~~(C) Piping plover (Charadrius melodus circumcinctus);

~~(E)~~(D) Red-cockaded woodpecker (Picoides borealis); and

~~(F)~~(E) Roseate tern (Sterna dougallii dougallii).

(3) Crustacea: None Listed At This Time.

(4) Fish:

(A) Cape Fear shiner (Notropis mekistocholas);

(B) Roanoke logperch (Percina rex);

(C) Shortnose sturgeon (Acipenser brevirostrum), when found in inland fishing waters as defined in G.S. 113-291(9)a. and (9)b.; and

(D) Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus), when found in inland fishing waters.

(5) Mammals:

(A) Carolina northern flying squirrel (Glaucomys sabrinus coloratus);

(B) Eastern cougar (Puma concolor);

(C) Gray bat (Myotis grisescens);

(D) Indiana bat (Myotis sodalis);

(E) Manatee (Trichechus manatus), when found in inland fishing waters; and

(F) Virginia big-eared bat (Corynorhinus townsendii virginianus).

(6) Mollusks:

(A) Appalachian elktoe (Alasmidonta raveneliana);

(B) Carolina heelsplitter (Lasmigona decorata);

(C) Dwarf wedgemussel (Alasmidonta heterodon);

(D) James spinymussel ~~(Pleurobema~~ (Parvaspina collina);

(E) Littlewing pearlymussel (Pegias fabula);

(F) Tan riffleshell (Epioblasma florentina walkeri); and

(G) Tar River spinymussel ~~(Elliptio~~ (Parvaspina steinstansana).

(7) Reptiles:

(A) Kemp's ridley seaturtle (Lepidochelys kempii);

(B) Atlantic hawksbill seaturtle (Eretmochelys imbricata imbricata); and

(C) Leatherback seaturtle (Dermochelys coriacea).

(b) The following species of resident wildlife shall be designated as state-listed endangered species:

(1) Amphibians:

(A) Gopher frog (Rana [=Lithobates] capito);

(B) Hickory Nut Gorge green salamander (Aneides carvanesis);

~~(B)~~(C) Ornate chorus frog (Pseudacris ornata); and

~~(C)~~(D) River frog (Rana [=Lithobates] heckscheri).

(2) Birds:

(A) American peregrine falcon (Falco peregrinus anatum);

(B) Bewick's wren (Thryomanes bewickii);

(C) Common tern (Sterna hirundo);

(D) Henslow's sparrow ~~(Ammodramus~~ (Centronyx henslowii); and

(E) Wayne's black-throated green warbler (Setophaga virens waynei).

(3) Crustacea: Bennett's Mill cave water slater (Caecidotea carolinensis).

(A) Bennett's Mill cave water slater (Caecidotea carolinensis); and

(B) Waccamaw crayfish (Procambarus braswelli).

(4) Fish:

(A) Blotchside logperch (Percina burtoni);

(B) Bridle shiner (Notropis bifrenatus);

~~(C) Dusky darter (Percina sciera);~~

~~(D)~~(C) Orangefin madtom (Noturus gilberti);

~~(E)~~(D) Paddlefish (Polyodon spathula);

~~(F)~~(E) Robust redhorse (Moxostoma robustum);

~~(G)~~(F) Rustyside sucker (Thoburnia hamiltoni);

~~(H)~~(G) Sharpnose darter (Percina oxyrhyncus); and

~~(I)~~(H) Stonecat (Noturus flavus).

(5) Mammals: None Listed At This Time.

(6) Mollusks:

(A) Atlantic pigtoe (Fusconaia masoni);

(B) Barrel floater ~~(~~Anodonta (Utterbackiana couperiana);

(C) Brook floater (Alasmidonta varicosa);

(D) Carolina creekshell (Villosa vaughaniana);

(E) Fragile glyph (Glyphyalinia clingmani);

(F) Green floater (Lasmigona subviridis);

(G) Greenfield rams-horn (Helisoma eucosmium)

(H) Knotty elimia (Elimia christyi);

(I) Longsolid (Fusconaia subrotunda);

(J) Magnificent rams-horn (Planorbella magnifica);

(K) Purple wartyback (Cyclonaias tuberculata);

(L) Savannah lilliput (Toxolasma pullus);

(M) Slippershell mussel (Alasmidonta viridis);

(N) Tennessee clubshell (Pleurobema oviforme);

(O) Tennessee heelsplitter (Lasmigona holstonia);

(P) Tennessee pigtoe ~~(Fusconaia~~ (Pleuronaia barnesiana); and

(Q) Yellow lampmussel (Lampsilis ~~cariosa);~~ cariosa). ~~and~~

~~(R) Yellow lance (Elliptio lanceolata).~~

(7) Reptiles:

(A) Eastern coral snake (Micrurus fulvius fulvius); and

(B) Eastern diamondback rattlesnake (Crotalus ~~adamanteus).~~ adamanteus); and

(C) Mimic glass lizard (Ophisaurus mimicus).

History Note: *Authority G.S. 113-134; 113-291.2; 113-292; 113-333;*
Eff. June 11, 1977;
Amended Eff. October 1, 2017; August 1, 2016; May 1, 2008; April 1, 2001; February 1, 1994;
November 1, 1991; April 1, 1991; June 1, 1990;
Readopted Eff. September 1, 2021.

15A NCAC 10I .0104 THREATENED SPECIES LISTED

(a) The following species of resident wildlife shall be designated as federally-listed threatened species:

(1) Amphibians: None Listed At This Time.

(2) Birds:

(A) Eastern black rail (Laterallus jamaicensis jamaicensis);

~~(A)~~(B) Piping plover (Charadrius melodus melodus);

~~(B)~~(C) Red knot (Calidris canutus rufa); and

~~(C)~~(D) Wood stork (Mycteria americana).

(3) Crustacea: None Listed At This Time.

(4) Fish:

(A) Spotfin chub (Erimonax monachus); and

(B) Waccamaw silverside (Menidia extensa).

(5) Mammals: Northern long-eared bat (Myotis septentrionalis)

(6) Mollusks: ~~Noonday globe (Patera clarki nantahala).~~

(A) Noonday globe (Patera clarki nantahala); and

(B) Yellow lance (Elliptio lanceolata).

(7) Reptiles:

(A) Bog turtle (Glyptemys muhlenbergii);

(B) American alligator (Alligator mississipiensis);

(C) Green seaturtle (Chelonia mydas); and

(D) Loggerhead seaturtle (Caretta caretta).

(b) The following species of resident wildlife are designated as state-listed threatened species:

(1) Amphibians:

(A) Eastern tiger salamander (Ambystoma tigrinum tigrinum);

(B) Green salamander (Aneides aeneus);

(C) Junaluska salamander (Eurycea junaluska);

(D) Long-tailed salamander (Eurycea longicauda longicauda);

~~(D)~~(E) Mabee's salamander (Ambystoma mabeei); ~~and~~

(F) Pine Barrens tree frog (Hyla andersonii); and

~~(E)~~(G) Wehrle's salamander (Plethodon wehrlei).

(2) Birds:

(A) Bald eagle (Haliaeetus leucocephalus);

(B) Caspian tern (Hydroprogne caspia);

(C) Gull-billed tern (Gelochelidon nilotica aranea); and

(D) Northern saw-whet owl (Aegolius acadicus).

(3) Crustacea: ~~None Listed At This Time.~~

(A) Broad River spiny crayfish (Cambarus spicatus);

(B) French Broad crayfish (Cambarus reburrus);

(C) Pamlico crayfish (Procambarus medialis);

(D) Sandhills crayfish (Procambarus pearsei); and

(E) South Mountains crayfish (Cambarus franklini).

(4) Fish:

(A) Bigeye jumprock (Moxostoma ariommum);

(B) Carolina madtom (Noturus furiosus);

(C) Carolina pygmy sunfish (Elassoma boehlkei);

(D) Carolina redhorse (Moxostoma sp.)(Pee Dee River and its tributaries and Cape Fear River and its tributaries);

(E) Least brook lamprey (Lampetra aepyptera);

(F) Logperch (Percina caprodes);

(G) Mimic shiner (Notropis volucellus);

(H) Rosyface chub (Hybopsis rubrifrons);

(I) Sharphead darter (Etheostoma acuticeps);

(J) Sicklefin redhorse (Moxostoma sp.)(Hiwassee River and its tributaries and Little Tennessee River and its tributaries);

(K) Turquoise darter (Etheostoma inscriptum); and

(L) Waccamaw darter (Etheostoma perlongum).

(5) Mammals:

(A) Eastern woodrat (Neotoma floridana floridana);

(B) Rafinesque's big-eared bat (Corynorhinus rafinesquii rafinesquii); and

(C) Red wolf (Canis rufus).

(6) Mollusks:

(A) Alewife floater (Anodonta implicata);

(B) Big-tooth covert (Fumonelix jonesiana);

(C) Cape Fear threetooth (Triodopsis soelneri);

~~(D) Carolina fatmucket (Lampsilis radiata conspicua);~~

~~(E)~~(D) Eastern lampmussel (Lampsilis radiata radiata);

~~(F)~~(E) Eastern pondmussel (Ligumia nasuta);

~~(G)~~(F) Engraved covert (Fumonelix orestes);

~~(H)~~(G) Mountain creekshell (Villosa vanuxemensis);

~~(I~~(H) Notched rainbow (Villosa constricta);

~~(J)~~(I) Rainbow (Villosa iris);

~~(K)~~(J) Roan supercoil (Paravitrea varidens);

~~(L)~~(K) Sculpted supercoil (Paravitrea ternaria);

~~(M)~~(L) Smoky Mountain covert (Inflectarius ferrissi);

~~(N)~~(M) Squawfoot (Strophitus undulatus);

~~(O)~~(N) Tidewater mucket (Leptodea ochracea);

~~(P)~~(O) Triangle floater (Alasmidonta undulata); and

~~(Q)~~(P) Waccamaw ambersnail (Catinella ~~waccamawensis)~~ waccamawensis).

~~(R) Waccamaw fatmucket (Lampsilis fullerkati); and~~

~~(S) Waccamaw spike (Elliptio waccamawensis).~~

(7) Reptiles:

(A) Northern pine snake (Pituophis melanoleucus melanoleucus); and

(B) Southern hognose snake (Heterodon simus).

History Note: *Authority G.S. 113-134; 113-291.2; 113-292; 113-333;*
Eff. March 17, 1978;
Amended Eff. June 1, 2008; April 1, 2001; November 1, 1991; April 1, 1991; June 1, 1990; September 1, 1989;
Temporary Amendment Eff. February 27, 2015;
Amended Eff. October 1, 2017; July 1, 2016; August 1, 2016;
Readopted Eff. September 1, 2021.

15A NCAC 10I .0105 SPECIAL CONCERN SPECIES LISTED

The following species of resident wildlife shall be designated as state-listed special concern species:

(1) Amphibians:

(a) Crevice salamander (Plethodon longicrus);

(b) Dwarf

alleganiensis alleganiensis);

(e) Four-toed salamander (Hemidactylium scutatum);

(f) Gray treefrog (Hyla versicolor);

~~(g) Longtail salamander (Eurycea longicauda longicauda);~~

~~(h)~~(g) Mole salamander (Ambystoma talpoideum);

~~(i)~~(h) Mountain chorus frog (Pseudacris brachyphona);

~~(j)~~(i) Mudpuppy (Necturus maculosus);

~~(k)~~(j) Neuse River waterdog (Necturus lewisi);

(k) Southern chorus frog (Pseudacris nigrita);

(l) Southern zigzag salamander (Plethodon ventralis); and

(m) Weller's salamander (Plethodon welleri).

(2) Birds:

(a) American oystercatcher (Haematopus palliatus);

(b) Bachman's sparrow (Peucaea aestivalis);

(c) Barn owl (Tyto alba);

(d) Black-capped chickadee (Poecile atricapillus);

~~(e) Black rail (Laterallus jamaicensis);~~

~~(f)~~(e) Black skimmer (Rynchops niger);

~~(g)~~(f) Brown creeper (Certhia americana nigrescens);

~~(h)~~(g) Cerulean warbler (Setophaga cerulea);

~~(i)~~(h) Glossy ibis (Plegadis falcinellus);

~~(j)~~(i) Golden-winged warbler (Vermivora chrysoptera);

~~(k)~~(j) Least bittern (Ixobrychus exilis);

~~(l)~~(k) Least tern (Sternula antillarum);

~~(m)~~(l) Little blue heron (Egretta caerulea);

~~(n)~~(m) Loggerhead shrike (Lanius ludovicianus);

~~(o)~~(n) Painted bunting (Passerina ciris);

~~(p)~~(o) Red crossbill (Loxia curvirostra);

~~(q)~~(p) Snowy egret (Egretta thula);

~~(r)~~(q) Tricolored heron (Egretta tricolor);

~~(s)~~(r) Vesper sparrow (Pooecetes gramineus); and

~~(t)~~(s) Wilson's plover (Charadrius wilsonia).

(3) Crustacea:

~~(a) Broad River spiny crayfish (Cambarus spicatus);~~

~~(b)~~(a) Carolina skistodiaptomus (Skistodiaptomus carolinensis);

~~(c)~~(b) Carolina well diacyclops (Diacyclops jeannelli putei);

~~(d)~~(c) Chowanoke crayfish (Orconectes virginiensis);

~~(e)~~(d) Graceful clam shrimp (Lynceus gracilicornis);

~~(f)~~ (e) Greensboro burrowing crayfish (Cambarus catagius);

~~(g)~~(f) Hiwassee headwaters crayfish (Cambarus parrishi);

~~(h)~~(g) Little Tennessee River crayfish (Cambarus georgiae);

~~(i)~~(h) North Carolina spiny crayfish (Orconectes carolinensis); and

~~(j)~~(i) Oconee stream crayfish (Cambarus chaugaensis); ~~and~~

~~(k) Waccamaw crayfish (Procambarus braswelli).~~

(4) Fish:

(a) American brook lamprey (Lethenteron appendix);

(b) "Atlantic" highfin carpsucker (Carpiodes sp. cf. velifer);

~~(b)~~(c) Banded sculpin (Cottus carolinae);

~~(c) Blackbanded darter (Percina nigrofasciata);~~

~~(d) Bluefin killifish (Lucania goodei);~~

~~(e)~~(d) Blue Ridge sculpin (Cottus caeruleomentum);

~~(f)~~(e) Blueside darter (Etheostoma jessiae);

~~(g)~~(f) Broadtail madtom (Noturus sp.)(Lumber River and its tributaries and Cape Fear River and its tributaries);

~~(h)~~(g) Carolina darter (Etheostoma collis);

~~(i)~~(h) Cutlip minnow (Exoglossum maxillingua);

~~(j)~~(i) Freshwater drum (Aplodinotus grunniens)(French Broad River);

~~(k) Highfin carpsucker (Carpiodes velifer)(Cape Fear River and its tributaries);~~

~~(l)~~(j) Kanawha minnow (Phenacobius teretulus);

~~(m)~~ (k) Lake sturgeon (Acipenser fulvescens);

~~(n)~~ (l) Least killifish (Heterandria formosa);

~~(o) Longhead darter (Percina macrocephala);~~

~~(p)~~(m) Mooneye (Hiodon tergisus);

~~(q)~~(n) Mountain madtom (Noturus eleutherus);

~~(r)~~(o) Ohio lamprey (Ichthyomyzon bdellium);

~~(s)~~(p) Olive darter (Percina squamata);

~~(t)~~(q) Pinewoods darter (Etheostoma mariae);

~~(u)~~(r) River carpsucker (Carpiodes carpio);

~~(v)~~(s) Sandhills chub (Semotilus lumbee);

(t) Sickle darter (Percina williamsi);

~~(w)~~(u) Smoky dace (Clinostomus sp.)(Little Tennessee River and tributaries);

~~(x)~~(v) Striped shiner (Luxilus chrysocephalus);

~~(y)~~(w) ~~Tennessee snubnose~~ Snubnose darter (Etheostoma simoterum);

~~(z)~~(x) ~~Thinlip~~ "Thinlip" chub ~~(Cyprinella zanema)(Lumber River and its tributaries and Cape Fear River and its tributaries);~~ (Cyprinella sp. cf. zanema);

~~(aa)~~(y) Waccamaw killifish (Fundulus waccamensis);

(z) Westfall's Darter (Percina westfalli);

~~(bb)~~(aa) Wounded darter (Etheostoma vulneratum); and

~~(cc)~~(bb) Yellowfin shiner (Notropis lutipinnis)(Savannah River and its tributaries).

