

Species Status Assessment

Class: Amphibia
Family: Scaphiopodidae
Scientific Name: *Scaphiopus holbrookii*
Common Name: Eastern spadefoot

Species synopsis:

The eastern spadefoot occurs in much of the eastern United States, from Alabama eastward and northward to Saratoga County in New York. Populations in New York are scattered through sandy uplands in the eastern part of the state. Although not easily detected because it spends most of the year underground, spadefoot toads occur in large numbers where habitat characteristics are appropriate, apparently limited more by its need for sandy soils than any other factor. While long-term trends are unknown due to the absence of baseline data, it is thought that habitat loss—especially loss of vernal pools and adjacent uplands from development—has resulted in a negative short-term trend.

I. Status

a. Current and Legal Protected Status

i. **Federal** Not Listed **Candidate?** No

ii. **New York** Special Concern; SGCN

b. Natural Heritage Program Rank

i. **Global** G5

ii. **New York** S2S3 **Tracked by NYNHP?** Yes

Other Rank:

NE Fish & Wildlife Agencies – Northeast Concern
Species of Severe Concern (NEPARC 2010)
IUCN Red List – Least Concern

Status Discussion:

Eastern spadefoot are locally abundant, but some populations in the Northeast are isolated and some have become extirpated, likely due to habitat loss. Massachusetts notes that museum specimens and historic literature indicate a much more widespread population, but no time frame is referenced; 52 occurrences have been documented since 1980 (MA Division of Fisheries and Wildlife 2005). NEPARC (2010) lists the eastern spadefoot a Species of Severe Concern because more than 75% of states list the species as SGCN.

II. Abundance and Distribution Trends

a. North America

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Time frame considered: _____

b. Regional (e.g., Atlantic Flyway, USFWS Region 5 - Northeast, Watershed, Hydrologic Unit)

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Regional Unit Considered: _____ Northeast _____

Time Frame Considered: _____ Last 30 years _____

c. Adjacent States and Provinces

CONNECTICUT **Not Present** _____ **No data** _____

i. Abundance

 X declining ___ increasing ___ stable ___ unknown

ii. Distribution:

 X declining ___ increasing ___ stable ___ unknown

Time frame considered: Not Specified

Listing Status: _____ Endangered SGCN? Yes

MASSACHUSETTS **Not Present** _____ **No data** _____

i. Abundance

 X declining ___ increasing ___ stable ___ unknown

ii. Distribution:

 X declining ___ increasing ___ stable ___ unknown

Time frame considered: Long-term declining trend

Listing Status: _____ Threatened SGCN? Yes

NEW JERSEY **Not Present** _____ **No data** _____

i. Abundance

___ declining ___ increasing X stable ___ unknown

ii. Distribution:

___ declining ___ increasing X stable ___ unknown

Time frame considered: Not Specified

Listing Status: _____ Not Listed SGCN? No

The NY Amphibian and Reptile Atlas (Herp Atlas) was conducted in 1990-99. The Herp Atlas database also includes historic records from prior to 1990; these records are primarily a compilation of museum records and researchers' field notes.

Trends Discussion:

Populations are widespread and secure across the southern portion of the spadefoot range, however they are not secure in the northern part of the range where, in several northeastern states, local extirpations have occurred due to urbanization (NatureServe 2012).

Natural fluctuations in population size associated with annual variations in weather and reproductive success render status assessments of spadefoot populations difficult (Klemens 1993, Semlitsch et al. 1996). However, extirpations have been noted in Massachusetts (MA Herp Atlas), Connecticut (Klemens 1993), and New York (NYNHP 2011). At least one historical population in New York, reported from Clarkstown in Rockland County (DeKay 1842) is believed to be extirpated.

