

**Final
Meeting Summary**

**Santa Margarita River
Watershed Nutrient Initiative Group Meeting
Wednesday October 24, 2012
12:30pm – 3:30pm**

Location:

San Luis Rey Water Reclamation Facility
3950 N. River Road
Oceanside, CA 92054

Attendee List:

Name	Organization	E-mail
Jason Uhley	Riverside County Flood Control & Water Conservation District	juhley@rcflood.org
Scott Thomas	Stetson Engineering	ScottT@StetsonEngineers.com
Sheri McPherson	County of San Diego	sheri.mcpherson@sdcounty.ca.gov
Barry Pulver	San Diego Regional Water Quality Control Board (RWQCB)	bpulver@waterboards.ca.gov
Chuck Katz	U.S. Navy (SPAWAR)	chuck.katz@navy.mil
Martha Sutula	SCCWRP	marthas@sccwrp.org
Denise Landstedt	Rancho California Water District (RCWD)	Landstadt1@ranchowater.com
Jeff Marchand	Fallbrook PUD	jeff@fpud.com
Jayne Joy	Eastern Municipal Water District	joyj@emwd.org
Judy Mitchell	Mission Resource Conservation District (RCD)	judy@missionrcd.org
Karla Standridge	Mission RCD	karla@missionrcd.org
Pei-Fang Wang	SSC PAC	Pei-fang.wang@navy.mil
Clint Boschen	Tetra Tech	Clint.boschen@tetrattech.com
Tommy Wells	AMEC Environment & Infrastructure, Inc.	tommy.wells@amec.com
Mark Bonsavage	USMC Camp Pendleton	Mark.bonsavage@usmc.mil
Ashli Desai	Larry Walker & Associates	ashlid@LWA.com
Roxy Carter	Cal Trout	rcarter@caltrout.org
Dave Ceppos	Center for Collaborative Policy, California State University Sacramento	dceppos@ccp.csus.edu
Via Telephone:		
Brittany Struck	National Marine Fisheries Service	Not provided

Meeting Materials:

- Agenda
- September 13, 2012 meeting summary
- Santa Margarita River (SMR) Watershed Nutrient 303(d) Listing Sampling Locations – Supplemental Information
- List of Possible Sources of Nutrients to Surface Waters of the SMR Watershed, Site Specific Data Obtained Regarding These Sources, and the Agencies that might have additional Site Specific Data on Each Source
- San Diego Integrated Regional Water Management (IRWM) Project Database Handout
- Special Studies Cost Summary
- Comments Summary
- PowerPoint handouts:
 - SMR Estuary Total Maximum Daily Load (TMDL)
 - SMR Watershed Model Update

Meeting Goals:

- Technical Advisory Committee (TAC) revision of special studies budgets and levels of effort
- TAC completion of draft final Project Work Plan
- TAC completion of draft final Monitoring Work Plan
- Receive information updates
- Track status of coordination and technical action items.
- Achieved shared understanding about the potential Estuary TMDL
- Steering committee decision – Extent of Estuary Modeling

Action Items:

Technical Advisory Committee Action Items

1. TAC members that have been responsible for initial scopes and costs estimates of special studies will provide revised versions to Martha Sutula by 5:00 pm, November 13. These revised versions will include descriptions of the study context, scope of services describing the tasks and deliverables, a timeline for activities, and budget estimate (by staff and by task).
2. Chuck Katz and Martha will speak with Mark Bonsavage about the target date and public availability of the Camp Pendleton groundwater report.
3. Martha will work with PF Wang to ensure information in the report (if available) can help inform setting boundary conditions for the proposed estuary groundwater model.
4. Martha will have the first draft of the Quality Assurance Project Plan (QAPP) available for review by the TAC on November 14.
5. Martha will schedule a conference call to discuss the first draft of the QAPP on approximately November 20th.
6. Final review comments on the Riverine Sampling Workplan are due from the TAC to Martha by November 7.
7. Scott Thomas will send to Dave Ceppos and Ashli, the Stetson technical memoranda to be used as technical backup on the topic of setting sampling number and site selection criteria.
8. Clint will contact Scott to discuss exclusion criteria and similar information that can inform TetraTech's pending work.

9. Regarding the Project Process Plan (formerly referred to as the "Project Workplan") (prepared by Ashli), Martha suggests that Section 4.4 include a description of the estuary
10. Ashli will expand Section 5.3.2 of the Project Process Plan (Process Plan) to include key policy questions and to address questions about what will happen if SSO are established for the river and its tributaries.
11. Ashli and Martha will write new information for the Process Plan to address the conceptual approach for dry / wet weather conditions. This is currently in Section 7 but might be moved to Section 6.
12. The TAC will provide redline / strikeout comments on the Process Plan to Ashli by 5:00 pm November 13

SMR Group Action Items

1. Future references in SMR documents to the "Riverside IRWM" need to be changed to "Upper Santa Margarita River IRWM".
2. Sheri McPherson will send out updated Google Earth .kmz file to group by November 2.
3. All SMR Participants will provide any relevant river and watershed technical reports or data to Ashli by November 9.
4. Clint and Ashli to work together to identify relevant modeling studies by November 1.
5. Martha will review existing data/reports that have been placed on the Cloud.
6. Scott Thomas will to send Ashli a write up of the history of the SMR group by November 2.
7. All future presentations about conditions on Camp Pendleton will be provided to Chuck Katz for initial review before they go out to the public and SMR Group distribution list

SMR Group Decisions

1. The September 13 SMR Group meeting summary was approved as final.
2. The Steering Committee approved the proposed estuary model boundaries as presented.
3. The Steering Committee approved that Total Nitrogen, Total Phosphorus, Dissolved Oxygen, macroalgae, and phytoplankton are the appropriate indicators to move forward with for the study at this point in time. This decision was qualified that these indicators are subject to change prior to finalization of plans.

Introduction

Dave Ceppos (Facilitator, Center for Collaborative Policy) reviewed the meeting goals and agenda, and inquired whether anyone had changes. No changes or comments were noted.

Review of September 13, 2012 Action Items

Due to the number of items and the limited amount of time between meetings, action items from previous meetings were not reviewed:

General Updates:

The County of San Diego is still on schedule in regards to the San Diego IRWM for a draft revised plan in late spring 2013. There are some monies from a planning grant to develop Salt Nutrient Management Plans (SNMP) for the Upper Rancho and Camp Pendleton areas.

RCWD kicked off their IRWM plan update on October 13. A stakeholder meeting was held on October 14 to start this process. There limited public turn out to the meeting so RCWD is

working on a stakeholder outreach plan and they hope to have more involvement in future IRWM activities. The consultant RCWD hired is starting to get things moving for their SNMP. RCWD has received preliminary notice of planning grant award but has not yet received final work. They are moving forward as funds permit and will move forward stronger once they receive final word on the planning grant.

The County of San Diego and RCWD discussed how grant applications should be submitted, the IRWM process, and where matching funds requirements would come from.

Camp Pendleton completed a SNMP and submitted it for stakeholder input early October. It is currently available for review if any parties are interested. Interested parties should contact Mark Bonsavage.

TAC Meeting Updated

A summary of the TAC meeting held immediately prior was presented. The TAC meeting had two main focuses.

- The TAC reviewed the remaining issues associated with river monitoring technical work plan. They have produced a new draft that is considered mostly complete and open for comment. The next step will be to turn this work plan into a QAPP.
- The TAC reviewed the details of the Process Plan. This is in the process of being written. The Process Plan will be a document that stitches everything together. Technical consultants provided technical input for the Process Plan this morning. The first version of the Process Plan will be available for review during the next SMR Watershed Nutrient Initiative meeting. This version will not have a schedule or cost.

Regional Board Executive Officer Presentation

The presentation to the RWQCB Executive Officer (EO) was rescheduled to November 21, 2012 at 10:00 am. The EO was on unexpectedly on jury duty during the originally scheduled presentation. Participants will give an update about the meeting at the November 28 SMR Group meeting.

303(d) Listed Reaches Summary

Ashli presented a Google Earth overlay she created with detailed 303(d) listed reaches within the SMR Watershed. The following points were noted:

- Almost every listed reach is listed from one sampling location towards the base of the reach.
- There are reaches listed based on one or two sampling locations.
- Beneficial uses are not detailed on the overlay.
- A quick summary of the reasons for listing was also created.
 - Reaches listed prior to 1994 tend to not have good data available as to why they were listed.
 - Some sites have been listed based on unknown sample locations.
 - Most reaches have been listed more recently and have good data available as to why they were listed.

Status of Existing Historical Information Gathering

Ashli updated the group on the status of existing historical data. She has compiled a list of the studies she has reviewed to date and also has prepared a list of people to be contacted who may possess data from the SMR Watershed. Chemistry and flow data were stated as being the primary sources of data sought. Toxicological and bioassessment data is not relevant at the present time to the modeling effort. Similar modeling reports may have some value to the current effort.

Project Process Plan

Ashli presented an update on the Process Plan. A draft has been developed but several sections still require further input. The intent is to have a draft version available prior to the next meeting.

The intent of this document is to pull all the pieces together and also as a record of the decisions made by the SMR Group. This document will gather and put things into one place and also provide a framework or context for this project and all the things that might influence this project. The hope is that this document will provide a means to allow the SMR Group to think about influences two years or further from now.

This document will include a philosophy of the proposed water quality assessment and management approach and the detailed technical pieces will be appendices (e.g., monitoring plan, work plan, etc.). The Process Plan will present proposed solutions for water quality management outside of the creation of a TMDL as this has been an underlying intent of the SMR Group process since its inception (and as is memorialized in the SMR Group Charter).

