Vernal Pool

Vernal pool at Saratoga National Historical Park

Photo credits: *Gregory J. Edinger*

System Palustrine

Subsystem Forested Mineral Soil Wetlands

Did you know?
Many animals depend on vernal pools, especially for breeding. Most of these animals such as frogs, toads, turtles, and salamanders spend a majority of their life in nearby wetlands but migrate to breed or feed in productive vernal pools. Fingernail clams and air-breathing snails live their entire life in vernal pools and must burrow beneath leaves and mud when the pool dries until the water returns. Fairy shrimp produce eggs that remain in the dry pool after the adult's death and hatch after the pool refills.

Summary

Protection Not listed in New York State, not listed federally.

Rarity G4, S3

A global rarity rank of G4 means: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S3 means: Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.

State Ranking Justification

There are probably a few thousand occurrences statewide. Vernal pools are typically small (i.e., generally under one acre) and may be overlooked as wetlands after the water draws down. A few documented occurrences have good viability and are protected on public land or private conservation land. This community has statewide distribution, and likely includes several high quality examples. The current trend of this community is probably stable for occurrences on public land, or declining slightly elsewhere due to moderate threats related to development pressure, alteration to the natural hydrology, and reduced protection regulations for isolated wetlands. This community has probably declined moderately from historical numbers likely correlated with logging and development of the surrounding landscape.

Larger occurrences of this natural community (>12.5 acres) are protected under NY State wetland laws.

Conservation Issues

Threats

In 2001, the federal Supreme Court ruled that the US Congress did not give authority to the US Army Corps of Engineers (US ACE) under section 404 of the Clean Water Act to regulate the filling of isolated wetlands. This decision led US EPA and US ACE officials to issue guidance in January 2003 that made it more difficult for regulators to protect isolated wetlands, such as vernal pools (Brooks and Paton 2005). Vernal pools are threatened by development (e.g., agriculture, residential, roads) and its associated run-off (e.g., septic, silt, nutrients), habitat alteration (e.g., excessive logging, pollution, trash dumping), and recreational overuse (e.g., ATVs). Alteration to the natural hydrological regime is also a threat to this community (e.g., ditching, impoundments).

Management Considerations

Where practical, establish and maintain a natural wetland buffer to reduce storm-water, pollution, and nutrient run-off, while simultaneously capturing sediments before they reach the vernal pool. Buffer width should take into account the erodibility of the surrounding soils, slope steepness, and use of the surrounding upland by vernal pool fauna. Wetlands protected under Article 24 are known as New York State "regulated" wetlands. The regulated area includes the wetlands themselves, as well as a protective buffer or "adjacent area" extending 100 feet landward of the wetland boundary (NYS DEC 1995). Vernal pools seldom meet the size criteria for state regulated wetland. If possible, minimize the number and size of impervious surfaces in the surrounding landscape. Avoid habitat alteration within the wetland and surrounding landscape. For example, roads and trails should be routed around vernal pools, and ideally should not pass through the buffer area. Restore vernal pools that have been unnaturally disturbed (e.g., remove obsolete impoundments and ditches in order to restore the natural hydrology). Prevent the spread of invasive exotic species into the wetland through appropriate direct management, and by minimizing potential dispersal corridors, such as roads.

Specific management recommendations for vernal pools can be found in the following: 1) Best Development Practices: Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States (Calhoun and Klemens 2002), and 2) Forestry Habitat Management Guidelines for Vernal Pool Wildlife (Calhoun and deMaynadier 2004).

Inventory Needs

Need to survey for occurrences statewide to advance documentation and classification of vernal pools. Finding occurrences with several pools forming a complex should be a priority. A statewide review of vernal pools is desirable.

Research Needs

Research is needed to fill information gaps about vernal pools, especially to advance our understanding of their classification, hydrology, floristic variation, and characteristic fauna. Research is needed to see if vernal pool species assemblages are related to the underlying bedrock (e.g., acidic vs. alkaline) and/or the surrounding forest type (e.g.,

needle-leaf evergreen vs. broad-leaf deciduous).

Short Term Trends

The number and acreage of vernal pools in New York have probably declined in recent decades as a result of reduced protection regulations for isolated wetlands. Their relatively small size and seasonal hydroperiod may have contributed to the decline with many occurrences going undetected as regulated wetlands.

Long Term Trends

The number and acreage of vernal pools in New York have declined moderately from historical numbers likely correlated to the alteration to the natural hydrology and direct destruction, in both forested and urban areas.

