

Bight '08 Estuaries Eutrophication Assessment

Karen McLaughlin

Presentation to SCCWRP Commission

June 1, 2012

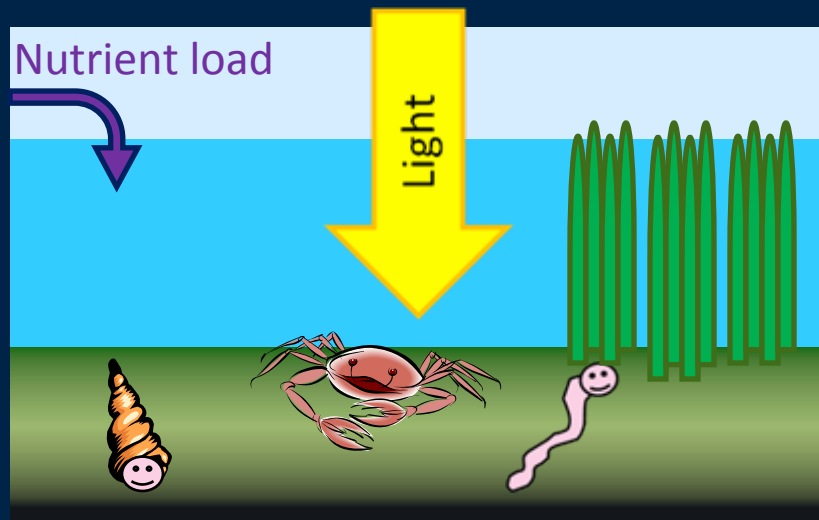
Why Assess Eutrophication in Southern California Bight Estuaries?

- Eutrophication is one of the leading causes of degraded biological condition in US water bodies
- Not enough data in SCB to make an assessment
- Bight Program = Opportunity
 - First large scale assessment in southern California

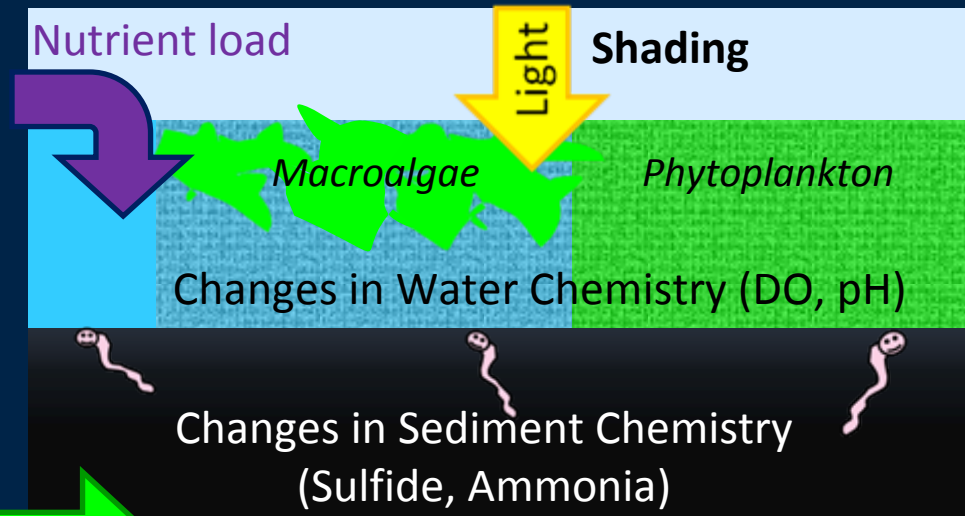
Key Questions

- What is the extent and magnitude of eutrophication in southern California estuaries?
- Is eutrophication driven by nutrient concentrations or nutrient loads?

