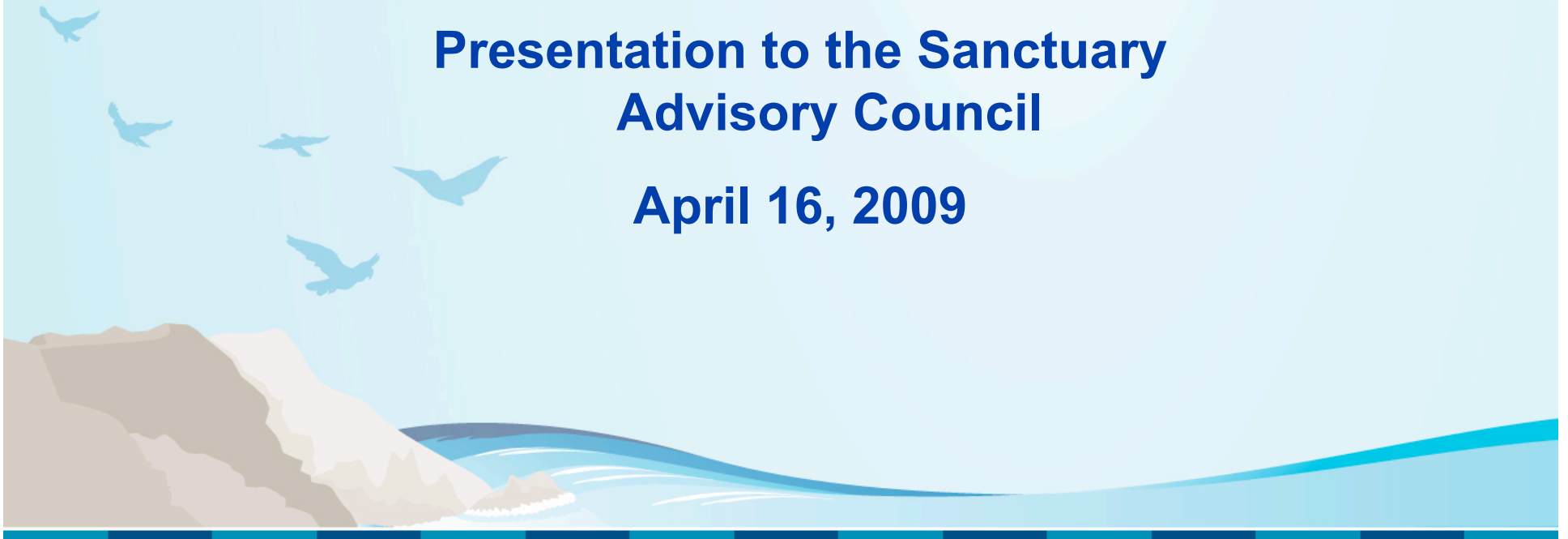


# **Gulf of the Farallones National Marine Sanctuary**

## **Ocean Climate Initiative**

**Presentation to the Sanctuary  
Advisory Council**

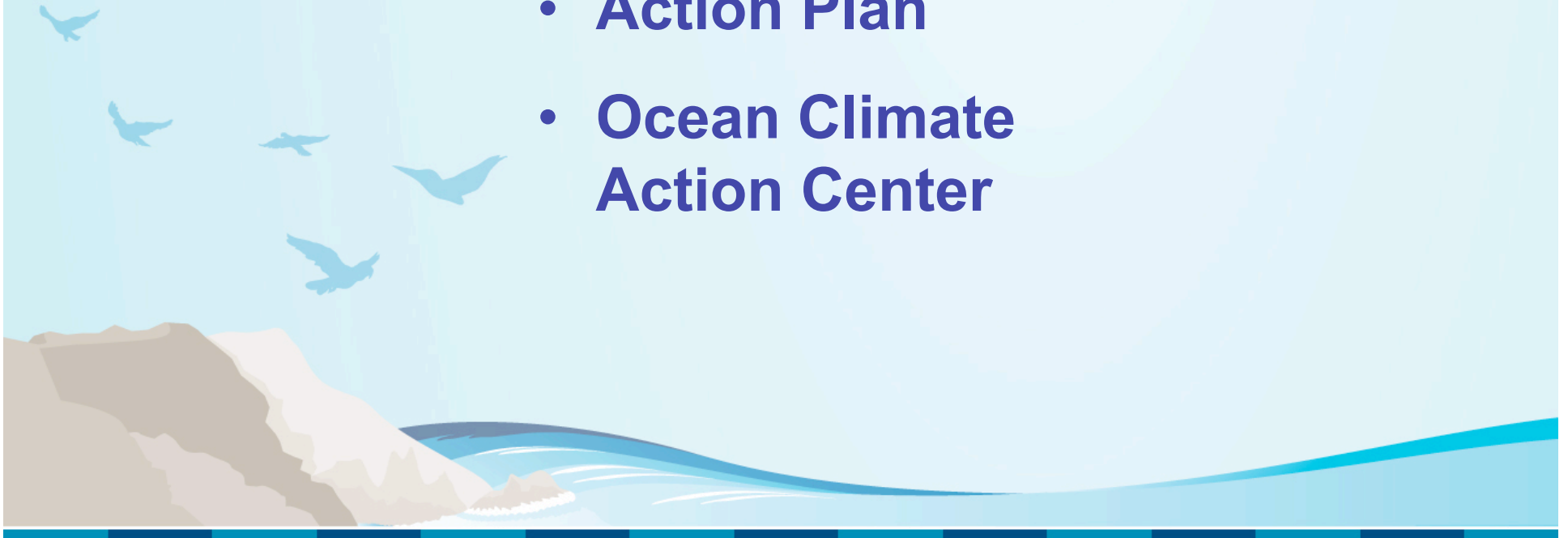
