

An Advisory Group Guide to Science Products Supporting the Biointegrity and Biostimulatory Policy

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October 26, 2018

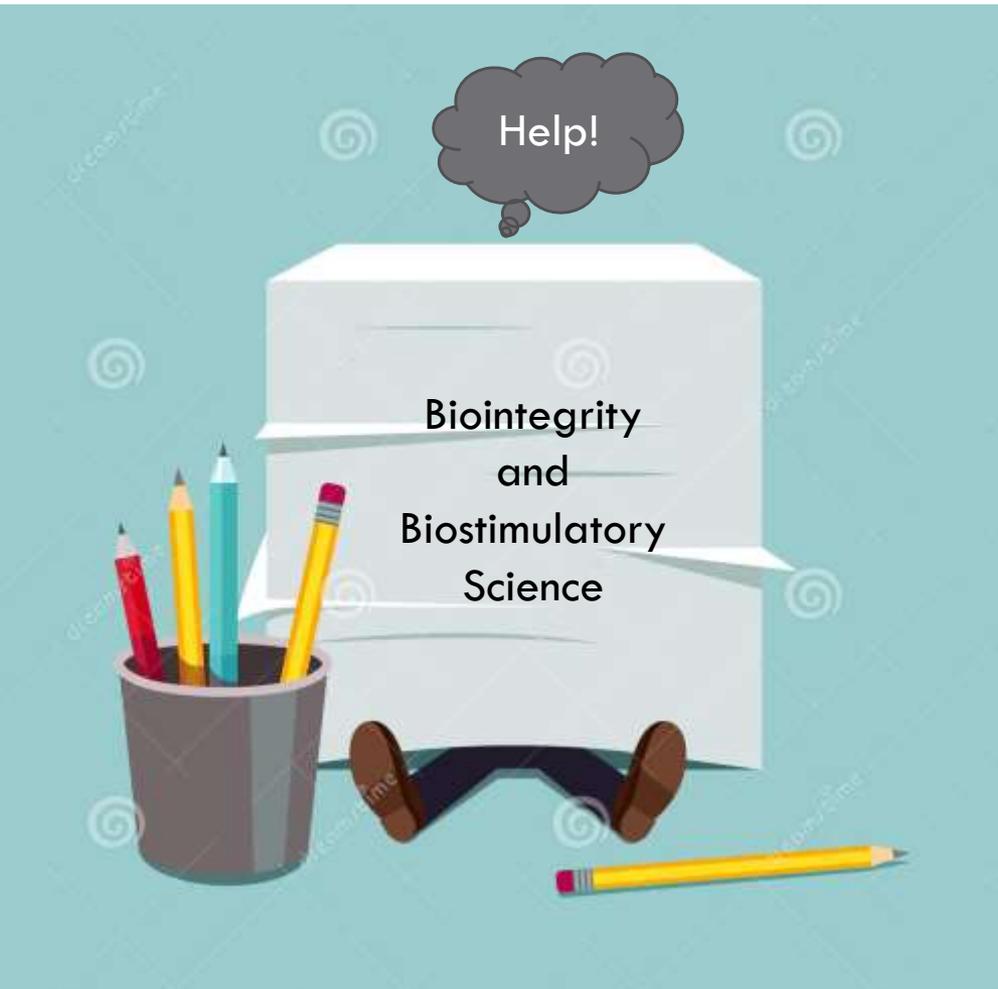
Context

“Science products are the raw materials, but we don’t have a plan for the house. How can we give feedback on the raw materials if we don’t know what you are doing to build”

“we haven’t had time to review the products”

....anonymous stakeholders

- Advisory groups need a guide for how all the science products fit together in order to prioritize their feedback
- Integrated view also important for beginning to map out policy options



Take Home Message: Conceptual View of Review and Timeline of Completion of Technical Products

Finalize Spring 2019

Finalize as Policy Options
Become Clarified

Finalize Before Staff
Report

Biointegrity Tools, CSCI (Mazor et al. 2016)
ASCI (Theroux et al. in prep), Channels in
Developed Landscapes, Beck et al in review)

Reference Distribution, Biointegrity
Interpretation Support (Ode et al. 2016,
BCG Paul et al in prep)

