SPECIES PROFILE

Hognose Snake
Heterodon platirhinos

Federal Listing: None
State Listing: Threatened
Global Rank: G5
State Rank: S3
Author: James Taylor, University of New Hampshire; Michael Marchand, NHFG

Element 1: Distribution and Habitat

1.1 Habitat Description

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 (*Bufo* spp.); 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 occurs individually in mammal burrows, loose soil, or down logs (Plummer 2002, Ernst and Ernst 2003).

1.2 Justification

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). In New England, the eastern hognose snake is listed as S2 in Rhode Island, S3S4 in Connecticut, and S4 in Massachusetts; it doesn't occur in Vermont or Maine.

New Hampshire's peripheral population of hognose snakes is state threatened (RSA 212-A, FIS 1000). Hognose snakes in New Hampshire probably have large home ranges (Plummer and Mills 2000, S. Najar, New Boston Air Force Base, personal communication) 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.

1.3 Protection and Regulatory Status

Listed as state threatened under RSA 212-A.

1.4 Population and Habitat 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 addition, 3 expert 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.

1.5 Town Distribution Map

1.6 Habitat Maps

The University of New Hampshire completed a potential habitat map for eastern hognose snakes within its New Hampshire range. These maps were primarily based on available GIS data layers including landcover, soils, elevation, and distance to a known hognose snake occurrence. An accuracy assessment has not been conducted on this model but maps should help prioritize areas to target for further surveys. One limitation of this mapping procedure is that soils data was not available for Merrimack and Belknap counties. Maps will need to be updated as new data layers (especially soils) become available.

1.7 Source of information

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

1.8 Extent and Quality of the Data

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. Verified records in Manchester, Londonderry, Hollis, and Nashua are greater than 20 years old. More recently, unverified reports have been received for Londonderry and it is likely that a population still exists. Recent reports in Hudson are unverified but likely.

1.9 Distribution Research

Verify habitat suitability model by field surveying those sites likely to be most suitable for eastern hognose snakes (Fitzgerald 1994). Extensive time can be spent searching for hognose snakes with limited success. Therefore, surveys should be coordinated by the NHFG and could involve trained volunteers of the RAARP.

Element 2: Species/Habitat Condition

2.1 Scale

Abundance was evaluated throughout the New Hampshire range of eastern hognose snakes. Condition of specific locations can be evaluated by a GIS based on the habitat model described in Element 1.6 along with field surveys.

2.2 Relative Health

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. 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). The New Boston Air Force Base incidentally encounters several snakes annually and densities appear low, but a systematic survey has not been conducted (S. Najar, New Boston Air Force Base, personal communication).

2.3 Population Management Status

There is very little population management and or research occurring for hognose snakes in New Hampshire. The New Boston Air Force Base, in cooperation with the NHFG and a local veterinarian, implanted a transmitter in 1 adult hognose snake during spring 2005. This snake has been tracked on a regular basis and NHFG and the NBAFB intend to implant transmitters in several additional adult hognose snakes as they are encountered.

2.4 Relative Quality of Habitat Patches

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 (*Bufo americanus*), spring peepers (*Pseudacris crucifer*), gray treefrogs (*Hyla versicolor*), and pickerel frogs (*Rana palustris*), appear to be common in this area of the state. The range of another native amphibian, the Fowler's toad (*Bufo fowleri*), coincides fairly well with that of the hognose snake, but this overlap may be a consequence of preference for similar sandy habitats, rather than a prey specialization to Fowler's toads. 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 or of other factors not yet clearly understood.

2.5 Habitat Protection Status

Only a few eastern hognose snake records are on or near conservation land (University of New Hampshire Complex Systems GRANIT data layer). These areas are generally small and fragmented (Stevens, 1998) and it is not known whether management of conservation parcels is compatible for hognose snakes.

2.6 Habitat Management Status

No habitat management has occurred specifically for hognose snakes in New Hampshire to date. Restoration of Pine Barrens in south-central New Hampshire (e.g., Concord) should improve habitat suitability for hognose snakes, but it is unknown whether source populations exist in close enough proximity to become established. Potential impacts to hognose snake habitats are assessed during the Nongame & Endangered Species Program review of newly proposed developments projects.

2.7 Sources of Information

Condition of hognose snake locations was assessed based on data from the RAARP and rare species database maintained by the NHNHB. See Element 1.6 for details on habitat maps.