(5) Mammals:

(a) Allegheny woodrat (Neotoma magister);

(b) Buxton Woods white-footed mouse (Peromyscus leucopus buxtoni);

(c) Coleman's oldfield mouse (Peromyscus polionotus colemani);

(d) Eastern big-eared bat (Corynorhinus rafinesquii macrotis);

(e) Eastern small-footed bat (Myotis leibii leibii);

(f) Florida yellow bat (Lasiurus intermedius floridanus);

(g) Pungo white-footed mouse (Peromyscus leucopus easti);

(h) Southeastern bat (Myotis austroriparius);

(i) Southern rock vole (Microtus chrotorrhinus carolinensis); and

(j) Star-nosed mole (Condylura cristata parva).

(6) Mollusks:

(a) Appalachian gloss (Zonitoides patuloides);

(b) Bidentate dome (Ventridens coelaxis);

(c) Black mantleslug (Pallifera hemphilli);

(d) Blackwater ancylid (Ferrissia hendersoni);

(e) Blue-foot lancetooth (Haplotrema kendeighi);

(f) Cape Fear spike (Elliptio marsupiobesa);

(g) Clingman covert (Fumonelix wheatleyi clingmanicus);

(h) Dark glyph (Glyphyalinia junaluskana);

(i) Dwarf proud globe (Patera clarki clarki);

(j) Dwarf threetooth (Triodopsis fulciden);

(k) Fringed coil (Helicodiscus fimbriatus);

(l) Glossy supercoil (Paravitrea placentula);

(m) Great Smoky slitmouth (Stenotrema depilatum);

(n) High mountain supercoil (Paravitrea andrewsae);

(o) Honey glyph (Glyphyalinia vanattai);

(p) Lamellate supercoil (Paravitrea lamellidens);

(q) Mirey Ridge supercoil (Paravitrea clappi);

(r) Open supercoil (Paravitrea umbilicaris);

(s) Pink glyph (Glyphyalinia pentadelphia);

(t) Pod lance (Elliptio folliculata);

(u) Queen crater (Appalachina chilhoweensis);

(v) Ramp Cove supercoil (Paravitrea lacteodens);

(w) Ridged lioplax (Lioplax subcarinata);

(x) Roanoke slabshell (Elliptio roanokensis);

(y) Saw-tooth disc (Discus bryanti);

(z) Seep mudalia (Leptoxis dilatata);

(aa) Spike (~~Elliptio~~ Eurynia dilatata);

(bb) Spiral coil (Helicodiscus bonamicus);

(cc) Velvet covert (Inflectarius subpalliatus);

(dd) Waccamaw amnicola (Amnicola sp.);

(ee) Waccamaw siltsnail (Cincinnatia sp.); and

(ff) Wavy-rayed lampmussel (Lampsilis fasciola).

(7) Reptiles:

(a) Carolina pigmy rattlesnake (Sistrurus miliarius miliarius);

(b) Carolina swamp snake (Seminatrix pygaea paludis);

(c) Carolina watersnake (Nerodia sipedon williamengelsi);

(d) Cumberland slider (Trachemys scripta troostii);

(e) Diamondback terrapin (Malaclemys terrapin);

(f) Eastern chicken turtle (Deirochelys reticularia reticularia);

(g) Eastern coachwhip (Coluber (=Masticophis) flagellum flagellum);

(h) Eastern slender glass lizard (Ophisaurus attenuates longicaudus);

~~(g) Eastern smooth green snake (Opheodrys vernalis vernalis);~~

~~(h)~~ (i) Eastern spiny softshell (Apalone spinifera spinifera);

~~(i) Mimic glass lizard (Ophisaurus mimicus);~~

(j) Northern map turtle (Graptemys geographica);

~~(j)~~(k) Outer Banks kingsnake (Lampropeltis getula sticticeps);

~~(k)~~(l) Stripeneck musk turtle (Sternotherus minor peltifer); and

~~(l)~~(m) Timber rattlesnake (Crotalus horridus).

History Note: *Authority G.S. 113-134; 113-291.2; 113-292; 113-333;*
Eff. September 1, 1989;
Amended Eff. October 1, 2017; August 1, 2016; May 1, 2008; July 18, 2002; April 1, 2001; November 1, 1991; April 1, 1991; June 1, 1990;
Readopted Eff. September 1 2021.

Appendix B: Proposed Changes to Protected Animal Lists

Proposed Changes to Protected Animal Lists – Crustaceans, Amphibians, Reptiles, and Technical Corrections

North Carolina Wildlife Resources Commission

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Summary of Criteria Used to Determine a Species' Recommended Status

(modified from IUCN 2012).

Use any of the criteria A–E	**Endangered**	**Threatened**	**Special Concern**
A. Population reduction Declines measured over the past 10 to 50 years			
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%
A1. Population reduction observed, estimated, or inferred in the past where causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following: **(a)** direct observation **(b)** an index of abundance appropriate to the taxon **(c)** a decline in area of occupancy, extent of occurrence, and/or habitat quality **A2.** Population reduction observed, estimated, or inferred in the past where causes of the reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (c) under A1. **A3.** Population reduction projected to be met in the future (up to a maximum of 50 years) based on (b) to (c) under A1. **A4.** An observed, estimated, inferred, or projected population reduction (up to a maximum of 50 years) where the time period must include both the past and the future, and where causes of the reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (c) under A1.			
B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
B1. Extent of occurrence	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy	< 10 km²	< 500 km²	< 2,000 km²
AND both of the following:			
(a) Severely Fragmented or Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals.			
C. Small population size and decline			
Number of mature individuals	< 750	< 3,500	< 10,000
AND either C1 or C2:			
C1. An estimated continuing decline of at least:	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
(up to a max. of 50 years in future)			
C2. A continuing decline and number of mature individuals in each subpopulation:	< 150	< 700	< 1,400
D. Very small or restricted population			
Either:			
D1. Number of mature individuals	< 150	< 700	< 1,400
OR			
D2. Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to E or EX in a very short time.			**D2.** typically: AOO <20 km² or number of locations ≤ 5
E. Quantitative Analysis			
Indicates the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations (50 years max.)	≥ 20% in 20 years or 5 generations (50 years max.)	≥ 10% in 50 years

Broad River Spiny Crayfish

Cambarus spicatus

Current N.C. Status: Special Concern

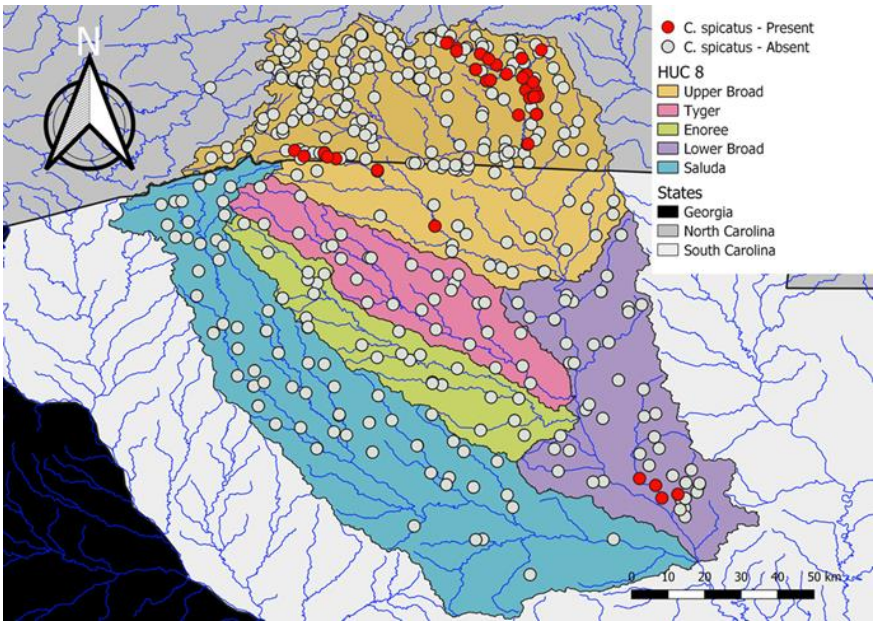
Proposed N.C. Status: Threatened

National Status

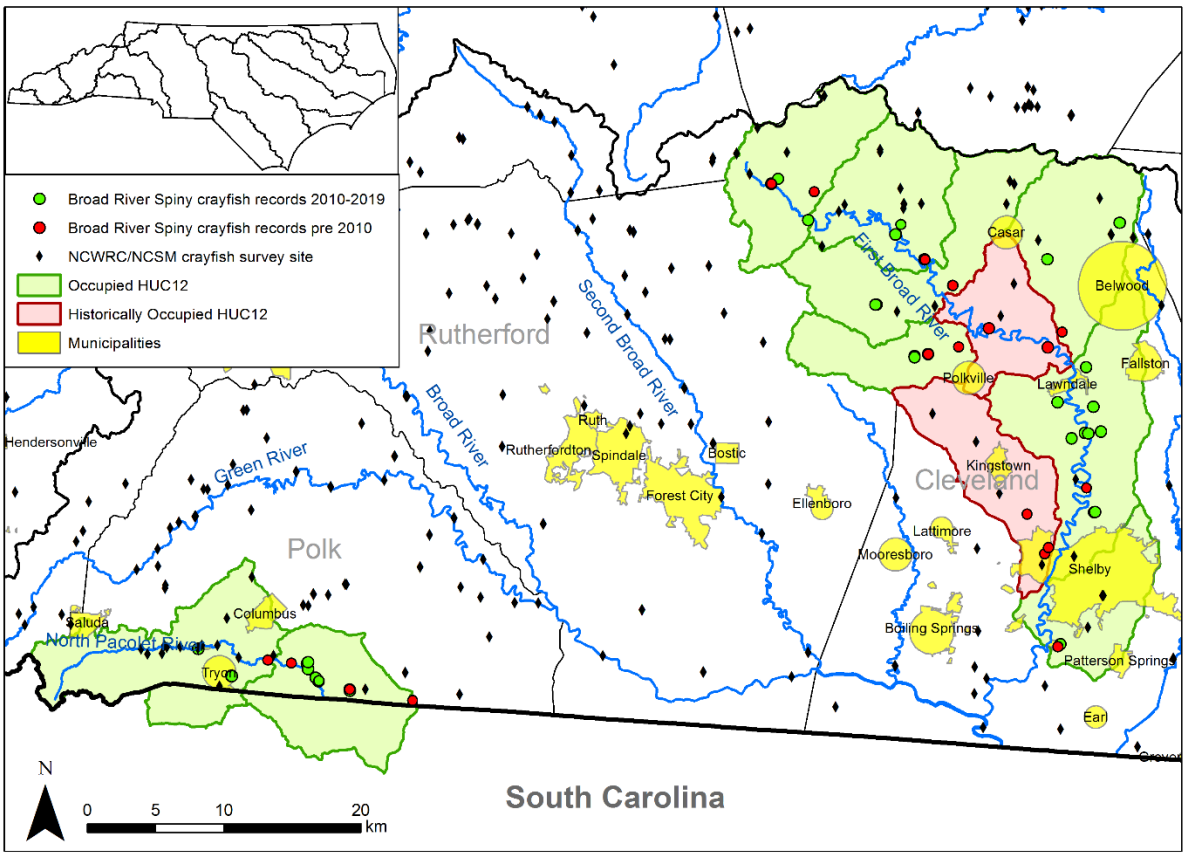
Current USFWS Status: Not Listed
Current IUCN Status: Data Deficient (DD)
Current NatureServe G-Rank: G3 – Vulnerable (last reviewed 1 July 2009, last changed 19 Feb 1996)

Range

This speices is restricted to the Broad River basin in North and South Carolina. In North Carolina it is located in the First Broad and Pacolet River watersheds in Rutherford, Cleveland and Polk counties.



National Distribution of the Broad River Spiny Crayfish



Distribution of the Broad River Spiny Crayfish in North Carolina

Rationale for Status Change

This species exceeds the criteria to be considered Threatened under Criteria B1 and B2. Examination of data from the NCWRC Aquatics Database indicate that the Extent of Occurrence (EOO) = 804 km^2 and Area of Occupancy (AOO) = 66 km^2. *Cambarus spicatus* is presently known to occur in 10 locations (= 10 HUC12s; Figure 1). The species is severely fragmented with no current connectivity between the First Broad and North Pacolet River populations in NC due to habitat degradation throughout large reaches of the Broad River basin (NCDEQ 2018). The species appears to be exhibiting a decline in geographic extent. The number of known locations has declined from 12 to 10 since 2010 (figure 1). Both of the HUC12s where it has not been recently collected were each sampled several times at various locations. The Broad River Spiny Crayfish's is now narrowly distributed (EOO less than 5000 km^2 and AOO less than 500 km^2). This combination of narrow distribution, decline in number of locations, decline in EOO, and fragmentation exceeds the criteria for this species to be considered threatened.

Summary of Criteria Evaluated

Criterion	Score
A1	No change
A2	No change
A3	No change
A4	Data Deficient
B1	Threatened
B2	Threatened
C1	Data Deficient
C2	Data Deficient
D1	Data Deficient
D2	Data Deficient
E	Data Deficient

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
NCWRC	State	South Mountains Game Lands protects portion of headwaters of First Broad River sub-basin.
NC Department of Environmental Quality	State	Outstanding Resource Water designation for North Fork First Broad River.
NC Department of Environmental Quality	State	Water Supply Watershed for portion of Pacolet River tributaries.
NC Clean Water Trust Fund	State	Conservation easements and land ownership along small portions of streams in Pacolet River sub-basin.
Various (e.g., Upstate Forever, Conserving Carolina)	Private	Conservation easements and land ownership along small portions of streams in Pacolet River sub-basin.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification, Curtailment	Present, Threatened	Water quality degradation from chemical and excess nutrient pollution, agriculture, logging, residential and commercial development, and road construction and maintenance.

Destruction, Modification, Curtailment	Present, Threatened	Siltation and physical habitat degradation from agriculture, logging, residential and commercial development, channel clearing and snagging, and road construction and maintenance.
Modification, Curtailment	Present, Threatened	Flow reduction or alteration from agriculture and water supply withdrawals. Could be exacerbated by climate change.
Modification, Curtailment	Present	Habitat fragmentation by dams and culverts.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Recreational	Low	Use as fishing bait.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	Unknown	Potential competition and displacement by non-native and invasive crayfish and fish species.
Disease	Unknown	Porcelain disease occurs in North Carolina and can result in heavy population losses in some species. It is unknown if this crayfish species is susceptible to porcelain disease or if the disease occurs in its current range. Porcelain disease is known from some co-occurring species in the First Broad River, but has not been detected in Broad River Spiny Crayfish at this time.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
None known		

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

French Broad River Crayfish

Cambarus reburrus

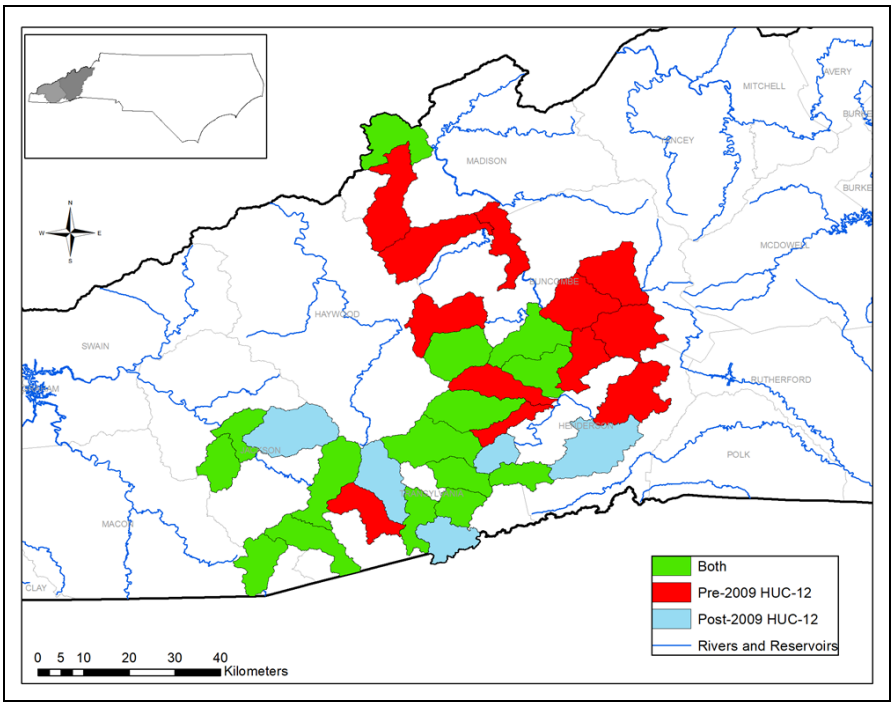
Current N.C. Status: Not listed

Proposed N.C. Status: Threatened

National Status: This species is not federally listed and is considered Least Concern by IUCN but is ranked at G3 (Vulnerable) by Nature Serve and S2 by the NC Natural Heritage Program.

