

## Eastern Hog-nosed Snake

*Heterodon platirhinos*

Federal Listing	N/A
State Listing	E
Global Rank	G5
State Rank	S1
Regional Status	Very High



Photo by New Boston Air Force Station

### Justification (Reason for Concern in NH)

The eastern hognose snake was listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as of January 1, 2001 and is considered a species of regional concern in the northeastern United States (Therres 1999). Eastern hognose snakes were listed as a species of ‘Severe’ and ‘Very High’ concern in the northeast United States (NEPARC 2011, Northeast RSGCN list 2014). In New England, the eastern hognose snake is listed as S2 in Rhode Island, S2S3 in Connecticut, and S4 in Massachusetts; it doesn’t occur in Maine. The species was previously unknown from Vermont but a single individual was confirmed in southeastern part of the state within the last 10 years. New Hampshire’s peripheral population of hognose snakes is state endangered (RSA 212-A, FIS 1000). Hognose snakes in New Hampshire have large home ranges (LaGory et al. 2009, Goulet 2010, Goulet and Mills 2011, Goulet et al. 2015) and are restricted to the Merrimack River corridor south of Concord, an area where development and human population increases are intense and remaining blocks of suitable habitat are becoming smaller and isolated (SPNHF 2005). In addition, the sandy, well-drained soils preferred by hognose snakes are easily converted to residential and commercial developments and are targeted for commercial sand extraction operations.

### Distribution

The eastern hognose snake is found from southern New England and Ontario south along Atlantic coast to Florida and west to Texas, Kansas, Nebraska, and South Dakota (Ernst and Ernst 2003). New Hampshire represents the northern limit of the species range on the east coast, where they are restricted to the sandy plain of the Merrimack River, extending from Concord on the north to the Massachusetts state line, as far east as Londonderry, and as far west as New Boston. In fact, the majority of recently confirmed reports (2008-2013) have been near the western boundary of the species’ known range in NH (i.e., Mason, Brookline, Milford, Mont Vernon, New Boston) suggesting the need to target surveys in these areas. In addition, 3 biologists have reported finding eastern hognose snakes historically in the Durham/Lee area of southeastern New Hampshire (Phillip Sawyer, formerly Professor of Zoology, University of New Hampshire; David Allen, formerly a biologist with the USDA Soil Conservation Service, now known as the Natural Resource Conservation Service; John Litvaitis, Professor of Wildlife Ecology, University of New Hampshire. Sandy soils generated by glacial outwash, the critical habitat feature for hognose snakes, are common in the Durham/Lee area. Also, a recent documented occurrence in southeastern Vermont might indicate a potential for an undocumented population along the Connecticut River in southwestern New Hampshire (e.g., Hinsdale).

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### Habitat

Eastern hognose snakes are found in open woodland, grasslands, and fields with sandy soil derived from glacial outwash (Michener and Lazell 1989). Natural vegetation commonly occurring in these New Hampshire sandy soils include white pine (*Pinus strobus*), pitch pine (*Pinus rigida*), scrub oak (*Quercus ilicifolia*), and a mixture of hardwoods (Michener and Lazell 1989). Hognose snakes feed largely on amphibians, especially toads; however, other prey may be taken (Edgren 1955, Platt 1969). Therefore, wetlands that are suitable for amphibian breeding may be an important habitat component, but prey preference could potentially vary regionally or locally depending on prey availability. Eggs are laid in sandy soils, usually during June-July, and young snakes emerge from nests in August-September (Ernst and Ernst 2003). Hibernation often occurs individually in mammal burrows, loose soil, or down logs (Plummer 2002, Ernst and Ernst 2003). Selection of habitat may occur at multiple spatial scales (Goulet 2010, Goulet et al. 2015). At one site in NH, microhabitat features associated with snake activity sites (compared to random sites) included higher ground- surface temperatures, proximity to wetlands, limited canopy closure, as well as an abundance of shrubs, debris, and rock cover (Goulet 2010, Goulet et al. 2015). Some sites in NH are associated with active or abandoned sand & gravel operations because of the preferred sandy deposits and the mix of sandy openings and patches of shrubs surrounded by forest.

