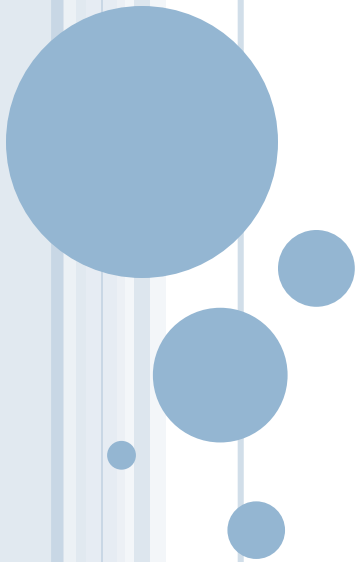


# **SCCWRP SCIENCE SUPPORTING NUTRIENT MANAGEMENT**



# SWRCB Is DEVELOPING NUTRIENT OBJECTIVES

SWRCB Staff are considering narrative objective, with numeric guidance phased by waterbody type

Phase I (2016): Establish narrative approach applicable to all waterbodies and numeric guidance for **wadeable streams**

Phase II (2017): **Lakes**

Phase III: (2019): **Estuaries and non-wadeable rivers**

# NUTRIENT OBJECTIVES ARE SCIENTIFICALLY CHALLENGING

- Nutrients are required to support life
  - How much is too much?
- Direct effects (e.g. toxicity) are often less important than indirect effects
  - Indirect effects occur at much lower levels than toxic effects
- Ambient concentrations can sometimes give false positives or negatives
- Need a different approach



# SWRCB STAFF FAVOR ECOLOGICAL RESPONSE APPROACH

- Coined as “nutrient numeric endpoint (NNE) approach”
- Consists of two major components
  - Response indicators with numeric endpoints for waterbody assessment
  - Models to link response indicator numeric endpoints to nutrient targets (e.g. permits, TMDLs, etc.)

