

Seatuck Environmental Association

A Landowners Guide to

VERNAL POOL

Protection & Management

A Landowners Guide

to Vernal Pool Protection & Management

For more information about vernal pools the following references have extensive information on vernal pool ecology, management, and protection:

- Vernal Pool Association—www.vernalpool.org
- A Field Guide to the Animals of Vernal Pools, Vernal Pool Association, Leo P. Kenney & Matthew R. Burne, 2000
- Vernal Pools—Natural History and Conservation, Elizabeth A. Colburn, 2004

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Credits

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What are Vernal Pools?

Vernal pools are a unique type of freshwater wetland that are usually seasonal in nature, with highest water levels occurring in spring—hence the name “vernal.” Through the warmer months, vernal pools diminish as water levels drop due to increased evaporation rates and the intake of water by trees. Many pools dry out each year during the summer and fall.



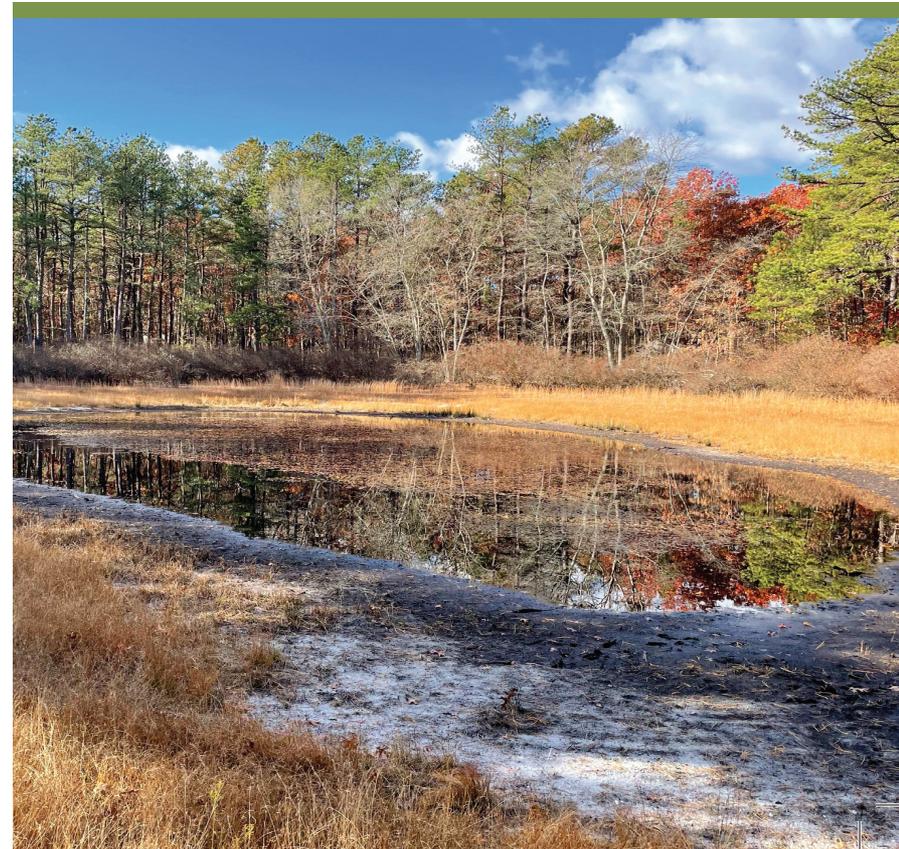
Due to their cyclical ‘wet-dry’ nature, vernal pools cannot sustain fish populations. This makes them an especially important habitat for many species to breed (or carry out other vulnerable parts of their life cycle) because high rates of fish predation don’t threaten them as they would be in ponds, streams, or other wetlands.





Vernal pools vary in shape, size, and composition. Typically, they are embedded in woodlands with trees and shrubs surrounding their edges and sometimes within the shallow water. In some cases, vernal pools are situated in more open habitats such as fields and meadows, sometimes even within coastal sand dunes.

