

# Biological Objectives for California Streams

## Monitoring Study Group 12 December 2012



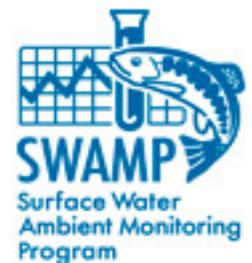
*Karen Larsen*

*Director, Office of Information  
Management & Analysis*



# Overview

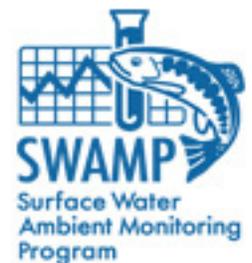
- Technical Elements of Biological Objectives
- Define Biological Objectives
- Outline need for policy
- Process for developing policy
- Policy alternatives
- Progress and Next Steps



# Technical Elements of Biological Objectives

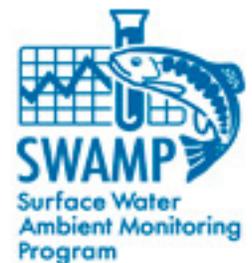


- Principles of Bioassessment
- Bio-objectives Technical Foundation
  - Defining Reference Condition
  - Scoring Biotic Condition



# What is Bioassessment?

- **Biological Monitoring Tools used by SWAMP**
  - tissue chemistry
  - egg shell chemistry
  - pathogen monitoring
  - indicator species monitoring
  - invasive species monitoring
  - sediment toxicity
  - water column toxicity (including Toxicity Identification Evaluations)
- ***Bioassessment*** = direct measurement of water body health from the communities of organisms that live in those water bodies



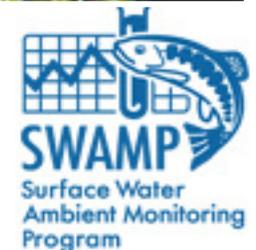
# Core Principles

Most water bodies contain diverse groups of organisms that have predictable responses to multiple stressors

Resident organisms provide a record of water body conditions over time

Monitoring biology provides a **direct** measure of water body health

Biological measures incorporate responses to both chemical and non-chemical stresses



# Benthic Macroinvertebrates (BMIs) (bottom-dwelling invertebrates)

- Diverse and abundant
- Species vary in sensitivity to stressors
- Taxa reside at site for several months to more than a year



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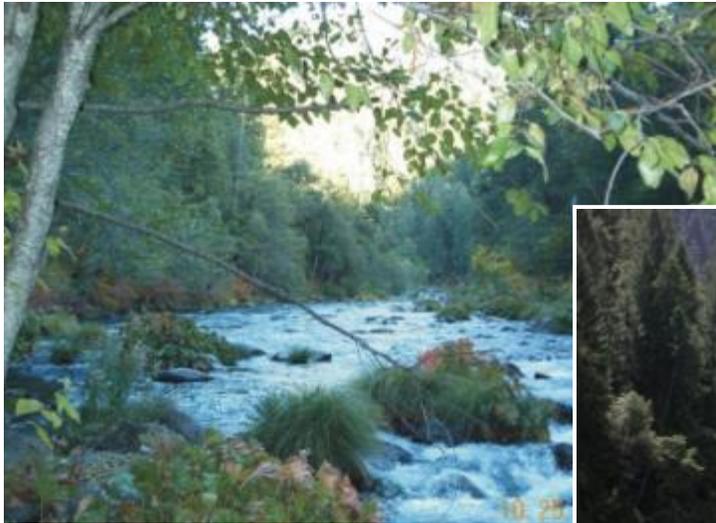


# Technical Foundation of Biological Objectives



# Scoring Tools Depend on Reference Sites

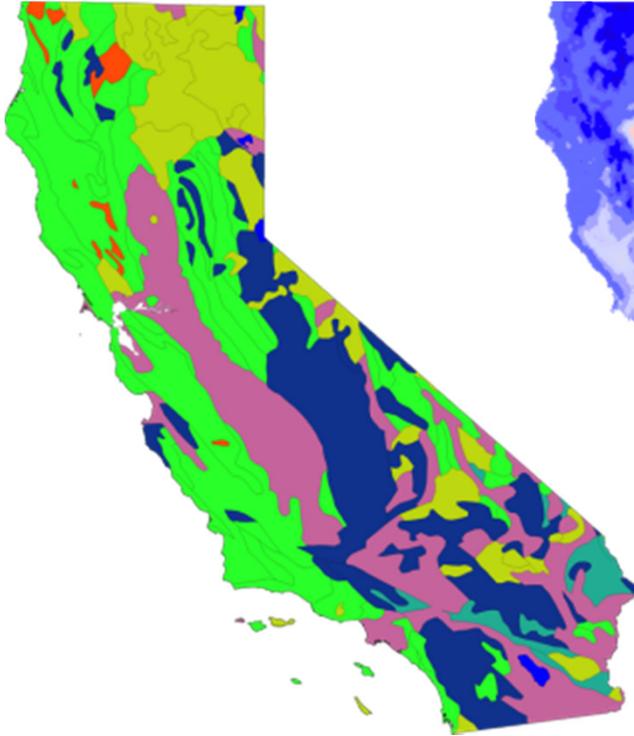
“What should the biology look like at a test site?”