Range: This species occurs in portions of the French Broad River Basin, upper Savannah River Basin, and Tuckasegee River Sub-basin of the Little Tennessee River Basin.

National distribution of the French Broad Crayfish



Distribution of the French Broad Crayfish in North Carolina

Rationale for Status Change: Current estimated area of occupancy is ≈600 km^2. This is below the target Area of Occupancy for Special Concern (2000 km^2). This along with the population reduction noted above, qualifies this species for Special Concern. Current estimate of Extent of Occurrence is 1679 km^2. This is calculated by summing the area of occupied HUC12s. This exceeds the target for Threatened (5000 km^2). This, along with the declines noted in Criterion A, qualifies this species for Threatened status.

Summary of Criteria Evaluated

Criterion	Score
A1	Data Deficient
A2	Special Concern
A3	Data Deficient
A4	Data Deficient
B1	Threatened
B2	Special Concern
C1	Data Deficient
C2	Data Deficient
D1	Data Deficient
D2	Least Concern
E	Data Deficient

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
U.S. Forest Service	Federal	Pisgah and Nantahala National Forests protect portions of French Broad, Tuckasegee and Savannah river basins.
NC Department of Environmental Quality	State	Outstanding Resource Water, High Quality Water, and Water Supply Watershed designations for portions of French Broad, Tuckasegee and Savannah river basins.
NC Clean Water Trust Fund	State	Conservation easements and land ownership along small portions of streams.
NC Forest Service	State	Headwaters State Forest, Dupont State Forest
Various (e.g., Mainspring Conservation Trust, North American Land Trust, Conserving Carolina)	Private	Conservation easements and land ownership along small portions of streams in Pacolet River sub-basin.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification, Curtailment	Present, Threatened	Water quality degradation from chemical and excess nutrient pollution, agriculture, logging, residential and commercial development, and road construction and maintenance.
Destruction, Modification, Curtailment	Present, Threatened	Siltation and physical habitat degradation from agriculture, logging, residential and commercial development, channel clearing and snagging, and road construction and maintenance.
Modification, Curtailment	Present, Threatened	Flow reduction or alteration from agriculture and water supply withdrawals. Could be exacerbated by climate change.
Modification, Curtailment	Present	Habitat fragmentation by dams and culverts.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Recreational	Low	Use as fishing bait.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	Unknown	Potential competition and displacement by non-native and invasive crayfish and fish species.
Disease	Unknown	Porcelain disease occurs in North Carolina and can result in heavy population losses in some species. It is unknown if this crayfish species is susceptible to porcelain disease or if the disease occurs in its current range.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
None known		

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

South Mountains Crayfish

Cambarus franklini

Current N.C. Status: None

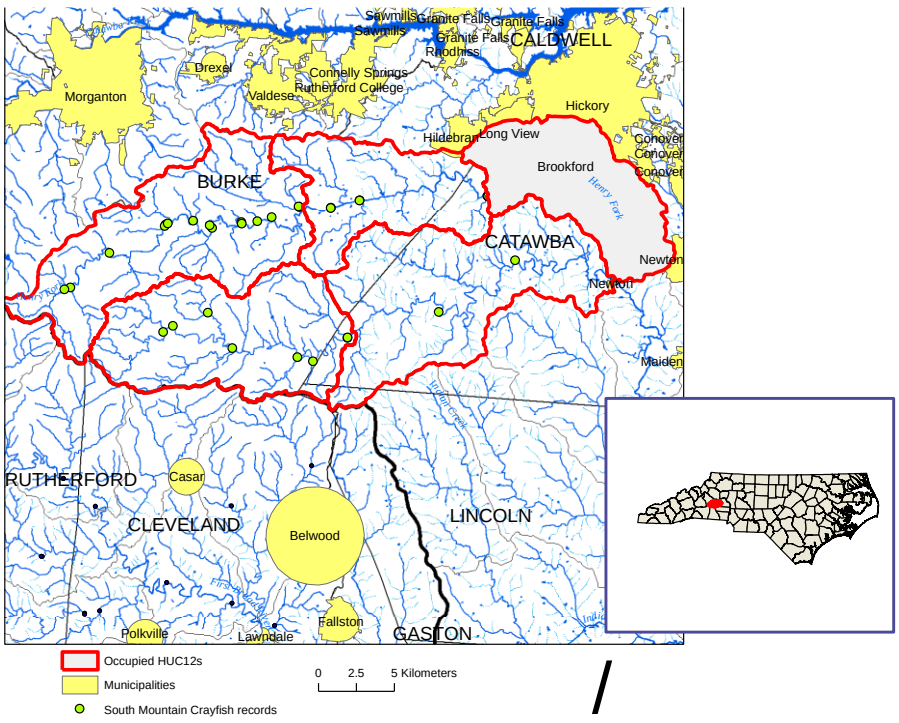
Proposed N.C. Status: Threatened

National Status

None. This species was just formally described in 2019 so it has not been evaluated by any entity.

Range

The South Mountain Crafyish is only found in Jacob Fork and Henry Fork rivers and tributaries in the upper South Fork Catawba River watershed in Burke and Catawba counties in the western Piedmont of North Carolina.



Distribution of the South Mountains Crayfish

Rationale for Status Change

This species qualifies for Threatened using Criterion B: Geographic Range (B1 and B2)
Examination of data from the NCWRC Aquatics Database indicate that the Extent of Occurrence (EOO) = 546 km^2 and the Area of Occupancy (AOO) = 84 km^2. The species is known to occur in 5 locations (= 5 HUC12s). There is strong evidence of a decline in quality of habitat, as recent high flow events following the removal of Shuford Mill Dam have caused serious degradation of habitat in the lower Henry Fork River. This has affected and estimated 2 kilometers of stream habitat.

Summary of Criteria Evaluated

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Threatened
B2	Threatened
C	Data Deficient
D1	Least Concern
D2	Special Concern
E	Data Deficient

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
NC Division of Parks and Recreation	State	South Mountains State Park protects headwaters of Henry Fork and Jacob Fork sub-basins.
NC Department of Environmental Quality	State	Outstanding Resource Water designation for headwaters of Henry Fork and Jacob Fork sub-basins.
NC Clean Water Trust Fund	State	Conservation easements and land ownership along portions of streams in Henry Fork and Jacob Fork sub-basins.
NCWRC	State	South Mountains Game Lands protects a small portion of headwaters of Henry Fork sub-basin.

Foothills Conservancy of North Carolina	Private	Conservation easements and land ownership along portions of streams in Henry Fork and Jacob Fork sub-basins.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification, Curtailment	Present, Threatened	Water quality degradation from chemical and excess nutrient pollution, agriculture, logging, residential and commercial development, and road construction and maintenance.
Destruction, Modification, Curtailment	Present, Threatened	Siltation and physical habitat degradation from agriculture, logging, residential and commercial development, channel clearing and snagging, and road construction and maintenance.
Modification, Curtailment	Present, Threatened	Flow reduction or alteration from agriculture and water supply withdrawals. Could be exacerbated by climate change.
Modification, Curtailment	Present	Habitat fragmentation by dams and culverts.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Recreational	Low	Use as fishing bait.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	Low	Potential competition and displacement by non-native and invasive crayfish and fish species.
Disease	Unknown	Porcelain disease occurs in North Carolina and can result in heavy population losses in some species. It is unknown if this crayfish species is susceptible to porcelain disease or if the disease occurs in its current range, but it occurs in the adjacent First Broad River.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
None known		

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Pamlico Crayfish

Procambarus medialis

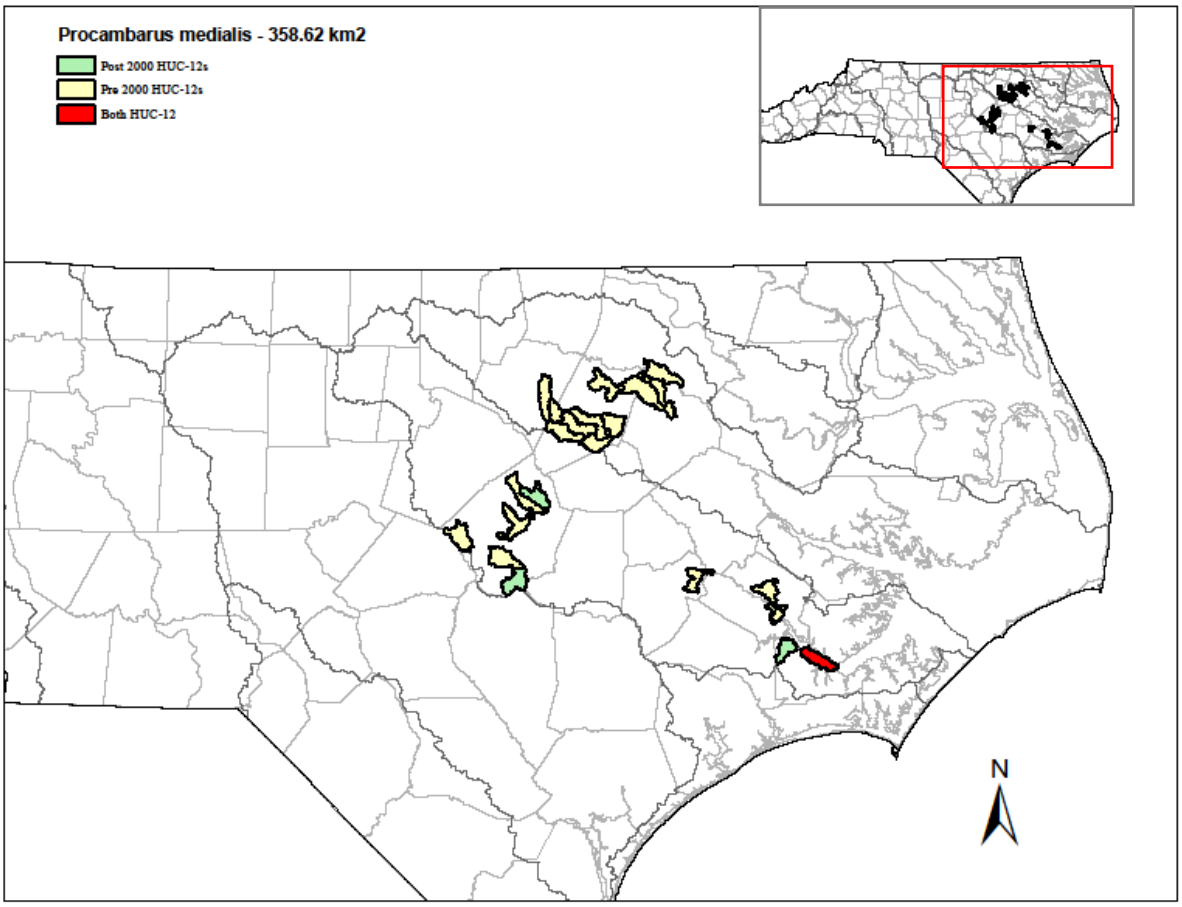
Current N.C. Status: Not Listed

Proposed N.C. Status: Threatened

National Status: This species is not federally listed. It is ranked G3 (vulnerable) by NatureServe and Not Assessed by the IUCN.

Range: This species is known only from the Neuse and Tar-Pamlico drainages in North Carolina. While historically it has been found in the upper Tar, it has not been observed there since pre-2000. Fragmented populations across the Neuse drainage have recently been detected from Johnston and Craven counties, but only encompass 4 localities.

Rationale for Status Change: Populations of the Pamlico Crayfish appear to be declining in North Carolina, with no recent records from the Tar-Pamlico River Basin. The species has undergone a 68.67% reduction in extent of occurrence with only 4 known current localities comprised of 358.62 km^2 in the Neuse River Basin. This extent of occurrence exceeds the threshold for listing as Threatened. Further, the Red Swamp Crayfish (*Procambarus clarkii*), an invasive species, and anthropogenic impacts also further threaten the species and could drive it to extinction or endangered status within the foreseeable future.



Distribution of the Pamlico Crayfish

Summary of Criteria Evaluated

Criterion	Score
A1	Data Deficient
A2	Threatened
A3	Data Deficient
A4	Data Deficient
B1	Threatened
B2	Threatened
B(a)	Threatened
B(b)	Threatened
C	Data Deficient
C1	Data Deficient

C2	**Data Deficient**
D1	**Data Deficient**
D2	**Special Concern**
E	**Data Deficient**

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
U.S. Forest Service	Federal	Croatan National Forest protects a portion of the Neuse river basin.
U.S. Department of Defense	Federal	Cherry Point Marine Air Station controls a small portion of the species' range.
NC Department of Agriculture	State	Conservation Enhancement Reserve Program provides easements on very limited areas.
NC Clean Water Trust Fund	State	Conservation easements and land ownership along very small portions of streams.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification, Curtailment	Present, Threatened	Degradation and fragmentation of stream habitats have forced this species to exist only in roadside ditches.
Destruction, Modification, Curtailment	Present, Threatened	Water quality degradation from chemical and excess nutrient pollution, agriculture, logging, residential and commercial development, and road construction and maintenance.
Destruction, Modification, Curtailment	Present, Threatened	Siltation and physical habitat degradation from agriculture, logging, residential and commercial development, channel clearing and snagging, and road construction and maintenance.
Modification, Curtailment	Present, Threatened	Flow reduction or alteration from agriculture and water supply withdrawals. Could be exacerbated by climate change.
Modification, Curtailment	Present	Habitat fragmentation by dams and culverts.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Recreational	Low	Use as fishing bait.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	Unknown	Potential competition and displacement by non-native and invasive crayfish and fish species. In particular, Red Swamp Crayfish is sympatric and of high concern.
Disease	Unknown	Porcelain disease occurs in North Carolina and can result in heavy population losses in some species. It is unknown if this crayfish species is susceptible to porcelain disease or if the disease occurs in its current range.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
None known		

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Sandhills Crayfish

Procambarus pearsei

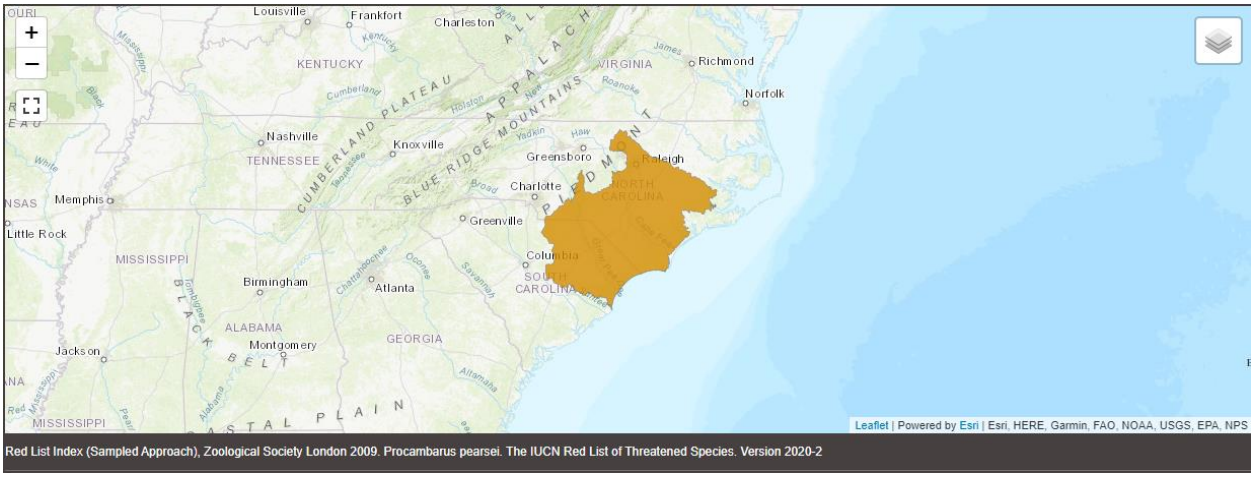
Current N.C. Status: Not Listed

Proposed N.C. Status: Threatened

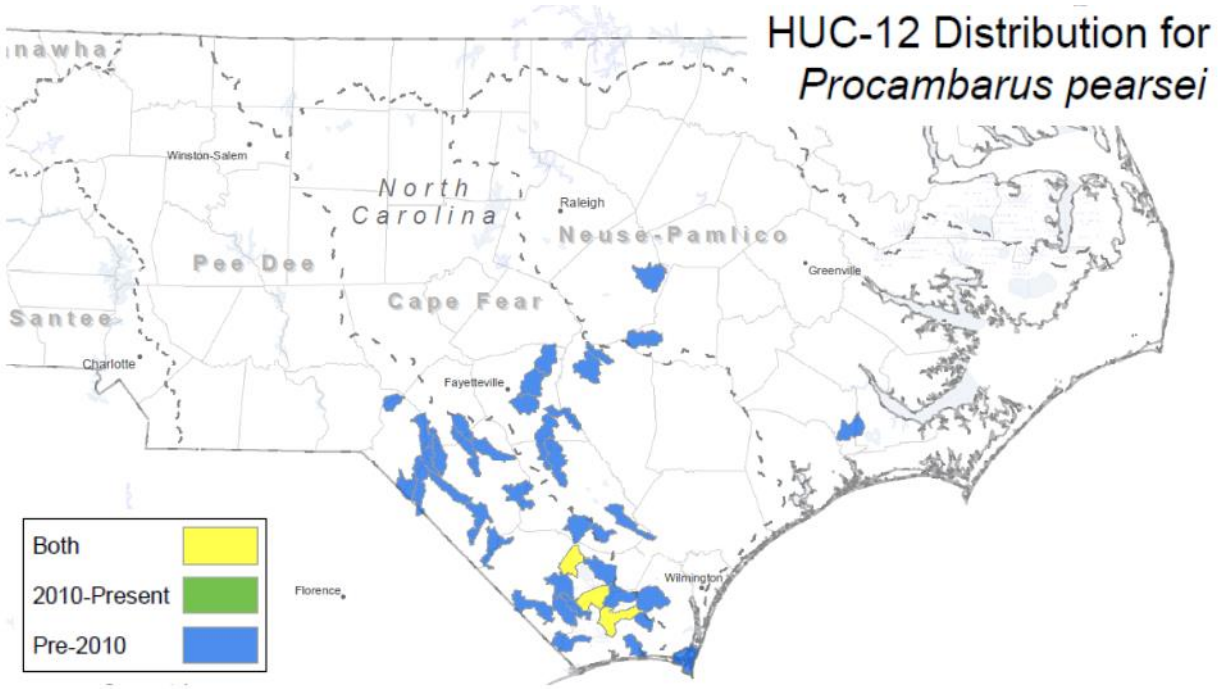
National Status: This species is not federally listed. It is ranked G4 (apparently secure) by NatureServe and Data Deficient by the IUCN.

