



Department of Defense Legacy Resource Management Program

Recommended Best Management Practices for the Northern Red-bellied Cooter on Department of Defense Installations

Department of Defense Partners in Amphibian and Reptile Conservation



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Introduction

The Northern Red-bellied cooter (*Pseudemys rubriventris*) is a species for which the U.S. Fish and Wildlife Service (USFWS) has been petitioned for listing under the Endangered Species Act (ESA). Throughout most of the species' range, the Northern Red-bellied Cooter does not receive protection under the ESA; it is currently listed by the USFWS under the "National Listing Workplan" (<https://www.fws.gov/endangered/what-we-do/listing-workplan.html>). However, isolated populations in Massachusetts were previously recognized as a separate subspecies ("Plymouth" Red-bellied Cooter; *Pseudemys rubriventris bangsi*) and that subspecies was listed under the ESA as endangered in 1980. Further evaluations of the taxonomic status concluded that these populations do not warrant taxonomic recognition as a distinct subspecies. Nevertheless, Massachusetts Division of Fisheries and Wildlife lists the "Plymouth" Red-bellied Cooter as endangered and the USFWS still recognizes this Massachusetts population as federally endangered, as an ecologically and geographically distinct population segment.

The Department of Defense (DOD), through its Partners in Amphibian and Reptile Conservation (PARC) network, and the USFWS have developed Best Management Practices (BMPs) for the Northern Red-bellied Cooter. The management practices described in this document were developed specifically for DoD installations, but are also suitable for implementation off DoD installations.

The management practices described in this report are intended as guidelines that DoD natural resource managers can use to help plan, prioritize, and implement conservation and management actions that provide a conservation benefit to the Northern Red-bellied Cooter, while also providing information to comply with regulatory processes such as the Sikes Act, Environmental Protection Agency's National Environmental Policy Act (NEPA) and associated components (i.e., Environmental Assessments, Environmental Impact Statements), etc. Implementation of these BMPs should not impede military readiness activities, should be documented in installation Integrated Natural Resource Management Plans (INRMPs), and should align with existing efforts among the DoD, federal/state governmental agencies, and non-governmental organizations (NGOs) to prevent this species' continued decline and preclude its listing under the ESA.

Species Profile

Description:

The Northern Red-bellied Cooter belongs to a group of hard-shelled freshwater turtles that are known for their frequent basking behavior. Adult size is up to 10-12 inches in carapace length; some females reach 15 inches, with weights up to 10 pounds. They are larger than most freshwater turtles within its natural range, except the Snapping Turtle (*Chelydra serpentina*). Females are substantially larger than males—but even the males are substantially larger than any Painted Turtle (*Chrysemys picta*), with which they may occasionally be confused. Adult Red-bellied Cooters have a highly domed carapace (top shell) that varies in color from brownish to black, sometimes appearing mahogany. There are broad red lines or bands that appear

perpendicular to the spine and are clearly visible from the side of a basking cooter, although they may only be visible when the shell is wet. The pattern on the carapace of old adult males often breaks up with age and forms a mottling or reticulated pattern; referred to as melanistic. Old melanistic males may develop a mottled, salmon-colored carapace. Adult males have long front claws. The plastron, or underside of the shell, is a reddish or pink color, with some female plastrons being bright red. The head has yellow-greenish striping; these markings may be faded in older individuals, in which the head appears nearly black. Most adults have a small projection (cusp) on each side of the center of the front of the upper jaw, forming a notch at the midline.

Hatchling carapaces are a beautiful, greenish, with a mix of yellow and lighter green markings. Hatchlings have an orange-reddish plastron.

Age to maturity has been estimated at 7-9 years for males and 11 years for females. Longevity is believed to be 40-55 years. Clutch size most commonly is 10-12 eggs, although clutches up to 17 eggs have been reported.



An adult Northern Red-bellied Cooter with a dark head characteristic of an older cooter (left); a shell of a deceased adult illustrating the characteristic broad red bands. Pictures by K.A. Buhlmann.

