

Appendix A.1

**Amphibian & Reptile SGCN  
Conservation Reports**

**Vermont’s Wildlife Action Plan 2025**

**Draft 12/26/2025**

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Jefferson Salamander *Ambystoma jeffersonianum*

# Jefferson Salamander

*Ambystoma jeffersonianum*

## Conservation Assessment

**SGCN:** Medium Priority      **State Rank:** S2      **Global Rank:** G4      **State Trend:** Unknown  
**Regional SGCN?** Yes      **State T&E?** SC      **Federal T&E?** No

## Conservation Assessment

The Jefferson Salamander has a state rank of S3, is a special concern species in Vermont, and is patchily distributed across the state in low and mid-elevation deciduous and mixed forests. Vermont represents the northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation), habitat conditions (e.g., overwintering temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation, road mortality, wetland pH shifts, genetic dilution by unisexual salamanders, diseases, and altered climates. The Jefferson Salamander has specific habitat requirements (e.g., mature forests, closed canopies, embedded vernal pools), which makes populations especially vulnerable to habitat change.

## Distribution

The Jefferson Salamander is widespread but patchily distributed in Vermont. The species is primarily restricted to low and moderate elevations across most of the state.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Confident        |
| Champlain Hills                     | Probable         |  | Hudson River                           | Confident        |
| Northern Green Mtns                 | Confident        |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Confident        |  | Lake Memphremagog/<br>St Francis River | Confident        |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Confident        |  |                                        |                  |
| Vermont Valley                      | Confident        |  |                                        |                  |
| Southern Green Mtns                 | Confident        |  |                                        |                  |
| Taconic Mtns                        | Confident        |  |                                        |                  |

## Habitats

The Jefferson Salamander occupies mature forests with closed canopies, abundant coarse woody debris, underground refugia, and embedded breeding sites (e.g., vernal pools). In Vermont, the species is most commonly found in ridgetop Northern Hardwood Forests at moderate elevations.



**Jefferson Salamander    *Ambystoma jeffersonianum***

**Habitat Types**

- Northern Hardwood Forest
- Oak-Pine-Northern Hardwood Forest
- Spruce-Fir-Northern Hardwood Forest
- Ponds
- Hardwood Swamps
- Seeps and Vernal Pools
- Softwood Swamps
- Farm Pond

**Threats**

Potential non-habitat threats to Jefferson Salamander populations include genetic dilution by unisexual salamanders, diseases, predation, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., cutaneous respiration). Vehicle strikes are a major source of mortality during the spring migration period. The impacts of these threats may be especially acute when combined with the species' behavior (e.g., habitat fidelity) and patchy distribution in Vermont.

Generally, Jefferson Salamander populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include physical infrastructure (e.g., roads) that splinters contiguous habitats, trail development that facilitates human encroachment, wetland sedimentation, acid rain and other processes that alter wetland pH, invasive species (e.g., Phragmites) that decrease habitat quality, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

**Threat Types**

- Biological Limitations: *Loss of Metapopulation Structure*
- Climate Change: *Changes in Precipitation & Hydrological Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Hydrologic Alteration; Sedimentation*
- Human Intrusions & Disturbance: *Recreation & Trails; Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Invasion by Exotic Species; Predation or Herbivory; Competition; Genetics*
- Other: *Other Non-Habitat Threats; Other Habitat Threats; Information Needs*
- Pollution: *Herbicides & pesticides; Other Pollutants*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*



Jefferson Salamander *Ambystoma jeffersonianum*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Monitor threats**

Monitor and mitigate diseases, road mortality, invasive species, and other threats

**Population change**

Monitor breeding phenology, population recruitment, abundance trends, and breeding site characteristics

**Threats and their significance**

Evaluate impacts of droughts, trail-based recreation, and other threats

**Medium Priority**

**Population genetics**

Assess population genetic diversity; evaluate prevalence and potential impacts of breeding with unisexual salamanders

**Other research**

Continue to identify, validate (Vermont Vernal Pool Mapper), and monitor potential breeding sites (Vermont Vernal Pool Monitoring Project)

**Conservation Actions**

**Land/Water Protection**

**Easements**

Conserve important habitats including aquatic breeding sites and adjacent terrestrial habitat.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Site new roads downslope and >650 feet from breeding habitats; direct trail development away from breeding habitats.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Proportion of new roads and trails within occupied habitats.



**Jefferson Salamander    *Ambystoma jeffersonianum***

**Habitat Restoration**

Enhance or create breeding habitats to facilitate dispersal and establish new populations.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of enhanced or created pools that are used.

**Habitat Restoration**

Work with public and private landowners and land managers to enhance or restore forests surrounding breeding habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of forests enhanced or restored; number of sites enhanced or restored.

**Natural Processes Restoration**

Install, maintain, and monitor road crossing structures.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Number of structures installed, maintained, and monitored.

**Natural Processes Restoration**

Maintain or create habitat connectivity between breeding habitats and adjacent terrestrial habitats.

*Threat:* Habitat Fragmentation

*Performance Measure:* Proportion of suitable terrestrial habitat surrounding breeding sites.

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts to breeding habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Standards**

Adopt draft pool-breeding amphibian habitat guidelines at state level and encourage towns to implement guidelines.

*Threat:* Habitat Alteration

*Performance Measure:* Number of towns that adopt guidelines; number of trainings offered.

**Standards**

Conduct timber harvests near breeding habitats during winter months; follow riparian management guidelines for ANR lands.

*Threat:* Habitat Alteration

*Performance Measure:* Proportion of harvests conducted during winter; percent canopy cover retained.

**Research, Education & Awareness**



**Jefferson Salamander   *Ambystoma jeffersonianum***

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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Spotted Salamander *Ambystoma maculatum*

# Spotted Salamander

*Ambystoma maculatum*

## Conservation Assessment

**SGCN:** Medium Priority      **State Rank:** S5      **Global Rank:** G5      **State Trend:** Stable  
**Regional SGCN?** No      **State T&E?** No      **Federal T&E?** No

## Conservation Assessment

The Spotted Salamander has a state rank of S5 and is widely distributed across Vermont. Primary threats potentially affecting populations include habitat fragmentation, road mortality, diseases, droughts, and altered climates. The species primarily breeds in vernal pools but will also use beaver ponds, varied wetlands, and permanent waterbodies. Therefore, conservation actions that benefit the Spotted Salamander will also benefit other vernal pool facultative and obligate species.

## Distribution

The Spotted Salamander is widely distributed in Vermont and has been documented in every town.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Confident        |
| Champlain Hills                     | Confident        |  | Hudson River                           | Confident        |
| Northern Green Mtns                 | Confident        |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Confident        |  | Lake Memphremagog/<br>St Francis River | Confident        |
| Northeastern Highlands              | Confident        |  |                                        |                  |
| Southern VT Piedmont                | Confident        |  |                                        |                  |
| Vermont Valley                      | Confident        |  |                                        |                  |
| Southern Green Mtns                 | Confident        |  |                                        |                  |
| Taconic Mtns                        | Confident        |  |                                        |                  |

## Habitats

The Spotted Salamander occupies deciduous and mixed forests with abundant cover and embedded or nearby breeding sites (e.g., vernal pools, beaver wetlands). The species overwinters and spends much of its active period in underground burrows, with individuals most often seen during the spring migration and breeding periods.

## Habitat Types

- Northern Hardwood Forest
- Oak-Pine-Northern Hardwood Forest



### Spotted Salamander *Ambystoma maculatum*

- Spruce-Fir-Northern Hardwood Forest
- Open Peatlands
- Shrub Swamps
- Marshes and Sedge Meadows
- Ponds
- Hardwood Swamps
- Seeps and Vernal Pools
- Softwood Swamps
- Farm Pond

## Threats

Potential non-habitat threats to Spotted Salamander populations include diseases, predation, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., cutaneous respiration). Vehicle strikes are a major source of mortality during the spring migration period. The impacts of these threats may be especially acute when combined with the species' life history (e.g., delayed sexual maturity) and behavior (e.g., habitat fidelity).

Generally, Spotted Salamander populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include physical infrastructure (e.g., roads) that splinters contiguous habitats, trail development that facilitates human encroachment, wetland sedimentation that hinders respiration, invasive species (e.g., Phragmites) that decrease habitat quality, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

## Threat Types

- Climate Change: *Changes in Precipitation & Hydrological Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Hydrologic Alteration; Sedimentation*
- Human Intrusions & Disturbance: *Trampling, Persecution, Direct Impacts; Recreation & Trails*
- Other: *Information Needs*
- Pollution: *Herbicides & pesticides; Other pollutants*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*

## Research and Monitoring Needs

### High Priority

#### Habitat requirements

Identify important breeding sites and movement corridors

#### Monitor threats



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Taxon Conservation Report - Herptiles

**Spotted Salamander** *Ambystoma maculatum*

Monitor and mitigate diseases, road mortality, invasive species, and other threats

**Population change**

Monitor breeding phenology, population recruitment, abundance trends, and breeding site characteristics

**Other monitor**

Continue to identify, validate (Vermont Vernal Pool Mapper), and monitor potential breeding sites (Vermont Vernal Pool Monitoring Project)

**Conservation Actions**

**Land/Water Protection**

**Easements**

Conserve important habitats including aquatic breeding sites and adjacent terrestrial habitat.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Site new roads downslope and >650 feet from breeding habitats; direct trail development away from breeding habitats.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Proportion of new roads and trails within occupied habitats.

**Habitat Restoration**

Work with public and private landowners and land managers to enhance or restore forests surrounding breeding habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of forests enhanced or restored; number of sites enhanced or restored.

**Habitat Restoration**

Enhance or create breeding habitats to facilitate dispersal and establish new populations.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of enhanced or created pools that are used.

**Natural Processes Restoration**

Install, maintain, and monitor road crossing structures.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Number of structures installed, maintained, and monitored.

**Natural Processes Restoration**

Maintain or create habitat connectivity between breeding habitats and adjacent terrestrial habitats.



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Taxon Conservation Report - Herptiles

**Spotted Salamander** *Ambystoma maculatum*

*Threat:* Habitat Fragmentation

*Performance Measure:* Proportion of suitable terrestrial habitat surrounding breeding sites.

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts to breeding habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented .

**Standards**

Adopt draft pool-breeding amphibian habitat guidelines at state level and encourage towns to implement guidelines.

*Threat:* Habitat Alteration

*Performance Measure:* Number of towns that adopt guidelines; number of trainings offered.

**Standards**

Conduct timber harvests near breeding habitats during winter months; follow riparian management guidelines for ANR lands.

*Threat:* Habitat Alteration

*Performance Measure:* Proportion of harvests conducted during winter; percent canopy cover retained.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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Vermont Fish & Wildlife Department  
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Spotted Salamander *Ambystoma maculatum*

1



Four-toed Salamander *Hemidactylium scutatum*

# Four-toed Salamander

*Hemidactylium scutatum*

## Conservation Assessment

**SGCN:** Medium Priority      **State Rank:** S2      **Global Rank:** G5      **State Trend:** Unknown  
**Regional SGCN?** No      **State T&E?** SC      **Federal T&E?** No

## Conservation Assessment

The Four-toed Salamander has a state rank of S3, is a special concern species in Vermont, and is patchily distributed throughout the Lake Champlain Basin and parts of the Connecticut River and Hudson River basins. Aside from coastal areas that experience relatively mild climates, Vermont represents the near northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation), habitat conditions (e.g., overwintering temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation, road mortality, diseases, and altered climates. The Four-toed Salamander has specific nesting and breeding site requirements, which makes populations especially vulnerable to habitat change.

## Distribution

The Four-toed Salamander is primarily found at low elevations in Addison, Chittenden, Franklin, Rutland, and Windham counties, with few verified records from Bennington and Orange counties. There are no verified records from northeastern Vermont.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Confident        |
| Champlain Hills                     | Confident        |  | Hudson River                           | Confident        |
| Northern Green Mtns                 | Not Probable     |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Confident        |  | Lake Memphremagog/<br>St Francis River | Probable         |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Confident        |  |                                        |                  |
| Vermont Valley                      | Confident        |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Confident        |  |                                        |                  |

## Habitats

The Four-toed Salamander uses mature, low elevation forests and wetlands containing nesting structure (e.g., downed trees, tussocks, hummocks). Nesting structures are typically covered in





#### Four-toed Salamander *Hemidactylium scutatum*

Sphagnum moss and have overhanging features above standing water. Example breeding sites include red maple swamps, bogs, fens, and vernal pools.