## *Algae & Aquatic Plants*

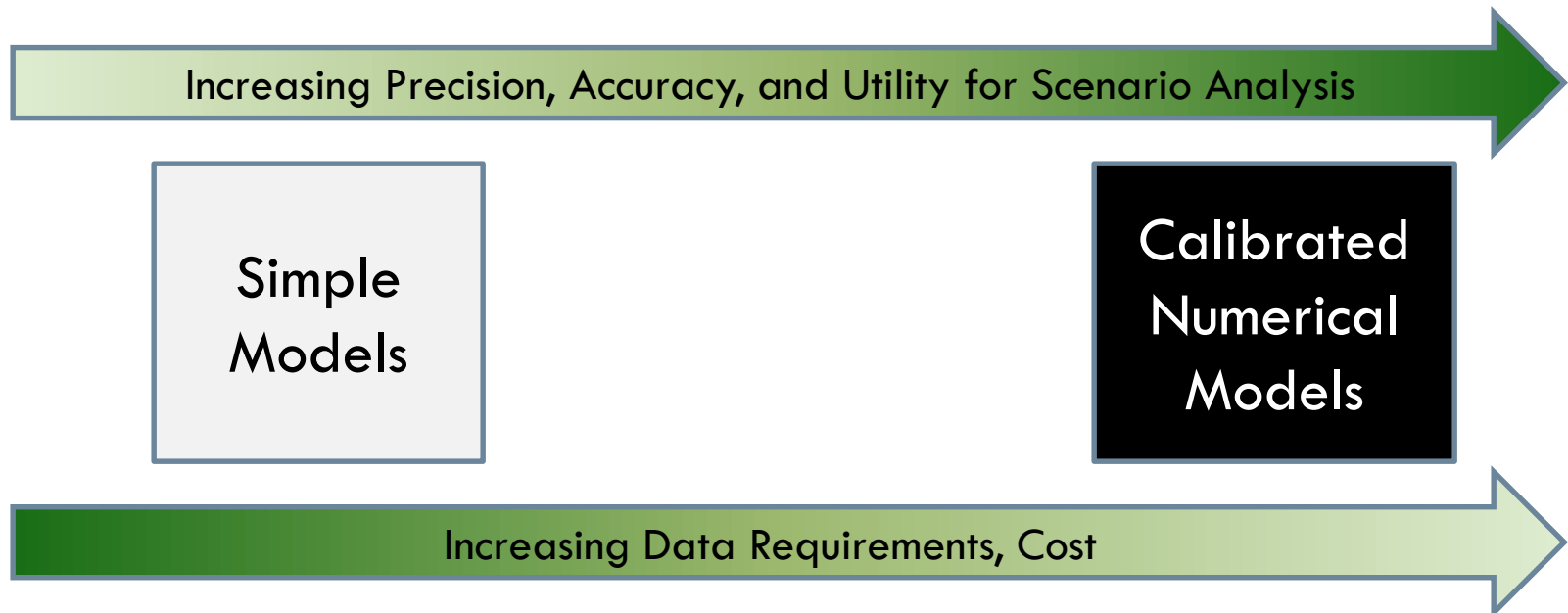


## *Dissolved Oxygen, pH*



# MODELS TO LINK TO NUTRIENT MANAGEMENT: TWO BOOK ENDS

- Calibrated numerical models
  - Site-specific, high precision, requires considerable expertise and expensive data
- Simple models
  - Regional or statewide, lower precision, low cost and expertise

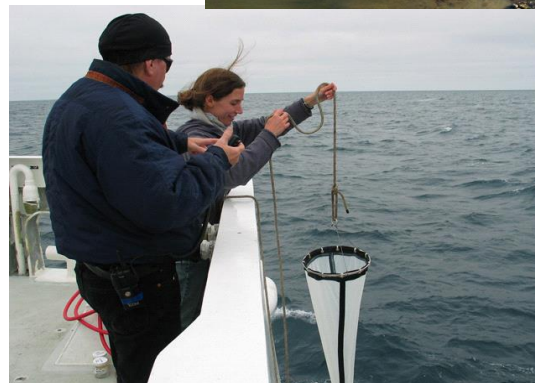


# STATE OFFERING SIMPLE MODELS TO SET “DEFAULT” NUTRIENT TARGETS

- Translates response indicator numeric endpoints to site-specific nutrient targets
  - Accounts for site-specific factors that control response to nutrients (canopy cover, temperature, etc.)
- “Default” nutrient targets resulting from model are a starting point for conversations on permits and TMDLs
- Flexibility offered to stakeholders to develop more sophisticated models if required
- Models available for wadeable stream and lakes

