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# Overview of NOAA's Climate-Living Marine Resources Science and Management Challenges

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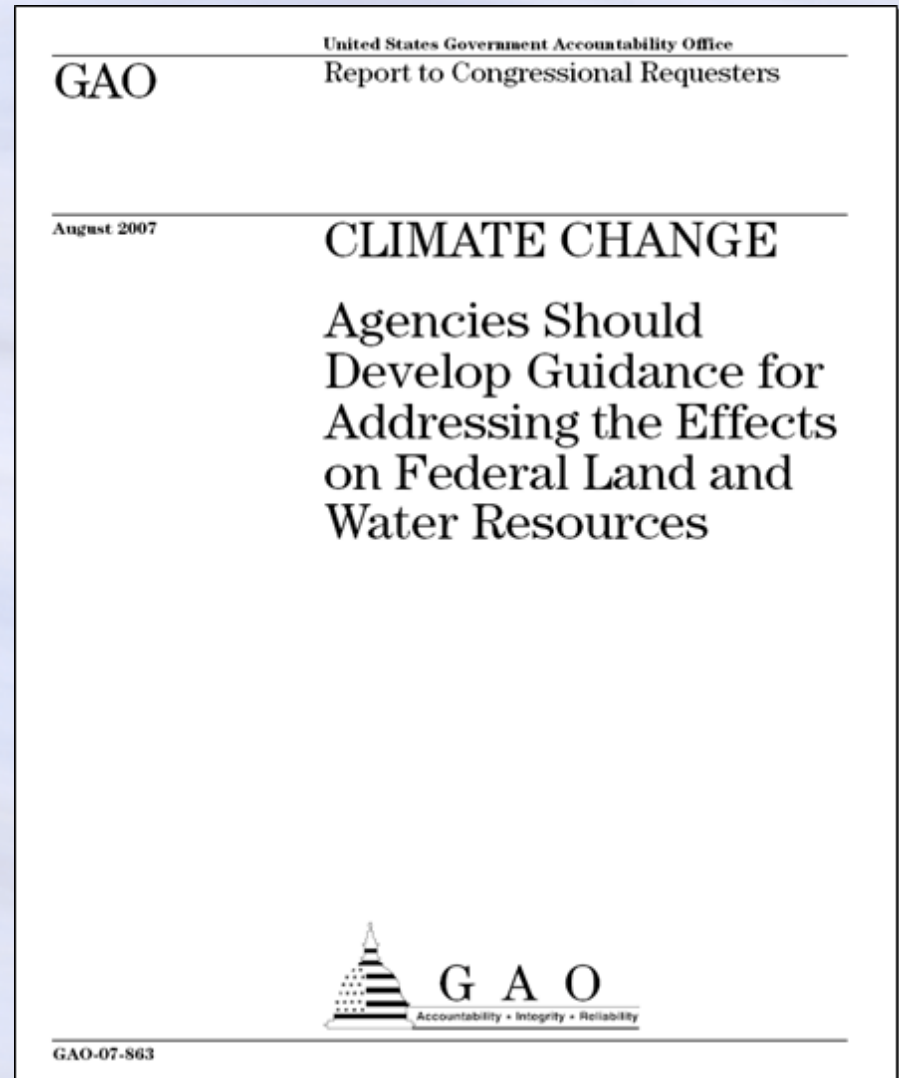
October 21, 2008



# August 2007 GAO Report

“In general, resource managers lack specific guidance for incorporating climate change into their management actions and planning efforts.

Without such guidance, their ability to address climate change and effectively manage resources is constrained.”





