

Northern Black Racer

Coluber constrictor constrictor

Federal Listing	N/A
State Listing	T
Global Rank	G5
State Rank	S2
Regional Status	High



Photo by Brendan Clifford

Justification (Reason for Concern in NH)

Based on historic reports of large populations of black racers, substantial population declines have likely occurred in New Hampshire. Racers reach the northern extent of their geographic range in central New Hampshire and southern Maine, and are listed as Endangered in Maine and Threatened in Vermont. Early successional and shrub-dominated habitats are rapidly declining throughout the northeastern United States, largely as a result of commercial and residential development and forest maturation (Kjoss and Litvaitis 2000). In New Hampshire, remaining patches of early-successional habitat are small and patchily distributed (Kjoss and Litvaitis 2000). Severe habitat loss, alteration, and fragmentation throughout the species' distribution is exacerbated by the species extensive habitat requirements (Kjoss and Litvaitis 2000).

Distribution

A total of 11 subspecies of black racers are recognized, all of which range north of Mexico (Ernst and Ernst 2003). The Northern black racer occurs from southern Maine and central New York, southwest to eastern Tennessee, northwestern Georgia, and northeastern Alabama (Ernst and Ernst 2003). In New Hampshire, this species is restricted to areas south of the White Mountains, with the greatest number of verified records in the southeast. Within this region, black racers occur discontinuously, suggesting that populations may be confined to small pockets of optimal habitat (Klemens 1993). The species distribution map associated with this profile is based on data synthesized at the time of its creation. Distribution maps are continually being updated as new reports are received.

Habitat

The Northern black racer (*Coluber constrictor constrictor*) is a long, slender snake associated with a wide variety of early successional habitats, including brushy areas; utility right-of-ways; grasslands; old fields; sand pits; rocky ridges and ledges; and the edges of agricultural fields (Hunter et al. 1999, Kjoss and Litvaitis 2000, Ernst and Ernst 2003, NHFG Data). As racers move between habitat patches they may use forested habitats, particularly those that have been altered from timber harvests (NHFG Data). In New Hampshire racers appear to have much larger home ranges than those reported from more southern populations. The home ranges of 25 tracked racers in NH averaged 112 ha for males and 70 ha for females but exceeded 200 ha for some individuals (NHFG Data). Similar home range sizes have been reported from a single population in Maine (Mays and Persons 2011).

Mammal burrows and rock crevices may be used as nest sites, retreats, and hibernacula (Ernst and Ernst 2003, NHFG Data). High hibernacula site fidelity is common as individuals may return to the exact crevice or a location close by (NHFG Data). These sites are normally used communally, either in

Appendix A: Reptiles

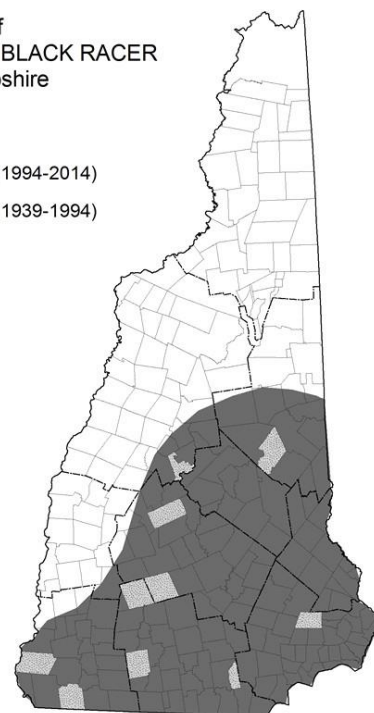
intra- or interspecific assemblages, during the months of October through April (Ernst and Ernst 2003, NHFG Data). Juvenile prey consists primarily of insects whereas adult prey consists of frogs, toads, birds and their eggs, small mammals, and snakes, with mammals being the dominant food item (Ernst and Ernst 2003). Nesting, which also may be communal, typically occurs from the end May through June in loose soil, litter, or hollow logs (Ernst and Ernst 2003, Mays and Persons 2011). Hatchlings emerge in August or September (Hunter et al. 1999, NHFG Data).

