DETERMINING CLIMATE CHANGE INDICATORS FOR THE NORTH-CENTRAL CALIFORNIA COAST

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NATIONAL MARINE SANCTUARIES
GULF OF THE FARALLONES

UCAR
UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

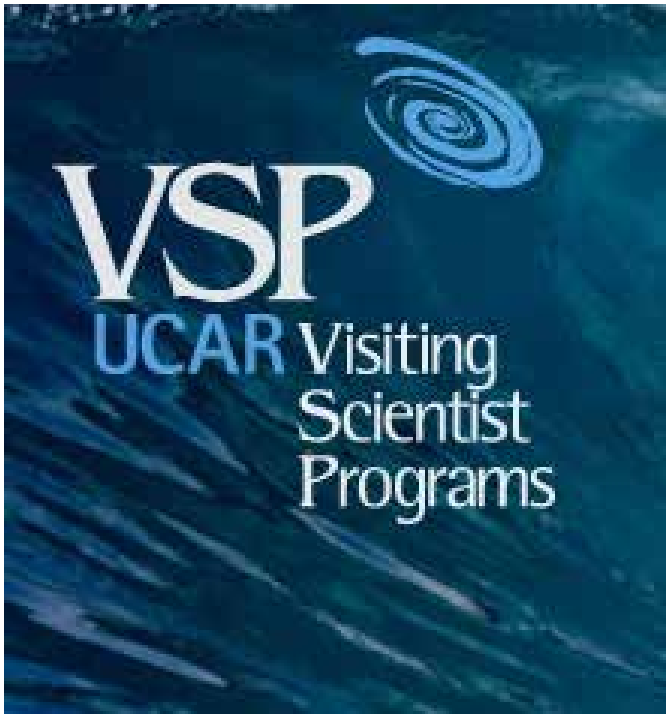
USGS
science for a changing world

Personal Experience

- Ph.D. in Atmospheric and Oceanic Sciences from CU Boulder
- Thesis research: Air-sea interactions in the Indian Ocean
- Expertise: regional climate dynamics, data analysis, numerical climate models

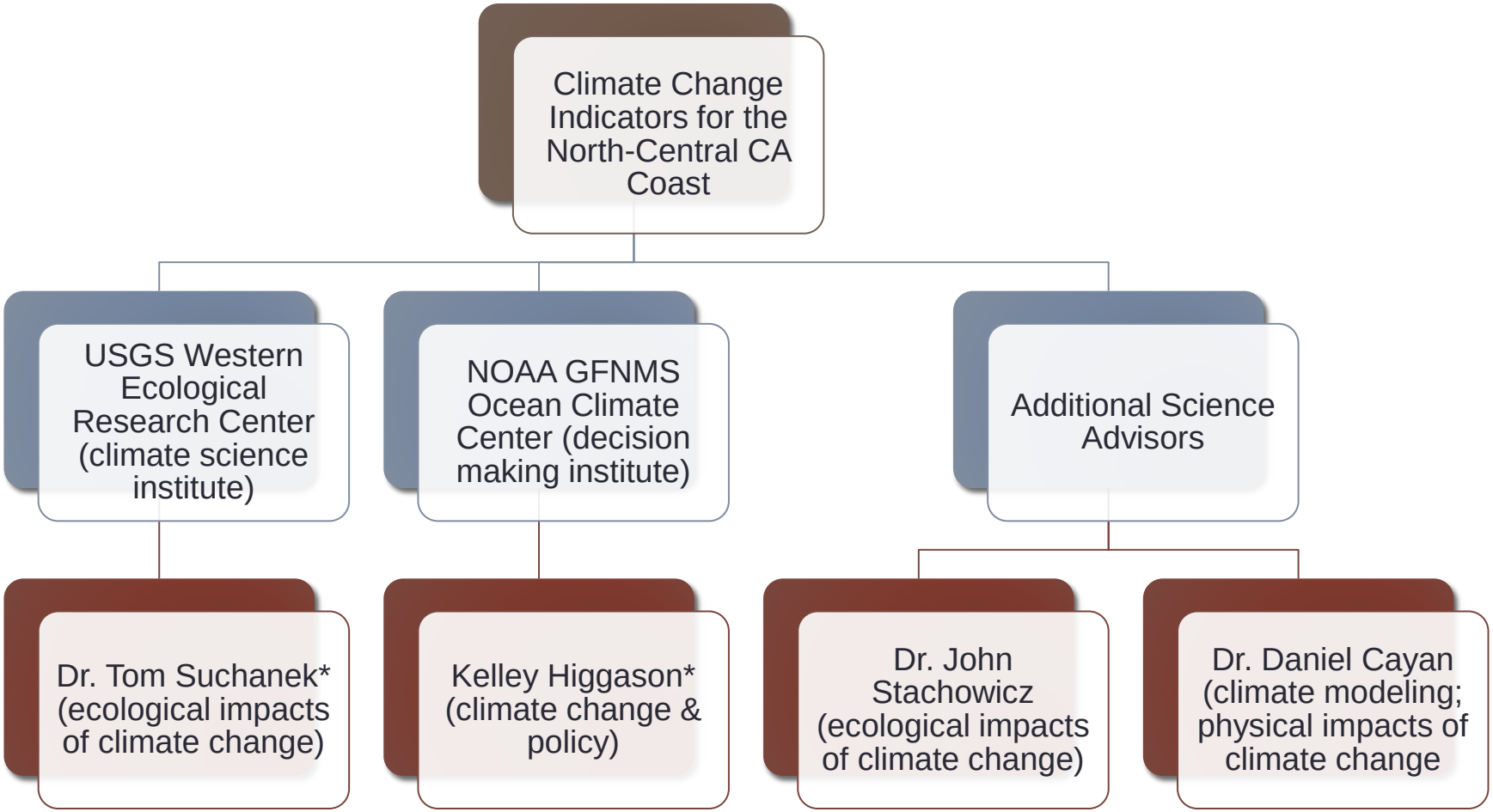
What is PACE?