### NH Wildlife Action Plan Habitats

- Appalachian Oak Pine Forest
- Pine Barrens
- Developed Habitats
- Hemlock Hardwood Pine Forest
- Marsh and Shrub Wetlands
- Shrublands
- Vernal Pools

Distribution of  
EASTERN HOGNOSE SNAKE  
in New Hampshire

■ Current (1994-2014)  
■ Historic (1939-1994)



**Distribution Map**

## *Appendix A: Reptiles*

### **Current Species and Habitat Condition in New Hampshire**

There are 45 known occurrence records of hognose snakes in New Hampshire, 13 of which (29%) are considered historic (over 20 years old). Many of these historic sites may still be occupied and have gone undetected more recently due to the cryptic behavior of the species. However, for the purposes of this section only the 32 current (within 20 years) occurrence records are summarized. Total land area within 500 meters of known current records is 7,099 ha, 77% of which (5,448 ha) was in natural cover (forest, grass, wetland, floodplain forest). 26,165 ha of habitat was identified when forest blocks overlapping the 500 meter buffer were included. The mean size of habitat polygons was 61 ha +/- 253 ha SD. Ninety-six habitat polygons are over 10 Ha, with the largest being 3,568 ha.

Information on the condition of hognose snakes in New Hampshire is not suitable to determine the viability of local populations. Several hognose snakes are reported to the NHFG annually; however, these observations largely consist of individual snakes, with very few locations having repeated observations.

The most studied population in NH occurs at the New Boston Air Force Station. Several years of radiotelemetry studies have been completed along with continued mark-recapture of the population (LaGory et al. 2009, Goulet 2010, Goulet et al. 2015). Incidental encounters within this population continue and natural resources staff at the NBAFS provide education and technical assistance to other staff at the NBAFS. The NBAFS also has an Integrated Natural Resources Management Plan for the property which includes recommendations for eastern hognose snakes. Progress on this plan is reviewed by NHFG and USFWS staff on an annual basis. The NBAFS is near the edge of the NH's western range and habitat is somewhat different from the typical citations (NBAFS includes more mesic hemlock forests with variable soils, Goulet et al. 2015). The NBAFS ownership has relatively low levels of development and paved roads, has restricted use by the public, and habitat is managed with wildlife as a focus. As such, the NBAFS provides a potentially suitable landscape for hognose snakes to persist.

The second most studied population in NH is in Pembroke at the Army National Guard property. Hibernation locations and successful reproduction have been confirmed at this site and some critical habitat areas have been identified (Goulet and Mills 2011). However, further evaluation is needed to assess the condition of this population.

All other sites in NH are represented by incidental encounters and reports to the NHFG. During April-September 2015, NHFG conducted targeted searches for hognose snakes within 13 focal areas in the towns of Litchfield and Londonderry. No hognose snakes were observed despite a substantial effort and relatively recent incidental encounters by the public. During the summer of 2002, the University of New Hampshire surveyed 6 sites for hognose snake presence but none were encountered (Oberkrieser and Litvaitis 2002). These efforts indicate the difficulty in observing this cryptic species, especially when densities are likely low.

The majority of recently confirmed reports (2008-2013) have been near the western boundary of the species' known range in NH (Mason, Brookline, Milford, Amherst, Mont Vernon, New Boston) suggesting the need to target surveys in these areas. All records for towns of Bedford and Manchester are historic (1973-1985). Recent reports within the towns of Hollis, Nashua, Merrimack, Pembroke, and Bow, as well as towns between, need further evaluation. Litchfield and Londonderry have a combination of historic and recent reports but a targeted survey during 2015 did not reveal any new occurrences.

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### **Population Management Status**

There is very little population management and or research occurring for hognose snakes in New Hampshire. The New Boston Air Force Station and Pembroke Army National Guard have both conducted several years of radiotelemetry to document habitat use and movement patterns within their ownership (LaGory et al. 2009, Goulet 2010, Goulet and Mills 2011). This information is used during planning for various land management activities.

### **Regulatory Protection (for explanations, see Appendix I)**

- NHFG Rule FIS 803.02. Importation.
- NHFG Rule FIS 804.02. Possession.
- NHFG Rule FIS 811.01 Sale of Reptiles.
- Endangered Species Conservation Act (RSA 212-A)
- NHFG FIS 1400 Nongame special rules
- Fill and Dredge in Wetlands - NHDES
- Comprehensive Shoreland Protection Act - NHDES
- Alteration of Terrain Permitting - NHDES

### **Quality of Habitat**

Sandy glacial outwash is plentiful along the Merrimack River in Hillsborough and Merrimack counties, as well as the Lee/Durham area of New Hampshire. The abundance of the prey base (principally toads and frogs) has not been quantified, but several species, including American toads (*Anaxyrus americanus*), spring peepers (*Pseudacris crucifer*), gray treefrogs (*Hyla versicolor*), and pickerel frogs (*Rana palustris*), appear to be common in this area of the state. Development is intense and human population densities are rapidly expanding in southern New Hampshire. Many remaining fragmented blocks of habitat may be too small to support viable local populations of hognose snakes. The scarcity of hognose snake encounters may be a reflection of low habitat quality along with low detection probability.