NH Wildlife Action Plan Habitats

- Shrublands
- Grasslands
- Appalachian Oak Pine Forest
- Developed Habitats
- Hemlock Hardwood Pine Forest
- Rocky Ridge
- Cliff
- and Talus

Distribution of
NORTHERN BLACK RACER
in New Hampshire

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



Distribution Map

Current Species and Habitat Condition in New Hampshire

Populations are likely smaller and more fragmented than historic levels based on historic reports and the current level of human development that have reduced habitat. In a historic report (1940-1950, specific date unknown) Donald Carle, professor of science at Keene Teachers College, noted that 112 black racers were found at one location in Keene. In a multi-year study on the movement and habitat-use of black racers in New Hampshire, 3 populations with greater than 25 individuals were documented with mark-recapture techniques and an additional 5 populations had greater than 10 individuals marked (NHFG Data). Still, most statewide records (Element Occurrences) consist of single individuals and no site or population information exists (NHB Data).

Population Management Status

During 2009-2015, NHFG surveyed 9 racer populations with mark-recapture techniques and radio-telemetry to document the population sizes and delineate the approximate site boundaries. Site-specific threats have been identified for several populations which will be incorporated into local management plans.

Appendix A: Reptiles

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

Quality of Habitat

Data on the presence and condition of most shrubland habitats in New Hampshire is insufficient. The largest shrubland habitats in the state are likely associated with utility right-of-ways that are maintained as early-successional habitat. Large powerline corridors that have limited road crossings can provide suitable habitat for some populations (NHFG Data). Active sand and gravel pits may provide suitable habitat in some areas but are also likely to put individual snakes at risk to direct mortality (NHFG data). Abandoned pits that are left to re-vegetate naturally provide ideal habitat conditions that may exist for decades although these areas are often targeted for reclamation by landowners thereby reducing the habitat quality. The remaining shrubland habitats in the state are mostly small, disjunct patches associated with old fields, regenerating clearcuts, the edges of agricultural fields or un-kept sections of backyards. While racers will readily use these habitats they are often too small to hold individuals for extended periods. Habitat patches associated with backyards or the edges of industrial lots are likely to increase encounters with roads or people.

The habitat quality varied at nine racer sites that were surveyed by NHFG. Five sites had powerline right-of-ways where several individual racers spent the majority of the active season, although snakes were not confined to the right-of-way and moved back and forth to nearby fields (NHFG Data). Flood control structures (e.g., rip rap dikes) and the associated landscape were heavily used at two sites and are likely to provide stable and suitable habitat patches for those populations. Two sites were comprised primarily of smaller habitat patches associated with agricultural fields and backyards. However, despite some sites having larger and higher quality habitat patches, racers were documented using the edges of yards at eight of nine sites, although the frequency varied between sites.

Habitat Protection Status

The amount of conserved land at the NHFG survey sites (n = 9) ranged from less than 5% to greater than 90% of the site. At four sites less than 10% of the land is in conservation with none of the known hibernacula protected. More than 50% of the land is protected at five sites with the hibernacula on conserved land at four of these sites. Although the majority of Element Occurrence records in the Rare Species Database are on private lands, these records may be representative of long distance movements and the site boundaries and protection status cannot be determined without further investigation.

Habitat Management Status

There has been little habitat management conducted in New Hampshire specifically for black racers, but management for early-successional habitat that has been targeted toward other species (e.g., New England cottontail, American woodcock) has likely benefitted racers at some sites. Land-use activities such as timber harvesting and rotational mowing of utility right-of-ways are conducted statewide and are likely to enhance or maintain racer habitat where they occur.

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 upland habitat (Threat Rank: High)

Racers have extensive home ranges and travel between several habitat patches during their active season. Patches that are lost to development force racers to shift their home ranges which may increase the risk of road crossings or human encounters. While the loss of small patches may not be immediately threatening to populations that are supported by extensive shrublands (i.e., powerlines), there may be immediate impacts to populations that are nestled within highly developing areas.

The majority of racer Element Occurrences exist in southeastern New Hampshire, the region with the highest human population and greatest development pressure. The home range sizes of racers in New Hampshire is larger than what has been reported in other populations in the United States (NHFG Data) and may be partly a result of already reduced habitat availability from existing development.