The group consensus was that time needed to be dedicated during the next meeting to determine what the outcomes of the Process Plan and this project should be 3-5 years down the road.

Estuary Modeling

Martha, Clint, Barry, and PF presented a presentation on modeling.

The presentation began with a review of why models are required. A TMDL may be required which would cause numeric targets to become very important. To determine the ongoing conditions within a watershed and if numeric targets are being met, either monitoring or modeling may be used. Monitoring produces a more accurate picture of what is occurring. However, it is very costly and there is not enough money or resources to continually monitor the entire watershed. Thus, modeling becomes necessary. The required parts of a model are creation, calibration, and validation. Then you can use it to start making predictions of future impacts. The models proposed to be used for this project are fully vetted and widely accepted. This project also proposes that there is a better alternative approach besides the TMDL approach. Currently, groups are working outside the TMDL process in similar manners to manage Lake San Marcos and the Tijuana River Watershed.

Models are predictive tools and are very useful. You have to be careful to get the flow as accurate as possible. If the flows are close estimates, then you have a chance at getting the other variables correct. They are only as good as the data you put into them.

The SMR watershed between the upstream dam discharge points and the upper limits of the estuary is proposed to be modeled. There is a good basis for this modeling effort. This watershed has been previously monitored. This effort will focus on refining the model and increasing its resolution using more U.S. Geological Survey gauging stations, dam discharge records, and soil type data from San Diego Association of Governments and Southern California Association of Governments. Irrigation data and sediment transport will also be included in the model. The model is considered by the TAC irreplaceable for wet weather estimation. It is generally felt that the need for the modeling effort will become very apparent as the project progresses. It was noted that data from the lakes may need to be used with caution as the water quality monitoring points may be from surface sites and discharge may come from the bottom of the lakes which may have significantly different chemical makeup. It was also noted that the watershed has had significant population growth in recent years, thus, historical data

may likely not represent actual present conditions. Older data sets should be relied upon with caution. It was also noted that the model will not have very good predictability on reaches within the watershed that are ephemeral.

The estuary will also be modeled for nitrogen, phosphorus, biomass, dissolved oxygen (DO), and sediment. The EPA has been briefed on this project and stated they will try to support this study. This will be the first study of this kind. There is currently uncertainty as to where the upstream boundary of the estuary is. A proposed area was presented for discussion. This did not include the salt pan area to the south. It was noted that the adopted boundary would likely have regulatory implications. Existing known data sets were also discussed. It was noted that the stream channel is typically ephemeral upstream of the estuary. It was also decided that simulations should be created with both the ocean mouth open, and closed.

Resource Decision – The proposed estuary modeling boundary was adopted with no objections.

Next, the proposed indicators to be monitored were presented. It was noted that the water quality objectives for nitrogen and phosphorus in the RWQCB Basin Plan came from an EPA document based on data over 10 years old from the eastern U.S. that is likely not applicable to the SMR region. An impact of nutrients on estuaries was presented. This presentation ended by suggesting that the appropriate indicators to use for this project are DO, macroalga, and phytoplankton along with total nitrogen and total phosphorus. SCCWRP stated that there was no downside to monitoring these indicators in their professional opinion and that it should not cost any additional monies to do so.

Resource Decision – The proposed indicators were adopted with no objections.

Next Meeting:

Rancho California Water District
2nd Floor Conference Room
42135 Winchester Road
Temecula, CA 92589-9017
Time: 9:30 am – 12:00 pm

Santa Margarita River Estuary TMDL

July 19, 2012

Goals of Discussion

- Overview of TMDL components
 - How does modeling fit into this?
- Conceptual approach for modeling
 - Watershed loads
 - Estuary
- Actions
 - Feedback on approach?
 - Input to modelers on boundaries of the estuary
 - Agree on indicators for estuary numeric targets

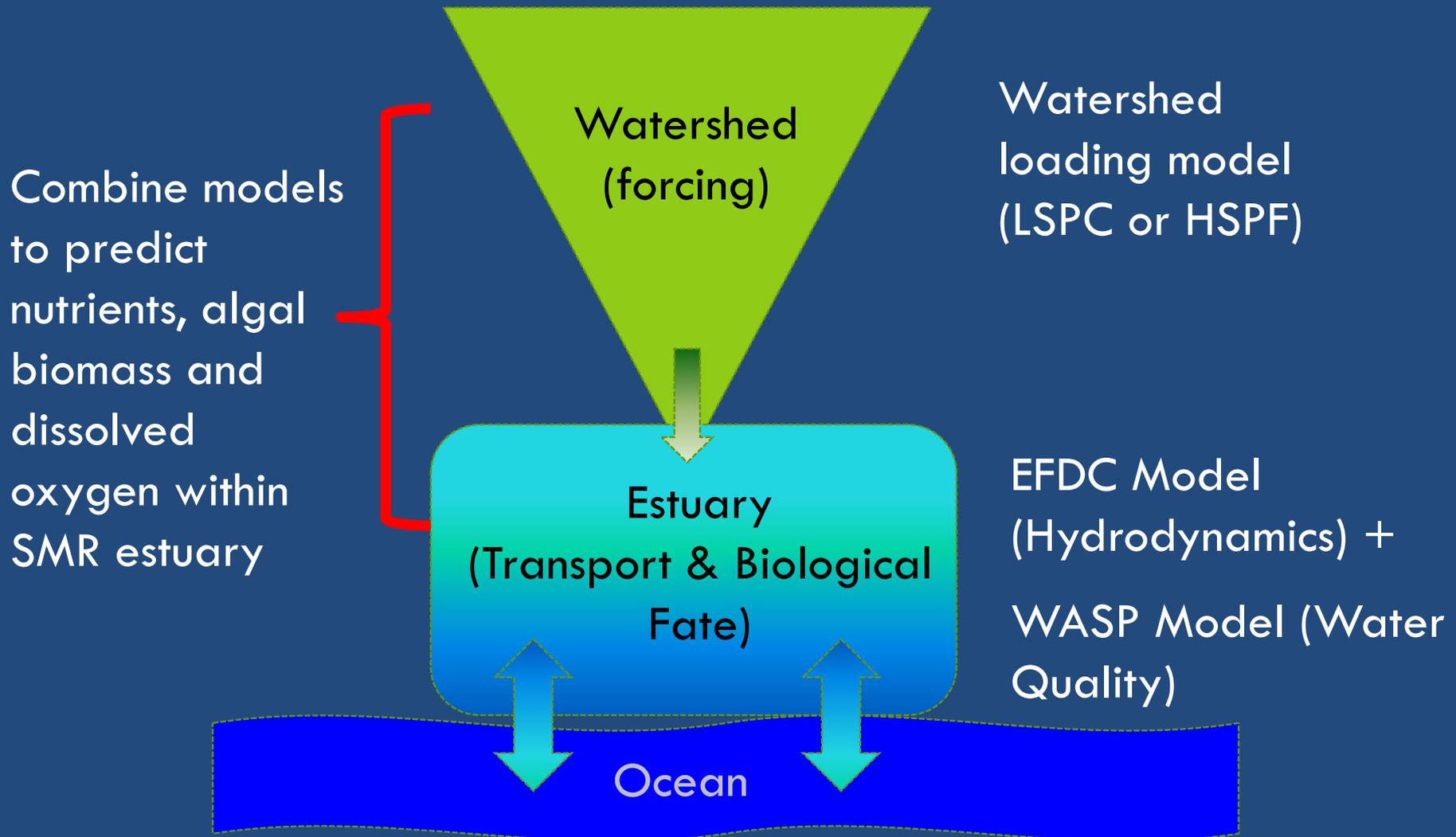
What is the Process to Establish a TMDL?

- Formulate problem statement
- Decide on numeric targets
- Calibrate and validate watershed loading and estuary water quality models
- Choose management scenarios (Options for how to reduce loads, e.g. Best management practices, etc.)
- Determine TMDL “maximum load” and margin of error
- Calculate existing loads and model management scenarios
- Establish load and waste load allocations
- Establish implementation plan

Why Use Models?

