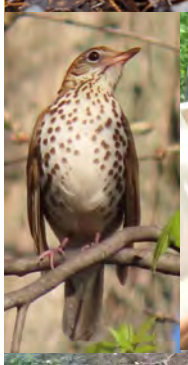
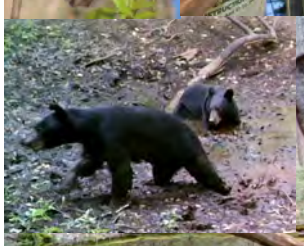
Vernal Pools
Are for Everyone

Vernal pools attract a variety of wildlife and are accessible outdoor classrooms for wetland education.





Bear and deer photos by Taylor Blackman, Penn State University

A marshy vernal pool in its dry phase

Resources

> Amphibian Research and Monitoring Initiative: http://armi.usgs.gov/

> Frogwatch USA—Association of Zoos and Aquariums: https://www.aza.org/frogwatch

> Pennsylvania Amphibian and Reptile Survey: https://paherpsurvey.org/

> The Vernal Pool Association: https://www.vernalpool.org/

> Vernal Pools of Pennsylvania: http://www.naturalheritage.state.pa.us/VernalPools.aspx

Landowner Assistance

> Dept. of Conservation & Natural Resources, Service Foresters

> Dept. of Environmental Protection, Bureau of Conservation & Restoration

> Dept. of Agriculture, PA Invasive Species Council

> PA Game Commission, Private Landowner Assistance Program

> USDA Natural Resources Conservation Service: https://offices.sc.egov.usda.gov/locator/app

> County Conservation Districts: https://pacd.org/?page_id=59

> Penn State University Cooperative Extension: https://extension.psu.edu/county-offices

> Local Conservancies, locator at: https://weconservepa.org/

> Watershed Organizations and Resources: https://pawatersheds.org

Western Pennsylvania Conservancy
Pennsylvania Natural Heritage Program
800 Waterfront Drive, Pittsburgh, PA 15222
website: http://www.naturalheritage.state.pa.us/
Vernal Pool email: spcoordinator@paconserve.org

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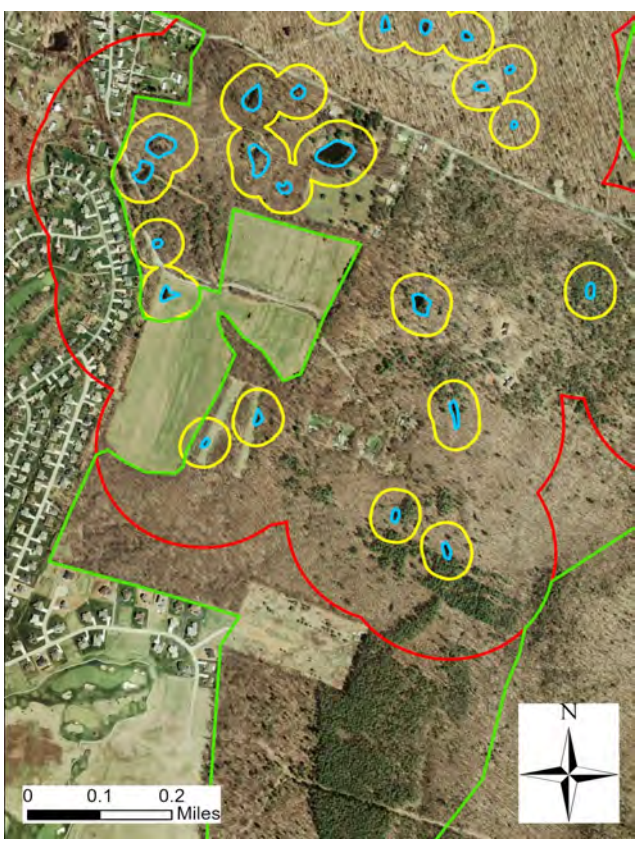
Pennsylvania
Vernal Pool
Pocket Guide

Good things come in small packages!

