



Scientific basis for biointegrity  
goals:

Reference concepts and the  
Biological Condition Gradient

Webinar for Stakeholder Advisory Group

September 17, 2018

# What is a “biointegrity goal”?

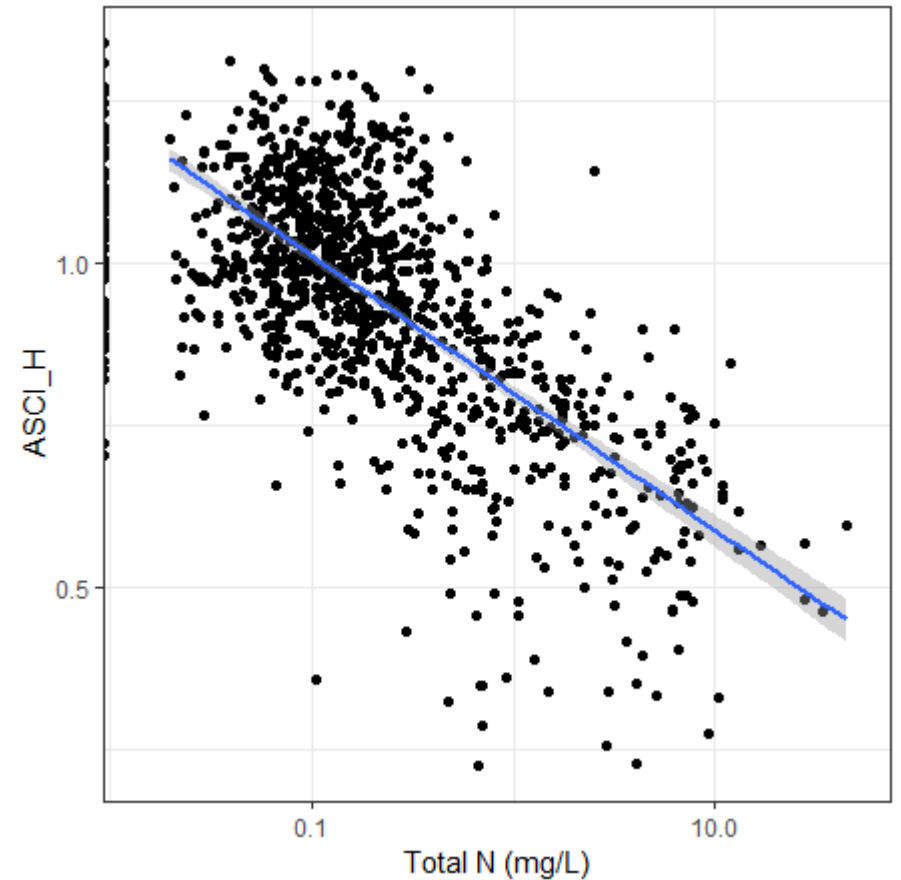
- A “goal” is an ecological state of a stream that corresponds to sufficient support for ALU. Examples:
  - Largely natural
  - Similar to reference
  - No more than a minor loss of diversity
- We can derive numbers and thresholds for biointegrity indices that correspond to these goals
  - Goals may be used to set narrative or numeric objectives
- Depending on needs and context, we can set different goals for different streams
  - WB staff do not intend to set different objectives for constrained streams, but may use other approaches for setting appropriate goals.

# Principles and assumptions

- Bioassessment indices are a direct way to measure support for several aquatic life uses (CLD, WRM, SPWN, and others)
- Multiple measures provide more comprehensive evidence of ALU support
- CSCI and ASCIs are the standard way to measure biointegrity in most California wadeable streams
  - Additional and alternative measures may be appropriate in certain circumstances

# Goals for biointegrity policy... and beyond

- Biointegrity goals needed for biological objectives, assessing management effectiveness, and other activities
- But also needed for setting biostimulatory targets!



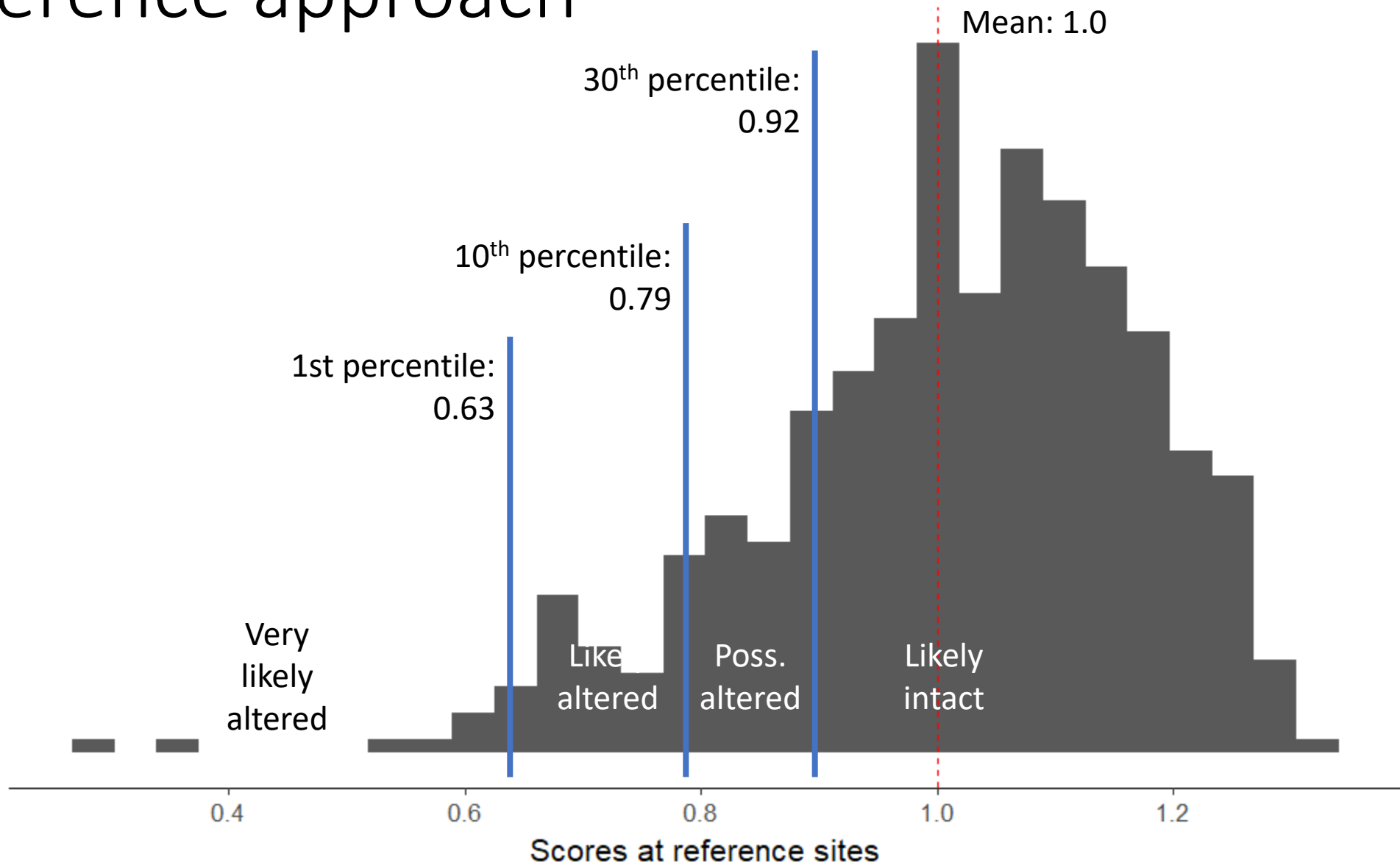
# Two approaches to setting goals for biointegrity

