

**The following information on vernal pools was  
excerpted, with permission from a  
publication entitled Wicked Big Puddles by Leo  
Kenney and the Vernal Pool Association  
for inclusion in the Connecticut Envirothon  
aquatics study materials.**

# **Wicked Big Puddles**

A guide to the study and certification of vernal pools.

by Leo P. Kenney

Photographs by the author unless otherwise noted.

Drawings by Mark Erelli except as noted.

A product of Reading Memorial High School and the  
members of the Vernal Pool Association

Funding for the production of this document provided  
by the New England regional office of the U. S.  
Environmental Protection Agency.



Printed by the U. S. Government Printing Office  
September, 1995

## Introduction

This work is intended as a guide for high school students and teachers who wish to identify, study and certify vernal pools as a class, club, or individual activity. This book is an outgrowth of work which has gone on at Reading Memorial High School since the early 1980s. We intend this guide to be supplemental to "Certified", published by the Massachusetts Audubon Society.

Vernal pool certification is a process which allows the average citizen with little specialized knowledge to "do something for the environment". Vernal pools are found throughout the Commonwealth and with alarming rapidity are being destroyed in the name of progress for parking lots, roadways, shopping malls, residential development and agriculture. The Wetlands Protection Act recognizes vernal pools for possible protection if they have been certified by the Massachusetts Division of Fisheries and Wildlife. Without certification or other credible evidence to the contrary, they are presumed not to exist.

Not all habitat destruction is in the tropical rain forest, James Bay or the Pacific Northwest. Throughout the world habitat, destruction is affecting the survival of numerous species. Only recently have we recognized the value of -smaller habitats in the roles of preserving biological diversity. Vernal pools provide essential breeding habitat for a number of organisms and support an interesting food web involving organisms of various levels of complexity.

A vernal pool which has been found and certified might be protected against future development. The organisms which utilize the pool (for breeding, for food, for water, for estivation and hibernation, etc.) will have a resource essential for their existence. Their habitat will be protected from encroachment. Through vernal pool certification, an individual can make a difference.

Even without the certification process, the identification and study of vernal pools is important. If we are to make intelligent decisions regarding our use of the environment, we must be aware of those organisms which share it with us. Vernal pool identification can be part of a biological inventory indicating those organisms which exist in a locale at this time. This booklet is for those who wish to do their part to "think globally but act locally".

*Addendum to 2nd edition:*

*We (the students and I) are pleased (and somewhat amazed) at the overwhelming positive response of teachers, conservationists, students and the public to our effort to publicize and protect vernal pools. We wish to thank the various environmental groups, federal and state agencies, businesses and individuals which provided us with encouragement, information, funding and awards. In environmental work; If we all work locally, we have a worldwide effect.*

*Leo Kenney, August 1995*

# 1. What is a vernal pool?

There are a number of possible definitions for a vernal pool. In all cases they reflect the temporary nature of the pool and the organisms which use the pool for breeding activities. In different parts of the United States (or the world) where temporary wetlands are found, their characteristics vary somewhat as they reflect the climate of the region. Since this booklet is aimed at (but not limited to) those who wish to study and certify vernal pools in Massachusetts, we will begin with a definition which works in this area.

Vernal pools are contained basin depressions generally holding water for two to three months in the spring and summer and supporting the activities of certain amphibian and invertebrate species. The name is derived from the source of the water for many of these pools. They are filled by the spring ("vernal" is "spring" in Latin) snow melt and spring rains. Often they are dry by late summer.

However, not all pools are filled by spring snow melt. Some fill in the fall as the groundwater table rises. Some, of course, get water from both rising groundwater in the fall and spring as well as melt off in the spring. Others contain water for a number of years and are semi-permanent, yet dry, or almost dry, when the water table drops sufficiently. Regardless of water source or water budget, these temporary ponds are all popularly referred to as "vernal pools".

The periodic drying of the pool is an important feature. Drying prevents the pool from supporting breeding populations of fish which would be extremely successful predators on the populations of amphibians and invertebrates which depend on vernal pools for their existence. Complete drying, however, is not always a requirement for a vernal pool. Shallow water, summer heat, winter freezing, and insufficient oxygen in the water can all keep a pool free of breeding fish populations.

Vernal pools are separated from other bodies of water. They occupy a "contained basin depression" or low spot in the terrain which does not have a permanent outlet. It may overflow at times



Fig. 1-1. Small vernal pool in wooded location. Some pools are less than 1000 sq. ft. in area and very shallow.

of high water but must be isolated most of the time. It cannot be part of a permanent stream or river system. It must not have a permanent outlet but may have a permanent inlet.