- Postdocs Applying Climate Expertise
- Administered by University Corporation for Atmospheric Research (UCAR) & NOAA Climate Program Office
- Apply knowledge about climate dynamics to policy issues



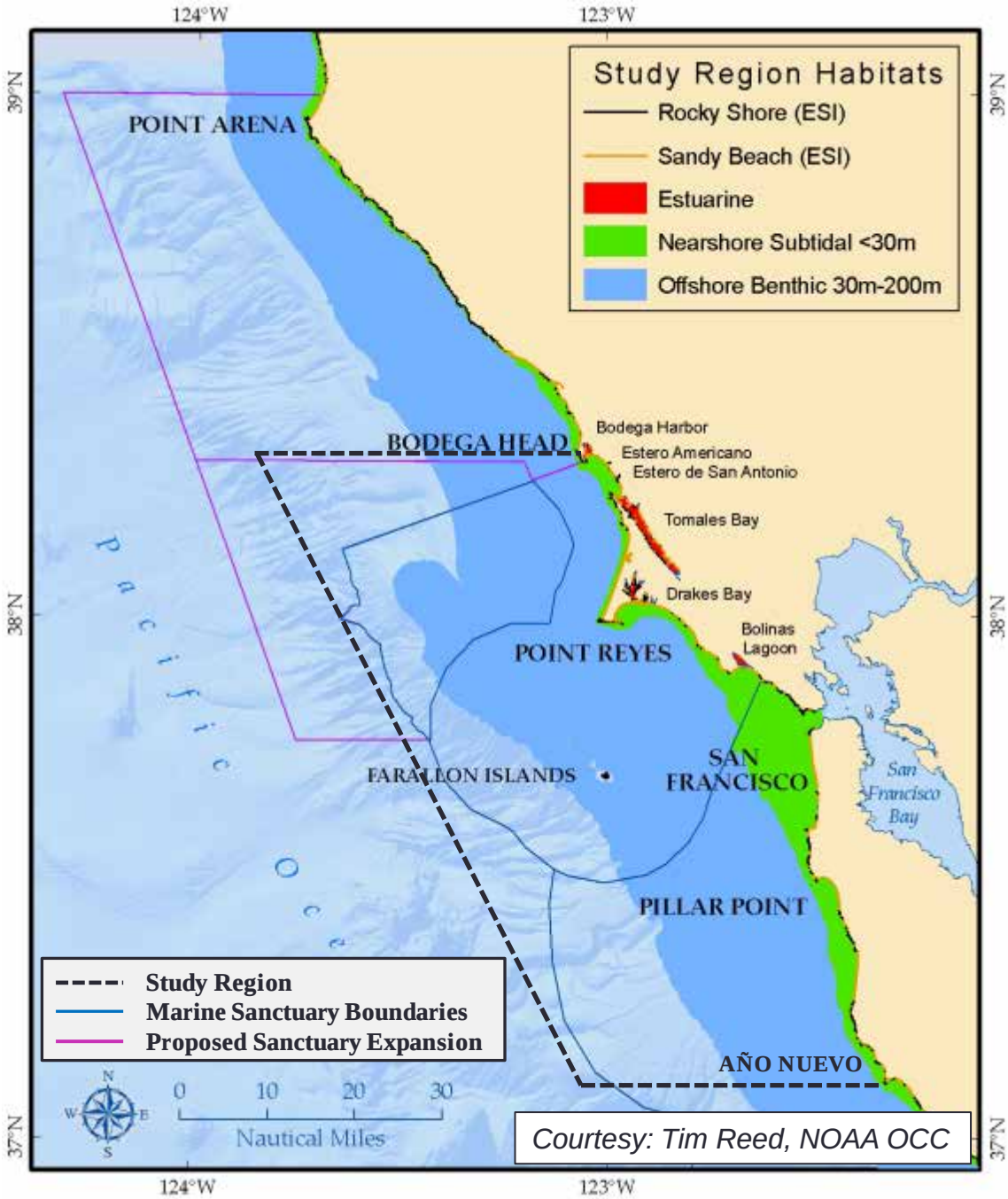
http://www.vsp.ucar.edu/pace/index.html

Project Hosts



Background

- GFNMS study region includes area along North-Central CA coast from Bodega Head to Año Nuevo
- Variety of habitats à unique responses to changing climate



