

# Papahānaumokuākea Marine National Monument

## Climate Change – Sea Level Rise

### Management Issue

Global climate change is documented to be a driver of sea level rise. The impacts of sea level rise in the Papahānaumokuākea Marine National Monument (PMNM or Monument) can include loss of terrestrial habitat and the possibility of drowning of the coral reefs found there.

### Description

Sea level rise is expected to have significant effects on the islands and other land masses within the Monument (Baker et al. 2006). Projected terrestrial habitat loss by 2100 at French Frigate Shoals, Pearl and Hermes Atoll, and Lisianski is predicted to be up to 65% under a median scenario (48 cm rise), and up to 75% under the maximum scenario (88 cm rise). Spring tides would probably periodically inundate all land below 89 cm (median scenario) in elevation. Although Midway Atoll was not included in this study the environmental consequences of island inundation would likely be greater for Midway, with its buried toxic materials. The loss of terrestrial habitat and possible release of toxic chemicals could have adverse effects on numerous terrestrial and marine resources. Loss of beach habitat in PMNM would likely contribute to the declines in two protected species that utilize these habitats: Hawaiian monk seal and green sea turtles. Monk seals are critically endangered and most of their remaining population resides in the Northwestern Hawaiian Islands. They use the beaches for pupping and resting. Green sea turtles from the entire Hawaiian chain nest almost exclusively at the beaches of French Frigate Shoals. Additionally, the impacts to the seabird populations which also use the nearshore areas for nesting could be significant. Managers need to understand the extent and implications of sea level rise in the Monument to better protect the natural, cultural and historic resources found there.



*Newly hatched green sea turtle on the beach at French Frigate Shoals, an area that is in danger of disappearing with an increase in sea level change. Photo credit: James Watt*

### Questions and Information Needs

- 1) How much land habitat is likely to be lost due to sea level rise at each atoll in the PMNM?
- 2) Which species (marine and terrestrial) are likely to be impacted by increases in sea level?
- 3) What are the impacts to each affected species by sea level rise?
- 4) How will Midway Atoll be impacted by sea level rise in terms of historic resources, buried contaminants and existing and planned infrastructure?
- 5) What options are available to managers to address and potentially mitigate sea level rise in the Monument?
- 6) How might cultural resources of each atoll be affected by sea level rise?
- 7) How much seal haul-out and pupping habitat is in danger of being lost?
- 8) How much sea turtle nesting grounds is in danger of being lost?

### Scientific Approach and Actions

- Investigate similarities between efforts around the Pacific in terms of response to sea level rise
- Develop models that predict sea level rise for each atoll
- Investigate mitigation options for impacted species
- Investigate mitigation options for historic and cultural resources that may be impacted by sea level rise
- Investigate mitigation options for buried contaminants which may be exposed by sea level rise
- Communicate results of research and monitoring by coordinating an annual meeting to present current research being conducted in the Northwestern Hawaiian Islands
- Use materials gathered and created during research expeditions to develop or enhance education and output products.

*Updated: 5/1/2010*

*For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>*

## Potential Key Partners and Information Sources

NOAA/NMFS/Coral Reef Ecosystems Division; US Fish and Wildlife Service; NOAA/NMFS/Pacific Islands Fisheries Science Center Protected Species Division; State of Hawai'i Department of Land and Natural Resources; Hawai'i Institute of Marine Biology; Native Hawaiian Cultural Practitioners

## Management Support Products

- Models that predict the sea level rise at each atoll
- Reports and publications on impacts of sea level rise to marine, terrestrial, historic and cultural resources based on model scenarios
- Education and outreach products to inform about the impacts of increased sea level on Monument resources

## Planned Use of Products and Actions

- Possible relocation of artifacts/contaminants that might be affected by sea level rise
- Facilitating future research
- Mitigation options identified by scientific activities will be considered for action
- Possible creation of new sand islands for nesting, pupping etc. in response to lost habitat

## Program References

### PMNM Management Plan

- Action Plan 3.2.1 Threatened and Endangered Species
  - Strategy TES-1: Support activities that advance recovery of the Hawaiian monk seal for the life of the plan;
  - Strategy TES-3: Ensure that nesting populations of green turtles at source beaches are stable or increasing over the life of the plan.
- *Other Action Plans:*
  - 3.1.1 - Marine Conservation Science
  - 3.2.3 - Habitat Management and Conservation
  - 3.5.1 - Agency Coordination
  - 3.6.2 - Information Management
  - 3.6.3 - Coordinated Field Operations

### PMNM Condition Report

- Sea level rise may be a factor in response to Question 1, Question 5 and climate change is an issue with respect to Question 8 and Question 14.

### Other Documents

- Monument Goals 1, 2, and 5



*An endangered Hawaiian monk seal basking on small sand island at Pearl and Hermes Atoll, NWHI. These sand islands are often only a few feet in elevation and very susceptible to complete disappearance with any small increase in sea level. Photo credit: James Watt*

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