Range: This species historically is known to occur in the lower Cape Fear Basin in NC and the Lumber-Little Pee Dee and Waccamaw River basins in NC and SC.

Rational for Status Change: Despite the widespread distribution of this species across southeastern North Carolina in the past, this species has experienced a dramatic decline since 2010. Coincident with this decline is a rapid increase in the abundance of the invasive *Procambarus clarkii* in the Pee Dee watershed. It appears that this invasive species is displacing *P. pearsei,* as well as other species, in this region. This population reduction is based on direct observation and decline in the area of occupancy that appears to be caused by an invasive crayfish whose spread may not be reversible. Area of Occupancy is NC is less than 100 km^2 (AOC = 14 km^2) which exceeds the threshold for Threatened.



National Distribution of the Sandhills Crayfish



Distribution of the Sandhills Crayfish in North Carolina

Summary of Criteria Evaluated

Criterion	Score
Al	Data Deficient
A2	Threatened
A3	Data Deficient
A4	Data Deficient
Bl	Threatened
B2	Threatened
B(a)	Threatened
B(b)	Threatened
C	Data Deficient
Cl	Data Deficient
C2	Data Deficient

DI	Data Deficient
D2	Special Concern

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
National Park Service	Federal	Wild and Scenic River designation for portion of Lumber River.
NC Department of Environmental Quality	State	Outstanding Resource Water designation for portion of Lumber river basin around Lake Waccamaw. High Quality Water designation for upper portion of Lumber River.
NC Division of Parks and Recreation	State	Lumber River State Park along lower portion of Lumber River; Lake Waccamaw State Park.
NC Clean Water Trust Fund	State	Conservation easements and land ownership along very small portions of streams.
NCWRC	State	Juniper Creek, Sandhills, and Columbus County game lands.
Various (e.g., NC Coastal Land Trust)	Private	Conservation easements and land ownership along small portions of streams in Lumber River.
The Nature Conservancy	Private	Green Swamp Preserve.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification, Curtailment	Present, Threatened	Water quality degradation from chemical and excess nutrient pollution, agriculture, logging, residential and commercial development, and road construction and maintenance.
Destruction, Modification, Curtailment	Present, Threatened	Siltation and physical habitat degradation from agriculture, logging, residential and commercial development, channel clearing and snagging, and road construction and maintenance.
Modification, Curtailment	Present, Threatened	Flow reduction or alteration from agriculture and water supply withdrawals. Could be exacerbated by climate change.
Modification, Curtailment	Present	Habitat fragmentation by dams and culverts.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Recreational	Low	Use as fishing bait.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	Unknown	Potential competition and displacement by non-native and invasive crayfish and fish species. In particular, Red Swamp Crayfish is sympatric and of high concern.
Disease	Unknown	Porcelain disease occurs in North Carolina and can result in heavy population losses in some species. It is unknown if this crayfish species is susceptible to porcelain disease or if the disease occurs in its current range.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
None known		

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Waccamaw Crayfish

Procambarus braswelli

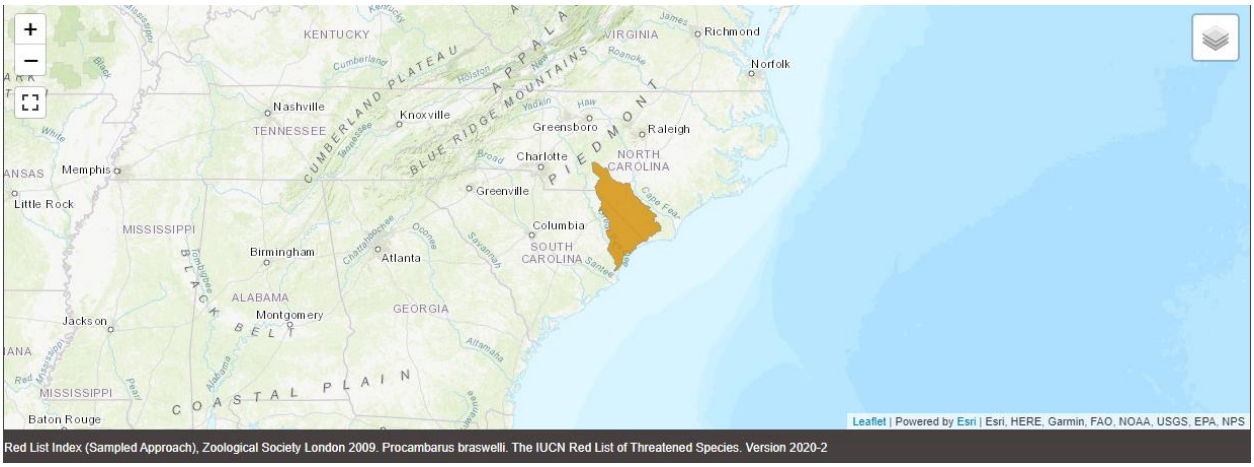
Current N.C. Status: Special Concern

Proposed N.C. Status: Endangered

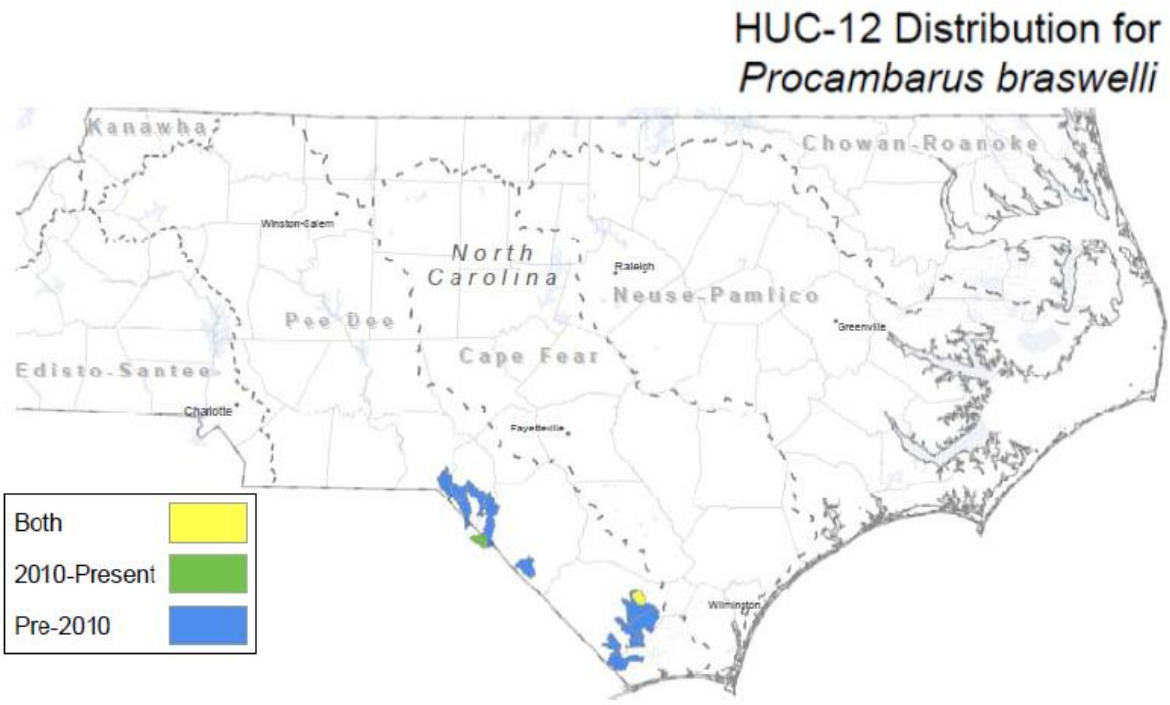
National Status: This species is not federally listed, but is ranked at G3 (Vulnerable) by Nature Serve and Data Deficient by IUCN.

Range: This species occurs in a small number of disjunct locations in the Waccamaw and Pee Dee River basins in NC and SC.

Rational for Status Change: Populations throughout the species range have substantially declined over the past 20 years. The last record of the Waccamaw Crayfish in North Carolina is from 2012, from Lake Waccamaw. Intensive surveys undertaken in 2018 and 2019 in Lake Waccamaw and all historic sites throughout the Waccamaw River drainage revealed widespread populations of the invasive Red Swamp Crayfish (*Procambarus clarkii*) but failed to detect Waccamaw Crayfish. These surveys indicate that the range of the species as a whole is greatly reduced. This species faces numerous threats including poor population connectivity and introduction of invasive crayfish species. Area of Occupancy in NC, based on all records from 2001 to present, is less than 10 km^2 (AOC = 4 km^2) which exceeds the threshold for Endangered.



National Distribution of the Waccamaw Crayfish



Distribution of the Waccamaw Crayfish in North Carolina

Summary of Criteria Evaluated

Criterion	Score
Al	Data Deficient
A2	Endangered
A3	Data Deficient
A4	Data Deficient
Bl	Endangered
B2	Endangered
B(a)	Threatened
B(b)	Endangered
C	Data Deficient
Cl	Data Deficient
C2	Data Deficient
Dl	Data Deficient
D2	Endangered

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
NC Department of Environmental Quality	State	Outstanding Resource Water designation for portion of Lumber river basin around Lake Waccamaw. High Quality Water designation for upper portion of Lumber River.
NC Clean Water Trust Fund	State	Conservation easements and land ownership along small portions of streams.
NC Division of Parks and Recreation	State	Lake Waccamaw State Park, Lumber River State Park
NCWRC	State	Sandhills, Juniper Creek and Columbus County game lands.
The Nature Conservancy	Private	Green Swamp Preserve

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification, Curtailment	Present, Threatened	Water quality degradation from chemical and excess nutrient pollution, agriculture, logging, residential and commercial development, and road construction and maintenance.
Destruction, Modification, Curtailment	Present, Threatened	Siltation and physical habitat degradation from agriculture, logging, residential and commercial development, channel clearing and snagging, and road construction and maintenance.
Modification, Curtailment	Present, Threatened	Flow reduction or alteration from agriculture and water supply withdrawals. Could be exacerbated by climate change.
Modification, Curtailment	Present	Habitat fragmentation by dams and culverts.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Recreational	Low	Use as fishing bait.
Recreational, Commercial	Low	Collection for aquarium trade.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	Unknown	Potential competition and displacement by non-native and invasive crayfish and fish species. In particular, Red Swamp Crayfish is sympatric and of high concern.
Disease	Unknown	Porcelain disease occurs in North Carolina and can result in heavy population losses in some species. It is unknown if this crayfish species is susceptible to porcelain disease or if the disease occurs in its current range.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
None known		

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Pine Barrens Treefrog

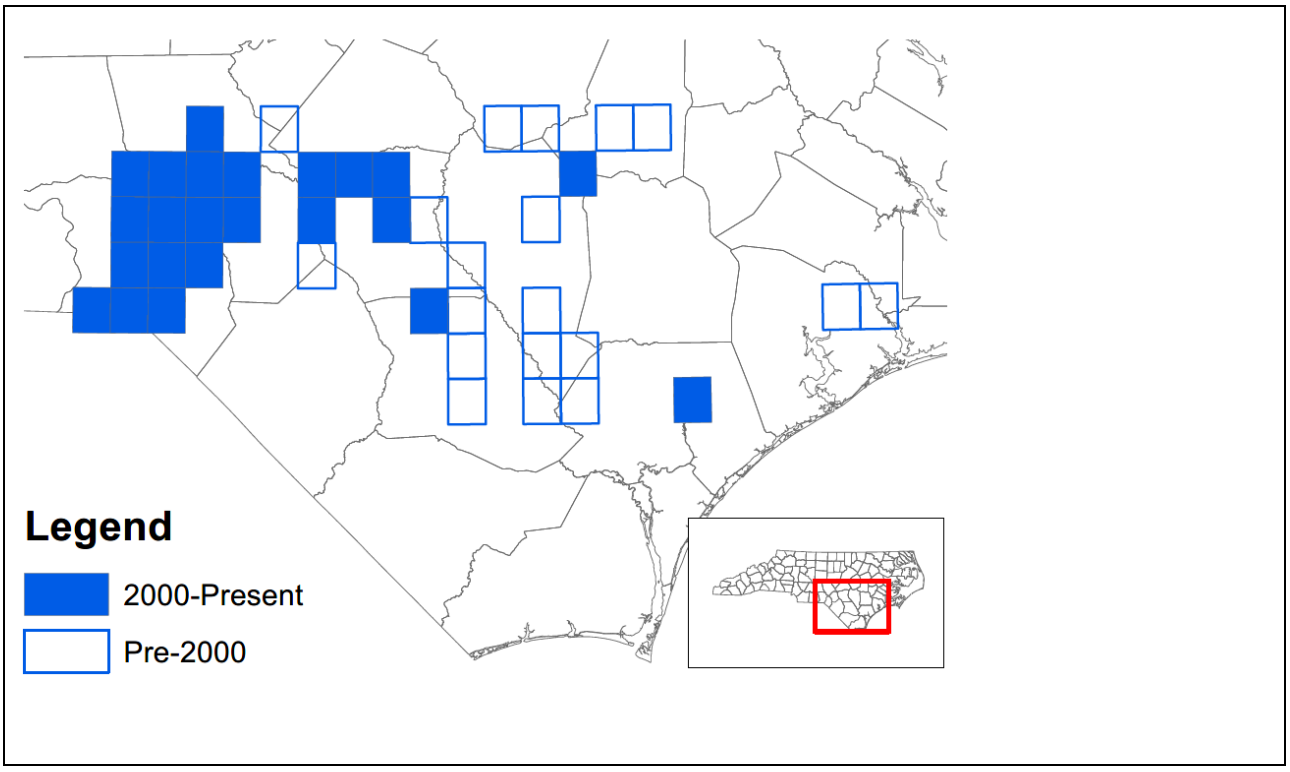
Hyla andersonii

Current N.C. Status: Not Listed

Proposed N.C. Status: Threatened

National Status: This species is not listed at the national level. NatureServe ranks the Pine Barrens Treefrog as G4, or apparently secure.

Range: *Hyla andersonii* populations are divided into three distinct geographical areas: the Pine Barrens of New Jersey; North and South Carolina; and western Florida and south central Alabama. North Carolina populations are mostly centered around the Sandhills, with outlying localities in the lower Coastal Plain.