**April 16, 2009**



## **OCEAN CLIMATE INITIATIVE GOAL:**

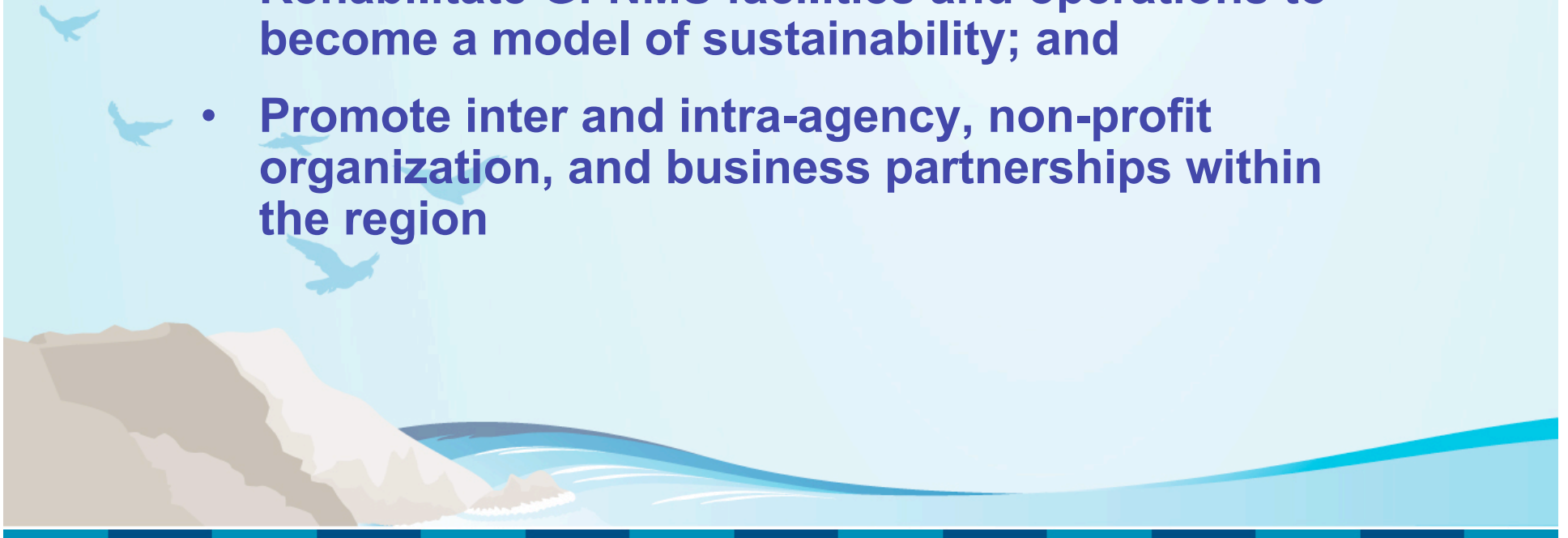
**Provide solutions on a local, state, and federal level through partnerships, research collaborations, education, and policy reform.**