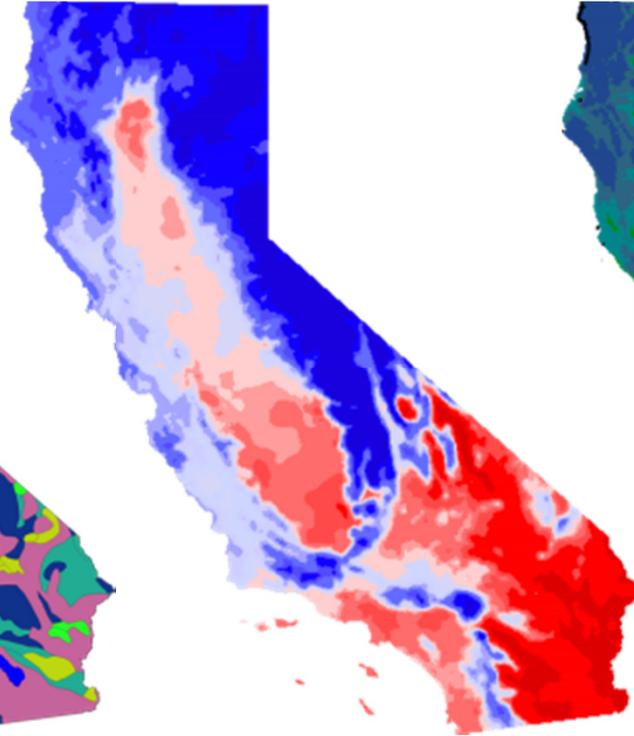
Biological Objectives for California

# Technical Challenges: Natural Variation

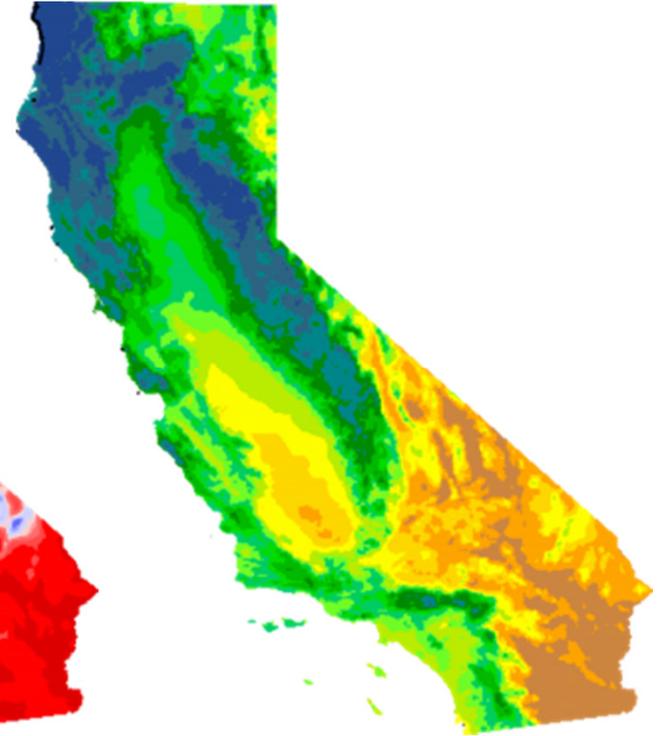
**Geology**



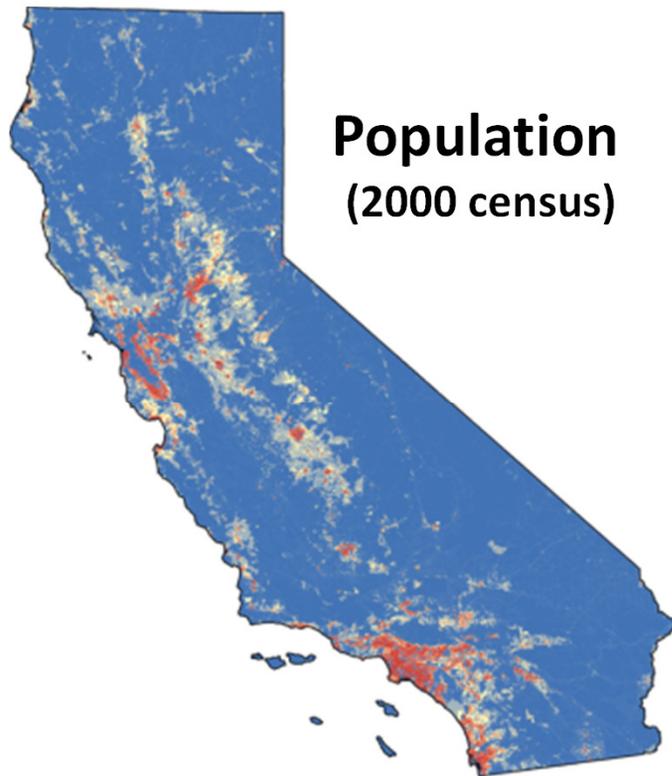
**Temperature**



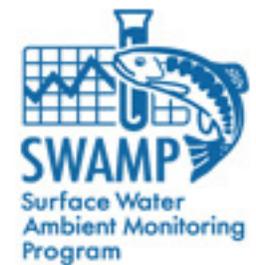
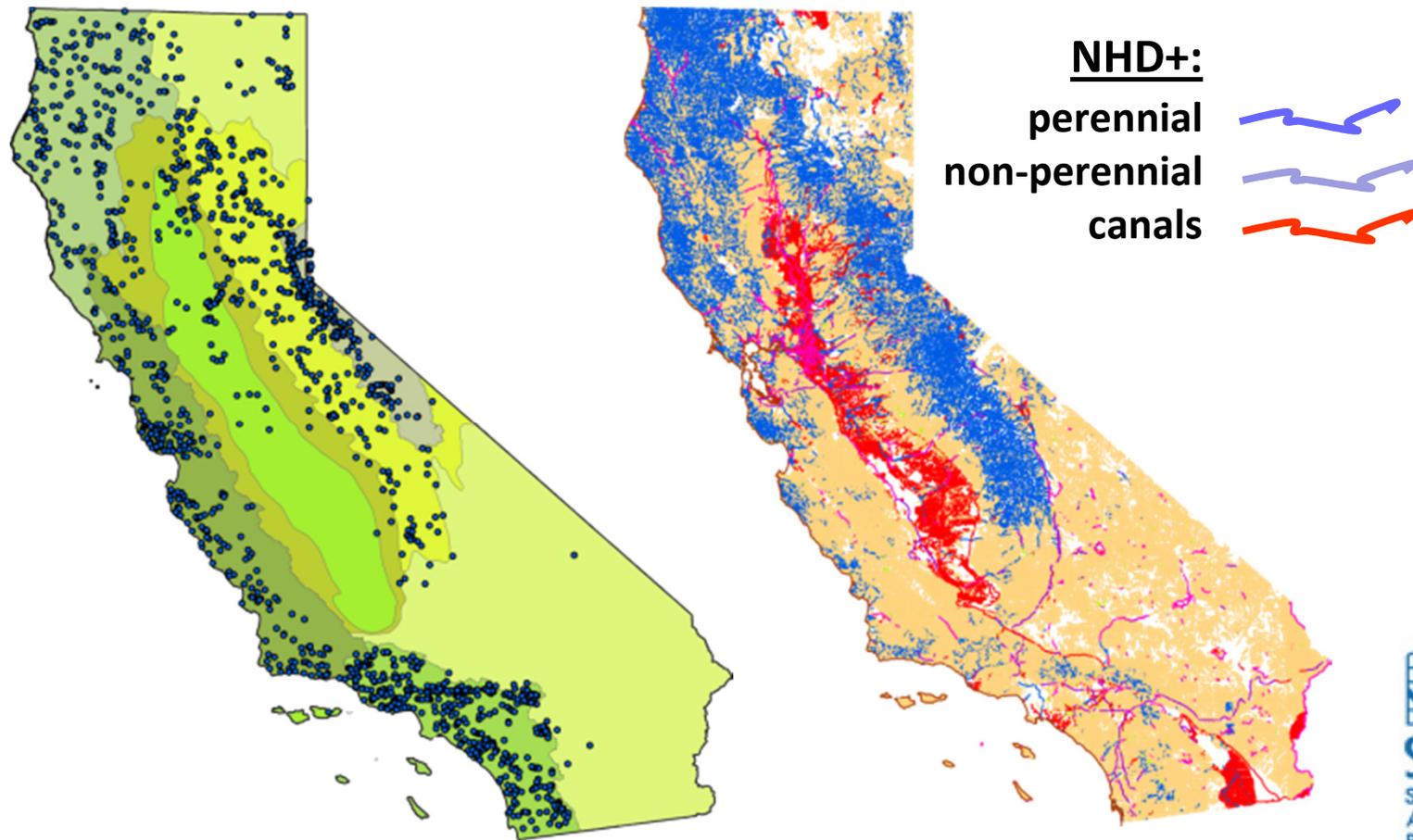
**Precipitation**



# Technical Challenges: Human Disturbance



# SWAMP's Reference Condition Management Program



# Screening Watershed Stressors

- **Infrastructure:** roads, railroads
- **Population**
- **Hydromodification**
  - manmade channels, canals, pipelines
- **Landuse**
  - % agricultural, urban development
  - timber harvest, grazing intensity
- **Other**
  - fire history, dams, mines
  - invasive invertebrates, plants
  - 303d listed, NPDES/CWIQS discharges



