

# First Biennial Ocean Climate Summit

## Finding Solutions for San Francisco Bay Area's Coast and Ocean

Gulf of the Farallones National Marine Sanctuary (Marine Sanctuary) will address climate change impacts within the San Francisco Bay Area's coast and ocean environment through fostering awareness, advocating solutions, and promoting action amongst government agencies, public organizations, private corporations, and individuals in order to build ecosystem resilience and sustainability.



2008 Gulf of the Farallones National Marine Sanctuary

## EVENT INFORMATION

### Transportation

For information on public transit serving the Presidio of San Francisco, a map of the Presidio, and the PresidiGo Shuttle schedule please visit: [presidio.gov](http://presidio.gov)

Gulf of the Farallones will provide shuttle service from the Argonaut Hotel to and from the event. Please RSVP to [Sarah Ratzesberger](#) if you would like to reserve a space. We are currently working to organize a shuttle to and from the Embarcadero BART station as well. Please check back for more details.

Click [here](#) for directions to the Golden Gate Club and event parking information.

### Make your trip carbon neutral

The following websites offer options to offset your carbon footprint resulting from transportation to the Ocean Climate Summit:

#### **LiveNeutral**

Purchases third-party-verified and legally accountable emissions reduction credits through the Chicago Climate Exchange.

#### **Carbonfund.org**

Supports three types of carbon offset projects: renewable energy, energy efficiency and reforestation. Verified through the Environmental Resources Trust, Climate Community and Biodiversity Standards, Chicago Climate Exchange, and UNFCCC JI.

#### **Terrapass**

Supports three types of projects: clean energy produced by wind power; farm power such as dairy farm methane digesters; and landfill methane capture. Verified through the Chicago Climate Exchange, Center for Resource Solutions, Gold Standard, and Voluntary Carbon Standard.

For a more detailed list of carbon offset options, please visit:

[ecobusinesslinks.com](http://ecobusinesslinks.com)

2008 Gulf of the Farallones National Marine Sanctuary

### Hotels

The following hotels are Kimpton "green" hotels located within San Francisco and participating in a promotion offering 15% off of hotel rooms Monday through Thursdays until May 5, 2008. For more information on this promotion visit: [kimptonhotels.com](http://kimptonhotels.com)

Many of these hotels also offer the federal government room rate.

#### **The Argonaut**

495 Jefferson Street at Hyde  
San Francisco, CA 94109

[argonauthotel.com](http://argonauthotel.com)

Reservations: 866-415-0704

Hotel: 415-663-0800

Fax: 415-663-2800

Room: \$229.00 per night for king bed

Federal rate: \$162.00 per night for king bed

Gulf of the Farallones will provide shuttle service from this site. Please RSVP to [Sarah Ratzesberger](#) if you would like to reserve a space.

#### **Harbor Court Hotel**

165 Steuart Street  
San Francisco CA 94105

[harborcourthotel.com](http://harborcourthotel.com)

Reservations: 866-792-6283

Hotel Direct: 415-882-1300

Fax: 415-882-1313

Room: 249.00 per night for queen bed

Room: 269.00 per night for king bed

This hotel is ~5 blocks away from a potential shuttle site. We are currently working on organizing a shuttle leaving from the Embarcadero BART station. Please check back for more details.

### **Hotel Triton**

342 Grant Ave.,  
San Francisco, CA 94108

[hoteltriton.com](http://hoteltriton.com)

Reservations: 800.800.1299

Hotel: 415.394.0500

Fax: 415.394.0555

Room: 229.00 per night for king bed

Fed rate: 152.00 per night for king bed

This hotel is ~10 blocks away from a potential shuttle site. We are currently working on organizing a shuttle leaving from the Embarcadero BART station. Please check back for more details.

Please go to [kimptonhotels.com](http://kimptonhotels.com) to view a listing of additional Kimpton hotels that are located in San Francisco's Union Square.

All hotel prices quoted here are subject to change.

## SUMMIT SCHEDULE

[Download the Ocean Climate Summit Proceedings](#)

### Introduction

Maria Brown, Superintendent, Gulf of the Farallones National Marine Sanctuary

### Welcoming Remarks

Daniel Basta, Director, NOAA's Office of National Marine Sanctuaries

### Ocean Impacts, Ecosystem Response, and Human Adaptation

Moderator Tessa Hill, Assistant Professor, Department of Geology and Bodega Marine Laboratory, University of California, Davis

[Download Tessa Hill's Presentation](#)

Dr. Franklin Schwing, Director, Environmental Research Division, SW Fisheries Science Center

[Download Frank Schwing's Presentation](#)

Dr. William Sydeman, President and Senior Scientist, Farallon Institute

[Download Bill Sydeman's Presentation](#)

### Break

### Perceptions, Behaviors, and Economics Within a Changing Ocean Environment

Moderator: Ed Ueber, Oceans Superintendent, Golden Gate National Recreation Area/  
Senior Policy Advisor, Office of National Marine Sanctuaries (retired)

### Ocean Economics

2008 Gulf of the Farallones National Marine Sanctuary

Dr. Judith Kildow, Director, National Ocean Economics Program, Monterey Bay Aquarium Research Institute

[Download Judy Kildow's Presentation](#)

### Public Perception and Behavioral Change

Kevin Sweeney, Alliance for Climate Change Protection

[Download Kevin Sweeney's Presentation](#)

### Regional Climate Change Actions

Moderator: Bruce Riordan, Executive Director, Bay Area Climate Solutions

[Download Bruce Riordan's Presentation](#)

### Local Policy Efforts

Ted Droettboom, Regional Planning Program Director, San Francisco Joint Policy Committee

[Download Ted Droettboom's Presentation](#)

### State Policy Efforts

Dr. Bill Dean, Climate Change Advisor, Office of the Secretary, California Environmental Protection Agency

[Download Bill Dean's Presentation](#)

### Lunchtime Keynote

Dr. Susanne Moser, Director, Principal Researcher, Susanne Moser Research & Consulting, and editor of the book, "Creating a Climate for Change"

[Download Susi Moser's Presentation](#)

### Breakout Sessions

- Develop new and strengthen existing partnerships on climate change for science, policy, and education

- Develop strategies to address climate change issues and change behavior within the San Francisco Bay Area's coast and ocean environment

## Funding Local Solutions to a Global Issue

Moderator: Joe Sciortino, Project Director, 11th Hour Project

[Download Joe Sciortino's Presentation](#)

Charlotte Pera, Vice President for U.S. Programs, Energy Foundation

[Download Charlotte Pera's Presentation](#)

Samantha Rodgers, Energy Policy Analyst, Greenpeace

[Download Samantha Rodgers' Presentation](#)

## Wrap-up

Maria Brown, Superintendent, Gulf of the Farallones National Marine Sanctuary

- Final comments and questions.
- Where do we go from here?

## Adjourn

Reception to immediately follow hosted by the 11th Hour Project.

## SUMMIT GOALS

Gulf of the Farallones National Marine Sanctuary is convening this summit to bring together agencies, non-profit organizations, scientists, policy advisors, educators, and private businesses to:

1. Promote partnerships to address climate change in the Bay Area coast and ocean environment; and
2. Develop strategies for an Action Plan to establish the "Climate Solutions Initiative" for the Bay Area marine environment.

## SUMMIT OBJECTIVES

- Partner with the San Francisco Joint Policy Committee to address climate change, taking a leadership role on marine issues;
- Identify the key climate change factors affecting the San Francisco Bay Area's coast and ocean;  
Discuss the steps in research, outreach, and policy reform needed to be taken to address the carbon footprint affecting this region's coast and ocean;
- Determine how existing climate change programs can collaborate to help support the needs of the San Francisco Bay Area's coast and ocean;
- Identify the important critical marine habitats within the region that must be managed for resilience and sustainability; and
- Promote partnerships amongst agencies, non-profit organizations, private businesses, and stakeholders.

## DESIRED OUTCOMES

- Information exchange and networking on current climate change science and policy actions.
- Action Plan that complements the San Francisco Joint Policy Committee activities, addresses climate change issues, and advocates solutions for the Bay Area coast and ocean environment.

2008 Gulf of the Farallones National Marine Sanctuary

**SPONSORS**

**National Oceanic and Atmospheric Administration**



**California Academy of Science**



**Gulf of the Farallones National Marine Sanctuary**



**11th Hour Project**



## DIRECTIONS TO THE GOLDEN GATE CLUB

Presidio of San Francisco  
135 Fisher Loop  
San Francisco, CA 94129

### **From Bay Bridge/ Lombard Street Gate (East Presidio Entrance)**

**Please be advised that the Bay Bridge Seismic Retrofit Project will periodically result in detours on the westbound approach. Visit the 511 website for current conditions.**

Take the Fremont Street exit (it is the first exit off of the Bay Bridge). This exit will direct you around onto Fremont Street. Cross Market Street and then turn left onto Pine Street. Continue on Pine Street to Franklin Street. Turn right onto Franklin. Turn left onto Lombard Street and stay in the left lane. Following the signs toward the Presidio, use the Lombard Street left hand turn lane (after Broderick Street) to stay on Lombard. Enter the Presidio at the Lombard Gate. Turn right onto Presidio Boulevard. At the next stop sign Presidio Blvd merges with Lincoln Blvd. Follow Lincoln Blvd until you reach the row of large brick buildings, take a left onto Montgomery St. Turn right onto Sheridan Ave. and at the three-way intersection take a left onto Ord St. Follow Fisher Loop up the hill. The Golden Gate Club is the building to your right.

### **From SFO Airport (South Presidio Entrance):**

Take Highway 380 West to Highway 280 North towards San Francisco, follow signs to Golden Gate Bridge. Follow signs for 19th Ave./Park Presidio. When you are close to the Presidio, take a right on California and a left on Arguello. Enter the Presidio at Arguello Gate. For directions to Golden Gate Club, see "From Arguello Gate".

### **From the Golden Gate Bridge (Northeast Presidio Entrance):**

Be sure to be in the far right toll lane. From the toll plaza immediately turn right onto Merchant (25th Ave Exit). Follow the sign for Golden Gate NRA. Merchant ends at Lincoln Blvd. Take a left onto Lincoln Blvd. and once you pass the National Cemetery, turn right onto Infantry Terrace, and take another immediate right onto Fisher Loop. The Golden Gate Club is the building to your right.

### **From Presidio Blvd. Gate (Southeast Presidio Entrance):**

Stay on Presidio Blvd., which turns into Lincoln Blvd. at the three-way stop sign. Go straight through the stop sign and continue straight. At the row of red brick buildings, take a left onto Montgomery St. Turn right onto Sheridan Ave. and at the three-way intersection take a left onto Ord St. Follow Fisher Loop up the hill. The Golden Gate Club is the building to your right.

### **From the Marina Gate (Northeast Presidio Entrance)**

Follow Mason Street west. Turn left onto Halleck Street. Take Halleck Street to the stop sign and turn right onto Lincoln Boulevard. Follow Lincoln Boulevard past the Presidio Fire Station, until you reach the row of large brick buildings, take a left onto Montgomery St. Turn right onto Sheridan Ave. and at the three-way intersection take a left onto Ord St. Follow Fisher Loop up the hill. The Golden Gate Club is the building to your right.

### **From the Arguello Blvd. Gate (South Presidio Entrance)**

Follow Arguello Blvd to the first stop sign which is at the bottom of the hill. Go straight. At next stop sign turn left onto Sheridan Avenue. The next stop sign is Sheridan @ Montgomery. Go straight and then make a left on Fisher Loop. As you drive up Fisher Loop, the Golden Gate Club is on your right.

### **From 25<sup>th</sup> Avenue Gate (Southwest Presidio Entrance):**

Soon after entering the Park on El Camino del Mar it turns into Lincoln Blvd. Stay on Lincoln Blvd. and follow it past two overpasses. Once you pass the National cemetery on your right, turn right onto Infantry Terrace, and take an immediate right onto Fisher Loop. The Golden Gate Club is the building to your right.

**Public Transportation:** Muni - (415) 673-6864 or Golden Gate Transit at (415) 455-2000

For complete transit information, visit [www.presidio.gov](http://www.presidio.gov) (**Public Transit to the Presidio**) or **511**. Once in the Presidio, MUNI and Golden Gate Transit connect with the free **PresidiGo Shuttle**.

Muni Bus # 43 to Letterman Hospital

Muni Bus #29 to the Main Post

Muni Bus #41 and #45 end at Lyon Street

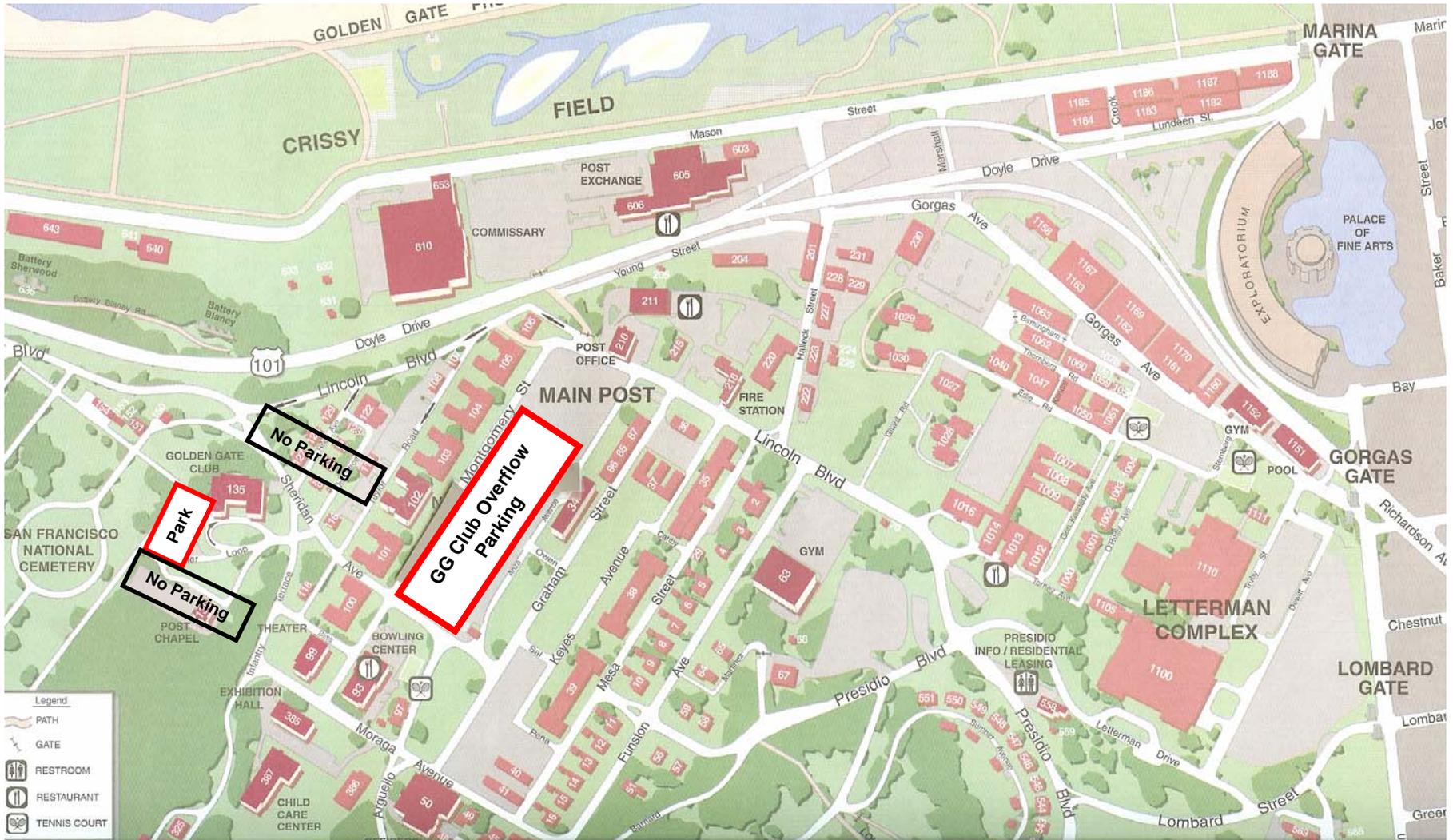
Muni Bus #28 Richardson and Golden Gate Bridge

\*\*\*Please Note: Public parking is available in the lot above the Golden Gate Club or on the Main Post. Parking is not permitted on Riley Avenue.

# Golden Gate Club –Parking Map

135 Fisher Loop  
SF, CA 94129

Handicap & limited parking is available at the Golden Gate Club. Overflow parking is located on the Main Post.



**Note: Cars improperly parked are subject to ticketing and towing by US Park Police**

# **First Biennial Ocean Climate Summit: Finding Solutions for San Francisco Bay Area's Coast and Ocean**



**Proceedings of the Summit:  
April 29, 2008  
Golden Gate Club, The Presidio  
San Francisco, California**

**U.S. Department of Commerce**  
National Oceanic and Atmospheric Administration  
National Ocean Service  
Office of Ocean and Coastal Resource Management  
**Office of National Marine Sanctuaries**



August 2008

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### *About the Marine Sanctuaries Conservation Series*

*The National Oceanic and Atmospheric Administration's National Ocean Service (NOS) administers the Office of National Marine Sanctuaries (ONMS). Its mission is to identify, designate, protect and manage the ecological, recreational, research, educational, historical, and aesthetic resources and qualities of nationally significant coastal and marine areas. The existing marine sanctuaries differ widely in their natural and historical resources and include nearshore and open ocean areas ranging in size from less than one to over 5,000 square miles. Protected habitats include rocky coasts, kelp forests, coral reefs, sea grass beds, estuarine habitats, hard and soft bottom habitats, segments of whale migration routes, and shipwrecks.*

*Because of considerable differences in settings, resources, and threats, each marine sanctuary has a tailored management plan. Conservation, education, research, monitoring and enforcement programs vary accordingly. The integration of these programs is fundamental to marine protected area management. The Marine Sanctuaries Conservation Series reflects and supports this integration by providing a forum for publication and discussion of the complex issues currently facing the sanctuary system. Topics of published reports vary substantially and may include descriptions of educational programs, discussions on resource management issues, and results of scientific research and monitoring projects. The series facilitates integration of natural sciences, socioeconomic and cultural sciences, education, and policy development to accomplish the diverse needs of NOAA's resource protection mandate.*

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# Proceedings of the First Biennial Ocean Climate Summit

## April 29, 2008

Kelley Higgason  
Gulf of the Farallones National Marine Sanctuary  
Office of National Marine Sanctuaries

Maria Brown  
Gulf of the Farallones National Marine Sanctuary  
Office of National Marine Sanctuaries



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Silver Spring, Maryland  
August 2008

Office of National Marine Sanctuaries  
Daniel J. Basta, Director

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## **DISCLAIMER**

Report content does not necessarily reflect the views and policies of the Office of National Marine Sanctuaries or the National Oceanic and Atmospheric Administration, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

## **REPORT AVAILABILITY**

Electronic copies of this report may be downloaded from the Office of National Marine Sanctuaries web site at [www.sanctuaries.nos.noaa.gov](http://www.sanctuaries.nos.noaa.gov). Hard copies may be available from the following address:

National Oceanic and Atmospheric Administration  
Office of National Marine Sanctuaries  
SSMC4, N/ORM62  
1305 East-West Highway  
Silver Spring, MD 20910

## **COVER**

Marin County coastline. Photo credit: Kelley Higgason.

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## Executive Summary

The marine environment plays a critical role in the amount of carbon dioxide (CO<sub>2</sub>) that remains within Earth's atmosphere, but has not received as much attention as the terrestrial environment when it comes to climate change discussions, programs, and plans for action. It is now apparent that the oceans have begun to reach a state of CO<sub>2</sub> saturation, no longer maintaining the "steady-state" carbon cycle that existed prior to the Industrial Revolution. The increasing amount of CO<sub>2</sub> present within the oceans and the atmosphere has an effect on climate and a cascading effect on the marine environment. Potential physical effects of climate change within the marine environment, including ocean acidification, changes in wind and upwelling regimes, increasing global sea surface temperatures, and sea level rise, can lead to dramatic, fundamental changes within marine and coastal ecosystems. Altered ecosystems can result in changing coastal economies through a reduction in marine ecosystem services such as commercial fish stocks and coastal tourism.

Local impacts from climate change should be a front line issue for natural resource managers, but they often feel too overwhelmed by the magnitude of this issue to begin to take action. They may not feel they have the time, funding, or staff to take on a challenge as large as climate change and continue to *not* act as a result. Already, natural resource managers work to balance the needs of humans and the economy with ecosystem biodiversity and resilience. Responsible decisions are made each day that consider a wide variety of stakeholders, including community members, agencies, non-profit organizations, and business/industry. The issue of climate change must be approached as a collaborative effort, one that natural resource managers can facilitate by balancing human demands with healthy ecosystem function through research and monitoring, education and outreach, and policy reform.

The Scientific Expert Group on Climate Change in their 2007 report titled, "Confronting Climate Change: Avoiding the Unmanageable and Managing the Unavoidable" charged governments around the world with developing strategies to "adapt to ongoing and future changes in climate change by integrating the implications of climate change into resource management and infrastructure development". Resource managers must make future management decisions within an uncertain and changing climate based on both physical and biological ecosystem response to climate change and human perception of and response to the issue. Climate change is the biggest threat facing any protected area today and resource managers must lead the charge in addressing this threat.

Recognizing the urgency to act now, on April 29, 2008, Gulf of the Farallones National Marine Sanctuary held the "First Biennial Ocean Climate Summit" for the San Francisco Bay Area's coast and ocean environment. The purpose of the summit was to discuss potential climate change drivers and impacts, as well as adaptation and mitigation solution strategies, for local coastal and open ocean ecosystems. The goal of the summit was to address these potential climate change impacts through fostering awareness, advocating solutions, and promoting action amongst government agencies, public organizations, private corporations, and individuals in order to build ecosystem resilience

and sustainability. To achieve this goal, the following summit objectives were established for the Bay Area's coast and ocean environment: identify key climate change drivers and impacts affecting the area; discuss the steps in research, outreach, and policy reform needed to address the carbon footprint affecting this area; determine how existing climate change programs can collaborate to help support the needs of this area; identify the important critical marine habitats within the area that must be managed for resilience and sustainability; and promote partnerships amongst agencies, non-profit organizations, private businesses, and stakeholders. The desired summit outcomes included developing strategies for an Action Plan to establish the "Climate Solutions Initiative" for the Bay Area marine environment and serving as a pilot program for implementing localized climate change initiatives amongst NOAA's national marine sanctuary system. The summit was an invitation-only event to ensure a participant size that would be compatible with the afternoon working session. Over 100 participants from numerous federal, state, and local agencies, non-profit organizations, foundations, academic institutions, and the business community attended the meeting.

The first half of the day included science, public perception, and policy panel discussions that the sanctuary identified as critical background information with welcoming remarks provided by the Director of NOAA's Office of National Marine Sanctuaries. The first panel, "Ocean Impacts, Ecosystem Response, and Human Adaptation", outlined climate change drivers and impacts specific to this region and a temperate ocean environment, providing background information to aid in the establishment of a climate change scenario for the Bay Area marine region. The second panel, "Perceptions, Behaviors, and Economics Within a Changing Ocean Environment", discussed the implications of climate change on local coastal economies and current strategies that are being employed to communicate climate change and facilitate behavioral change. The third panel, "Regional Climate Change Actions", outlined climate change policy actions that are occurring on a regional level through both state and local efforts, and provided a sense of hope for dealing with potential climate change impacts. The lunchtime keynote address was provided by Dr. Susanne Moser, editor of the book "Creating a Climate for Change," and included information on public perception of climate change and further discussion on communication tactics that can be used to help facilitate behavioral change in individuals. Dr. Moser stressed the need to convey a sense of urgency without trying to instill fear, as well as the importance of matching the message with the messenger.

The second half of the day was a working session of the participants to build and strengthen partnerships as well as develop strategies on how to best address climate change issues within the Bay Area's marine environment. Five breakout groups were convened, focusing on one of the following themes: engaging the community; changing human behavior; prioritizing areas for protection and restoration; communicating science to natural resource managers and policy makers; and reducing other human-induced stressors. A facilitator and note taker were provided for each group and participants were asked to brainstorm strategies to address each theme as it pertains to the Bay Area's marine environment.

## **Acknowledgements**

### **Summit Planning Committee**

Christopher Andrews, Associate Executive Director, California Academy of Sciences

Maria Brown, Superintendent, Gulf of the Farallones National Marine Sanctuary

Kelley Higgason (Summit Coordinator), Gulf of the Farallones National Marine Sanctuary

Linda Hunter, Executive Director, Farallones Marine Sanctuary Association

Brian Johnson, Deputy Superintendent, Gulf of the Farallones National Marine Sanctuary

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### **Summit Staff**

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Miriam Gordon, Gulf of the Farallones National Marine Sanctuary

Sara Heintzelmen, Farallones Marine Sanctuary Association

Justin Holl, Gulf of the Farallones National Marine Sanctuary

Brad Hunt, Ocean Science Trust

Aliana Knap-Prasek, Golden Gate National Recreation Area

Irina Kogan, Gulf of the Farallones National Marine Sanctuary

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Sage Tezak, Gulf of the Farallones National Marine Sanctuary  
Christy Walker, Gulf of the Farallones National Marine Sanctuary  
Bob Wilson, GFNMS Advisory Council Member

Gulf of the Farallones National Marine Sanctuary would also like to thank Dr. John Largier, Professor of Coastal Oceanography at U.C. Davis' Bodega Marine Laboratory and GFNMS Advisory Council member, for his many hours spent in helping to organize and shape the Ocean Impacts, Ecosystem Response, and Human Adaptation panel for this summit.

## Introduction

### **Master of Ceremonies: Maria Brown, Superintendent, Gulf of the Farallones National Marine Sanctuary**

The summit objectives are to:

- Address local coastal climate change issues
- Identify key climate change factors
- Discuss innovative strategies to address climate change
- Identify ways to collaborate
- Identify critical habitats and species in the region
- Information exchange
- Develop a climate change action plan for the San Francisco Bay Area's coast and ocean environment that will potentially become part of a regional marine/terrestrial plan in partnership with the San Francisco Bay National Estuarine Research Reserve and the San Francisco Bay Joint Policy Committee.

## Welcoming Remarks

### **Daniel Basta, Director, NOAA's Office of National Marine Sanctuaries**

- The Office of National Marine Sanctuaries has developed the Blue Seas, Green Communities Initiative, which is headed up by Liz Moore. This is a program to offer solutions in the form of things people can do and the behavior change and changing perceptions that are necessary.
- Changing the climate is personal. People are concerned, and he has noticed this from all walks of life.
- There is a need for better science, better legislation, and better information to lead to better knowledge in the long-term.
- We need to think innovatively to tackle this problem.

## Panel 1: Ocean Impacts, Ecosystem Response, and Human Adaptation

### **Moderator: Dr. Tessa Hill, Assistant Professor, Department of Geology and Bodega Marine Laboratory, University of California, Davis**

Dr. Hill's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- Global and continental temperature change
  - Natural forcing vs. accelerated rates, this includes the ocean.
  - The difference between natural and current temperature is significant. We should expect increases of 1-4 °C.
  - Past California response can be seen as oxygen in ice cores.
  - There are similar responses in the arctic ice sheet and for coastal California.
  - Oceanography responds rapidly and a cascade of responses are expected.
  - There will be changes in seabird and marine mammal populations, fisheries, coastal erosion, ocean acidification, etc.

- Acidification
  - Decreasing pH (0.1 pH unit to 0.7 pH units), the difference is analogous to the difference between milk and acid rain.
  - Impacts urchins, oysters, abalone, ocean water snails, and structure habitats such as carbonate-algae (e.g. crustose corallines).
  - What can we expect the changes to be in oceanographic and marine ecosystem responses and how can we change, adapt, and mitigate these changes?

**Dr. Franklin Schwing, Director, Environmental Research Division, Southwest Fisheries Science Center**

Dr. Schwing's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- The primary factors related to climate change are oceanographic factors.
- Within the California Current there has been recent changes and natural variation.
- Coastal upwelling refers to nutrient rich cool waters that fertilize the ecosystem.
- The interface between upwelling and chlorophyll is an indicator of productivity. These areas are where we will mostly see the most change/impacts.
- General warming trends have increased in recent time. There are variations from year to year and decade to decade, but these are natural and our ecosystem has adapted to be able to change.
- In the North Pacific the trends seen over annual, decadal, and multiple-decadal time periods are alternating between warmer and cooler states.
- Not all El Niños are created alike. In 1957 it was much more severe and produced greater changes than what was seen in the 1983 El Niño.
- Coastal waters are warming much more quickly than temperatures in the waters offshore.
- The thermocline depth is increasing making it more difficult to generate upwelling and reducing productivity of zooplankton.
- There is now a more sub-tropical source of water in the California Current (water from the south is reaching further north and more frequently).
- There was lower productivity in 2005 and 2006 due to weak springtime upwelling.
- Climate projections for the 21<sup>st</sup> Century:
  - Anthropogenic warming will overcome natural regime shifts and variability will be greater.
  - West Coast cool regimes will disappear in 30-50 years.
  - Sea surface temperatures will be 2° F warmer by 2050.
  - The variability (swings from warm to cool regimes/cycles and swinging back to warmer regimes/cycles) will be overwhelmed by global warming, resulting in more warm regimes.
- Ecological impacts could be that salmon, a cold water species, will become extinct.

- Jumbo squid may become established in what is now a cooler ecosystem for the long-term. Jumbo squid will have major impacts on the ecosystem, as they feed on the same prey as many vertebrate such as seabirds and marine mammals.
- Sea levels are projected to rise over the next 100 years by 1 meter.
- Critical wetlands may become inundated and the estuarine ecosystem will change, thus impacting species dependent on wetlands for nurseries, etc.
- Impacts will be regional to local.
- Change in temperatures will impact major ocean circulation patterns. Changes in ocean currents and chemistry, land runoff, and sea level may be significant such that adaptability of local species will be overwhelmed by long-term changes.
- There will be bottom up changes in the ecosystem with multiple stressors such as fisheries, pollution, as well as human induced warming.

**Dr. William Sydeman, President and Senior Scientist, Farallon Institute**

Dr. Sydeman's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- This presentation is based on biological and ecological oceanic changes over the past 30 years.
- The Cassin's Auklet can be viewed as an indicator of changes to the local ecosystem. Seabirds and salmon can be viewed as a surrogate of the ecosystem. They are climate and food web indicators.
- We need to make changes to fisheries management actions to include climate change impacts as an additional stressor.
- The California Current creates upwelling. Also, localized upwelling is created at capes and promontories resulting in "in-situ upwelling."
- The Cassin's Auklet is a planktivore. There was colony abandonment during the strong El Niños of 1983 and 1997 and during the anomalous upwelling timing in 2005 and 2006. Mean in breeding success is the same from the 1970's to now but the variation changed from 11% to 82% in this decade.
- The productivity of Chinook Salmon, can be correlated to the productivity of Cassin's Auklets. Their variation was 20% in the 1970's, 50% in the 1990's, and 37% in the 2000's.
- Salmon feed on juvenile rockfish and depend on their relative abundance. Commercial and non-commercial rockfish species have very similar production and variability rates.
- "Boreal" copepods off of Oregon can be used as an indicator for availability of prey species for juvenile rockfish.
- Abundance of copepods may be influencing productivity of prey species off our area.
- From 1999-2002, a stronger California Current may have brought the copepods to North-central California. A weaker California Current in 2005-2006 may not have brought the copepods to this area.
- The west wind drift is the bifurcation of the North Pacific (Gulf of Alaska) Current and the California Current. When the bifurcation reaches the west coast at areas off of southern Alaska, there are more copepods and better productivity in

the California Current. When the bifurcation reaches the west coast further south at Vancouver Island, there are fewer copepods off of Oregon, and poorer productivity along the California Current, leading to poorer productivity for rockfish and Cassin's Auklets.

- What can we do as scientists and managers?
  - We need to work better with fisheries scientists to determine relationships and stressors as indicators of future productivity.
  - Use krill and copepods as indicators of ecosystem health and use adaptive management principles to be more responsive to changes.
  - Improve our understanding of the implications of management actions and include anthropogenic factors in management actions.
  - Coastal communities need to change their business plans.

### Q&A:

1) John McCokser, California Academy of Sciences, asked the following:  
Is there value in the CalCOFI data sets that are unpublished?

Frank Schwing answered:

Yes. There is a tremendous amount of un-mined data and information. There needs to be a systematic work-up of biomass of species that have been archived.

2) Lara Hanson, EcoAdapt, asked the following:

Have either of you thought of using a promesis model as a way of viewing trends?  
Promesis normally occurs on the population level and it is when organisms are exposed to lower levels of contaminants or stress and you actually get a spike in reproduction (i.e. a “last gas” effort for a system that is failing to put everything into reproduction for a year or two to see if enough genetic diversity can be created to overcome this.

Bill Sydeman answered:

He was not familiar with that term, but, it is an interesting idea and could be possible. Before 2002, there was a series of years where things built up. The system only resets partially every year. We need to think about that kind of auto correlated structure.

Frank Schwing added:

We recognize from observations and models there is a rebound effect following poor conditions. There is higher than normal reproductive rate output following poor years.

3) Adina Abeles, COMPASS, asked the following:  
Can we help the ecosystem to adapt to these changes?

Frank Schwing answered:

We can reduce stressors to the system, such as better control of run-off and more conservative fisheries management. When rebuilding stocks we must consider anthropogenic stressors. We need to have a better understanding as to when to focus on anthropogenic assistance, for example, we should know when it is useful to assist fish

escapements or to not put too much effort and money into hatchery fish in years when the environment is not conducive to reproductive success.

Bill Sydeman agreed stating:

We need to reduce other stressors. There are certain things we can control and manage and we need to concentrate on these.

## **Panel 2: Perceptions, Behaviors, and Economics Within a Changing Ocean Environment**

**Moderator: Ed Ueber, Oceans Superintendent, Golden Gate National Recreation Area/ Senior Policy Advisor, Office of National Marine Sanctuaries (retired)**

The climate is changing with detrimental effects to the planet. We need to look at what we are doing. We are the drivers of the change. Often it is too late before we realize the effects of our actions.

### **Ocean Economics**

**Dr. Judith Kildow, Director, National Ocean Economics Program, Monterey Bay Aquarium Research Institute**

Dr. Kildow's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- We have an important challenge ahead of us. We have mainly focused on the data, and this is important. We also need to focus on human perception and behavior as well as the economic impact of climate change.
- Shoreline inundation and ocean acidification will affect our local ecosystems.
- The economies of many San Francisco area counties are at risk.
- On February 10, 2007 the latest IPCC report released stated humans are responsible for the rate of change. The rate of change is what we need to be most concerned about.
- On February 7, 2008 there was a U.S. oil and gas lease sale in Chukchi Sea, Alaska. This shows a sense of denial and “business as usual” even one year after the release of the IPCC report.
- Planetary changes occur in geological not ecological time...reversals will take millions of years. The next 30 years will be irreversible; changes are already underway. We need to focus on what happens after those 30 years. We can't turn back the changes, we can only slow them down.
- The greatest impacts will affect life furthest from the tropics, those in low lying areas, areas with fast growing populations, and the poorest and least educated.
- The Bay Area is one of the most vulnerable places for sea level rise.
- What is at risk? Economic effects include loss of jobs, homes, and economic productivity. 81% of the U.S. population lives in coastal states. Over 50% of U.S. economy is located in coastal counties. Over 50% of U.S. jobs are in coastal counties.
- The most vulnerable industries include: insurance, financial, power, tourism, transportation, agriculture, forestry, fishing and more.

- We measure two kinds of economy: coastal economies and ocean economies.
- On the north-central coast, San Francisco area counties have a total \$203 billion dollar economy. This economy is vulnerable.
- Ocean economies are dependent on the ocean, e.g. tourism and recreation.
- Greenhouse gas impacts by the end of century include: the oceans acidifying with pH levels dropping 3-5 points, loss of commercial and recreational fisheries, loss of coral reefs, and loss of marine mammals.
- According to fisheries data for San Francisco counties, from 1981 to 2006 fisheries declined (by pound). The landed value of catch also declined. As our fisheries decline, we are weakening ecosystem resilience.
- We have to think outside of the box.
- The Stern Report was a study on what it would cost to be proactive instead of reactive. The report found that global economy could fall 5-20% by 2050 (\$8 - \$32 trillion). This was with the assumption that greenhouse gases in the atmosphere will double from pre-industrial period levels.
- The types of costs include: prevention, investment, and destruction costs. The Stern Report refers to prevention costs as new industries, jobs, more investment, etc. Investment costs include: new technologies, efficiencies, and a social paradigm shift. Destruction costs are losses like those from Hurricane Katrina.
- The problems will take global action. Local action will just be a drop in the bucket.
- The rate of change is what matters. Rapid Social Change = Slower Environmental Change. Slower Social Change = Rapid Environmental Change.
- Inaction now benefits people alive today. Action now benefits the next generations.
- Discount rates dictate how we spend money— intergenerational equity.
- What are social tipping points? What are the indicators that we are changing? In the last year, something has started happening. The media has started covering global warming. Capital Hill is having dedicated sessions and wanting to learn more. Meetings like this are occurring. Meetings are occurring to inform government decision makers.
- Climate change could cause the largest and most consequential technology revolution for the next century.
- The Third Industrial Revolution could be a carbon-free society.
- There is a social paradigm shift happening now.
- All new ideas are not solutions. Do you plant trees, fertilize the ocean, sequester carbon, re-zone the coast, adapt or mitigate?
- Oceans outstrip all others as a carbon sink for approximately 60% of all atmospheric carbon.
- We need to force coastal managers to re-zone coastal areas.
- It's our choice – do we go on with business as usual, do we continue economic growth with mitigation investments toward a carbon-free society, or do we stabilize economic and population growth?
- We can be viewed as the enemy.
- See [www.oceaneconomic.org](http://www.oceaneconomic.org) for more information.

## **Public Perception and Behavioral Change**

### **Kevin Sweeney, Chief of Staff, Alliance for Climate Change Protection**

Mr. Sweeney's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- We need to talk about impacts in a personal way.
- In Ireland there was a conference that brought climate change down to a local level. Scientists told locals how climate change would affect Ireland at a local level. Artists, musicians, and poets described how the changes would affect them locally. Although not devastating, it was heartbreaking.
- Inaction is bad for us. We have to resist just looking at future generations.
- Visit [wecansolveit.org](http://wecansolveit.org) for more information.
- Public Opinion Status– The good news is 82% of the U.S. population gets it. People believe global warming is happening. The bad news is that they do not understand the urgency or solvability of the problem.
- We should not focus on the 20% of people that do not believe in climate change. We should focus on the 80% of population that do and take them to the next level of knowledge.
- Once people accept the information they become depressed and stupefied. We need to link urgency with solvability and give them a means to do something about it all.
- The needle of public opinion has moved, and it needs to keep moving.
- In Presidential debates climate change rates 20th out of 21 public policy issues. The partisan gap is deepening. There is a 20-35 point spread between Democrats and Republicans.
- Only 17% of people rank climate change in the top three issues when voting. We want to make climate change a bigger priority to people.
- Today, 72 additional coal-fired power plants are proposed in the U.S. We need to stop them.
- We must tell these stories in an urgent, economic way.
- There are huge opportunities for the economy. Direct comparisons of economies can be performed, e.g. compare building a coal plant with building a wind farm. There are often the same initial costs, but in five years wind power is free and green!
- We must give people the opportunity to get us out of the current economic downturn by doing something about climate change.
- The Alliance for Climate Protection campaign aims to persuade the American people and people around the world on the importance and urgency of solving the climate crisis. The strategy is mass persuasion and mobilization, e.g. airing commercials on American Idol, etc.
- We must come up with language, dialogue, and a framework for people to cross the line and to have a new opinion and take a new stance. Ask people to join the movement!
- Their campaign message is, create hope not fear, urgency not panic. We must issue an invitation, not an accusation. We will generate response by making friends, not enemies.

- We must acknowledge small steps, but offer them a chance to take a larger step, e.g. changing a light bulb is good, but changing a law is better.
- Use broad and diverse partnerships and use the Alliance as a resource.
- The Alliance will engage in four primary types of research:
  1. Benchmark and Brand Tracking
  2. Values and Message Testing
  3. Creative Testing
  4. Engaging the Opposition

### **Q&A:**

1) Carol Bernthal, NOAA, Olympic Coast National Marine Sanctuary, asked the following:

There is momentum, but how do people's actions result in tangible benefits? How do we measure benefits? Right now there is a lot of greenwashing in business. How do we measure real change?

Kevin Sweeney answered:

It is important to have metrics such as public opinion. Is it changing? There has to be a specific push for action.

2) Peter Grenell, San Mateo Harbor District, asked the following:

You focused on immediate action. I would suggest that current action affects future action, e.g. in the Middle Ages, people got both personal gratification from building a cathedral, as well as from the idea that future generations would enjoy it for centuries. There has to be efforts in education, efforts to change people's behavior. We need to focus on educating children.

Kevin Sweeney answered:

It is helpful to have a personal drive. I always think of my children and what year it will be when they are my age.

Ed Ueber summarized the panel:

We have received a call for action. How do our social actions affect the environment? We can take local actions. Population growth is a huge problem that people are not addressing. Everyone must take small steps in their own life, but push for world change in people's perception.

### **Panel 3: Regional Climate Change Actions**

**Moderator: Bruce Riordan, Executive Director, Bay Area Climate Solutions**

Mr. Riordan's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- This session will focus on policy and where we are at on a local and regional level.

- The focus must be on hope, confidence, and challenge.
- In the nine Bay Area counties what are among the top ten projects? Green buildings, the Moscone Center, California Academy of Sciences, Adobe in San Jose, Berkeley First, financing for solar energy for homeowners, and the Green Business Program.
- For public transportation options, we have the Cal Train Baby Bullet, Fruitvale BART, Emeryville Go-around, Corte Madera Creek Trestle (an integrated system for biking and walking), and Cal CARS to name a few.
- We need a structure and funding to make these projects more widespread.

### **Local Policy Efforts**

#### **Ted Droettboom, Regional Planning Program Director, San Francisco Joint Policy Committee**

Mr. Droettboom's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- The Joint Policy Committee (JPC) is composed of four regional agencies: the Association for Bay Area Governments (ABAG), Bay Conservation and Development Commission (BCDC), Metropolitan Transportation Committee (MTC), and the Bay Area Air Quality Management District (Air District).

Climate and the Bay Area- Changes, Challenges, and Choices:

#### 1) Changes:

- By the end of the century, California has identified three scenarios: lower emissions (if we can meet the Governor's 2050 target as does the rest of the world), medium high emissions, or higher emissions (business as usual).
- Even in the lower level climate change scenario, there is a projected 3-5 degree change in temperature and 6-14 inches of sea level rise.
- In the San Francisco Bay Area you will have a brine effect due to snow pack loss and sea level rise in the Bay Area. This will effect drinking water availability.
- San Francisco and Oakland airports will be flooded. There will be expenses to mitigate flooding of transportation systems due to sea level rise and storm surges. This will also affect highways, e.g. Hwy 101, etc. We will probably invest in the infrastructure to save these areas.
- We currently experience less than ten "Spare the Air" days per year. Under the lower scenario we will have four times the number of "Spare the Air" days. In the higher scenario we are worse than L.A. today for air quality. This has major health effects.
- For CO<sub>2</sub> emissions per capita, the Bay Area does better on average than the rest of the United States. This is largely due to the absence of heavy industry and cleaner power. We still have 3-4 times the world average for our carbon footprint though.
- In the Bay Area, 50% of the carbon comes from the transportation sector (85% of this is from private vehicles). The rest of the world has about 14% of carbon from transportation. The majority is from private vehicles.