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

Sand and gravel pits are attractive to racers because they typically provide large sections of early successional habitat, often adjacent to the active mining areas. Additionally, active pits may have industrial equipment or debris strewn about that provides attractive cover items for snakes. Females may nest under debris or anywhere in the loose soil associated with the pit. Racers are vulnerable to direct mortality when mining activities shift or expand to the areas that had previously been left idle, or when long-standing equipment is moved. Sand pits also provide attractive locations for ATVs and other human activities which may result in human-snake encounters.

The use of sand and gravel pits by radio-tracked racers was observed at three sites (NHFG Data). At one site the mortality of a radio-tracked individual from soil compaction was documented after expansion of the mining area. Two racers were killed by people using the sandpits as recreational areas (NHFG Data).

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

Roads fragment habitat, increasing mortality as snakes are forced to cross roads on a more frequent basis. Racers appear more willing than other snake species to attempt road crossings (Andrews and Gibbons 2005) and annual losses of adults, particularly gravid females, may lead to population declines or local extinctions. While some low-traffic roads that bisect habitat patches may allow for snakes to cross with only occasional mortality, high intensity roads may isolate habitat patches.

The majority of Element Occurrences exist in southeastern New Hampshire, the region with the highest human population and greatest development pressure. Radio-tracked snakes were documented crossing roads on numerous occasions at four different sites (NHFG Data) and several observations of road-killed snakes have been observed in New Hampshire in the past ten years (NHB Data). Given their extensive movement requirements, racers from many populations in the state are likely to cross a road at some point during their active season.

Appendix A: Reptiles

Mortality of individuals from vehicles on utility rights of way (Threat Rank: Medium)

Utility rights of way that are maintained in an early-successional stage often provide highly suitable habitat for racers. Racers are particularly vulnerable to disturbance or mortality from maintenance vehicles during the first couple weeks of spring emergence as snakes bask near den sites before dispersing, but also during the hibernation period if dens become compacted by heavy equipment and trap snakes underground. The risk of vehicle-mortality is likely to be lower during the warmer summer months when their ability to flee quickly is not restricted by cool temperatures.

Communal racer dens have been documented in powerline corridors at two sites in NH and likely occur at several other undocumented sites. At sites where dens are located in close proximity to powerlines, racers may move directly into powerline corridors upon emergence to bask (NHFG Data). Extensive use of powerline corridors was documented at several sites and some individuals remained in powerline corridors for the entire active season (NHFG Data).

Mortality from human persecution (Threat Rank: Medium)

Many people have an irrational fear or hatred for snakes. The large size and defensive behavior of racers may make them more vulnerable to human persecution than most other species. Their large home ranges and active movement habits may result in snakes visiting many backyards during their active season. Gravid females are particularly vulnerable as residential gardens or flower beds provide attractive nesting sites. Additionally, females may nest communally at some sites increasing the population impacts from human persecution.

Human persecution of racers was documented at three monitoring sites during a NHFG research project (NHFG Data) and anecdotal accounts of human persecution exist from several additional sites. Tracked snakes from all monitored populations came into contact with human establishments during different parts of the active season with some individuals spending several weeks in backyards.

Mortality and habitat conversion (compaction of dens and crevices) from forestry practices (Threat Rank: Medium)

Small mammal burrows (i.e., chipmunk burrows) in forested habitats are often used by racers as winter hibernacula. Individual burrows may hold single snakes or be communal and support greater than ten individuals (NHFG Data). Depending on the site, populations may use several burrows separated by long distances (i.e., different hillsides) or few burrows situated on a single hillside. Machinery used during winter timber harvests may compact the soil and trap snakes underground. Entire populations may be vulnerable to extirpation at sites where single burrows are used as hibernacula. Currently, landowners are encouraged but not always required to consult with NHFG before commencing forestry activities in the vicinity of rare species records.

Mammal burrows situated in forested habitats were used at five different monitoring sites during a NHFG study (NHFG Data). Although no direct impacts from forestry have been documented, the collapse of one chipmunk burrow (under undisturbed conditions) was documented when a radio-tracked racer and a second live snake were observed upon the excavation of the burrow two months after the emergence period (NHFG Data). Although the cause for the soil collapse is unknown this case illustrates the vulnerability of hibernacula associated with mammal burrows.

