Species Status Assessment

Common Name: Four-toed salamander **Date Updated:** March 12, 2025

Scientific Name: *Hemidactylium scutatum* **Updated By:** L. Pipino, C. Macklem

Class: Amphibia

Family: Plethodontidae

Species Synopsis:

The four-toed salamander, *Hemidactylium scutatum* (Temminck and Schlegel 1838), is the only species in the *Hemidactylium* genus, which belongs to the lungless salamander family, Plethodontidae (Wake 2012). These salamanders absorb oxygen through their moist skin. A study examining the range-wide phylogeography of the four-toed salamander identified six unique clades based on mitochondrial DNA but did not recommend a change to the current taxonomy of the species (Herman and Bouzat 2016). This work placed the New York population of four-toed salamanders in a clade that includes other four-toed salamander populations in the northeast (Herman and Bouzat 2016).

Four-toed salamanders are distributed patchily across much of the eastern United States and northward into southern Canada (Conant and Collins 1991). Due to its secretive nature, the species is likely more abundant than records indicate, and populations range-wide appear to be relatively stable (NatureServe 2023). In 2006, the four-toed salamander was removed from the list of Special Concern species in Massachusetts because it was found to be more abundant than previously thought. Pennsylvania also removed the four-toed salamander from the state's Species of Greatest Conservation Need (SGCN) list in 2015 due to Pennsylvania having an apparently secure population with low levels of threats (PGC-PFBC 2015). In New York, four-toed salamanders occur patchily across the state; they are difficult to find in many areas and are known to be locally abundant in only a few (Gibbs et al. 2007).

Four-toed salamanders are found in moist forests with adjacent wetlands that contain sphagnum hummocks over open water, a vital component for nesting. Such areas include bogs, swamps, fens, wet meadows, vernal pools, and the edges of lakes and ponds.

I. Status

a. Current legal protected Status

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

ii. **New York:** Not Listed; HPSGCN

b. Natural Heritage Program

i. **Global:** G5

ii. **New York:** S4 **Tracked by NYNHP?:** No

Other Ranks:

-IUCN Red List: Least Concern
-COSEWIC: Not at Risk
-Northeast Regional SGCN List (2023): Not listed
-NEPARC Regional List (2010): Species of Moderate Concern

Status Discussion:

Four-toed salamanders are described as secure due to being “widely but discontinuously distributed throughout much of the eastern U.S. and adjacent Canada” and being “more abundant and widespread than previously available records indicated” (NatureServe 2023).

Four-toed salamanders are a Group 2 Candidate Wildlife Species for assessment by the Canadian Committee on the Status of Endangered Wildlife in Canada. As such, the species is deemed to be of an intermediate priority level for assessment (COSEWIC 2025).

The Northeast Partners in Amphibian and Reptile Conservation (NEPARC 2010) lists four-toed salamander as a Species of Moderate Concern because the Northeast comprises <50% of the species’ US distribution, but more than 25% of states list the species as a SGCN.

The four-toed salamander is listed as a SGCN in the neighboring states of Connecticut and Vermont. but was removed from the list of Special Concern species in Massachusetts in 2006 and from the SGCN list in the 2015-2025 Pennsylvania Wildlife Action Plan.

II. Abundance and Distribution Trends

Region	Present?	Abundance	Distribution	Time Frame	Listing status	SGCN?
North America	Yes	Stable	Stable		G5	-
Northeastern US	Yes	Stable	Stable		-	No
New York	Yes	Unknown	Unknown		S4, Not listed	Yes
Connecticut	Yes	Stable	Stable		S4, Not listed	Yes
Massachusetts	Yes	Stable	Stable	1980-2015	S3S4, Not listed	No
New Jersey	Yes	Stable	Stable		SU, Not listed	No
Pennsylvania	Yes	Stable	Stable	2005-2015	S4, Not listed	No
Vermont	Yes	Unknown	Unknown	2005-2015	S2, Special Concern	Yes
Ontario	Yes	Stable	Stable	Through 1999	S4, Not listed	No
Quebec	Yes	Stable	Stable	Through 1999	S3, Not listed	No

Column options
Present?: Yes; No; Unknown; No data; (blank) or Choose an Item
Abundance and Distribution: Declining; Increasing; Stable; Unknown; Extirpated; N/A; (blank) or Choose an item
SGCN?: Yes; No; Unknown; (blank) or Choose an item

Monitoring in New York:

The New York Amphibian and Reptile Atlas Project (Herp Atlas), conducted from 1990-1999, documented the geographic distribution of all species of amphibians and reptiles in the state. The Herp Atlas database also includes pre-1990 records from various sources, such as museum records, researchers' field notes, agency reports, and published literature.

