Comparable Biological Assessments from Different Methods and Analyses

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- Why needed? With varied CA programs, started at different times, and differing agency support, objectives, and regional coverages > can they be compared?
- What was done? Side-by-side comparisons of methods differing at field, lab and analytical steps: contrast data, metrics, endpoints, and assessed impairment
- What we found out: Similar performance, and where slight differences existed, final assessments still in agreement
- How we applied the results: Adopt standard method, and integrate assessments using different analytical tools and data sources when available

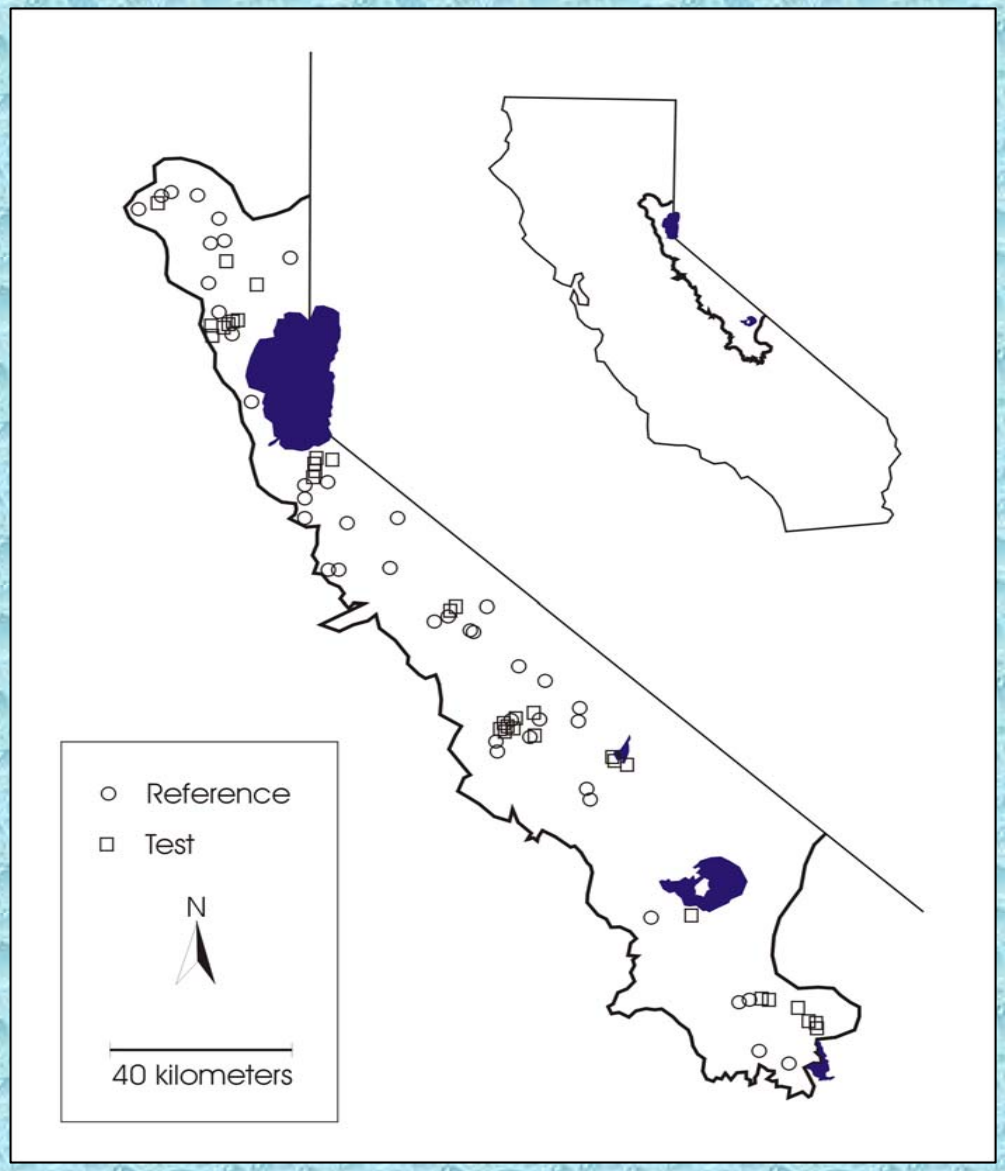
Contrast of Methods

PROTOCOL	UC-SNARL Lahontan	CSBP Dept. Fish & Game	R5.USFS-USU Forest Service
Net type & mesh	D-frame, 250 μM	D-frame, 500 μM	D-frame, 500 μM
Replication	5 composites of 3	3 composites of 3	1 composite of 8
Area sampled	1.39 m^2 (1x1)	1.67 m^2 (1x2)	0.74 m^2 (1x1)
Subsampling	Drum splitter	Grid Tray	Grid Tray
Enumeration	250-500 count [>1500 total]	300 fixed count [900 total]	500 fixed count [500 total]
Taxonomic Resolution	Genus / species (<u>including midges and mites</u>) plus large & rare	Genus / species (midges / mites to subfamily / family) plus large & rare	Genus / species (<u>including midges and mites</u>) plus large & rare

Region & Setting
Eastern Sierra Nevada

40 streams: 1st to 4th order
6000-9000 ft elevation
[drawn from a larger survey data set of >250 sites]

Impact sources: Sediment
- Livestock grazing
- Channel alteration



Flow Chart of Study

1. Reference Selection:

<0.2 Rd xings/km and/or
<25% Bank erosion
with no pollution source

YES → **Reference 24**

NO → **Test 16**

2. Concurrent collection of field data and laboratory processing

CSBP

SNARL

USFS

Community similarity
Metric similarity & precision
Endpoint similarity & precision
Assessment agreement

