

## Species Status Assessment

<b>Class:</b>	Amphibia
<b>Family:</b>	Ranidae
<b>Scientific Name:</b>	<i>Lithobates [Rana] kauffeldi</i>
<b>Common Name:</b>	Atlantic Coast leopard frog

### Species synopsis:

More than a century of taxonomic confusion regarding the leopard frogs of the East Coast was resolved in 2012 with the publication of a genetic analysis (Newman et al. 2012) confirming that a third, cryptic species of leopard frog (*Rana* [= *Lithobates*] sp. nov.) occurs in southern New York, northern New Jersey, and western Connecticut. The molecular evidence strongly supported the distinction of this new species from the previously known northern (*R. pipiens* [= *L. pipiens*]) and southern (*R. sphenoccephala* [= *L. sphenoccephalus*]) leopard frogs.

*Rana kauffeldi* is morphologically similar to *R. sphenoccephala* and *R. pipiens*, but distinguishable by advertisement call, genetics, habitat, geographic distribution, and a combination of morphological characters (Feinberg et al. 2014).

Bioacoustic evidence of the frog's occurrence in southern New Jersey, Maryland, Delaware, and as far south as the Virginia/North Carolina border is available, thereby raising uncertainty about which species of leopard frog occur(s) presently and historically throughout the region. Some evidence suggests that Long Island might at one time have had two species: the southern leopard frog in the pine barrens and the Atlantic Coast leopard frog in coastal wetlands and the Hudson Valley. For simplicity's sake, in this assessment we retain the name "Atlantic Coast leopard frog" even though much of the information available may also refer to the southern leopard frog or a combination of species (Feinberg et al. 2014).

**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**    S1S2      **Tracked by NYNHP?**    Yes

**Other Rank:**

IUCN Red List – Least Concern  
Species of Moderate Concern (NEPARC 2010)

**Status Discussion:**

In diagnosing, describing, and defining the Atlantic Coast leopard frog, a new and potentially at-risk cryptic vertebrate species has been added to the northeastern and mid-Atlantic U.S. fauna. This species can be characterized as 1) potentially vulnerable with highly specialized and restrictive habitat needs; 2) locally abundant where present, but often only occurring in isolated and scattered locales; 3) having a restricted distribution across heavily populated, urbanized regions; and 4) having suffered extirpations from certain areas. Concerns over habitat loss and degradation continue today, along with a suite of other threats (e.g., disease, contaminants) that may pose additional future challenges (Feinberg et al. 2014).

**II. Abundance and Distribution Trends**

**a. North America**

**i. Abundance**

     declining         increasing      X   stable         unknown

**ii. Distribution:**

     declining         increasing      X   stable         unknown

Time frame considered: Past 20 years

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

**i. Abundance**

X declining \_\_\_ increasing \_\_\_ stable \_\_\_ unknown

**ii. Distribution:**

X declining \_\_\_ increasing \_\_\_ stable \_\_\_ unknown

Regional Unit Considered: northern edge (NY and PA)

Time Frame Considered: last 20 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

Regional Unit Considered: Not specified

Time Frame Considered: Not listed                      SGCN? No

**MASSACHUSETTS**                      Not Present \_\_\_\_\_                      No data \_\_\_\_\_

**i. Abundance**

\_\_\_\_ declining    \_\_\_\_ increasing                      \_\_\_\_ stable                       X  unknown

**ii. Distribution:**

\_\_\_\_ declining    \_\_\_\_ increasing                      \_\_\_\_ stable                       X  unknown

**Regional Unit Considered:** \_\_\_\_\_ Not specified \_\_\_\_\_

**Time Frame Considered:** \_\_\_\_\_ Not listed \_\_\_\_\_ SGCN? No \_\_\_\_\_

**ONTARIO**                                      Not Present  X  \_\_\_\_\_                      No data \_\_\_\_\_

**QUEBEC**                                      Not Present  X  \_\_\_\_\_                      No data \_\_\_\_\_

**VERMONT**                                      Not Present  X  \_\_\_\_\_                      No data \_\_\_\_\_

**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 \_\_\_\_\_

**PENNSYLVANIA**                      **Not Present** \_\_\_\_\_                      **No data** \_\_\_\_\_

**i. Abundance**

  X   **declining**    \_\_\_ **increasing**                      \_\_\_ **stable**                      \_\_\_ **unknown**