Appendix A: Reptiles

Mortality from the destruction of dens and crevices during various human activities (landscaping, vehicle compaction) (Threat Rank: Medium)

Racers may use a variety of habitat features for hibernacula. Although chipmunk burrows appear to be common, racers may use different types of rock formations such as natural rocky hillsides or various human-created features including back-filled rock and old farming stone piles when they are available. Once these areas are concealed in by soil and grasses they may be difficult to recognize and be inadvertently run-over with vehicles. Local populations may be extirpated in dens are compacted during the hibernation period.

Radio-tracked racers have been documented using areas of back-filled rock for hibernation at five sites with each site communal (NHFG Data). Two of the three largest known populations have dens associated with this type of structure. One den site with greater than ten individuals was inadvertently compacted by heavy machinery and required excavation to free the trapped snakes.

Habitat degradation and conversion due to the succession from grass and shrubs to forested areas (Threat Rank: Medium)

Shrubland-dependent wildlife shift in space and time in response to natural succession, disturbance and human land uses (Litvaitis 2005). As more open land is converted to development there is less overall space for shrubland –dependent species to shift into when natural forest succession or lack of active management makes their current habitat patch unsuitable.

Although over 80% of New Hampshire is reforested, second growth forests lack the structural diversity present in virgin forests. Forest maturation, coupled with suppression of natural disturbance (e.g., fire) has reduced the amount of early successional conditions (Litvaitis 2003). Concurrently, shrublands are being developed for residential and commercial purposes. Thus, early successional habitat is at or below historical levels (Brooks 2003). Human created shrublands (e.g., old fields, reverting gravel pits, rights-of-way) have increased in importance to shrubland-dependent wildlife. These human created shrublands tend to be ephemeral and require natural or human disturbance to retain their characteristics (Brooks 2003).

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. Evidence of potential SFD has been observed in several racer populations in New Hampshire. During mark-recapture surveys at 9 sites many individual snakes were observed with lesions including several with severe infections. One individual required euthanasia.

Appendix A: Reptiles

List of Lower Ranking Threats:

- Disturbance and mortality from increased recreation (hiking, mountain biking, OHRV, dog walking)
- Mortality from mowing and agricultural machinery and vehicles
- Mortality from welded plastic erosion control blankets
- Mortality from landscaping and land management activities

Actions to benefit this Species or Habitat in NH

Document communal den sites

Primary Threat Addressed: Mortality from the destruction of dens and crevices during various human activities (landscaping, vehicle compaction)

Specific Threat (IUCN Threat Levels): Residential & commercial development / Housing & urban areas / Landscaping and residential habitat management

Objective:

Identify and protect racer populations across the state

General Strategy:

Although racer records exist in many towns across the southern part of the state, no population information is known for most locations. Identifying and protecting den locations, particularly large communal dens that act as source populations will be critical to the long-term persistence of racers in the state. Even less is known of the presence of racers in the southwestern NH and areas north of Concord and these areas should be targeted for surveys. Where dens are known provide technical assistance to landowners to minimize impacts to populations.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Update environmental review guidelines with racer threats

Primary Threat Addressed: Mortality and habitat conversion (compaction of dens and crevices) from forestry practices

Specific Threat (IUCN Threat Levels): Biological resource use

Objective:

Update environmental review guidelines with racer threats

General Strategy:

Black racers are listed as threatened in New Hampshire. As such, NHFG will review any proposed activities (residential and commercial development, recreation, habitat management, etc.) that has

Appendix A: Reptiles

the potential to harm racers. 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 racers. Guidelines will consider scenarios where impacts should be avoided and scenarios where impact minimization or mitigation may be appropriate. Pre- and post- construction monitoring of racers and associated habitat (e.g., shrublands, nesting areas) should be considered as a component of project review. Although all racer populations have some protection by state law (RSA 212-A), NHFG should prioritize protection at higher quality sites

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Provide technical assistance to utility companies to minimize disturbance and mortality to individual snakes or populations

Primary Threat Addressed: Mortality of individuals from vehicles on utility rights of way

Specific Threat (IUCN Threat Levels): Transportation & service corridors

Objective:

Reduce the mortality of racers from human land-use practices

General Strategy:

Utility rights-of-way are typically maintained as large tracts of early successional habitat that is attractive to racers. Work with utility companies to develop BMPs for maintenance activities. Important factors to consider include timing (done during the active or inactive period for snakes), the potential of disturbing den sites and the removal of vegetation. Recommendations may differ depending on a known population and the vicinity of the den site to the right-of-way.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Discourage landowners from reclaiming abandoned sand and gravel pits

Primary Threat Addressed: Habitat conversion due to development of upland habitat

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

Objective:

Maintain long-standing viable habitat patches for racers

Appendix A: Reptiles

General Strategy:

Abandoned sand pits are often viewed as eyesore and targeted for reclamation. However these disturbed sites have important habitat components for several wildlife species include nesting and basking habitat for racers. Provide technical assistance to town conservation commissions and private landowners about the benefits to leaving sites to re-vegetate naturally.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Provide strategies to landowners to reduce the potential impacts of mowing and agricultural work to snakes.

Primary Threat Addressed: Mortality from mowing and agricultural machinery and vehicles

Specific Threat (IUCN Threat Levels): Agriculture & aquaculture

Objective:

Reduce the mortality of racers from human land-use practices

General Strategy:

Contact landowners that have large hay fields in the vicinity of known racer populations to explain the threat and actions that may reduce mortality.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Enhance or create early successional habitats at known racer sites

Primary Threat Addressed: Habitat degradation and conversion due to the succession from grass and shrubs to forested areas

Specific Threat (IUCN Threat Levels): Natural system modifications

Objective:

Conduct habitat management at known sites to maintain or enhance the population viability

General Strategy:

Racers were documented traveling long distances through forested habitats to reach preferred early successional habitats (NHFG Data). Incorporate racers into existing habitat management plans (e.g., state lands) and work with landowners to develop management plans where racers are known to occur.

Appendix A: Reptiles

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Add language and actions into existing and new management plans that benefit or reduce impacts to racers

Primary Threat Addressed: Disturbance and mortality from increased recreation (hiking, mountain biking, OHRV, dog walking)

Specific Threat (IUCN Threat Levels): Human intrusions & disturbance

Objective:

Reduce potential threats and increase habitat suitability by incorporating racers into management plans

General Strategy:

Black racers, and other rare reptiles and amphibians, should be incorporated into habitat inventories as well as management and restoration efforts on state lands and private lands when possible. Prioritize the incorporation of racers into plans that may impact known populations.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Determine the state-wide distribution of racers

Primary Threat Addressed: Habitat conversion due to development of upland habitat

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

Objective:

Improve the understanding of racer distribution in NH

General Strategy:

Target RAARP volunteers to produce verified reports of black racer locations, especially in those areas where records are scarce particularly in the southwest and central part of the state. Conduct targeted surveys based on reports and the presence of suitable habitat (e.g., den, basking and nesting habitats) to document extant populations.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Appendix A: Reptiles

Inform landowners surrounding known populations about protection status of racers

Primary Threat Addressed: Mortality from human persecution

Specific Threat (IUCN Threat Levels): Biological resource use / Hunting & collecting terrestrial animals / Persecution/control

Objective:

Build awareness for racer conservation

General Strategy:

Conduct targeted outreach to landowners surrounding known populations, particularly at sites that have been surveyed extensively and where human-snake encounters have been documented. Outreach should include flyers or brochures as well as in-person visits in areas known to be frequented by snakes. Involve NHFG Conservation Officers as necessary to reinforce the legal protections.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Incorporate actions to reduce impacts to racers in Best Management Practices (BMP's) for forestry

Primary Threat Addressed: Mortality and habitat conversion (compaction of dens and crevices) from forestry practices

Specific Threat (IUCN Threat Levels): Biological resource use

Objective:

Reduce the mortality of racers from forestry operations.