While there are currently no regular monitoring activities for the four-toed salamander in New York, since 2009, the Amphibian Migrations and Road Crossings Project, led by the Hudson River Estuary Program, enlists volunteers to monitor seasonal migrations of amphibians within the Hudson River Valley (NYSDEC n.d.).

Trends Discussion:

The short-term population trend of the four-toed salamander is relatively stable across its range; the long-term trend is described as "Likely stable in extent of occurrence, probably less than 25% decline in population size, area of occurrence, and number/condition of occurrences, but data are scant" (NatureServe 2023). States with more disjunct, isolated, peripheral, or small populations tend to be more imperiled (NatureServe 2023).

Early concern was expressed by Wright (1918), who stated that four-toed salamanders were vanishing in New York due to draining of wetlands. Although there is no specific trend data available for this species in New York, it is likely that populations have declined over the past century as a result of habitat loss. Klemens (1993) assessed the population in southern New England (including a study area in southern NY) as secure, and noted that it was flourishing in many moderately developed and semi-rural areas. He also reported the discovery of ten new populations in New York through species-specific surveys.

While the species can be difficult to find, targeted survey efforts over the last 30 years have resulted in the identification of new county records across its range (NatureServe 2023). Survey efforts also indicate that the species is widespread, although insufficient distribution and abundance data prevent reliable tracking of population trends and status.

The four-toed salamander was removed from the list of Special Concern species of Massachusetts in 2006 and from the SGCN list of Pennsylvania's 2015-2025 Wildlife Action Plan due to populations having low levels of threats and being more abundant than previously thought. However, the species remains a SGCN in New York, Vermont, and Connecticut due to loss of habitat, uncertainty about population status and trends, and concerns about increasing land development, climate change, pollution, and disease.