**ii. Distribution:**

  X   **declining**    \_\_\_ **increasing**                      \_\_\_ **stable**                      \_\_\_ **unknown**

Time frame considered:   Since 1980s  

Listing Status:                   Endangered                      SGCN?   Yes

**d. NEW YORK**

No data \_\_\_\_\_

**i. Abundance**

declining     increasing     stable     unknown

**ii. Distribution:**

declining     increasing     stable     unknown

Time frame considered: Since 1970s

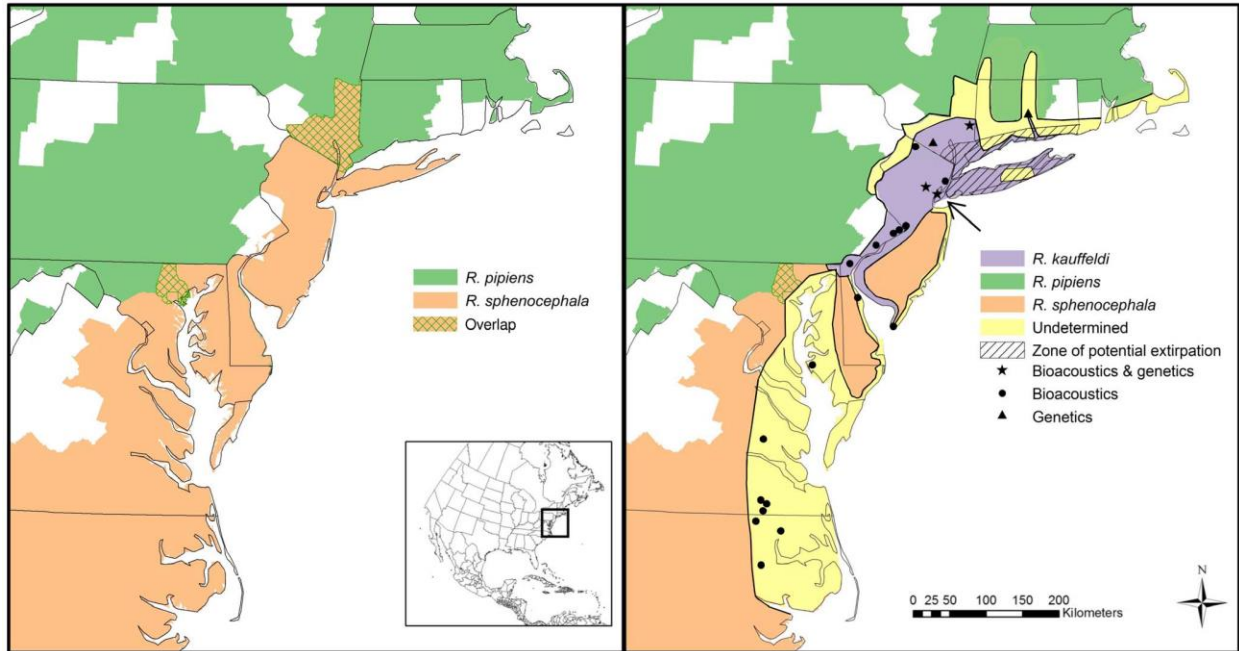
**Monitoring in New York:**

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. Note that several of the "southern leopard frog" records in the database are considered suspect.

**Trends Discussion:**

The range of the southern leopard frog is restricted in the Northeast almost entirely to the non-glaciated portions of New York (Long Island and Orange and Rockland counties) and New Jersey (Klemens et al. 1987). Newman et al. (2012) documented the undescribed leopard frog in western Connecticut as well.

Populations in New York occur in areas that have been subjected to heavy development. Where appropriate habitat remains, southern leopard frog populations appear to be stable, but wetland losses have undoubtedly caused a long-term decline (Gibbs et al. 2007).



**Figure 1.** Leopard frog distributions in the Northeast and mid-Atlantic US. Left: currently recognized IUCN (2012) range maps for *R. pipiens* (green) and *R. sphenoccephala* (orange) with areas of potential overlap (hatched). Right: newly interpreted distributions for all three leopard frog species including *R. kauffeldi*. Symbols indicate known *R. kauffeldi* populations and purple shading depicts areas where our field work has confirmed the occurrence of *R. kauffeldi*. Yellow shading indicates areas of less intensive examination and sampling; *R. kauffeldi* may occur in these areas based on habitat and proximity to known populations. Potential sympatry is also possible in the yellow shaded areas, with *R. sphenoccephala* (from Long Island southward), or *R. pipiens* (north and west of Long Island). The type locality for *R. kauffeldi* is indicated by an arrow (Feinberg et al. 2014).