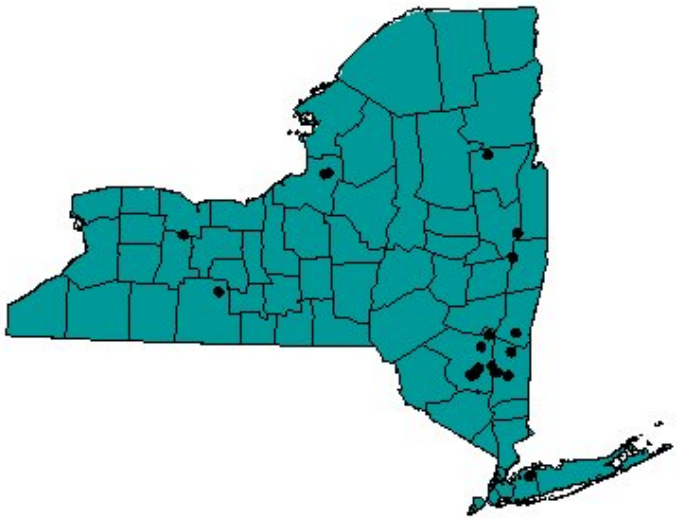
Development Considerations

When considering road construction and other development activities minimize actions that will change what water carries and how water travels to this community, both on the surface and underground. Water traveling over-the-ground as run-off usually carries an abundance of silt, clay, and other particulates during (and often after) a construction project. While still suspended in the water, these particulates make it difficult for aquatic animals to find food; after settling to the bottom of the wetland, these particulates bury small plants and animals and alter the natural functions of the community in many other ways. Thus, road construction and development activities near this community type should strive to minimize particulate-laden run-off into this community. Water traveling on the ground or seeping through the ground also carries dissolved minerals and chemicals. Road salt, for example, is becoming an increasing problem both to natural communities and as a contaminant in household wells. Fertilizers, detergents, and other chemicals that increase the nutrient levels in wetlands cause algae blooms and eventually an oxygen-depleted environment where few animals can live. Herbicides and pesticides often travel far from where they are applied and have lasting effects on the quality of the natural community. So, road construction and other development activities should strive to consider: 1. how water moves through the ground, 2. the types of dissolved substances these development activities may release, and 3. how to minimize the potential for these dissolved substances to reach this natural community.

Rare Species

False Hop Sedge (*Carex lupuliformis*)
Cat-tail Sedge (*Carex typhina*)
Brown Bog Sedge (*Carex buxbaumii*)
Featherfoil (*Hottonia inflata*)

Range



The map shows the known locations for vernal pool (black dots) based on the New York Natural Heritage Program database . A general approximation of the potential range (blue shading) throughout the state is based on the U.S. Forest Service Ecological Units (Keys et al. 1995).

Data Sources

- New York Natural Heritage Program (Natural Heritage Element Occurrences)
- NYS GIS Data Sharing Cooperative, simplified by NYS Department of Environmental Conservation, Habitat Inventory Unit (County Boundary for New York State)
- U.S. Department of Agriculture, Forest Service (Subregions of the conterminous United States)

Best Places to See

Adirondack Park (Warren County)
Minnewaska State Park (Ulster County)
Mohonk Preserve (Ulster County)
Muttontown Preserve (Nassau County)
Peebles Island State Park (Saratoga County)
Quinn Oak Openings Unique Area (Monroe County)
Roosevelt-Vanderbilt National Historic Site (Dutchess County)
Saratoga National Historic Park (Saratoga County)

New York State Distribution

This community is widespread throughout New York State. It is probably represented by different regional variants.

Global Distribution

This physically broadly-defined community may be worldwide. Examples with the greatest biotic affinities to New York occurrences are suspected to span north to southern Canada, west to Minnesota, southwest to Indiana and Tennessee, southeast to Georgia, and northeast to Nova Scotia.

Identification Comments

Vernal pools are intermittently to ephemerally ponded, small, shallow depressions usually located within an upland forest. They are typically flooded in spring or after a heavy rainfall, but are usually dry during summer. Many vernal pools are filled again in autumn. The substrate is dense leaf litter over hydric soils. Vernal pools typically occupy a confined basin (i.e., a standing waterbody without a flowing outlet), but may have an intermittent stream flowing out of it during high water. Since vernal pools cannot support fish populations, there is no threat of fish predation on amphibian eggs or invertebrate larvae. Characteristic animals of vernal pools include species of amphibians, reptiles, crustaceans, mollusks, annelids, and insects. Vernal pool amphibians include spotted salamander (Ambystoma maculatum), blue-spotted salamander (A. laterale), Jefferson's salamander (A. jeffersonianum), marbled salamander (A. opacum), and wood frog (Rana sylvatica). Fairy shrimp (Anostraca) are obligate vernal pool crustaceans, with Eubranchipus spp. being the most common.

The Best Time to See

Vernal pools are best observed after spring thaw when they are filled with melt water and breeding wood frogs start calling. April is generally a good month to visit vernal pools in New York (earlier to the south and later to the north). Repeat visits to the same vernal pool as the water draws down increases the chances of seeing the full array of characteristic vernal pool species at different stages of their life cycle.

Characteristics Most Useful for Identification

Individual vernal pools are typically small (<0.5 acre), are surrounded by upland forest with trees that overhang the pool, providing a continuous leaf litter substrate, and are generally sparsely vegetated and fishless. The presence of animals categorized as obligate vernal pool species (species that depend upon vernal pool habitat for their survival) helps confirm the identification.

Elevation Range

Known examples of this community have been found at elevations between 50 feet and 1890 feet.