Distribution of the Pine Barrens Treefrog in North Carolina

Rationale for Status Change: Based on surveys by NCWRC and the NC Natural Heritage Program, biologists estimate there are between 650 and 800 mature Pine Barrens Treefrogs in our state. Furthermore, continued surveys give confidence that there are far fewer than 700 individuals in any one sub-population. Based on these criteria, we assign a conservation status of Threatened by Criterion C.

Summary of Criteria Evaluated

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Special Concern
B2	Special Concern
B(a)	Special Concern
B(b)	Special Concern
C	Threatened
C1	Data Deficient
C2	Threatened
D1	Special Concern
D2	Special Concern

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
US Department of Defense	Federal	Land conservation and management on Fort Bragg.
NC Wildlife Resources Commission	State	Land conservation and management on Holly Shelter, Suggs Mill Pond, and Sandhills game lands.
NC Division of Mitigation Services	State	Easements
NC Division of Parks and Recreation	State	Land conservation and management on Carvers Creek State Park, and Weymouth Woods/Sandhills Nature Preserve.
Various Land Trusts	Private	Land conservation, easements, and management by North Carolina Coastal Land Trust, and The Nature Conservancy.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification	Present, Threatened	Roads and road construction destroy and fragment habitats. Residential and commercial development can destroy and fragment habitat.
Destruction, Modification, Curtailment	Present, Threatened	Altered hydrology of breeding habitat (seeps, pocosins) due to climate change, land cover changes, or water extraction.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Commercial	Low	Illegal collection for the pet trade or personal collections.
Scientific	Low	Research projects can disturb habitat; impede animal movement toward breeding sites; or remove too many individuals from a population.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Disease	High	Disease threats of at least three pathogens have been identified, two of which (chytrid fungus and Ranavirus) have been found in North Carolina.
Predation	Low	Illegal collection for the pet trade or personal collections reduces number of individuals available for reproduction.

Other	Low	Nighttime road mortality from vehicular traffic.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
US Fish and Wildlife Service	Federal	Listing under federal Endangered Species Act; designation of Critical Habitat. However, species has not been petitioned.
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Southern Chorus Frog

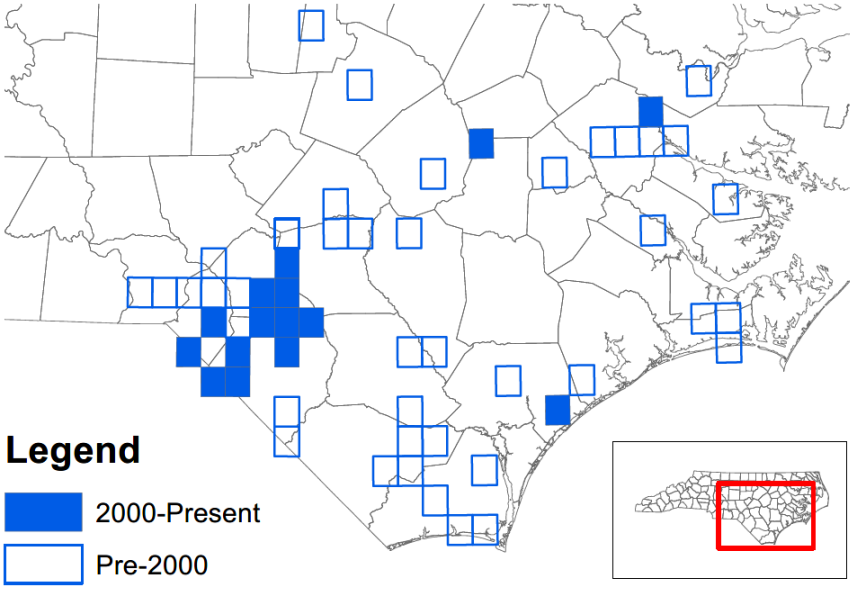
Pseudacris nigrita

Current N.C. Status: Not Listed

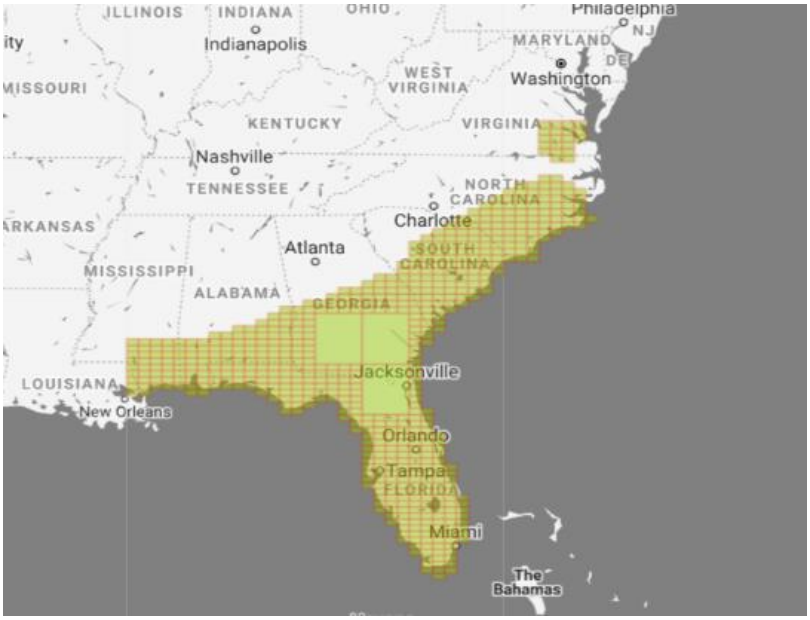
Proposed N.C. Status: Special Concern

National Status: This species is not listed at the national level. NatureServe ranks the Southern Chorus Frog as G5, or globally secure.

Range: *Pseudacris nigrita* is a frog of the southeastern Coastal Plain, with a range stretching from eastern Lousiana and central Mississippi, to southeastern Virginia. North Carolina populations are highly fragmented, with most occurrences in the Sandhills.



Distribution of the Southern Chorus Frog in North Carolina



Rationale for Status Change: Southern Chorus frogs have experienced a marked decline in Extent of Occurrence and Area of Occupancy. Since 2000, these animals have been documented from only a handful of localities, in an area encompassing just over 15,000 km^2. These factors place the species firmly into the category of Special Concern according to Criterion B.

Summary of Criteria Evaluated

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Special Concern
B2	Special Concern
B(a)	Special Concern
B(b)	Special Concern
C	Data Deficient
C1	Data Deficient
C2	Data Deficient
D1	Data Deficient
D2	Special Concern

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
US Department of Defense	Federal	General land conservation of Fort Bragg and Camp Lejeune.
US Forest Service	Federal	General land conservation and management of Croatan National Forest.
NCWRC	State	Land conservation and management on Holly Shelter, Sandhills, and Suggs Mill game lands.
The Nature Conservancy	Private	Land conservation and management on several preserved areas.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction	Present, Threatened	Loss and fragmentation of habitat through agriculture, logging, and development.
Modification, Curtailment	Present, Threatened	Drought from climate variability can deplete groundwater, alter habitat, and favor species more tolerant of dry conditions, including nonnative and invasive species.
Modification, Curtailment	Present, Threatened	Residential and commercial development near existing populations can increase water withdrawals, thus reduce groundwater maintenance of breeding ponds and wetlands. Development can also contribute sediments and contaminants to local surface waters.
Modification, Curtailment	Present, Threatened	Logging and site preparation could impede movement and impact populations.
Curtailment	Present, Threatened	Recreational use of conservation lands can disturb habitat and impede animal movement.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Scientific	Low	Research projects can disturb habitat; impede animal movement toward breeding sites; or remove too many individuals from a population.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Disease	High	Disease threats of at least three pathogens have been identified, two of which (chytrid fungus and Ranavirus) have been found in North Carolina.
Predation	High	Fire ants are potential predators and are known to attack other amphibian species where they co-occur.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
US Fish and Wildlife Service	Federal	Listing under federal Endangered Species Act; designation of Critical Habitat. However, species has not been petitioned.
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Hickory Nut Gorge Green Salamander

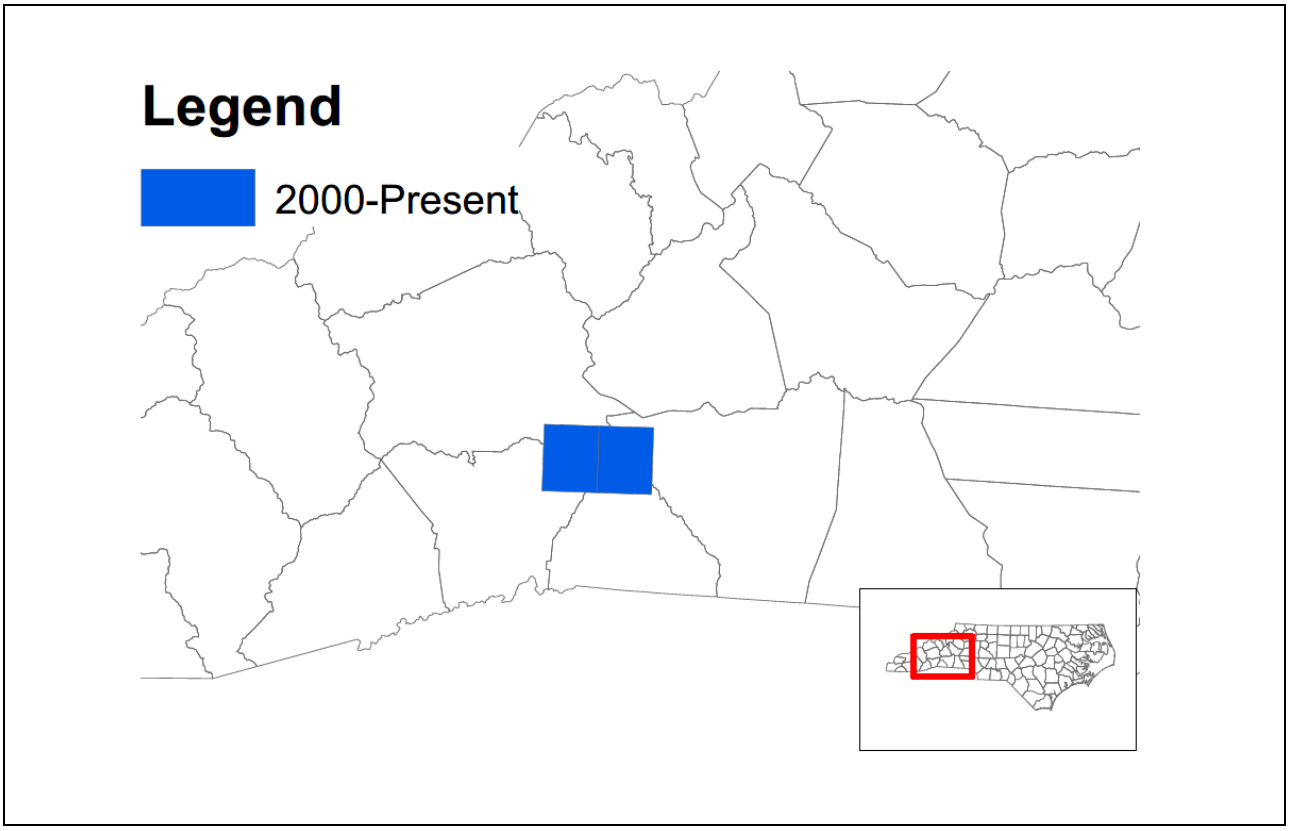
Aneides caryaensis

Current N.C. Status: Not listed

Proposed N.C. Status: Endangered

National Status: This species is not federally listed, as it was only described in 2019. NatureServe ranks this taxon as G1 (Critically Imperiled).

Range: The North Carolina-endemic *Aneides caryaensis* occurs only in the vicinity of Hickory Nut Gorge, in Buncombe, Henderson, and Rutherford counties. It formerly occurred at one site in Polk County.



Distribution of the Hickory Nut Gorge Green Salamander in North Carolina

Rationale for Status Change: The Hickory Nut Gorge Green Salamander occurs in a very limited range (<100 km^2) in three counties in the world and is patchily distributed in those counties. Additionally, recent models have estimated that there are fewer than 250 individuals (both adults and non-hatchling juveniles) in this population. These two factors make this species extremely vulnerable to development and collection pressure. Criteria B and C are the primary metrics that warrant a state listing of endangered.

Summary of Criteria Evaluated

Criterion	Score
A1	Data Deficient
A2	Threatened
A3	Data Deficient
A4	Data Deficient
B1	Endangered
B2	Threatened
B(a)	Endangered
B(b)	Endangered
C	Endangered
C1	Data Deficient
C2	Endangered
D1	Threatened
D2	Special Concern

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
NC State Parks	State	General land conservation and management of Chimney Rock SP.
Carolina Mountain Land Conservancy	Private	Land conservation and management.
Youngs Mountain/Kens Rock Registered Heritage Area	Private	Land conservation and management.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction	Present, Threatened	Logging and development removes overstory that shades and provides movement corridors. Rock quarrying or mining of outcrops will destroy habitats.
Modification	Threatened	Roads and road construction destroy and fragment habitats. Residential and commercial development can destroy and fragment habitat.
Curtailment	Present, Threatened	Intense wildfires and residential and commercial development can remove overstory that provides shading of rock outcrop habitat; arboreal travel corridors between rock outcrops can be destroyed by wildfire.
Modification, Curtailment	Threatened	Drought from climate variability can reduce moisture gradients in cove habitats and result in drier conditions on rock outcrops. Acid rainfall can eliminate suitable rock outcrops.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Commercial	Low	Illegal collection for the pet trade or personal collections.
Recreational	Low	Hiking, rock climbing, and other pedestrian activities can disrupt normal behaviors.
Scientific	High	Research projects can disturb habitat; impede animal movement toward breeding sites; or remove too many individuals from a population.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Disease	High	Disease threats of at least three pathogens have been identified, two of which (chytrid fungus and Ranavirus) have been found in North Carolina; the fungus *Batrachochytrium salamandrivorans* (Bsal) is a potential threat. The parasitic nematode *Batacholandros magnavulgaris* has been reported from green salamanders.

Predation	Low	Fire Ants could move into higher elevations as temperatures warm with climate change. Illegal collection for the pet trade or personal collections reduces number of individuals available for reproduction.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
US Fish and Wildlife Service	Federal	Listing under federal Endangered Species Act; designation of Critical Habitat. 2015 finding stated there is substantial evidence for listing the Green Salamander.
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Long-tailed Salamander