Biostimulatory CA-specific analyses
protective of Biointegrity (Fetscher et
al. 2014, Mazor et al. in prep)

Iterations on stress-
response analyses

Wadeable Stream Eutrophication Synthesis (Sutula et al. TR 1048)
Approaches to Assessment, Prevention and Management (Sutula TR 871)

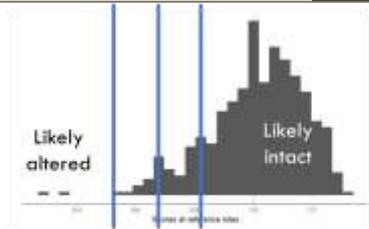
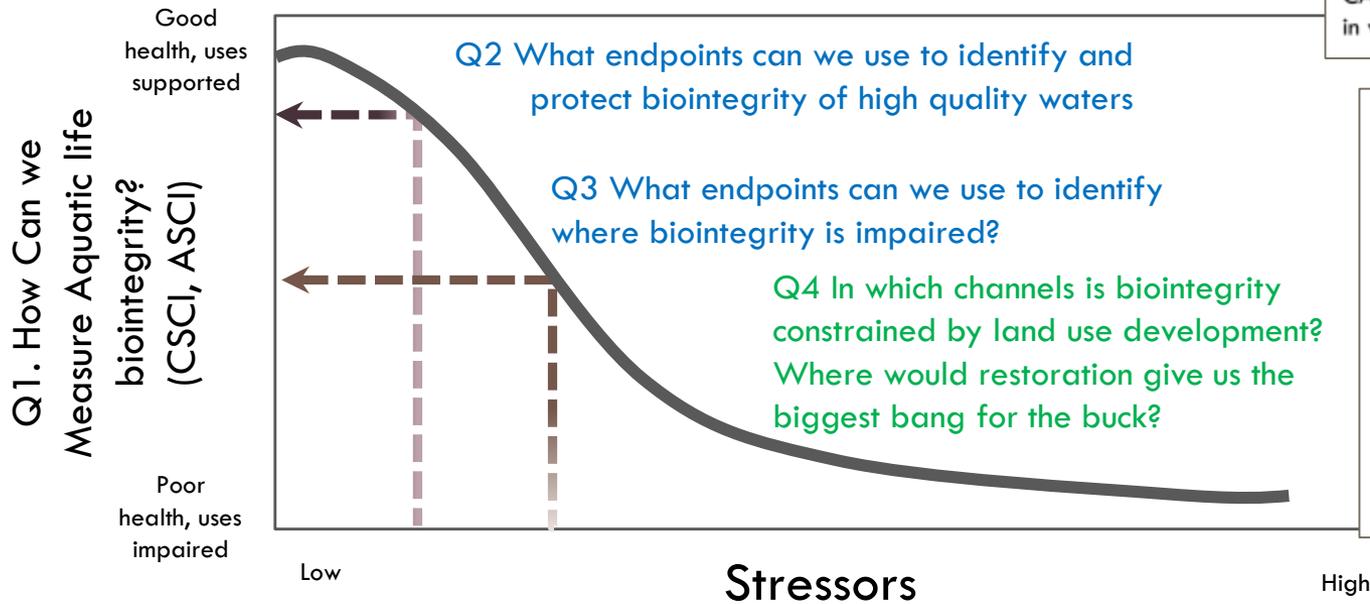
Science to Support Biointegrity- Biostimulatory Policy

Step 1: Biointegrity Science

Step 2: Biostimulatory Science

STEP 1: BIOINTEGRITY

BIOINTEGRITY POLICY QUESTIONS AND SCIENCE PRODUCTS TO SUPPORT ANSWERS



CA has used 1st, 10th, and 30th percentiles in various programs already



...But it's hard to communicate the relevance of a percentile of reference to policy makers and the public

What Science Products Can Be Used to Answer Biointegrity Questions?