#### 2) Challenges:

- We may have to go beyond technology. It is projected there will be a 55% increase in vehicle miles traveled relative to 1990 by 2020. This state had passed

the Pavley law, which was to impose vehicle emission standards that would have brought CO<sub>2</sub> levels down to 20% of 1990 levels. The federal EPA has refused implementation of this law though by refusing to give California a waiver. This is the level we need to be at though to meet the AB32 target for 2020.

### 3) Choices:

- Recently the JPC developed a common strategy in their climate program. It is a mechanism for moving forward and it emphasizes joint regional actions.
- The goal is to be a model for California, the nation and the world, although the relative effects might be trivial. The big contribution is to set an example for the rest of the world to follow.
- There are four supporting goals: meet and surpass state targets; maintain safety and sustainability; measure and evaluate; and document and publicize.
- Six strategies include: establish priorities; increase public awareness and motivate action; provide assistance; reduce driving/promote alternatives; prepare to adapt; and break old habits.
- Reducing driving can be effective in short term, but this is politically difficult and it has equity issues.
- Land-use decisions are the most effective for the long-term. Compact development (smart growth) can reduce greenhouse gases by 20 – 40%. The distance from the coast that development is should be a discussion point (less energy needed for cooling/heating, more public transportation, etc. the closer you are to the coast).
- We must break old habits. There might be new ideas that can be more effective.

### **State Policy Efforts**

**Dr. Bill Dean, Climate Change Advisor, Office of the Secretary, California Environmental Protection Agency**

Dr. Dean's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- California has been involved in climate change for several years, starting with funding research.
- The state is currently looking at impacts to California from global warming.
- California is uniquely vulnerable. There are 1000 miles of coastline, we are dependent on the Sierra snow pack and the Delta for fresh water, and we have a sensitive agricultural economy.
- The federal government has not provided enough leadership. Currently, the state is taking action.
- In 2005, an Executive Order established statewide greenhouse gas emission targets.
- By 2050, the goal is to reduce our emissions to 80% below 1990 levels. We are hoping that other states will follow our lead.
- There is also the Western Climate Change Initiative where seven states and three Canadian provinces are working together.
- Three years ago the Climate Action Team (CAT) was formed within the state. Virtually all California state agencies are engaged in this.

- Assembly Bill (AB) 32 made the 2020 target into a law.
- Subgroups of CAT include:
- 1) Land-use Planning– which puts responsibility at the local level.
  - 2) Scenarios– which evaluates the effects of climate change on California and also provides funding for research on rising sea levels and storm impact.
  - 3) Water Energy– which evaluates California’s water system and state water plan.
  - 4) Adaptation– which asks, what do we do now that climate change is happening? What do we protect, what do we abandon?
- The Air Resource Board (ARB) is working on its scoping plan, as required by AB 32. The plan contains 100+ measures and strategies for reducing greenhouse gas emissions. The draft scoping plan is set to come out in June 2008.

### Q&A:

1) Bill Douros, Office of National Marine Sanctuaries, West Coast Region, asked the following:

The importance of transportation is clear. The Bay Area is renowned for public transportation such as BART. Has anyone looked at what emission levels would have been without BART? To quantify that would be of value. This could be used to promote what we have done and used for marketing.

Ted Droettboom answered:

The problem is not establishing BART, it is using it. For example, for those that both live and work within ½ mile of BART, your probability of taking BART to work is about 40%, if you violate that assumption at either end the probability drops to about 4%. We need to direct development toward public transit stations.

Bruce Riordan added:

7% of our trips in the Bay Area are on public transportation. We have to get at the rest by making vehicles more efficient.

2) Ed Ueber, National Park Service/Office of National Marine Sanctuaries asked the following:

On the high-medium-low chart, what is the impact of fires? With increased fires, are we considering their contribution to increased greenhouse gases?

Ted Droettboom answered:

Some data is not available on fires. Fires will probably move from the southern part of the state up to the northern part of the state. It will increase particulate matter, which has direct health effects. It is a bigger problem than the smog and ozone problem.

3) Brenda Donald, Gulf of the Farallones National Marine Sanctuary Advisory Council, asked the following:

If the interior heats up, then more people will move to the coast. Have you approached the California Coastal Commission with any of these thoughts?

Ted Droettboom answered:

We are not talking about direct shoreline development, but areas that feed into the coast. The alternative to that is to start to fill up the Central Valley and use agricultural land for housing and have people live in very hot climates that do not have the transportation infrastructure in place. We are going to face a crossroads in protecting the coastline. We need a state settlement policy. It cannot just be local governments concerned with land use. The state should be concerned so that we can maintain sustainability.

4) Judith Kildow, Monterey Bay Research Institute asked the following:

Is there some way that we do not have to assume the demographics that we project? We seem to create self-fulfilling policies by assuming an increase in demographics.

Ted Droettboom answered:

It makes sense to put more growth in California, as it is cooler than the rest of the nation. Other areas will be affected more drastically, e.g. those living on coral atolls. This part of the world is more habitable than others.

Judith Kildow also asked:

Has anyone looked at the elasticity of energy use for transportation, especially in the last six months with the increase in fuel prices?

Ted Droettboom answered:

There are continuing studies with elasticity in transportation. People do not have a lot of choice for transportation. People who have moved further away to have affordable housing have to pay for gasoline. The areas that are declining in mortgage prices fast are those areas furthest from public transportation.

Bruce Riordian added:

Three-fourths of our driving trips are discretionary, non-work trips.

Ted Droettboom added:

You almost have to drive to the grocery store or your kids to school in some parts of this region.

5) Heather Kerkering, CenCOOS asked the following:

Some of the incentives you spoke of were energy incentives. I did not hear much about changing water usage. The only solution that I have seen is the creation of desalination plants. Are there any programs such as Berkeley First providing incentives for residents to decrease water usage?

Bruce Riordian answered:

There will have to be. 18% of our electricity is just for our water system. 30% of our natural gas is just for our water system. We have 30-50% energy waste in our water systems.

## Lunchtime Keynote Address

**Dr. Susanne Moser, Director, Principal Researcher, Susanne Moser Research & Consulting, and editor of the book, *Creating a Climate for Change***

Dr. Moser's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- People contradicting one another is a sign of a good conference. It encourages us to think hard about what is really going on. So I plan to contradict some of what we've heard so far.
- Where is climate change in the public mind? We are trying to create change, are people willing? This presentation will make the case for the need for better communication and social change. What is not seen does not exist. With climate change this will get easier as the average person sees more of the effects. Once people can detect issues they put them on the agenda.
- The framing of a problem is a critical factor for determining the response. We can bring in a whole new set of people to the response if climate change is not seen as just an environmental issue.
- If the constituency does not talk about it then nothing will happen in DC. Grassroots concern is needed.
- Communicators should promote what can be done.

Where are we with climate change?

- It is becoming popular.
- 2007 was the year of the climate. The communication part of climate change was recognized and there was lots of media attention.
- When asked what is the biggest environmental problem that society faces right now, global warming was rated as the top problem by 33% of Californians and 29% of people in the U.S.
- In 2008 it is back to being rated as the highest problem by only 16-17%.
- 51% of people say they have heard a lot about the issue.
- In California more people think that it is extremely important. Most people in California think that it is very serious, more than the U.S average.
- Flooding, drought, and air pollution were seen as the most important impacts of global warming by Californians.
- 43% of Californians say that we need immediate action.

March 2008 Gallup poll:

- 4% decline in people who care a great deal about climate change. Global warming was ranked 9th out of 12 environmental issues.
- Why does this matter? It matters because if people are not personally worried about an issue they are very unlikely to take personal action.
- Only a small percent of people are motivated altruistically to take action.
- In the 2007 poll, people thought that climate change was not an imminent problem.
- What are the most important impacts? When people were asked about the effects of global warming most people think of the polar bears, or something that

happens to other species, or people in other countries, or in the U.S. elsewhere. Only 10% see it as something that will effect them personally.

Ready for action:

- When asked about what kinds of actions people would support to address climate change, 35 miles per gallon car standard was a policy that most people would favor.
- Many people are also in favor of the Kyoto Treaty, but tend to know very little about what it actually involves or requires.
- Gas or electricity tax– there is a sharp drop in the percentage of people supporting such policies, because fewer people are in favor of things that personally effect them.

Are Californians better?

- One-fourth of Californians don't know if the problem can be solved.
- A majority of Californians think that they have to take personal action. The willingness to take action is generally high.
- Survey results also suggest that Californians are conscious and well informed consumers.
- They are motivated by arguments of precaution and responsibility, e.g. it makes them a “good person.”

Would Californians favor some actions over others?

- Generally speaking, policies that would provide incentives to do something are favored more strongly than laws and regulations and taxation to induce certain actions or changes.
- At the same time, there is strong support for regulating businesses. What if the regulation increased the price that Californians had to pay for goods and services? Less people would then support the idea of regulating businesses.
- What about taxing businesses based on the amount of greenhouse gases that they emit? People are in favor of this. Taxing individuals in California on the amount that they produce is not as popular, but if their tax money went directly to reducing greenhouse gases then more people supported it.

In summary – some inconvenient truths:

- People like measures that don't hurt their pocket book.
- There is not a clear understanding of the gravity of this issue.
- Few people have begun to make changes.
- Global warming plays a small role in electoral decisions.
- No state has achieved 1990 emission standards.

The challenge before us. What have we tried?

- Al Gore believes that it is an information or knowledge deficit problem. If people only understood global warming then people would just do the right thing.
- We no longer need to convince people that the problem is real, we have reached a saturation level of people who see it as a problem.
- People shut down with the same pattern of communication and you have lost the opportunity to tell them something new. “ Global warming is REAL...” People already know this. We need to tell them what to do.
- Be worried, be very worried– the fear appeal is found on many magazine covers and in articles.

- Fear alone is not a sufficient motivator to change. What else do you need besides fear? A way to translate that into action. Anything overwhelming needs to be translated into an action or people will go numb.
- Then there is the myth of “What we really need is a big disaster”— this is not a safe bet for change either, because most people want to go back to “normal”, i.e., to what they had before the disaster.
- Or: “If only the media did better in covering this story...” The media is an important way, but not the only way to communicate. The media is good at setting the public agenda, but it is very limited in what it can do in terms of behavior change.

What goals are we trying to pursue with our communication?

- 1) Inform and educate
- 2) Mobilize
- 3) Initiate social change

Effective communication then means that the communication achieves a desired goal (e.g., behavior change, a policy change). To do so, it has to do two things:

- We must increase the motivation to make the change, i.e., people need a really good reason why.
- We must lower the barriers to change, and at different stages in the change process, people face different hurdles.

Best practice in communications begins with the audience:

- All audiences are not the same.
- Communication must be tailored to who you are talking too.
- We tell people to get out of their cars, but they still need to get to where they need to go. If not by car, then how? If there is no feasible alternative (e.g., functional public transportation), then they can’t give up their cars. So, we need to give people the options to get around in new ways.
- Make the global warming issue local and salient to people.
- Match the messenger with the audience.
- Mass media can help to set the agenda, but it is demonstrably bad at changing people’s behavior. It is more persuasive to hear about an issue from someone you know and trust, through a direct, face to face communication.
- A recommendation for scientists and those who communicate about the science of climate change— lead with certainty, what you are most confident about, and talk about uncertainty last. People are less likely to keep listening and believe your message if you start with everything that is uncertain.
- We absorb messages better from people who are like us (PLU’s).
- People need hope, help, and practical support.

Elevating motivation:

- Knowledge and information is a relatively shallow motivation for people. Deeper beliefs, concerns, and values reach deeper and are longer-lasting in their effect.
- Create a vision of a worthwhile future. Imagine the world came together and reduced emissions. Even if we work as hard as we can there are still going to be major climate changes and problems with the environment. Thus, despite all our hard efforts, we still would get negative feedback from the environment. So, we need new indicators of positive change that tell us that we are doing well, and

they will come from the policy, economic, technological, social and cultural changes we'll make.

### **Q&A:**

1) Lara Hansen, EcoAdapt, asked the following:  
What is a worthwhile future?

Dr. Moser answered:

I alone can't dictate that vision. I have many visions. We need to discuss this with one another. We can develop indicators together.

Lara Hansen also asked:  
What is an example?

Dr. Moser answered:

How do people love to live? What kind of community do you want? We need to learn how to live with one another in other ways.

2) Franklin Schwing, NOAA's Southwest Fisheries Science Center asked the following:  
What she thought the future held for climate scientists?

Dr. Moser answered:

There is more to learn. Reach out beyond your discipline, tackle interdisciplinary science challenges. We need to learn how to talk to one another.

3) Carol Bernthal, Olympic Coast National Marine Sanctuary, asked the following:  
There are key leaders in each community and we should have those people carry the message. How do you identify who those leaders are?

Dr. Moser answered:

Call a meeting. The active, engaged people in a community come to those meetings. Also, identify existing networks and groups in communities. You can reach smaller groups through the use of existing networks. Start thinking about retail communication – ways of tailoring your message to them. Importantly, also identify the people who can cross the boundaries between different groups and different communities. We tend to forget certain groups, and we have to broaden our coalitions.

4) Steve Goldberg, Bay Conservation and Development Commission, asked the following:

The American public doesn't understand complicated science. We need to stop talking about whether or not global warming is real. We need to talk about what we can do.

Dr. Moser answered:

That's right. America will never be a nation of climate Ph.D.s. We need to bring the conversation to things that people know and care about, to what they can do and what the

barriers are to making the necessary changes. Also, it's easier for people to change if they are not alone. Change happens when you have social accountability, peer pressure, and social support – like the example of having eco teams and eco villages.

5) Chris Mobley, Channel Islands National Marine Sanctuary, asked the following:  
What insight can be gained by places that are doing this better than us?

Dr. Moser answered:

There are many fabulous programs throughout Europe and Australia and we need to communicate the successes, failures and lessons learned better among nations.

6) Jodi Cassel, University of California Cooperative Extension Sea Grant, asked the following:

In terms of educating people, what should we tell them to do?

Dr. Moser answered:

There is so much individuals can do, but we must be realistic in telling people that we need change at all levels and in all sectors in society. We must create a sense of the collective – so that people don't feel alone – and help them see what their part is in the big collective effort. Communication should be a time to learn from one another, not just educating the other and telling them what to do. People must provide their local knowledge and help shape the actions they can do together. In terms of reaching out to communities, you must be educated on a community before you go in talking about climate change.

7) Tom Roth, Representative Lynn Woolsey, asked the following:

How do we compete with a media culture that tells us everything is fine and that we should continue to consume?

Dr. Moser answered:

Tell people something different, use humor, art, or the actual truth. Use the “hope theory,” i.e. tell someone how serious the problem is and then help them understand what to do to get to a place of hope.

### **Breakout Groups– Five Minute Summaries**

Please see Section XI. for complete Breakout Group notes.

#### **Summary from Breakout Group 1, Engage the Community:**

Brenda Donald, Gulf of the Farallones National Marine Sanctuary Advisory Council, reporting for group.

What are the key groups that we want to get this message to?

- All groups. Religious groups should be thought of as a good resource. We must consider people's perceptions and acknowledge different perspectives, from Congress to Walmart shoppers. There are sustainability reports available for big

businesses, such as the “Chronicle 200” (San Francisco Chronicle Annual Report on the Top 200 Bay Area companies).

What are the different strategies to get the message out?

- Commitment and consistency. The messenger is important. The message has to be one of hope. One example of this is the Climate Witness program from World Wildlife Fund (WWF) where people report the changes they have personally observed.

How do you share resources?

- Organizations such as World Wildlife Fund have a global network. You can also use clearinghouse methods and coalitions. Central places where information can be collected should be used. You can also use social networking through technology such as Facebook.

What are the next steps?

- Look at what you are doing in your business and personal life. It is fair to ask groups we are working with the same thing. We need to start somewhere. Light bulbs are a start. Look at what is being done and build from there. We should train people to spread the message in a hopeful way.

What are 3-5 ways climate change can impact us personally in the Bay Area?

- Living below sea level, salmon fishery, war, etc. There is a very long list.

### **Summary from Breakout Group 2, Change Human Behavior**

Carol Tang, California Academy of Sciences, reporting for group.

- Less is more.
- We need to talk about simple, targeted, effective messages, both in our communication methods and in what the public can do.
- There are too many messages for the public to understand. They are bombarded by media and propaganda. We should focus on health and economics, issues that really effect people.
- This is the same for actions. We need to pick simple actions that have the most impact, e.g. transportation, water, smaller houses, smaller cars and smaller families.
- We should focus on values, responsibilities and rewards and understanding each targeted audience in relation to these.
- Climate change is so huge and overwhelming. The group was lamenting the low priority of climate change. We need to look at all of the top issues and draw lines of interrelatedness with climate change.
- All issues are linked, and focusing on that will simplify the message. We all contribute to CO<sub>2</sub> emissions. These emissions can be a common metric, and we can see how it changes through time due to individual actions.
- We should promote beauty and community pride in our area. If we can get people to understand what we have and appreciate it, we’re on the right track.

### **Summary from Breakout Group 3, Prioritize Areas for Protection and Restoration**

Bob Wilson, Gulf of the Farallones National Marine Sanctuary Advisory Council, reporting for group.

Identify and display critical habitats:

- This is not a realistic question. This is a process, not an answer or product.
- We are dealing with change, therefore everything is going to change including our goals.
- Areas of critical habitats aren't going to remain the same through time.
- What is resilience exactly?
- We need a paradigm shift.
- The shoreline will have the most and the earliest changes.
- The group had to look outside the GFNMS boundaries.
- We can't just look locally for management, this must go to the national and international level.

### **Summary from Breakout Group 4, Communicate Science to Natural Resource Managers and Policy Makers**

Steve Goldbeck, Bay Conservation and Development Commission (BCDC), reporting for group.

Translate complex science to understandable information in a timely manner.

- The connection should be made between the sanctuary and the Bay.

Who is the target audience? Who are the managers we are trying to address?

- We need to focus on the people in the trenches and key decision makers. We need to look at who can really affect outcomes and use the information that is being prepared.

Can we manage this system?

- If we have climate change can we really do anything to change it? Aren't we really managing the people who interact/use the systems?
- We need to have a focused approach. We need an analysis that is useful to decision makers.
- We need a vulnerability analysis for the Sanctuary that would look at potential impacts of climate change with a scenario-based approach. We should look at outcomes of various scenarios on the system.
- We don't want to scare people to death, but we need to show them real outcomes.
- We should look at different management scenarios and costs. If we act sooner or later what are the associated costs?

Once we get this, what do we do with it?

- Get information to the public annually or semi-annually. It will be constantly changing.
- People "Google" what they want to know. We need to have a website that is focused on the Sanctuary in the context of a greater system that would include scenarios and possible outcomes, impacts and management strategies.

Who?

- The Sanctuary!
- This hasn't quite happened yet. We need a non-profit organization to speak freely. We need a broader message and a group to provide it.
- We need targeted information that looks at potential impacts in a format that is usable and accessible.

**Summary from Breakout Group 5, Reduce Human-induced Stressors:**

Chris Mobley, Channel Islands National Marine Sanctuary, reporting for group.

- Enhance ecosystem resilience.
- This is not just GFNMS, but includes all of the Bay Area.

Are there more stressors to add to the list?

- Water diversion, land use planning, habitat loss, and many others.

How would you assess impacts on ecosystems from stressors?

- Methods are out there. The take home message is we need to be more interdisciplinary and connected, using various tools that exist. We need to identify sources of impacts and which will have the biggest impact.
- This is not necessarily getting new data but synthesizing existing data as well. Sharing and advancing knowledge on trends and status out there is important.
- Other than an impact assessment, there are lots of economic methodologies, even lawsuits demanding that any EIR or EIS should include climate change.
- Agencies using existing laws haven't thought adequately about impacts of climate change over time. One example is wetlands loss; we need to build sea level changes into planning now.

Who are potential partners?

- Government, non-profit organizations, insurance industry. There are opportunities for a consortium.
- When it comes to stressors, the idea is to go after the low hanging fruit. Go after the biggest factors, e.g. reducing energy use saves money and water use conservation. Just those two factors would have a big impact on all stressors.

What is the audience?

- Go after the kids. They are easily brainwashed and will pressure their parents.
- The audience should be carefully targeted and the message should be crafted specifically to them.

**Q&A:**

1) Anne Walton, Office of National Marine Sanctuaries, Pacific Islands Region, asked the following:

Looking over these five themes, there has been lots of connectivity. At the base, the goal is to change human behavior. We need to coordinate and consolidate. What are the next steps and where are we going?

Maria Brown, Gulf of the Farallones National Marine Sanctuary, answered: She will address this shortly during the meeting wrap-up.

2) Brenda Donald, Gulf of the Farallones National Marine Sanctuary Advisory Council, stated the following:

The systems model is difficult to address. We need to decide how to look at this issue on many layers but ultimately make them cohesive.

3) Chris Mobley, Channel Islands National Marine Sanctuary, stated:

This shows the importance of enforcement. There are lots of incentives, but little enforcement. Things don't work if they are not enforced.

#### **Panel 4: Funding Local Solutions to a Global Issue**

**Moderator: Joe Sciortino, Project Director, The 11<sup>th</sup> Hour Project**

Mr. Sciortino's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

- Mr. Sciortino volunteered with the sanctuary a few years ago in the SEALS program. This experience helped to re-direct his career to the environmental field.

Philanthropic change:

- The 11<sup>th</sup> Hour Project is the climate change focused part of the Schmidt Family Foundation. They are a five-person team with one full time employee. They try to convert hopelessness to problem solving.

There are two types of strategies:

- Top-down strategies target key policy makers.
- There is currently a lot of effort to influence at the federal level. Mr. Sciortino attended a conference a few weeks ago that was also attended by the governor of Kansas. Kansas is doing a great job with climate change. The state government has vetoed two permits for coal-fired plants, despite inaction at the federal level. They are not being backed up by the federal government, but they are fighting on their own.
- Bottom-up strategies educate the public and get them to influence policy makers.
- 45% of grants go to public education and media. The next largest funded is policy (22%).

The Regeneration Project:

- This project reaches out to church and interfaith groups. It is an example of finding a target group and then matching the messenger to the target group. Free copies of "An Inconvenient Truth" and a guide were sent to 4,000 churches that requested this across the country. One-half million people watched the movie last October with their faith group. This year they are funding a contest to see which church can reduce their emissions the most during a certain amount of time.

The Energy Action Coalition:

- This is a group of students that are mobilizing other college students into rallies against climate change. Students leading students.

Communications and media:

- The Center for Investigative Reporting has put out a coal documentary.
- Cal Academy of Sciences will have a climate change exhibit.

Climate Central:

- This is a new organization created by Jane Lubchenko and Steve Pakala. It addresses the need for scientists to come together and be spokespeople for climate change. It aims to provide an honest and objective source of science and solutions for climate change though presenting the latest research to the media. It will bring together a communications arm with scientists. There will be people to package the science in a compelling way through marketing. They will target local news organizations and look at things like the Chicago Marathon being canceled because it was too hot and statistics about probabilities of future climate scenarios.

The opportunities ahead include:

- A movement away from awareness and toward solutions. Everyone is onboard with awareness. We really need solutions now. We must decide, what are the right solutions?
- We may have to prioritize environmental issues, e.g. solar panes vs. threatened species.
- We should focus on collaborative funding, i.e. avoiding duplicating efforts among funders, and collaborating to use funds most effectively.

### **Charlotte Pera, Vice President for U.S. Programs, Energy Foundation**

Ms. Pera's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

The Energy Foundation: Building Markets for Clean Energy Technology

- Philanthropy should be working on these problems. The energy world is very complicated and needs staff with expertise. They combined three trusts to organize this foundation.
- We address water pollution, air pollution, waste, etc. but our main focus is climate change.

Energy Foundation partners:

- The foundation was started in 1991 with an office in China.
- Currently, there are eleven funding partners, and 55 staff in U.S. and China.
- The annual revenue \$70 million.

Our vision:

- Technology and innovation can solve global warming.
- Policy shapes energy markets.
- Targeted philanthropy can influence policy.

Big picture of the climate problem:

- A study was performed by the California Environmental Association to figure out an answer to the climate problem and the role of philanthropy. We need to halt warming within 2 degrees, and by 2030 we need to cut emissions in half globally which would be 30 gigatons.
- We are targeting six sectors including electric utilities, industrial energy efficiency, and building codes.
- Targeting the U.S., Europe, China, India, and Latina America (cut deforestation) is the best place to start.

- U.S. programs include: buildings, the power sector, utilities, renewables, transportation and climate policy (to put a price on carbon).

The model has been working:

- One success story is stopping conventional coal. There were 35 large coal plants defeated out of 100 plants on the drawing board. Groups are resisting power plants. The campaign is working. There was 200 million metric tons of CO<sub>2</sub> avoided by these plants not being built. There is a \$55 billion renewables market. 24 states have adopted Renewable Portfolio Standards to drive technology.

Arguments that work well:

- Wind has been a boon to rural communities and can increase annual incomes. Wind is now cost-competitive.

For more information go to [www.ef.org](http://www.ef.org).

### **Samantha Rodgers, Global Warming Field Director, Greenpeace**

Ms. Rodgers's presentation is available at

<http://farallones.noaa.gov/ecosystemprotection/ecosystemprotect.html>. Then click 2008 Ocean Climate Summit- Schedule.

Project Hot Seat: Congress can stop global warming

- Greenpeace is a global organization working in 40 countries with 3 million members. We work on the six most pressing environmental problems, and climate change is the number one priority. We want to avoid a 2 degree temperature increase with the business as usual scenario. A 4 degree rise leads to the extinction of 40% of all species. Sea level rise of 20 feet with a 3 degree temperature increase will cause wetland destruction, with a 2 degree increase there will be severe flooding.
- To prevent a 2 degree increase we need to reduce our emissions by 50% by 2050.
- The success of this rests on the U.S. We'll either be a leader or a scapegoat.
- In 2012, we'll have the opportunity to reengage in the Kyoto Protocol. We need to prepare for this with policy.
- We need to use energy more efficiently, put a limit on global pollution, stop polluting power plants, and invest in clean energy. In the U.S., this would cut our emissions by 80%.
- The Energy Revolution Report shows how those cuts are feasible using existing technology.

Strategies:

- Environmental groups are facing rollbacks in the Senate. The House of Representatives has never gone on record. Environmental groups at the national level have tried to defeat these rollbacks at the Senate level.
- With the next Administration there is nowhere to go but up, but we have industry on one side and environmental groups on the other. We need Congress to back environmental policies.
- We need to pass national global warming legislation in the House by building a core who will push this policy.
- We need to mobilize the public, using local impacts as examples.
- Congressman Leonard Boswell, IA, is a moderate democrat who won the last election by 2%. He had no position on global warming. People in his district pushed him to have a position, and it was effective.

- We must educate the public and inspire them to get involved. More constituents equal more power.
- They have held media worthy events, such as a crop circle in the shape of a wind turbine. They have partnered with steel workers and other local groups for media coverage. They also led Congressman Boswell to sponsor climate legislation.
- The overall successes have been great. We worked in 34 communities and 27 members or candidates have improved their position on climate change. Ten have become global warming champions. They have inspired a total of 85,000 people to take action and garnered 500 media hits.

## Q&A:

1) Chris Mobley, Channel Islands National Marine Sanctuary, asked the following: He read an article about the amount of energy that has been saved by heavy industry through harvesting the energy they waste with heat capturers. This amount of energy is equal to what is generated by all the solar panels worldwide. Has the Energy Foundation worked with industry to capture lost energy?

Charlotte Pera, Energy Foundation, answered:

They are mostly working with industry in China. There is an initiative in China to improve energy efficiency by 2010 and reduce their emissions by 1.5 gigatons. They are targeting industries for this. There are pilot projects looking at that type of lost energy from industry though.

## Wrap-up

### **Maria Brown, Superintendent, Gulf of the Farallones National Marine Sanctuary**

There has been lots of information exchanged all day, some key points include:

- Climate change will have a significant impact on California, greater than other areas.
- There is a general acknowledgement that climate change is real.
- We need to move to conveying a sense of urgency and solvability on local, statewide, national, and international levels.
- We need to identify our audiences and have a diversity of audiences.
- We need to focus our message and have a common message. We need to also have the appropriate messengers.
- We need hope.
- There is a need to establish a network through which we can communicate. We need to develop messages then divide and conquer.
- The messages should be simple and bring in health and economics.
- There are lots of public concerns and many are directly related to climate change.
- We should focus on community pride.
- We need to have an adaptive management approach.
- We need to get information out to public through venues such as the internet.
- We need to identify community leader.
- We need to expand our network to include industry.

- The 11<sup>th</sup> Hour Project is funding education. We need to look to educators and policy makers.
- We need to focus on solutions.

Where do we go from here?

- We will electronically send the participant list out to continue networking.
- The proceedings from today will be distributed to the participants. They will also be posted on the website, so they are accessible.
- The Sanctuary will look at strategies from the breakout groups and establish working groups. We will produce an Action Plan with climate solution strategies for the San Francisco Bay coast and ocean environment. In two years we will reconvene this group to report on progress. What is working, what is not?
- Ms. Brown thanked the participants for dedicating time to work with us on addressing this issue. She also thanked the summit planning community, panelists, moderators, sponsors, and Kelley Higgason for planning and coordinating the summit. It will take all of us working together to address climate change, as it is the most pressing environmental issue we face today.

## Extended Notes from Summit Breakout Groups

### Group 1

Participants:

Name	Affiliation
Jodi Casell ( <i>facilitator</i> )	University of California Cooperative Extension Sea Grant
Brenda Donald	Save Our Shores
Bill Douros	Office of National Marine Sanctuaries, West Coast Region
Peter Grenell	San Mateo Harbor District
Lara Hansen	EcoAdapt
Sara Heintzlemen	Farallones Marine Sanctuary Association
Tessa Hill	University of CA, Davis, Bodega Marine Laboratory
Justin Holl	Gulf of the Farallones National Marine Sanctuary
Brian Johnson	Gulf of the Farallones National Marine Sanctuary
Aliana Knapp-Prasek	Golden Gate National Recreation Area
Marina Psaros ( <i>note taker</i> )	San Francisco Bay National Estuarine Research Reserve
Chris Powell	Golden Gate National Recreation Area
Sara Randall	Institute for Fisheries Resources
Mary Jane Schramm	Gulf of the Farallones National Marine Sanctuary
Alan Schreiber	Farallones Marine Sanctuary Association
Jonathan Stern	San Francisco State University
Lori Topinka	California Academy of Sciences

Goal: Engage the Community

Objectives:

- Build a constituency to support climate change solutions in the San Francisco Bay Area.

Audience:

- Key community members to engage include the commercial fishing industry, shipping industry, eco-tourism industry, community leaders (agency, non-profit, etc.), policy makers, and future decision-makers (youth).

Sample Questions:

1. Is this the right audience? Are there other groups that can be added to this list?
2. How will strategies differ for engaging each of these audiences? What similarities will they have? Provide some example strategies.
3. What are some strategies for sharing resources between these groups?
4. What steps would need to be taken to build a constituency for climate change and the ocean?

Group Discussion:

Key constituency groups – missing groups:

- Approach strategy should be opportunistic. Look at your community and see what resonates with people.
- To recap Susanne, target the message. The message is driven by the recipient.
- Different groups have different perceptions of climate change issues and impacts.
- Elected officials (money is needed).
- Zoning board members, planning commissioners (appointees).
- Religious groups and organizations (“stewards” and religion as motivating force).
- Faces that do not reinforce the idea that this is an elitist issue – different income and education levels (example: Wal-Mart consumer).
- The list can be endless: shouldn’t we get to mechanisms for change?
- Youth as future decision makers. They are drivers of change right now.
- Low-income and underserved communities. “If it doesn’t work for the poorest person, it’s not going to work.”

What matters to whom?

- Changing light bulbs at home doesn’t make much difference if less than 10% of people use mass transit. We need to do something big that includes changes in infrastructure and behavior, and on a national and state level. Use model of religious conservatives: local level takeovers. Goal: to get people to use their influence on the political leaders that they have access to.
- Business leaders beyond fishing and ecotourism. Politics is one avenue to power, business another. Real estate, insurance, etc.
- Educators and parents: teachers spend a lot of time with kids and often they’re looking for resources.

- The people who have already built these connections to different communities, for example, PG&E. Rather than ignore these existing avenues and start from scratch, reach out to them.
- People have limited time in their lives – they’ll mobilize on issues they think are important and talk to people who are active and have solutions. People get turned off if the message isn’t directly relevant to them.
- The business section of the San Francisco Chronicle has “Chron 200.” These are publicly traded companies in the Bay Area. We could investigate which have sustainability reports. Approach them to see how to engage. Many companies promote volunteer opportunities for employees’/community service hours.

How will strategies differ for engaging each of these audiences?

- “Hotspot” exhibit uses food. Engaging over food got a lot of involvement.
- Recycling, composting, waste needs real examples of what you can and cannot recycle.
- Keep in mind that every audience you have comes from a different background. For some people, changing a light bulb or packing food into a reusable container really is a big thing. Figure out where on the continuum of action each type of audience falls.
- Consistency and commitment over the long term is necessary to build trust.
- People have to feel that they have something to gain (or can prevent a loss). Ex: Marine Life Protection Act had various open stakeholder sessions. Recreational fishermen were very impressive, because they were so organized and effective. This came from their certainty that they would lose their rights to fish where they’d gone before. People need to feel that they will LOSE something good if climate change impacts occur, so engage on that concrete issue.
- Community is crucial: it’s not “us” educating “them,” it’s a community of equals.
- WWF has a program called Climate Witness, which gets people to talk about the changes they’ve seen with their own eyes. Rather than WWF going to them and showing them models of what would happen, WWF asked them “what have you already seen?” This gives a starting point for communities to talk about what they were interested in working on. So became a “partner” with the community – genuinely engage (not preaching) and with no end-goal as agenda.
- Commercial fisheries example: you can’t go in and tell people what to do. You need to listen and build trust. Now after 4 years, there is some credibility that exists and issues identified that can be worked on together (statement provided by Institute For Fisheries Resources representative). The fisherpeople have so much knowledge to share (and often feel that their knowledge isn’t well-enough heard).
- Find a big demonstration project that can grab the public’s attention. Lights Out San Francisco, for example, with major media coverage.
- Set goals for recycling (diversion in San Francisco is set at 67%). Cal Academy’s rate was 7%. Now staff has bought in, as a comparison against the city. Feedback of “where we are and where we could be” should be used.
- It is also important to see metrics and set real goals.

Strategies for sharing resources between groups:

- In order to share, we would need a central location to learn about what’s actually out there.

- There is a proposal on the table for a global network, a massive multi-institutional partnership. It includes some global partners (IUCN as convener) and then will include governments, civil society, etc. In each country, there will be one host institution, e.g. IUCN in Brazil and IPCC in India. So people who want support on adaptation strategies (who's doing what, etc.) can get it. It will be modeled after an extension agency operation.
- Watershed model: Build a watershed coalition to help watersheds coordinate data. Clearinghouse mechanism.
- Social networking and viral marketing. Social networking works with specific generations. Viral marketing works similarly- ideas get out and spread like fire.
- Free event so that no stakeholders are left out because they can't afford it. Have this happen a couple times a year.
- Engage technology. Quest web manager has an excellent outreach mechanism. There is a need for more web-based infrastructure that's available and transparent to all groups involved.
- "Discover your street" or "Discover your local area" can be used. Trying to get more local and rediscover what we have here.
- Inventory what's out there and what people are doing. Sea Grant is setting up programs in other countries.

What steps need to be taken to build constituency?

- Lara's question: How many people are actually including climate change in what they do and incorporating the reality of it into work plans? This is the first step: to build the internal constituencies in our organizations in order to be able to be examples to others.
- Ask, "what are you doing to help?" Positive reinforcement encourages people to do more. Think about your car, your packaging, your investment decisions...examples abound of things that people don't think of as affecting global climate change.
- Train people how to speak to their communities, knowing how to communicate the positive message that will engage change.
- Do your homework before you go into a community. People will get engaged if they can make connections to their own lives and situations. Question is: "what can I do?" and know that you have a ready answer (i.e., what are you trying to achieve with a particular community). Once you know what the goal is with a community, then you need to figure out how to get into that community.
- Does the general public really know what climate change is? We talk about recycling, not driving a Hummer, etc. How do you connect these activities to the nebulous thing that is climate change? Put effort into getting a clear picture of what climate change is so that people know how what they do will affect climate change.
- "The Story of Stuff" online- this is a great example of a simple way to communicate a message.
- One important step to building constituencies is to figure out the best way to communicate facts. Also, look for reinforcing bodies for communication (like churches).

- The message that climate change is real still does need to get out there. There are still plenty of people who don't know or believe. A UCSC professor wrote an excellent book on communicating climate change. We don't want people to feel bad that they bought a light bulb, but this needs to be the first step, the gateway drug.
- Question: what concrete ways can we show people how climate change is affecting them? What used to be accessible and no longer is (a kind of fish, a bird, something that used to be there and now isn't)? Even polar bears and melting Greenland are far away – these aren't part of your everyday life. Showing these changes remove climate change from the world of abstraction.
- There is also the need to communicate the bigness of the issue (acidification of the ocean, etc). There are other impacts that are here now and observable now. Can't limit thoughts to just local issues as this is global.
- Kids- make environmental communication fun; keep it positive.
- Local work is key. When you talk about coral bleaching somewhere else, people don't care, but showing videos and models of storm surge and rising sea levels in one's own backyard really engages people. Give people something up front (like a free movie) to get them in an initial engagement.
- Systems thinking- we're asking people to do something very difficult, which is use systems thinking. That's why the engagement is difficult.
- We've used polar bears and coral reefs because they're big and flashy and exciting. Given more time, we'll have our own charismatic example on the California coast, like salmon or abalone. So think about each constituency and figure out what that example will be that will engage them through that.
- One thing we could do is figure out five effects that we have observed or anticipate – concrete examples of real effects.
- An education process would need to narrow in on local issues, but also give the wider global context.

Impacts that global climate change is already having or will have in the future within our neighborhoods, the region, or the Bay Area:

- "I live just below sea level"
- Change in wines that can be grown in California
- California trout: all native trout endangered in 50 years
- Food shortages in long term, food cost in short term
- Pressure on our natural spaces
- Access to fresh water (drinking water)
- War
- Wave mining along northern coast
- Sun exposure and cancer rates
- Ocean acidification, calcification of basic food chain
- Things washing up on shore and rotting
- No blue whales (or other krill obligate wildlife)
- Air temperatures rising in Northern California disproportionate to Southern California (and we just don't have the infrastructure)
- West Nile virus in California, and human mortality
- Shifted rainfalls

- Shifted marine species
- Upwelling shutdowns related to shifted current patterns
- Bee colony crashes and food chain effects
- A bunch of salmon recipes that you can't use
- Animal migrations and protected areas that no longer serve their original habitat purpose
- Changes in precipitation that affect what we can grow
- Expansion of oxygen-poor zones
- Collapse of ski industry
- Increasing ozone layer problems
- Increasing frequency and severity of storm events
- Shortage of anti-depressants
- Die offs of some species, invasions of others
- Papaya and squid will be big winners!

Group 2

Participants:

Name	Affiliation
Chris Andrews	California Academy of Sciences
Lori Arguelles	National Marine Sanctuary Foundation
Igor Barinov	Gulf of the Farallones National Marine Sanctuary
Robin Blanchard	California Coastal Commission
Carrie Chen	Aquarium of the Bay
Amy Dean	Farallones Marine Sanctuary Association
Dru Devlin	Farallones Marine Sanctuary Association
Ted Droettboom	MetroCenter & San Francisco Bay Joint Policy Committee
Joanne Mohr	Farallones Marine Sanctuary Association
Carol Preston ( <i>facilitator</i> )	Gulf of the Farallones National Marine Sanctuary
Sarah Ratzesberger	Gulf of the Farallones National Marine Sanctuary
Joe Sciortino	The 11th Hour Project
Carol Tang	California Academy of Sciences
Lorie Topinka	California Academy of Sciences
Ed Ueber	National Park Service & Office of National Marine Sanctuaries
Christy Walker ( <i>note taker</i> )	Gulf of the Farallones National Marine Sanctuary
Anne Walton	Office of National Marine Sanctuaries
Dorris Welch	Oakland Museum & Sanctuary Advisory Council

Goal: Change Human Behavior

Objectives:

- Encourage the public to make choices that reduce their individual carbon footprints by demonstrating direct connections to the ocean.

Audience:

- San Francisco Bay Area public and media

Sample Questions:

1. What are the different types of audiences that occur within the Bay Area?
2. How will messages differ for each audience? What similarities will they have? Provide some examples.
3. How will “messengers” differ for each audience? Who should be delivering the message?
4. How can a sense of urgency be better placed on climate change?
5. How can the persuasiveness of messages be increased?
6. What types of opportunities are there for engaging each of these audiences (e.g. outreach events, concerts, relationship-building with the media)?
7. How can the media be better engaged to help get messages across?

Group Discussion:

Summary of our discussion and overall themes (presented by Carol Tang to the larger group):

- Changed our Goal to “Change Human Behavior to Save the Oceans”
- Removed “by demonstrating direct connections to the oceans” from our objective. Decided that was a very tall order and not necessary to achieve our goal.

Less is More:

- Too many messages out there – confusing and sometimes contradictory, need to focus on a few things that can make a real difference and what people can do, that are tangible.
- People’s environmental, economic and social concerns are related. Not necessarily concerned about global climate change. This isn’t in the top 3 environmental concerns, because the ones listed above climate change are all linked to climate change issues. Need to help people make the connection and also connect to larger economic and social/societal issues.
- Need to determine what is most effective and strategic? Then focus on this and have a coordinated message.
- Need to work with communities to understand their values and issues and work to develop messages that resonate with them, ones that will motivate them to action.

Three main groups to focus on:

- Business Leaders
- Family (parents, grandparents)
- Community Leaders
- In many ways, these folks determine the values for our society.

Areas/issues to focus on:

- Reduce fossil fuel use
- Reduce water use
- Reduce consumption (buy less)

- Reduce population growth (Note: some discussion about the difficulty (e.g. political correctness) of getting this message out and acceptability of this message, some members of the group weren't sure the U.S. was ready for this)

In order to change behavior, we often need positive/negative feedback. We need to come up with incentives and laws to help encourage the behavior we want and discourage the most harmful behavior.

In the Bay Area, we can capitalize on the love people have for their community and sense of Community Pride, protecting the beautiful place where they live.

