Introduction to Vernal Pools and Pool-Breeding Amphibians

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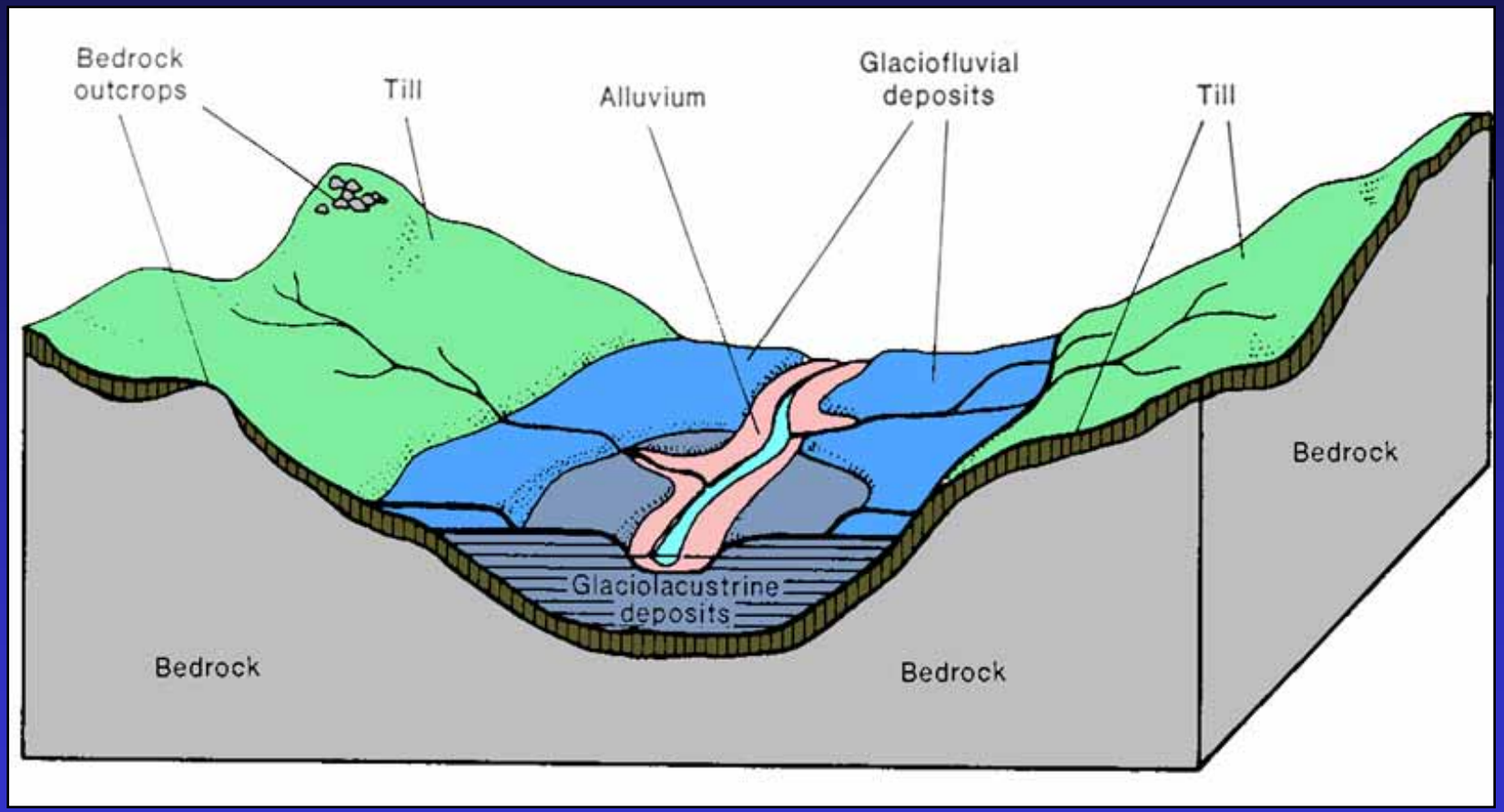
Vernal Pools: What are they?