- **Site Scenario**
- **Action Plan**
- **Ocean Climate Action Center**



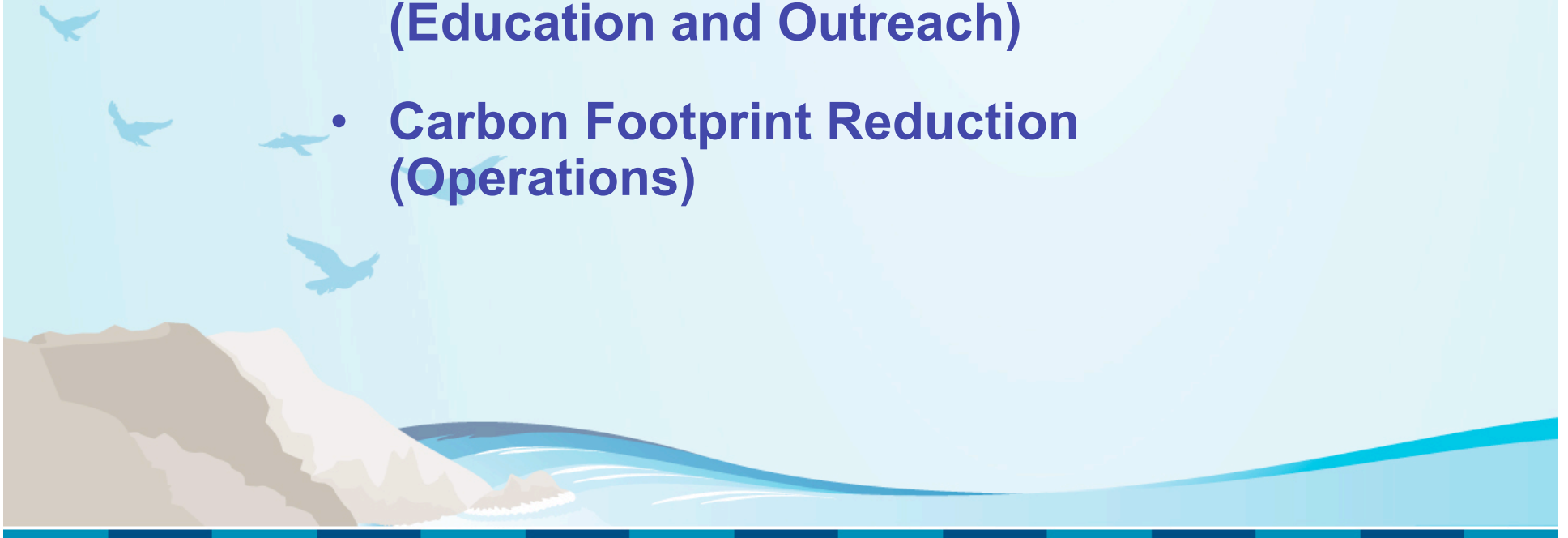
# OCEAN CLIMATE INITIATIVE OBJECTIVES:

- Identify physical drivers and address biological impacts of climate change on the region's coast and ocean;
- Act as a climate change communication center;
- Manage local marine ecosystems for resiliency;
- Rehabilitate GFNMS facilities and operations to become a model of sustainability; and
- Promote inter and intra-agency, non-profit organization, and business partnerships within the region



## **INITIATIVE ACTION PLAN:**

- **Conservation Science  
(Research and Monitoring)**
- **Ecosystem Resilience and Protection  
(Resource Protection)**
- **Community Action  
(Education and Outreach)**
- **Carbon Footprint Reduction  
(Operations)**



# INITIATIVE WORKING GROUPS:

- **Climate Change Site Scenario - joint with CBNMS (will become Research and Monitoring)**
  - Chair: John Largier
  - Other SAC members: Bob Breen
- **Green Operations**
  - Chair: Chris Powell (Brenda Donald in Chris' absence)
  - Other SAC members: Bob Wilson, Bob Breen
- **? Ecosystem Resilience and Protection**
- **? Community Action**



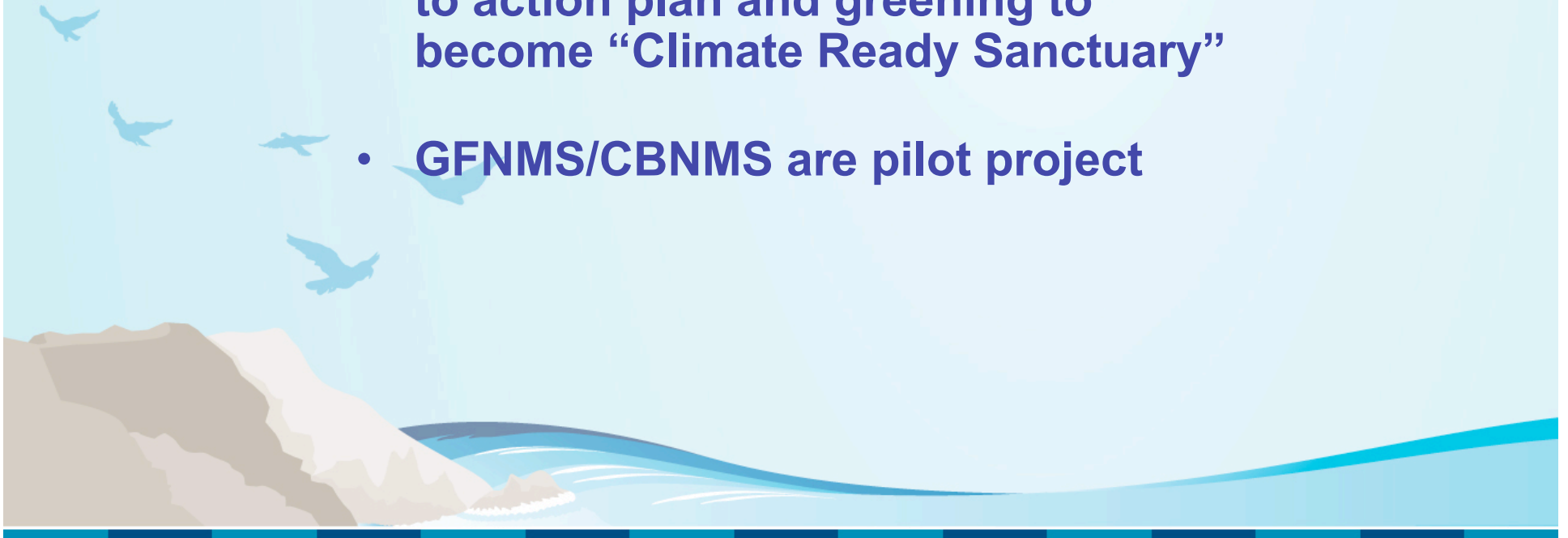
## **INTERNAL STAFF TEAMS:**

- **Green Operations - Employee Green Team**
- **Ecosystem Resilience and Protection - Ecosystem Protection Team**
- **Community Action - Education and Outreach Team**