Notes from the general discussion:

Discussion of Question #1: Types of audiences and audience concerns

Audiences

- Faith-based groups – example a recent story on NPR radio about a church group who took on reducing their carbon footprint for Lent
- Community groups
- Community leaders – important audience, embedded in the community, can be a great conduit to community members
- Kids- important audience
- Business leaders in community- impacts of businesses making green choices can start to impact in other areas in the community; people see it done in local businesses and start to see it as normal and think they can do it too.
- Decision makers/politicians
- High-income folks – transportation studies indicate that the single determinant of disposable carbon allowance (ability to drive) is based on income – perhaps target high-income folks
- Personal connections – start with your own circle of friends, family, co-workers
- Grandparents – usually a high legacy concern for next generations
- Moms/Dads/homemakers – concern for bettering the lives of their children

Ideas/issues/comments regarding audiences:

- Lower socioeconomic groups – may have a harder time making choices to change behavior due to economic constraints, but may have less impact in the first place due to lower consumption rates. They may also be more affected by effects of global warming and other environmental issues (e.g. social justice issues).
- Need to understand when you talk about the “Bay Area” that there are lots of smaller communities here of many different groups with different backgrounds, interests and concerns.
- Need to be aware of how race intersects with understanding of global climate change issues.
- Reflection of changes made in own life, this can help inform us when talking with others about changes they can make, about what is possible.

- Supportive community – having a supportive community can make it easier to make changes/make better choices (like AA, Weight Watchers, etc.)
- Kids – need to be able to offer more solid ideas for things kids can actually do (that they have control over)
- Kids – have a strong sense of fairness, right/wrong – a great time to talk to them about these issues
- Best if can present concerns about climate change and about actions one can take and motivation to take the actions within a context of a person’s existing beliefs/thoughts/ideas
- Guilt as a motivator?
- Need to be aware of barriers to changes in behavior (financial and otherwise), climate change may not be high on the priority list.
- Some solutions involve a higher commitment to change such as relocating, changing jobs, funding school busing, changing how communities are designed, etc.
- Need to have flexibility, not a lot of homogeneity in audiences

Move to Question #2 – Messages for each audience etc.

Three groups to focus on out of this discussion:

- Business leaders and city governments
- Families (grandparents/parents/kids)
- Community leaders

*Note: Start with business leaders and if there is time, discuss others.*

- In corporations, there are layers of audiences – internal, external and the industry
- A recent report (in New York Times or Washington Times) said that in clothing manufacturing out of 1018 “green” claims, only one was not exaggerated. Real need for certification and standards – some industries do better than others – but many are lacking.
- In some industries/corporations, it may make sense to work with HR managers as a target audience within the corporation. Google is a company that has lots of perks (many of them green – buses to corporate offices, stipends for buying Prius’, etc). May be a good message to other companies to “do these sorts of things and you can have monetary success and high retention” (happy employees)
- Wal-mart also has green programs and encourages green actions by employees at home as well as at work. Up front costs now for changes in manufacturing can result in long-term savings.
- Manufacturing footprint needs to be included in the calculation for certification.
- Also, there is an issue with the perception versus the reality of how green something truly is.
- Many industries are on a small margin and don’t have the ability to do what Google does – in these cases, CEOs, not HR managers, may be the best audiences to work with at these companies.
- If we are looking at cultural change and values – who establishes them?

Let's look at the three groups we outlined:

- Corporate values/culture
- Family values (but not in the religious right sense of the phrase)
- Political system/culture

How do you establish culture?

- In the Corporate world – it's the CEO – so most appropriate person to work with there.
- In the family – the parents and grandparents are the value setters

Would you use the same message?

- YES – but emphasize different things based on audience orientation
- Corporations – financial benefits
- Families – legacy, core good
- Political – community values, more votes, community good

Let's not just focus on economics; people also have concerns about health – their health and their children's health. We can use a healthy choices link to carbon footprint (examples: buy local, seasonal, organic, walk instead of drive).

We are getting side tracked by all this – the real issue is – what do we want people to do? Can we identify 3-5 things that are real that people can do and that will have a real positive impact on the planet and the oceans?

- Help people realize that Climate Change effects people now (not just in 30 years, 50 years) and that they have a responsibility to do something to effect change.
- How can we do this as public educators? How can we use this time to come up with a strategy to get people motivated to do things to help the planet and themselves?
- Let's cut out the "crap" (the bad, misleading info, green-washing) and narrow it down to about 5 things that people can really do to make a difference.
- People are busy, have little time – need to make it real, simplify, need to target audience with direct message of top five things they can do to make a difference.
- We can use community pride as a motivator, people love their communities, and want to keep them healthy and in good shape, especially in the Bay Area. People here think they live in one of the best places on earth – use this to motivate them.
- Can also look at smaller communities and have healthy competitions between Bay Area communities to see who can cut their CO2 emissions by the largest percentage the fastest etc. (San Jose vs. San Francisco, Palo Alto vs. Berkeley, etc)

What do we want to focus on?

1. Reduce fossil fuel use – suggest cut household use by some goal by a target date (20% by 2010 for example), this might involve driving less, getting a more fuel efficient vehicle, carpooling more, using less plastic, buying organic, etc.

2. Reduce water usage – Water = Energy (18% of energy use in California is used just to move water around). In the 1970's people conserved more, now the per capita use is higher than it was before, even though we have more efficient technologies.
3. Population growth – The more humans there are, the bigger impact we have on the planet. As the biggest consumers, each additional American has a greater impact on the planet than a baby born anywhere else. This is not an easy topic in this country, but one that needs to be discussed. It was brought up in the 70's and relatively quickly shot down, but the time has come for it to be discussed again, even if it isn't well received in all sectors of society.
4. Consume less – Our consumer culture increases our carbon footprint. We need to try and get people to buy less, reuse more, use less plastics, etc.
  - What it comes down to is changing values.
  - Need feedbacks that people can relate to – one way is CO2 equivalents (i.e. number of tons of CO2 released/day) – can be a common metric that can be used to help quantify all these things to help people see the value of what they are doing and the damage of inaction.
  - There is a misconception in the US/California that our carbon footprint is pretty good – much better than China, India and Israel and most other countries. This is just not the case. People have a tendency to not want to make a sacrifice if they feel like it is more of a sacrifice than someone else is making.
  - People need convenience and/or a strong personal motivating reason to make a change.
  - This group is not too concerned that global climate change is not at the top of the list of the seventeen environmental concerns in the poll – it doesn't need to be, because most of the other things that were higher are all related to climate change.
  - People are bombarded with information about the environment and environmental problems – need branding – not to overwhelm them.
  - Use responsibility.
  - Need a simpler list of what to do – spread widely – like the nutrition pyramid.
  - In the Bay Area, for a certain segment of the population, it has become very “hip” to be eco-chic, perhaps we can build on this.

### Group 3

#### Participants:

Name	Affiliation
Carol Bernthal	Olympic Coast National Marine Sanctuary
Bob Breen	Fitzgerald Marine Reserve & Sanctuary Advisory Council
Laura Castellini ( <i>facilitator</i> )	Golden Gate National Recreation Area
Richard Charter	Defenders of Wildlife & Sanctuary Advisory Council
Pat Conroy	SF Public Utilities Commission & Sanctuary Advisory Council
Terry Gosliner	California Academy of Sciences
Daphne Hatch	Golden Gate National Recreation Area
Dan Howard	Cordell Bank National Marine Sanctuary
Jaime Jahncke	PRBO Conservation Science
Gary Knoblock	Gordon & Betty Moore Foundation
Gerry McChesney	USFWS Farallones Wildlife Refuge
Liz Moore	Office of National Marine Sanctuaries
Tim Reed	Gulf of the Farallones National Marine Sanctuary
Ellen Sampson	SF Bay Conservation & Development Comm.
Becky Smyth	NOAA Coastal Services Center
Sage Tezak ( <i>note taker</i> )	Gulf of the Farallones National Marine Sanctuary
Tamara Williams	Golden Gate National Recreation Area
Bob Wilson	The Marine Mammal Center & Sanctuary Advisory Council

Goal: Prioritize Areas for Protection and Restoration

#### Objectives:

- Identify and display through GIS mapping, the important critical marine habitats within the region that must be managed for resilience and sustainability.

#### Audience:

- Natural resource managers and scientists

#### Sample Questions:

1. What steps can be taken to begin to identify these areas (e.g. identify types of habitat, geographical locations of habitat, species composition within each habitat, importance of the services they provide)? What data is already available?
2. How can GIS mapping help to identify these areas? What types of GIS tools are available?
3. How can vulnerability of these areas be assessed? What assessments have already been performed to date (i.e. USGS report for GGNRA, Tim's map)?
4. What types of ecosystems are thought to recover more easily from climatic disturbances?

### Group Discussion:

- What is the boundary? The Bay, the region?
- The fundamental question is whether we are discussing physical vulnerability of the climate or areas that need to be protected? One may be outside the realm of any protection.
- In regards to sea level rise, BCDC speaks to 1 m sea level rise, but it is difficult to measure this on the outer coast. The difference is managed shorelines. Hard shorelines/managed shorelines should be mapped to get an idea of what the consequences are.
- We have no model to predict from
- If you want to protect the species here then we need to protect species in Oregon and Washington and bring sanctuaries there.
- Assumption is to manage the natural habitats rather than the built areas.
- Go to those areas that are already critical marine habitats – Bolinas Lagoon, Tomales Bay, Farallon Islands, Duxbury Reef, etc.
- What can we do to maximize resiliency in Bolinas Lagoon? It would take heroic efforts or we could let infrastructure force the decisions.
- What standard of protection and restoration are we shooting for? We need to determine this.
- What are the anthropogenic sources of stress?
- Sea level rise will happen, but what infrastructure needs to be restored?
- Moving infrastructure is the only option. Wetland systems need to be protected.
- We must manage nonnatives while changing infrastructure.
- Stressors are different for near shore and coastal waters, but they will persist in both environments.
- Climate change was brought up to incorporate in the MLPA process, but it was shouted down by members of the fishing community.
- What is resilience and sustainability? What are the components of reliance and sustainability?
- Back up one step...what are the threats from climate change? Sea level rise, temperature change, acidification, storm intensity and effects on near shore environment, and biogeochemistry.
- Focus on the areas that will be most durable?
- We need to address resilience and sustainability to sea level rise. How will you predict which areas will be affected?
- For sea level rise, the critter below the surface won't be affected, but we need to really focus on areas of the outercoast.
- Critical marine habitats – what is going to happen to kelp, the rocky reef, the islands, etc.?
- We should focus on the Farallon Islands.
- Temperature shifts, species shifts.
- What are the critical marine habitats – deep water sandy habitat in San Francisco Bay, kelp, rocky reefs, Farallon Islands.
- Is sand mining affecting the beaches that need the sand?
- Climate played almost no role in the MLPA process.

- The National Marine Sanctuary Act needs to include climate change.
- Resilience is the ability to bounce back/having enough diversity to bounce back. There needs to be a range of variability.
- Ecosystem resilience is the ability of the entire ecosystem to bounce back, but it will never return to what it was.
- Question #2 – How do you manage for warming temperatures? Acidification? Complete ecosystem change? On land there are more tangible options.
- When the habitats move how do you manage it? There are the only thing you can manage. You can identify these habitats because they are characterized by physical rather than biological aspects.
- We should define habitats by physical features and get people thinking about managing something that is dynamic and ever changing.
- How do you evolve a strategy for a species that is no longer here? You have to think about the species that are present in GFNMS.
- Look at it from a species perspective rather than a place perspective. There should be clear parameters on what an invasive is and what isn't.
- We really need to stop thinking about the sanctuary rather than the rest of the ocean.
- We need to shift how we fundamentally manage the ocean and think in terms of the entire west coast, the California Current, etc.
- The banks and islands have high diversity and abundance, some species will change and there will be new diversity, but they will still be hotspots.
- Bolinas Lagoon – as things change the Lagoon will be ready.
- A management strategy for a place is difficult with constantly shifting species. How effectively can you manage something that is on a trajectory that is constantly changing?
- We need to have adaptive management.
- Change will happen so fast.
- The role/motivation of protective areas is place-based management.
- This is not about doing away with protective areas, but about learning how to manage these protective areas.
- There are certain areas in the ocean that are recognized as being productive. They will change, the species composition and community will change, but they will still be unique
- How do you manage habitats?
- Create a resilience sustainability report/map for each habitat. How will the physical environment change?
- Create habitat vulnerability reports/maps.
- We can manage human impacts.
- Equate managing habitats like managing a flood shoal island. They are constantly moving. What is the species composition like?
- We need to manage coastal beach habitat for resilience.
- We need to have a baseline in order to measure change.
- The Russian Arctic is becoming the number one emitter of greenhouse gases.
- We should manage our ecosystems by compartmentalizing them.
- We need a west coast management regime for climate change.

- Display map – identify areas based on ground surveys according to durability/resilience, and rank their susceptibility to sea level rise and geological susceptibility. You could also add a biological layer to this.
- We already know what the problems are, we have to just do it. The mystery is in the approach.
- Mapping the substrate is very expensive. We need to determine what information is needed and go through a period of knowledge gathering.
- What can we do now? From a GIS point of view it is easy to map areas that will be threatened.
- We need to look outside of our defined systems. What are other systems along the coast that need to be looked at also?
- We need to look at the mechanism.
- At Cordell Bank National Marine Sanctuary (CBNMS), they are monitoring habitats but living communities. There is currently a transition between canary and vermilion rockfish. These species need to be monitored. These are the indicators. Humboldt squid and grunion are also good indicators.
- The protection of physical habitat will increase community resilience.
- What is our end goal? Are we trying to protect habitat or provide alternative habitat? Are we trying to manage species? Are we trying to measure assemblage?
- We need to take a habitat approach for the entire region.
- How do we protect all the species that currently reside in the region? With a 5° increase in temperature, where will the species that currently reside here be? We need to protect those areas.
- The original plan for GFNMS was a 6 nautical mile area around the island.
- Ecosystem linkages can be a similar roadmap for protecting global climate change with zones or adaptation zones, i.e. northern expansion of GFNMS and CBNMS.
- The critical habitats we will manage are the same critical habitats that are currently managed, the shoreline habitats will be the most affected.
- The shoreline will be affected, but these areas are already being managed.
- We can I.D. habitats, but resilience of a particular species is more difficult.
- South and North – we need to manage the California Current Ecosystem. Will the California Current endure? We don't know!!!
- The regional profile from the MLPA process is the answer to Question #2.
- Hazard vulnerability indices are needed.
- The end game is not knowable...

## Group 4

### Participants:

Name	Affiliation
Adina Abeles ( <i>facilitator</i> )	COMPASS
Joshua Basofin	Defenders of Wildlife
Ellie Cohen	PRBO Conservation Science
Jeff Dorman	University of California, Berkeley
Natasha Fraley	California Academy of Sciences
Toby Garfield	Romberg Tiburon Center
Mark Johnson	California Coastal Commission
Steve Goldbeck	San Francisco Bay Conservation & Development Commission
Irina Kogan ( <i>note taker</i> )	Gulf of the Farallones National Marine Sanctuary
Jennifer Martin	PRBO Conservation Science
Toni Mizerek	California Resources Agency
Luke Nachbar	National Ocean Service/NOAA
Becky Pollock	NOAA Coastal Services Center
Dave Reynolds	National Weather Service
Dominique Richard	Sanctuary Advisory Council
Frank Schwing	Southwest Fisheries Science Center
Michael Skuja	Defenders of Wildlife
Mendel Stewart	USFWS Don Edwards SF Bay National Wildlife Refuge
Bill Sydeman	Farallon Institute for Advanced Ecosystem Research

Goal: Communicate Science to Natural Resource Managers and Policy Makers

### Objectives:

- Coordinate a cohesive research plan to fill information gaps regarding climate change and translate complex scientific information into accessible formats on a timely basis.

### Audience:

- Natural resource managers, policy makers, and scientists

### Sample Questions:

1. What types of questions are managers and policy makers asking? What are their concerns? What are the major issues they face as decision-makers addressing climate change?
2. On what scale and timeframe do managers normally need data? What sufficiently determines a trend (i.e. 3 years, 10 years, more)?
3. What is the resolution desired to detect change? Do managers want to know about 10% change or 50% change?

4. Do acute impacts (floods, coastal erosion, storm surges, etc.) get treated differently than chronic impacts (range expansions, changes in predator-prey relationships, etc.)?
5. What steps will need to be taken to coordinate a cohesive research plan that addresses the answer to Question 1? How could the structure of this plan be developed (i.e. through the use of a working group, existing long-term data, etc.)
6. Who would the partners in this region be? What data is already available? What new data would need to be generated?
7. How can scientists best make this data available to managers and policy makers (i.e. reports, peer-reviewed literature, seminars, etc.)?
8. What are more accessible formats that could be used (i.e. Podcasts, websites, short films, etc.)? How could each of these best be utilized?
9. How can scientists better engage the local media? Why is this important?

Group Discussion:

- How much influence do managers have on policy? Are we focusing on the right audience?
- High-level managers are also policy makers.

What do we know?

- We know climate change is real and quantify manifestations.
- It is happening now.

What do managers need to know to do a better job?

- How to tailor messages to competing interests.
- In ecosystem management, we need enough information to avoid making bad decisions, i.e. risk aversion.
- We need certainty of a specific scenario to plan.
- Yes, sea level rise for example, what estimate do we use to plan?
- We need better information to assess impacts. Not just what will happen, but what are the impacts? Even basic impact information is helpful so we can communicate it to the public. Uncertainty levels are the information that is needed next. People need specific information so they can lay out scenarios. Modeling may be needed to evaluate impacts.
- Sounds like contingency plans are needed for scenarios.
- We need to know what we don't know. Rather than trying to know everything, we need to use adaptive management.
- We need a vulnerability assessment.
- Managers also want to know about cost.
- We need to weigh the costs versus the difficulty in quantifying costs. There are trade offs.

To recap (Adina):

- Currently there are many different scenarios.
- What will happen if the system is pushed a different way?
- There are trade-offs.
- We need to understand local impacts.

## Discussion cont.

- Managers may not know where data is or how the information affects what they do.
- Managers need to think more broadly. We jumped into narrow area quickly.
- We should parse out local information versus global scale.
- We need broad-brush information, e.g. does spending money on salmon stream restoration help if fish die in the ocean? Would we benefit more from broad-brush versus local?
- People want information that directly affects them. They are self-focused. We should not focus on the global scale, but tangible information instead.
- Rather than providing a prescribed information list, we should provide a template for steps to go through to identify what information he/she needs.
- Scientists and managers don't know what to do.
- Steve was part of a conference to step through the process of doing a vulnerability analysis. For GFNMS, they need more of a science focus because they are not planners.
- There are two time horizons – mitigation until the tipping point (so what do we do now versus later, e.g. wave/wind energy). GFNMS has a great energy resource in wind/currents. The scientific point of view is that the energy resource is there, but what do we do and is there resource management willing to put this in place?
- We need to bring this back to ecosystem services. What do wildlife/humans rely on, e.g. krill, salmon? We should protect the source of food web. We need ongoing monitoring because the rule of the game is constant change and the scenarios will keep changing. There needs to be a new Paradigm of management: constant change. We need to identify a suite of indicators for change.
- We need to identify the scale of change that needs action.
- What do managers do in the face of constant change?
- The initial reaction is uncertainty and search for guidance. We need awareness. Then to think about it. Then action.
- What are people managing for, e.g. endangered species, biodiversity, optimal yield, etc. What is needed will vary on goals.
- The goal and objective for this group don't match. One is communication. The other is a research plan.
- Adina suggested changing this group to be about communication. The group agreed.
- Many agencies have established staff to be communicators. There needs to be front-line communicators for sanctuaries. The sanctuary's job is to bring in stakeholder opinion and be the central point of information flow, not to be the policy maker but the information flow person. The sanctuary should form a stakeholder advisory group specific to climate change.
- NGO's should be involved because they are between scientists and managers.
- We can't hold on to old ideas/methods. Managers are territorial.
- There is a disconnect between on the ground managers and higher ups.
- Managers don't just manage ecosystems but also money and how it is spent.
- We need to brainstorm a strategy for data dissemination.

- Managers need predictive information/forecast. Scientists are not comfortable predicting.
- How do we get information on indicators and forecasting to managers?
- Climate change is now being considered in CEQA. Use the precautionary principle.
- The goal is to use adaptive management in the face of unknowns.
- What do managers do with the information, e.g. if prediction that all Cassin's Auklets will die next year – what does a resource manager do?

Strategic and targeted messages:

- Develop maps – very powerful
- Don't just scare – offer solutions
- Solutions maps for different groups will vary. So hard to get head around what one could fit all.
- Communicate interconnections.
- If we act now rather than later it is cheaper. Capture indirect costs. Find specific examples of direct and indirect costs of inaction.

Review:

- We need a web portal for the national marine sanctuary system that looks at impacts, outcomes, ways to mitigate, and cost (including cost-benefit analysis of action versus inaction). This needs to be Google-able. It also needs site-specific information.
- Keep awareness with Legislature in State on things we need.
- Make the focus regional.
- Who will bring the message forward? The message will change depending on presenters.
- It has to be a consortium.
- Many of us are already on multiple consortia.

## Group 5

### Participants:

Name	Affiliation
Bruce Bowser	Environmental Action Committee West Marin & Sanctuary Advisory Council
Steve Gittings	Office of National Marine Sanctuaries
Miriam Gordon ( <i>note taker</i> )	Gulf of the Farallones National Marine Sanctuary
Brad Hunt ( <i>facilitator</i> )	California Ocean Science Trust
Brian Keller	Office of National Marine Sanctuaries/Southeast, Gulf of Mexico, and Caribbean Region
Heather Kerkerling	Monterey Bay Aquarium Research Institute
Judith Kildow	Monterey Bay Aquarium Research Institute
Shannon Lyday	Farallones Marine Sanctuary Association
John McCosker	California Academy of Sciences
Paul Michel	Monterey Bay National Marine Sanctuary
Chris Mobley	Channel Islands National Marine Sanctuary
Adam Parris	Bay Conservation and Development Commission
Jan Roletto	Gulf of the Farallones National Marine Sanctuary
Peter Roopnarine	California Academy of Sciences
Tom Roth	Rep. Lynn Woolsey
Pat Rutten	NOAA Fisheries Restoration Center
Jarrod Santora	Farallon Institute for Advanced Ecosystem Research

Goal: Reduce Human-induced Stressors

### Objectives:

- Limit human-induced stressors in order to enhance ecosystem resilience and resistance to the effects of climate change. Priority stressors for this region are:
  - Introduced species
  - Degraded water quality
  - Wildlife disturbance
  - Overfishing
  - Toxic spills

### Audience:

- Natural resource managers, policy makers, and scientists

### Sample Questions:

1. Are there more stressors that should be added to this list or expanded upon?
2. How could an impact assessment best be developed to prioritize ecosystem impacts of each of these stressors? What data already exists? What new data would need to be generated?

3. What avenues exist other than an impact assessment report to identify priority stressors in this region?
4. Who are the partners in this region that could work together to develop an impact assessment, etc.?
5. For each of these stressors, what strategies could be developed to address their impacts? How would these strategies differ? What similarities would they have?
6. What audiences should be targeted for outreach in order to help reduce each stressor?

#### Group Discussion:

The group added the following priority stressors:

- Land use
- Resource consumption
- Habitat utilization
- Non-point source pollution
- Water diversion/degradation
- Failed mitigation
- Discharge of sewage
- Sediment depletion
- Watershed management, land use practices – such as agriculture, forestry

#### Prioritization

- Overfishing – but this is also compounded or outweighed by water waste
- Habitat loss – particularly wetland loss
- Water quality

Wetlands can help communities keep pace with sea level rise. So we should put a lot of emphasis on this. We need to consider sediment loss too.

#### Urgency:

- We need programs that address these stressors to consider climate change urgently.
- Climate change will increase the connections of all these stressors.
- Invasive species, for example, was an anthropogenic transport issue. Climate change will contribute and exacerbate this problem.
- It is important to translate scientific changes into more synergistic ways of viewing policy.
- Most of the agencies that deal with these stressors don't consider climate change a driver – that needs to change.
- There needs to be consistency in long range planning amongst the myriad of agencies for climate change.
- We have to look at things as “ecological communities” as we try to save them, rather than one species at a time.

#### Enforcement:

- Over the years, enforcement has decreased, for example, there are 11 enforcement people for the State Water Resources Control Board, and the number of Fish and Game wardens has decreased. We are short on enforcement.
- There needs to be a different mind-set about how we govern. The MLPA process is creating strict boundaries. It's a perfect example of a modern process that has taken climate change and shifting conditions into account.
- How do we implement adaptive management? How do you do it?
- Management plans have to be monitored, re-evaluated, updated. We need to address the problem of fractured goals with unintended consequences. Management plans need to encompass a wide range of goals, for example, a range of species and a wide range of conditions.

#### What can we do?

- Encourage individual action.
- Limit human induced stressors by trying to find ways to get individuals to reduce water and energy consumption.
- Influence large scale planning to consider climate change. Regarding larger scale projects, the action agencies have to build in some progressive planning. A good model is the plan for the Napa River flood control including wetland restoration.
- Rather than looking at amphibians, birds, and fish separately, all kinds of species and ecosystem concerns need to be addressed for each plan or action. The Endangered Species Act needs to have things added to it in order to stream-line permitting and add adaptive management.
- Instead of trying to save everything everywhere, we need to prioritize. Pick the most important watersheds. Triage-based management. We need to identify where we get the most species and habitats.
- We also need to consider the scale of a project. Where are the largest sources? Use the Costco, Walmart approach – working with the largest drivers of a system means you get the biggest bang for the buck. Who are the biggest perpetrators contributing stress? Population.

Question #2 – How could an impact assessment best be developed to prioritize ecosystem impacts of each of these stressors? What data already exists? What new data would need to be generated?

- Tourism is a huge economy with a huge footprint, paving and concrete, for example. We need green buildings.
- Ship-building and shipping pollutes estuaries, bays and off-shore.
- Answering the question...measuring the impact via human activity would be based on ecosystem properties. Would you measure water usage? Carbon outputs?
- Impact assessments suffer from scale and time. Monitoring data is lacking. There's some short-term data. There is a need for setting up monitoring networks to understand changes. We need sound data collection. There are methodologies to identify the biggest culprits. Diagnostic tools, analytical tools should be added to monitoring.

- We suggest a preventative approach to management, then monitoring, then research, then looking at new threats.
- We need an information gathering system. We don't know how to integrate the information. There should be a standardized system that the public and politicians can understand. Modeling and other fields need to grow.
- This question asks us to look at assessment in the context of climate change. We should develop some standardized ways of doing assessment in this context. We have very little to tell managers and scientists about how to do environmental assessment, i.e. modeling ecosystems tells us it's no longer stationary. There are multi-dimensional structures acting on each other.
- Conclusion: we need to develop uniform systems of assessment for climate change.
- There may be a legal framework that will require this. Someone at Northwest Fisheries Science Center has built such a model – the Atlantis model. In Australia and New Zealand they have used these modeling systems to show trajectories. It requires a massive amount of data.

Question # 4: Who in the region could partner to develop these tools?

- There are a lot of tools. We need an inventory of who is doing what. The Ocean Protection Council (OPC) is looking at who is developing these tools. Federal agencies need to do this. Who has the money? Right now the MLPA process under the OPC has the money. There is a proposal to come up with an inventory. Is the OPC interested in funding the development of such assessments?
- The private sector is also engaged. There is an awful lot of modeling and research going on here. The insurance industry is one example. Business and private sectors are coming to the government for information and predictions. So, they are likely partners. Consortia can be created.
- GFNMS can be an organizer or bring together the stakeholders. For example, the Bolinas Lagoon project is an example of how state and federal agencies can come together. There needs to be a facilitating agency to bring a consortium together. Other processes like CAL FED can be too big for such a process to be successful.
- These stressors have been with us for a long time. Continuing to address these will address ecosystems. Climate change has not been the driver.

Question #5: What are the strategies?

- Low hanging fruit strategy. Address what is most accessible. Do things that are easy and have a big payoff such as energy and water efficiency, land-use planning, and planning for habitat restoration. Current land-use practices need to be managed better.

Outreach

- How much of this is education? It's important, but there needs to be more. It may take more than education, e.g. financial incentives. Cost is a driver.
- Education needs to be at a 5<sup>th</sup> grade level.
- The mass populace responds to profit and getting stuff as well as regulation and marketing.

## NMSP CONSERVATION SERIES PUBLICATIONS

To date, the following reports have been published in the Marine Sanctuaries Conservation Series. All publications are available on the Office of National Marine Sanctuaries website (<http://www.sanctuaries.noaa.gov/>).

A Scientific Forum on the Gulf of Mexico: The Islands in the Stream Concept (NMSP-08-04)

M/V *ELPIS* Coral Reef Restoration Monitoring Report Monitoring Events 2004-2007 Florida Keys National Marine Sanctuary Monroe County, Florida (NMSP-08-03)

CONNECTIVITY Science, People and Policy in the Florida Keys National Marine Sanctuary (NMSP-08-02)

M/V *ALEC OWEN MAITLAND* Coral Reef Restoration Monitoring Report Monitoring Events 2004-2007 Florida Keys National Marine Sanctuary Monroe County, Florida (NMSP-08-01)

Automated, objective texture segmentation of multibeam echosounder data - Seafloor survey and substrate maps from James Island to Ozette Lake, Washington Outer Coast. (NMSP-07-05)

Observations of Deep Coral and Sponge Assemblages in Olympic Coast National Marine Sanctuary, Washington (NMSP-07-04)

A Bioregional Classification of the Continental Shelf of Northeastern North America for Conservation Analysis and Planning Based on Representation (NMSP-07-03)

M/V *WELLWOOD* Coral Reef Restoration Monitoring Report Monitoring Events 2004-2006 Florida Keys National Marine Sanctuary Monroe County, Florida (NMSP-07-02)

Survey report of NOAA Ship McArthur II cruises AR-04-04, AR-05-05 and AR-06-03: Habitat classification of side scan sonar imagery in support of deep-sea coral/sponge explorations at the Olympic Coast National Marine Sanctuary (NMSP-07-01)

2002 - 03 Florida Keys National Marine Sanctuary Science Report: An Ecosystem Report Card After Five Years of Marine Zoning (NMSP-06-12)

Habitat Mapping Effort at the Olympic Coast National Marine Sanctuary - Current Status and Future Needs (NMSP-06-11)

M/V *CONNECTED* Coral Reef Restoration Monitoring Report Monitoring Events 2004-2005 Florida Keys National Marine Sanctuary Monroe County, Florida (NMSP-06-010)

M/V *JACQUELYN L* Coral Reef Restoration Monitoring Report Monitoring Events 2004-2005 Florida Keys National Marine Sanctuary Monroe County, Florida (NMSP-06-09)

M/V *WAVE WALKER* Coral Reef Restoration Baseline Monitoring Report - 2004 Florida Keys National Marine Sanctuary Monroe County, Florida (NMSP-06-08)

Olympic Coast National Marine Sanctuary Habitat Mapping: Survey report and classification of side scan sonar data from surveys HMPR-114-2004-02 and HMPR-116-2005-01 (NMSP-06-07)

A Pilot Study of Hogfish (*Lachnolaimus maximus* Walbaum 1792) Movement in the Conch Reef Research Only Area (Northern Florida Keys) (NMSP-06-06)

Comments on Hydrographic and Topographic LIDAR Acquisition and Merging with Multibeam Sounding Data Acquired in the Olympic Coast National Marine Sanctuary (ONMS-06-05)

Conservation Science in NOAA's National Marine Sanctuaries: Description and Recent Accomplishments (ONMS-06-04)

Normalization and characterization of multibeam backscatter: Koitlah Point to Point of the Arches, Olympic Coast National Marine Sanctuary - Survey HMPR-115-2004-03 (ONMS-06-03)

Developing Alternatives for Optimal Representation of Seafloor Habitats and Associated Communities in Stellwagen Bank National Marine Sanctuary (ONMS-06-02)

Benthic Habitat Mapping in the Olympic Coast National Marine Sanctuary (ONMS-06-01)

Channel Islands Deep Water Monitoring Plan Development Workshop Report (ONMS-05-05)

Movement of yellowtail snapper (*Ocyurus chrysurus* Block 1790) and black grouper (*Mycteroperca bonaci* Poey 1860) in the northern Florida Keys National Marine Sanctuary as determined by acoustic telemetry (MSD-05-4)

The Impacts of Coastal Protection Structures in California's Monterey Bay National Marine Sanctuary (MSD-05-3)

An annotated bibliography of diet studies of fish of the southeast United States and Gray's Reef National Marine Sanctuary (MSD-05-2)

Noise Levels and Sources in the Stellwagen Bank National Marine Sanctuary and the St. Lawrence River Estuary (MSD-05-1)

Biogeographic Analysis of the Tortugas Ecological Reserve (MSD-04-1)

A Review of the Ecological Effectiveness of Subtidal Marine Reserves in Central California (MSD-04-2, MSD-04-3)

Pre-Construction Coral Survey of the M/V Wellwood Grounding Site (MSD-03-1)

Olympic Coast National Marine Sanctuary: Proceedings of the 1998 Research Workshop, Seattle, Washington (MSD-01-04)

Workshop on Marine Mammal Research & Monitoring in the National Marine Sanctuaries (MSD-01-03)

A Review of Marine Zones in the Monterey Bay National Marine Sanctuary (MSD-01-2)

Distribution and Sighting Frequency of Reef Fishes in the Florida Keys National Marine Sanctuary (MSD-01-1)

Flower Garden Banks National Marine Sanctuary: A Rapid Assessment of Coral, Fish, and Algae Using the AGRRA Protocol (MSD-00-3)

The Economic Contribution of Whalewatching to Regional Economies: Perspectives From Two National Marine Sanctuaries (MSD-00-2)

Olympic Coast National Marine Sanctuary Area to be Avoided Education and Monitoring Program (MSD-00-1)

Multi-species and Multi-interest Management: an Ecosystem Approach to Market Squid (*Loligo opalescens*) Harvest in California (MSD-99-1)

# First Biennial Ocean Climate Summit

## Finding Solutions for San Francisco Bay Area's Coast and Ocean



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# **Ocean Impacts, Ecosystem Response and Human Adaptation**

**Dr. Tessa M. Hill**

University of California, Davis

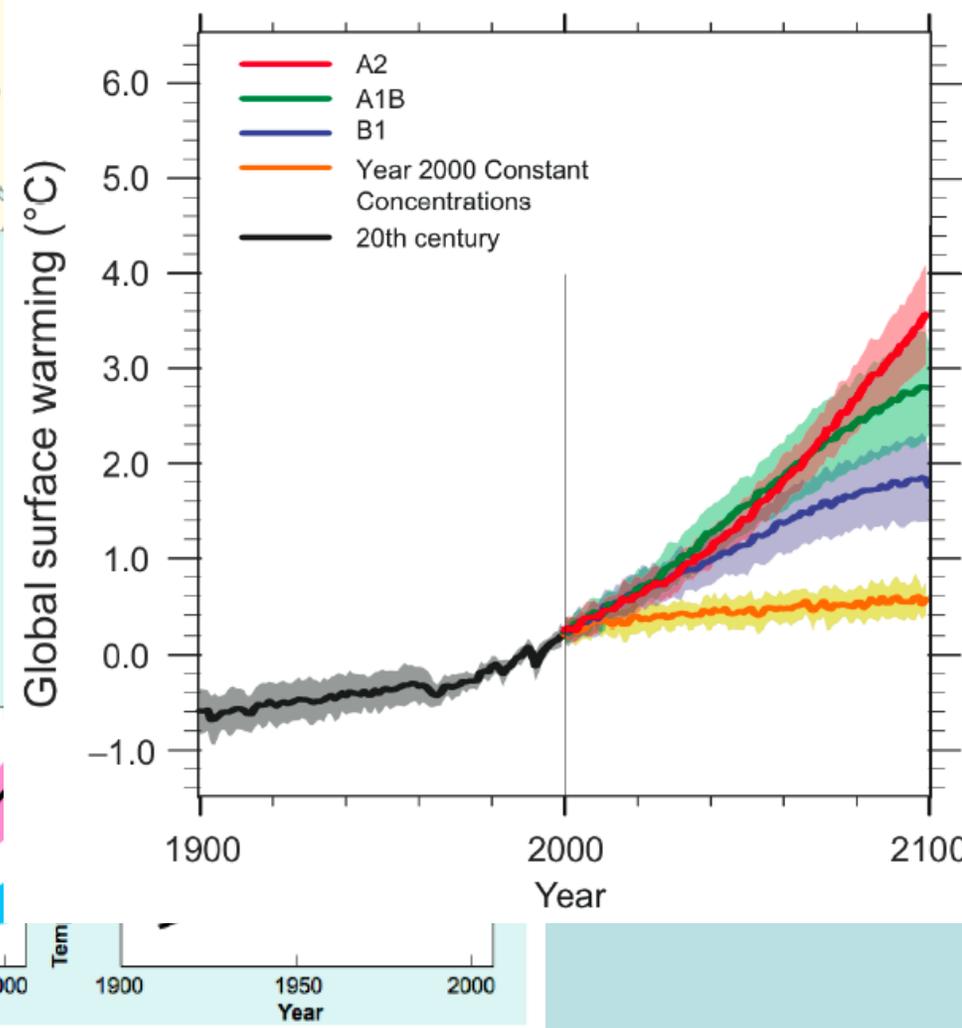
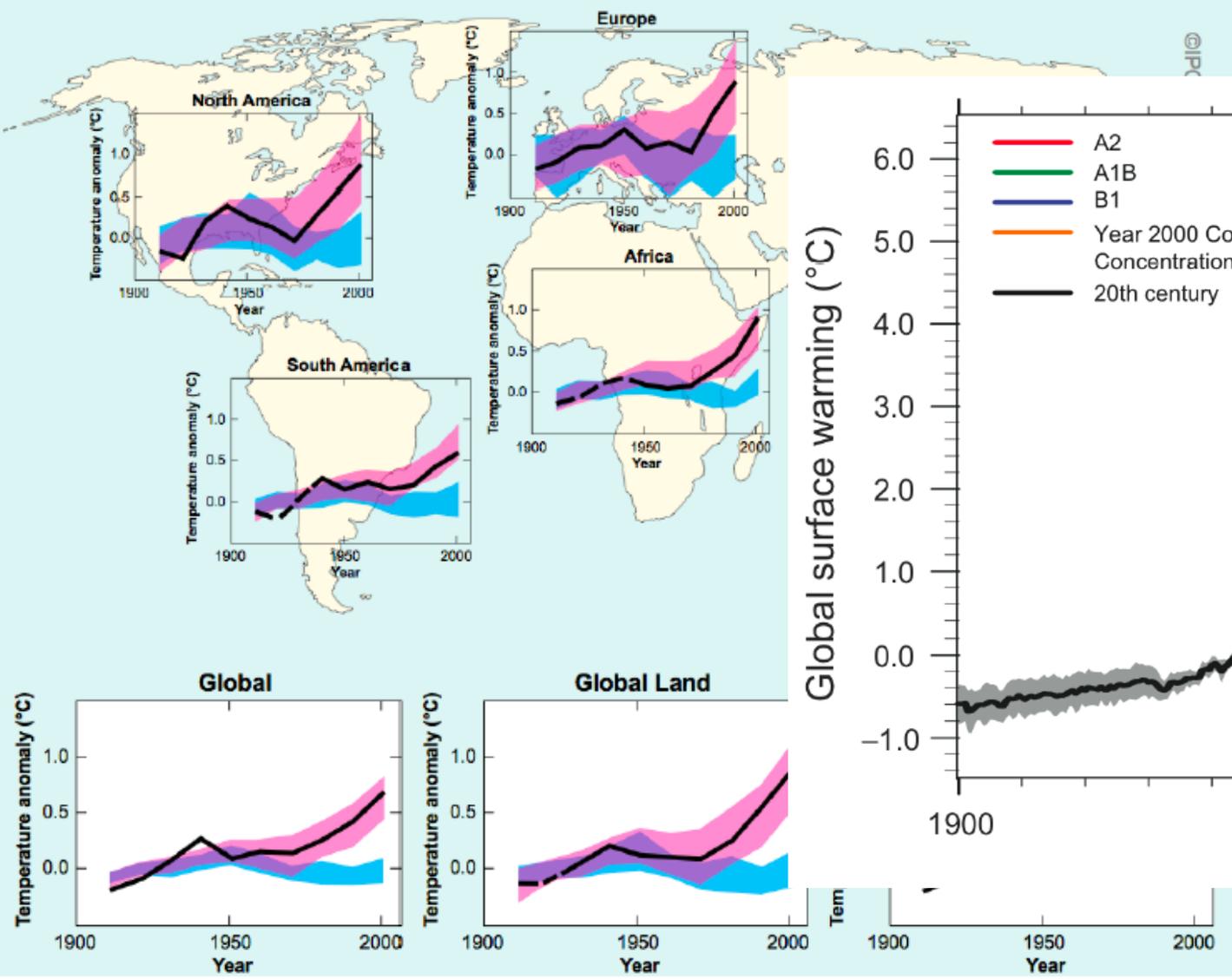
First Biennial Ocean Climate Summit

