

Is it a Vernal Pool?





MAY 5 2003

Characteristics and Ecology of Vernal Pools

In 10 “Take Home Messages”



Abandoned Farm Pond



Floodplain Pool



Depression in Agricultural Field



Headwater Pool



Swamp Depression



Upland Basin Depression

TAKE HOME MESSAGE #1

Vernal pools occur in many types of depressions (natural and manmade) across the landscape



HYDROLOGY



When does the pool fill?

How long does the pool hold water?

Factors Affecting Hydrology

- Source of water – precipitation, groundwater, surface run-off, flooding
- Soils – permeability
- Physical depression – surface area, depth of basin
- Surrounding vegetation – evapotranspiration
- Connection to other wetlands

Hydrologic Classification of Vernal Pools

(Colburn 2004)

- Spring fill : short cycle (3-4 months)
- Spring fill : long cycle (5-8 months)
- Fall fill : short cycle (7-9 months)
- Fall fill : long cycle (9-11 months)
- Semi-permanent: (36-120 months)

Amphibian Species Composition & Hydroperiod

NO FISH

- **Spring Short** - wood frog, American toad, spadefoot
 - **Fall Short** - add marbled salamander
 - **Spring Long** - wood frog, gray treefrog, leopard frog, pickerel frog, spring peeper, fowler's toad, spadefoot, American toad, spotted salamander, Jefferson salamander, blue-spotted salamander, four-toed salamander, eastern newt
 - **Fall Long** - add marbled salamander
 - **Semi-permanent** - wood frog, gray treefrog, leopard frog, pickerel frog, spring peeper, fowler's toad, spadefoot, American toad, spotted salamander, Jefferson salamander, blue-spotted salamander, four-toed salamander, eastern newt, bull frog, green frog
-

FISH

- **Permanent** – bull frog, green frog, pickerel frog, American toad, eastern newt

TAKE HOME MESSAGE #2

Vernal pools have varying hydrological cycles that prevent the establishment of permanent fish populations and determine the biological community present



CANOPY COVER



Influences embryo/larvae development



Influences the food pyramid

Open

- Spring peeper
- Gray treefrog
- Leopard frog
- American toad
- Fowler's toad
- Spadefoot toad
- Wood frog
- Spotted salamander
- Blue-spotted salamander
- Eastern newt
- Four-toed salamander

Shaded

- Wood frog
- Spotted salamander
- Blue-spotted salamander
- Jefferson salamander
- Marbled salamander

TAKE HOME MESSAGE #3

The biological diversity of vernal pools is influenced by the amount of sunlight and leaf litter input