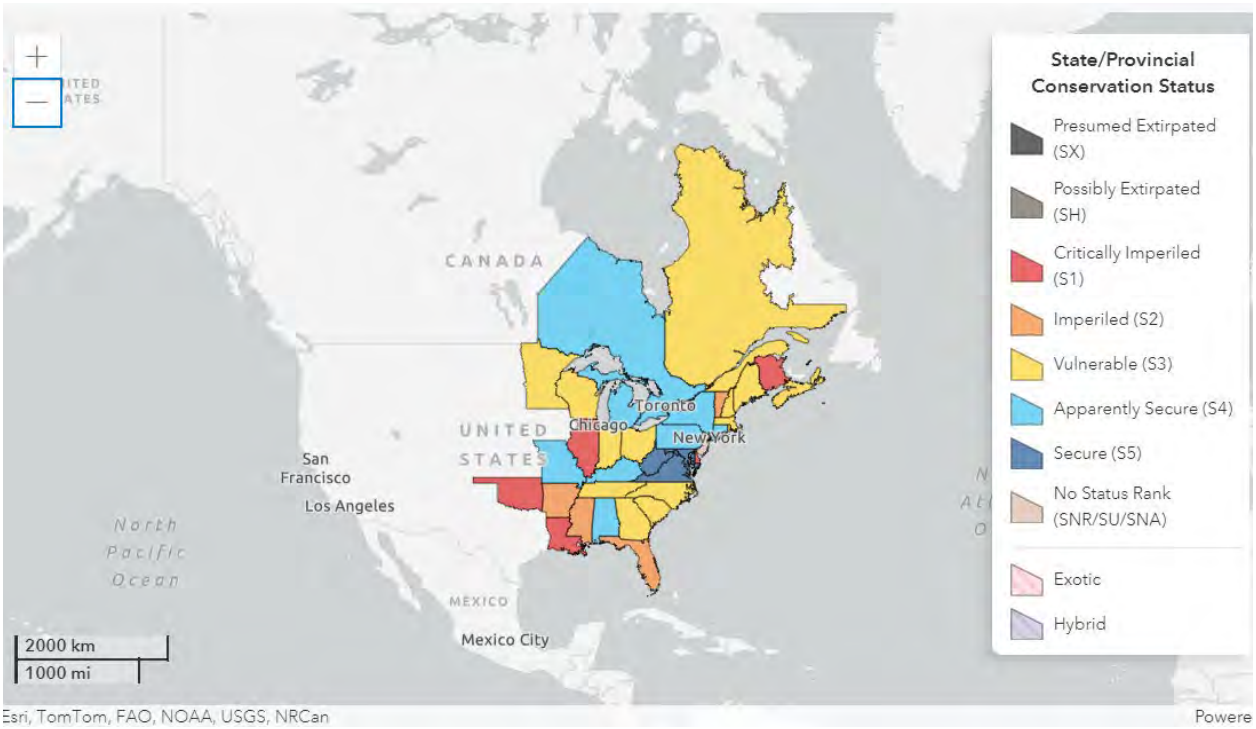

Figure 1. Conservation status of four-toed salamanders in North America (NatureServe 2023)

Figure 2. Four-toed salamander range map (IUCN 2022)

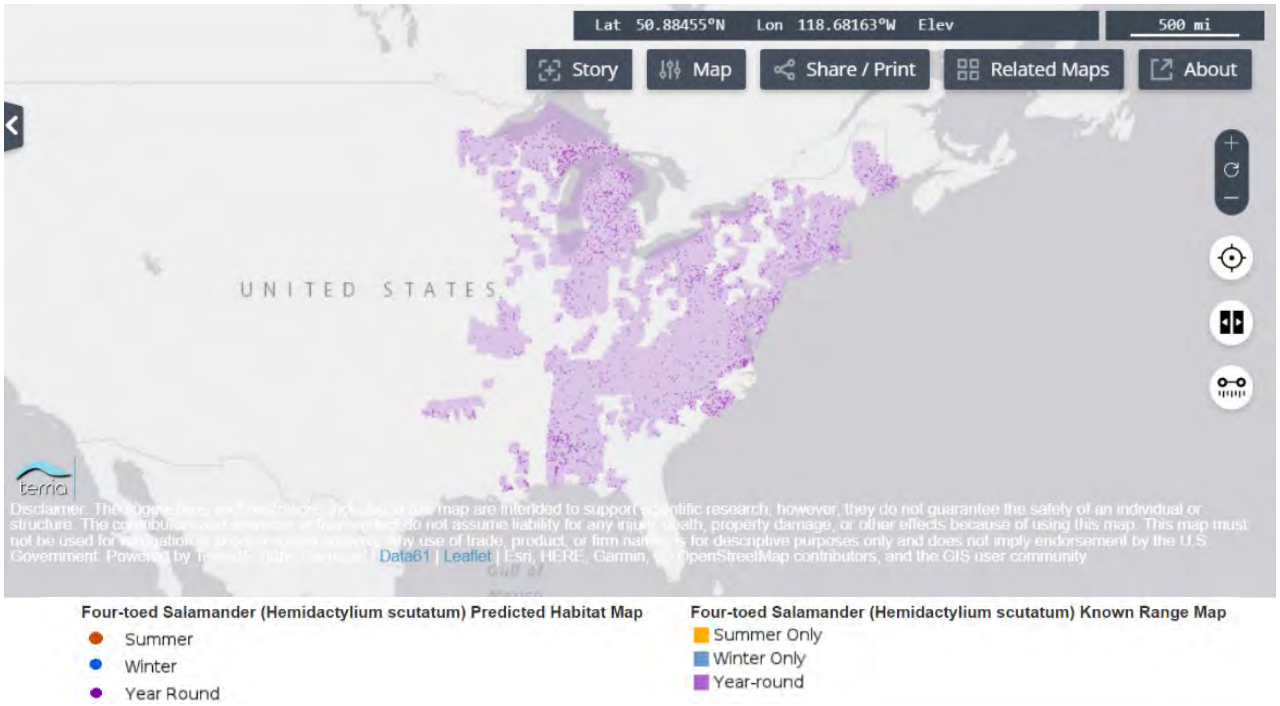

Figure 3. Four-toed salamander predicted habitat map and known range map (USGS 2019)

