

Species Status Assessment

Class:	Reptilia
Family:	Viperidae
Scientific Name:	<i>Crotalus horridus</i>
Common Name:	Timber rattlesnake

Species synopsis:

The timber rattlesnake occurs widely across the eastern United States from central New England southward to northern Florida and westward to eastern parts of Nebraska, Kansas, Oklahoma, and Texas. New York is at the northern edge of the range. In the Northeast, timber rattlesnakes are found in mountainous or hilly woodlands with rocky outcroppings, steep ledges, and talus slides. Populations of timber rattlesnake have undergone drastic declines rangewide since European settlement due to loss of habitat to development, removal by collectors, and mortality resulting from persecution and roadkill. It is thought that populations in New York have been reduced by 60% from their historical numbers (Stechert 1982).

Timber rattlesnakes have been studied extensively in New York. Populations currently occur in three general areas of the state: southeastern Adirondack Mountains, southeastern New York, and the Southern Tier. Northern populations have stabilized following the end of the bounty system, as have some dens in the Shawangunk Mountains and parts of the lower Hudson Highlands, but populations elsewhere are considered to be of poor status.

I. Status

a. Current and Legal Protected Status

- i. **Federal** Not Listed **Candidate?** No
- ii. **New York** Threatened; SGCN

b. Natural Heritage Program Rank

- i. **Global** G4
- ii. **New York** S3 **Tracked by NYNHP?** Yes

Other Rank:

IUCN – Least Concern

NEPARC – Species of Severe Concern

Species of Northeast Regional Conservation Concern (Therres 1999)

Status Discussion:

Timber rattlesnake populations have declined rangewide from historical levels, by perhaps 85% to 90% (W. H. Martin pers. comm. *in* Racette and Shea 2013), as a result of habitat loss and persecution. In New York, timber rattlesnakes have been extirpated from Long Island, New York City, parts of western New York, parts of the Adirondacks, and parts of the Catskill Mountains, with overall population loss statewide estimated at 60% (Stechert 1982).

Currently, there are an estimated 26 to 32 sub-populations in New York, occurring in association with as many as 218 active dens. In the Lake Champlain/Lake George region, the population has stabilized in response to the cessation of bounty hunting, while populations in other areas remain vulnerable to the effects of habitat loss and illegal take (Racette and Shea 2013). Element occurrence rankings in the New York Natural Heritage Program database indicate that only 35 (17%) of the 204 active dens have a status of “good” or better, and 125 (61%) have a status of “fair.”

Timber rattlesnakes are extirpated from Ontario, Quebec, Maine, Michigan, Delaware, and Rhode Island. It is listed as endangered or threatened in most northeastern states where it still occurs. In Pennsylvania, however, timber rattlesnake is a strictly-regulated game species that is also a candidate for state listing. NEPARC (2010) lists timber rattlesnake as a species of severe concern because more than 75% of northeastern states list it as SGCN.

II. Abundance and Distribution Trends

a. North America

i. Abundance

X declining ___ increasing ___ stable ___ unknown

ii. Distribution:

X declining ___ increasing ___ stable ___ unknown

Time frame considered: More than 30 years

b. Regional

i. Abundance

X declining ___ increasing ___ stable ___ unknown

ii. Distribution:

X declining ___ increasing ___ stable ___ unknown

Regional Unit Considered: Northeast

Time Frame Considered: Past 25 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 (SWAP)

Listing Status: Endangered SGCN? Yes

MASSACHUSETTS Not Present _____ No data _____

i. Abundance

declining ___ increasing ___ stable ___ unknown

ii. Distribution:

declining ___ increasing ___ stable ___ unknown

Time frame considered: 12 occurrences since 1980, down from 21
occurrences historically

Listing Status: Endangered SGCN? Yes

NEW JERSEY Not Present _____ No data _____

i. Abundance

declining ___ increasing ___ stable ___ unknown

ii. Distribution:

declining ___ increasing ___ stable ___ unknown

Time frame considered: _____

Listing Status: Endangered (1979) SGCN? Yes

ONTARIO Not Present _____ No data _____

i. Abundance

___ declining ___ increasing ___ stable ___ unknown

ii. Distribution:

___ declining ___ increasing ___ stable ___ unknown

Time frame considered: _____

Listing Status: Designated extirpated in 2001

PENNSYLVANIA Not Present _____ No data _____

i. Abundance

___ declining ___ increasing X stable ___ unknown

ii. Distribution:

___ declining ___ increasing X stable ___ unknown

Time frame considered: Declining in some areas, stable in others

Listing Status: Game species/candidate for state listing SGCN? Yes

QUEBEC Not Present X No data _____

i. Abundance

___ declining ___ increasing ___ stable ___ unknown

ii. Distribution:

___ declining ___ increasing ___ stable ___ unknown

Time frame considered: _____

Listing Status: _____

VERMONT Not Present _____ No data _____

i. Abundance

X declining ___ increasing ___ stable ___ unknown

ii. Distribution:

X declining ___ increasing ___ stable ___ unknown

Time frame considered: Historically widespread; currently 5 den sites

Listing Status: Endangered SGCN? Yes

d. NEW YORK

No data _____

i. Abundance

 X declining ___ increasing ___ stable ___ unknown

ii. Distribution:

 X declining ___ increasing ___ stable ___ unknown

Time frame considered: More than 30 years

Monitoring in New York.

The NYSDEC has established a goal of monitoring all dens by visual survey at least once every five years. Many dens are monitored more frequently during the course of research projects.

Trends Discussion:

Timber rattlesnakes were abundant at the time of European settlement, occurring in 30 states and Ontario (Environment Canada 2010). Currently, it is ranked as critically imperiled in 7 states, imperiled in 3 states, and vulnerable in 12 states. It is extirpated from Ontario, Maine, Rhode Island, Delaware, and Michigan.

In New York, timber rattlesnakes were present in Long Island and New York City through the late 19th century and into the early 20th century (Gibbs et al. 2007). They were also widespread through the western part of the state, where several dens were recently extirpated (see Racette and Shea 2013). Estimates of losses to New York populations vary by region. In northern New York, W.S. Brown estimates that den populations have been reduced by as much as 75%, and R. Stechert estimates that the total population is about 40% of what it was 100 years ago (see Racette and Shea 2013). Currently, the majority of dens are at some stage of depletion, while a few have rebounded as a result of legal protection.

Trends in abundance and distribution differ throughout the state. Dens in the northern part of the state are currently considered stable, with some den populations considered large and apparently robust. There is no evidence of natural recolonization of an extirpated den site, an important measure of population recovery. In the southeastern part of the state there are very few large den populations, and even these are not considered stable, due to their proximity to higher human populations, which increases their susceptibility to development and persecution. Some of these dens may be critically depleted, with concerns about genetic depression and poor reproduction limiting the ability of the sub-population to recover without management intervention. There is inadequate information to determine trends in the Southern Tier area.

