

**Comparability of EMAP and
Arizona DEQ Macroinvertebrate and
Habitat Methods of Data Collection**

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Methods comparison studies have been done before...

- Gerth & Herlihy (2006) –Western EMAP study
- Herbst & Sillforff (2004) - 3 survey approaches in CA
- Rehn et al (2007) - CA reachwide & riffle samples

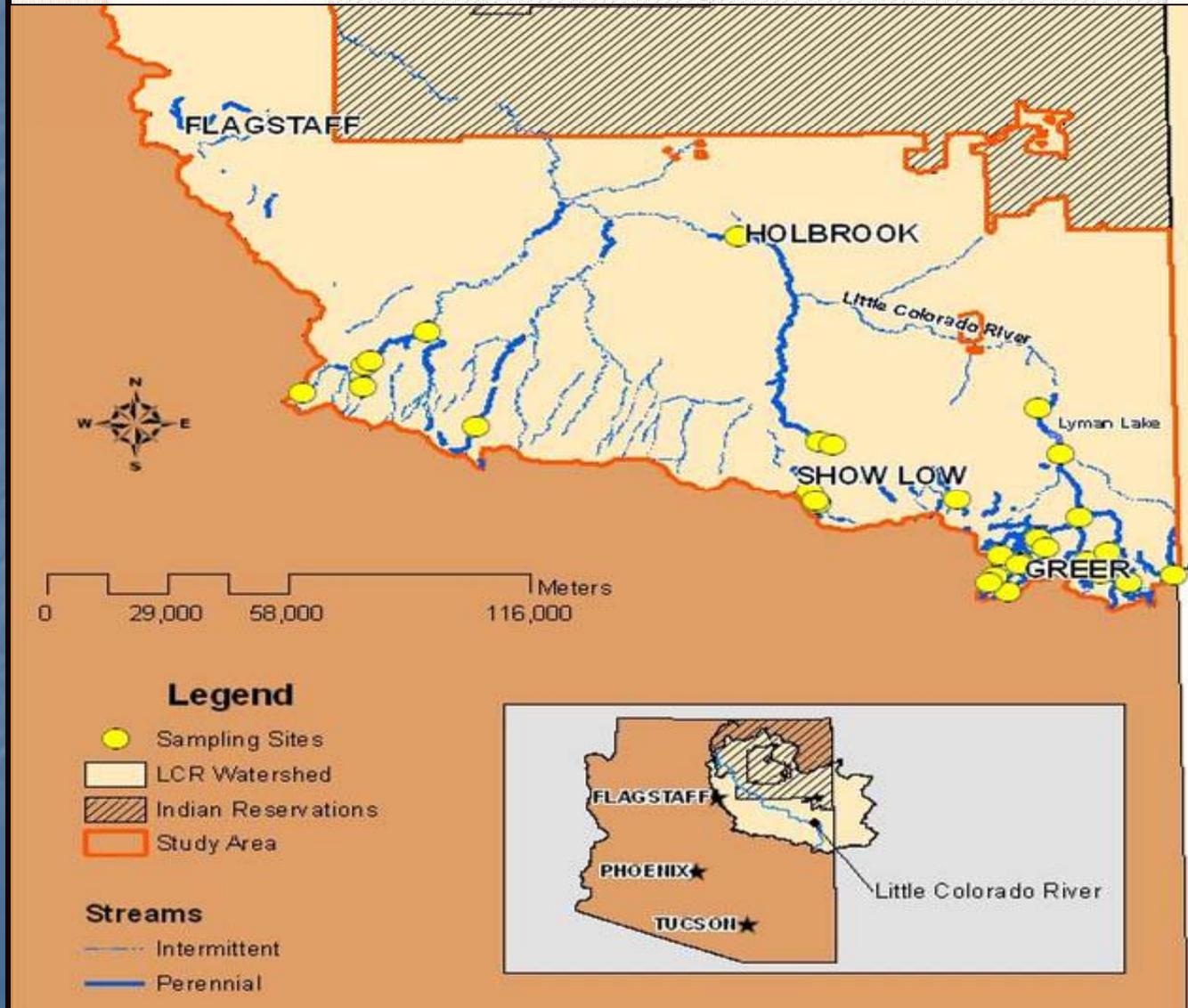
Why do another comparison study?

