DRAFT DOCUMENT 85/176/2007

SF Bay Area National Parks:
Research Needs and Priorities Related to Global Climate Change

General themes:

1. **Separating patterns and trends due to global climate change from other variations.**
2. **Predicting impacts of GCC on park resources and surrounding systems. This includes ecology, geology, hydrology, water supply, and other park resources.**
3. **Predicting impacts of GCC on wildlife, vegetation communities, T&E species.**
4. **Predicting economic impacts of GCC on human structures and infrastructure (including roads and trails).**
5. **Predicting impacts of GCC on cultural resources.**
6. **Prioritizing responses to GCC: what can be avoided or mitigated vs. what can't.**
7. **Predicting impacts of GCC on park experiences, visitation and other social science based themes.**
8. **Summarize/Synthesize known changes in this region (e.g. sea level rise over last 150 years, changes in temperature, hydrology)**

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Specific themes

1. **Marine/Estuarine**
   a. Predicted and actual impacts of warming oceans on intertidal species composition/range/numbers. (PORE/GOGA)
   b. Predicted and actual impacts of fluctuations in upwelling and nearshore oceanography on food web and species reproductive success and persistence (PORE/GOGA).
   c. Precipitation changes on water quality, salinity, invasive species persistence, native species persistence.
   d. How will GCC impact restoration efforts in Giacomini wetlands
   e. How will global climate change impact Marine Protected Areas

2. **Streams**
   a. Predicted changes in flow regimes and impacts on morphology, fish, water quality
   b. Effects of temperature changes on stream ecology and species

3. **Terrestrial**
   a. **What are expected changes to fire regime due to GCC?**

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4. **Shoreline**
    a. Impacts of rising sea level on dune systems and associated plants and animal species.
    b. Sea level impacts on Phoca and Eseal, haul out areas. Subsequent impacts on reproduction.
    c. Loss of coastal geologic resources
    d. Changes in sand delivery

5. **Wildlife**
    a. **What species and what changes (e.g. changes in reproduction, population size, other) are suspected for this region. Are there any species or metrices that are good indicators of climate change?**
    b. **Are there known changes in phenolgies in this region for wildlife (nesting periods, changes in migration times, etc.)**

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6. **Vegetation**
    a. **What species and what changes (e.g. changes in reproduction, population size, other) are suspected for this region. Are there any species or metrices that are good indicators of climate change?**
    b. **For what species do we know changes in phenology as a result of climate change.**
    c. **What are the changes to fog patterns and how are they affecting changes in vegetation.**

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7. **T&E Species**
    a. Prediction of impacts on selected PORE/GOGA/PINN T&E species in 2050 & 2100? Distribution Maps, reproductive success, population size. Perhaps a general plus, equal or minus score based on expert opinion?
    b. Create triage lists to judge possible reponses of individual species

8. **Invasive Species**
    a. How might GCC impact strategies for invasive mitigation/control and prioritization
    b. What invasives are likely to become more problematic under GCC?

9. **Restoration projects**
    a. How will GCC impact restoration in Giacomini wetlands and Crissy Field?

10. **Impacts on cultural resources**

a. Loss of cultural resources – coastal fortifications, middens, artifacts…
b.

11. Impacts on visitor experiences