Science Panel Response

April 19, 2012

You Have 5 Issues

- Model Selection
- Eveness correction
- Reference Pool Restriction
- Threshold selection
  - uncertainty
- Antidegradation

Observed/ Expected Indices

*Developed in UK (Wright and others 1970s-1980s, RIvPACS)
– now widely used worldwide*

Species-based approach: Compare number of **observed** ("O") taxa to number of **expected** ("E") taxa

"Expected" taxa at a test site are modeled using predictive modeling techniques

Compare test site to subsets of the reference sites that are physically similar to the test site *(geology, climate, elevation, latitude, etc.)*

Index score is a direct measure of taxonomic loss

Observed Over Expected Models

- O/E models can be very effective scoring tools
  - Science Team did a great job at building an effective model

- Science Team needs to prepare a clear explanation of this model for lay audiences
  - Have transparent and reproducible technical support

- Panel recommends exploring correction to address issue of potential mathematical artifacts that could bias model

- We recommend that a modeled multi-metric index is worth exploring

Scoring Tool Performance Measures

1. <u>Applicability</u> – the extent of the stream population that can be scored accurately with the index

2. <u>Precision</u> – variability of scores for sites considered to be in similar condition (e.g., reference sites)

3. <u>Accuracy</u> – proximity of score to "true" condition

4. <u>Responsiveness</u> – ability to discriminate impaired sites and sensitivity to gradients of stress

5. <u>Repeatability</u> – similarity of scores for repeated measurements

Model Comparisons

1. <u>O/E Old Model</u> - From Hawkins 2005

2. <u>O/E New model</u> – Newly developed model based on our full reference data set

3. <u>O/E Restricted model</u> – Newly developed model based on a smaller, but more restricted reference data set

4. <u>O/E Eveness correction</u> – Same newly developed models, but corrects for uneven abundance
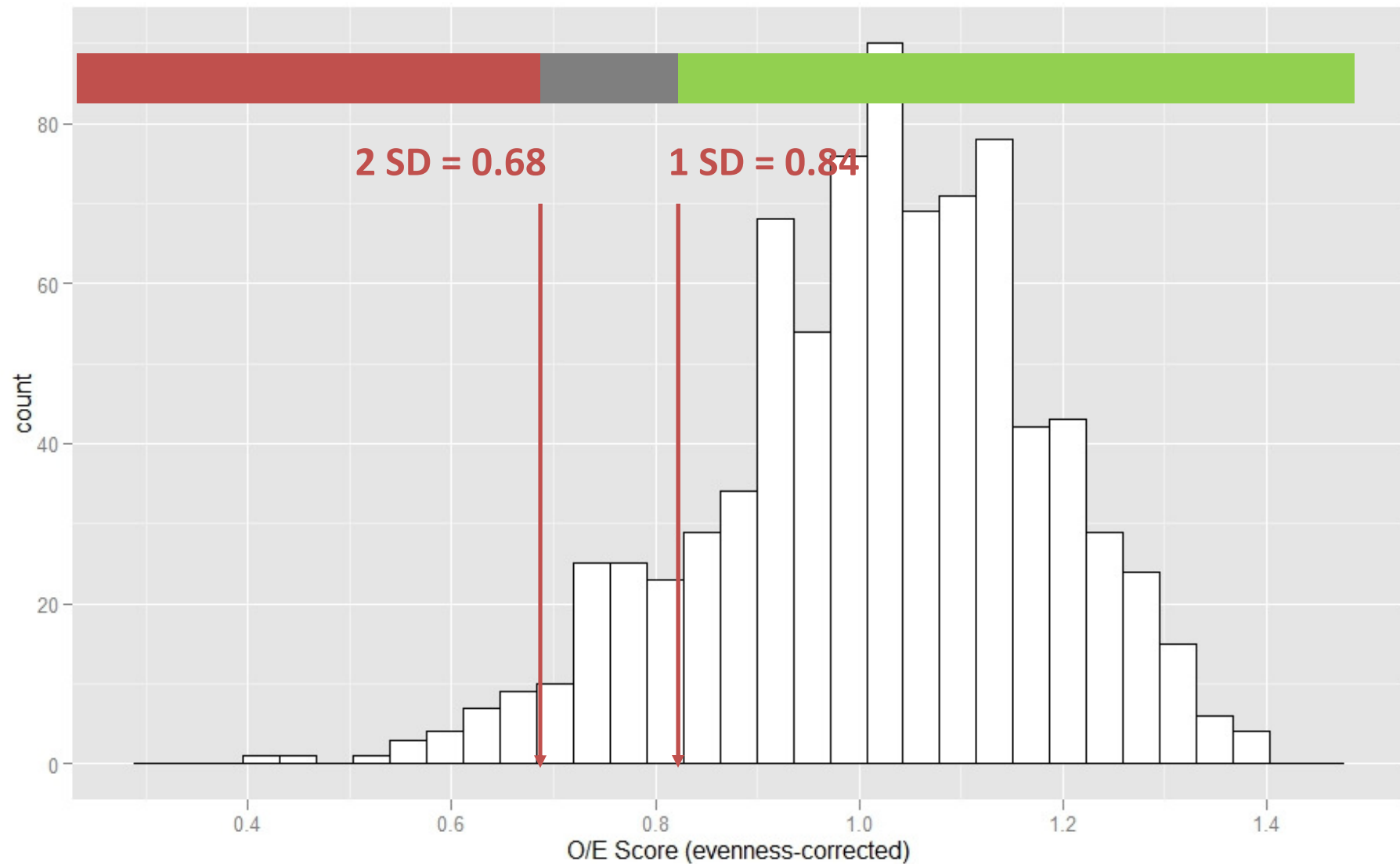
Evenness Correction

- To correct or not correct is an equivocal philosophical approach

- There are some advantages for correction
  - Marginally reduces model variability
  - Focuses the model on concept of "species loss"

- There are some disadvantages
  - May remove some estimate of impact
  - Makes model explanation more difficult

- The Panel's general recommendation is that evenness correction is not required

Reference Pool Restriction

- The Science Team has done a good job setting original reference pool screening criteria

- Model performance is not dramatically different with the restricted reference data set
  - Original reference set likely improves capturing natural gradients

- Recommended specific additional analyses for quantifying potential bias
  - Check O/E scores of removed sites to ensure centered on 1.0
  - Evaluate relationships of O/E of reference sites with anthropogenic stressors

O/E Reference Site Distribution

Threshold Selection and Uncertainty

- No scientific basis for selecting a specific threshold
  - Degree of acceptable biological change is a value judgment

- Either biological or statistical approaches to threshold selection could be used
  - A hybrid approach might be useful

- Interval-equivalence tests can quantify statistical uncertainty
  - Grey area could incorporate both model and sampling variability

Anti-Degradation

- Science Team showed us two approaches
  - Mean condition approach
  - Condition class approach

- Actual site condition can vary considerably within a class

- Challenges for future technical work is creating a definition of initial condition and controlling for potential confounding natural temporal variability and human activities
  - Be aware of small, incremental degradation over time