

Upland – Wetlands Linkages: The Role of Wetland Hydroperiod and Upland Landscape Features on Amphibian Populations



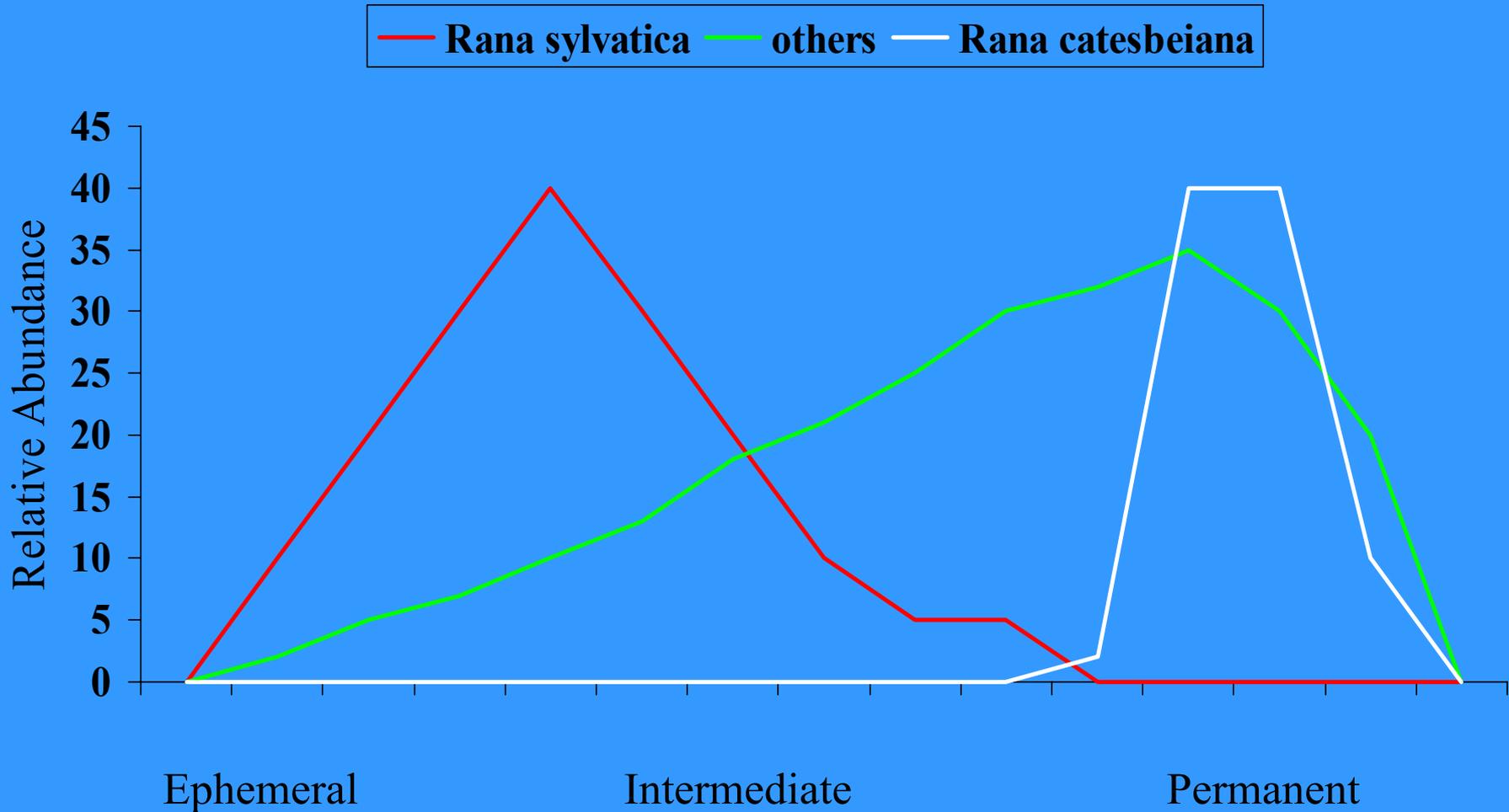
Kim Babbitt



University of New Hampshire

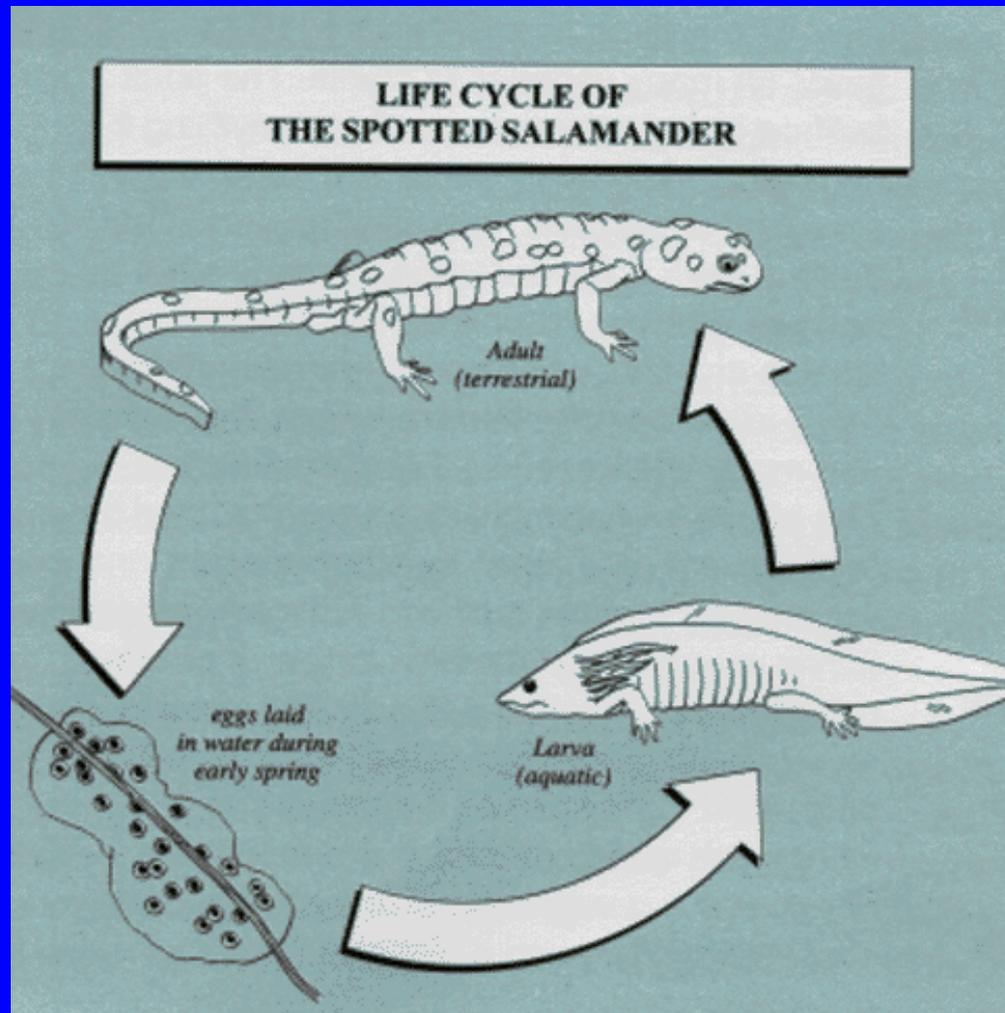
October 2001

Hydrologic Gradient



Adapted from: Werner and McPeck (1994)

Amphibians Have Complex Life Cycles



Importance of Upland Landscape for Amphibians

- Non-breeding summer habitat
- Winter hibernation sites
- Upland characteristics may influence water chemistry of wetlands.

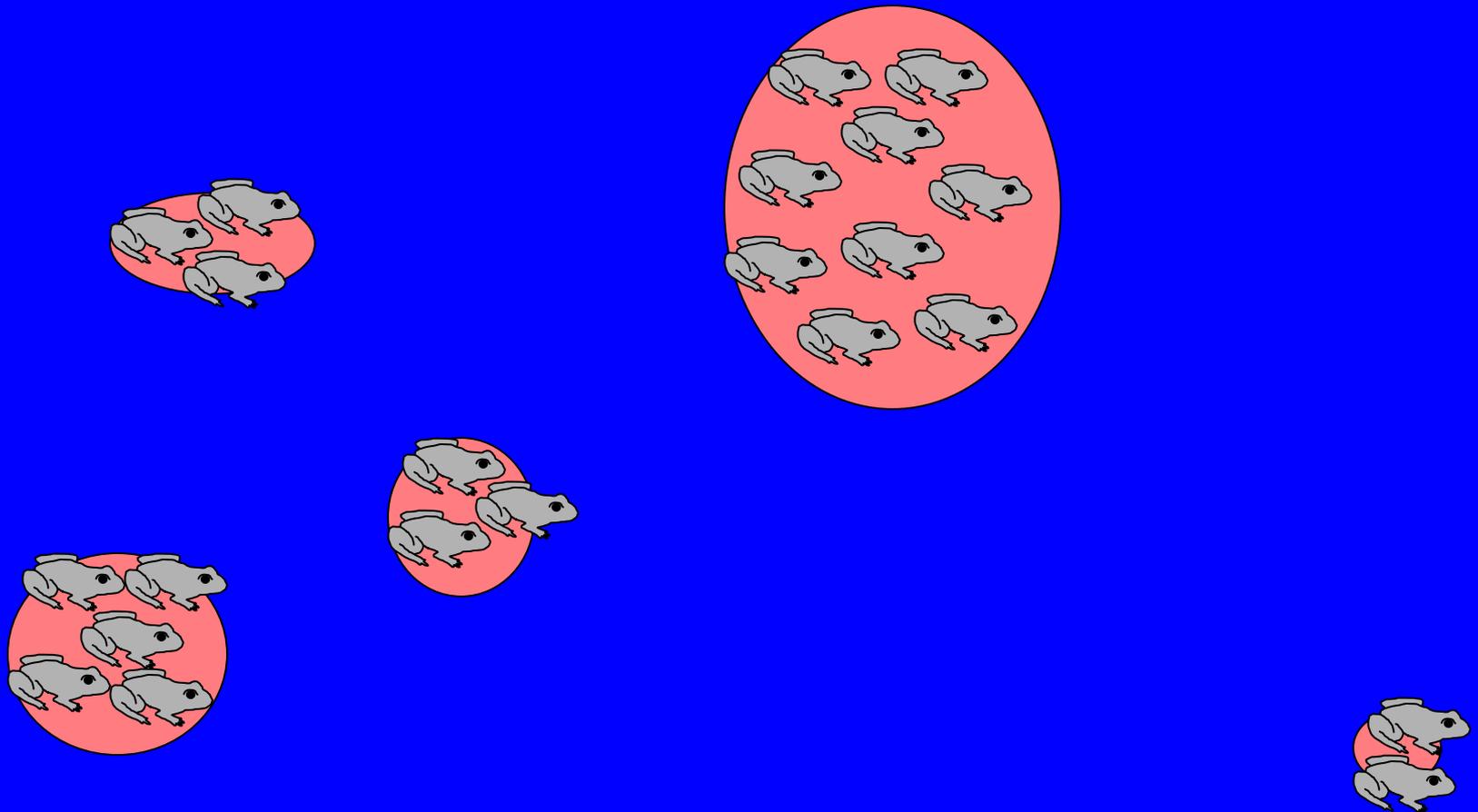


Why are amphibians susceptible to landscape alteration?