During the dry season, vernal pool sites can be distinguished by the saucer-like depression or muddy areas the water leaves behind. The extent of the former pool is often identifiable by leaves and the bases of trees and shrubs that have been darkly water-stained in contrast to the surrounding ground and vegetation.



Ecological Significance of Vernal Pools

Vernal pools play many important ecological roles and are critical for healthy forests and wildlife populations.



Their ecological significance includes the following:

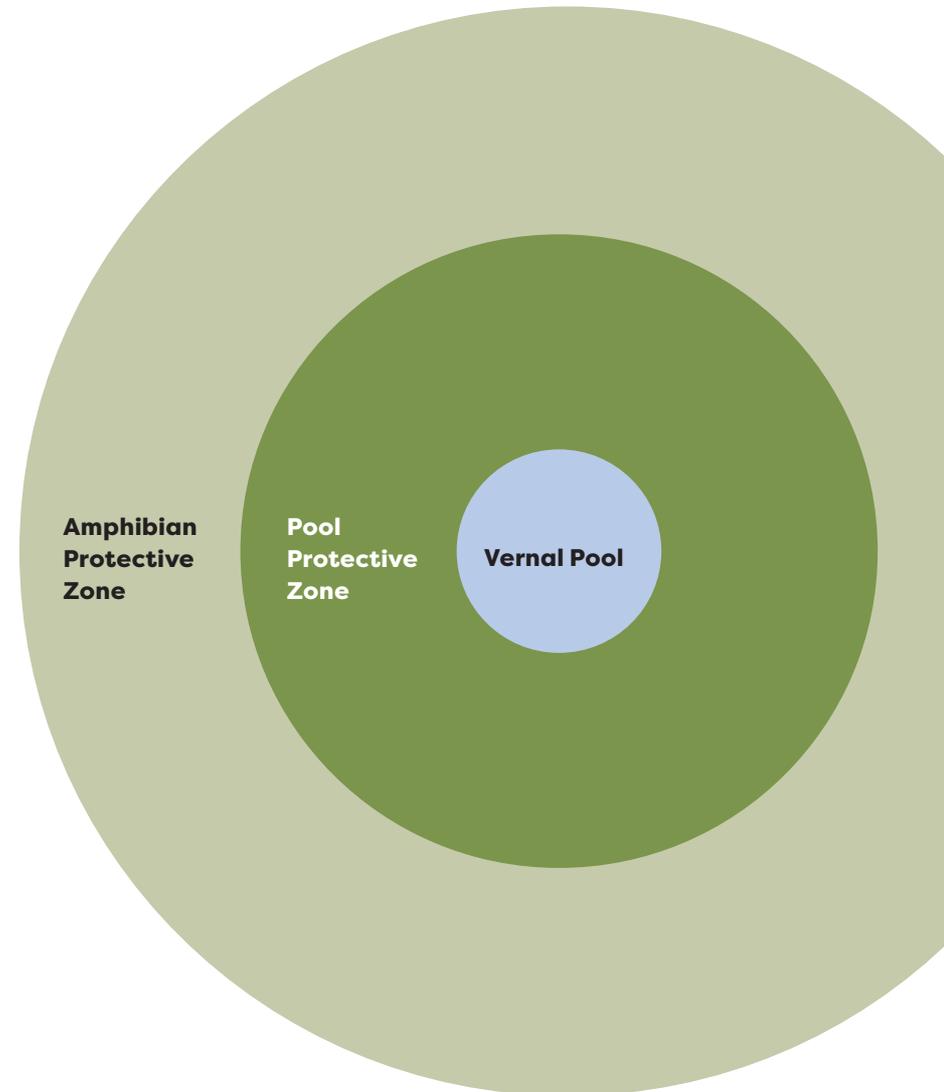
- **Unique species:** AAs detailed on page 16 (see Vernal Pool Wildlife), vernal pools provide breeding habitat for a unique assemblage of species, including salamanders, frogs, turtles, insects, and crustaceans, that have evolved to rely on the temporary and fish-free nature of vernal pools.
- **Wildlife Habitat:** Many other species, including birds (e.g., wood ducks), mammals (e.g., bats), insects, and snakes, also rely on vernal pools as habitat and/or a critical source for freshwater and food.
- **Flood Reduction & Groundwater Recharge:** Vernal pools reduce flooding by holding stormwater, allowing underground aquifers to recharge
- **Water purification:** Vernal pools filter out pollutants that eventually enter waterways and drinking water supplies.
- **Carbon sequestration:** Vernal pools capture and store atmospheric carbon dioxide, which helps to combat climate change.