# SCCWRP Is CONDUCTING RESEARCH SUPPORTING NUTRIENT OBJECTIVES ACROSS WATERBODY TYPES

- Wadeable Streams
- Estuaries
- Coastal Waters
- Lakes



# RECENTLY COMPLETED EPA-ORD STUDY PROVIDES A SCIENTIFIC FOUNDATION FOR WADEABLE STREAMS

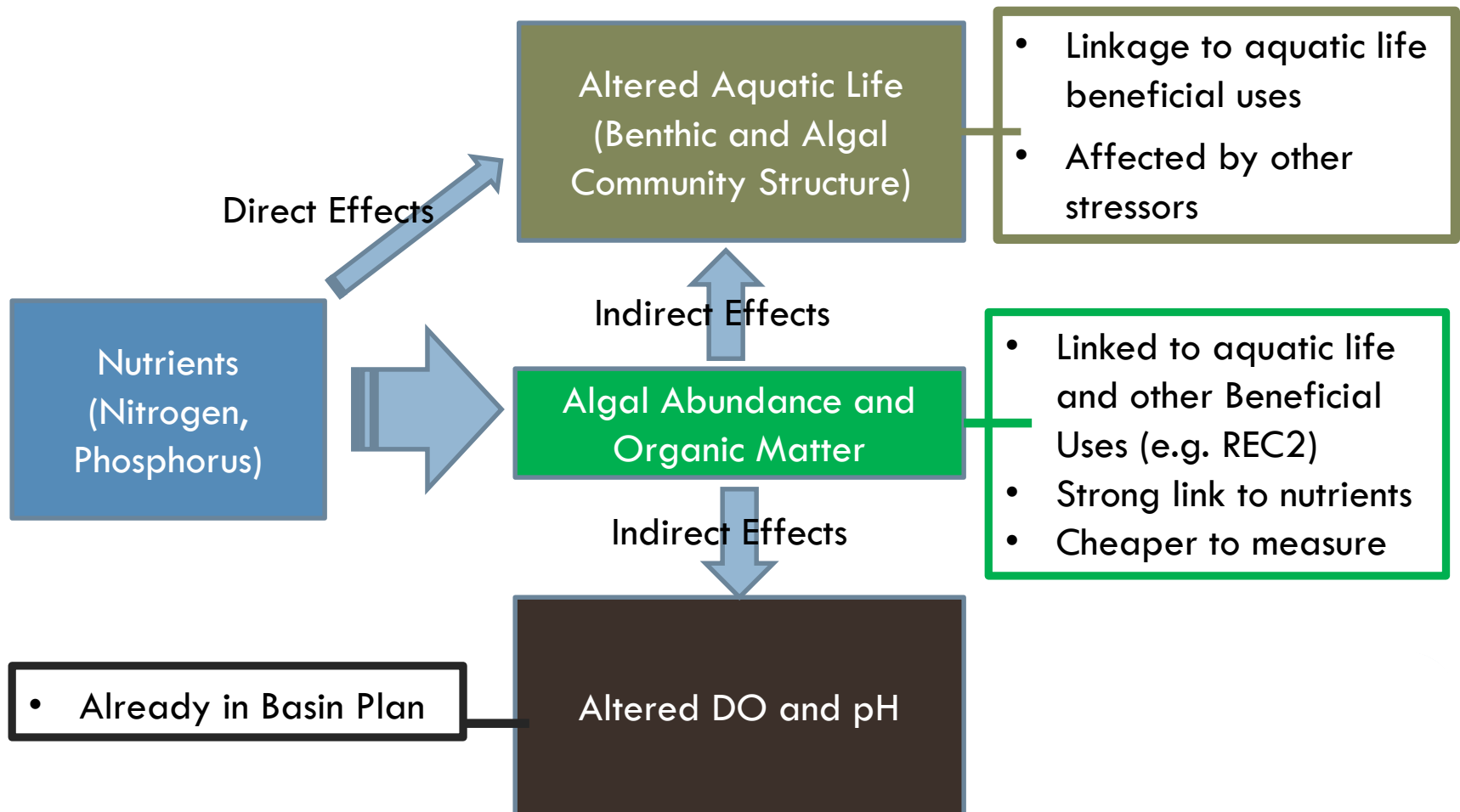
## Goals:

1. Identify **appropriate response indicators**
2. Identify **thresholds of adverse effects of response indicators** on aquatic life to support decision on regulatory endpoints
  - **Relative to reference and ambient concentrations of those indicators** in wadeable streams
3. **Validate the simple model** for wadeable streams and recommend avenues for refinement