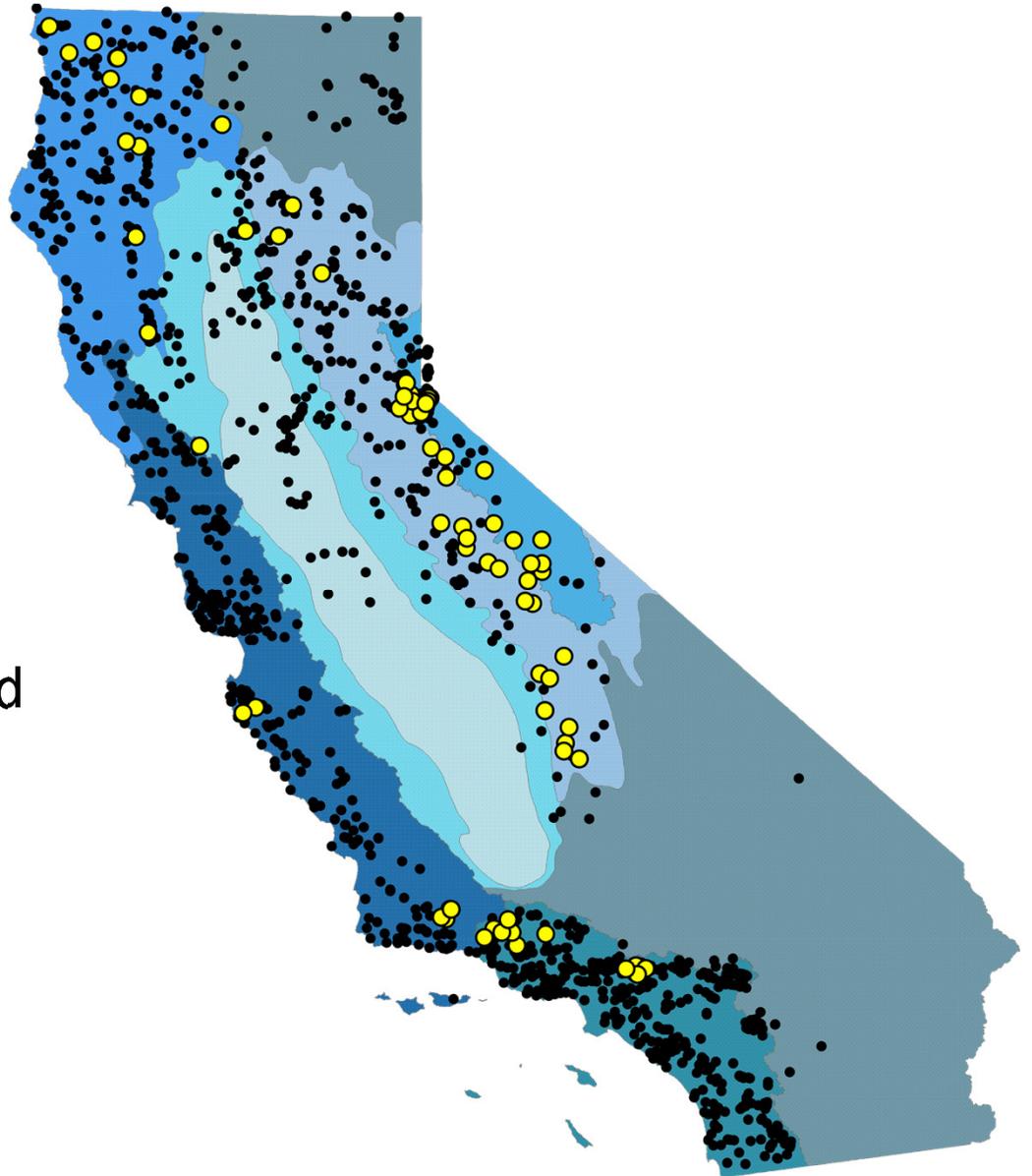
# Screening Local Condition

- Chemistry: nutrients, conductance, pH, Cl-, turbidity
- Habitat (SWAMP habitat condition):
  - Riparian condition, canopy
  - Instream condition, fines
  - Human disturbance



## Reference in a Perfect World

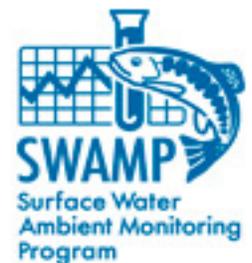
**109 sites passed** (yellow dots); almost all small streams concentrated in high elevation areas



# Reference Criteria for Biological Objectives

## Balancing site purity and representativeness

- **Trade-off:** Need to relax screening criteria to get good representation of all stream types
- **Performance Objectives:**
  1. Reference pool represents all types of CA streams
  2. Relaxed criteria do not sacrifice biological quality of sites

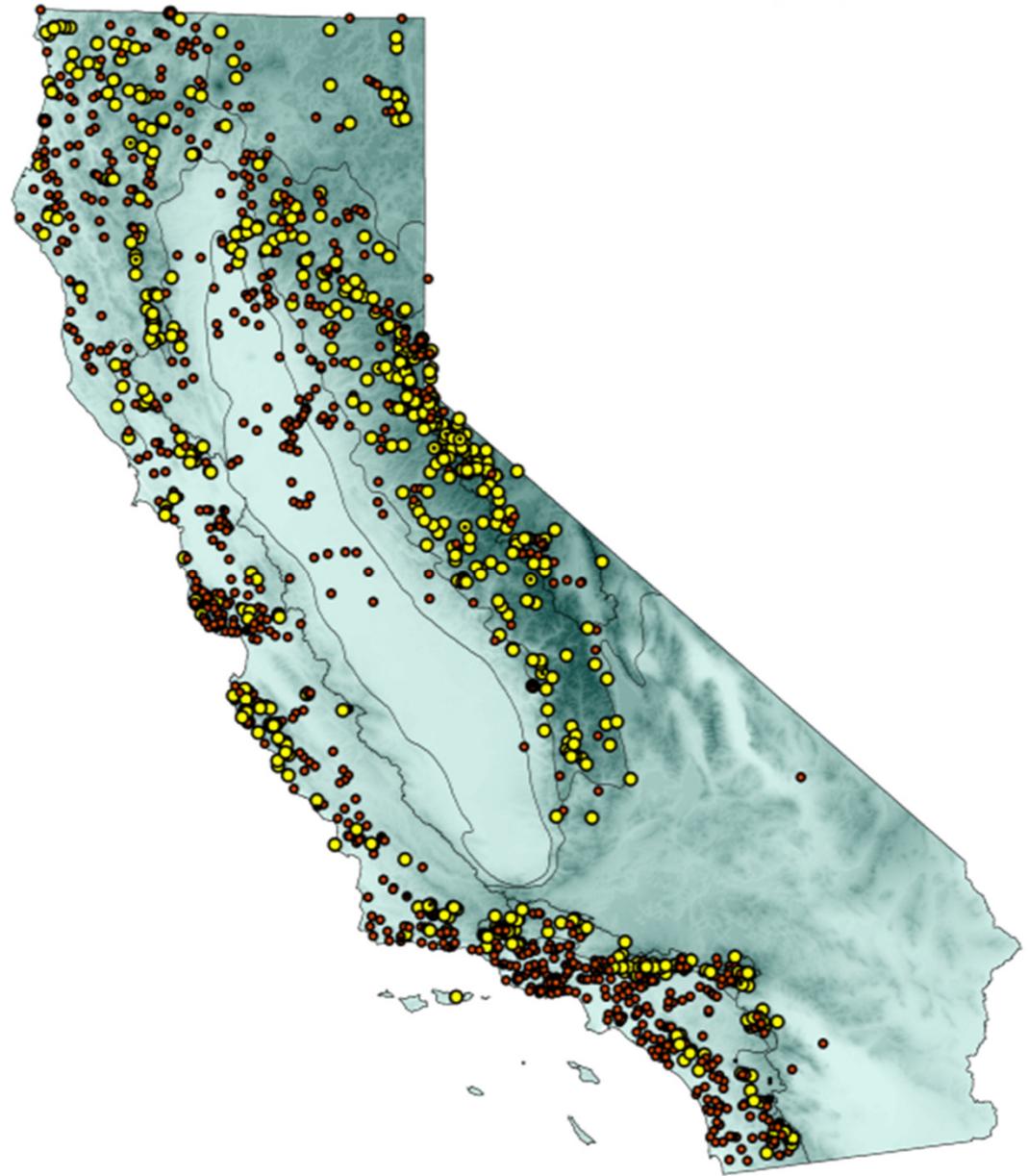


# Reference Site Stressor Thresholds

Metric	“Platinum” (1k, 5k)	2012 Bio-Objectives (1k,5k, ws)	South Coast IBI (5k,ws)	North Coast IBI (1k, ws)	Western Sierra IBI
Local Disturbance	0	<b>1.0</b>	-	-	-
% Agricultural	0	<b>3</b>	5	5,5	5,5
% Urban	0	<b>3</b>	3	3,3	3,3
Watershed Development	0	<b>5</b>	included in urban	included in urban	included in urban
Road Dens (km/km <sup>2</sup> )	0	<b>1.5</b>	2.0	1.5/ 2.0	2.0
Paved road x-ings (#)		<b>5/10/50</b>			
TN, TP	1.5/ 0.05	<b>3.0/ 0.5</b>	-	-	-
Dam Storage (MG)	0	<b>10<sup>4</sup></b>	-	-	-
Active Producing Mines	-	<b>0 @5k</b>	-	-	-
% Canals & Pipelines	-	<b>10</b>	-	-	-