- New AZ Biocriteria standards (Jan 2009)
- Riffle method basis for AZ Biocriteria
- AZ 305(b) assessments cannot use EMAP reachwide samples until we demonstrate no significant difference between the methods
- ADEQ would like to migrate to reachwide method but needs a translator study to allow use of both methods for 305b & 303d

REMAP Grant for ADEQ

- ADEQ received a REMAP grant in 2007 to produce:
 - Macroinvertebrate comparison study
 - Basin-wide bioassessment using a probabilistic survey design
 - Improve AZ perennial streams map

Little Colorado River Basin – probabilistic survey site selection





West Fork Little Colorado River



Barbershop Canyon



Clear Creek



Silver Creek



Chevelon Canyon



Coyote Creek



Silver Creek



Little Colorado River near Holbrook

Differences in Macroinvertebrate Sampling Methods

	ADEQ Method	EMAP Method
Habitat	Riffle	Reach
Sub-samples	3	11
Area sampled	27 ft ²	11 ft ²
Time sampled	3 min	5.5 min

ADEQ Coldwater Index of Biological Integrity

- Total taxa richness
- Diptera taxa richness
- Intolerant taxa richness
- Hilsenhoff Biotic Index
- Stonefly % composition
- Scraper % composition
- Scraper taxa richness
- IBI score is average of 7 metric scores, based on % of reference value and scaled 0-100



Coldwater IBI Assessment Categories

Bioassessment Result	Index of Biological Integrity Scores		Assessment Category
	Cold Water	Warm Water	
Greater than the 25th percentile of reference condition	≥ 52	≥ 50	Attaining
Between the 10th and less than the 25th percentile of reference condition	46 - 51	40 - 49	Inconclusive
Less than the 10th percentile of reference condition	≤ 45	≤ 39	Impaired