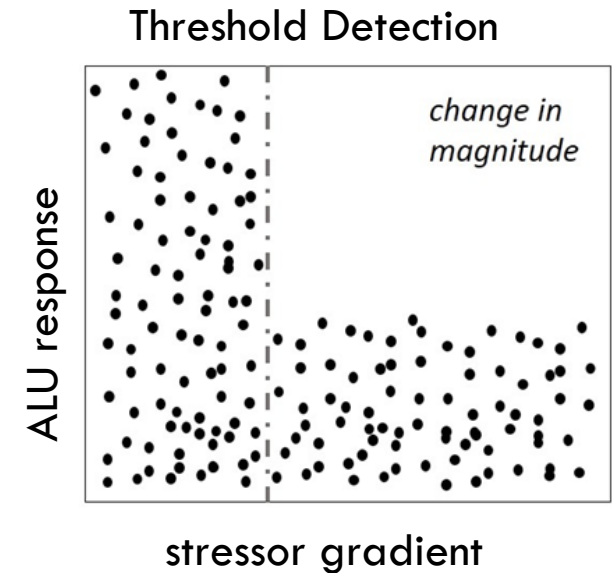
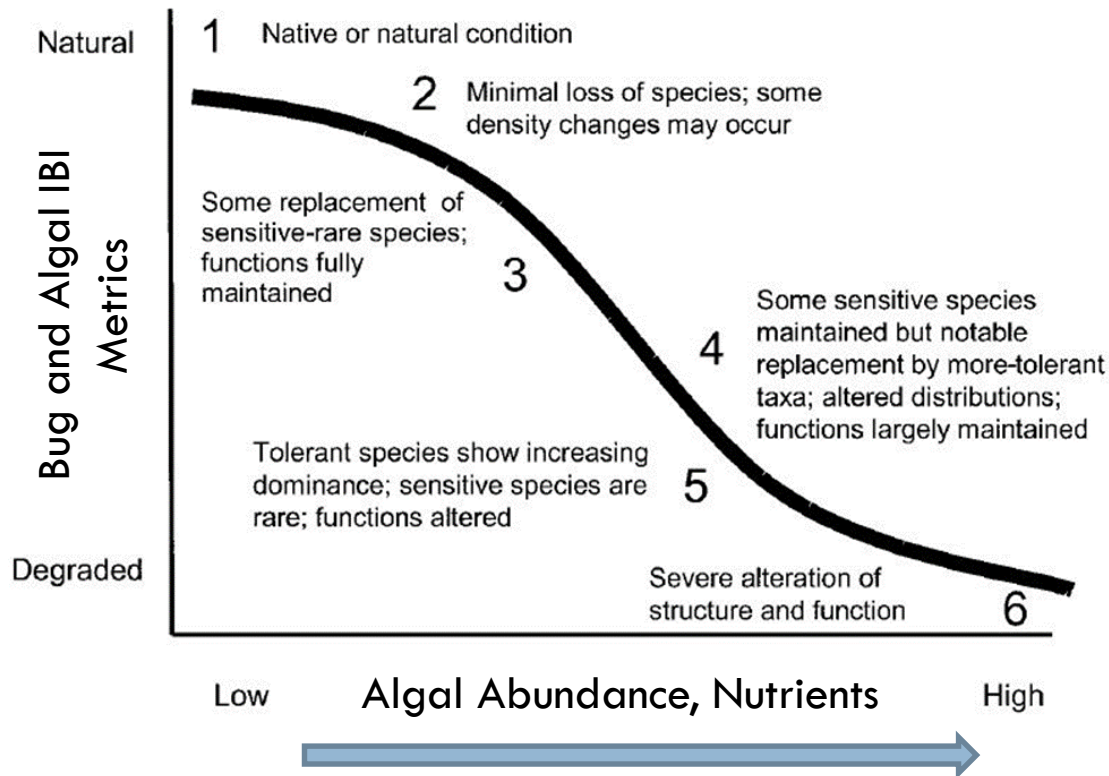