VEGETATION



Shrubs



Red Maple



Grasses and Sedges



Four-toed salamander

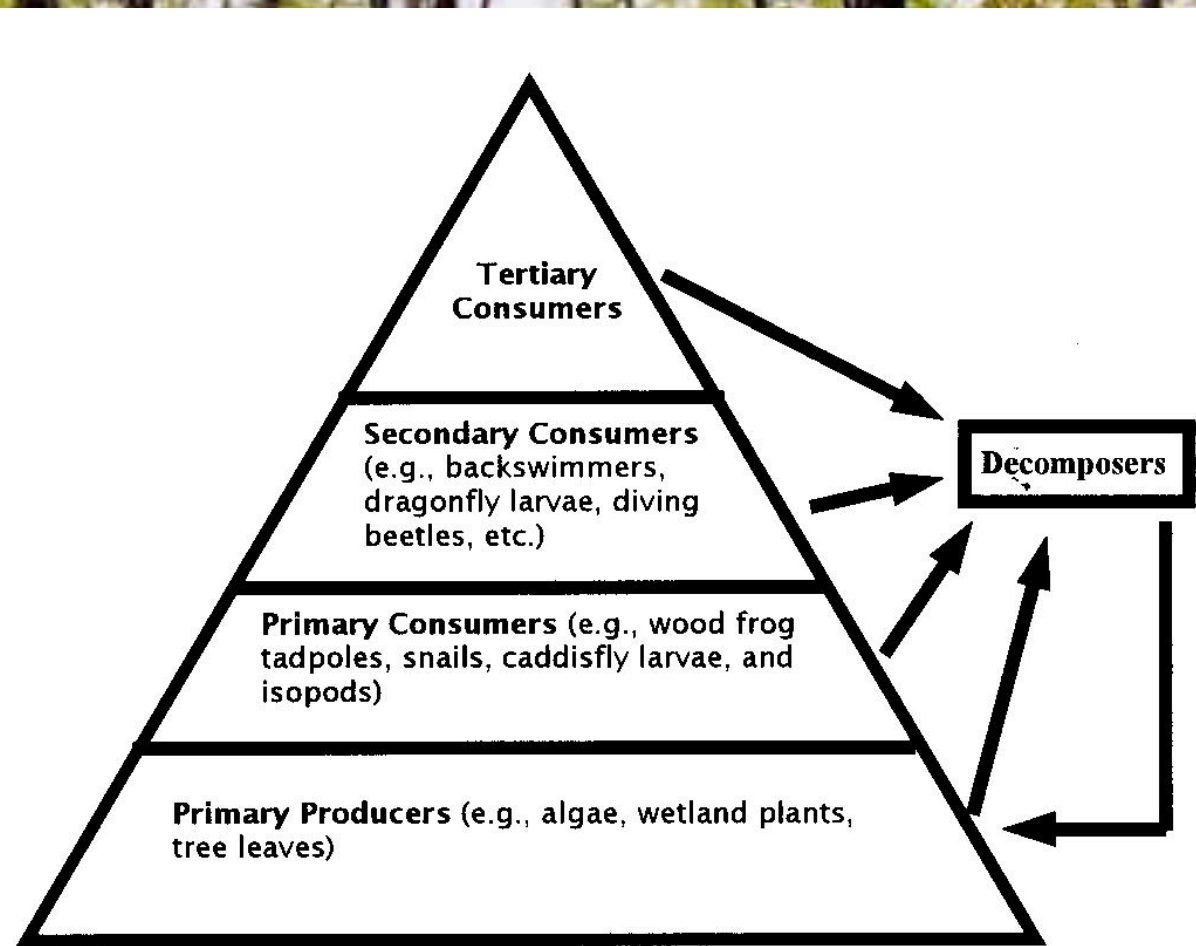
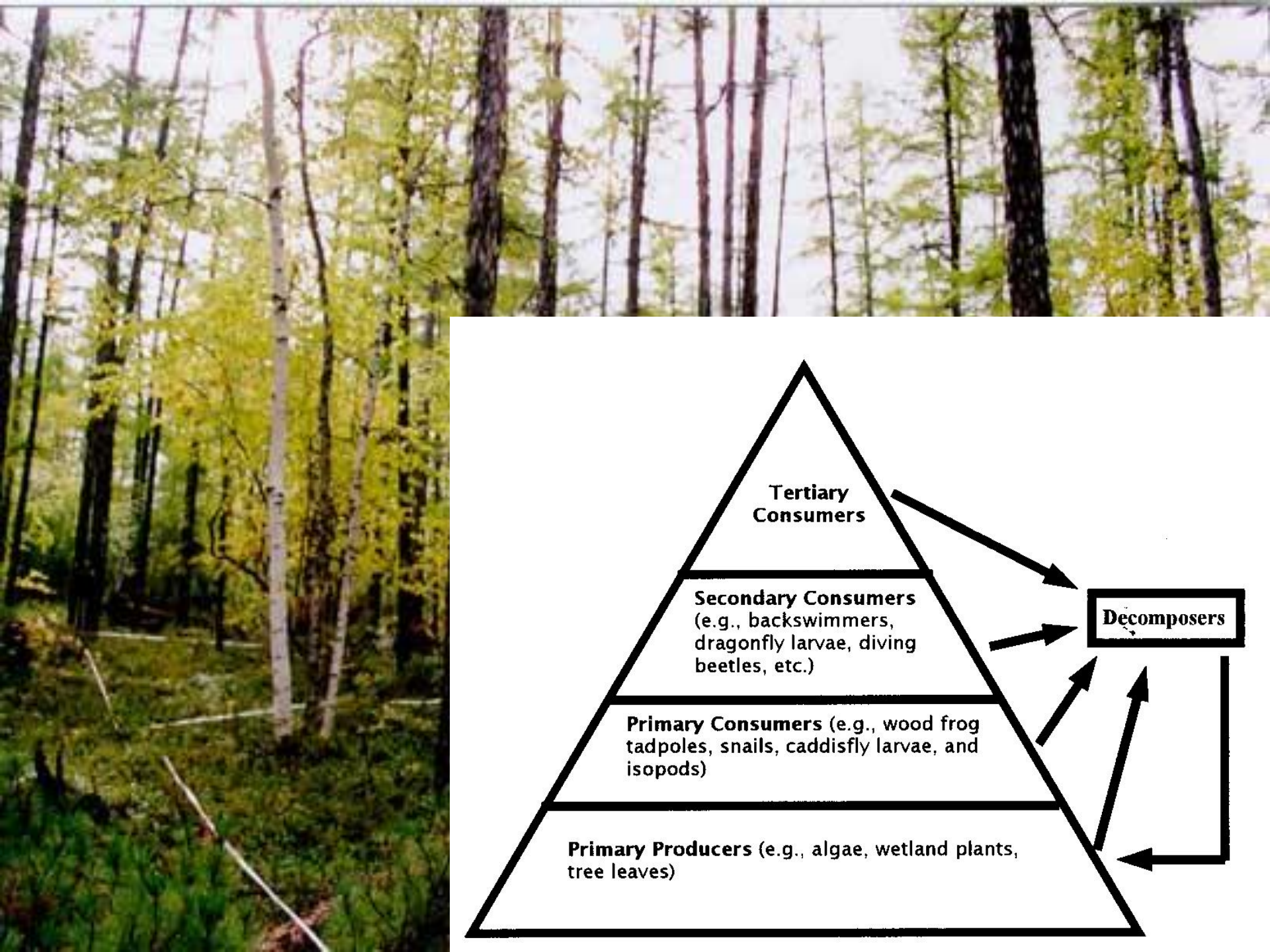
TAKE HOME MESSAGE #4