- Depressions in the land
- Surface water for part of the year
- Fill between late fall and spring
- Dry up during summer or early fall
- Located in upland or wetland
- Sometimes referred to as “seasonal ponds”

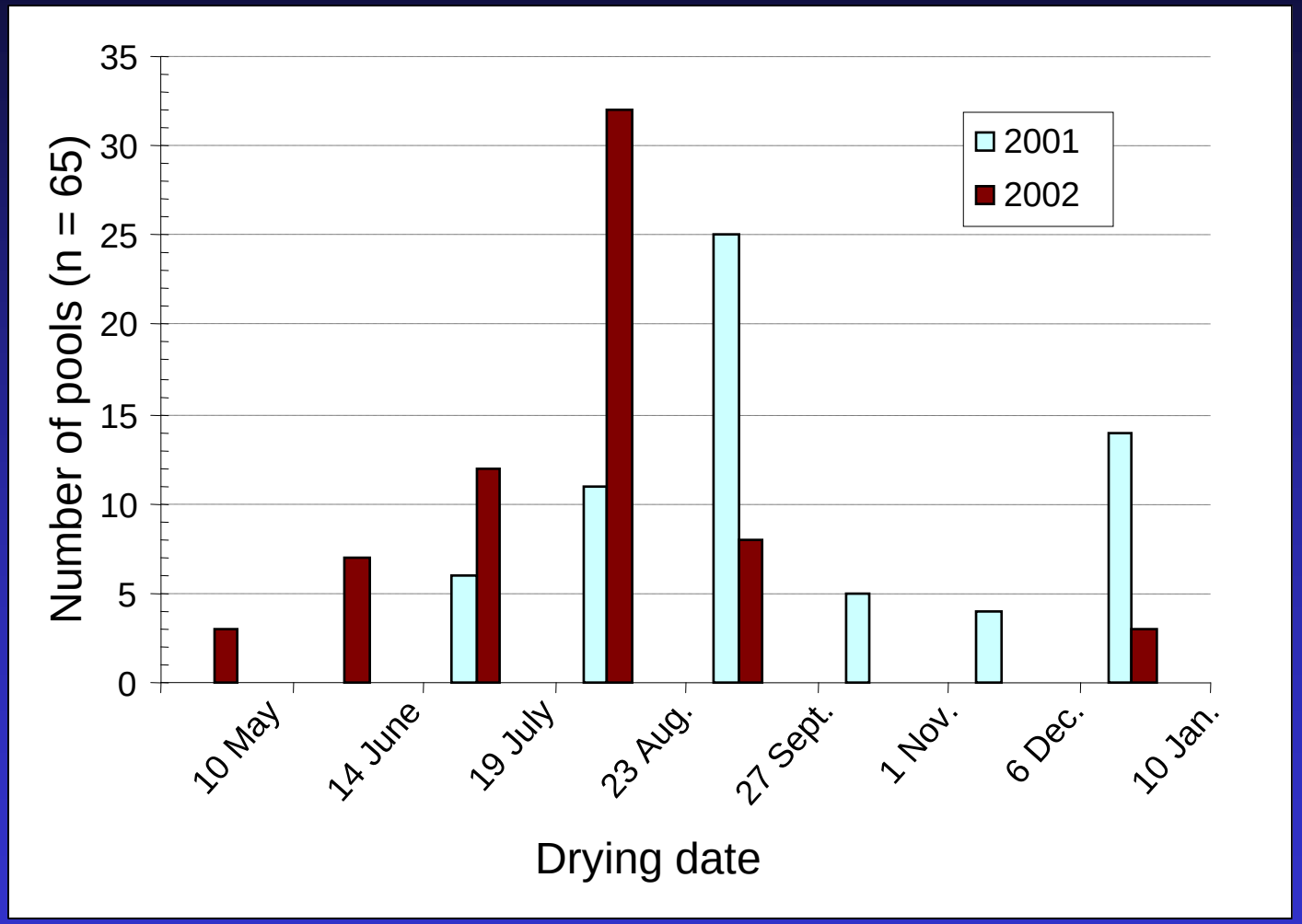
Vernal Pools: Size and depth

Most < ½-acre, < 4 feet deep
at high water

Vernal Pools: Topographic and geologic setting



Vernal Pools: Hydroperiod



Vernal Pools: Vegetation

Water lilies

Non-woody Emergents

Trees

Shrubs

Litter or moss

Vernal Pools: Wildlife

Aquatic invertebrates

Amphibians

