THE VERNAL POOL SURVEY PROJECT

Endangered and Nongame Species Program
NJ Division of Fish and Wildlife
WHAT IS A VERNAL POOL?

• Wetland that occurs in a confined basin depression without a permanently flowing outlet.
TYPES OF VERNAL POOLS
WOODLAND
VERNAL
POOLS
OPEN-CANOPY EMERGENT VERNAL POOLS
SCRUB-SHRUB

VERNAL POOLS
VERNAL SWAMPS
MAN-MADE

VERNAL POOLS
THE SIZE OF VERNAL POOLS

RANGE: 10-square feet --- several acres
Vernal Pool Plant Indicators/Associates

Highbush blueberry  
(*Vaccinium corymbosum*)

Buttonbush  
(*Cephalanthus occidentalis*)

Other species:  
spicebush  
leatherleaf  
sweet pepper bush  
willow  
winterberry
WHAT IS A VERNAL POOL?

• Wetland that occurs in a confined basin depression without a permanently flowing outlet.

• Maintains ponded water for at least two contiguous months between March and September.
THE VERNAL POOL CYCLE

- During fall and winter months, vernal pools become filled by rain, melting snow, and groundwater discharge
- Under normal weather patterns most vernal pools are filled to capacity by April

As spring gives way to summer, a combination of decreased rainfall, higher air temperatures, and increased water uptake by plants causes water levels to recede in vernal pools
- By July, most vernal pools are dry
VERNAL POOL IN OCTOBER

VERNAL POOL IN APRIL
WHAT IS A VERNAL POOL?

• Wetland that occurs in a confined basin depression without a permanently flowing outlet.
• Maintains ponded water for two contiguous months between March and September.
• **Dries up during the year or is otherwise free of reproducing fish populations.**
WHAT IS A VERNAL POOL?

• Wetland that occurs in a confined basin depression without a permanently flowing outlet.
• Maintains ponded water for two contiguous months between March and September.
• Dries up during the year or is otherwise free of permanent fish populations.
• **Features at least one obligate or two facultative amphibian or reptile species.**
Definitions: OBLIGATE & FACULTATIVE SPECIES

- **Obligate**: amphibians that rely on vernal pools for the successful completion of their life-cycle
- **Facultative**: amphibians AND reptiles that can use vernal pool habitat for all or a portion of their life cycle, but do not necessarily rely on such habitats.
OBLIGATE VERNAL POOL
SPECIES

Eastern Tiger Salamander*
Spotted Salamander
Blue-spotted Salamander*
Jefferson’s Salamander
Marbled Salamander

Wood Frog
Eastern Spadefoot Toad

* State Endangered    ** State Threatened
OBLIGATE VERNAL POOL SPECIES

Marbled salamander

Spotted salamander

Blue-spotted salamander

Jefferson salamander

Eastern tiger salamander

Wood frog

Eastern spadefoot toad
**FACULTATIVE VERNAL POOL SPECIES**

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WHY ARE VERNAL POOLS SO IMPORTANT?

• High biodiversity - 500 animal species identified in vernal pools within the northeastern U.S.

• In NJ there are 7 amphibian species depend exclusively on vernal pools for breeding (obligates), 2 of which are endangered

• All 14 of NJ’s frog species use vernal pools for breeding

• provide foraging habitat for wading birds, turtles, snakes, mammals; food webs

• habitat for rare plants and invertebrates (e.g. fairy shrimp, dragonflies)
VERNAL POOL SURVEY PROJECT

OVERVIEW OF METHODOLOGY

Mapping

• Rutgers University using remote-sensing techniques to identify potential vernal pools

  WWW.DBCRSSA.RUTGERS.EDU/IMS/VERNAL

Ground-Truthing

• ENSP Biologists and volunteers inspect potential vernal pools in the field to determine if vernal or not

Species Surveys

• Volunteers perform species surveys at verified vernal pools (Feb-June) and submit data

Data Integration

• Data collected on pools integrated into DEP Certified Vernal Pool database and DEP Critical Habitat Mapping (LANDSCAPE PROJECT)
STATE-LEVEL VERNAL POOL PROTECTION

• New Rule adopted Sept. 2001 affording protection to isolated wetlands and/or wetlands <1 acre in size = VERNAL POOLS

• Before this rule, wetlands of this nature could be filled with General Permit #6

Vernal Pools can only be protected with new regulations IF they meet CERTIFICATION criteria:

1. Occurs in a confined basin depression without a permanently flowing outlet.

2. Provides documented habitat for obligate or facultative vernal pool herptile species

3. Maintains ponded water for at least two continuous months between March and September of a normal rainfall year.

4. Free of fish populations throughout the year, or dries up at some time during a normal rainfall year.
HOW TO CERTIFY A VERNAL POOL