# CLIMATE CHANGE SITE SCENARIO

- **Jointly developing with CBNMS**
- **Requested by ONMS - preliminary template provided**
- **All 14 sites will complete in addition to action plan and greening to become “Climate Ready Sanctuary”**
- **GFNMS/CBNMS are pilot project**



# North-Central California Coast and Ocean Climate Change Site Scenario



- Team of 20+ scientists
- Downscale information - Point Arena to Año Nuevo
- Shared understanding
- Synthesize
- Informed decision-making
- Prioritize actions
- Guide policy development
- Guide management actions



# CLIMATE CHANGE SITE SCENARIO

## DRIVERS OF REGIONAL CHANGE

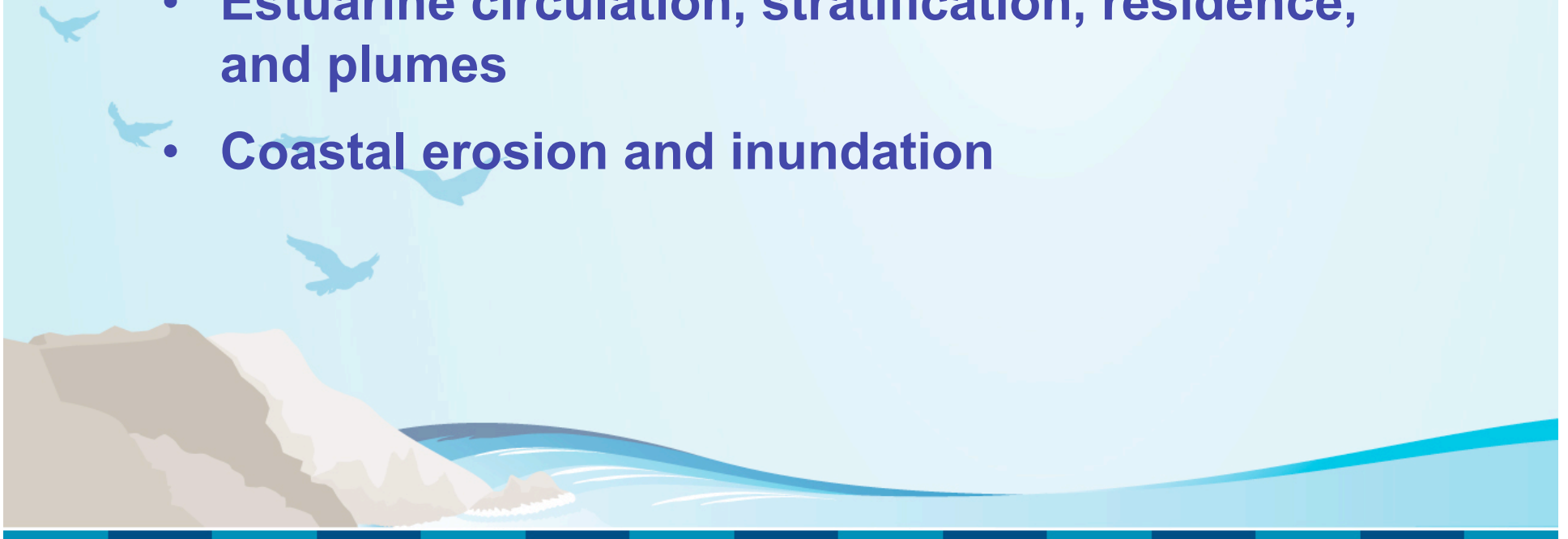
- **Sea level rise** (mean trend, storm surge, etc.)
- **Regional winds** (increases, delays, shifting patterns)
- **Changing waves** (increased amplitude, frequency, extremes)
- **Ocean circulation** (California Current System)
- **Water properties** (temperature, salinity, pH, DO, etc.)
- **Precipitation and land runoff** (amount and timing, discussion on fire, etc.)
- **Local atmospheric conditions** (fog, cloudiness, air temps, etc.)