3. Analysis

Metric screening and selection
>optimal IBI developed

RIVPACS (site groups, taxa associations, etc)
>optimal O/E models developed

SNARL-IBI

CSBP-IBI ↔ USFS-IBI

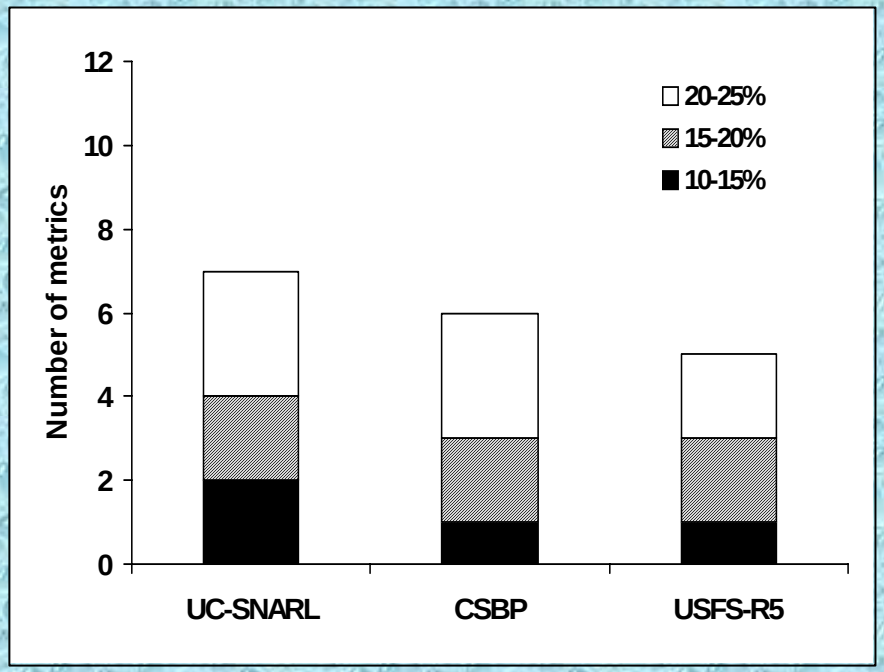
SNARL-O/E

CSBP-O/E ↔ USFS-O/E

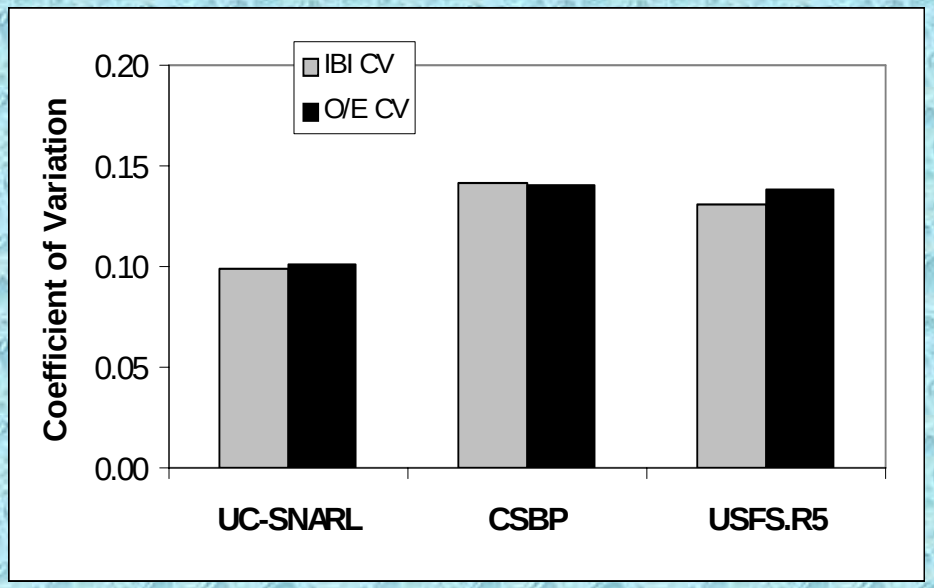
cross-comparisons

Precision Differences:

- Though the SNARL method exhibits slightly better metric performance at DQOs of 10-25%, the IBIs and O/Es endpoints are all below DQO of 15% (based on reference data set)



Metrics Used for IBIs



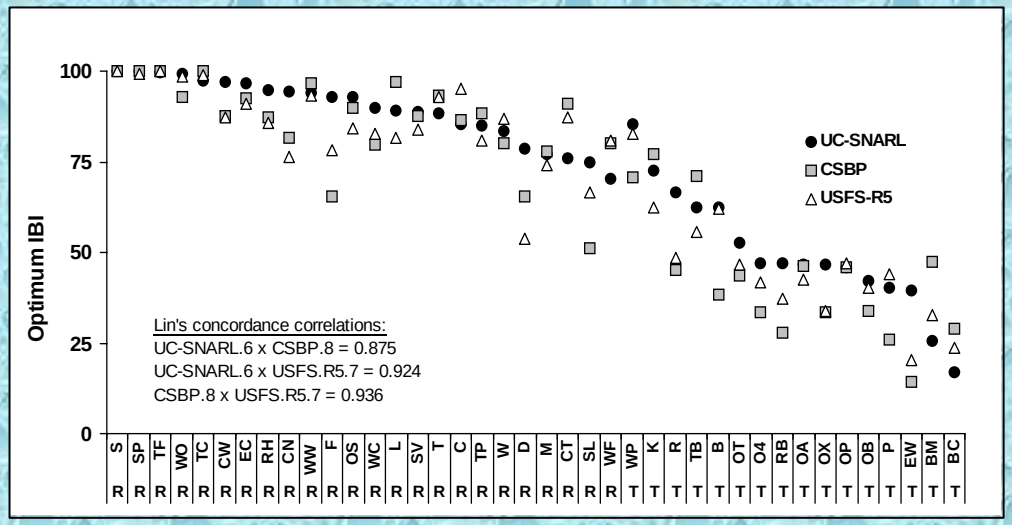
IBI and RIVPACS models

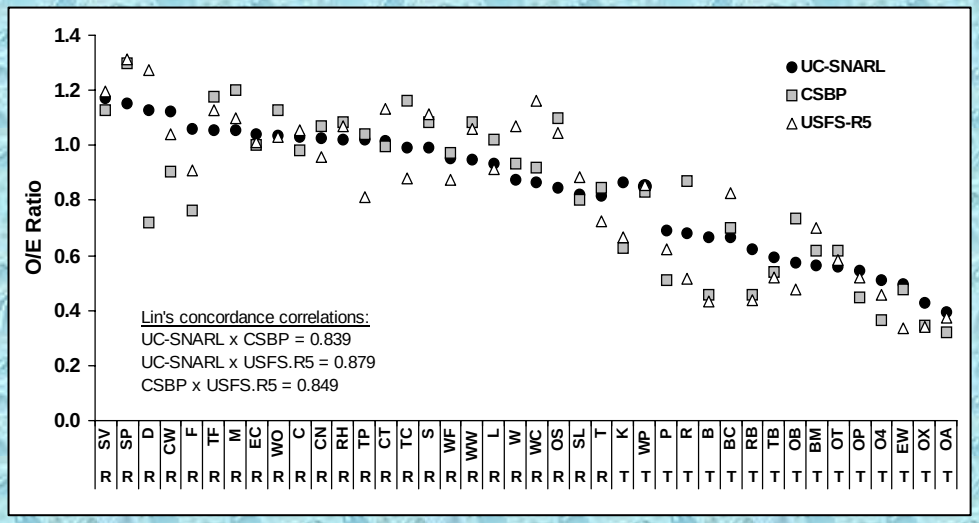
Correlations of IBI and O/E Scores Among Methods