Q1. How can we Measure Aquatic life biointegrity? (Answer: CSCI, ASCI)

- Mazor et al. (2016)- California Stream Condition Index (CSCI) based on benthic macroinvertebrates
- Theroux et al. in prep – Algal Stream Condition Index (ASCI) based on algae

Q2 and Q3 What endpoints can we use to identify and protect biointegrity of high quality waters ? What endpoints can we use to identify where biointegrity is impaired

- Ode et al. 2016 Natural variability of CSCI at reference sites
- Mazor et al. 2016 comparison of CSCI reference percentiles (REF30, REF10, REF01) to distribution of ambient stream data around the state
- **Theroux et al. (in prep)** comparison of ASCI reference percentiles (REF30, REF10, REF01) to ambient distribution of stream data around the state
- **Paul et al. in prep.** How does a percentile of reference of CSCI or ASCI compare to expert derived bins of biological condition? What do those bins correspond to terms of loss of biointegrity structure (and function)?

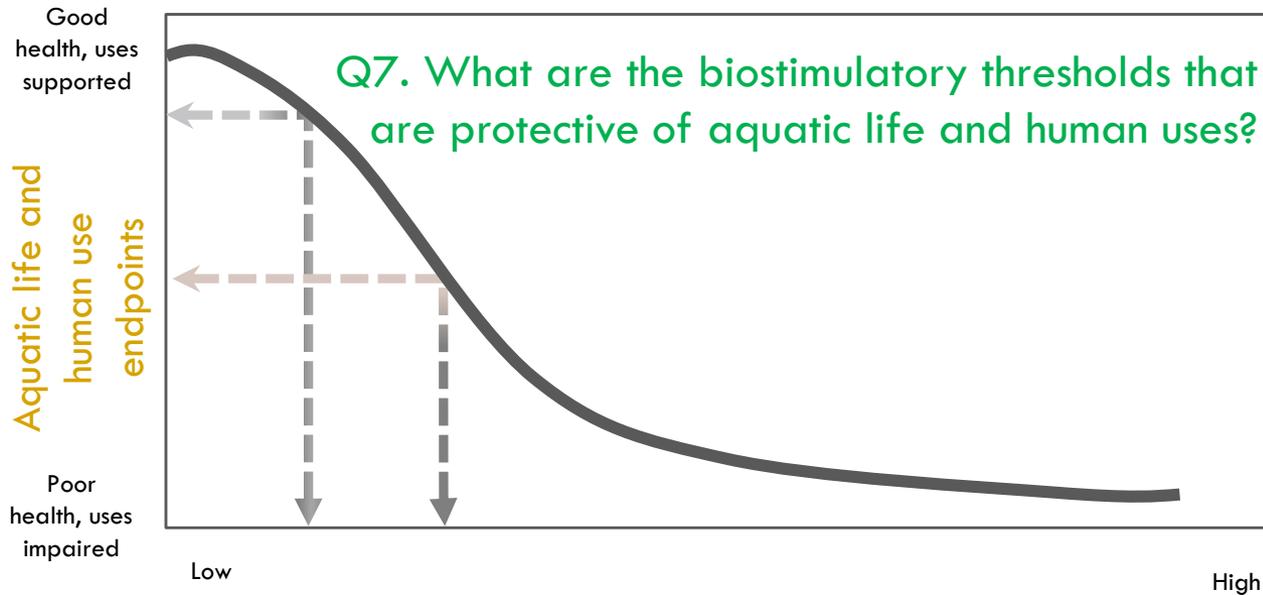
Q4 In which channels is biointegrity constrained by land use development?

- **Beck et al. (in review)** – Channels in developed landscapes tool

STEP 2:
BIOSTIMULATORY

BIOSTIMULATORY POLICY QUESTIONS AND SCIENCE PRODUCTS TO SUPPORT ANSWERS

Q8. What are numeric protection endpoints for aquatic life and human related uses?



Q5. What is a biostimulatory effect?

Q6. What are the best indicators to measure biostimulatory effects on wadeable streams? e.g. Nutrients (TN, TP), Organic Matter (Benthic Chl-a, AFDM, % Macroalgal Cover)

What Science Products Can Be Used to Answer Biostimulatory Policy Questions?

Q5. What is a biostimulatory impact?