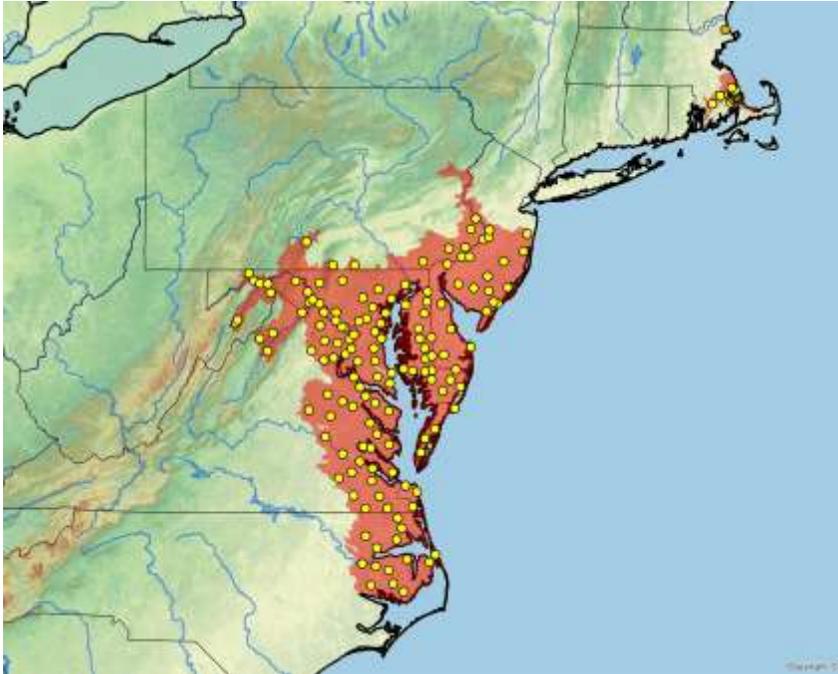


The bright plastral and carapace patterns of a juvenile Northern Red-bellied Cooter. Pictures by K.A. Buhlmann.



Plastral patterns of a hatchling Northern Red-bellied Cooter (left). Head striping on a juvenile cooter (right). Pictures by K.A. Buhlmann.

Range: The range of the Northern Red-bellied Cooter is generally confined to the mid-Atlantic states of the U.S. Its contiguous range includes North Carolina to New Jersey, with an isolated population in Massachusetts. It is mostly restricted to the Coastal Plain physiographic province, including the Pine Barrens of southern New Jersey, southeastern Pennsylvania, most of Delaware, Maryland, eastern Virginia, the panhandle of West Virginia, and northeastern North Carolina. In some areas it is associated with pine barrens habitats, and has expanded its range in some areas, into central New Jersey via old canal systems, and elsewhere perhaps from translocations and release of pet turtles.



Northern Red-bellied Cooter Range Map (TTWG, In Press), modified from Buhlmann et al (2009) and based on occurrences in hydrologic units (HUCs).

Distribution on Military Sites:

The Northern Red-bellied Cooter is confirmed present on the following 27 military sites (Petersen et al 2018)

- Air Force: Dare County Range (NC); Joint Base Langley-Eustis (Fort Eustis) (VA); Joint Base McGuire-Dix-Lakehurst (NJ); Warren Grove Air National Guard (NJ)
- Army: Aberdeen Proving Ground (MD); Fort A.P Hill (VA); Fort Belvoir (VA); Fort Indiantown Gap (PA); Fort Mifflin Readiness Center (PA); Maneuver Training Center-Fort Pickett (VA)
- Marine Corps: MCB Quantico (VA)
- Navy: JEB Little Creek-Fort Story (Little Creek, Fort Story) (VA); NALF Fentress (VA); NAS Oceana (Dam Neck Annex, Main Base) (VA); NAS Patuxent River (MD); Naval Recreation Center Solomons (MD); Naval Support Facility Dahlgren (VA); NSA Northwest (VA); NSF Carderock (MD); NSF Indian Head (MD); Naval Research Laboratory Washington (Chesapeake Bay Detachment) (DC); NWS Earle (NJ); NWS Yorktown (Cheatham Annex, Main Base) (VA)

The Northern Red-bellied Cooter is unconfirmed and potentially present on the following 11 military sites; specimens have been found in the same county as these sites, but not within the boundaries of the installation itself (Petersen et al. 2018):

- Air Force: Joint Base Andrews (MD)