- Estimate total loads based on limited sampling effort
- Source attribution
- Establish linkage between management endpoints and controlling factors (linkage analysis)
- Helps to identify important data gaps
- Allows you to test implementation scenarios

Conceptual Approach



Process to Model

- Model set up
- Assemble data, conduct QA, and develop input files
- Calibrate and validate hydrology
- Calibrate and validate water quality
- Link models (watershed and estuary)
- Use models to estimate TMDL
- Run implementation scenarios

Presentation Roadmap

- Watershed hydrodynamic and nutrient loading model-
Clint Boschen, TetraTech
- Estuary hydrodynamic and water quality model- PF
Wang, SPAWAR
- Numeric Targets- Barry Pulver, SDRWQCB and Martha
Sutula, SCCWRP



Santa Margarita Watershed Model Update

10/24/2012



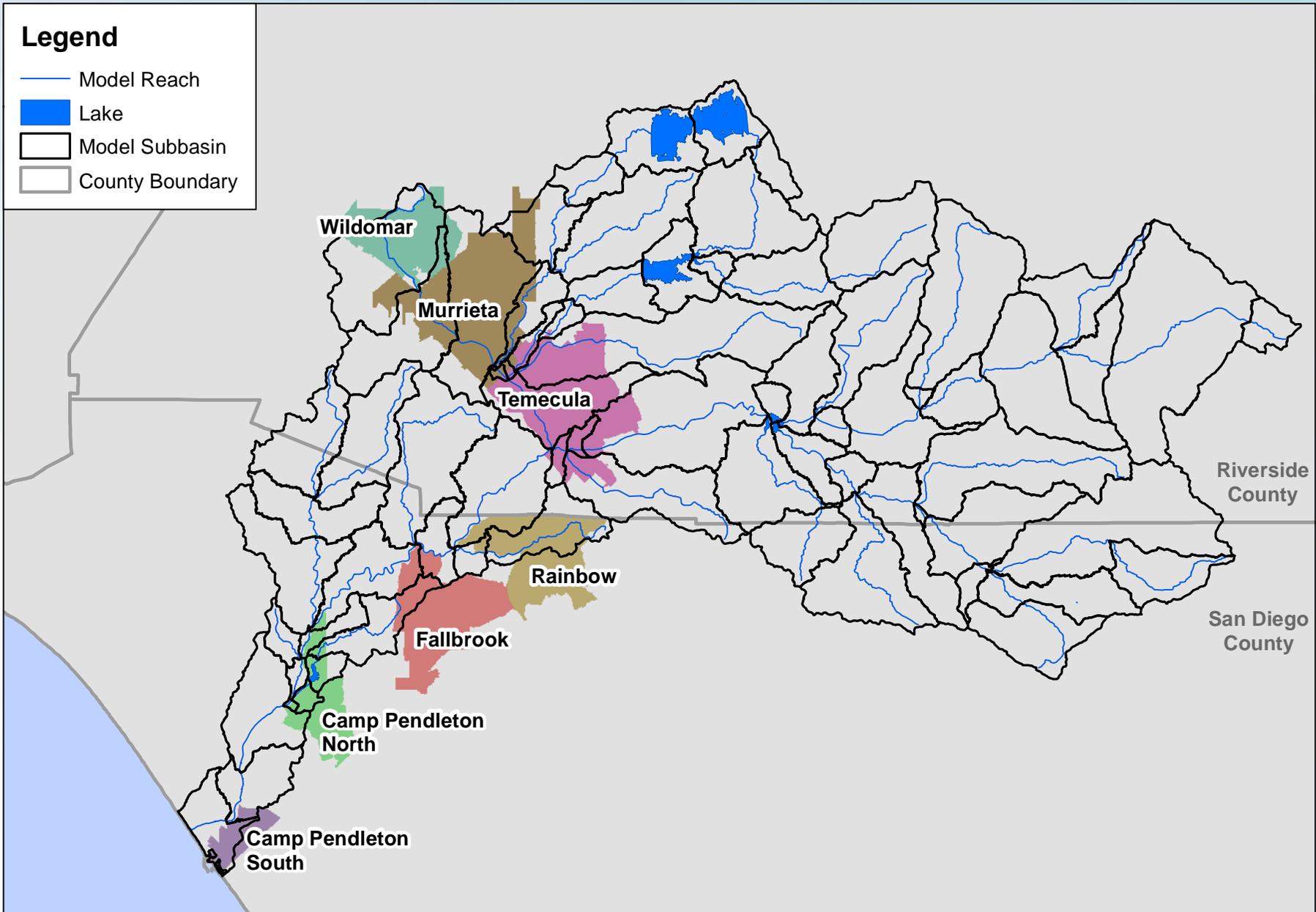
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Santa Margarita Watershed Phase 1

- ▶ Located in Riverside and San Diego Counties
- ▶ Developed areas include Camp Pendleton, Fallbrook, Rainbow, Temecula, etc.
- ▶ Phase 1 report dated June 2008 prepared by Tetra Tech for SDRWQCB and EPA R9.
- ▶ Phase 1 simulation period: 1990 through 2006.
- ▶ Rancho California Water District discharge has two releases.
1) Reclaimed water from 1997 – 2002. 2) Raw water from Colorado River to satisfy water rights beginning in 2003.
- ▶ Key considerations: Irrigation, ground water interactions, and imported water
- ▶ Camp Pendleton base in the downstream portion of the study area

Legend

- Model Reach
- Lake
- Model Subbasin
- County Boundary



Santa Margarita Watershed: Municipalities

NAD_1983_UTM_Zone_11N
Map produced 10-23-2012 - C. Carter

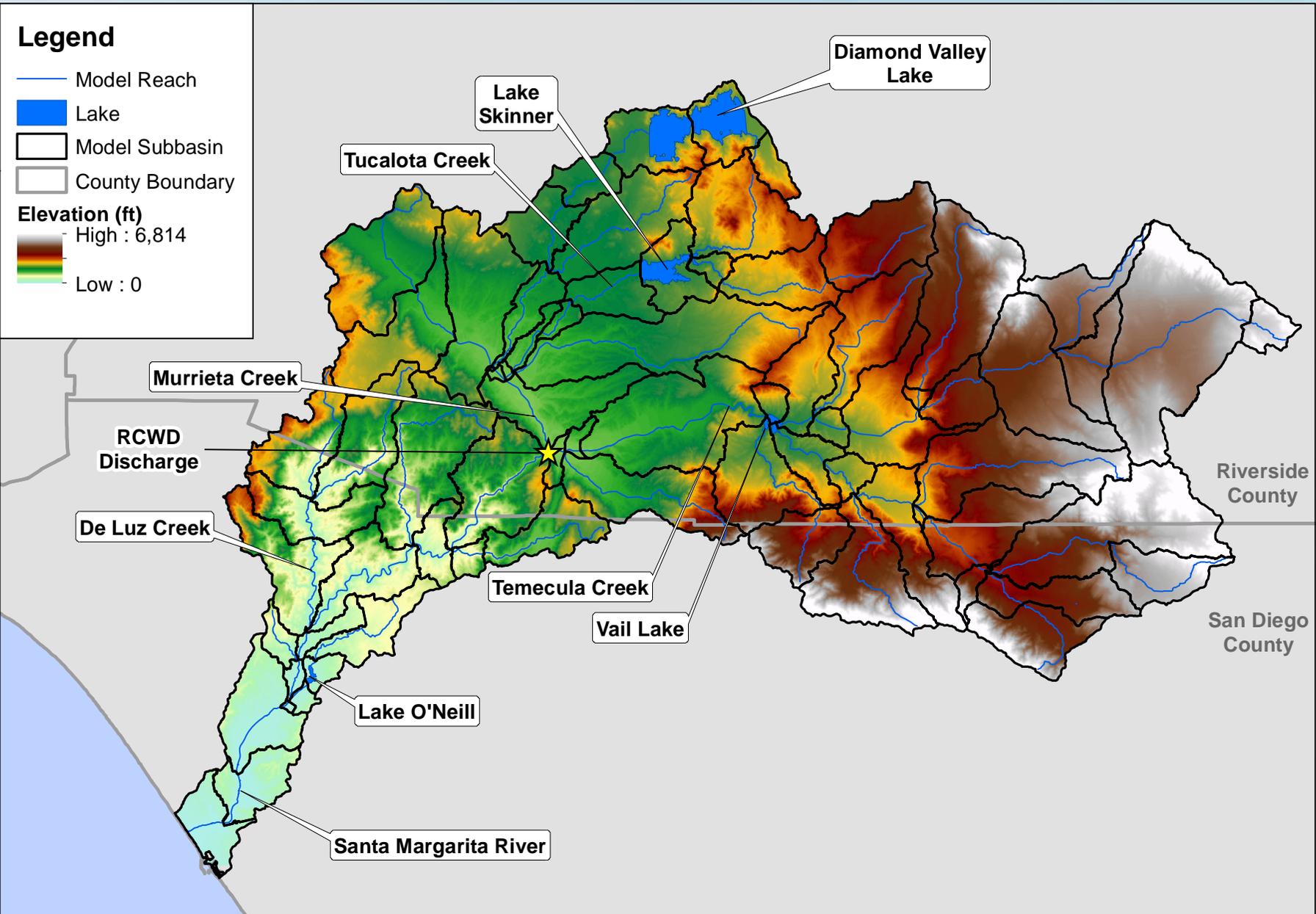


Model (HSPF) Development Phase 1

- ▶ Three upstream lakes
 - Diamond Valley Lake. DA = 21 mi². Receives imported water from the Colorado River through the San Diego Canal
 - Lake Skinner. DA = 53 mi². Receives imported water from the Colorado River through the San Diego Canal. Intake for Robert A. Skinner filtration plant
 - Vail Lake. DA = 319 mi². No imported water. Stored water replenishes local ground water
- ▶ Diversion to Lake O'Neill for use by Camp Pendleton
 - Receives inflow from Fallbrook Creek
 - Water rights diversion from Santa Margarita River

Legend

- Model Reach
- Lake
- ▭ Model Subbasin
- ▭ County Boundary
- Elevation (ft)**
 - High : 6,814
 - Low : 0



