



Species Action Plan: Bog Turtle (*Glyptemys muhlenbergii*)

Purpose: This plan provides an initial five year blueprint for the actions needed to attain near-term and, ultimately, long-term goals for the conservation and recovery of the bog turtle. The action plan is a living document and will be updated, as needed, to reflect progress toward those goals and to incorporate new information as it becomes available.

Goals: The immediate conservation goal for the bog turtle is to significantly increase efforts towards recovery of the bog turtle through habitat restoration, management, and protection; and to continue to collect baseline data for long-term monitoring and assessment of the Pennsylvania bog turtle population. The long-term recovery goal is to increase viable, reproducing, and protected populations of bog turtle and ultimately, in cooperation with the US Fish and Wildlife Service (USFWS), to remove the bog turtle from the lists of Pennsylvania endangered, threatened and candidate species (58 Pa. Code §75).

Natural History

Taxonomy: Class Reptilia, Order Testudines (turtles), Family Emydidae (water turtles), Bog Turtle (*Glyptemys muhlenbergii*)



Figure 1. Bog Turtle (*Glyptemys muhlenbergii*). Photo-PFBC file.

Description: The bog turtle is a small, semi-aquatic turtle with a maximum carapace length of 114 mm (Figure 1). The bog turtle's brown or black carapace is slightly sculpted, somewhat domed, and has a slight mid-dorsal keel. Growth rings are typically visible on the scutes of young to middle-aged bog turtles but often become smoothed by sediments in older specimens. The plastron is hingeless, posteriorly notched and connected to the carapace by a wide bridge. The coloration of the plastron is predominantly dark brown to black, with some individuals exhibiting tan or brownish markings that typically originate along the centerline. The background color of the skin is dark brown to black, with a mottled appearance on the head. An orange colored blotch located behind the eyes on the dark skin of the neck and head is diagnostic (Hulse *et al.* 2001).

Habitat: The bog turtle is a habitat specialist that relies on early successional,



groundwater-driven, emergent wetlands. Primary bog turtle habitat typically consists of wetlands with wet, mucky soils, and open, sunny, emergent vegetation. The classic example of bog turtle habitat is a spring-fed meadow with dominant vegetation consisting of low pedestal-forming grasses and sedges, often containing a scrub-shrub wetland component, and with soft mud or “mucky” soils. The turtles are often associated with tussock sedge (*Carex stricta*). This sedge and other pedestal-forming vegetation (*Scirpus*, *Cyperinus*, and *Carex* spp.) create a wide range of micro-climates. Reed canary-grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*) are invasive plant species that commonly occur in altered, disturbed or degraded sites. The bog turtle hibernates in spring seeps, most often under root masses and with maximum solar exposure (Ernst *et al.* 1989, Eichelberger 2005, Gress pers. comm.).

Life History: Bog turtles in Pennsylvania typically emerge from hibernation in late March through April, dependent upon local weather conditions, and return to the hibernacula in October. Breeding occurs from late April through early June (Barton and Price 1955). Generally, nesting occurs 21 to 31 days after copulation and, in Pennsylvania, bog turtles generally nest from June through early July (Hulse *et al.*, 2001, C. Urban, personal observation). An average of three (range 1-6) elliptical white

eggs are typically deposited between the blades of tussock sedge or within a sphagnum mat above the water line (Hulse *et al.*, 2001).

Hatchlings in the wild typically emerge from mid-August through September and overwinter at or near the nest site. The bog turtle is considered to be mature at a plastron length of 70 mm (Ernst 1977) (carapace length of approximately 75 mm) and an age of 6 to 10 years, depending on conditions.

Bog turtles are omnivorous and will eat insects, slugs, worms, frogs, salamanders, *Carex* seeds, Japanese beetles, berries, cattails, skunk cabbage, snails, and carrion (Nemuras 1967, Zappalorti 1976, Holub and Bloomer 1977 as cited in Ernst *et al.* 1994, Ernst 1985).

Distribution and Status

National Distribution: Two separate geographical populations of *Glyptemys muhlenbergii* are recognized (USFWS 2001) (Figure 2). The northern population exists within New York, Massachusetts, Connecticut, Pennsylvania, New Jersey, Delaware, and Maryland. A disjunct southern population, separated by 250 miles from the northern population, exists in Virginia, North Carolina, Tennessee, South Carolina, and Georgia, primarily in the Blue Ridge Province (Lee and Herman 1999).