April 29, 2008

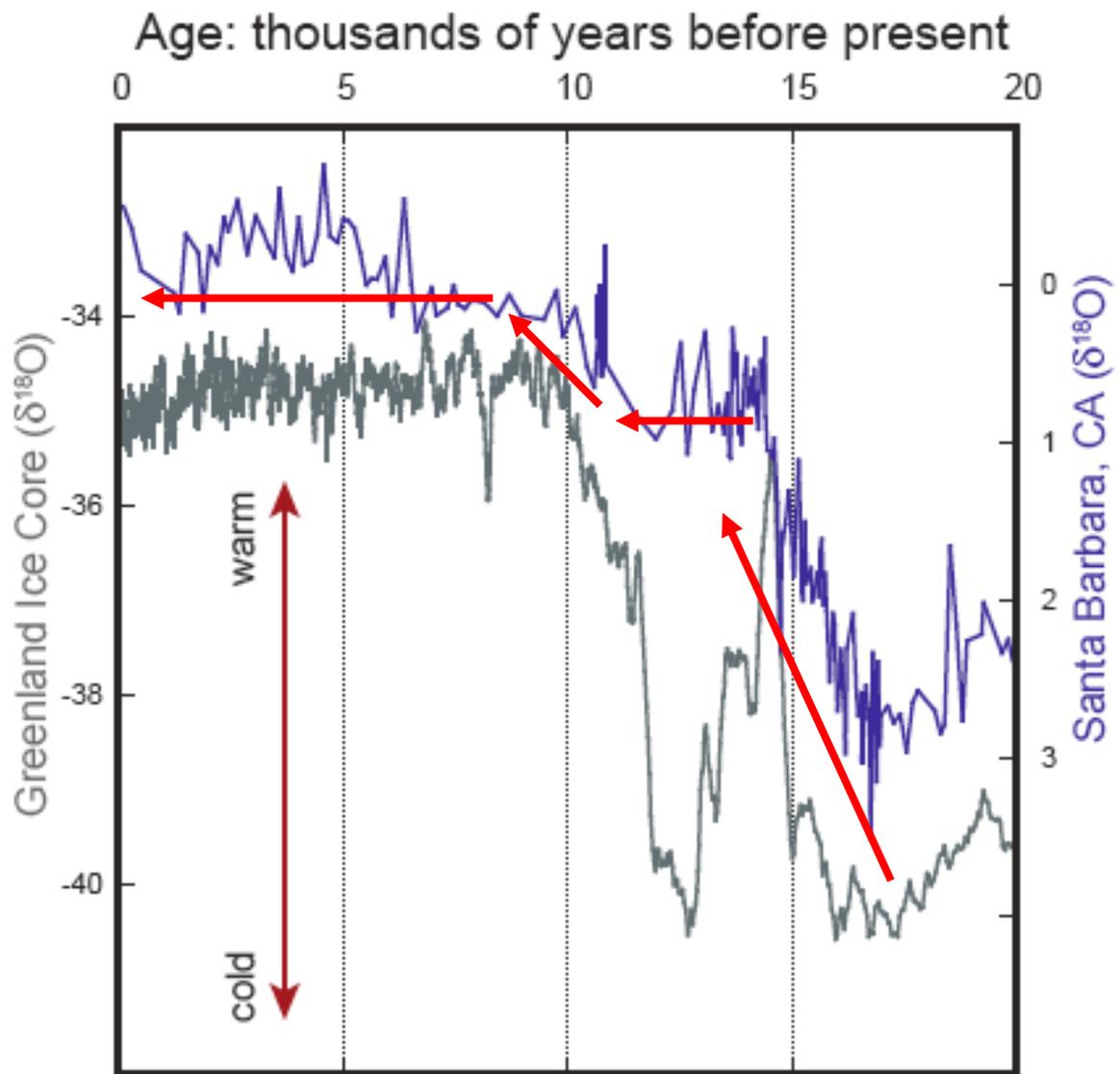


# Planning for future change

## Global and Continental Temperature Change



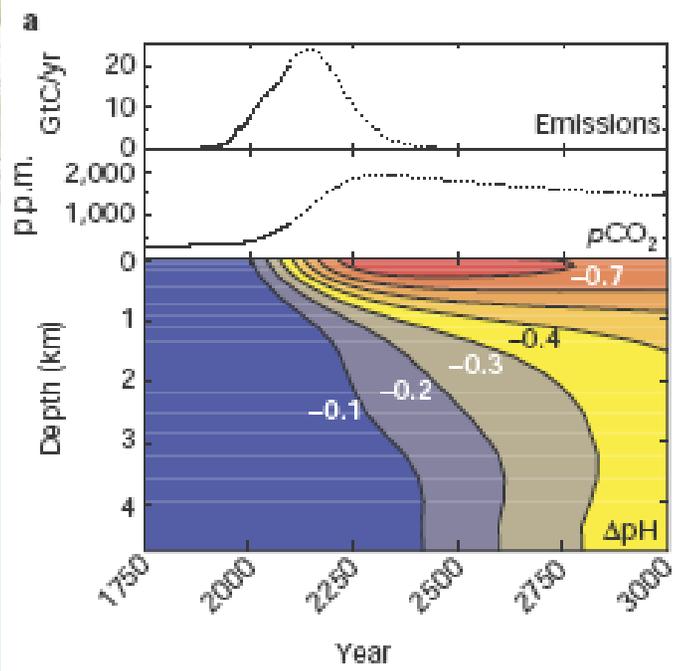
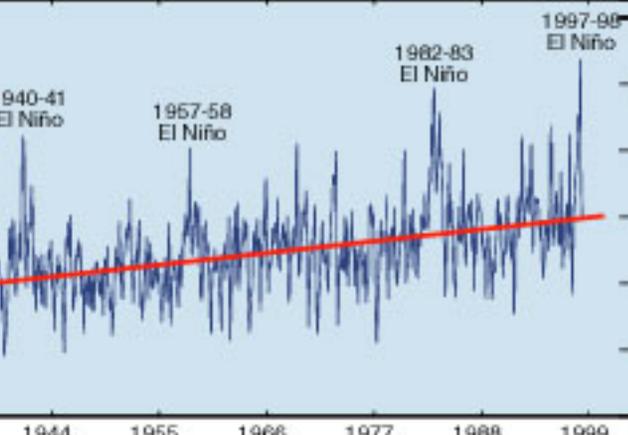
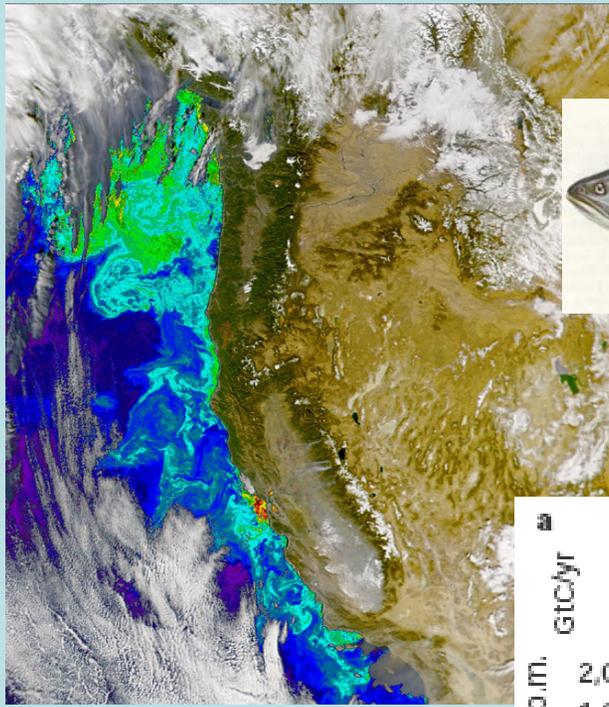
# Past climate change: The coastal California response



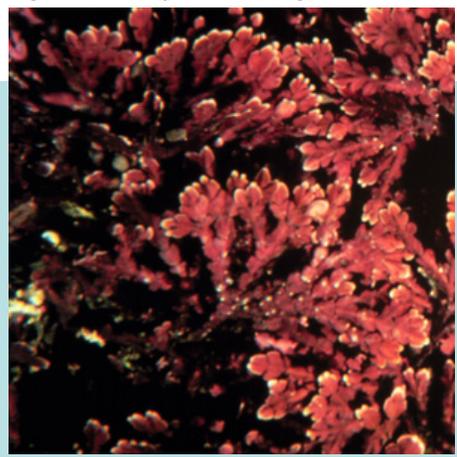
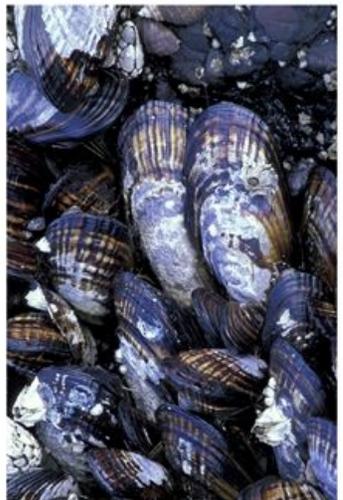
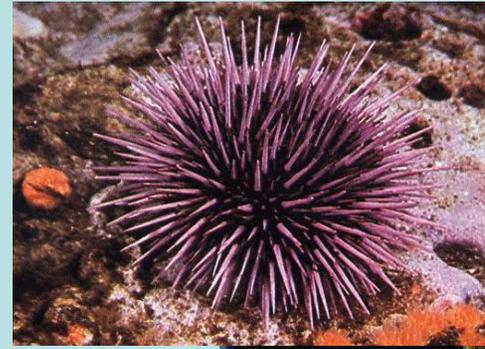
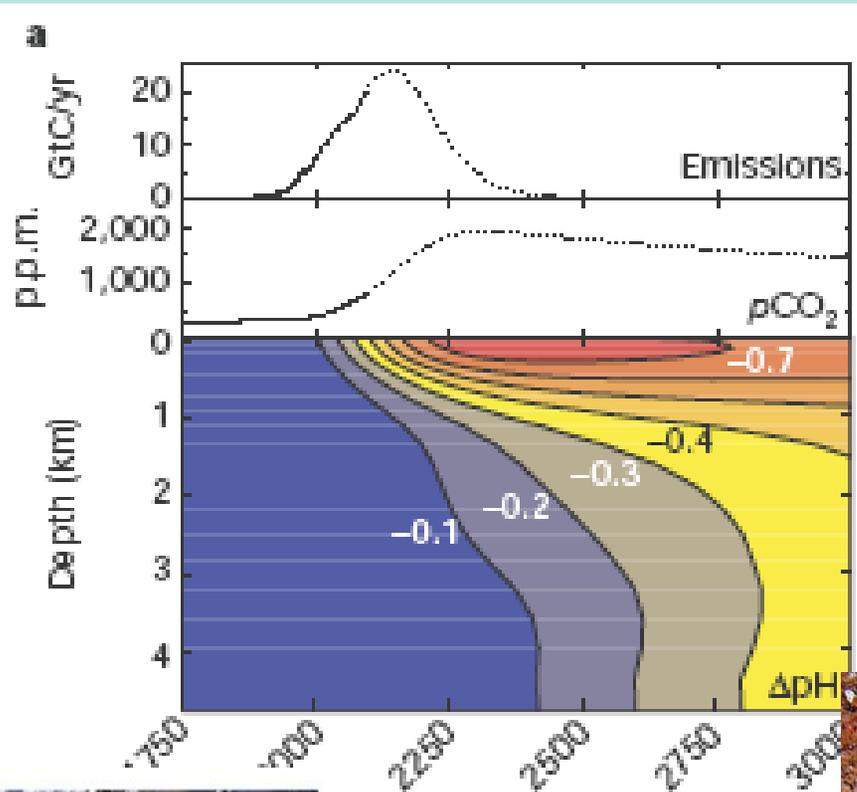
✓ We can reconstruct the temperature of coastal waters over hundreds to thousands of years.

✓ Sea surface temperatures responded rapidly and synchronously with global climate change

# Impacts of future climate change: Ecosystems and Humans

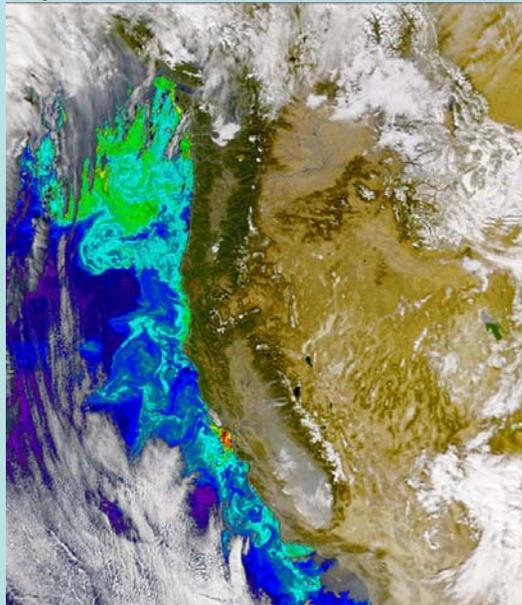


# Ocean Acidification



# Major Questions

- ❖ When global climate change is scaled down to regional (N. California) impacts, what can we expect in terms of oceanographic and ecosystem response?
- ❖ How can humans adapt, respond, and participate in conservation measures to mitigate these oceanographic ecosystem impacts?



# First Biennial Ocean Climate Summit

## Finding Solutions for San Francisco Bay Area's Coast and Ocean





**Climate Change and its Implications  
for the California Coast and Ocean:  
Physical Forcing and Signals**

**Frank Schwing**

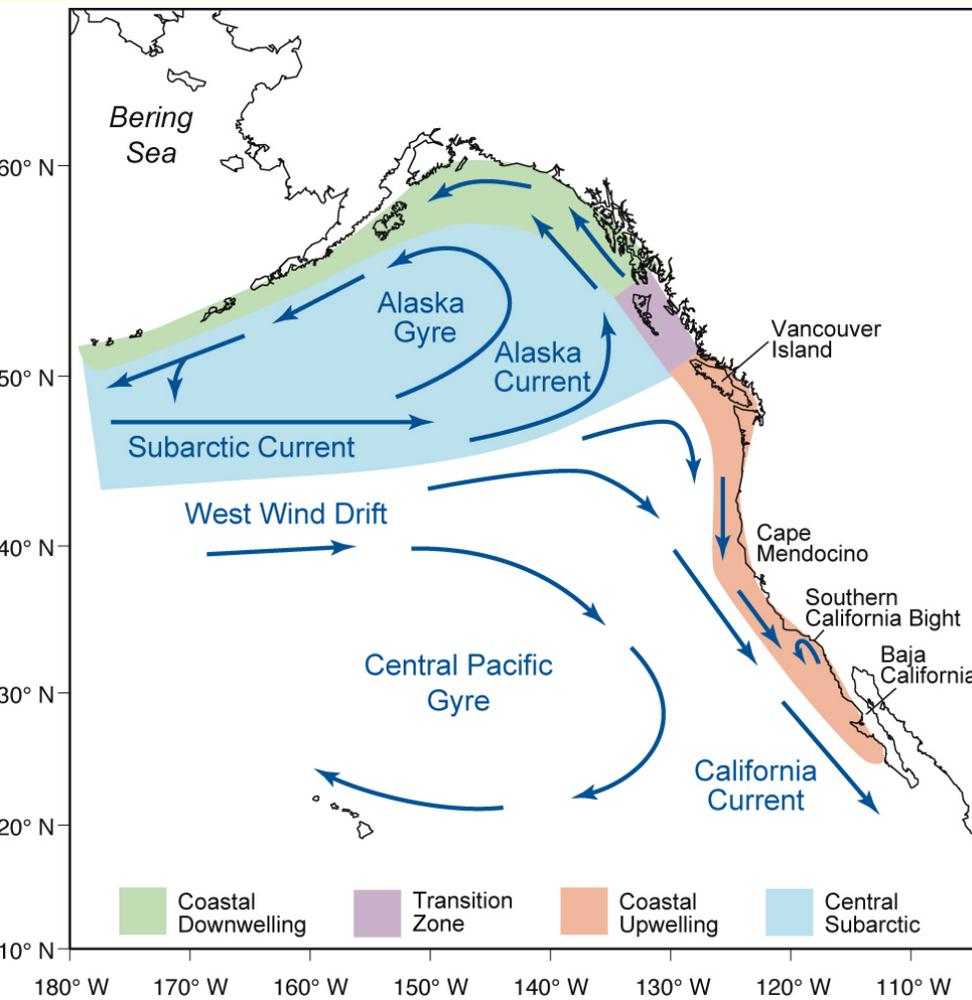
Southwest Fisheries Science Center

First Biennial Ocean Climate Summit

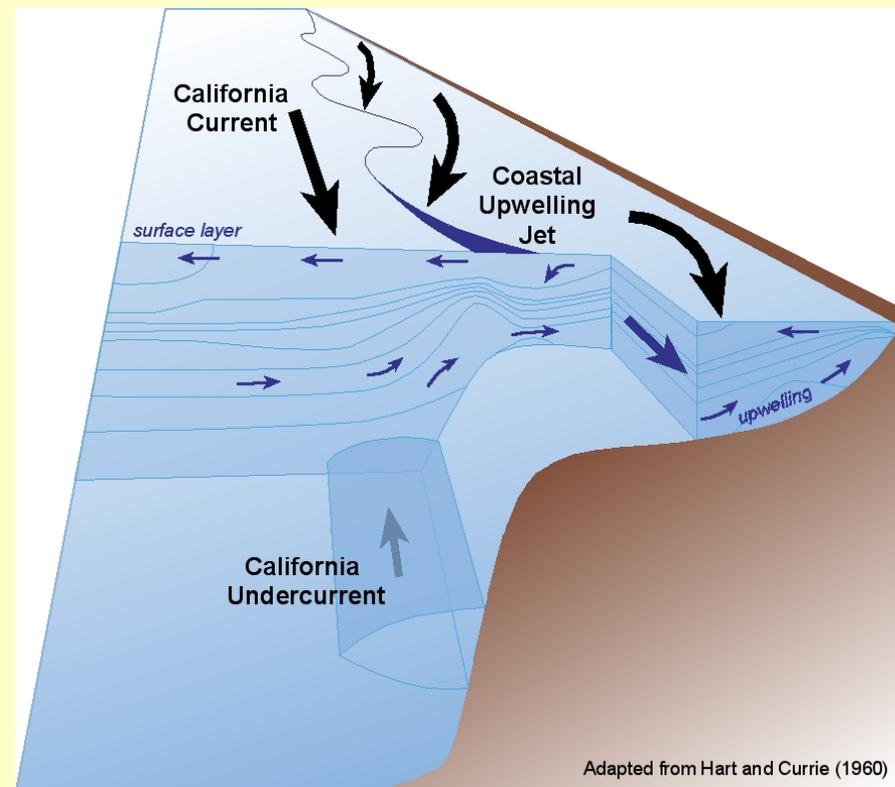
April 29, 2008



# Large-Scale Circulation: The California Current, Part of the North Pacific Ocean Circulation

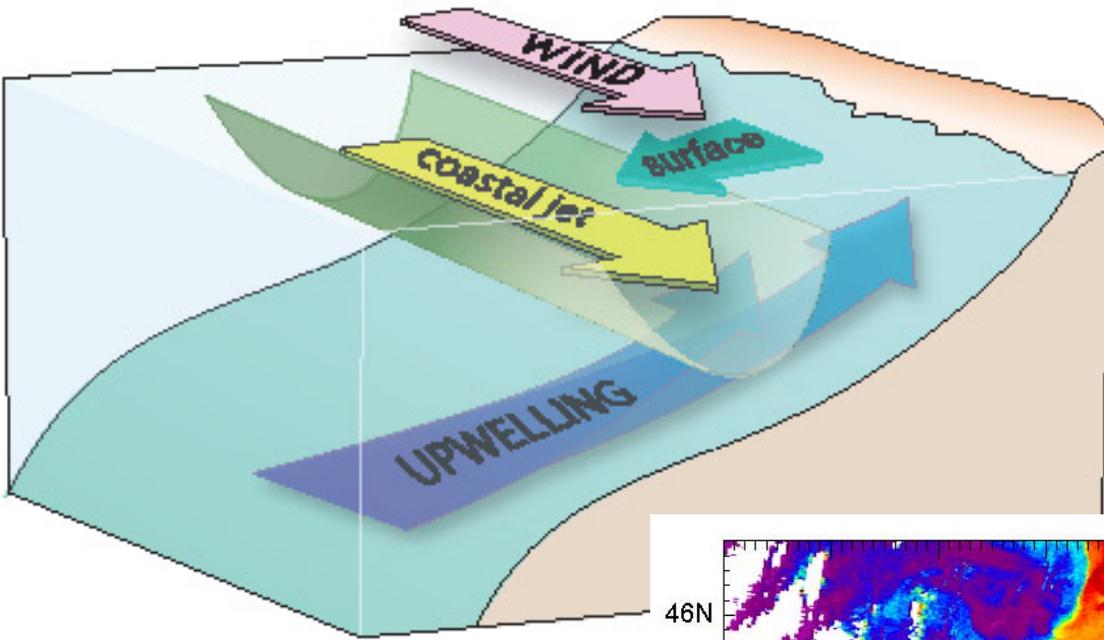


(from Jack Barth, OSU)



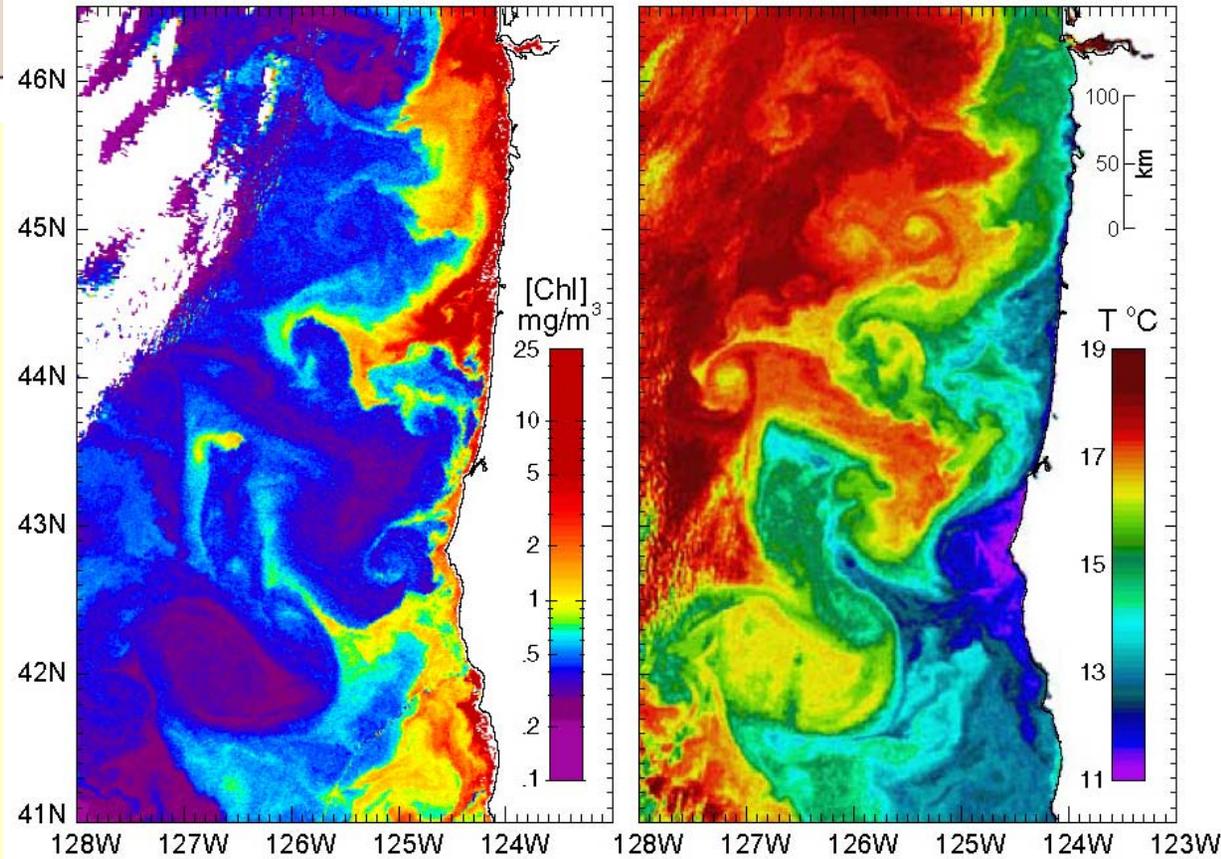
Adapted from Hart and Currie (1960)

# Coastal upwelling



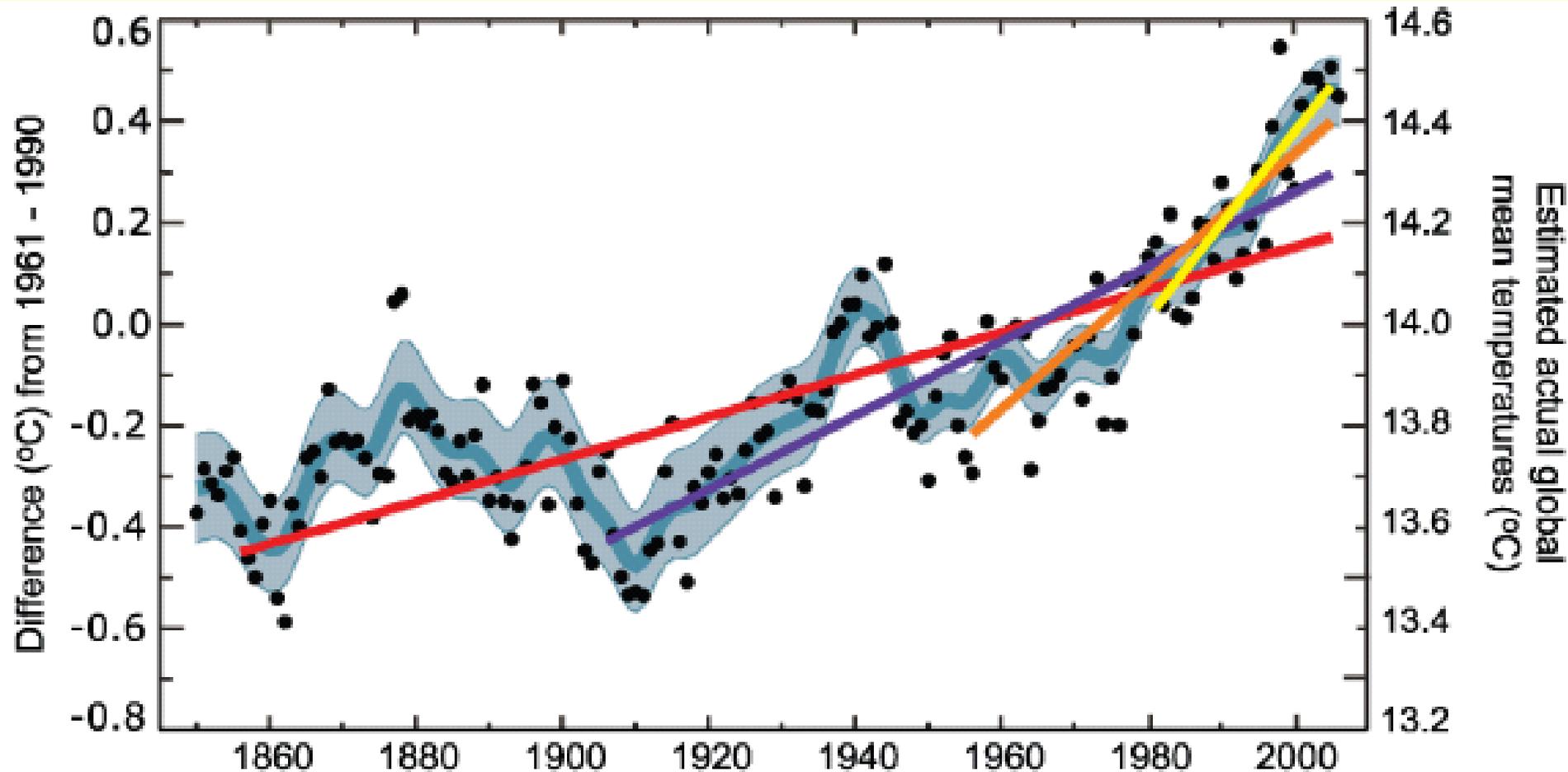
## satellite chlorophyll and temperature

(from Jack Barth, OSU)



# Recent Climate Variability - Global and Regional

# Global Temperature Trend



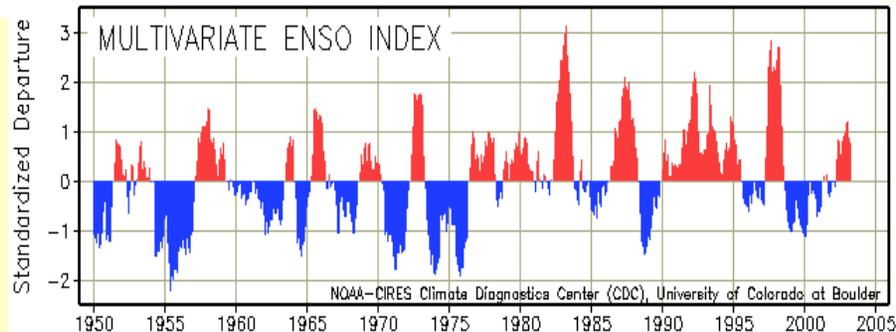
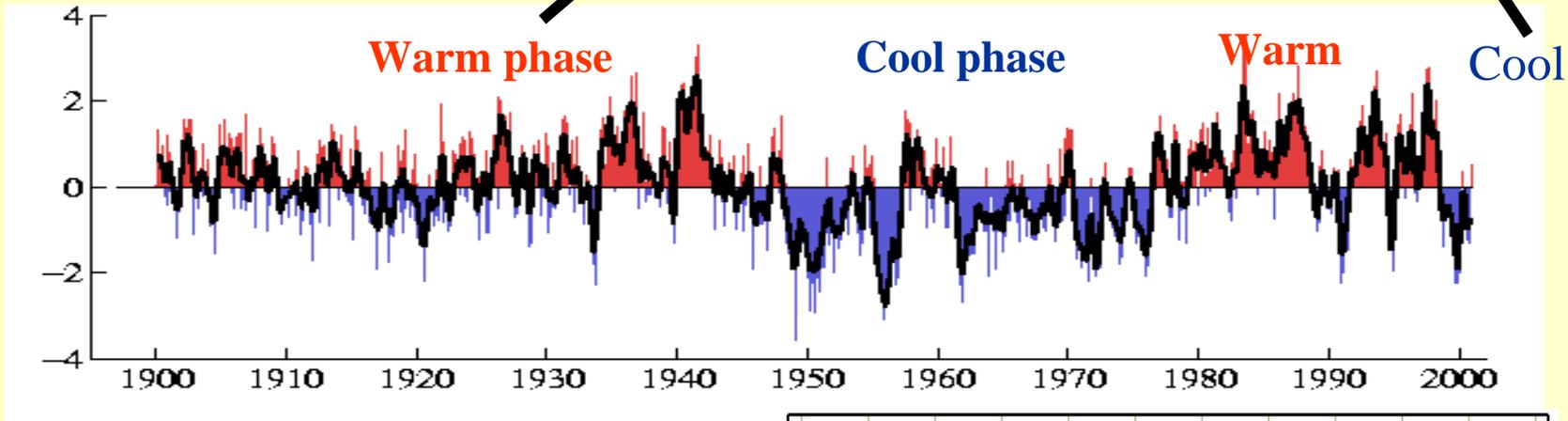
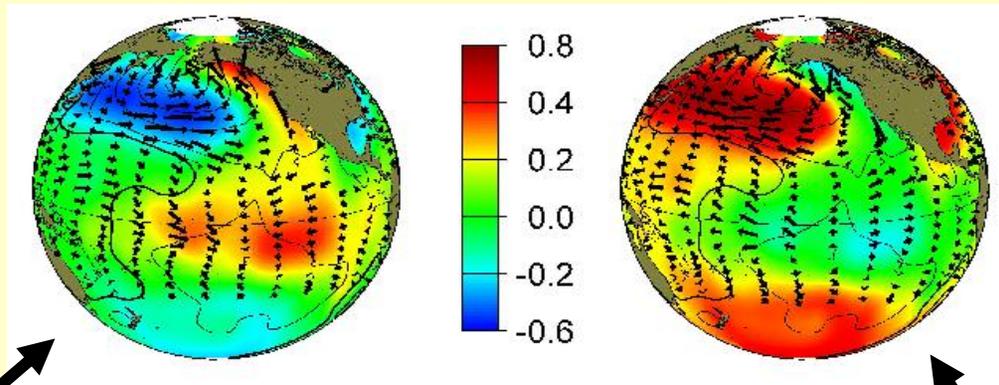
	Period Years	Rate °C per decade
● Annual mean		
— Smoothed series		
□ 5-95% decadal error bars		
	25	0.177±0.052
	50	0.128±0.026
	100	0.074±0.018
	150	0.045±0.015

# Climate Anomaly Patterns

SST – colors

SLP – contours

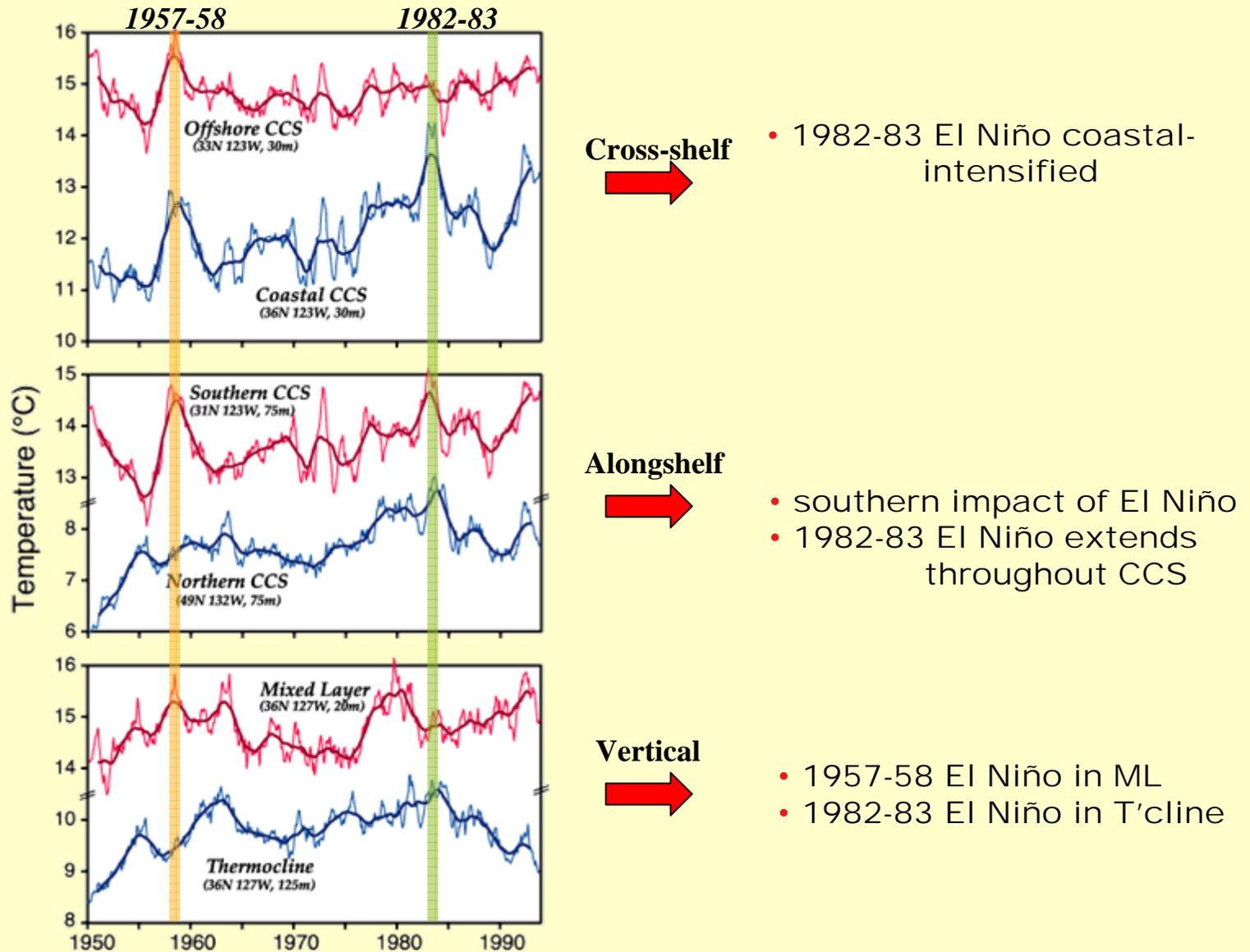
Wind stress – arrows



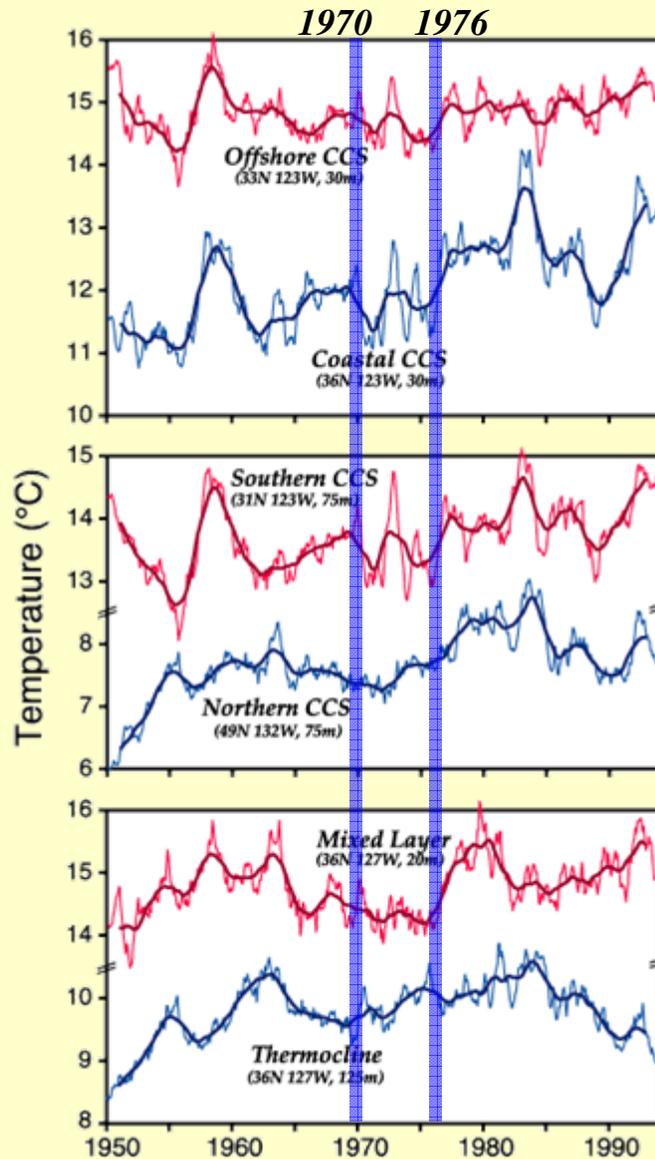
Basin-wide atmospheric & oceanic variability at interannual to decadal scales

(from Mantua et al., 1997)

# Interannual temperature variability is not uniform in space or time



# Decadal Temperature Trends in CCS



## Cross-shelf



- more variance at coast
- 1977 shift coastal-intensified

## Alongshelf



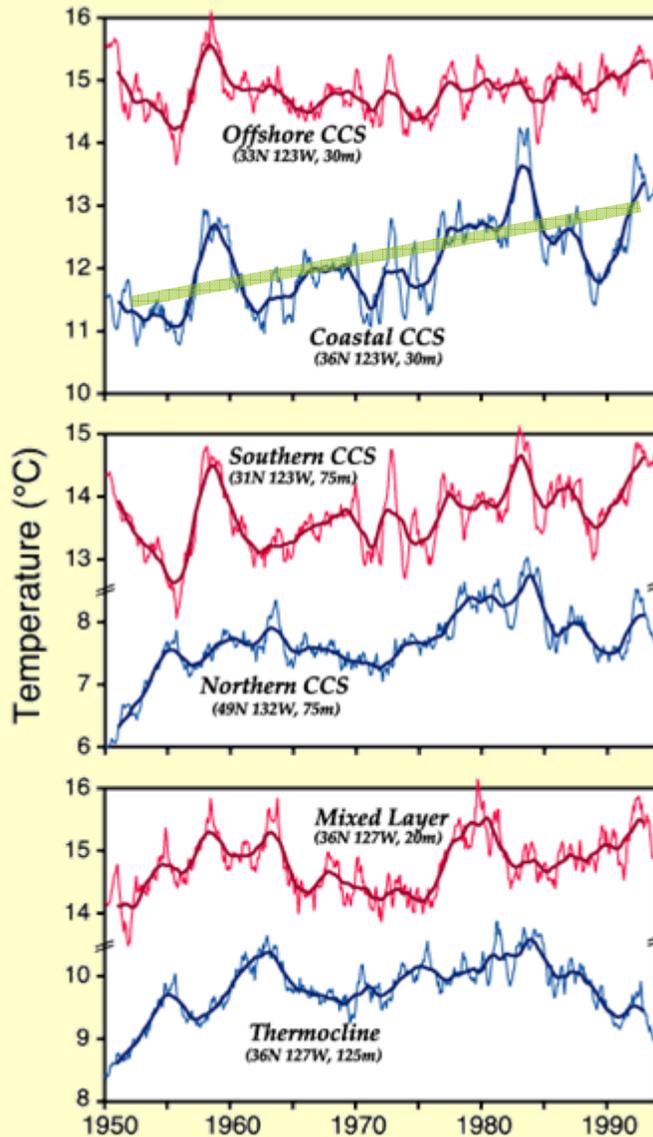
- northern warming begins ca. 1970
- southern 1977 shift more abrupt

## Vertical

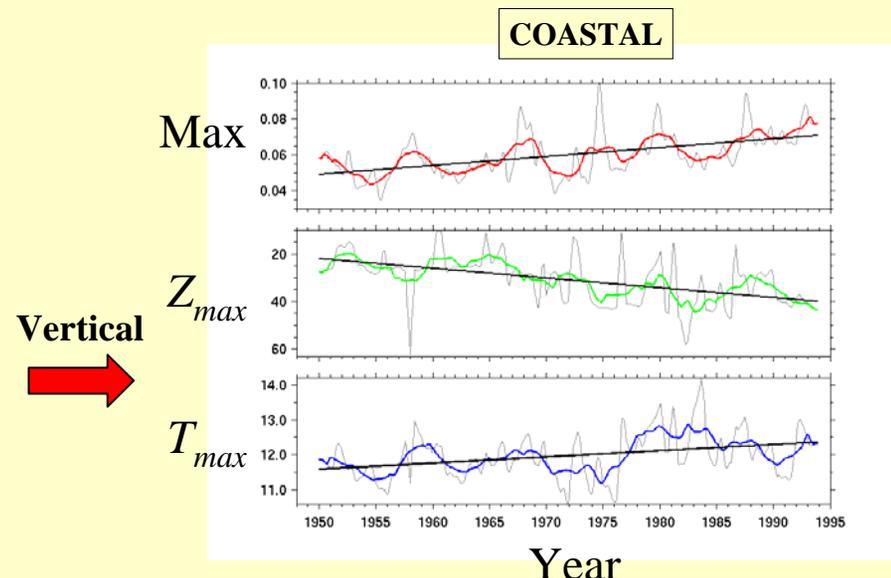


- 1970 warming in thermocline, leads mixed layer
- stratification trends

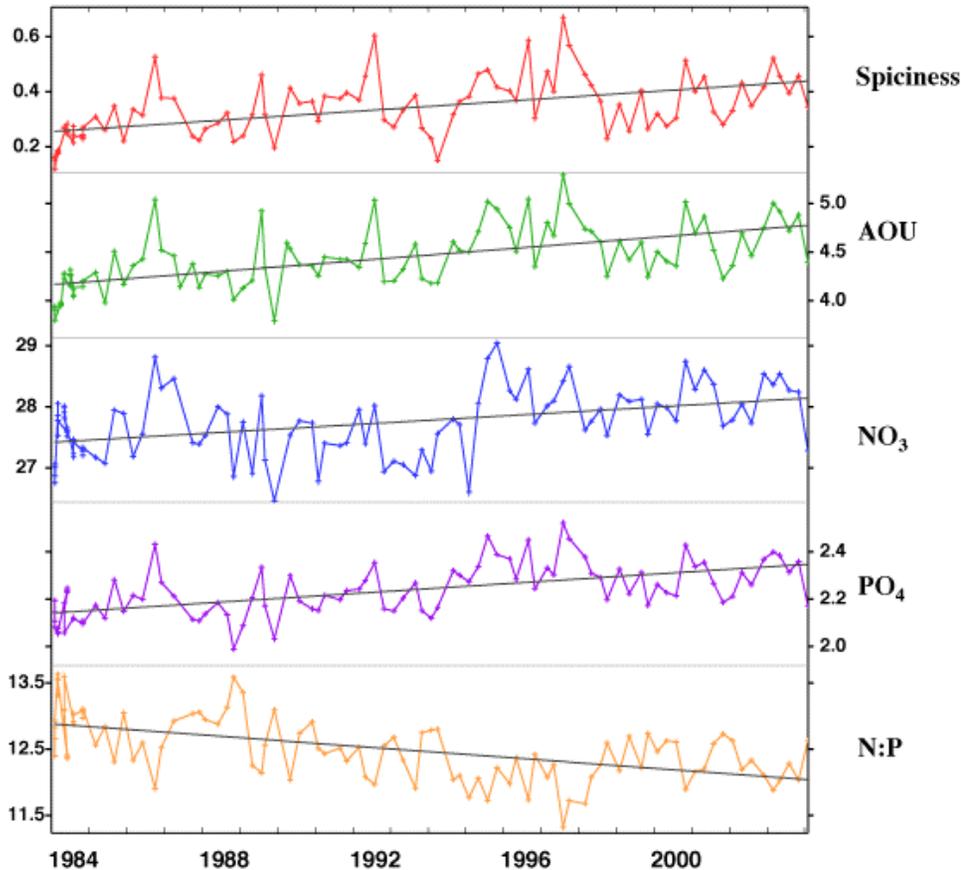
# Interannual variability superimposed on long-term trend



