

USING AMPHIBIANS IN BIOASSESSMENTS

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WHY USE AMPHIBIANS?

- Widespread concern for declining populations
- Comparatively less well known than other vertebrates
- Much public support and interest
- May serve as sentinel organisms for other species

**AMPHIBIANS COME IN A
DIVERSE ARRAY OF LIFE
HISTORIES**



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Eastern Tiger Salamander

Photo: Hoberg and Gause

Credit: Hoberg and Gause, USGS Northern Prairie Wildlife Research Center

AMPHIBIANS USE MANY TYPES OF WETLAND HABITATS



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Why, continued

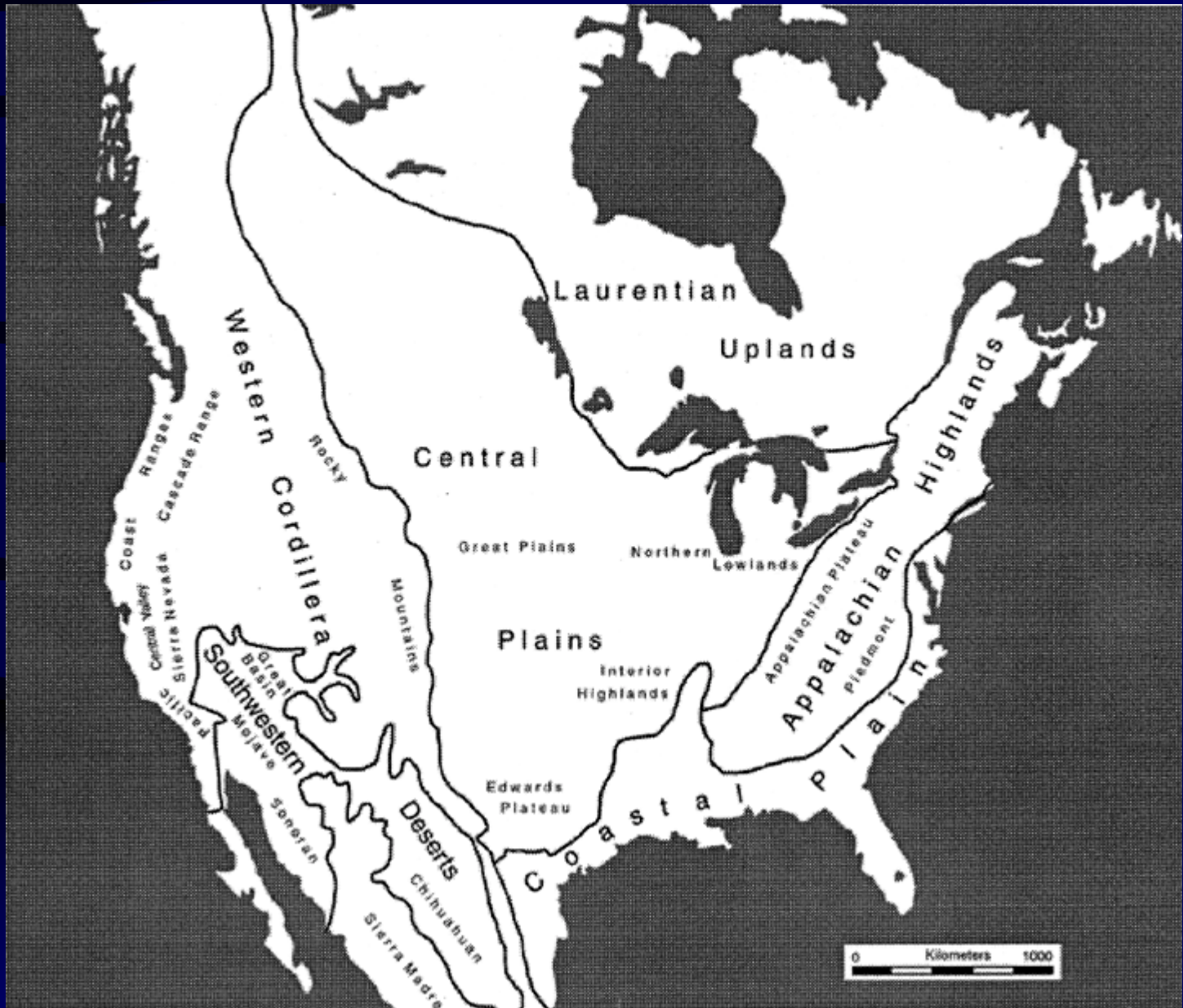
- Several species uniquely link aquatic and terrestrial environments
- Complex life cycles increase selection of potential metrics
- Habitat differences among species enhances selection of metrics
- Additional study should increase understanding of amphibian habitat needs

Required Modifications to Basic Plan

- Must consider upland habitats – landscape
- Reliable estimates of population size often not possible
- Repeated sampling should be considered due to seasonal differences in breeding times and life stages
- More than one life stage should be sampled