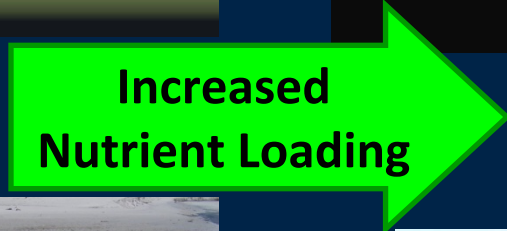
Conceptual Model of Development of Eutrophication in SCB Estuaries



Minimally Disturbed

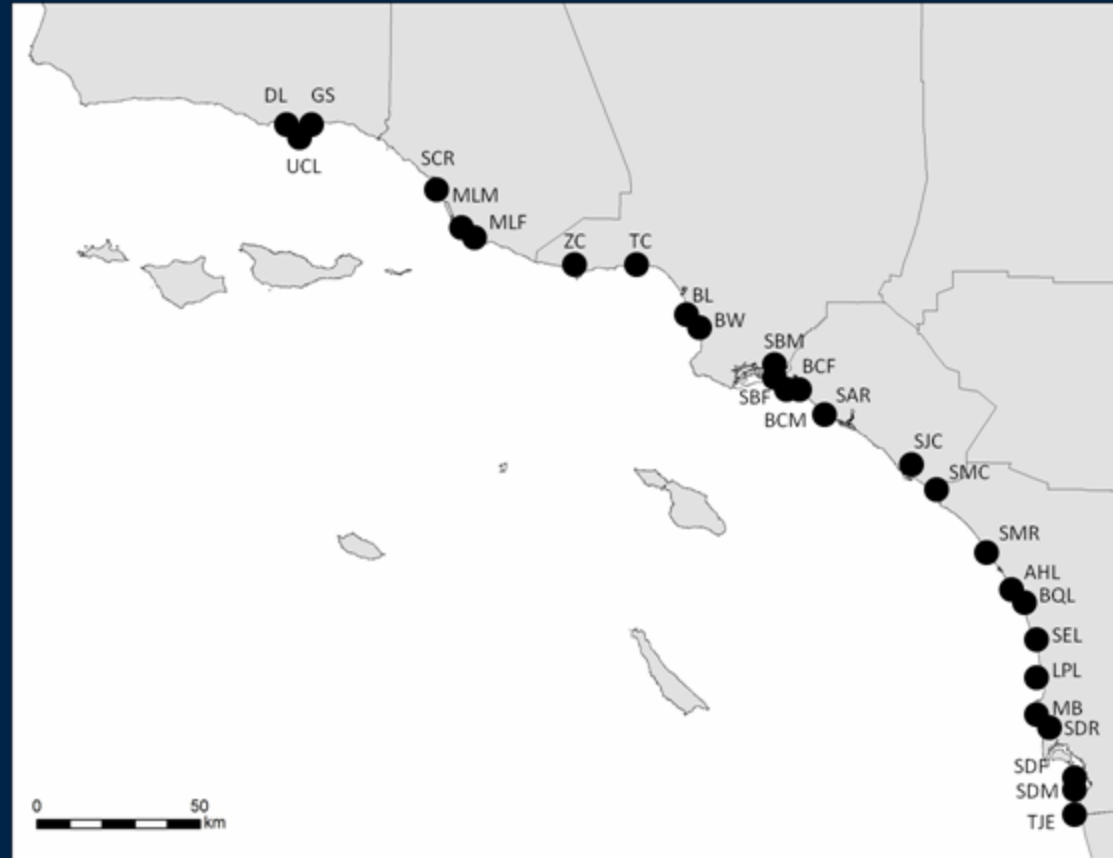


Affected by Eutrophication



Approach

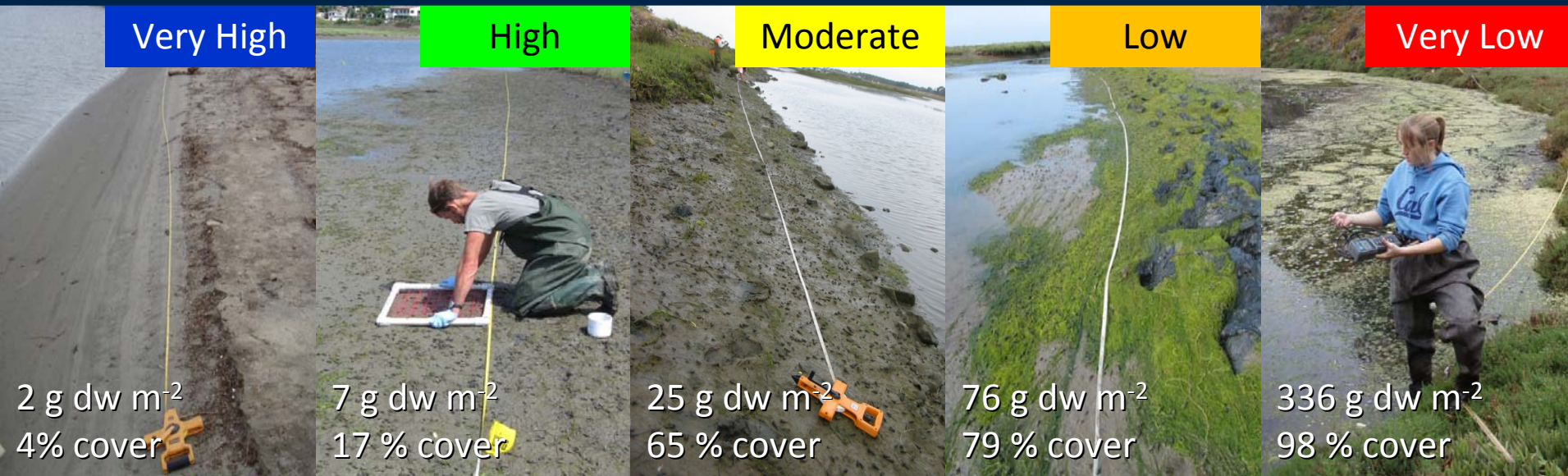
- 27 Segments from 23 Estuaries; Randomly Selected
- Monitor 3 core indicators:
 - Macroalgae
 - Phytoplankton
 - Dissolved Oxygen
- Use European Union-Water Framework Directive to interpret data



Macroalgae Assessment