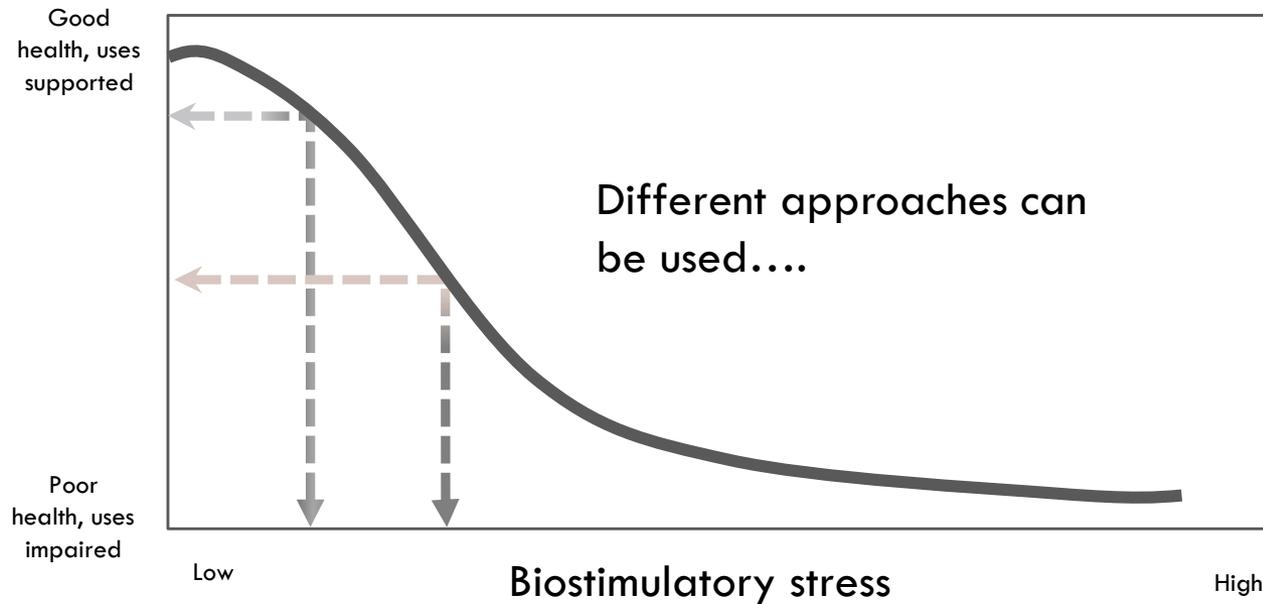
- **Sutula TR 841** Approaches to Assessing and Managing Biostimulatory Impacts in California Waterbodies (defines biostimulatory vis a vis eutrophication, provides generic conceptual models, and organizing assumptions for science across all waterbody types)

Q6. What Indicators Can Be Used to Measure Biostimulatory Impacts?

- ***In any waterbody***: Sutula TR 841. Generic lists of indicators applicable across waterbody type
- ***Wadeable streams***: Sutula et al. 1048. Scientific Bases for Assessment, Prevention, and Management of Biostimulatory Impacts in California Wadeable Streams (stream conceptual models, review of indicators, and [same] organizing assumptions for science)

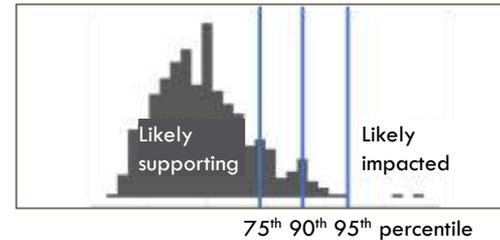
What Science Products Can Be Used to Answer Biostimulatory Policy Questions?

Q7. What are the biostimulatory thresholds that are protective of aquatic life and human uses?