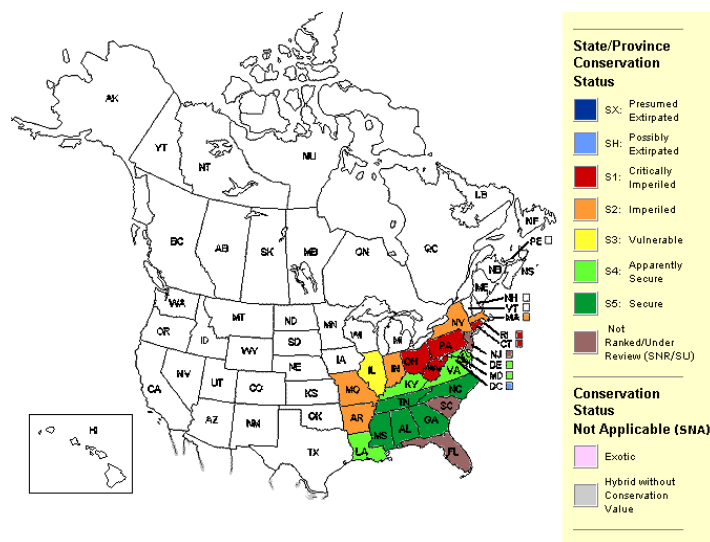


Figure 1: Conservation status of eastern spadefoot toad in the United States (NatureServe 2012).



Figure 2: Distribution of eastern spadefoot toad in the United States (IUCN 2014)

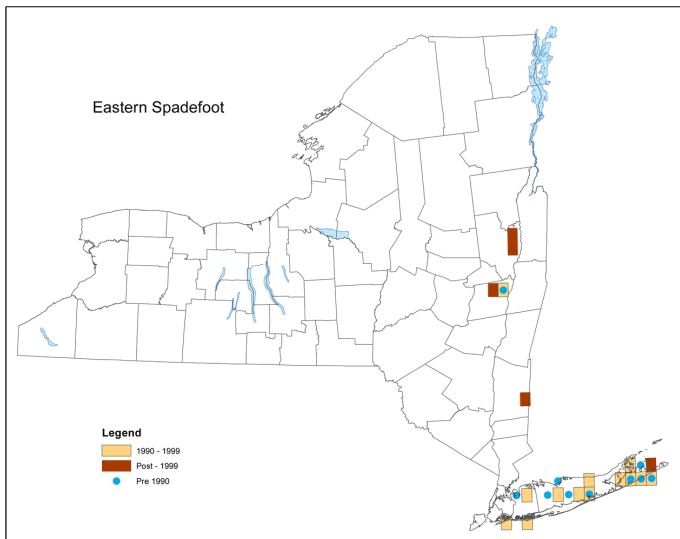


Figure 3: Distribution of eastern spadefoot in New York (NY Herpetology Database, NYSDEC)

III. New York Rarity, if known:

Historic (select one)	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
prior to 1970	_____	_____	<1%
prior to 1980	_____	_____	_____
prior to 1990	_____	_____	_____

Details of historic occurrence:

The eastern spadefoot toad is known historically from Long Island and the sand plains of Albany and Saratoga counties.

Current	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
	_____	_____	2%

Details of current occurrence:

The NYS Amphibian and Reptile Atlas (1990-99) documented eastern spadefoot toads in 13 survey quads. One of these is in Albany County and the rest are on Long Island. Since 2000, records have been added to the NY Herpetology database in 5 additional survey quads, bringing the total quads with records to 18 (2%). Two of these newly added records are in Saratoga County where sandy soils are prevalent. Another is in The Nature Conservancy's Roger Perry Memorial Reserve in Dutchess County.

Populations are known in areas where sandy soils provide appropriate habitat: on Long Island and in the sand plains of Albany and Saratoga counties. A new population was discovered in the Dover Plains area, halfway between Albany and New York City.