Santa Margarita Watershed

NAD_1983_UTM_Zone_11N
Map produced 10-23-2012 - C. Carter



Model (HSPF) Simulation Phase 1

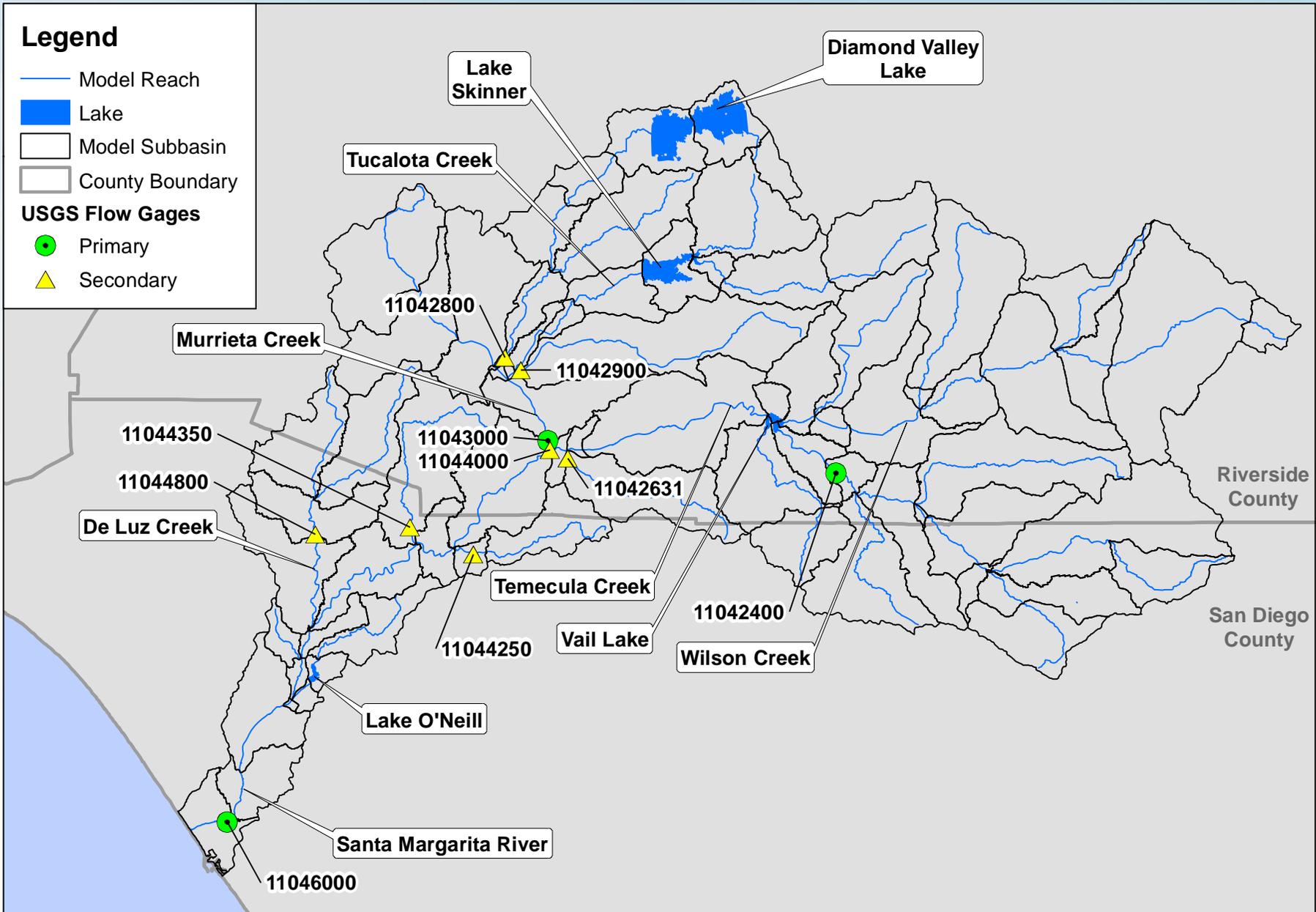
- ▶ Hydrology
 - Preliminary calibration
 - 3 primary USGS gages used for calibration
 - 7 secondary USGS gages
- ▶ Suggested improvements
 - Better use of 7 secondary USGS gages for calibration process
 - Revisiting irrigation
 - Additional parameter revision
 - Append 2007 and 2008 to the simulation period
- ▶ Water Quality
 - Developed module for sediment

USGS Flow Stations

USGS ID	Name	Primary/Secondary
11042400	Temecula Cr nr Aguanga	Primary
11046000	Santa Margarita R at Ysidora	Primary
11043000	Santa Margarita R at FPUD Sump nr Fallbrook	Primary
11044000	Santa Margarita R nr Temecula	Secondary
11044800	Deluz Cr nr Deluz	Secondary
11042631	Pechanga Cr nr Temecula	Secondary
11044250	Rainbow Cr nr Fallbrook	Secondary
11044350	Sandia Cr nr Fallbrook	Secondary
11042900	Santa Gertrudis Cr nr Temecula	Secondary
11042800	Warm Springs Cr nr Murrieta	Secondary

Legend

- Model Reach
- Lake
- Model Subbasin
- County Boundary
- USGS Flow Gages**
- Primary
- ▲ Secondary



Santa Margarita Watershed: USGS Flow Gages

NAD_1983_UTM_Zone_11N
Map produced 10-23-2012 - C. Carter

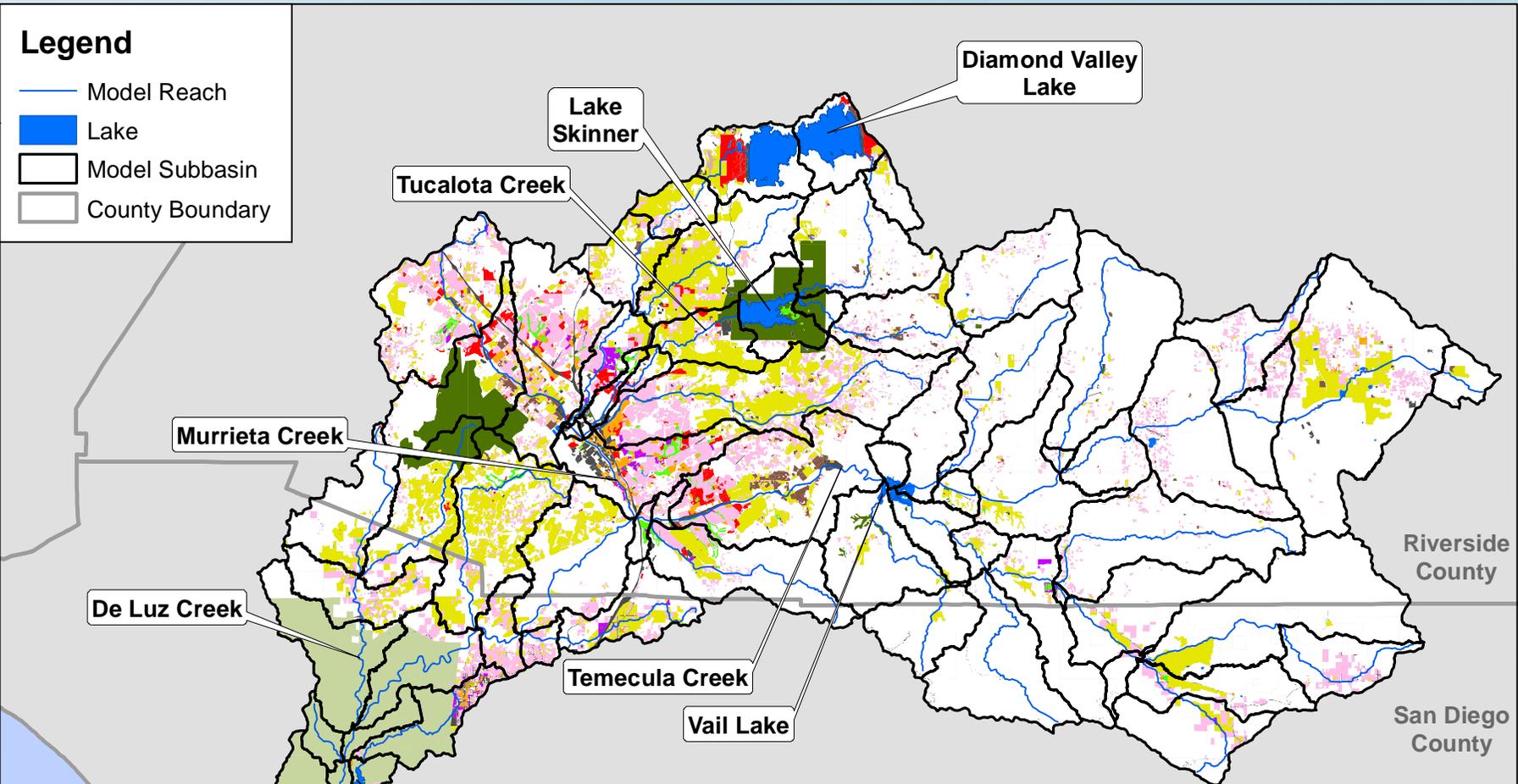


Land Use

- ▶ Model land use is used to assign hydrologic and water quality parameters
- ▶ SANDAG 2007 and SCAG 2001 were used to develop model input.
- ▶ Coverages were compared and SANDAG codes were assigned to SCAG parcels.