# WHAT ARE THE APPROPRIATE RESPONSE INDICATORS IN WADEABLE STREAMS?

## Response Indicators

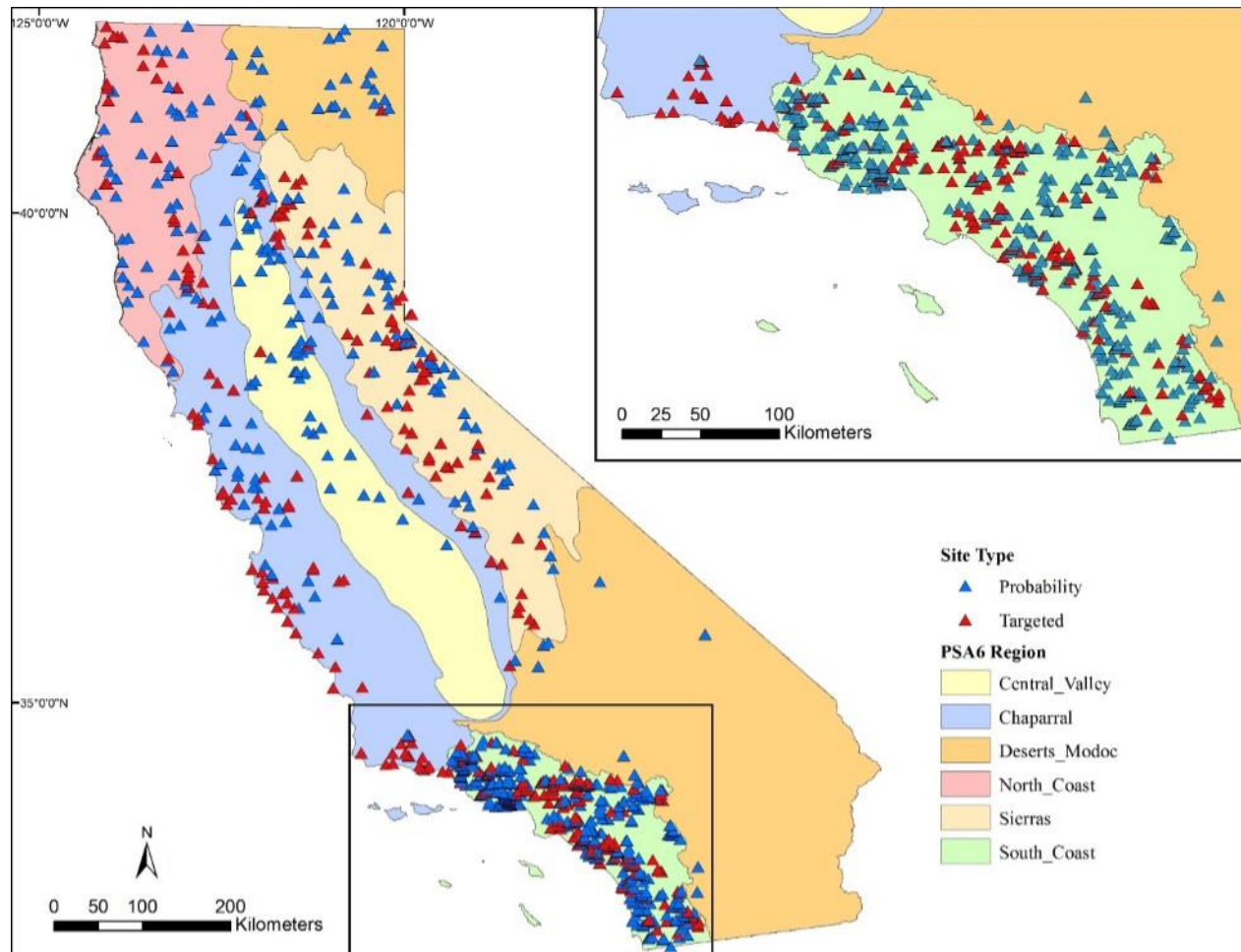


# IDENTIFY ECOLOGICAL THRESHOLDS ALONG BIOLOGICAL CONDITION GRADIENT



# STREAM BIOASSESSMENT PROGRAM PROVIDES ROBUST DATASET FOR ANALYSIS

Available data from combined surveys (>1,000 wadeable stream reaches)



# EPA-ORD STUDY APPROACH: INDICATORS AND THRESHOLDS

- Compile and expand on existing stream bioassessment data to include additional landscape variables
- Investigate relationship of stress (algal abundance, nutrients) on response (benthic invertebrate & algal community metrics)
  - Narrow down list of 10+ algal abundance metrics available through stream algal bioassessment program
- Identify ecological thresholds in those relationships
- Estimate distribution of algal abundance indicators and nutrients at ambient and reference sites
  - Provide context for thresholds detected