Vernal Pool Management Zones

To most effectively protect and manage vernal pools, it is convenient to break the habitat into three management zones: the pool basin itself, a 300-foot wide “Pool Protective Zone” ringing the pool, and a wider 600-foot “Amphibian Protection Zone.”

The pool itself is the most sensitive zone, and activities here should be kept to a minimum (see Do’s & Don’ts on page 12). Filling or other physical alteration of the pool is strongly discouraged (and is most likely illegal without a permit pursuant to state and, in some cases, local regulations). Activities in the Pool Protective Zone can also directly impact the health and integrity of vernal pools. Removing trees eliminates the shade that keeps pools from drying too quickly and the leaves that help feed the pool’s food web. Vegetation removal and other disturbances can also result in dangerous levels of sedimentation in the pools.

Activities in the Amphibian Protection Zone are less of a direct concern to the integrity of the vernal pool itself but will impact the welfare of a number of amphibians that use the pool for breeding but otherwise live in the leaf-litter and forest vegetation of the forest. These include spotted salamanders and wood frogs that live a surprising distance from the pool during the non-breeding season.

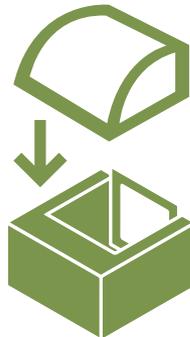


Protecting Vernal Pools and Pool Species—Do's & Don'ts

As an owner of property fortunate to contain one or more vernal pools, you have a great deal of influence over the fate of the pool and the myriad of species that depend upon it for their survival. Decisions made, the impacts of which may not be fully apparent or appreciated, may mean the difference between life and death for these animals and affect the overall quality of the vernal pool. Below are some of the issues and associated recommendations regarding vernal pool management and protection to consider.

1. Window Wells

A number of small animals, including salamanders, frogs, and toads, are known to fall into basement window wells. Once there, individuals often die from starvation since they cannot escape. If your house is near a vernal pool and has window wells to provide light to basement windows, consider placing covers on them. Well covers are readily available at home improvement stores.



2. Limit Chemical Use

Vernal pool inhabitants, especially amphibians, are very sensitive to chemicals such as pesticides, herbicides, and other lawn care products. Minimize or, better yet, eliminate use of all chemicals within 150 feet of a vernal pool. If chemicals are aerially sprayed, extend the protection zone to 500 feet.



3. Don't Introduce Fish!

Fish and vernal pool species don't mix! Fish eat amphibians and their eggs, as well as a variety of aquatic insects and invertebrates that form the food web in a vernal pool. In pools where fish are introduced, amphibian populations decline and often disappear.



4. Don't Remove Branches...**Introduce Some!**

Mole salamanders, wood frogs, and Fowler's toads anchor their egg masses to aquatic vegetation and to branches that have fallen into the vernal pool. Leave branches in place and consider occasionally adding some more!

**5. Don't Fill!**

Vernal pool basins exist because they are natural depressions in the local landscape. Don't fill them or add material of any kind to vernal pools or the surrounding area where material could wash into pools (in fact, doing so likely violates state and local laws!)

**6. Keep Pets out of Vernal Pools in the Spring**

While they might enjoy playing in vernal pools, dogs can easily dislodge or damage egg masses and injure or kill breeding adult amphibians. Please keep dogs out of vernal pools from spring through early summer.

**7. Limit Clearing of Leaves, Vegetation, and Dead Wood**

The health of the vernal pools and their associated wildlife can best be protected when surrounding trees, shrubs, and other vegetation are left intact. Trees provide important shade and drop leaves that help drive the vernal pool food web. Fallen trees and branches, as well as the layers of accumulated leaf litter, provide important habitat for a wide variety of amphibians and invertebrates.

