

Species Focus of conservation concern

Jefferson's and blue-spotted salamander

These salamanders prefer to breed in wetlands that lack fish. Their breeding pools must also hold water for more than four months, providing enough time for larvae to develop. Look for Jefferson's or blue-spotted salamanders in deciduous forests of southern New Hampshire, hiding under stones and rotting logs. These species migrate during the breeding season, and are subject to crushing by vehicles on warm (>40 degrees F), rainy spring nights. Work with your community to identify road crossings during migration and alert drivers through the media or road signs.



Blue-spotted salamander

Blanding's turtle

Blanding's turtles, endangered in New Hampshire, require large and diverse habitats and must travel long distances to satisfy their habitat needs and find nesting sites. They use vernal pools as "stepping stones" between larger wetlands, foraging for amphibian eggs and tadpoles. Areas with many vernal pools are critical, especially those in southeastern New Hampshire, to the survival of Blanding's turtles, and the loss of any vernal pool in these areas is detrimental. Leave undisturbed travel corridors between vernal pools and other wetlands for dispersing turtles.



Blanding's turtle

Marbled Salamander

Marbled salamanders are extremely rare in New Hampshire, and are listed as a state-endangered species. Historical and recent records exist in the towns of Milford, Hollis, and Hinsdale. Marbled salamanders breed in vernal pools that flood in the late fall or early winter. The pools must hold water through the following spring in order for marbled salamander eggs to hatch. Vernal pools found in floodplain forests and Appalachian oak-pine forests are preferred by breeding marbled salamanders. Both habitats types are under increasing pressure from development, particularly in southern New Hampshire, where marbled salamander populations are most likely to be found. Permanent protection of these vernal pools is critical to the survival of this species in New Hampshire.



Marbled salamander

Wildlife found in vernal pools

The species listed here are closely associated with vernal pools, but many other wildlife species will use vernal pools at some time of the year for breeding or foraging. Follow stewardship guidelines to help maintain or enhance vernal pool habitats for these and other species that depend on vernal pools. Species of conservation concern--those wildlife species identified in the Wildlife Action Plan as having the greatest need of conservation--appear in bold typeface.

- American toad
- **Blanding's turtle****
- **Blue-spotted salamander**
- Bull frog
- Damselflies & Dragonflies
- Eastern garter snake
- Fairy shrimp
- Fowler's toad
- Giant water bug
- Gray tree frog
- Green frog
- **Jefferson salamander**
- **Marbled salamander****
- **Northern leopard frog**
- Pickerel frog
- Red-spotted newt
- **Ribbon snake**
- Snapping turtle
- Spring peeper
- **Spotted turtle***
- Wood frog
- **Wood turtle**



Salamander eggs

* state-threatened species

** state-endangered species

Where to get help

If you have information about a wildlife species of conservation concern, contact NH Fish & Game's Wildlife Division at 603-271-2461. Contact the UNH Cooperative Extension Wildlife Specialist at 603-862-3594 for technical assistance for landowners or your community.

Publications and assistance on forestry and wildlife topics are available through the UNH Extension Educators in Forest Resources in each county. Contact information for each UNH Cooperative Extension office is provided below. Additional publications, contact information, resources, and web versions of all brochures in the Habitat Stewardship Series are available on the UNH Cooperative Extension website at: nhwoods.org.

Belknap County	603-527-5475	Grafton County	603-787-6944	Rockingham County	603-679-5616
Carroll County	603-447-3834	Hillsborough County	603-641-6060	Strafford County	603-749-4445
Cheshire County	603-352-4550	Merrimack County	603-225-5505	Sullivan County	603-863-9200
Coos County	603-788-4961				

Authorship

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About the Habitat Stewardship Series

Much of the land in New Hampshire is privately owned. These individuals are the primary stewards of our wildlife and forests, and also our clean water, scenic views, fresh air, natural and cultural heritage, and recreational resources. The Habitat Stewardship Series has been created to help landowners and land managers recognize the habitats critical for wildlife species at risk, and to illustrate the role private landowners can play in sustaining those species through conservation, management, and sound land stewardship.

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Vernal Pools

Habitat Stewardship Series

NEW HAMPSHIRE WILDLIFE ACTION PLAN



UNIVERSITY of NEW HAMPSHIRE
COOPERATIVE EXTENSION



Rev. 10/08

Recognizing vernal pools

Vernal pools are unique wetlands that provide critical breeding habitat for several amphibian species of conservation concern in New Hampshire. Learn to recognize these often-inconspicuous pools, understand their habitat values, and discover what you can do to conserve these special wetlands.



A flooded vernal pool

- **Vernal pools** are wetlands with a seasonal cycle of flooding and drying. Some vernal pools flood in the spring with water from melting snow, rain or high groundwater and then typically dry by summer's end. Other pools follow a similar pattern, but fill with rain in autumn, hold water all winter and spring, and then dry out by late summer. The annual drying cycle of vernal pools makes them different from other wetlands and plays a key role in determining which wildlife species uses which pools as habitat.

Locating vernal pools

Vernal pools can exist almost anywhere—in forests, fields, shrub swamps, marshes, or in gravel pits. They can be smaller than one-tenth acre or larger than two acres. Vernal pools occur as isolated wetlands (not connected to other wetlands), as part of larger wetlands (for example, a vernal pool within a scrub-shrub swamp), or in floodplains along rivers. Vernal pools in woodlands are often small enough that the forested canopy remains unbroken above them, staying shady and cool throughout the growing season. These may be overlooked, appearing as simple pools of water in the forest, with little vegetation growing in them.

