

Developing the Technical Foundation for Statewide Biological Objectives

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Our Guiding Principles

- **The state should have biological objectives for all waterbody types**
- **The state should use multiple indicators for biological objectives**
- **The state should develop biological objectives with numeric endpoints**
- **There should be statewide consistency with regional flexibility**

A Number Of Scoring Tools Currently Exist in California

- **Regional Index of Biotic Integrity**
- **Statewide predictive models**
 - Observed over expected (O/E)
- **Each has their issues that limits their regulatory application**
 - old, incomplete, and/or not comparable

Steps For Developing a New O/E Tool

- **Reference condition**
 - Sets biological expectation
- **Calibrating and validating the predictive model**
 - How good can we estimate “E”
- **Establishing thresholds**
 - When is “O” different from “E”

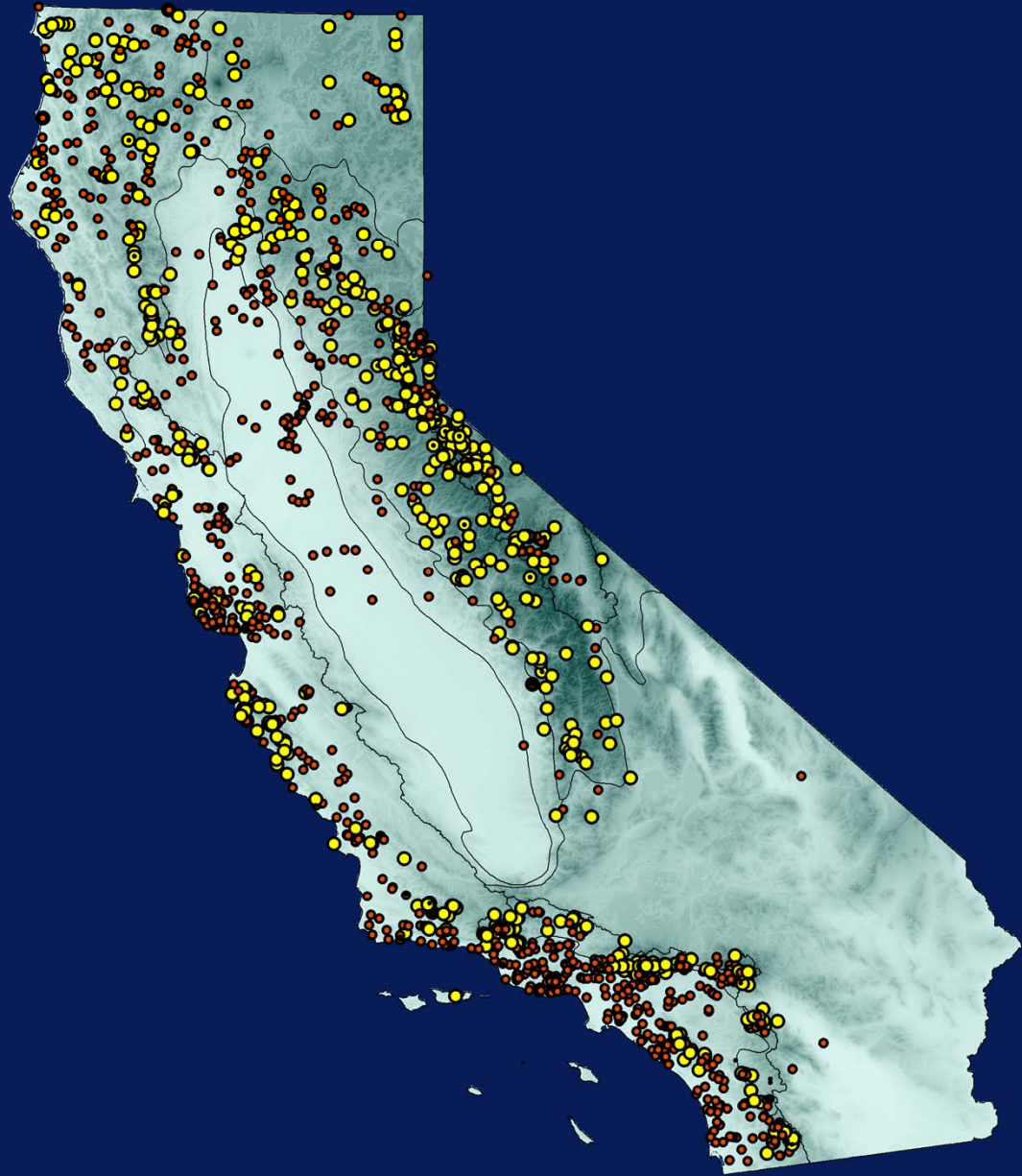
Defining Reference Condition

- **NOT based on biology**
- **Compiled more than a dozen large-scale data sets**
 - Over 1,700 sites statewide
- **Compiled more than 1,200 metrics of disturbance**
 - Landscape scale (GIS data)
 - Site scale (local data)
- **Identify screening levels for each metric**
 - Balance between sufficient representation without allowing impacts (Type I vs. Type II errors)