More Modifications

- More than one sampling method may be desirable but many methods are available
- Care should be taken in handling amphibians
 - Spread of disease
 - Need for a ‘frog farm’
 - Licenses often required
- **Critical need for regional considerations**

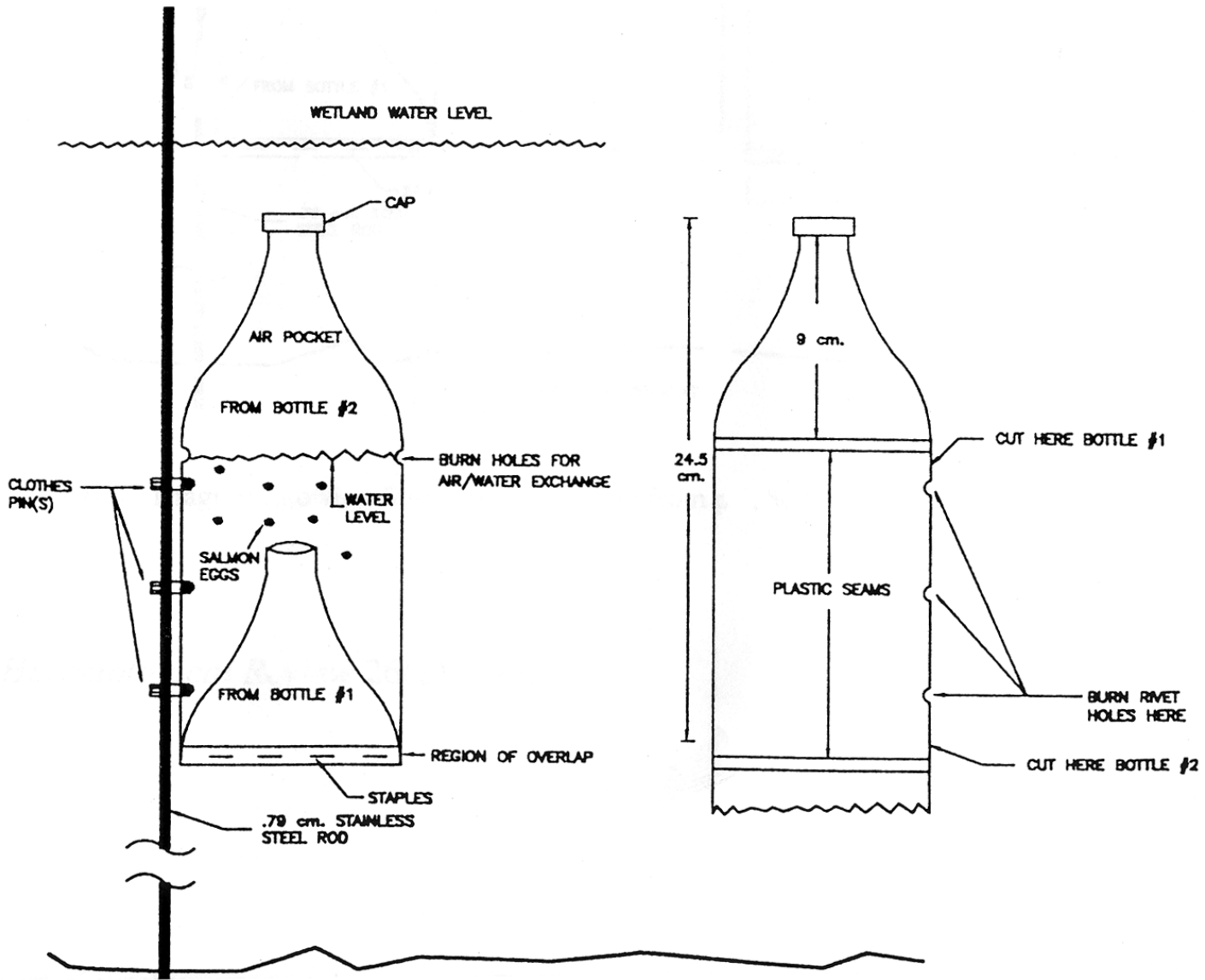


METHODS OF SURVEYING

- **Aquatic Sampling**

- Funnel Traps
- Calling Surveys
- Egg Mass Counts
- Dip Net Sweeps
- Seines
- Electrofishing

Calling Surveys





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Surveying for Larvae: Advantages

- Can be easier to find and capture than adults
- Confirms successful breeding, egg-laying and hatching
- Larval periods of different species overlap, enhancing measurement of diversity