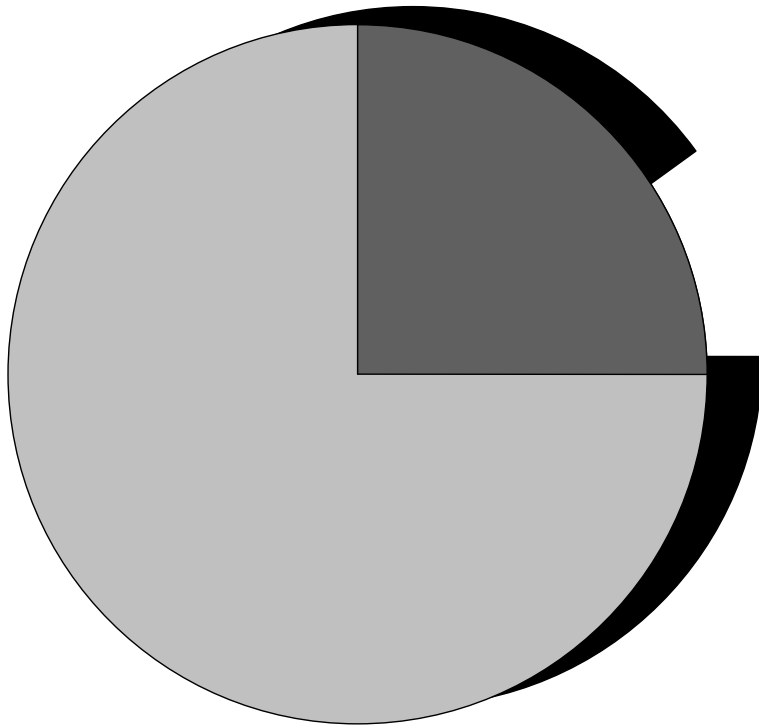
# IDENTIFIED INDICATORS STRONGLY CORRELATED TO AQUATIC LIFE

- **Benthic chlorophyll a (Live Biomass)**
  - Mean thresholds 20-40 mg m<sup>-2</sup>
- **Ash free dry mass (All Organic Matter)**
  - Mean thresholds 10-40 g m<sup>-2</sup>
- **Total nitrogen and phosphorus**
  - Mean thresholds of 0.05-0.1 mg L<sup>-1</sup> TP and 0.4-0.8 mg L<sup>-1</sup> TN
- No thresholds found for percent cover—though this indicator still has utility for REC-2

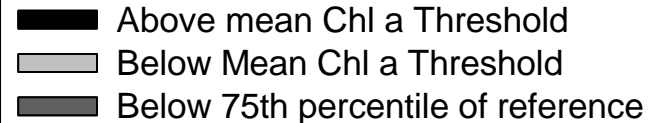
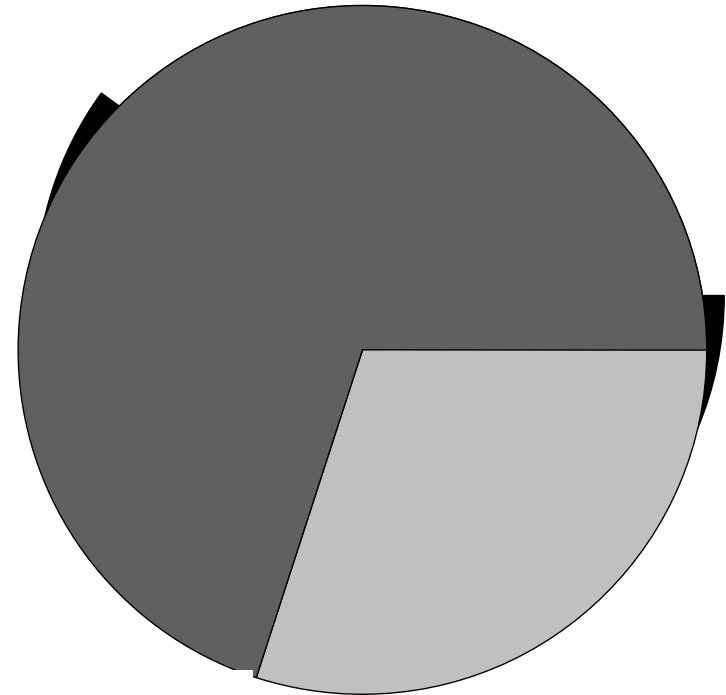