#### Habitat Types

- Northern Hardwood Forest
- Oak-Pine-Northern Hardwood Forest
- Open Peatlands
- Shrub Swamps
- Marshes and Sedge Meadows
- Softwood Swamps
- Hardwood Swamps
- Seeps and Vernal Pools
- Farm Pond

#### Threats

Potential non-habitat threats to Four-toed Salamander populations include diseases, predation, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., cutaneous respiration). The impacts of these threats may be especially acute when combined with the species' life history (e.g., specific nesting requirements) and patchy distribution in Vermont.

Generally, Four-toed Salamander populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific habitat threats include physical infrastructure (e.g., roads) that splinters contiguous habitats, trail development that facilitates human encroachment, altered water and soil chemistries, invasive species (e.g., Phragmites) that decrease habitat quality, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles. The species has specific nesting requirements, which increases its vulnerability to habitat disturbances.

#### Threat Types

- Biological Limitations: *Loss of Metapopulation Structure*
- Climate Change: *Changes in Precipitation & Hydrological Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Sedimentation; Habitat Alteration; Habitat Fragmentation; Hydrologic Alteration*
- Human Intrusions & Disturbance: *Recreation & Trails; Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Invasion by Exotic Species; Genetics*
- Other: *Information Needs*
- Pollution: *Herbicides & pesticides; Other pollutants*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*



**Four-toed Salamander *Hemidactylium scutatum***

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Habitat requirements**

Evaluate habitat use and movement patterns; identify important sites (e.g., breeding) and movement corridors; identify upper elevational limits

**Monitor threats**

Monitor and mitigate diseases, road mortality, persecution, invasive species, and other threats

**Population change**

Monitor breeding phenology, population recruitment, abundance trends, and breeding site characteristics

**Threats and their significance**

Evaluate impacts of droughts, trail-based recreation, and other threats

**Other monitor**

Continue to identify, validate (Vermont Vernal Pool Mapper), and monitor potential breeding sites (Vermont Vernal Pool Monitoring Project)

**Conservation Actions**

**Land/Water Protection**

**Easements**

Conserve important habitats including aquatic breeding sites and adjacent terrestrial habitat.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Site new roads downslope and >650 feet from breeding habitats; direct trail development away from breeding habitats.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Proportion of new roads and trails within occupied habitats.

**Habitat Restoration**

Work with public and private landowners and land managers to enhance or restore forests



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**Four-toed Salamander *Hemidactylium scutatum***

surrounding breeding habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of forests enhanced or restored; number of sites enhanced or restored.

**Habitat Restoration**

Enhance or create breeding habitats to facilitate dispersal and establish new populations.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of enhanced or created pools that are used.

**Natural Processes Restoration**

Install, maintain, and monitor road crossing structures.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Number of structures installed, maintained, and monitored.

**Natural Processes Restoration**

Maintain or create habitat connectivity between breeding habitats and adjacent terrestrial habitats.

*Threat:* Habitat Fragmentation

*Performance Measure:* Proportion of suitable terrestrial habitat surrounding breeding sites.

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts to breeding habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Standards**

Adopt draft pool-breeding amphibian habitat guidelines at state level and encourage towns to implement guidelines.

*Threat:* Habitat Alteration

*Performance Measure:* Number of towns that adopt guidelines; number of trainings offered.

**Standards**

Conduct timber harvests near breeding habitats during winter months; follow riparian management guidelines for ANR lands.

*Threat:* Habitat Alteration

*Performance Measure:* Proportion of harvests conducted during winter; percent canopy cover retained.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs



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*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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Mudpuppy *Necturus maculosus*

# Mudpuppy

*Necturus maculosus*

## Conservation Assessment

**SGCN:** High Priority      **State Rank:** S2      **Global Rank:** G5      **State Trend:** Declining  
**Regional SGCN?** Watchlist      **State T&E?** SC      **Federal T&E?** No

## Conservation Assessment

The Mudpuppy has a state rank of S2, is a special concern species in Vermont, and is native to Lake Champlain and some tributaries. The species is considered introduced to the Connecticut River, with individuals likely sourced from outside northeastern U.S. (Chellmen 2011). Vermont represents the near northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation), habitat conditions (e.g., water temperatures), etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation (e.g., dams), population isolation, regular lampricide treatments, floods, and altered climates. The largest known lampricide-caused mortality event occurred in the Lamoille River during 2009, where 528 dead Mudpuppies were detected. In response, efforts have been made to establish a novel population in the Lamoille River outside of the lampricide treatment zone. The Vermont Amphibian and Reptile Scientific Advisory Group has twice recommended the Mudpuppy be listed as state-threatened, but the Vermont Agency of Natural Resources did not accept either recommendation.

## Distribution

The Mudpuppy is native to Lake Champlain and may occupy shoals, shallows, and lower tributaries. The species can also be found in a few interior lakes and the Connecticut River and its tributaries. Populations associated with the Connecticut River at least partially stem from historic introductions from an out-of-state source population(s).

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Confident        |
| Champlain Hills                     | Confident        |  | Hudson River                           | Not Probable     |
| Northern Green Mtns                 | Not Probable     |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Confident        |  | Lake Memphremagog/<br>St Francis River | Not Probable     |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Confident        |  |                                        |                  |
| Vermont Valley                      | Not Probable     |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Not Probable     |  |                                        |                  |



**Mudpuppy** *Necturus maculosus*

**Habitats**

The Mudpuppy occupies permanent waterbodies with abundant cover (e.g., flat rocks, logs) used for nesting and refuge. Juveniles typically occupy pools where silt and organic debris accumulate. Dams block upriver movements and restrict the species to the lower reaches of some rivers.

**Habitat Types**

- Large Rivers (>6th order)
- Mid-size Rivers (4th-6th order)
- Lakes

**Threats**

Potential non-habitat threats to Mudpuppy populations include pollution, hooking and bait use by anglers, dredging, low genetic diversity, biocides (e.g., lampricide), diseases (e.g., botulism), predation, droughts, floods that cause nest failure, and altered temperature and precipitation regimes that impact physiological processes. The impacts of these threats may be especially acute when combined with the species' life history (e.g., fully aquatic, delayed sexual maturity) and restricted and patchy distribution in Vermont.

Generally, Mudpuppy populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include hydroelectric dams that fragment river systems and restrict the species' movements, poor water quality management practices (e.g., inadequate riparian buffers) that contribute to sedimentation, the removal of instream structure (e.g., snags, rocks) that provide nesting sites and refuge, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

**Threat Types**

- Biological Limitations: *Loss of Metapopulation Structure; Reproductive Traits*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Storms & Severe Weather*
- Energy Production & Mining: *Energy Production & Mining*
- Habitat Modifications: *Hydrologic Alteration; Habitat Alteration; Habitat Fragmentation; Sedimentation*
- Human Intrusions & Disturbance: *Recreation & Trails; Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Genetics; Disease*
- Other: *Other Non-Habitat Threats; Information Needs*
- Pollution: *Herbicides & pesticides; Other pollutants*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports;





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investigate credible reports from unknown sites

**Population change**

Conduct surveys at historic sites; establish baseline population estimates and monitor over time; evaluate efficacy of translocation efforts

**Threats and their significance**

Evaluate impacts of lampricide, flooding, dams, and other threats; investigate alternatives to current lampricide practices (e.g., treatment frequency)

**Medium Priority**

**Habitat requirements**

Evaluate habitat use and movement patterns; identify important sites (e.g., breeding) and movement corridors

**Other monitor**

Investigate alternative survey techniques (e.g., eDNA)

**Conservation Actions**

**Land/Water/Species Management**

**Invasive/Problematic Species Management**

Encourage use of alternative lamprey control methods or longer intervals between lampricide treatments.

*Threat:* Herbicides & pesticides

*Performance Measure:* Number of alternative methods used; interval length between treatments.

**Natural Processes Restoration**

Maintain streamflow conditions that support populations; remove appropriate barriers that restrict upstream movement.

*Threat:* Habitat Fragmentation

*Performance Measure:* Miles of continuous suitable aquatic habitats.

**Species Restoration**

Augment populations through headstarting, translocation, and/or repatriation.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Number of stable populations; survivorship; population size.

**Law & Policy**

**Planning & Zoning**

Improve water quality through decreased pesticide use, nutrient runoff, sedimentation, etc.

*Threat:* Other pollutants



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*Performance Measure:* Nitrogen level, phosphorus level, turbidity levels, etc.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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**Fowler's Toad** *Anaxyrus fowleri*

# **Fowler's Toad**

*Anaxyrus fowleri*

## **Conservation Assessment**

**SGCN:** High Priority      **State Rank:** S1      **Global Rank:** G5      **State Trend:** Declining  
**Regional SGCN?** No      **State T&E?** E      **Federal T&E?** No

## **Conservation Assessment**

The Fowler's Toad has a state rank of S1, was listed as state-endangered in 2015, and is restricted to few sites in the Connecticut River Basin. Vermont represents the northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation), habitat conditions (e.g., overwintering temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation (e.g., dams), population isolation, genetic dilution due to hybridization with the American Toad, diseases, and altered climates. Given habitat fragmentation and the species' patchy distribution, populations may suffer from low genetic diversity. Scant reporting in Vermont may be attributed to the species' close resemblance to the much more common American Toad.

## **Distribution**

While the Fowler's Toad is widely distributed in the eastern United States, Vermont's only known extant population is restricted to southeastern Windham County. However, historic and/or unverified records have been reported from eastern Windsor and northeastern Windham counties.

| <b>Distribution by Biophysical Region:</b> | <b>Occupancy Status</b> |  | <b>Distribution by Basin</b>                   | <b>Occupancy Status</b> |
|--------------------------------------------|-------------------------|--|------------------------------------------------|-------------------------|
| <b>Champlain Valley</b>                    | Not Probable            |  | <b>Connecticut River</b>                       | Confident               |
| <b>Champlain Hills</b>                     | Not Probable            |  | <b>Hudson River</b>                            | Not Probable            |
| <b>Northern Green Mtns</b>                 | Not Probable            |  | <b>Lake Champlain</b>                          | Not Probable            |
| <b>Northern VT Piedmont</b>                | Not Probable            |  | <b>Lake Memphremagog/<br/>St Francis River</b> | Not Probable            |
| <b>Northeastern Highlands</b>              | Not Probable            |  |                                                |                         |
| <b>Southern VT Piedmont</b>                | Confident               |  |                                                |                         |
| <b>Vermont Valley</b>                      | Not Probable            |  |                                                |                         |
| <b>Southern Green Mtns</b>                 | Not Probable            |  |                                                |                         |
| <b>Taconic Mtns</b>                        | Not Probable            |  |                                                |                         |

## **Habitats**

The Fowler's Toad occupies low elevation habitats with loose, well-drained sandy or gravelly soils with limited vegetation. Breeding sites include wetlands, still water areas of rivers, and other aquatic





### Fowler's Toad *Anaxyrus fowleri*

habitats that are relatively shallow, sparsely vegetated, and have sandy bottoms and gradually sloping banks. The species forages near breeding sites and overwinters in burrows that extend below the frostline but are above the water table.

### Habitat Types

- Large Rivers (>6th order)
- Upland Shores
- Wet Shores
- Marshes and Sedge Meadows
- Ponds
- Lakes
- Seeps and Vernal Pools
- Farm Pond
- Hedgerows

### Threats

Potential non-habitat threats to Fowler's Toad populations include certain land management practices (e.g., mowing, haying, tilling), biocides (e.g., herbicides), low genetic diversity, diseases, predation, vehicle strikes, hybridization with the American Toad, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., cutaneous respiration). The impacts of these threats may be especially acute when combined with the species' life history (e.g., specific breeding requirements) and restricted distribution in Vermont.