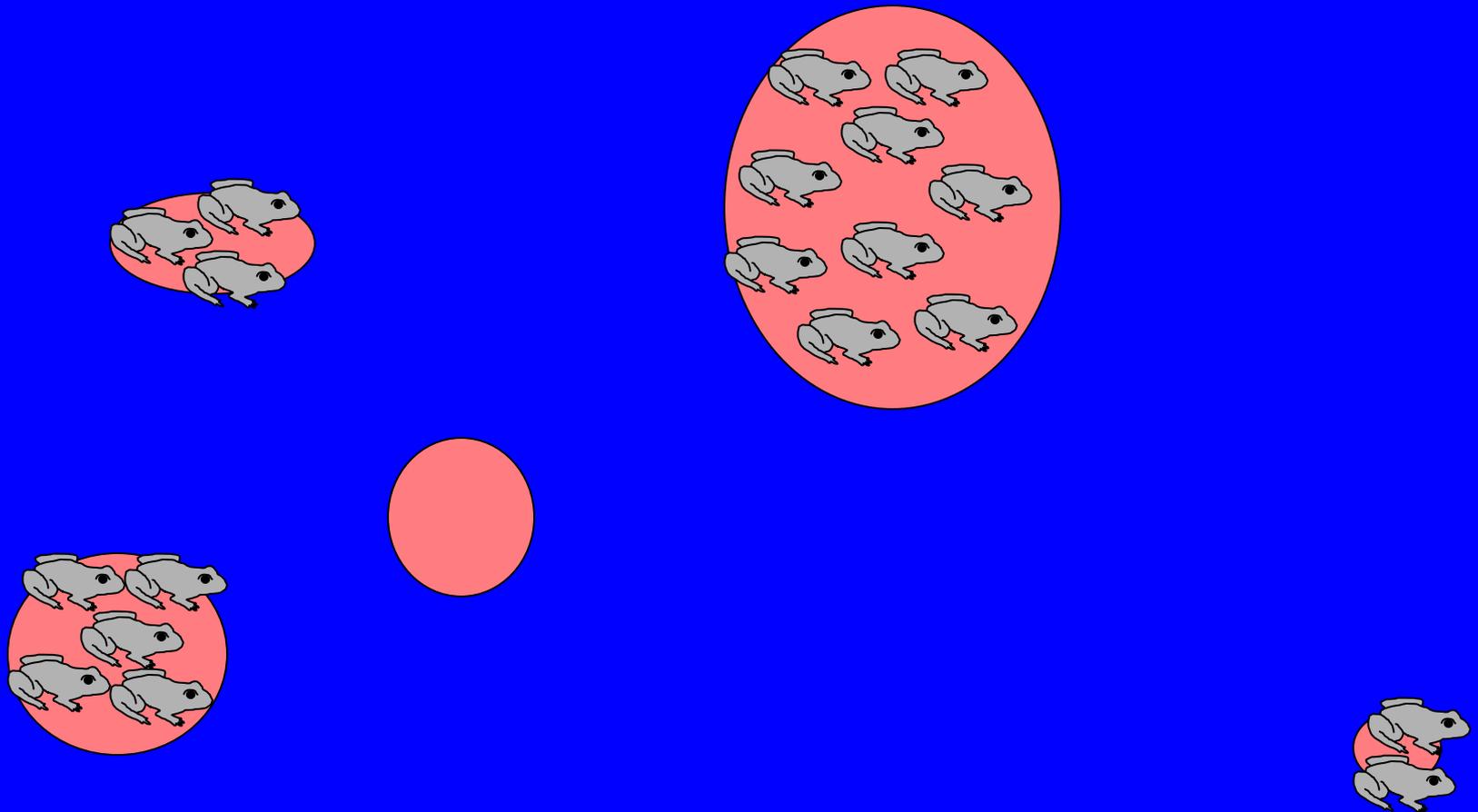
- Vulnerability to heat, desiccation, pollution
- Low mobility



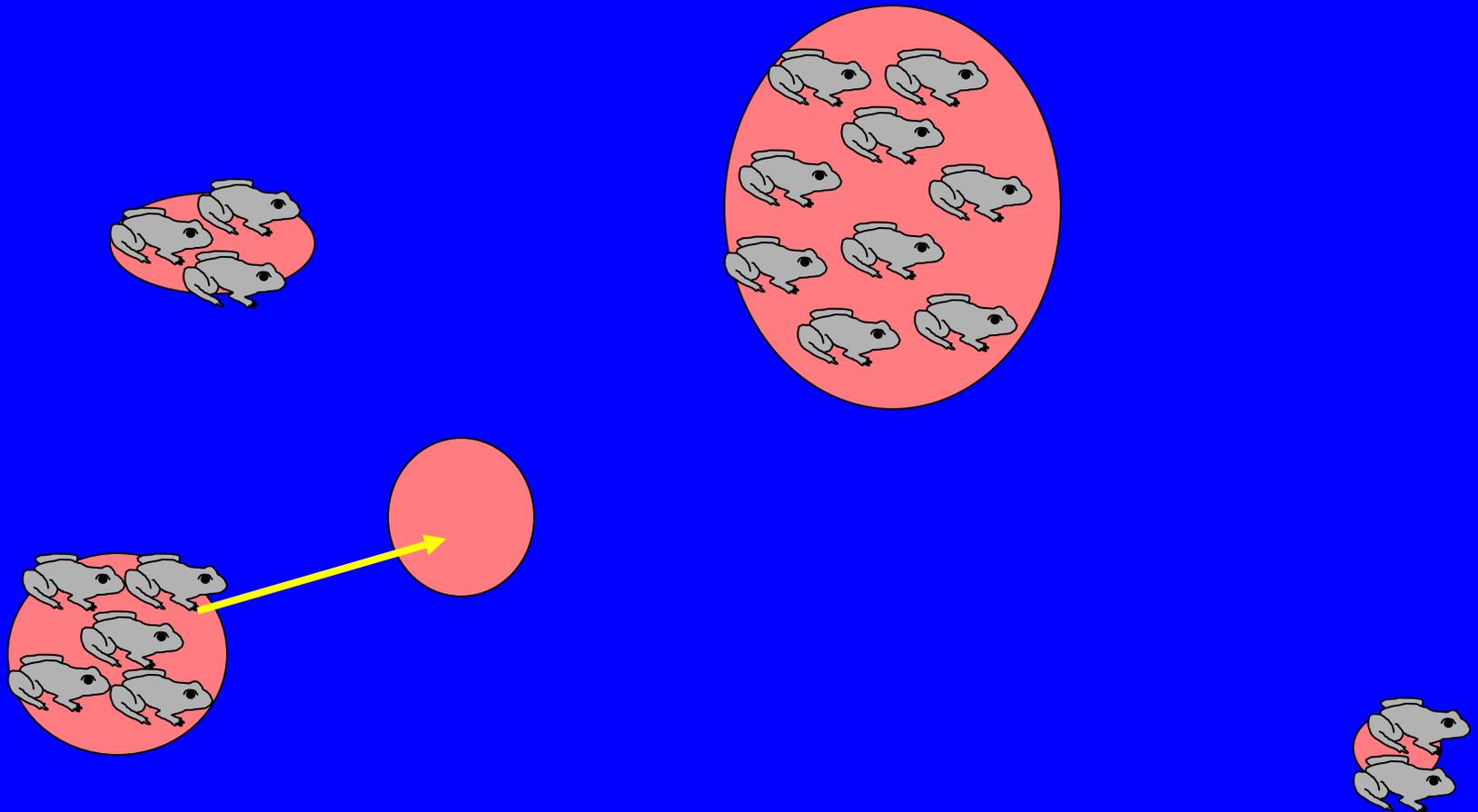
Metapopulation: a group of small populations which interact



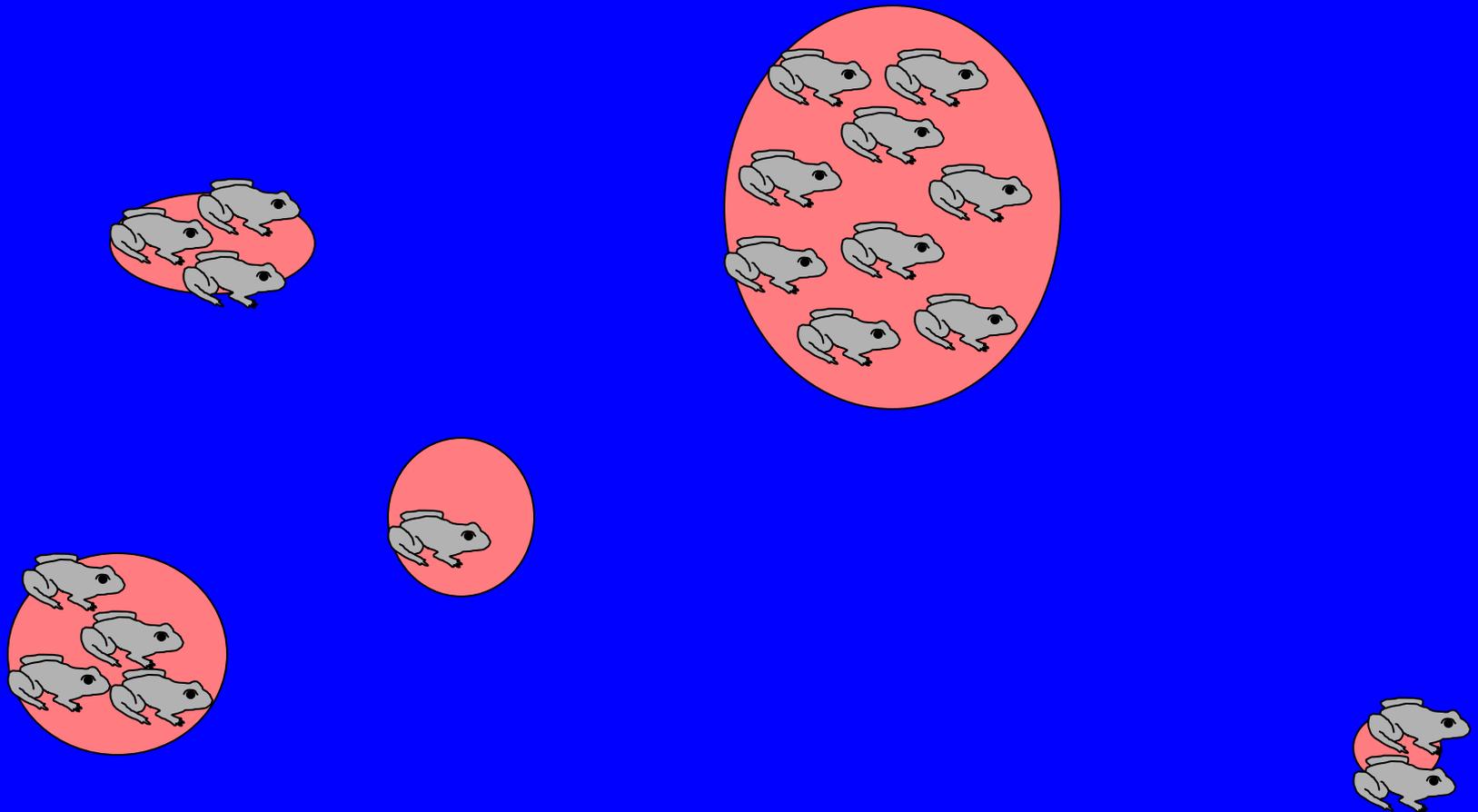
Metapopulation: a group of small populations which interact