Vegetative structure of vernal pools is diverse and can influence the species of organisms present



Life in a Vernal Pool







Fingernail Clam

Snail



Fairy Shrimp



Isopod

**Complete Life
Cycle in Pool**



Dragonfly Nymph



Caddis fly Larvae

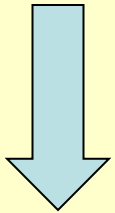


Predacious Diving Beetle
(Adult & Larvae)

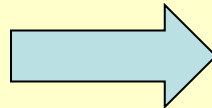
**Portion of Life Cycle
in Pool**



Spotted Salamander



© John White



Scott Egger

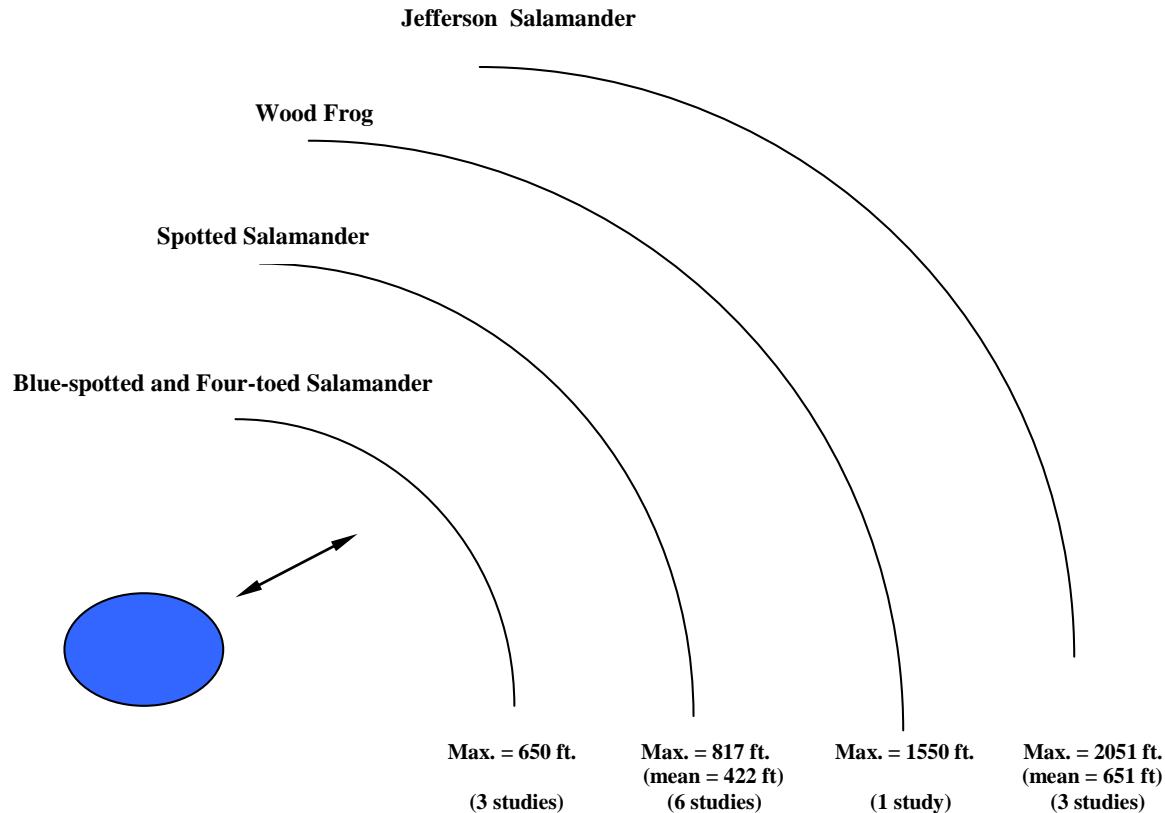
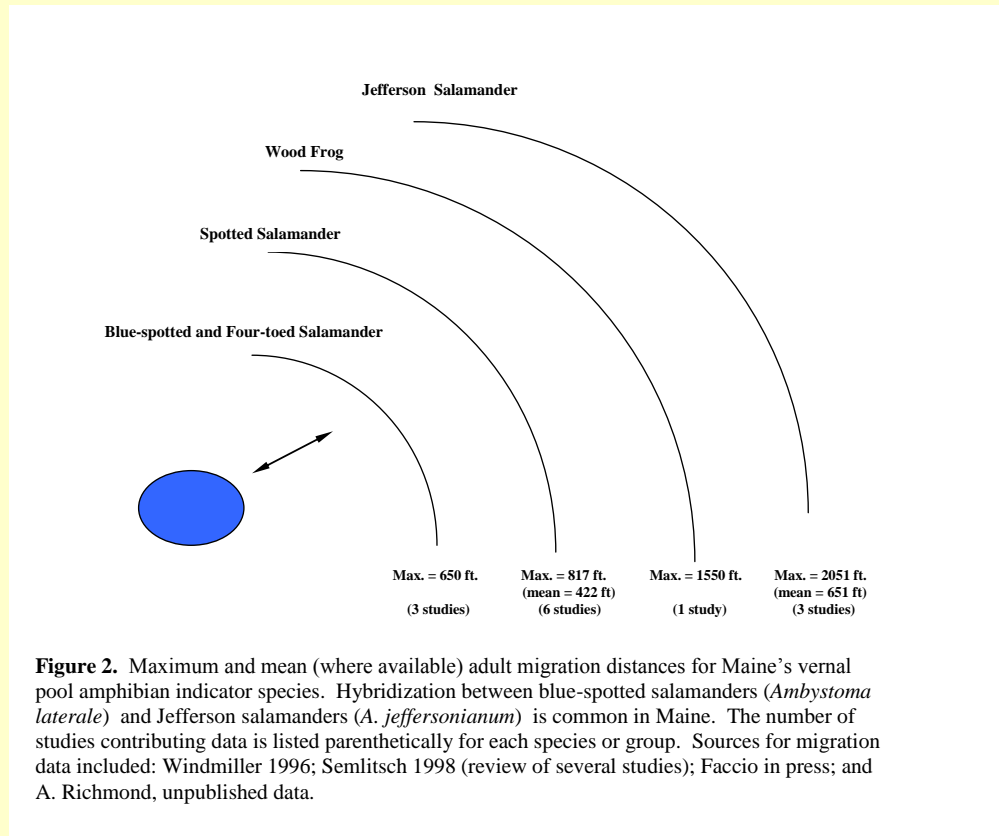


Figure 2. Maximum and mean (where available) adult migration distances for Maine’s vernal pool amphibian indicator species. Hybridization between blue-spotted salamanders (*Ambystoma laterale*) and Jefferson salamanders (*A. jeffersonianum*) is common in Maine. The number of studies contributing data is listed parenthetically for each species or group. Sources for migration data included: Windmiller 1996; Semlitsch 1998 (review of several studies); Faccio in press; and A. Richmond, unpublished data.