Generally, Fowler's Toad populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific habitat threats include physical infrastructure (e.g., roads) that splinters contiguous habitats, trail development that facilitates human encroachment, shoreline development and hardening (e.g., riprap) that decrease habitat quality and quantity, dams that restrict natural river processes (e.g., shoreline scouring), invasive species (e.g., Phragmites) that decrease habitat quality, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

### Threat Types

- Biological Limitations: *Loss of Metapopulation Structure*
- Climate Change: *Storms & Severe Weather; Changes in Precipitation & Hydrological Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Energy Production & Mining: *Energy Production & Mining*
- Habitat Modifications: *Habitat Succession; Habitat Alteration; Habitat Fragmentation; Hydrologic Alteration; Inadequate Disturbance Regime*
- Human Intrusions & Disturbance: *Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Genetics*
- Other: *Other Habitat Threats; Information Needs*
- Pollution: *Herbicides & pesticides; Other pollutants*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*





**Fowler's Toad** *Anaxyrus fowleri*

## Research and Monitoring Needs

### High Priority

#### Distribution and abundance

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

#### Habitat requirements

Evaluate habitat use and movement patterns; identify important sites (e.g., breeding) and movement corridors

#### Population change

Establish baseline population estimates and monitor over time

#### Threats and their significance

Evaluate impacts of droughts, diseases, land management practices (e.g., tilling), and other threats

### Medium Priority

#### Habitat change

Monitor habitat impacts from flooding and controlled water releases (e.g., dams)

#### Population genetics

Assess population genetic diversity; evaluate prevalence and potential impacts of interbreeding with the American Toad

## Conservation Actions

### Land/Water Protection

#### Publicly-Owned Protected Areas

Conserve important habitats including aquatic breeding sites and adjacent terrestrial habitat.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

### Land/Water/Species Management

#### Compatible Resource Use

Conduct timber harvests within occupied habitats during winter months.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Proportion of harvests that occur during winter months.



**Fowler's Toad *Anaxyrus fowleri***

**Compatible Resource Use**

Encourage herp-friendly mowing/haying practices including delayed mows (after 11/1), raised mower decks (>8 inches), etc.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of landowners who adopt guidelines; number of trainings offered.

**Habitat Restoration**

Work with public and private landowners and land managers to promote early successional habitats; decrease insecticide use.

*Threat:* Habitat Succession

*Performance Measure:* Acres of early successional habitats managed using herp-friendly practices.

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Policy & Regulations**

Support efforts to decrease greenhouse gas emissions and risks to SGCN from climate change.

*Threat:* Habitat Alteration

*Performance Measure:* Number of initiatives supported; greenhouse gas emission levels.

**Policy & Regulations**

Ensure adequate water is released from hydroelectric dams to create and maintain downstream breeding habitat.

*Threat:* Habitat Alteration

*Performance Measure:* Number of scour patches and sand and gravel deposits.

**Standards**

Adopt draft pool-breeding amphibian habitat guidelines at state level and encourage towns to implement guidelines.

*Threat:* Habitat Alteration

*Performance Measure:* Number of towns that adopt guidelines; number of trainings offered.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**



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**Fowler's Toad** *Anaxyrus fowleri*

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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**Boreal Chorus Frog** *Pseudacris maculata*

# **Boreal Chorus Frog**

*Pseudacris maculata*

## **Conservation Assessment**

**SGCN:** High Priority      **State Rank:** S1      **Global Rank:** G5      **State Trend:** Historic  
**Regional SGCN?** No      **State T&E?** E      **Federal T&E?** No

## **Conservation Assessment**

The Boreal Chorus Frog was first documented in Vermont in the 1970s, last documented in 1999 in Alburgh, has a state rank of S1, and was listed as state-endangered in 2012. Surveys conducted in northwestern Vermont during the early 2000s did not detect the species, which has also disappeared from the New York portion of the Lake Champlain Basin (Corser et al. 2012) and many of its historic locations in Quebec and eastern Ontario. Potential contributing factors to the species' apparent extirpation in Vermont include habitat loss and succession, certain land management practices (e.g., mowing, biocide use), and invasive species.

## **Distribution**

Vermont represents the southeastern extent of the Boreal Chorus Frog's geographic range. Surveys conducted in the 1970s documented the species in Georgia, North Hero, St. Albans, and Swanton. The species was last documented in Vermont in 1999 in Alburgh.

| <b>Distribution by Biophysical Region:</b> | <b>Occupancy Status</b> | <b>Distribution by Basin</b>                   | <b>Occupancy Status</b> |
|--------------------------------------------|-------------------------|------------------------------------------------|-------------------------|
| <b>Champlain Valley</b>                    | Historic Records Only   | <b>Connecticut River</b>                       | Not Probable            |
| <b>Champlain Hills</b>                     | Not Probable            | <b>Hudson River</b>                            | Not Probable            |
| <b>Northern Green Mtns</b>                 | Not Probable            | <b>Lake Champlain</b>                          | Historic Records Only   |
| <b>Northern VT Piedmont</b>                | Not Probable            | <b>Lake Memphremagog/<br/>St Francis River</b> | Not Probable            |
| <b>Northeastern Highlands</b>              | Not Probable            |                                                |                         |
| <b>Southern VT Piedmont</b>                | Not Probable            |                                                |                         |
| <b>Vermont Valley</b>                      | Not Probable            |                                                |                         |
| <b>Southern Green Mtns</b>                 | Not Probable            |                                                |                         |
| <b>Taconic Mtns</b>                        | Not Probable            |                                                |                         |

## **Habitats**

The Boreal Chorus Frog is primarily terrestrial and can be found in moist, vegetated areas near breeding sites. Breeding sites typically lack canopy cover and have abundant emergent vegetation. In Vermont, historic breeding sites were open cattail ponds adjacent to agricultural lands and wetland systems.



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**Boreal Chorus Frog**    *Pseudacris maculata*

**Habitat Types**

- Marshes and Sedge Meadows
- Wet Shores
- Lakes
- Ponds
- Seeps and Vernal Pools
- Wet Swales and Ditches
- Farm Pond
- Grassland

**Threats**

The potential extirpation of the Boreal Chorus Frog in Vermont is not well understood but possible contributing factors include increased agricultural mechanization, biocides (e.g., pesticide), predation, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., cutaneous respiration). The impacts of these threats may be especially acute when combined with the species' life history (e.g., short lifespan) and restricted distribution in Vermont.

The potential extirpation of the Boreal Chorus Frog in Vermont is not well understood but is likely associated with habitat degradation, fragmentation, alteration, and/or conversion. Invasive species (e.g., Phragmites), agricultural practices (e.g., wetland drainage), and habitat succession have likely reduced the quality and quantity of shallow open wetlands. European buckthorn has been shown to negatively impact embryo development of the closely related Western Chorus Frog (Sacerdote and King 2014).

**Threat Types**

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Loss of Metapopulation Structure; Reproductive Traits*
- Climate Change: *Changes in Temperature Regimes; Changes in Precipitation & Hydrological Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Habitat Succession; Hydrologic Alteration*
- Human Intrusions & Disturbance: *Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Genetics; Invasion by Exotic Species*
- Other: *Information Needs*
- Pollution: *Herbicides & pesticides; Other pollutants*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**



**Boreal Chorus Frog** *Pseudacris maculata*

Conduct surveys to determine if unknown populations exist; if extant, evaluate relative abundance

**Habitat requirements**

If extant, evaluate habitat use and movement patterns and identify important sites (e.g., breeding, overwintering) and movement corridors

**Threats and their significance**

If extirpated, identify potential cause(s)

**Other monitor**

Coordinate with Canadian partners to develop an effective and standardized survey technique

**Medium Priority**

**Population genetics**

If extant, assess population genetic diversity

**Other research**

Develop and validate a habitat suitability model; assess the feasibility and requirements for successfully restoring populations

**Conservation Actions**

**Land/Water Protection**

**Publicly-Owned Protected Areas**

Conserve important habitats including aquatic breeding sites and adjacent terrestrial habitat.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Habitat Restoration**

Work with public and private landowners and land managers to promote early successional habitats; encourage conservation-compatible agricultural practices.

*Threat:* Habitat Succession

*Performance Measure:* Acres of early successional habitats managed using herp-friendly practices.

**Law & Policy**

**Policy & Regulations**

Support efforts to decrease greenhouse gas emissions and risks to SGCN from climate change.

*Threat:* Habitat Alteration

*Performance Measure:* Number of initiatives supported; greenhouse gas emission levels.





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**Standards**

Improve agricultural practices that degrade or remove wetlands and surrounding habitat; restore altered or lost wetlands.

*Threat:* Habitat Alteration

*Performance Measure:* Number of farmers contacted; acres of wetlands restored.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

**Research**

Evaluate genetic diversity of museum specimens, voucher specimens, etc.

*Threat:* Genetics

*Performance Measure:* Number of specimens evaluated.

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**Taxon Conservation Report - Herptiles**

**Boreal Chorus Frog**    *Pseudacris maculata*

Thesis, McGill University, Montreal, Canada.

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Mink Frog *Lithobates septentrionalis*

## Mink Frog

*Lithobates septentrionalis*

### Conservation Assessment

**SGCN:** Medium Priority      **State Rank:** S3      **Global Rank:** G5      **State Trend:** Declining  
**Regional SGCN?** No      **State T&E?** No      **Federal T&E?** No

### Conservation Assessment

The Mink Frog has a state rank of S3, is a special concern species in Vermont, and is patchily distributed across northern portions of the state. The species was first documented in the Lake Champlain Basin in 2021. Vermont represents the near southeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., oxygen diffusion, embryo development) and habitat conditions (e.g., water temperatures), etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation, population isolation, shoreline development and hardening (e.g., riprap), and altered climates. Given habitat fragmentation and the species' patchy distribution and limited dispersal ability, populations may suffer from low genetic diversity.

### Distribution

Vermont partly represents the southern extent of the Mink Frog's geographic range, with most records being from Caledonia, Essex, Orleans, and Washington counties. Two populations were recently discovered in northern Addison County.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Confident        |
| Champlain Hills                     | Confident        |  | Hudson River                           | Not Probable     |
| Northern Green Mtns                 | Confident        |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Confident        |  | Lake Memphremagog/<br>St Francis River | Confident        |
| Northeastern Highlands              | Confident        |  |                                        |                  |
| Southern VT Piedmont                | Not Probable     |  |                                        |                  |
| Vermont Valley                      | Not Probable     |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Not Probable     |  |                                        |                  |

### Habitats

The Mink Frog is a boreal species that primarily occupies cold, permanent waterbodies with emergent vegetation (e.g., lily pads, pickerelweed). The species is rarely found away from water.



**Mink Frog**    *Lithobates septentrionalis*

**Habitat Types**

- Marshes and Sedge Meadows
- Open Peatlands
- Lakes
- Ponds
- Floodplain Forests

**Threats**

Potential non-habitat threats to Mink Frog populations include pollution, low genetic diversity, biocides (e.g., herbicides), diseases, predation, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., oxygen diffusion, embryo development). The impacts of these threats may be especially acute when combined with the species' patchy distribution in Vermont.

Generally, Mink Frog populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include shoreline development and hardening (e.g., riprap) that decrease habitat quality and quantity, lake and pond sedimentation that hinders respiration, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

**Threat Types**

- Biological Limitations: *Loss of Metapopulation Structure*
- Climate Change: *Changes in Temperature Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Sedimentation*
- Invasives and Other Problematic Species, Genes & Diseases: *Disease; Genetics*
- Other: *Information Needs*
- Pollution: *Herbicides & pesticides; Other pollutants*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Monitor threats**

Monitor and mitigate diseases and other threats

**Medium Priority**



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**Mink Frog** *Lithobates septentrionalis*

**Population change**

Conduct surveys at historic sites; establish baseline population estimates and monitor over time

**Population genetics**

Assess population genetic diversity

**Threats and their significance**

Evaluate impacts of altered climates, shoreline hardening and development, and other threats

**Other research**

Develop and validate a habitat suitability model

**Conservation Actions**

**Land/Water Protection**

**Privately-Owned Protected Areas**

Conserve important habitats including aquatic breeding sites and adjacent terrestrial habitat.