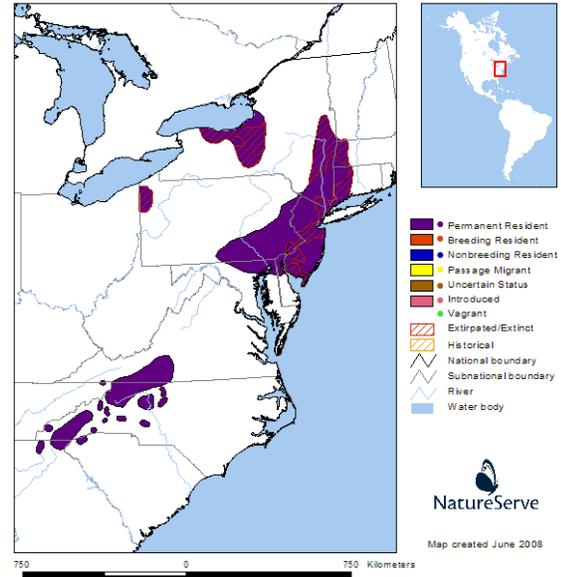


Figure 2. Distribution of *Glyptemys muhlenbergii* in North America (NatureServe 2010).

Pennsylvania Distribution: Within Pennsylvania, bog turtles are limited in distribution to portions of 15 southeastern and eastern counties and possibly other isolated areas in northwestern Pennsylvania (Figure 3).

Fragmented populations occur from Adams and Cumberland Counties eastward to the Delaware River and northward to Monroe County. Historically, a western population existed in Crawford and Mercer Counties and is currently considered historic or extirpated. Although significant suitable habitat acreage exists, researchers have searched for and failed to confirm the northwestern population in the last 25 years (Ruhe 2009).

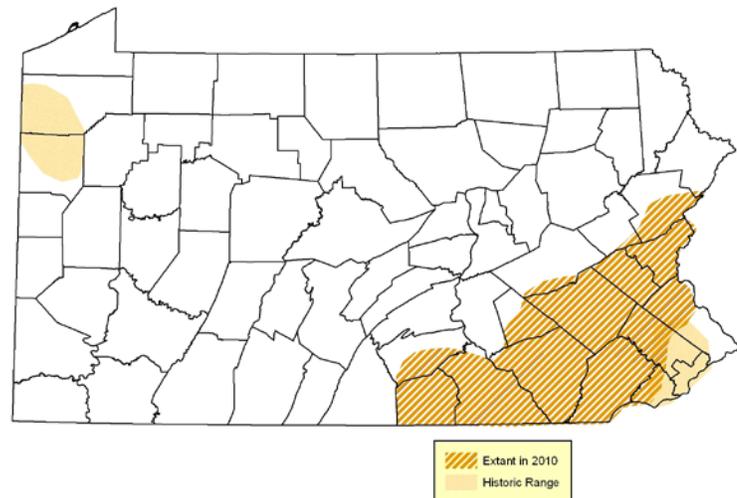


Figure 3. Distribution of *Glyptemys muhlenbergii* in Pennsylvania. (PFBC 2010).

Pennsylvania Legal Status: The bog turtle was listed as Endangered in Pennsylvania in 1974.

Federal Status: The US Fish and Wildlife Service (USFWS) listed the bog turtle as Threatened in 1997 (USFWS 1997).



Management Status

Previously undocumented bog turtle sites continue to be discovered every year through *ad hoc* surveys, surveys related to environmental review, incidental encounters and some targeted surveys (USFWS 2008). Limited targeted surveys have failed to find bog turtles within the historic range in northwestern Pennsylvania (Ruhe 2009). To assess the effects of development on bog turtles, the PFBC is currently sponsoring a monitoring study of bog turtle populations and their habitat (Rocco and Brooks 2009). Sites in the study will be re-visited in 10 years to monitor changes in their respective bog turtle colonies and associated habitat. As the planning phase to develop a mitigation mechanism for protecting the highest priority sites within the framework of environmental review of proposed development projects, a *Habitat Conservation Plan (HCP) to Establish Conservation Banks for the Bog Turtle in Chester County, Pennsylvania and part of Delaware* was developed in 2009 (The HCP Team 2009). This plan has been reviewed by the USFWS. To meet USFWS stipulations resulting from the review, further funding needs to be secured. Upon approval of the HCP by the USFWS, funding will be sought for implementation of the plan.

