

# BACKGROUND

- **15 years ago, CTAG requested SCCWRP undertake modeling to investigate potential nutrient discharge influences on OA and hypoxia**
  - We formed a partnership with UCLA in 2013 to develop ROMS-BEC
- **Spent a decade developing and validating the model**
  - Published nearly 100 journal manuscripts describing this work
- **A few years ago, we started transitioning from model development to running application scenarios**
  - Focused on regional bookend scenarios
  - The bookend runs suggested nutrient inputs have a non-trivial effect on local acidification

# EXPERT REVIEW PANEL

- **Some community members expressed concern about whether the model is mature enough for use as a management decision-making tool**
- **An independent expert panel was formed to review the model**
  - Six internationally renowned experts who met for over a year
  - Held five public sessions to receive information
  - Administered through National Water Research Institute to ensure independence
- **They concluded that the model is built on fundamental principles of physical and biogeochemical oceanography**
- **They also provided us a roadmap to enhance its managerial usefulness**

# MANY SUGGESTIONS

- **The Panel offered 40 recommendations**
  - Challenge is to discriminate "nice to have" from critical activities
- **Modeling team has its own opinions, but we want this to be a community decision**
  - You are the ones who need to have confidence in the model if you are to use it
- **We formed an advisory group to help with those prioritization decisions**
  - The NWRI Expert Panel Steering Committee

# NWRI STEERING COMMITTEE

- **Diverse membership**
  - Three POTW representatives (Lan Wiborg, Steve Wagner, Lorien Fono)
  - Three Regulators (Karen Mogus, Dave Gibson, Justine Kimball)
  - One NGO (Sean Bothwell, California Coastkeeper Alliance)
  - One ex-officio science advisor (Kristen Davis, Stanford University)
- **Facilitated by an independent third party**
  - Kevin Hardy from National Water Research Institute
- **They met for six months to prioritize the Panel recommendations**
  - Including an in-person meeting in April

# GOAL FOR TODAY

- **Present SCCWRP's plan to respond to Expert Panel recommendations**
  - Our modeling research priorities for the next three years
- **Informed by input from the Steering Committee**
  - Also informed by our interactions with CTAG
- **Plan includes a strategy for continuous review and feedback**
  - Ongoing input regarding stakeholder needs
  - Continuing technical review of our modeling work

# FOUR CLASSES OF EXPERT PANEL RECOMMENDATIONS

- **Quantify model uncertainty**
- **Enhance model and biological interpretation tools**
- **Next round of model runs**
- **Transition to a community model**
- **These categories follow a logical sequence**
  - Improve understanding of model performance and refine model tools before proceeding to model applications and training others to use the model
  - I'll use these categories as an organizational tool for today's presentation

# STEERING COMMITTEE RECOMMENDATIONS

- **Each Steering Committee member got 100 points to allocate**
- **Priorities differed among sectors**
  - Regulated parties put 237 of their 300 points into additional uncertainty analyses
  - Regulators put 190 of their 300 points into running new model scenarios
- **Three recommendations got votes from all committee members**
  - Model run to assess how alternative global emission scenarios affect influence of local inputs
  - Provide more spatial context when presenting model runs, such as predicted changes in Marine Protected Areas
  - Improve the data dissemination and visualization tools

# OUR PLAN STARTS WITH QUANTIFYING UNCERTAINTY

- **Develop agreement on a routine method for quantifying uncertainty**
  - When we run management scenarios, we want to add “error bars” to the findings
- **Key is quantifying uncertainty relative to the questions you are asking**
  - We will use a Quality Assurance Project Plan as a structuring vehicle
  - QAPP is all about assessing fitness of the model for its intended purpose
- **We have started on a case study that we will complete by year-end**
  - How confident are we that if you remove all nutrients you see a change in habitat?
  - Working closely with CTAG Modeling Committee to make sure we get it right



# COMMUNITY-SUPPORTED UNCERTAINTY ANALYSES

- **Expert Panel identified several possible uncertainty analyses**
  - They did not receive many votes from the regulator community
  - However, implementing those will enhance comfort among the regulated community
  - We are in funding negotiations with CASA to get their highest priority analyses going right away
- **Validation with existing data**
  - Temporal validation against mooring data
  - Spatial validation for apparent oxygen utilization and photosynthetically active radiation
- **Sensitivity analysis**
  - CASA is still considering which parameters are priorities