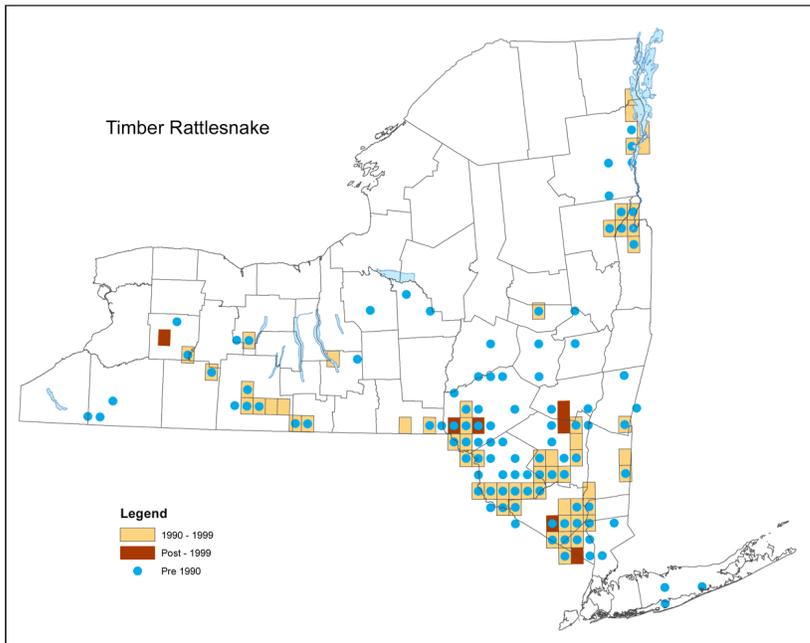


Figure 1: Current and historic records of timber rattlesnake in New York (NY Herpetology database, NYSDEC).

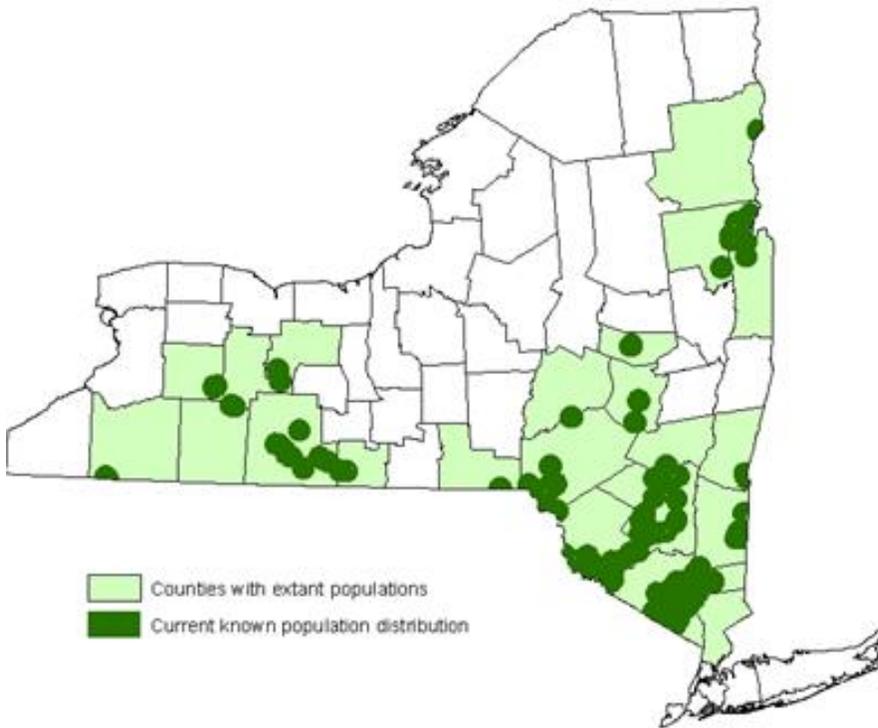


Figure 2: Distribution of timber rattlesnake in New York (NY Recovery Plan).