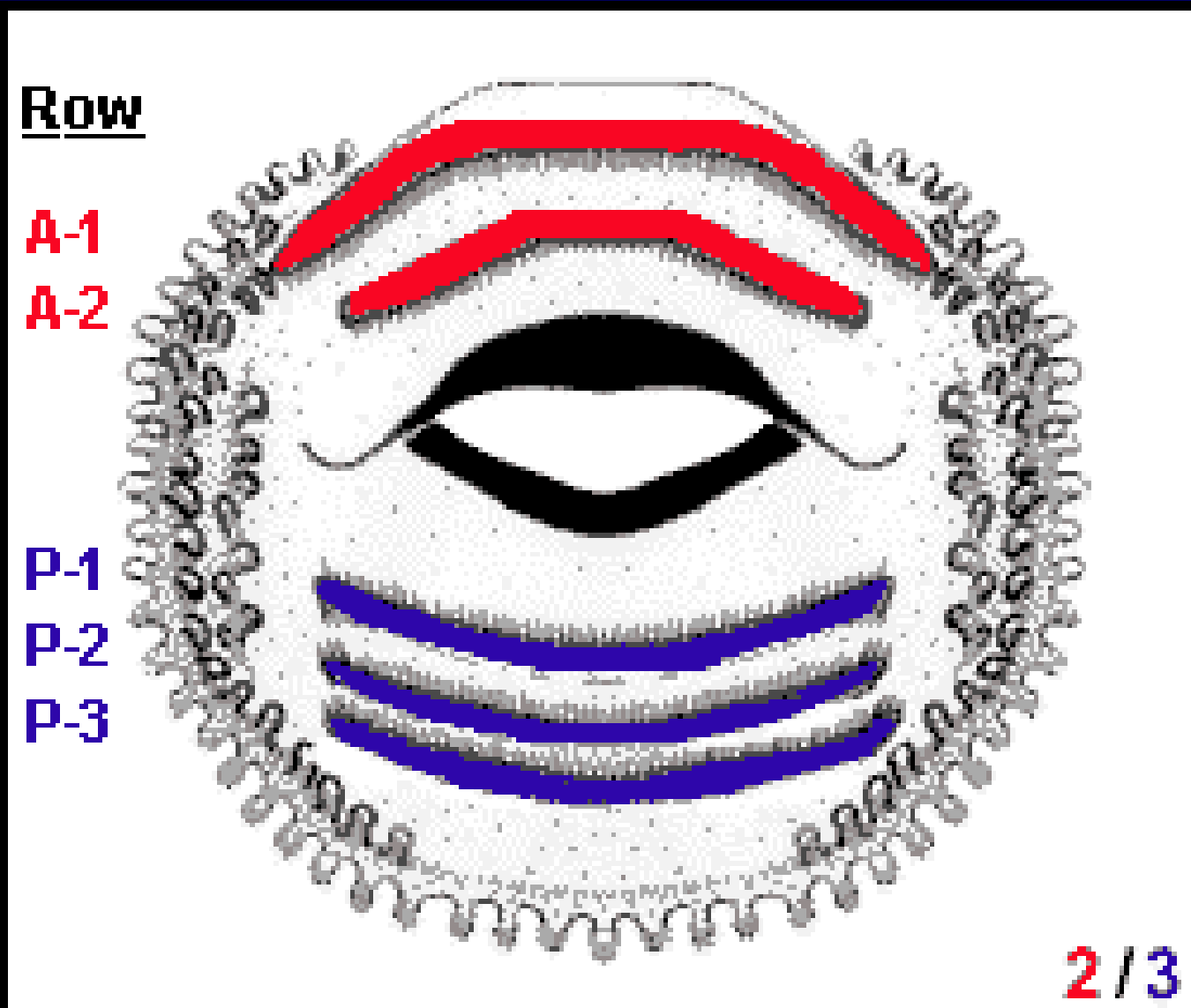
Surveying for Larvae: Disadvantages

- May be difficult to key out in the field
- Critical anatomic features require hand lens or microscope to see clearly
- May need to culture through metamorphosis to identify to species (i.e. frog farms)