The Importance of Uplands for Vernal Pool Wetlands

Vernal pool amphibians move hundreds to thousands of feet a year between breeding, feeding, sheltering, and overwintering sites. This map shows a group of vernal pools and the upland habitat the amphibians need.



Vernal pool basin (blue) = Fully flooded pool in spring.
Core habitat (yellow) = Adjacent forest critical to pool health; measure from pool edge out at least 100 feet, but up to 200 feet (illustrated) for healthiest pools.
Upland habitat (red) = Supporting forested area where vernal pool amphibians spend summer, fall and winter; measure from pool edge out at least 400 feet, but up to 1000 feet (illustrated) for healthiest pools.
Upland habitat modified (green) = Remove unsuitable habitat such as active agriculture and residential development; include more forested habitat.

Vernal Pool Conservation - Best Management Practices

Best management practices for vernal pool habitats are detailed in this Conservation and Management Guide, available as a pdf from the **Vernal Pools of PA website** at https://www.naturalheritage.state.pa.us/VernalPools.aspx, under the "Resources" tab.

The gray tree frog (*Hyla versicolor*), pictured at left, is another example of a **vernal pool facultative species.** They can breed in a variety of wetland habitats. **Vernal Pool Indicators** (see inside brochure) differ in that they require vernal pools for successful breeding.

Vernal Pool Checklist

- ☐ **Seasonal dry down**: Most years the pool completely or nearly dries up in late summer or early fall.
- ☐ **Small size**: Generally a small and shallow wetland.
- ☐ **Wetland plants**: Some vernal pools are unvegetated, but many have wetland vegetation in the pool basin or around the perimeter. Some typical species include:
  - plants like sedges, rushes, mannagrasses, rice cut-grass, and wool-grass
  - ferns like cinnamon, marsh and royal fern
  - woody shrubs like buttonbush, highbush blueberry, and winterberry
  - Trees like red maple, black gum, pin oak, and swamp white oak
- ☐ **Indicator species**: Presence of specialized animals adapted to the dry phase such as: mole salamanders (Jefferson, Marbled, Spotted, or Blue-spotted), Wood Frogs, Eastern Spadefoots, Fairy Shrimp, and Clam Shrimp (see illustrations inside brochure).
- ☐ **No Fish**: Seasonal drying cycle maintains a fishless environment.

VERNAL POOL FACULTATIVE SPECIES, like this spring peeper (*Pseudacris crucifer*), breed in vernal pools, but can also use permanent lakes and ponds.

Marbled Salamander (*Ambystoma opacum*)

Adult marbleds are chunky black salamanders with white bands. Males and females rendezvous in dry pool basins on rainy nights in fall, unlike most vernal pools amphibians which breed in flooded pools in spring. Their larvae have time to develop before other predators arrive in the spring. All mole salamander larvae have large, frilly external gills.

Jefferson Salamander (*Ambystoma jeffersonianum*)

Adult Jefferson salamanders are gray or brown with pale blue flecking. Adults breed in vernal pools in early spring, and will cross snow and ice to get to the pools. The female lays small egg masses attached to vegetation or branches in the pool. The eggs develop over 4-6 weeks and hatch in mid-spring. The larvae grow for 3-4 months, then transform into immature adults that leave the pool and move into the surrounding forest in mid to late summer.

Spotted Salamander (*Ambystoma maculatum*)

The spotted salamander is our most common mole salamander. Adults have yellow spots on a dark background. They move to vernal pools to breed in the spring, though usually a little later than the Jefferson salamanders. Like the Jeffersons, their larvae go through full metamorphosis from aquatic larvae to land-dwelling juvenile and leave the pool before it dries in late summer.