2.8 Extent and Quality of the Data

The condition of hognose snakes in New Hampshire is extremely poorly understood. Predicted habitat models for hognose snakes have some limitations based on available GIS data layers (See Element 1.6).

2.9 Condition Assessment Research

Habitat assessments should be conducted where hognose snakes have been reported and where hognose snake models predict suitable habitat (see Element 1.6). Systematic sampling of hognose snake, vegetative composition, and amphibian assemblages and abundance needs to be conducted at sites where hognose snakes have been documented. Because hognose snakes are difficult to locate, searching for snakes and monitoring individuals will require multiple years and will use the combination of experienced herpetologists and trained technicians and possibly volunteers. Volunteers are not authorized to handle state-protected species without a permit; therefore, a reporting protocol coordinated by NHFG will need to define roles of those involved. At highest priority sites, hognose snakes should be monitored (radiotelemetry) to assess viability as well as basic life history requirements (e.g., home range size, habitat use). Known locations should be evaluated in detail using a GIS and field surveys to assess size, location, and juxtaposition of remaining habitat blocks and conservation parcels.

Element 3: Species and Habitat Threat Assessment

3.1.1 Development (Habitat Loss and Conversion)

(A) Exposure Pathway
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 relays on.

(B) Evidence
Urbanization often converts hognose snake habitat to pavement and mown lawns. Eastern hognose snakes are also noted for having relatively large home ranges [in Arkansas, 21.4-72.8 ha, mean of 50.2 +/- 6.4 ha, 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 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. Other prey may be taken (Platt 1969) and it is not known to what extent eastern hognose snakes depend on amphibian prey in New Hampshire.

3.1.2 Transportation Infrastructure (Road mortality)

(A) Exposure Pathway
Hognose snakes probably have large home ranges in New Hampshire. Roads fragment habitat, increasing mortality as snakes are forced to cross roads on a more frequent basis. Hognose snakes are relatively slow moving and therefore vulnerable while crossing roadways.

(B) Evidence
Given the probable large home range requirements of this species 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 large home ranges.

3.1.3 Unregulated take (killing and collection of individuals)

(A) Exposure Pathway
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. 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).

(B) Evidence
At least several individual hognose snakes have been killed and reported to the NHFG. However, there is no information on the frequency with which this species is killed or collected by humans.

3.2 Sources of Information

Literature reviews and knowledge/ experience with the eastern hognose snake and the Merrimack River region by the authors are the major sources of this information.

3.3 Extent and Quality of Data

Information regarding threats is based on literature reviews from other states or known condition of New Hampshire's rapidly changing landscape. Site-specific threats to hognose snakes in New Hampshire are unknown because of limited occurrence and condition information.

3.4 Threat Assessment Research

Developments proposed in known or potential hognose snake habitat should be assessed for the species presence. If a known threat is proposed or implemented near a known hognose snake location, the local population should be monitored to assess impacts (e.g., development, recreation, gravel/sand extraction). Also, a subset of hognose snake locations should be monitored to assess threat and viability.

Element 4: Conservation Actions

The most immediate step is to document the location and condition of existing hognose snake populations in New Hampshire. This information should be used to guide habitat protection and management and develop a detailed recovery/protection plan outlining specific research, management, land protection, and other potential actions (e.g., captive rearing). Conservation objectives and monitoring responses will be evaluated for this plan based on distribution and condition research. However, distribution and condition research can take many years. Therefore, it is critical that while this work occurs that known information is incorporated into current land protection and management and education and outreach.

4.1.1 Restoration, Management, and Habitat Protection

Increase coordination among those conducting restoration, management, and protection of Pine Barrens and other sandy outwash areas along the Merrimack River to ensure that habitat needs of hognose snakes are incorporated and threats are avoided. Land protection should focus on protecting large parcels within the range of hognose snakes and linking these areas with other suitable linear habitats (e.g., riparian, powerlines). Providing these linkages and large protected areas may be partially consistent with protection of other species of high conservation concern (e.g., New England cottontails, black racers).

4.1.2 Outreach and Education

People continue to kill snakes, including hognose snakes, out of fear and lack of knowledge of the species status. NHFG needs to increase education and outreach materials (newspaper articles, website development) to the public regarding the biology and status of this species. Also, the NHFG should promote maximizing native landscaping (rather than manicured mowed lawns) in residential developments (newly proposed and established).