- warming has occurred everywhere, but magnitude varied
- stratification has increased in coastal waters



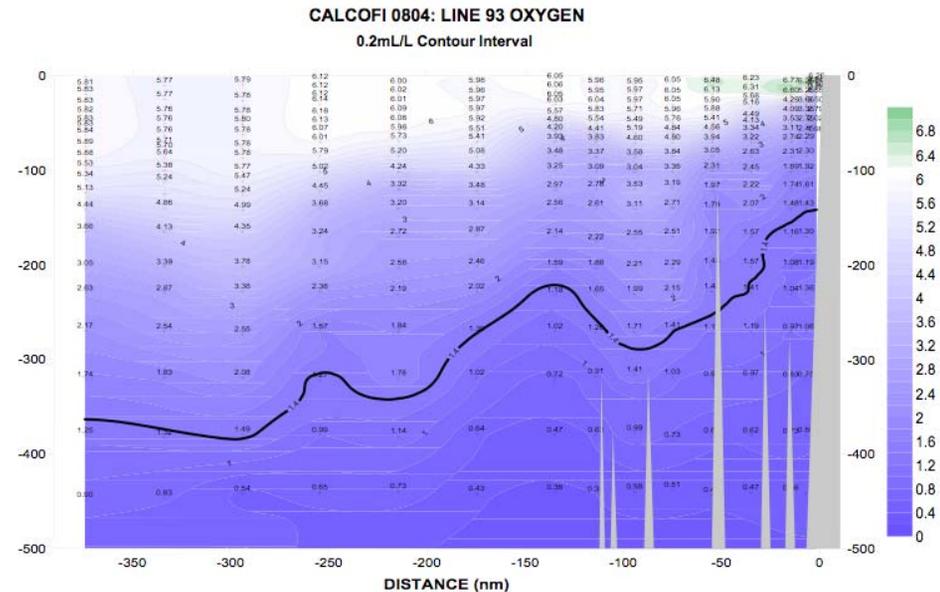
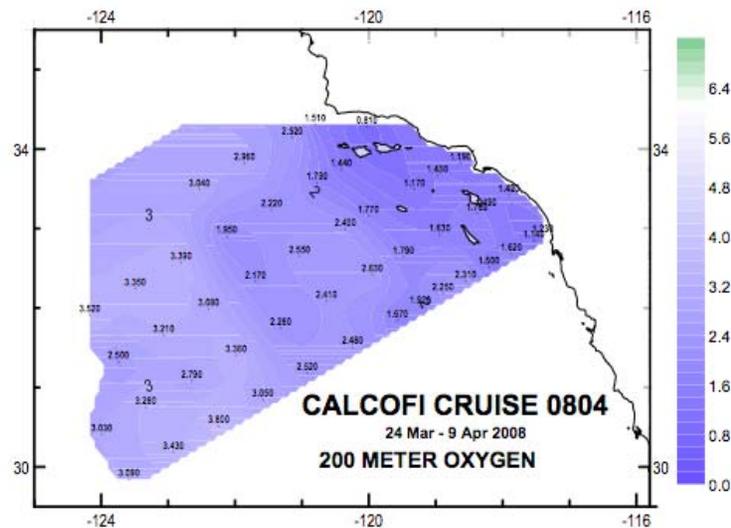
# More Sub-tropical Source Water in California Current



- Station 93.30 at sigma-theta=26.4
- Representative of California Undercurrent Waters
- Long-term warming trend
- Increases in total nitrate and phosphate, but at different rates
- Long-term trend in N:P ratio
- Also trends in preformed and regenerated nutrients
- Possible shifts in source waters and ecosystem structure

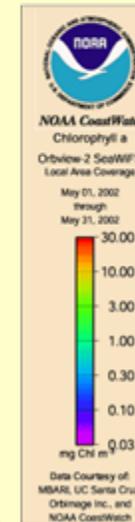
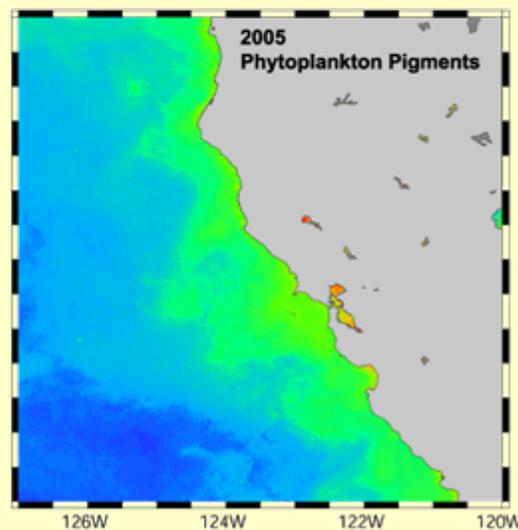
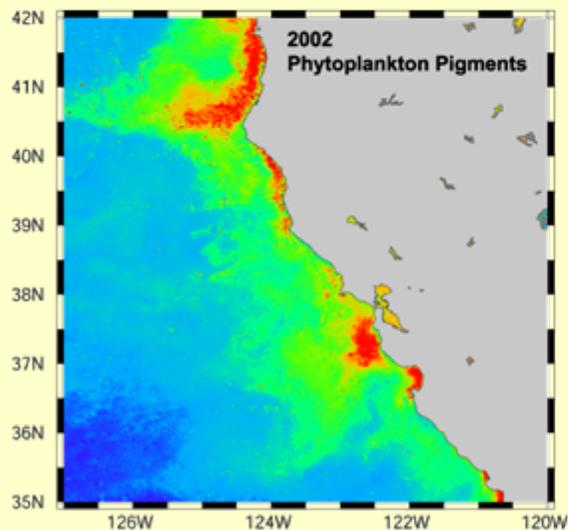
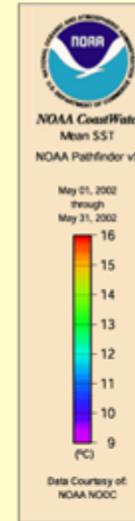
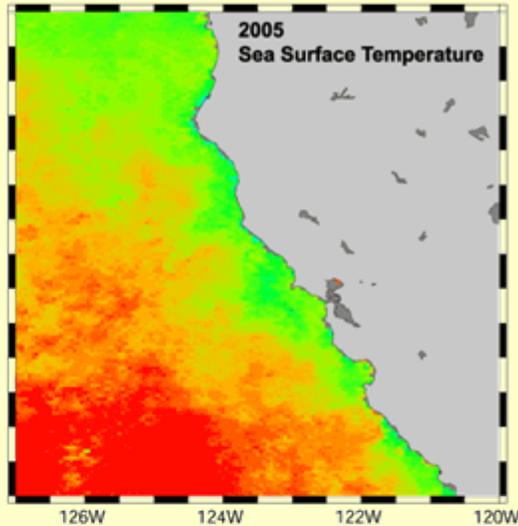
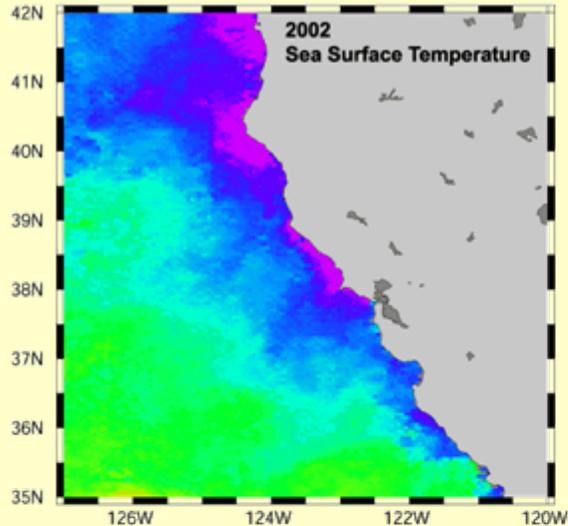
# Low Oxygen Waters Spreading into the California Current

- Lower oxygen levels seen along entire west coast
- Anoxic episodes have caused massive fish/shellfish deaths
- Hypoxic waters shoaling to 150 m off southern California



(from Steven Bograd, NOAA NMFS)

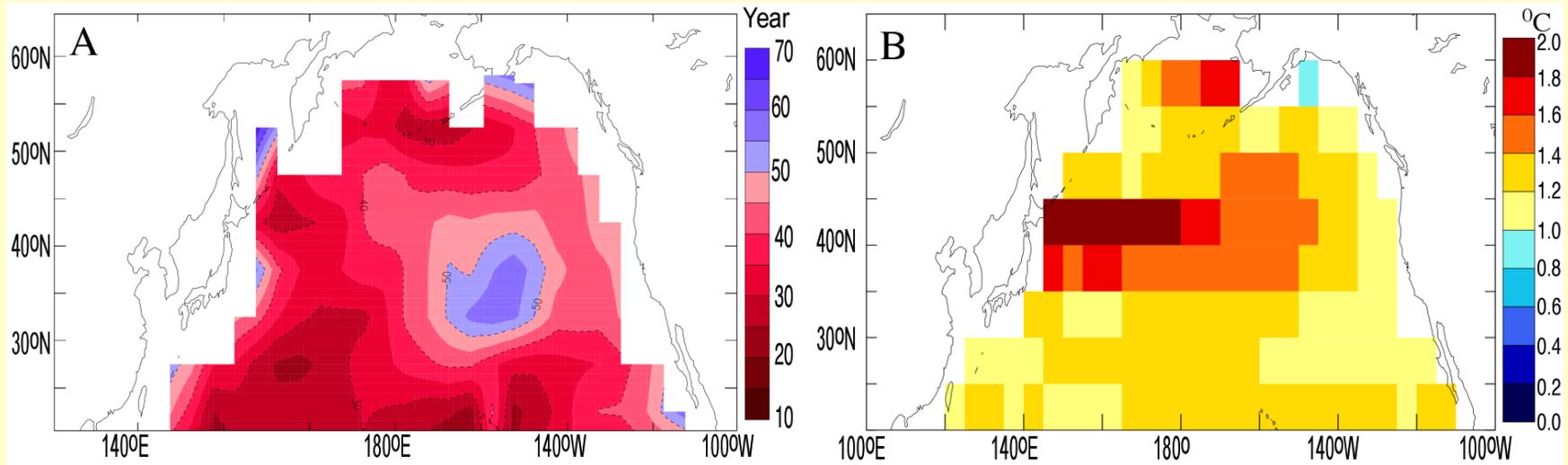
# Lower Production in 2005 & 2006 due to Weak Springtime Upwelling



(from David Foley,  
NOAA NESDIS)

# Climate Projections for the 21st Century

# 21st century anthropogenic warming will overcome natural regime shift variability



Year of anthropogenic dominance

IPCC projected (2040-2049) SST relative to 1980-1999

West coast cool regimes disappear in 30-50 years

Sea surface temperatures 2°F warmer by 2050

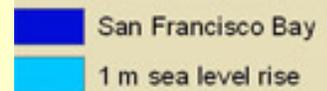
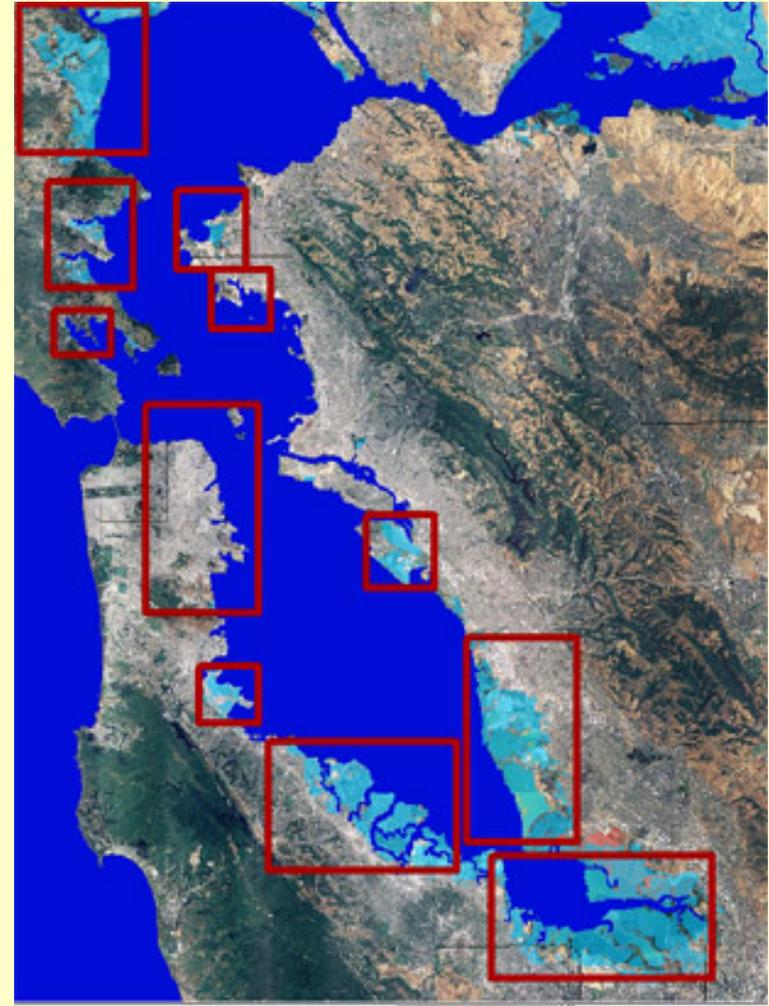
(from Overland and Wang, 2007)

# SF Bay - 1m Sea Level Rise Projection

San Francisco Bay Scenarios for Sea Level Rise  
SFO



Map is based on USGS 2m DGM and National Agriculture Imagery Program data. Map is illustrative and depicts a potential inundation scenario in 2100. Limitations in the geospatial data available may effect accuracy. Map should not be used for planning purposes.



Map is based on USGS 2m DSM and National Agriculture Imagery Program data. Map is illustrative and depicts a potential inundation scenario in 2100. Limitations in the geospatial data available may effect accuracy. Map should not be used for planning purposes.

# Summary and Conclusions

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Climate change is global, but ecological responses and human interests in it are local/regional.

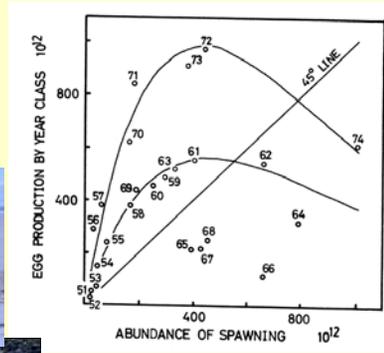
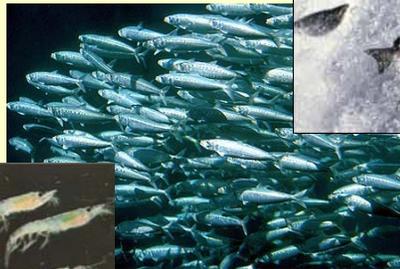
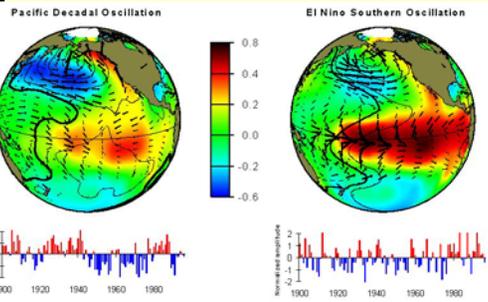
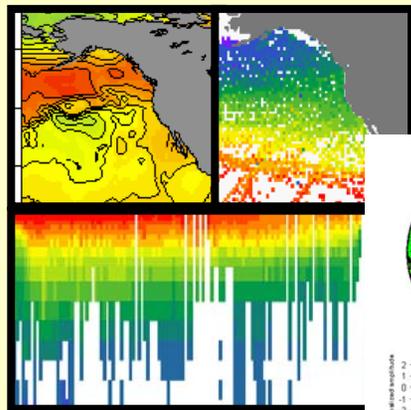
Changes in ocean temperature, currents and chemistry, land runoff, and sea level may be significant for ecosystems and coastal human communities.

There are natural short-term fluctuations in these factors, but these are marked by significant long-term trends.

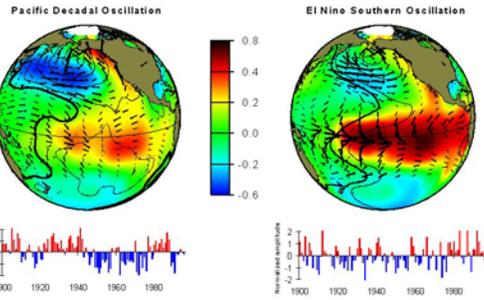
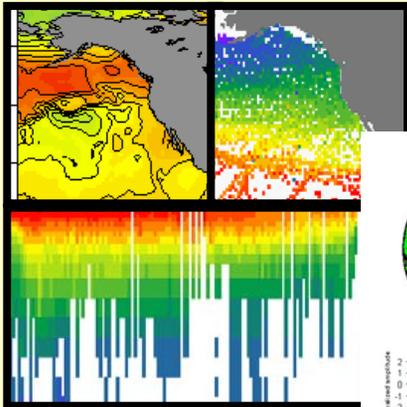
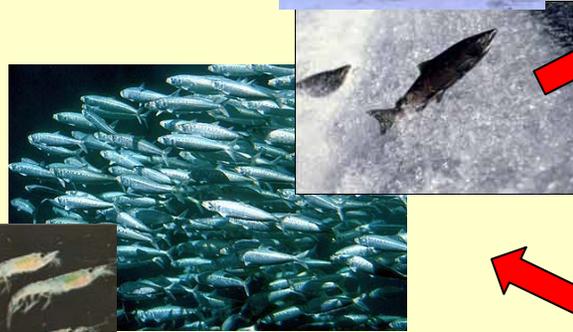
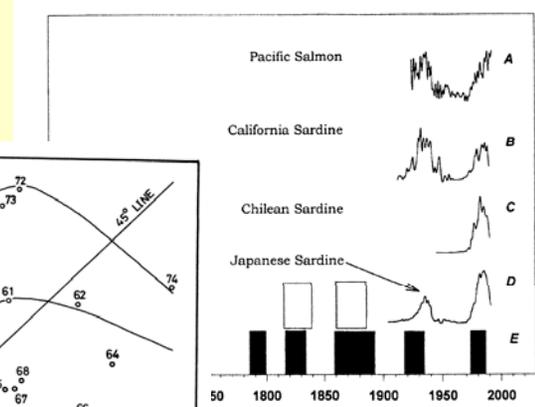
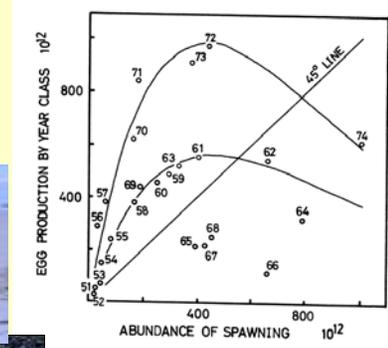
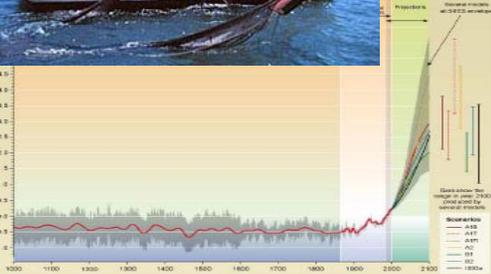
Observations of past change (and its consequences) provide clues about future climate change.

Climate forecasts for specific regions are needed to inform coastal communities and guide human adaptation and mitigation decisions.

# Ecosystem Response to Environmental Variability



# Anthropogenic Influences on Ecosystems



# Climate Change Projected to Impact California Current Ecosystem

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## Projected changes - 21st century

- Warmer summer temperatures; greater ocean stratification, weaker upwelling (*very likely*)
- Warmer & wetter winters; greater freshwater inflow, coastal flooding (*very likely*)
- Higher coastal sea level (*very likely*)
- More extreme events; stronger storms, El Nino, hurricanes (*likely*)
- Delayed seasonal cycle; delayed upwelling (*likely*)

## Examples of ecological impacts

- Northward species shifts
- Lower productivity & food
- Exotic species introduced
- Reduced coastal water quality
- Toxic blooms
- Human health hazards
- Intertidal species displaced
- Wetlands reduced
- Greater coastal erosion
- Fisheries reduced & displaced
- Warm-water fisheries available
- Delayed spring bloom
- Reproduction, migration impacted

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**Climate change – ecosystem change in  
northern California: implications for  
fisheries, marine wildlife and coastal  
communities**

**William J. Sydeman**

Farallon Institute for Advanced Ecosystem  
Research

[www.faralloninstitute.org](http://www.faralloninstitute.org)

First Biennial Ocean Climate Summit

April 29, 2008





# Talk Outline

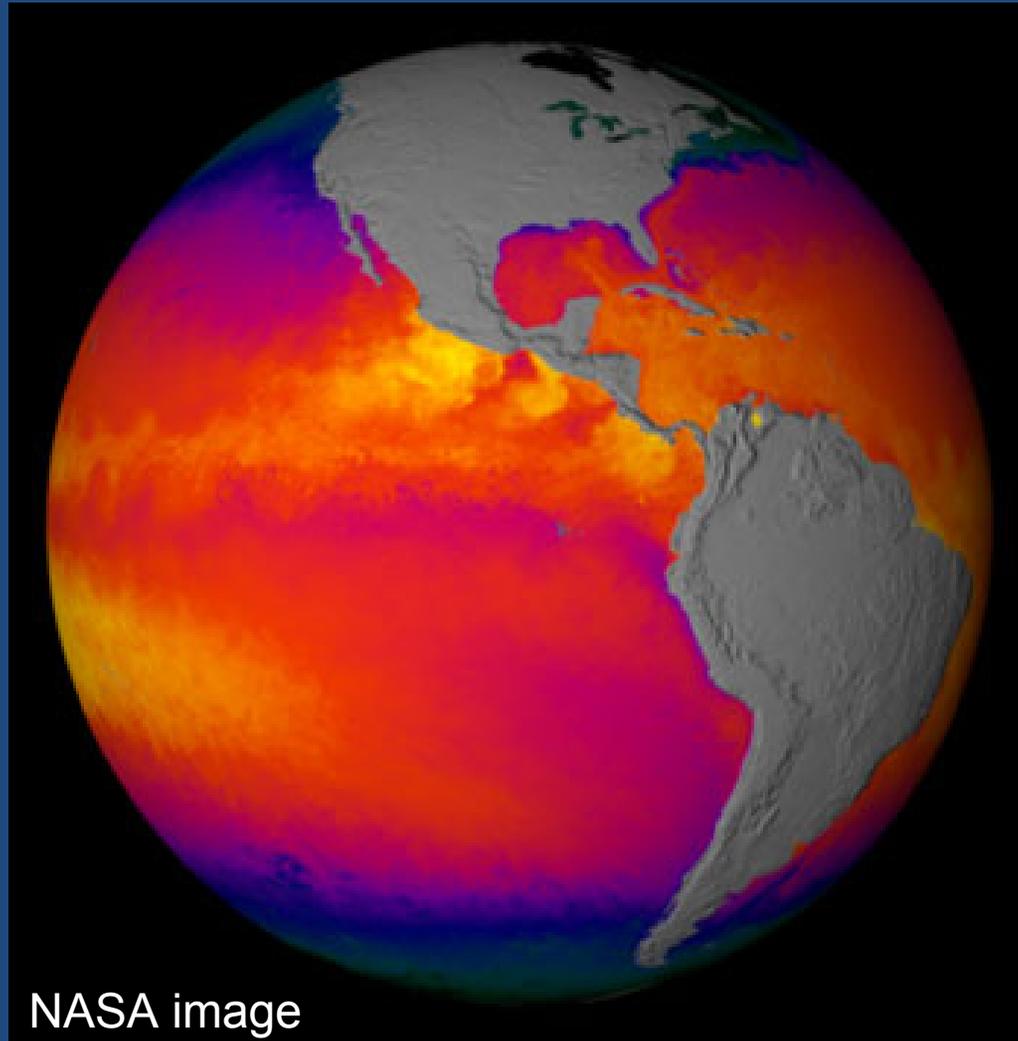
(1) Climate Change – “Ecosystem” Change

- are seabirds (auklets) and salmon being impacted by climate change?

(2) Climate - Food Webs, and Food Web Indicators (copepods)

(3) Conclude – Thoughts for Fishers and Research Needs for Enhancing Ecosystem-based Fisheries Management in Light of Climate Change

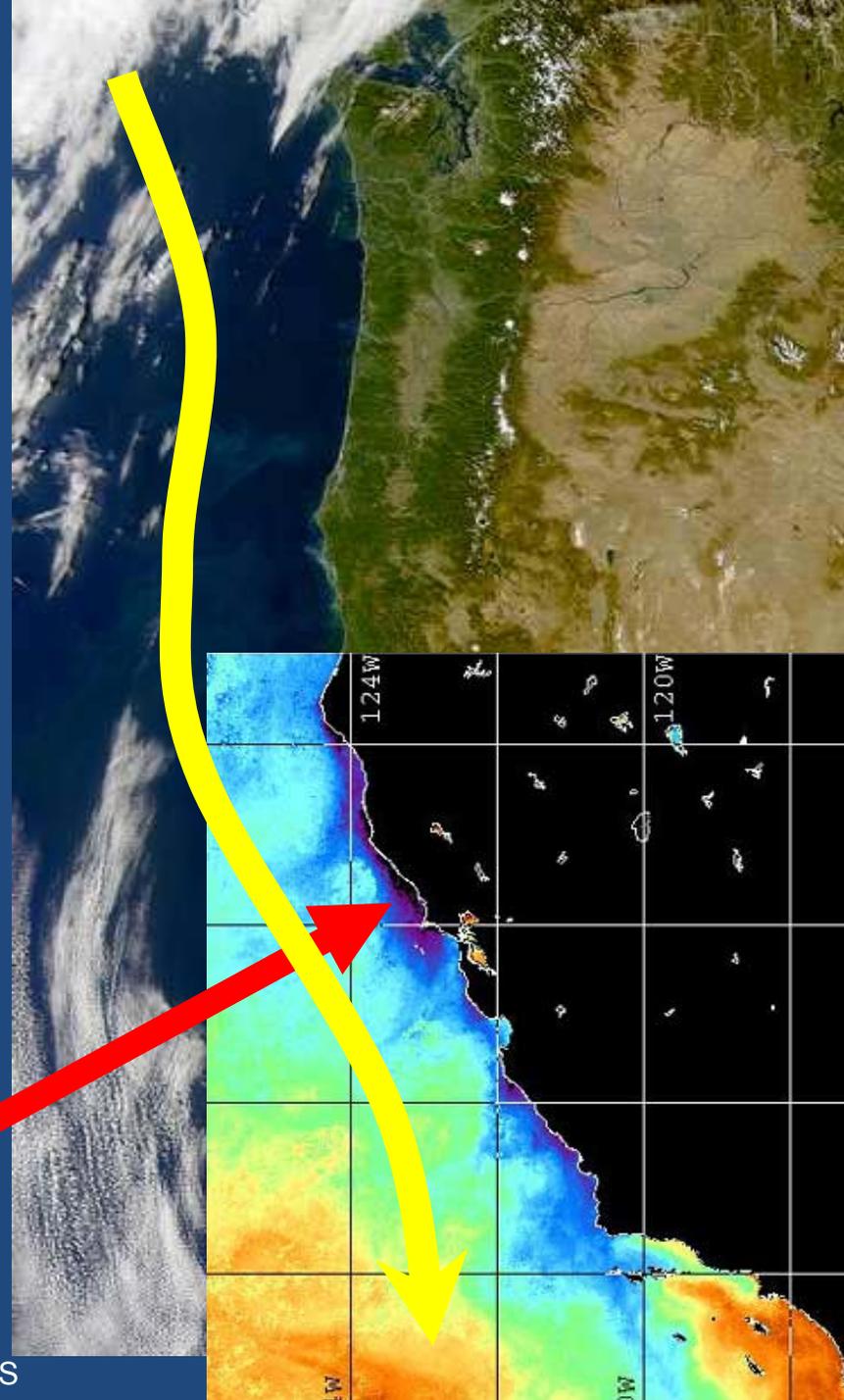
# Climate Change is Global, but Effects are Local ("think global, act local")



# The CA Current LME – Drivers of Ecosystem Dynamics

- (1) California Current – offshore “river in the sea” – *advects* water and plankton from Gulf of Alaska
- (2) Capes & promontories – *in-situ* coastal upwelling and productivity

E.g., Pt. Arena/Pt. Reyes Upwelling Cell (39° to 36° N)



# some of the actors...

Krill

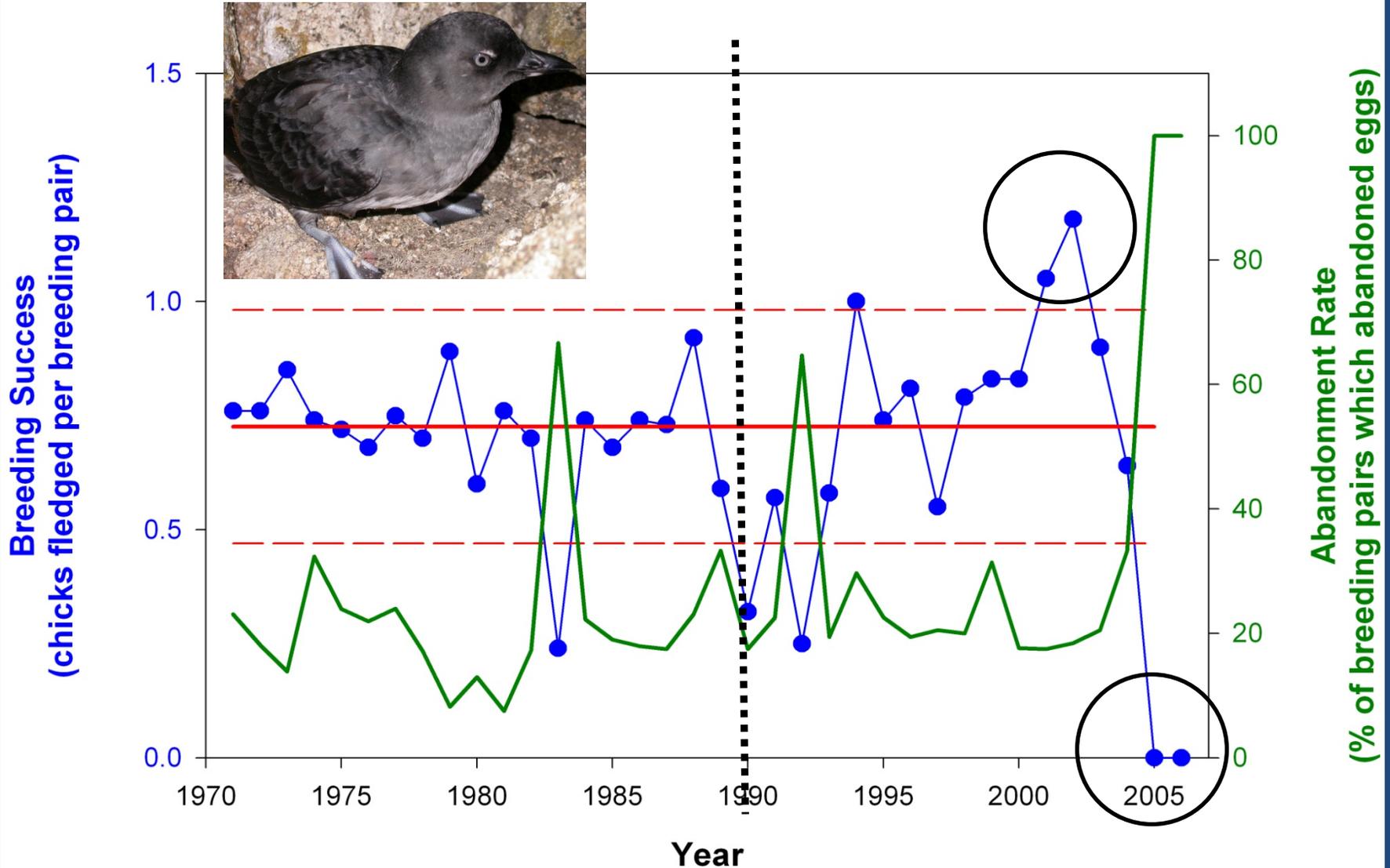
Cassin's auklet



Young bocaccio rockfish (*Sebastes paucispinis*).

Photo: Donna Schroeder

# Breeding Success and Abandonment, 71-06

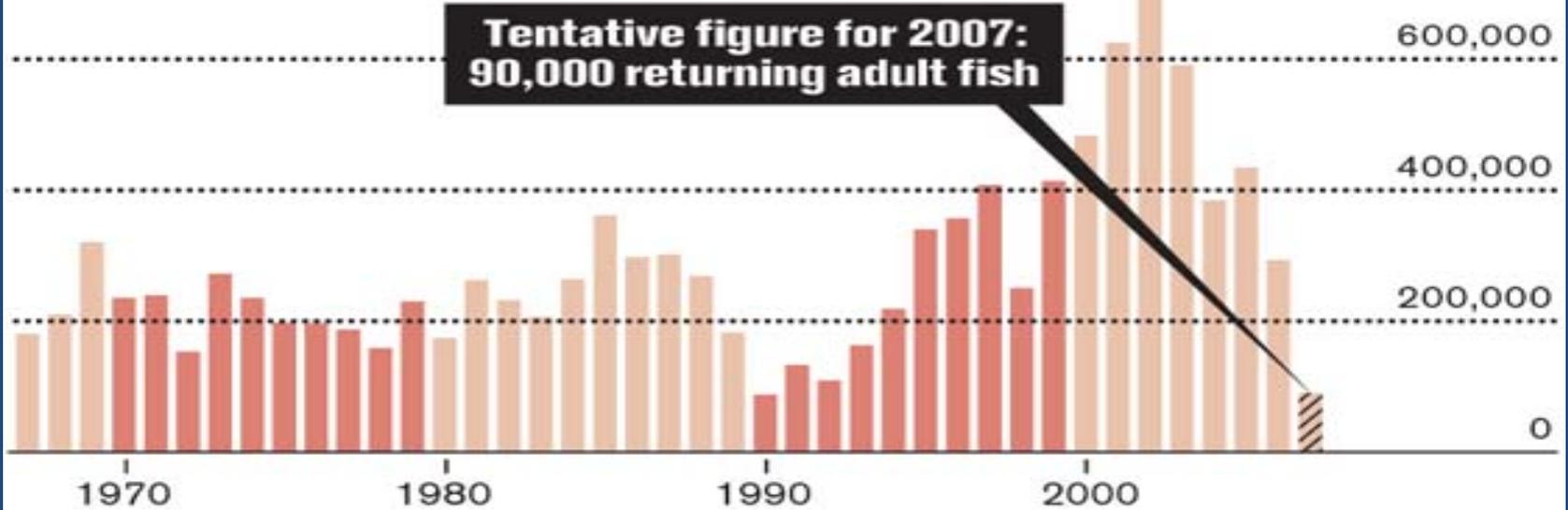


... the salmon situation...what happened in '02

## Chinook salmon

Numbers of Central Valley fall-run chinook salmon are expected to hit near-record lows when this year's counts are confirmed.

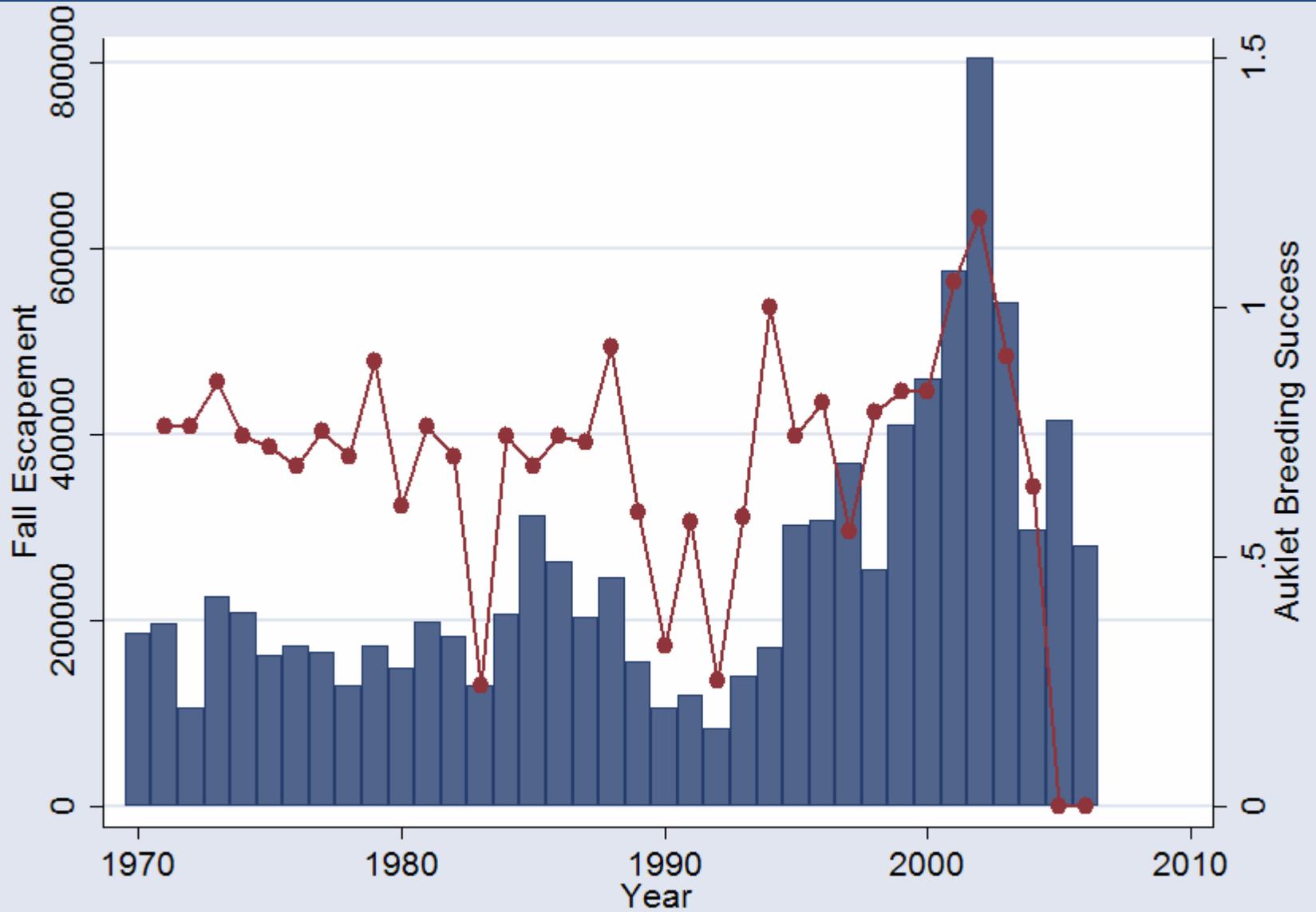
### Fall-run chinook salmon population Sacramento and San Joaquin River systems



Source: Department of Fish and Game

The Chronicle

# Salmon (bars) and Auklets (points)



# Auklet Breeding Success by Decade

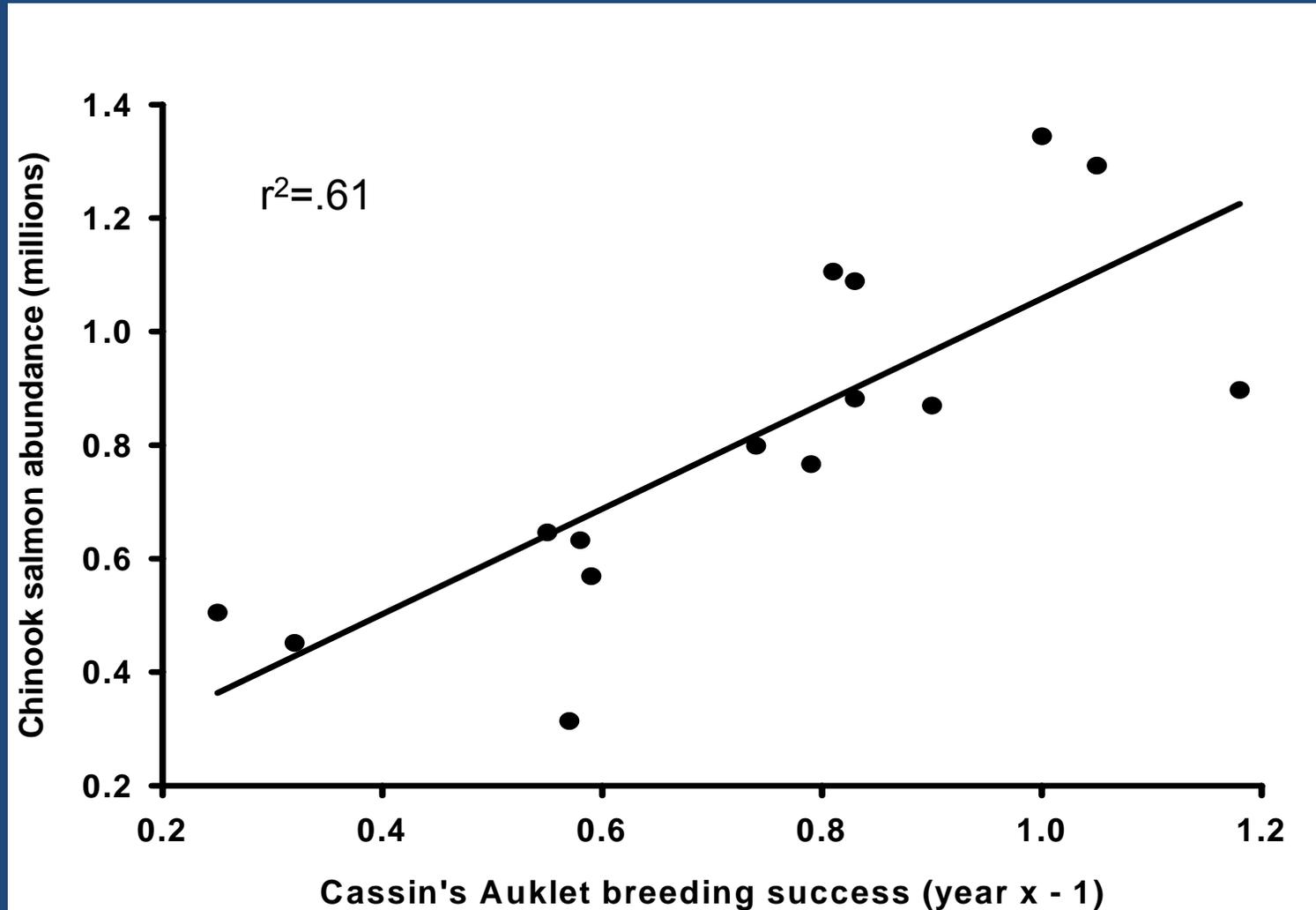
<u>Decade</u>	<u>Mean</u>	<u>CV(%)</u>
1971-1980	0.745	11.0
1981-1990	0.642	32.5
1991-2000	0.695	30.4
2001-2006	0.628	82.6