1. Reference variability (percentile of reference)
2. Expert opinion (Biological Condition Gradient, BCG)

# Two approaches to setting goals for biointegrity

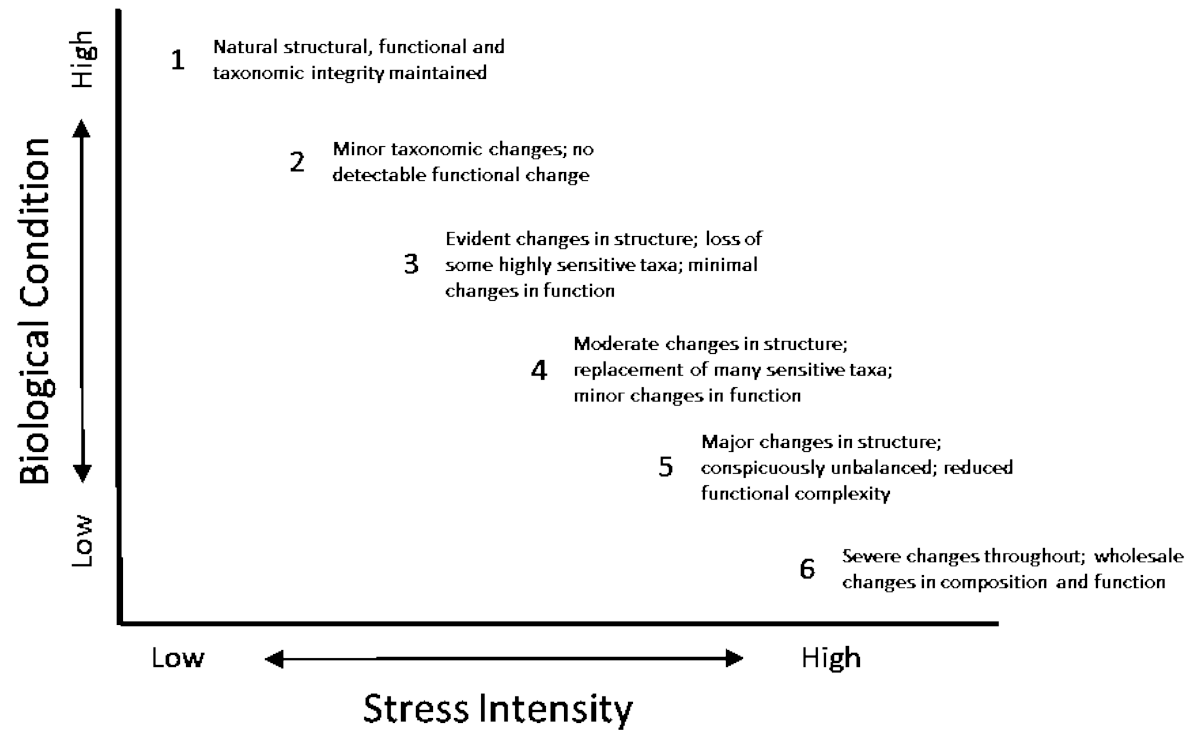
1. Reference variability (percentile of reference)
  - WB staff prefers this approach for setting goals
2. Expert opinion (Biological Condition Gradient, BCG)
  - WB staff want to use the BCG to communicate and interpret scores

# Reference approach



# BCG approach

Standard narratives of condition-classes, adapted to California by panel of experts



Still reference based, but relies on expert opinion rather than statistical calculation of deviation from reference