# GAO Report: Recommendations



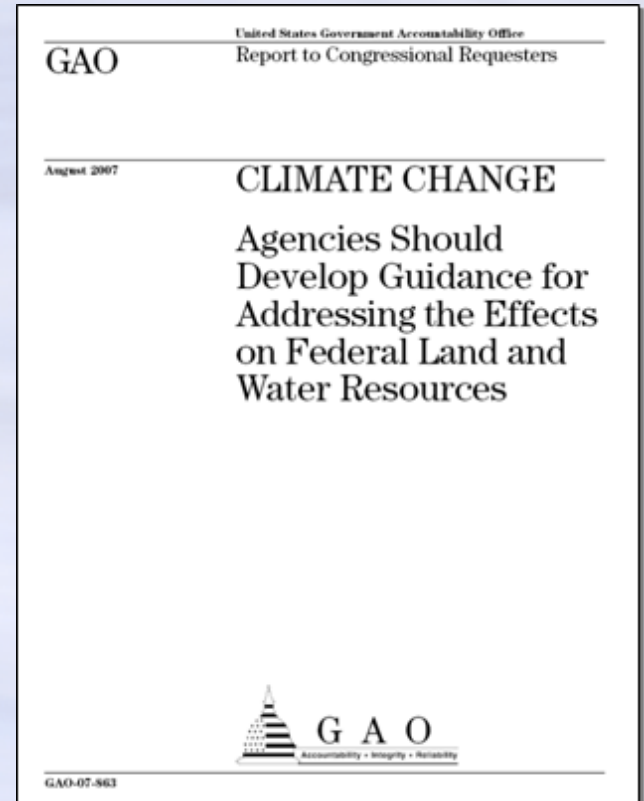
- *“GAO recommends that the Secretaries of Agriculture, Commerce, and the Interior develop guidance incorporating agencies’ best practices, which advises managers on how to address climate change effects on the resources they manage and gather the information needed to do so.”*
- *“Resource managers at our workshop also said that climate change is not a priority, in part, because of limited support from agency leaders. Specifically, resource managers discussing the coasts and oceans ecosystem said that there has been little support from agency leaders to comprehensively address climate change issues”.*



# GAO Report: Initial NOAA Response

By December 2008...

- NOAA will engage in consultations within agency to identify climate information needs and capacities
- Written guidance will be provided to help resource managers address climate change effects (including where to go for site-specific information, best practices)
- NOAA will enhance its interagency dialogue on climate and ecosystem management, contributing to identification of best practices





# NOAA's Authorities to Act: Impacts of Global Change Drivers on Trust Resources



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- Endangered Species Act
  - Marine Mammal Protection Act
  - Magnuson Stevens Fishery Conservation & Management Reauthorization Act
  - Marine Sanctuaries Act
  - National Environmental Policy Act
  - Coral Reef Conservation Act & Task Force
  - International Treaties, Bilateral Agreements, Commissions & Councils



# Magnuson Stevens Act Responsibilities



- National Standard 6: *“Conservation and management measures shall take into account and allow for variations among and contingencies in fisheries, fishery resources, and catches”*
- Some FMPs (e.g., Pacific Coastal Pelagics) already provide adjustments in MSY for periods of low and high productivity influenced by climate variability. Climate will become a more important issue in rebuilding plans and time frames
- Optimum Yield *“...is prescribed on the basis of maximum sustainable yield as reduced by any relevant economic, social or ecological factor.”* Climate will impact rebuilding plans and definition of maximum sustainable yield



# Climate change reflected in stock assessment process



- Scientific stock assessments use best scientific information available
- Climate change may affect important stock assessment parameters, including:
  - Natural mortality
  - Growth rates
  - Age at maturity
  - Recruitment Levels – leading to biomass targets