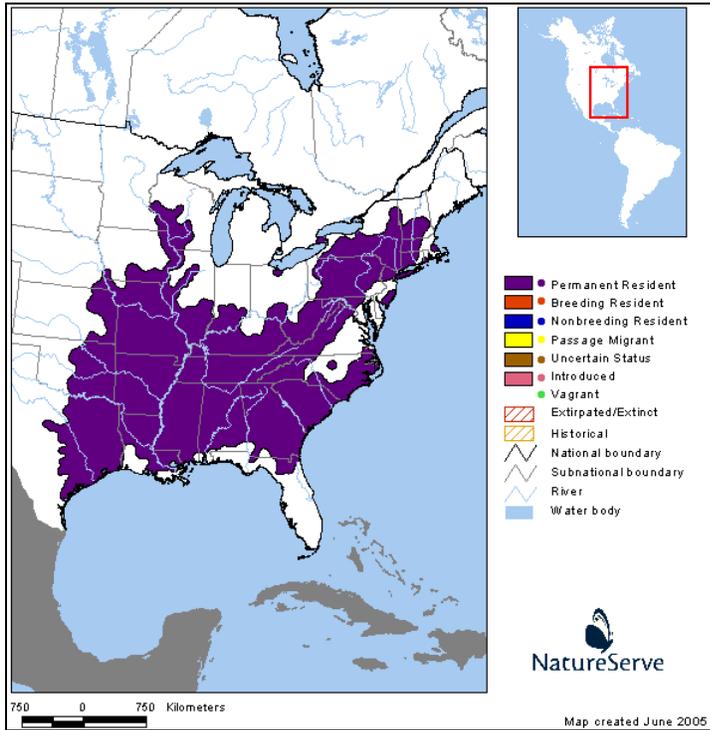


Figure 3: Distribution of timber rattlesnake in the United States (NatureServe 2013).

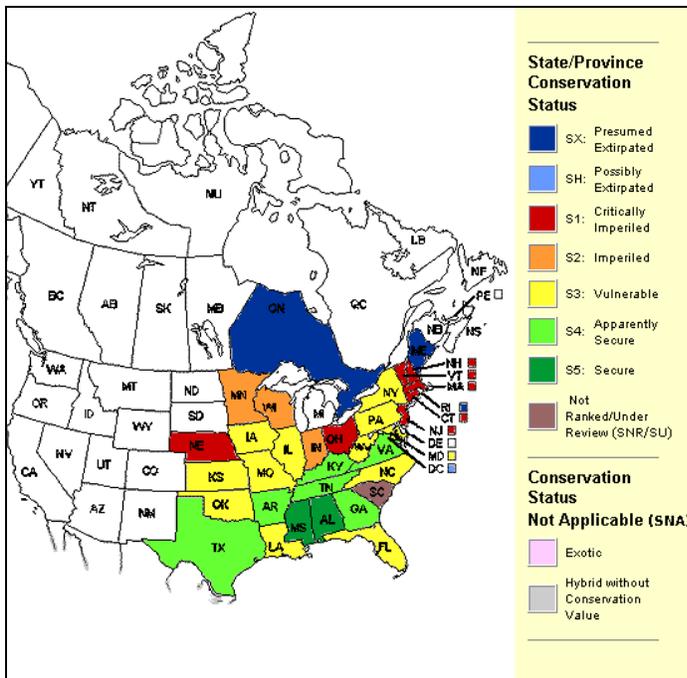


Figure 4: Conservation status of timber rattlesnake in the United States (NatureServe 2013).

III. New York Rarity, if known:

Historic	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
prior to 1970	_____	_____	_____
prior to 1980	_____	_____	_____
prior to 1990	_____	_____	_____

Details of historic occurrence:

Timber rattlesnakes have been extirpated from Long Island, New York City, and much of western New York and the Catskill Mountains.

Current	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
	<u>8K to 10K</u>	<u>~218</u>	<u>+/-5%</u>

Details of current occurrence:

Timber rattlesnakes occur in isolated populations in southeastern New York, the Southern Tier, and in the peripheral eastern Adirondack Mountains. There are currently 26-32 sub-populations of timber rattlesnake with an additional 28 isolated den locations (Racette and Shea 2013). The NY Natural Heritage Program database included 204 known active den sites in 2012; there are some additional, recently verified sites not yet available in the NYNHP database.

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	_____

IV. Primary Habitat or Community Type:

1. Cliff and Talus
2. Residential Rural
3. Oak Forest
4. Powerline
5. Oak-Pine Forest

Habitat or Community Type Trend in New York:

Declining Stable Increasing Unknown

Time frame of decline/increase: last 200 years

Habitat Specialist? Yes No

Indicator Species? Yes No

Habitat Discussion:

The annual life cycle of timber rattlesnakes centers around the hibernaculum, which is typically situated on a mountain slope with southern exposure where a partial canopy cover provides both sun and shade, and there is access to deep underground retreats (Gibbs et al. 2007). Populations that occurred historically on Long Island used tree root cavities as hibernacula (Racette and Shea 2013).

