

Development and Use of the Amphibian Index of Biotic Integrity (AmphIBI) in Ohio's Regulatory Program



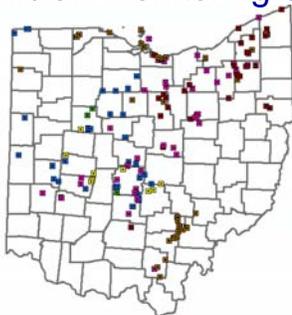
Developing an Amphibian IBI

- Ohio EPA has been monitoring wetland amphibians since 1996
 - ◆ 1996-2006 monitored 190 natural wetlands
 - ◆ 2001 - monitored 4 wetland mitigation banks and 10 individual wetland mitigation projects
 - ◆ 2004 – monitored 8 wetland mitigation banks
- Amphibian Index of Biotic Integrity (AmphIBI)
 - ◆ 2002 – developed index
 - ◆ 2004 – tested with additional sites
 - ◆ 2005 – used to assess Cuyahoga River watershed wetlands
 - ◆ 2006 – used to assess urban wetlands - Columbus

Monitoring Techniques



Amphibian Monitoring Sites





Western chorus frog,
Pseudacris triseriata



Northern leopard frog,
Rana pipiens pipiens



American Toad,
Bufo americanus



Bullfrog,
Rana catesbeiana



Green Frog,
Rana clamitans melanota



Gray treefrog,
Hyla versicolor



Smallmouthed salamander,
Ambystoma texanum



Jefferson salamander,
Ambystoma jeffersonianum



Ambystomatid hybrid



Wood frog,
Rana sylvatica



Spotted Salamander,
Ambystoma maculatum



Tiger salamander,
Ambystoma tigrinum



AmphIBI Metrics

- Amphibian Quality Assessment Index (AQAI)
- Number of pond breeding salamander species
- Relative abundance of sensitive species
- Relative abundance of tolerant species
- Presence of spotted salamanders or wood frogs

Assigning Tolerance Coefficients

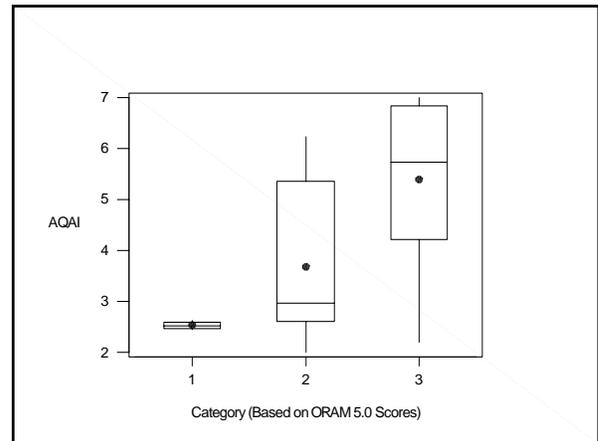
- 1-3, species are tolerant of human disturbances and generally have broad niches 
- 4-5, species are intermediate 
- 6-10, species are sensitive to human disturbance and may have narrow niches 

Amphibian Species Sensitivity

<u>Salamanders:</u>		<u>Frogs and Toads:</u>	
▪ Smallmouth	4	▪ Toads	1
▪ Jefferson	5	▪ Bullfrog	2
▪ Tiger	6	▪ Spring peeper	2
▪ Spotted	8	▪ Chorus frogs	2
▪ Marbled	8	▪ Green frog	3
▪ Newt	9	▪ Leopard frog	3
▪ Four-toed	10	▪ Gray treefrogs	5
▪ Blue-spotted	10	▪ Wood frog	7

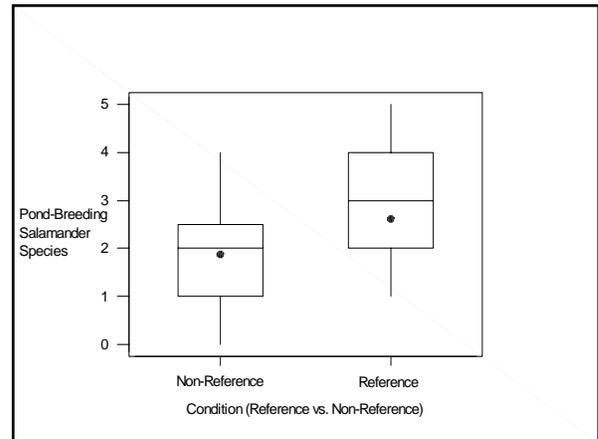
Amphibian Quality Assessment Index

- Take total of number of individuals of each species times their tolerance coefficient
- Sum the totals from all species
- Divide by the total number of individuals of all species
- Basically an average C of C score for the amphibian community present



