Bioassessment Program Developments in AZ

Patti Spindler

Arizona Department of Environmental Quality

Arizona Bioassessment Program Update

- Biocriteria Standards issues
- Arizona REMAP grant
- Research initiatives

Standards issues

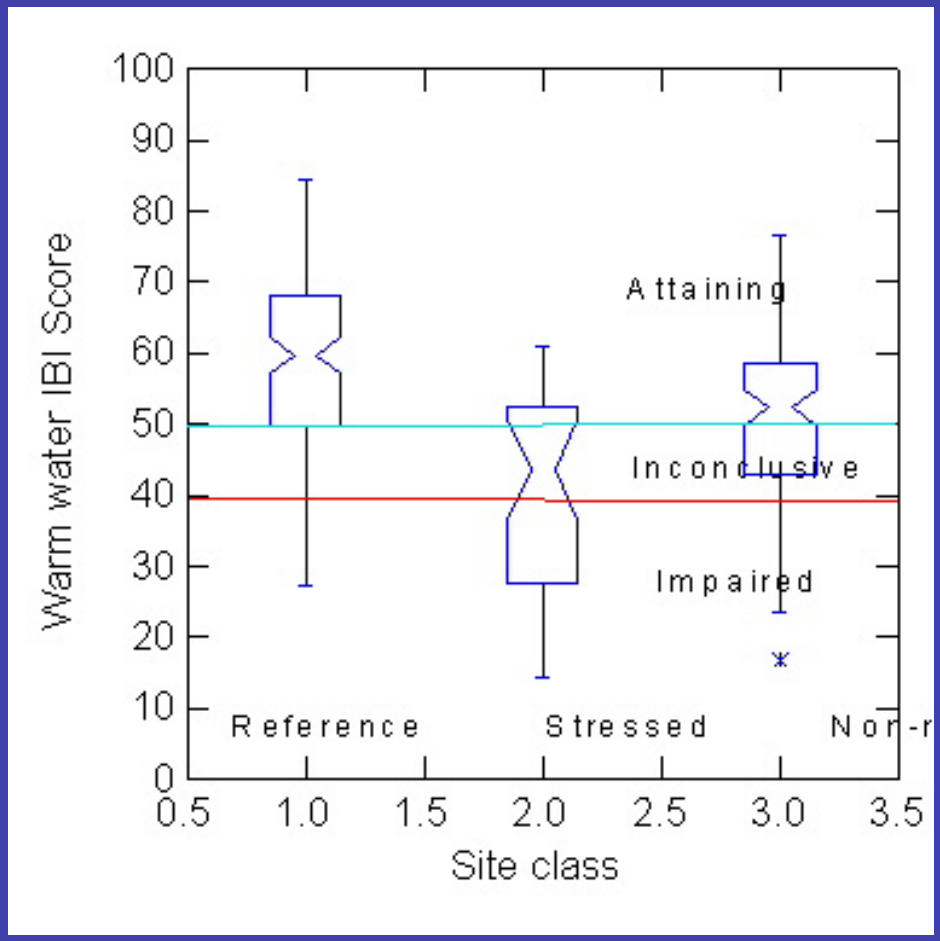
- AZ hybrid narrative/numeric Biocriterion
- Comments from AZ stakeholders
- Linkage to bottom deposits