New York's Contribution to Species North American Range:

% of NA Range in New York	Classification of New York Range
___ 100 (endemic)	___ Core
___ 76-99	<u>X</u> Peripheral
___ 51-75	___ Disjunct
___ 26-50	Distance to core population:
<u>X</u> 1-25	_____

Rarity Discussion:

Spadefoot toads are common in the southeastern United States, and can be locally abundant in the northeastern states as well, though their secretive nature may cause them to appear less common than they truly are. However, some populations in the Northeast are limited and fragmented. These populations generally face pressure from habitat loss caused by development . The species requires ephemeral and vernal pools, as well as the surrounding uplands, which receive limited legal protection at best (Mahaney and Klemens 2008).

IV. Primary Habitat or Community Type:

- 1. Oak-Pine Forest
- 2. Pine Barrens
- 3. Coastal Coniferous Barrens
- 4. Coastal Plain Pond
- 5. Vernal Pool

Habitat or Community Type Trend in New York:

Declining Stable Increasing Unknown

Time frame of decline/increase: Since 1970s

Habitat Specialist? Yes No

Indicator Species? Yes No

Habitat Discussion:

Due to their multistage lifecycle, eastern spadefoot toads require a matrix of habitat types. They are found primarily in uplands of varying cover types, including open forest, shrubland, brushy areas, and occasionally old fields and farmlands (Gibbs et al. 2007), interspersed with ephemeral or vernal pools with open canopies. As a species that spends most of its time burrowed underground, the spadefoot requires dry soils that are easy to burrow in: either sand or sandy loam. These soils are characteristic of pitch pine/scrub oak natural communities and coastal oak woodlands, with sparse shrub growth and scattered temporary pools. Areas with leaf litter are preferred, in order to prevent desiccation and avoid predation (Baughman and Todd 2007). Spadefoot toads also prefer to burrow under shrubs, particularly are the edges of forested areas, which provide higher prey abundance, increased soil moisture, and protection from predators (Timm 2013). Upland areas

with high root density or unnatural substrates, such as sod or gravel, are generally avoided (Jansen 2001). In New York, remaining populations are found in pine barrens habitats.

V. New York Species Demographics and Life History

- Breeder in New York**
 - Summer Resident**
 - Winter Resident**
 - Anadromous**
- Non-breeder in New York**
 - Summer Resident**
 - Winter Resident**
 - Catadromous**
- Migratory only**
- Unknown**

Species Demographics and Life History Discussion:

Adults spend most of the time burrowed underground, emerging to feed every 5 to 9 days, often on warm, rainy nights from late spring until early fall. During winter, individuals may burrow as deep as 8 feet below the surface. The lifespan is 5 to 12 years. These toads require a habitat matrix of ephemeral or shallow vernal pools, surrounded by upland sandy soils and small shrubs with sparse root systems. They can dig burrows easily in loose sandy soils, but are impeded by dense root systems and dense soils. They prefer to feed and burrow under small shrubs which act as cover from predators and afford easy access to their insect prey (Timm 2013).

The eastern spadefoot is an explosive breeder (Wells 1977). In the Northeast, breeding may occur anytime from April to September. The critical event that triggers emergence of adults from underground is heavy rain when temperatures are above 55°F (Timm 2013). These heavy rain events may not occur on a yearly basis in the Northeast, and there may be several years between breeding events. In Massachusetts, breeding only occurred in 6 of 11 years sampled from 2001-2011 (Timm 2013). Breeding takes place in ponds and puddles, or in slight depressions and ditches that fill with water during heavy rains. Egg masses containing thousands of eggs are attached to submerged vegetation. Because breeding pools are ephemeral, eggs hatch quickly, sometimes in as

little as 48 hours but generally in 5 to 12 days. Eggs and larva cannot develop properly below 10°C (50°F) (Gosner and Black 1955). Sexual maturity is reached between 15–19 months after metamorphosis (Pearson 1955).