**III. New York Rarity:**

<b>Historic</b> (select one)	<b><u># of Animals</u></b>	<b><u># of Locations</u></b>	<b><u>% of State</u></b>
<b>prior to 1970</b>	_____	<u>100+</u>	<u>20%</u>
<b>prior to 1980</b>	_____	_____	_____
<b>prior to 1990</b>	_____	_____	_____

**Details of historic occurrence:**

Southern leopard frogs were known from Long Island, New York City, and the lower Hudson Valley; these specimens may have actually been Atlantic Coast leopard frogs.

<b>Current</b>	<b><u># of Animals</u></b>	<b><u># of Locations</u></b>	<b><u>% of State</u></b>
	_____	<u>6</u>	<u>&lt;1%</u>

**Details of current occurrence:**

*Rana kauffeldi* is known from three states (CT, NY, NJ) based on genetic samples [3] and seven states (NY, NJ, PA, Delaware [DE], Maryland [MD], Virginia [VA], and North Carolina [NC]) based on bioacoustic sampling reported here. The estimated range from these samples is approximately 780 km, north-to-south, from central CT to northeastern NC (Fig. 1). The range is narrow, however, east-to-west, occurs almost entirely within the densely populated I-95 corridor, and is smaller than most if not all other ranid frogs along the eastern North American seaboard. Within the presented range, a core sampling area (Fig. 1, purple shading) was depicted where gaps in genetic and bioacoustic information were filled by other lines of evidence (e.g., specimens, photographs, geology, or historical literature). *Rana kauffeldi* appears to occur parapatrically in this core area.

**New York’s Contribution to Species North American Range:**

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



**Rarity Discussion:**

**IV. Primary Habitat or Community Type:**

1. Freshwater Marsh
2. Wet Meadow/Shrub Swamp
3. Eutrophic Pond
4. Ditch/Artificial Intermittent Stream

**Habitat or Community Type Trend in New York:**

Declining       Stable       Increasing       Unknown

Time frame of decline/increase: Since 1950s

Habitat Specialist?       Yes       No

Indicator Species?       Yes       No

**Habitat Discussion:**

*Rana kauffeldi* inhabits a restricted range of mesic lowland habitats that primarily includes coastal freshwater wetlands, tidally influenced backwaters, and interior riparian valley floodplains. This species is typically associated with large wetland complexes composed of open-canopied marshes, wet meadows, and slow-flowing systems with ample open upland and early-successional habitats. Aquatic conditions are usually clear, shallow, and sometimes ephemeral, with emergent shrubs or stands such as cattail, *Typha* spp., or the invasive common reed, and *Phragmites australis* (Feinberg et al. 2014).

**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:**

*Rana kauffeldi* begins breeding around the same time as *R. sylvatica* and *R. sphenoccephala* and slightly in advance of *R. pipiens* and *R. palustris*. In NY, migratory activity has been observed on rainy nights with above-average temperatures in early February, and the onset of chorusing has been documented after several days of above-average temperatures in early-to-mid March. Choruses are most consistent nocturnally, with air temperatures ranging from 10–18uC, but sustained diurnal and nocturnal chorusing is common early in the season and through the initial 2–3 week peak breeding period (late March and early April in NY), especially on warmer days. Thereafter, chorusing tapers to a more episodic nocturnal and precipitation-based regime from mid-April through early June (in NY). Opportunistic mid-summer chorusing has not been observed as it has been for *R. sphenoccephala* (Pace 1974, Bridges and Dorcas 2000), but occasional second breeding periods have been observed with the onset of cooler autumn temperatures and precipitation (late August through November). Individuals may exhibit a limited degree of color change around a general base color that can vary widely between frogs, from light green to dark brown. Holmes (1916) noted that leopard frogs (*sensulato*) tend towards darker nocturnal shading and brighter, more vivid diurnal colors (as a putative mode of camouflage). Some degree of seasonal color change also appears to exist in *R. kauffeldi*; frogs were often observed with darker, drabber color and fainter tympanic spots in the early spring, and more vivid and varied overall color and brighter, more defined tympanic spots later in the season. During breeding, males congregate in concentrated groups, or possible leks (Pace 1974), that typically include five or more frogs, with as

few as 30 cm between individuals. Males call while floating in shallows with emergent vegetation and as little as 20 cm of water.