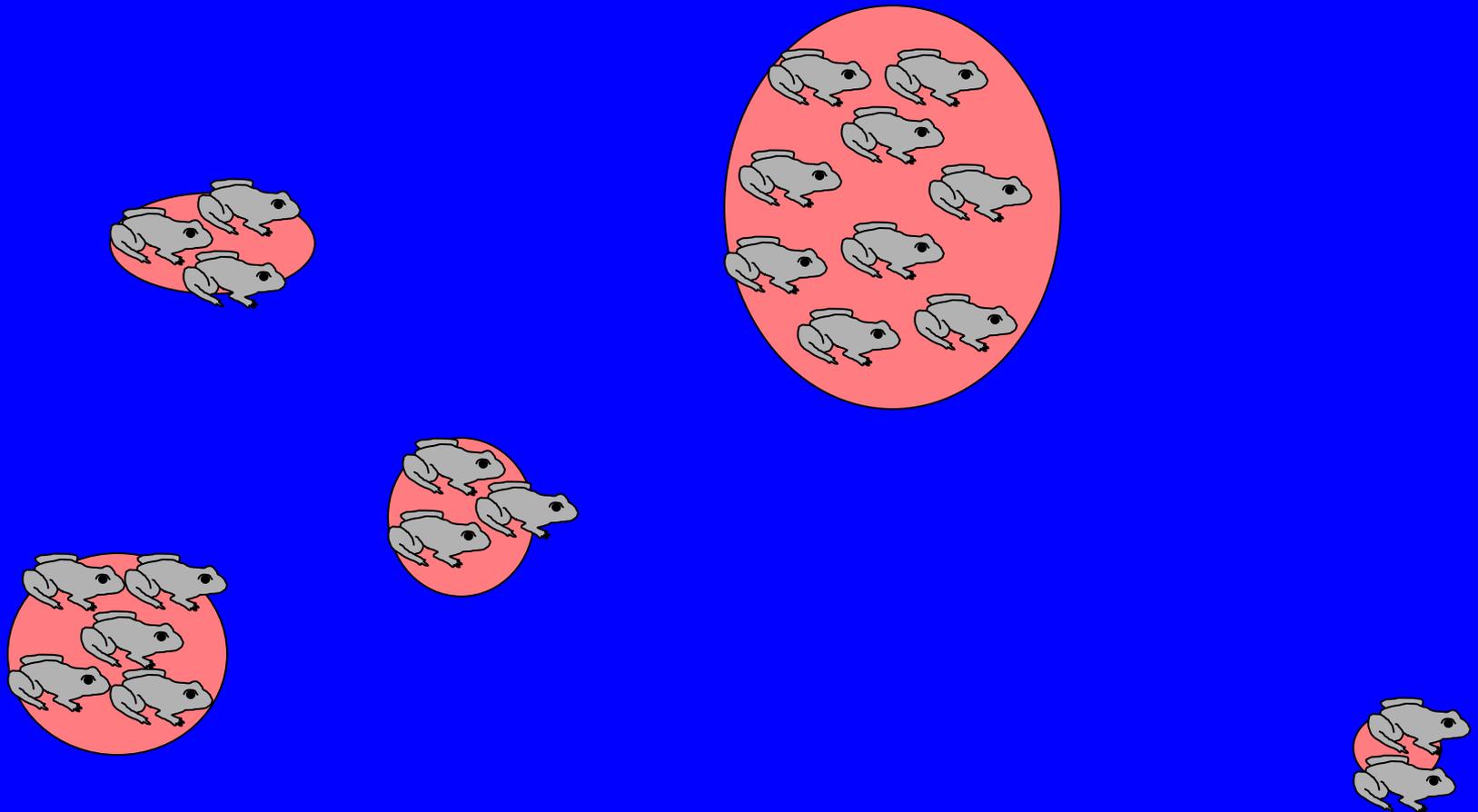
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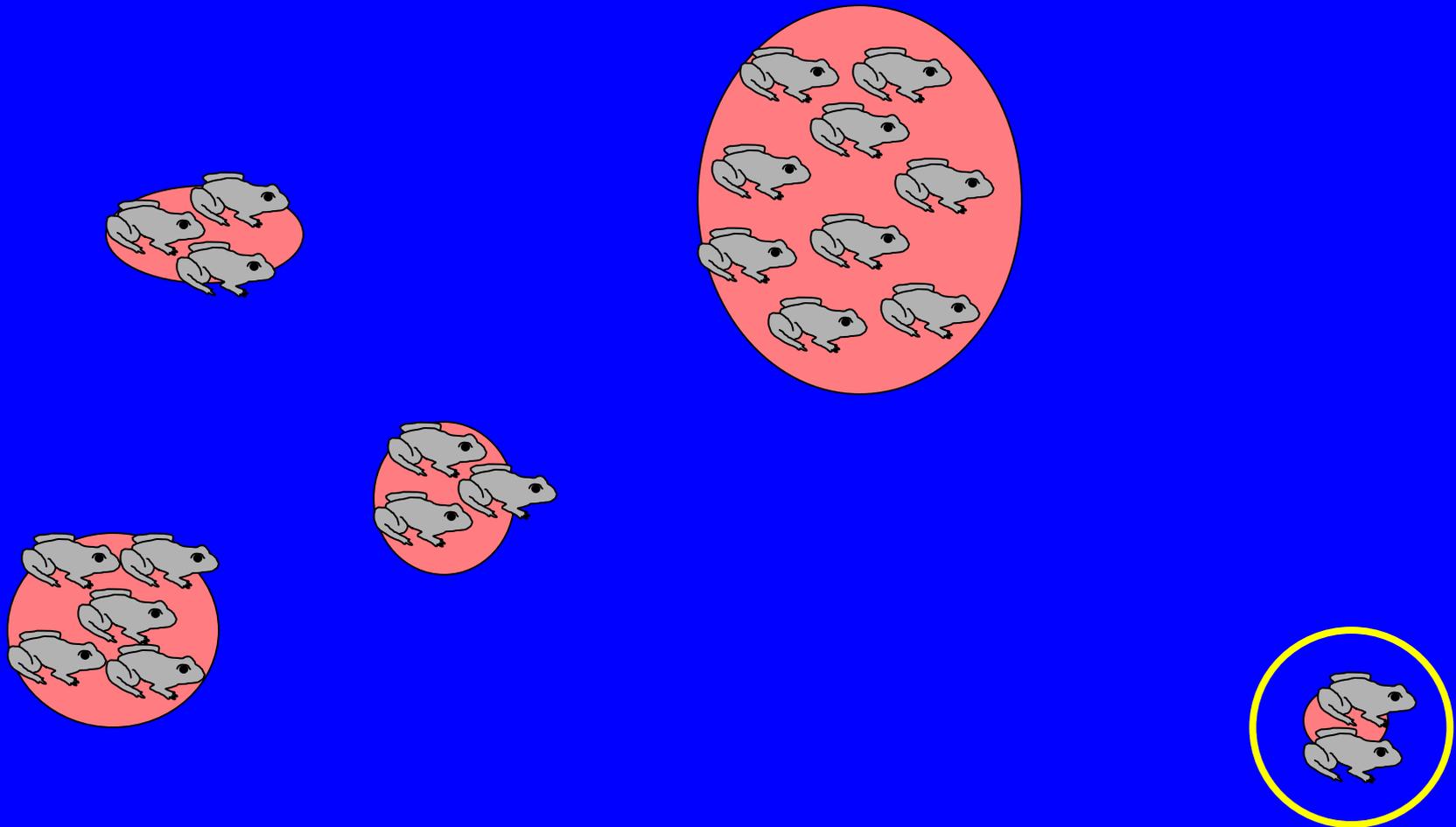
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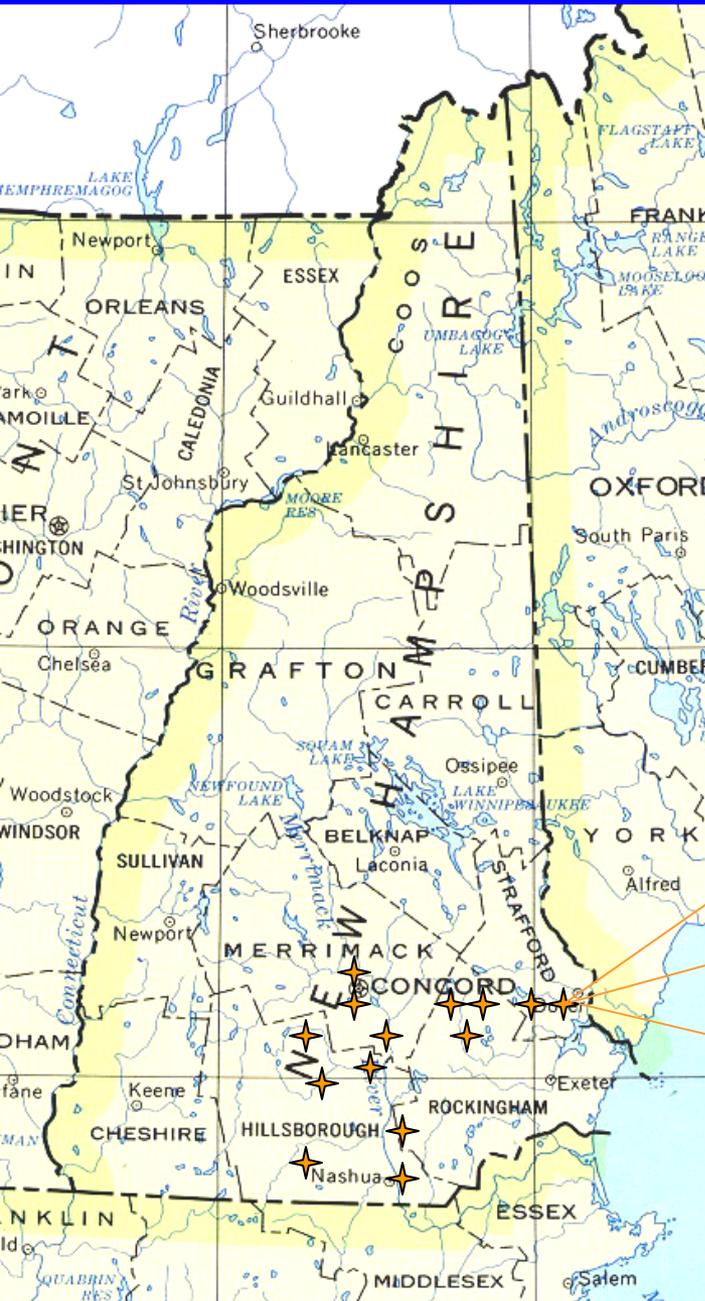
Amphibian Metapopulations