## Reference Sites

PSA REGION	n
North Coast	79
Central Valley	1
Coastal Chaparral	87
Interior Chaparral	30
South Coast Mountains	96
South Coast Xeric	22
Western Sierra	131
Central Lahontan	142
Deserts + Modoc	27
<b>TOTAL</b>	<b>615</b>



Biological Objectives for California

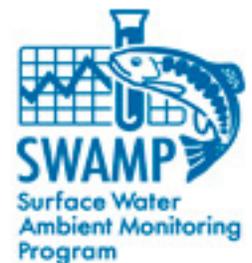
# Tools for Scoring Biological Condition

- Multi-metric indices (Index of Biotic Integrity)
- Observed/Expected indices
  - Compare organisms observed at test sites to those expected to occur in least disturbed “reference” sites
  - Produce easily interpreted scores with quantifiable precision

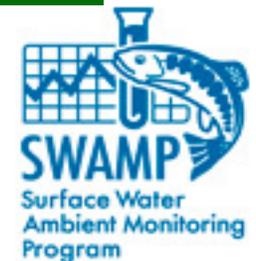
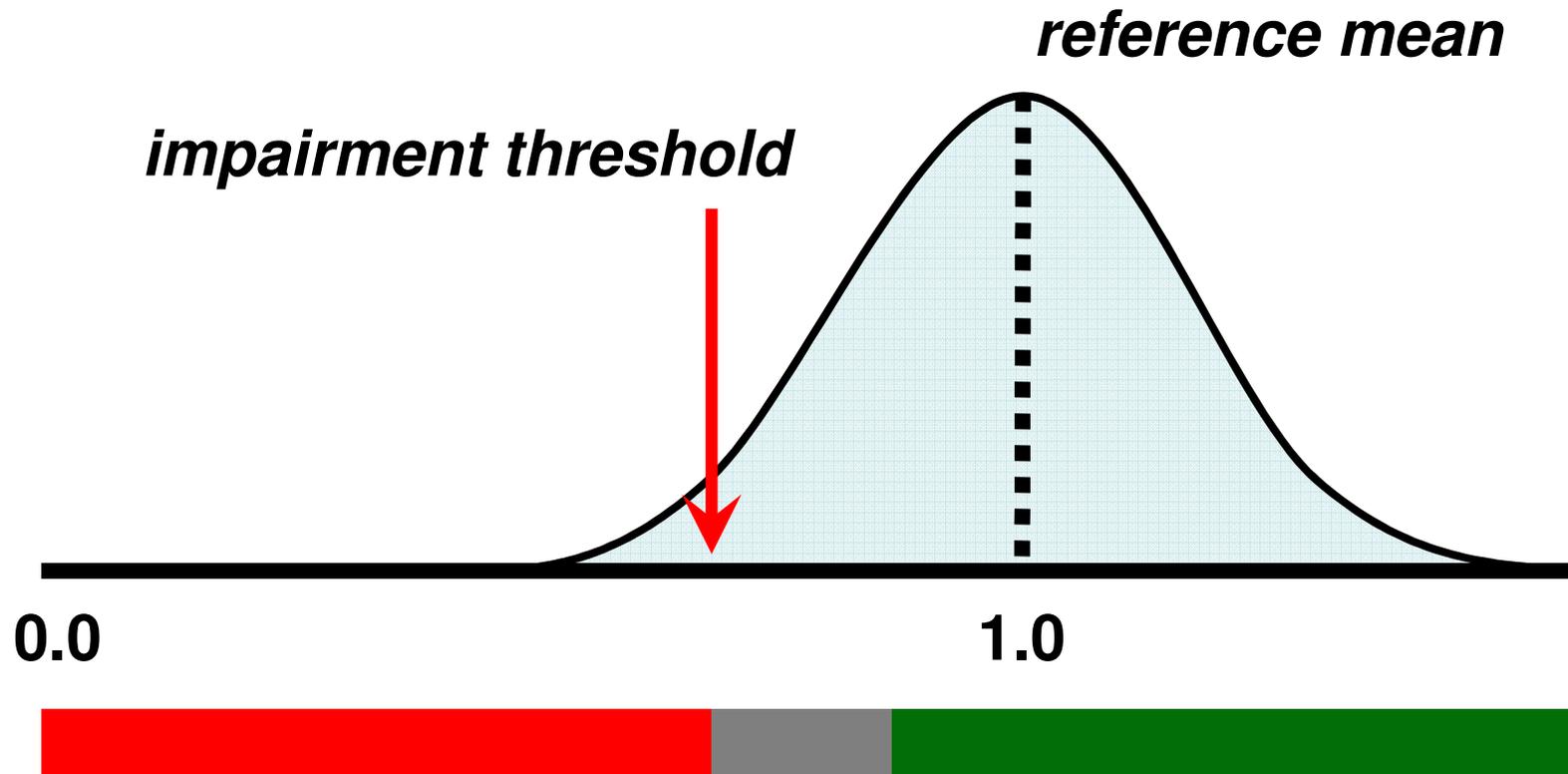


## Observed/ Expected Indices

- Compare number of **observed** (“O”) taxa to number of **expected** (“E”) taxa
- “Expected” taxa based on reference condition and modeling
- Test sites are compared to similar reference sites (based on climate, geology, elevation, etc.)



