Papahānaumokuākea
Marine National Monument

Management Plan

U.S. Fish and Wildlife Service · National Oceanic and Atmospheric Administration · State of Hawai'i

Vol. I

Papahānaumokuākea Marine National Monument

Management Plan

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Note to Reviewers:

The December 2006 Memorandum of Agreement for Promoting Coordinated Management of the Northwestern Hawaiian Islands Marine National Monument identified the Secretaries of Commerce and the Interior, and Governor of Hawaiʻi as Co-Trustees for the Papahānaumokuākea Marine National Monument. The agreement provided for the inclusion of the Office of Hawaiian Affairs into the Monument management process to assure the perpetuation of Hawaiian cultural resources in the Monument, including the customary and traditional rights and practices of Native Hawaiians exercised for subsistence, cultural, and religious purposes under the Constitution of the State of Hawaiʻi, Article XII, Section 7.

The Co-Trustees will work together in a coordinated fashion to cooperatively manage areas where joint or adjacent jurisdiction exists, while continuing to honor the policies and statutory mandates of the various management agencies. Therefore, it is important to remember as you read this document that there are both coordinated agency activities and specific Co-Trustee responsibilities. Of course even where one agency has primary responsibility, input from another Co-Trustee can often be helpful, and this continuing coordination is presumed throughout the Monument Management Plan.

The authors of the Monument Management Plan identified these important pieces of information as you read this document:

1) Cooperative and Individual Co-Trustee Responsibilities

Prior to its designation, several Federal conservation areas existed within the Monument, namely the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, managed by the National Oceanic and Atmospheric Administration (NOAA) within the U.S. Department of Commerce, and the Hawaiian Islands and Midway Atoll National Wildlife Refuges, managed by the U.S. Fish and Wildlife Service (FWS) within the U.S. Department of the Interior. Nothing in the Monument Management Plan will diminish the responsibilities and requirements by the Federal agencies to continue to manage these areas.

Furthermore, the Proclamation issued by President Bush on June 15, 2006, establishing the Monument expressly stated it did not diminish or enlarge the jurisdiction of the State of Hawaiʻi. In 2005 the State designated all of its waters in the NWHI as a Marine Refuge, and it has jurisdiction over the State Seabird Sanctuary at Kure Atoll, the northwesternmost emergent feature in the NWHI. To provide for the most effective conservation and management of the natural, cultural, and historic resources of the NWHI, Governor Lingle on December 8, 2006, entered into the agreement with the two Secretaries to have State lands and waters in the NWHI managed as part of the Monument, with the three parties serving as Co-Trustees.

2) Specific Agency Requirements

FWS is required to develop Comprehensive Conservation Plans (CCPs) for all National Wildlife Refuges by October 2012 (National Wildlife Refuge System Improvement Act of 1997). So that there would be a single management plan for the Monument, FWS moved its planning effort forward to have this Monument Management Plan also serve as, and meet the requirements of, the CCPs for the two refuges within the Monument.

Because this Monument Management Plan is a mixture of the existing Reserve Operations Plan, the subsequent draft national marine sanctuary management plan, the refuge CCPs, and State plans, as fully described in Section 2.2 of the plan, it does not resemble typical sanctuary management plans, typical refuge CCPs, or typical State of Hawaiʻi management plans. However, this plan and the accompanying environmental analysis meet all applicable Federal and State requirements.

3) Funding Estimates

This Monument Management Plan provides long-term guidance for management decisions over a 15-year horizon and sets forth desired outcomes, with strategies and activities to reach those outcomes, including the agencies' best estimate of future needs. These are sometimes substantially above current budget allocations and are included primarily for agency strategic planning and program prioritization purposes. This management plan does not constitute a commitment of funds, or a commitment to request funds, by Federal or State agencies. All funding for current and possible future Monument activities is subject to the budgeting and appropriations processes of the Federal and State governments.