TAKE HOME MESSAGE #5

Vernal pools are ecologically connected to surrounding upland and wetland habitats



Wood Frog

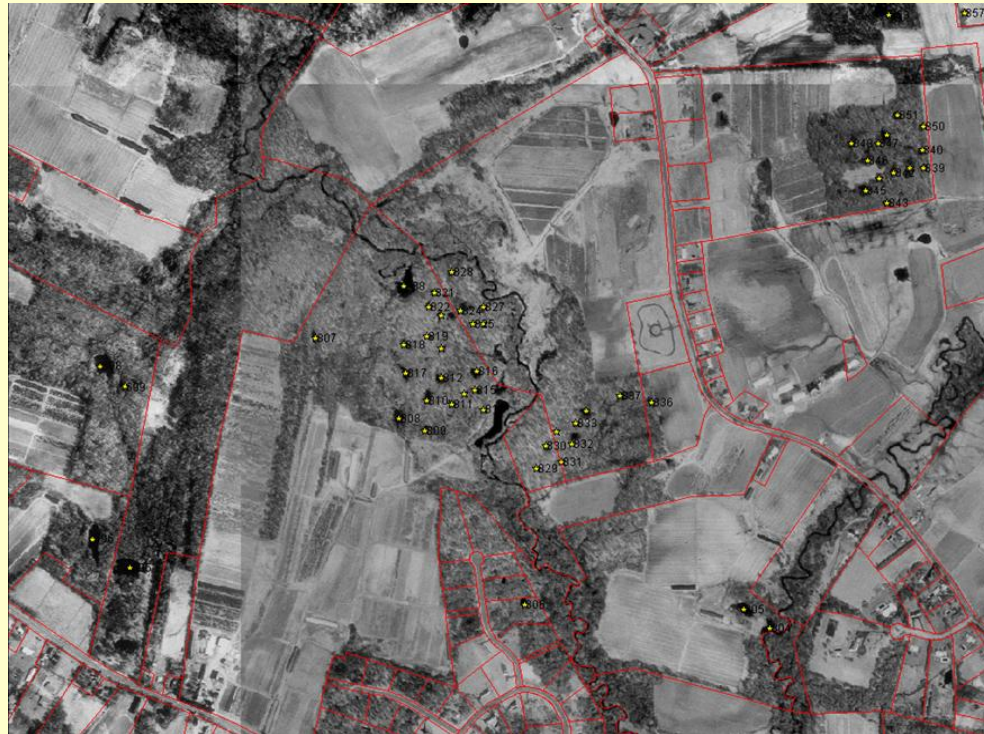
Seasonal Habitat Use

- Forest habitat along the margins of the pool (over-winter)
- Reproduce in the vernal pool (early spring)
- Move to forested wetlands post-breeding with periodic use of closed canopy forest (summer refuge)



Take Home Message #6

It is not just the area around the pool (core habitat), but also the spatial arrangement and connections among different habitat types that is important



Wood Frog



Eastern Spadefoot



Fairy Shrimp



Blue-spotted Salamander



Jefferson Salamander



Spotted Salamander



Marbled Salamander



Obligate Species



Facultative Species

Bullfrog



Spotted Turtle



Ribbon Snake



Opportunistic Use of Pool

State-listed Species (Animals)



Ribbon Snake (SC)



Spadefoot (E)



Leopard Frog (SC)



Blue-spotted salamander (E, SC)



Jefferson salamander (SC)

State-listed Species (Plants)



Vernal Pool Amphibian Breeding Seasons

Early Spring
(March-April)

Late Spring
(May-June)

Early Summer
(July-August)

Late Summer
(September)