# BCG approach

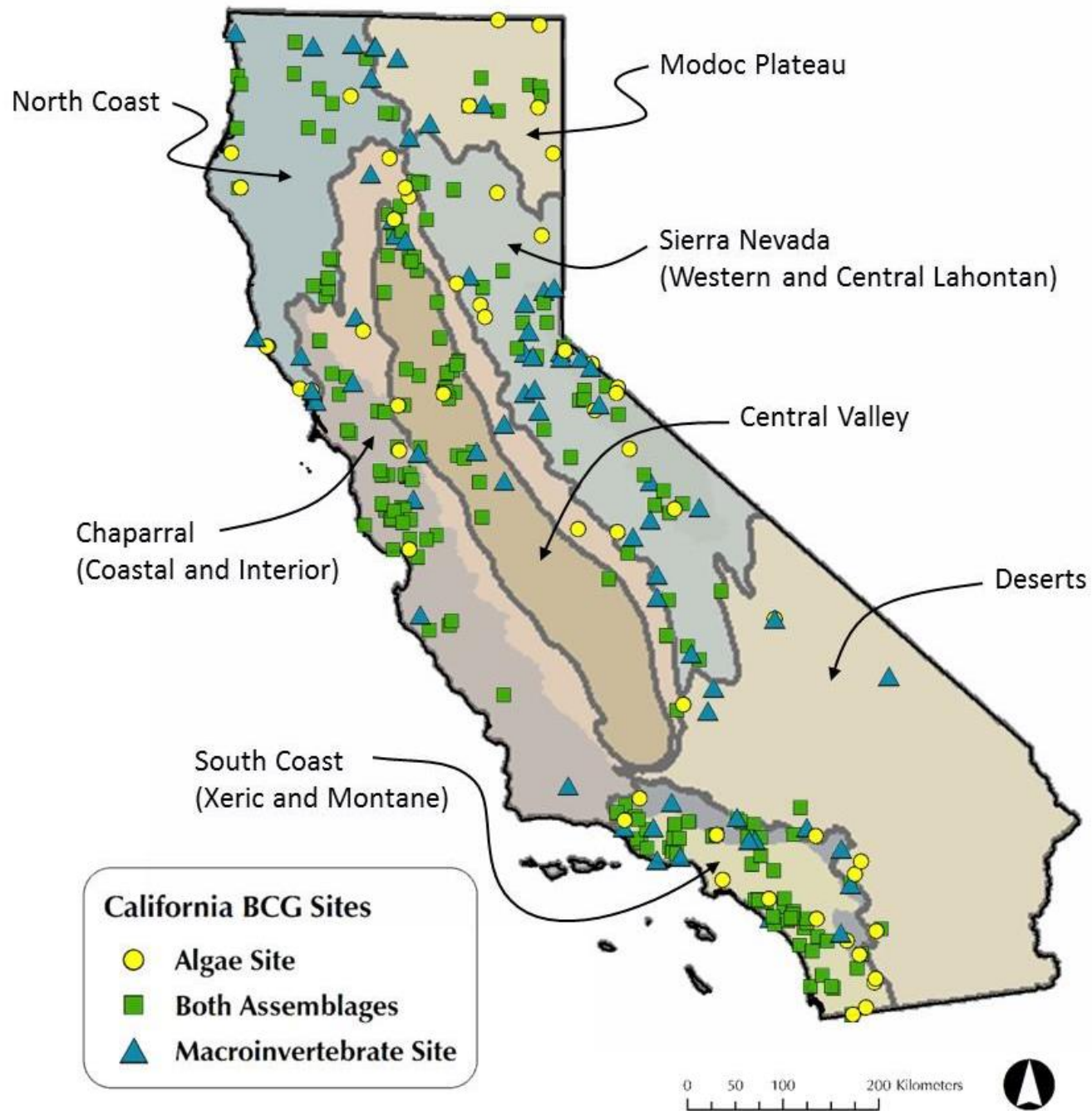
Standard narratives of condition-classes, adapted to California by panel of experts

Bin	Description
1	Natural or native condition
2	Minimal alteration in structure or function
3	Evident changes in structure, minimal loss of function
4	Moderate changes in structure, minor loss of function
5	Moderate changes in structure and function
6	Severe changes in structure and major loss of function

Still reference based, but relies on expert opinion rather than statistical calculation of deviation from reference

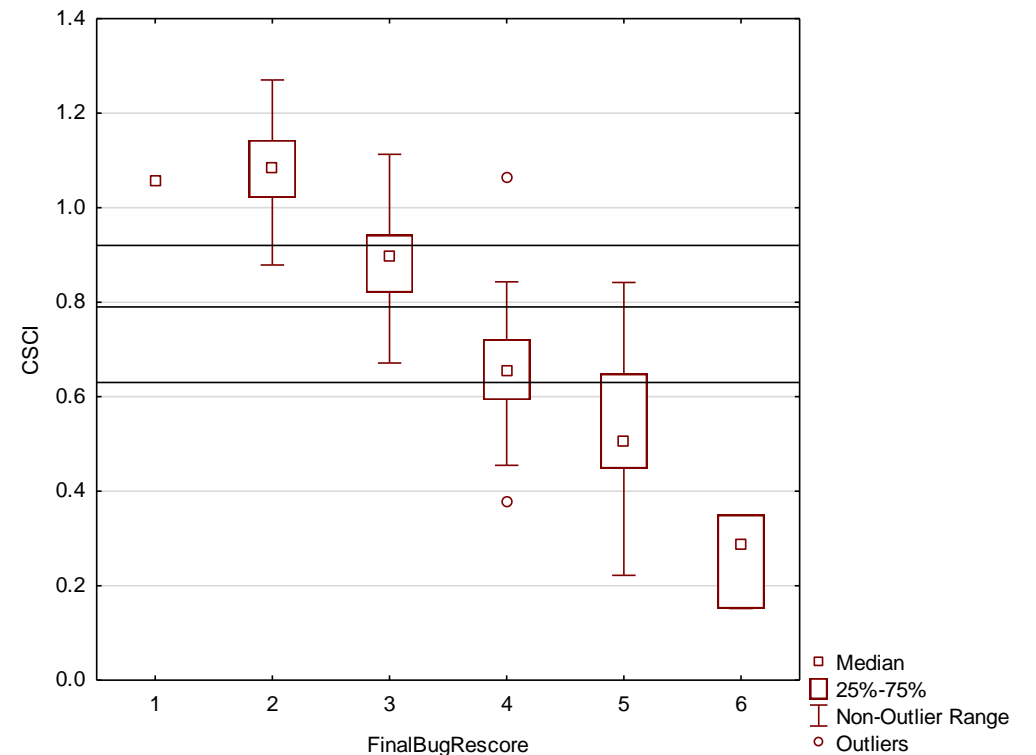
# Process for developing a BCG model

- Assemble panels of expert ecologists (2 panels for bugs, algae)
- Ask panels to adapt national definitions to California
  - Describe biological characteristics of each “bin”
  - Ascribe tolerance values to taxa
- Create a dataset of 250 sites across the state, representing different ecoregions and exposures to stress
- Panels assign sites to bins
- Crosswalk bins to observed index scores (probability-odds models)
- Identify scores associated with high likelihood of bin membership