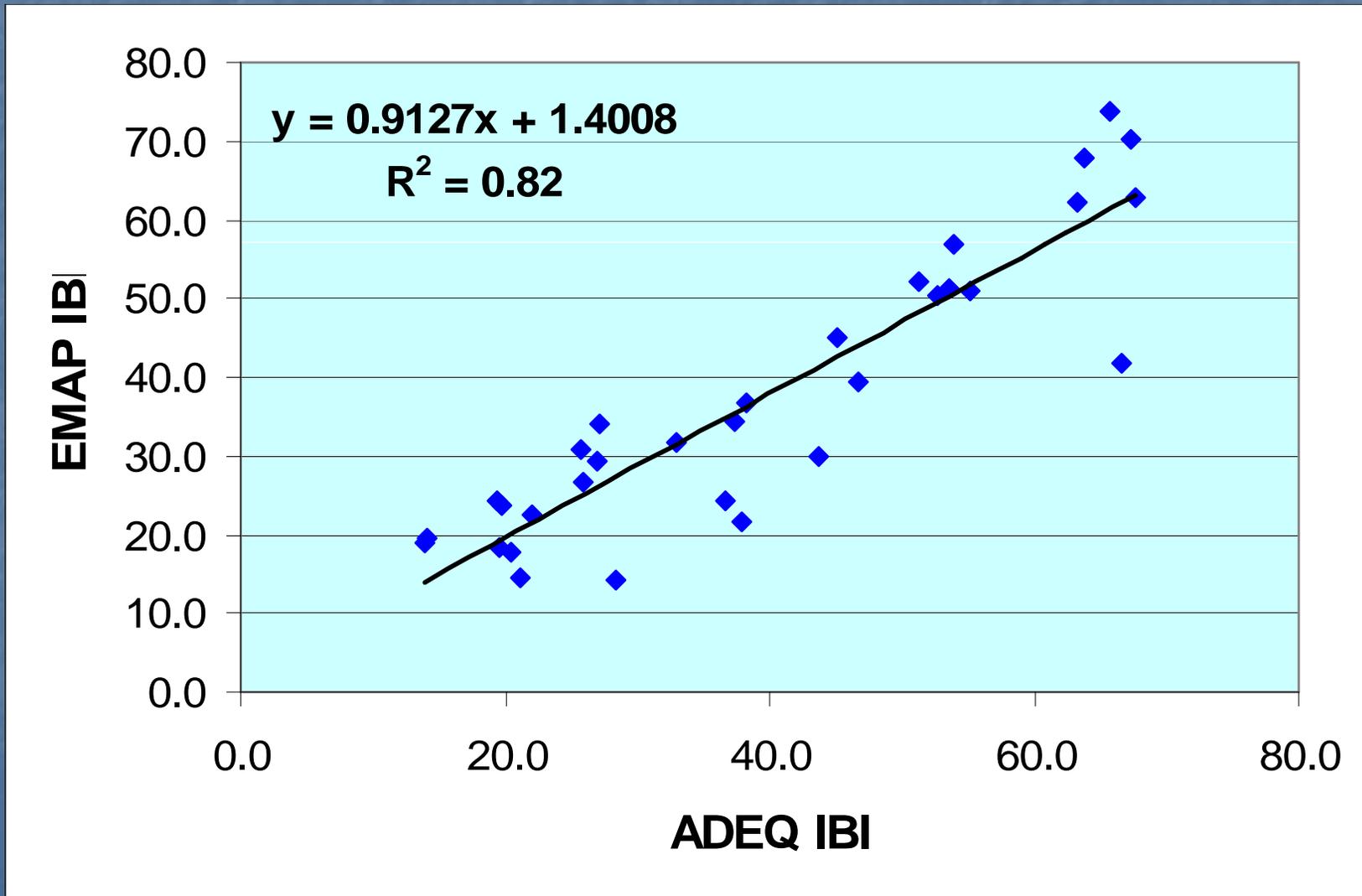
Habitat Data Used in Comparison Study

- Reach-wide % fines (Adeq zig-zag100 count vs. Emap transect 105 count)
- Embeddedness in riffles (Adeq 100 count vs. Emap 55 count)
- Riffle median particle size (D50)
- Pool, percent of reach (Adeq reach paces vs. Emap thalweg measures)
- Riffle, percent of reach
- Habitat index score (ADEQ 5-attributes vs EMAP 10)
- Canopy, percent cover (Adeq 12 measures-concave; Emap 66 measures convex)
- Crayfish abundance category
- Water temperature
- Laboratory total dissolved solids

Similar IBI Scores between Methods

Dataset	N	Mean ADEQ IBI Score	Mean EMAP IBI Score
Reference sites	3	60	59
All sites	32	40	37
Meadow streams, C & E type channel	14	39	35
High gradient streams >2% slope	15	43	42

EMAP and ADEQ Sample IBI Scores Correlated



IBI Results among Biocriteria Attainment Classes

Scoring Category	IBI Score Range	ADEQ Samples	EMAP Samples	EMAP Results Agree with ADEQ results	EMAP & ADEQ Results disagree
Meeting IBI criterion	≥52	10 (31%)	7 (22%)	6 (19%)	4 (12%)
Inconclusive	46-51	2 (6%)	3 (9%)	0	2 (6%)
Violating IBI criterion	≤45	20 (63%)	22 (69%)	20 (63%)	0