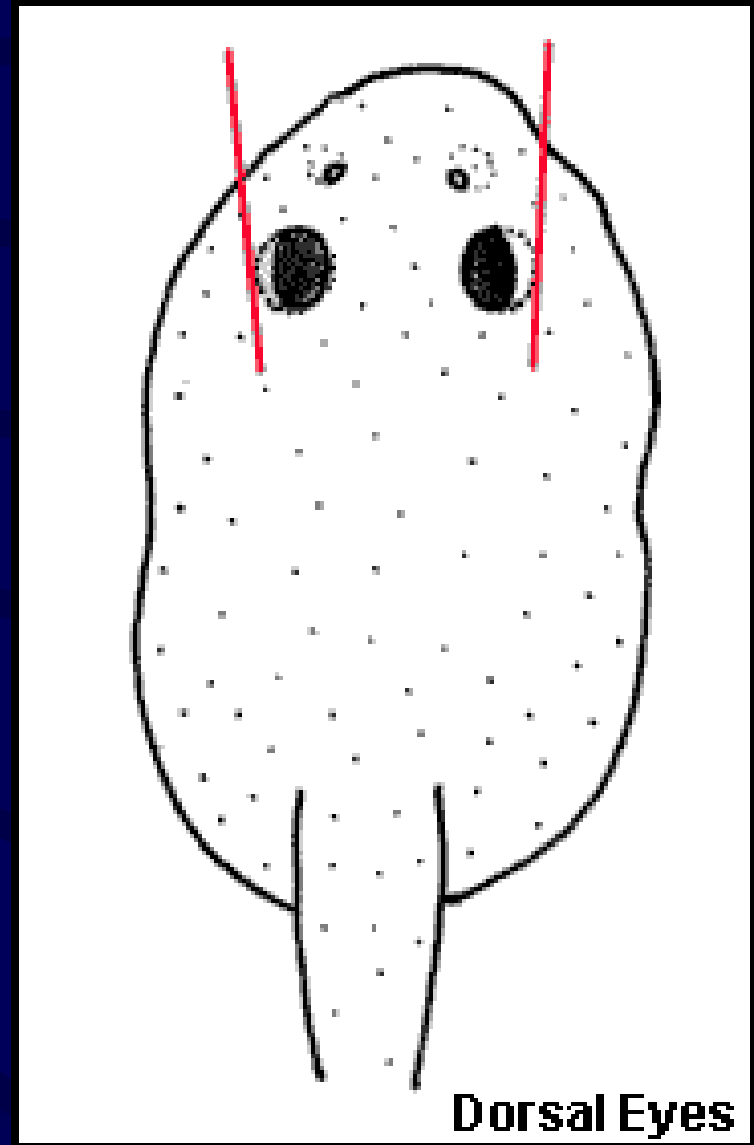
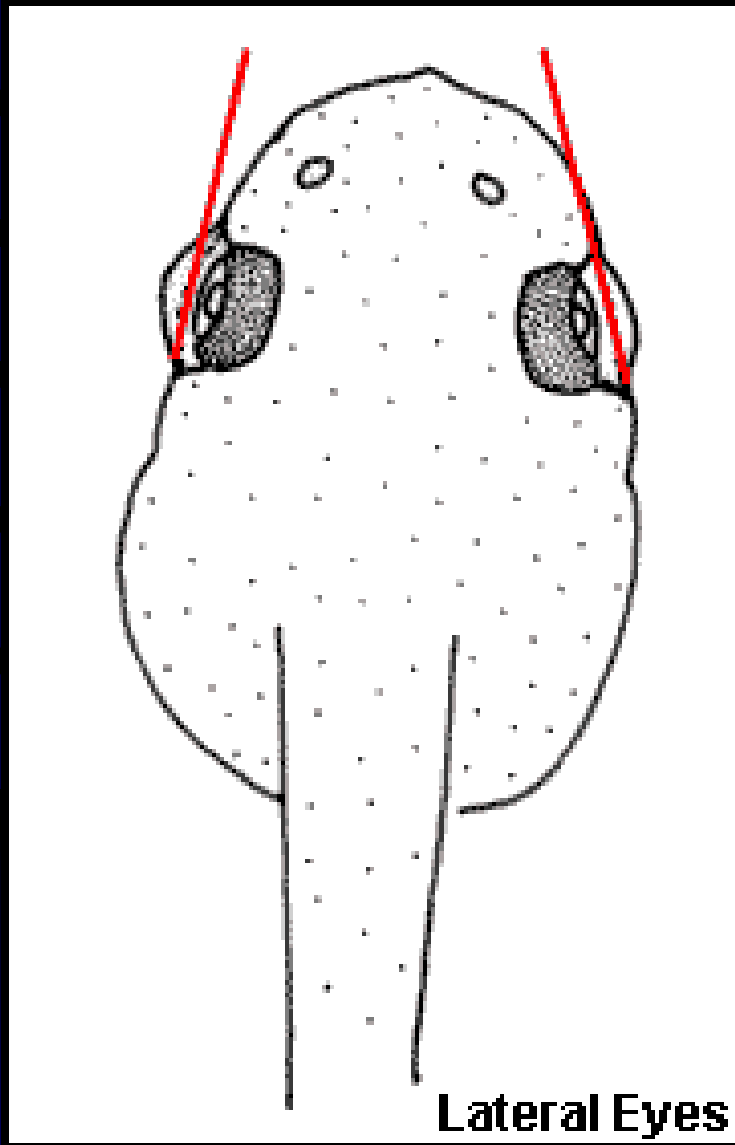
Phenotypic Plasticity in Gray Treefrog Tadpoles