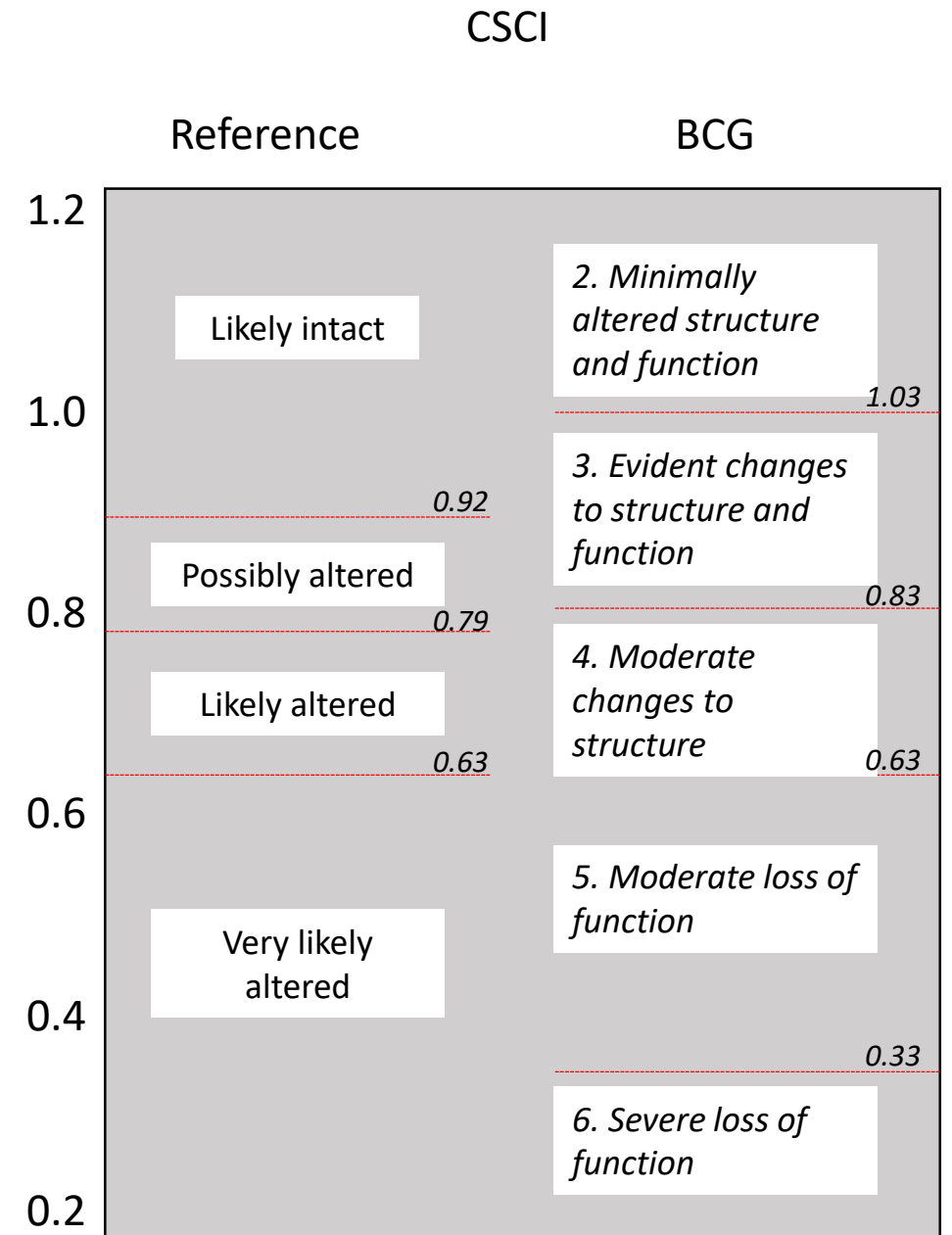
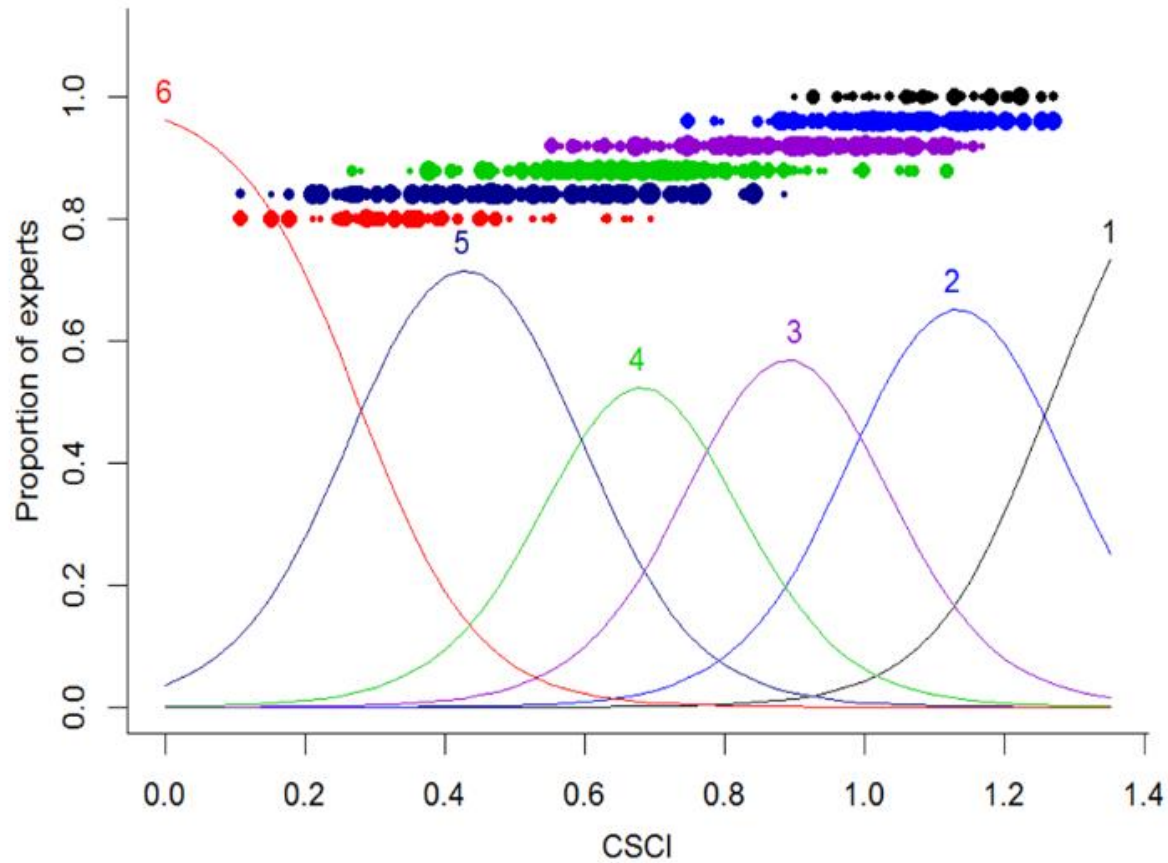