Ecological Condition Interpreted from WFD Framework

Biomass (g dw m ⁻²)	Percent Cover				
	≤5%	> 5%	> 15%	> 25%	> 75%
> 415	Moderate	Low	V. Low	V. Low	V. Low
> 140	Moderate	Moderate	Low	V. Low	V. Low
> 70	High	Moderate	Moderate	Low	Low
> 15	V. High	High	High	Moderate	Low
≤ 15	V. High	High	High	Moderate	Moderate

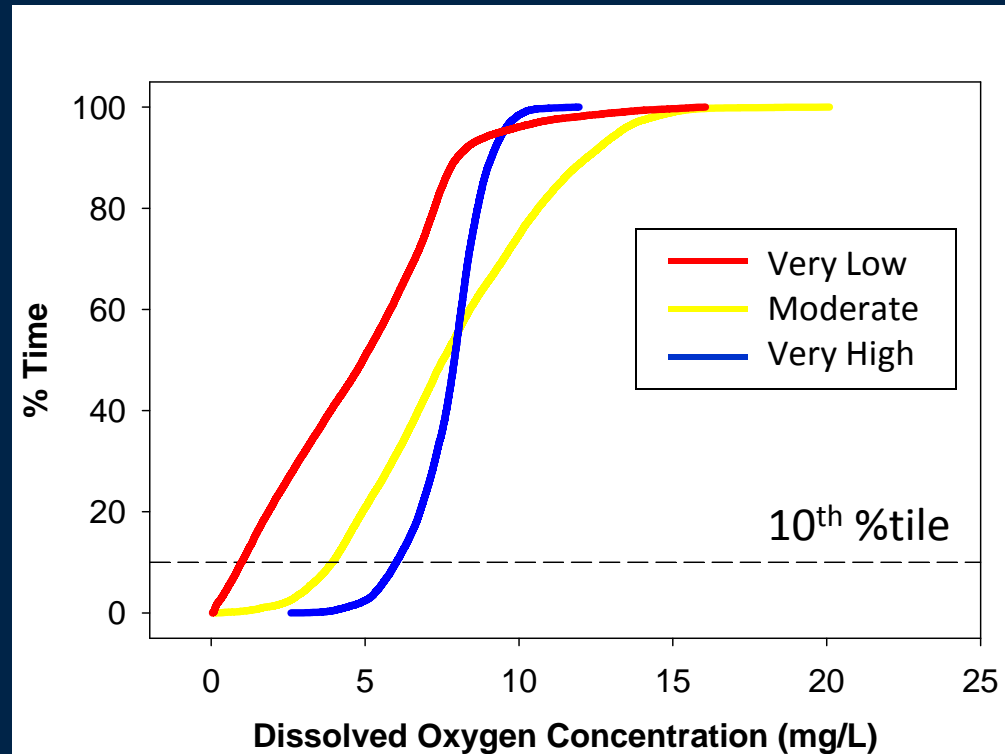


Dissolved Oxygen Assessment

Ecological Condition Interpreted from WFD Framework

10th percentile of hourly
running average DO data
(mg/L)