*Threat:* Conversion of Habitat

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Encourage herp-friendly mowing/haying practices including delayed mows (after 11/1), raised mower decks (>8 inches), etc.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of landowners who adopt guidelines; number of trainings offered.

**Compatible Resource Use**

Conduct timber harvests within occupied habitats during winter months.

*Threat:* Conversion of Habitat

*Performance Measure:* Proportion of harvests that occur during winter months.

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Policy & Regulations**

Support efforts to decrease greenhouse gas emissions and risks to SGCN from climate change.

*Threat:* Conversion of Habitat



**Mink Frog *Lithobates septentrionalis***

*Performance Measure:* Number of initiatives supported; greenhouse gas emission levels.

**Standards**

Adopt draft pool-breeding amphibian habitat guidelines at state level and encourage towns to implement guidelines.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of towns that adopt guidelines; number of trainings offered.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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**Mink Frog**    *Lithobates septentrionalis*

Northeast Partners in Amphibian and Reptile Conservation. (2022). Disinfection of Field Equipment for Amphibian Pathogens: Minimizing Spread of Chytrid Fungi (Bd & Bsal) and Ranavirus. 2 pp.

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Spotted Turtle *Clemmys guttata*

# Spotted Turtle

## *Clemmys guttata*

### Conservation Assessment

**SGCN:** High Priority      **State Rank:** S1      **Global Rank:** G5      **State Trend:** Unknown  
**Regional SGCN?** Yes      **State T&E?** E      **Federal T&E?** UR

### Conservation Assessment

The Spotted Turtle has a state rank of S1, was listed as state-endangered in 1999, is a Regional Species of Greatest Conservation Need, was a candidate species for federal listing by the United States Fish and Wildlife Service, and is currently known from only three widely separated populations across the state. Two of these three populations are believed to be small and tenuous. Vermont represents the near northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation, embryo development), habitat conditions (e.g., overwintering temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation, road mortality, population isolation, diseases, nest predation, human disturbance (e.g., unleashed dogs), illegal collection, and certain land management practices (e.g., mowing, haying). The Vermont Spotted Turtle Recovery Plan and the Status Assessment and Conservation Plan for the Spotted Turtle in the Eastern United States guide the state's monitoring, research, management, and recovery strategies (Vermont Fish and Wildlife Department 2019, Willey et al. 2022).

### Distribution

Currently, only three widely separated Spotted Turtle populations are known in Vermont. A population in Windham County was identified in the 1990s, a population in Bennington County was identified in 2001, and a population in Addison County was identified in 2010. It is possible that there are additional populations in the state that have not yet been discovered.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Confident        |
| Champlain Hills                     | Not Probable     |  | Hudson River                           | Confident        |
| Northern Green Mtns                 | Not Probable     |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Not Probable     |  | Lake Memphremagog/<br>St Francis River | Not Probable     |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Confident        |  |                                        |                  |
| Vermont Valley                      | Confident        |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Unknown          |  |                                        |                  |



**Spotted Turtle**    *Clemmys guttata*

**Habitats**

The Spotted Turtle occupies shallow wetlands with abundant vegetation but may use a mosaic of upland and wetland habitats during the active period. In Vermont, the species uses red maple swamps, shrub swamps, bog/fen wetlands, and emergent swamp complexes. Females have been documented nesting in lawns, hummocks, along railroad tracks, and presumably in Sphagnum mats.

**Habitat Types**

- Northern Hardwood Forest
- Oak-Pine-Northern Hardwood Forest
- Open Peatlands
- Marshes and Sedge Meadows
- Shrub Swamps
- Wet Shores
- Softwood Swamps
- Hardwood Swamps
- Seeps and Vernal Pools
- Lawns and Gardens
- Mine
- Powerlines/RR/Roadsides

**Threats**

Potential non-habitat threats to Spotted Turtle populations include low genetic diversity, diseases, invasive species (e.g., Pond Slider), illegal collection, nest predation, human disturbance, vehicle strikes, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). The impacts of these threats may be especially acute when combined with the species' life history (e.g., delayed sexual maturity, low fecundity, temperature-dependent sex determination), behavior (e.g., habitat fidelity), and restricted and patchy distribution in Vermont.

Generally, Spotted Turtle populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include physical infrastructure (e.g., roads, railroads) that splinters contiguous habitats, trail development that facilitates human encroachment, invasive species (e.g., Phragmites, Japanese knotweed) that decrease habitat quality, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

**Threat Types**

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Loss of Metapopulation Structure; Reproductive Traits*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Changes in Temperature Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Hydrologic Alteration*
- Human Intrusions & Disturbance: *Harvest or Collection; Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Competition; Disease; Invasion by Exotic*



### Spotted Turtle *Clemmys guttata*

*Species; Genetics; Predation or Herbivory*

- Other: *Information Needs; Other Habitat Threats*

- Pollution: *Herbicides & pesticides; Other pollutants*

- Roads & Transportation Corridors: *Roads & Transportation Corridors*

## Research and Monitoring Needs

### High Priority

#### Distribution and abundance

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

#### Habitat change

Monitor habitat quality, quantity, and connectivity at known sites

#### Habitat requirements

Evaluate habitat use and movement patterns; identify important sites (e.g., nesting) and movement corridors

#### Population change

Establish baseline population estimates and monitor over time

### Medium Priority

#### Monitor threats

Monitor and mitigate diseases, nest predation, road mortality, invasive species, illegal collection, and other threats

#### Population genetics

Assess population genetic diversity

#### Other research

Assess the feasibility and requirements for successfully restoring and/or establishing new populations; develop nesting site creation guidelines; develop a repatriation plan

## Conservation Actions

### Capacity Building

#### Alliance Development

Work cooperatively with appropriate organizations and landowners; develop and maintain public and local government allies.



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**Spotted Turtle *Clemmys guttata***

*Threat:* Habitat Alteration

*Performance Measure:* Number of partnering landowners organizations; number of allies.

**Land/Water Protection**

**Publicly-Owned Protected Areas**

Conserve important habitats including nesting, foraging, and overwintering habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Site new roads as far from aquatic habitats as possible; direct trail development away from occupied habitats.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Proportion of new roads and trails within occupied habitats.

**Compatible Resource Use**

Conduct timber harvests within occupied habitats during winter months.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Proportion of harvests that occur during winter months.

**Compatible Resource Use**

Encourage towns and individuals to restrict mechanized and motorized vehicle use where appropriate.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of sites where ATV use is restricted.

**Habitat Restoration**

Enhance or create nesting habitat.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of created and/or managed nesting areas.

**Invasive/Problematic Species Management**

Monitor important habitats and remove or treat invasive species including pond sliders, phragmites, knotweed, etc.

*Threat:* Invasion by Exotic Species

*Performance Measure:* Acres managed or treated; number of invasive species reported.

**Natural Processes Restoration**

Install, maintain, and monitor road and rail crossing structures.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Number of structures installed, maintained, and monitored.

**Species Restoration**



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**Spotted Turtle *Clemmys guttata***

Augment populations through headstarting, translocation, and/or repatriation.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Number of stable populations; survivorship; population size.

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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**Spotted Turtle**    *Clemmys guttata*

- 1      Spotted Turtles in the Eastern United States. Technical Report to the Virginia Dept. of Wildlife
- 2      Resources and the U.S. Fish and Wildlife Service.
- 3

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Wood Turtle *Glyptemys insculpta*

# Wood Turtle

## *Glyptemys insculpta*

### Conservation Assessment

**SGCN:** High Priority      **State Rank:** S3      **Global Rank:** G2G3      **State Trend:** Unknown  
**Regional SGCN?** Yes      **State T&E?** SC      **Federal T&E?** UR

### Conservation Assessment

The Wood Turtle has a state rank of S3, is a special concern species in Vermont, is a Regional Species of Greatest Conservation Need, is a candidate species for federal listing by the United States Fish and Wildlife Service, and is widely distributed across the state's river valleys. Primary threats potentially contributing to the species' rarity include habitat fragmentation, road mortality, diseases, nest predation, human disturbance (e.g., unleashed dogs), illegal collection, floods, and certain land management practices (e.g., mowing, haying). The Conservation Plan for the Wood Turtle in the Northeastern United States guides the state's monitoring, research, management, and recovery strategies (Jones et al. 2019).

### Distribution

The Wood Turtle is widely distributed across low and moderate elevations in Vermont, with current records from every county except Grand Isle County.

| Distribution by Biophysical Region: | Occupancy Status | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|----------------------------------------|------------------|
| Champlain Valley                    | Confident        | Connecticut River                      | Confident        |
| Champlain Hills                     | Confident        | Hudson River                           | Confident        |
| Northern Green Mtns                 | Confident        | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Confident        | Lake Memphremagog/<br>St Francis River | Confident        |
| Northeastern Highlands              | Confident        |                                        |                  |
| Southern VT Piedmont                | Confident        |                                        |                  |
| Vermont Valley                      | Confident        |                                        |                  |
| Southern Green Mtns                 | Confident        |                                        |                  |
| Taconic Mtns                        | Confident        |                                        |                  |

### Habitats

The Wood Turtle is a river valley specialist that occupies cold, oxygenated, meandering streams and rivers with moderate gradients and sand and/or gravel bars. Females nest in cutbanks, sand and gravel bars, dry stream beds, sand and gravel quarries and pits, powerline corridors, along roadsides and railroad tracks, etc. Individuals overwinter instream within undercut banks, logjams, and pools and may migrate to upland foraging sites that are more than 1,000 feet from streams and rivers.





## Wood Turtle *Glyptemys insculpta*

### Habitat Types

- Northern Hardwood Forest
- Oak-Pine-Northern Hardwood Forest
- Spruce-Fir-Northern Hardwood Forest
- Mid-size Rivers (4th-6th order)
- Headwater Tributaries (1st-3rd order)
- Large Rivers (>6th order)
- Upland Shores
- Shrub Swamps
- Wet Shores
- Marshes and Sedge Meadows
- Floodplain Forests
- Hardwood Swamps
- Seeps and Vernal Pools
- Softwood Swamps
- Young Forest-Northern Hardwoods
- Young Forest-Pine and Hemlock
- Mine
- Old Field/Shrub
- Grassland

### Threats

Potential non-habitat threats to Wood Turtle populations include diseases, recreation (e.g., unleashed dogs), illegal collection, nest predation, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, droughts, floods that cause nest failure, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). Vehicle strikes are a major source of mortality during the species' active period. The impacts of these threats may be especially acute when combined with the species' life history (e.g., delayed sexual maturity, low fecundity), behavior (e.g., habitat fidelity), and patchy distribution in Vermont.

Generally, Wood Turtle populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include physical infrastructure (e.g., roads, railroads) that splinters contiguous habitats, floods that erode nesting substrates, invasive species (e.g., Phragmites, Japanese knotweed) that decrease habitat quality, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

### Threat Types

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Reproductive Traits*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Storms & Severe Weather*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Habitat Succession; Hydrologic Alteration; Sedimentation*
- Human Intrusions & Disturbance: *Harvest or Collection; Recreation & Trails; Trampling, Persecution,*



**Wood Turtle    *Glyptemys insculpta***

*Direct Impacts*

- Invasives and Other Problematic Species, Genes & Diseases: *Predation or Herbivory; Disease; Invasion by Exotic Species*
- Other: *Information Needs*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Habitat change**

Evaluate the effectiveness of habitat restoration efforts

**Medium Priority**

**Habitat requirements**

Evaluate habitat use and movement patterns; identify important sites (e.g., nesting) and movement corridors

**Monitor threats**

Monitor and mitigate diseases, nest predation, road mortality, invasive species, illegal collection, and other threats

**Population change**

Establish baseline population estimates and monitor over time; prioritize southern Vermont due to lack of previous monitoring efforts

**Population genetics**

Assess population genetic diversity

**Threats and their significance**

Evaluate impacts of development projects (e.g., solar), floods, and other threats

**Other research**

Develop nesting site creation guidelines; develop a repatriation plan



Wood Turtle *Glyptemys insculpta*

**Conservation Actions**

**Land/Water Protection**

**Easements**

Conserve important habitats including nesting, foraging, and overwintering habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Site new roads >300 feet from occupied streams/rivers (>1,000 feet for regionally significant populations); direct trail development away from occupied habitats.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Proportion of new roads and trails within occupied habitats.