Background - Observations

- Sea level rising

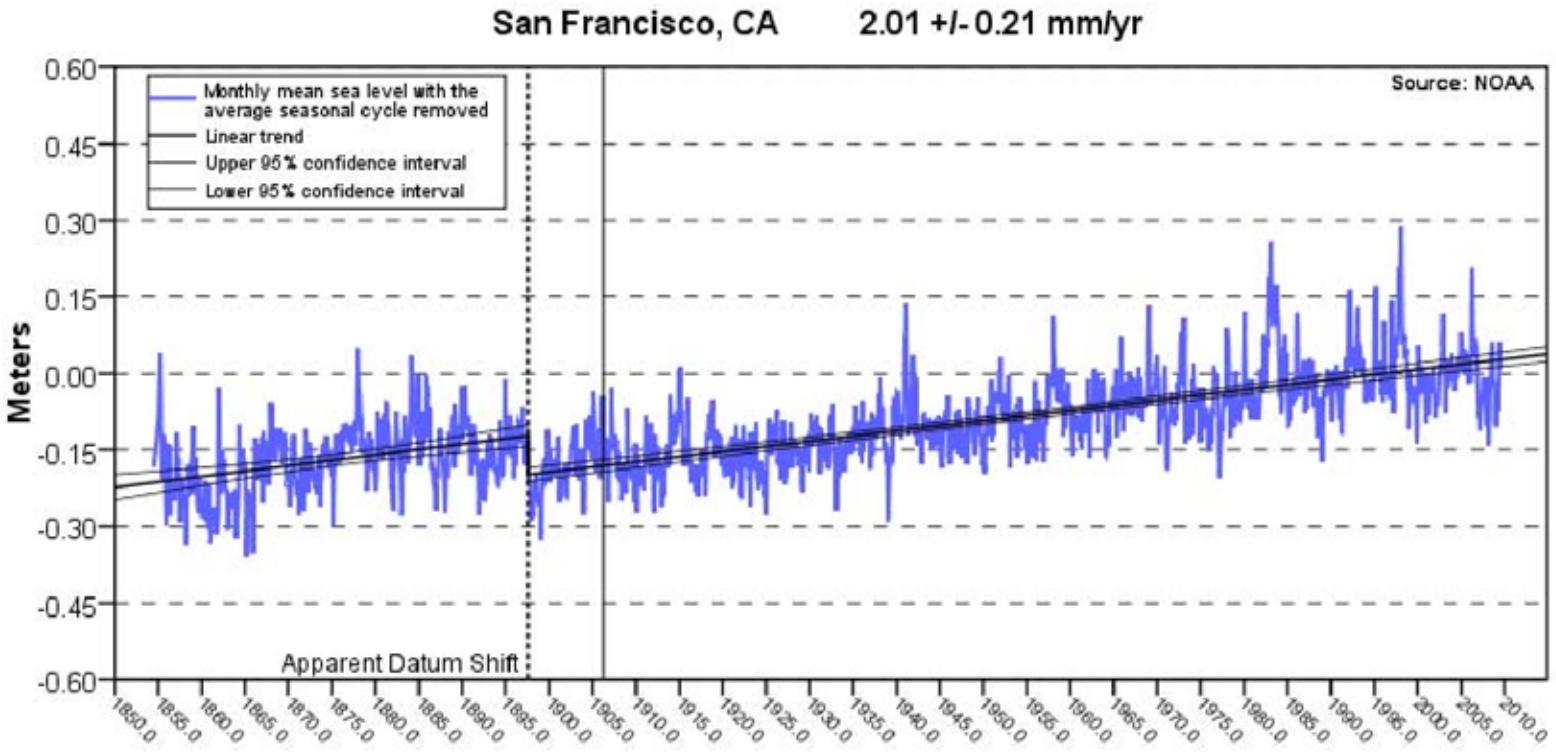


Figure 3.12. *The mean sea level trend for Gauge No. 9414290 San Francisco, CA is 2.01 millimeters/year with a 95% confidence interval of +/- 0.21 mm/yr based on monthly mean sea level data from 1897 to 2006, which is equivalent to a change of 0.66 feet (~20.1 cm) in 100 years. NOAA (2009).*