Legend

-  Model Reach
-  Lake
-  Model Subbasin
-  County Boundary



Land Use (SCAG 2007)

- | | | |
|---|--|--|
|  Single Family Residential |  Military |  Livestock |
|  Multi Family Residential |  Park/Golf Course |  Horse Ranch |
|  Commercial/Institutional |  Open Space |  Vacant |
|  Industrial/Transportation |  Orchard/Vineyard/Other Ag. |  Open Water |
| | |  Construction |

Santa Margarita Watershed

NAD_1983_UTM_Zone_11N
Map produced 10-23-2012 - C. Carter



0 2.5 5 10 Kilometers

0 2.5 5 10 Miles



Phase 2 Objectives

- ▶ Extend simulation period through 2010 instead of 2008
- ▶ Refine hydrology calibration
- ▶ Calibrate sediment
- ▶ Calibrate nutrients
- ▶ Provide flow/water quality time series to estuary modeling team

Model (HSPF) Development Phase 2

- ▶ Refine weather time forcings to extend through 2010
- ▶ Retain Phase 1 subbasin delineations
- ▶ Extend dam outflow series for selected impoundments
- ▶ Update the diversion to Lake O'Neill
- ▶ Improved understanding of ground water interactions and resulting model representation

Model (HSPF) Development Phase 2 - Schedule

- ▶ Current – Dec 2012
 - Compile recent monitoring data
 - Update/refine weather data
 - Update SCAG/SANDAG land use coverage, investigate Landfire dataset
 - Dams, diversions, discharger updates
 - Extend modeling period through 2010
 - Finalize hydrology recalibration and develop Tech Memo
- ▶ Jan – Apr 2013
 - Complete sediment calibration
 - Complete nutrient calibration
 - Develop Tech Memo
- ▶ Post Apr 2013 (funding/schedule pending)
 - Model runs to support TMDL allocations
 - BMP scenarios, if needed
 - Detailed watershed modeling report

Presentation Roadmap

- Watershed hydrodynamic and nutrient loading model-
Clint Boschen, TetraTech
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- Numeric Targets- Barry Pulver, SDRWQCB and Martha
Sutula, SCCWRP

Overview of Estuary Water Quality Modeling

- Modeling Approach
- Model Setup, Domain and Model Grid
 - Agreement on model boundaries?
- Preliminary Model Test Run Output
- Timeline

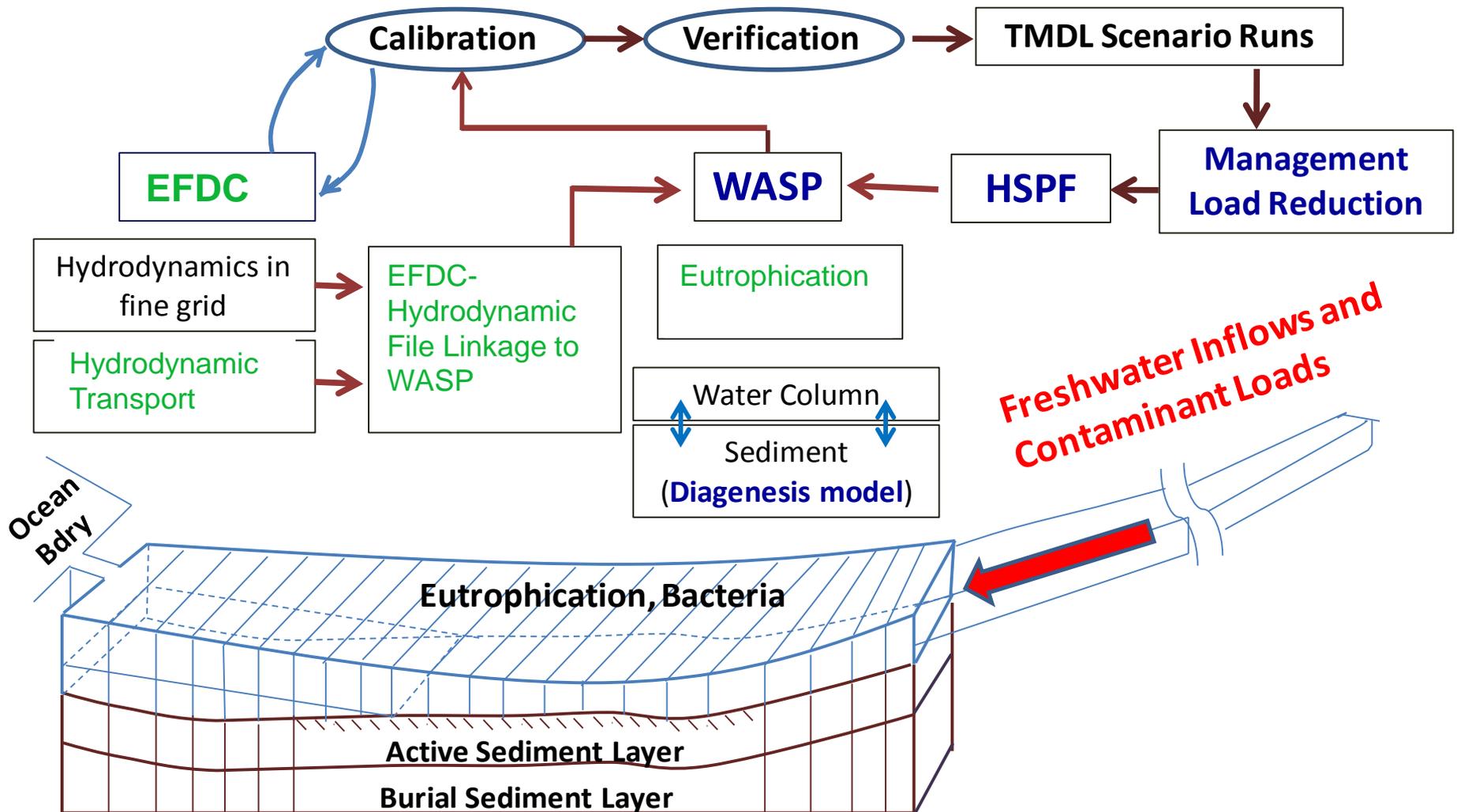
What is Involved in Modeling Eutrophication in Estuaries?

- Physical Processes:
 - Advection and Dispersion
 - Interaction of freshwater inflows with saline ocean water
 - Sediment transport
- Biogeochemical Processes:
 - Contaminant-dependent processes
 - Eutrophication processes:
 - Nitrogen, Phosphorus
 - Primary producer biomass (phytoplankton, macroalgae, aquatic plants, etc)
 - Dissolved oxygen
 - Sediment diagenesis

Using Environmental Fluid Dynamics Code (EFDC) and Water Quality Simulation Program (WASP) To Model Estuary

- Simulate hydrodynamic current and water mass for physical processes
- Seamless linkage of hydrodynamic information to drive transport for eutrophication module
- Simulate eutrophication processes with EPA's most updated model
- Attempt to add sediment transport and deposition from watershed loads in SML
- Attempt to add sediment diagenesis processes in SML (within limit of field data)

How Models are Used in TMDL Studies



Process to Model

- Model set up
 - Bathymetry problematic, new data collection funded
 - Establish model boundaries
 - Agree on indicators for numeric targets
- Assemble data, conduct QA, and develop input files
- Calibrate and validate hydrology
- Calibrate and validate water quality
- Link models (watershed loading + estuary hydrology + water quality)
- Use models to estimate TMDL
- Run implementation scenarios

Model Domain/Boundary



Proposed Estuary Model Boundaries

- Upstream at transition to freshwater habitat
 - Use presence of riparian vegetation to determine where approximate boundary lies
- Ocean inlet
- Lateral boundaries
 - Dry weather is critical condition
 - Targeting up to ordinary high water mark, so salt pannes and off channel habitat not included
 - Bathymetry variations may be important for plant biomass distribution