# CLIMATE CHANGE SITE SCENARIO

## REGIONAL ENVIRONMENTAL RESPONSES

- **Coastal upwelling**
- **Regional water properties** (nutrients, DO, temp, etc.)
- **Regional ocean acidification**
- **Estuarine circulation, stratification, residence, and plumes**
- **Coastal erosion and inundation**



# **CLIMATE CHANGE SITE SCENARIO**

## **CHANGING PHYSICAL HABITAT STRUCTURE**

- **Offshore pelagic**
- **Offshore benthic**
- **Offshore island**
- **Sandy beach**
- **Rocky intertidal**
- **Nearshore sub-tidal**
- **Estuarine**



# CLIMATE CHANGE SITE SCENARIO

## BIOTIC RESPONSES

- **Plankton**
- **Invertebrates**
- **Macroalgae and plants**
- **Fish** (will be added)
- **Seabirds**
- **Marine mammals**

May change to leading section:

- **Population connectivity**
- **Phenology**
- **Physiology**
- **Range shifts**



# CLIMATE CHANGE SITE SCENARIO

## ECOSYSTEM AND COMMUNITY RESPONSE MECHANISMS

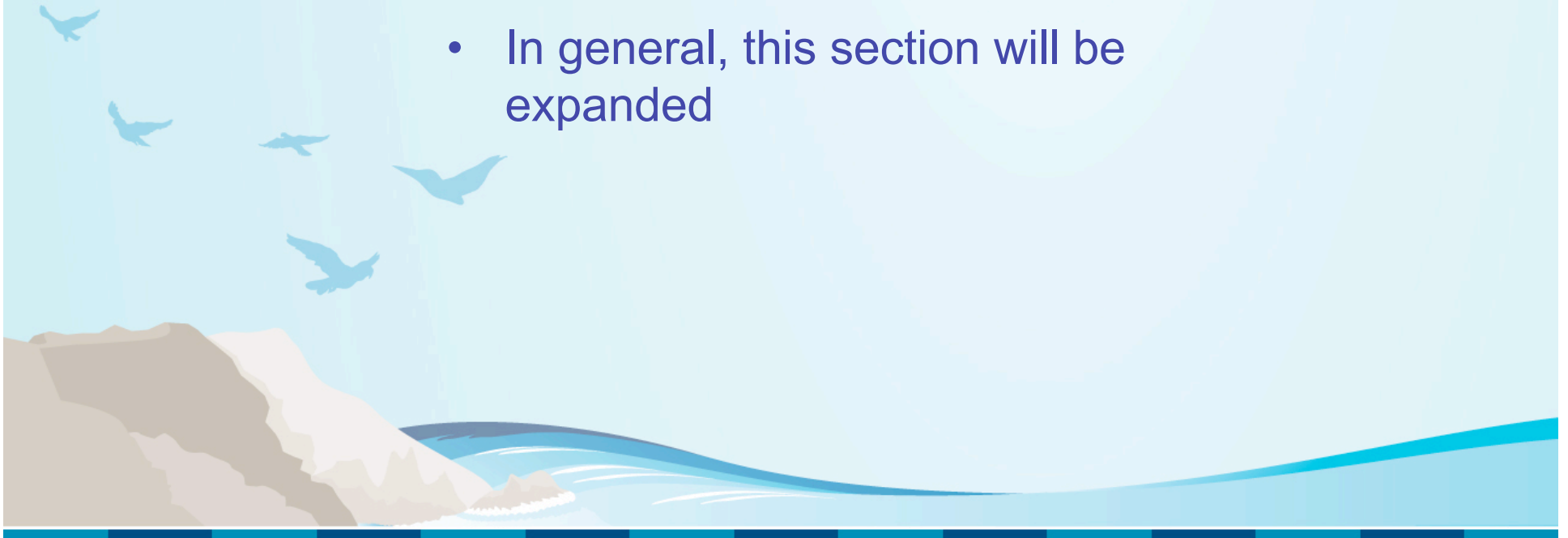
- Pelagic habitat
- Nearshore intertidal habitat
- Estuarine habitat
- **Sandy beach habitat** (may be added)