**8. Don't Compact the Soil, and be Careful with Trail Placement**

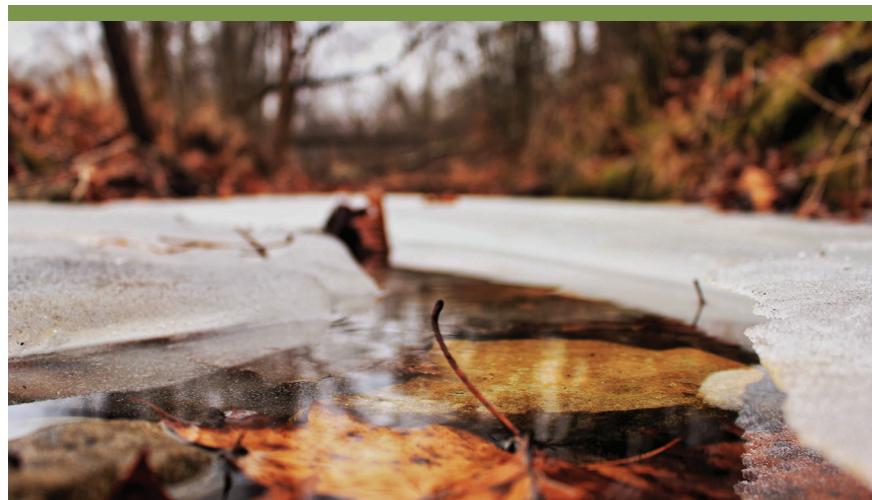
Most vernal pool amphibians spend the majority of the year in the woodland floor around vernal pools, often under the leaf litter and within underground burrows. Avoiding the use of heavy equipment in the "Amphibian Zone" will avoid destroying habitat by compacting soil and crushing burrows. Amphibians also migrate to and from vernal pools, so limiting the introduction of trails in the proximity of vernal pools, especially for horse riding and mountain biking, can prevent unnecessary injury and death to these unique animals.



Vernal Pool Wildlife

The Vernal Pool Food Web

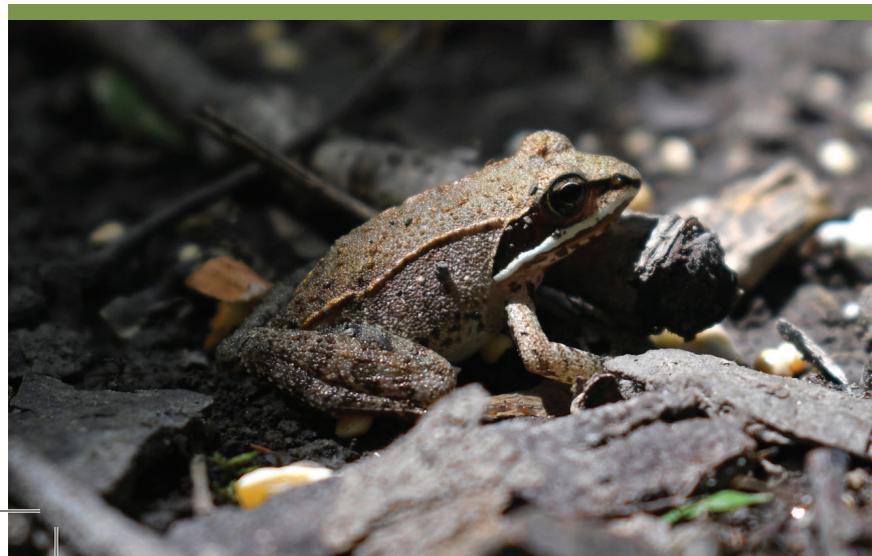
Leaves from nearby deciduous tree species (oak, maple, birch, beech, etc.) are the main drivers of the vernal pool food web, together with the variety of aquatic plants and algae that grow in the pool. As leaves sink into the pool, they are broken down by a host of bacteria and invertebrates. In turn, these species and the algae growing on surfaces provide food for a wide diversity of invertebrates, including fairy shrimp and a variety of beetles, water bugs, isopods, and amphipods. These species are then fed upon by predacious invertebrates (such as dragonfly larvae), birds (including waterfowl that eat fairy shrimp), salamanders, and frog tadpoles.



