Natural Heritage & Endangered Species Program

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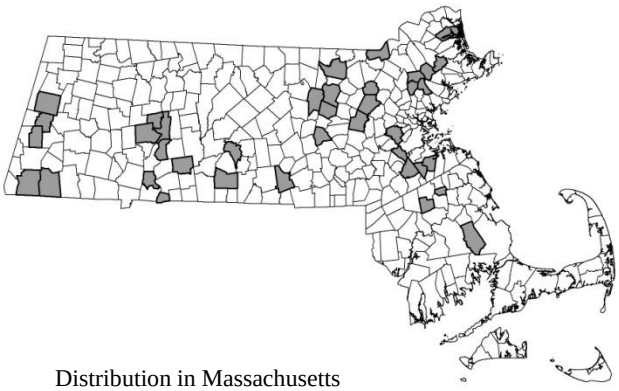
Massachusetts Division of Fisheries & Wildlife

Northern Leopard Frog
Lithobates pipiens

State Status: **None**
Federal Status: **None**

DESCRIPTION: The Northern Leopard Frog is a medium-sized, spotted frog with variable coloration. Spots are always dark (black or brown), rounded (circular to elliptical), encircled by a thin, light-colored (whitish to neon green) halo, and distributed irregularly over the back and sides of the body. The dorsal base color of Northern Leopard Frog can vary from a dull tan to a brilliant green. The undersides are white and unmarked. Length (from snout to vent) is 2–3.5 inches (5–9 cm), with females typically larger than males (especially when gravid). Tadpoles have olive to brownish-colored bodies with whitish bellies and dark-speckled tails.

SIMILAR SPECIES: Pickerel Frog (*L. palustris*) is commonly confused with Northern Leopard Frog. However, the "spots" of Pickerel Frog are typically dark brown bordered by a thin line of black, rectangular in shape, and distributed in two parallel rows down the back (as well as a single prominent row along each side). The dorsal base color of Pickerel Frog is always brownish (never green), and the inner thighs of adults and older juveniles are colored bright yellow to orange.



Distribution in Massachusetts
1990-2015
Based on records in Natural Heritage Database
Map updated 2015

Northern Leopard Frog
Photo by Bill Byrne

RANGE: Northern Leopard Frog occurs across most of northern North America, ranging from southern Quebec west to southern Alberta and eastern portions of Washington, Oregon, and California. The range extends across New England, New York, the Great Lakes States and the Upper Midwest, south to Arizona and New Mexico. Disjunct populations occur in Labrador and the southern Northwest Territories.

Within Massachusetts, populations of Northern Leopard Frog are scattered among portions of at least 8 counties: Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, and Worcester. Recent data suggest the species is distributed sparsely, but it is abundant locally.

HABITAT: Northern Leopard Frog utilizes both aquatic and terrestrial habitats. Aquatic habitat usually consists of extensive floodplain marshes or large, semi-permanent to permanent shrub swamps associated with margins of streams, rivers, lakes, and ponds. Such wetland systems are often circumneutral to calcareous and contain much emergent vegetation (e.g., *Typha* spp.,

Cephalanthus occidentalis). Aquatic habitat is used primarily for overwintering and breeding. During late spring through early fall, Northern Leopard Frogs disperse widely into upland fields, grasslands, and wet meadows. Forested areas, including regenerating clearcuts, are also used. Where appropriate habitat mosaics are contiguous, local populations may span miles.

A small Northern Leopard Frog stream in western Massachusetts.
Photo by Jacob E. Kubel

LIFE CYCLE/BEHAVIOR: Northern Leopard Frogs spend winters in shallow, excavated "pits" at the bottoms of ponds and other permanent wetlands where they lie dormant until ice thaws and waters begin to warm in mid- to late March. In Massachusetts, the breeding season usually commences in early to mid-April, whereupon the frogs become active and move into shallower waters with emergent vegetation, or migrate to breeding sites. When overland movements are necessary to reach breeding sites, they tend to occur during warm (>40°F), nocturnal rains, coincident with breeding migrations of mole salamanders (*Ambystoma* spp.) and Wood Frogs (*Lithobates sylvaticus*). Once daytime temperatures start to reach 50°F and nighttime temperatures hold in the mid- to high 40s, male Northern Leopard Frogs begin calling to attract mates.

The call of the Northern Leopard Frog consists of two sequences. The first is a slow, guttural crescendo of staccato "knocking" notes. The second is a series of several short, nasal grunts. Calling activity is generally slow, truncated, and sporadic during cool temperatures and at the beginning of the breeding period. However, once warm, sunny days and warm nights arrive, many males erupt into a full chorus of calling for a period of several days to a week. The overlapping calls of dozens of males have a resonant, ethereal quality and cannot be mistaken for any other animal.

Females, already carrying eggs, evaluate the males and select their mates. The male grasps the female from above with his forelimbs tucked securely beneath hers, holds her in place, and fertilizes her eggs as she releases them into the water (a behavior termed "amplexus"). The eggs are deposited in a mass that resembles a flattened sphere and contains up to 6,000 individual eggs.