# Six Climate Change Issues – Living Marine Resources



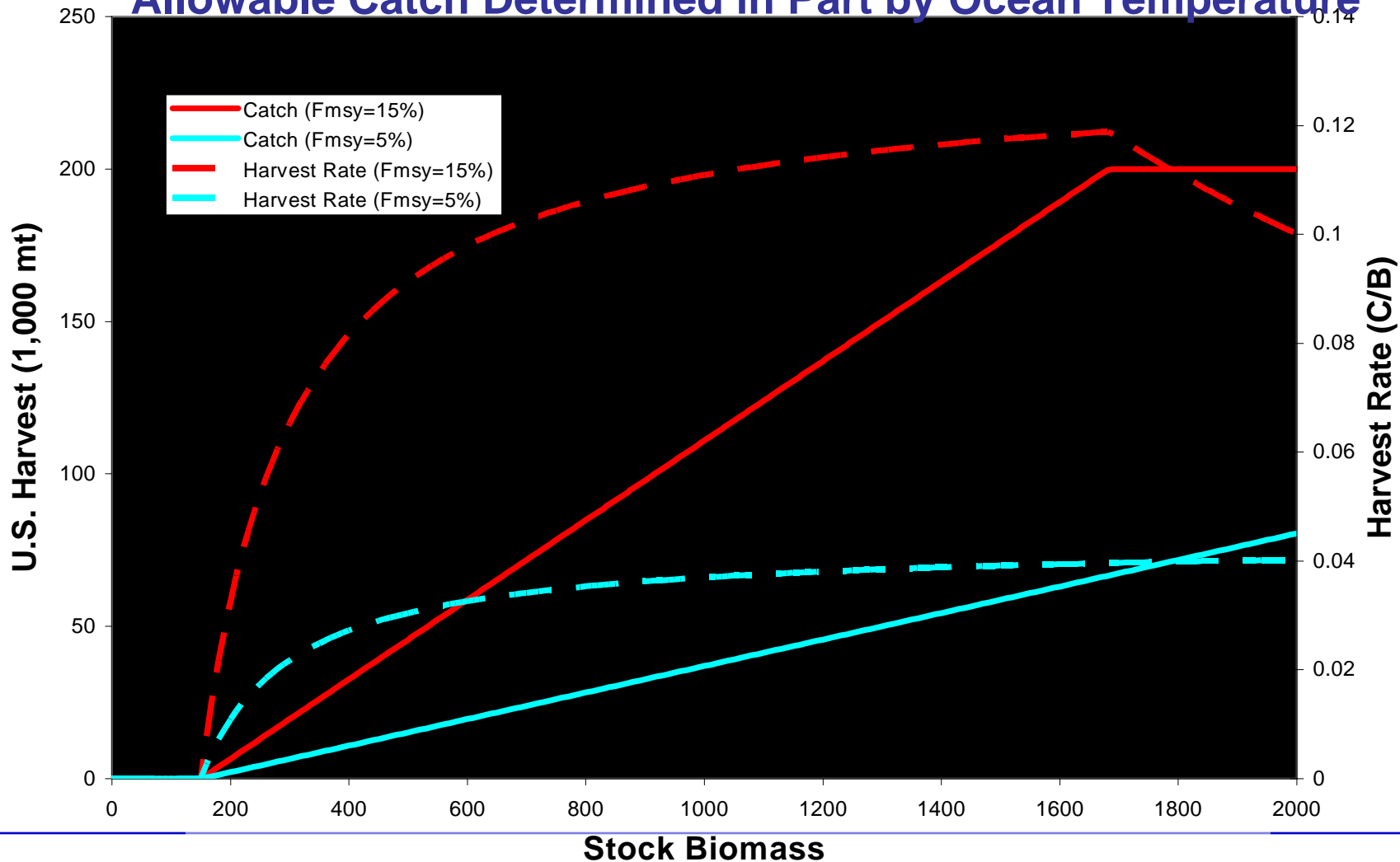
- Attribution of climate signals impacting ecosystems: long term change vs. natural variability
- Ocean warming: impacts on distribution & productivity (phenology, production, invasives)
- Impacts of loss of sea ice on living marine resources (at both poles)
- Ocean acidification impacts on marine biota
- Freshwater supply & resource management
- Sea level rise (natural resource implications)