As of 2007, 214 extant bog turtle occurrences have been documented in Pennsylvania. The 214 occurrences made up a total of 132 population analysis sites

(PAS) (i.e., groups of wetland complexes that are thought to support bog turtle subpopulations with likely dispersal among the wetlands; from USFWS 2001), which represented an increase of 57 PAS from 2000 to 2007 (USFWS 2008). A total of 42 occurrences had some level of land protection, and management had occurred at 17 of those wetlands as of 2007 (USFWS 2008). Management of individual wetlands supporting bog turtles is ongoing at several sites in Pennsylvania, initiated by a variety of entities, including the USFWS Partners for Wildlife Program, land trusts, and individual landowners. The USFWS has funded a review of bog turtle occurrence data including mapping and assessment of wetland habitats, which should be completed in 2011. Additional federal funding has recently been allocated to locating potential bog turtle sites in southern York County.

In 2010, a Landowner Incentive Program (LIP) grant provided for development of 20 management plans for landowners in the Cherry Valley area. These plans provide guidance for landowners to protect habitat and minimize indirect loss of individual bog turtles.

The Pennsylvania Fish & Boat Commission (PFBC) has recently obtained a grant through the National Fish and Wildlife Foundation (NFWF) to coordinate habitat restoration efforts in Pennsylvania. This project will take effect in 2011.



Threats

- 1) Habitat loss by anthropogenic alteration or destruction
 - a. Historical and ongoing residential, commercial and industrial development, road construction, and agricultural practices
 - b. Genetic isolation and risk of local extirpation are exacerbated by loss of habitat and its connectivity.
- 2) Habitat loss by natural succession and lack of habitat management
 - a. Disturbance processes (e.g., beaver ponds, low density cattle grazing) are needed at many sites to create and maintain suitable wet meadow habitat
 - b. Encroachment by trees and shrubs creates shading, thereby eliminating bog turtle nesting and basking habitat
- 3) Invasive plant species: Invasive plants such as reed canarygrass (*Phalaris arundinacea*), common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), and narrow-leaved cattail (*Typha angustifolia*) can form dense homogenous stands thus eliminating or reducing basking and nesting areas, creating barriers to turtle movements, and can be responsible for excessive uptake of water from the wetlands.
- 4) Illegal collection: Given their high black market value, bog turtles are in constant danger of illegal collection by poachers (Hulse *et al.* 2001, USFWS 2001).
- 5) Predation (especially of nests): Predominant predators of nests and juveniles are meso-mammals (i.e., raccoon, opossum, mink, fox), but small mammals such as shrews have been documented as egg predators (Zappalorti *et al.* 1995).

Conservation and Recovery

Conservation Actions:

The USFWS Recovery Plan for the Bog Turtle, Northern Population calls for actions for the protection and restoration of bog turtle wetland habitat and the hydrologic processes that create and maintain it, protection of upland habitat buffers and dispersal corridors, and external threat abatement to minimize common mortality factors like poaching, predation, and roadkill (National Fish and Wildlife Foundation. 2009, USFWS 2009). Of the specific proposed actions in that recovery plan, the PFBC advocates implementation of the following:

- 1) Identify known bog turtle sites and develop management plans based upon priority of current needs.



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- a. Determine the acreage and habitat improvement needs for each site.
 - b. Develop habitat restoration training program for PFBC habitat managers
 - c. Encourage private landowners to enroll in conservation incentive programs such as the Wetlands Reserve Program (WRP).
 - d. Complete management plans for WRP-protected sites. Manage habitat, through grazing and other forms of vegetation management, to become suitable for bog turtle nesting
 - e. Initiate restoration in early successional wetland habitat as deemed necessary.
 - f. Develop and implement methodologies to protect bog turtle nests from predators.
- 2) Obtain funding to complete and implement HCP for Chester County, which could be used as a model in other bog turtle counties.
 - 3) Monitor occupied bog turtle sites.
 - a. Continue long-term research on the response of bog turtle populations to development pressures
 - b. Develop monitoring program at sites undergoing habitat management to measure population response.
 - 4) Continue and expand ongoing protection measures for the bog turtle populations.
 - a. Review and comment on permit applications that involve proposed temporary and/or permanent disturbances to known bog turtle habitat.
- b. Spot check projects to confirm adherence to recommended actions.
 - c. Investigate the possibility of developing a bog turtle conservation fund with the USFWS.
- 5) Continue to survey for undocumented populations of bog turtle within their historically-occupied range.
 - a. Use existing models to identify potential habitat (See Bog Turtle HCP)
 - b. Obtain landowner permissions for survey.
 - c. Inventory sites.
 - 6) Develop plans to establish bog turtle wetland connectivity corridors.
 - a. Map contiguous habitat and potential dispersal barriers.
 - b. Seek opportunities for reducing dispersal barriers.
 - c. Work with partners to protect corridor habitats through easements.



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