Reptiles

Waterfowl

Songbirds

Mammals

Seasonal drying excludes fish

Vernal Pool Amphibians in RI

Wood frog

Spotted salamander

Marbled salamander

Spring peeper

Gray treefrog

Pickerel frog

American toad

Green frog

American bullfrog

Red-spotted newt

Pool-breeding Amphibian Life Cycle
(e.g., Wood Frog)

Aquatic habitat (pool)

Eggs

Larvae

Terrestrial habitat (forest)

Adults

Metamorphs

Conservation of Pool-breeding Amphibians

Vernal pool

Forested upland

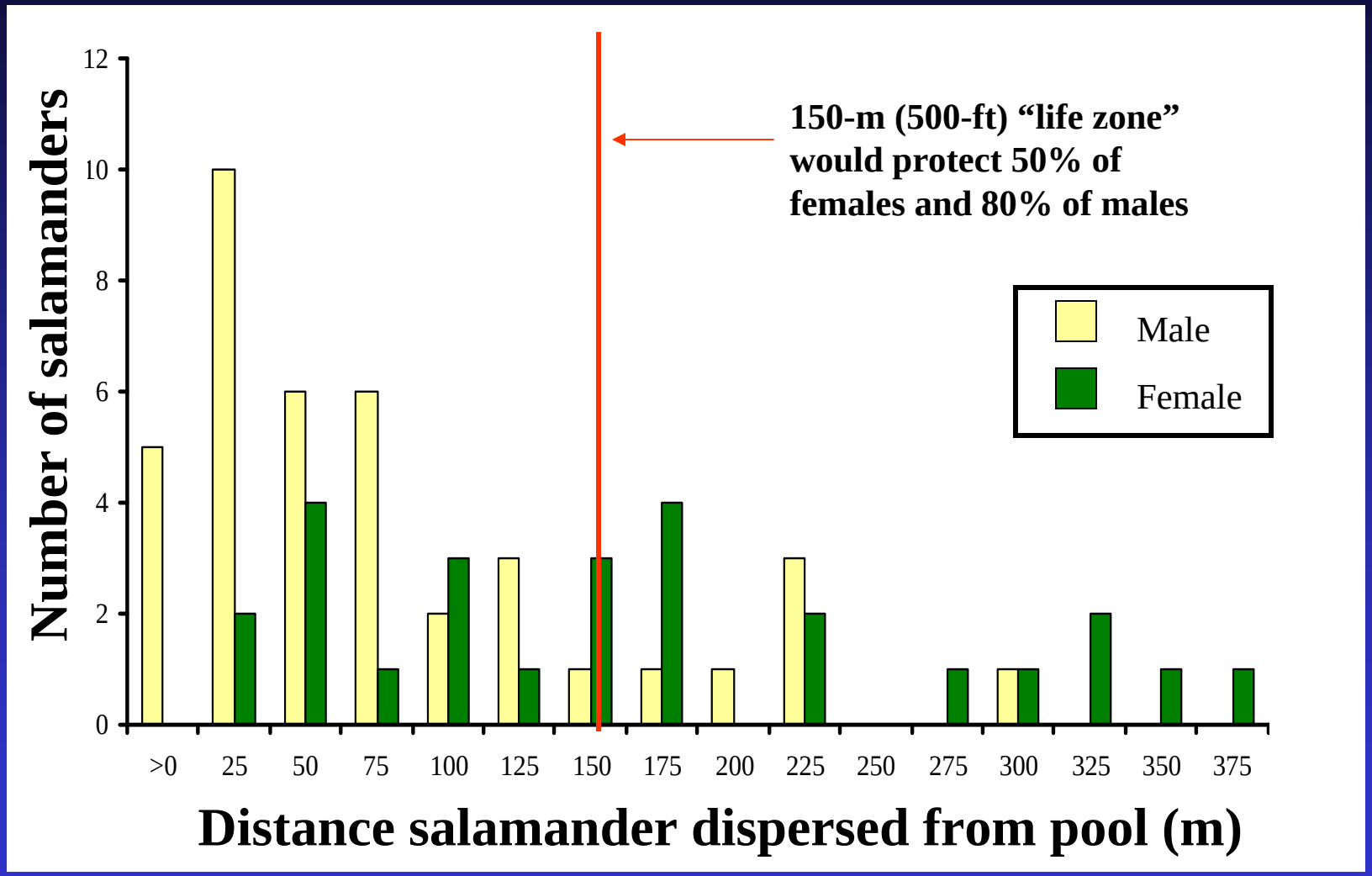
Vulnerability of Vernal Pools and their Fauna