Very High	≥ 5.7
High	4.0 - 5.7
Moderate	2.4 - 4.0
Low	1.6 - 2.4
Very Low	< 1.6

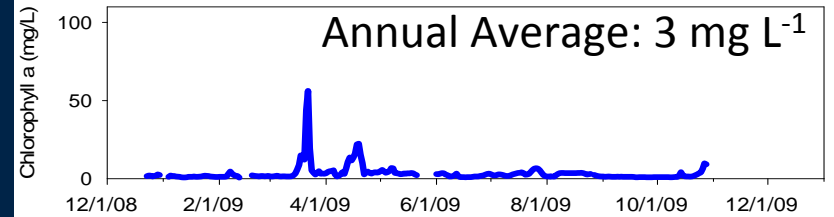


Phytoplankton Assessment

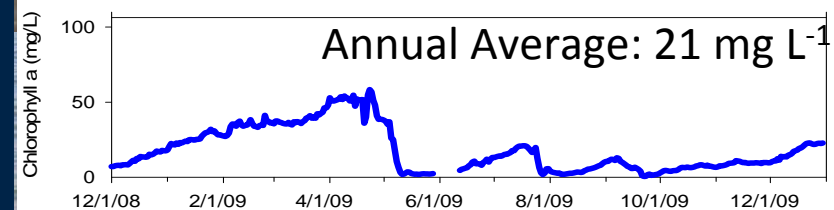
Ecological Condition Interpreted from WFD Framework

Annual Average of Sonde
Chlorophyll a ($\mu\text{g/L}$)

Very High	< 5
High	5 - 7
Moderate	7 - 10
Low	10 - 30
Very Low	≥ 30



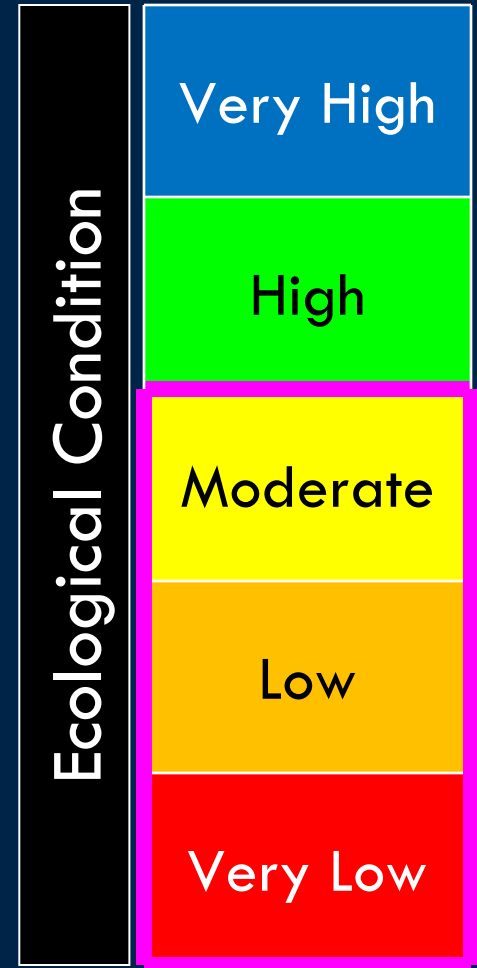
Very High



Low

Eutrophication is Pervasive in SCB Estuary Segments

Indicator	% Less than High	% Less than Moderate
Macroalgae	78%	41%
Phytoplankton	37%	28%
Dissolved Oxygen	59%	43%



How Do SCB Estuaries Compare?