# Salmon Returns by Decade

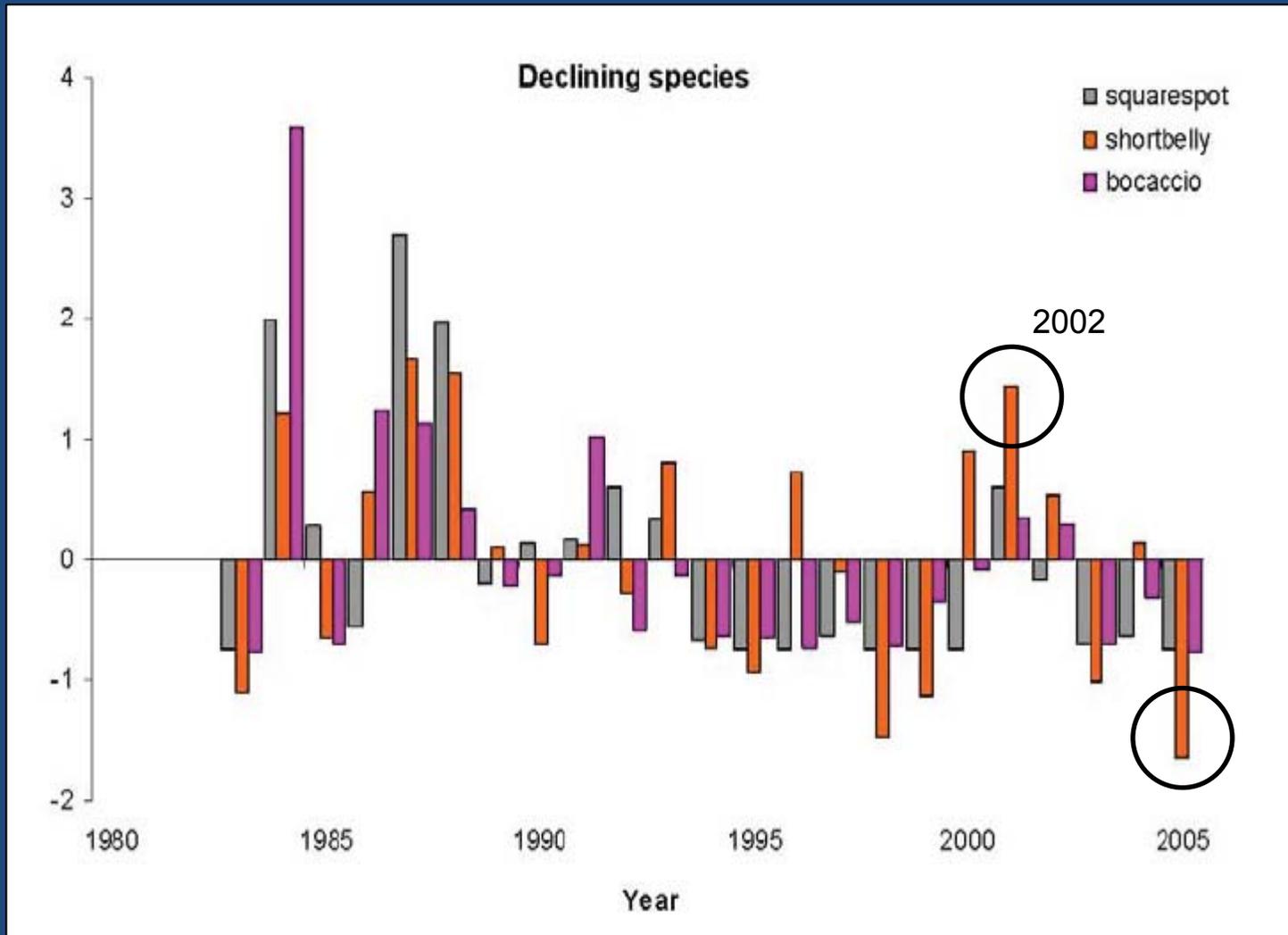
<u>Decade</u>	<u>Mean</u>	<u>CV(%)</u>
1970-1979	172,160	20.6
1980-1989	204,150	27.5
1990-1999	225,660	52.1
2000-2006	481,920*	37.5 (n=7)

\*preliminary estimate for 2007=~90,000

# auklets & salmon (1990-2004)

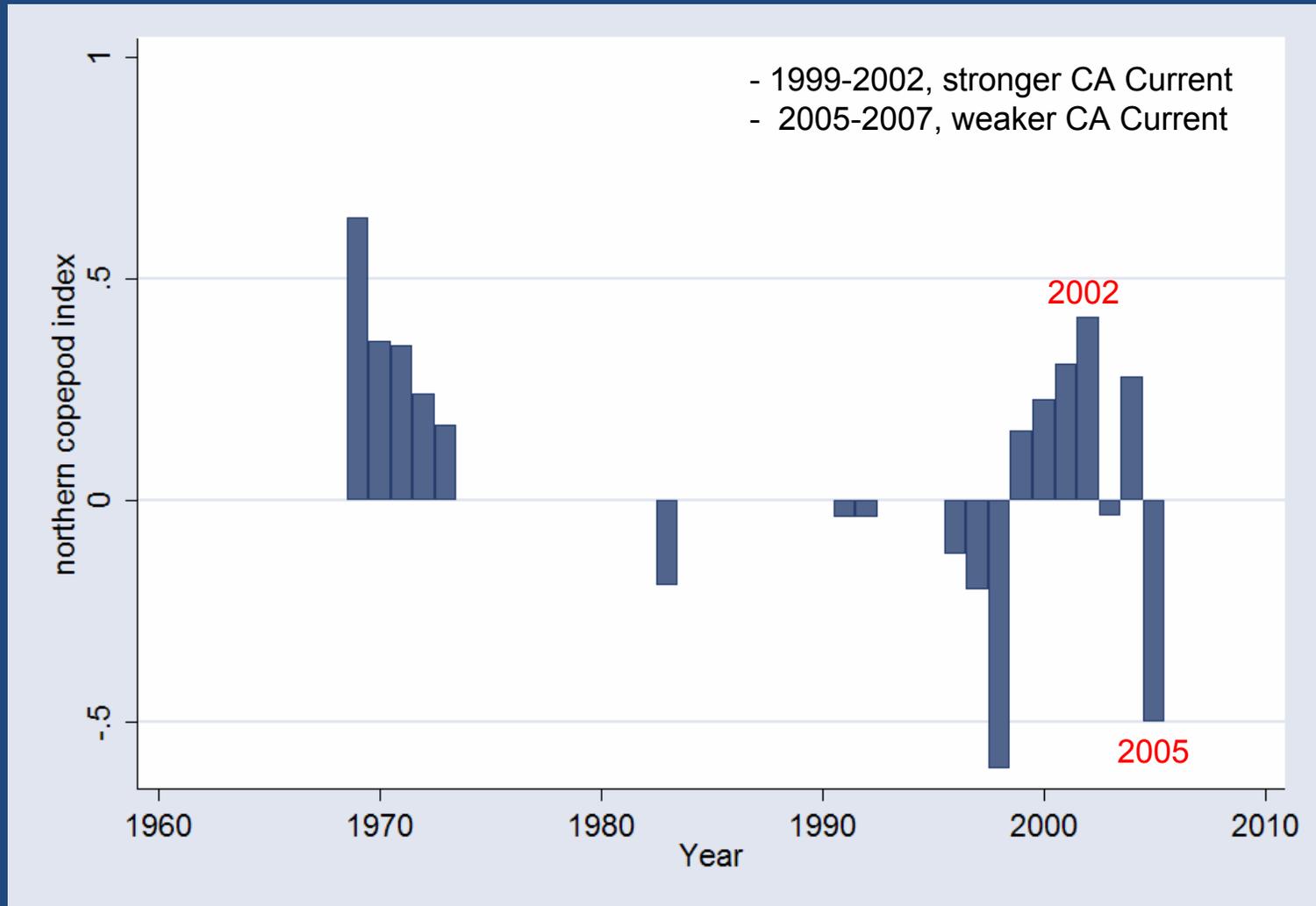


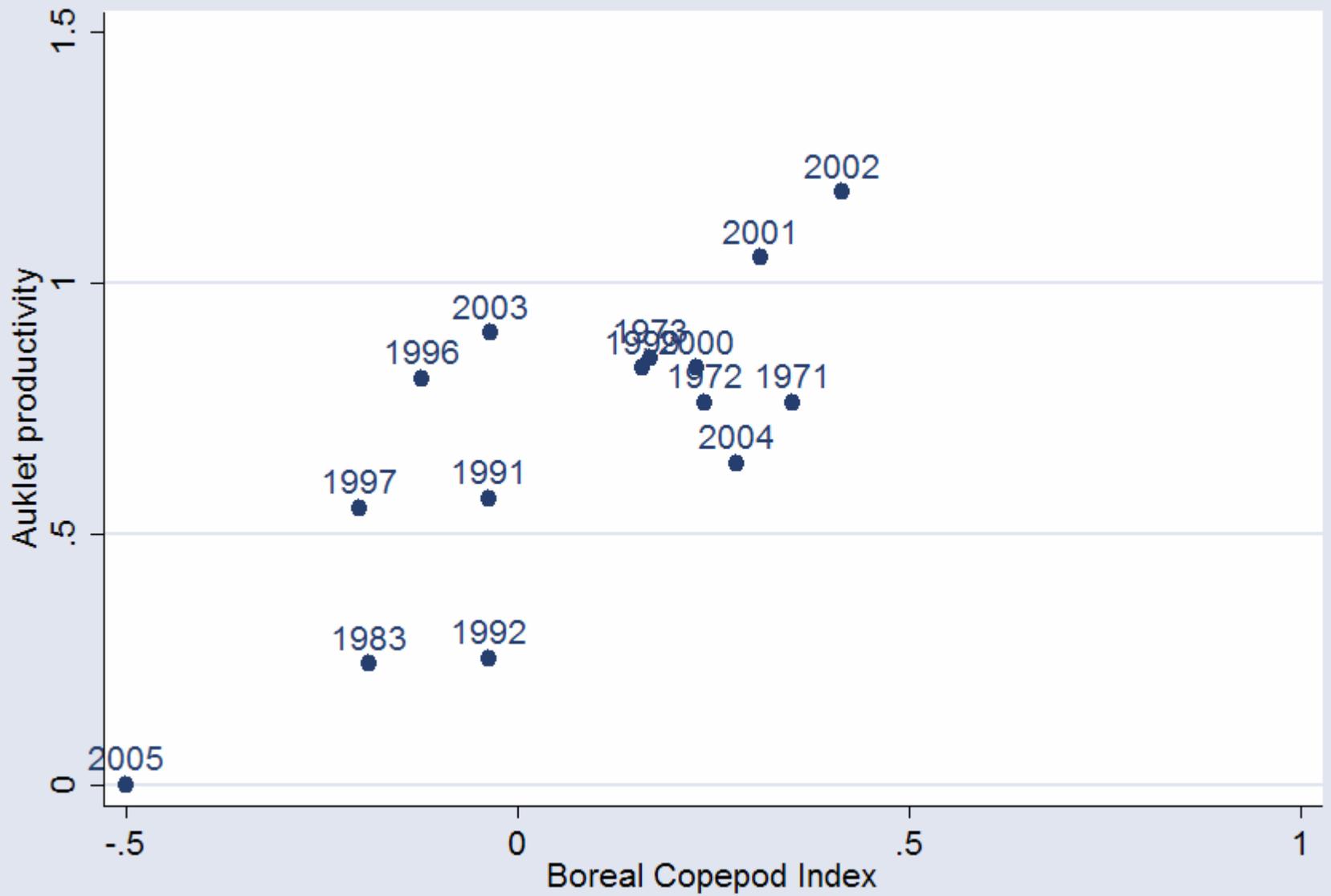
# Juv. Rockfish (*Sebastes*) Relative Abundance





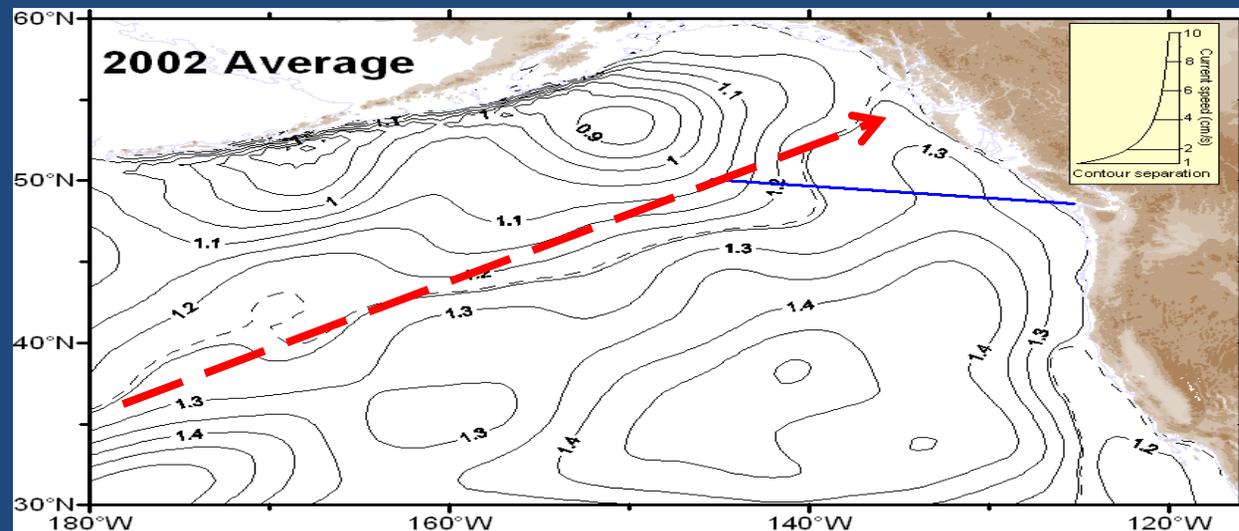
# “Boreal” Copepods off Newport, OR





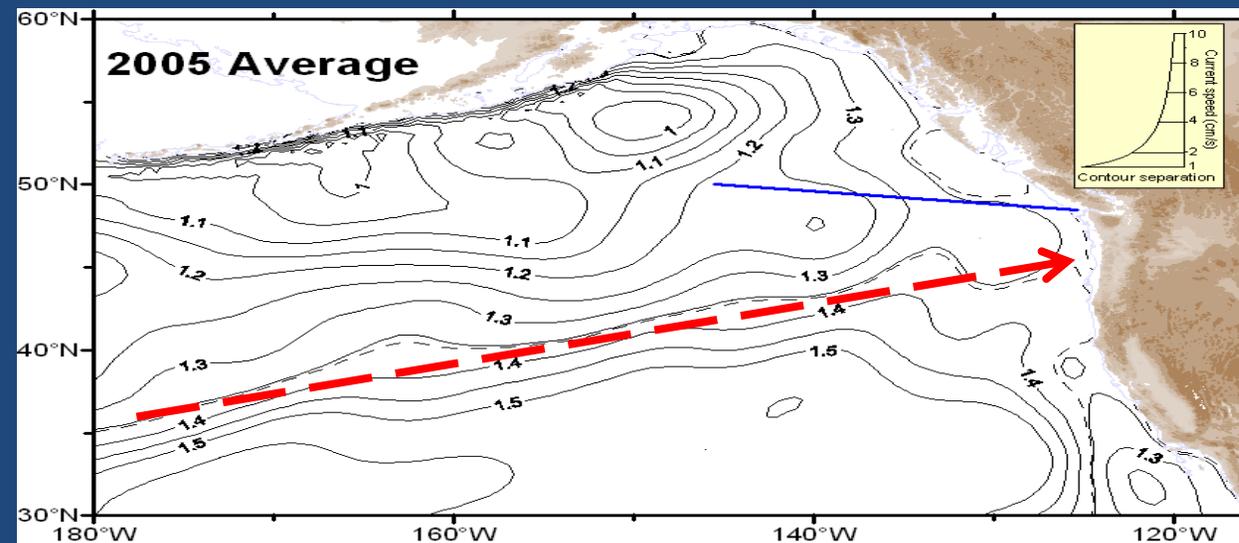


# North Pacific Current, 2002 vs. 2005



## 2002

- Highest returns (ever!)
- Highest success
- Rockfish increase
- Boreal copepods
- NPC shifted north



## 2005

- Moderate returns (lag to 2007)
- Breeding failure
- Rockfish decrease
- Tropical copepods
- NPC shifted south

# Climate Change “Canaries” of the CA Current?

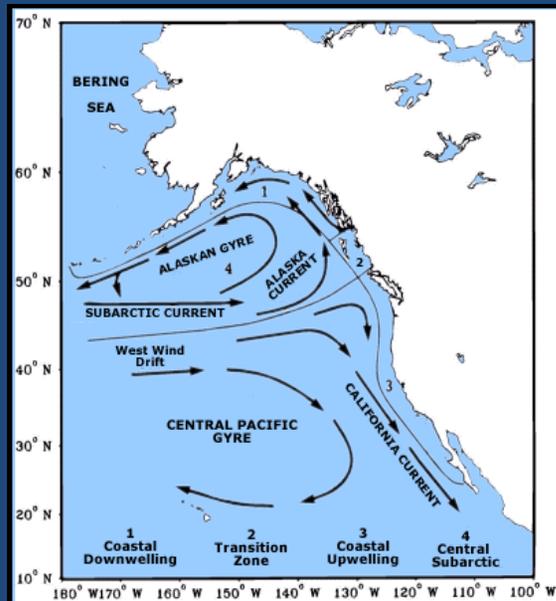
fisheries



salmon



currents



copepods

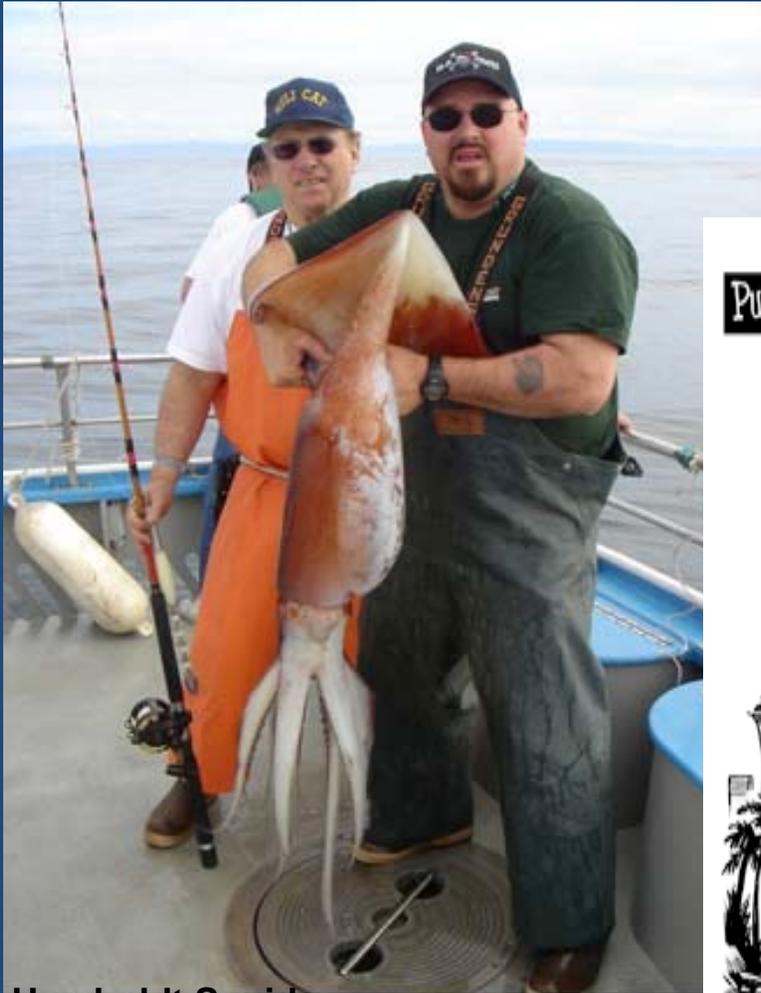


rockfish

auklets

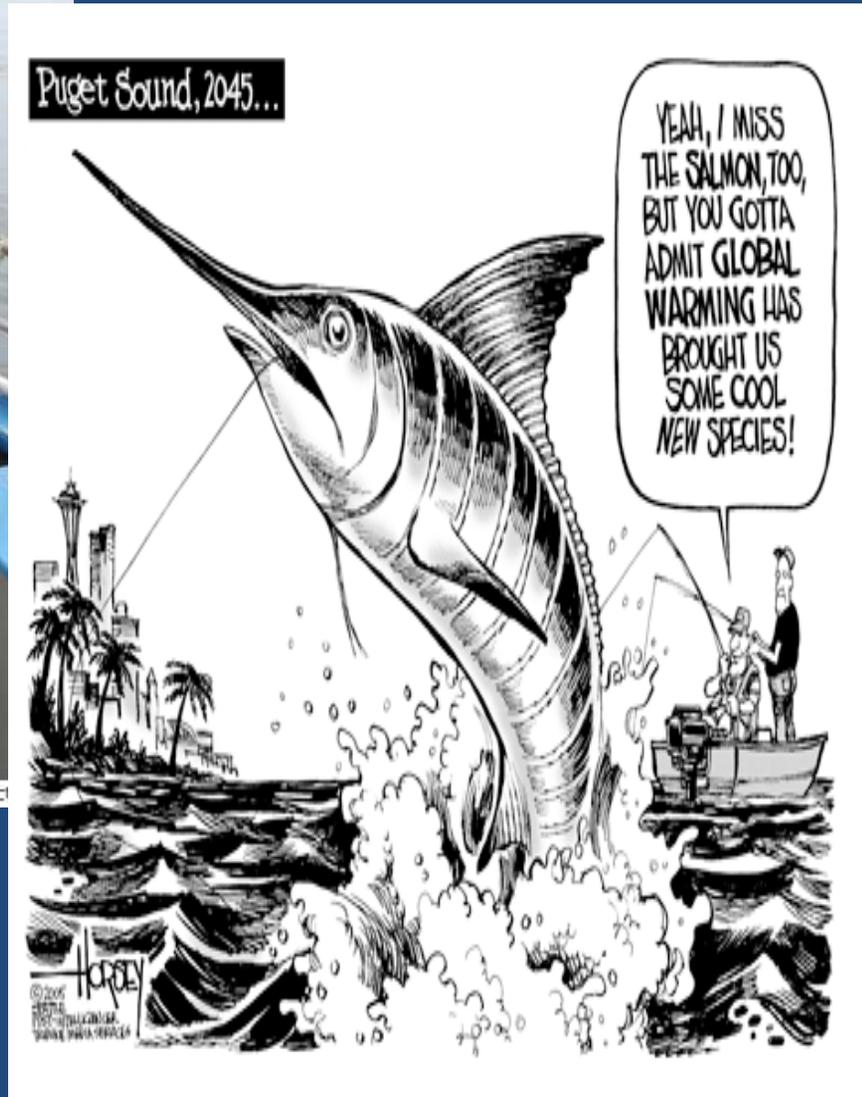


New fisheries?  
New ecology?  
“No-analog ecosystems?”

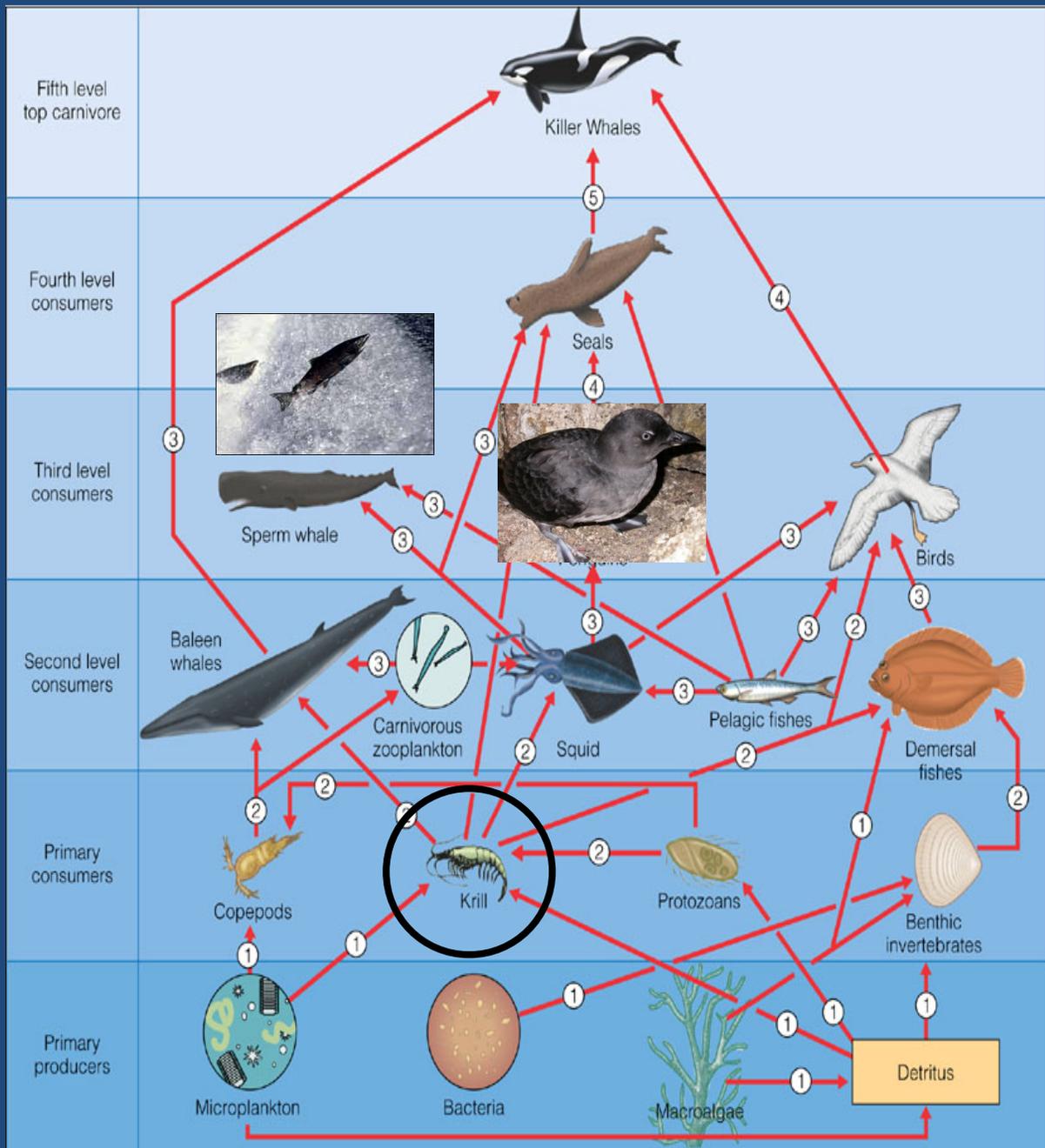


Humboldt Squid

Tom Mat

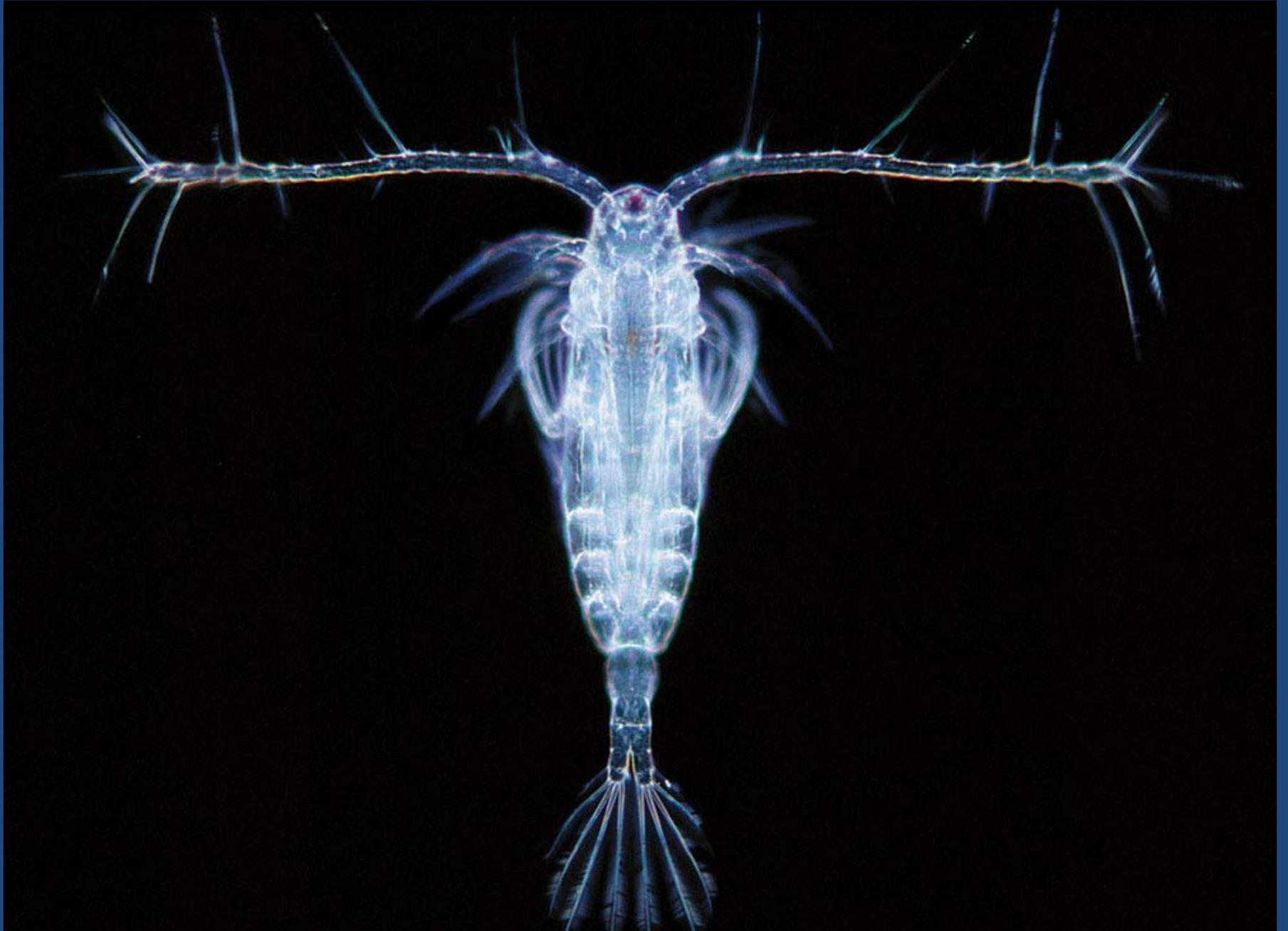


Seattle Times



It's all about krill...but, difficult to study

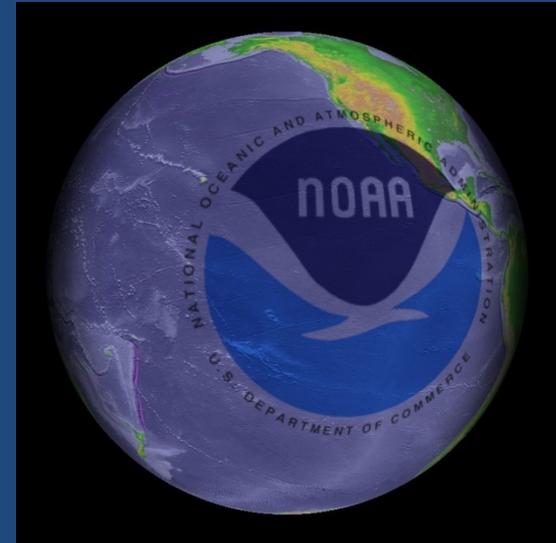




# Conclusions: Climate-Ecosystem Change

- I. Variability appears to be increasing, auklets and salmon (note: outer continental shelf species...).
- II. Climate change – global-scale “ecosystem oceanography” is important (currents!).
- III. Species’ responses to climate change - food webs; difficult to assess; indicators (copepods?)
- IV. Implications for management: the ocean climate change backdrop
- V. Implications for coastal communities – winners and losers; adapt
- VI. The \$64M question: Who will win, where, and when?

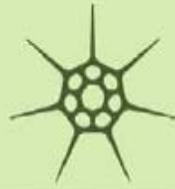
# Support



William T. Peterson, Frank Schwing and Team IEA

Questions?





Farallon Institute

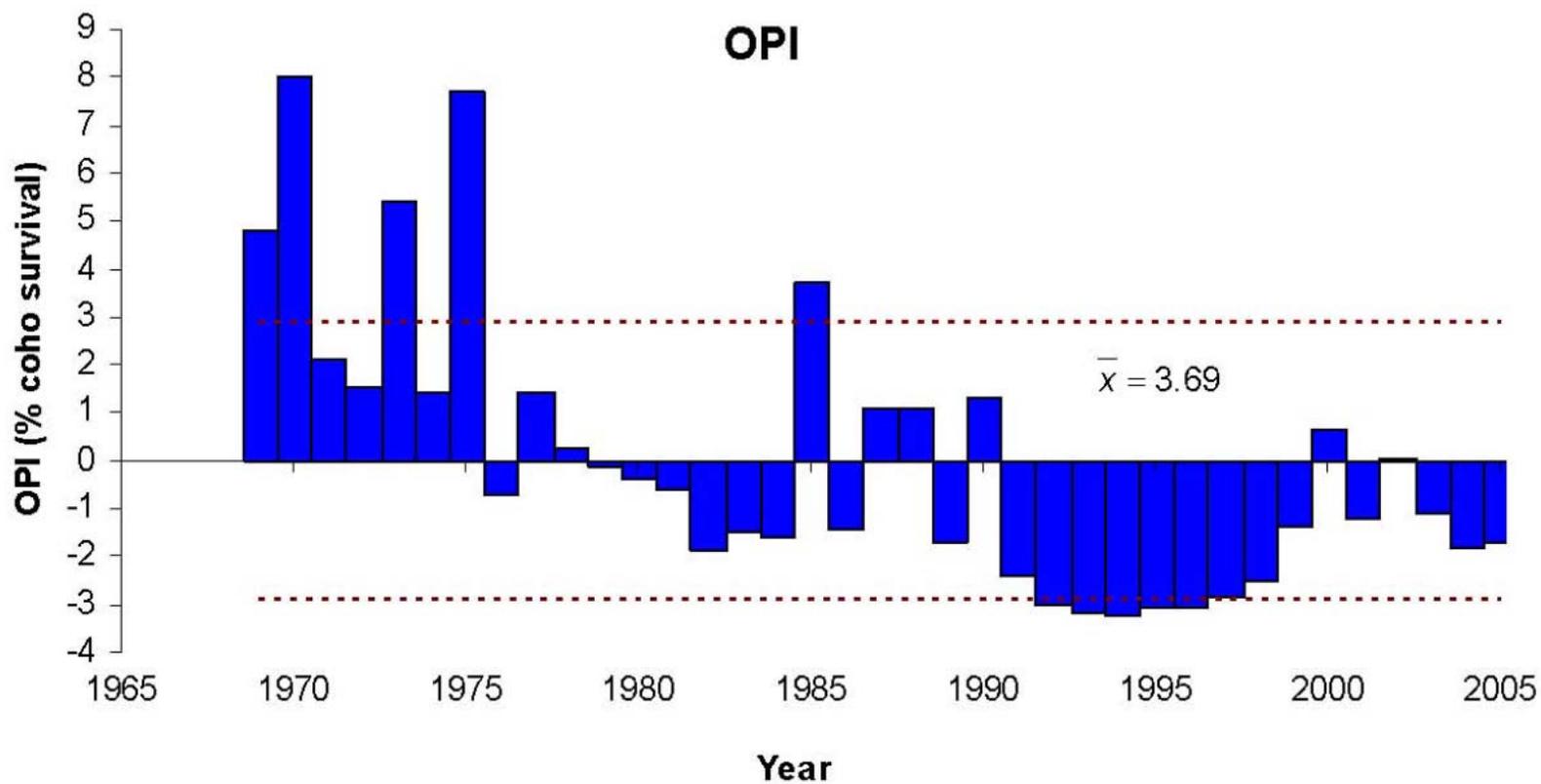
Advanced Ecosystem Research

## Ecosystem Oceanography

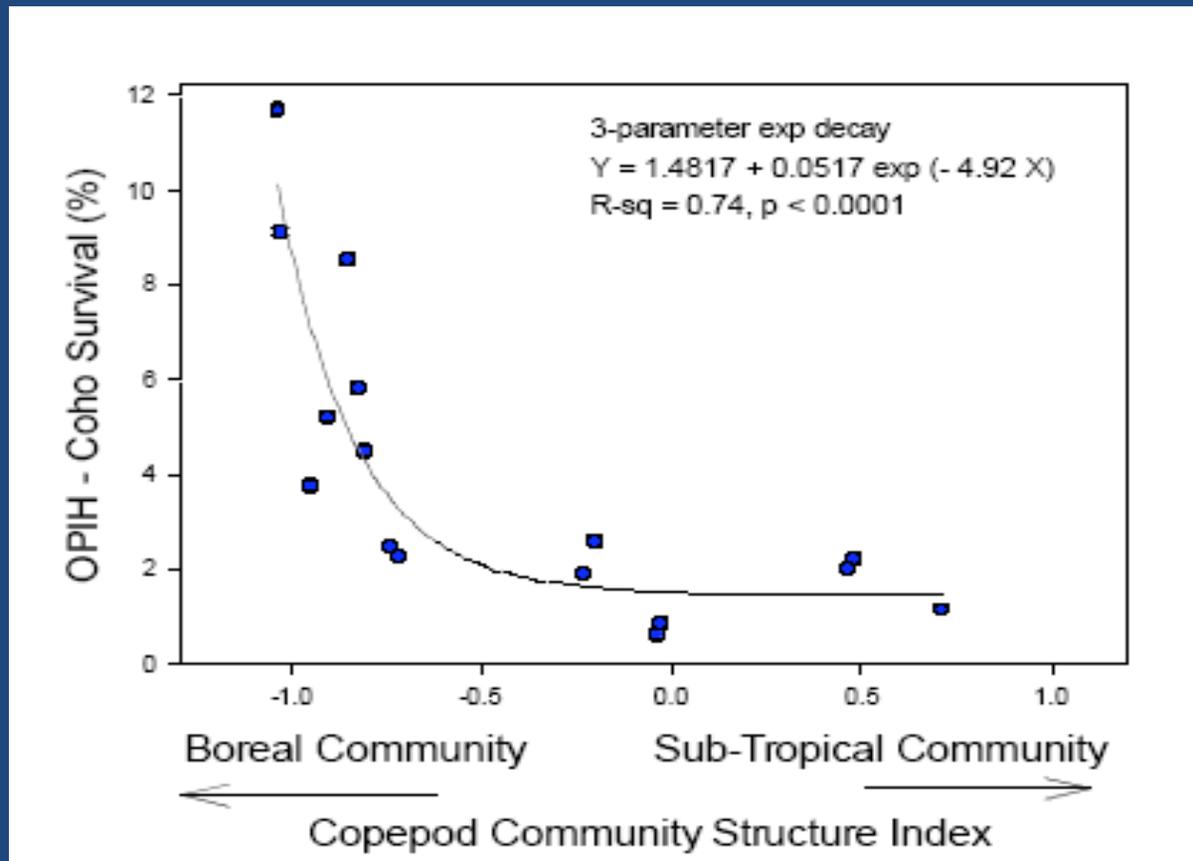
- Multi-disciplinary (physics to predators)
- Large (marine ecosystem) scale
- integrated ecological analyses (food webs)



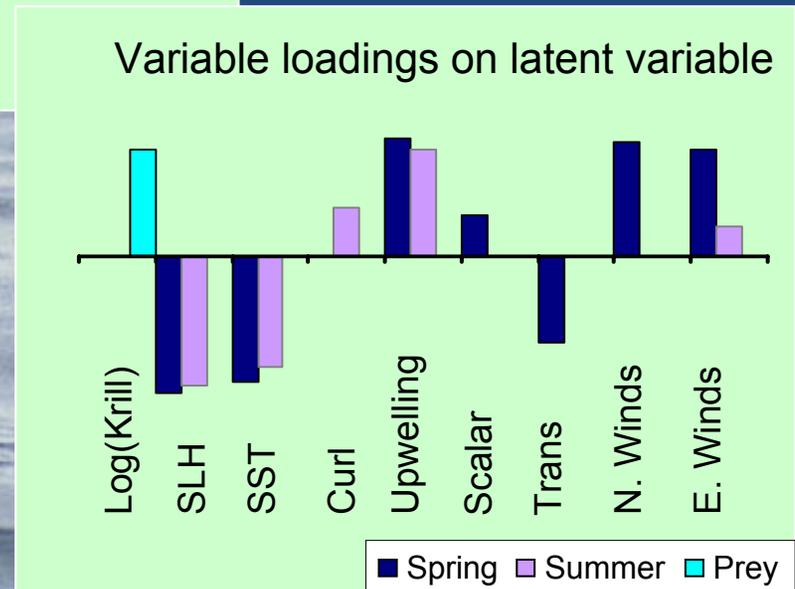
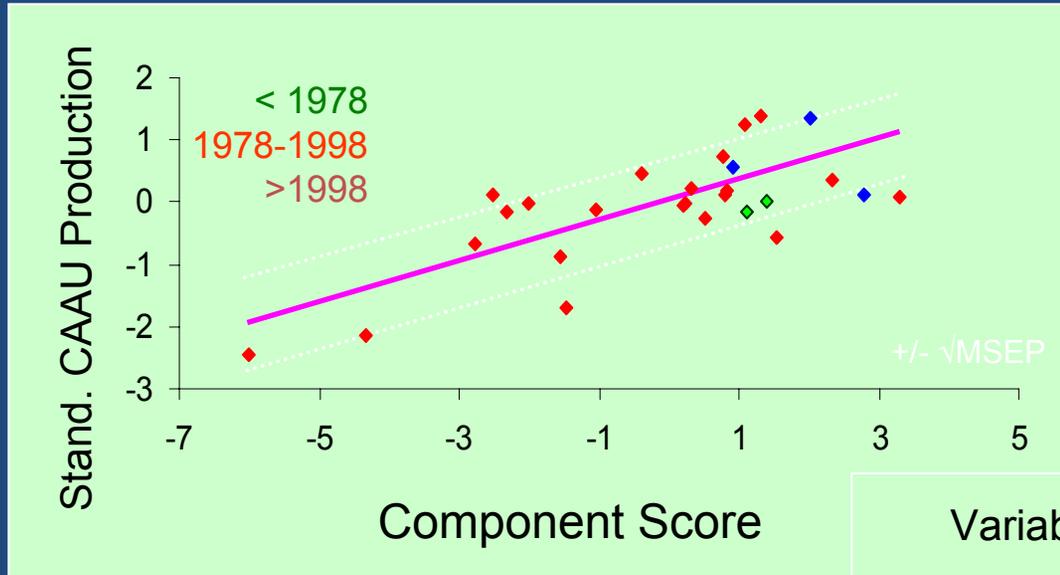
# Coho salmon survival, Oregon



# Copepod Community Structure and OR Coho Survival



# Cassins Auklet Production: $R^2 = 0.54$ , $P = 0.0001$ , $N = 27$



# First Biennial Ocean Climate Summit

## Finding Solutions for San Francisco Bay Area's Coast and Ocean



CALIFORNIA  
ACADEMY OF  
SCIENCES



NATIONAL MARINE  
SANCTUARIES

GULF OF THE  
FARALLONES



# First Biennial Ocean Climate Summit

## Finding Solutions for San Francisco Bay Area's Coast and Ocean



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GULF OF THE  
FARALLONES





Coastal and Ocean Economics

Judith Kildow, Ph.D

First Biennial Ocean Climate Summit

April 29, 2008



# Topics

- The Problem: Climate Change
  - Shoreline inundation
  - Ocean Acidification
  - Etc.
- Why you should care - What's at Risk?
- San Francisco area counties economies
- Facing the Challenge

THE  
BRITISH  
ARE COMING!  
THE BRITISH ARE  
COMING!!!