Marbled Salamander egg masses

A female marbled salamander lays her clutch of eggs in a dry pool basin in early fall. She tucks the eggs under leaves, logs, or rocks. She stays with her eggs until the pool fills partway with water, which usually happens with the first tropical storms of the fall. She then returns to the adjacent woodlands and finds a burrow where she spends the winter.

Jefferson Salamander egg masses

Jefferson salamander egg masses (EMs) are more slender, cylindrical, and made of a softer jelly than spotted salamander EMs. Jefferson EMs are always clear and never white. Both species like to attach their EMs to vegetation or sticks in the pool, and their EMs may develop a greenish color from algae. Jeffersons are less commonly encountered than spotteds in Pennsylvania. Photo: Spotted EM on left; Jefferson EM on right.

Spotted Salamander egg masses

Spotted salamanders lay golf ball to fist-sized egg masses (EMs) that often contain over 100 eggs in a cluster. Their EMs may be clear or milky-white. Spotted EMs are generally larger, firmer, and more rotund than Jefferson EMs.

Wood Frog (*Lithobates sylvaticus*)

Wood frogs are small gray-brown frogs with a white upper lip and dark mask over the eye. Males have a loud, duck-like, quacking call. Tadpoles are dark with bronzish flecking on their sides and bellies. Tiny gills are briefly visible when they hatch, but these are soon covered up as they grow. Wood frogs are the only frog found north of the Arctic Circle. They accumulate glucose in their bodies as temps drop in the fall, allowing them to spend the winter frozen solid.

VERNAL POOL INDICATORS

Four amphibians and two crustaceans that specialize in vernal pools are shown on this page. The amphibians migrate annually to vernal pools to mate and lay eggs. Their young are aquatic and have the best chance for survival in fishless waters like vernal pools. The young must develop quickly then metamorphose into air-breathing juveniles before the pool dries each summer.

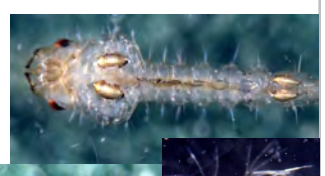
As adults, vernal pool amphibians are **terrestrial**, feeding and over-wintering in upland forests.

Vernal Pool Food Web

A variety of tiny insects and crustaceans flourish in vernal pools in the spring. They feed growing salamanders and insects, which in turn nourish bird and mammal visitors.

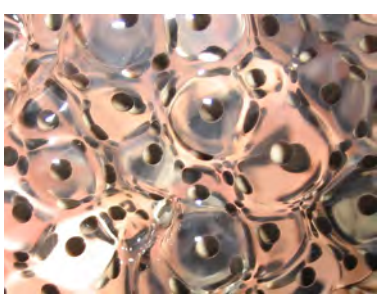
Top R: phantom midge larvae (*Mochlonyx*)

Middle L to R: seed shrimp (Ostracoda), copepod (Copepoda), water flea (Cladocera); Bottom L to R: phantom midge larvae (*Chaoborus*), midge larvae (Chironomidae), mosquito pupae (Culicidae)



Wood Frog egg masses

Wood frogs lay soft, loose clusters of eggs in early spring. Unlike mole salamanders, their egg masses do not have an extra protective layer of jelly. Wood frogs often lay their eggs collectively, creating a large raft of egg masses, which may turn green over time due to growth of a harmless algae. The tadpoles grow quickly and leave the pool as tiny froglets in July and August, before the pool dries up.



Springtime Fairy Shrimp (*Eubranchipus vernalis*)

Fairy shrimp are small crustaceans of vernal pools. Males (left) have long clasping 'trunks'. Females (below) carry eggs in a pouch at the base of their swimmerettes. The eggs overwinter in dry pool basins and must freeze and dry before hatching.

Variable Clam Shrimp (*Eulimnadia diversa*)

Clam shrimp are another type of crustacean found only in vernal pools. They are less commonly encountered than fairy shrimp and can use very small and quick-drying pools. They have a little clam shell on the outside that protects the tiny shrimp-like creature inside.