Creeper

Strophitus undulatus

Federal Listing	N/A
State Listing	SGCN
Global Rank	N/A
State Rank	S3
Regional Status	

Photo by Ethan Nedeau

Justification (Reason for Concern in NH)

Freshwater mussels are the most imperiled fauna in North America, having suffered steep declines in diversity, abundance, and distribution within the last 200 years (Richter et al. 1997, Master et al. 2000, Lydeard et al. 2004). Creeper populations are vulnerable to extirpation or extinction in New Hampshire, and are a species of special concern in Maine and Massachusetts. Although they occur where their habitat requirements are met throughout the region, they occur at a low abundance throughout their range. Mussel species are especially sensitive to pollutants, oxygen levels and temperature levels, making them important indicators of waterbody health.

Distribution

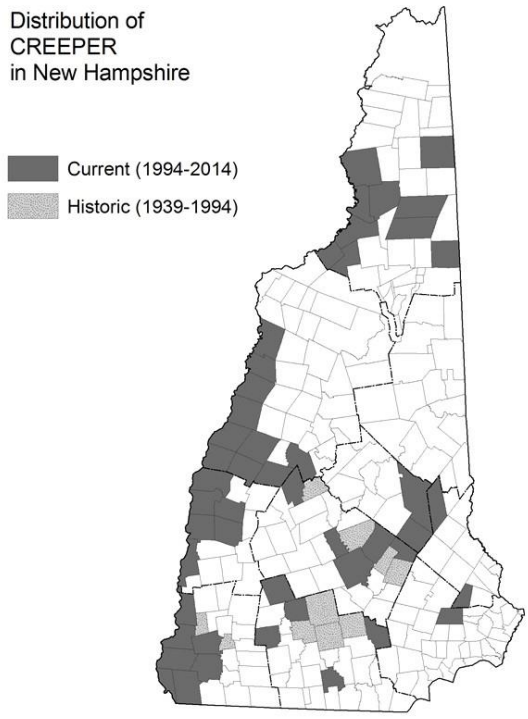
Creepers can be found in most major watersheds in the northeast, although are never common (Nedeau et al. 2000). The creeper can use a broad range of host fish to complete its life cycle, and is the only mussel species known to also use amphibians for this purpose (Nedeau 2008), allowing it to persist in a broader range of watersheds than other more host-specific species. The species has been documented from the Massachusetts border to as far north as Stratford and Errol. Creepers are found in stream and river habitats throughout New Hampshire. New Hampshire has over 197 documented sites where creepers occur. Documented occupied watersheds include the Connecticut River and tributaries, Upper Ammonoosuc and Androscoggin rivers in the north, and Lakes Region rivers in central NH. There are few documented records in the Great Bay area and the Contoocook, Merrimack, and Souhegan river stretches.

Habitat

Creepers are a freshwater mussel that can be found in small streams and rivers with sand, cobble, or gravel substrates. It seems to prefer low to moderate velocity river stretches, and may occur in small impoundments that retain at least some flow (Nedeau 2008). As part of its life cycle, all mussel species must attach to the fins or gills of a fish in order to grow and reach their next life stage, where they sink to the bottom of the waterbody and spend the rest of their lives. The creeper is known to attach to largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), fathead minnow (*Pimephales promelas*), fallfish (*Semotilus corporalis*), golden shiner (*Notemigonus crysoleucas*), and bluegill (*Lepomis macrochirus*), and thus will occur in habitats where these fish are commonly found.

NH Wildlife Action Plan Habitats

- Large Warmwater Rivers
- Warmwater Rivers and Streams
- Coldwater Rivers and Streams
- Lakes and Ponds with Coldwater Habitat
- Warmwater Lakes and Ponds



Distribution Map

Current Species and Habitat Condition in New Hampshire

Although the creeper is widely distributed in the state, it seems to be rarely abundant. In Maine, fewer than ten individuals were typically found at any given site, and long-term viability of these small populations is of concern (Nedeau et al. 2000). In other parts of the northeast, large watersheds that support robust populations of many other mussel species have documented very few live creepers, suggesting increased rarity of creeper populations throughout their range (Nedeau 2008). The most abundant populations in New Hampshire seem to be in the Ashuelot River, with many sites documenting over 10 individuals, and a few sites with over 100 individuals (NH Survey Data).

Population Management Status

There is little to no management particularly for creeper populations in New Hampshire. Historically, surveys have focused on mussel species that are more endangered, and thus have not adequately described the habitat, distribution and abundance of creepers in the state (Nedeau 2008).