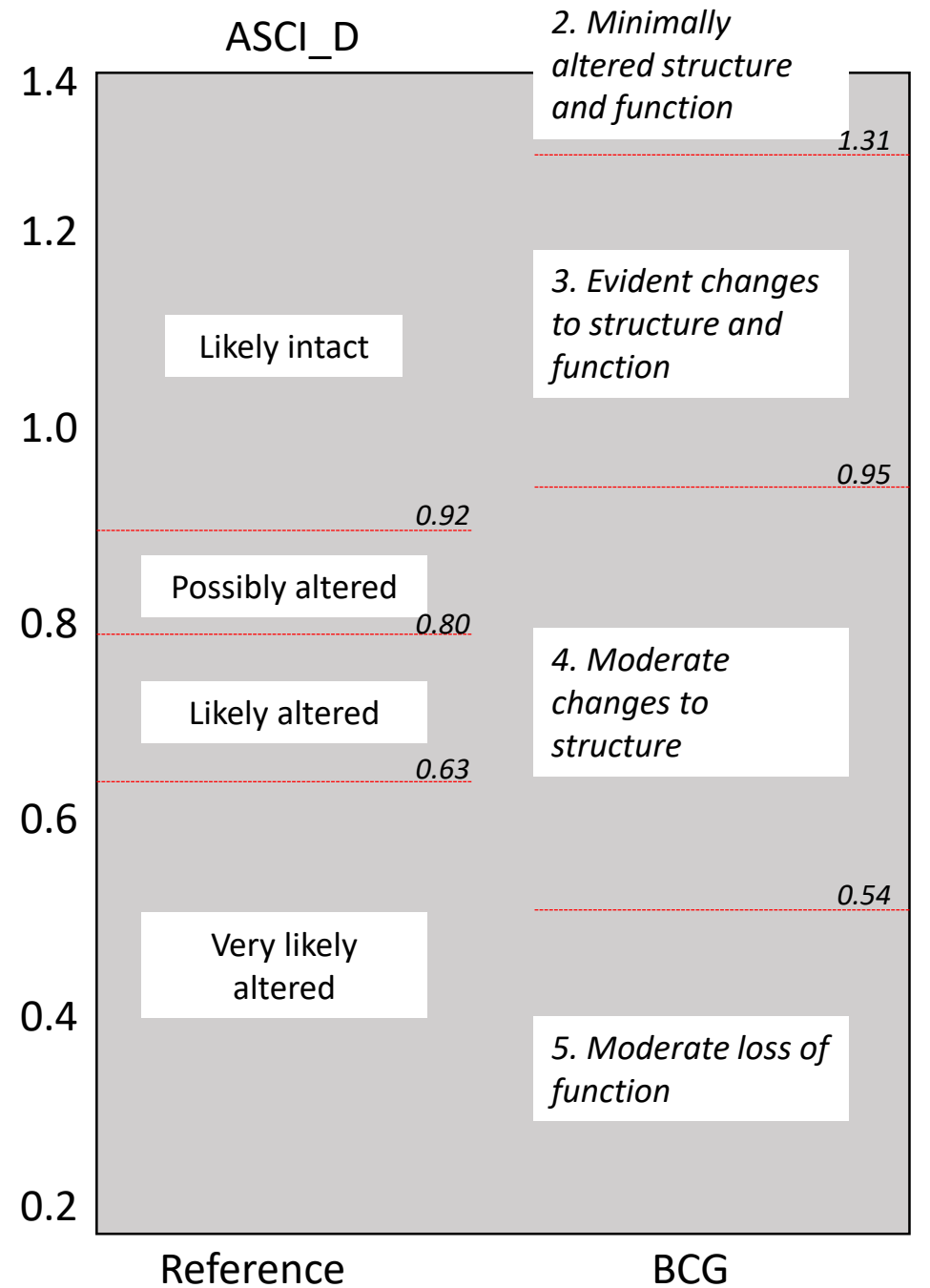
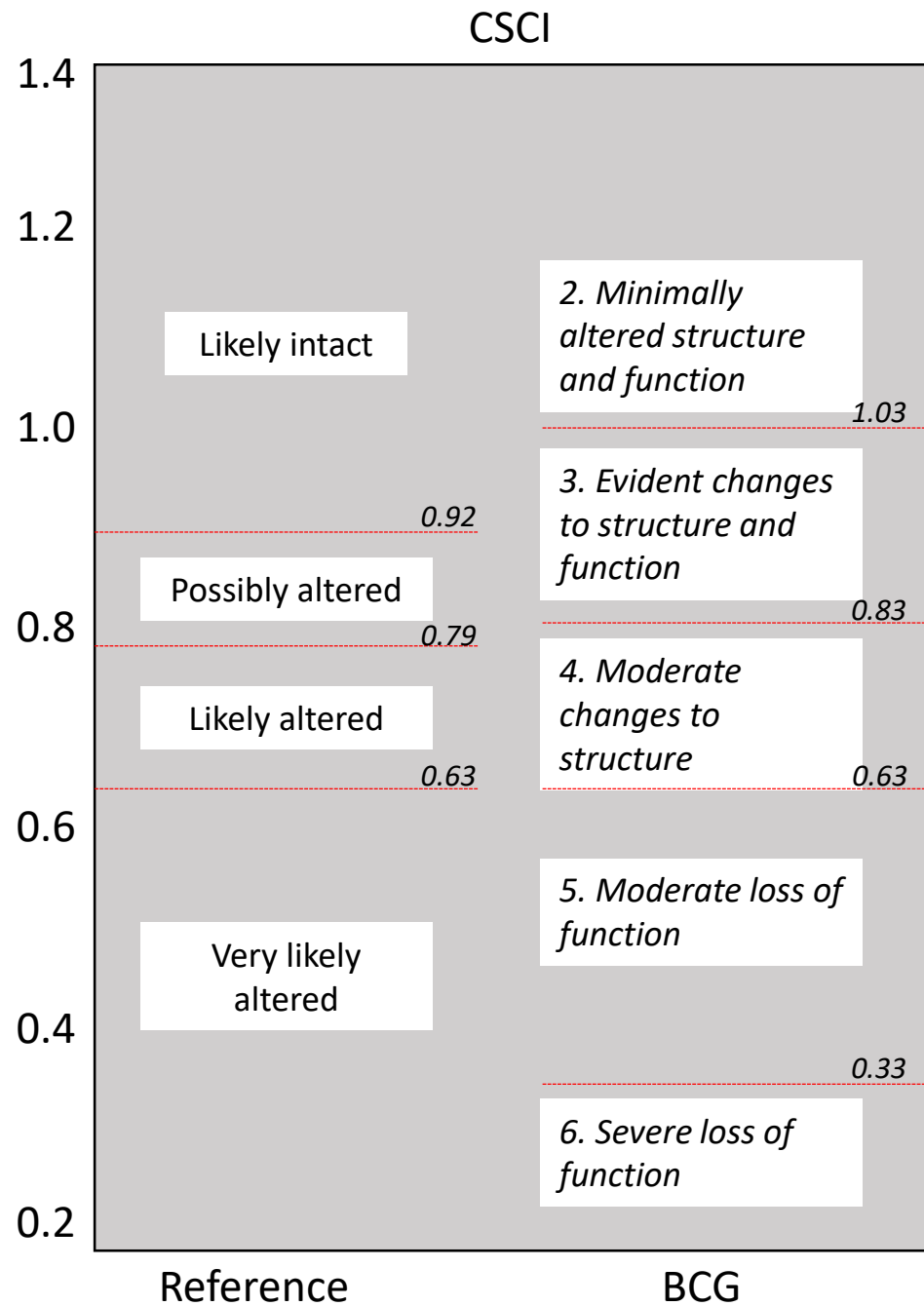
Large statewide development data set