GLOBAL WARMING  
IS COMING!!  
GLOBAL WARMING  
IS COMING!!!

1987  
150  
THE STUDENT  
TRAVELER



M B A R I



# Remember the Date

IPCC Report: February 10, 2007

We are responsible  
for  
Rate of Change



US Oil and Gas Lease Sale in Chukchi Sea, Alaska  
**February 7, 2008**



# Reality

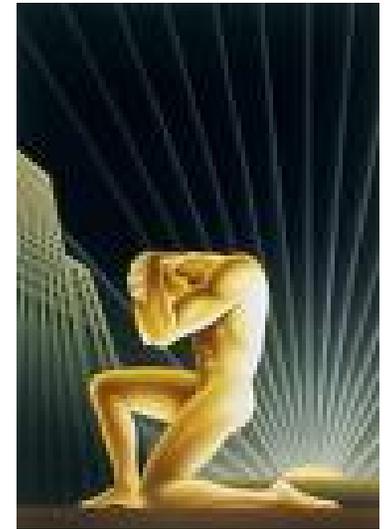
We created the world in 30 years.

We can't turn back time.

Only slow it down.

**The train has left the station!**

**Planetary changes occur in geological not  
ecological time...reversals will take  
millions of years**



# Climate Change

Greatest impacts will affect:

- Life furthest from the tropics
- **Those in low lying areas**
- **Areas with fastest growing populations**
- The poorest and least educated



# Raise Sea Levels (One meter rise)



 Area affected by a 1-meter sea rise

# What's at Risk?? (from the National Ocean Economics Program)



# Economic Effects

**Loss of:**

jobs...

homes...

economic productivity...



- 81% of US population in coastal states
- 50+% of US economy in coastal counties
- 50+% of US jobs in coastal counties

# More Economic Effects

Industries most vulnerable

- Insurance and Financial
- Power
- Tourism
- Transportation
- Agriculture
- Forestry
- Fishing AND MORE.....



# Coastal County Economy, 2005

	Establishments	Employment	Wages	GDP
Marin	11,692	108,938	\$5,960,388,330	\$15,186,992,926
San Francisco	44,158	535,547	\$37,930,293,745	\$109,924,935,246
Napa	4,766	65,201	\$2,619,756,360	\$5,724,823,022
San Mateo	23,063	334,873	\$22,770,115,959	\$55,233,497,297
Sonoma	17,711	191,572	\$7,956,499,608	\$17,540,601,425
SF area Counties Total	<b>101,390</b>	<b>1,236,131</b>	<b>\$77,237,054,002</b>	<b>\$203,610,849,920</b>



# Ocean Economy Sector

County	2004	Tourism and Recreation Sector in Coastal Zip Codes			
Marin		Establishments	Employment	Wages	GDP
		599	8,268	\$155,948,583	\$310,304,000
Napa		Establishments	Employment	Wages	GDP
		94	1,386	\$25,453,198	\$53,493,000
San Mateo		Establishments	Employment	Wages	GDP
		1,309	21,721	441,490,585	\$909,803,000
Sonoma		Establishments	Employment	Wages	GDP
		274	4,578	\$74,968,677	\$158,075,000
San Francisco		Establishments	Employment	Wages	GDP
		2,543	41,905	\$984,512,808	\$2,111,644,000



# GHG Impacts by end of Century

Oceans acidify and pH drops 3-5 points

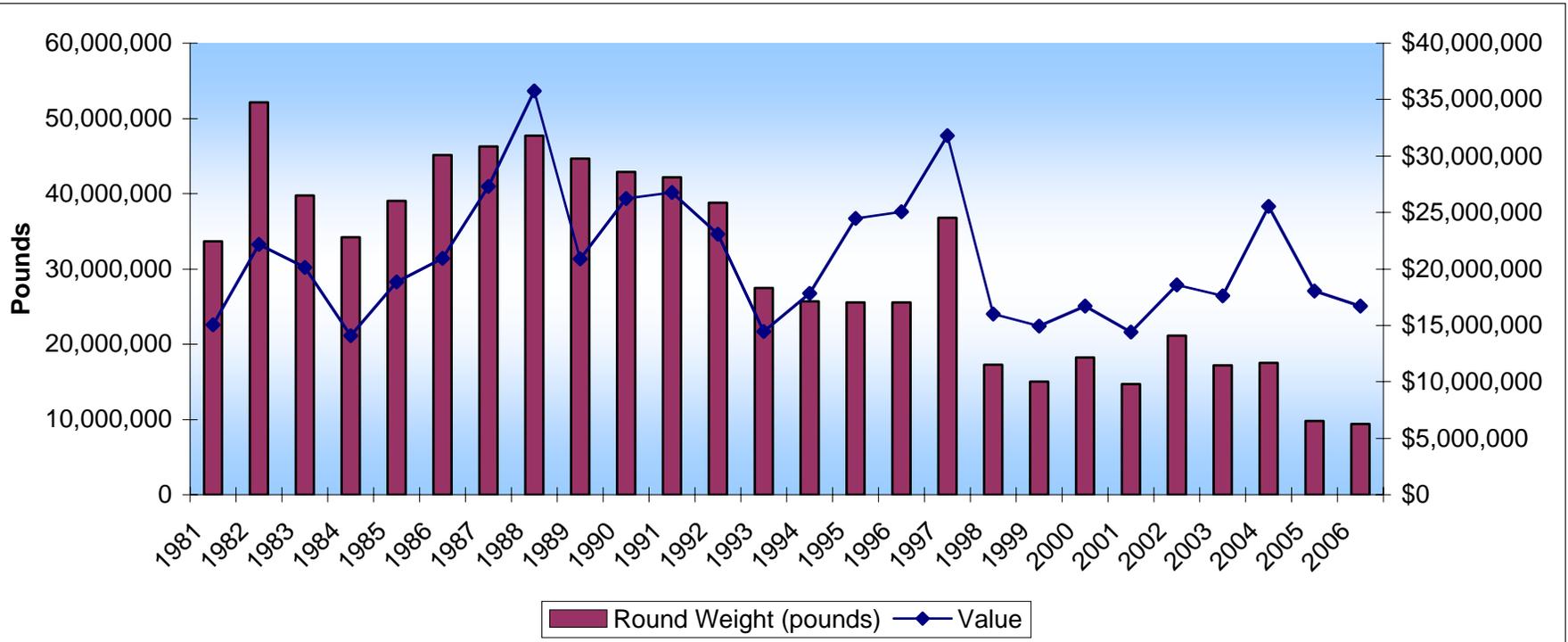
– Loss of Commercial and Recreational Fisheries

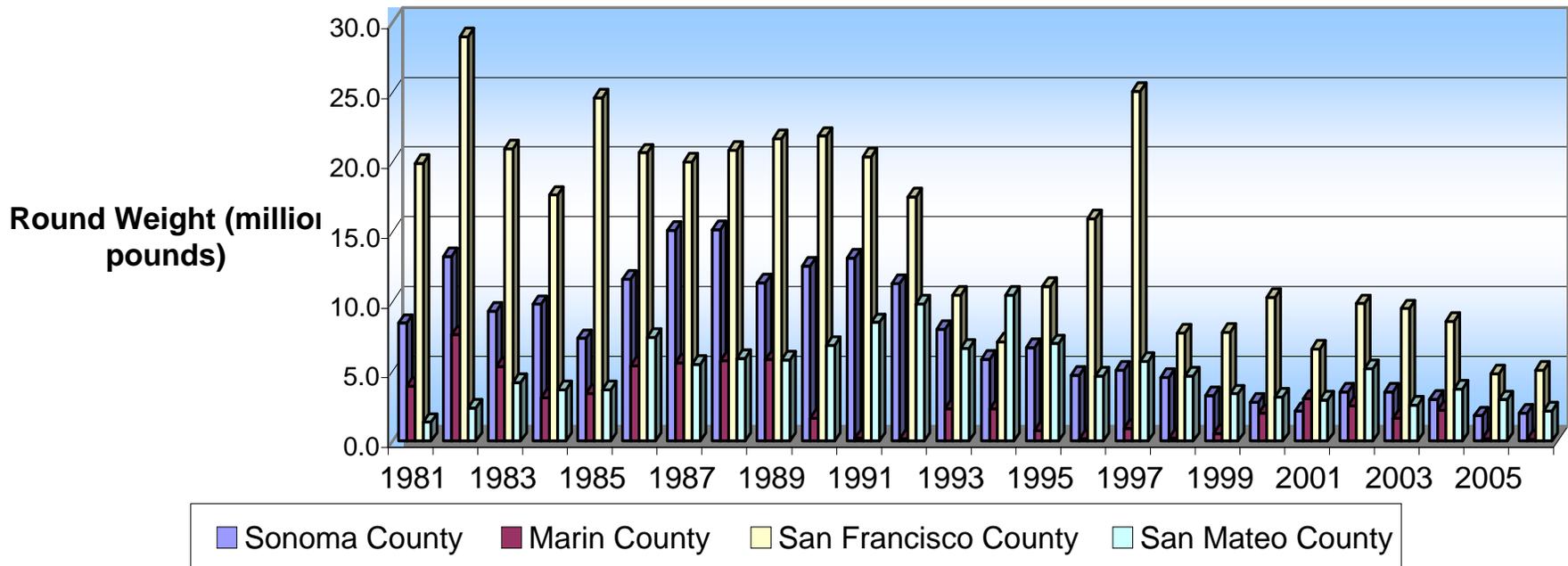
– Loss of Coral Reefs

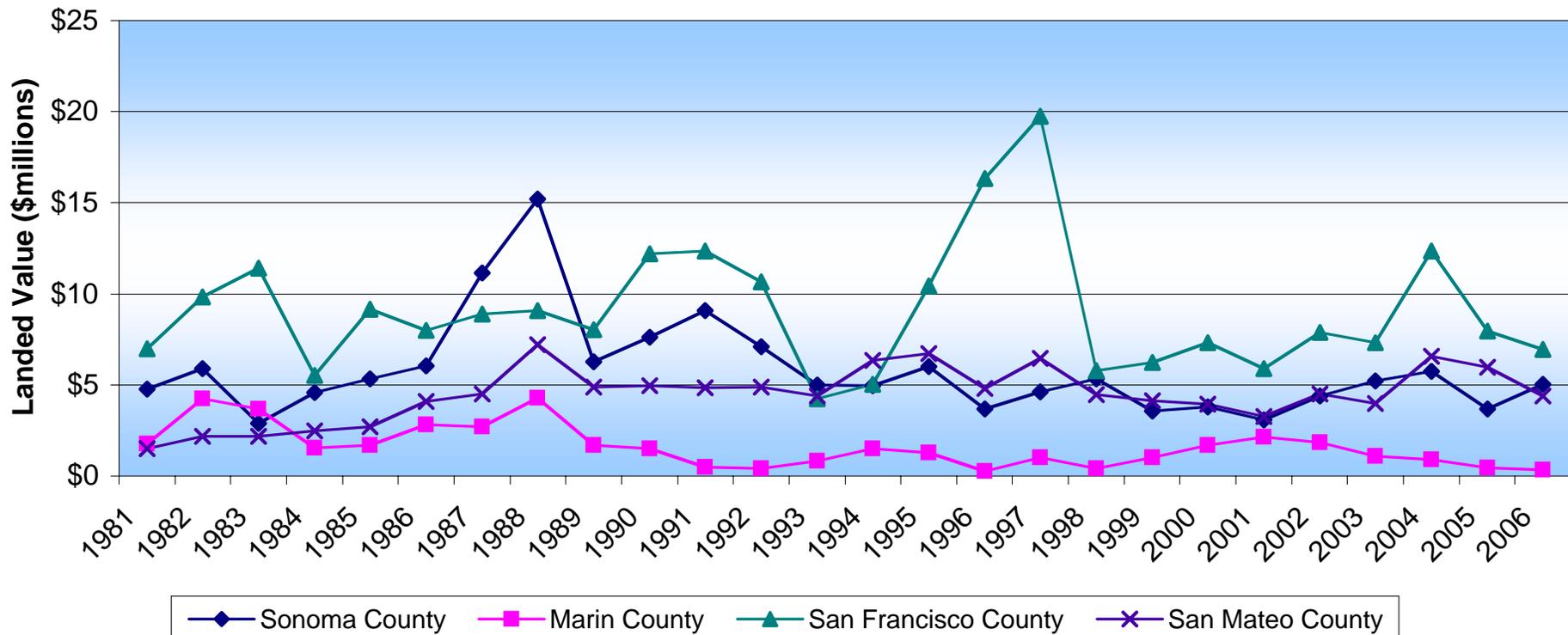


- Loss of Marine Mammals

# San Francisco Area Counties, 2006







# Business as Usual



## World GDP

- Could fall 5% to 20% by 2050 (\$8-32 Trillion) - N.Stern

## Assumption

- 2035 - GHG in atmosphere will double pre-industrial period with 2 degrees rise
- End of 21st century - 5 degree rise

# Types of Costs

- **Prevention Costs** - Stern Report
  - New industries, jobs, more investment
- **Investment costs** - New technologies, efficiencies, social paradigm shift
- **Destruction Costs** - Katrina losses

# “RATE OF CHANGE” IS WHAT MATTERS

**Rapid Social Change = Slower Environmental Change**



**Slower Social Change = Rapid Environmental Change**

# Who in the World?

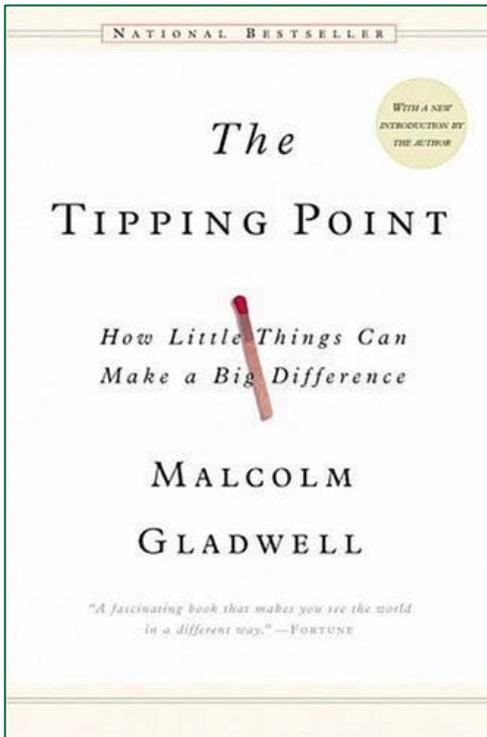
- Inaction now benefits people alive today
- Action now benefits the next generations
- Discount rates dictate how we spend \$
  - Intergenerational equity



M B A R I



# Tipping Points



- **Environmental** Tipping Points
- **Societal** Tipping Points

# Climate Change Could Cause:

- The largest and most consequential technology revolution for the next century
- 
- A Third Industrial Revolution - a carbon-free society
- A Social Paradigm Shift



# Technology Fixes

All new ideas are not solutions

- Plant trees
- Fertilize ocean
- Sequester carbon
- Rezone coast
- **Adapt or Mitigate**



**Oceans outstrip all others as a sink - 60%**

# It's Our Choice

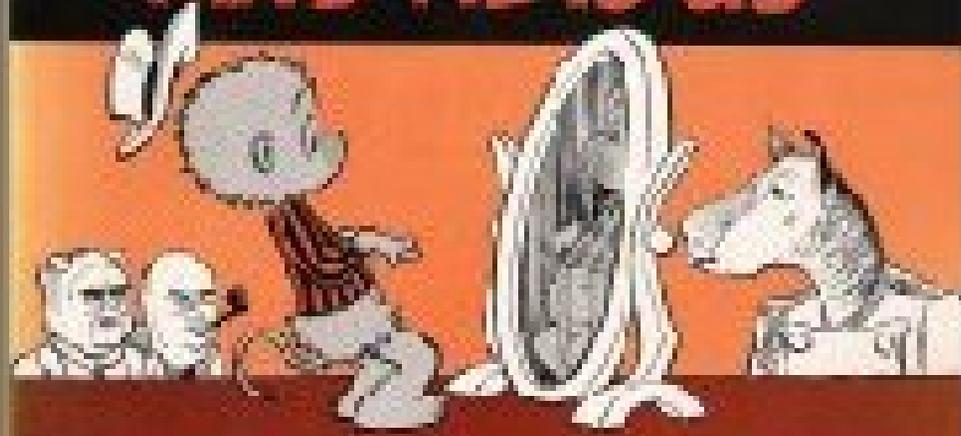
- Business as Usual
- Continue Economic Growth with mitigation investments toward a carbon-free society
- Stabilize Economic and Population Growth in a carbon-free society



11.95

# POGO:

**WE HAVE MET  
THE ENEMY  
AND HE IS US**



*Walt Kelly*



[www.oceaneconomics.org](http://www.oceaneconomics.org)

g

**QUESTIONS????**





kevin.sweeney@climateprotect.org



[wecansolveit.org](http://wecansolveit.org)

[kevin.sweeney@climateprotect.org](mailto:kevin.sweeney@climateprotect.org)

# Public Opinion Status

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## **GOOD NEWS**

- Technical capacity to achieve deep cuts within our grasp
- Media attention is high
- High level public awareness
- US Presidential Candidates pledged new policies

## **BAD NEWS**

- Low level sense of urgency
- Low level sense of solvability
- Low priority as a voting issue
- Policies being proposed inadequate and/or lack enough support
- Naysayers ramping up well-funded campaign
- Current advocacy efforts falling short

## The needle has moved...

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Most people are aware of climate change as a problem.

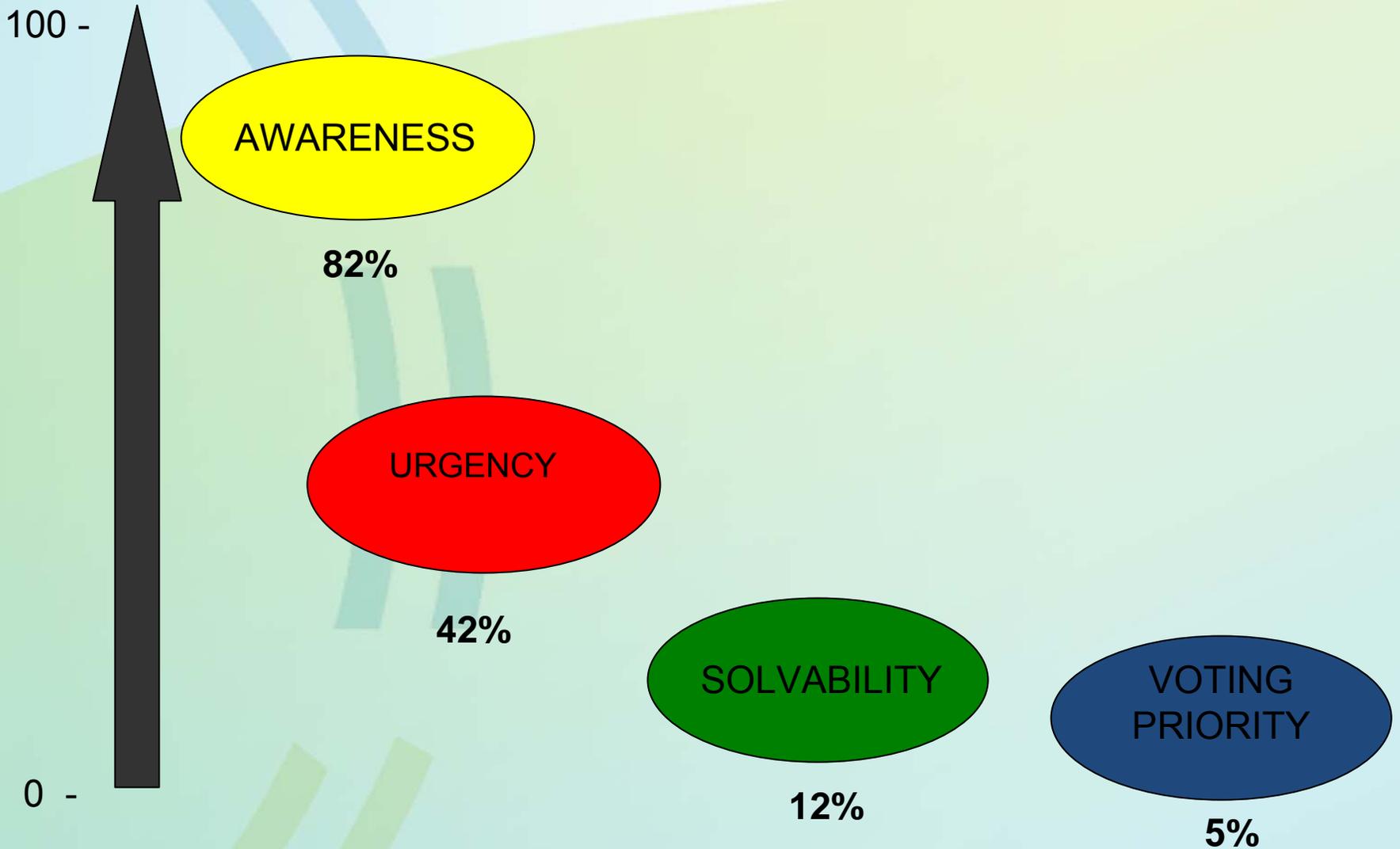
- 82% of Americans claim they know what climate change is and how it is affecting the environment
- 68% of Americans believe that “human activity” is responsible for global warming
- 69% of Americans believe that the earth is “heating up in a significant way”

## ...and it needs to keep moving

---

- In Presidential debates, Top reporters (NBC, CNN, ABC, CBS, FOX) ignoring issue: 3,201 questions – only 8 mentioned climate change
- Of 21 public policy issues tested in January 08, “dealing with global warming” ranks 20<sup>th</sup>.
- The partisan gap is deepening – 20-35 point spread between Democrats and Republicans

# Current US Public Opinion







**= Affordable power  
for Pennsylvania**

CLEAN COAL.

PENNSYLVANIASPOWER.ORG



**+ Technology  
= A cleaner environment  
for Pennsylvania**

CLEAN COAL.

PENNSYLVANIASPOWER.ORG

# America's Power print ad

More than 50 percent of Pennsylvania's electricity is generated by coal, at a third the cost of most other fuels.

Businesses come to Pennsylvania because that electricity is affordable. It's the same reason your electric rates have remained affordable. Without American coal, jobs would be more scarce and life could be more expensive.

America's Power, 2008

# Huge Opportunities for the Economy

820,000 new high-wage jobs at 42,000 companies if 20% renewables by 2020  
- *Blue-Green Alliance*

Capacity to create new jobs:  
*Wind = 2.79 jobs/MWavg*  
*Coal = 1.01 jobs/MWavg*  
- *Dan Kammen (UC Berkeley)*

3 million green-collar jobs,  
\$1.4 trillion in new GDP,  
\$284 billion net energy savings  
- *Apollo Alliance*

241,000 new jobs with 35 mpg fleetwide average by 2018  
- *Union of Concerned Scientists*

# CAMPAIGN OBJECTIVE AND STRATEGY

---

**Objective:** Persuade the American people, and people around the world, of the importance and urgency of solving the climate crisis.

**Strategy:** Mass persuasion and mobilization

Urgency

Solvability

Media and consumer branding integrated with grassroots organizing and online engagement

# Campaign Message

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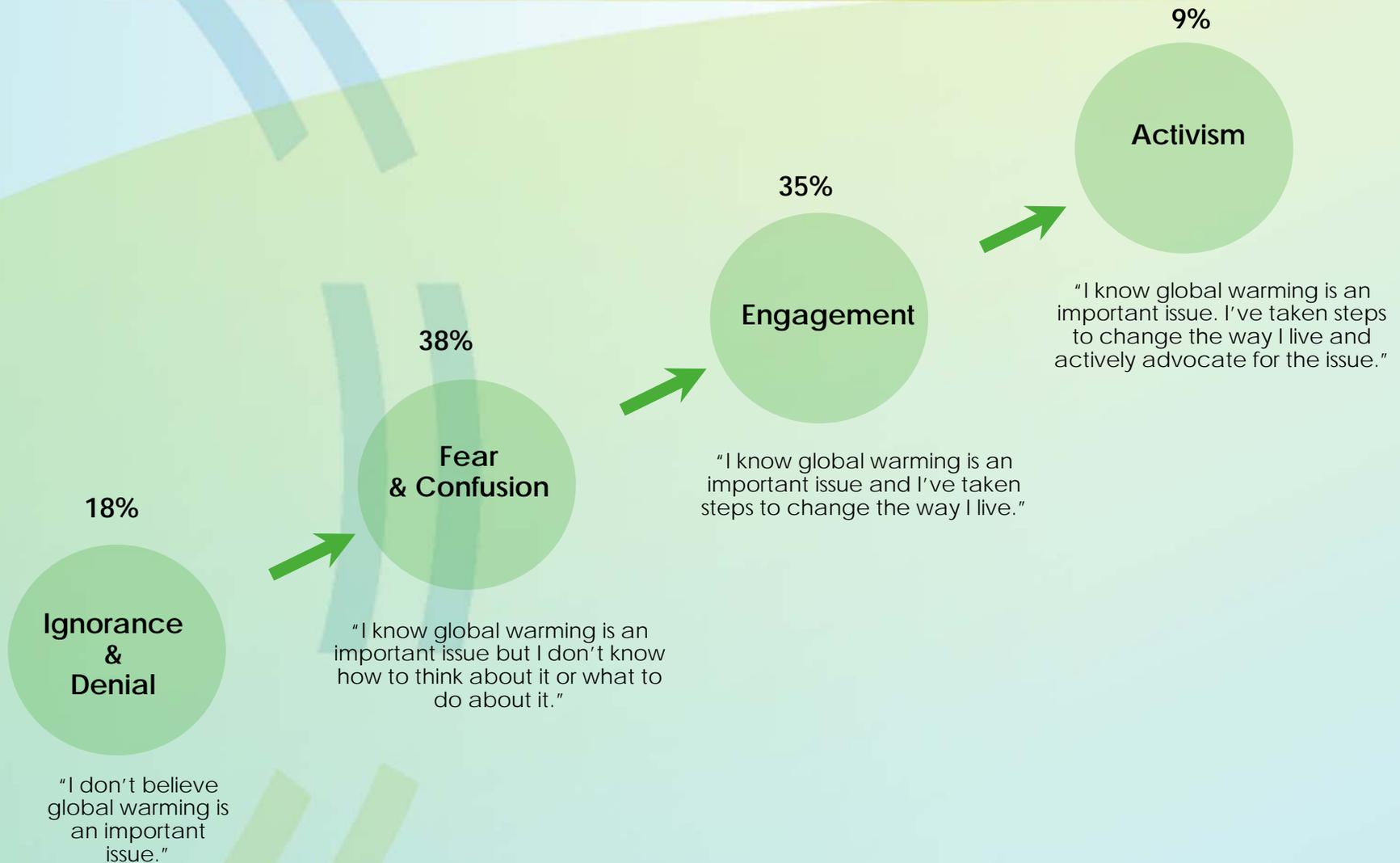
Create **hope** not fear, **urgency** not panic.

Issue an **invitation**, not an accusation.

Make **friends**, not enemies.

Generate **response**.

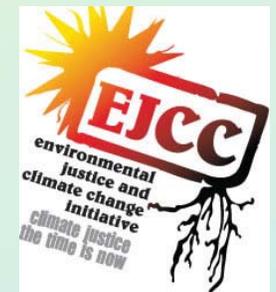
# CURRENT ATTITUDE GROUPINGS



# BROAD & DIVERSE PARTNERSHIPS TO MAINSTREAM ISSUE

## Meet the Partners

Family, Faith, Business, Labor, Youth, Hunters



# RESEARCH

---

In 2008, the Alliance will engage in four primary types of research:

1. Benchmark and Brand Tracking - Designed to benchmark and then measure changes and progress of the campaign over time
2. Values and Message Testing - Used to develop motivating solutions messaging for influencer target
3. Creative Testing - Qualitative and Quantitative pre-testing of creative executions to test efficacy
4. Engaging the Opposition - Test the expected back-and-forth with our opponents to inform the rapid response efforts



[wecansolveit.org](http://wecansolveit.org)

[kevin.sweeney@climateprotect.org](mailto:kevin.sweeney@climateprotect.org)

# First Biennial Ocean Climate Summit

## Finding Solutions for San Francisco Bay Area's Coast and Ocean





# **Regional Climate Change Actions**

**Bruce Riordan**

Bay Area Climate Solutions

First Biennial Ocean Climate Summit

April 29, 2008



Hope!  
Confidence!  
Challenge!



Not Bay Area in  
2050



Moscone Center



Academy of Sciences



Adobe



Berkeley FIRST (Financing)

# BayArea Green Business Program

- About Us
- Green Business Listings
- Becoming Green
- For Government
- Green Resources
- Contact Us

## Who Are We

A partnership of environmental agencies, professional associations, waste management agencies, utilities and a concerned public

## What We Are Doing

We are working together to recognize and assist businesses that operate in an environmentally friendly manner

Copyright © 2000 ABAG. All rights reserved.

Origen Marketing & Design

kmm 04/03/00

Green Business Program



Caltrain Baby Bullet



Emery-Go-Round



Fruitvale  
BART



Peninsula Caltrain

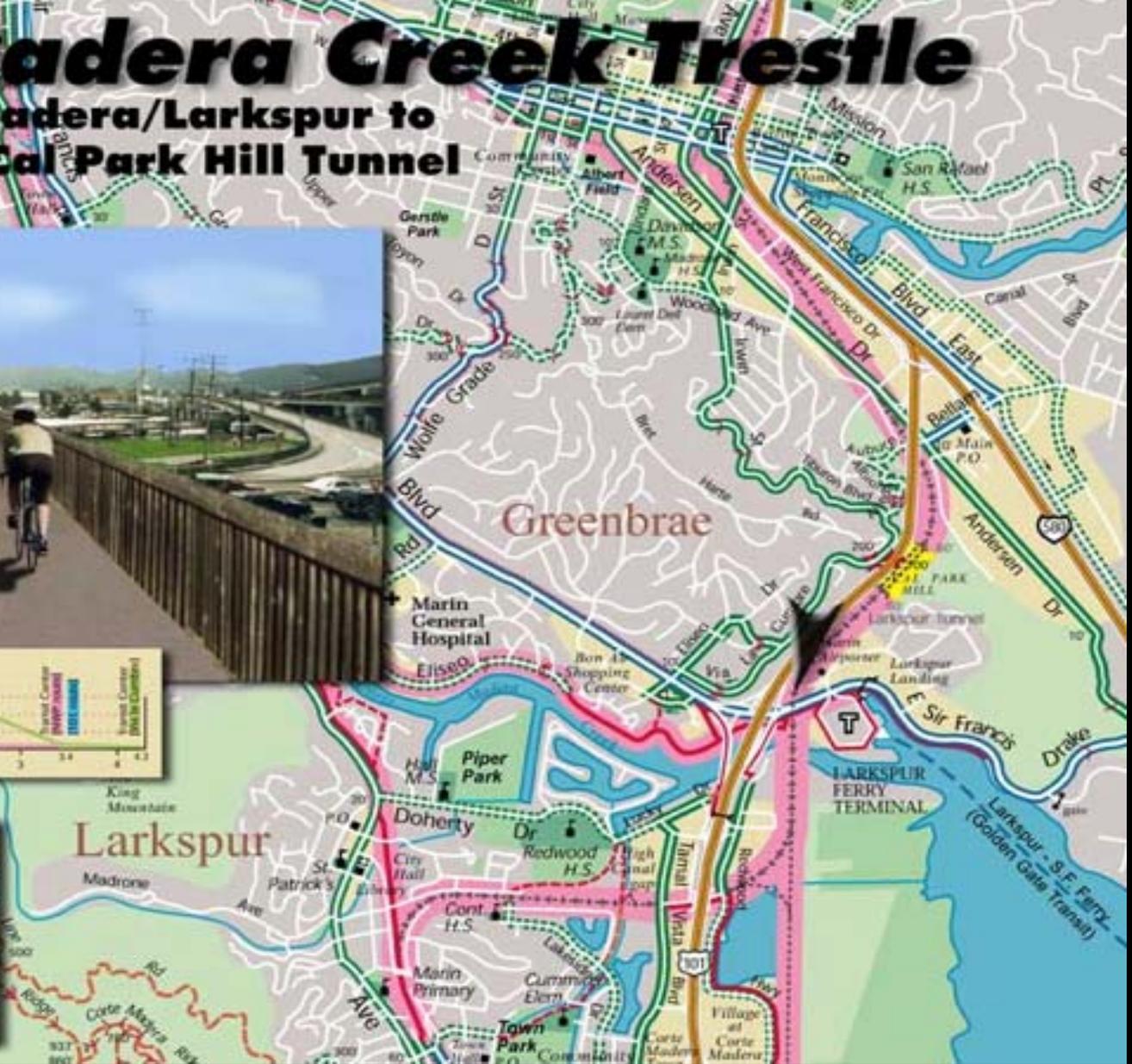


Sonoma Mountain Village

# Corte Madera Creek Trestle

Linking Corte Madera/Larkspur to San Rafael via Cal Park Hill Tunnel

**Proposed**



Marin County Bike and Pedestrian Master Plan



CalCARS Plug In Hybrid



# First Biennial Ocean Climate Summit

## Finding Solutions for San Francisco Bay Area's Coast and Ocean





**Bay Area Regional Agencies  
Climate Protection Program**

**Ted Droettboom**

San Francisco Joint Policy Commission

First Biennial Ocean Climate Summit

April 29, 2008



# Joint Policy Committee (JPC): Four Regional Agencies



Association of Bay Area  
Governments (ABAG)



Bay Area Air Quality  
Management District (Air  
District)



Bay Conservation and  
Development Commission  
(BCDC)



Metropolitan  
Transportation  
Commission (MTC)



# Climate and the Bay Area

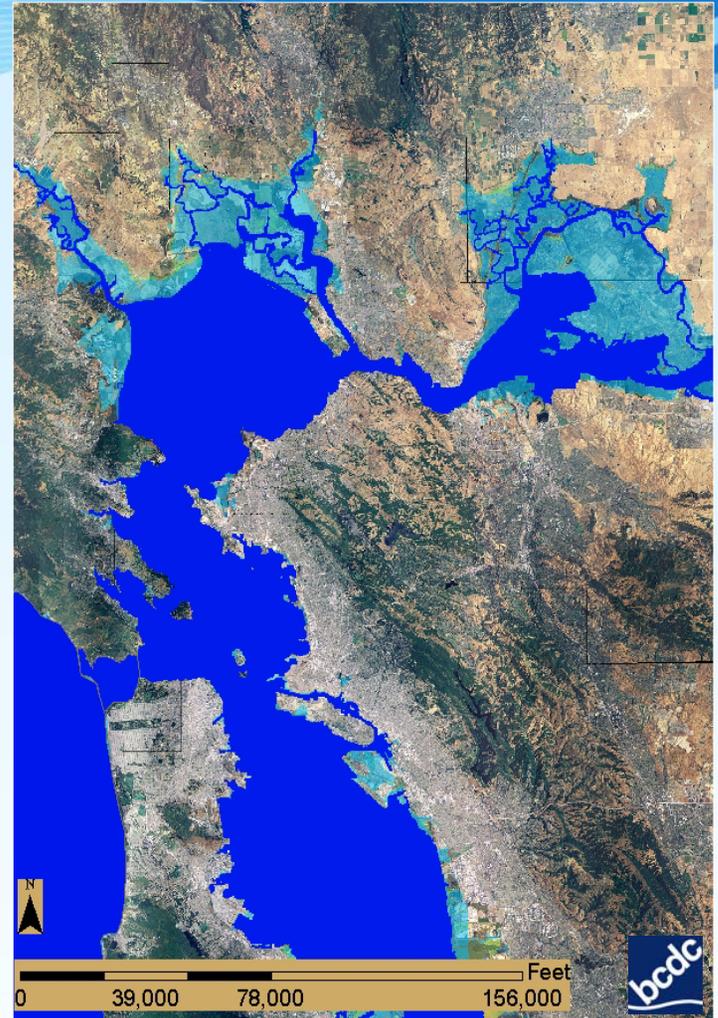
1. **Changes:** How we might be affected
2. **Challenges:** How we contribute to the problem
3. **Choices:** What we can do about it

# Changes:

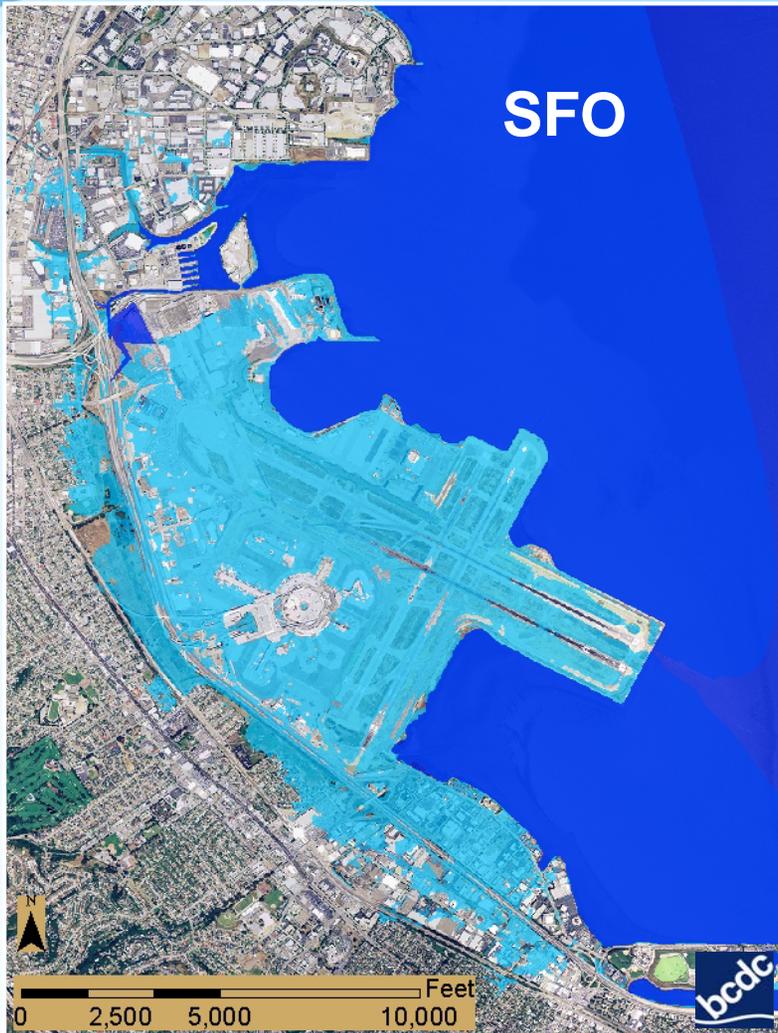
## By the End of the Century...or Earlier

Emission Scenario	Lower <i>2050 Target</i> (550 ppm)	Medium-High (830 ppm)	Higher <i>Business-as-Usual</i> (970 ppm)
Temperature rise	3.0-5.4°	5.5-7.9°	8.0-10.4°
Snow pack loss	30-60%	70-80%	90%
Sea level rise	6-14"	14-22"	22-30"
Heatwave days	1-2X	2-2.5X	3-4X
Increase in electricity demand	3-6%	11%	20%
Increase in large fire risk	10-35%	55%	NA