Regulatory Protection (for explanations, see Appendix I)

- Fill and Dredge in Wetlands - NHDES
- Rivers Management and Protection Program - NHDES
- Comprehensive Shoreland Protection Act - NHDES
- Clean Water Act-Section 404

Quality of Habitat

Very little habitat information exists. Most creeper populations or site occurrences have not been assessed in many years. Ecological attributes have not been measured, and research is needed to determine population size, density, and recruitment and to assess habitat. NH DES conducted a new assessment of water quality in the Connecticut River mainstem in 2004. Of particular importance to mussel species, the assessment suggested that sedimentation and turbidity may be the greatest threat to water quality, particularly in the northern part of the state (Headwater CRJC 2009). In Cheshire county, where creeper densities appear highest, sudden water releases from the Ball Mountain and Townsend Dams for whitewater recreation contribute to sedimentation and greatly affect the natural communities downstream (Wantastiquet CRJC 2009).

Habitat Protection Status

Habitat protection is variable among stream reaches and regions of the state. Some protection of riparian areas is provided by the NH Shoreland Protection Act (NHDES).

Habitat Management Status

Currently there are no management or restoration efforts targeting creeper habitat in the state. However, the Nature Conservancy, the Monadnock Conservancy, the Society for the Protection of New Hampshire Forests, and the Southwestern Regional Planning Commission have developed a conservation plan for the Ashuelot River Watershed (Zankel 2004). The Connecticut River Joint Commission published a Connecticut River Management Plan in 2008 (http://crjc.org/pdffiles/WATER.final.pdf).

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 impacts (fragmentation) from dams that cause inhospitable stream conditions (Threat Rank: Medium)

Fragmentation from dams or undersized stream crossings causes many issues for mussel populations. The presence of dams changes how water flows and transports sediment through an aquatic system (Nedeau 2008). Dams can produce low flow conditions which reduce the availability of mussel habitat and can increase vulnerability to other threats.

The Connecticut River watershed has an extraordinary number of dams (Nedeau 2008). Multiple dams within a watershed lead to mussel populations that are isolated and therefore more susceptible to other threats such as pollution and habitat degradation (Nedeau 2008, Strayer et al. 1996). Dams can alter stream temperatures in impoundments and downstream areas (Nedeau 2008), which can have direct impacts on mussel species and/or their host fish species.

Any combination of increased water temperature, lack of water, low dissolved oxygen levels, and concentrated pollutants can create inhospitable stream conditions for freshwater mussels (Nedeau

2008). Dams and culverts constrict channels and can cause these poor stream conditions. Some mussel species have shown a decline in abundance downstream of a road crossing (Levine et al. 2003), although this hasn't been specifically studied for creepers.

Habitat degradation and mortality from increased flooding that destroys mussel beds (Threat Rank: Medium)

Cycles of extreme episodic flooding and dewatering can cause direct adult mortality by scouring. Extreme fluctuations in flow disrupt mussel life cycles by exposing young mussels to flood-induced damage, mortality, or displacement to potentially unfavorable habitat downstream (Layzer et al. 1993, Richter et al. 1997). Dewatering exposes mussels to heat, desiccation, and opportunistic predators. Predator foraging efficiency increases with decreasing depth.

Undersized culverts placed at road stream crossings can be problematic in times of high flow or storm conditions, where flooding may result. Road stream crossings are extremely common and can alter habitat conditions, and thus have negative impacts on aquatic life. In addition, dam maintenance often requires periodic de-watering and flooding that changes the habitat conditions, which has direct impacts on aquatic species (Nedeau 2008). Flooding typically leads to sedimentation, which can cause mass mortality of mussel beds.

List of Lower Ranking Threats:

Habitat degradation and mortality from streambank stabilization

Habitat degradation and mortality from impervious surface run-off that contains excess nutrients, sediment and toxins

Species impacts from reduction or loss of host fish from degraded habitat and species composition changes

Mortality from recreational activities within a stream that can crush mussels

Mortality from the introduction and spread of problematic diseases and parasites

Species impacts from introduced or invasive animals that result in competition, predation, and reduced habitat quality

Habitat impacts from introduced or invasive plants

Habitat impacts and disturbance from development of riparian habitats that increases stream temperature

Habitat degradation and mortality from dams that alter hydrology upstream and downstream

Actions to benefit this Species or Habitat in NH

Restoration and management of streams and rivers, with an emphasis on reducing stream fragmentation and restoring natural flow regimes, reducing pollution and riparian disturbance.

Primary Threat Addressed: Habitat degradation and mortality from dams that alter hydrology upstream and downstream

Specific Threat (IUCN Threat Levels): Natural system modifications

Objective:
Restoration of fragmented rivers will allow increased dispersal, increasing the overall potential for persistence of mussels. As mussels are established in new habitat, linear range, recolonization, and population size increase.

