Northern Red-bellied Cooter
Massachusetts Population
(Pseudemys rubriventris)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
New England Field Office
North Atlantic-Appalachian Region
Concord, NH

March 2022

5-YEAR REVIEW
Northern Red-bellied Cooter
Massachusetts Population
(*Pseudemys rubriventris*)

GENERAL INFORMATION

Species:

Northern red-bellied cooter (*Pseudemys rubriventris*), Massachusetts population; listed as Plymouth redbelly turtle (*Pseudemys rubriventris bangsi*)

Date listed: April 2, 1980

FR citation(s):

43 FR 21702 21705	Proposed Endangered Status and Critical Habitat
44 FR 53422 53424	Reproposal of Critical Habitat
45 FR 21828 21833	Listing as Endangered with Critical Habitat
71 FR 20717 20718	Initiation of a 5-Year Review
71 FR 58363 58364	90-Day Finding on a Petition to Delist
85 FR 64527 64529	Initiation of a 5-Year Review

Classification: Endangered

Critical habitat/4(d) rule/Experimental population designation/Similarity of appearance listing: Critical habitat was designated concurrent with species listing, 43 FR 21702 21705.

Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a 5-year review is to assess each threatened species and endangered species to determine whether its status has changed and it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants. To inform this 5-year review, the U.S. Fish and Wildlife Service (Service) conducted a Species Status Assessment (SSA).

The SSA report (USFWS 2021) was prepared by the New England Ecological Services Field Office with support from the North Atlantic-Appalachian Regional Office, Hadley, Massachusetts. The Service invited a state agency from Massachusetts, the only state within the range of the listed entity, to participate in development of the SSA. The team consisted of Service biologists as well as a species expert from the Massachusetts Division of Fisheries and Wildlife (MassWildlife). Analysis support was provided by the North Atlantic-Appalachian Region's Science Applications Program and contracted staff from Chesapeake Conservancy. The SSA report represents our evaluation of the best available scientific information, including the resource needs and the current and projected future conditions of the species. The Service distributed the draft SSA report for peer and partner review in the summer of 2021 and received no comments. Additional Service biologists reviewed sections of the SSA report prior to it being used as the scientific basis to support a decision-making process reflected in the recommendation presented in this 5-year review.

REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) policy

The 2007 5-year review (USFWS 2007) considered the Plymouth redbelly turtle under the 1996 DPS policy and determined:

1. New information since listing indicates the taxonomy of the listed entity is incorrect. *Pseudemys rubriventris bangsi* is no longer a recognized subspecies of *Pseudemys rubriventris*, and the Massachusetts population should be referred to as the northern red-bellied cooter.
2. The population of the northern red-bellied cooter in Massachusetts meets the definitions for discreteness and significance in the 1996 DPS policy.

For a more in-depth discussion on the application of the 1996 DPS policy to the northern red-bellied cooter and the description of the listable northern red-bellied cooter entity as the Massachusetts population DPS, see section 2.1 of the 2007 5-year review. The Service has not yet issued a proposed rule to revise the listing of the northern red-bellied cooter in Massachusetts from a subspecies to a DPS.

There is no new information since 2007 relative to the discreteness and significance of the Massachusetts population that would change the Service's determinations and recommendation regarding the status of the Massachusetts population as a DPS.

Recovery Criteria

Recovery Plan or Outline: The original recovery plan for this species was published in 1981, followed by a first revision in 1985 (USFWS 1981, 1985). The second revision of the recovery plan is dated May 6, 1994 (USFWS 1994).

The 1994 recovery plan (USFWS 1994) includes criteria for reclassifying the Massachusetts population of the northern red-bellied cooter, referred to as the Plymouth redbelly turtle in the plan, from endangered to threatened, and criteria for delisting.

The 1994 recovery plan stated that:

> Reclassification to threatened status will be considered when:
> - the Plymouth redbelly turtle increases from the current population level of approximately 300 breeding-age individuals to a total of 600 breeding-age individuals distributed among a minimum of 15 self-sustaining populations.
>
> Although the turtle's restricted range may remain a limiting factor, delisting will be considered when:
> - the distribution of the species is expanded to 20 or more self-sustaining populations (in lakes, ponds, and possibly rivers) and numbers are increased to a total of 1,000 or more breeding-age individuals.
> - sufficient habitat is protected to allow long-term maintenance of the population.