Summer habitat consists primarily of deciduous forest in mountainous areas, but rattlesnakes also use coniferous forest, mixed forest, old fields, or wetlands (Brown 1993). In Pennsylvania, timber rattlesnakes are found in higher abundance in oak-dominated forests because of a higher abundance of rodent prey (Brittingham et al. 2005). Timber rattlesnakes will swim across large water bodies and may therefore also be found on islands (W. Brown personal communication, Furman 2007). Migratory habitat exists between the den site and the summer foraging habitat, and is susceptible to fragmentation by development and roads.

Gravid females have specific habitat requirements for gestating and birthing. Knolls, outcrops, and shelter boulders near the dens are used as communal gestating sites and birthing rookeries that provide full sun exposure for at least part of the day, protection from predators, and shelter from inclement weather. Such areas consist of a rock or group of rocks, averaging 164m from the den (Martin 1992 in Racette and Shea 2013). Due to their microhabitat requirements and limited mobility during gestation, gravid females are especially prone to illegal collection at the gestating knolls.

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

Timber rattlesnake populations are centered around communal wintering dens. Both males and females exhibit strong site fidelity to their natal den. Ingress/egress dates vary regionally, but in New York timber rattlesnakes are generally active from April or early May to mid or late October. After a period of 1 to 4 weeks, snakes move away from the dens, with males ranging an average of 2.5 miles and females ranging an average of 1.3 miles (Brown 1993).

In northeastern New York, W. S. Brown (see Racette and Shea 2013) found that females reach sexual maturity in 7 to 11 years and males in 4 to 7 years. Males may mate annually. While most females mate every three years, some reproduce only every four, five, or even six years. Based on preliminary data over an 18-year period, the number of lifetime reproductive efforts appears to be in the range of 1 to 2 efforts per female (Brown 1997). Mating occurs in late July to mid-September and females store sperm until the following late spring or early summer when the oocytes have enlarged and are ready for fertilization. Young are born alive in late August or mid-September (Furman 2007). Litters range from 4 to 14 young and the average sex ratio at birth is 1:1.

Individuals more than 30 years old have been documented in a long-term mark-recapture study in northeastern New York (Brown 2008), and others in the same study area have been aged at more than 40 years old (W. Brown pers. comm. *in* Racette and Shea 2013). Survivorship of first-year timber rattlesnakes in New York is estimated at 65% to 68%; after the first year, survivorship for adults increases to 90% or more (Brown et al. 2007).

Timber rattlesnakes feed primarily on small mammals including chipmunk, white-footed mouse, voles, and squirrels. They are preyed upon by black racer, coyote, red fox, gray fox, red-tailed hawks and other raptors, as well as wild turkey.

VI. Threats:

The primary threats to timber rattlesnake populations include human persecution, habitat loss, disease, and climate change (Racette and Shea 2013). Timber rattlesnakes are often collected or killed when encountered, with the pattern of human persecution extending back to the arrival of European colonists. Bounties for dead rattlesnakes were in place in some counties until 1971. During the bounty-hunting era, thousands of snakes were killed for awards ranging from 25 cents to \$5, and several populations were hunted to extirpation (Brown 2006, Furman 2007). Timber rattlesnakes are persecuted today—despite their state status as a threatened species—both by deliberate killing and by collection. The discovery of dens by collectors can be particularly deleterious, as the snakes using that den can be easily removed. Timber rattlesnakes are sensitive to disturbance, such as rock-climbing or frequent visits to a den site, and may alter their behavior to avoid such interactions with humans (Brown 2008 *in* Racette and Shea 2013).

Habitat loss from residential and commercial development, mining, and recreation is the primary cause of timber rattlesnake declines in New York (Stechert 1980, Racette and Shea 2013). Roads associated with development cause habitat fragmentation and result in mortality from passing vehicles. Timber rattlesnakes often move two miles or more from den sites. Any roads encountered within that area may cause interrupted dispersal and decreased genetic diversity, and put individuals at risk of being killed (Clark et al. 2010). Because of their late sexual maturity and low reproductive rate, removal of even a small percentage of individuals may put the population below the threshold from which recovery is not possible.