- Worldwide amphibian declines
- Main reason: habitat loss and fragmentation
- Vulnerability of pools due to:
  - small size
  - inconspicuous when dry
- Loss of pools and upland habitats critical
- Urban sprawl prime threat in RI

Limitations of Wetland Regulations

- Laws pertain to wetlands, upland edge
- RI regulations protect vernal pools as “ponds,” “vegetated wetlands,” or “special aquatic sites”
- Protection of upland habitat minimal
- Amphibians need extensive forest
- Regulations not designed to meet that need

An Example: Spotted Salamander Dispersal



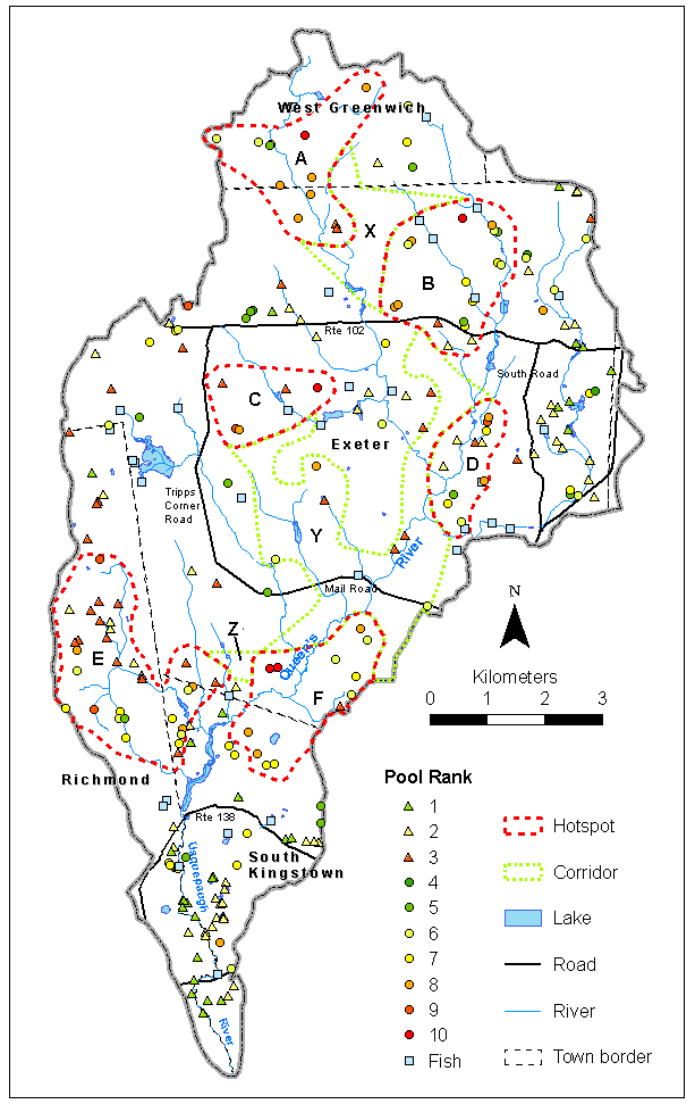
A Non-regulatory Approach

