

# Papahānaumokuākea Marine National Monument

## Climate Change – Sea-Level Rise

### Management Issue

Global climate change is documented to cause rises in sea levels. The impacts of sea-level rise in the Papahānaumokuākea Marine National Monument (PMNM or Monument) include loss of terrestrial habitats and shallow-water marine habitats.

### Description

Sea-level rise is expected to have significant effects on the land masses within the Monument (Baker et al. 2006). Terrestrial habitat at French Frigate Shoals, Pearl and Hermes Atoll, and Lisianski is predicted to decline by up to 65% under a median scenario (48 cm rise), and up to 75% under the maximum scenario (88 cm rise) by 2100. Even in a median scenario, spring tides will periodically inundate all land below 89 cm. Although Midway Atoll was not included in this study, the environmental consequences of inundation would likely be greater for Midway, due to the fact that this atoll harbors 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: the Hawaiian monk seal and green sea turtles. Monk seals are critically endangered and most of their remaining population resides in the Northwestern Hawaiian Islands (NWHI). 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 seabird populations which 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 island or 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 of sea-level rise to various species of the NWHI?
- 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 will cultural resources of each island or atoll be affected by sea-level rise?
- 7) How much seal haul-out and pupping habitat is in danger of being lost due to sea-level rise?
- 8) How much sea turtle nesting grounds is in danger of being lost due to sea-level rise?

### 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 island or 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

*Updated: September 2014*

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

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- research in the NWHI
- Use materials gathered during research expeditions to develop education and outreach products.

### 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 island or 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
- Evaluate mitigation options such as the 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
  - o Strategy TES-1: Support activities that advance recovery of the Hawaiian monk seal for the life of the plan;
  - o 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:*
  - o 3.1.1 - Marine Conservation Science
  - o 3.2.3 - Habitat Management and Conservation
  - o 3.5.1 - Agency Coordination
  - o 3.6.2 - Information Management
  - o 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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