Stream Sites where IBI Scores Dissimilar

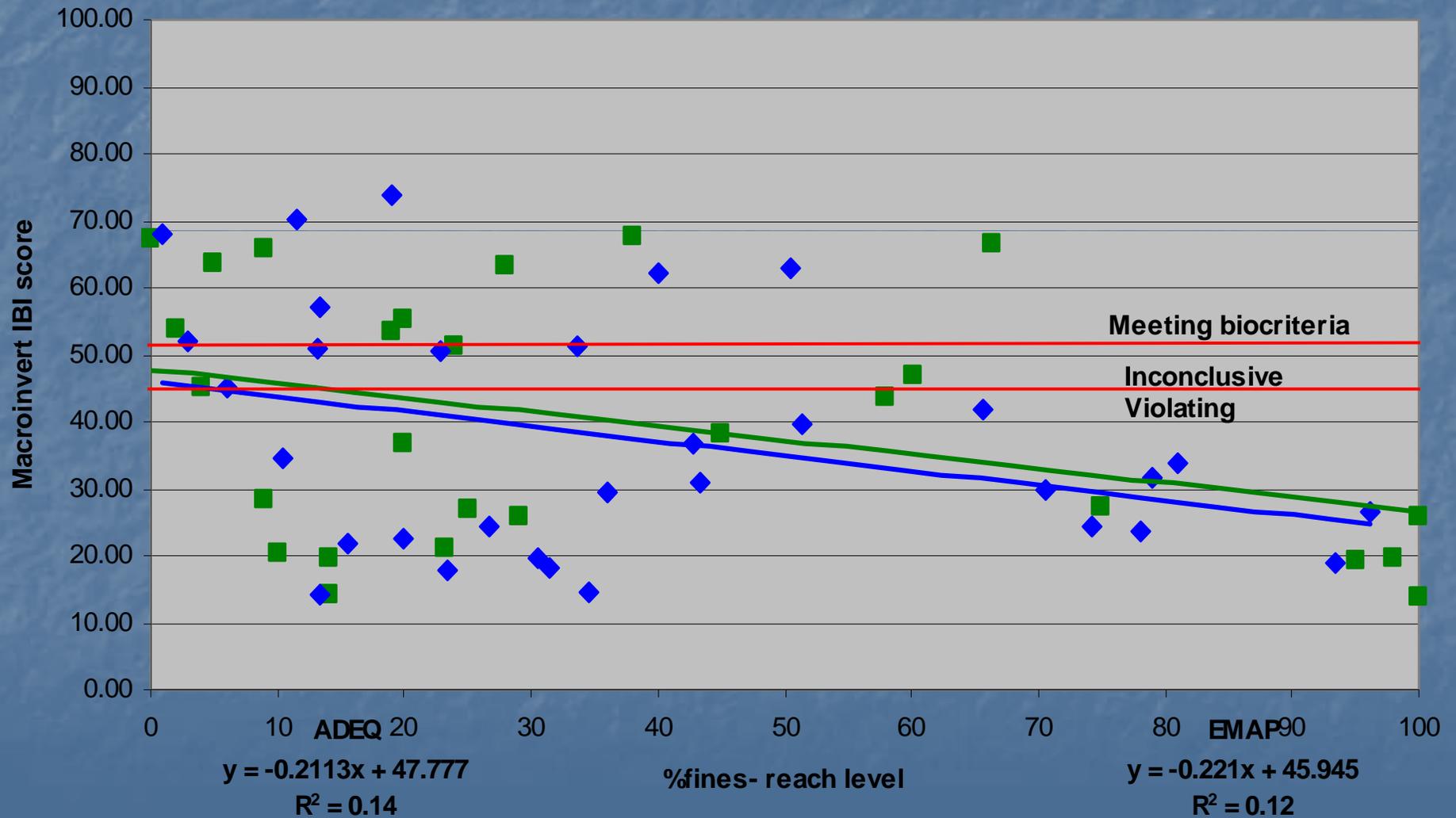
StationID	ADEQ- IBI	ADEQ Narrative rating	EMAP- IBI	EMAP Narrative Rating	Rosgen Stream type	Reason
LCELR000.13	55.1	Meets	51.0	Inconclusive	C	MARGINAL DIFF
LCHAL010.20	52.7	Meets	50.4	Inconclusive	B	MARGINAL DIFF
LCMIN018.05	53.6	Meets	51.1	Inconclusive	B	MARGINAL DIFF
LCLVL001.32	66.5	Meets	41.9	Violates	E	NOT EXPLAINED
LCMLK001.18	46.7	Inconclusive	39.5	Violates	B	LOW % RIFFLE= 37%
LCHAL004.59	51.3	Inconclusive	52.2	Meets	B	MARGINAL DIFF