# Use O/E Scores to Define Impairment



# What are biological objectives?

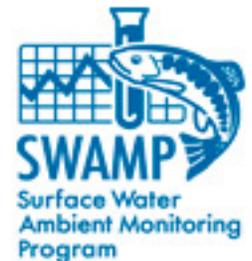
## Water Quality Standards

Beneficial Uses  
*Aquatic Life*

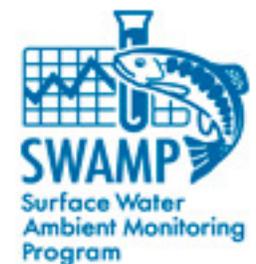
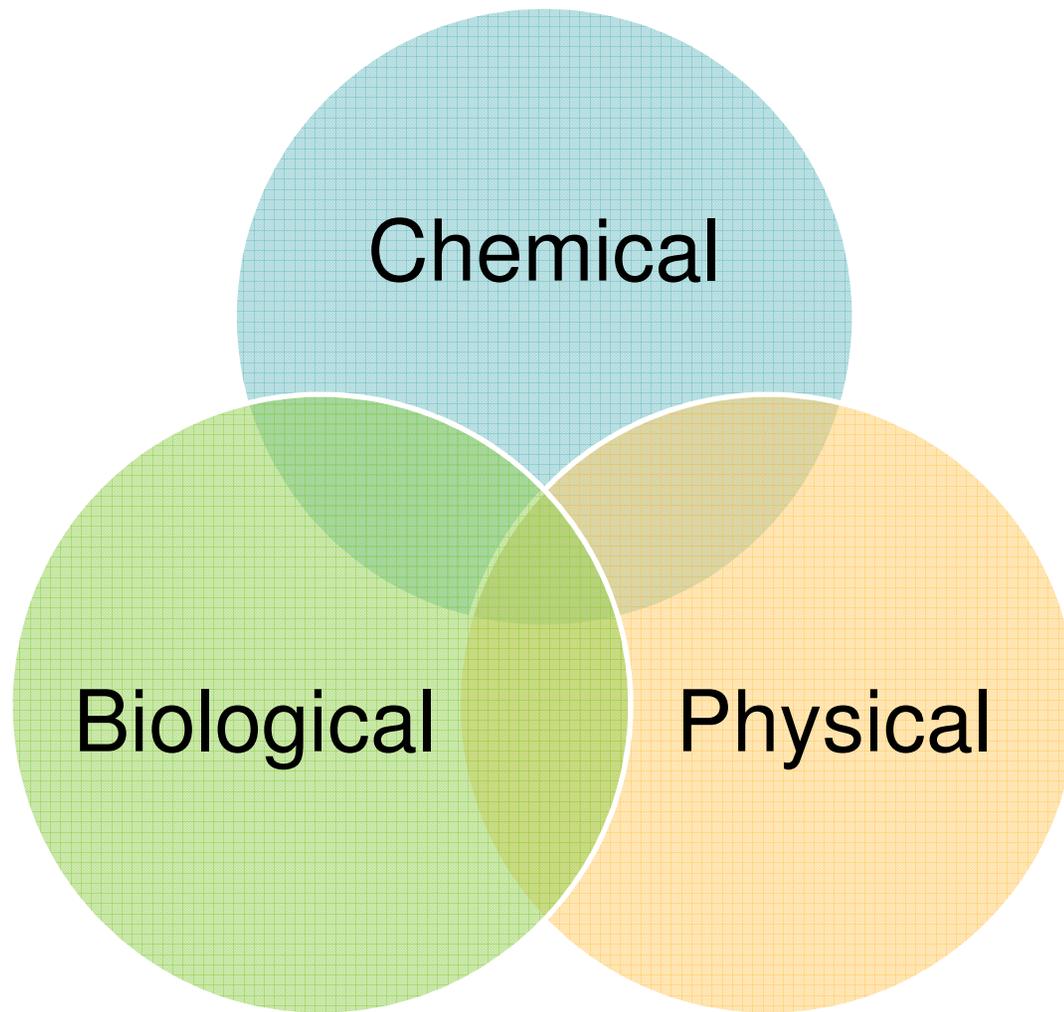
Water Quality Objectives  
*Biological Objectives*

Anti-degradation

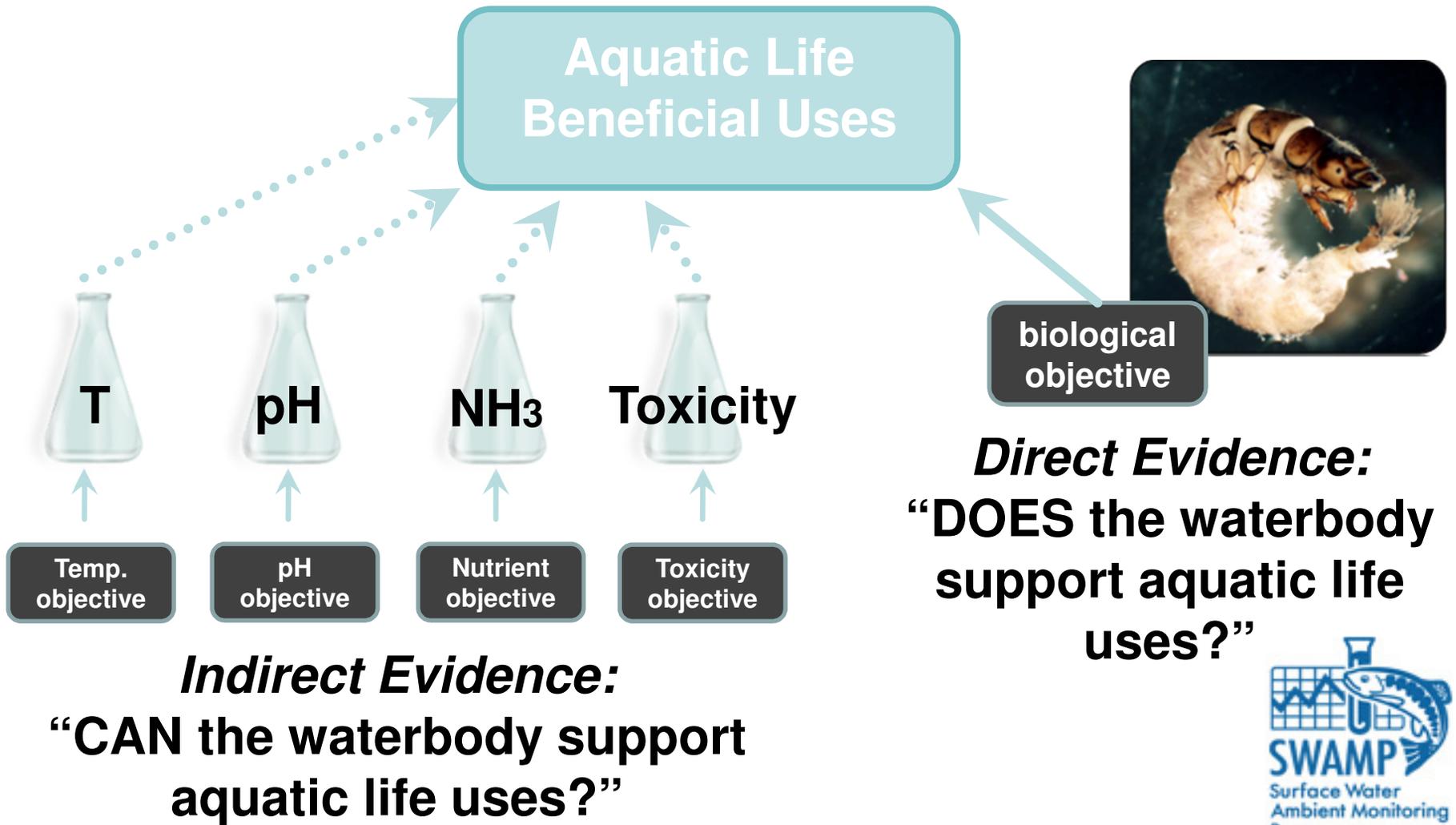
Implementation  
*305(b), 303(d), Permitting*