# CLIMATE CHANGE SITE SCENARIO

## ADDITIONAL DRIVERS OF CHANGE

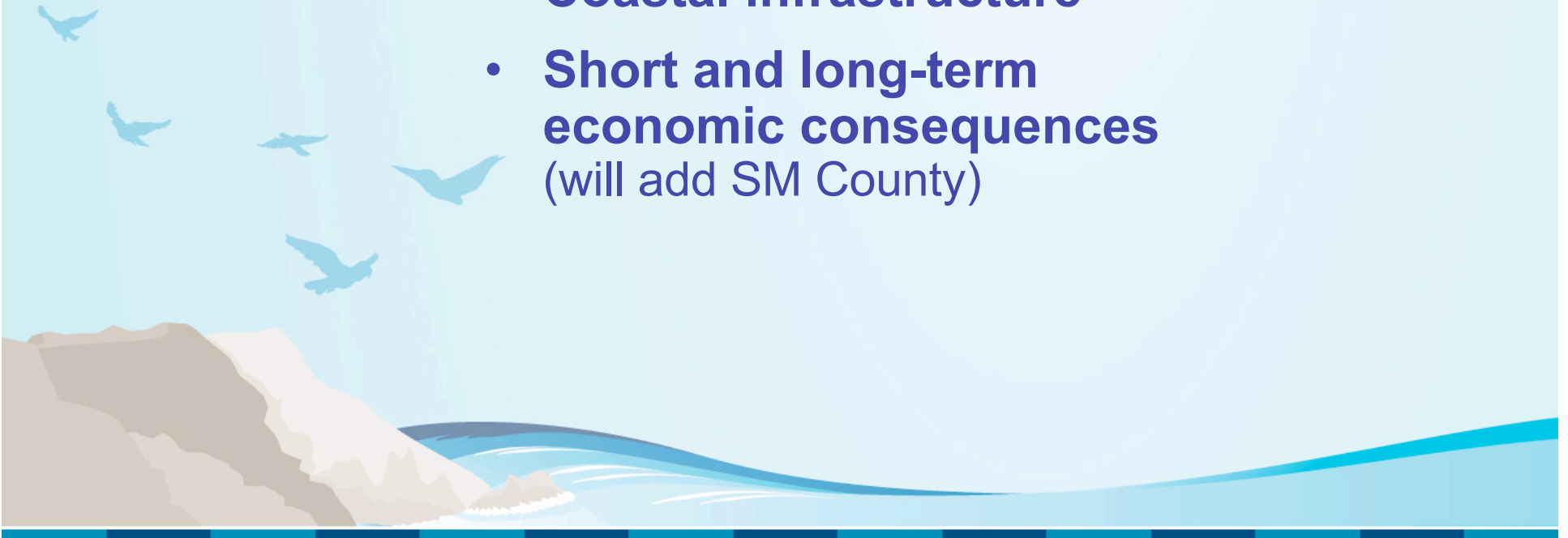
- **Fishing** (needs to be expanded)
- **Disease**
- **Contaminants**
- In general, this section will be expanded