Overall rank determined from average of three ranks

Best



Worst

Estuary	Condition Category and Rank for Each Indicator		
	Macroalgae	Phytoplankton	Dissolved Oxygen
Batiquitos Lagoon	7	10	3
Seal Beach 1	5	12	4
Los Penasquitos Lagoon	6	7	10
Santa Ana R. Wetlands	14	2	9
San Elijo Lagoon	8	5	17
Bolsa Chica 1	15	11	5
Seal Beach 2	9	8	14
Topanga Lagoon	2	13	16
Tijuana River Estuary	11	1	19
San Diego Bay 1	10	15	7
Agua Hedionda Lagoon	3	20	11
Ballona Lagoon	19	3	13
San Juan Creek	4	25	8
Mugu Lagoon 1	18	19	1
Bolsa Chica 2	21	4	15
San Mateo Lagoon	24	18	2
Ballona Wetlands	13	6	26
Mission Bay	12	9	27
Zuma Lagoon	17	14	18
Santa Clara River	1	27	21
San Diego Bay 2	22	24	6
Santa Margarita Estuary	20	21	12
San Diego River	16	23	24
Goleta Slough	23	17	23
Devereaux Lagoon	27	16	25
UCSB Campus Lagoon	25	22	22
Mugu Lagoon 2	26	26	20

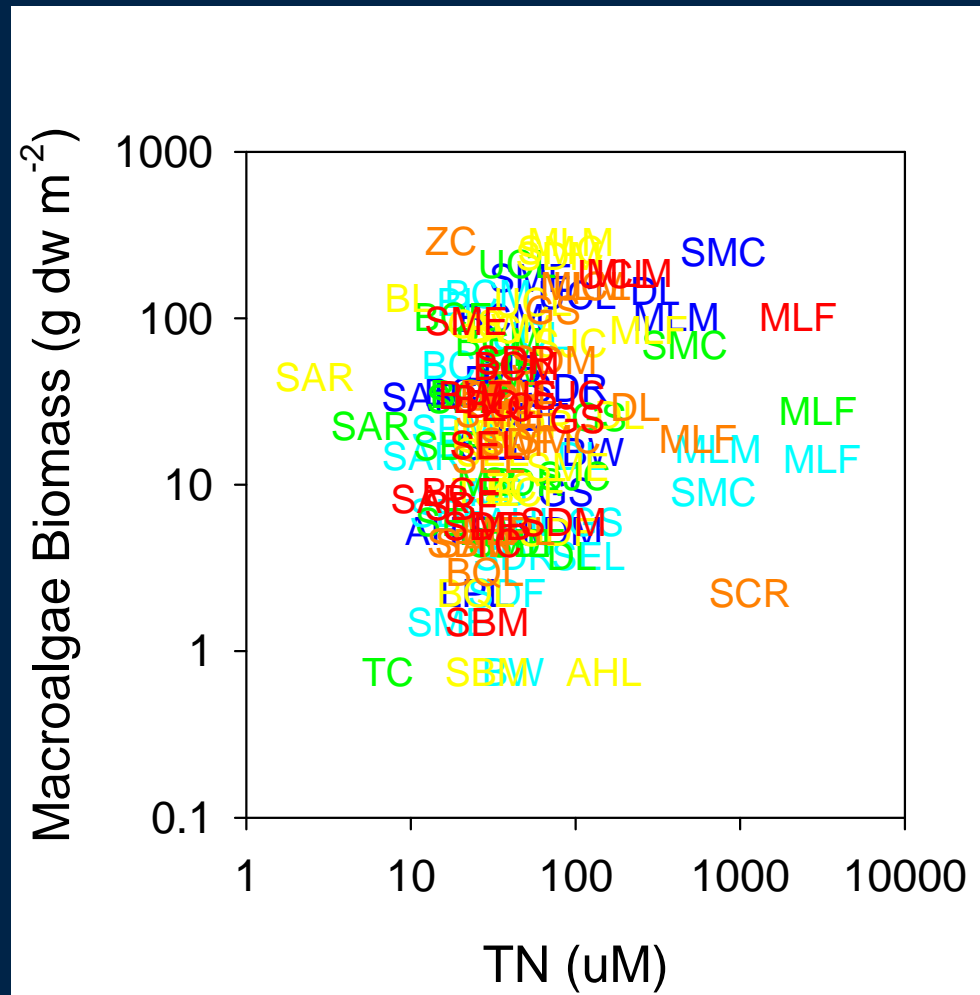
Key Questions

- What is the extent and magnitude of eutrophication in southern California estuaries?
- Is eutrophication driven by nutrient concentrations or nutrient loads?