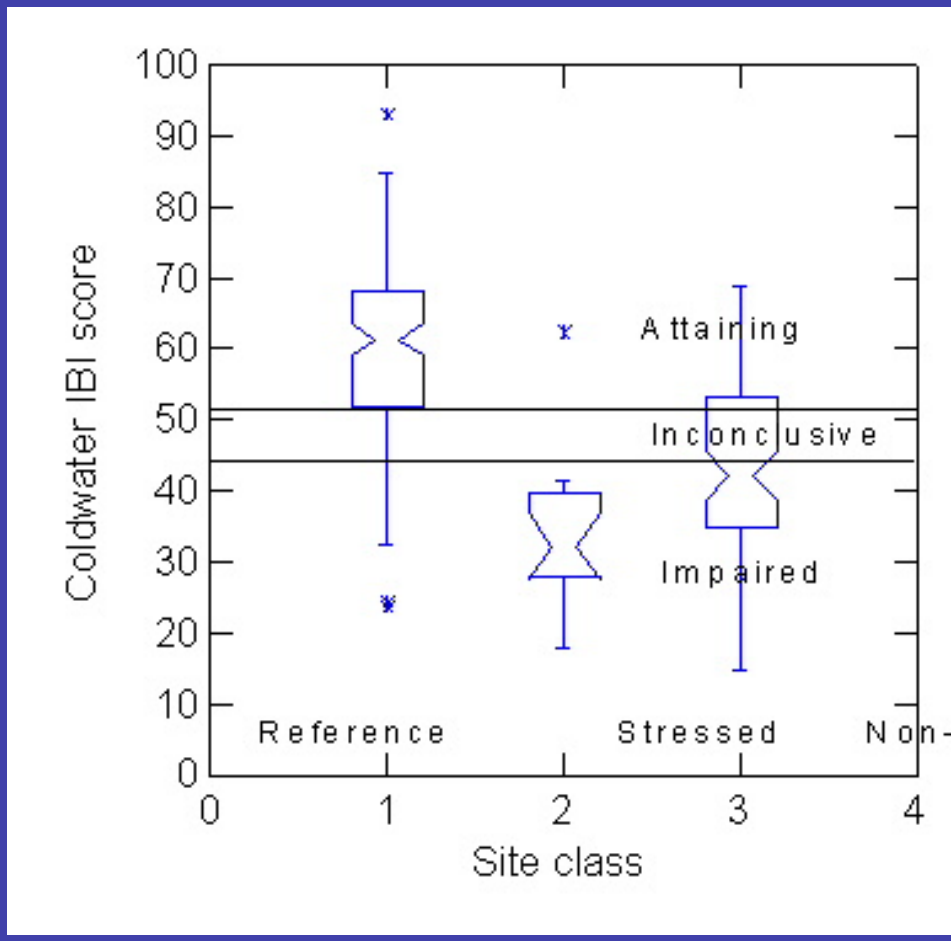
AZ Narrative/Numeric Biocriterion

- "A wadeable, perennial stream shall support and maintain a community of organisms having a taxa richness, species composition, tolerance and functional organization comparable to that of a reference stream in Arizona."

Bioassessment Result	Index of Biological Integrity Scores	
	A&Wc	A&Ww
≥ 25th percentile of reference	≥ 52	≥ 50
>10th percentile of reference and < 25th percentile of reference	46-51	40-49
≤ 10th percentile of reference	≤ 45	≤ 39

Index of Biological Integrity - Reference Percentiles





Stakeholder comments on new Biocriterion

- Rationale for selecting 25th percentile threshold – false positives?
- Why not use non-reference data to set criteria?
- Use of single bioassessment samples for assessment & listing?
- Minimum flow required for sampling?
- Sampling in perennial/intermittent streams

Narrative Bottom Deposits Standard

The current narrative "bottom deposits" standard says that a surface water shall be free from pollutants in amounts or combinations… "that settle to form bottom deposits that inhibit or prohibit the habitation, growth or propagation of aquatic life."

[See R18-11-108(A)1)].

Bottom Deposits IP
Cold water streams

- Bjornn, et. al., found that when the percentage of fine sediment exceeds 20 to 30 percent in spawning riffles, the survival and emergence of salmonid embryos begins to decline.

Some Arizona salmonids

Apache Trout

Gila trout

Brook trout

Cutthroat trout

Rainbow trout

Brown trout

Bottom Deposits IP
Warm water streams

- Relyea, et al (2000) found species-specific responses to fine sediment in streambeds. She labeled 29 taxa found only at % fines <50% as fine sediment intolerant and 54 taxa found at %fines >50% as fine sediment tolerant

- Spindler (2004) found that adverse sediment effects to macroinvertebrates occur at 40% to 50% fines in the San Pedro River.

Ephemeroptera - Baetidae - Baetis

Bottom Deposits Implementation

- Bottom deposit standard based on literature values for wadeable perennial streams is met when:
  - Percent fines in riffle habitats of cold water stream is ≤30% using a riffle pebble count method (Bjornn, 1977)
  - Percent fines in a stream reach of a warm water stream is ≤ 50% using a reach pebble count method (from Relyea, 2000)
- Develop AZ empirical standard & tolerance values when more data available across biocondition gradient