- knowledge about their life history, habitat requirements, and limiting factors is sufficient to effectively protect and manage the turtles and their habitat.

Given that the most recent recovery plan (USFWS 1994) is over 25 years old, the plan criteria should be reexamined to assess the adequacy of the criteria given new information about the Massachusetts population of the northern red-bellied cooter and its habitat. For example, the reclassification and delisting criteria specifically mention discrete numbers of self-sustaining populations based on information at the time that suggested individual water bodies were representative of individual populations. However, new information about northern red-bellied cooter movements between waterbodies has shown that metapopulation dynamics may be present in some areas. Additionally, how to determine whether a subpopulation is "self-sustaining" is somewhat uncertain given the species' life history, which is characterized by a long life-span and late sexual maturity. Adult individuals may persist for many years in suboptimal habitat even with limited or no annual recruitment, which makes it difficult for managers to recognize declines in the sustainability of populations over short periods of time.

The previous 5-year review (USFWS 2007) determined that the reclassification criteria identified in the 1994 recovery plan were not met. The 2007 review recommended the listed entity remain endangered but that the Service update the taxonomy and list the Massachusetts population as a DPS.

Updated Information and Current Species Status

Biology and Habitat:

Chapter 2 of the SSA Report contains the best available information on the life history and habitat of the Massachusetts population of the northern red-bellied cooter (USFWS 2021, pp. 4-12).

In 1980, the Massachusetts population of the northern red-bellied cooter was known to occur in only 12 ponds in Plymouth County, with an estimated population of around 200 individuals. Since 1985, MassWildlife has operated a headstart program that raises wild-born hatchlings in captivity for 9 months to maximize growth before release and has released over 4,400 hatchlings as of 2021. A study conducted from 2014 to 2016 in a portion of the species' range within Plymouth County estimated that there were 933 individuals distributed across 7 subpopulations within the study area, excluding recent headstarts released from 2013 to 2016 (Regosin et al. 2017, p. 25).

The 2021 SSA report assessed 43 analysis units (AUs), consisting of occupied water bodies where northern red-bellied cooters have been observed or where headstarted hatchlings have been released, and estimated an overall current population of around 1,950 individuals within the species' entire range in Massachusetts (USFWS 2021, p. 38).

Biologists originally thought northern red-bellied cooters did not travel far in upland environments and considered each occupied pond a unique population or subpopulation.

However, a recent analysis of movement patterns suggests that northern red-bellied cooters may make short (< 40 m (131.2 ft)) overland movements between aquatic habitats more often than previously thought (Regosin et al. 2017, p. 34). Out of 72 previously marked individuals that were recaptured between 2015 and 2016 and could be accurately identified, 37 were captured in a different water body than their original capture/release site (Regosin et al. 2017, p. 31). Longer distance movements do occur and may include interpond movements between multiple water bodies over several years. Multidecade interpond movements of 20 km (12.4 mi) and 4 km (2.5 mi) have been documented, while the greatest straight-line distance traveled by an individual during a single study season totaled 3.76 km (2.34 mi) over 133 days and three interpond movements (Regosin et al. 2017, pp. 31-32). Metapopulation dynamics may be present throughout the species' range in Massachusetts (Regosin et al. 2017, p. 36), with some waterbodies experiencing more immigration or emigration events than others. Individual water bodies (rivers, ponds, lakes, reservoirs, and some wetlands) or groups of water bodies located close together may represent subpopulations that are part of a larger metapopulation.

Threats Analysis (threats, conservation measures, and regulatory mechanisms):

The purpose of a 5-Year Review is to recommend whether a listed taxon continues to warrant protection under the ESA and, if so, whether it should be reclassified (from threatened to endangered or from endangered to threatened). This task requires that the analysis of the threats to the species be performed while assuming that the species is not receiving the regulatory protections, funding, recognition, and other benefits of ESA listing. Summaries of ongoing applications of ESA protections may shed light on some future activities that constitute threats to the species. However, the analysis under Factor D (Inadequacy of Existing Regulatory Mechanisms) focuses on the adequacy of existing alternative (i.e., non-ESA) mechanisms to address the continuing and foreseeable threats.

