

SPECIES PROFILE

Marbled Salamander

Ambystoma opacum

Federal Listing: Not listed

State Listing: Endangered

Global Rank: G5

State Rank: S1

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ELEMENT 1: DISTRIBUTION AND HABITAT

1.1 Habitat Description

Marbled salamanders breed in seasonally flooded, palustrine wetlands, but spend most of their lives in the forested uplands surrounding these wetlands (Noble and Brady 1933, Bishop 1941, Petranka 1989, Klemens 1993). Marbled salamanders use several types of palustrine wetlands (e.g., ephemeral pools and streams, fishless swamps, ponds with low water levels) for breeding and nesting (Noble and Brady 1933, Bishop 1941, Petranka 1989). Eggs are laid along the exposed edges of the wetlands, and wetlands must flood in the late fall or early winter in order for eggs to hatch (Bishop 1941, Petranka 1989). Salamanders hide nests, usually in bare mineral soil, beneath leaf litter, grass clumps, or logs, or within root complexes (Jackson et al. 1989, Petranka 1990, Figiel and Semlitsch 1995). To sustain a viable marbled salamander population, a wetland must hold standing water for about 10 months in most years (approximately September to June), so that the salamander larvae have sufficient time to develop and metamorphose (Noble and Brady 1933, Bishop 1941).

For upland habitat, marbled salamanders seem to prefer deciduous or mixed-deciduous woodlands (Klemens 1993), especially oak-maple and oak-hickory woods (Minton 1972) and floodplain forests (Petranka 1998). Marbled salamanders also seem to favor dry, friable soils, including sand and gravel deposits

and rocky slopes (Bishop 1941, Klemens 1993). Marbled salamanders can inhabit somewhat drier areas than other *Ambystoma* species (Bishop 1941). Marbled salamanders use deeply imbedded rocks or logs (Klemens 1993) as cover objects, and probably use small mammal burrows as shelter throughout most of the year and as hibernacula in the winter (DeGraaf and Yamasaki 2001, Smyers et al. 2002). In Connecticut, this species was observed at elevations ranging from 30 to 335 m (Klemens 1993).

The area and configuration of upland habitat needed to sustain a marbled salamander population is unknown, but probably varies according to local site conditions. This species likely operates as metapopulations, which require a multitude of habitat patches (i.e., breeding wetland and adjacent upland forest) connected by habitat that is hospitable to dispersing salamanders, in order to persist (Semlitsch 1998). At the local population level, salamanders in Indiana migrated an average distance of 194 m (range 0- 450 m) from breeding wetlands into the surrounding uplands (Williams 1973 as cited in Semlitsch 1998).

1.2 Justification

The marbled salamander is at the northern periphery of its range in New Hampshire and is the rarest amphibian species in the state. Few documented occurrences of the species exist for New Hampshire; however, a systematic survey to determine the location of all potential populations has not been conducted. The southern distribution of this species in the state, together with intensive developmental pressure in the same area, places this species at significant risk of extirpation.

1.3 Protection and Regulatory Status

The marbled salamander is listed as Endangered un-

der the New Hampshire Endangered Species Conservation Act (RSA 212-A). See the vernal pools habitat profile for regulations of vernal pool habitat.

1.4 Population and Habitat Distribution

The marbled salamander is endemic to the eastern half of the United States. It ranges from southern New Hampshire, west through southeastern New England and Pennsylvania to the Lake Michigan region, and south to eastern Texas and northern Florida (Klemens 1993, DeGraaf and Yamasaki 2001, NatureServe 2004). In New England, this species occurs throughout Connecticut, Rhode Island, Massachusetts east of the Connecticut River, and in the Berkshire Hills of western Massachusetts (Klemens 1993, DeGraaf and Yamasaki 2001). One specimen was collected from western Vermont (DeGraaf and Yamasaki 2001).

Historically, marbled salamanders were reported from Milford (Hoopes 1938) and Hollis (NHNHB 1965), both in Hillsborough County south-central New Hampshire. Records from RAARP (2005) indicated that a marbled salamander was observed in Hinsdale, Cheshire County in 2000 (photo verified), and another was possibly observed in Hollis in 1997 (no photo or specimen but near location of historic report). A statewide survey and more recent documentation of this species are lacking.

Populations of marbled salamanders, where they exist in New Hampshire, will likely be clustered in relatively undisturbed forest uplands around temporary and seasonally flooded wetlands. Such a habitat mosaic, of seasonally-flooded wetlands embedded in forested upland, is common throughout much of New Hampshire, but is increasingly fragmented by human development, especially in the southern portions of the state, which is where this species is most likely to occur.

1.5 Town Distribution Map

Not completed for this species.

1.6 Habitat Map

Known sites were mapped (historic and recent). A potential habitat map was not created for this species.

1.7 Sources of Information

Information relating to the distribution of this species was gathered through an extensive literature review.

1.8 Extent and Quality of Data

No comprehensive survey has been conducted for this species in New Hampshire. The species was known to occur in southern New Hampshire historically (Hoopes 1938, Taylor 1993) and the New Hampshire RAARP has record of a possible sighting in 1997 and a vouchered sighting in 2000 from south-central and southwestern New Hampshire, respectively.