EXECUTIVE SUMMARY

Papahānaumokuākea Marine National Monument (Monument) in the Northwestern Hawaiian Islands comprises one of the largest protected areas in the world. The Monument, a vast, remote, and largely uninhabited marine region, encompasses an area of approximately 139,793 square miles (362,061 square kilometers) of Pacific Ocean in the northwestern extent of the Hawaiian Archipelago. Covering a distance of 1,200 miles, the 100-mile wide Monument is dotted with small islands, islets, and atolls and a complex array of marine and terrestrial ecosystems. This region and its natural and historic resources hold great cultural and religious significance to Native Hawaiians. It is also home to a variety of post-Western-contact historic resources, such as those associated with the Battle of Midway. As such, the Monument has been identified as a national priority for permanent protection as a Monument for its unique and significant confluence of conservation, ecological, historical, scientific, educational, and Native Hawaiian cultural qualities.

On June 15, 2006, President George W. Bush issued Presidential Proclamation 8031 establishing the Northwestern Hawaiian Islands Marine National Monument under the authority of the Antiquities Act of 1906 (16 U.S.C. 431). The Monument includes a number of existing federal conservation areas: the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, managed by the U.S. Department of Commerce through the National Oceanographic and Atmospheric Administration (NOAA); and Midway Atoll National Wildlife Refuge, Hawaiian Islands National Wildlife Refuge, and Battle of Midway National Memorial, managed by the U.S. Department of the Interior through the U.S. Fish and Wildlife Service (FWS). These areas remain in place within the Monument, subject to their applicable laws and regulations in addition to the provisions of the Proclamation.

The Northwestern Hawaiian Islands also include State of Hawaiʻi lands and waters, managed by the State through the Department of Land and Natural Resources as the Northwestern Hawaiian Islands Marine Refuge and the State Seabird Sanctuary at Kure Atoll. These areas also remain in place and are subject to their applicable laws and regulations.

The President accordingly assigned management responsibilities to the Secretaries of Commerce and the Interior, acting through NOAA and FWS. The President also directed the Secretary of Commerce, in consultation with the Secretary of the Interior and the State of Hawaii, to modify, as appropriate, the plan developed by NOAA through the public national marine sanctuary designation process and for the two federal agencies to promulgate additional regulations.

The joint implementing regulations for the Monument were promulgated on August 29, 2006 (71 FR 51134, 50 CFR Part 404). These regulations codify the scope and purpose, boundary, definitions, prohibitions, and regulated activities for managing the Monument. Proclamation 8031 was later amended on March 6, 2007, to establish the Native Hawaiian name of the Monument, Papahānaumokuākea Marine National Monument, and clarify some definitions.

To provide the most effective management of the area, Governor Linda Lingle, Secretary of Commerce Carlos M. Gutierrez, and Secretary of the Interior Dirk Kempthorne signed a Memorandum of Agreement (MOA) on December 8, 2006, which provided for coordinated administration of all the federal and state lands and waters within the boundaries of the Monument. The MOA provided that management of the Monument is the responsibility of the three parties acting as Co-Trustees: the State of Hawaiʻi, Department of Land and Natural Resources; the U.S. Department of the Interior, FWS; and the U.S. Department of Commerce, NOAA. It also established the institutional arrangements for managing the Monument, including representation of Native Hawaiian interests by the Office of Hawaiian Affairs on the Monument Management Board.

The organizational structure for the Monument consists of:

- A Senior Executive Board composed of a designated senior policy official for each party that is directly responsible for carrying out the agreement and for providing policy direction for the Monument;
- A Monument Management Board (that reports to the Senior Executive Board) composed of representatives from the federal and state agency offices that carry out the day-to-day management and coordination of Monument activities; and
- An Interagency Coordinating Committee representing other state and federal agencies as appropriate to assist in the implementation of Monument management activities.

This Monument Management Plan (Plan) describes a comprehensive and coordinated management regime to achieve the vision, mission, and guiding principles of the Monument and to address priority management needs over the next 15 years. The Plan is organized into three main sections; introduction, management framework, and action plans that address specific issues related to priority management needs.