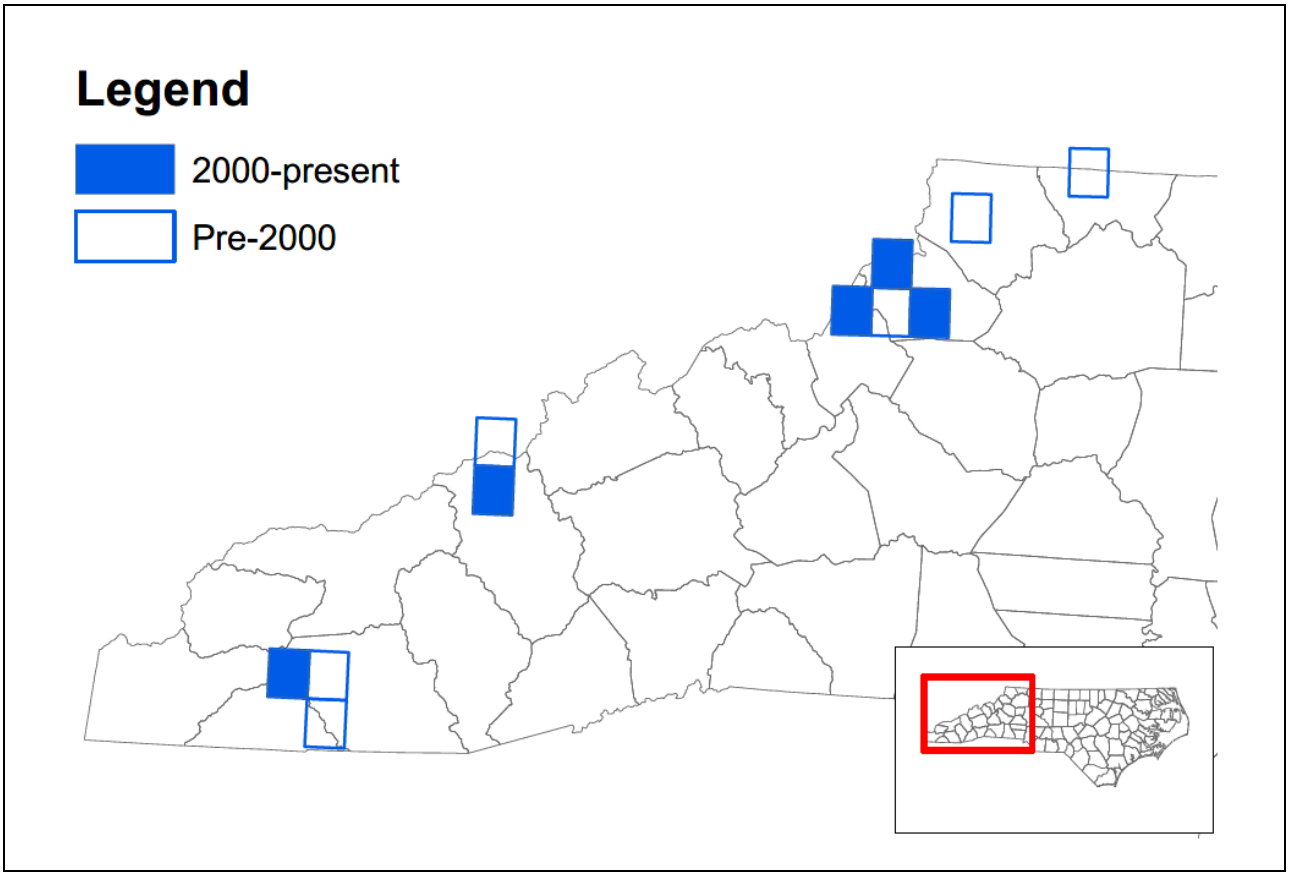
Eurycea longicauda

Current N.C. Status: Special Concern

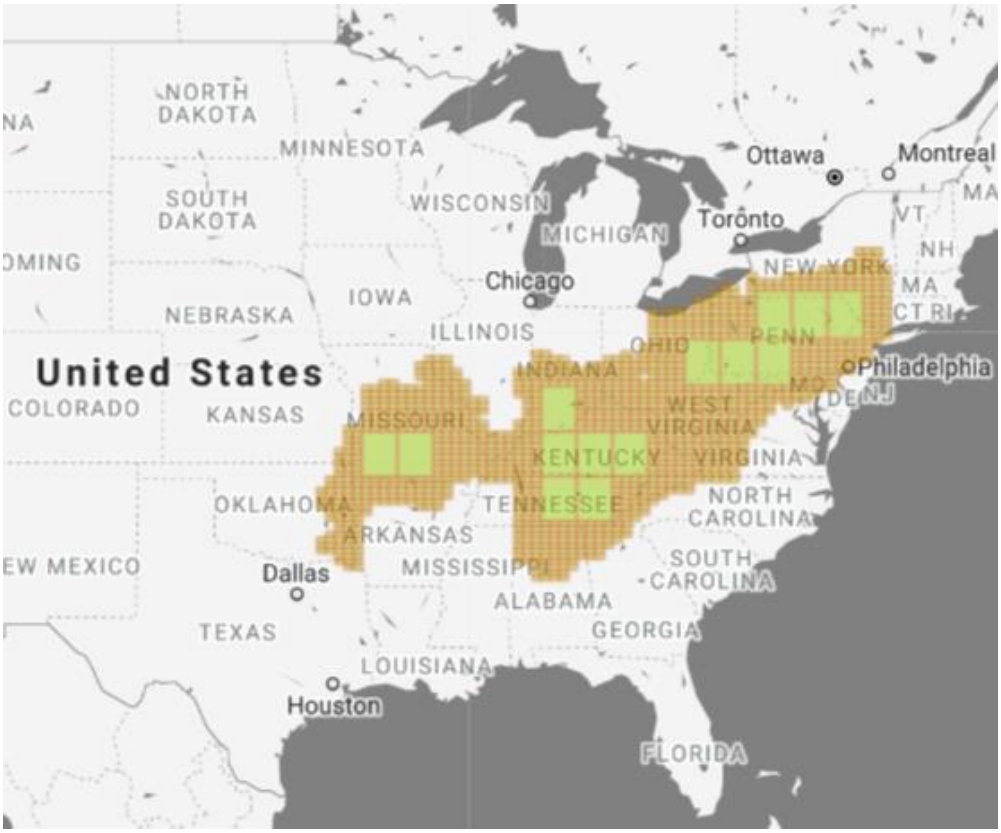
Proposed N.C. Status: Threatened

National Status: This species is not listed at the national level. NatureServe ranks the Long-tailed Salamander as G5, or globally secure.

Range: *Eurycea longicauda* has a large range outside of North Carolina, ranging as far south as Alabama, west to Oklahoma, and north to southern New York. In NC, populations occur in discrete pockets, west of the Blue Ridge Escarpment.



Distribution of the Long-tailed Salamander in North Carolina



Rationale for Status Change: Populations of Long-tailed Salamander in North Carolina are highly fragmented, with a geographic range of 2,500-5,000 km^2. The area of occupancy for the species is less than 250 km^2. Therefore, according to Criteria B and C, this species should be listed as Threatened.

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Threatened
B2	Threatened
B(a)	Threatened
B(b)	Threatened
C	Threatened
C1	Data Deficient
C2	Threatened
D	Special Concern
D2	Special Concern

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
US Forest Service	Federal	General land conservation and management of Nantahala and Pisgah National Forests.
NC Land and Water Fund	State	Conservation easements in Watauga River basin.
Blue Ridge Conservancy	Private	Land conservation and easements in Watauga River basin.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction	Present, Threatened	Logging and development removes overstory that shades and provides movement corridors. Rock quarrying or mining of outcrops will destroy habitats.
Modification	Threatened	Roads and road construction destroy and fragment habitats. Residential and commercial development can destroy and fragment habitat.
Curtailment	Present, Threatened	Intense wildfires and residential and commercial development can remove overstory that provides shading of rock outcrop habitat; arboreal travel corridors between rock outcrops can be destroyed by wildfire.
Modification, Curtailment	Threatened	Drought from climate variability can reduce moisture gradients in cove habitats and result in drier conditions on rock outcrops. Acid rainfall can eliminate suitable rock outcrops.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Commercial	Low	Illegal collection for the pet trade or personal collections.
Recreational	Low	Hiking, rock climbing, and other pedestrian activities can disrupt normal behaviors.
Scientific	Low	Research projects can disturb habitat; impede animal movement toward breeding sites; or remove too many individuals from a population.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Disease	High	Disease threats of at least three pathogens have been identified, two of which (chytrid fungus and Ranavirus) have been found in North Carolina; the fungus *Batrachochytrium salamandrivorans* (Bsal) is a potential threat
Predation	Low	Fire Ants could move into higher elevations as temperatures warm with climate change. Illegal collection for the pet trade or personal collections reduces number of individuals available for reproduction.
Other	Low	Road mortality from vehicular traffic.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
US Fish and Wildlife Service	Federal	Listing under federal Endangered Species Act; designation of Critical Habitat. However, species has not been petitioned.
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Northern Map Turtle

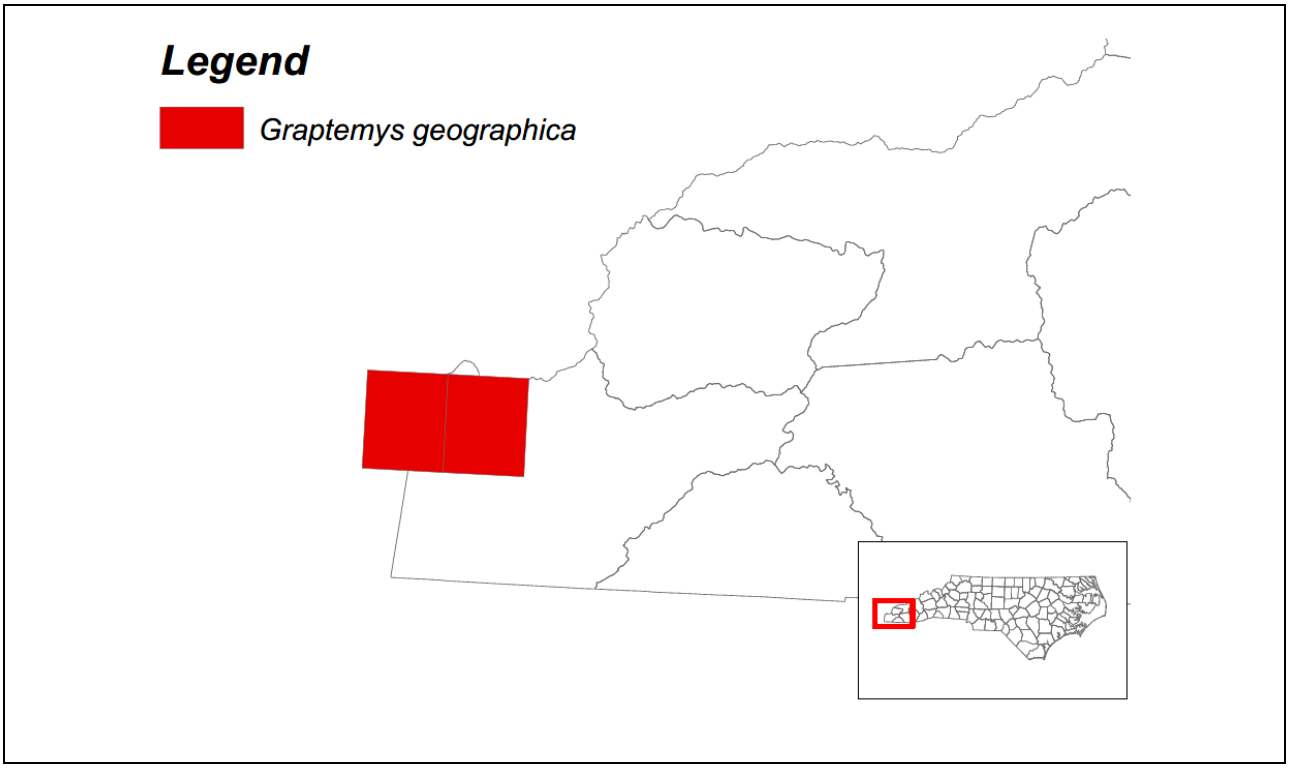
Graptemys geographica

Current N.C. Status: Not Listed

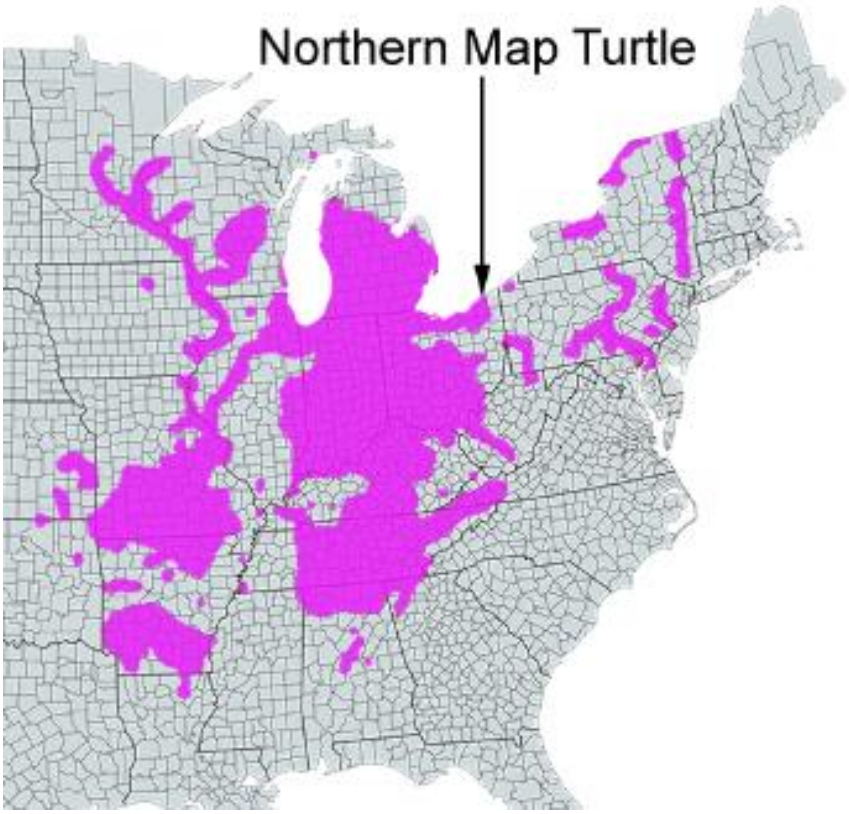
Proposed N.C. Status: Special Concern

National Status: This species is not listed at the national level. NatureServe ranks the Northern Map Turtle as G5, or globally secure.

Range: Northern Map Turtles have a large overall distribution, occuring from Ontario to Kansas, to southern Arkansas. In North Carolina, this species has only been documented in far western Cherokee County.



Distribution of the Northern Map Turtle in North Carolina



Rationale for Status Change: *Graptemys geographica* is found in fewer than 5 locations in a small section of the Hiwassee Drainage. Because of its very restricted range in North Carolina, Criterion D would recommend a listing of Special Concern for this species.

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Data Deficient
B2	Data Deficient
B(a)	Data Deficient
B(b)	Data Deficient
C	Data Deficient
C1	Data Deficient
C2	Data Deficient
D1	Special Concern
D2	Special Concern

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
Tennessee Valley Authority	Federal	Conservation and management on Hiwassee and Apalachia reservoirs.
US Forest Service	Federal	Conservation and management on Nantahala National Forest.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification	Present	Inundation of riverine habitat by large reservoirs.
Destruction, Modification	Present, Threatened	Development of shoreline habitat affecting reproductive habitat
Curtailment	Present	Habitat fragmentation due to dams
Modification, Curtailment	Present	Flow alterations from dam regulation

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Recreational	Low	Harvest for food

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Disease	Low	Ranavirus has been detected in the state and can affect certain turtle species.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Eastern Slender Glass Lizard

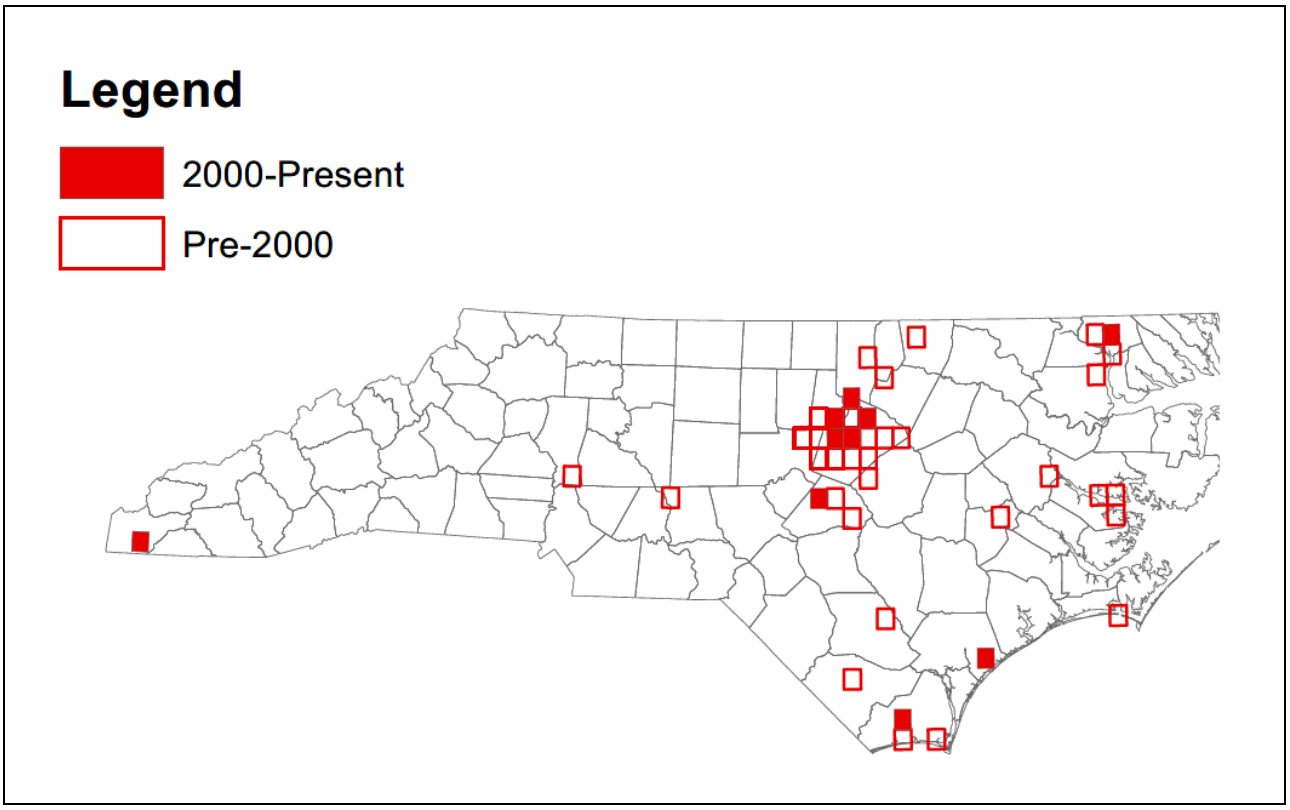
Ophisaurus attenuatus longicaudus

Current N.C. Status: Not Listed

Proposed N.C. Status: Special Concern

National Status: This species is not listed at the national level. NatureServe ranks *Ophisaurus attenuatus* as G5, or globally secure. The Eastern Slender Glass Lizard (*O. a. longicaudus*) is listed as T5, meaning the subspecies is also globally secure.