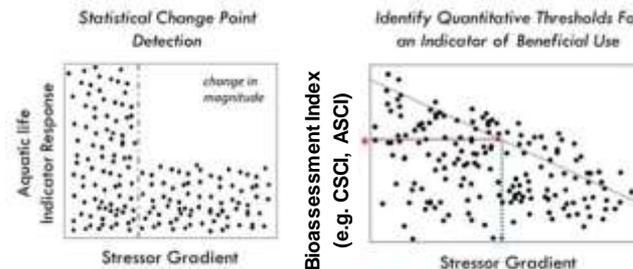
EPA Says There are Three Ways to Derive Thresholds for Nutrients (and other Biostimulatory Indicators)

- Percentile of range of variability at reference sites
 - No protection endpoint required
 - Assumption is that if it is within range of natural variability then uses are supported



TN, TP, Benthic Chl-a, AFDM

- Empirical Stress Response modeling
 - Protection endpoint regressions (right panel; protection **endpoint** is required)
 - **Change point analyses (Left panel; protection endpoint not required)**



*Biointegrity Goal * Related Stressor Level

- Causal modeling – not appropriate for statewide questions, but can do this at a watershed scale (e.g. Klamath, Santa Margarita River, etc. case studies) = WATERSHED MANAGEMENT APPROACH

What Science Products Can Be Used to Answer Biostimulatory Policy Questions?

Q7. What are the biostimulatory thresholds that are protective of aquatic life and human uses?

Wadeable streams, dominated by benthic primary producers (most streams in state): TN, TP, Benthic Chl_a, AFDM, macroalgal % cover, DO diel variability

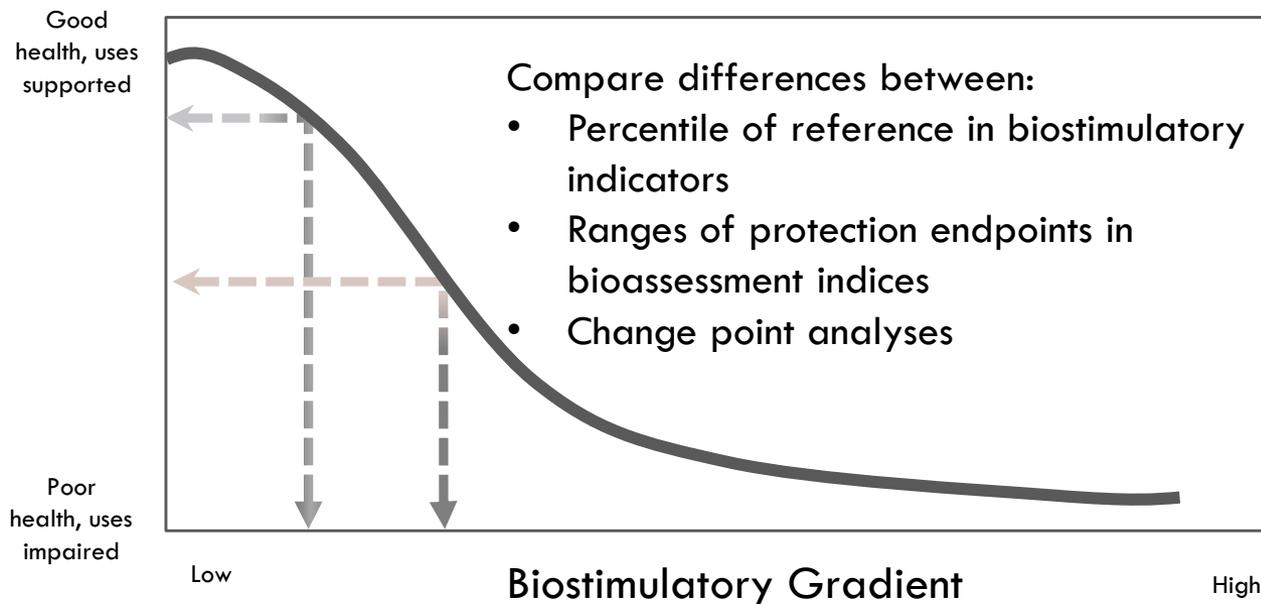
- %ILE OF REFERENCE: Fetscher et al. (2014)- 75th and 95th, ecoregion and statewide
- %ILE OF REFERENCE: Mazor et al. in prep – 90th, ecoregion and statewide
- **CHANGEPOINT: Fetscher et al. (2014) – Comparative for CSCI and So Cal algal IBI, statewide)**
- **CHANGEPOINT: Mazor et al. in prep – Raw taxonomy for bugs and algae, statewide**
- **PROTECTION ENDPOINT: Mazor et al. in prep – 30th, 10th and 1st percentile of reference, BCG bins 3 and 4 for bugs (CSCI) and algae (ASCI)**
- **Literature from other states, using comparable approaches, state criteria: Sutula et al. TR 1048, notably Jessup et al. (2015) for New Mexico streams**

Wadeable streams, dominated by sestonic primary producers (most streams in state): TN, TP, water column chl-*a*, DO diel variability

- **Literature from other states, using comparable approaches, state criteria: Sutula et al. TR 1048**

What Science Products Can Be Used to Answer Biostimulatory Policy Questions?