# Pacific Sardine Harvest Control Rule (Pacific Fishery Management Council 1998)

## Allowable Catch Determined in Part by Ocean Temperature





# Climate Change and Extinction Risks

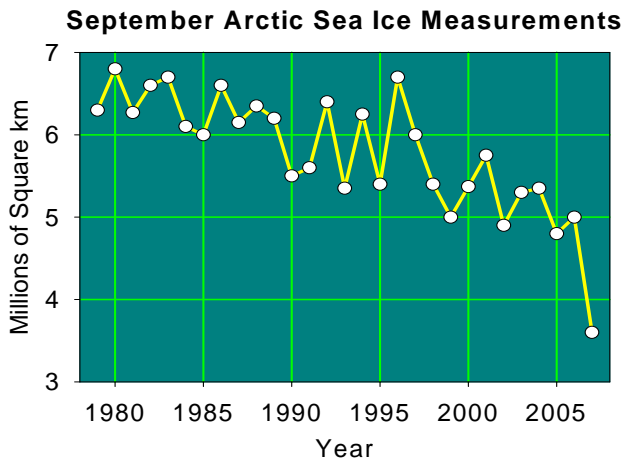
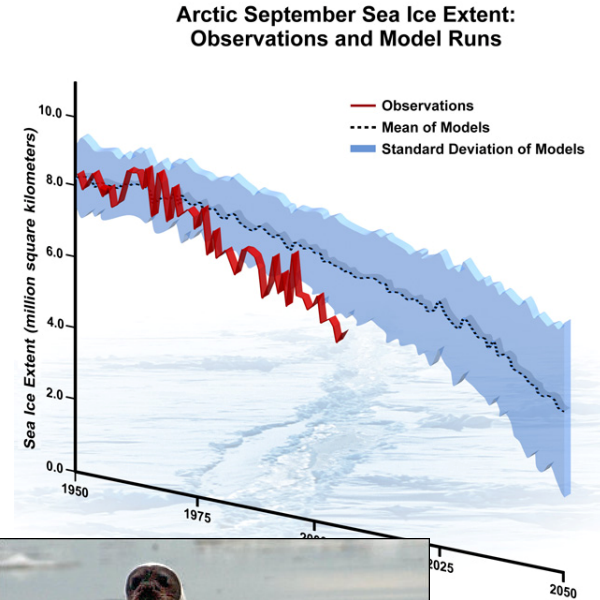
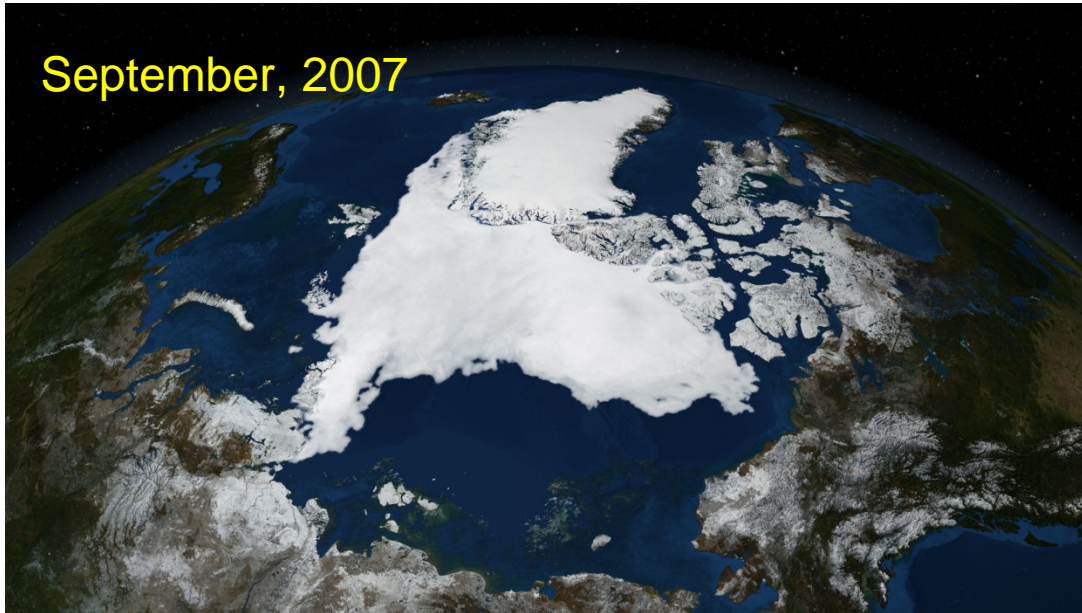


“Approximately 20 to 30% of plant and animal species assessed so far are *likely* to be at increased risk of extinction if increases in global average temperature exceed 1.5 to 2.5°C (*medium confidence*).”

- IPCC Climate Change  
2007: Synthesis Report



# Loss of Arctic Sea Ice – Ecological Implications for NOAA



Petition To List



Ringed, Ribbon, Spotted, Bearded Seals

+Arctic FMP

NOAA Trust Resources  
MMPA + ESA

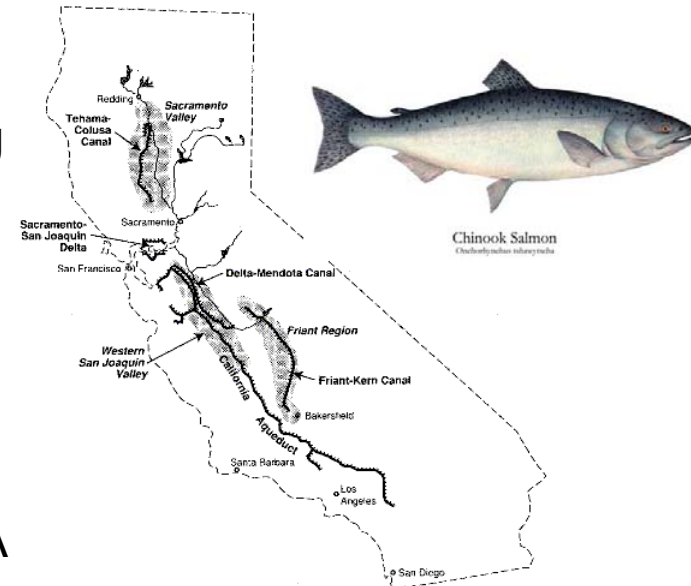


# ESA Case Study: Central Valley Project and State Water Project Operations, Criteria and Plan (OCAP) BiOP/ California Chinook Salmon & Steelhead