### **Habitat Protection Status**

Twenty-eight percent (1,525 ha) of area within 500 meters of recent (within 20 years) hognose records are in conservation. When the 500 meter buffer around occurrences is extended to include overlapping forest blocks, 20% (5,207 ha) of land area is in conservation. The average (mean) size of conservation parcels was 63 Ha +/- 180 Ha SD. Thirty-seven conserved habitat polygons are over 10 Ha with largest conserved habitat polygon = 1,480 ha. However, the actual amount of land in permanent protection is likely considerably less because the NH conservation lands layer includes some areas that are not permanently protected (e.g., New Boston Air Force Station). Also, it is not known whether management of conservation parcels (e.g., habitat management, recreation) is compatible for hognose snakes.

### **Habitat Management Status**

No habitat management has occurred specifically for hognose snakes in New Hampshire to date. Restoration of Pine Barrens (i.e., prescribed fires, forestry, and mowing) in south-central New Hampshire (e.g., Concord) may improve habitat suitability for hognose snakes but this needs further evaluation. Management of shrubland habitats for other species such as New England Cottontail (e.g., Londonderry and Litchfield) may benefit hognose snakes (LaGory et al. 2009) but a detailed hognose snake assessment is needed to determine where snakes are present and how they are affected (positively or negatively) by management. Potential impacts to hognose snake habitats are assessed during the Nongame & Endangered Species Program review of newly proposed developments projects.

### **Threats to this Species or Habitat in NH**

*Threat rankings were calculated by groups of taxonomic or habitat experts using a multistep process (details in Chapter 4). Each threat was ranked for these factors: Spatial Extent, Severity, Immediacy, Certainty, and Reversibility (ability to address the threat). These combined scores produced one overall threat score. Only threats that received a “medium” or “high” score have accompanying text in this profile. Threats that have a low spatial extent, are unlikely to occur in the next ten years, or there is uncertainty in the data will be ranked lower due to these factors.*

#### **Habitat conversion due to development of uplands (Threat Rank: High)**

The corridor along the Merrimack River in Hillsborough and Merrimack counties is heavily urbanized and continuing to grow in human population and development. Continuing habitat conversion may degrade preferred habitat, fragment it into areas too small to support the home range of an individual, increase encounters with humans and other generalist predators, and reduce the prey base of anurans that this species depends on.

Urbanization often converts hognose snake habitat to pavement and mowed lawns. Eastern hognose snakes are also noted for having relatively large home ranges (LaGory et al. 2009, Goulet 2010, Goulet and Mills 2011) and at times moving as much as 600 m at a time (Plummer and Mills 2000)]; conversion of habitat to standard New Hampshire 0.8 ha (2 acre) building lots or commercial uses dominated by impervious surfaces thus has great potential to negatively affect this species.

Amphibian populations, likely the primary prey for hognose snakes, are adversely impacted by wetland filling (especially vernal pools) and development of surrounding uplands, resulting from residential and commercial development.

#### **Habitat conversion and mortality from mining (sand & gravel) (Threat Rank: Medium)**

The abundance of sandy deposits along the Merrimack River is important to the distribution of hognose snakes in NH and has been an attractive resource for mining operations. As a result, sand mining operations are often found in or around known populations of hognose snakes in NH. Substantial removal of sandy deposits may reduce habitat quality for hognose snakes by reducing nesting and foraging areas. Mining operation machinery may also directly kill snakes by running over them or excavating them while snakes or eggs are underground. Following extraction of sand, these areas are often targeted for commercial development which severely and permanently reduces habitat availability and suitability. Abandoned sand operations can be valuable habitat for hognose snakes and other wildlife species.

Numerous NH wildlife species including hognose snakes are known to occur in or around sandy mining operations, especially those that have been abandoned. It is known that some of these previous mining operations have been converted to commercial developments in areas where hognose snakes were known or suspected to occur (i.e., Bow, Concord, Londonderry). No hognose snakes have been tracked via radiotelemetry at these locations.