OBLIGATE SPECIES METHOD

1. Document breeding evidence of any 1 of the 7 OBLIGATE Vernal Pool Amphibians
   *photos preferred but not required*

2. Fill out data sheet
   *take detailed field notes*

3. Identify pool on USGS topo map, aerial map, or tax map
   *GPS coordinates useful*

4. Submit data sheet, photos, maps, etc. to ENSP for review

FACULTATIVE SPECIES METHOD (if you cannot document any obligate species)

1. Document at least 2 of the FACULTATIVE Vernal Pool Herptiles; for all amphibians
   evidence of breeding is required

2. Provide evidence that pool is devoid of breeding fish populations and/or dries out completely
   during the year

   Steps 3 & 4 above
THE AMPHIBIANS AND REPTILES
OF VERNAL POOLS
OBLIGATE VERNAL POOL SPECIES
MOLE SALAMANDERS

Family: Ambystomatidae

• spend much of their time underground ("fossorial")

• emerge to breed, then return to their hideouts, only occasionally venturing forth on rainy nights

• large, lunged salamanders

• predatory larvae
SPOTTED SALAMANDER
(Ambystoma maculatum)

Adult

Communal egg masses

Egg mass

Breeds in all types of pools

National distribution

NJ range
JEFFERSON SALAMANDER
(Ambystoma jeffersonianum)

Adult - note blue flecking

Adult - blue speckles fade with age

Egg mass

Upland woodland pools

National distribution
BLUE-SPOTTED SALAMANDER  
(*Ambystoma laterale*)

**State Endangered**

- **Adult**
- **Eggs** laid singly, in sheets or in clusters
- **Vernal swamps; bottomland pools**
- **National distribution**
Range Map of Jefferson and Blue-spotted salamanders in New Jersey

Blue-spotted salamander

Jefferson salamander
100% Blue-Spotted

ONLY FOUND IN FLOODPLAINS AND BOTTOMLAND POOLS
100% Jefferson

PRIMARILY FOUND IN UPLAND DECIDOUS WOODLAND POOLS
Blue-spotted X Jefferson salamander Hybrids

70% Blue-Spotted
70% Blue-Spotted
70% Jefferson
MARBLED SALAMANDER  
(Ambystoma opacum)

Adult

Breeds in dry pools during fall

Adult with eggs

National distribution

NJ range

Marbled Salamander  
Ambystoma opacum
EASTERN TIGER SALAMANDER
(Ambystoma tigrinum)

Adult tiger salamander

Frequently breeds in abandoned gravel pits

Egg mass

National distribution

NJ range
LARVAE OF MOLE SALAMANDERS

- bushy, external gills
- flat, wide heads
- predatory--feed on aquatic insects, nematodes, and eggs and larvae of other amphibians
More mole salamander larvae
WOOD FROG
(Rana sylvatica)

- Adult
- Egg masses
- Tadpoles
- Transforming juvenile
- Lays eggs communally
- National distribution
- NJ range
EGG MASS IDENTIFICATION

Spotted salamander

- Irregularly shaped
- Clear or milky white
- 30-200 eggs per mass
- Individual or communal
- Submerged
- Colonized by algae

Wood frog

- Globular
- Clear jelly; dark embryo
- 500-2000 eggs per mass
- Near surface
- Colonized by algae
EASTERN SPADEFOOT
(Scaphiopus holbrookii)

Adult

Breeds in all types of pools; will sometimes use puddles

Adult--notice vertical pupil

National distribution

Tadpole

NJ range
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* *State Endangered*  ** *State Threatened*
AMERICAN TOAD
(Bufo americanus)

- One or two large warts in each dark spot

- Found anywhere from backyards to remote woodlands; breeds in shallow bodies of water, including vernal pools, the shallow edges of streams, and permanent ponds

CALL: Long, musical trill, lasting up to 30 seconds
FOWLER’S TOAD
(Bufo woodhousii fowleri)

- Three or more warts usually present in each spot

- Occurs mainly in sandy habitats throughout the state; breeds in vernal pools, ditches, and the shallow edges of lakes and ponds

CALL: a short (1-4 seconds), harsh nasal b-w-a-a-a-a-h
GREEN FROG
(Rana clamitans)

• May be found in any body of freshwater, but are most commonly observed in permanent bodies of water

CALL: a twang like a banjo string or a plucked rubber band
BULLFROG  
(*Rana catesbeiana*)

- May inhabit any permanent body of freshwater; usually found in vegetation at the water’s edge

**CALL:** Bellowing *jug-o-rum*
PICKEREL FROG
(Rana palustris)

• Found in a variety of habitats, ranging from clear streams in ravine or meadows, to brown, murky waters of the Coastal Plain

CALL: Like a low, raspy snore; can call while underwater
SOUTHERN LEOPARD FROG
(Rana utricularia)