Background - Observations

- Wave height increasing

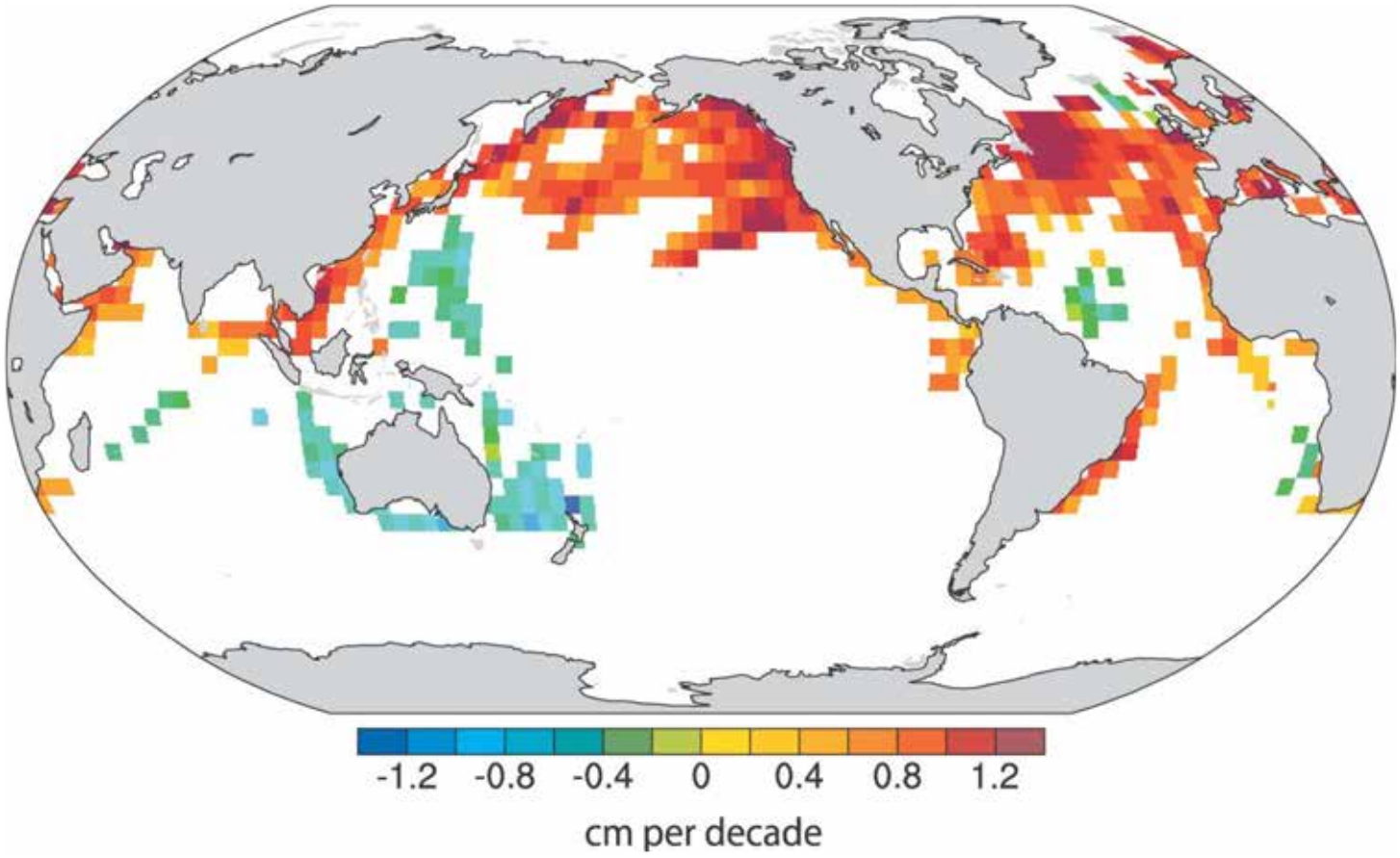


Figure 3.7. *Estimates of linear trends in significant wave height (cm per decade) for regions along the major ship routes of the global ocean for 1950 to 2002. Trends are shown only for locations where they are significant at the 5% level. Adapted from Gulev and Grigorieva (2004). IPCC.*

Background - Observations

- Bottlenose dolphin range expanding to the North

Figure 5.7. *Approximate range (in bold) of California coastal bottlenose dolphins based on aerial surveys along the coast of California from 1990-2000. These bottlenose dolphins are found within about 1 km of shore. Carretta et al. (2009).*