# ONLY 10% OF STATE STREAM MILES ABOVE MEAN THRESHOLD FOR CHLOROPHYLL A, BUT 40% OF SOUTH COAST

Statewide



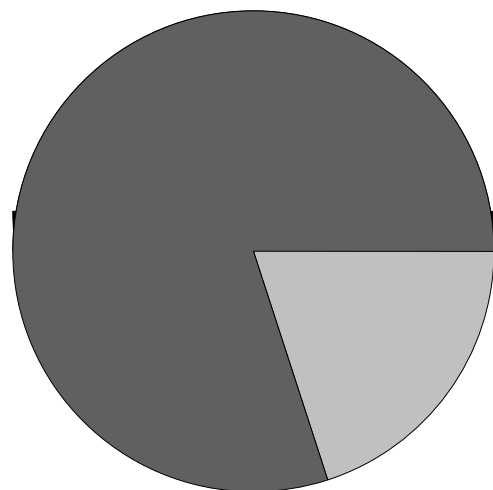
South Coast



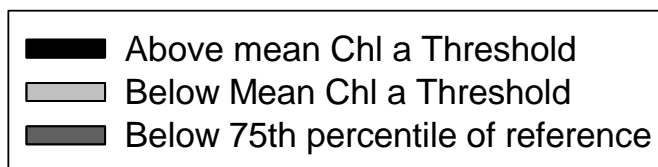
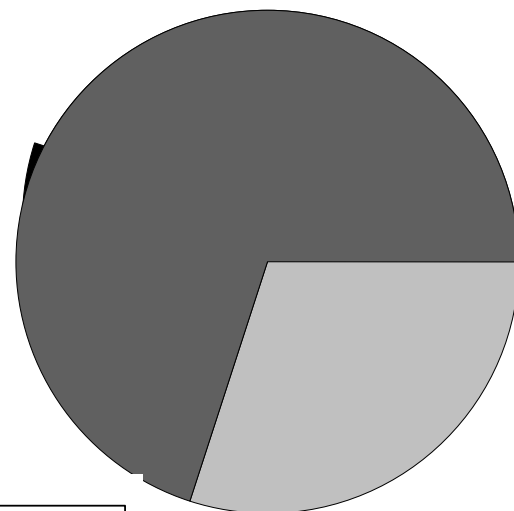
# SIMILAR STORY FOR NITROGEN & PHOSPHORUS