Range: *Ophisaurus a. longicaudus* reaches the Mississippi River, which acts as the barrier between it and the nominate subspecies. In NC, most individuals have been observed in and around the Triangle, with several peripheral populations in the Coastal Plain and a small cluster in Cherokee County.



Distribution of the Eastern Slender Glass Lizard in North Carolina

Rationale for Status Change: The total geographic range for *Ophisaurus a. longicaudus* in North Carolina is 11,981 km^2, based on documented observations since 2000. Additionally, the paucity of individual observations in this time allows us to estimate that there are fewer than 1,400 individuals across the state. Therefore, this species should be listed as Special Concern by Criteria B and C.

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Special Concern
B2	Data Deficient
B(a)	Special Concern
B(b)	Special Concern
C	Special Concern
C1	Data Deficient
C2	Special Concern
D1	Data Deficient
D2	Data Deficient

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
US Forest Service	Federal	General land conservation and management of Croatan National Forest.
NC Wildlife Resources Commission	State	Conservation and management of Holly Shelter game land.
NC Division of Parks and Recreation	State	Conservation and management of Merchants Millpond, Umstead and Raven Rock state parks.
Wake County/City of Raleigh	County/City	Conservation and easements of open space parcels.
The Nature Conservancy	Private	Conservation and management of Green Swamp Preserve.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification	Present, Threatened	Habitat loss and fragmentation due to development.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
None known		

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	High	Road mortality from vehicular traffic.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Mimic Glass Lizard

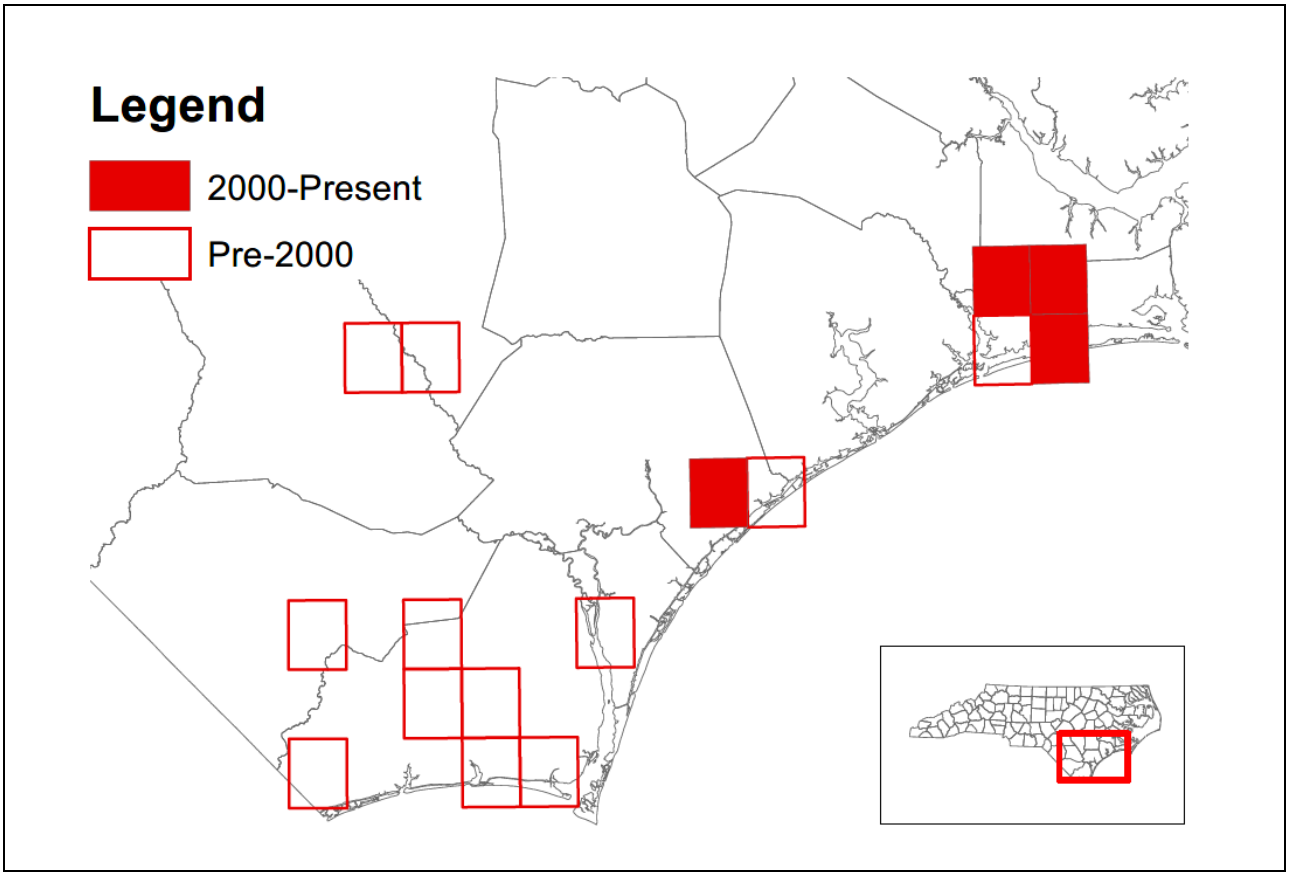
Ophisaurus mimicus

Current N.C. Status: Special Concern

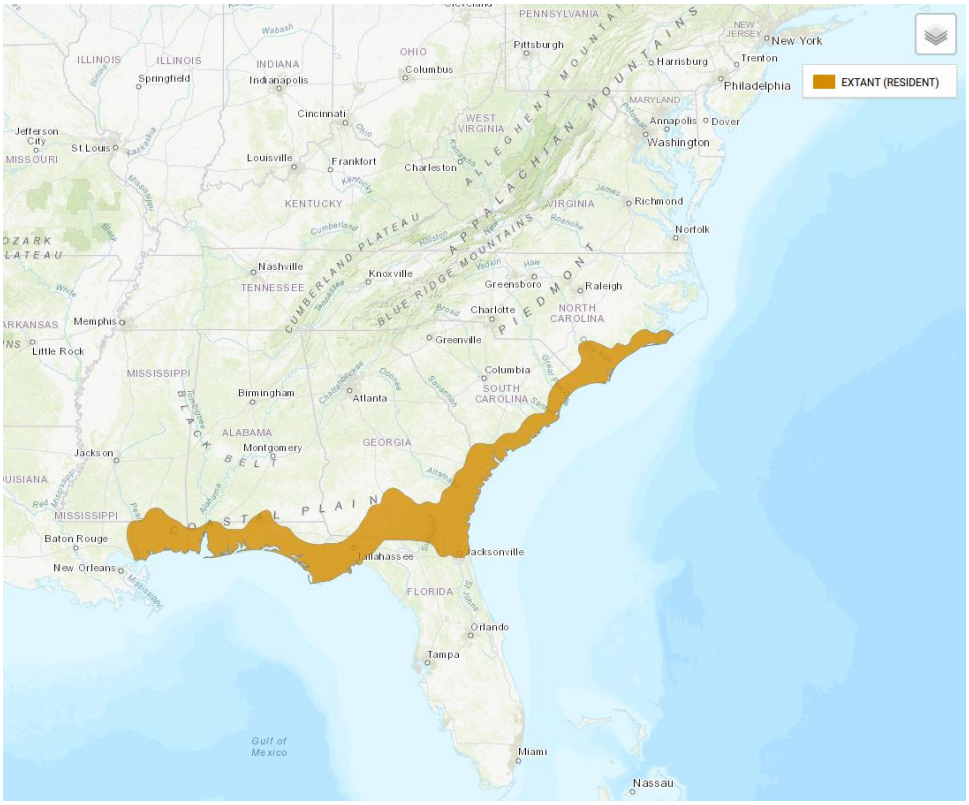
Proposed N.C. Status: Endangered

National Status: This species is not listed at the national level. NatureServe ranks the Mimic Glass Lizard as G3, or Vulnerable.

Range: A denizen of flatwoods and sandy soils, *Ophisaurus mimicus* occupies habitat from North Carolina to northern Florida, and to eastern Mississippi. In our state, this species has only been observed in the southeastern Coastal Plain.



Distribution of the Mimic Glass Lizard in North Carolina



Rationale for Status Change: Since 2000, only six specimens of this elusive lizard have been found in North Carolina, despite extensive survey efforts throughout its range. This paucity of records supports the estimation of a small total population of *O. mimicus* in the state (<3,500). Furthermore, because of the fragmented distribution of its subpopulations, no subpopulation could have more than 700 mature individuals. By applying this information to Criterion C, we receive a Conservation Status of Threatened. However, because formerly contiguous populations of this species are now broken up across the landscape, immigration into North Carolina is no longer likely, making our regional population a sink. As such, we apply a Regional Correction to uplist the Mimic Glass Lizard to State Endangered.

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Special Concern
B2	Data Deficient
B(a)	Special Concern
B(b)	Special Concern
C	Threatened
C1	Data Deficient
C2	Threatened
D1	Data Deficient
D2	Data Deficient

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
US Forest Service	Federal	Land conservation and management on Croatan National Forest
NC Wildlife Resources Commission	State	Land conservation and management on Holly Shelter and Suggs Mill game lands.
The Nature Conservancy	Private	Land conservation and management of Green Swamp game land.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction, Modification	Present, Threatened	Habitat loss and fragmentation due to development.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
None known		

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	Low	Road mortality from vehicular traffic.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Eastern Coachwhip

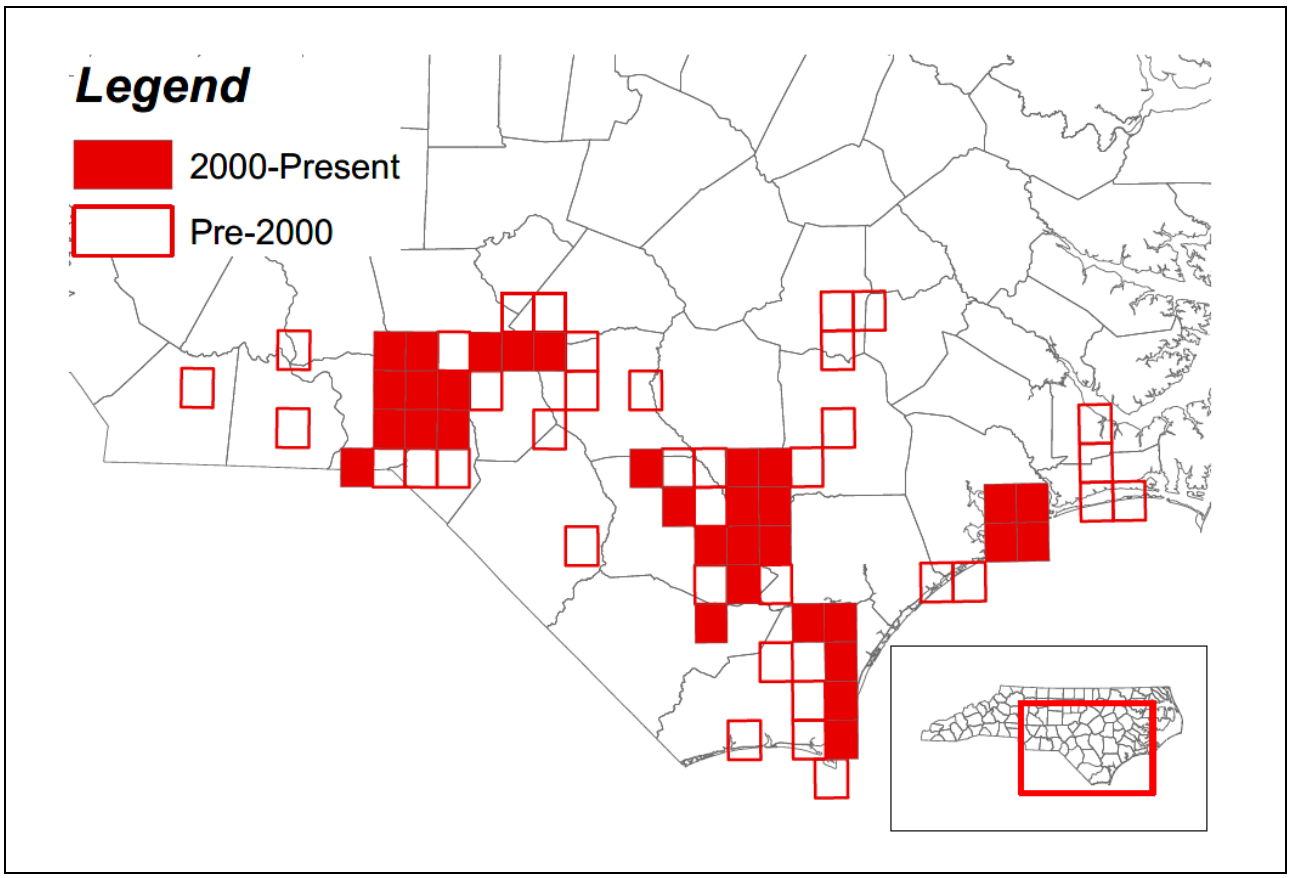
Coluber (=Masticophis) flagellum flagellum

Current N.C. Status: Not Listed

Proposed N.C. Status: Special Concern

National Status: This species is not listed at the national level and has been given a rating of G5 (globally secure) by NatureServe. This organization ranks the Eastern Coachwhip as T5, a secure subspecies.

Range: *Coluber flagellum* has a very large range, stretching from coast to coast, and as far north as Nebraska. The Eastern Coachwhip (*Coluber f. flagellum*) occupies habitat from Eastern Texas to Florida, and as far north as southeastern Coastal Plain and Sandhills of North Carolina



Distribution of the Eastern Coachwhip in North Carolina

Rationale for Status Change: *Coluber f. flagellum* ranges across our southeastern Coastal Plain and Sandhills. However, the Extent of Occurrence is a mere 15,000 km^2. Additionally, the species occurs in fewer than 10 discrete locations, and is experiencing a decline in overall Area of Occupancy, as well as extent and/or quality of habitat. Therefore, based on the parameters of Criterion B, we recommend a status of Special Concern.