# Why biological objectives?



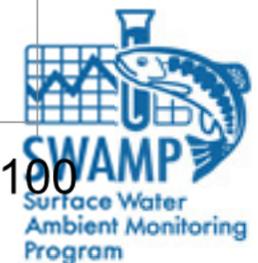
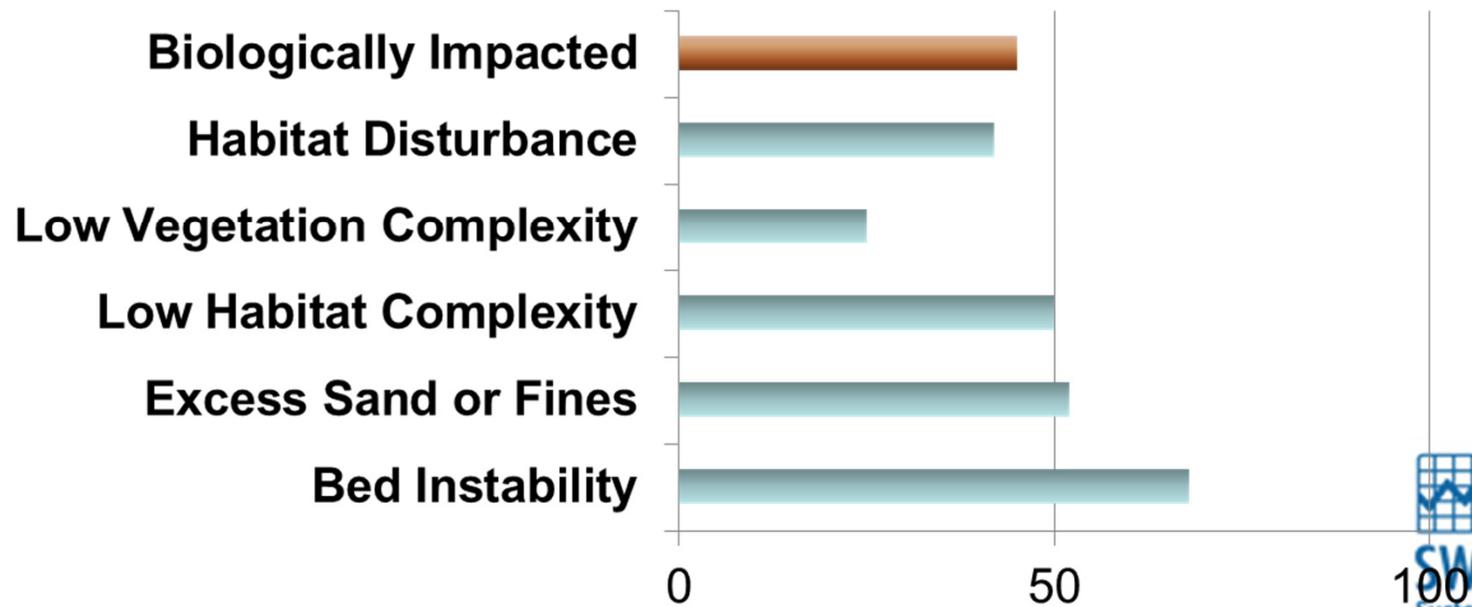
# Why biological objectives?



# Why propose a biological objectives policy?

*Streams are degraded*

**Stressor Extent  
Perennial Stream Survey**



# Why propose a biological objectives policy?

*Mechanisms for protecting streams are limited*



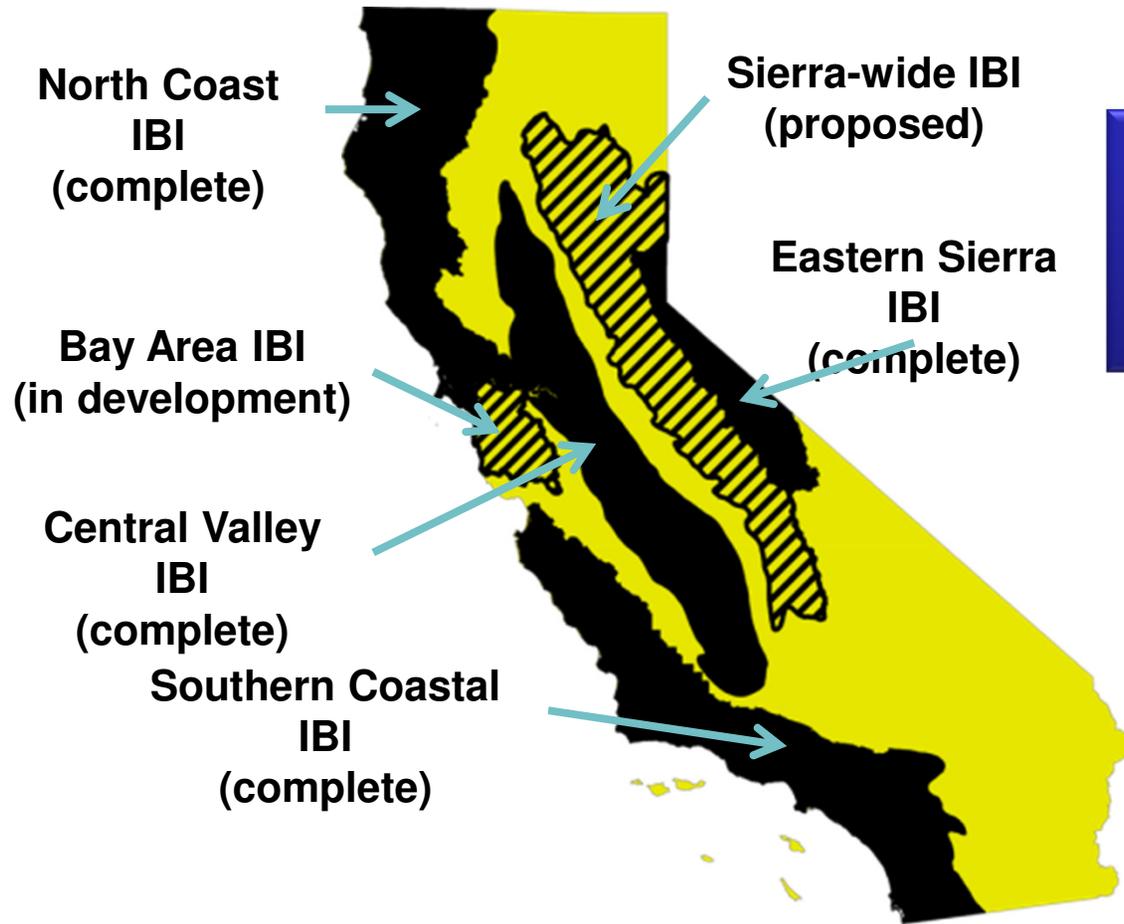
# Why propose a biological objectives policy?



*Mechanisms for restoring streams are limited*



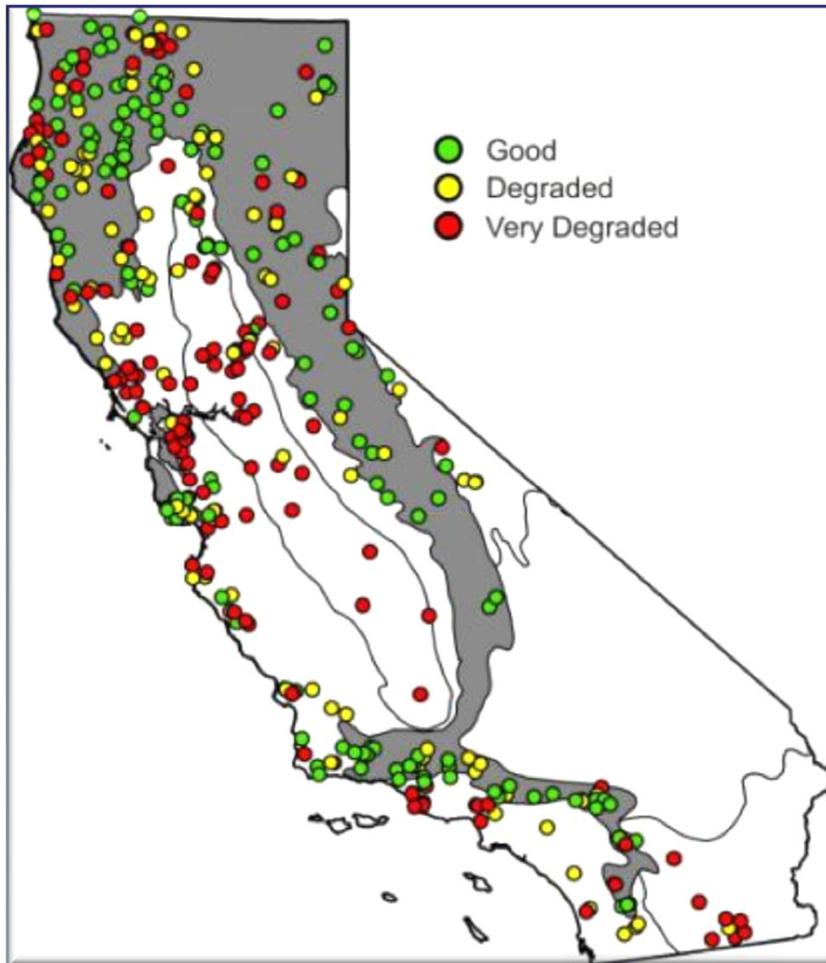
# Why propose a biological objectives policy?