The introduction provides the vision and mission of the Monument. It also provides the background, setting, environmental and anthropologic stressors, as well as the status and condition of natural, cultural, and historic resources of the Monument.

The management framework for the Monument includes key elements to move toward an ecosystem approach to management. An ecosystem approach to management requires the implementation and coordination of multiple steps in a comprehensive and coordinated way. These key management framework elements include:

- The legal and policy basis for establishment of the Monument;
- The vision, mission, and guiding principles that provide the overarching policy direction for the Monument;
- Institutional arrangements between Co-Trustees and other stakeholders;
- Regulations and zoning to manage human activities and threats;
- Goals to guide the implementation of action plans and priority management needs; and
- Concepts and direction for moving toward a coordinated ecosystem approach to management.

The third section of the plan consists of 22 action plans that address six priority management needs and provide an organizational structure for implementing management strategies. These priority management needs are to understand and interpret Monument resources, conserve wildlife and their habitats, reduce threats to Monument resources, manage human activities, facilitate coordination, and achieve effective operations. Together, the priority management needs, action plans, and strategies are aimed at achieving long-term ecosystem protection for the Monument.

The action plans contain strategies and activities that are aimed at achieving a desired outcome. Each action plan describes the issue or management need, the context and history of the action plan's particular issue or management need, and the strategies and activities planned for the Monument over the next 15 years. Ongoing evaluation and monitoring of these management actions will be conducted to provide informed decision-making and to provide feedback to management on the success of meeting the stated desired outcomes of each action plan.

The six priority management needs, action plans, and corresponding desired outcomes are as follows:

Understanding and Interpreting the Northwestern Hawaiian Islands

- Marine Conservation Science Action Plan
    - ❖ Protect the ecological integrity of natural resources by increasing the understanding of the distributions, abundances, and functional linkages of marine organisms and their habitats in space and time to improve ecosystem-based management decisions in the Papahānaumokuākea Marine National Monument.
- Native Hawaiian Culture and History Action Plan
    - ❖ Increase understanding and appreciation of Native Hawaiian histories and cultural practices related to Papahānaumokuākea Marine National Monument and effectively manage cultural resources for their cultural, educational, and scientific values.
- Historic Resources Action Plan
    - ❖ Identify, document, preserve, protect, stabilize, and where appropriate, reuse, recover, and interpret historic resources associated with Midway Atoll and other historic resources within the Monument.
- Maritime Heritage Action Plan
    - ❖ Identify, interpret, and protect maritime heritage resources in Papahānaumokuākea Marine National Monument.

Conserving Wildlife and Habitats

- Threatened and Endangered Species Action Plan
    - ❖ Safeguard and recover threatened and endangered plants and animals and other protected species within Papahānaumokuākea Marine National Monument.
- Migratory Birds Action Plan
    - ❖ Conserve migratory bird populations and habitats within Papahānaumokuākea Marine National Monument.
- Habitat Management and Conservation Action Plan
    - ❖ Protect, maintain, and where appropriate, restore the native ecosystems and biological diversity of Papahānaumokuākea Marine National Monument.

Reducing Threats to Monument Resources

- Marine Debris Action Plan
  - ❖ Reduce the adverse effects of marine debris to Papahānaumokuākea Marine National Monument resources and reduce the amount of debris entering the North Pacific Ocean.
- Alien Species Action Plan
  - ❖ Detect, control, eradicate where possible, and prevent the introduction of alien species into Papahānaumokuākea Marine National Monument.
- Maritime Transportation and Aviation Action Plan
  - ❖ Investigate, identify, and reduce potential threats to Papahānaumokuākea Marine National Monument from maritime and aviation traffic.
- Emergency Response and Natural Resource Damage Assessment Action Plan
  - ❖ Minimize damage to Papahānaumokuākea Marine National Monument resources through coordinated emergency response and assessment.