EFDC+WASP Model Grid

Upstream Boundary

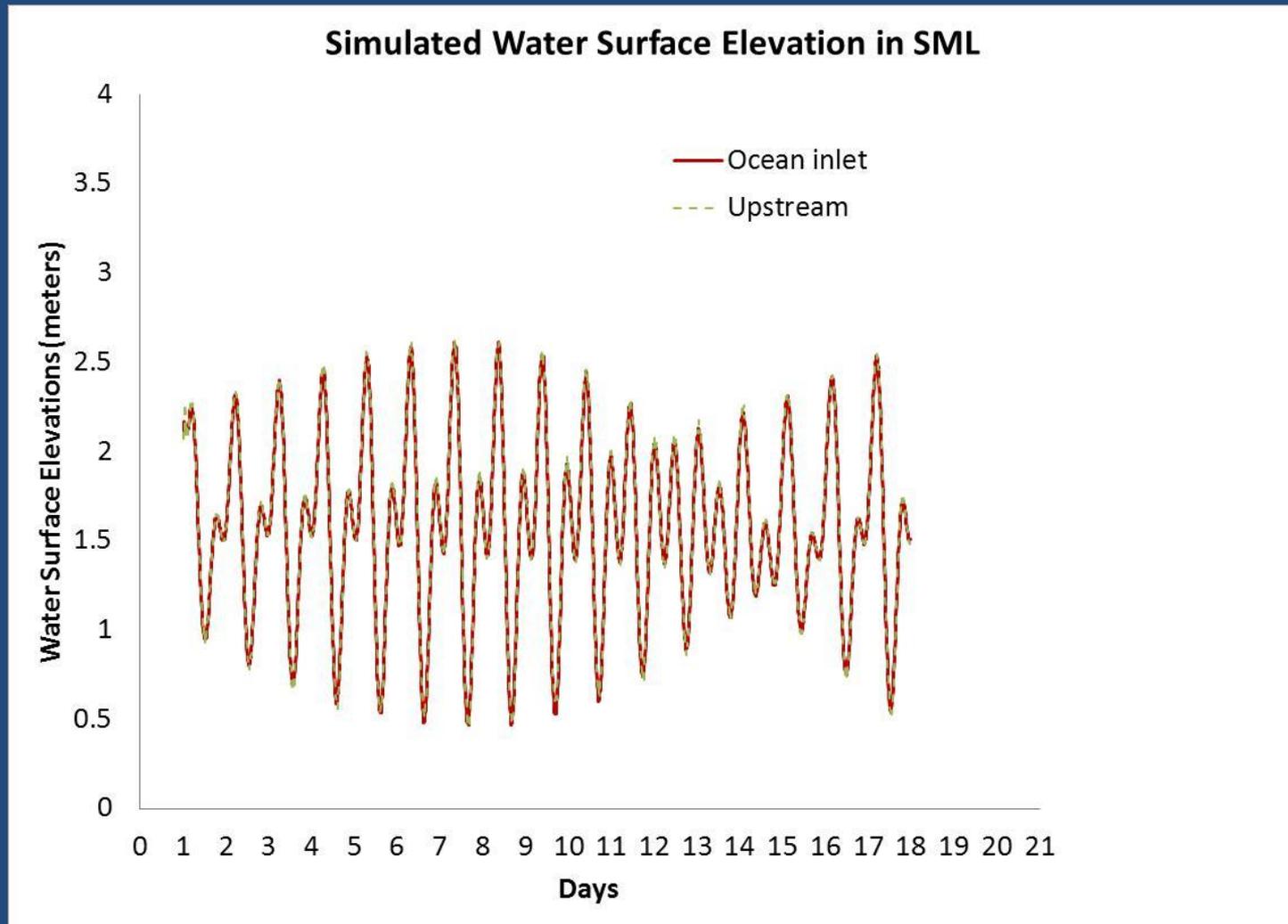


Ocean Boundary

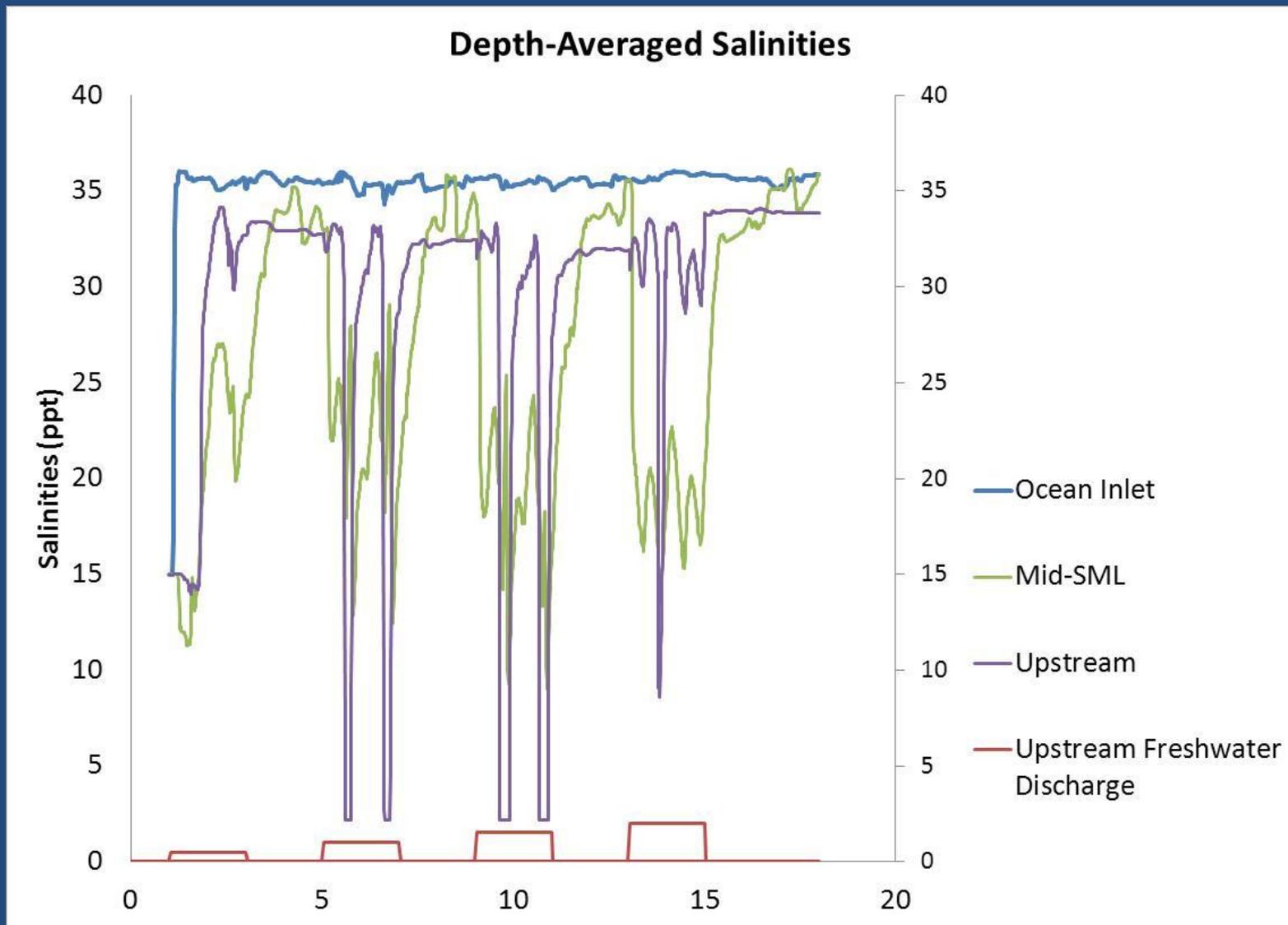


Comments on Proposed Model Boundaries?

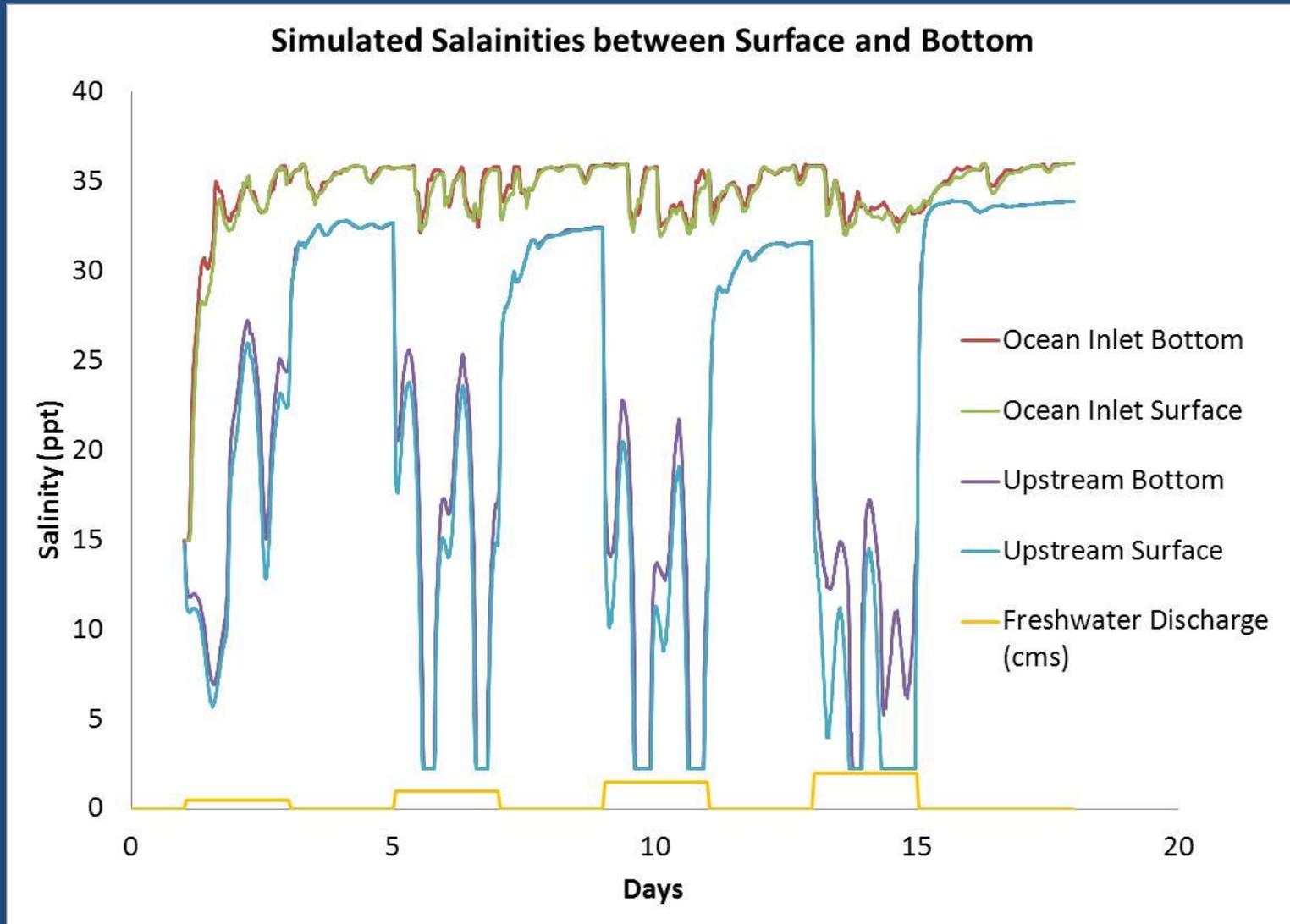
Preliminary Model Setup and Results (SML Depths=2.5 meters)