*Biological monitoring data are not assessed consistently statewide*



# Why propose a biological objectives policy?

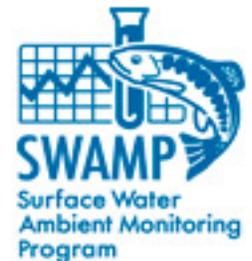


*Regional Water Boards  
need measurable,  
enforceable biological  
thresholds*

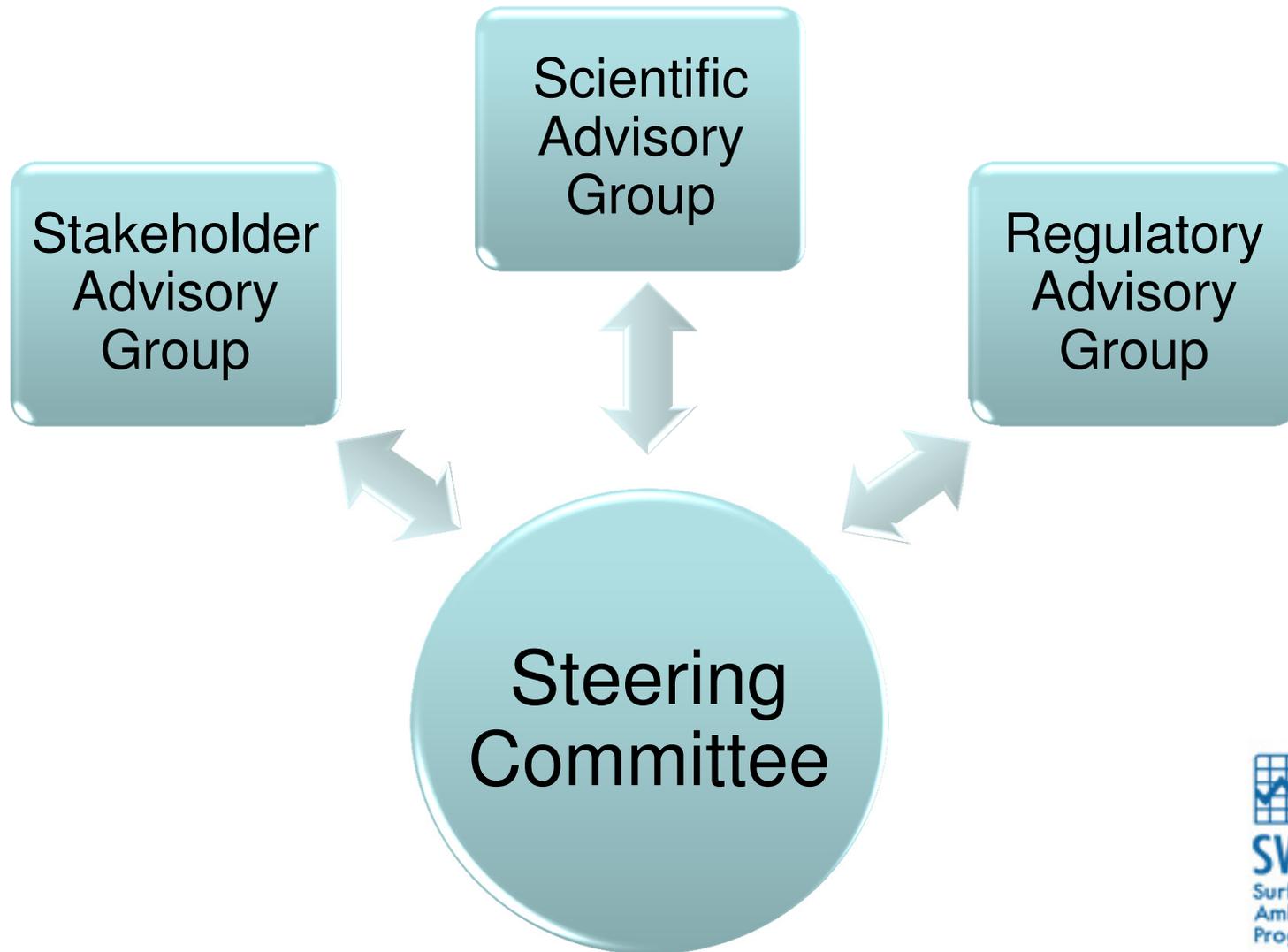


## Policy Goals

- Develop new or apply existing narrative water quality objectives to protect aquatic life uses
- Establish policy for identifying and protecting high quality streams (anti-degradation)
- Define how compliance with narrative objectives will be measured – numeric thresholds
- Establish realistic expectations by stream-type
- Institute policy with statewide consistency AND regional flexibility