- Army: Adelphi Laboratory Center (MD); Blossom Point Research Facility (MD); Fort Detrick (MD); Fort George G. Meade (MD); Fort Lee (VA); Sea Girt (NJ)
- Navy: NAS Patuxent River (Bloodsworth Island Bombing Range, Webster Field) (MD); Naval Research Laboratory Washington (Pomonkey Detachment) (MD); NS Norfolk (Craney Island, Main Base) (VA); NSA Annapolis (MD)

Habitat:

Northern Red-bellied Cooters prefer permanent aquatic bodies of water, including large deep water habitats such as ponds and lakes. Abundant aquatic vegetation is an important component of the habitats of this species, as it provides important cover for hatchlings and subadults. They occur in tannin-stained (black water) habitats in New Jersey Pine Barrens. They are known from open-water kettle ponds in Massachusetts. Northern Red-bellied Cooters will occasionally enter brackish waters as illustrated by reports of barnacles on the shells of some individuals. However, populations do not exist solely in brackish waters and those individuals have access to freshwater habitats. Red-bellied Cooters are known from slow-moving river stretches, such as the Potomac and Shenandoah in Virginia and West Virginia, the Delaware River and Delaware and Raritan Canal in New Jersey, and the Taunton River in Massachusetts. They are found in ponds on the Outer Banks of North Carolina. They do not prefer ephemeral wetlands.

Behavior:

Basking: Northern Red-bellied Cooters bask frequently throughout the year, and people and managers are more likely to document their presence through this method. These cooters are often encountered in modest numbers; a basking aggregation of 47 individuals was observed at optimal habitat on the Jug Bay protected area in Maryland; the total Jug Bay area population was estimated at least 100 individuals. They often co-occur with Painted Turtles, but the adult cooters are much larger, and thus easily distinguished.

Movements: Although adults are occasionally found on land (likely changing their location and accessing nearby water bodies), most movements are believed to occur within aquatic habitats. Adult females are most often encountered on land during the nesting season.

Nesting: Females choose to nest in open canopy sites, including agricultural fields and the edges of roads, which can lead to mortalities. Cooter, and other turtle species, often dig nests in lawns, but if the grass is thick, grass roots often envelope the eggs, and this seems to lower hatching success (K. Buhlmann, pers. comm). Open, sparsely vegetated, sandy soiled areas are the best nesting sites. Nesting typically begins during daylight hours but the female may not complete the process until after dark. Nests are constructed in the spring, most likely to be observed late May to late-June depending on the location within the species range.

Eggs are laid in nests dug in soft soil in open areas usually within 100 yards of water (USFWS 1981). Cooters often nest in tilled or disturbed soil.

Eggs in nests incubate by the heat of the sun and hatch in approximately 73-80 days. Clutch size varies with the size and age of the female, but ranges from 5-17 eggs, with 10-12 being the average.

Hatchlings may emerge from the nest and enter the pond in autumn, but they also have the ability to overwinter in the nest- hatching from the egg, but then remaining buried in the nest as a hatchling turtle for the entire winter and emerging the following spring.

Foods: As adults, Northern Red-bellied Cooters are nearly exclusively herbivorous, feeding on a variety of aquatic plants including: *Potamogeton*, *Elodea*, *Vallisneria*, *Myriophyllum*, *Utricularia*, and *Sagittaria*. Juveniles are omnivorous and eat small animal prey as well, including aquatic insects, crayfish, snails, and tadpoles.

Threats:

The lists of threats to Northern Red-bellied Cooters include those common to most other turtles and wildlife: loss of habitat (whether by pollution, destruction via development, or isolation of habitats in increasingly humanized landscapes), collection for the pet trade, consumption of eggs and hatchlings by predators, and mortality associated with automobile collisions. Specific threats and potential conservation ameliorations are given in the following sections.

Conservation Status

At the federal level, Northern Red-bellied Cooters range-wide have been petitioned for listing and are prioritized for evaluation in the USFWS Listing Workplan, with a scheduled decision date of 2023. The isolated Massachusetts population remains federally listed as Endangered, but is not in proximity to the DoD Installations listed herein.

The Northern Red-bellied Cooter is considered Near Threatened (NT) on the IUCN Red List (van Dijk, 2011) and has a NatureServe Global Rank of G5-Secure.