- Each wetland is a habitat patch
- Amphibians breeding for the first time may move to new wetlands
- Wetland populations exist within a matrix of upland landscape

Research Goals

- Examine the influence of wetland hydroperiod on the distribution of amphibians.
- Examine the effect of upland landscape characteristics on amphibian use of wetlands as breeding sites.

Study Area for Hydroperiod Study - Southern New Hampshire



short

+

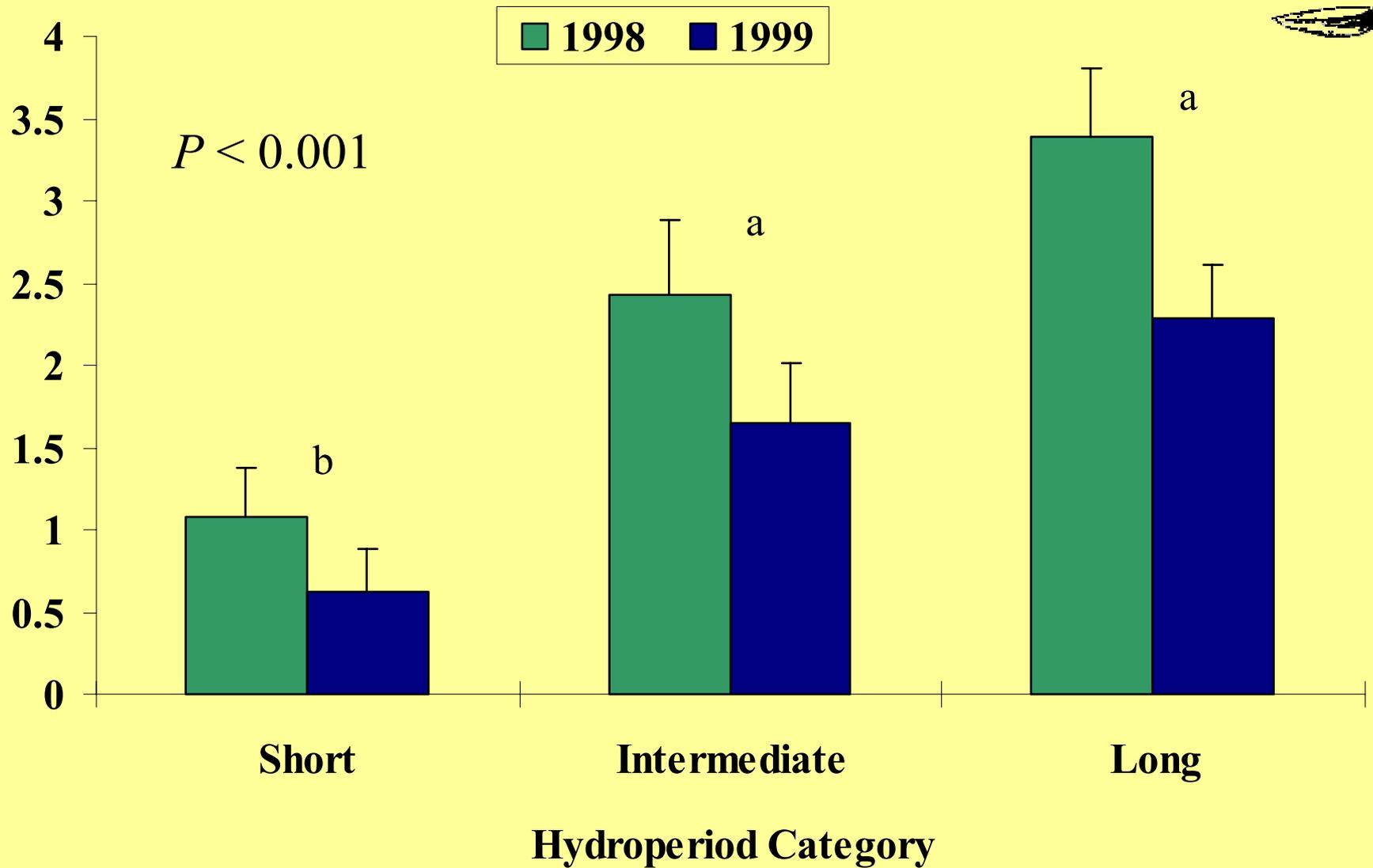
intermediate

+

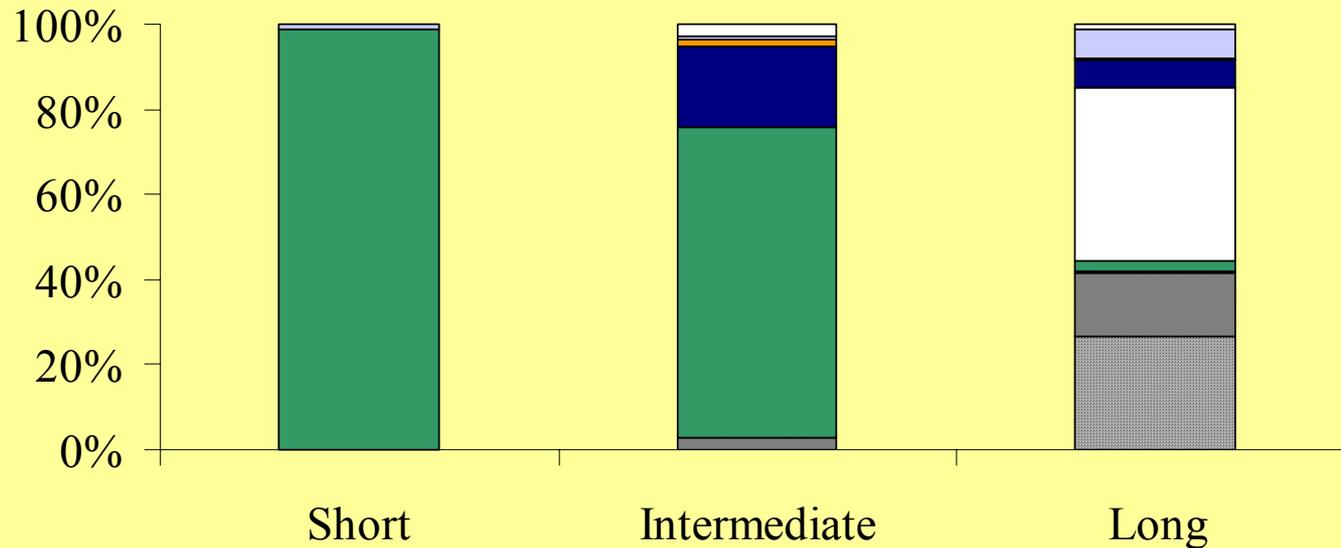
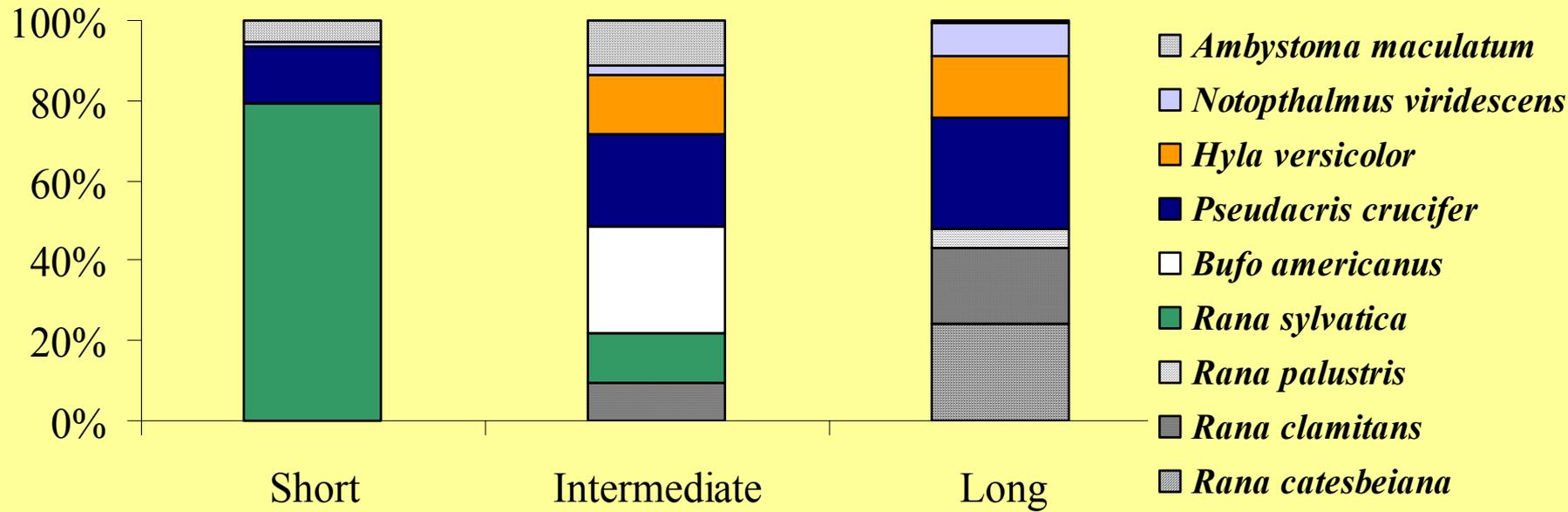
long