Simulated Depth-Averaged Salinities with Freshwater Discharges



Simulated Water Column Salinities with Freshwater Discharges



Timeline for Estuary Modeling

Work Element

Approximate Timelines

- Model set up
 - Bathymetry data collection Dec 2012
- Assemble data, develop input files Mar 2013
- Calibrate and validate hydrology June 2013
- Calibrate and validate water quality Sept 2013
- Link models (watershed and estuary)
- Use models to estimate TMDL
- Run implementation scenarios

Presentation Roadmap

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SCCWRP

SSOs for Santa Margarita River Estuary Following SWRCB Impaired Waters Guidance

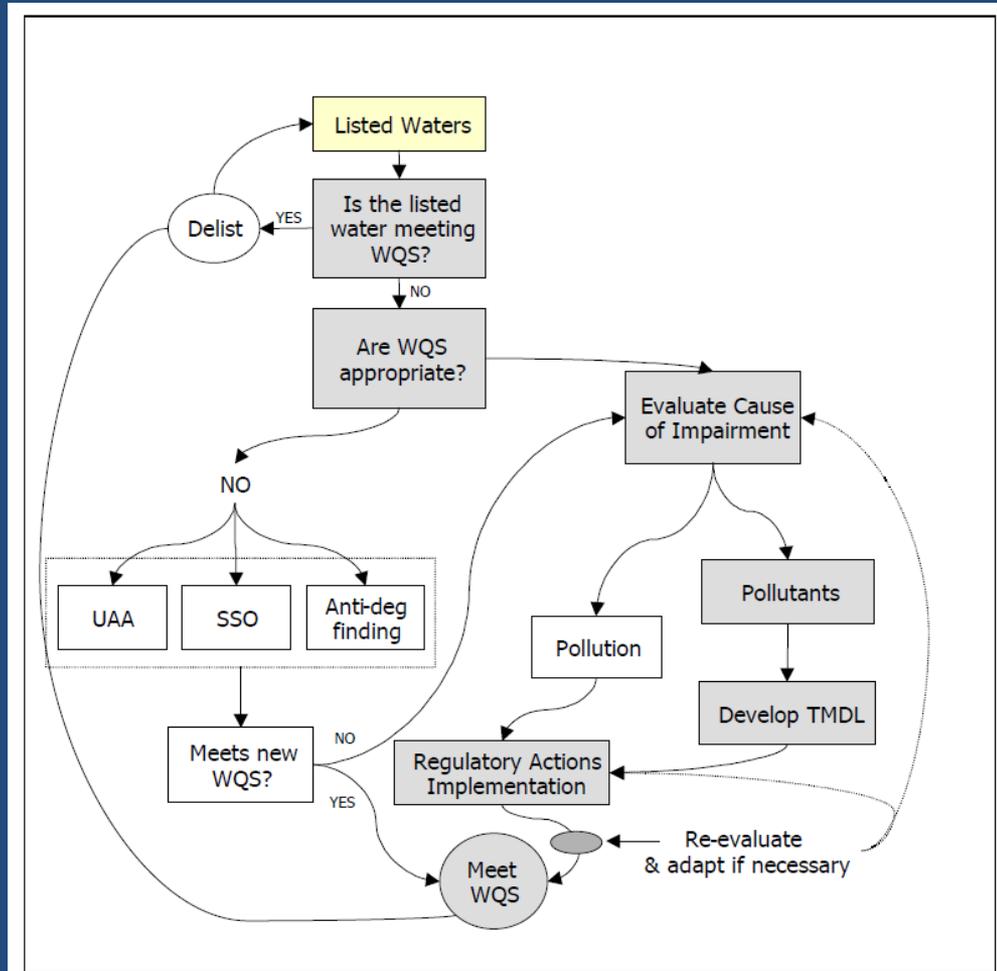


Figure 1-1. Regulatory Options Summary

From SWRCB Impaired Water Guidance

What is the Decision You Are Being Asked To Make?

What indicators should be modeled in order to evaluate them for numeric targets?

Given: Basin plan objectives

- Dissolved oxygen
- Biostimulatory objectives

Alternative: Nutrient numeric endpoint (NNE)

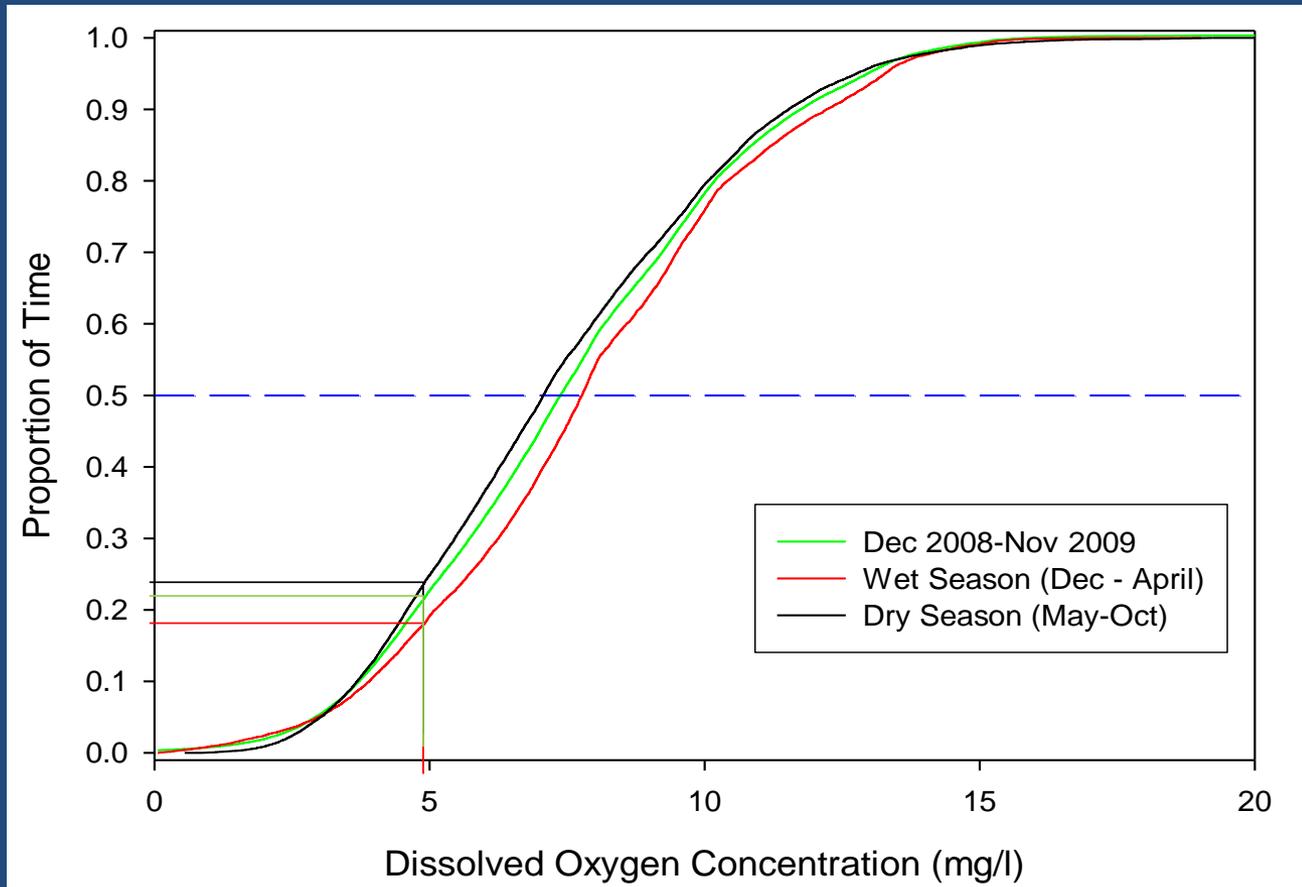
Basin Plan Objectives for Dissolved Oxygen

- MAR and WARM – 5.0 mg/l
- COLD – 6.0 mg/l

Applied instantaneously (no averaging)

10% exceedence allowed

SMR Estuary DO Data Shows Exceedance 21% of Time (Dec 2008-2009)



Basin Plan Objectives for Biostimulatory Substances

“Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those which stimulate algae and emergent plant growth. Threshold **total phosphorus concentrations** shall not exceed **0.05 mg/l** in any stream at the point where it enters a standing body of water, nor **0.025 mg/l** in any standing body of water. A desired goal in order to prevent plant nuisance in streams and other flowing waters appears to be **0.1 mg/l total phosphorus.**”

“Natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a **ratio of Nitrogen: Phosphorus – 10:1**, on a weight of weight basis shall be used.”