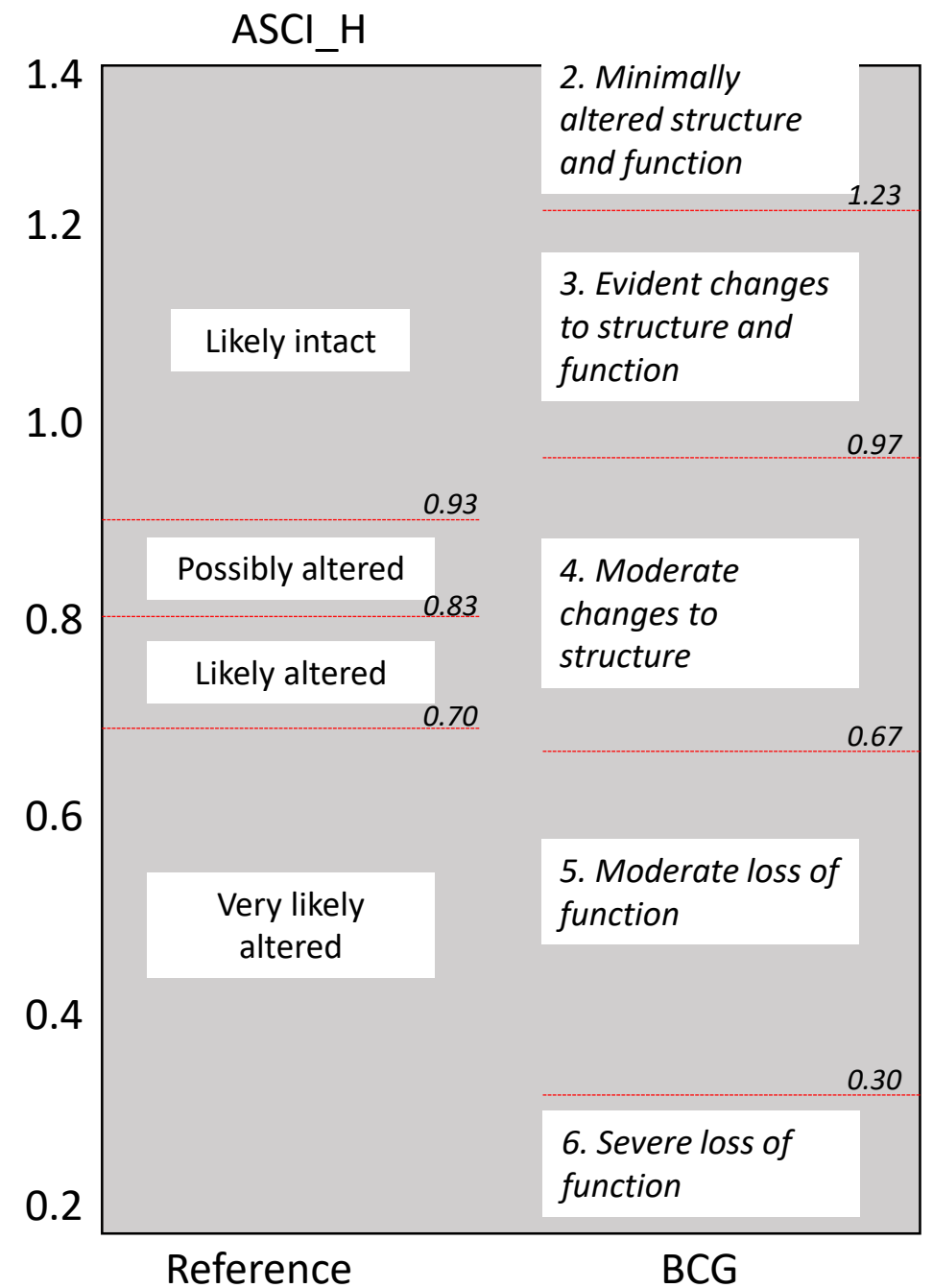
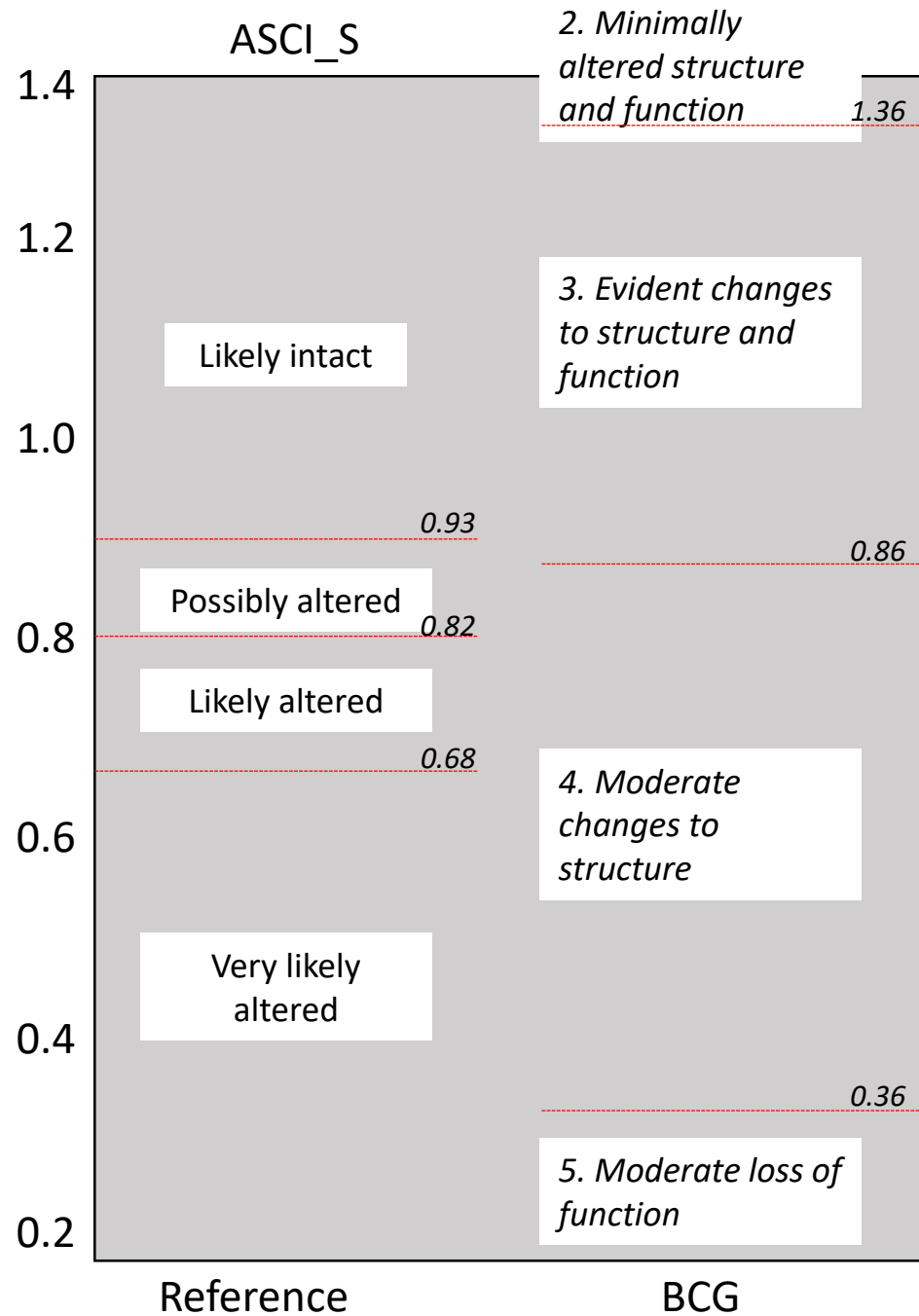
Panels reviewed mostly the same sites (80%)