Plants of vernal pools

Some sunnier vernal pools may contain sphagnum moss, sedges, ferns and shrubs such as high-bush blueberry or buttonbush. Red maple and eastern hemlock commonly grow on the edges of vernal pools, although pools may be found in many different forest types. Dry vernal pools can sometimes be identified by the presence of dark, matted leaves within a depression in the ground.



A dry vernal pool

Why are vernal pools important?

Fish are top predators in wetlands, but they can't survive in pools that dry out. As a result, vernal pools provide key breeding habitat for amphibians whose tadpoles and larvae are especially vulnerable to fish predation: wood frogs, spotted, blue-spotted, and Jefferson's salamanders. In the spring, these amphibians migrate from nearby woodlands to vernal pools – where they breed and deposit their eggs. Once hatched, tadpoles and larvae develop quickly into young frogs and salamanders that must leave the wetland before it dries up – by early or mid-summer for wood frogs, or by late summer or early autumn for salamanders.

Other species besides amphibians use vernal pools as habitat. Fairy shrimp are small crustaceans that require vernal pools for breeding. Spotted and Blanding's turtles, great blue herons, raccoons and predatory insects travel to vernal pools to feed on amphibian eggs, tadpoles, insects and crustaceans in the pools.

Where do vernal pools occur in New Hampshire?

Vernal pools exist in all parts of the state, but are most common in the flatter regions of central and southeastern New Hampshire. Vernal pools are scattered across the landscape and are easily overlooked in wetland inventories. As a result, most vernal pools haven't been adequately mapped, and scientists don't know how many pools have already been lost to development.



Fairy shrimp

Enlarged to show detail. Actual size is 1/2"-1 1/2"

Threats from development

The impact of human development on vernal pools is the most significant threat to these habitats and their associated wildlife. Development, road-building and re-grading of land can fill and destroy vernal pools, causing immediate loss of habitat and (for some species) permanent loss of populations.

Many amphibians breed in the pools where they hatched, returning to the same pool every year. If one pool is lost, the pool's returning amphibians may be lost as well. Although many vernal pools meet the state regulatory definition of a wetland, some pools either don't meet the definition (for example, no vegetation) or are overlooked during wetlands' mapping due to their small size and isolation. If construction of a new development will affect wetlands, it is often the small pools which are chosen to be filled.

Threats to surrounding woodlands

The time most amphibians spend in a vernal pool is short but critical. They breed in the pool, but they spend about 11 months of the year in the surrounding woodlands, usually within 600 yards of the wetland. So, even when development plans avoid direct impacts to vernal pools, some amphibians may be lost if the woods surrounding the pool are significantly altered. Indirect impacts of development such as changes in water flow, changes to the water table, increased pollution, and the removal of forested canopy near pools can combine to degrade or destroy the habitat value of nearby vernal pools.

Threats during migration

Many amphibians in New Hampshire migrate to their breeding pools in the spring along discrete migration routes. Roads may cut across these routes, and vehicle traffic can kill migrating amphibians. Juvenile amphibians face similar threats during their dispersal from the pools where they hatched.

Stewardship Guidelines for vernal pools

- Work with the New Hampshire Fish and Game Department to identify and map the vernal pools on your land or in your town (contact the Wildlife Division at 603-271-2461).
- New Hampshire Fish and Game tracks all sightings of rare reptiles and amphibians. Report any sightings you make to the New Hampshire Reptile and Amphibian Reporting Program (guidelines and forms are online at New Hampshire Fish & Game: wildlife.state.nh.us).
- To conserve the greatest diversity of amphibians, focus conservation efforts on areas containing a variety of wetlands such as vernal pools and others that hold water all year long. Keep in mind:
 - Isolated pools (without inlet or outlet) are less likely to have fish.
 - Small pools can have just as many (or more) breeding amphibians as larger wetlands—size isn't a good measure of habitat value.
 - Most amphibians require wetlands that hold water at least four months.
 - Pools that hold water for four to 11 months (including permanent wetlands) help protect against complete reproductive failures in more seasonal pools during dry years.
 - Pools that hold water less than four months can still serve as foraging sites, as wood frog breeding sites, as habitat for insects and crustaceans, and as stepping stones for amphibians migrating to new habitats.
 - Clusters of vernal pools may be more productive for wildlife than single, isolated pools.
- When conducting any work near vernal pools, avoid creating ruts and skid roads that collect or change the flow of water. Through runoff, these disturbances can influence the timing of wet/dry periods in a vernal pool, altering the species that can breed there.
- To avoid changing the pool's ability to hold water, don't run heavy machinery through vernal pool basins (wet or dry).
- Avoid clearcuts in or around vernal pools. Removing the shade of the tree canopy can heat up the air, soil and water in the pool, change the period of time that water remains in the pool, and influence which species can survive there.
- In upland areas within 300 feet of a pool, and in corridors between vernal pools, retain ground cover (logs, surface stones, deep leaf-litter) as cover for amphibians, and maintain a moist environment on the forest floor by retaining patches of canopy shade.
- Consult a licensed New Hampshire forester before conducting a timber harvest on your property. Understand and follow all laws pertaining to tree harvesting near wetlands and waterbodies. Many vernal pools qualify as wetlands by New Hampshire state regulations. Follow established Best Management Practices, and harvest timber near vernal pools only when the soils are either frozen (winter) or very dry (summer).
- The quality of the uplands that surround vernal pools has a strong impact on the diversity of the vernal pool. When possible, keep development, roads, and driveways at least 300 yards away from vernal pools (and other wetlands).
- When planning new roads or upgrades that bisect known amphibian and reptile migration corridors (especially for such species as Blanding's turtles, marbled or Jefferson salamanders), consider incorporating tunnel crossings under roads with accompanying drift fencing to minimize deaths among these animals during migration.
- Zoning ordinances that promote cluster development can help preserve natural lands and and/or wetlands.



Wood Frog