14 blocks with wetlands of each hydro-period

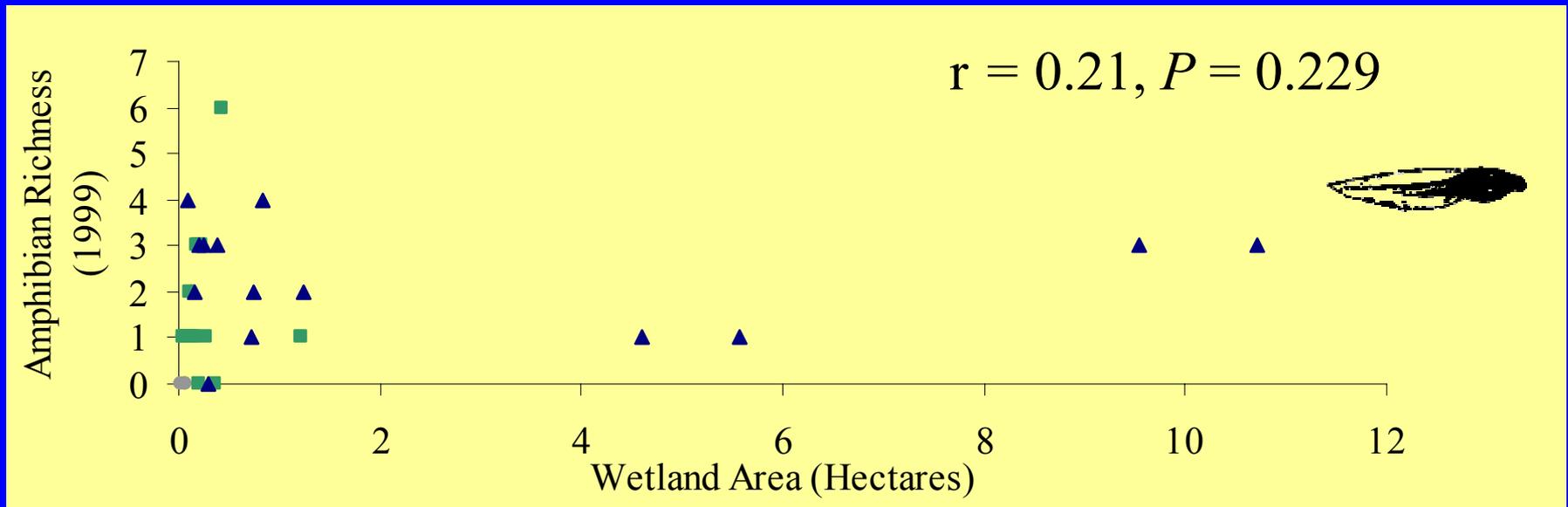
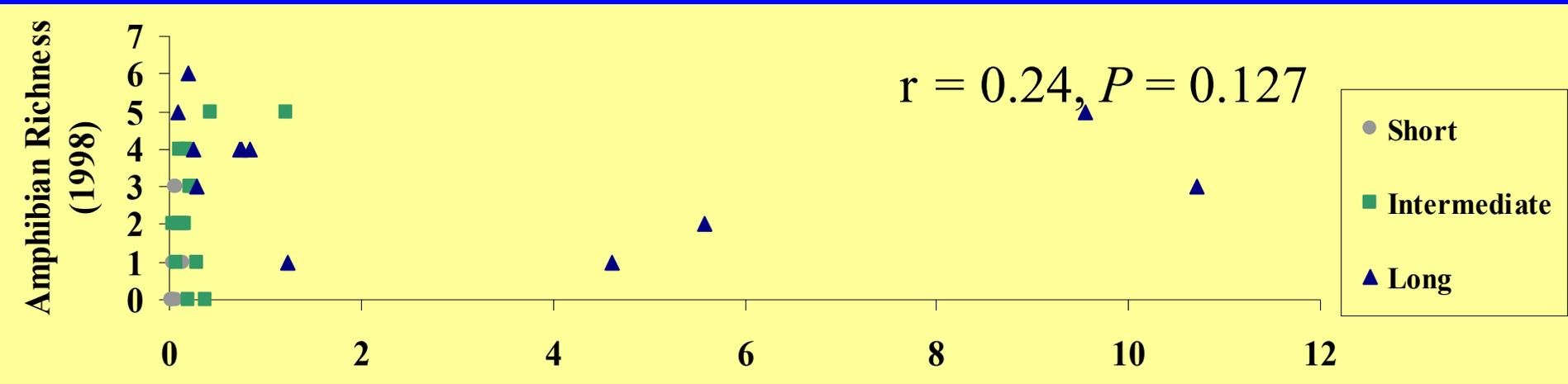
Amphibian Species Richness



Composition of Amphibian Assemblages in 1998 and 1999



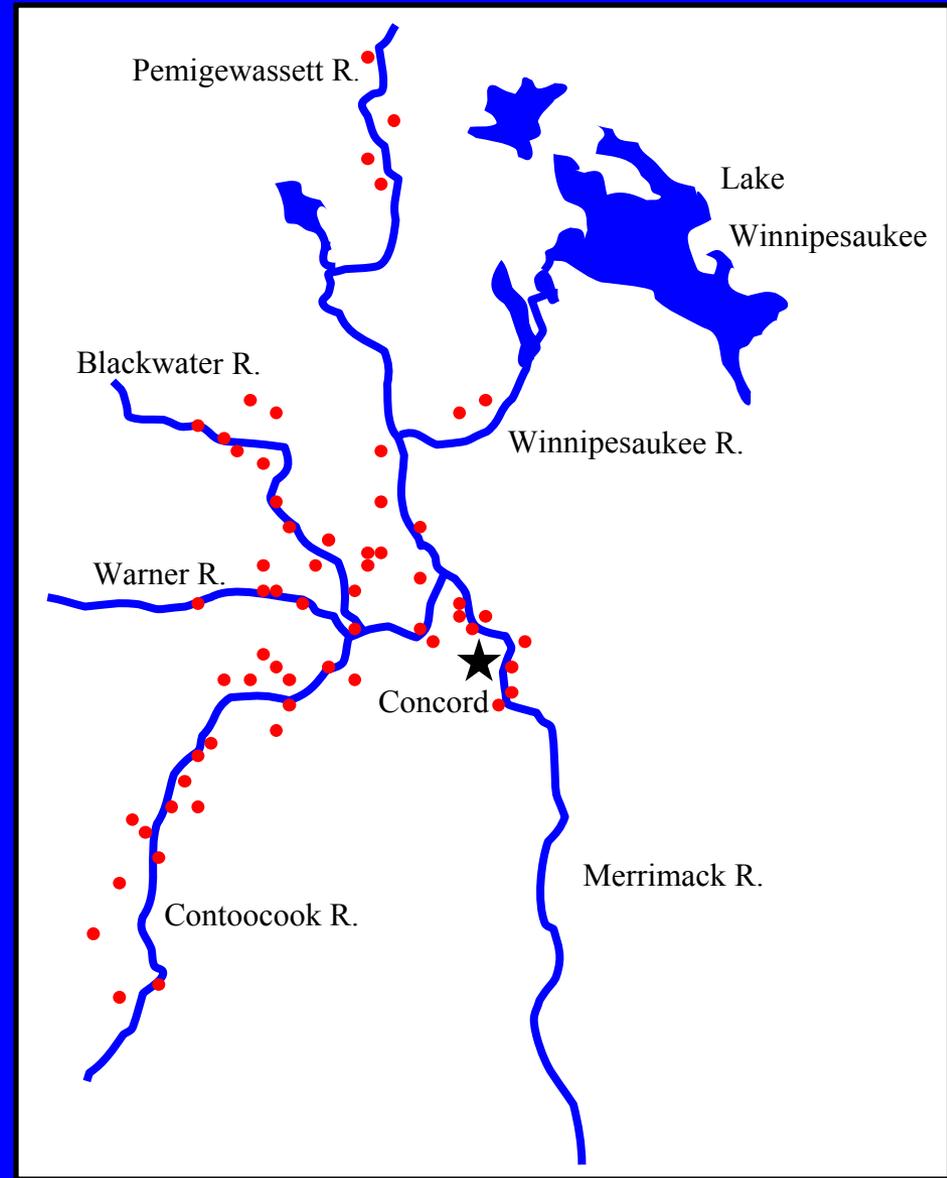
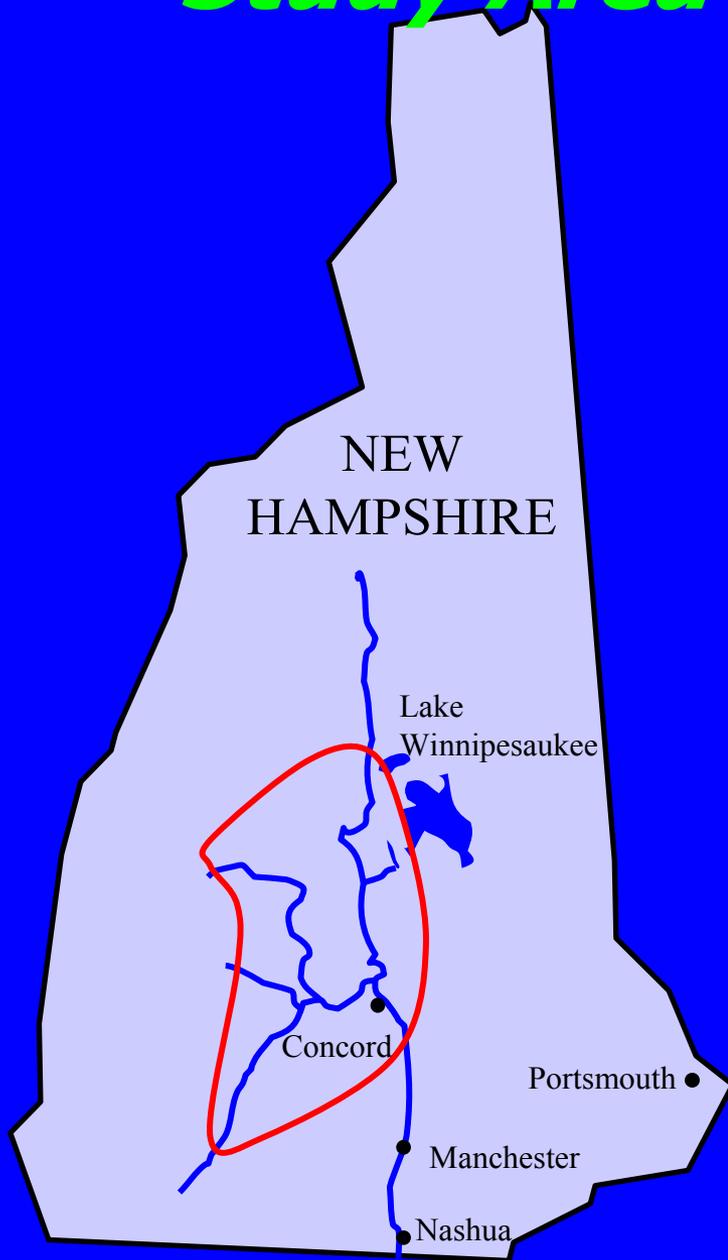
Wetland Area and Amphibian Richness



Management Implications

- Species using shorter hydroperiod wetlands live in a spatially-temporally variable environment. “Insurance” wetlands within dispersal distances may be critical.
- Wetland size is not a good criterion for wetland regulation.
- Current regulations are not adequate for protecting species that are obligate vernal pool breeders.