**Compatible Resource Use**

Conduct timber harvests within 300 feet of occupied streams/rivers during winter months (1,000 feet for regionally significant populations).

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Proportion of harvests conducted during winter; percent canopy cover retained.

**Compatible Resource Use**

Encourage herp-friendly mowing/haying practices including delayed mows (after 11/1), raised mower decks (>8 inches), etc.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of landowners who adopt guidelines; number of trainings offered.

**Compatible Resource Use**

Encourage towns and individuals to restrict mechanized and motorized vehicle use where appropriate.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of sites where ATV use is restricted.

**Habitat Restoration**

Enhance or create nesting habitat.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of created and/or managed nesting areas.

**Invasive/Problematic Species Management**

Monitor important habitats and remove or treat invasive species including pond sliders, phragmites, knotweed, etc.

*Threat:* Invasion by Exotic Species

*Performance Measure:* Acres managed or treated; number of invasive species reported.



**Wood Turtle    *Glyptemys insculpta***

**Natural Processes Restoration**

Install, maintain, and monitor road and rail crossing structures.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Number of structures installed, maintained, and monitored.

**Species Restoration**

Augment populations through headstarting, translocation, and/or repatriation.

*Threat:* Reproductive Traits

*Performance Measure:* Number of stable populations; survivorship; population size.

**Law & Policy**

**Planning & Zoning**

Encourage towns to implement state's riparian management guidelines and incorporate into zoning regulations.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of towns that incorporate guidelines in their zoning regulations.

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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Eastern Musk Turtle (Stinkpot) *Sternotherus odoratus*

# Eastern Musk Turtle (Stinkpot)

*Sternotherus odoratus*

## Conservation Assessment

**SGCN:** Medium Priority      **State Rank:** S2      **Global Rank:** G5      **State Trend:** Unknown  
**Regional SGCN?** No      **State T&E?** SC      **Federal T&E?** No

## Conservation Assessment

The Eastern Musk Turtle has a state rank of S2, is a special concern species in Vermont, and is restricted to Lake Champlain, some associated tributaries, and several smaller lakes in the Poultney River drainage. Vermont represents the near northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation, embryo development), habitat conditions (e.g., overwintering temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include population isolation, nest predation, shoreline development and hardening (e.g., riprap), and the mechanical harvesting of aquatic plants. Invasive aquatic plants (e.g., Eurasian watermilfoil, water chestnut) are commonly removed from Vermont waterbodies using mechanical harvesters, which may also remove Eastern Musk Turtles basking amongst aquatic vegetation.

## Distribution

The Eastern Musk Turtle occupies shallow bays and major tributaries of northern and southern Lake Champlain, as well as several smaller lakes in the Poultney River drainage. There are very few records of the species from Addison and southern Chittenden counties despite populations existing north and south of these areas.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Not Probable     |
| Champlain Hills                     | Not Probable     |  | Hudson River                           | Not Probable     |
| Northern Green Mtns                 | Not Probable     |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Not Probable     |  | Lake Memphremagog/<br>St Francis River | Not Probable     |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Not Probable     |  |                                        |                  |
| Vermont Valley                      | Not Probable     |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Confident        |  |                                        |                  |



**Eastern Musk Turtle (Stinkpot) *Sternotherus odoratus***

**Habitats**

The Eastern Musk Turtle is primarily aquatic and occupies shallow, permanent, low elevation waterbodies with slow currents, soft substrate, and abundant aquatic vegetation. Females often nest under logs and debris along shorelines.

**Habitat Types**

- Large Rivers (>6th order)
- Marshes and Sedge Meadows
- Shrub Swamps
- Ponds
- Lakes

**Threats**

Potential non-habitat threats to Eastern Musk Turtle populations include pollution, mechanical harvesting of aquatic plants (e.g., Eurasian watermilfoil), nest predation, invasive species (e.g., Pond Slider), illegal collection, droughts, floods that cause nest failure, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). The impacts of these threats may be especially acute when combined with the species' life history (e.g., low fecundity, temperature-dependent sex determination), behavior (e.g., basking), and restricted and patchy distribution in Vermont.

Generally, Eastern Musk Turtle populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific habitat threats include shoreline development and hardening (e.g., riprap) that decrease nesting habitat quality and quantity, floods that erode nesting substrates, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

**Threat Types**

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Reproductive Traits*
- Climate Change: *Changes in Temperature Regimes; Storms & Severe Weather*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration*
- Human Intrusions & Disturbance: *Trampling, Persecution, Direct Impacts; Harvest or Collection*
- Invasives and Other Problematic Species, Genes & Diseases: *Competition; Predation or Herbivory; Invasion by Exotic Species*
- Other: *Information Needs; Other Non-Habitat Threats*
- Pollution: *Other pollutants*





**Eastern Musk Turtle (Stinkpot) *Sternotherus odoratus***

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Monitor threats**

Monitor and mitigate illegal collection, diseases, invasive species, and other threats

**Other monitor**

Develop an effective and standardized survey protocol; investigate alternative survey techniques (e.g., eDNA)

**Medium Priority**

**Habitat requirements**

Evaluate habitat use and movement patterns; identify important sites (e.g., nesting, overwintering) and movement corridors

**Population change**

Conduct surveys at historic sites; establish baseline population estimates and monitor over time

**Threats and their significance**

Evaluate impacts of shoreline hardening and development, winterkill, and aquatic plant mechanical harvesting, and other threats

**Other research**

Develop and validate a habitat suitability model; develop a repatriation plan

**Conservation Actions**

**Land/Water/Species Management**

**Habitat Restoration**

Enhance or create nesting habitat.

*Threat:* Conversion of Habitat

*Performance Measure:* Number of created and/or managed nesting areas.

**Habitat Restoration**

Communicate with mechanical weed harvester operators to increase awareness and appreciation and encourage reporting.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of harvester operations who report observations.



**Eastern Musk Turtle (Stinkpot) *Sternotherus odoratus***

**Habitat Restoration**

Work with public and private landowners and land managers to provide undisturbed aquatic habitats with natural shorelines.

*Threat:* Habitat Alteration

*Performance Measure:* Number of landowners and land managers contacted; number of undisturbed habitats.

**Invasive/Problematic Species Management**

Monitor important habitats and remove or treat invasive species including pond sliders, phragmites, knotweed, etc.

*Threat:* Invasion by Exotic Species

*Performance Measure:* Acres managed or treated; number of invasive species reported.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation; convey impacts of shoreline hardening on nest site availability.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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Spiny Softshell (Turtle) *Apalone spinifera*

# Spiny Softshell (Turtle)

*Apalone spinifera*

## Conservation Assessment

**SGCN:** High Priority      **State Rank:** S1      **Global Rank:** G5      **State Trend:** Stable  
**Regional SGCN?** Watchlist      **State T&E?** T      **Federal T&E?** No

## Conservation Assessment

The Spiny Softshell has a state rank of S1, was listed as state-threatened in 1987, and is restricted to Lake Champlain. Vermont is the only New England state that has native Spiny Softshell populations, and it represents the near northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation, embryo development), habitat conditions (e.g., overwintering temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include population isolation, shoreline development and hardening (e.g., riprap), nest predation, human disturbance (e.g., unleashed dogs), floods, and altered climates. The Vermont Eastern Spiny Softshell Recovery Plan guides the state's monitoring, research, management, and recovery strategies (Vermont Fish and Wildlife Department 2009).

## Distribution

The Spiny Softshell occupies northern Lake Champlain and lower tributaries in Chittenden, Franklin, and Grand Isle counties. The species is primarily associated with the Missisquoi and Lamoille rivers. Several recent reports represent the only verified records of the species in the Winooski River in more than 100 years.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Not Probable     |
| Champlain Hills                     | Not Probable     |  | Hudson River                           | Not Probable     |
| Northern Green Mtns                 | Not Probable     |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Not Probable     |  | Lake Memphremagog/<br>St Francis River | Not Probable     |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Not Probable     |  |                                        |                  |
| Vermont Valley                      | Not Probable     |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Not Probable     |  |                                        |                  |



**Spiny Softshell (Turtle) *Apalone spinifera***

**Habitats**

The Spiny Softshell is primarily aquatic and occupies permanent waterbodies with soft substrates, abundant basking sites (e.g., fallen trees, sandbars), and emergent vegetation that is used for foraging and refuge. In Vermont, females nest on sandy and shaley beaches with good solar exposure, well-drained soils, and little vegetation.

**Habitat Types**

- Large Rivers (>6th order)
- Upland Shores
- Wet Shores
- Marshes and Sedge Meadows
- Shrub Swamps
- Lakes

**Threats**

Potential non-habitat threats to Spiny Softshell populations include pollution, hooking by anglers, boat strikes, invasive species (e.g., Pond Slider), nest predation, recreation (e.g., unleashed dogs), droughts, floods that cause nest failure, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). The impacts of these threats may be especially acute when combined with the species' life history (e.g., delayed sexual maturity, low fecundity), behavior (e.g., habitat fidelity), and restricted and patchy distribution in Vermont.

Generally, Spiny Softshell populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include shoreline development and hardening (e.g., riprap) that decrease nesting habitat quality and quantity, floods that erodes nesting substrates, habitat succession that decreases solar radiation at nesting sites, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles. The availability of suitable nesting habitat is likely the most limiting resource for this species.

**Threat Types**

- Biological Limitations: *Reproductive Traits; Loss of Metapopulation Structure*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Storms & Severe Weather*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Succession; Inadequate Disturbance Regime*
- Human Intrusions & Disturbance: *Trampling, Persecution, Direct Impacts; Recreation & Trails*
- Invasives and Other Problematic Species, Genes & Diseases: *Competition; Disease; Genetics; Invasion by Exotic Species; Predation or Herbivory*
- Other: *Information Needs*
- Pollution: *Herbicides & pesticides; Other pollutants*



**Spiny Softshell (Turtle) *Apalone spinifera***

**Research and Monitoring Needs**

**High Priority**

**Monitor threats**

Monitor and mitigate diseases, illegal collection, nest predation, and other threats

**Other research**

Assess the feasibility and requirements for successfully restoring populations; develop nesting site creation guidelines; develop a repatriation plan

**Medium Priority**

**Distribution and abundance**

Continue to protect nests, discourage nest predation, and monitor annual reproduction

**Habitat requirements**

Evaluate habitat use, movement patterns, and population interchange; identify important sites (e.g., nesting) and movement corridors

**Population genetics**

Assess population genetic diversity; determine if populations are genetically distinct from other regions

**Threats and their significance**

Evaluate impacts of shoreline hardening and development, floods, and other threats

**Other research**

Evaluate techniques for marking headstarts; assess headstart survival, disease associations, and reproductive success

**Conservation Actions**

**Capacity Building**

**Alliance Development**

Work cooperatively with appropriate organizations and landowners; develop and maintain public and local government allies.

*Threat:* Habitat Alteration

*Performance Measure:* Number of partnering landowners organizations; number of allies.

**Land/Water Protection**

**Publicly-Owned Protected Areas**

Conserve important habitats including nesting, foraging, and overwintering habitats.



Vermont Fish & Wildlife Department  
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Taxon Conservation Report - Herptiles

**Spiny Softshell (Turtle) *Apalone spinifera***

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Habitat Restoration**

Enhance or create basking habitat.

*Threat:* Habitat Alteration

*Performance Measure:* Number of enhanced or created basking sites that are used.

**Invasive/Problematic Species Management**

Monitor important habitats and remove or treat invasive species including pond sliders, phragmites, knotweed, etc.

*Threat:* Invasion by Exotic Species

*Performance Measure:* Acres managed or treated; number of invasive species reported.

**Species Restoration**

Promote nesting success by restricting access, removing debris, protecting nests, deterring and trapping predators, etc.

*Threat:* Predation or Herbivory

*Performance Measure:* Number of successful nests.