As stated by Mathewson (Mathewson 1955), their calls are low-pitched and do not carry far. This is especially apparent in the presence of louder, higher pitched sympatric species like spring peepers (*Pseudacris crucifer*). Thus dense aggregations may have compensatory value, especially when faced with noisy conditions (Wollerman 1999) or acoustic competition from other anurans (Wells 2007, Gerhardt and Schwartz 1995, Penna and Velasquez 2011). Egg masses are often clustered in groups or deposited near one another. Porter (1941) and Moore (1949) discussed eggs and embryonic development among specimens (referred to as *R. pipiens*) from Philadelphia and NJ, respectively, that we consider *R. kauffeldi*. Little is known about non-breeding activity or dispersal in *R. kauffeldi*, but leopard frogs have been described as being fairly terrestrial on Staten Island (Mathewson 1955). In our work, we observed individuals on land later in the season, but also noted periods, typically in summer and early fall, when few if any individuals could be found. Diet is not specifically known, but is presumably similar to those reported for other regional leopard frog species.

## VI. Threats:

Atlantic Coast leopard frogs occur in the most densely developed areas of New York and have undoubtedly declined due to loss of wetlands. Where wetlands remain, however, clearly this species can survive even when surrounded by suburbia. However, where it becomes necessary to cross roads between upland areas and breeding areas, amphibians suffer high road mortality.

The chytrid fungus, *Batrachochytrium dendrobatidis* (Bd), first described in 1998 (Longcore et al. 1999), is a fungal pathogen that has affected more than 200 amphibian species in 6 countries (Skerratt et al. 2007). Southern leopard frogs are known to be susceptible to Bd (Daszak et al. 2005) and it is possible that Atlantic Coastal leopard frogs are as well.

Southern leopard frog was classified as “moderately vulnerable” to predicted climate change in an assessment of vulnerability conducted by the New York Natural Heritage Program (Schlesinger et al. 2011) and Atlantic Coast leopard frog would likely have the same rating.

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

**No**       **Unknown**

**Yes (describe mechanism and whether adequate to protect species/habitat)**

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 salamander

species are open to harvest. The legislation also outlaws the sale of any native species of herpetofauna regardless of its origin.

The Freshwater Wetlands Act provides protection for wetlands greater than 12.4 acres in size under Article 24 of the NYS Conservation Law. The Army Corps of Engineers has the authority to regulate smaller wetlands in New York State, and the DEC has the authority to regulate smaller wetlands that are of unusual local importance. The Protection of Waters Program provides protection for rivers, streams, lakes, and ponds under Article 15 of the NYS Conservation Law.

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

The Comprehensive Wildlife Conservation Strategy (NYSDEC 2005) includes recommendations for the following actions for freshwater wetland amphibians, which includes southern leopard frog. Conservation actions following IUCN taxonomy are categorized in the table.

**Easement acquisition:**

- \_\_\_ Secure habitats critical to species survival by acquisition of conservation easements, or by other land protection mechanisms.

**Habitat management:**

- \_\_\_ Manage the variety of factors which might be limiting wetland habitat suitability for resident amphibian species, including management of exotic plant and animal species, management of adverse hydrological alterations, and management of anthropogenic inputs of sediments and toxicants.

**Habitat research:**

- \_\_\_ Develop standardized habitat survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the character, quality and extent of occupied habitat.

**Life history research:**

- \_\_\_ Document life history parameters specific to New York populations of the species, including age and sex ratios, longevity, age at sexual maturity, survivorship of young, predator-prey relationships, and wetland/upland habitat requirements.

**Modify regulation:**

- \_\_\_ Modify Freshwater Wetlands Act, in order to protect wetlands smaller than 12.4 acres where they support species of conservation concern, and in order to expand the protected upland buffer beyond the 100-foot limit where necessary.
- \_\_\_ Adopt provisions into New York's Environmental Conservation Law designating four-toed salamander and Fowler's toad as a protected small game species.

**Other action:**

- \_\_\_ Periodically evaluate status of the subject species to determine whether appropriate E/T/SC status listings are in effect.

**Population monitoring:**

- \_\_\_ Conduct periodic surveys of known sites of species occurrence, in order to detect population trends.

**Statewide baseline survey:**

- \_\_\_ Develop standardized population survey protocols, and implement protocols at all known and potentially suitable sites to document the extent of occupied habitat.