III. New York Rarity:

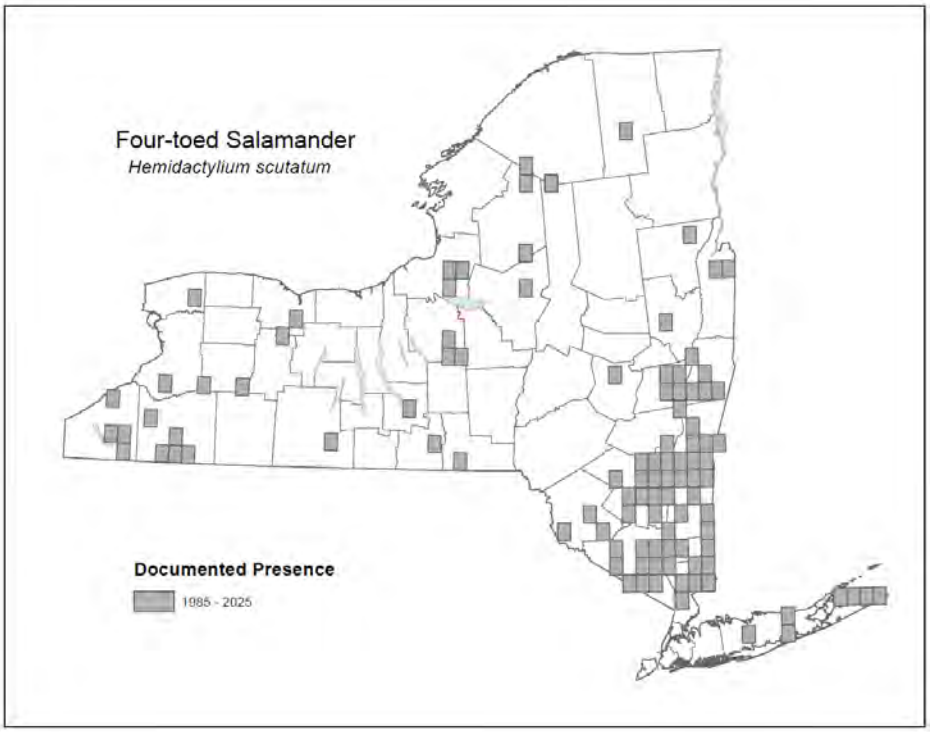

Figure 4. Distribution of four-toed salamander (*Hemidactylium scutatum*) records in New York (1985-2025). (NY Herpetology Database, Amphibian Migrations and Road Crossings Data, NYSDEC)

Details of historic and current occurrence:

In New York, four-toed salamanders are distributed patchily across the state. They are challenging to find in many areas and are known to be locally abundant in only a few (Gibbs et al. 2007). Due to the absence of regular statewide monitoring efforts for this species, estimates of abundance and population trends remain unknown. It is likely that the species is more abundant than available records indicate, as four-toed salamanders are often difficult to locate.

The NYS Amphibian and Reptile Atlas (1990-99) documented four-toed salamanders in 64 out of 979 survey quadrangles statewide. Historic data from 1985-1990 identified records in an additional 12 quadrangles. Since 2000, observations have been made in 28 new survey quadrangles, with 18 of these records submitted through the Amphibian Migrations and Road Crossings project (AMRC, 2009-2023), and the remaining 10 from the NY Herpetology Database. From 1985-2025, the four-toed salamander was recorded from a total of 104 quadrangles across the state (see Figure 4).

Citizen science records submitted through iNaturalist align with the known distribution of the species in New York (iNaturalist 2025). Unobscured records from this platform further identify an additional 20 quadrangles not captured in Figure 4. Additionally, 43 of the 104 known survey quads have been reconfirmed using iNaturalist community data.