http://www.coral.org/files/images/7599-Dolphin.jpg

Background – Climate Change Indicators

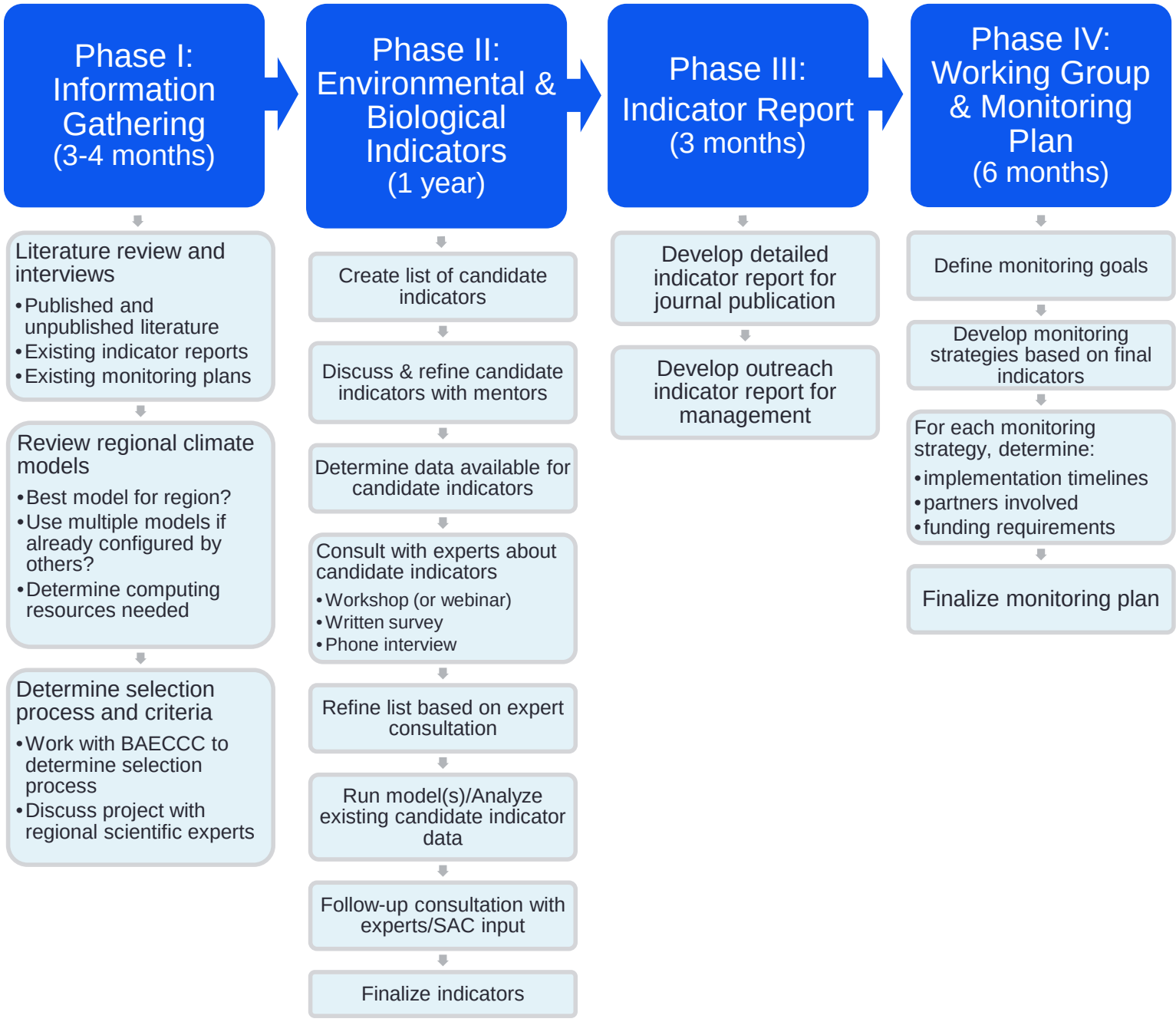
- Measurable variables
- Used to determine presence and impacts of climate change
- Basis of most regional climate change monitoring and response plans
- 2 Categories:
  1. Environmental
  2. Biological

Existing Research: Climate Change Indicators

- State of CA report (Mazur & Milanes 2009)
  - BUT scaled for entire state
- No regionally-scaled set of climate change indicators for study area
- *Need*: environmental and biological climate change indicators scaled for North-central CA coast
  - Systematic exploration of physical & biological environmental systems
  - Evaluate smaller region

Project Goals

1. Create a set of clearly-defined climate change indicators for GFNMS region
2. Maximize confidence in chosen indicators with:
   a. Collaboration with partner scientists & local experts
   b. Numerical computer modeling
   c. Data analysis
3. Define climate change monitoring goals for GFNMS region
4. Incorporate indicators into a collaborative monitoring plan to track vulnerability of resources in GFNMS region


Phase I: Information Gathering (3-4 months)
Literature review and interviews
•Published and unpublished literature
•Existing indicator reports
•Existing monitoring plans
Review regional climate models
•Best model for region?
•Use multiple models if already configured by others?
•Determine computing resources needed
Determine selection process and criteria
•Work with BAECCC to determine selection process
•Discuss project with regional scientific experts
Phase II: Environmental & Biological Indicators (1 year)
Create list of candidate indicators
Discuss & refine candidate indicators with mentors
Determine data available for candidate indicators
Consult with experts about candidate indicators
•Workshop (or webinar)
•Written survey
•Phone interview
Refine list based on expert consultation
Run model(s)/Analyze existing candidate indicator data
Follow-up consultation with experts/SAC input
Finalize indicators
Phase III: Indicator Report (3 months)
Develop detailed indicator report for journal publication
Develop outreach indicator report for management
Phase IV: Working Group & Monitoring Plan (6 months)
Define monitoring goals
Develop monitoring strategies based on final indicators
For each monitoring strategy, determine:
•implementation timelines
•partners involved
•funding requirements
Finalize monitoring plan

Phase I: Information Gathering (3-4 months)

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Existing indicator reports
Existing monitoring plans

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Thank You – Any Questions?

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