Chapter 3 of the SSA Report presents a detailed description of the threats affecting the viability of the Massachusetts population of the northern red-bellied cooter starting on page 13 (USFWS 2021). Below we summarize new information about current and future threats to, and other factors affecting the continuing existence of, the Massachusetts population of the northern red-bellied cooter since the 2007 5-year review. These include habitat loss and fragmentation (Factor A), collection (Factor B), predation (Factor C), the inadequacy of existing regulatory mechanisms (D), climate change (Factor E), and the headstart program (Factor E).

Other potential threats identified in the 2007 5-year review or reviewed in the 2021 SSA Report, include water quality (USFWS 2021, pp. 13-14), invasive species (USFWS 2021, p. 19), road mortality and boat strikes (USFWS 2021, pp. 19-20), harassment and disturbance (USFWS pp. 21-22), pathogens (USFWS 20221, pp. 22-24), and effects of small population size (USFWS 2021 p. 24).

Habitat Loss and Fragmentation

Suitable upland habitat for the northern red-bellied cooter can be lost or fragmented through destruction by residential and commercial development or agriculture (USFWS 2021, pp. 14-17). The 1994 recovery plan identified rapid development in Plymouth County, and the County still contains some of the fastest growing areas in Massachusetts. Even when developed areas

maintain some habitat features like nesting areas in lawns and roadsides, they increase other threats such as fragmentation, predation, and vehicle strikes. Although active agricultural areas are suboptimal habitat due to increased risk of disturbance or injury compared to undeveloped areas, they can provide some nesting habitat and are becoming increasingly important to the species' conservation future. Habitat loss also can occur through habitat succession as events/actions (e.g., low intensity fires) that maintain open canopy and thin undergrowth occur less frequently. Prescribed fire to maintain habitat features for the northern red-bellied cooter becomes increasingly difficult as developed areas expand.

Loss of aquatic habitat is another threat resulting from land use change and increased demands on groundwater through pumping for residential and agricultural use (USFWS 2021 pp. 16-17). Loss of basking habitat, loss of aquatic vegetation, dam removal, severe reduction in water level, and other changes could impact suitability of habitat for northern red-bellied cooters.

Road mortality in fragmented landscapes is a major threat facing some turtle populations. Road mortality or injury of northern red-bellied cooters from vehicle collisions has been documented in recent years (USFWS 2021, pp. 19-20). Adult mortality, particularly of female turtles making overland movements in search of nest sites, has the potential to lead to male biased populations, decreased reproductive output, and decreased juvenile recruitment. Increased habitat fragmentation, road densities, or traffic volume may increase the potential for road mortality to impact population viability in the future.

Habitat protection around waterbodies occupied by northern red-bellied cooters is a high priority management activity identified in the 1994 Recovery Plan (USFWS 1994, p. 16) and continues to be a current conservation priority. The level of protection of shoreline and surrounding uplands around waterbodies occupied by this species varies from total protection from human activity to no protections, including many areas that are protected from some activities or land uses but not all. Currently, there are no known major nesting areas that are completely protected by the Federal government, Commonwealth of Massachusetts, municipal, or nongovernmental organizations (USFWS 2021, pp. 28-30, 33-34, 85-86). Uncertainty exists around what level of land protection and how much protected land is necessary to secure habitat for this species. Increasing the level of protection on lands that already have protections from some activities or land uses would benefit northern red-bellied cooters by increasing habitat connectivity and ensuring adequate nesting habitat free of human disturbance and the threat of habitat loss.

A modeled analysis of habitat quality metrics for the 2021 SSA Report showed that a majority of AUs would experience some level of decline in habitat quality at the 2080 time step compared to the current condition, although the significance of these declines is unknown (USFWS 2021, p. 47). New information regarding northern red-bellied cooter movement patterns between aquatic habitats and the likelihood that metapopulation dynamics are at work throughout most or all of the species' range in Massachusetts, indicates that protection of upland areas to preserve and enhance connectivity and minimizing road mortality should be a conservation priority.