In Massachusetts, a vernal pool must be utilized by certain animal species to be an actual vernal pool under the Wetlands Protection Act. Vernal pools are unique as a wetland resource as they are the only type of wetland which is defined by its animal populations rather than its plant populations. Vernal pool animal species may be divided into two general groups, those which breed



Fig. 1-2. Large pool with emergent vegetation. Many pools are over 10,000 sq. ft. in area and have sections over 4 ft. deep.

or spend their entire lives in a vernal pool and those which do not do so. Those species which must use vernal pools are referred to as the obligate vernal pool species. Of the species which might utilize vernal pools but are not obligate species, some have life histories and environmental requirements which could be used to indicate suitable conditions for obligate species. These are the facultative species. They may breed in or utilize vernal pools but they are also found elsewhere. The presence of certain obligate or facultative species can be used to define a vernal pool. Other species found in vernal pools do not define vernal pools but they are important members of the overall biological

community supported by vernal pools.

Obligate vernal pool species (shortened to "obligate species") are the mole salamanders, wood frog, and the fairy shrimp. Facultative vernal pool species ("facultative species") include (but are not limited to) spring peepers, gray treefrogs and green frogs; American toads, Fowler's toads and spadefoot toads; four-toed salamanders and red-spotted newts; spotted, painted and snapping turtles; leeches; insects such as water scorpions, predaceous diving beetles, whirligig beetles, dobsonflies, caddisflies, dragonflies and damselflies; freshwater clams; and amphibious air-breathing snails. The presence of some species, such as the turtles which do not breed in the pool, indicates the existence of a suitable food resource which is often the eggs and larvae of the obligate and facultative species listed above.

The Natural Heritage and Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries and Wildlife is charged with the certification of vernal pools in Massachusetts. Their staff does not seek out vernal pools. That is for volunteers to

do. The staff will review submissions and "certify" those which meet the outlined criteria (see Appendix for complete discussion). The "Guidelines for Certification" by the NHESP (see Appendix) provides five routes for the certification of a vernal pool. By implication, there would seem to be 5 definitions of a vernal pool.

The five methods are very briefly:

1. Contained basin depression with water which is utilized for breeding by wood frogs and/or mole salamanders.
2. Contained basin depression with water which is utilized by fairy shrimp.
3. Contained basin depression with water for 2-3 months which dries up yearly or is otherwise free of fish which supports the breeding of certain amphibians and/or contains certain reptiles or invertebrates.
4. Contained basin depression with water for 2-3 months which dries up yearly or is otherwise free of fish and which contains certain invertebrate or plant species.
5. Contained basin depression with water for 2-3 months which dries up yearly or is otherwise free of fish which has any reptiles or amphibians in the standing water.

Methods one and two reflect the importance of vernal pools to certain easily identifiable organisms, the obligate breeding species ("obligate species"). Methods three, four and five are an attempt to provide a method to document an area suitable for obligate species at times when those species might not be present or have not been properly observed. The latter three methods merely indicate that a water body is a vernal pool because it is contained, fishless, holds water for sufficient time and supports typical vernal pool organisms.

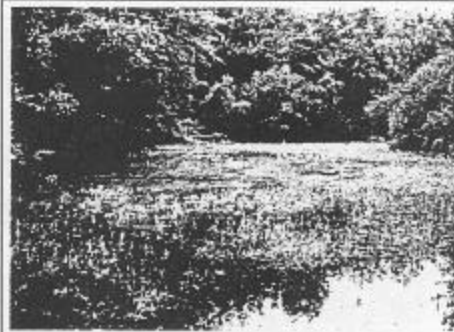


Fig. 1-3. "Open canopy" vernal pool in early summer. The canopy of trees and shrubs around and within a pool affects pool function.

The best and preferred method is the one which requires obligate species (combination of #1 and #2).

Thus, we arrive at our definition of a vernal pool. A **vernal pool** is a contained basin depression, holding water for two to three months or more, which lacks breeding populations of fish and which supports the breeding of wood frogs or mole salamanders or contains fairy shrimp. You might certify or study a pool by the facultative routes (3-5) but they will not be addressed in depth in this pamphlet. Most information contained herein is directed towards a body of water which supports the obligate species.



Fig.1-4. Vernal pool in winter. The combination of ice and open water makes the pool obvious from a distance.

If a contained basin has water and supports any of the obligate species, it is a vernal pool. The presence of the obligate species presupposes water for sufficient time to complete development and the absence of fish. If you observe obligate species utilizing the pool, you do not have to observe it dry nor attempt to prove it is otherwise free of fish.

Now that we know what a vernal pool is when we speak of one, be aware that wildlife and nature do not respect the precision of human definitions. Mole salamanders do indeed breed in deeper wide areas of "temporary streams". Wood frogs will find their way into fountains and tire ruts and lay their eggs. Fish will be introduced to vernal pools by natural or human activities and may persist for a number of years only to die out with drying or low, oxygen-poor water. Scant winter or spring precipitation will cause pools to dry early. Meanwhile, vernal pool organisms will continue to go to these areas to complete their life cycles. These areas are all "vernal pools" from the organism's point of view, but they might or might not fit our definition. Definitions are an imperfect human attempt at understanding the ever changing biological world.