There is growing consensus among herpetologists that some snake species, including timber rattlesnakes, are exhibiting symptoms of a new disease characterized by fungal lesions (see Racette and Shea 2013). Facial lesions on timber rattlesnakes emerging from hibernation are not uncommon, but these so-called hibernation blisters normally heal with the first skin shed of the active season. At some locations, lesions observed in recent years are more severe, and in many cases recurrent. Infected snakes appear to transition from one shed cycle directly into another—possibly without feeding—in an effort to heal the lesion. This drain on fat reserves and body mass can become debilitating and even fatal. Research has indicated that these persistent lesions may be a form of dermatitis caused by the fungus *Chrysosporium ophidiicola*. Efforts are ongoing to characterize the degree to which this fungal dermatitis is a conservation threat.

Increased annual mean temperatures resulting from predicted climate change should create more favorable conditions for timber rattlesnakes, resulting in increased overwinter survival and increased reproductive potential. However, changes in hydrology and phenology may have negative repercussions in terms of increased incidence of disease or other unknown ecological changes such as increased annual mean temperatures within den crevices. Dispersal to more northern latitudes may not be possible due to the presence of roads and other development (Racette and Shea 2013).

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

No Unknown

Yes

The timber rattlesnake is listed as a threatened species in New York and is protected by Environmental Conservation Law (ECL) section 11-0535 and the New York Code of Rules and Regulations (6 NYCRR Part 182). A permit is required for any proposed project that may result in a take of a species listed as Threatened or Endangered, including, but not limited to, actions that may kill or harm individual animals or result in the adverse modification, degradation or destruction of habitat occupied by the listed species.

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

Even with these protections, impacts and threats, such as habitat loss and direct mortality, still take place.

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

A Timber Rattlesnake Conservation Action Plan (TRCAP) is being developed to refine and update a comprehensive summary of this plan published by Martin et al. (2008).

A recovery plan that includes management recommendations has been drafted for populations of timber rattlesnakes in New York (Racette and Shea 2013). The goal of the plan is to outline methods to maintain self-sustaining populations of timber rattlesnake and sufficient high-quality habitat to support the species within its historical range. See the plan for details.

Conservation actions following IUCN taxonomy are categorized in the table below.

Conservation Actions	
Action Category	Action
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
Education & Awareness	Awareness & Communications
Law/Policy	Compliance & Enforcement

The Comprehensive Wildlife Conservation Strategy (NYSDEC 2005) includes recommendations for the following actions for woodland/grassland snakes, which includes timber rattlesnake.

Easement acquisition:

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

Habitat management:

___ Develop and implement mitigation measures to manage the adverse effects of habitat fragmentation.

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 habitat requirements.

Modify regulation:

___ Adopt into New York's Environmental Conservation Law provisions which designate timber rattlesnake, smooth greensnake, black ratsnake, northern black racer, northern copperhead, eastern hognose snake, short-headed gartersnake and worm snake as protected small game species.

Other action:

___ Determine significance of specific threats to populations of species in this group, and formulate management options to control significant threats.

- ___ Enhance law enforcement and public education to limit specimen collection, killing and translocation of woodland/grassland snake species.
- ___ Educate the New York public to abandon misconceptions about the menace/value of woodland/grassland snakes.

Population enhancement:

- ___ Employ restoration techniques for timber rattlesnakes at selected sites as needed including head starting and repatriation/relocation strategies.

Population monitoring:

- ___ Conduct periodic re-survey of known sites of species occurrence, in order to detect population trends.

Statewide baseline survey:

- ___ Develop standardized population survey protocols, and implement survey protocols at all known and potentially suitable sites, to document the extent of occupied habitat for each of the woodland/grassland snake species in New York.

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