- One alternative solution:

  - identify and rank all pools in watershed for amphibian diversity and productivity
  - target areas with high-ranking pools and extensive forests for acquisition, easements

- Approach used in Queen's watershed
- Questions:

  - How to assess individual pools?
  - What key characteristics to look for?



Research on Key Habitat Features

- Last 10 years – NRS identified features influencing presence, abundance, diversity of amphibians in vernal pools
- Key features:
  - internal characteristics of pool
  - characteristics of surrounding landscape

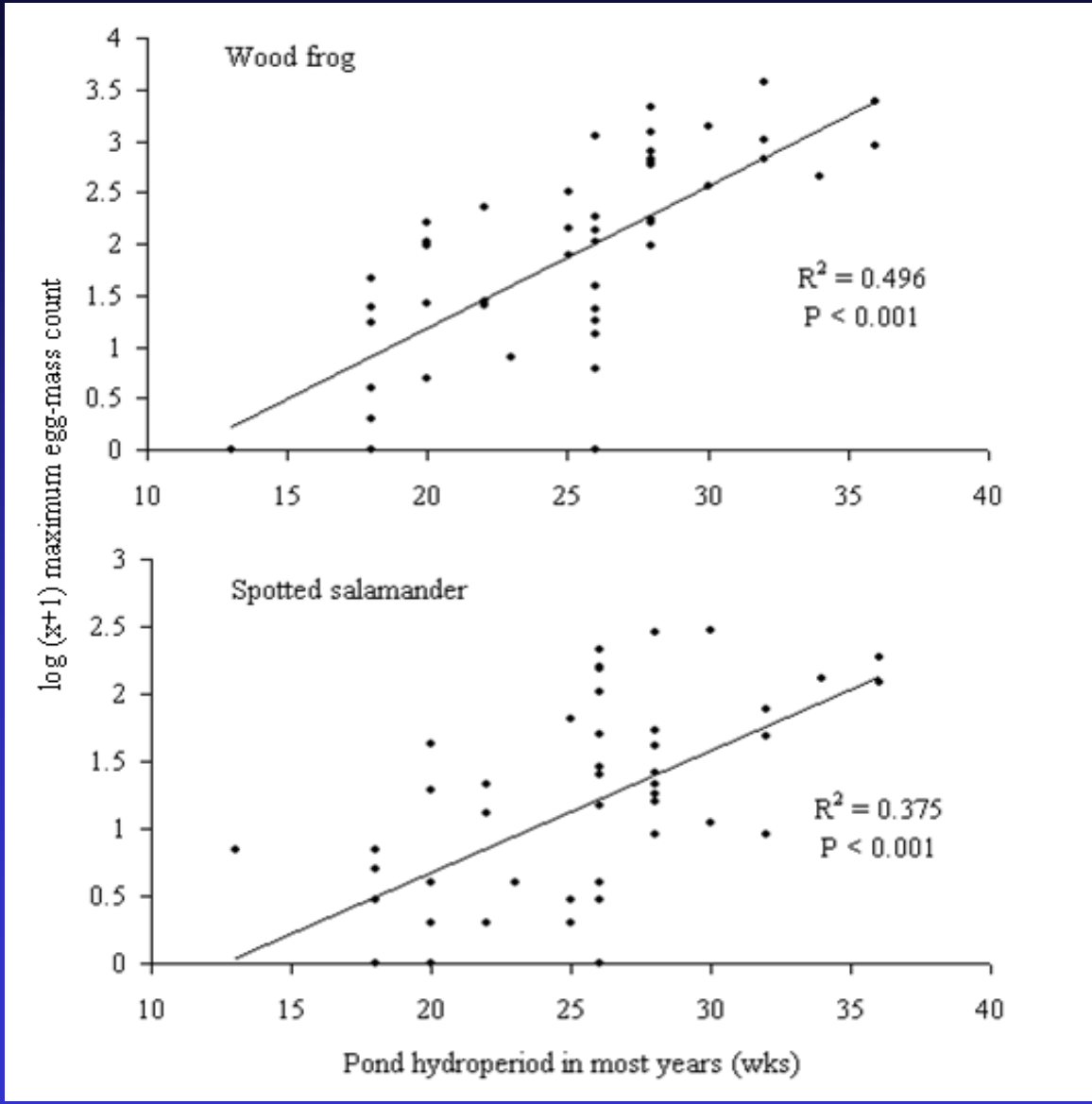
Central Role of Hydroperiod (Hp)