Wood frog

Spadefoot

Spadefoot

Marbled salamander

Spring peeper

Fowler's toad

Spadefoot

Spotted salamander

Gray treefrog

Blue-spotted salamander

Spring peeper

Jefferson salamander

Pickerel frog

Four-toed salamander

Leopard frog

Newt

Pickerel frog

American toad

Spadefoot

TAKE HOME MESSAGE #7

Vernal pools provide important habitat for a high diversity of organisms including species with life cycles adapted specifically to them



TAKE HOME MESSAGE #8

The presence of “obligate” vernal pool-breeding species (any stage of life cycle) are often used to confirm the presence of a vernal pool

Spotted salamander



Fairy shrimp



Wood frog



Latitude (degrees)

42.0

41.8

41.6

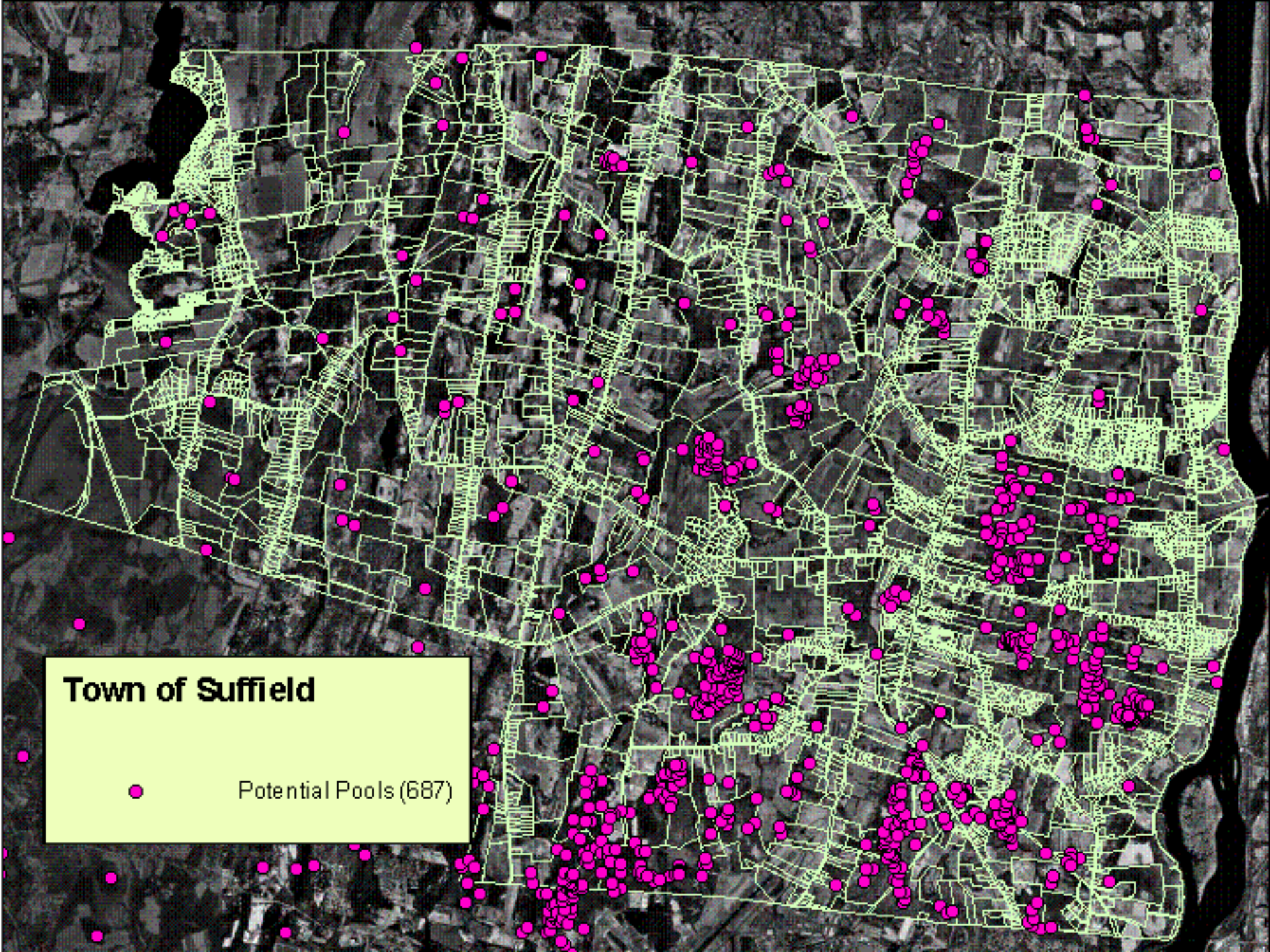
41.4

41.2

41.0



BIOGEOGRAPHY & GEOLOGY



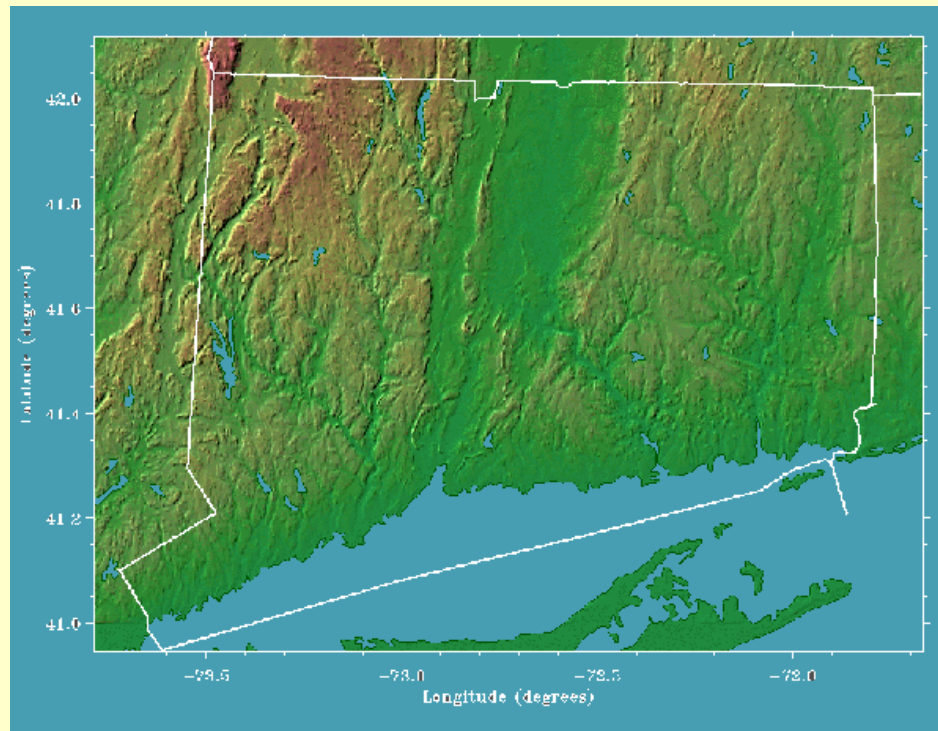
Town of Suffield



Potential Pools (687)

TAKE HOME MESSAGE #9

The geology and post-glacial distribution of animals influences the biological and physical characteristics of vernal pools in various regions of the state