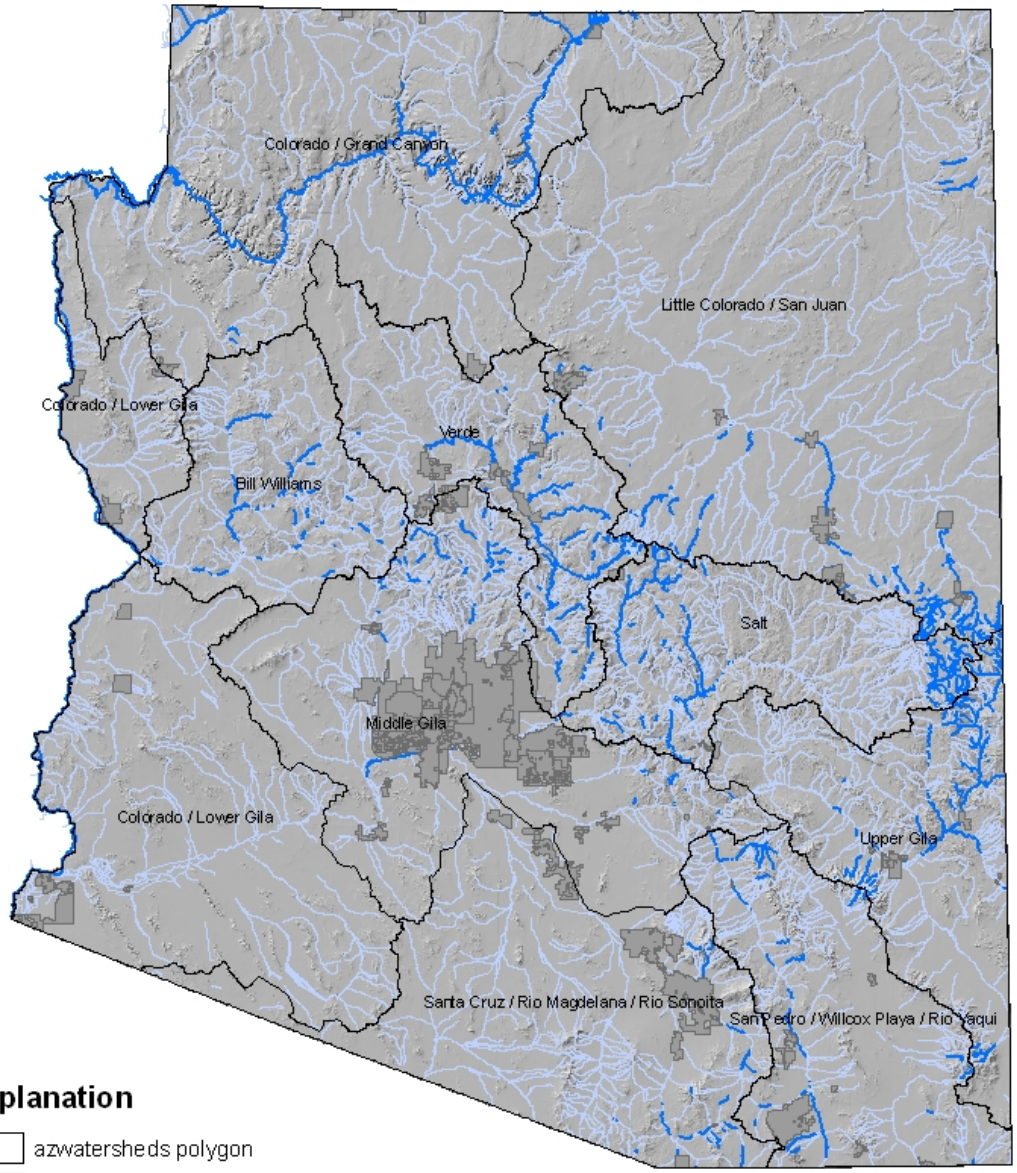
AZ REMAP Project

- REMAP Part 1 modeling & field truthing perennial stream miles
- Part 2 methods comparison study & EMAP style bioassessment

Where is perennial?

- Updated an existing Arizona Game & Fish Dept perennial & intermittent streams map
  - USGS conducted hydrologic modeling analyses of gaged and ungaged streamflows to determine most probable stream class (perennial, nearly perennial, weakly perennial and non-perennial flow).
  - Field observations & ground truthing
  - Land managers questionairre

Arizona Perennial Streams 2007



Explanation

azwatersheds polygon

Cities all

Perennial stream miles, updated

Stream type	Stream miles, statewide (%)	Stream miles, Non-Indian
Predicted perennial 2007	5592 (3.7%)	4778 (5.3%)
Non-perennial 2007	144322 (96.3%)	85597 (94.7%)
Total stream miles	149914	90375

Random site selection in dry regions is problematic!

- Western EMAP study evaluated 384 random sites to obtain 47 perennial stream sites (12% success rate!) using Reach file 3 Hydrology map

- Arizona REMAP study evaluated 166 random sites to obtain 38 perennial stream sites (23% success rate)

AZ REMAP
Random Site Evaluations

Percent of sites	Description
24.7	Dry
41.0	Error in waterbody type due to GIS cover errors (wetland, stagnant water, lake)
3.0	Landowner denial
3.6	Not accessible
3.0	Physical barrier
0.6	Same reach
22.9	Target-sampleable
1.2	Unwadeable

AZ REMAP Part II

- Methods comparison study: EMAP & ADEQ macroinvertebrates and habitat
- EMAP style bioassessment for the Little Colorado River basin
- Results will be available in 2008

Western EMAP
Stressors of concern in AZ

- Non-native vertebrates
- Riparian disturbance
- Poor riparian vegetation cover
- Relative bed stability
- Crayfish (all non-native in AZ)
- Mercury contamination in fish tissue

Western EMAP Stressors for fish in AZ

- Vertebrate biointegrity – 70% AZ stream miles most-disturbed/impaired condition
- Stressors with high relative risk:
  - Salinity
  - Total nitrogen
  - Asian clams
  - Habitat complexity
  - Crayfish
  - Mercury contamination in fish tissue

Western EMAP
Stressors for invertebrates in AZ

- Macroinvertebrates – 57% AZ stream miles most-disturbed/impaired condition

- Stressor with significant risk = Crayfish

Research initiatives

- Archived Midges added to database & IBIs
- Developing diatom bioassessment tool
- Developing reference condition for Grand Cyn tributary streams
- BCG for sediment/bottom deposits
- Biocriteria for intermittent streams