<b>Conservation Actions</b>	
<b>Action Category</b>	<b>Action</b>
Land/Water Protection	Site/Area Protection
Land/Water Protection	Resource/Habitat Protection
Land/Water Management	Site/Area Management
Land/Water Management	Habitat and Natural Process Restoration
Land/Water Management	Invasive/Problematic Species Control
Law/Policy	Legislation

**VII. References**

Caldwell, J.P. 1986. Selection of egg deposition sites: A seasonal shift in the southern leopard frog, *Rana sphenoccephala*. *Copeia* 1986:249-53.

- Daszak, P., D. E. Scott, A. M. Kilpatrick, C. Faggioni, J. W. Gibbons, and D. Porter. 2005. Amphibian population declines at Savannah River Site are linked to climate, not chytridiomycosis. *Ecology* 86: 3232–3237.
- Feinberg, J. A., C. A. Newman, G. J. Watkins-Colwell, M. D. Schlesinger, B. Zarate, B. R. Curry, H. B. Shaffer, and J. Burger. 2014. A new cryptic North American leopard frog species (Amphibia: Ranidae: *Rana*) from the northeast and mid-Atlantic United States with a summary of regional taxonomy. *Plos One* 9:10.
- Gerhardt HC, Schwartz JJ. 1995. Interspecific interactions in anuran courtship. In: Heatwole H, Sullivan BK, editors. *Animal biology, volume 2: social behavior*. Chipping Norton, NSW, Australia: Surrey Beatty and Sons. pp. 603–632.
- Gibbs, J. P., A. R. Breisch, P. K. Ducey, G. Johnson, J. L. Behler, R. Bothner. 2007. *Amphibians and reptiles of New York State: Identification, natural history, and conservation*. Oxford University Press. 504 pages.
- Holmes SJ. 1916. *The biology of the frog*. New York, NY: Macmillan. doi:10.5962/bhl.title.30369.
- Longcore, J. E., A. P. Pessier A. P., and D. K. Nichols. 1999. *Bd* gen. et sp. nov., a chytrid pathogenic to amphibians. *Mycologia* 91:219–227.
- Mathewson R. 1955. Reptiles and amphibians of Staten Island. *Proc Staten Island Inst Arts Sci* 17: 28–50.
- Moore JA. 1949. Geographic variation of adaptive characters in *Rana pipiens* Schreber. *Evolution* 3: 1–24. doi:10.2307/2405448.
- NEPARC. 2010. Northeast Amphibian and Reptile Species of Regional Responsibility and Conservation Concern. Northeast Partners in Amphibian and Reptile Conservation (NEPARC). Publication 2010-1.
- Newman, C. E., J. A. Feinberg, L. J. Rissler, J. Burger, and H. Bradley Shaffer. 2012. A new species of leopard frog (Anura: Ranidae) from the urban northeastern US. *Molecular Phylogenetics and Evolution* 63:445–455.
- Pace AE (1974) Systematic and biological studies of the leopard frogs (*Rana pipiens* complex) of the United States. *Misc Pub Univ Mich Mus Zool* 148: 1– 40.
- Penna M, Velasquez N (2011) Heterospecific vocal interactions in a frog from the southern temperate forest, *Batrachyla taeniata*. *Ethology* 117: 63–71.
- Porter, KR. 1941. Diploid and androgenetic haploid hybridization between two forms of *Rana pipiens*, Schreber. *Biol Bull* 80: 238–264. doi:10.2307/1537601.

Saenz, D., J.B. Johnson, C.K. Adams, and G.H. Dayton. 2003. Accelerated hatching of southern leopard frog (*Rana sphenocephala*) eggs in response to the presence of crayfish (*Procambarus nigrocinctus*) predator. *Coepia* 2003:646-49.

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.

Skerratt, L. F., R. Speare, S. Cashins, K. R. McDonald, A. D. Phillott, H. B. Hynes, and N. Kenyon. 2007. Spread of Chytridiomycosis has caused the rapid global decline and extinction of frogs. *EcoHealth* 4:125-134.

Wells KD (2007) *The ecology and behavior of amphibians*. Chicago, IL: University of Chicago Press. doi:10.7208/chicago/9780226893334.001.0001.

Wollerman L (1999) Acoustic interference limits call detection in Neotropical frog *Hyla ebraccata*. *Anim Behav* 57: 529-536.

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