# BCG: Models crosswalk to ranges of index scores







# Scores associated with goals

Goal	CSCI	ASCI-D	ASCI-S	ASCI-H
Ref-30	0.92	0.92	0.93	0.93
Ref-10	0.79	0.80	0.82	0.83
Ref-01	0.63	0.63	0.68	0.70
BCG2	1.025	1.310	1.360	1.230
BCG3	0.825	0.950	0.860	0.970
BCG4	0.625	0.540	0.360	0.670
BCG5	0.325	NA	NA	0.300

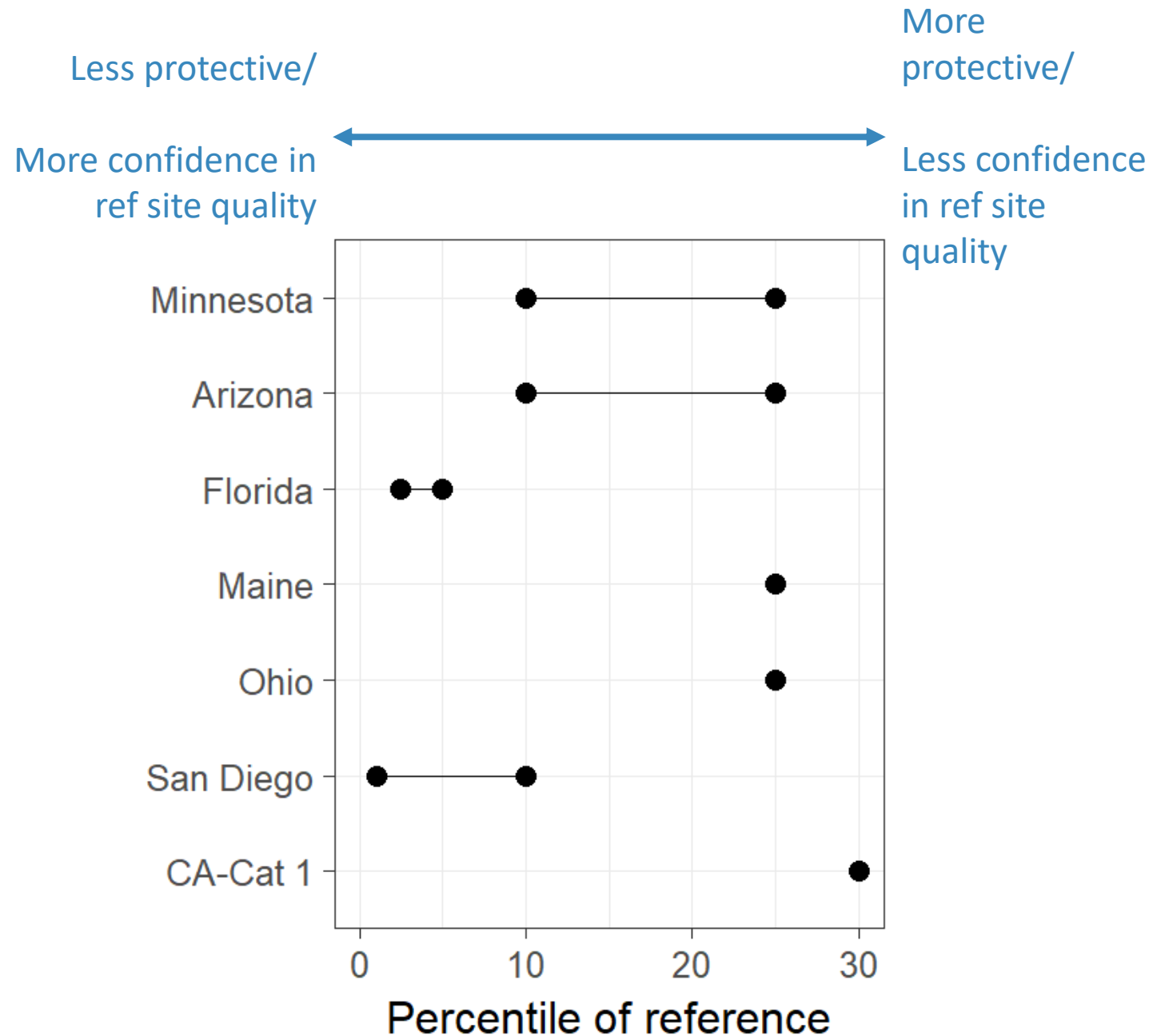
BCG2: Numbers are *really high*

BCG5: Couldn't even model scores for ASCI-D, ASCI-S

BCG3 to BCG4: A very wide interval ASCI-D, ASCI-S (~0.4 to 0.5 points) vs. others (0.3 points)

Both approaches have been used (or evaluated) for bio/nutrient criteria in other states

- Ref proposed for Reg 9's bio-objectives, Category 1 listings
- MN, FL use BCG3 for most streams, BCG4 for modified uses.