#### **Mortality of individuals from vehicles on roadways (Threat Rank: Medium)**

Given the probable large home range requirements of this species (LaGory et al. 2009, Goulet 2010, Goulet and Mills 2011) and high road densities along the Merrimack River corridor, the opportunity for deadly encounters with automobiles is probably high.

The number of snakes found dead on roads has been enumerated at other locations (Ashley and Robinson 1996, Enge and Wood 2002), but the degree to which road mortality threatens population viability in New Hampshire is largely unknown but expected for slow-moving species or those with

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large home ranges. However, it is also possible that hognose snakes avoid crossing some paved roads which might reduce road mortality but could have adverse genetic implications to local populations (Robson 2011).

### **Mortality from human persecution (Threat Rank: Medium)**

Many people have an irrational fear or hatred for snakes. The eastern hognose snake has an extensive threat display (Lazell and Michener 1976) and is a heavy bodied snake that is commonly misidentified as a dangerous species (e.g., cobra, rattlesnake). Removal of individuals from an already small population can reduce population size. Small populations are subject to many problems that threaten viability including demographic and environmental stochasticity, genetic drift, and inbreeding depression (Meffe and Carroll 1997).

At least several individual hognose snakes have been killed and reported to the NHFG in previous 10 years (e.g., Bow, Litchfield) and it is likely to occur more often than reported since hognose snakes are state protected (low reporting), may occur near human dwellings (higher likelihood of encounter), and are commonly misidentified as a dangerous snake. There is no information on the frequency with which this species is killed or collected by humans and impacts to local populations.

### **Mortality and species impacts (decreased fitness) of individuals from various diseases (snake fungal disease) (Threat Rank: Medium)**

Since the mid-1990's an increasing number of snakes in the eastern United States have been observed with fungal skin infections. As the number of reported cases has grown the infections have now been termed snake fungal disease (SFD). A novel fungus (*Ophidiomyces ophidiicola*) has been identified in many individuals with suspected SFD and is thought to be the cause of mortality although some questions remain as to whether this species is the primary or secondary pathogen.

*O. ophidiicola* has now been documented in more than 10 different snake species from 11 different states ranging from New Hampshire to Florida and as far west as Arkansas and Minnesota. Eastern hognose snakes have not been reported with signs of SFD to date (NEPARC 2013) and therefore, there is no evidence to determine prevalence and effect on populations. However, based on the large number of other snake species affected and the difficulty in observing hognose snakes, it is possible that this species is also affected.

### **List of Lower Ranking Threats:**

- Mortality from subsidized or introduced predators
- Habitat conversion and succession from grass and shrubs to forested areas
- Mortality to individuals from military training activities
- Mortality and degradation from legal and illegal OHRV activity
- Species impacts from declines in prey abundance
- Mortality from welded plastic erosion control blankets

## **Actions to benefit this Species or Habitat in NH**

### **Conserve priority hognose snake habitat**

**Primary Threat Addressed:** Habitat conversion due to development of uplands

**Specific Threat (IUCN Threat Levels):** Residential & commercial development

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### **Objective:**

Conserve priority hognose snake habitat

### **General Strategy:**

Hognose snake parcels need to be prioritized for protection. These sites will be updated over time as new information becomes available. Priority sites will be incorporated into NH Wildlife Action Plan revision maps and incorporated into state land conservation funding consideration (e.g., Aquatic Resource Mitigation Fund, LCHIP). NHFG staff will provide technical assistance to land trusts and towns in identifying and conserving priority parcels. NHFG staff will also provide technical assistance in developing management objectives compatible with hognose snake conservation.

### **Political Location:**

Hillsborough County, Merrimack County, Rockingham County

### **Watershed Location:**

Merrimack Watershed, Coastal Watershed

## **Promote wildlife friendly erosion control matting**

**Primary Threat Addressed:** Mortality from welded plastic erosion control blankets

**Specific Threat (IUCN Threat Levels):** Residential & commercial development

### **Objective:**

Promote wildlife friendly erosion control matting to reduce mortality of snakes.

### **General Strategy:**

Some erosion control matting has a welded plastic netting that captures and kills snakes and birds. Wildlife friendly options are available and will be favored and promoted during environmental reviews, technical assistance with landowners, and technical assistance to other land managers.

### **Political Location:**

Statewide

### **Watershed Location:**

Statewide

## **Enforce wildlife regulations**

**Primary Threat Addressed:** Mortality from human persecution

**Specific Threat (IUCN Threat Levels):** Biological resource use

### **Objective:**

Enforce wildlife regulations pertaining to the illegal harm, killing, collection, possession, or sale of eastern hognose snakes in New Hampshire.