General Strategy:

Timber harvesting can have population-level impacts if communal den sites (i.e., chipmunk burrows) are located in forests and the entrances are compacted by vehicles. Encourage landowners and foresters to consult with NHFG to determine the likelihood of communal den sites in harvest areas.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Appendix A: Reptiles

Inform and educate landowners (industrial) about the threats to racers and actions that can be taken to mitigate threats

Primary Threat Addressed: Habitat conversion and mortality from mining (sand & gravel)

Specific Threat (IUCN Threat Levels): Energy production & mining

Objective:

Reduce the mortality of racers from human land-use practices

General Strategy:

Racers may use the disturbed edges of industrial lands (e.g., active sandpits, lumber yards) for basking or nesting habitat. Scattered debris surrounding these lands may provide attractive cover objects. Inform landowners in the vicinity of known racer populations about the potential for snake encounters and strategies for minimizing mortality.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County

Watershed Location:

Androscoggin-Saco Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Inform and educate landowners (residential) about the threats to racers and actions that can be taken to mitigate threats

Primary Threat Addressed: Mortality from landscaping and land management activities

Specific Threat (IUCN Threat Levels): Residential & commercial development / Housing & urban areas / Landscaping and residential habitat management

Objective:

Reduce the mortality of racers from human land-use practices

General Strategy:

Protection of the den or summer habitats does not ensure the protection of the species. Racers travel long distances and therefore may be affected by many land-use practices and may regularly come in contact with humans. Based on the documented movement and habitat use at several sites, potential threats have been identified at each site and should be targeted with educational and outreach materials. Strategies might include creating brochures that target landowners that are likely to come across racers in their yard or direct visits to targeted parcels (e.g., known communal nesting areas).

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Appendix A: Reptiles

Protect critical racer habitat at priority populations

Primary Threat Addressed: Habitat conversion due to development of upland habitat

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

Objective:

Maintain healthy populations at known racer sites.

General Strategy:

The den locations and critical habitats have been documented for nine populations. Some populations have sufficient protection of den sites and/or summer habitats but others are completely unprotected. Conservation actions should first target known den areas followed by the surrounding habitat patches. Identify critical habitats at new sites with the use of GIS, visual surveys or radio- telemetry.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Middle CT Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

Monitor the health of known populations

Primary Threat Addressed: Mortality and species impacts (decreased fitness) of individuals from various diseases (snake fungal disease)

Specific Threat (IUCN Threat Levels): Invasive & other problematic species, genes & diseases

Objective:

Identify potential health concerns in known populations so the appropriate conservation actions can be taken

General Strategy:

Potential snake fungal disease was observed in every population that was monitored. Given the baseline data that has been collected for each population (i.e., mark-recapture data) there may be opportunity to track the prevalence of SFD over time. Additionally, three populations that were monitored represent source populations and are therefore high priorities for conservation. Long-term monitoring of these populations will be important in mitigating new threats that arise.

Political Location:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, Merrimack Watershed, Coastal Watershed

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

Appendix A: Reptiles

Primary Threat Addressed: Mortality from welded plastic erosion control blankets

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

Objective:

Reduce the mortality of racers and other 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:

Belknap County, Carroll County, Cheshire County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:

Androscoggin-Saco Watershed, Lower CT Watershed, Pemi-Winni Watershed, 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, records and Taylor (1993) and literature reviews and unpublished reports and professional knowledge of the authors. State and global heritage ranks were taken from NatureServe 2015. Habitat and life history information was collected from scientific literature and a multi-year radio-telemetry study conducted by NHFG.

NHFG conducted population and habitat-use research at 9 racer sites from 2010-2013 (NHFG data). All racer records are maintained as Element Occurrences in the NH Natural Heritage Bureau Rare Species Database. Conservation lands were identified with GIS. Threat assessments were conducted by a group of NHFG biologists (Michael Marchand, Brendan Clifford, Loren Valliere, Josh Megysey).

Data Quality

NHFG conducted a four-year radio-telemetry study of nine racer populations to evaluate movement patterns and habitat preferences in New Hampshire. Home range sizes were calculated for 25 individual snakes and habitat selection was evaluated at multiple spatial scales. Population size was estimated for each site using mark-recapture methods.

The movement and habitat requirements of racers in New Hampshire have been documented by NHFG. Based on the multi-site assessment this data is likely to be applicable to most sites in New Hampshire.

2015 Authors:

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2005 Authors:

Celine Goulet and Michael Marchand, NHFG

Appendix A: Reptiles

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