Our Final Scenario

615 Sites based on 10 metric cutoffs

- % Landscape disturbance
- % Urban
- % Agriculture
- % Development
- Roads (# and density)
- Mines
- Dams
- Nutrients
- Canals/pipelines

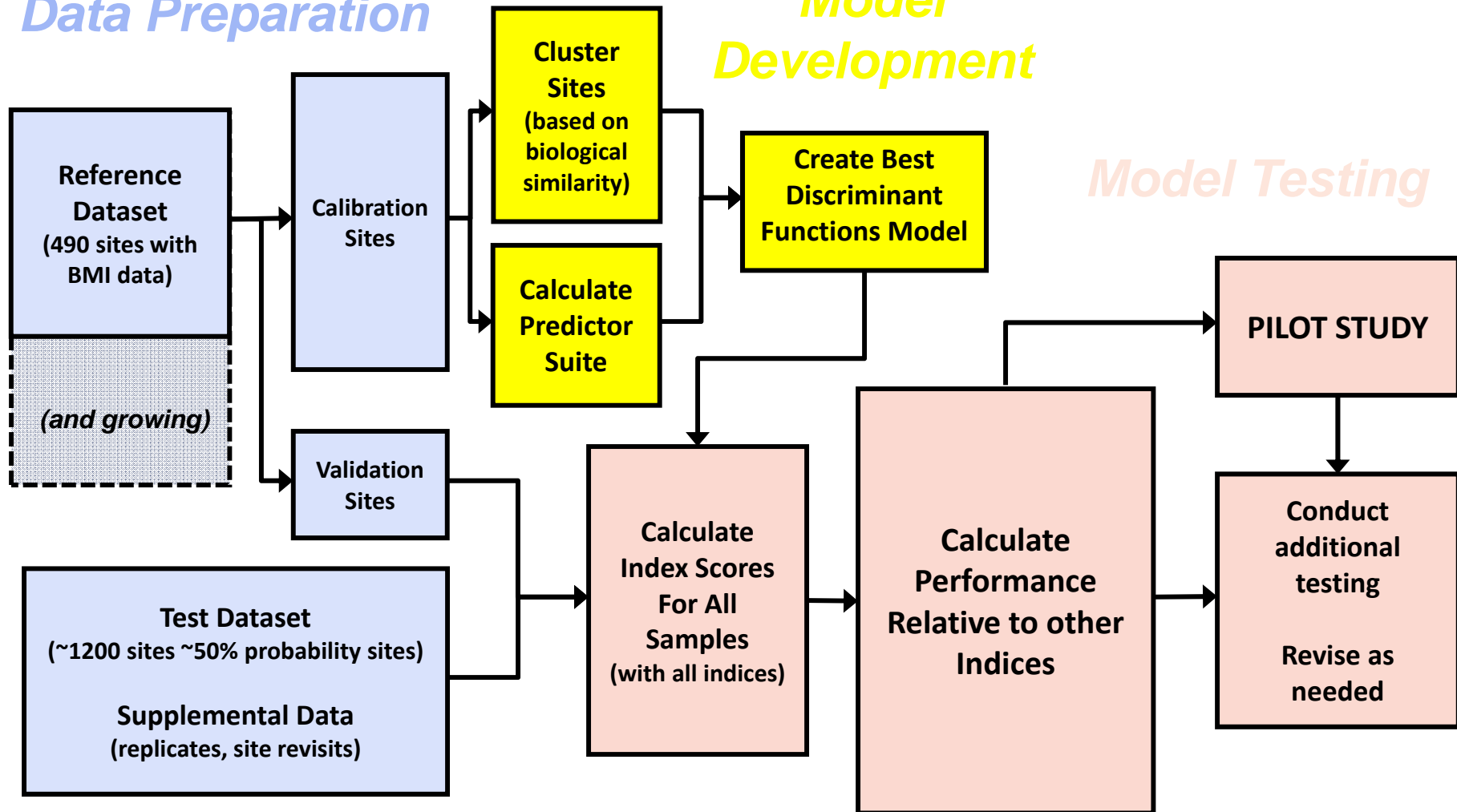


O/E Index Development Process

Data Preparation

Model Development

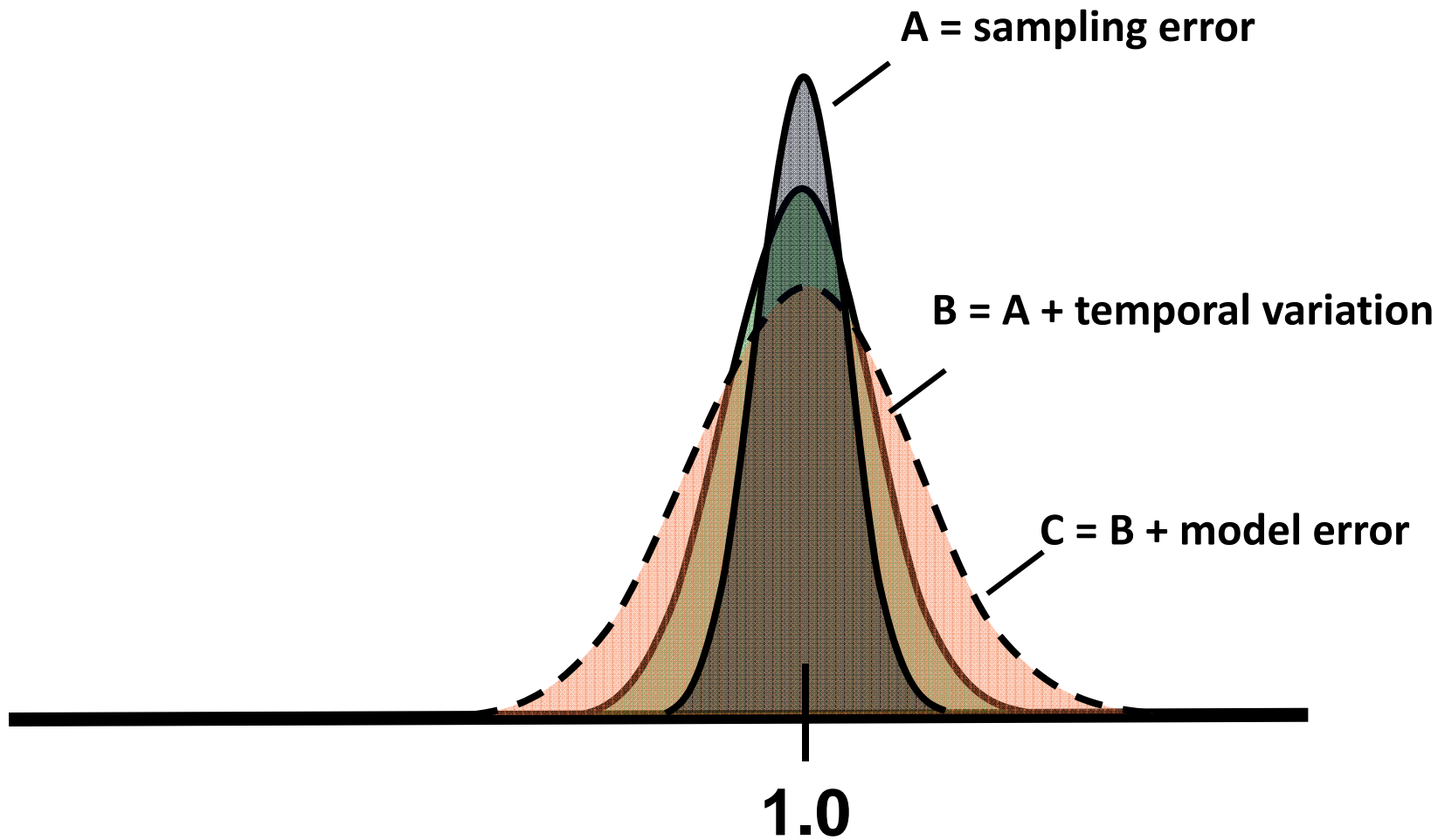
Model Testing



The New O/E Model

- **Based on 5 physical factors, predicts what species should be present at a site (=E)**
 - elevation, precipitation, temperature, watershed area, geology (conductivity)
- **Measure what species actually occur at that site (=O)**
- **The ratio represents the O/E score**
 - Range from 0 to 1, 1 being best