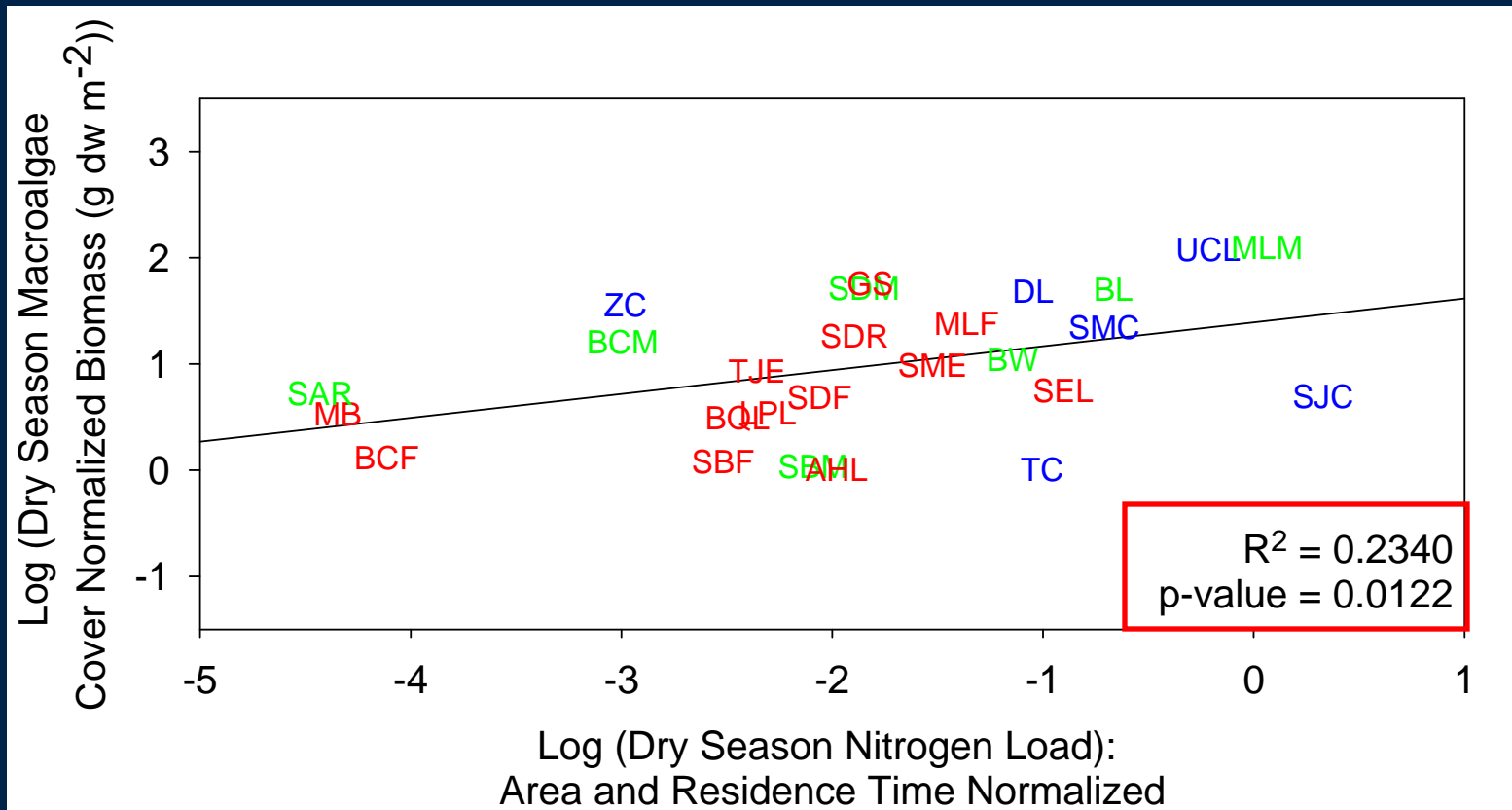
Approach

- Investigate statistical relationship between indicators and water column nutrients and riverine nutrient loads
- Data Collection:
 - Estuarine water column nutrients at each segment
 - Riverine Nutrient Loading
 - Dry weather
 - Wet Weather