New York's Contribution to Species North American Range:

Percent of North American Range in NY	Classification of NY Range	Distance to core population, if not in NY
1-25%	Core	

Column options
Percent of North American Range in NY: 100% (endemic); 76-99%; 51-75%; 26-50%; 1-25%; 0%; Choose an item
Classification of NY Range: Core; Peripheral; Disjunct; (blank) or Choose an item

IV. Primary Habitat or Community Type *(from NY crosswalk of NE Aquatic, Marine, or Terrestrial Habitat Classification Systems):*

1. Mixed Northern Hardwoods
2. Hardwood Swamp
3. Floodplain Forests
4. Riparian
5. Mixed Hardwood Swamp
6. Vernal Pool
7. Open Acidic Peatlands

Habitat or Community Type Trend in New York

Habitat Specialist?	Indicator Species?	Habitat/ Community Trend	Time frame of Decline/Increase
Yes	Yes	Declining	

Column options
Habitat Specialist and Indicator Species: Yes; No; Unknown; (blank) or Choose an item
Habitat/Community Trend: Declining; Stable; Increasing; Unknown; (blank) or Choose an item

Habitat Discussion:

Four-toed salamanders occur in moist forest habitats of a wide variety as long as they include small ponds, seeps, bogs, or swamps (Gibbs et al. 2007; Meyer 2008).

Eggs are laid in mossy areas that just overhang water (Bishop 1941, Gibbs et al. 2007), a microhabitat that may be limited even in relatively large wetlands. Vegetative moisture level appears to be more critical than the species of moss that are present (Thurow 1997, Gibbs et al. 2007). Researchers in Maine (Chalmers 2004, Chalmers and Loftin 2006b) observed that four-toed salamanders were typically found nesting in marshes with a history of beaver activity or in wetlands with a forested canopy and some input from groundwater (e.g., seeps or slow-moving, seasonal streams). Other wetlands with nesting four-toed salamanders included large, beaver-dammed ponds with fish; natural and human-constructed, isolated vernal pools, and fens. They also found that among wetlands with four-toed salamander nests, the wetland shorelines that had nests tended to have deeper vegetation, deeper water beneath and within 2 m of the nest, more moss spp. and winterberry, and less meadowsweet, leatherleaf, and sheep laurel (Chalmers 2004, Chalmers and Loftin 2006b).

Larvae are aquatic, occupying the wetland habitats adjacent to the nesting site (Meyer 2008). Larvae tend to prefer slow-moving or still water, fishless bodies of water, waters that won't dry until metamorphosis in late summer, and waters with an adjacent moist terrestrial microhabitat containing leaf litter, moss, and/or decaying logs (Thurow 1997; Meyer 2008). Adults, and presumably juveniles, use forested terrestrial habitats and cover objects such as logs, stumps, stones, moss, or leaves adjacent to the water's edge (Thurow 1997, Gibbs et al. 2007). Four-toed salamanders also overwinter in terrestrial habitats beneath rotting logs or leaf litter, in the spaces between rotting tree roots, or in small depressions or cavities in the ground (Blanchard 1933).

V. Species Demographic, and Life History:

Breeder in NY?	Non-breeder in NY?	Migratory Only?	Summer Resident?	Winter Resident?	Anadromous/ Catadromous
Yes	-	-	Yes	Yes	-

Column options
First 5 fields: Yes; No; Unknown; (blank) or Choose an item
Anadromous/Catadromous: Anadromous; Catadromous; (blank) or Choose an item

Species Demographics and Life History Discussion:

Four-toed salamanders reach sexual maturity by three years of age (Meyer 2008). Mating and courtship take place in forested terrestrial habitats during the fall (Gibbs et al. 2007). Females do not breed every year, likely because of limitations on food resources (Harris and Ludwig 2004). Adults have been found up to 660 feet away from the nearest wetland (NHESP 2007) and will disperse through unsuitable habitats such as roads, pastures, and forests with open canopies; however, four-toed salamanders often avoid forest edges and more open cover habitats and seem to rely on forest habitats with suitable cover and water bodies to disperse (Meyer 2008). Average dispersal or migration distances of four-toed salamanders are unknown (Meyer 2008).