State Conservation Status:

1. State Threatened in Pennsylvania (no possession or take)
2. Considered Secure/Stable in New Jersey (DiLeo, 2015)
3. Not listed in Maryland, Delaware, Virginia, or North Carolina and not included in the Wildlife Action Plans of these states.
4. Protected from commercial take in Maryland, New Jersey, and North Carolina under State regulations
5. Take is regulated (with season closures and/or daily possession limits in Delaware, Virginia, and West Virginia)

The State Natural Heritage Program databases rank the Northern Red-bellied Cooter as the following: S2: Imperiled: WV and PA; S4: Apparently Secure: NJ, VA, NC; S5: Secure: MD, DE; Under Review: MA

Recommended Conservation Implementation Strategies and Best Management Practices for Northern Red-bellied Cooters on Military Sites

In general, implementation of the specific BMPs listed below should not be performed at the expense of an existing Northern Red-bellied Cooter population. Habitat management practices, while serving long-term benefits, should be carefully planned prior to their implementation to minimize potentially adverse impacts to turtle activity periods and locations. Make sure to document performance of any of the following BMPs, whether current or future, in your installation's INRMP. The USFWS may consider these proactive conservation actions prior to making a listing determination for this species.

- 1. Identify Northern Red-bellied Cooter Habitats.** Documenting occurrence or continued occurrence of Northern Red-bellied Cooters on the DoD installations mentioned in this document can be achieved by conducting visual surveys of basking turtles in installation ponds, lakes, and rivers (see *Inventory and Monitoring Techniques* below).
- 2. Protect Northern Red-bellied Cooter Habitats.** Once aquatic habitats inhabited by Northern Red-bellied Cooters are identified, efforts should be made to identify potential pollution inputs (i.e., road runoff, outfalls) that may be degrading water quality. Correct pollution issues, as applicable.
- 3. Enhance Northern Red-bellied Cooter Basking Habitat.** The addition of basking sites may be helpful to a cooter population. Downed trees that are separated from the shoreline of a pond or stream are preferred, as turtles likely feel more secure from terrestrial predators. Artificial basking rafts such as an anchored floating wood raft installed near the shore may also be used if not trees are present. The addition of basking sites may also help simply with detection, and can help with monitoring.



Felled trees provide basking sites for Northern Red-bellied Cooters. The management technique is easily applied and adds structure to a lake or pond habitat for other aquatic life as well.

- 4. Identify Invasive Species Threats to the Aquatic Habitat.** Identify and control invasive plants (i.e., *Phragmites*, *Eurasian millfoil*) that degrade the habitat quality for Northern Red-bellied Cooters. Several species of invasive plants spread and cover bankside basking and nesting habitat. Also identify and control invasive vertebrates such as the Red-eared Slider Turtles (*Trachemys scripta elegans*) that compete with Northern Red-bellied Cooters for resources and habitat. Note that Yellow-bellied Sliders (*Trachemys scripta scripta*) are native and co-occur in the Virginia and North Carolina portions of Northern Red-bellied Cooter range. Invasive fish species such as Chinese Snakeheads (*Channa argus*) likely will eat hatchling cooters, and other native fauna. Consult with experts who could help identify solutions and protocols for invasive species management.
- 5. Be Alert for Poaching Activity.** Some aquatic water bodies on DoD facilities are open to legal fishing and recreation. Be aware that collection of turtles by individuals, especially commercial collection for food or the pet trade, would represent a serious threat to maintaining stable, viable populations of Northern Red-bellied Cooters. Turtle entanglement and drowning in fishing line and trampling of nests is unfortunately common in some areas with heavy recreational fishing pressure. Basking turtles of many species, including cooters, have been the target of “plinking” where individual recreationists with guns illegally shoot basking turtles from logs, usually from boats. DoD Natural Resource managers should be alert for any signs of poaching activity.
- 6. Identify Nesting Locations and Protect Nests.** During May-July, seek information on observations of large freshwater turtles walking across roads, parking lots, lawns, and golf courses. These turtles are likely females in search of suitable nesting sites. Several actions/alternatives can be taken once female turtles are observing digging a nest and depositing eggs. First, observe the process without disturbing the female, note the location of the nest, and protect it with signage or fencing. Second, should resources and priorities allow, cover the nest with wire mesh to protect the egg contents from predation. To be most effective, this must be done as soon as the nest is discovered, as turtle nests are typically depredated by mammalian predators (mostly raccoons) the first night after the eggs are deposited. Covering the nest with a 3 ft x 3 ft flat piece of half-inch wire mesh protects the nest from most predators for the duration of incubation, but the mesh must either be removed or modified prior to hatching so the baby turtles are not trapped in the nest.
- 7. Identify Nesting Hazards and Enhance Nesting Habitat.** Although Northern Red-bellied Cooters are known to inhabit man-made lakes and reservoirs, the shorelines of these water bodies often include bulwarks, riprap, or mowed lawns to the edge of the water. Grass lawns are not optimal for nesting, as grass roots can adhere to the buried eggs and decrease hatching success. Preferred nesting areas consist of areas of open loamy/sandy soil with sparse canopy cover, usually within 100 yards of the water’s edge. Create nesting habitats by removing shade trees and tilling or mounding soil to attract female cooters. Proper siting of man-made nesting habitats can help minimize nesting in