### **General Strategy:**

In NH, it is illegal to kill, harm, possess, collect, or sell an eastern hognose snake without a permit from the NHFG. Because the species is endangered and populations are few and appear to have low densities, enforcement of rules and laws pertaining to this species are particularly important. NHFG biologists will work with NHFG law enforcement staff to identify violations and enforcement actions.

### **Watershed Location:**

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### **Political Location:**

Hillsborough County, Merrimack County,  
Rockingham County

### **Watershed Location:**

Merrimack Watershed, Coastal Watershed

### **Monitor hognose snake populations**

#### **Objective:**

Assess the distribution and condition of hognose snake populations.

#### **General Strategy:**

Eastern hognose snakes are often difficult to detect during surveys. Effective monitoring will likely require monitoring individual animals with radiotelemetry to determine habitat use and movement.

### **Political Location:**

Hillsborough County, Merrimack County,  
Rockingham County

### **Watershed Location:**

Merrimack Watershed, Coastal Watershed

### **Disseminate information about species status**

**Primary Threat Addressed:** Mortality from human persecution

**Specific Threat (IUCN Threat Levels):** Biological resource use

#### **Objective:**

Provide outreach and technical assistance to landowners within the range of the eastern hognose snake to reduce animals being killed.

#### **General Strategy:**

NHFG will increase landowner knowledge of the species' status and threats by developing materials and messages on various media including Facebook, NHFG webpage, press releases to other media outlets (newspaper, radio, television), and targeted landowner communications

### **Political Location:**

Hillsborough County, Merrimack County,  
Rockingham County

### **Watershed Location:**

Merrimack Watershed, Coastal Watershed

### **Review any proposed activities that has the potential to harm eastern hognose snakes.**

**Primary Threat Addressed:** Habitat conversion due to development of uplands

**Specific Threat (IUCN Threat Levels):** Residential & commercial development

**Specific Action:** Review development proposals in eastern hognose habitat through NHFG environmental review program

#### **Objective:**

Review all proposed activities in hognose snake habitat in order to avoid, minimize, and mitigate the effects of the proposal on a state endangered wildlife species protected under RSA 212-A.

#### **General Strategy:**

Eastern hognose snakes are listed as endangered in New Hampshire. As such, NHFG will review any proposed activities (residential and commercial development, recreation, habitat management, etc.)

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that has the potential to harm hognose snakes. NHFG will work with applicants and permitting staff from other state and federal agencies, primarily Department of Environmental Services (Wetlands Bureau) and U.S. Army Corps of Engineers, to identify avoidance and minimization conditions for permit applicants. NHFG will develop guidelines for consistent and effective review of projects potentially impacting hognose snakes. Guidelines will consider scenarios where impacts should be avoided and scenarios where impact minimization of mitigation may be appropriate. Pre- and post-construction monitoring of hognose snakes and associated habitat should be considered as a component of project review. Although all hognose snake populations have some protection by state law (RSA 212-A), NHFG should prioritize protection at higher quality sites.

### Political Location:

Hillsborough County, Merrimack County,  
Rockingham County

### Watershed Location:

Merrimack Watershed, Coastal Watershed

## References, Data Sources and Authors

### Data Sources

The major source of distribution information for New Hampshire was from the Reptile and Amphibian Reporting Program (RAARP) and NH Wildlife Sightings website coordinated by the Nongame and Endangered Wildlife Program at NHFG, the rare species database maintained by the NHHNB, and literature reviews and unpublished reports and professional knowledge of the authors. State and global heritage ranks were taken from NatureServe 2015. Habitat maps were completed by UNH, Complex Systems Research Center during the development of the 2005 NH WAP.

Condition of hognose snake locations was assessed based on data from the RAARP, NH Wildlife Sightings and rare species database maintained by the NHHNB. Threat assessments were conducted by a group of NHFG biologists (Michael Marchand, Brendan Clifford, Loren Valliere, Josh Megysey).

### Data Quality

The extent of the eastern hognose snakes' current range in the state, given the clustering of records near the Merrimack River south of Concord, is fairly well known. However, it is possible that there is an unidentified population in southwestern NH along the Connecticut River.

The condition of hognose snakes in New Hampshire is extremely poorly understood.

### 2015 Authors:

Michael Marchand, NHFG

### 2005 Authors:

James Taylor, UNH and Michael Marchand, NHFG

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