Habitat Attributes also Correlated

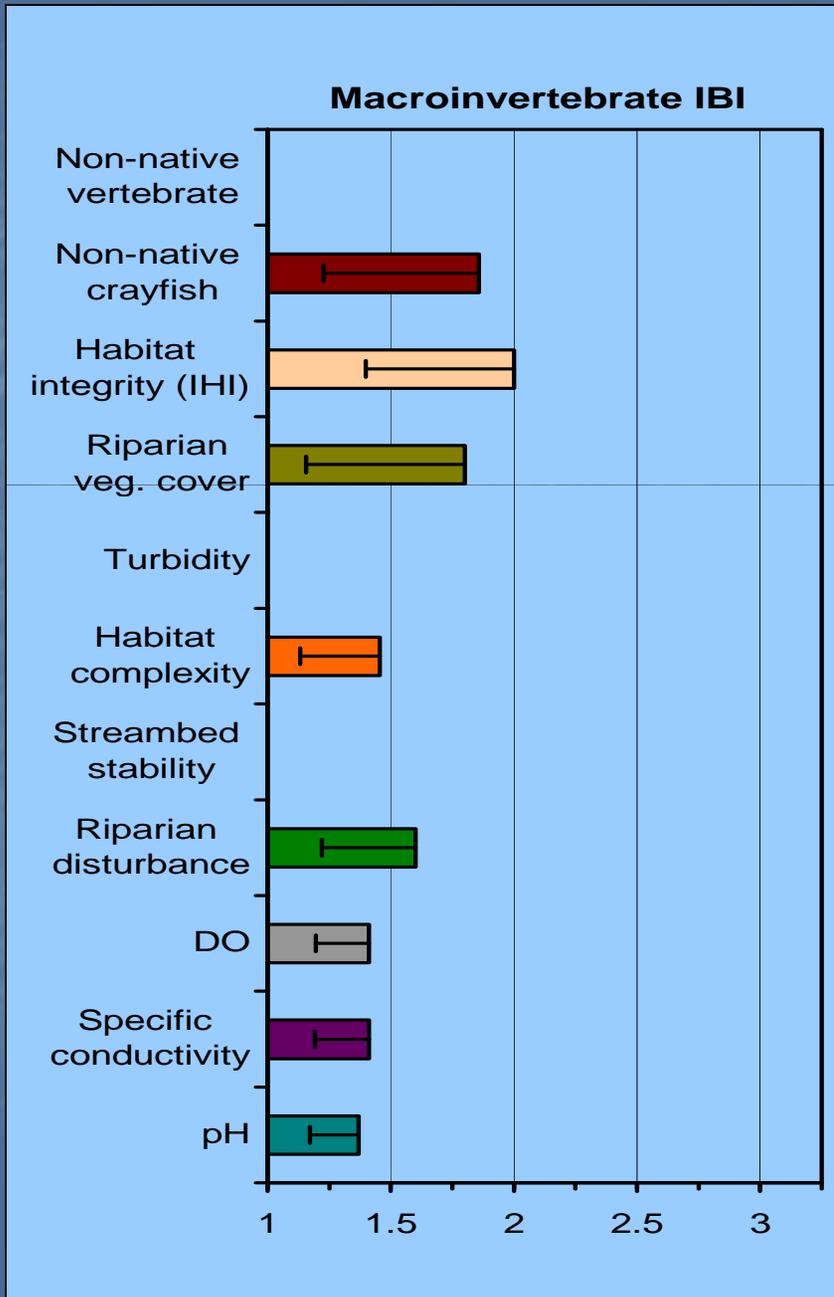
- Reach-wide % fines (+ EMAP)
- Embeddedness in riffles (+ ADEQ)
- Reach median particle size (D50) (+ ADEQ)
- Pool, percent of reach (+ EMAP)
- Riffle, percent of reach (+ ADEQ)
- Habitat index score (+ ADEQ)
- Canopy, percent cover (+ EMAP)