Collection

Overutilization for commercial, recreational, scientific, or educational purposes does not appear to be a current factor in the decline or recovery of the northern red-bellied cooter. However, in

recent years, the collection of North American turtle species for illegal trade has emerged as a significant threat and is considered to be a conservation crisis that is occurring at an international scale (Ernst and Lovich 2009, pp. 26-27; Stanford et al. 2020, entire). The threat of illegal collection has increased due to intensifying demand from both domestic and international markets. Although this is not known to be a current threat for the Massachusetts population of northern red-bellied cooters, there is evidence that this species is included in the pet trade in other parts of its range to some degree. It is possible that collection could become a future threat to the viability of this population if demand shifts as global turtle populations decline (USFWS 2021 pp. 21, 51).

Predation

The Service identified predation as a threat to the northern red-bellied cooter in the 1994 recovery plan, and nest monitoring and protection has been a component of the species' management since before 2007. Predation of eggs and hatchlings is an ongoing threat that is spatially variable, but the Service continues to document loss of all unprotected nests in entire nesting locations in some years. As habitat loss and fragmentation continue, northern red-bellied cooters are increasingly nesting in or near residential and agricultural landscapes, which may have higher densities of predators and higher predation risk. Opportunistic nest protection by managers continues to be effective at precluding medium-sized predators from accessing nests, but only a small percentage of total nests laid in a given year are found during monitoring.

The ongoing headstart program aims to reduce predation vulnerability by producing hatchlings that are larger than similar-aged turtles in the wild. The headstart program and nest protection efforts are valuable conservation programs that increase survival rate for some eggs and hatchlings, but do not address the underlying range-wide threat of predation, which is expected to continue to be a factor limiting the northern red-bellied cooter (USFWS 2021, pp. 17-18). Permanently decreasing the number of generalist egg predator species that occur within the northern red-bellied cooter's range in Massachusetts is considered infeasible, as it was at the time of the 2007 5-year review.

Climate Change

Climate change has the potential to affect precipitation, seasonal temperatures, aquatic habitat, pathogens, and invasive species. However, we are uncertain about the extent to which climate change will negatively or positively impact the species in Massachusetts (USFWS 2021, p. 25-26, 50-51).

Regulatory Mechanisms

A description of current non-ESA regulatory mechanisms is available starting on page 29 of the SSA Report (USFWS 2021).

The ESA currently plays an important role in progress towards the recovery of the northern red-bellied cooter. Some threats such as alteration or loss of habitat due to development are being managed, but not eliminated. The regulatory requirements under ESA section 7 and the prohibition of take under ESA section 9 have protected the Massachusetts population of the northern red-bellied cooter from disturbance and habitat degradation. Through informal ESA section 7 consultations with Federal agencies, adverse effects to northern red-bellied cooters

have been minimized or avoided. In addition, the ESA designation of around 10 ponds and 3,269 acres of land in Plymouth County, MA, as critical habitat has allowed for additional habitat protection in that area. The absence of all ESA protections would create a gap in mechanisms to address continuing threats to northern red-bellied cooter from development, habitat connectivity, or water quality and could result in increased habitat degradation, disturbance, harassment, or collection.

Headstart Program

The headstart program established in 1985 by MassWildlife has successfully increased the size and extent of the northern red-bellied cooter population in Massachusetts. Over 4,000 hatchlings have been headstarted since the start of the program. Headstarts have been released at more than 30 sites, including 11 of the original ponds that supported natural occurrences of the species at the time of Federal listing and more than 15 sites without evidence of existing or historical occupancy (USFWS 2021, p. 27; Regosin et al. 2017, p. 14). A recent study estimated survivorship of 0.91, 0.97, and 0.98 for headstarted individuals in three ponds and pond complexes that did not have naturally occurring populations.