# CLIMATE CHANGE SITE SCENARIO

## DIRECT IMPACTS ON HUMANS

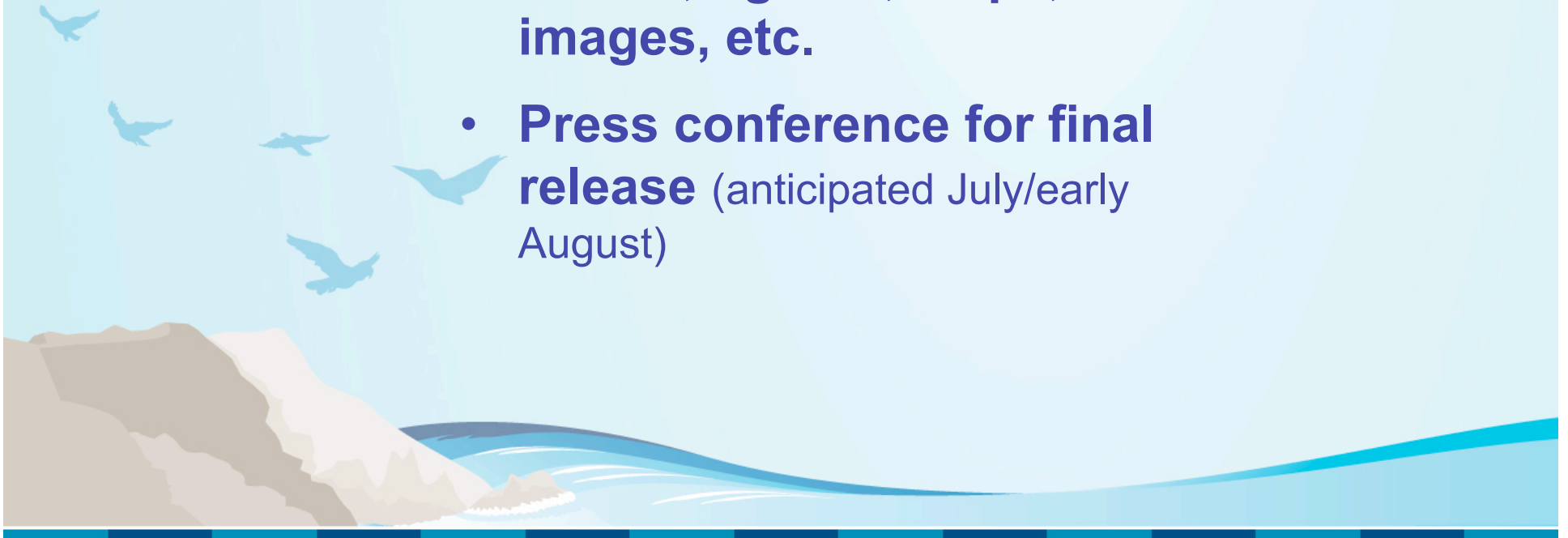
- **Public health**
- **Fisheries**
- **Ecotourism**
- **Coastal infrastructure**
- **Short and long-term economic consequences**  
(will add SM County)



# CLIMATE CHANGE SITE SCENARIO

## TO COME...

- **Conclusion**
- **Supplementary boxes** (will be formatted, modified, etc.)
- **Tables, figures, maps, images, etc.**
- **Press conference for final release** (anticipated July/early August)





# OCEAN ACIDIFICATION

- **West coast sanctuaries all adopted resolutions**
- **West coast writing team - NOAA Ocean Acidification West Coast Research Plan**
  - Partners include PMEL, NWFSC, ONMS
  - Sanctuaries as sentinel sites; education and outreach
- **Regional collaboration - GFNMS, CBNMS, Bodega Marine Lab, UCSF, PRBO**



# National Involvement

- **ONMS Green Team**
- **ONMS Climate Subcommittee**
  - Coordinate climate efforts into a cohesive national program
  - Maximize ability to prepare for and protect resources from climate change impacts
  - ONMS as part of the larger climate effort within and outside of NOAA
- **Trilateral Committee for Wildlife and Ecosystem Conservation and Management** (May 11-14)
  - Lead by USFWS with NOAA as partner (U.S., Canada, Mexico)
  - Ecosystem Conservation Table
  - GFNMS as project example for U.S. marine protected areas