**Species Restoration**

Augment populations through headstarting, translocation, and/or repatriation.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Number of hatchlings headstarted; survivorship; population size

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Planning & Zoning**

Improve water quality through decreased pesticide use, nutrient runoff, sedimentation, etc.

*Threat:* Other pollutants

*Performance Measure:* Nitrogen level, phosphorus level, turbidity levels, etc.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs



### Spiny Softshell (Turtle) *Apalone spinifera*

*Performance Measure:* Number of reports received; number of observers.

#### Awareness Raising and Communications

Increase public awareness and appreciation; convey impacts of shoreline hardening on nest site availability.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

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**Vermont Fish & Wildlife Department**  
**Wildlife Action Plan 2025**  
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**Spiny Softshell (Turtle)    *Apalone spinifera***

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Common Five-lined Skink *Plestiodon fasciatus*

## Common Five-lined Skink

*Plestiodon fasciatus*

### Conservation Assessment

**SGCN:** High Priority      **State Rank:** S1      **Global Rank:** G5      **State Trend:** Unknown  
**Regional SGCN?** No      **State T&E?** E      **Federal T&E?** No

### Conservation Assessment

The Common Five-lined Skink has a state rank of S1, was listed as state-endangered in 1987, and is restricted to relatively few scattered sites across two towns in western Rutland County. Vermont represents the northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation, embryo development), habitat conditions (e.g., hibernaculum temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include predation, population isolation, human disturbance, decreased cover used as refuge, and decreased basking site quality through habitat succession. Given habitat fragmentation and the species' patchy distribution and limited dispersal ability, populations may suffer from low genetic diversity.

### Distribution

The Common Five-lined Skink can be found in two towns in western Rutland County. Most reports are within two miles of Lake Champlain.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Not Probable     |
| Champlain Hills                     | Not Probable     |  | Hudson River                           | Not Probable     |
| Northern Green Mtns                 | Not Probable     |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Not Probable     |  | Lake Memphremagog/<br>St Francis River | Not Probable     |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Not Probable     |  |                                        |                  |
| Vermont Valley                      | Not Probable     |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Not Probable     |  |                                        |                  |

### Habitats

In Vermont, the Common Five-lined Skink uses warm, low-elevation habitats with abundant cover and basking sites near Lake Champlain. Foraging sites often contain leaf litter and woody debris mixed with exposed broken rock. The species may use buildings, manure and wood piles, old vehicles, and other



### Common Five-lined Skink *Plestiodon fasciatus*

anthropogenic features that provide cover and foraging opportunities. Females nest in moist substrates, including mulch piles and decaying logs.

### Habitat Types

- Northern Hardwood Forest
- Oak-Pine-Northern Hardwood Forest
- Cliffs and Talus
- Outcrops and Upland Meadows
- Subterranean
- Building/Structure
- Mine
- Other Cultural

### Threats

Potential non-habitat threats to Common Five-Lined Skink populations include low genetic diversity, predation (e.g., domestic cats), human disturbance, vehicle strikes, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). The impacts of these threats may be especially acute when combined with the species' life history (e.g., limited dispersal), behavior (e.g., basking), and restricted and patchy distribution in Vermont.

Generally, Common Five-Lined Skink populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific habitat threats include habitat succession that decreases the quality and quantity of basking sites; physical infrastructure (e.g., roads) that splinters contiguous habitats; trail development that facilitates human encroachment; decreased coarse woody debris and leaf litter that provide basking, refuge, and foraging opportunities; and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

### Threat Types

- Biological Limitations: *Loss of Metapopulation Structure; Loss of Prey Base*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Habitat Succession*
- Human Intrusions & Disturbance: *Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Genetics; Predation or Herbivory*
- Other: *Information Needs*

### Research and Monitoring Needs

#### High Priority

#### Distribution and abundance

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

#### Population change



**Common Five-lined Skink** *Plestiodon fasciatus*

Establish baseline population estimates and monitor over time

**Other monitor**

Develop an effective and standardized survey technique

**Medium Priority**

**Habitat requirements**

Evaluate habitat use and movement patterns; identify important sites (e.g., nesting, overwintering) and movement corridors

**Population genetics**

Assess population genetic diversity

**Conservation Actions**

**Capacity Building**

**Alliance Development**

Work cooperatively with appropriate organizations and landowners; develop and maintain public and local government allies.

*Threat:* Habitat Alteration

*Performance Measure:* Number of partnering landowners organizations; number of allies.

**Land/Water Protection**

**Publicly-Owned Protected Areas**

Conserve important habitats including overwintering and foraging habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Habitat Restoration**

Create small forest canopy openings; retain coarse woody material.

*Threat:* Habitat Succession

*Performance Measure:* Number of sites actively managed.

**Species Restoration**

Maintain or create habitat connectivity among populations within and outside of VT.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Proportion of suitable dispersal habitat between populations.

**Law & Policy**



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**Common Five-lined Skink    *Plestiodon fasciatus***

**Compliance & Enforcement**

Minimize disturbances and vandalism at basking sites.

*Threat:* Habitat Alteration

*Performance Measure:* Number of complaints and disturbance reports.

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

**Awareness Raising and Communications**

Encourage individuals to keep their cats indoors.

*Threat:* Predation or Herbivory

*Performance Measure:* Number of pet owners contacted.

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North American Racer *Coluber constrictor*

# North American Racer

*Coluber constrictor*

## Conservation Assessment

**SGCN:** High Priority      **State Rank:** S1      **Global Rank:** G5      **State Trend:** Declining  
**Regional SGCN?** Watchlist      **State T&E?** T      **Federal T&E?** No

## Conservation Assessment

The North American Racer has a state rank of S1, was listed as state-threatened in 2005, and is restricted to only one known site in Windham County; however, anecdotal historic reports from the southern Connecticut River Basin suggest the species was more common decades ago. Vermont represents the near northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation), habitat conditions (e.g., hibernaculum temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation, population isolation, road mortality, motorized and mechanized recreation (e.g., ATVs, mountain bikes), the loss of early successional habitats, and persecution.

## Distribution

While the North American Racer is widely distributed across most of the United States, Vermont's only known extant population is restricted to southeastern Windham County. Verified records have been reported from other parts of eastern Windham County, but no populations are known. Historic and/or unverified records have been reported from Windsor and southeastern Rutland counties.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Not Probable     |  | Connecticut River                      | Confident        |
| Champlain Hills                     | Not Probable     |  | Hudson River                           | Not Probable     |
| Northern Green Mtns                 | Not Probable     |  | Lake Champlain                         | Not Probable     |
| Northern VT Piedmont                | Not Probable     |  | Lake Memphremagog/<br>St Francis River | Not Probable     |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Confident        |  |                                        |                  |
| Vermont Valley                      | Not Probable     |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Not Probable     |  |                                        |                  |

## Habitats

The North American Racer primarily forages in open and early successional habitats (e.g., pastures, power corridors) and overwinters in rock outcrops and cracks in ledges and cliffs. In Vermont, the



### North American Racer *Coluber constrictor*

species uses warm, low elevation open and early successional habitats with abundant rock outcrops and ledges. Vermont's transition from farmland to forests over the last ~100 years has likely contributed to population declines.

### Habitat Types

- Oak-Pine-Northern Hardwood Forest
- Cliffs and Talus
- Outcrops and Upland Meadows
- Young Forest-Red Oak and Red Cedar
- Powerlines/RR/Roadsides
- Subterranean
- Grassland
- Hedgerows
- Old Field/Shrub
- Orchards

### Threats

Potential non-habitat threats to North American Racer populations include certain land management practices (e.g., powerline maintenance), low genetic diversity, biocides (e.g., rodenticide), diseases (e.g., snake fungal disease), persecution, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). The impacts of these threats may be especially acute when combined with the species' low abundance and restricted distribution in Vermont.

Generally, North American Racer populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include physical infrastructure (e.g., roads) that splinters contiguous habitats, trail development that facilitates human encroachment, the loss of open and early successional habitats to development and habitat succession, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

### Threat Types

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Loss of Metapopulation Structure; Loss of Prey Base*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Changes in Temperature Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Habitat Succession; Inadequate Disturbance Regime*
- Human Intrusions & Disturbance: *Recreation & Trails; Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Disease; Genetics*
- Other: *Information Needs; Other Habitat Threats*
- Pollution: *Herbicides & pesticides*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*





North American Racer *Coluber constrictor*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Monitor threats**

Monitor and mitigate diseases and other threats

**Population change**

Conduct surveys at historic sites; establish baseline population estimates and monitor over time

**Medium Priority**

**Population genetics**

Assess population genetic diversity

**Other research**

Assess the feasibility and requirements for successfully restoring populations

**Conservation Actions**

**Capacity Building**

**Alliance Development**

Work cooperatively with appropriate organizations and landowners; develop and maintain public and local government allies.

*Threat:* Habitat Alteration

*Performance Measure:* Number of partnering landowners organizations; number of allies.

**Land/Water Protection**

**Publicly-Owned Protected Areas**

Conserve important habitats including overwintering and foraging habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Encourage herp-friendly mowing/haying practices including delayed mows (after 11/1), raised mower decks (>8 inches), etc.

*Threat:* Trampling, Persecution, Direct Impacts



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**North American Racer    *Coluber constrictor***

*Performance Measure:* Number of landowners who adopt guidelines; number of trainings offered.

**Compatible Resource Use**

Encourage towns and individuals to restrict mechanized and motorized vehicle use where appropriate.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of sites where ATV use is restricted.

**Compatible Resource Use**

Conduct timber harvests within occupied habitats during winter months.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Proportion of harvests that occur during winter months.

**Habitat Restoration**

Work with public and private landowners and land managers to promote early successional habitats; enhance or create overwintering, basking, and nesting habitats.

*Threat:* Habitat Succession

*Performance Measure:* Acres of early successional habitats managed using herp-friendly practices.

**Species Restoration**

Augment populations through headstarting, translocation, and/or repatriation.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Number of stable populations; survivorship; population size.

**Species Restoration**

Maintain or create habitat connectivity among populations within and outside of VT.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Proportion of suitable dispersal habitat between populations.

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Standards**

Encourage towns and individuals to use wildlife-friendly erosion matting and garden netting.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of towns, contractors, and homeowners who use wildlife-friendly products.

**Research, Education & Awareness**

**Awareness Raising and Communications**



**North American Racer    *Coluber constrictor***

Increase public awareness and appreciation; counter misinformation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

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**North American Racer    *Coluber constrictor***

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Central Ratsnake *Pantherophis alleghaniensis*

## Central Ratsnake

*Pantherophis alleghaniensis*

### Conservation Assessment

**SGCN:** High Priority      **State Rank:** S2      **Global Rank:** G4G5      **State Trend:** Unknown  
**Regional SGCN?** No      **State T&E?** T      **Federal T&E?** No

### Conservation Assessment

The Central Ratsnake has a state rank of S2, was listed as state-threatened in 2005, and is restricted to two relatively small and disconnected areas in Rutland and Addison counties. These occupied areas are separated by approximately 24 miles. Vermont represents the northeastern extent of the Central Ratsnake's geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation), habitat conditions (e.g., hibernaculum temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation, population isolation, road mortality, certain land management practices (e.g., mowing), and disease. Given habitat fragmentation and the species' patchy distribution and limited dispersal ability, populations may suffer from low genetic diversity.

### Distribution

The Central Ratsnake is found in two separate regions in Vermont. The species occupies approximately 17 square miles in northern Addison County and approximately 200 square miles in northwestern Rutland County and southwestern Addison County. Verified records from other parts of the state, including several in Rutland City, are believed to be transported animals.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Not Probable     |
| Champlain Hills                     | Not Probable     |  | Hudson River                           | Not Probable     |
| Northern Green Mtns                 | Not Probable     |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Not Probable     |  | Lake Memphremagog/<br>St Francis River | Not Probable     |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Not Probable     |  |                                        |                  |
| Vermont Valley                      | Not Probable     |  |                                        |                  |
| Southern Green Mtns                 | Not Probable     |  |                                        |                  |
| Taconic Mtns                        | Confident        |  |                                        |                  |

### Habitats

In Vermont, the Central Ratsnake uses warm, low-elevation, rocky forests with embedded or nearby basking, foraging, and denning habitats. Foraging sites include field edges, trees and old buildings, and



### Central Ratsnake *Pantherophis alleghaniensis*

wetland margins. The species overwinters in rocky outcrops, talus, and cracks in ledges and cliffs. Central Ratsnakes are exceptional climbers that use large, decaying trees for refuge, basking, and nesting. Females will also nest in decaying stumps, logs, and vegetation.