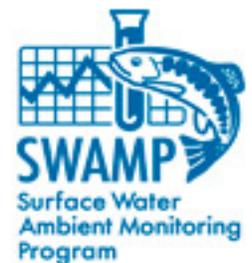
# Collaboration and Participation

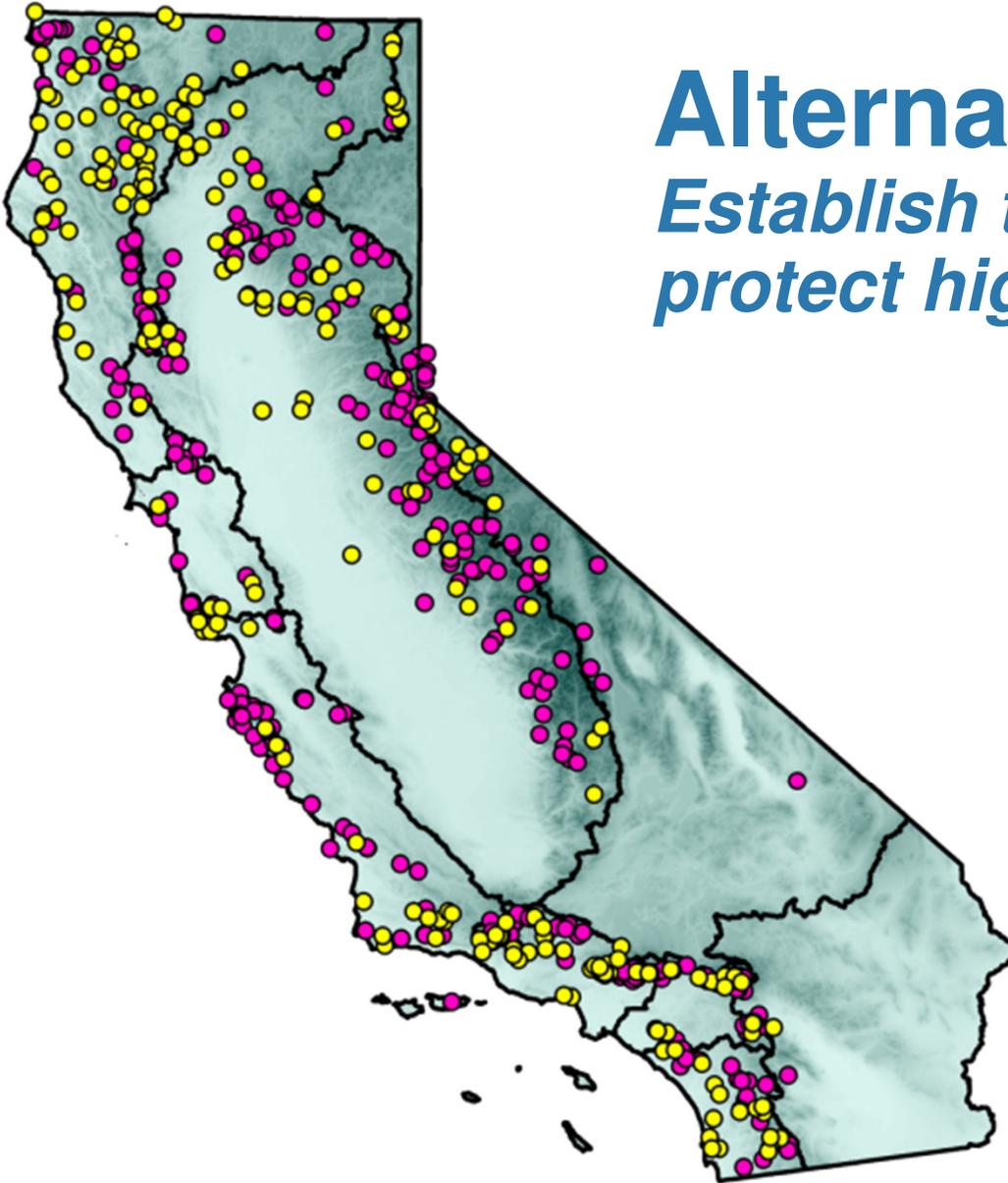


# Alternative 1

## *No Action*

- No new policy would be established.
- Existing Regional Water Board Basin Plan objectives for protecting aquatic life uses would remain in place.



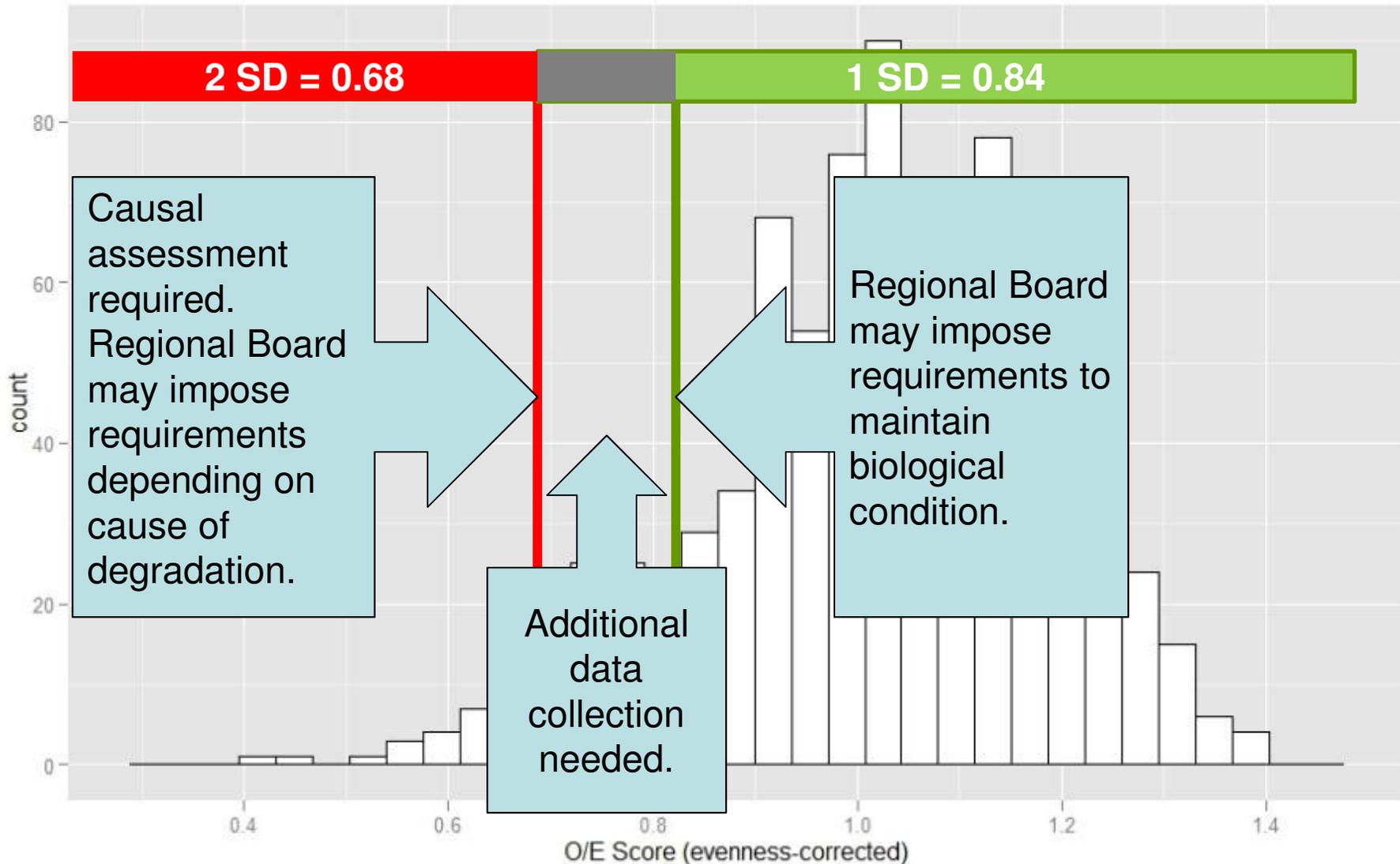


## Alternative 2

*Establish thresholds to protect high-quality streams*

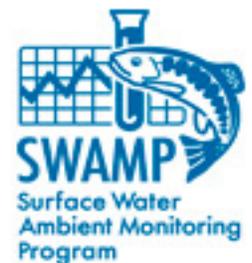


# Alternative 3 - *Establish thresholds to protect and restore streams*



# Pilot Studies

- Evaluate Alternatives with Real Data
  - Ventura Watershed
  - Southern California
  - Statewide
  
- Causal Assessment
  - Garcia R. – N. CA, Timber Harvest
  - Salinas R. – C. CA, Agriculture
  - Santa Clara R. & San Diego R. – So. CA Urban



# Implementation Issues

Monitoring  
Requirements

Thresholds

Independent  
Applicability

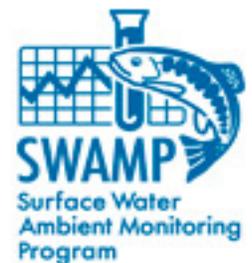
Exceptions  
for Modified  
Streams

Causal  
Assessments

Impairment  
Listing

Habitat  
Restoration

Flow

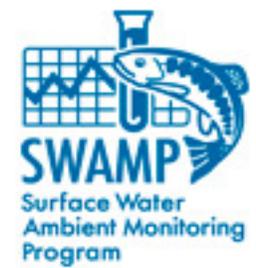


# Project Schedule

Major Milestones	Estimated Date
✓ CEQA scoping meetings	Sep 2012
Scoring tool complete	Fall 2012
Causal assessment guidance complete	Dec 2012
Board workshop information item on technical work	Jan 2013
Complete draft policy	July 2013
Scientific peer review	Aug-Sep 2013
Release public review draft policy	Nov 2013
Public workshops	Jan 2014
Public comment period closes	Apr 2014
Board Meeting/Adoption	2 <sup>nd</sup> half 2014

Surface Water  
Ambient Monitoring  
Program

# Questions?



## Contacts

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