Study Area – Landscape Study

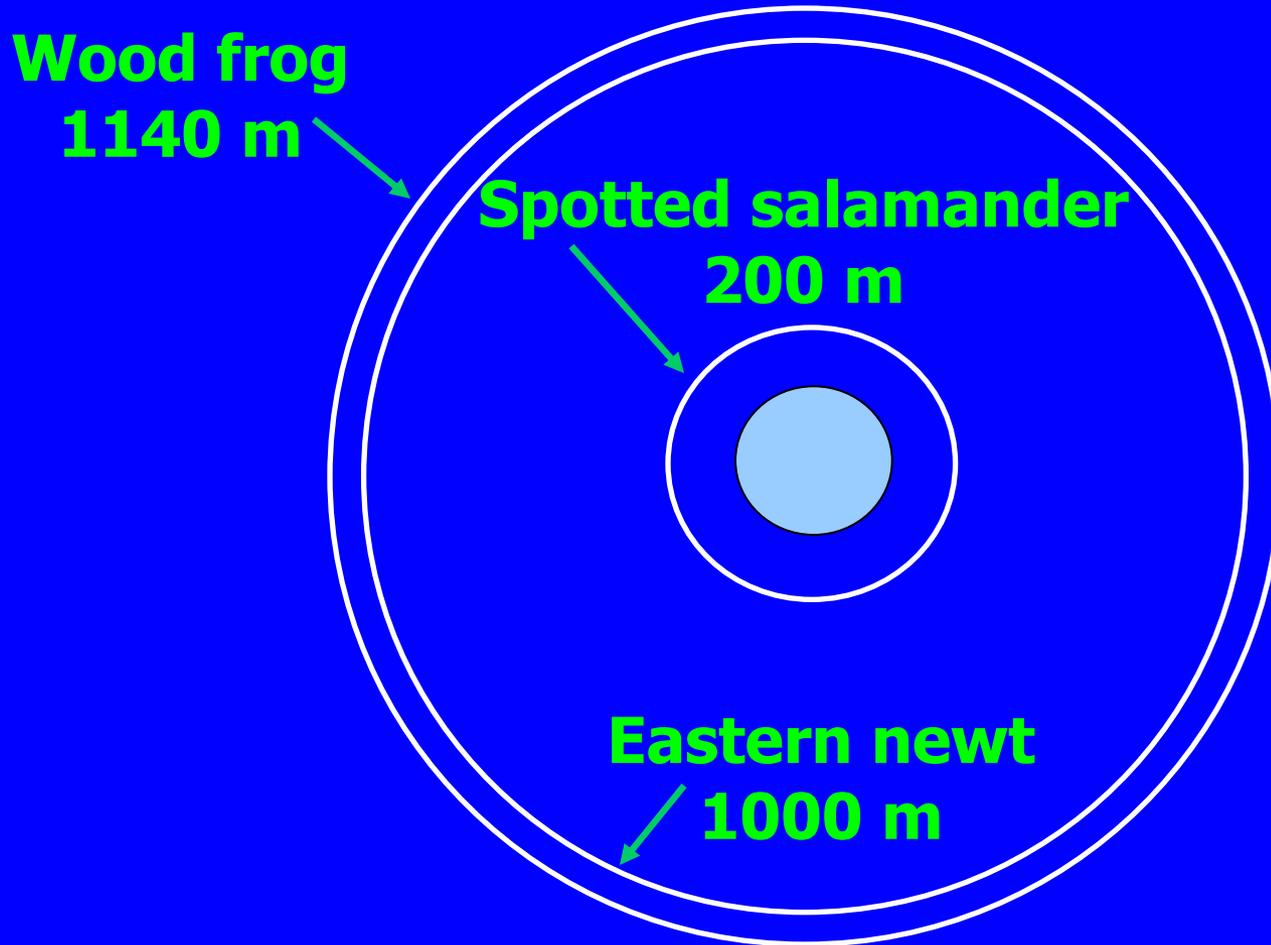


GIS Methods

Landcover (forest/non-forest) was digitized from 1:40,000 aerial photos



Dispersal Distances



Buffers were generated around each wetland

100m

250m

500m

750m

1000m

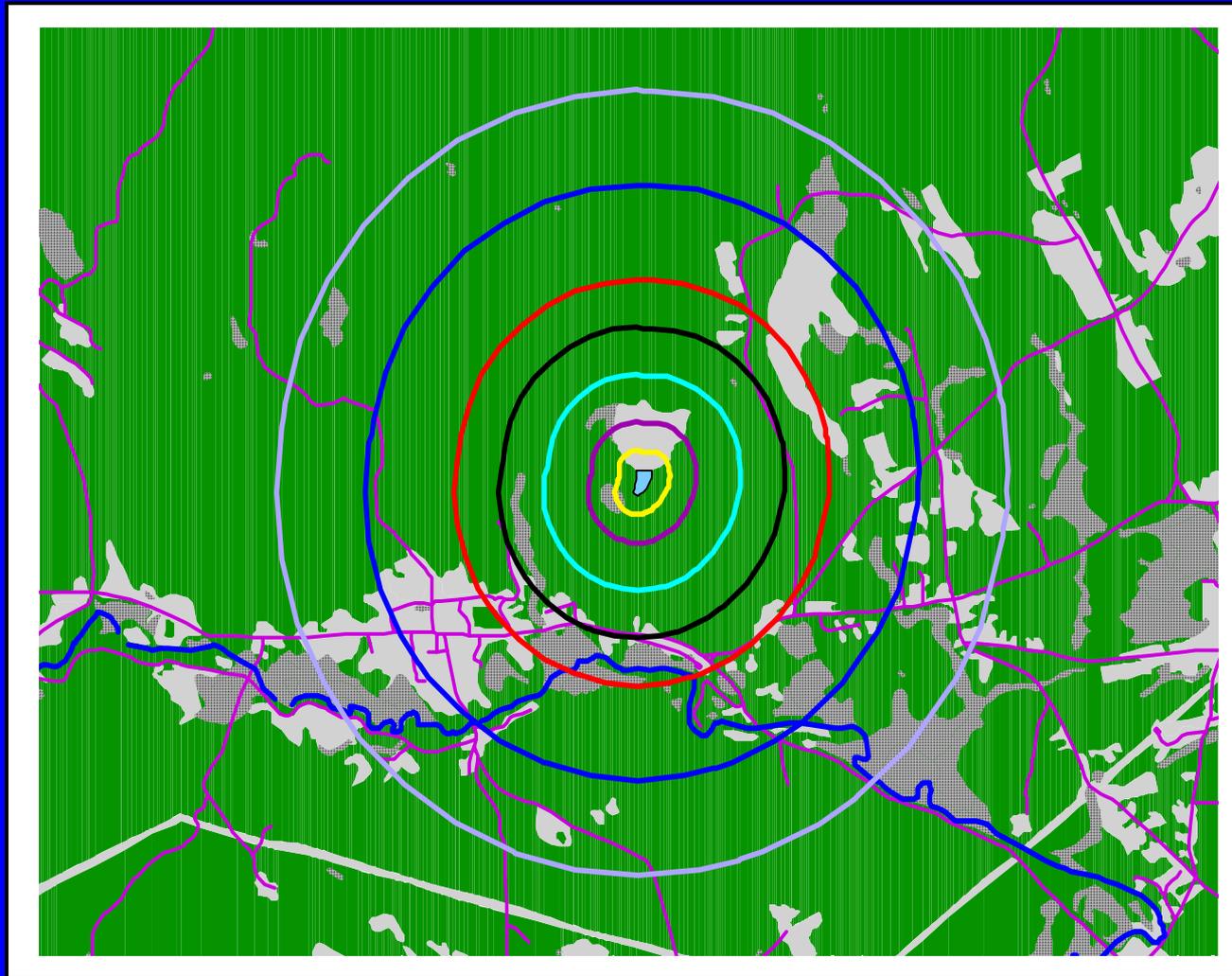
1500m

2000m

Within each buffer, four variables were measured:

- Percent forest**
- Road density**
- Percent wetland**
- River density**

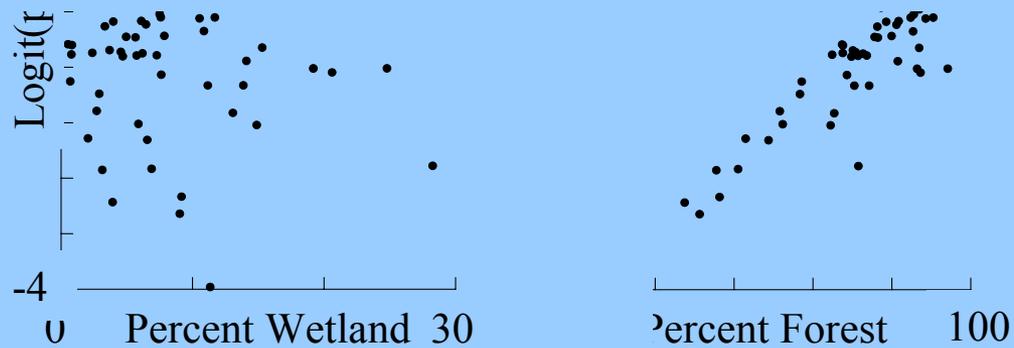
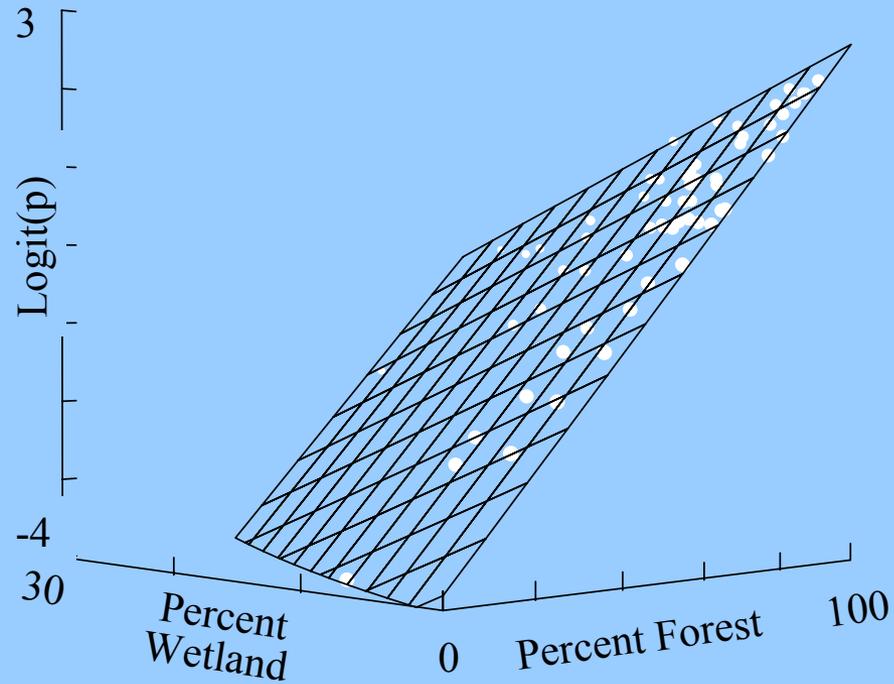
Conceptual Example of Landscape Analysis