suboptimal locations and decrease the distance nesting females need to travel over land, thus reducing the risk of road-related mortality.



An example of an ideal nesting area for Northern Red-bellied Cooters. Note the open canopy and sandy/loamy soil with sparse grasses, as well as the short distance to the aquatic habitat.

- 8. Prevent Turtle Roadway Mortality.** It is becoming understood that additive (above normal) levels of mortality suffered by female turtles as they encounter roads and automobiles is leading to long term extirpations of turtle populations. A female cooter requires 11 or more years to mature, after which they typically produce a clutch of eggs each year for up to 40 years. Once a cooter reaches adulthood, it has few enemies besides automobiles. A female turtle killed on the roadway while going to nest represents not only the loss of a breeding female and that clutch of eggs, but also the loss of every clutch she would have produced in subsequent years. There are experts who can assist with design of turtle fencing to prevent road mortality and divert females to alternate nesting areas. Additional studies like radio telemetry can help determine movement patterns of cooters, especially over land between aquatic habitats, and thus help managers identify barriers to successful turtle movement. Consider installing turtle crossing signage and potentially reducing speed limits during the nesting season along roads with high turtle activity.
- 9. Monitor Population Trends.** If desired, herpetological experts can help design monitoring protocols for Northern Red-bellied Cooters. Basking surveys can provide insight into population numbers, but a mark-recapture program can provide measures of true population size, sex ratios, demography (*i.e.*, representation of different age classes, and reproduction), growth, and survivorship. Share observations of sick or diseased turtles with reptile/wildlife-focused veterinarians. Emerging diseases affect not only humans, but wildlife as well.

10. Consider Population Manipulations That Aid Recovery. Techniques for manipulating populations include nest protection and headstarting of hatchling turtles (*i.e.*, raising hatchling turtles in captivity for their early vulnerable periods of life to quickly increase their size, thus increasing survivorship of the turtles upon release). Since the early 1980's the US Fish and Wildlife Service and the Massachusetts Division of Fisheries and Wildlife have been headstarting Northern Red-bellied Cooters to recover the Massachusetts population. If increasing the numbers of cooters in a population is a goal, seek advice from conservation ecologists associated with DoD who have experience with these methods.

11. Seek Opportunities to Collaborate on Species Conservation. Working with researchers, such as those within DoD PARC, state agencies, federal agencies, or universities, can benefit conservation efforts. These partnerships lead to discussions, brainstorming, and efficient methods to help DoD natural resource managers obtain the information they need to manage and recover at-risk and endangered and threatened species, minimize conflicts with the military mission, and maintain military readiness.

Inventory and Monitoring Techniques for Northern Red-bellied Cooters

Basking Surveys

Visual surveys of artificial or natural basking sites (*i.e.* logs, banks and sandbars, etc.) can be conducted with speed, efficiency, and take less time than other ground survey methods. Basking surveys require binoculars or a spotting scope, and can be conducted on foot or via boat in larger bodies of water. This method is not ideal for estimating population size, but it requires much less effort than other survey methods such as mark-recapture. Optimum survey periods are early spring through early summer and must be conducted when environmental conditions are suitable for turtle basking activity (*i.e.*, sunny days with air temperatures above 70 F). Surveys conducted in the morning might have a better chance of spotting turtles.