As amphibians grow large enough to leave the pools and spread into the forest, they're preyed upon by a variety of predators, including garter snakes, raccoons, and owls. Similarly, when some insects, such as dragonflies and caddisflies, leave the pools as winged adults, they provide food for birds, bats, and other wildlife. This process moves energy and nutrients from vernal pools into adjacent upland systems, helping to nourish the forest. The food web of vernal pools is complex, and its role is significant!

Vernal Pool Species

Vernal pool animals can conveniently be broken into two groups: “obligate” species and “facultative” species. Obligate species depend upon vernal pools for their survival, while facultative species use pools but don’t exclusively depend upon them. Examples of obligate species include spotted, tiger, blue-spotted, and marbled salamanders, wood frogs, and fairy shrimp, as well as several dragonfly, damselfly, and plant species. Facultative species include a variety of turtles and snakes, as well as other salamanders and frogs (e.g., red-spotted newt, green frog, spring peeper, grey treefrog, Fowler’s toad) and several species of waterfowl (notably wood duck). The following are some of Long Island’s key vernal pool species:



Wood Frog (*Lithobates sylvatica*)

Wood frogs are an obligate vernal pool species that are widespread on Long Island. Their bodies are about three inches, but they look much larger when their long legs are stretched out in the water. They vary in color from brown to grey to rust, but they are easily recognized by the prominent black “robber’s mask” across their face. Wood frogs migrate into pools from surrounding woodlands to breed after stirring from their winter hibernation (typically mid-March on Long Island). Each vernal pool can host dozens to hundreds of wood frogs. Their breeding season is a compressed, explosive affair, with frogs typically arriving, mating, laying eggs, and leaving the ponds in about a week. Their mating calls, which collectively can be quite loud, resemble the sound of quacking ducks.

Successful mating is evident by the appearance of gelatinous egg masses, which can contain as many as 1,000 eggs. The masses float near the surface of the pool, typically anchored to sticks, branches, or vegetation. Female wood frogs tend to congregate, so in pools with large populations, it is not unusual to find dozens of egg masses in one section of the pool, forming “communal clusters.” The masses sometimes become colonized with symbiotic green algae, which provides oxygen to the developing embryos. When the tadpoles first hatch (in four to eight weeks, depending on water temperature) they will graze upon the algae. The young tadpoles, which are distinguished by gold flecking on the upper side, like to bask at the surface, soaking up the warmth of the sun’s rays.

After mating, wood frogs leave the vernal pools behind and, living up to their name, spend the rest of the year on the ground amidst the forest. They are among the most terrestrial of frogs, often found hundreds of feet from the nearest wetland.

Spotted Salamander (*Ambystoma maculatum*)

Spotted salamanders, also obligate vernal pool species, are an iconic member of the “mole salamanders” genus, so named because they spend most of their lives in forest leaf litter and in underground burrows, including those made by small mammals. While generally uncommon, spotted salamanders are the most widespread of the four mole salamander species on Long Island, with known breeding populations across the northern half of the island and on the South Fork. They are striking amphibians with dark bodies and rows of bright yellow-to-orange spots running from head to tail. They’re typically six to eight inches long, with the largest females reaching upwards of ten inches!

After arising from their winter dormancy, adults emerge abruptly on rainy nights when temperatures are suitable (again, typically mid-March on Long Island) and migrate to nearby vernal pools, with males entering the pools first. In some cases, large numbers congregate into breeding balls known as breeding congresses. After mating, females lay gelatinous egg masses that contain up to a hundred eggs. The masses are similar in appearance to those of the wood frog but can be distinguished by the jellylike coating that surrounds the entire mass. They are also more often anchored



in the middle of the water column, as opposed to the surface. Salamander egg masses also become colonized with symbiotic green algae that provide oxygen to the developing embryos. The adults leave the pools within a few days after breeding is complete.