Pearson (1955) determined that eastern spadefoot toads returned to their home sites, sometimes even to the same burrow, after breeding in a pond 0.4 km (0.25 mi) away. Spadefoot toads may emigrate up to 449 m from breeding ponds, although most travel closer to 130 m (Timm 2013). Pearson (1955) calculated that eastern spadefoot toads have an average home range of 10.1 m² (108.4 ft²) while Timm (2013) found substantially larger home ranges, 108 m² (354 ft²), using radio-telemetry. Individuals may shift burrows several times during the spring-fall active period, with toads generally staying within 50m of the original burrow. During the active period spadefoot toads tend to dig shallower burrows, only 0.4 m (1.3 ft) with deeper burrows for overwintering (Timm 2013).

Due primarily to its sensitivity to environmental conditions, eastern spadefoot toads have adapted to use pools with short hydroperiods, they are able to breed in pools most other amphibians cannot utilize, thus reducing predation and maximizing food resources.

VI. Threats:

The eastern spadefoot toad is a vernal pool species. Because it occurs in floodplains and valleys, it is threatened by habitat destruction from residential and industrial development, as well as habitat alteration and changes in water chemistry from agricultural practices (Jansen et al. 2001).

Threats include vernal pool loss from development, upland habitat loss and fragmentation, road mortality, contaminants, parasites, and pathogens (NYSDEC 2006). The species is also vulnerable to pesticides, as it appears to have been extirpated on Nantucket Island, MA after World War II as a result of DDT use (MA SWAP).

The chytrid fungus, *Batrachochytrium dendrobatidis*, is a fungal pathogen that causes death in more than 100 amphibian species (Daszak et al. 1999). It has recently appeared in the United States (e.g. Rittman et al. 2003) and its effects on amphibian populations could be detrimental, although it has not yet been identified in spadefoot toads. First identified in the 1960s (Granoff et al. 1965), ranaviruses have been shown to cause mortality in at least 14 families and more than 70 individual species of amphibians (Miller et al. 2011) including spadefoot toads (Hoverman et al. 2011).

Eastern spadefoot was classified as “highly vulnerable” to predicted climate change in an assessment of vulnerability conducted by the New York Natural Heritage Program (Schlesinger et al. 2011).

Are there regulatory mechanisms that protect the species or its habitat in New York?

No Unknown

Yes

In 2006, the State of New York adopted legislation (ECL section 11-0107 sub 2) that gave all native frogs, turtles, snakes, lizards and salamanders legal protection as game species, and no amphibian species are open to harvest. The legislation also outlaws the sale of any native species of herpetofauna regardless of its origin.

The temporary pools that spadefoot toads breed in frequently do not meet the definition of a wetland, and therefore are not protected under wetland laws.

Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

Additional study of the species to help assess needed conservation actions would be beneficial, as would the development of an eastern spadefoot management plan for New York. Buffer areas surrounding vernal pools should be considered when managing state lands. A 250m buffer is recommended.

The Comprehensive Wildlife Conservation Strategy (NYSDEC 2005) includes recommendations for the following actions for eastern spadefoot. Conservation actions following IUCN taxonomy are categorized in the table.

Habitat management:

Provide for stability/security of vernal pool habitats which support the species.

Invasive species control:

Manage exotic competitors, predators and pathogens which might undermine the integrity of spadefoot toad populations.

Modify regulation:

Adopt into New York's Environmental Conservation Law provisions which designate spadefoot toad as a protected small game species.

Population monitoring:

Conduct periodic monitoring of populations in order to detect population trends.

Statewide baseline survey:

Develop population survey protocols, and implement protocols at known and potentially suitable sites to determine present distribution and status of this species in New York.

Statewide management plan:

— Incorporate eastern spadefoot toad conservation objectives into state land management planning.

Conservation Actions	
Action Category	Action
Land/Water Management	Site/Area Management
Land/Water Management	Habitat and Natural Process Restoration
Land/Water Management	Invasive/Problematic Species Control

VII. References

Baughman, B. and B. Todd. 2007. Role of substrate cues in habitat selection by recently metamorphosed *Bufo terrestris* and *Scaphiopus holbrookii*. *Journal of Herpetology* 41:154-157.