### Habitat Types

- Northern Hardwood Forest
- Oak-Pine-Northern Hardwood Forest
- Outcrops and Upland Meadows
- Upland Shores
- Cliffs and Talus
- Marshes and Sedge Meadows
- Hardwood Swamps
- Young Forest-Red Oak and Red Cedar
- Other Cultural
- Old Field/Shrub
- Orchards
- Powerlines/RR/Roadsides
- Hedgerows
- Mine
- Grassland
- Building/Structure

### Threats

Potential non-habitat threats to Central Ratsnake populations include certain land management practices (e.g., mowing, haying), biocides (e.g., rodenticide), low genetic diversity, diseases (e.g., snake fungal disease), persecution, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). Vehicle strikes are a major source of mortality during the species' active period. The impacts of these threats may be especially acute when combined with the species' behavior (e.g., basking) and restricted and patchy distribution in Vermont.

Generally, Central Ratsnake populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific habitat threats include physical infrastructure (e.g., roads) that splinters contiguous habitats, trail development that facilitates human encroachment, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

### Threat Types

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Loss of Metapopulation Structure; Loss of Prey Base*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Changes in Temperature Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Habitat Succession*
- Human Intrusions & Disturbance: *Trampling, Persecution, Direct Impacts; Harvest or Collection;*



**Central Ratsnake *Pantherophis alleghaniensis***

*Recreation & Trails*

- Invasives and Other Problematic Species, Genes & Diseases: *Disease; Genetics*
- Other: *Information Needs*
- Pollution: *Herbicides & pesticides*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Habitat requirements**

Evaluate habitat use and movement patterns; identify important sites (e.g., overwintering) and movement corridors

**Population genetics**

Assess population genetic diversity

**Medium Priority**

**Monitor threats**

Monitor and mitigate diseases, road mortality, persecution, and other threats

**Threats and their significance**

Evaluate impacts of rodenticide, trail-based recreation, and other threats; evaluate the effectiveness of road crossing structures

**Conservation Actions**

**Capacity Building**

**Alliance Development**

Work cooperatively with appropriate organizations and landowners; develop and maintain public and local government allies.

*Threat: Habitat Alteration*

*Performance Measure: Number of partnering landowners organizations; number of allies.*

**Land/Water Protection**

**Publicly-Owned Protected Areas**



**Central Ratsnake *Pantherophis alleghaniensis***

Conserve important habitats including overwintering and foraging habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Encourage herp-friendly mowing/haying practices including delayed mows (after 11/1), raised mower decks (>8 inches), etc.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of landowners who adopt guidelines; number of trainings offered.

**Compatible Resource Use**

Encourage towns and individuals to restrict mechanized and motorized vehicle use where appropriate.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of sites where ATV use is restricted.

**Compatible Resource Use**

Conduct timber harvests within occupied habitats during winter months.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Proportion of harvests that occur during winter months.

**Habitat Restoration**

Work with public and private landowners and land managers to promote early successional habitats; encourage conservation-compatible agricultural practices.

*Threat:* Habitat Succession

*Performance Measure:* Acres of early successional habitats managed using herp-friendly practices.

**Natural Processes Restoration**

Install, maintain, and monitor road crossing structures.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Number of structures installed, maintained, and monitored.

**Species Restoration**

Maintain or create habitat connectivity among populations within and outside of VT.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Proportion of suitable dispersal habitat between populations.

**Species Restoration**

Implement the Rattlesnake Response Program, which includes ratsnakes.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of relocation requests.

**Law & Policy**





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**Central Ratsnake *Pantherophis alleghaniensis***

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Standards**

Encourage towns and individuals to use wildlife-friendly erosion matting and garden netting.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of towns, contractors, and homeowners who use wildlife-friendly products.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Increase public awareness and appreciation; counter misinformation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

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**Eastern Ribbonsnake** *Thamnophis saurita*

# **Eastern Ribbonsnake**

*Thamnophis saurita*

## **Conservation Assessment**

**SGCN:** High Priority      **State Rank:** S2      **Global Rank:** G5      **State Trend:** Unknown  
**Regional SGCN?** Watchlist      **State T&E?** SC      **Federal T&E?** No

## **Conservation Assessment**

The Eastern Ribbonsnake has a state rank of S2, is a special concern species in Vermont, and is restricted to relatively few sites in Grand Isle, Rutland, Windham, and potentially Chittenden counties. Vermont represents the near northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation), habitat conditions (e.g., hibernaculum temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation, population isolation, road mortality, and certain land management practices (e.g., mowing). Given habitat fragmentation and the species' patchy distribution and limited dispersal ability, populations may suffer from low genetic diversity.

## **Distribution**

The Eastern Ribbonsnake primarily occupies western Rutland County but can also be found in parts of western Chittenden, southern Grand Isle, and eastern Windham counties.

| <b>Distribution by Biophysical Region:</b> | <b>Occupancy Status</b> |  | <b>Distribution by Basin</b>                   | <b>Occupancy Status</b> |
|--------------------------------------------|-------------------------|--|------------------------------------------------|-------------------------|
| <b>Champlain Valley</b>                    | Confident               |  | <b>Connecticut River</b>                       | Confident               |
| <b>Champlain Hills</b>                     | Not Probable            |  | <b>Hudson River</b>                            | Not Probable            |
| <b>Northern Green Mtns</b>                 | Not Probable            |  | <b>Lake Champlain</b>                          | Confident               |
| <b>Northern VT Piedmont</b>                | Not Probable            |  | <b>Lake Memphremagog/<br/>St Francis River</b> | Not Probable            |
| <b>Northeastern Highlands</b>              | Not Probable            |  |                                                |                         |
| <b>Southern VT Piedmont</b>                | Confident               |  |                                                |                         |
| <b>Vermont Valley</b>                      | Not Probable            |  |                                                |                         |
| <b>Southern Green Mtns</b>                 | Not Probable            |  |                                                |                         |
| <b>Taconic Mtns</b>                        | Confident               |  |                                                |                         |

## **Habitats**

In Vermont, the Eastern Ribbonsnake occupies warm, undeveloped, low elevation habitats with embedded or nearby wetlands and basking sites. Commonly used habitats include wetland edges, wet meadows and fields, pastures, open forests, and rocky areas.



## Eastern Ribbonsnake *Thamnophis saurita*

### Habitat Types

- Oak-Pine-Northern Hardwood Forest
- Cliffs and Talus
- Outcrops and Upland Meadows
- Shrub Swamps
- Marshes and Sedge Meadows
- Ponds
- Seeps and Vernal Pools
- Old Field/Shrub
- Farm Pond
- Grassland
- Hedgerows
- Mine

### Threats

Potential non-habitat threats to Eastern Ribbonsnake populations include certain land management practices (e.g., mowing, haying), low genetic diversity, diseases, persecution, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). The impacts of these threats may be especially acute when combined with the species' behavior (e.g., basking) an restricted and patchy distribution in Vermont.

Generally, Eastern Ribbonsnake populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific habitat threats include physical infrastructure (e.g., roads) that splinters contiguous habitats; trail development that facilitates human encroachment; the loss of wetlands, wet meadows, and pastures to agriculture, development, and habitat succession; and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

### Threat Types

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Loss of Metapopulation Structure*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Changes in Temperature Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Succession; Hydrologic Alteration; Habitat Alteration; Habitat Fragmentation*
- Human Intrusions & Disturbance: *Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Genetics*
- Other: *Information Needs*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*



**Eastern Ribbonsnake** *Thamnophis saurita*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Habitat requirements**

Evaluate habitat use and movement patterns; identify important sites (e.g., overwintering) and movement corridors

**Monitor threats**

Monitor and mitigate diseases, road mortality, persecution, and other threats

**Population change**

Establish baseline population estimates and monitor over time

**Medium Priority**

**Population genetics**

Assess population genetic diversity

**Threats and their significance**

Evaluate impacts of land management practices (e.g., haying), droughts, population isolation, trail-based recreation, and other threats

**Other research**

Develop and validate a habitat suitability model

**Conservation Actions**

**Land/Water Protection**

**Easements**

Conserve important habitats including overwintering and foraging habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Encourage towns and individuals to restrict mechanized and motorized vehicle use where appropriate.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of sites where ATV use is restricted.



**Eastern Ribbonsnake** *Thamnophis saurita*

**Compatible Resource Use**

Encourage herp-friendly mowing/haying practices including delayed mows (after 11/1), raised mower decks (>8 inches), etc.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of landowners who adopt guidelines; number of trainings offered.

**Habitat Restoration**

Work with public and private landowners and land managers to provide undisturbed aquatic habitats with natural shorelines.

*Threat:* Habitat Alteration

*Performance Measure:* Number of landowners and land managers contacted; number of undisturbed habitats.

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Standards**

Encourage towns and individuals to use wildlife-friendly erosion matting and garden netting.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of towns, contractors, and homeowners who use wildlife-friendly products.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**Awareness Raising and Communications**

Increase public awareness and appreciation; counter misinformation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

**References**

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**Eastern Ribbonsnake    *Thamnophis saurita***

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- Mifsud, D. A. (2023). *Michigan Amphibian and Reptile Best Management Practices Second Edition*. Herpetological and Management Technical Publication 2023.
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Smooth Greensnake *Opheodrys vernalis*

## Smooth Greensnake

*Opheodrys vernalis*

### Conservation Assessment

**SGCN:** Medium Priority      **State Rank:** S3      **Global Rank:** G5      **State Trend:** Declining  
**Regional SGCN?** Watchlist      **State T&E?** SC      **Federal T&E?** No

### Conservation Assessment

The Smooth Greensnake has a state rank of S3, is a special concern species in Vermont, and has a widespread but patchy distribution across much of the state. Primary threats potentially contributing to the species' rarity include habitat fragmentation, population isolation, road mortality, motorized and mechanized recreation (e.g., ATVs, mountain bikes), the loss of early successional habitats, and insecticides. As insectivores, Smooth Greensnakes are particularly vulnerable to the effects of insecticides.

### Distribution

The Smooth Greensnake is widespread but patchily distributed in Vermont. The species can be found at low and moderate elevations but no populations are known from northern and northeastern Vermont.

| Distribution by Biophysical Region: | Occupancy Status |  | Distribution by Basin                  | Occupancy Status |
|-------------------------------------|------------------|--|----------------------------------------|------------------|
| Champlain Valley                    | Confident        |  | Connecticut River                      | Confident        |
| Champlain Hills                     | Confident        |  | Hudson River                           | Confident        |
| Northern Green Mtns                 | Confident        |  | Lake Champlain                         | Confident        |
| Northern VT Piedmont                | Confident        |  | Lake Memphremagog/<br>St Francis River | Not Probable     |
| Northeastern Highlands              | Not Probable     |  |                                        |                  |
| Southern VT Piedmont                | Confident        |  |                                        |                  |
| Vermont Valley                      | Confident        |  |                                        |                  |
| Southern Green Mtns                 | Confident        |  |                                        |                  |
| Taconic Mtns                        | Confident        |  |                                        |                  |

### Habitats

In Vermont, the Smooth Greensnake occupies open and early successional habitats (e.g., wetland edges, sedge meadows, pastures, powerlines) that are not frequently mowed and have embedded or nearby waterbodies. Females typically nest in warm, relatively moist habitat features (e.g., under rocks and logs, in decaying vegetation).





## Smooth Greensnake *Opheodrys vernalis*

### Habitat Types

- Cliffs and Talus
- Marshes and Sedge Meadows
- Wet Shores
- Young Forest-Boreal Hardwoods
- Young Forest-Pine and Hemlock
- Young Forest-Northern Hardwoods
- Young Forest-Red Oak and Red Cedar
- Old Field/Shrub
- Grassland
- Hedgerows
- Powerlines/RR/Roadsides

### Threats

Potential non-habitat threats to Smooth Greensnake populations include certain land management practices (e.g., mowing, haying), low genetic diversity, biocides (e.g., insecticides), diseases, persecution, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). The impacts of these threats may be especially acute when combined with the species' life history (e.g., low fecundity) and patchy distribution in Vermont.