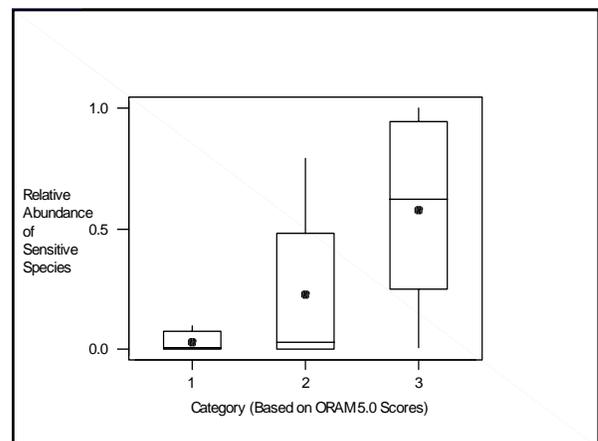
Number of Species of Pond Breeding Salamanders

- More species diversity expected in wetlands with higher numbers, quality and diversity of habitat features
- Most salamander species are extremely sensitive to disturbance
- Wetlands sampled had a range of 0-5 species
- Only 3 wetlands with ORAM scores below 57.5 had more than 2 species



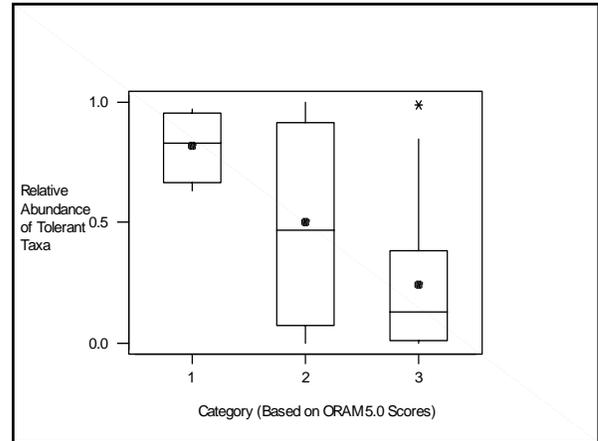
Relative Abundance of Sensitive Species

- More intact systems have a larger percentage of their populations comprised of individuals from sensitive species
- Disturbed systems have none, or at best, a small percentage of their populations comprised of individuals from sensitive species



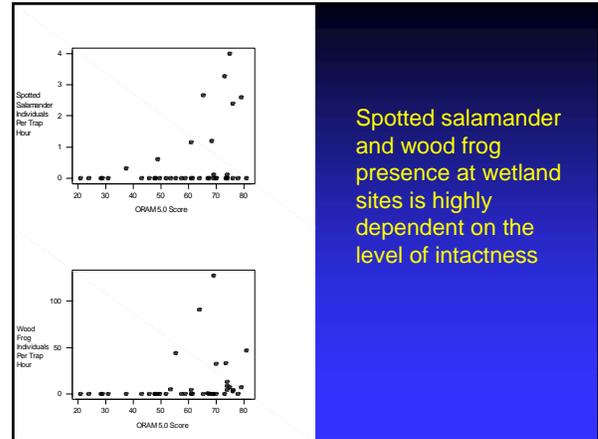
Relative Abundance of Tolerant Species

- Correlates well with disturbance level of wetland
- Disturbed sites are dominated by tolerant species
- You can get tolerant individuals utilizing intact systems



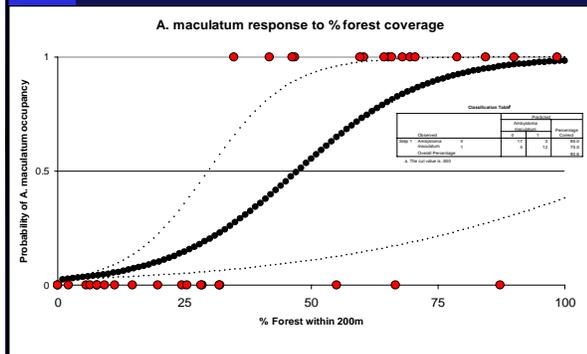
Spotted Salamanders or Wood Frogs

- These species only occur at wetlands that are intact or minimally impacted
- The sites where both species occurred are "reference" wetlands