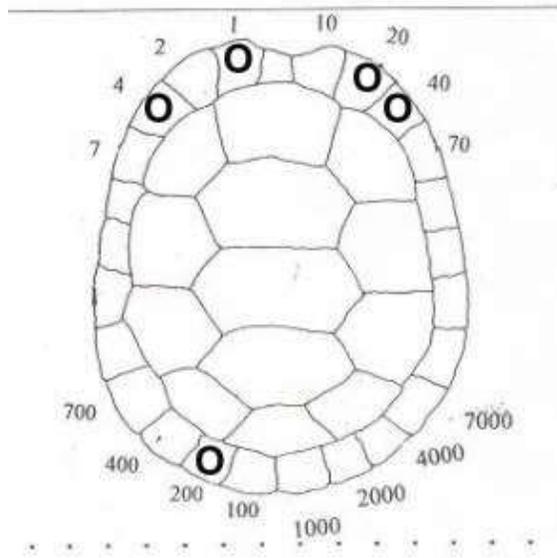
Nesting Surveys

Wildlife cameras can be used to detect Red-bellied Cooter nesting activity, as well as detect the presence of nest and egg predators, and monitor human disturbance. Detection of nesting areas via wildlife cameras could also help identify those areas where heavy foot traffic and therefore nest trampling is a concern.

Mark-recapture

Mark-recapture is still the most widely-used method to census turtle populations. This technique involves making permanent marks on the shell, such as notching or drilling the lateral scutes to provide long-term, distinctive visual indicators of individual turtles. It is recommended that you check with your respective state agency to determine permit requirements before starting a mark-

recapture study. In addition, some states may already have a specific marking protocol established for this species.



Example Marking Template

A scute marking system, such as the one illustrated, can be used to mark a unique code to identify individual turtles. The 1-2-4-7 system allows for any number between 1 and 9 by marking or drilling. No more than two scutes on any of the four “corners” of the turtle are marked. The identification code for this turtle is 265. Up to 9999 different turtles can be identified with this method. The marks on turtle shells can be made as notches from a knife or file or as holes drilled through the marginals (illustrated here). Hatchlings can be marked with small scissors or fingernail clippers. Marks on the shells of terrestrial and freshwater turtles do not damage the turtle but are permanent, being identifiable as many as 30 years after initial marking.

Genetics

Collection of genetic material can be obtained by minimally invasive specimen sampling such as shell filings, nail clippings, blood draws, or carcass tissue and can provide information on the unique genetic markers for turtle populations. These markers can be used in a wider context with regional partners such as state biologists and researchers to determine population characteristics (isolation and dispersal), and support law enforcement functions such as preventing poaching, prosecution, and return of seized turtles. It is recommended that you check with your respective state wildlife agency to determine if state or regional genetic studies are already underway and if a permit is required for collecting genetic material.

Benefits of Northern Red-bellied Cooter Best Management Practices to Military Training Operation

1. Since they are largely aquatic, Northern Red-bellied Cooters have little impact on military training activities. With proper basking structures and nesting habitat, they can co-exist in lakes and ponds on military bases.
2. Access limitations to military installations can provide refuge for Northern Red-bellied Cooter populations from various poaching pressures.

3. Maintaining a viable population(s) of Northern Red-bellied Cooters on military property may document reduced levels of endangerment for the species and reduce the need for additional state or federal protections.
4. Basking turtles are of interest to people who appreciate the outdoors, especially to children, and enhance the quality of the living environment on military bases.
5. Suitable Northern Red-bellied Cooter habitat and monitoring is beneficial for the military by providing erosion and sedimentation control, water storage, biosecurity, cover and concealment, aesthetics, and beneficial habitat conditions for other at-risk species.

Military Points of Contact

Contact your Military Service headquarters natural resources personnel with questions regarding Northern Red-bellied Cooter management and conservation actions:

Navy: Tammy Conkle (tamara.conkle@navy.mil; 202-685-9203)

Marine Corps: Jacque Rice (jacqueline.rice@usmc.mil; 571-256-2796)

Army: Steve Sekscienski (steven.sekscienski@us.army.mil; 571-256-9725)

Air Force: Kevin Porteck (kevin.porteck@us.af.mil; 210-925-4259)

Species Experts

Mike Jones: mtjones@bio.umass.edu; (508)-389-7863

Kurt Buhlmann: kurt@srel.uga.edu

Anthony Tur: Anthony_Tur@fws.gov; (413) 387-3966

For additional experts on turtles, in general, search the Partners in Amphibian and Reptile Conservation (PARC) Expert Partner Database <https://parcplace.org/network/parc-partners/>

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