1.9 Distribution Research

Current distribution data are lacking for marbled salamanders, and it is necessary to determine whether and where the species persists in the state. Surveying for the marbled salamander should focus on appropriate habitat across the southern portion of the state. Using remote sensing (e.g., aerial photography, land cover), a potential habitat layer should be created in a Geographic Information Systems (GIS). Priority sites should be inventoried in the field. Since this wetland identification technique is somewhat limited by the size of vernal pools, by the season during which the photographs were taken, and by the tree species surrounding the pools, field surveys should also be conducted.

The surveying should be conducted in the fall to look for migrating adults and nests, and in the spring to look for larvae. During the spring, surveyors can dip-net for larvae; surveying prior to egg hatching by other vernal-pool breeding salamanders would help ensure likely capture of marbled salamander larvae (as accurate identification of larval ambystomatids can be difficult).

ELEMENT 2: SPECIES/HABITAT CONDITION

2.1 Scale

There are insufficient data from which to determine species condition.

2.2 Relative Health of Populations

There are no data on population number or population sizes from which to determine relative health of populations. However, as it is likely that the species occurs in low numbers, it may be in danger of extirpation.

2.3 Population Management Status

No specific management plans exist for populations at these observation locations. Confirmation of the existence of these populations is necessary. Additionally, a systematic survey, focused on southern New Hampshire, is needed to locate other potential marbled salamander populations. Population management plans can be created after populations have been identified.

2.4 Relative Quality of Habitat Patches

There are not sufficient data available with which to assess the quality of habitat patches for the marbled salamanders.

2.5 Habitat Patch Protection Status

There are insufficient data with which to assess protection status.

2.6 Habitat Management Status

Marbled salamander habitat is indirectly managed through wetland and water resource protection, forestry management regulations (i.e., New Hampshire RSA 482-A; New Hampshire Rule Chapters Wt 100-800; Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire), and through land preservation (e.g., conservation restrictions and land acquisitions).

These efforts are not specifically designed to manage for marbled salamanders. Population growth and associated development will likely destroy or degrade potential marbled salamander habitat, despite measures aimed at slowing and redirecting development. Additionally, some forest management techniques (e.g., clear cutting) could also contribute to the fragmentation and degradation of potential marbled salamander habitat (deMaynadier and Hunter 1999,

Pough and Wilson 1976 cited in DeGraaf and Yamasaki 2001, Faccio 2003).

Basic distribution and habitat use data for the species are needed to develop effective habitat management plans. In the absence of these basic data, habitat management efforts might focus on limiting disturbance in and around vernal pools that are embedded within a relatively large matrix of minimally disturbed forest. The goal of habitat management efforts should be to maintain habitat patches that allow for metapopulation dynamics (i.e., multiple pool/upland patches connected by dispersal habitat). Thus, the usefulness (to salamanders) of pool buffer zones and dispersal corridors between habitat patches needs to be evaluated.

2.7 Sources of Information

Information relating to the condition of this species and its habitat was gathered during an extensive literature review, a review of New Hampshire laws and administrative codes, and a review of the New Hampshire RAARP.

2.8 Extent and Quality of Data

See element 1.8. No information is available on the condition of this species and its habitat in New Hampshire.

2.9 Condition Assessment Research

- Monitor populations for habitat patch occupancy and determine stability and growth rates of local populations.
- Determine potential for regional dynamics at metapopulation level (i.e., determine interaction of spatial arrangement of viable habitat, local threats, and dispersal capacity of the species).

ELEMENT 3: SPECIES AND HABITAT THREAT ASSESSMENT

3.1.1 Scarcity (Natural Rarity)

(A) Exposure Pathway

The current known distribution of this species suggests that it may be extremely rare in the state, and may occur as only 1 or 2 populations, putting it at

risk of demographic stochasticity.

(B) Evidence

There are no data available from which to analyze this threat. However, the generally increased risk of extinction for small, isolated populations is well established.

3.2 Sources of Information

Information on marbled salamander distribution was obtained from the RAARP database.

3.3 Extent and Quality of Data

Other than the records in the RAARP database, there are no data on this species in the state.

3.4 Threat Assessment Research

Because there is so little information about this species in the state, establishing a research program to assess threat is premature. The most important research is a systematic survey and mapping of the distribution of this species in New Hampshire and adjacent areas of Massachusetts. If populations are documented in New Hampshire, local threats can be assessed. The Jefferson salamander profile contains a more extensive examination of threats assessment research, and threats to the marbled salamander would be essentially the same (with the exception of hybridization).

ELEMENT 4: CONSERVATION ACTIONS

Since the current distribution of this species in New Hampshire is unknown, it is impossible to evaluate the urgency of threats to, and the impacts of prospective conservation actions on, specific salamander populations and habitat patches. See the Jefferson salamander profile for a more extensive list of conservation actions that would be appropriate for marbled salamanders if several populations are identified.

ELEMENT 5: REFERENCES

5.1 Literature

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- survival of larval *Ambystoma*: evidence from whole-pond manipulations. *Ecology* 70:1752-1767.
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- Windmiller, B.S. 1996. The pond, the forest, and the city: spotted salamander ecology. Dissertation, Tufts University, Medford, Massachusetts, USA.

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 and Game's Nongame and Endangered Species Program.

Distribution of Marbled Salamanders in New Hampshire

Distribution
■ Known
▨ Historic



0 10 20 40 Miles

Known = verified observations based on specimens, photos, or expert observation (e.g., NHBG's Reptile & Amphibian Reporting Program (RAARP), museum specimens, etc)
Historic = observations greater than 20 years old from the same data sources and Oliver and Bailey (1939)