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Special Concern
B2	Data Deficient
B(a)	Special Concern
B(b)	Special Concern
C	Data Deficient
C1	Data Deficient
C2	Data Deficient
D1	Data Deficient
D2	Data Deficient

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
US Department of Defense	Federal	Land conservation and management on Fort Bragg, Camp Lejeune, and Sunny Point Ocean Terminal.
NC Wildlife Resources Commission	State	Land conservation and management on Suggs Mill Pond, and Sandhills game lands.
NC Forest Service	State	Land conservation at Bladen Lakes State Forest
NC Division of Parks and Recreation	State	Land conservation and management on Lake Waccamaw, and Carolina Beach state parks.
Various Land Trusts	Private	Land conservation, easements, and management by Sandhills Area Land Trust, North Carolina Coastal Land Trust, and The Nature Conservancy.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Curtailment	Present, Threatened	Suppression of fire disturbance.
Destruction, Modification	Present, Threatened	Habitat loss and fragmentation due to development.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Commercial	Low	Illegal collection for the pet trade or personal collections.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Other	High	Competition for space and egg depredation from fire ants.
Other	High	Road mortality from vehicular traffic.
Disease	High	Snake Fungal Disease

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor

None known

Wood Frog – Coastal Plain populations

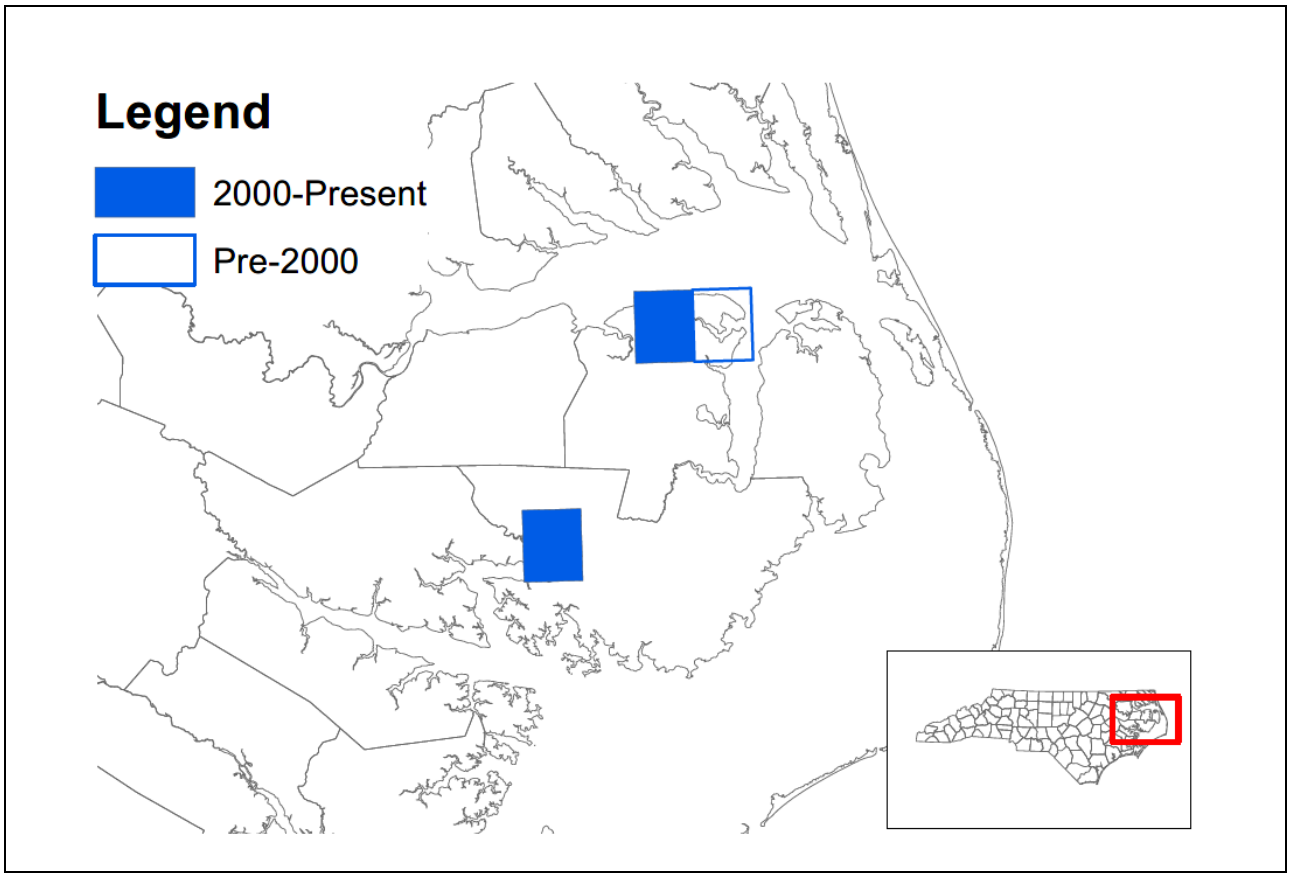
Rana sylvatica

Current N.C. Status: Not Listed

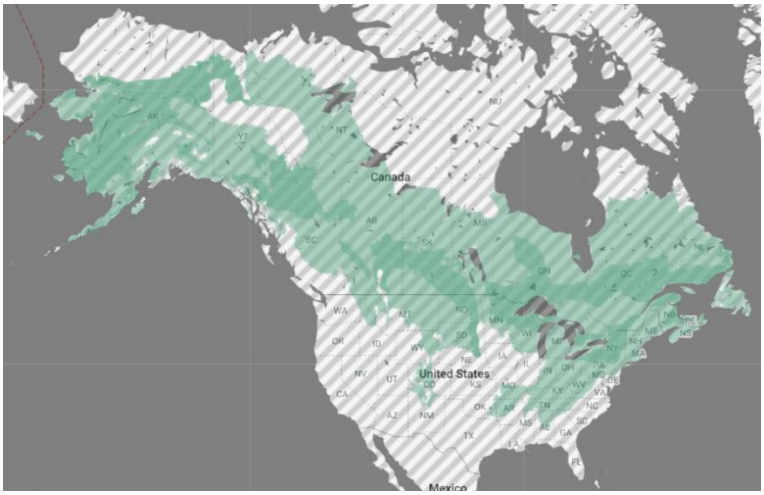
Proposed N.C. Status: Threatened

National Status: *Rana sylvatica* has no designation by the U.S. Fish and Wildlife Service. NatureServe ranks the species at G5 but recognizes this Tidewater population as distinct.

Range: Wood Frogs have a huge distribution in North America, from the Southern Appalachians through the Boreal Forest, to western Alaska. In North Carolina, the main population of *Rana sylvatica* occurs from the Triad west. However, the Coastal Plain population only occurs on the Albemarle Peninsula, in disjunct pockets of Hyde and Tyrrell counties.



Distribution of the Wood Frog – Coastal Plain population in North Carolina



Rationale for Status Change: This exceedingly rare population of Wood Frogs is only known from Hyde and Tyrrell counties. Only a handful of individuals have been found since their original discovery. The extent of occurrence is <5,000 km^2. This factor, along with only two known populations, supports a designation of Threatened through Criterion B.

Criterion	Score
A1	Data Deficient
A2	Data Deficient
A3	Data Deficient
A4	Data Deficient
B1	Threatened
B2	Data Deficient
B(a)	Threatened
B(b)	Threatened
C	Data Deficient
C1	Data Deficient
C2	Data Deficient
D1	Data Deficient
D2	Special Concern

GS 113-334 (c) Relevant Data and Factual Information

1. Are any other State or Federal agencies or Private Entities taking steps to protect the wild animal which is the subject of the proposal?

Agency/Private Entity	Agency/Entity Type (Fed., State, Private)	Protection
NC Dept. of Transportation	State	Mitigation site provides some land protection and management.
The Conservation Fund	Private	Land conservation or management of Palmetto-Peartree Preserve.
Scranton Hardwood Forest	Private	Land management.

2. Is there present or threatened destruction, modification, or curtailment of its habitat?

Type of Impact (Destruction, Modification, Curtailment)	Occurrence (Present, Threatened)	Description
Destruction	Present, Threatened	Loss of habitat through logging and development.
Modification, Curtailment	Present, Threatened	Drought from climate variability can deplete groundwater, alter habitat, and favor species more tolerant of dry conditions, including nonnative and invasive species.
Modification, Curtailment	Present, Threatened	Residential and commercial development near existing populations can increase water withdrawals, thus reduce groundwater maintenance of breeding ponds and wetlands. Development can also contribute sediments and contaminants to local surface waters.
Modification, Curtailment	Threatened	Logging and site preparation could impede movement and impact populations.
Curtailment	Present, Threatened	Recreational use of conservation lands can disturb habitat and impede animal movement.

3. Is there the potential for over-utilization for commercial, recreational, scientific, or educational purposes?

Type of Over-Use (Commercial, Recreational, Scientific, Educational)	Potential (Low, High)	Description
Scientific	Low	Research projects can disturb habitat; impede animal movement toward breeding sites; or remove too many individuals from a population.

4. Is there the potential for critical population depletion from disease, predation, or other mortality factors?

Type of Depletion (Disease, Predation, Other)	Potential (Low, High)	Description
Disease	High	Disease threats of at least three pathogens have been identified, two of which (chytrid fungus and Ranavirus) have been found in North Carolina.
Predation	High	Fire ants are potential predators and are known to attack other amphibian species where they co-occur.

5. Are there alternative regulatory mechanisms?

Agency	Agency Type (Federal, State)	Regulatory Mechanism

US Fish and Wildlife Service	Federal	Listing under federal Endangered Species Act; designation of Critical Habitat. However, species has not been petitioned.
NC Wildlife Resources Commission	State	Collection Permits and Captivity License programs. Partial protection currently afforded under 15A NCAC 10H .1302; but additional rules could be enacted under G.S. 113-333 (a)(6) to provide more protection.

6. Are there other man-made factors that can affect continued viability of the animal in the State?

Other Man-Made Factor
None known

Technical Corrections – Birds

Federal Status Changes

Scientific Name	Common Name	Previous Federal Status, NC Register 2017	New Federal Status, NC Status
Setophaga kirtlandii	Kirtland's Warbler	Federal Endangered, NC Endangered	no Federal status, NC Endangered
Laterallus jamaicensis jamaicensis	Eastern Black Rail	no Federal status, NC Special Concern	Federal Threatened, NC Threatened

Scientific Name Changes

Common Name	Current Scientific Name, NC Register 2017	New Scientific Name
Red-cockaded Woodpecker	*Picoides borealis*	*Dryobates borealis*
Henslow's Sparrow	*Ammodramus henslowii*	*Centronyx henslowii*

Common Name Changes: None

Ineligible to List: None

References:

Chesser, R. T., K. J. Burns, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., D. F. Stotz,, B.M. Winger, and K. Winker. 2019. Fifty-ninth Supplement to the American Ornithological Society's Check-list of North American Birds. The Auk Ornithological Advances Vol 135, 2018, pp. 798-813.

Chesser, R. T., K. J. Burns, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., D. F. Stotz,, and K. Winker. 2019. Check-list of North American Birds (online). American Ornithological Society. http://checklist.americanornithology.org/taxa

Department of the Interior, Fish and Wildlife Service. 2019. Endangered and Threatened Wildlife and Plants; Removing the Kirtland's Warbler from the Federal List of Endangered and Threatened Wildlife. Federal Register Vol 84, No. 196, pp 54436-54463.

https://www.federalregister.gov/documents/2019/10/09/2019-22096/endangered-and-threatened-wildlife-and-plants-removing-the-kirtlands-warbler-from-the-federal-list

Department of the Interior, Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Threatened Species Status for Eastern Black Rail with a Section 4(d) Rule. Federal Register Vol 85, No. 196, pp 63764-63802.
https://www.federalregister.gov/documents/2020/10/08/2020-19661/endangered-and-threatened-wildlife-and-plants-threatened-species-status-for-eastern-black-rail-with

Technical Corrections– Fish

Federal Status Changes: None

Scientific Name Changes

Common Name	Current Scientific Name, NC Register 2017	New Scientific Name, New Common Name
Longhead Darter	*Percina macrocephala*	*Percina williamsi*, Sickle Darter
Blackbanded Darter	*Percina nigrofasciata*	*Percina westfalli,* Westfall's Darter
Highfin Carpsucker	*Carpiodes velifer*	*Carpiodes* sp. cf. *velifer*, "Atlantic" Highfin Carpsucker
"Thinlip" Chub	*Cyprinella zanema*	*Cyprinella* sp. cf. *zanema*, "Thinlip" Chub

Common Name Changes

Scientific Name	Current Common Name, NC Register 2017	New Common Name
Etheostoma simoterum	Tennessee Snubnose Darter	Snubnose Darter

Ineligible to List

Scientific Name	Common Name	Reason for Ineligibility
Percina sciera	Dusky Darter	Species' occurrence was based upon two misidentified lots of two specimens
Lucania goodei	Bluefin Killifish	Species is not native to North Carolina

References

Hayes, M.M., and K.R. Piller. 2018. Patterns of diversification in a North American endemic fish, the Blackbanded Darter (Perciformes, Percidae). Zoologica Scripta 2018:1-9.

Page, L.M., H. Espinosa-Pérez, L.T. Findley, C.R. Gilbert, R. N. Lea, N.E. Mandrak, R.L. Mayden, and J.S. Nelson. 2013. Common and scientific names of fishes from the United States, Canada, and Mexico. 7th edition. American Fisheries Society, Bethesda, MD. 384p.

Page, L.M., and T.J. Near. 2007. A new darter from the upper Tennessee River drainage related to *Percina macrocephala* (Percidae: Etheostomatinae). Copeia 2007:605-613.2

Rohde, F.C., R.G. Arndt, J.W. Foltz, and J.M. Quattro. 2009. Freshwater fishes of South Carolina. University of South Carolina Press, Columbia, SC. 430p.

Tracy, B. H., F.C. Rohde, and G. M. Hogue. (in review. 2020). An annotated atlas of the freshwater fishes of North Carolina.

Tracy, B.H., and W.C. Starnes. 2011. What happened to the Dusky Darter in North Carolina? Newsletter of the North Carolina Chapter of the American Fisheries Society. March 2011:10-12. https://nc.fisheries.org/wpcontent/uploads/2014/11/March2011_Newsletter.pdf.

Technical Corrections – Mollusks

Federal Status Changes

Scientific Name	Common Name	Previous Federal Status, NC Register 2017	New Federal Status, NC Status
Elliptio lanceolata	Yellow Lance	No federal status; NC Endangered	Federal Threatened; NC Threatened

Scientific Name Changes

Common Name	Current Scientific Name, NC Register 2017	New Scientific Name	New Common Name
James Spinymussel	*Pleurobema collina*	*Parvaspina collina*	
Tar River Spinymussel	*Elliptio steinstansana*	*Parvaspina steinstansana*	
Barrel Floater	*Anodonta couperiana*	*Utterbackiana couperiana*	
Tennessee Pigtoe	*Fusconaia barnesiana*	*Pleuronaia barnesiana*	
Alewife Floater	*Anodonta implicata*	*Utterbackiana implicata*	
**Carolina Fatmucket	*Lampsilis radiata conspicua*	*Lampsilis radiata*	Eastern Lampmussel
Eastern Lampmussel	*Lampsilis radiata radiata*	*Lampsilis radiata*	
**Waccamaw Fatmucket	*Lampsilis fullerkati*	*Lampsilis radiata*	Eastern Lampmussel
Waccamaw Spike	*Elliptio waccamawensis*	*Elliptio congaraea*	
Spike	*Elliptio dilatata*	*Eurynia dilatata*	

**WRC Staff Note: These 2 species have been combined with the Eastern Lampmussel (*Lampsilis radiata*) and will be removed from the Protected Animal List (15A NCAC 10I .0104)

Common Name Changes

Scientific Name	Current Common Name, NC Register 2017	New Common Name
Strophitus undulatus	Squawfoot	Creeper
Lampsilis fasciola	Wavy-rayed Lampmussel	Wavyrayed Lampmussel

Ineligible to List: None

References:

Freshwater Mollusk Conservation Society (FMCS). 2019. The 2019 checklist of freshwater bivalves (Mollusca: Bivalvia: Unionida) of the United States and Canada. Considered and approved by the Bivalve Names Subcommittee 14 April 2019. https://molluskconservation.org/Library/Committees/Bivalves_Revised_Names_List_2019.pdf

Department of the Interior, Fish and Wildlife Service. 2018. Endangered and Threatened Wildlife and Plants; Threatened Species Status for Yellow Lance, Final Rule. Federal Register Vol 83, No.64, pp 14189-14198; 03 April 2018. https://www.federalregister.gov/documents/2018/04/03/2018-06735/endangered-and-threatened-wildlife-and-plants-threatened-species-status-for-yellow-lance

Technical Corrections– Reptiles

Federal Status Changes: None

Scientific Name Changes:

None

Common Name Changes: None

Ineligible to List

Scientific Name	Common Name	Reason for Ineligibility
Opheodrys vernalis	Smooth Green Snake	Stuart et al. (2014) reported that the single existing putative North Carolina voucher specimen was disassociated from its data and considered erroneous. The few other historical reports are not supported by specimens or photographs (Palmer and Braswell 1995, Mitchell 2006). Stuart et al. (2014) recommended that ". . . the Smooth Green Snake should be removed

References

Mitchell, J. C. 2006. Status of the Smooth Green Snake (Opheodrys vernalis) in North Carolina and Virginia. Banisteria 28:37–43.

Palmer, W. M., and A. L. Braswell. 1995. Reptiles of North Carolina. The University of North Carolina Press, Chapel Hill, NC. 412 pp.

Stuart, B. L., J. Rosado, and P. D. Brinkman. 2014. Albert Rogers Crandall's Smooth Green Snake (Opheodrys vernalis) from North Carolina. Southeastern Naturalist 13(4):N37-N42. DOI: 10.1656/058.013.0413

Technical Corrections– Crayfish

Common Name	Current Scientific Name, NC Register 2017	New Scientific Name
Chowanoke Crayfish	*Orconectes virginiensis*	*Faxonius virginiensis*