Sources of variation in O/E scores

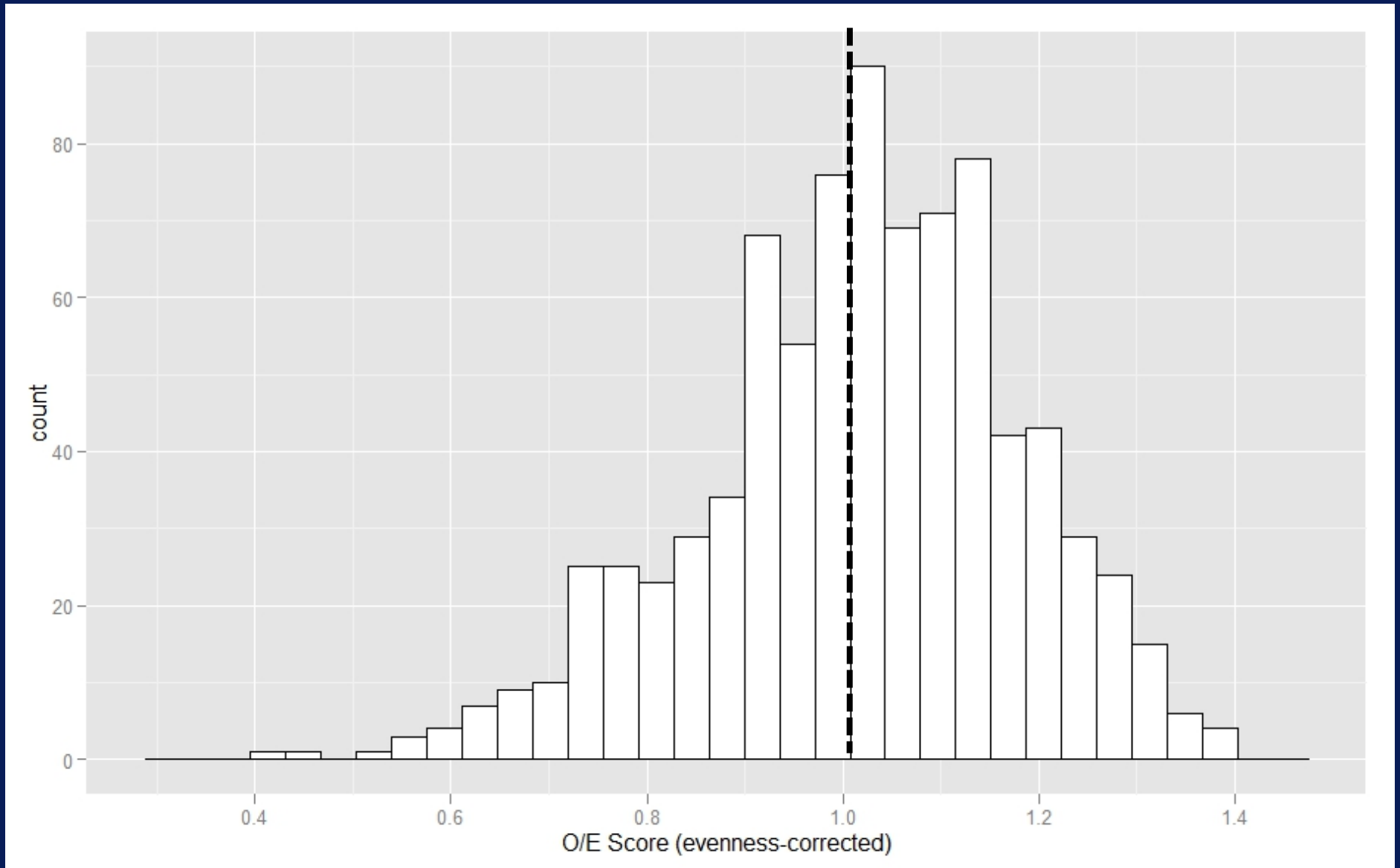


(after Hawkins et al. 2010)

Scoring Tool Performance Measures

1. Applicability – the extent of the stream population that can be scored accurately with the index
2. Precision – variability of scores for sites considered to be in similar condition (e.g., reference sites)
3. Accuracy – proximity of score to “true” condition
4. Responsiveness – ability to discriminate impaired sites and sensitivity to gradients of stress
5. Repeatability – similarity of scores for repeated measurements