- Overall 13/16 habitat attributes were significantly correlated

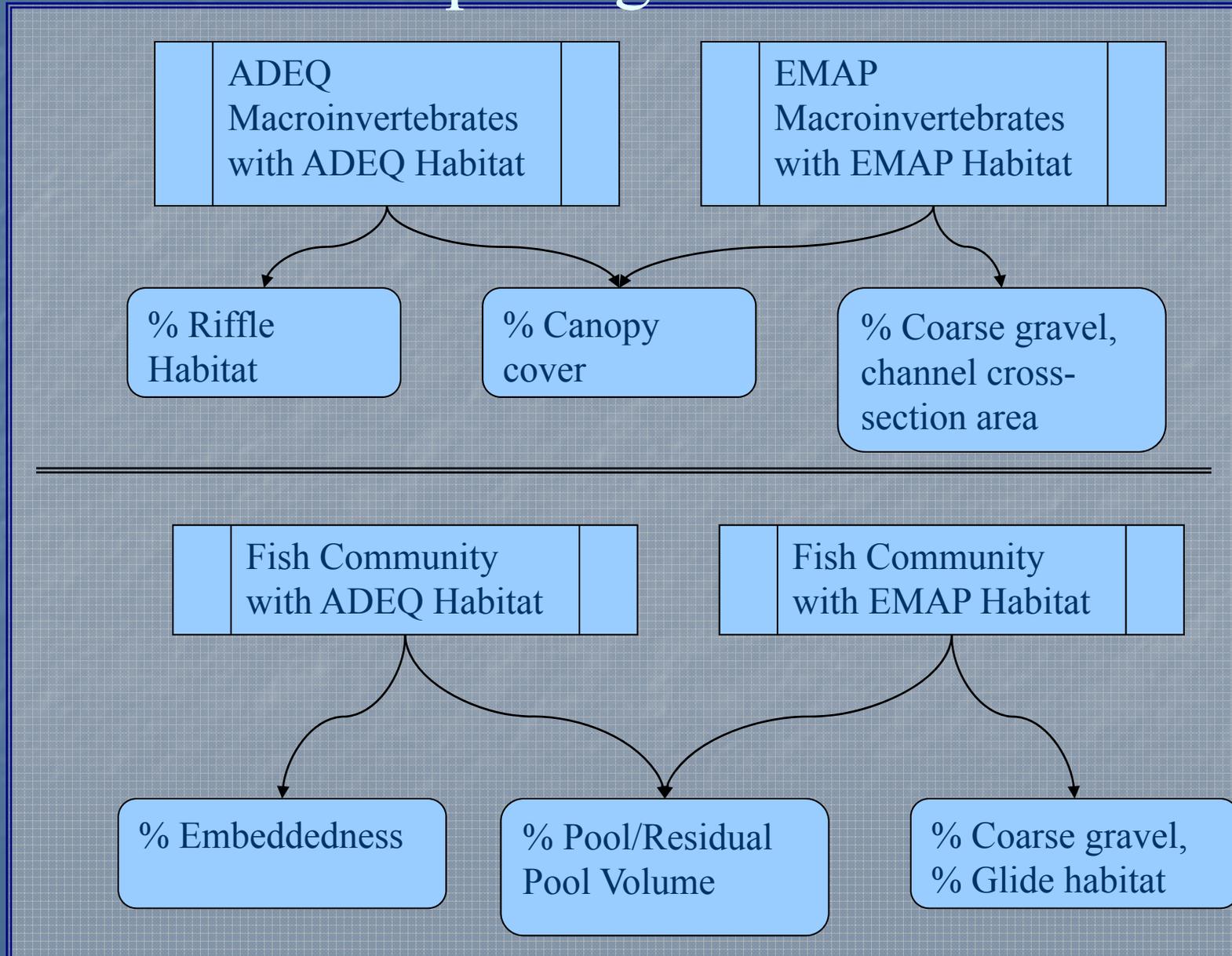
Impaired samples >60%, Percent fines (<2mm) not correlated to IBI Score



Relative Risk of Stressors to Biota



Habitat parameters selected by DFA/multiple regression models



Conclusions

- ADEQ and EMAP Macroinvertebrate & habitat collection methods are significantly correlated & comparable in AZ coldwater streams.
- Differences in IBI scores were generally small and near the biocriteria thresholds
- The two datasets can be used together for analysis purposes or used interchangeably in ADEQ or USEPA assessments in AZ coldwater streams.

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- ADEQ staff who put their blood, sweat & tears into the fieldwork to collect the data and the officework to understand and analyze the data