# BIOLOGICAL RESPONSE

- **Most uncertainty discussions have focused on validating against ocean chemistry**
- **Another approach to assess model confidence is to examine ambient biological effects**
  - Are the spatial patterns we see consistent with the model outputs?
- **We are quantifying shell dissolution**
  - Implementing this through the Bight Program
  - Partnering with other west coast monitoring programs to place local conditions into a regional context

# FOUR CLASSES OF EXPERT PANEL RECOMMENDATIONS

- Quantify model uncertainty
- Enhance model and biological interpretation tools
- Next round of model runs
- Transition to a community model

# ENHANCE MODEL AND BIOLOGICAL INTERPRETATION TOOLS

- **Update the model through 2024**
  - Presently calibrated only through 2017
- **Improve characterization of inputs**
  - Update wastewater outfall inputs using results from HDR study
  - Include all Mexican nutrient inputs
  - Improve temporal characterization of major rivers, particularly during “events”
- **Nearshore model enhancements**
  - Customize model setup for nearfield plume modeling
  - Studies to increase computational efficiency
- **Expand model interpretation to include more species**
  - To date, we have focused on pteropods for acidification and anchovies for oxygen
  - Additional species will give a more complete picture, including cascading ecosystem effects
  - Develop and apply dynamic models of target species (HABs, kelp, etc.)

# NEW MODEL RUNS

- **Runs to date have been bookends to assess whether additional model runs would be meaningful**
  - Next step is to run realistic scenarios
  - Some of those will be associated with POTW nutrient reduction
  - Model can also inform alternative OA mitigation strategies, such as mCDR
- **Will coordinate scenario development through the Steering Committee**
  - That will happen over the next few months while we are implementing the uncertainty analyses
- **Steering Committee prioritized one scenario already: How do alternative global emission scenarios affect influence of local inputs?**
  - Will work with CTAG Modeling Committee to populate details of this scenario

# STEERING COMMITTEE ROLE

- **Goal of using the Steering Committee is threefold**
  - Transparency: We want all parties to know what scenarios we are running
  - Collaboration: Can we design scenarios in ways everyone will agree are meaningful?
  - Leveraging: Shared funding when there is mutual interest in scenarios
- **The Steering Committee is a discussion body, not an approval body**
  - We will run scenarios individual member agencies would like to support
  - But let's try to avoid silos if we can
- **Will be supported by the CTAG Modeling Committee**
  - Some model run details will require input on technical details

# TRANSITION TO A COMMUNITY MODEL

- **Model's managerial value increases when people making decisions can employ it themselves**
  - SCCWRP already makes the model available, but it is a complex tool
  - There are several activities we will undertake to increase model accessibility
- **More model documentation**
  - Quality Assurance Project Plan will provide most of the desired documentation
  - Will also create a cataloging and versioning system that allows people to associate output datasets with the model's source code
- **Make the model output easy for others to reanalyze**
  - Automate production of graphical comparisons and summary statistics

# ENSURING QUALITY WORK

- **There are two aspects to developing a SCCWRP workplan**
  - Does the plan include the right activities?
  - Are those activities being done well?
- **Steering Committee has helped us prioritize the right activities**
  - Hope to have them continue, meeting twice per year to help with prioritization
  - They have indicated interest in doing so
- **Our plan includes two mechanisms for addressing the second question**
  - CTAG
  - Follow-up review by the Independent Expert Review Panel



# CTAG ROLE

- **CTAG formed a Modeling Committee to review our ROMS-BEC work**
  - Committee formed so CTAG can devote more time to this topic area
  - Meeting monthly via zoom and quarterly in person
  - Comprised of eight CTAG members and nine subject area experts
- **The Subcommittee will help us throughout the process**
  - At the beginning: Are we taking the proper technical approach?
  - Midcourse review to determine whether we need to refine directions based on initial findings
  - Review of the final written products
- **We are already interacting with them on two initial projects**
  - Quality Assurance Project Plan
  - Alternative global emission model runs

# INDEPENDENT EXPERT PANEL

- **CTAG will focus on ensuring we do individual projects well**
- **Also need to look at the entire body of work collectively**
  - Did our subsequent work adequately address issues identified by the Panel?
- **Hope to have the Independent Expert Panel revisit us in two years**
  - CASA has expressed willingness to financially support the Expert Panel process
  - NWRI has expressed interest in continuing to be the Panel convener
  - Individual Expert Panel members have expressed interest in serving again

# DOES THIS PLAN WORK FOR YOU?

- Have we prioritized the right technical activities?
- Are you happy with the CTAG role?
- Should we bring back the Independent Expert Panel?