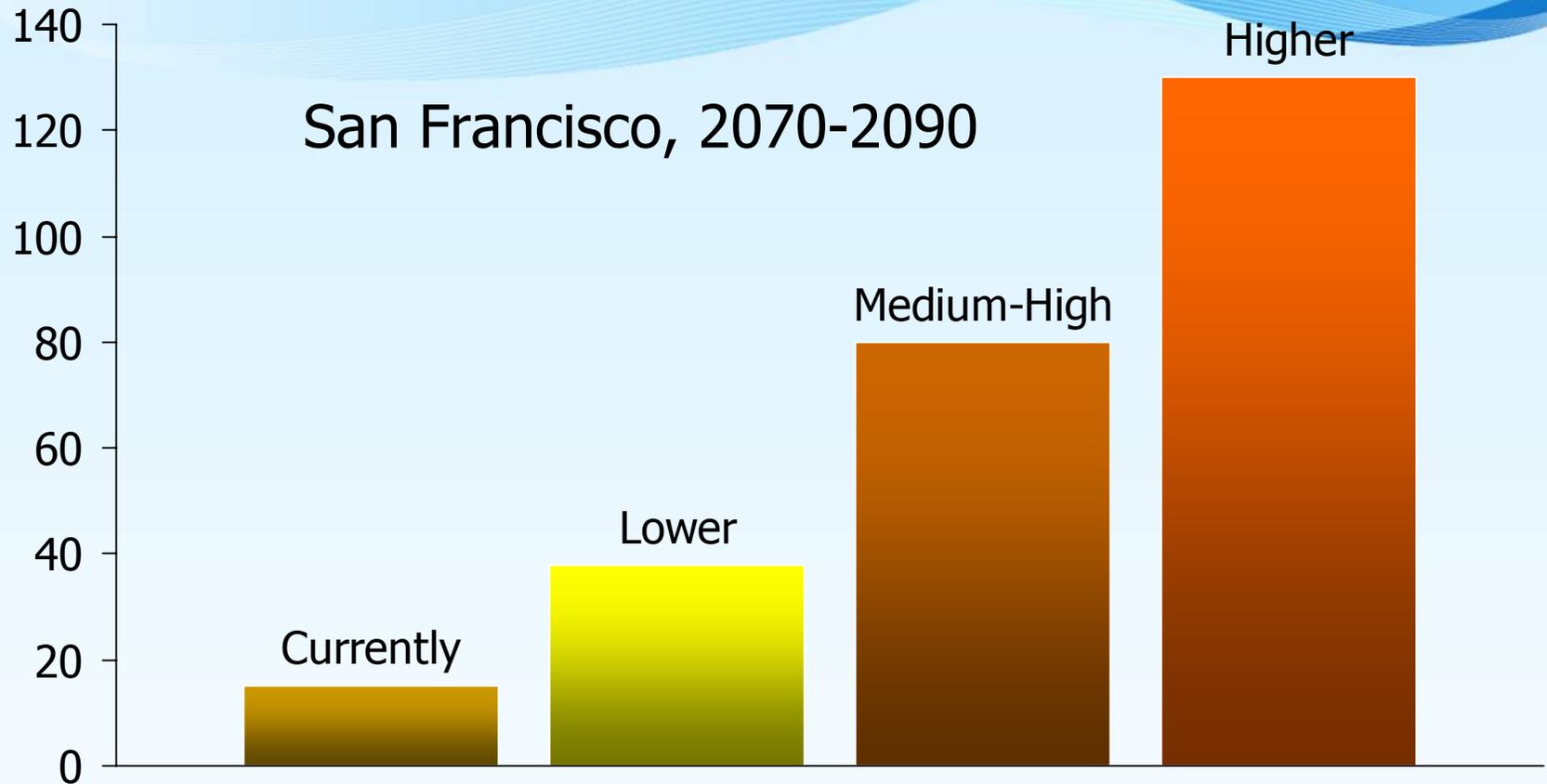
# Changes: Sea-level Rise and the Bay



# Changes: Sea-level Rise and the Bay



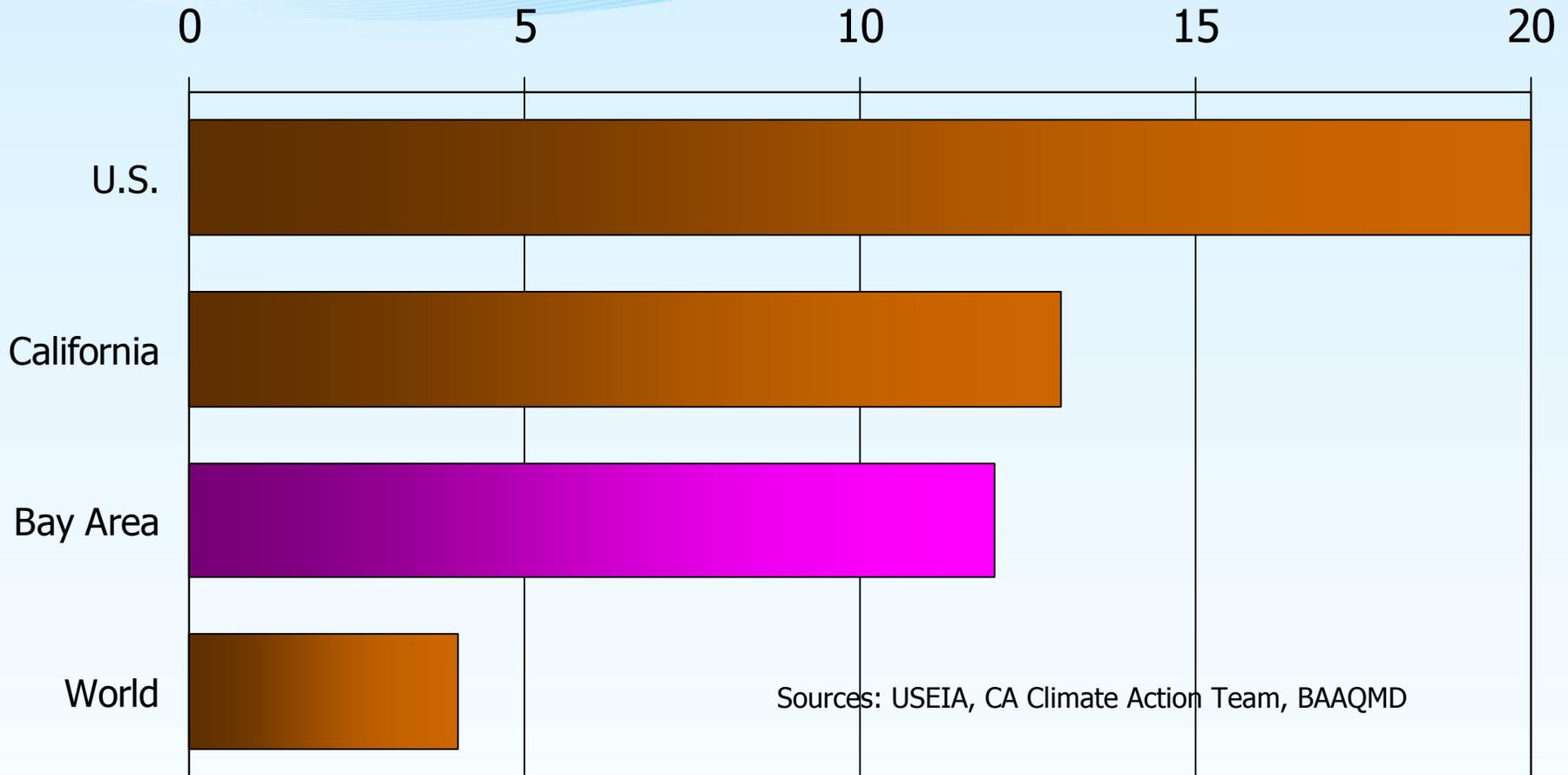
# Changes: Extreme Heat Days per Year



Source: BAAQMD

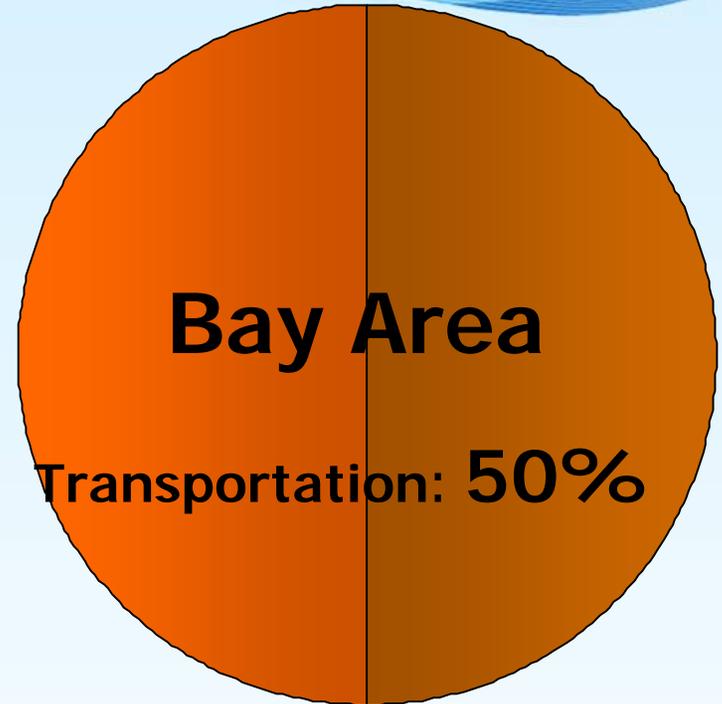
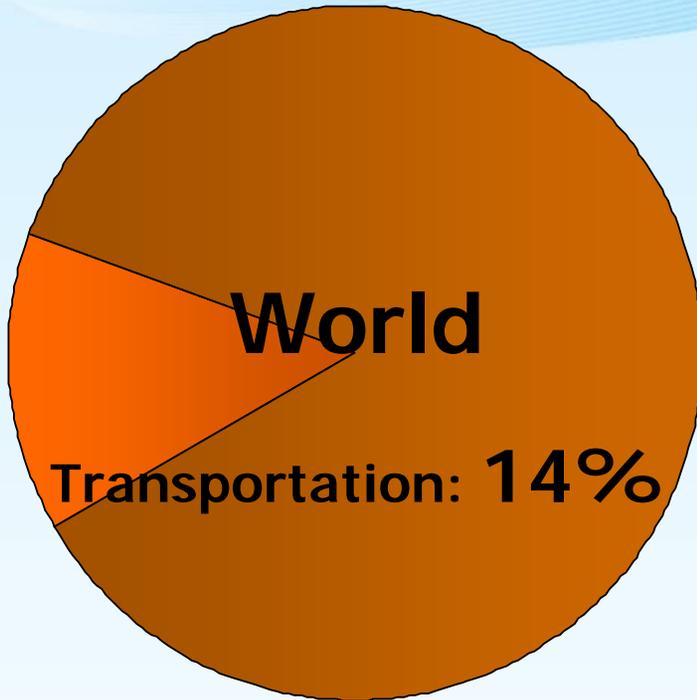
# Challenges: CO<sub>2</sub> Emissions per Capita

Metric Tons/Year



Sources: USEIA, CA Climate Action Team, BAAQMD

# Challenges: GHGs Compared

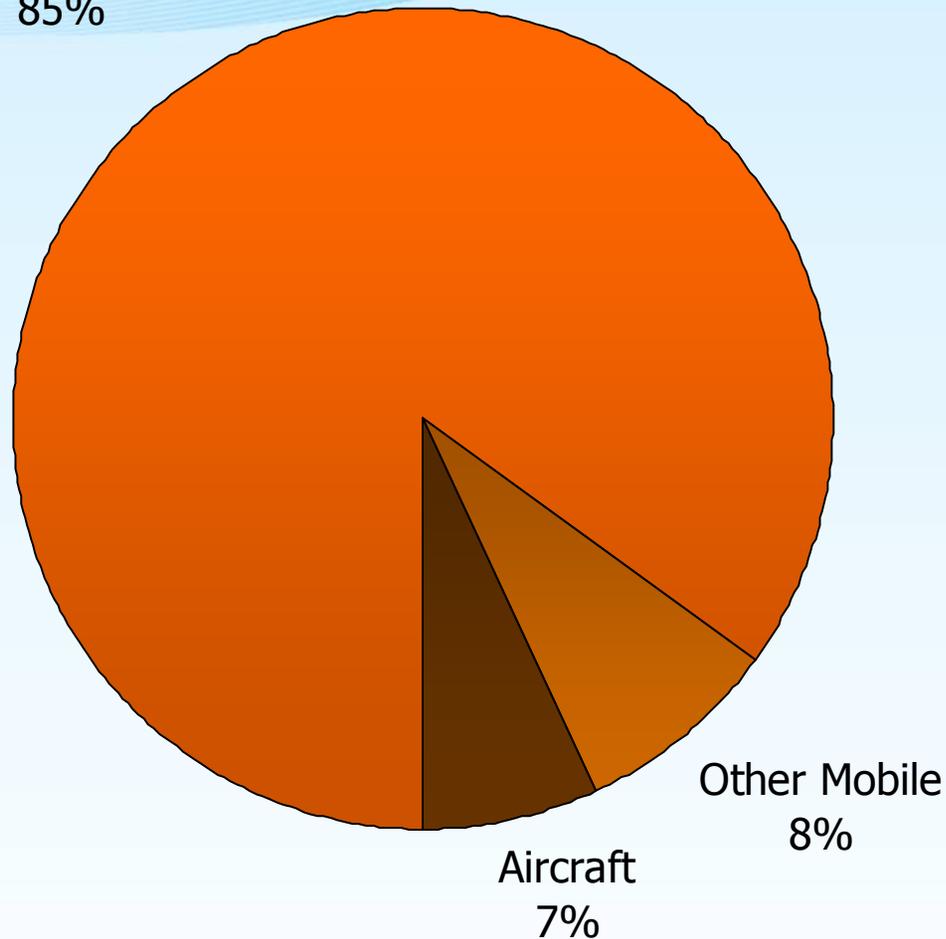


Sources: USEIA, BAAQMD

# Challenges:

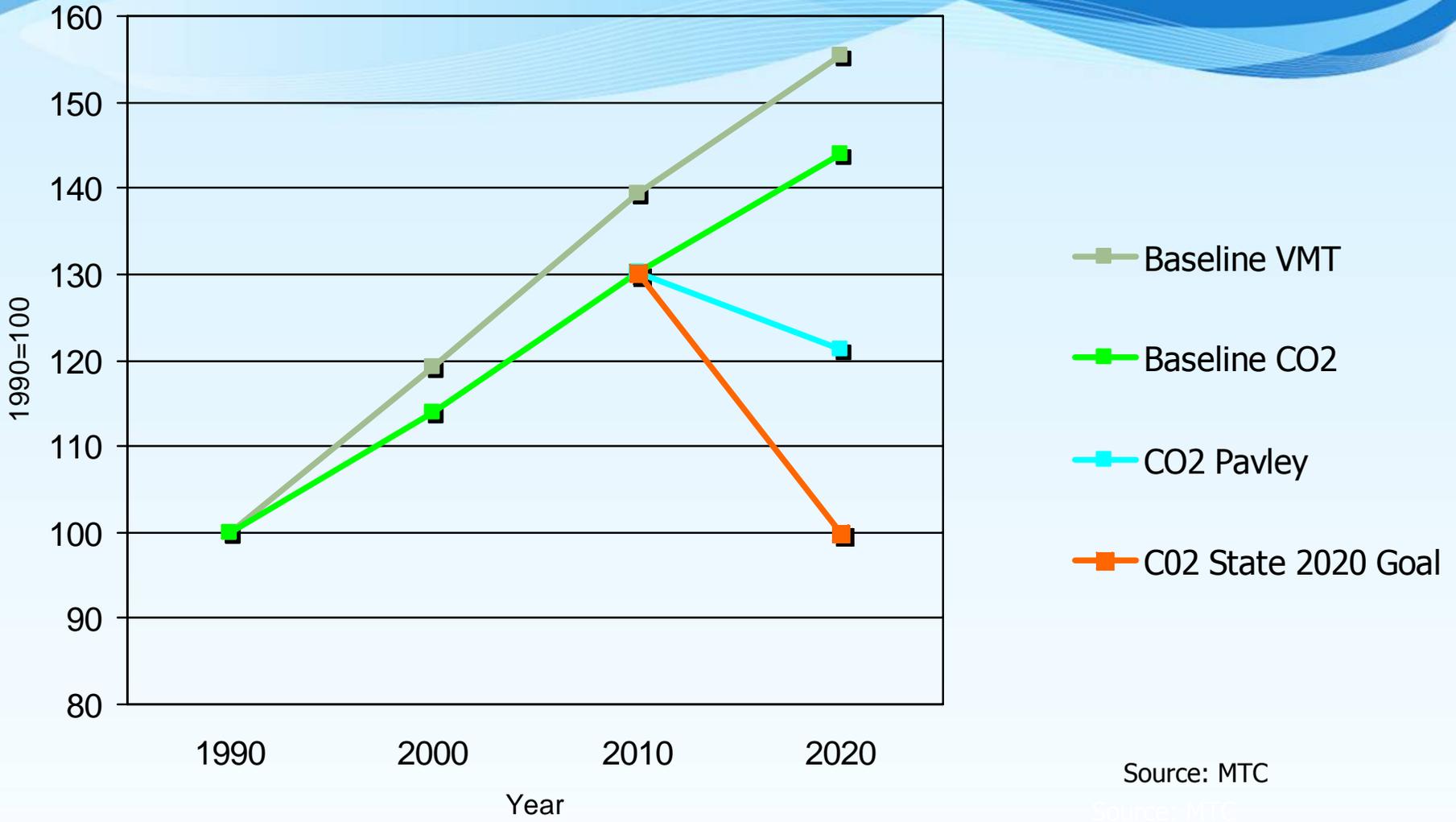
## Bay Area Transportation GHGs

On Road Vehicles  
85%



Source: BAAQMD

# Challenges: Beyond Emission Standards



# Choices:

## Individual Agency Climate Initiatives

### ABAG

- Smart Growth/FOCUS
- Energy Watch
- Green Business

### BAAQMD

- Climate Summit
- Regional GHG Inventory
- Climate Grants
- Outreach
- Integration

### BCDC

- Sea-level Rise Study
- Adaptation Strategy

### MTC

- Smart Growth
  - TLC/HIP
  - TOD/FOCUS
- Transit Expansion
- Fix-It-First Emphasis

# Choices:

## Joint Agencies Climate Program

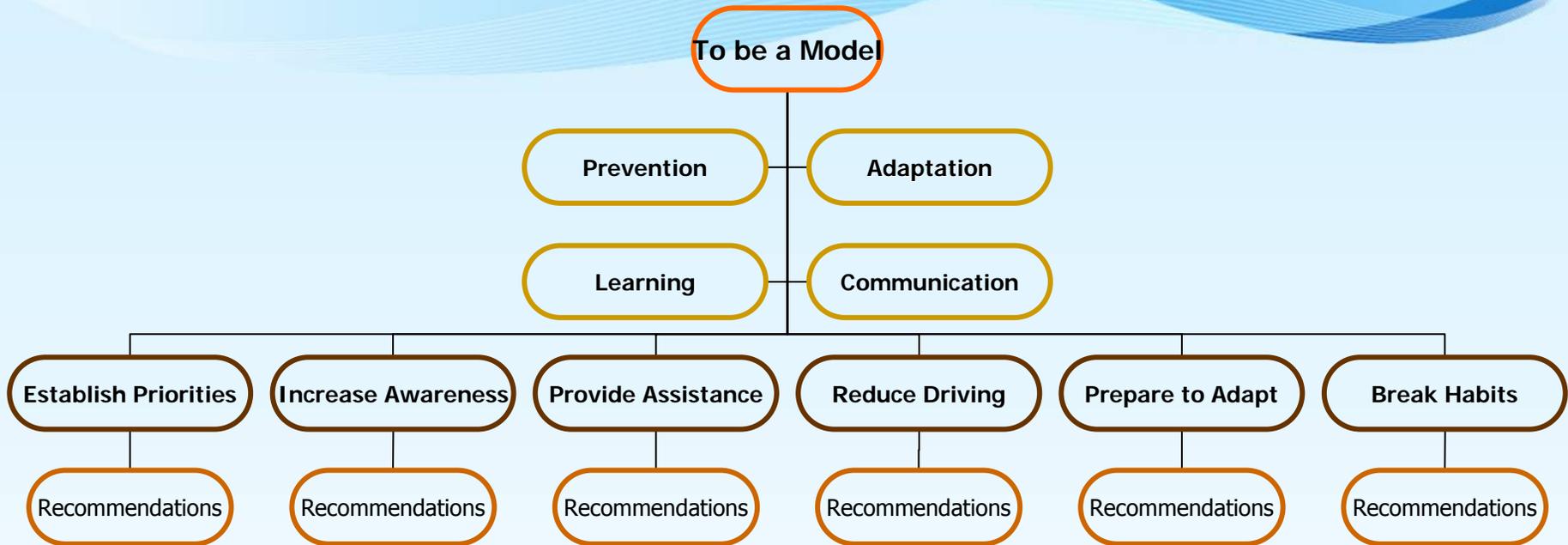
- Developed over 6 months
- 3 JPC meetings
- 2 public workshops
- Emphasizes **joint regional** actions
  - Synergies
  - Economies of Scale
- Not a fixed plan
- A structure for
  - Moving forward
  - Working together
  - Learning
  - Communicating
  - Improving
- Approved by JPC in July

# Choices: Program Structure

- One Key Goal
- Four Supporting Goals
- Six Strategy Elements
- Twenty action recommendations



# Choices: Program Structure



**Choices:**

**Key Goal**

**To be a model for California,  
the nation and the world.**



# Choices:

## Supporting Goals

- **Prevention**—Meet and surpass state targets
- **Adaptation**—Maintain safety and sustainability
- **Learning**—Measure and evaluate
- **Communication**—Document and publicize

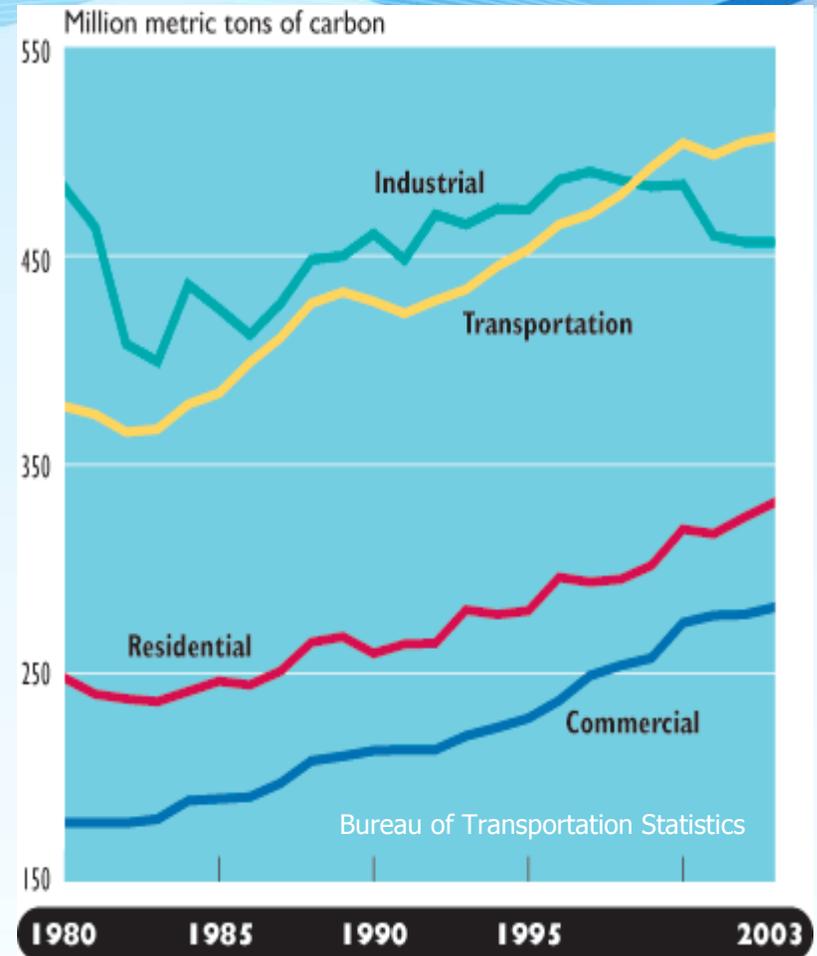
# Choices:

## Strategy Elements

1. Establish priorities
2. Increase public awareness and motivate action
3. Provide assistance
4. Reduce driving/promote alternatives
5. Prepare to adapt
6. Break old habits

# Choices: Strategy Elements

1. Establish priorities
2. Increase public awareness and motivate action
3. Provide assistance
4. Reduce driving/promote alternatives
5. Prepare to adapt
6. Break old habits



# Choices: Strategy Elements

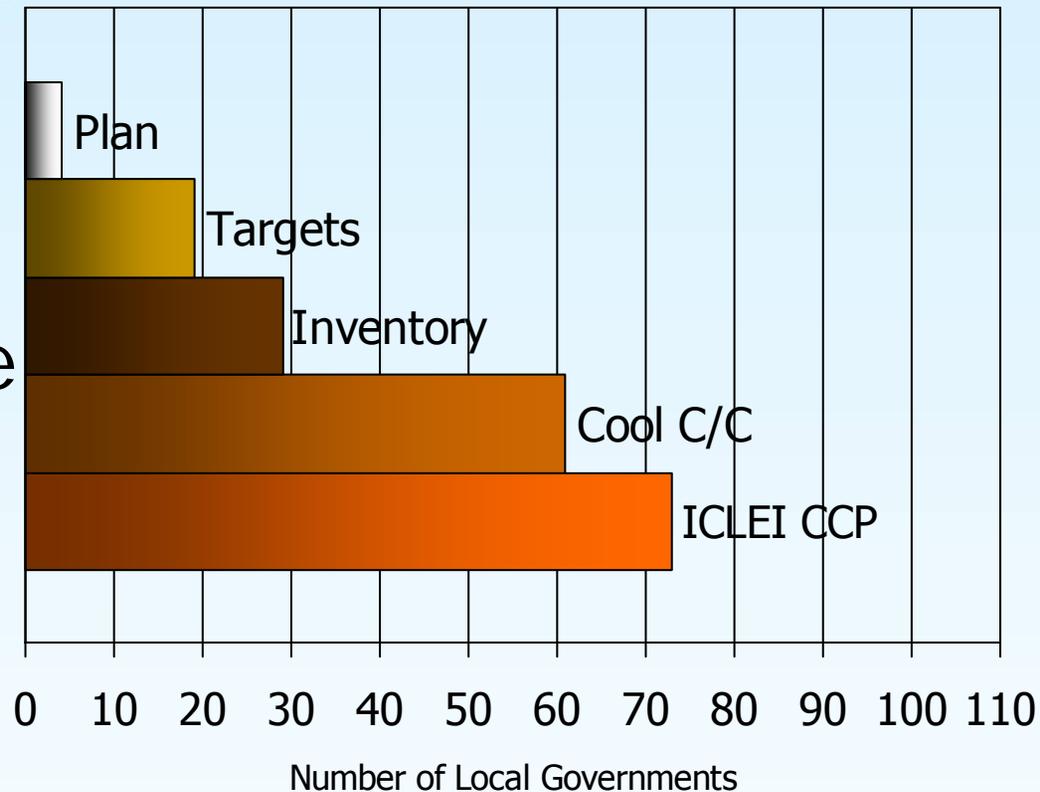
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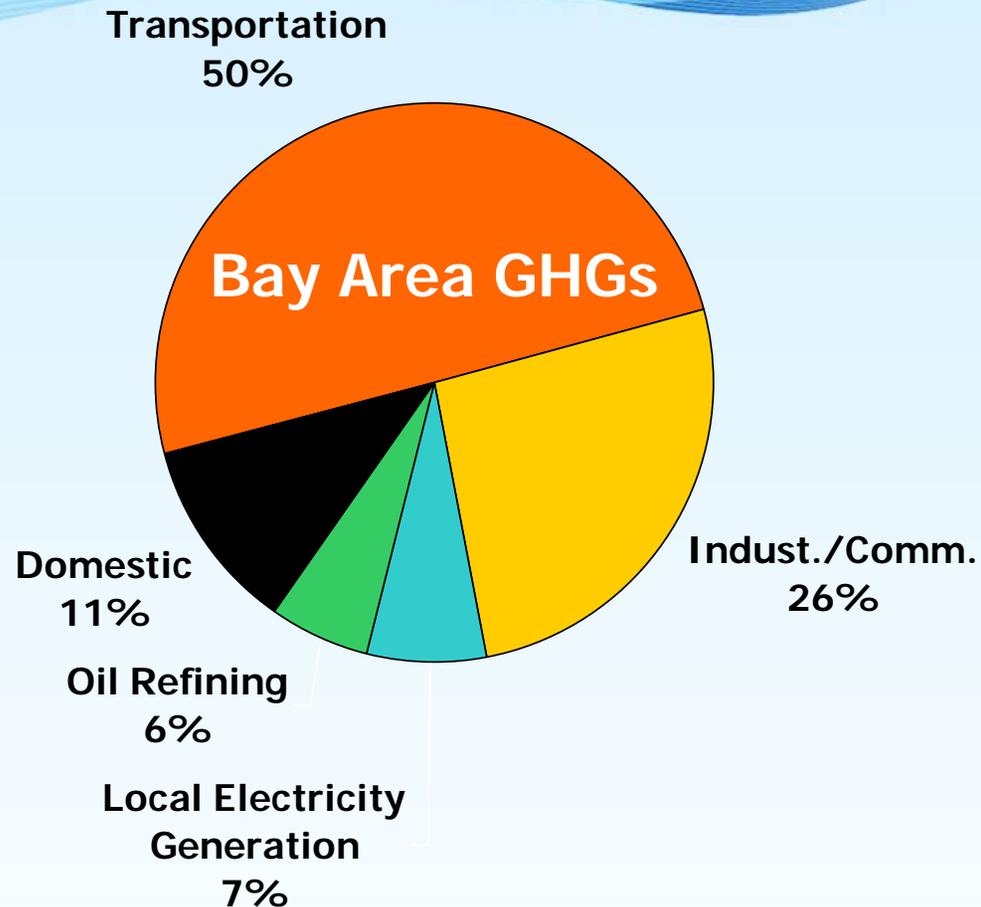
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Bay Area Local Governments  
Climate Actions



# Choices: Strategy Elements

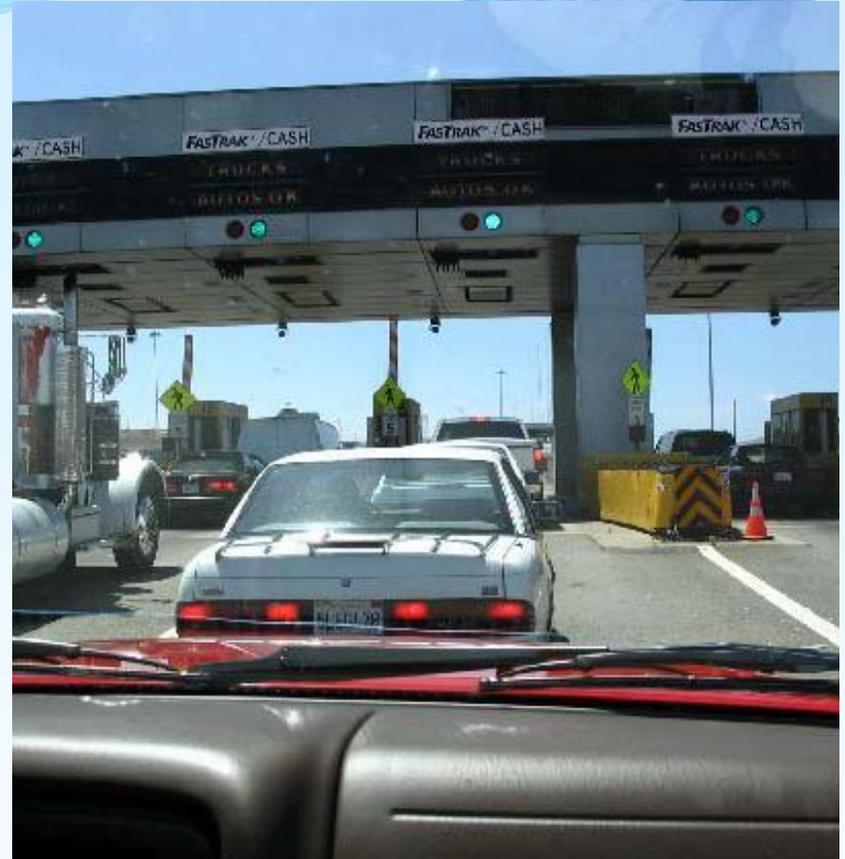
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# Choices:

## Reduce Driving/Promote Alternatives

- Pricing
- Land Use



# Choices:

## Reduce Driving/Promote Alternatives

- Pricing
- Land Use
- Can be effective in short term
- Need to deal with equity issues
- Need to provide choices
- Will be politically difficult



# Choices:

## Reduce Driving/Promote Alternatives

- Pricing
- Land Use
- Most effective in the long term
  - 1% annual growth rate
  - In any year, 99% of development is given
- Need to start now for long-term benefits
- Will also be politically difficult



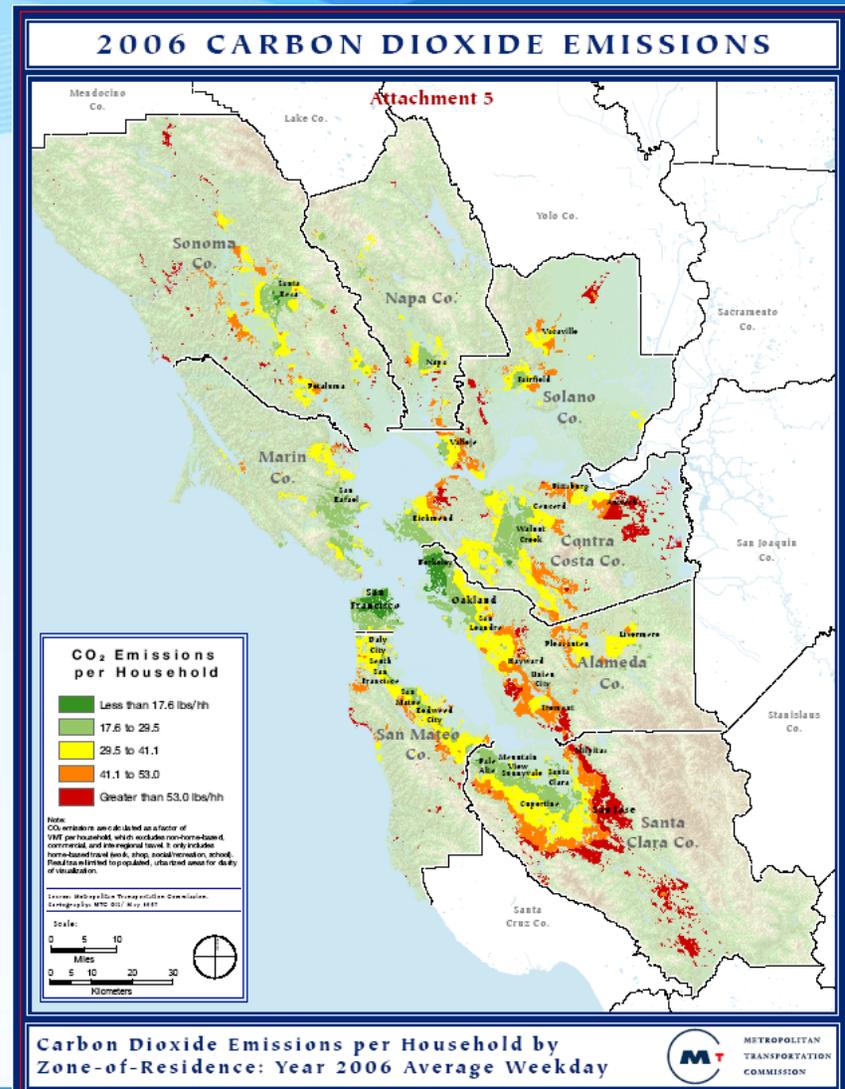
# Choices:

## Reduce Driving/Promote Alternatives

- Pricing
- Land Use



Transportation CO<sub>2</sub> from compact development is 20-40% less than from sprawl.

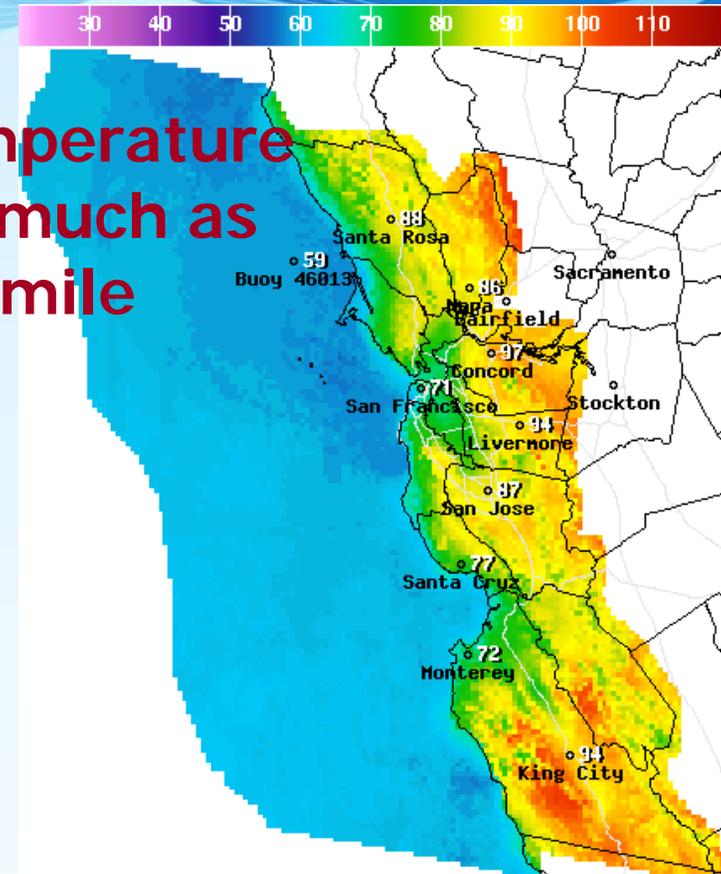


# Choices:

## Reduce Driving/Promote Alternatives

- Pricing
- Land Use

**Bay Area Temperature Gradient: As much as a degree per mile**



# Choices: Strategy Elements

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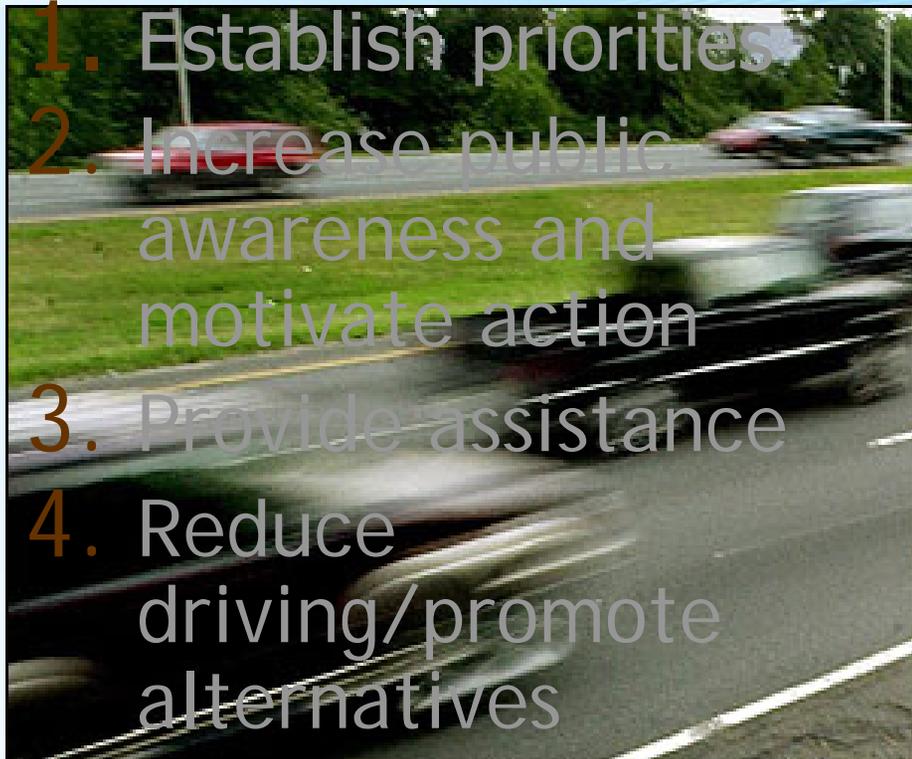
Chronicle / Liz Hafalia



# Choices:

## Strategy Elements

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# More Information



## The Joint Policy Committee

[www.abag.ca.gov/jointpolicy](http://www.abag.ca.gov/jointpolicy)

# First Biennial Ocean Climate Summit

## Finding Solutions for San Francisco Bay Area's Coast and Ocean



CALIFORNIA  
ACADEMY OF  
SCIENCES



NATIONAL MARINE  
SANCTUARIES  
GULF OF THE  
FARALLONES





# California's Climate Change Efforts

**Bill Dean, Ph.D**

California Environmental Protection Agency

First Biennial Ocean Climate Summit

April 29, 2008



# IMPACTS TO CALIFORNIA FROM GLOBAL WARMING

- ❑ Increased fire risk
- ❑ Sea level rise
- ❑ Loss of snow pack
- ❑ Heat waves that threaten public health and worsen air pollution
- ❑ Damage to agricultural industry
- ❑ Loss of native flora and fauna

# Why this matters to us:

- ❑ California is *uniquely* vulnerable
- ❑ 1,000 Miles of Coastline
- ❑ Dependent on Sierra snowpack for water (and energy)
- ❑ Dependent on Delta for fresh water
- ❑ Sensitive Agricultural Economy



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TIM DICKINSON Posted Jun 28, 2007

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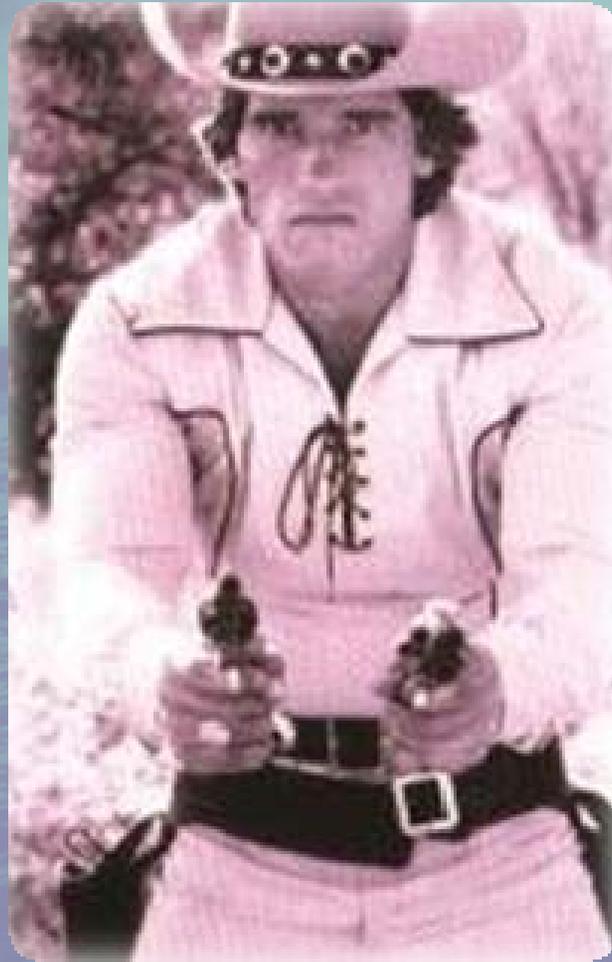
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## White House cuts global warming from report

Environmental study censored, say critics

**Fortunately, there's  
a new Sheriff in town!**



# 2005 Executive Order Established Statewide GHG Targets

**By 2010, Reduce to 2000 Emission Levels**

**By 2020, Reduce to 1990 Emission Levels**

**By 2050, Reduce to 80% Below 1990 Levels**



# Climate Action Team (CAT)

- ❑ Created under Executive Order
- ❑ Cabinet Level Members
- ❑ Coordinate the Process



# Unprecedented Effort

- ❑ Virtually all state agencies engaged
- ❑ Climate Action Team (CAT) coordinating the effort of 12 Subgroups
- ❑ All environmental agencies working together
- ❑ All environmental policies viewed through climate change lens



# Assembly Bill 32

- ❑ Global Warming Solutions Act of 2006
- ❑ Emissions Cap: Reduce GHG emissions to 1990 levels by 2020 (30% reduction)
- ❑ Detailed action schedule



# Land Use Sub-Committee of CAT (LUSCAT)

- ❑ Interacting with local governments
- ❑ Examining how land use decisions impact GHG emissions
- ❑ Reviewing planning processes within GHG context
- ❑ Working to improve transit system

# Scenario CAT Subcommittee

- ❑ Centered at PIER
- ❑ Funding research on sea levels, storm impacts

# Water Energy Group

- Examining link between GHG and water
- Evaluating California's water system and state water plan update

# Adaptation Sub-Committee of CAT

- Kicking off Adaptation Team
- Led by Resources Agency

# What's the Plan?

- ❑ ARB is working on its Scoping Plan, as required by AB 32.
- ❑ The Plan contains 100+ measures and strategies for reducing GHG emissions.
- ❑ Draft of Scoping Plan to come out in June.
- ❑ Final version to be adopted by ARB November 2008.