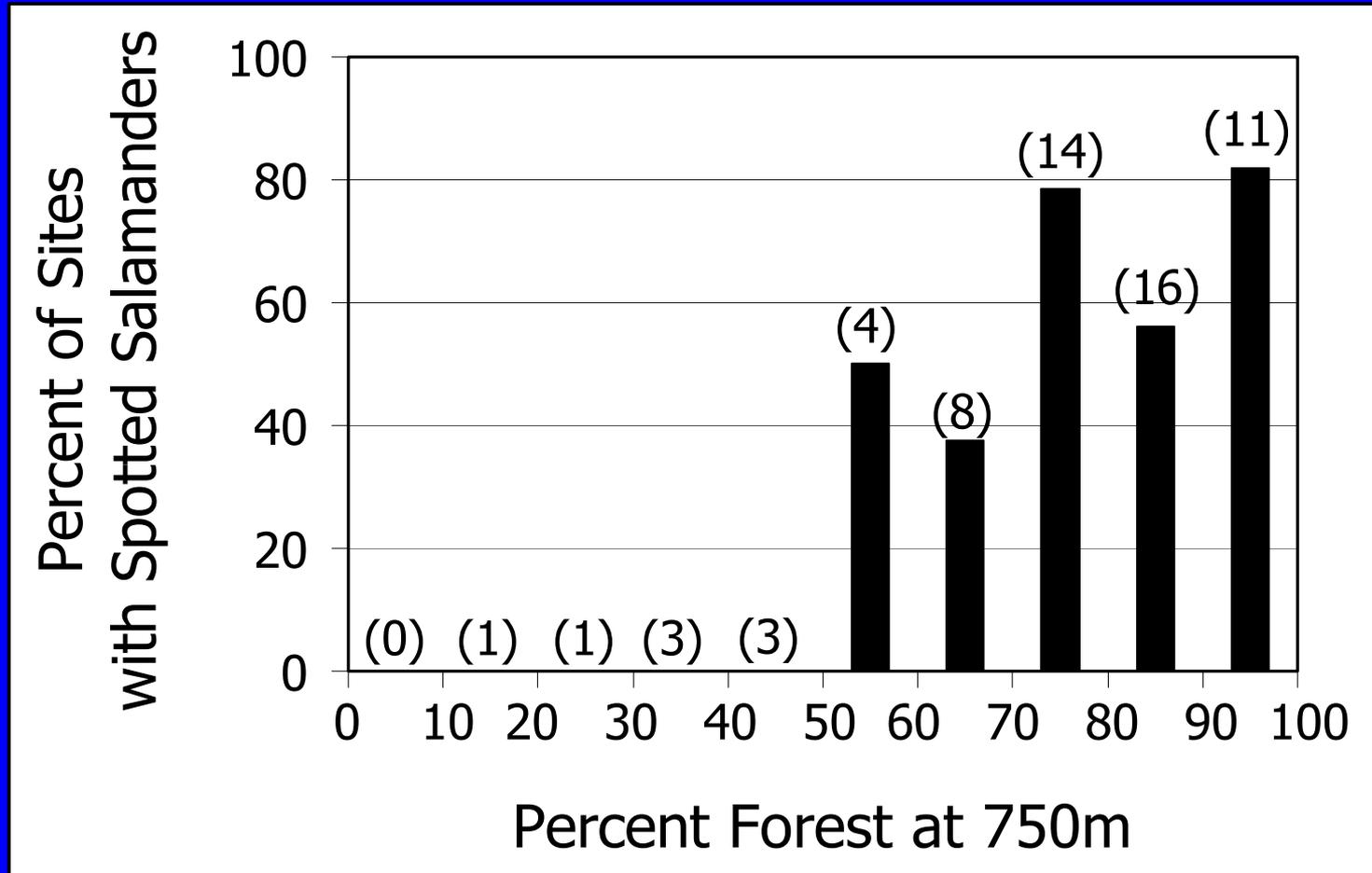
Spotted salamander
(Ambystoma maculatum)



Logistic regression model at 750m



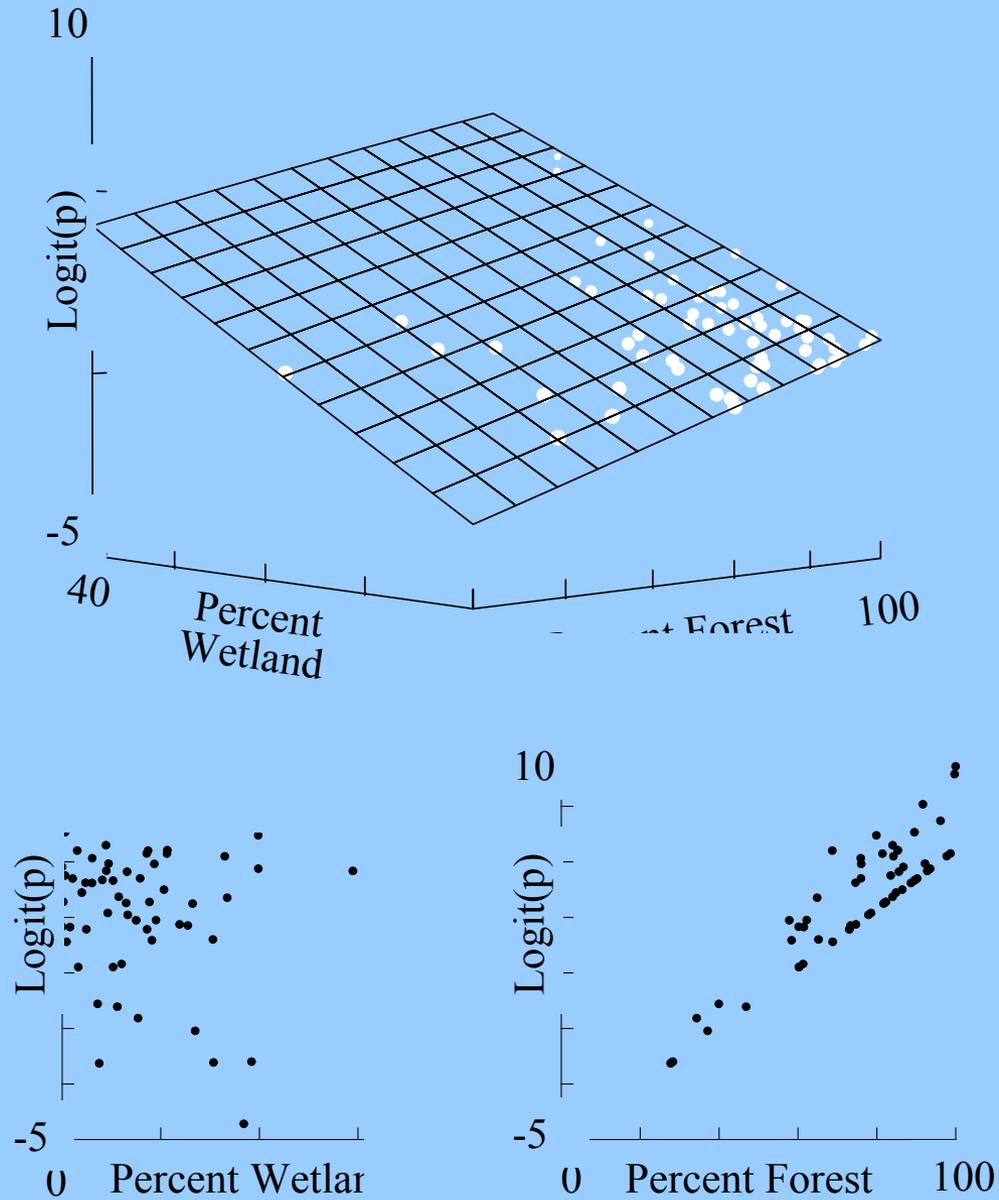
Positive relationship with percent forest - most important variable



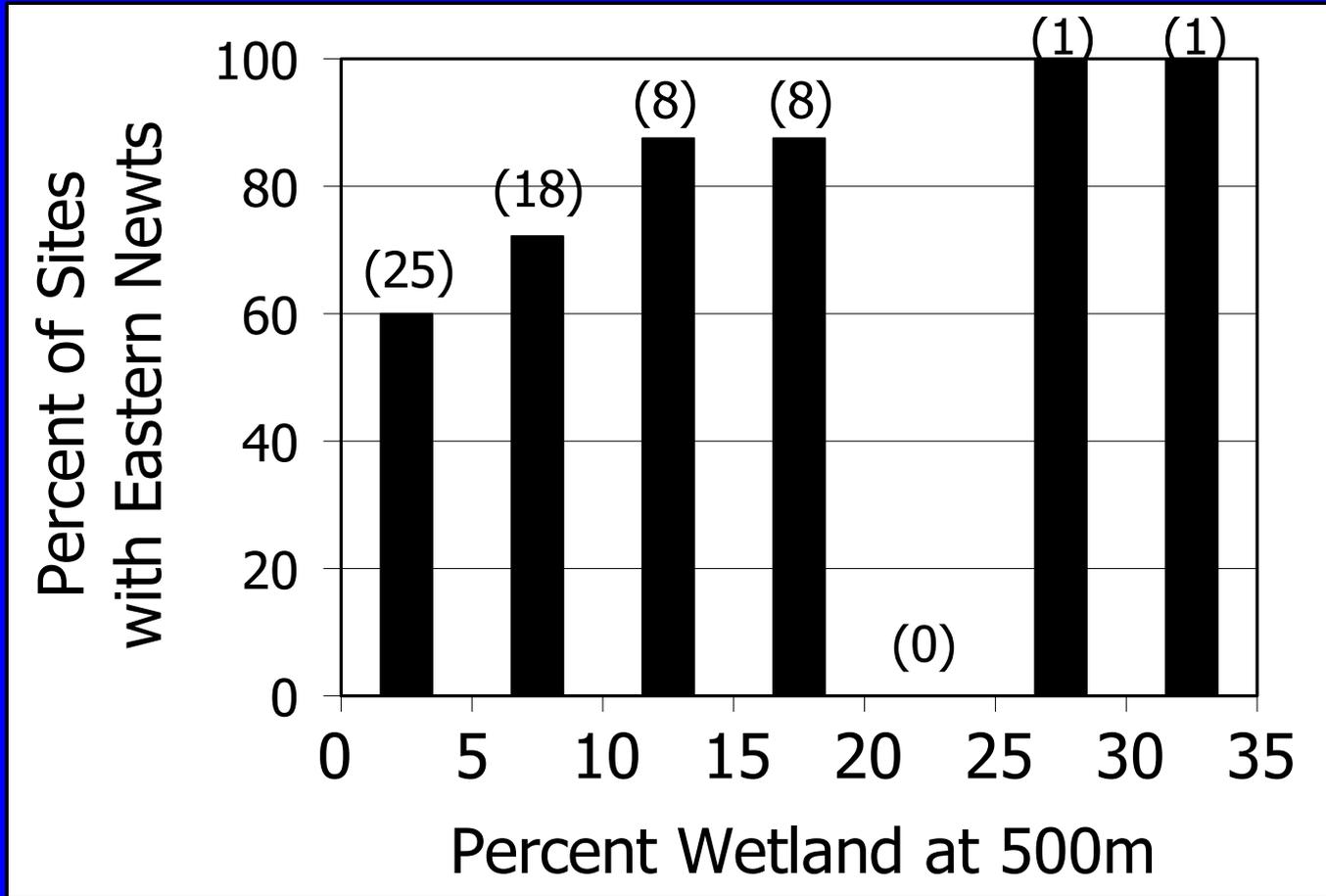
Eastern newt
(*Notophthalmus viridescens*)