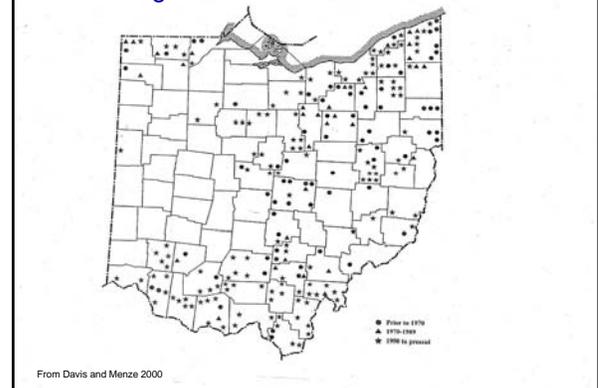


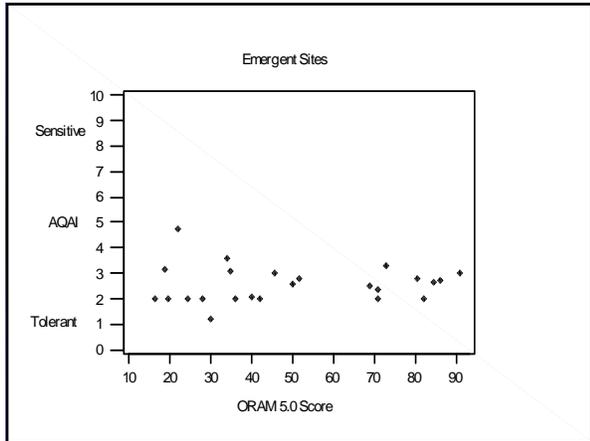
Spotted salamander and wood frog presence at wetland sites is highly dependent on the level of intactness

Spotted salamander



Wood Frog Distribution

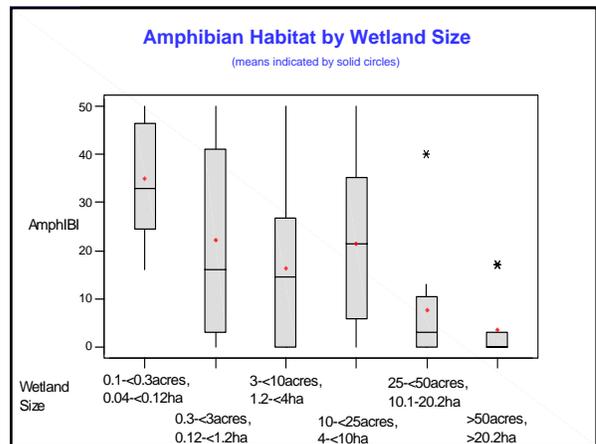
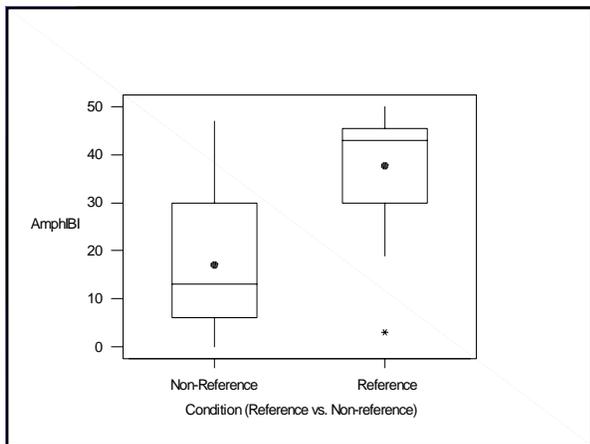
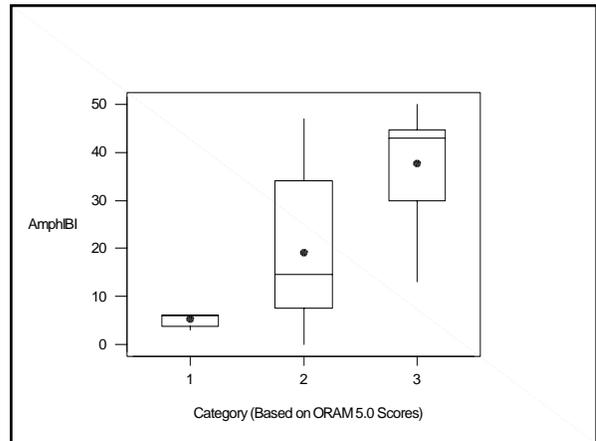