Similar Ecological Communities

Eutrophic pond: Eutrophic ponds are permanently flooded and usually never completely draw down. Eutrophic ponds usually have an inlet and outlet, and support fish.

Coastal plain pond: In New York, coastal plain ponds are restricted to Long Island and are most common in the Central Pine Barrens. The ponds are generally larger than vernal pools and reveal a distinct zonation of vegetation on the pond shore as the water draws down. Coastal plain ponds may hold water throughout the year and larger examples may support fish. Vernal pools are typically small (<0.5 acre), are surrounded by upland forest with trees that overhang the pool, and are generally sparsely vegetated and fishless.

Pine barrens vernal pond: Individual vernal pools are typically small (1 acre), surrounded

by fire-adapted pine barren communities, and the vegetation is usually well-developed and distinct from vernal pool vegetation. The two communities are similar in that they provide habitat for many of the same animals that depend on seasonally flooded depressions to breed.

Intermittent stream: Vernal pools form in depressions with no inlet or outlet. Intermittent streams flow down hill in a linear streambed. Both are ephemeral aquatic communities that usually dry up as the season progresses and they share many species that depend on intermittent flooding.

Characteristic Species

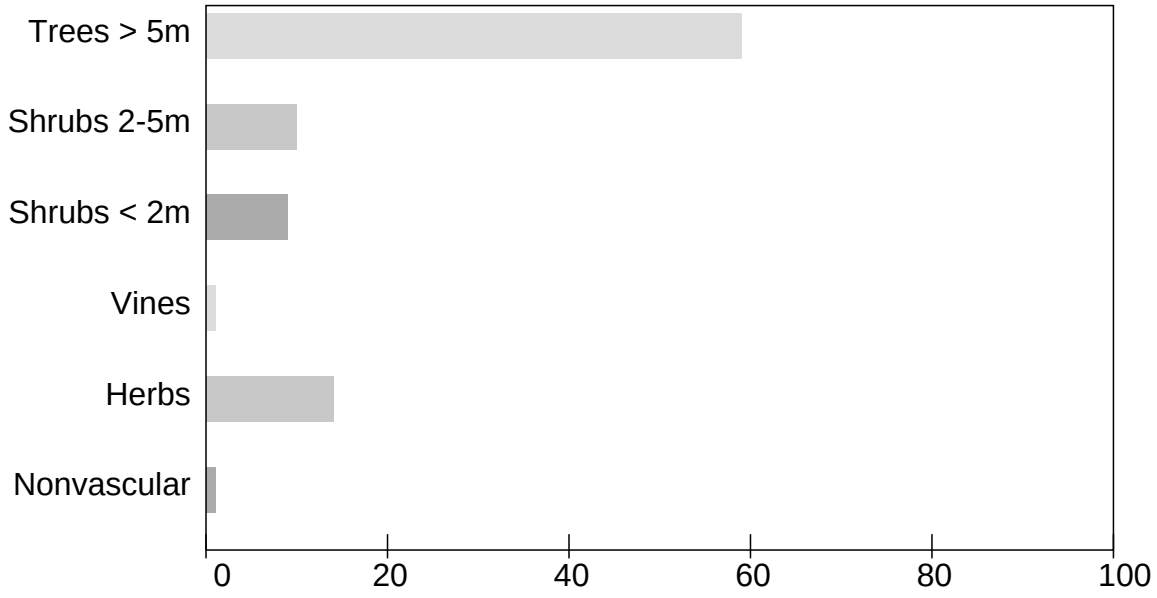
Trees >5m
Red Maple (*Acer rubrum*)
Yellow Birch (*Betula alleghaniensis*)
White Ash (*Fraxinus americana*)
Green Ash (*Fraxinus pennsylvanica*)
White Oak (*Quercus alba*)
Swamp White Oak (*Quercus bicolor*)
Pin Oak (*Quercus palustris*)
Eastern Hemlock (*Tsuga canadensis*)
Slippery Elm (*Ulmus rubra*)

Shrubs 2-5m
Spicebush (*Lindera benzoin*)
Pitch Pine (*Pinus rigida*)
Highbush Blueberry (*Vaccinium corymbosum*)

Shrubs <2m
Common Buttonbush (*Cephalanthus occidentalis*)
Sheep-laurel (*Kalmia angustifolia*)
Mountain Holly (*Nemopanthus mucronatus*)

Herbs
False Nettle (*Boehmeria cylindrica*)
Hoary Sedge (*Carex canescens*)
Tussock Sedge (*Carex stricta*)
Needle Spikerush (*Eleocharis acicularis*)
Lesser Duckweed (*Lemna minor*)
Sensitive Fern (*Onoclea sensibilis*)
Canada Clearweed (*Pilea pumila*)
Marsh Fern (*Thelypteris palustris*)

Mosses/Lichens
Leucobryum glaucum
Sphagnum spp.



This figure helps visualize the structure and "look" or "feel" of a typical vernal pool. Each bar represents the amount of "coverage" for all the species growing at that height. Because layers overlap (shrubs may grow under trees, for example), the shaded regions can add up to more than 100%.

Additional Resources

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