Overwintering also occurs in terrestrial habitats from late November to late March (NHESP 2007). Four-toed salamanders spend the winter beneath rotting logs, in cavities in the ground under leaf litter, or in the spaces between rotting tree roots, frequently together with wood frogs, spring peepers, eastern newts, or other salamanders (Blanchard 1933).

Emergence occurs in late March to early May (Meyer 2008). Upon emergence, gravid female four-toed salamanders migrate to aquatic habitats, where they lay eggs in a nest of mosses or plant roots just overhanging the water's edge to facilitate hatching larvae falling directly into the water below (Gibbs et

al. 2007). One study in Kentucky found that the best predictor of the number of eggs and number of nests was amount of moss at the wetland (King et al. 2022). In Maine, nests can be found from April to July with nest attendance rates by females of over 80%, egg development lasting 5-8 weeks, and hatching occurring in June and July (Chalmers 2004, Chalmers and Loftin 2006a). In New York, a single clutch averages 25 eggs (Gilbert 1941), but communal nesting is common, and a single nest can contain eggs from multiple females (Gibbs et a. 2007). Eggs in New York were estimated to develop for 42-60 days (Bishop 1941). The nests may be attended by one or more females until the larvae hatch (Meyer 2008). Nests are sometimes abandoned, which reduces hatching success, but eggs are still protected by a chemical repellant in the jelly layer (Hess and Harris 2000). The larval period lasts six weeks or less, with individuals metamorphosing at a total length of ca. 18-25 mm (Bishop 1941, Chalmers 2004, Chalmers and Loftin 2006a). Little is known of the ecology of larvae and juveniles (Gibbs et al. 2007). Four-toed salamanders have a lifespan of up to nine years (NHESP 2007).

VI. Threats:

The four-toed salamander has specialized breeding requirements that make it vulnerable to habitat disturbance including road construction, development, and timber harvest in and around boggy wetlands, peat lands, and forested wetlands. Chalmers (2004) also found that four-toed salamanders in Maine may be adversely affected by acid precipitation, as they were only found to occupy wetlands with a higher pH. Habitat disruption may be ameliorated to some extent by wetland protection regulations.

Corser and Dodd (2004) found that four-toed salamanders exist in metapopulations that use multiple ponds. Population size at a given pond was negatively correlated to its distance from adjacent ponds, suggesting that fragmentation can affect population size. Fragmentation that disrupts this salamander's ability to move between breeding and terrestrial sites, changes water/soil chemistry, temperature, pool hydroperiod, humidity, etc., may have negative effects. Klemens (1993) notes that populations may flourish in many moderately developed and semi-rural areas in southern New England and that road mortality does not appear substantial when compared to many species of frogs and Ambystomatid salamanders.

Several emerging pathogens may also pose a threat to four-toed salamander populations, including *Batrachochytrium dendrobatidis* (*Bd*) and ranavirus. The chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*), first described in 1998 (Longcore et al. 1999), has become a disease of global concern, with a recent study finding *Bd*-infection in 72% of sampled countries and in 54% of amphibian species tested (Monzon et al. 2020). Four-toed salamanders have been found to have a diverse assemblage of skin bacteria that inhibit the growth of fungi, including the pathogen *Bd*, which could provide protection against the disease (Harris et al. 2006; Lauer et al. 2008). Moreover, the communal nesting behaviors of four-toed salamanders may facilitate the transmission of antifungal bacteria to embryos, providing protection against fungal infections (Banning et al. 2008). However, a study of chytrid prevalence in Connecticut amphibians found that one of two four-toed salamanders tested positive (Richards-Hrdlicka et al. 2013).

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). A study found ranavirus eDNA in 9 out of 10 pools historically or contemporaneously occupied by four-toed salamanders in New York, indicating that ranavirus is prevalent across New York four-toed salamander habitats (Kaganer et al. 2022). A disease prevalence study in North Carolina identified a four-toed salamander infected with ranavirus in 2016 (Lentz et al. 2021). The fungus *Batrachochytrium salamandrivorans* (*Bsal*), also known as salamander chytrid, is another emerging pathogen that has caused major die-offs of salamanders in Europe, but has not yet been found in the United States (Martel et al 2013). The introduction of *Bsal* to North America could have severe impacts on biodiversity

and salamander conservation; however, a study on host susceptibility observed 0% infection in four-toed salamanders exposed to *B. salamandrivorans* (Gray et al. 2023).