- **Scores highly correlated among methods: concordance correlations of 0.88-0.92 IBIs, and 0.84-0.88 O/Es**
- **Close agreement in assessments among methods in most cases**

Most site scores from different methods are directly interchangeable and their correspondence can be further improved by:

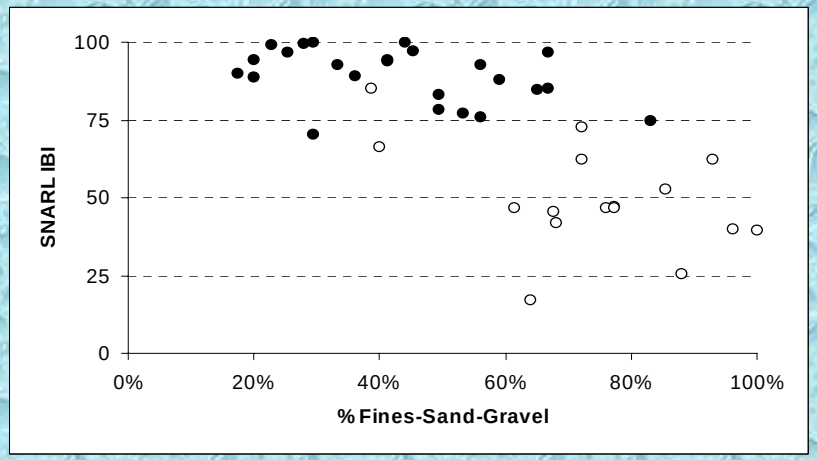
1. **Converting all data sets to fixed 500 count (re-sampling)**
2. **Use of the same metric sets for calculation of IBIs**

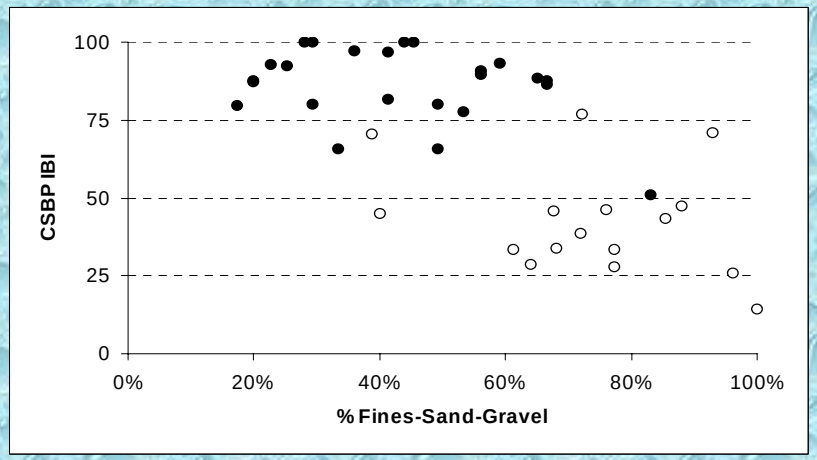


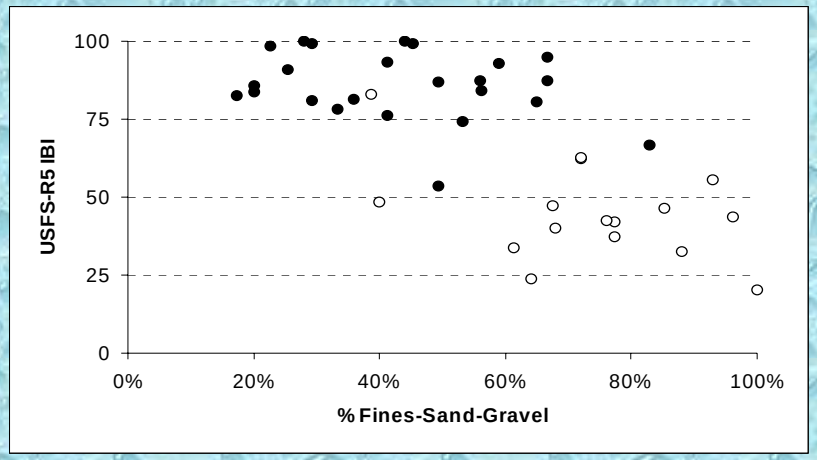


Stressor Detection?