Federal Pond has historically served as the primary source for hatchlings, because its breeding subpopulation of northern red-bellied cooters was considered more robust than any other subpopulation (USFWS 1994, p. 18). However, despite the addition of 156 headstarts to Federal Pond between 1987 and 2002, the population has not increased (Regosin et al. 2017, p. 41), and the headstart program is likely to source more hatchlings from alternative locations going forward. Additional information is needed regarding the genetic viability of populations augmented by the headstart program and headstart-only populations, as well as overall genetic diversity of the Massachusetts population.

The headstart program has succeeded in stabilizing the population by increasing the number of individuals on the landscape, increasing the number of occupied waterbodies, and expanding the extent of the known current range. However, there is uncertainty around how many subpopulations are self-sustaining and what would occur if the headstart program were to end. Without the input of headstarts, it is likely that some subpopulations would decline over time, although effects are unlikely to be measurable for many years due to the long lifespan of this species. Reproduction has been documented at several of the sites established through the headstart program, but additional information is needed about whether headstart-only occurrences are self-sustaining. More information about the headstart program is available starting on page 26 of the SSA Report (USFWS 2021).

Synthesis:

The SSA Report identified 43 AUs that represent waterbodies where the northern red-bellied cooter has been observed, many of which may represent reproducing subpopulations, distributed across the southeastern coastal plain of Massachusetts. This species is known to occupy a variety of aquatic habitat types including coastal plain ponds, large lakes, rivers, reservoirs, and other wetlands. The SSA Report current condition analysis assessed best available demographic and habitat quality metrics to estimate resiliency. Of the AUs, 11 were categorized as being in high resiliency condition, 15 AUs were in moderate resiliency condition, and 17 were in low

resiliency condition (USFWS 2021, p. 37). Future scenarios assessed how population growth rates and the use of headstarting as a conservation action might impact resiliency, redundancy, and representation. In all future scenarios analyzed in the SSA, the species is expected to persist in Massachusetts into 2080, although a loss of viability is predicted in the three most pessimistic scenarios (USFWS 2021, pp. 40-48). In the most pessimistic scenario examined, we applied a pessimistic population growth rate and assumed that no added inputs from the headstart program would occur. This resulted in 8 AUs categorized as being in high resiliency condition, 11 AUs in moderate condition, 9 AUs in low condition, and 15 AUs considered extirpated (USFWS 2021, p. 43).

The current condition of the northern red-bellied cooter population in Massachusetts is better than the historical baseline represented by the condition of the population at the time of listing in 1980, with improved redundancy, representation, and resiliency that can be attributed to recovery efforts such as the long-running headstart program. However, the likelihood of conservation efforts such as the headstart program continuing for the foreseeable future is uncertain and increasing turtle numbers through the headstart program alone will not prevent the population from declining in the future if underlying threats to viability are still present. In the future, we expect the species to continue to face a variety of threats to viability including habitat loss, fragmentation, road mortality, predation, and human disturbance. Conservation measures such as protection of aquatic habitat and nesting areas, habitat restoration, and efforts to reduce the likelihood of adult mortality or collection may be important strategies.

We conclude that the Massachusetts population of the northern red-bellied cooter has sufficient resiliency and redundancy such that the near-term risk of extinction throughout all of its range is very low, and it is no longer in danger of extinction. However, because our analysis indicates ongoing substantial factors threatening the species' viability in Massachusetts such that it is likely to become endangered in the foreseeable future, the Massachusetts population meets the definition of threatened. We therefore recommend the Service downlist the listed entity from endangered to threatened.

RESULTS

Recommended Classification:

_X_ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist** (*Indicate reasons for delisting per 50 CFR 424.11):*
    ____ *Extinction*
    ____ *Recovery*
    ____ *Original data for classification in error*
____ **No change is needed**

The Massachusetts population of the northern red-bellied cooter was federally listed as a distinct subspecies *Pseudemys rubriventris bangsi* and was known by several common names including Plymouth redbelly turtle, Plymouth red-bellied cooter, and Plymouth red-bellied terrapin. The 1994 recovery plan (USFWS 1994) and 2007 5-year review (USFWS 2007) both concluded,

based on the best available information, that the use of the trinomial was no longer appropriate and that the Massachusetts population should be recognized as a DPS of the northern red-bellied cooter (*Pseudemys rubriventris*). The invalid status of the junior synonym *bangsi* and acceptance of *Pseudemys rubriventris* as the scientific name for the Massachusetts population of the northern red-bellied cooter is supported by the Integrated Taxonomic Information System (ITIS). However, current regulation for this population still uses the original name, and we recommend that the name change and status as a DPS be published in the Federal Register.