Q7. What are the biostimulatory thresholds that are protective of aquatic life and human uses?



Intent is to show you the **range** of biostimulatory thresholds, given different protection endpoints and approaches, **starting with California studies**, then **national studies**, then **other state criteria**

What Science Products Can Be Used to Answer Biostimulatory Policy Questions?

Q8. What are numeric protection endpoints for aquatic life and human related uses?

Aquatic Life Related Uses:

- Ode et al. 2016 Natural variability of CSCI at reference sites
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- **Theroux et al. (in prep)** comparison of ASCI reference percentiles (REF30, REF10, REF01) to ambient distribution of stream data around the state
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Human Related Uses:

- REC2 Nuisance algal cover: **Sutula et al. TR 1048**
- Cyanobacterial toxins: **Sutula et al. TR 1048**

Conceptual View of Review and Timeline of Completion of Technical Products

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Previous Guidance to Advisory Groups for Review of Technical Products

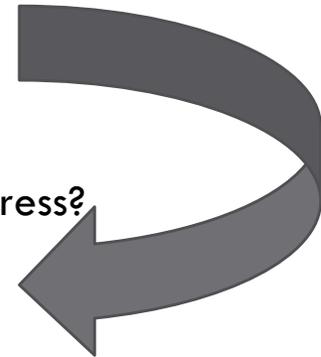
- Start by listening to the webinars
 - ASCI, percentile of reference and BCG <https://vimeo.com/290372091>
 - Channels in Developed Landscapes <https://vimeo.com/291742322>
 - Biostimulatory stress-response models and syntheses <https://vimeo.com/292211374>
- If you want to provide feedback on detail of biointegrity, review:
 - ASCI: Theroux et al. (in prep)
 - Channels in Developed Landscapes (Beck et al. in prep)
 - BCG Model as interpretation support (Paul et al. in prep)
- If you want to provide feedback on biostimulatory science, review:
 - Read Table 1.4 organizing assumption for science (draft TR 1048)
 - Start with eutrophication synthesis Section 4 (draft TR 1048)—this is a broad summary
 - Then read Mazor et al. (in prep)
 - Then Section 3 of TR 1048 for more detail on other sources of literature

Stakeholder Sector Leads Gave Waterboard Staff Feedback on Timing for Science Panel Review and Advisory Group Feedback

- Waterboard staff is developing a workplan and revised timeline for the policy- they will share that as soon as it's available
- Waterboard staff is considering how to best use available science advisory panel resources.
 - Resources for 2 meetings left
 - Will hold the first meeting on December 12 and 13th with goal of reviewing draft technical products
 - Still considering how to best utilize resources for the last meeting, so stay tuned.
- For December 12-13th, panel meeting,
 - Review products (see next slide for priorities)
 - Provide written feedback to Waterboard between now and December 12th (sooner the better)
 - Provide that same feedback to sector rep and help them organize that into a presentation to Panel

So...Your Opportunities for Feedback Starts today

- Initial impressions of science?
 - Issues we agree with that are easily addressed (let's not use Panel resources for this)
 - Issues we agree with, but that require additional resources
 - Issues we disagree with and want the Panel to weigh in
 - Larger issues not addressed in existing "raw materials"
- What are the major issues that you want the Panel to address?
 - Edit the science panel charge with you
- Other resources for review and feedback?
 - Science team office hours?



Agenda

Morning - Biointegrity

- ASCI
- BCG
- Channels in Developed Landscapes
- Wrap up on biointegrity

Afternoon

- Principles and organizing assumptions
- Wadeable stream indicator review
- Threshold science supporting decisions on biostimulatory targets

- Science Panel charge question revision