General Strategy:
Stream fragmentation, and attendant gene flow restrictions, will be reduced by removing barriers such as nonfunctional dams, where feasible, by operating dams at "run of the river" flow regimes, and by rehabilitating degraded river reaches. These measures will increase dispersal and recolonization of mussels into rehabilitated river reaches. Mussel populations and habitats must be assessed prior to implementation. Mussels found below a dam removal site or rehabilitated river reach may appear within 3 to 5 years, but 10 to 20 years or more may be necessary to establish a viable population. Riparian protection and restoration will be a long-term effort. As additional water quality and habitat assessment information is collected, efforts can be redirected or expanded. Pollution may render stream reaches uninhabitable. Destruction and transformation of riparian corridors accelerates erosion, bank sloughing, and runoff leading to increased levels of stream toxins, sediment, and higher stream temperatures. Education should be provided to adjacent landowners about practices that contribute pollutants into nearby rivers, streams, and ponds. Protection of riparian corridors through fee simple land acquisition, conservation easements, and private landowner cooperation will reduce pollution runoff and sedimentation. Properly sized culverts will reduce sedimentation and mass mortality of mussel beds. Surveys are needed to choose long-term, quantitative monitoring sites in occupied rivers and streams to assess patterns of disturbance and pollution. Following riparian disturbance mitigation or efforts to decrease pollution, the initial response of mussel populations should be monitored with qualitative surveying. As mussel populations increase in size, quantitative methods will be used (Strayer and Smith 2003). As additional water quality and habitat assessment information is collected, efforts can be redirected or expanded. The number of reproducing subpopulations of mussels will indicate the success of the program.

Political Location:
Statewide

Watershed Location:
Statewide

Direct swimming and fishing access points away from mussel beds

Primary Threat Addressed: Mortality from recreational activities within a stream that can crush mussels

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

Objective:
Reduce mortality of mussels from recreational activities within a stream or river.

General Strategy:
As additional information on mussel occurrences is collected and mapped, managers should consider ways to direct recreational activities away from sensitive mussel beds. This can include strategically placing docks, boat launches, parking areas, beaches, and trails away from documented mussel beds. This will help reduce disturbance to mussels, reduce the potential for direct mortality, and help reduce pollution and sedimentation into mussel habitat. Targeted outreach to fishermen may occur coinciding with this effort, advising that mussels not be cracked open and used for bait. This has been

commonly observed during mussel surveys.

Political Location:
Statewide

Watershed Location:
Statewide

Monitor status of mussel populations

Objective:
Conduct surveys to detect mussel populations and collect additional land use data in mussel-occupied habitats is needed to better inform management decisions and create conservation plans for the species.

General Strategy:
General distribution surveys should be focused on historic sites and areas where data is lacking. Data on population structure, age class distribution, sex ratio, recruitment, growth rates, and migration is needed, as well as distribution and abundance data on host fish. Studies may also examine the effects of predation and competition. Research is needed to determine the biological response of mussels to artificial flow regimes. Response variables include displacement of juveniles, interference of spawning success, larval release patterns, and host fish attachment success. Villella et al. used mark-recapture techniques to estimate survival, recruitment, and population growth of freshwater mussels (Villella et al. 2004), and this technique could provide valuable demographic information. Currently, much of the information on the condition of mussel populations and habitat is qualitative. Needed are quantitative studies to assess the physical habitat, including sediment type and hydrology, particularly shear, and water quality. As actions are initiated and populations potentially enlarge, mussel sites should be monitored using quantitative, statistically valid methods. Water quality monitoring stations upstream of mussel populations must be established.

Political Location:
Belknap County, Cheshire County, Coos County, Grafton County, Hillsborough County, Merrimack County, Rockingham County, Strafford County, Sullivan County

Watershed Location:
Statewide

References, Data Sources and Authors

Data Sources
Literature review, expert review and consultation, and NH mussel survey data (Gabriel 1995). Distribution data was obtained from unpublished reports, scientific literature, and consultation with experts. The threat assessment was conducted by Michael Marchand (NHFG), Barry Wicklow (St Anselm College), and Susi von Oettingen (USFWS).

Data Quality
NHFG has kept records of all mussel occurrences reported from surveys. NHFG also maintains records of mussel species submitted through the NH Wildlife Sightings online reporting website (http://nhwildlifesightings.unh.edu). Many mussel surveys occurring in New Hampshire are monitoring efforts in response to hydroelectric projects or dam impact studies. Most mussel studies

are focused on endangered mussel species, but usually record and report all mussel species observed. The Connecticut River main stem has been surveyed and intermittently monitored for mussels since 1988. Early surveys were conducted by canoe and snorkeling in shallow water, usually within 15 meters of the bank, and later SCUBA surveys were used to survey depths greater than 1.5 meters. Condition information for creeper in New Hampshire is lacking and needs further study.

2015 Authors:
Loren Valliere, NHFG

2005 Authors:
N/A. Species was not listed as SGCN during 2005 WAP.

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