New Recovery Priority Number (indicate if no change; see 48 FR 43098, September 21, 1983 & 48 FR 51985, November 15, 1983 - Correction): 9 (no change from current RPN)

Brief Rationale: Based on table 3 in 48 FR 51985, no change from the current RPN is recommended. Degree of threat remains moderate with high recovery potential and no conflict.

Listing and Reclassification Priority Number, if reclassification is recommended *(see 48 FR 43098, September 21, 1983)*

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: 6
Delisting (Removal from list regardless of current classification) Priority Number: ____

Brief Rationale: Based on Table 2 in 48 FR 43103, reclassification is an unpetitioned action and the management impact is low.

RECOMMENDATIONS FOR FUTURE ACTIONS

- Continue working with conservation partners on land protection, particularly of nesting habitat and areas where habitat connectivity is important. Protection of known nesting areas should be prioritized.
- Increase outreach to landowners to increase land protection and habitat restoration efforts where appropriate.
- Consider nest site restoration or creation in priority areas where nesting areas have not been identified or where known nest areas present long-term or persistent management concerns, such as proximity to roads, risk of collection, or increased risk of predation.
- Manage basking habitat in priority aquatic habitat where basking objects are limited.
- Continue to proactively identify new occupied waterbodies and monitor known sites via use of qualified personnel and grant programs to monitor existing populations, evaluate whether headstart-only populations are reproducing successfully, and assess sites where limited information is available about northern red-bellied cooter status. Continue to identify nesting areas that have not yet been located.
- Evaluate the extent of interpond movements in multipond AUs or between AUs where existing information about turtle movement is not available. Identify areas where road

crossings or other barriers to connectivity exist and determine whether there are feasible means to mitigate these threats or barriers.

- Conduct research and monitoring on demographics, genetics, and metapopulation dynamics.
- Develop guidance and best management practices for various activities that may affect northern red-bellied cooters to support avoidance and minimization of adverse impacts.
- Collaborate with MassWildlife, the Eastern Massachusetts National Wildlife Refuge Complex, and other partners to evaluate the northern red-bellied cooter headstart program and develop a strategy for implementing the program in the future so that release sites are targeted based on program goals. Consider opportunities to evaluate the demographic trend of subpopulations without headstart inputs by pausing release of headstarts at some ponds.
- Examine the significance of shallow vegetated coves for juvenile northern red-bellied cooters.
- Seek additional information about threats evaluated in the SSA, particularly concerning threats for which limited information was available or for which information was available only for some occupied waterbodies. Support additional research to assess how factors influencing viability might impact the northern red-bellied cooter in the future.
- Document and monitor winter kill events and conduct research on what factors might lead to these conditions, including possible anoxic conditions that may be caused by an overabundance of aquatic plants.
- Continue to implement nest protection and perform predator control, where possible. Conduct research and identify if feasible means to mitigate high nest/egg and hatchling predation rates can be implemented as alternatives to the headstart program.
- Update the Recovery Plan, including re-evaluating the recovery criteria.
- Develop a monitoring plan that will efficiently track the status of the population both during the process of recovery and post-delisting.
- Monitor collection and the illegal trade in turtles as a potential future threat and proactively protect sensitive location information.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Northern Red-bellied Cooter (*Pseudemys rubriventris*), Massachusetts Population

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

__X__ Downlist to Threatened
____ Uplist to Endangered
____ Delist (Indicate reasons for delisting per 50 CFR 424.11):
  ____Extinction
  ____ Recovery
  ____ Original data for classification in error
____ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: 6

REGIONAL OFFICE APPROVAL:

Approve SHARON MARINO Digitally signed by SHARON MARINO Date: 2022.03.25 08:35:12 -04'00' Date _____

Assistant Regional Director, Ecological Services, North Atlantic-Appalachian Region