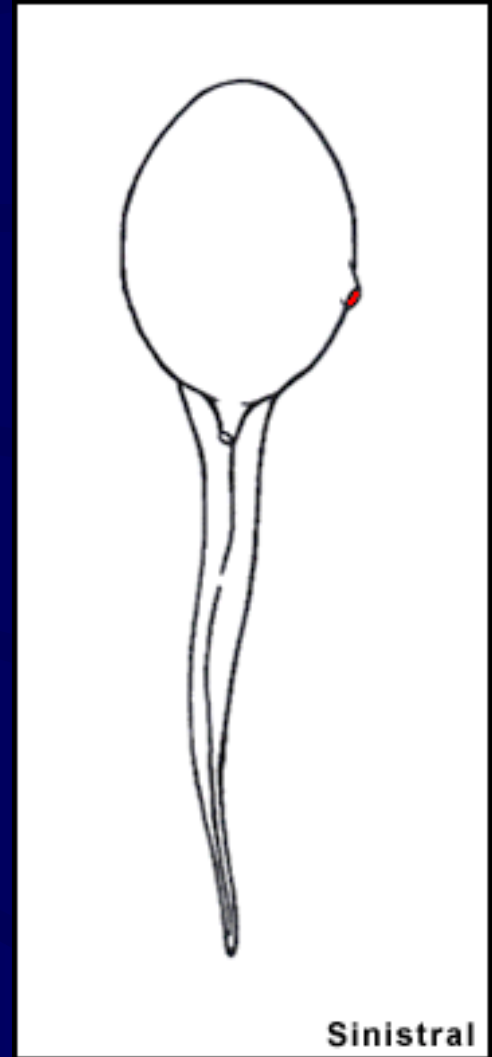
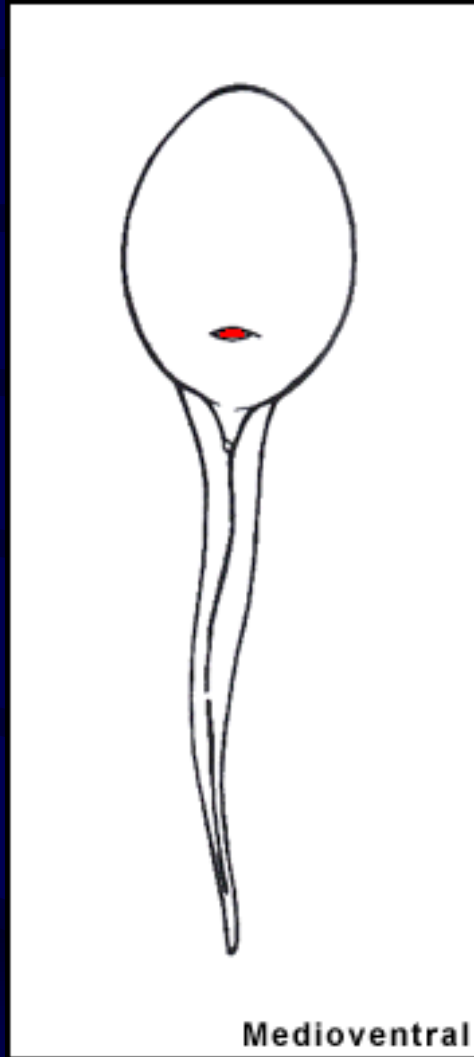
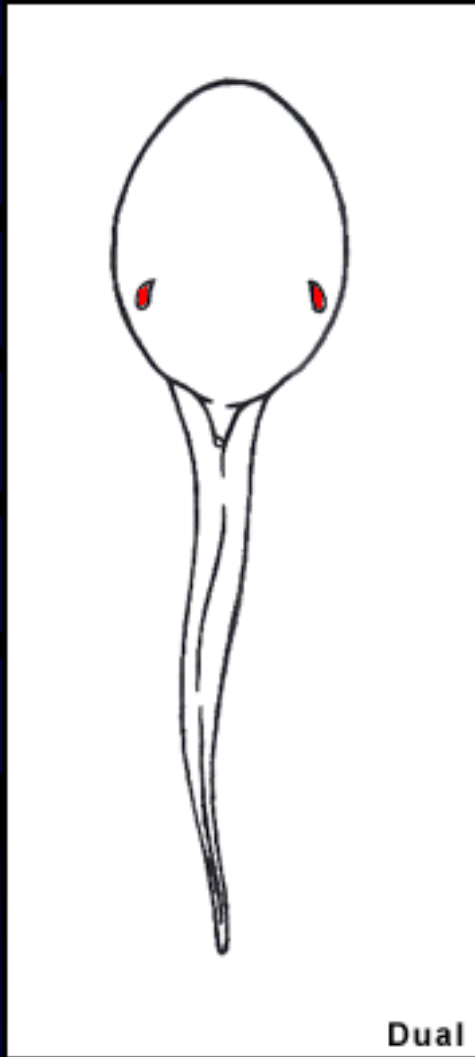
Tadpole oral apparatus with LTRF=2/3



Tadpole Eye Position



Tadpole Spiracle Position



METHODS OF SURVEYING

- **Terrestrial Sampling**

- Pitfall Traps

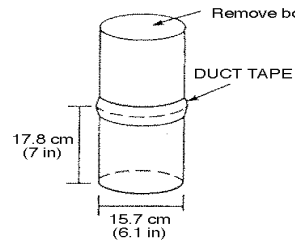
- PVC Pipes

- Cover Boards

- **For more details see:**

Heyer W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek, and M.S. Foster. 1994. Measuring and Monitoring biological diversity: standard methods for amphibians. Smithsonian Inst. Press, Washington, DC.