Generally, Smooth Greensnake populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include physical infrastructure (e.g., roads) that splinters contiguous habitats, trail development that facilitates human encroachment, the loss of open and early successional habitats to development and habitat succession, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

### Threat Types

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Loss of Metapopulation Structure; Loss of Prey Base*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Changes in Temperature Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Habitat Succession; Inadequate Disturbance Regime*
- Human Intrusions & Disturbance: *Recreation & Trails; Trampling, Persecution, Direct Impacts*
- Invasives and Other Problematic Species, Genes & Diseases: *Genetics*
- Other: *Information Needs*
- Pollution: *Herbicides & pesticides*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*



**Smooth Greensnake    *Opheodrys vernalis***

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Monitor threats**

Monitor and mitigate diseases, invasive species, and other threats

**Other monitor**

Develop an effective and standardized survey technique; investigate alternative survey techniques (e.g., camera traps)

**Medium Priority**

**Habitat requirements**

Evaluate habitat use and movement patterns; identify important sites (e.g., nesting) and movement corridors

**Population change**

Establish baseline population estimates and monitor over time

**Population genetics**

Assess population genetic diversity

**Threats and their significance**

Evaluate impacts of insecticide, drought, certain land management practices (e.g., haying), and other threats

**Other monitor**

Establish community science programs to monitor populations

**Other research**

Develop and validate a habitat suitability model; determine which natural communities and arrangement of communities best support sustained populations

**Conservation Actions**

**Land/Water Protection**

**Easements**

Conserve important habitats including overwintering and foraging habitats.

*Threat:* Habitat Alteration



**Smooth Greensnake *Opheodrys vernalis***

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Encourage herp-friendly mowing/haying practices including delayed mows (after 11/1), raised mower decks (>8 inches), etc.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of landowners who adopt guidelines; number of trainings offered.

**Compatible Resource Use**

Encourage towns and individuals to restrict mechanized and motorized vehicle use where appropriate.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of sites where ATV use is restricted.

**Compatible Resource Use**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Habitat Restoration**

Work with public and private landowners and land managers to promote early successional habitats; decrease insecticide use.

*Threat:* Habitat Succession

*Performance Measure:* Acres of early successional habitats managed using herp-friendly practices.

**Habitat Restoration**

Work with public and private landowners and land managers to promote early successional habitats; encourage conservation-compatible agricultural practices.

*Threat:* Habitat Succession

*Performance Measure:* Acres of early successional habitats managed using herp-friendly practices.

**Species Restoration**

Maintain or create habitat connectivity among populations within and outside of VT.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Proportion of suitable dispersal habitat between populations.

**Law & Policy**

**Standards**

Encourage towns and individuals to use wildlife-friendly erosion matting and garden netting.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of towns, contractors, and homeowners who use wildlife-friendly products.



**Smooth Greensnake    *Opheodrys vernalis***

**Research, Education & Awareness**

**Awareness Raising and Communications**

Increase public awareness and appreciation; counter misinformation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

**References**

Andrews, J. 2025. The Vermont Reptile and Amphibian Atlas.

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Vermont Fish & Wildlife Department  
Wildlife Action Plan 2025  
Taxon Conservation Report - Herptiles

Timber Rattlesnake *Crotalus horridus*

# Timber Rattlesnake

*Crotalus horridus*

## Conservation Assessment

**SGCN:** High Priority      **State Rank:** S1      **Global Rank:** G4      **State Trend:** Stable  
**Regional SGCN?** Yes      **State T&E?** E      **Federal T&E?** No

## Conservation Assessment

The Timber Rattlesnake has a state rank of S1, was listed as state-endangered in 1987, is a Regional Species of Greatest Conservation Need, and is currently known from only two populations in Vermont; however, the species' historically occupied at least 25 den areas distributed across much of the state (Breisch et al. 2021). A regretful statewide bounty program resulted in the killing of thousands of Timber Rattlesnakes during 1895–1971. Vermont represents the northeastern extent of the species' geographic range, so our state's populations are likely limited by climate-related factors that affect physiological processes (e.g., thermoregulation), habitat conditions (e.g., hibernaculum temperatures), the duration of the species' active period, etc. Primary threats potentially contributing to the species' rarity include habitat fragmentation and succession, population isolation, road mortality, certain land management practices (e.g., mowing, haying), disease, human disturbance, and persecution. Given habitat fragmentation and the species' patchy distribution and limited dispersal ability, populations may suffer from low genetic diversity. The Vermont Timber Rattlesnake Recovery Plan and The Timber Rattlesnake: Life History, Distribution, Status, and Conservation Action Plan guide the state's monitoring, research, management, and recovery strategies (Vermont Fish and Wildlife Department 2015, Breisch et al. 2021).

## Distribution

Historically, the Timber Rattlesnake was widely distributed across much of Vermont's low and moderate elevations. Today, the species is restricted to western Rutland County, with only two populations known.

| Distribution by Biophysical Region: | Occupancy Status      | Distribution by Basin                  | Occupancy Status      |
|-------------------------------------|-----------------------|----------------------------------------|-----------------------|
| Champlain Valley                    | Confident             | Connecticut River                      | Historic Records Only |
| Champlain Hills                     | Not Probable          | Hudson River                           | Historic Records Only |
| Northern Green Mtns                 | Not Probable          | Lake Champlain                         | Confident             |
| Northern VT Piedmont                | Not Probable          | Lake Memphremagog/<br>St Francis River | Not Probable          |
| Northeastern Highlands              | Not Probable          |                                        |                       |
| Southern VT Piedmont                | Historic Records Only |                                        |                       |
| Vermont Valley                      | Not Probable          |                                        |                       |
| Southern Green Mtns                 | Historic Records Only |                                        |                       |
| Taconic Mtns                        | Confident             |                                        |                       |



**Timber Rattlesnake** *Crotalus horridus*

## Habitats

In Vermont, the Timber Rattlesnake overwinters in low-elevation, communal hibernacula (e.g., talus, cracks in cliffs) embedded within mixed forests. In spring, individuals bask and stage near hibernacula before migrating to upland and wetland habitats to forage, bask, mate, seek refuge, etc. Gravid females typically remain near hibernacula to gestate until giving birth in August or September.

### Habitat Types

- Northern Hardwood Forest
- Oak-Pine-Northern Hardwood Forest
- Outcrops and Upland Meadows
- Cliffs and Talus
- Hardwood Swamps
- Young Forest-Red Oak and Red Cedar
- Hedgerows
- Mine
- Subterranean
- Old Field/Shrub

## Threats

Potential non-habitat threats to Timber Rattlesnake populations include certain land management practices (e.g., mowing, haying), low genetic diversity, biocides (e.g., rodenticide), diseases (e.g., snake fungal disease), illegal collection, persecution, motorized and mechanized recreation (e.g., ATVs, mountain bikes), vehicle strikes, droughts, and altered temperature and precipitation regimes that impact physiological processes (e.g., thermoregulation). The impacts of these threats may be especially acute when combined with the species' life history (e.g., delayed sexual maturity, irregular birthing frequency), behavior (e.g., habitat fidelity), and restricted distribution in Vermont.

Generally, Timber Rattlesnake populations are negatively impacted by habitat degradation, fragmentation, alteration, and conversion. Specific threats include physical infrastructure (e.g., roads) that splinters contiguous habitats, trail development that facilitates human encroachment, habitat succession that decreases solar radiation at hibernacula and gestation sites, the loss of mast-producing trees and shrubs that support the species' prey base, and altered temperature and precipitation regimes that disrupt natural communities and hydrological cycles.

### Threat Types

- Agriculture & Aquaculture Impacts: *Agriculture & Aquaculture Impacts*
- Biological Limitations: *Loss of Metapopulation Structure; Loss of Prey Base; Reproductive Traits*
- Climate Change: *Changes in Precipitation & Hydrological Regimes; Changes in Temperature Regimes*
- Conversion of Habitat: *Conversion of Habitat*
- Habitat Modifications: *Habitat Alteration; Habitat Fragmentation; Habitat Succession*
- Human Intrusions & Disturbance: *Recreation & Trails; Harvest or Collection; Trampling, Persecution,*



**Timber Rattlesnake** *Crotalus horridus*

*Direct Impacts*

- Invasives and Other Problematic Species, Genes & Diseases: *Disease; Genetics*
- Other: *Information Needs*
- Pollution: *Herbicides & pesticides*
- Roads & Transportation Corridors: *Roads & Transportation Corridors*

**Research and Monitoring Needs**

**High Priority**

**Distribution and abundance**

Evaluate relative abundance; identify suitable habitats and conduct surveys; solicit public reports; investigate credible reports from unknown sites

**Threats and their significance**

Evaluate impacts of development projects (e.g., solar), rodenticide, and other threats; evaluate the effectiveness of road crossing structures

**Medium Priority**

**Habitat requirements**

Better determine range and habitat usage to protect critical areas

**Monitor threats**

Monitor and mitigate diseases, road mortality, persecution, illegal collection, habitat succession, human disturbance, and other threats

**Population change**

Conduct surveys at historic sites; establish baseline population estimates and monitor over time

**Population genetics**

Assess population genetic diversity; evaluate techniques to augment population genetic diversity

**Conservation Actions**

**Capacity Building**

**Alliance Development**

Work cooperatively with appropriate organizations and landowners; develop and maintain public and local government allies.

*Threat: Habitat Alteration*

*Performance Measure: Number of partnering landowners organizations; number of allies.*



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**Timber Rattlesnake *Crotalus horridus***

**Land/Water Protection**

**Publicly-Owned Protected Areas**

Conserve important habitats including gestating, foraging, and overwintering habitats.

*Threat:* Habitat Alteration

*Performance Measure:* Acres of conserved habitats; number of sites conserved.

**Land/Water/Species Management**

**Compatible Resource Use**

Conduct timber harvests within occupied habitats during winter months.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Proportion of harvests that occur during winter months.

**Compatible Resource Use**

Encourage towns and individuals to restrict mechanized and motorized vehicle use where appropriate.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of sites where ATV use is restricted.

**Habitat Restoration**

Create small forest canopy openings; retain coarse woody material; daylight overwintering and gestation habitats.

*Threat:* Habitat Succession

*Performance Measure:* Number of sites actively managed.

**Natural Processes Restoration**

Install, maintain, and monitor road crossing structures.

*Threat:* Roads & Transportation Corridors

*Performance Measure:* Number of structures installed, maintained, and monitored.

**Species Restoration**

Maintain or create habitat connectivity among populations within and outside of VT.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Proportion of suitable dispersal habitat between populations.

**Species Restoration**

Augment populations through headstarting, translocation, and/or repatriation.

*Threat:* Loss of Metapopulation Structure

*Performance Measure:* Number of stable populations; survivorship; population size.

**Species Restoration**

Implement the Rattlesnake Response Program; restrict access to overwintering and gestating habitats.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of relocation requests; number of trespass events.





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**Timber Rattlesnake *Crotalus horridus***

**Law & Policy**

**Planning & Zoning**

Review Act 250, Section 248, roadwork, and other proposed projects and provide recommendations to avoid, minimize, or mitigate impacts.

*Threat:* Habitat Alteration

*Performance Measure:* Number of projects reviewed, number of recommendations implemented.

**Standards**

Encourage towns and individuals to use wildlife-friendly erosion matting and garden netting.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of towns, contractors, and homeowners who use wildlife-friendly products.

**Research, Education & Awareness**

**Awareness Raising and Communications**

Increase public awareness and appreciation; counter misinformation.

*Threat:* Trampling, Persecution, Direct Impacts

*Performance Measure:* Number of people reached through presentations, social media posts, etc.

**Awareness Raising and Communications**

Encourage public reporting including road mortality.

*Threat:* Information Needs

*Performance Measure:* Number of reports received; number of observers.

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