## Freshwater & Climate

- Chinook salmon and steelhead trout are listed endangered/threatened under ESA In the Sacramento River and related drainages in California
- In 2004, NMFS consulted with the State and Federal water agencies and determined that the proposed joint operation of the State and Federal Central Valley water projects was not likely to jeopardize the continued existence of listed salmon and steelhead
- Coalition of environmental groups filed suit regarding the BiOP for chinook and steelhead based in part on the fact that long-term climate impacts on water availability were not taken into account as part of the baseline
- The Bureau of Reclamation, NMFS and CALFED have reopened consultations under Section 7 of ESA regarding the BiOP

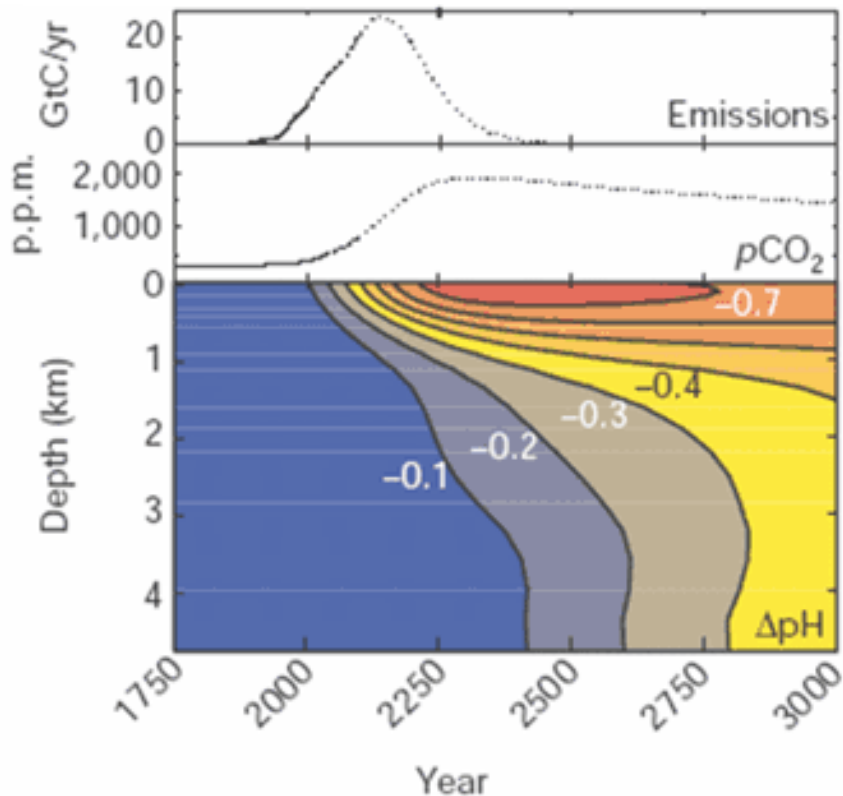