LANDSCAPE CHARACTERISTICS





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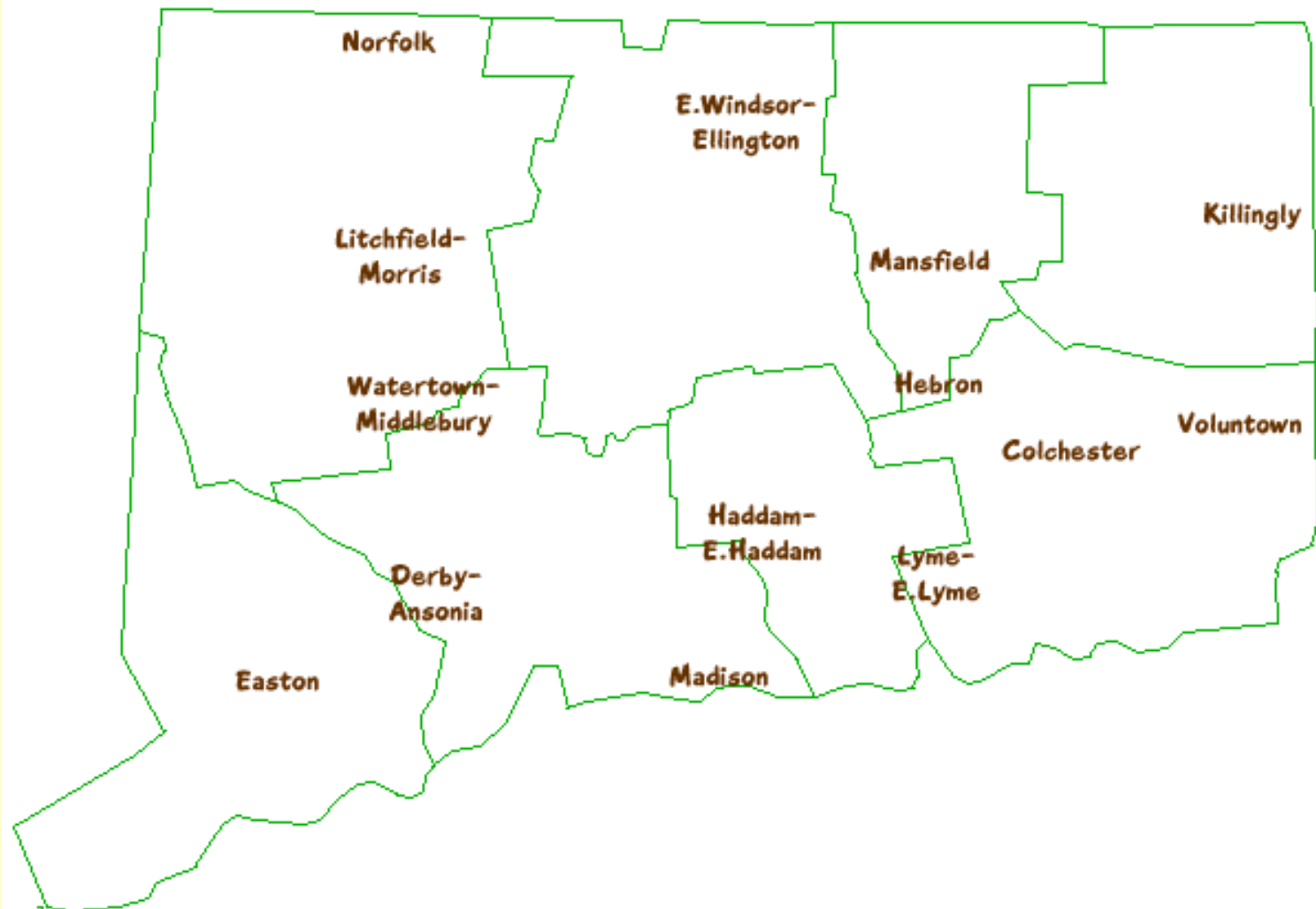
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810



Connecticut Amphibian Monitoring Project

CAMP Survey Blocks

Land Use-Cover

Rural Blocks

Urban-Suburban Blocks

Forest	82%	54%
Open	10%	32%
Developed	3%	12%
Wetland	5%	1%
Roads	7 mi.	12 mi.



Amphibians & Land Use-Cover

	<u>Rural</u>	<u>Urban-Suburban</u>
Spotted salamander	45%	23%
Red-backed salamander	64%	71%
Bullfrog	27%	63%
Green frog	65%	71%



TAKE HOME MESSAGE #10

Changes (natural and human-influenced) in land use and cover around vernal pools can influence the physical and biological characteristics of a vernal pool



SUMMARY

- Vernal pools occur in many types of natural and manmade depressions.
- Have varying hydrological cycles that influence the biological community that will be present, and prevent the establishment of permanent fish populations.
- Biological community is influenced by the amount of shading/sunlight and leaf litter input (the tree canopy).
- Vegetative structure can influence the species of organisms present.
- Provide important habitat for wildlife including species with life cycles adapted specifically to them (“obligate species”).

- Are ecologically connected to surrounding upland and wetland habitats, and the spatial arrangement and connections among these habitats is important in conservation planning.
- Geology and post-glacial distribution of animals has influenced the characteristics of vernal pools in various regions of the state.
- Natural and human-influenced changes in land use and cover around vernal pools can alter the physical and biological characteristics of the pools.