California O/E Reference Site Distribution



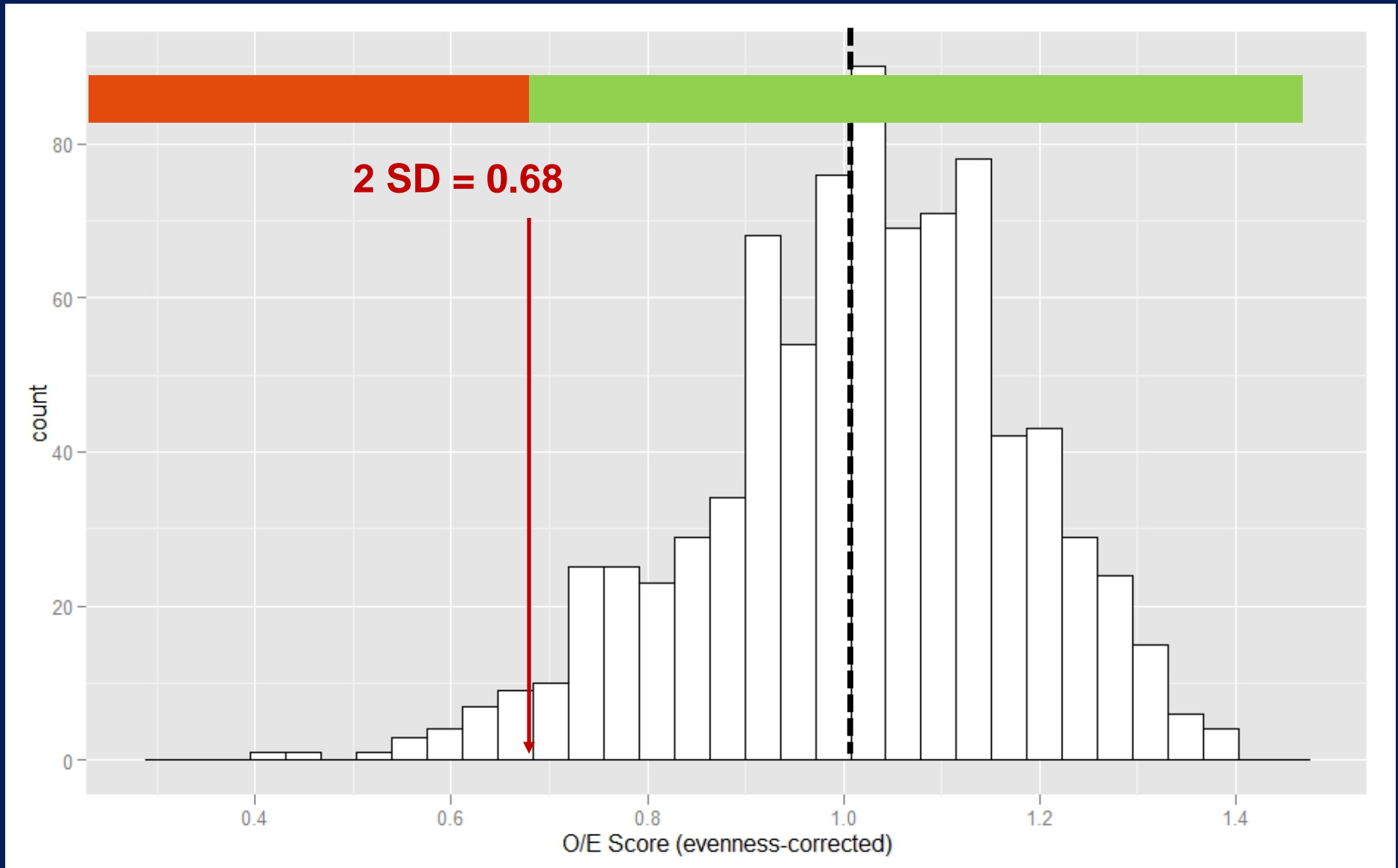
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Threshold Setting Is Not Straightforward

- **Its not completely a technical exercise**
 - There are two basic approaches
- **Based on statistical distributions**
- **Based on ecosystem function**
- **Either way needs to incorporate uncertainty**

California O/E Reference Site Distribution



Our Next Steps

- **Final model refinement**
- **Threshold setting**
 - Exception classes?
- **Causal Assessment**
 - What do you fix when you're out of compliance?