# Ocean Acidification: A Consequence of Human Production of Greenhouse Gasses – Ocean Impacts & NOAA Responsibilities



### Projected Increases in Ocean Acidity



2005 Fishery Landings Value = \$3.933 Billion (First Sale)



### Value:

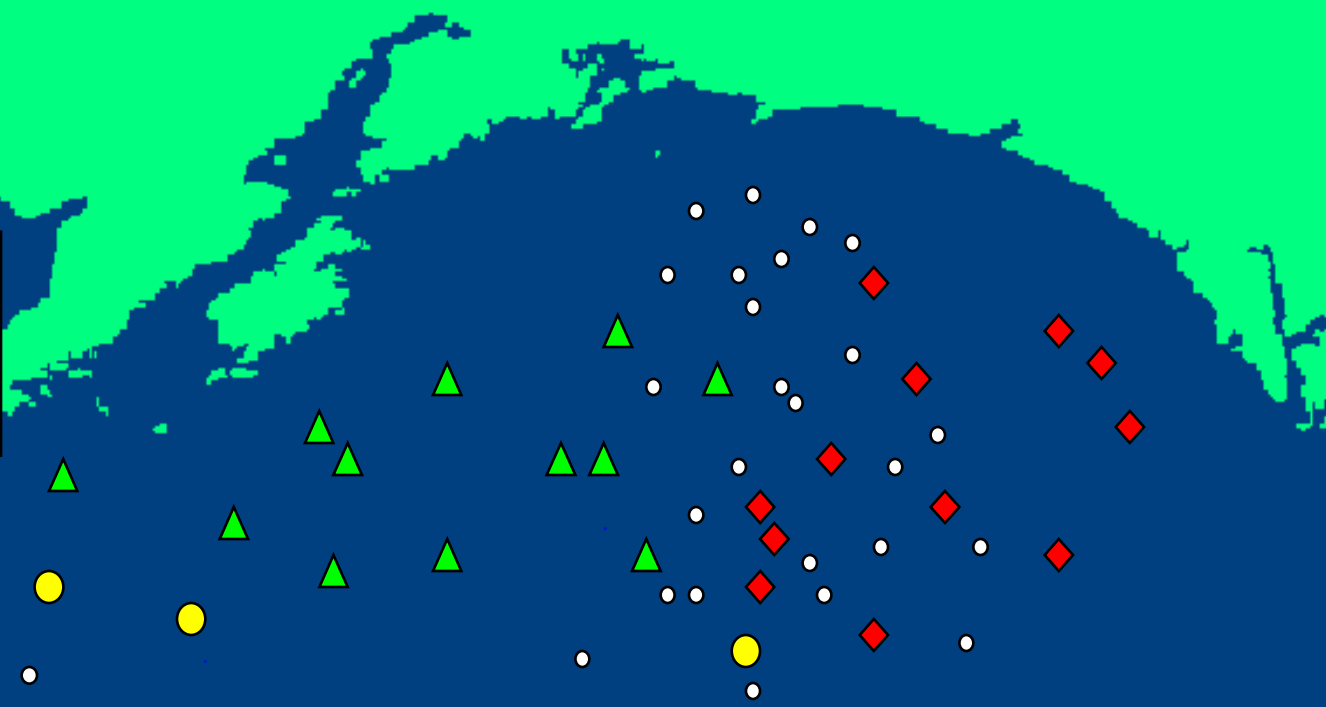
Bivalves: \$732M ex-vessel commercial value

Crustaceans: \$1,265M ex-vessel commercial value

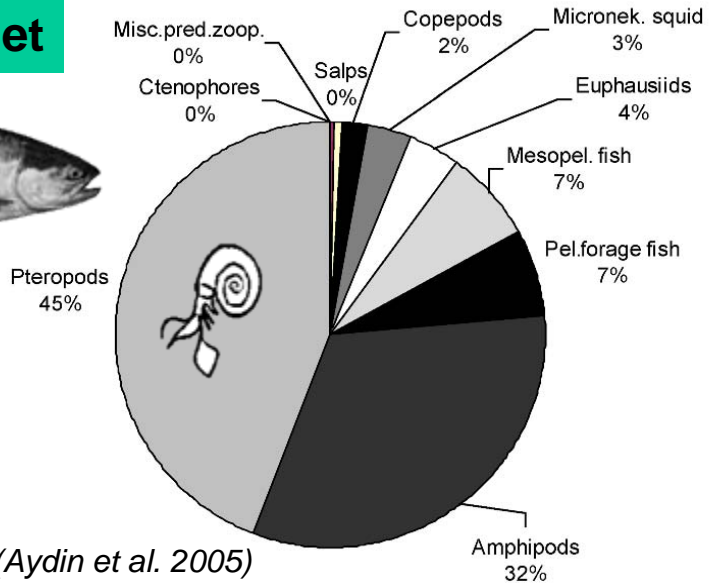
Combined : \$1,997M ex-vessel commercial value (51% of commercial catch by \$)

- Potential impacts on shelled plankton, coral reefs (shallow and deep), bivalves and crustaceans, and food chains
- Managed resources under Coral Reef Conservation Act, MSRA, ESA

- ▲ Western Alaskan Sockeye
- ◆ British Columbia Sockeye
- Central Alaskan Pink
- Japanese Chum



