

Papahānaumokuākea Marine National Monument
RESEARCH Permit Application

NOTE: *This Permit Application (and associated Instructions) are to propose activities to be conducted in the Papahānaumokuākea Marine National Monument. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031. Within this Application, provide all information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Papahānaumokuākea Marine National Monument (Monument).*

ADDITIONAL IMPORTANT INFORMATION:

- Any or all of the information within this application may be posted to the Monument website informing the public on projects proposed to occur in the Monument.
- In addition to the permit application, the Applicant must either download the Monument Compliance Information Sheet from the Monument website OR request a hard copy from the Monument Permit Coordinator (contact information below). The Monument Compliance Information Sheet must be submitted to the Monument Permit Coordinator after initial application consultation.
- Issuance of a Monument permit is dependent upon the completion and review of the application and Compliance Information Sheet.

INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED

Send Permit Applications to:
NOAA/Inouye Regional Center
NOS/ONMS/PMNM/Attn: Permit Coordinator
1845 Wasp Blvd, Building 176
Honolulu, HI 96818
nwhipermit@noaa.gov
PHONE: (808) 725-5800 FAX: (808) 455-3093

SUBMITTAL VIA ELECTRONIC MAIL IS PREFERRED BUT NOT REQUIRED. FOR ADDITIONAL SUBMITTAL INSTRUCTIONS, SEE THE LAST PAGE.

Papahānaumokuākea Marine National Monument Permit Application Cover Sheet

This Permit Application Cover Sheet is intended to provide summary information and status to the public on permit applications for activities proposed to be conducted in the Papahānaumokuākea Marine National Monument. While a permit application has been received, it has not been fully reviewed nor approved by the Monument Management Board to date. The Monument permit process also ensures that all environmental reviews are conducted prior to the issuance of a Monument permit.

Summary Information

Applicant Name: Haunani Hi‘ilani Kane

Affiliation: Assistant Professor in the School of Earth Sciences at the University of Hawai‘i at Mānoa

Permit Category: Research

Proposed Activity Dates: TBD - aiming for within 2023 (Summer or Fall)

Proposed Method of Entry (Vessel/Plane): TBD - Potential access methods include by means of vessels hosted by USFWS. We are currently unsure of whether or not the vessel will be separately permitted.

Proposed Locations: French Frigate Shoals

Estimated number of individuals (including Applicant) to be covered under this permit:

14

Estimated number of days in the Monument: TBD - a minimum number of 3-4 days estimated to complete field work

Description of proposed activities: (complete these sentences):

a.) The proposed activity would...

Assess the impacts and recovery upon islands and the shallow marine environment at French Frigate Shoals (FFS) due to recent hurricane events and accelerated sea-level rise. Our survey techniques will use a non-invasive method to collect high resolution aerial imagery to document change in island morphology and subsequent recovery following Hurricane Walaka. Our island and nearshore sediment data collection method will enable shifts in dominant sediment types and sources from the nearshore reef to be identified. This will enable estimates for future sediment production and replenishment to islands following environmental stressors. The proposed activities will improve the understanding of the potential loss and timescales for recovery of critical habitat following extreme storm events. The proposed activities will also improve understanding of how future sea level rise will impact essential habitats for priority species (e.g. sea turtles, monk seals, and various seabirds).

b.) To accomplish this activity we would

1.) Use an unmanned aerial system (UAS) (DJI Drone Phantom 4 Pro) to collect high quality aerial imagery paired with conducting Real Time Kinematic Global Positioning System (RTK-GPS) surveys at three different islands within FFS. RTK-GPS data will be corrected to a local short-term tide gauge 2.) Collect sediment samples (total: 200, $\frac{3}{4}$ cup volume) from the shallow marine environment (80, $\frac{3}{4}$ cup volume), and modern beach face (100, $\frac{3}{4}$ cup volume) at three islands within FFS.

Predictive modeling of island habitat response to hurricane events and accelerated sea-level rise requires the acquisition of high-resolution topographic (land) and bathymetric (shallow seafloor) elevation data. The applicant will derive digital elevation maps (DEMs) and 3D digital reconstructions of each island produced from UAS imagery + RTK-GPS data and Structure-from-Motion software. RTK-GPS control points will also be collected at the time of the UAS survey to ensure that each DEM is adequately georeferenced. A vertical datum will be derived from RTK-GPS control points and a local short-term tide gauge that will be installed for the duration of field work at each island and removed before they depart. The DEM will be used to assess past changes in island habitat documented in historical imagery and their predictive model will simulate island response to climate change impacts.

These models will be compared to 3D models of island environments collected in 2018 by the Climate Resilience Collaborative team at the University of Hawai'i at Mānoa led by Dr. Chip Fletcher (includes Dr. Kane listed on this permit). Comparing 2018 & 2023 3D island models and sediment composition will enable sediment budgets for each island to be quantified by both sediment source, and sediment volume. Ultimately we will obtain detailed data on the impacts of extreme storm events, and the capacity of atoll islands to naturally recover from environmental stressors. This research will allow us to decipher important characteristics of reduced resiliency affecting islands and critical island habitats across PMNM.

c.) This activity would help the Monument by ...

Providing detailed analyses of island habitat and sediment composition that is useful for determining the severity and prevalence of recent hurricane events (i.e. Hurricane Walaka) and accelerated sea-level rise across FFS. By resurveying sites visited in 2018 (Gin and East Island) we will provide visual representations of island recovery and loss. The 3D island reconstructions will provide useful data for assessing island elevation, and island sedimentary budgets. Both are useful metrics for predicting future time scales of vulnerability to storms and sea level rise. Furthermore analyses of island sediments will reveal the dependency of islands upon the adjacent nearshore reef for sediment replenishment following environmental stressors. Our research would provide managers insight into how sea-level rise and perturbations to the island's shape and nearshore bathymetry at FFS will affect the convergence or divergence of wave-drive sand transport, causing the islands to accrete or erode, respectively in the Monument.

Other information or background:

Obtaining a better understanding of the fate of reef islands is vital for understanding the future of critical habitats at FFS and also for depicting what impacts we may foresee for cultural, natural, and historic resources of the PMNM as a whole. Our island surveying methods have proved useful for determining the impacts of past and future sea level rise and storms. Combining a geologic sedimentary approach with cutting edge 3D reconstruction techniques will produce excellent data products that will enhance our understanding of the bio-geological parameters that govern reef-island resiliency and vulnerability to climate related stressors. This research will ultimately provide useful information for managers such as the spatial and temporal dynamics of island evolution and recovery, keystone island sediment species that disproportionately contribute to island composition, and the ability to identify and map the source of keystone species upon adjacent reefs.