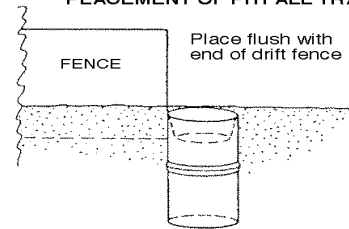
CONSTRUCTION OF PITFALL TRAPS



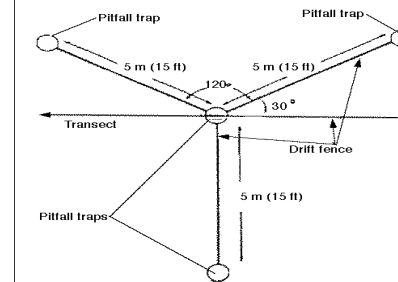
Create funnel by removing the bottom from a 453.5 g (1 lb) plastic margarine tub



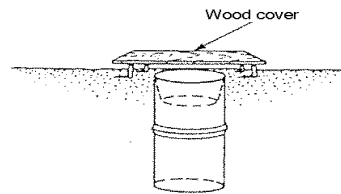
PLACEMENT OF PITFALL TRAPS



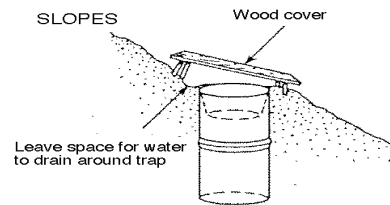
Installation in wetland



LEVEL GROUND



SLOPES



Individual traps: Use a board (cedar shake, plywood, or flat bark) raised 5 cm (1.9 in) above ground for cover



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LAB METHODS FOR ASSESSMENT OF AMPHIBIAN HEALTH

- Blood chemistry
 - Cholinesterase
 - Plasma Constituents
- Flow Cytometry
- Fluctuating Asymmetry
- Others
- **May be expensive**

SUGGESTED ATTRIBUTES

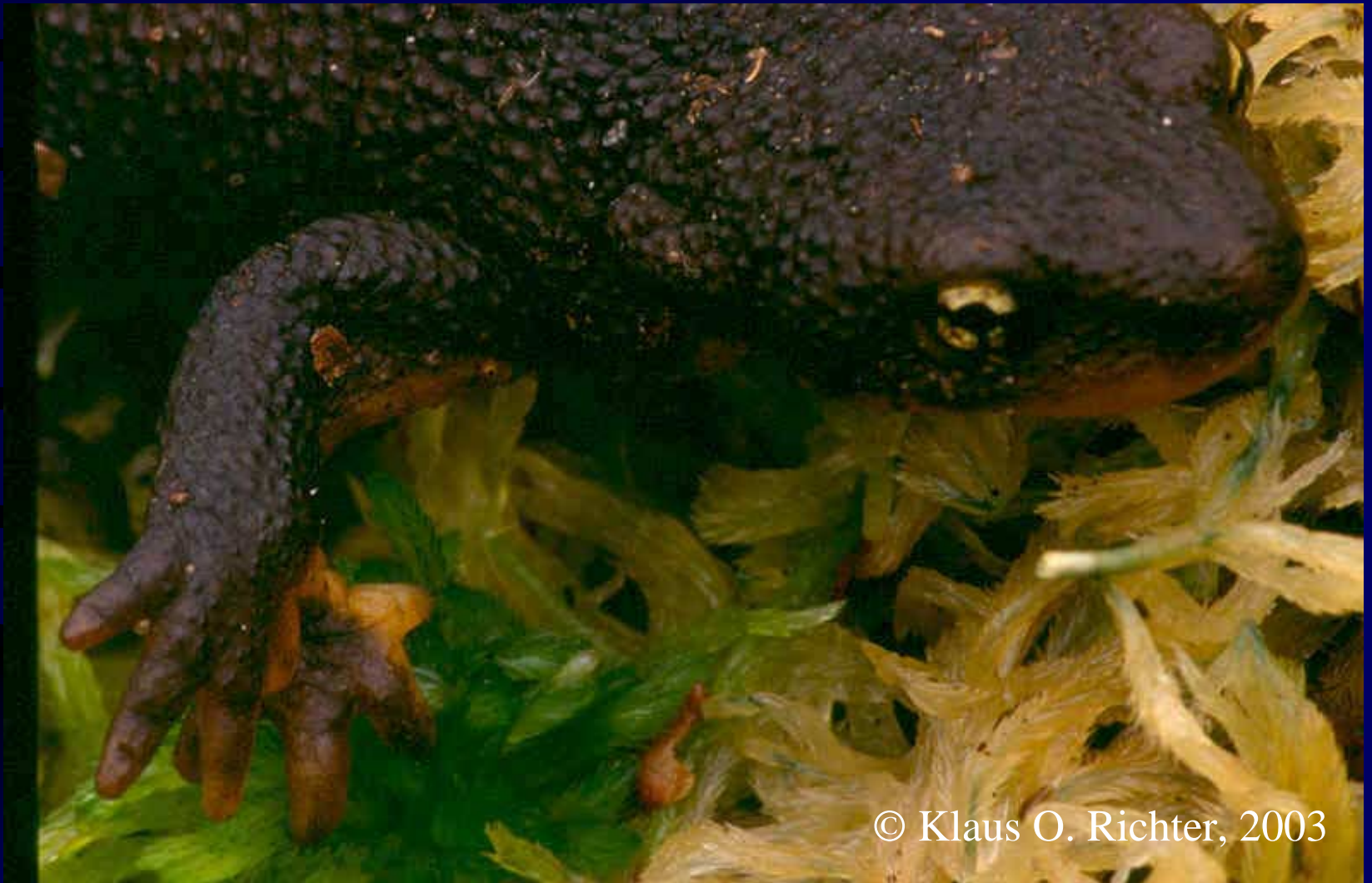
- Compare species presence to regional lists
- Proportion of non-indigenous species
- Percent of malformations
- Evidence of mortality
- Number and condition of egg masses
- Ratios of relative abundances of different life stages