## Pink salmon diet

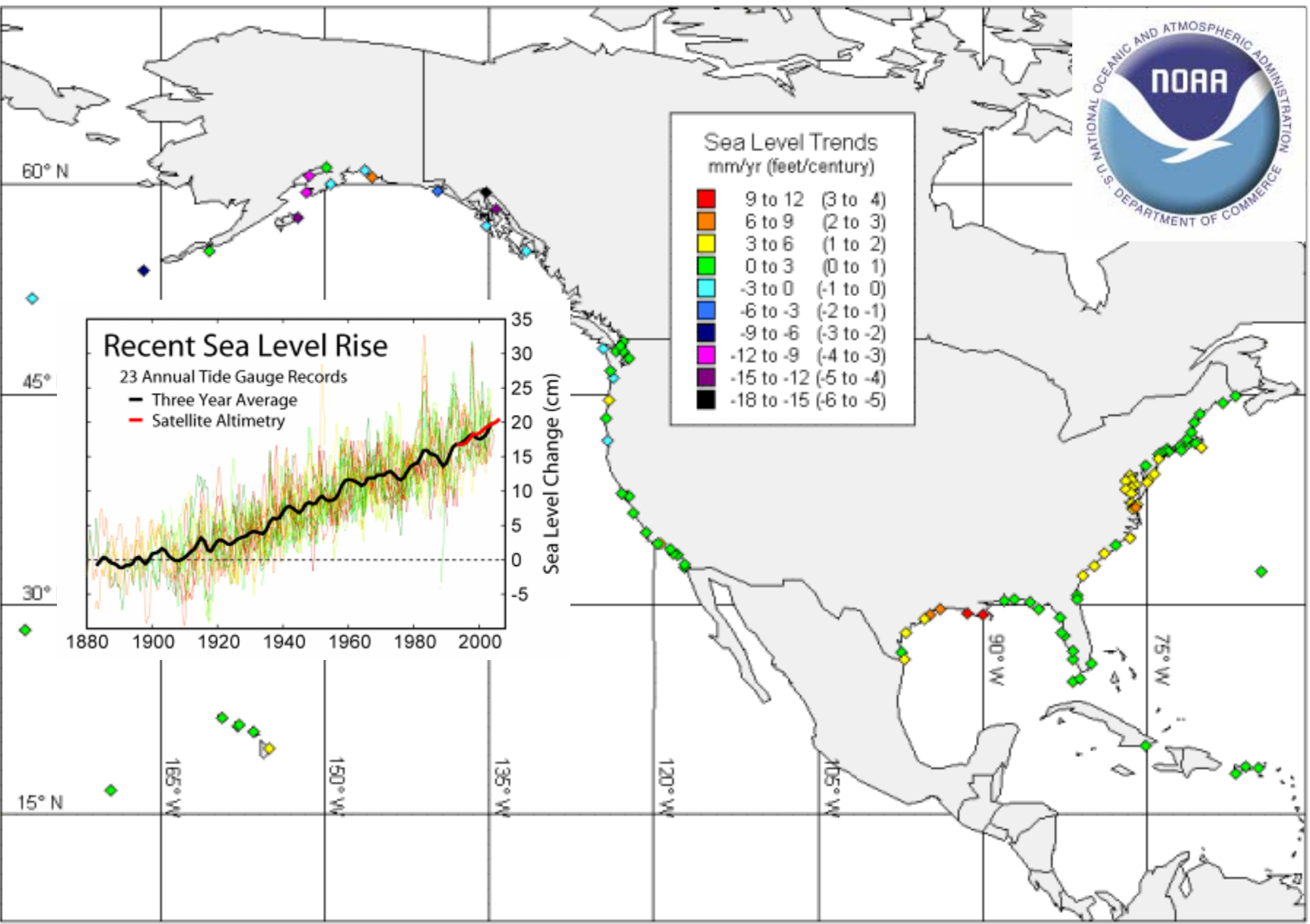
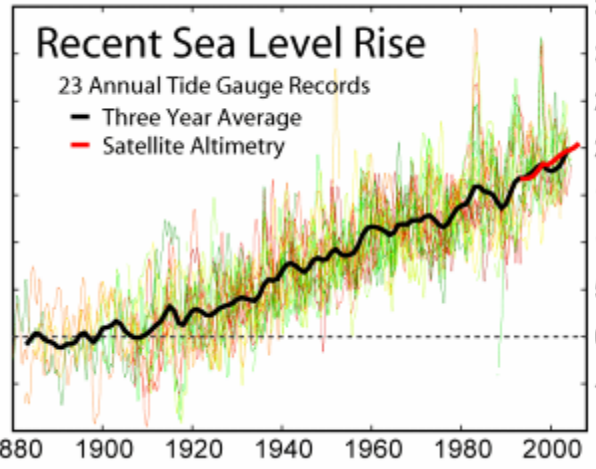
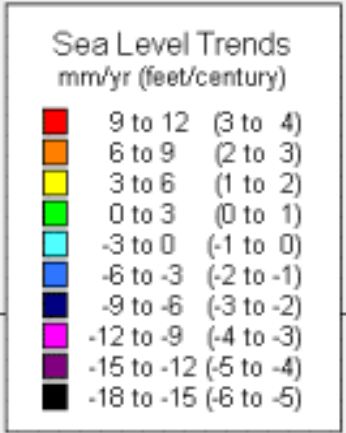