45-50% of South Coast Stream Miles Above Mean TN and TP Threshold

Total Nitrogen



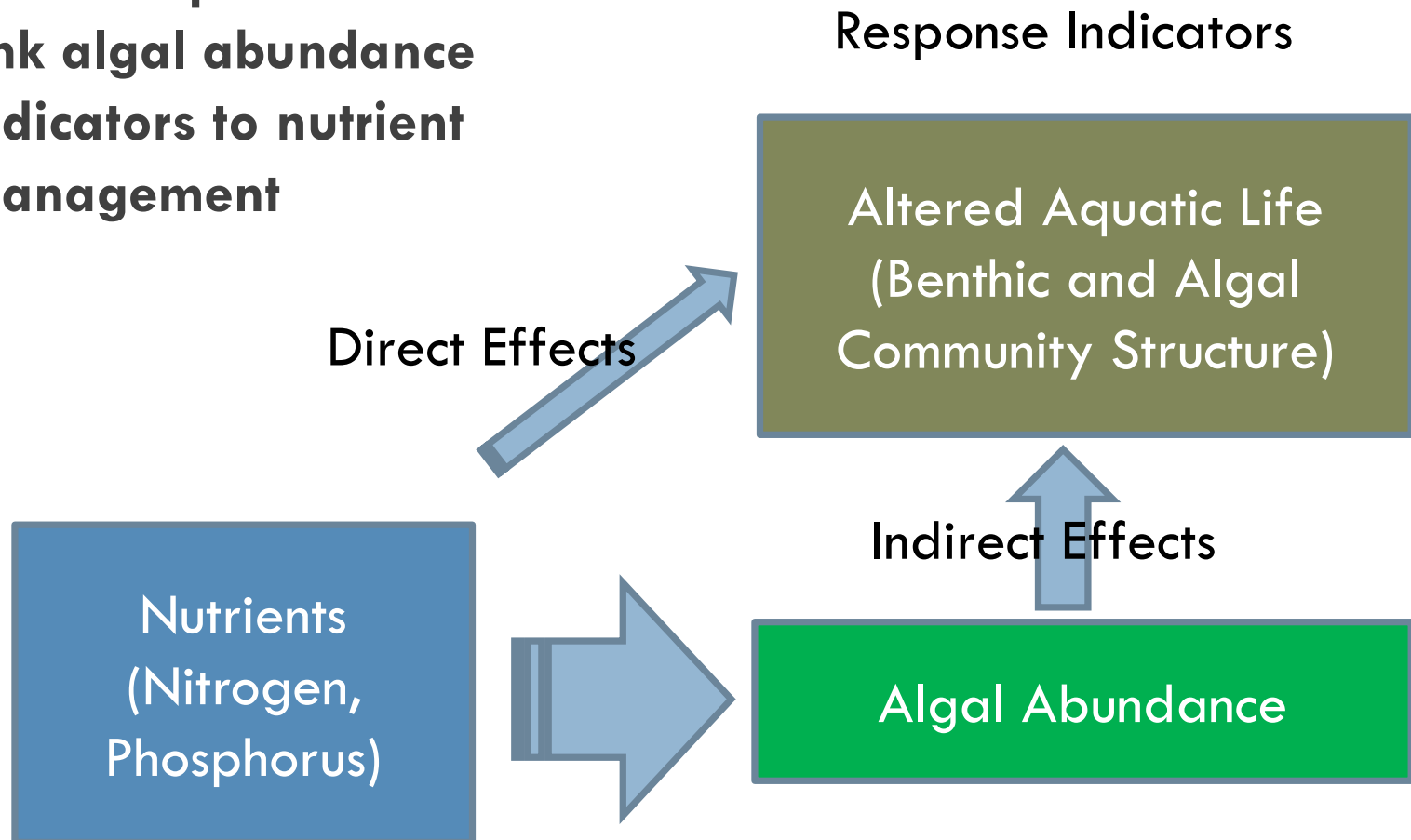
Total Phosphorus



*And....Thresholds for Nitrogen and Phosphorus Are Below What is Easily Achievable Via Treatment Technology*

# BUT NNE APPROACH CALLS FOR BIOTIC INDICATORS, NOT NUTRIENTS, TO BE USED FOR ASSESSMENT

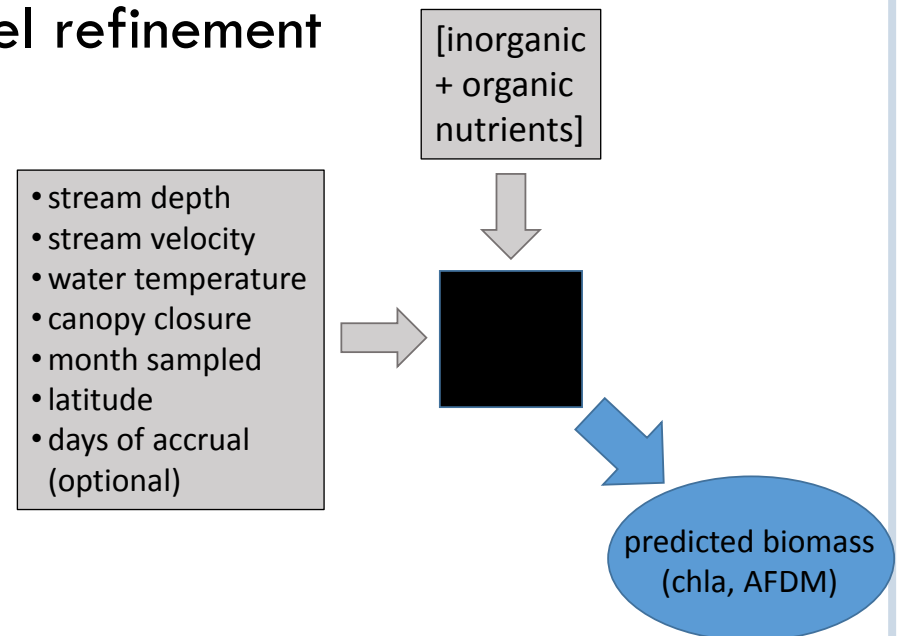
Need simple models to link algal abundance indicators to nutrient management





# VALIDATION OF SIMPLE MODEL (NNE BENTHIC BIOMASS TOOL): APPROACH

- Run model for stream bioassessment data set
  - Compare observed vs. predicted biomass values
- Explore sources of bias and error in model predictions
- Recommend avenues for model refinement



# VALIDATION OF NNE BENTHIC BIOMASS (SIMPLE) MODEL

- Validation work shows that SWRCB model needs refinement
  - Models fits range from  $R^2 = 0.1-0.26$
- Work is now underway to make those refinements
  - Accounting for landscape variability is key

# SCCWRP RESEARCH WILL PROVIDE TWO OPTIONS FOR SETTING “DEFAULT” NUTRIENT TARGETS

- Refined simple models to provide “default” nutrient targets
- TN and TP concentrations resulting from threshold analysis

***Should these be used, in what circumstances, and how?***

## NEXT STEPS AND TIMING

- Drafting technical work plan to govern wadeable stream science
  - Vet with advisory groups and Science Panel by fall 2015
- Additional analyses synthesis on response indicators and thresholds
  - Tie to biological condition gradient
- Refinement of simple models

*Expect to “wrap up” science by early 2015*

# GREAT TIME TO ENGAGE

- First Statewide Stakeholder Group meeting June 13, 2014
- EPA-ORD report in CTAG review
- Opportunity to input on science plan and implementation issues moving forward