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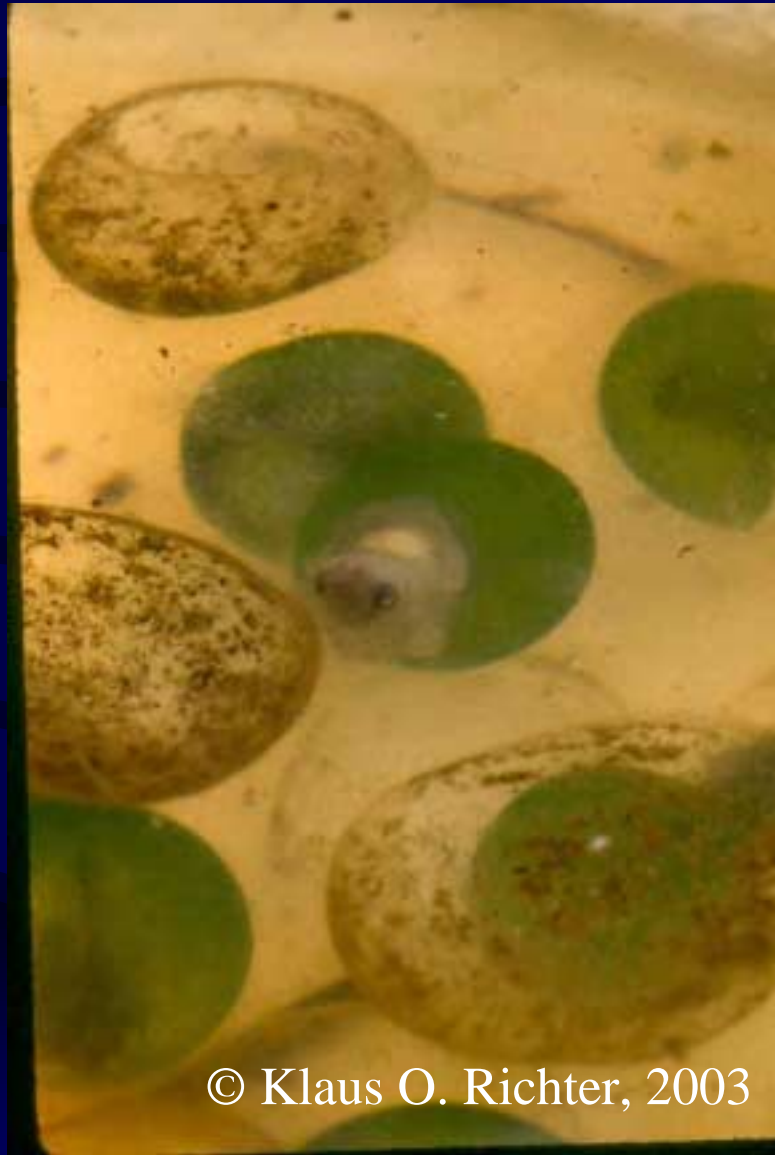
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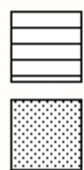
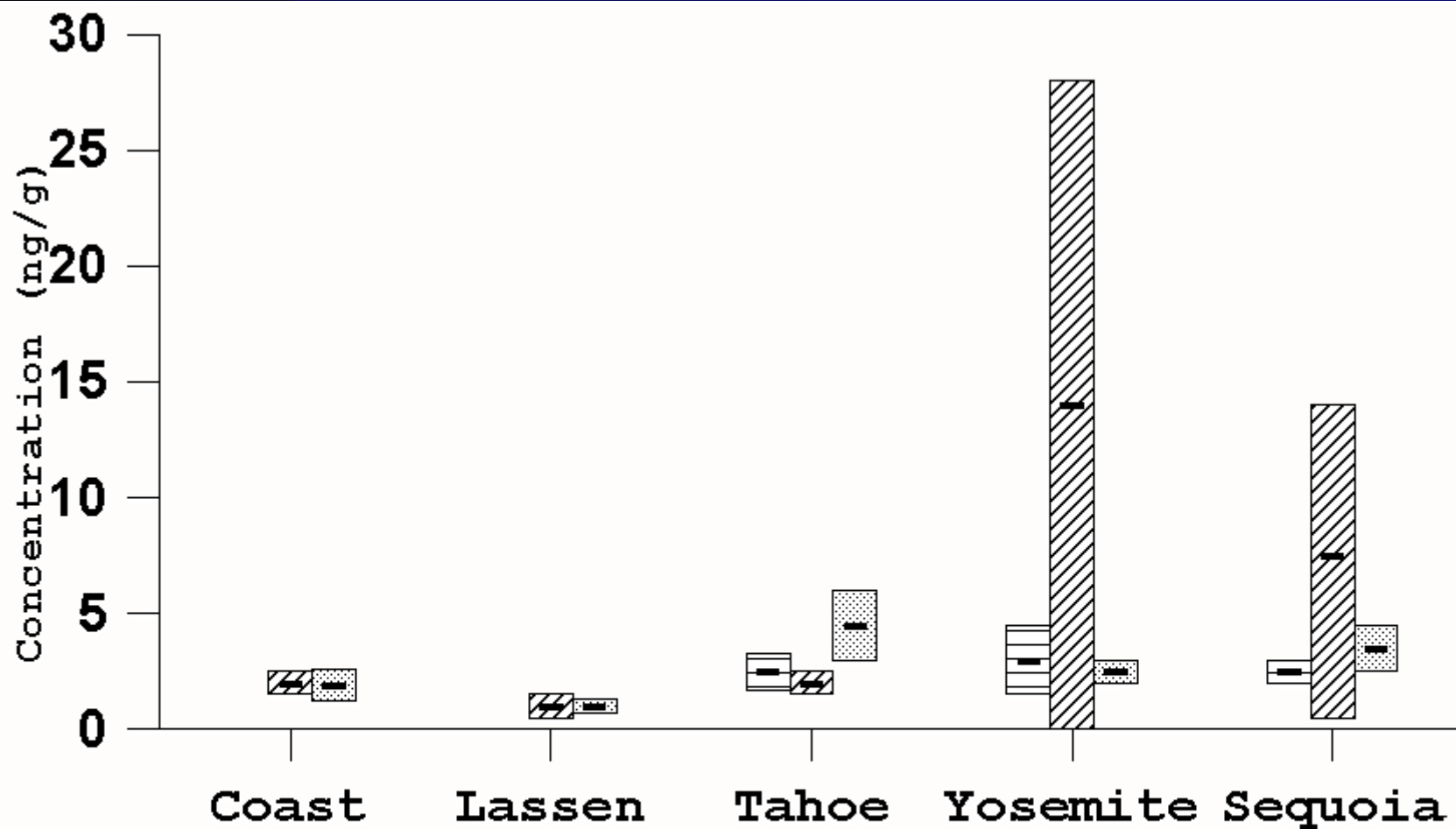
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ATTRIBUTES, cont.

- Percent Tolerant and Intolerant Species
- Snout-Vent Length Ratios
- Frequency of Parasitism or Infection
- Presence and Concentration of Contaminants
- Bioindicators of Contamination



Diazinon

Endosulfan



Chlorpyrifos

WHAT MORE DO WE NEED TO KNOW?

- Causes for amphibian malformations that might be tied to wetland assessment
- Nature of amphibian metapopulations and how they affect local abundance and distribution
- Variation in population dynamics among and within regions
- Detailed information on habitat preferences is lacking for several species

INFORMATION NEEDS, cont.

- Better understanding of ‘tolerant’ and ‘intolerant’ species
- More information on movement patterns
- Causes for amphibian population declines and how those causes can be tied into bioassessments

CONCLUSIONS

- Wetland assessments using amphibians need to consider landscape scale phenomena
- Disturbance gradients and their constituent factors need to be considered at a regional scale – no universal gradient likely
- The use of amphibians in biological assessments of wetlands is still in its infancy