For Most Indicators, No Relationship to Estuarine N and P Concentration

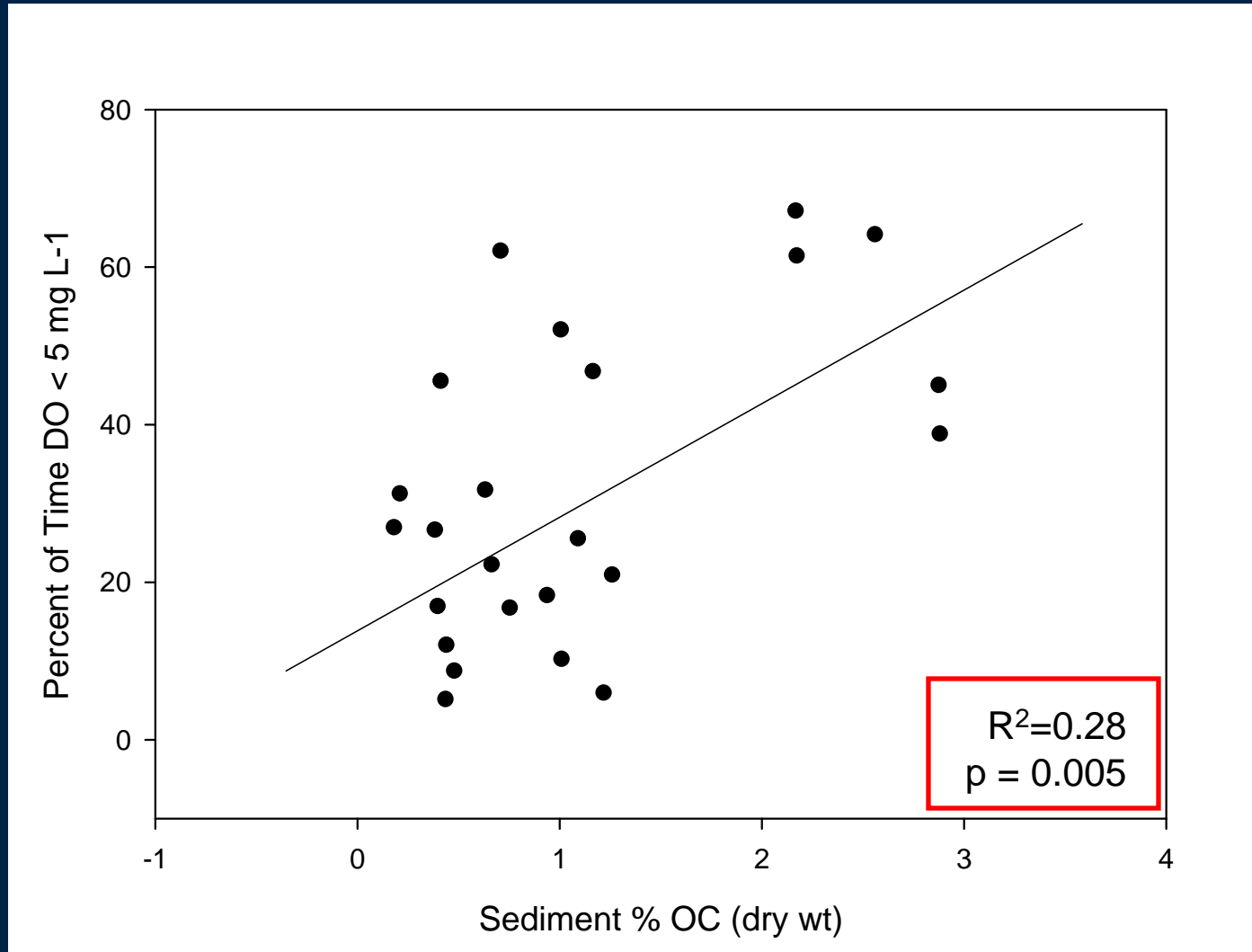


Significant Relationship Between Nutrient Loads and Macroalgae and Phytoplankton Response



Load-Response Models Improve When
You Account for Hydrology

Dissolved Oxygen: No Significant Relationship with Nutrient Loads But Significantly Correlated with Sediment Organic Matter