Four-toed salamanders may also be threatened by climate change. Climate change that affects hydroperiod and/or water temperature of breeding pools could also have significant impacts on productivity. Another study examined the proportion of habitat that will remain climactically suitable for four-toed salamanders in 2050 and 2070 based on climate change projections (Widmer et al. 2022). The study found that range restrictions increased with time and greenhouse gas concentrations, and that only 4% of current four-toed salamander habitat would remain suitable (Widmer et al. 2022).

Threat Level 1	Threat Level 2	Threat Level 3	Spatial Extent*	Severity*	Immediacy*	Trend	Certainty
1. Residential and Commercial	1.1 Housing & Urban Areas	(loss/degradation of habitat to development)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
4. Transportation & Service Corridors	4.1 Roads & Railroads	4.1.1 Roads (roadkill)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
8. Invasive & Other Problematic Species	8.4 Pathogens	8.4.2 Viral pathogens (ranavirus)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
8. Invasive & Other Problematic Species	8.4 Pathogens	8.4.3 Fungal pathogens (chytrid)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
9. Pollution	9.2 Industrial & Military Effluents	9.2.5 Mercury	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
11. Climate Change	11.4 Changes in Precipitation & Hydrological Regimes	11.4.2 Droughts	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.

Table 1. Threats to four-toed salamanders.

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

Yes: ✓ **No:** _____ **Unknown:** _____

If 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.

Under Article 24 of the New York State Environmental Conservation Law, the Freshwater Wetlands Act provides protection for wetlands greater than 12.4 acres in size, as well as smaller wetlands of unusual local importance. Starting on January 1, 2028, the Freshwater Wetlands Act will provide protection for wetlands greater than 7.4 acres in size. The Freshwater Wetlands Act also allows the Adirondack Park Agency to protect wetlands over one acre in size or any size wetland adjacent to open water within the Adirondack Park. The U.S. Army Corps of Engineers also protects wetlands, irrespective of size, under Section 404 of the Clean Water Act. Under Article 15 Title 5 of the New York State Environmental Conservation Law, the Protection of Waters program provides protection for the state's water resources, including rivers, streams, lakes, and ponds.

These regulatory mechanisms are likely insufficient to protect the four-toed salamanders or their habitats from all current threats.

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

To reduce negative effects of forestry practices, a 50 ft no-cut buffer should be left around wetlands where breeding occurs. Canopy cover of at least 75% should be left in 70% of the areas within a 250 ft buffer around breeding sites. Use of mechanized equipment within 250 ft of breeding sites should only occur between 15 November and 15 March of any given year. No vehicles should be allowed within 50 ft of breeding wetlands (NHESP 2007).

The Comprehensive Wildlife Conservation Strategy (NYSDEC 2005) includes recommendations for the following actions for freshwater wetland amphibians, which includes four-toed salamander. Actions that have been accomplished, or where progress has been made, are indicated with a check.

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 to protect wetlands smaller than 12.4 acres where they support species of conservation concern and 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 the 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 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.

Complete Conservation Actions table using IUCN conservation actions taxonomy at link below. Use headings 1-6 for Action Category (e.g., Land/Water Protection) and associated subcategories for Action (e.g., Site/Area Protection) - https://www.iucnredlist.org/resources/conservation-actions-classification-scheme

Action Category	Action	Description
A.1 Direct Habitat Management	A.1.0.0.0 Direct Habitat Management	Site/Area management
A.2 Direct Species Management	A.2.0.0.0 Direct Species Management	Invasive/problematic species control
C.6 Design and Plan Conservation	B.6.0.0.0 Design and Plan Conservation	Site/area and resource/habitat protection
C.6 Design and Plan Conservation	C.6.5.1.3 Develop a conservation, management, or restoration plan for protected private lands	Habitat and natural process restoration

Action Category	Action	Description
C.7 Legislative and Regulatory Framework or Tools	C.7.1.2.0 Create, amend, or influence legislation	Legislation

Table 2. Recommended conservation actions for the four-toed salamander.

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