4.1.3 Regulation and Policy

Avoid impacts to known hognose snake habitat (i.e., development, non-compatible recreational uses). Proposed developments in potential hognose habitat should be evaluated based on habitat suitability (size and quality), and distance to other known hognose locations. NHFG evaluates projects potentially impacting hognose snake; however, there is currently no mechanism for reviewing projects where there are no wetland impacts. Because hognose snakes often occur in dry habitats, this is extremely problematic. Therefore, the NHFG should coordinate with other regulatory agencies to review impacts to terrestrial habitats in addition to the existing wetland review (i.e., NHDES site-specific review process).

4.2 Conservation Action Research

Investigate the possibility of reestablishing hognose snakes in restored or protected habitats within the historic New Hampshire range. Habitat management occurring at known hognose snake locations should include a hognose snake monitoring component.

Element 5: References

5.1 Literature

Ashley, E. P., and J. T. Robinson. 1996. Road mortality of amphibians, reptiles and other wildlife on the Long Pond Causeway, Lake Erie, Ontario. Canadian Field-Naturalist 110:403-412.

Edgren, R. A. 1955. The natural history of the hognosed snakes, Genus Heterodon: A review. Herpetologica. 11:105-117.

Enge, K. M., and K. N. Wood. 2002. A pedestrian road survey of an upland snake community in Florida. Southeastern Naturalist 1:365-380.

Ernst, C. H. and E. M. Ernst. 2003. Snakes of the United States and Canada. The Smithsonian Institution. Washington, D.C., USA and London, England.

Fitzgerald, E. C. 1994. Habitat suitability index models for three threatened snake species in an urban county. Masters thesis. University of Missouri-Columbia.

Lazell, J. D., and M. C. Michener. 1976. This broken archipelago: Cape Cod and the islands, amphibians and reptiles. Quadrangle, New York Times Book Company, New York, USA.

Michener, M. C., and J. D. Lazell, Jr. 1989. Distribution and relative abundance of the eastern hognose

snake, *Heterodon platirhinos*, in eastern New England. Journal of Herpetology 23:35-40.

Meffe, G. K and C. R Carroll. 1997. Principles of Conservation Biology, 2nd ed. Sinauer, Sutherland, Massachusetts, USA

NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.5. NatureServe. Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed August 2, 2005).

Oberkrieser, M. and J. A. Litvaitis. 2002. Status of the hognose snake in the Merrimack River drainage of New Hampshire. Final report submitted to the New Hampshire Fish and Game Department, Concord, New Hampshire, USA.

Platt, D.R. 1969. Natural history of the hognose snakes, Heterodon platyrhinos and Heterodon nasicus. University of Kansas Publications, Museum of Natural History 18: 253-420.

Plummer, M. V. 2002. Observations on hibernacula and overwintering ecology of eastern hog-nosed snakes (*Heterodon platirhinos*). Herpetological Review. 33:89-90.

Plummer, M. V, and N.E. Mills. 2000. Spatial ecology and survivorship of resident and translocated hognose Snakes (*Heterodon platirhinos*). Journal of Herpetology 34: 556-575.

Society for the Protection of New Hampshire Forests. 2005. New Hampshire's Changing Landscape. Population growth and land use changes: what they mean for the Granite State. Executive Summary. Concord, New Hampshire, USA.

Stevens, M, ed.. 1998. An Assessment of the Biodiversity of New Hampshire with Recommendations for Conservation Action. Scientific Advisory Group, New Hampshire Ecological Reserve System Project, Concord New Hampshire, USA.

Taylor, J. 1993. The Amphibians and Reptiles of New Hampshire. New Hampshire Fish & Game, Concord, New Hampshire, USA.

Therres, G. D., Chairman of the Northeast Endangered Species and Wildlife Diversity Technical Committee. 1999. Wildlife species of regional conservation concern in the northeastern United States. Northeast Wildlife 54:93-100.

5.2 Data Sources:

NH Natural Heritage Bureau. 2005. Database of Rare Species and Exemplary Natural Community Occurrences in New Hampshire. Department of Resources and Economic Development, Division of Forests and Lands. Concord, New Hampshire, USA.

New Hampshire Reptile and Amphibian Reporting Program (RAARP). Coordinated by New Hampshire Fish & Game Department's Nongame & Endangered Species Program.

Distribution of Eastern Hognose Snake in New Hampshire