Eutrophication Driven By Nutrient Loading

- Indicator response related to nutrient loads, not nutrient concentrations
- Indicators integrate over different time scales
 - Macroalgae & Phytoplankton – Respond to present day nutrient loading
 - Dissolved Oxygen – Integrates the effects of eutrophication over many years

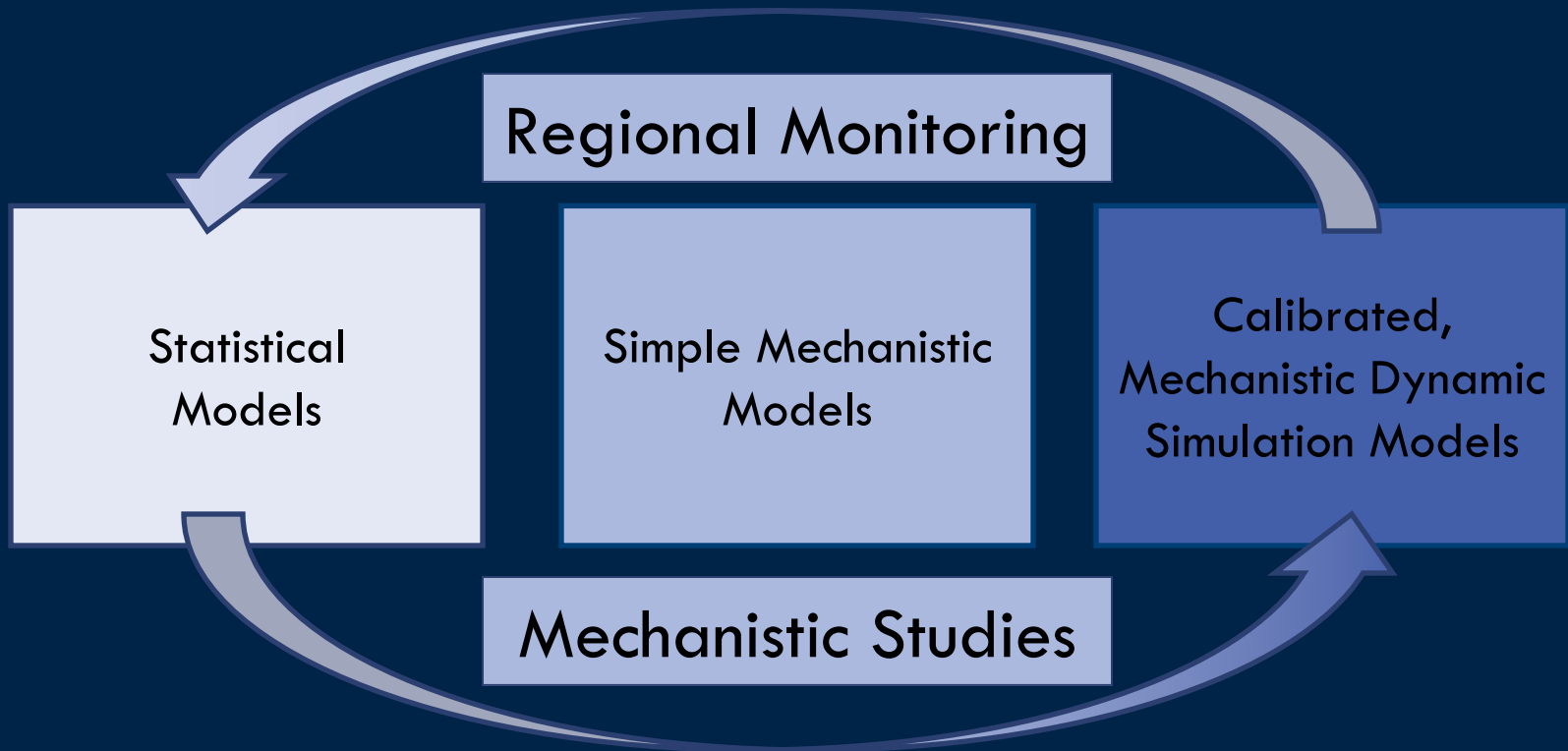
Next Steps

1. Refine Assessment Framework

- California is in the process of developing a framework; use Bight data set to inform the process
- Studies to address data gaps
- Optimize protocols for monitoring

Next Steps

2. Refine predictive load/ response models



Questions?