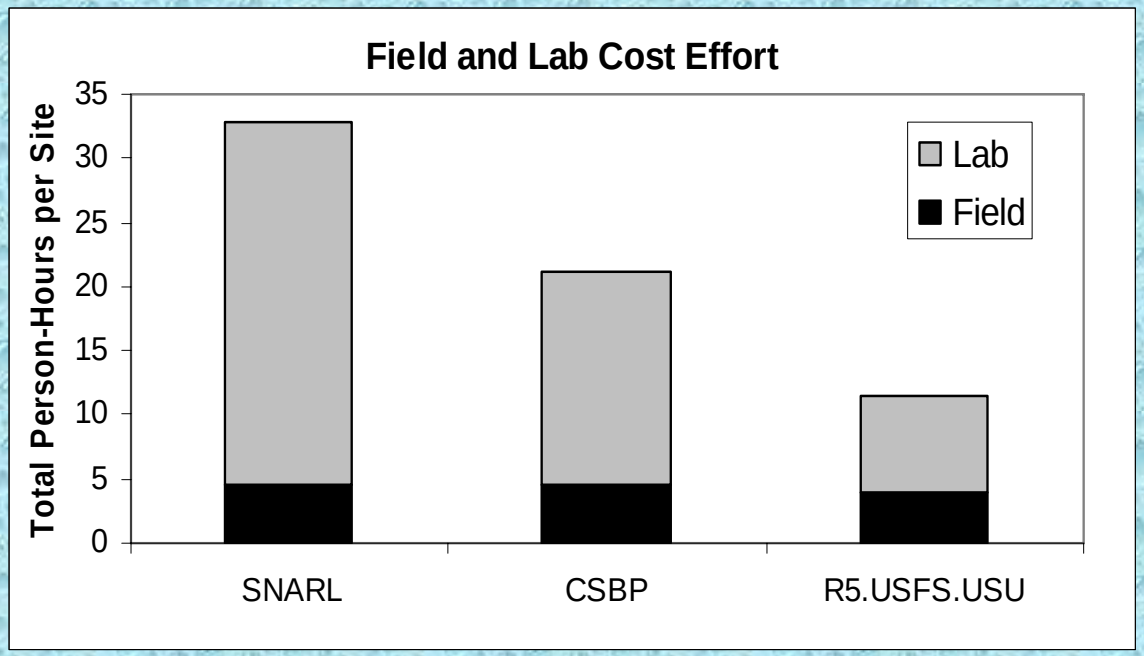
Similar responses to increased sediment deposition effects, with slightly better resolution by UC-SNARL method of threshold at just over 60% FSG, and less overlap between reference and test groups







How do methods compare in terms of cost?



- SNARL method with 5 replicate riffle samples taken per site is about 1.5X the cost-effort of CSBP and 3X that of the single R5.USFS.USU targeted riffle composite sample

Assessment of Impairment

- **Relative measure of accuracy among methods: assume test sites are impaired**
- **How many tests are not detected (type II error) as the type I error is relaxed (low scoring references rejected)?**
  - **Threshold: at 4th of 24 references (4/24 =17% type I error)**
  - **Result: each method detects all but one test site using both IBI and O/E criteria (type II =1/16 =6%)**
- **To what extent are methods in agreement for impairment detected and references retained?**
- **= 83-93% site assessments agree in being judged as impaired vs. unimpaired**

CONCLUSIONS:

- Different methods show similar performance characteristics and assessment scores
- Results had high correlation, were independent of multimetric or multivariate analysis, and showed similar accuracy in discriminating reference from test
- Methods are easily calibrated and converted from existing data sets (SNARL to TRC by 500 fixed-count re-sampling)
- Data sets from alternative methods offer opportunity for cross-confirmation, increased certainty in assessment, and multiple lines of evidence in identifying impacts and stressor thresholds