Estuary TN and TP Concentrations Exceed Biostimulatory Objectives (2008-2009 Data)

TN (mg l ⁻¹)	Jan'08	Apr '08	Jul '08	Oct '08	% Exceedance (TN> 1 mg L-1)
ME	3.1	1.1	0.3	ND	60%
Seg2	2.9	0.8	0.9	0.8	25%
Seg 1	13.6	7.9	2.3	2.3	100%
Ave Seg 1-2	8.2	4.4	1.6	1.5	

TP (mg l ⁻¹)	Jan'08	Apr '08	Jul '08	Oct '08	% Exceedance (TP> 0.1 mg L-1)
ME	0.1	0.1	0.2	ND	100%
Seg2	0.3	0.3	0.2	0.1	100%
Seg 1	0.1	0.1	0.3	0.6	100%
Ave Seg 1-2	0.2	0.2	0.2	0.37	100%

SSOs for Santa Margarita River Estuary Following SWRCB Impaired Waters Guidance

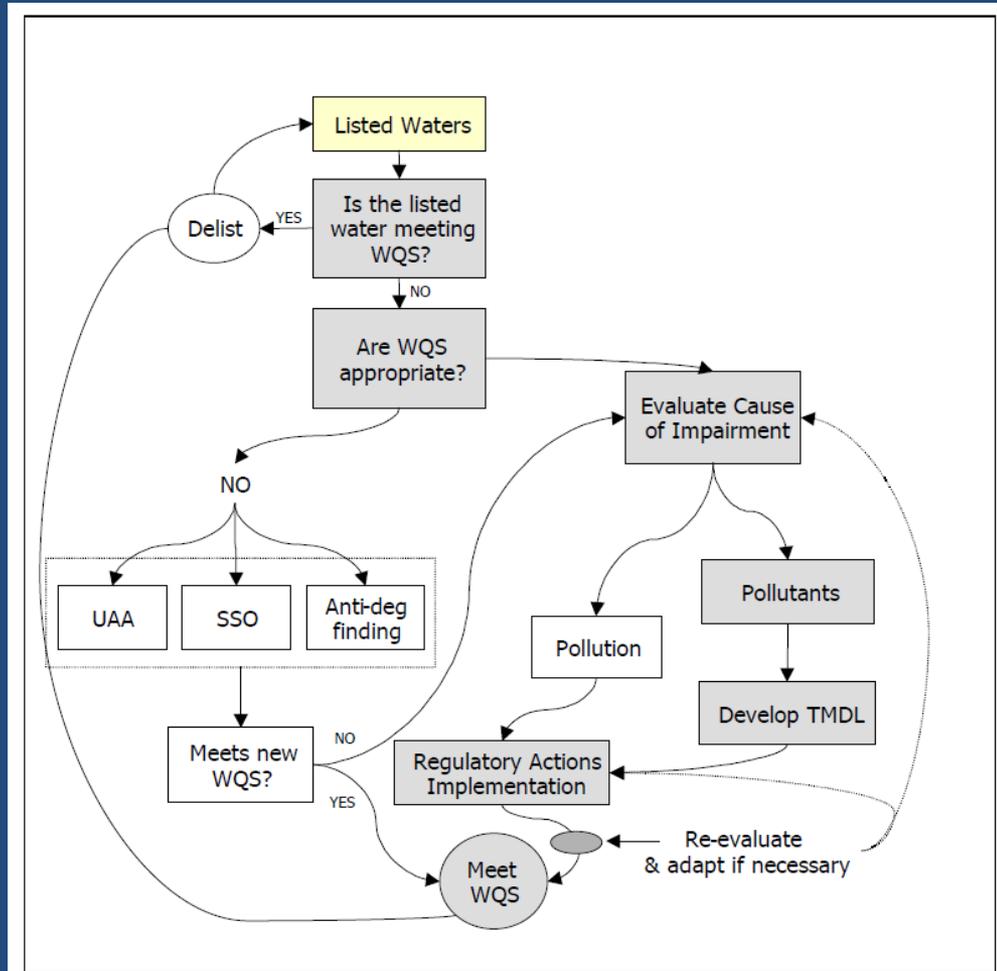


Figure 1-1. Regulatory Options Summary

From SWRCB Impaired Water Guidance

Freshwater NNE in Policy Development, Estuarine NNE Under Development

- Streams and Lakes:

- ✓ Numeric Endpoints

- ✓ Models

- Policy under development



- Estuaries

- Numeric endpoints under development



SWRCB Staff Approach to Developing Nutrient Objectives: Nutrient Numeric Endpoints (NNE)

- Narrative objective, with numeric guidance
 - Guidance coined as “ Nutrient Numeric Endpoint or NNE”
- Assessment based on response indicators
 - Assessing eutrophication rather than nutrient enrichment
- Models to link response indicators to nutrients et al. factors (e.g. hydrology,, etc)
 - Can account for mechanisms, rather than correlations
 - Ability to consider seasonal objectives

A. Increased Nutrient/Organic Matter Loads, and/or Altered N:P:Si Ratios

B. Ecological Response

Primary Producers

Water/Sediment Chemistry

Consumers (Invertebrates, Birds, Fish, Mammals)

C. Co-Factors, e.g.:

Hydraulic Residence Time
 Climate
 Suspended Sediment
 Stratification
 Estuarine circulation
 Hypoxia
 Top-down grazing
 Denitrification

Ecosystem Services and Beneficial Uses

Ecological Services

Beneficial Uses

Habitat, Food for Birds, Fish, Invertebrates, and Mammals

EST, MAR, WILD

Protection of Biodiversity, Spawning, Migration and Threatened/Rare Species

SPWN, MIGR, RARE

Production of Commercial Recreational Fish and Invertebrates

COMM, SHELL, AQUA

Human Services

Aesthetics, Odor

REC2

Good Water Quality, Taste

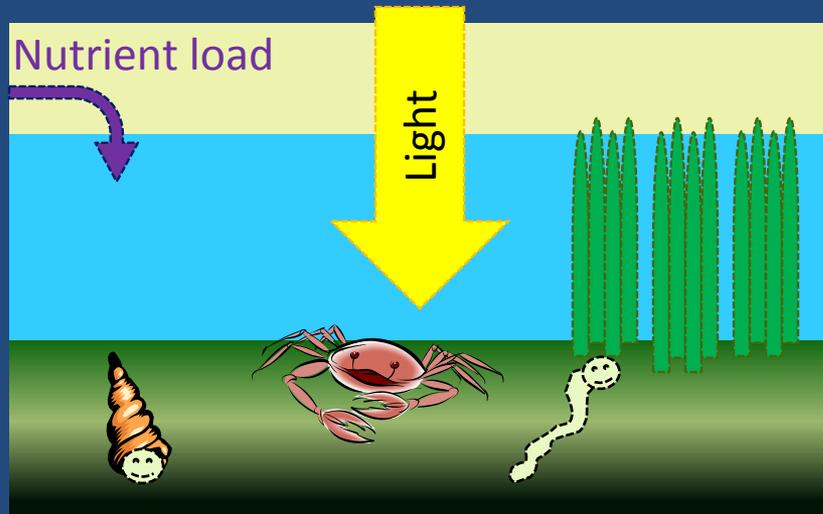
REC1

**Conceptual Model:
 Linking Nutrients,
 Ecological Response, &
 Beneficial Uses**

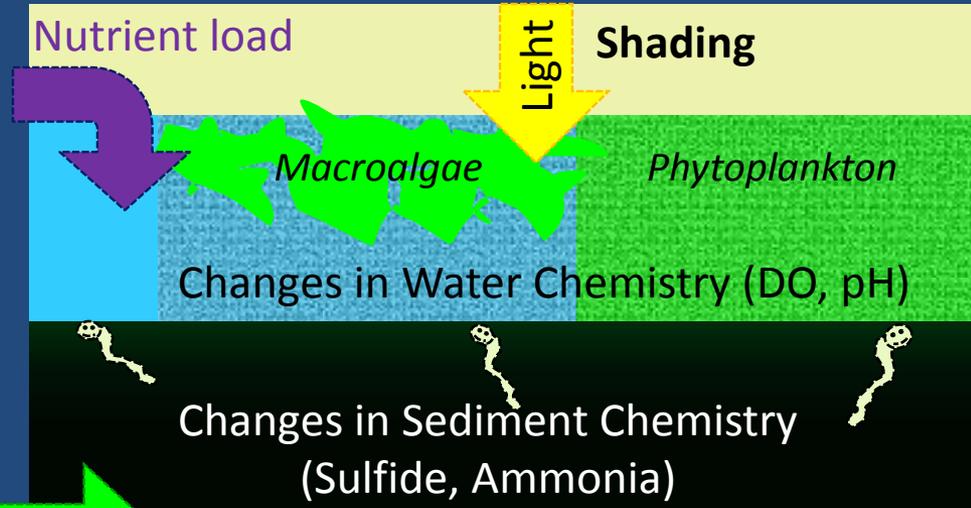
Co-factors modulate ecological response

Ecological response indicators have stronger link to beneficial uses than nutrients

Conceptual Model of Development of Eutrophication in SCB Estuaries



Minimally Disturbed



Affected by Eutrophication

Increased Nutrient Loading



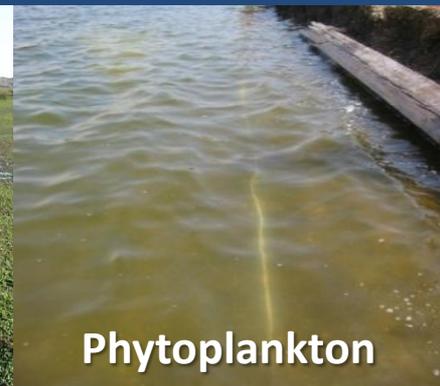
Seagrass



Benthic Diatoms



Macroalgae



Phytoplankton

Timeline for Science Supporting Assessment Framework Development

- **Dissolved oxygen**
 - Review of science supporting thresholds- December 2012
- **Macroalgae**
 - Experiments and field studies - September 2012
 - Assessment framework- Spring 2013
- **Phytoplankton**
 - Assessment framework for “closed or restricted” estuaries- Spring 2013

Punchline: Appropriate NNE Indicators for SMR Estuary

- Dissolved oxygen
- Macroalgal biomass
- Phytoplankton

SCCWRP Recommendation: Include these for consideration
as numeric endpoints