# Choices for biostimulatory, biointegrity policies

It's necessary to select a goal for many applications of biointegrity indices. Different goals may be appropriate for different purposes.

- WB staff wants to use reference approach to setting goals, but use BCG to help interpret and communicate meaning of index scores.
- Ref-10 has widespread use already.

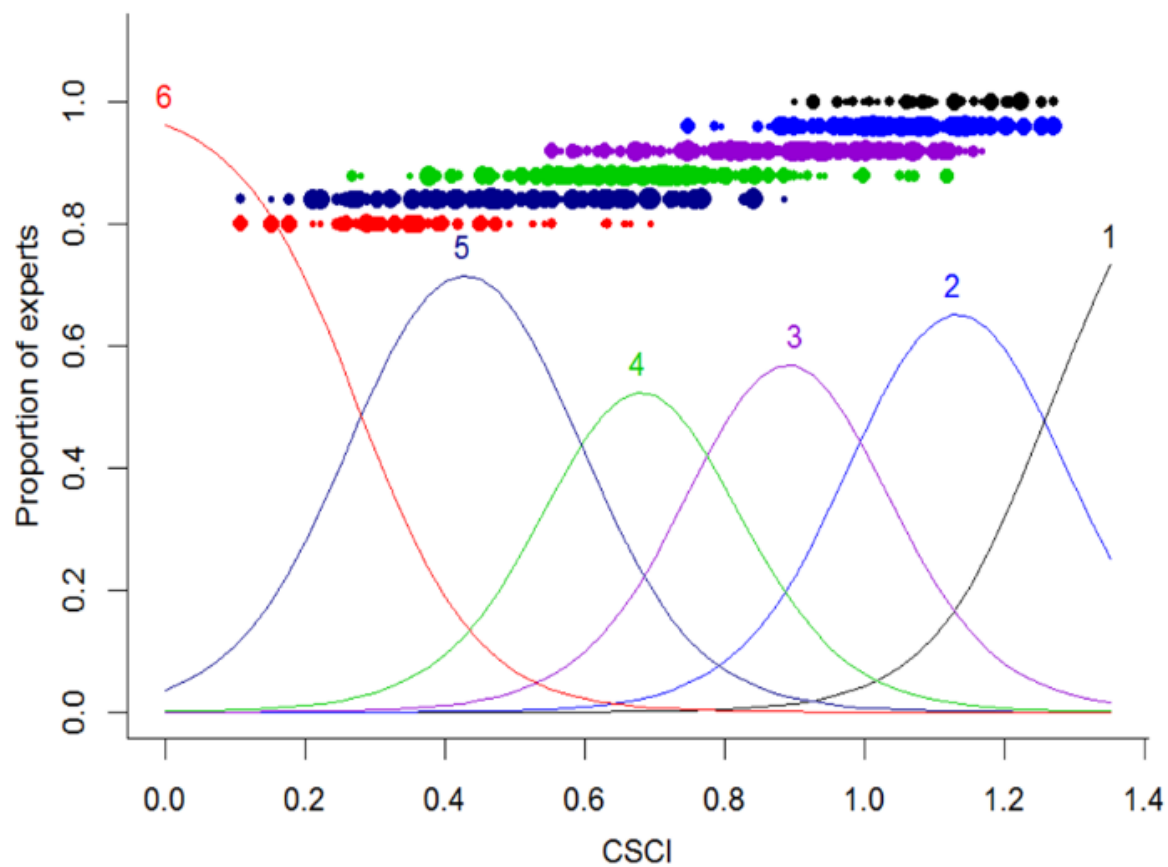
# Current status

- Expert panel has completed data review.
- CSCI model complete. ASCI models being re-tweaked for final version of indices.
- Report/journal article distributed to advisory groups for review by the end of September



# Probability-odds model

## CSCI



## Hybrid ASCI