Daszak, P., Berger, L., Cunningham, A.A., et al. 1999. Emerging infectious diseases and amphibian population declines. *Emerging Infectious Diseases* 5:735-748.

Gibbs, J. P., A.R. Breisch, P.K. Ducey, G. Johnson, J.L. Behler and R.C. Bothner. 2007. *The Amphibians and Reptiles of New York State: Identification, Natural History and Conservation*. New York; Oxford University Press.

Gosner, K. L. and I. Black. 1955. The effects of temperature and moisture on the reproductive cycle of *Scaphiopus h. holbrookii*. *American Midland Naturalist* 54:192-203.

Granoff A., P. E. Came, and K. A. Rafferty. 1965. The isolation and properties of viruses from *Rana pipiens*: their possible relationship to the renal adenocarcinoma of the leopard frog. *Annals of the New York Academy of Science* 126:237-255.

Hoverman, J. T., M. J. Gray, N. A. Haislip, and D. L. Miller. 2011. Phylogeny, life history, and ecology contribute to differences in amphibian susceptibility to ranaviruses. *Ecohealth*, Online ahead of print: doi: 10.1007/s10393-011-0717-7.

IUCN (International Union for Conservation of Nature), Conservation International & NatureServe. 2004. *Scaphiopus holbrookii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2

Jansen, K. P., A. P. Summers, and P. R. Delis. 2001. Spadefoot toads (*Scaphiopus holbrookii holbrookii*) in an urban landscape: effects of nonnatural substrates on burrowing in adults and juveniles. *Journal of Herpetology*, 35(1): 141-145.

Klemens, M.W. 1993. Amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History Survey of Connecticut, Bulletin Number 112, Hartford, Connecticut.

Mahaney, W.S. and M.W. Klemens. 2008. Vernal Pool Conservation Policy: The federal, state and local context. In: Calhoun, A.J.K. and P.G. deMaynadier, editors. Science and conservation of vernal pools in northeastern North America. Boca Raton, FL: CRC Press. p:193-211.

Massachusetts Division of Fisheries & Wildlife. 2005. Commonwealth of Massachusetts Comprehensive Wildlife Conservation Strategy. Department of Fish and Game, Executive Office of Environmental Affairs. <http://www.mass.gov/dfwele/dfw/>

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: January 4, 2013).

NEPARC. 2010. Northeast Amphibian and Reptile Species of Regional Responsibility and Conservation Concern. Northeast Partners in Amphibian and Reptile Conservation (NEPARC). Publication 2010-1.

Pearson, P.G. 1955. Population ecology of the spadefoot toad, *Scaphiopus h. holbrookii* (Harlan). *Ecological Monographs* 25:233–267.

Rittman, S.E., E. Muths, and D.E. Green. 2003. *Pseudacris triseriata* (western chorus frog) and *Rana sylvatica* (wood frog) Chytridiomycosis. *Herpetological Review* 34:53.

Schlesinger, M.D., J.D. Corser, K.A. Perkins, and E.L. White. 2011. Vulnerability of at-risk species to climate change in New York. New York Natural Heritage Program, Albany, NY.

Semlitsch, R.D., D.E. Scott, J.H.K. Pechmann and J.W. Gibbons. 1996. Structure and dynamics of an amphibian community: evidence from a 16-year study of a natural pond. Pp. 217–248 in Cody, M.L. and J.A. Smallwood (Eds.), *Long-term Studies of Vertebrate Communities*. Academic Press, San Diego, California.

Timm, B. 2013. The Ecology and Conservation of the Eastern Spadefoot (*Scaphiopus holbrookii*) in the Province Lands of Cape Cod National Seashore, U.S.A. Ph.D. Dissertation, University of Massachusetts Amherst.

Wells, K.D. 1977. The social behavior of anuran amphibians. *Animal Behaviour* 25:666–693.

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