Reasons for Absence of Sensitive Species at Emergent Sites

- Originally 95% of Ohio was forested – sensitive species are adapted to this environment
- Many emergent wetlands have stream hydrology inputs and therefore predatory fish populations
- Often wetlands are predominately emergent due to past disturbances

Scoring breakpoints for assigning metric scores for AmphIBI				
Metric	Score 0	Score 3	Score 7	Score 10
AQAI	<3.00	3.00 - 4.49	4.50 - 5.49	≥5.5
Rel. Abundance Sensitive Spp.	0%	.01 - 9.99%	10 - 49.99%	≥50%
Rel. Abundance Tolerant Spp.	>80%	50.01 - 79.99%	25.01 - 50%	≤25%
# of Pond-Breeding Salamander Spp.	0-1	2	3	>3
Spotted Salamanders or Wood Frogs	absent	-	-	present



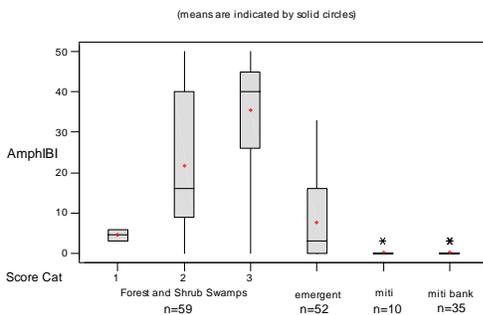
Tiered Aquatic Life Uses

Aquatic Life Use	AmphIBI Scores
Limited Wetland Habitat	0-9
Restorable Wetland Habitat	10-19
Wetland Habitat	20-39
Superior Wetland Habitat	40 and above

Species Composition of Wetland Mitigation Banks

- Abundant
 - ◆ Green frog, *Rana clamitans* 33%
 - ◆ Toads, *Bufo* sp. 22%
 - ◆ Leopard frog, *R. pipiens* 19%
 - ◆ Bullfrog, *R. catesbeiana* 12%
 - ◆ Spring peeper, *Pseudacris crucifer* 5%
- Absent or extremely rare
 - ◆ All Ambystomatid salamander species <1%
 - ◆ Red spotted newt, *Notophthalmus viridescens*
 - ◆ Spotted salamander, *Ambystoma maculatum*
 - ◆ Wood frog, *R. sylvatica*

Boxplots of AmphIBI by Wetland Type



Ecological Quality of Ohio Wetlands

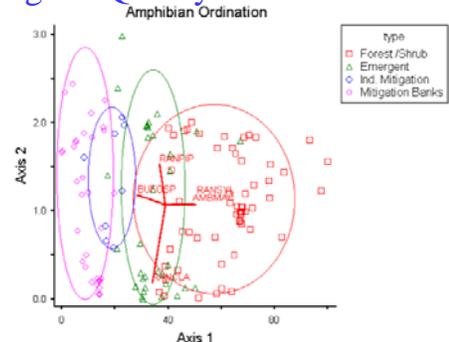


Figure 15. Principal components analysis (PCA) of amphibian community data for natural wetlands, individual mitigation wetlands, and mitigation bank sites. Percent of variance explained by first three axes: Axis 1 (14.4%), Axis 2 (10.4%), Axis 3 (8.9%)

Amphibian Habitat Needs

- Seasonal hydrology - March-June
- Fish-free – bass, sunfish, pike, bullheads
- Leaf litter/ woody debris
- Microtopographic features
- Woodlands – especially important within 200m radius
- Other breeding pools nearby

Bank Limitations to Amphibian Usage



- Narrow or no buffers and intensive surrounding land uses
- Presence of predatory fish – stream hydrology
- Permanent vs. seasonal hydrology
- Steep slopes and lack of vegetation – vegetation present is emergent class
- Large sizes minimizing edge habitats

Summary

- Amphibians are good indicators of wetland condition
- Amphibian communities are highly dependent on habitats surrounding wetlands
- The AmphIBI is a good tool for determining the quality of natural and constructed wetlands
- Mitigation wetlands are not compensating for losses in amphibian habitat

Use of the AmphIBI

- For determining the quality of natural wetlands
- Tiered Aquatic Life Uses
- Setting performance standards for mitigation wetlands designed to replace amphibian habitat functions
- Setting goals for reestablishment of amphibian populations at existing and newly constructed wetlands