• Inhabits a variety of wetland habitats; usually found in shallow freshwater, but occasionally found in brackish marshes

CALL: a repetitious clucking sound, with or without an additional low raspy call
CARPENTER FROG
(Rana virgatipes)

Adult

• Yellowish stripes along body

CALL: a rhythmic double-tapping, like carpenters hitting nails with hammers

Prefers sphagnum bogs

NJ range
NORTHERN SPRING PEEPER

(*Pseuadcris crucifer*)

- Inhabits a variety of habitats and breeds in almost any body of fresh water

**CALL:** *Peep, peep, peep, peep*--the call sounds like a high-pitched, chirpy whistle
NORTHERN GRAY TREEFROG

(*Hyla versicolor*)

- Warty skin
- Juveniles bright green
- Breeds in vernal ponds, marshes, and meadows
- Most common treefrog next to spring peepers

CALL: a loud, resonating, high-pitched trill
SOUTHERN GRAY TREEFROG

(Hyla chrysoscelis)

- Breeds in vernal ponds, marshes, and meadows, gravel pits

STATE ENDANGERED

CALL: rapid, high-pitched trill

NJ range
CHORUS FROGS

- Upland and New Jersey chorus frogs are almost identical in appearance, but are discernable by the thickness of stripes on back.

NEW JERSEY CHORUS FROG
(Pseudacris triseriata kalmi)

CALL: high-pitched ‘prreeeep’

NJ range

UPLAND CHORUS FROG
(Pseudacris triseriata ferarium)

- Found in a variety of habitats, including swamps, vernal pools, and ditches.

NJ range
NORTHERN CRICKET FROG

(Acris crepitans)

- Found near sunny, shallow pools, streams and marshes, with plenty of plants for shelter

CALL: Cricket-like; rhythmic, repetitive clicking
PINE BARRENS TREEFROG

*(Hyla andersonii)*

- **STATE THREATENED**
- **CALL:** repetitious honking
- **Restricted to acidic Pinelands pools**
- **Recent metamorph**
- **Adult displaying orange flashing on underside**
- **NJ range**
RED SPOTTED NEWT

(Notophthalmus viridescens)

- Found primarily in permanent ponds or semi-permanent vernal pools
- Has both aquatic and terrestrial stage after metamorphosis
- Adults highly predatory on larval amphibians

Juvenile (red eft)

Adults

Newt eating wood frog eggs

NJ range
FOUR-TOED SALAMANDER

(*Hemidactylium scutatum*)

Prefers highly structured mossy swamp pools

- Found in woodland and scrub-shrub vernal pools containing an abundance of rotting logs and sphagnum moss hummocks
- White belly heavily flecked with black markings
- Eggs deposited above water line in mossy hummocks
LONG-TAILED SALAMANDER

(Eurycea longicauda)

- Primarily associated with wooded seepages and streams but also found along edges of vernal pools formed in limestone sinkholes in Warren and Sussex County
- Orangish in color with long tail and herringbone pattern
- Breeds in pools; adults inhabit microhabitats along edge of pool
SPOTTED TURTLE

(*Clemmys guttata*)

- Turtle most frequently encountered in vernal pools
- Often found breeding in pools in March

NJ Range
Can be observed basking along logs along pool edge or foraging on egg masses and vegetation

- Strictly an aquatic turtle; if found in vernal pool it is almost certain that a permanent water body is close by

Characteristic pattern and coloration

NJ Range
COMMON SNAPPING TURTLE

(Chelydra serpentina)

- Migrates from permanent bodies of water in spring to gorge on amphibian egg masses and larvae in vernal pools

NJ Range
EASTERN MUD TURTLE
(Kinosternon subrubrum)

- Found occasionally in vernal pools located in proximity to floodplains; feeds heavily on invertebrates within vernal pools

NJ Range

Vernal ‘ditch’ used by mud turtles
WOOD TURTLE
(Clemmys insculpta)

STATE THREATENED

Adult male

Riparian habitat

• Will forage extensively in vernal pools located in the vicinity of riparian habitats (floodplains)
**VERNAL POOL PHENONLOGY – SOUTHERN NJ**

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**SEPT**

Marbled salamander
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# Phenology of Calling Frogs

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*Species abbreviations:*  
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- (Pseudacris triseriata ferarium)  
- (Pseudacris c. crucifer)  
- (Rana utricularia)  
- (Rana palustris)  
- (Bufo americanus)  
- (Acris c. crepitans)  
- (Rana virgatipes)  
- (Bufo woodhousii fowleri)  
- (Hyla andersonii)  
- (Hyla versicolor)  
- (Hyla chrysoscelis)  
- (Rana clamitans melanota)  
- (Scaphiopus h. holbrookii)  
- (Rana catesbeiana)