After hatching (in four to eight weeks), the salamander tadpoles, which typically stay amongst cover at the bottom of the pool, can be distinguished from frog tadpoles by the thinner, more streamlined bodies and the presence of feathery external gills. In two to four months, they metamorphose into young adults and leave the pools, moving upland to forage on insects, worms, and other invertebrates on the forest floor. They'll migrate back into a vernal pool the following spring but won't breed until they reach sexual maturity in several years. Spotted salamanders can live for more than twenty years and typically return to the same vernal pool to breed for their entire lives.

Other Amphibians

A host of other salamanders use vernal pools, including Long Island's three other mole salamanders (tiger, marbled, and blue-spotted) and the red-spotted newt. Tiger salamanders, which are listed as endangered in New York, are the first to migrate into vernal pools, sometimes as early as mid-January. The marbled salamander has a unique lifestyle, breeding in the autumn rather than spring. Unlike the mole salamanders, which all lay egg masses, newt eggs are laid singularly and attached to strands of vegetation.



Several species of frogs also use vernal pools on Long Island, including our two tree frogs: spring peepers and grey treefrogs. Peepers, which are tiny frogs often less than an inch in size, are a harbinger of spring on Long Island. Their distinctive “peeping” can be heard in vernal pools in March (or sometimes earlier on unusually warm winter days!). Grey treefrogs, which grow up to two inches, become active later in the year when their distinctive trilling call resonates through the forest in the early summer.

Fairy Shrimp (*Eubranchipus vernalis*)

Fairy shrimp are small crustaceans that are an obligate vernal pool species. They’re about three-quarters of an inch in length and can be prolific in vernal pools in early spring. Fairy shrimp swim upside down as they move through the water, eating bacteria, plankton, and other small living things suspended in the water. In turn, they are preyed upon by a number of vernal pool species, such as larval dragonflies, diving beetles, and waterfowl, providing an important source of protein for ducks.

Fairy shrimp are very hardy, emerging in late winter through early spring. The larvae rapidly develop into adults, which may produce several generations of offspring. They survive dry periods as resilient, egg-like cysts which can withstand cold, drought, and the digestive acids of birds. It is the cyst life stage which allows them to be transported from pool to pool, either by wind, by attaching to the legs of birds or other animals, or through ingestion.

Other Invertebrates

The diversity of living things in a vernal pool is certainly remarkable! But while salamanders and frogs get most of the attention, as with most natural communities, it’s the little things—the invertebrates—that really matter. Invertebrates make up most of the diversity and abundance in a vernal pool and have the most impact on their overall ecological health. In addition to fairy shrimp, vernal pools boast a host of “pods”—copepods, amphipods, and isopods, as well as the aquatic larval stages of many flying species, such as dragonflies, damselflies, caddisflies, mosquitoes, mayflies, and midges. On the surface, water striders, springtails, and whirligig beetles move about, while below them, water boatman, backswimmers, and daphnia swim through the water. There are snails, hydra, and tiny clams to be found on various surfaces. And living in the pond bottom are a variety of worms and other soft-bodied animals, and even leeches! Vernal pools are miniature yet highly robust and complex ecosystems!



About Seatuck

The Seatuck Environmental Association is a 501(c)(3) nonprofit dedicated to conserving Long Island wildlife and the environment. As the region's leading wildlife conservation organization, Seatuck pursues its mission by advocating for wildlife and advancing conservation projects, organizing community science wildlife research, and offering a wide range of educational opportunities for Long Islanders of all ages.

Seatuck's conservation initiatives involve protecting diadromous fish (river herring and American eel), migratory songbirds and seabirds, pollinator insects, horseshoe crabs, diamondback terrapins, river otters, and rare collections of native plants. Broader-level projects to protect water quality involve oyster shell recycling programs and promoting water reuse as a water management strategy.

Seatuck also strongly advocates for protecting open space and wildlife habitat, working with governmental partners, for example, to preserve Hauppauge Springs and Plum Island. In addition, the organization works with governmental and private landowners to manage open space and protect and restore wildlife habitat.

For more information about Seatuck's programs and activities, go to seatuck.org or visit us on social media.