- Hp: length of time pool holds water (no. weeks after 1 March)
- Hp determines which amphibians can breed successfully; each species has minimum required Hp
- *Paton & Crouch* (2002): 95% of metamorphs out of pool by:

Wood Frog	mid-July	21 wks
Spring Peeper	mid-Aug	24 wks
Gray Treefrog	early Sept	27 wks
Pickerel Frog	mid-Sept	29 wks
American Toad	late Sept	30 wks
Spotted Salamander	early Oct	31 wks

- Premature drying → death of larvae
- Pools with longer hydroperiods can support more species

Hydroperiod and Amphibian Productivity



Creation of Hydroperiod Classes

- So Hp affects amphibian diversity and productivity, but it may vary widely among years
- To simplify habitat assessment, we used Pawcatuck Hp and egg mass data to develop 4 Hp classes that described a pool's Hp *in most years* and reflected its habitat value for amphibians:

Class	Hp	Pool drying
1	< 20 wks	by mid-July
2	20-27 wks	mid-July – early Sept
3	28-36 wks	early Sept – early Nov
4	37-44 wks	after early Nov

- Hp class useful for predicting pool's potential amphibian diversity and productivity; for example:

  - Class 3 pools have most species, most egg masses
  - Class 1 pools have fewest species, fewest egg masses

Rapid Assessment of Hydroperiod Class

- Hp time-consuming to monitor; is there any way to estimate Hp class quickly?
- Using Pawcatuck data, we created two methods for estimating Hp class based on 1-2 visits
- *Skidds method:* used measurements of pool depth, tree canopy cover, water chemistry, geology, soils
- *Mitchell method:* based on types of plants in deepest zone
- Methods allowed rapid assessment of habitat suitability, based on Hp

Other Key Habitat Features

- Wood frog and spotted salamander egg mass counts positively associated with:
  - pool size
  - pool depth
  - area of upland forest within 1 km (0.6 mi)
- Counts for both species negatively associated with location on alluvium
- Wood frog counts negatively associated with residential development within 1 km

Applying Research Results in the Queen's

- Goal of NRS research
  - to understand vernal pools and their fauna better
  - to contribute to more effective conservation
- Queen's project: watershed-scale planning for vernal pool conservation
- Funding: RIDEM Office of Water Resources via EPA Non-regulatory Wetland Pilot Demonstration Grant
- Project team:
  - Jon Mitchell, Research Associate
  - Mike Narcisi, Field/Lab Assistant
  - Peter Paton, Professor
  - Dennis Skidds, NPS Data Manager
  - Frank Golet, Professor

Prioritizing Non-regulatory Protection of Vernal Pools in the Queen's River Watershed, Rhode Island

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Final Research Report

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