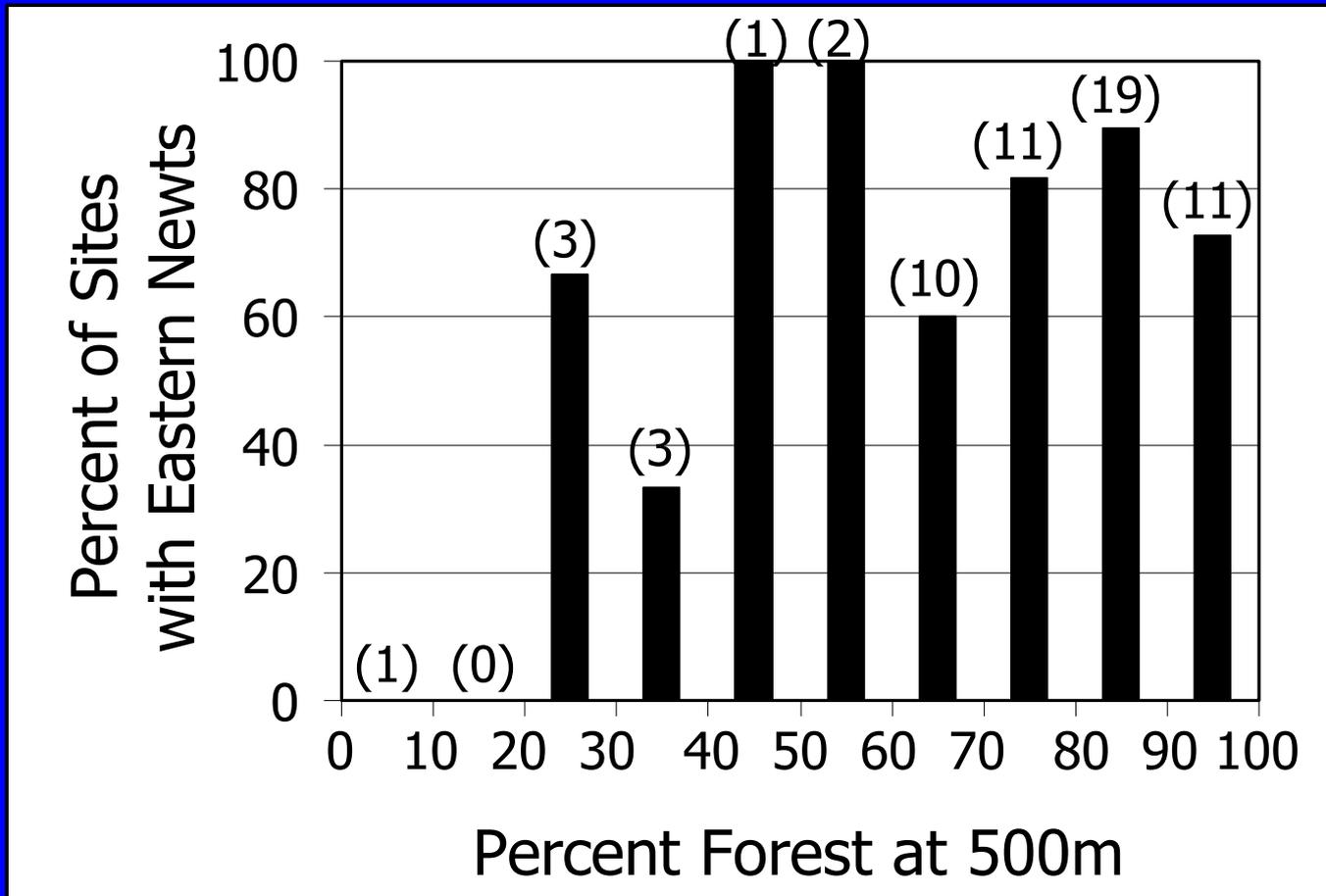
Logistic regression model at 500m



Eastern newts were positively associated with percent wetland



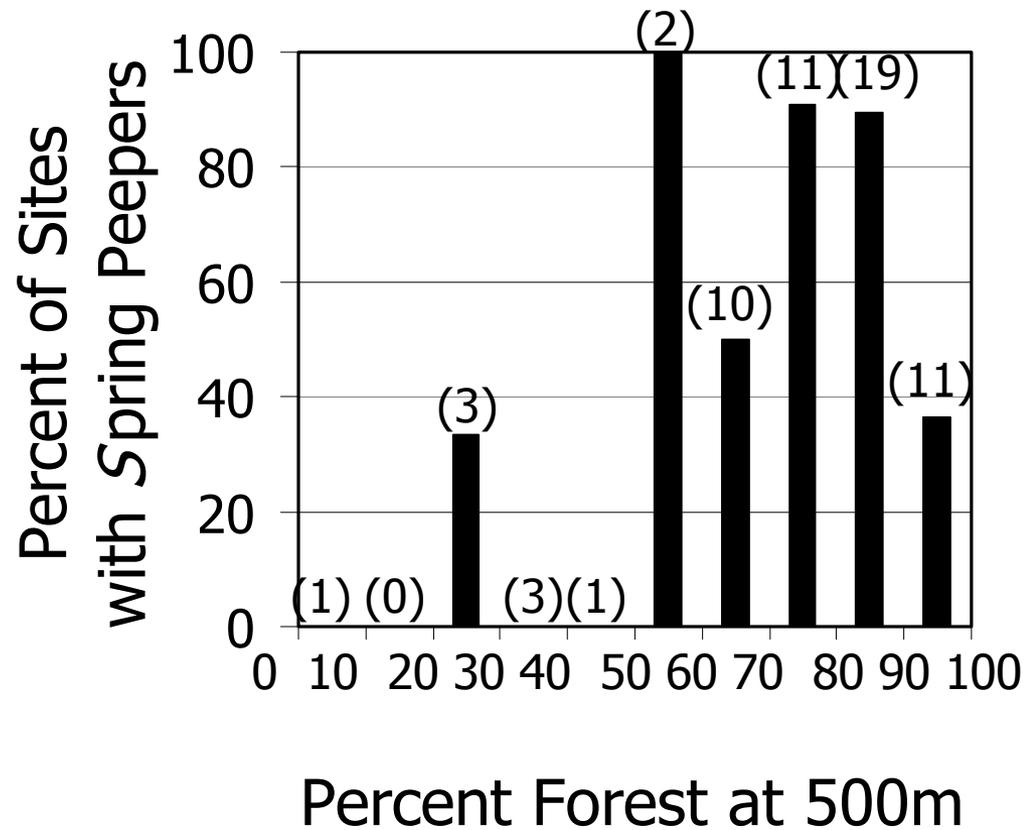
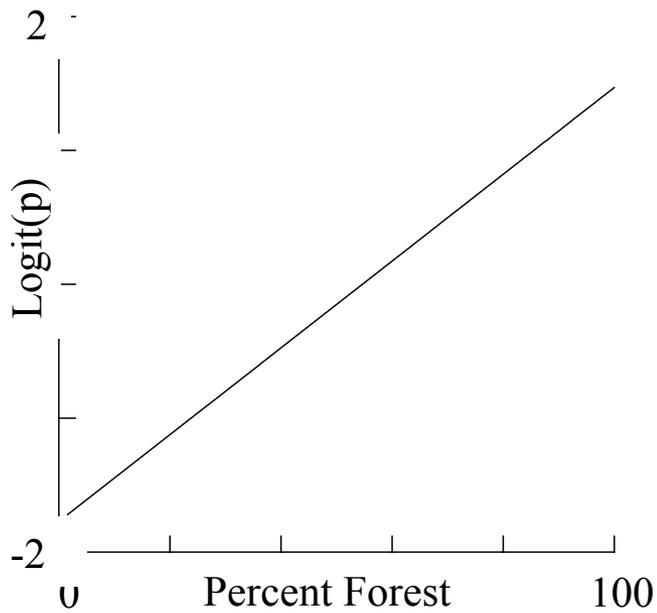
Eastern newts were positively associated with percent forest



Spring peeper
(*Pseudacris crucifer*)



Spring peepers were positively associated with percent forest at 500m



Wood frog
(*Rana sylvatica*)

No response to the landscape



Gray treefrog
(Hyla versicolor)



**No response to
the landscape**

Photo by Matt Tarr

Species Not Caught



**Northern leopard
frog (*Rana pipiens*)**



**Blue-spotted/Jefferson's
salamander (*Ambystoma
laterale x jeffersonianum*)**

Conclusions

- Spotted salamanders were most strongly influenced by the landscape (percent forest).
- Wood frogs may be more resilient to land use change.
- Eastern newts responded to percent forest and percent wetland.
- Spring peepers were associated with percent forest.

Management Implications

A photograph of a forested landscape with a pond in the foreground. The trees are reflected in the water. The sky is overcast and grey.

- **Effects of land use change were detected even in a largely forested landscape.**
- **Species differ in their responses to changes in land use.**
- **Question of whether buffers are a feasible or appropriate management approach.**