Eggs hatch in several weeks, whereupon the frog tadpoles remain in the water for a period of 2–3 months. During that time, the tadpoles feed on algae, plant matter, organic debris, and possibly small animal matter filtered from the water or scraped from surfaces. As the tadpoles grow, they develop limbs and metamorphose into small, juvenile frogs in July or August.

Recently metamorphosed frogs tend to congregate near the margins of their natal wetlands, feeding along banks or under the cover of floodplain vegetation. During late summer and early fall, adults and sub-adults return from upland fields, meadows, and forested swamps to their overwintering sites where they, too, will forage along the margins of the wetlands until cold temperatures force them into deep water for the winter.

When gravid, female Northern Leopard Frogs are distinguished easily from males merely by their girth.
Photo by Jacob E. Kubel

The diet of juvenile and adult Northern Leopard Frogs consists primarily of invertebrates, with crickets and grasshoppers being reported favorites. Juveniles are believed to mature in 2 years, with total life expectancy seldom exceeding 4 years in the wild.

POPULATION STATUS IN MASSACHUSETTS: As of May 2015, approximately 30 local populations had been documented among 38 towns since 1990. Historical records indicate the species once occupied parts of Bristol County, but recent surveys have failed to detect the species there. The sparse distribution of Northern Leopard Frog in Massachusetts, combined with an apparent contraction in its range both within the state and elsewhere in New England during the past several decades, has led to concerns about population declines and uncertainty about its conservation status.

A Northern Leopard Frog from Norfolk County, Massachusetts.
Photo by Brian Bastarache

Primary threats to Northern Leopard Frog in Massachusetts are habitat loss, habitat degradation, road mortality, and emerging infectious disease. The most common type of habitat loss is residential, commercial, industrial, or mining development in upland fields, meadows, and shrublands. However, filling of vernal pools may also result in loss of valuable stopover habitat in landscapes where individuals disperse long distances between population centers.

Habitat degradation typically occurs when development and roads fragment habitat (e.g., create gaps between upland-wetland habitat mosaics), chemical applications (e.g., pesticides, deicing salts, fertilizers) pollute breeding wetlands, or acid deposition changes water chemistry. High road densities and traffic volumes may result in increased levels of frog mortality; in extreme cases, roads function as physical barriers between upland and breeding habitats. Noise pollution from increasing road densities and traffic volumes may alter frog calling behavior in ways that either impair breeding activity or result in certain tradeoffs that could conceivably reduce reproductive fitness.

Several pathogens/emerging infectious diseases (e.g., *Batrachochytrium dendrobatidis*, ranavirus) are affecting amphibian populations throughout the world and could be impacting Northern Leopard Frogs in Massachusetts. Of particular concern is the potential spread of exotic pathogens via the commercial pet trade. Many amphibians in New England appear to be coping with the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), but they might not be so resilient to novel diseases introduced by animals imported from other countries.

MANAGEMENT RECOMMENDATIONS: At a local scale, Northern Leopard Frog sites should be managed to develop or maintain meadows and grasslands adjacent to confirmed and potential breeding wetlands. Such management should focus on sites where threats to frogs (e.g., chemical pollution, roads) are absent or minor. When possible, mowing of grasslands and wet meadows should be done on a rotational basis or in the fall. Hydrological regimes of overwintering sites and breeding wetlands should not be altered in ways that reduce hydroperiod at critical times or permanently inundate floodplains. Riparian buffers should be established in agricultural areas where chemical applications are used or soil erosion is occurring.

At the landscape scale, habitat mosaics consisting of marshes, wet meadows, grasslands, and swamp forest should be maintained to provide dispersal corridors and and, therefore, allow for genetic exchange between local populations. Land acquisition/protection efforts for maintaining habitat connectivity should prioritize rural areas with low road and development densities. A land-protection strategy may best serve long-term persistence of local populations and preservation of metapopulation dynamics where Northern Leopard Frogs occupy relatively large, connected areas containing suitable upland and wetland habitat mosaics. However, lands supporting small, peripheral, or isolated populations are also worth protecting for maintenance of genetic diversity at the state level.

Upland fields bordering floodplain marshes represent an ideal habitat configuration for Northern Leopard Frogs in Massachusetts. *Photo by Jacob E. Kubel*

Stronger controls are necessary to guard against the introduction and spread of amphibian pathogens and infectious disease. For example, national policy and enforcement regarding importation of exotic wildlife in the global pet trade should be improved to reduce and minimize the volume of diseased animals entering the country. Within Massachusetts, field biologists, anglers, and other outdoor enthusiasts should adopt and promote appropriate equipment-sanitation procedures when outdoor activities span wide geographic areas. A statewide amphibian monitoring program that includes sampling for pathogens and disease outbreaks should be developed.

Citizens are encouraged to assist with conservation of Northern Leopard Frog by reporting observations of the species to the NHESP, as land-protection and other conservation efforts are dependent on knowing where local populations occur. Citizens may also provide important information by reporting incidents of mass amphibian mortality.

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