**Predicted effect of climate change on pink salmon growth:**

- 10% decrease in pteropod production leads to 20% drop in mature salmon body weight (prey limitation).
- 10% increase in water temperature leads to 3% drop in mature salmon body weight (physiological effect).



# Trends in Sea Level Rise & Resource Impacts





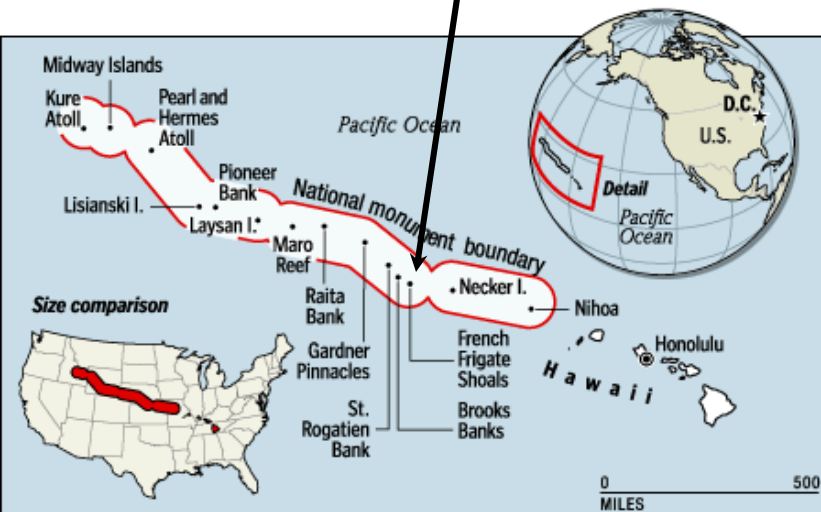
# SLR Example: How will Protected Species critical habitats change with SLR in the NWHI Monument?

## Example Whaleskate Island French Frigate Shoals, NWHI

- Once an important nesting island for Hawaiian green sea turtles and a primary pupping site for endangered Hawaiian monk seals
- Few feet above sea level; what would be the impacts of observed rates of SLR on Protected Species breeding and nesting habitat?
- 2006 study published by NOAA scientists in the journal Biological Conservation (Baker et al. 2006)



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# NOAA Strategy for Incorporating Climate Change Issues into LMR Management Activities

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- NOAA offices and labs identify, and prioritize climate change factors influencing MSRA, ESA, MMPA, NMSA, etc, and identify current resources for analyzing effects
- Develop Operational Guidelines - Engage a wide variety of NOAA offices to assess requirements and capabilities and develop SOPs and standardized products
- Create Climate Ecosystems WG - Combine NOAA's observations, models and forecasts of climate change impacts on resources
- Develop a strategy to communicate with regulators, constituents, and the public the impacts of climate change factors on resources and people managed by NOAA



# Proposal for a National Climate Service (NCS) & National Climate Partnership

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- NOAA currently developing an outline for what a National Climate Service would entail
- Proposal includes both a NCS (NOAA lead) and a National Climate Partnership (method to engage across agencies and with various levels of government, academia and the private sector)
- Proposal vetted to agencies (e.g., USGS, NASA, etc.) at an external users workshop (Vail Colorado, June 16-20, 2008)
- Significant comments on the structure, purpose, and relationship of a NCS to use sectors such as water managers, natural resource managers, energy companies, emergency managers etc.
- Comments and participation from the fisheries sector and from our fisheries management partners are encouraged
- Important issue for transition to the next administration



# Questions?



For more information:

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