Managing Human Uses

- Permitting Action Plan
  - ❖ Implement an effective and integrated permit program for Papahānaumokuākea Marine National Monument that manages, minimizes, and prevents negative human impacts by limiting access only for those activities consistent with Presidential Proclamation 8031 and other applicable laws, regulations and executive orders.
- Enforcement Action Plan
  - ❖ Achieve compliance with all regulations within Papahānaumokuākea Marine National Monument.
- Midway Atoll Visitor Services Action Plan
  - ❖ Offer visitors opportunities to discover, enjoy, appreciate, protect, and honor the unique natural, cultural, and historic resources of Papahānaumokuākea Marine National Monument.

Coordinating Conservation and Management Activities

- Agency Coordination Action Plan
  - ❖ Successfully collaborate with government partners to achieve publicly supported, coordinated management in Papahānaumokuākea Marine National Monument.
- Constituency Building and Outreach Action Plan
  - ❖ Cultivate an informed, involved constituency that supports and enhances conservation of the natural, cultural, and historic resources of Papahānaumokuākea Marine National Monument.
- Native Hawaiian Community Involvement Action Plan
  - ❖ Engage the Native Hawaiian community in active and meaningful involvement in Papahānaumokuākea Marine National Monument management.
- Ocean Ecosystems Literacy Action Plan
  - ❖ Cultivate an ocean ecosystems stewardship ethic, contribute to the nation's science and cultural literacy, and create a new generation of conservation leaders through formal environmental education.

Achieving Effective Monument Operations

- Central Operations Action Plan
    - ❖ Conduct effective and well-planned operations with appropriate human resources and adequate physical infrastructure in the main Hawaiian Islands to support management of Papahānaumokuākea Marine National Monument.
- Information Management Action Plan
    - ❖ Consolidate and make accessible relevant information to meet educational, management, and research needs for Papahānaumokuākea Marine National Monument.
- Coordinated Field Operations Action Plan
    - ❖ Coordinate field activities and provide adequate infrastructure to ensure safe and efficient operations while avoiding impacts to the ecosystems in Papahānaumokuākea Marine National Monument.
- Evaluation Action Plan
    - ❖ Determine the degree to which management actions are achieving the vision, mission, and goals of Papahānaumokuākea Marine National Monument.

Finally, the appendices (Volume III) include supporting documents such as the unified permit policy, application, and instructions; Midway Atoll Visitor Services Plan; Presidential Proclamations 8031 and 8112; Monument regulations (50 CFR Part 404); the Memorandum of Agreement for Promoting Coordinated Management of the Northwestern Hawaiian Islands Marine National Monument; operational protocols and best management practices; and the International Maritime Organization Particularly Sensitive Sea Area Designation and Associated Protective Measures. Volume IV contains the Midway Atoll Conceptual Site Plan. Volume V is the Response to Comments, including comments on all components of the management plan, including the environmental assessment, and Cultural Impact Assessment.

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ACRONYMS AND ABBREVIATIONS

AAUS	American Academy of Underwater Sciences
AIS	Alien Invasive Species
ATBA	Areas to be Avoided
AUV	Autonomous Underwater Vehicle
BLNR	Board of Land and Natural Resources, State of Hawai‘i
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
COPPS	Community Oriented Policing and Problem Solving
CoRIS	NOAA Coral Reef Information System
CPUE	Catch-per-unit-effort
CRED	PIFCS Coral Reef Ecosystem Division
CRER	Coral Reef Ecosystem Reserve
DLNR	State of Hawai‘i Department of Land and Natural Resources
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
DOI	U.S. Department of the Interior
EPA	U.S. Environmental Protection Agency
ERAT	Emergency Response and Assessment Team
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAD	Fish Aggregation Device
FP	Fibropapillomatosis
FWS	U.S. Fish and Wildlife Service
FFS	French Frigate Shoals
GIS	Geographic Information System
HAMER	Hawaiian Archipelago Marine Ecosystem Research Plan
HAR	Hawaii Administrative Rules
HAZWOPR	Hazardous Waste Operations and Emergency Response
HIMB	Hawai‘i Institute of Marine Biology
HINWR	Hawaiian Islands National Wildlife Refuge
HRS	Hawaii Revised Statutes
HURL	Hawai‘i Undersea Research Laboratory
IASMP	Integrated Alien Species Management Plan
ICC	Interagency Coordinating Committee
ICS	Incident Command System
IHO	International Hydrographic Organization
IMaST	Information Management and Spatial Technology
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
LORAN	Long Range Aid to Navigation
MARPOL	International Convention for the Prevention of Pollution from Ships 1973
MBTA	Migratory Bird Treaty Act
MMB	Monument Management Board
MMPA	Marine Mammal Protection Act

MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NCCOS	National Center for Coastal Ocean Science
NEPA	National Environmental Policy Act 1982
NHPA	National Historic Preservation Act
NHWIRAMP	Northwestern Hawaiian Islands Reef Assessment and Monitoring Program
NMFS	National Marine Fisheries Service of the National Oceanic and Atmospheric Administration
NOAA	National Oceanic and Atmospheric Administration
NOWRAMP	Northwestern Hawaiian Islands Reef Assessment and Monitoring Program
NRC	National Research Council
NRDA	Natural Resource Damage Assessment
NRSP	Natural Resources Science Plan
NWHI	Northwestern Hawaiian Islands
NWR	National Wildlife Refuge
OHA	Office of Hawaiian Affairs
ONMS	Office of National Marine Sanctuaries
OPA	Oil Pollution Act
PCB	Polychlorinated Biphenyls
PIFSC	NMFS Pacific Islands Fisheries Science Center
PIMS	Papahānaumokuākea Information Management System
PIRO	NMFS Pacific Islands Regional Office
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
PSSA	Particularly Sensitive Sea Area
RAC	Reserve Advisory Council
RAMP	Resource Assessment and Monitoring Program
ROP	Reserve Operations Plan
ROV	Remotely Operated Vehicle
R/V	Research Vessel
SCUBA	Self-Contained Underwater Breathing Apparatus
SEB	Senior Executive Board
SHIELDS	Sanctuaries Hazardous Incident Emergency Logistics Database System
SMA	Special Management Area
SOU	Special Ocean Use
SPA	Special Preservation Area
SST	Scientific Support Team
t/ha	tons per hectare
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USDA	U.S. Department of Agriculture
UXO	Unexploded Ordnance
VMS	Vessel Monitoring System

Introduction

1.0 Introduction

Presidential Proclamation 8031, issued by President George W. Bush on June 15, 2006, set aside the Northwestern Hawaiian Islands (NWHI) as the Papahānaumokuākea Marine National Monument (Monument), creating one of the world's largest marine protected areas, managed to protect ecological integrity. This Monument designation adds to the moʻokūʻauhau, or the genealogy, of the NWHI, as a place of deep significance to Native Hawaiians, and now, to the nation and the world.

In the Pacific, the NWHI have played a significant role in the culture and traditions of Native Hawaiians. Significant archaeological finds, as well as oral and written histories, confirm a deep relationship between the Hawaiian people and the NWHI. The region was also considered a sacred place, as evidenced by the many wahi kūpuna (ancestral sites) on the islands of Nihoa and Mokumanamana.

Monument Vision and Mission

Vision

To forever protect and perpetuate ecosystem health and diversity and Native Hawaiian cultural significance of Papahānaumokuākea.

Mission

Carry out seamless integrated management to ensure ecological integrity and achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture, and heritage resources for current and future generations.

The NWHI have been the focus of various conservation efforts by the United States, beginning in 1903, when President Theodore Roosevelt sent in Marines to stop the slaughter of seabirds at Midway Atoll. Over the next 100 years, and through the efforts of six U.S. Presidents and one Hawaiʻi Governor, the region received increasing protection, with the culmination being Proclamation 8031 that created the Monument.

Globally, the NWHI are a natural and cultural treasure of outstanding scientific, conservation, and aesthetic value. The establishment of the Monument builds on the long-standing efforts of state and federal agencies, nongovernmental organizations, stakeholders, and the public to provide for long-term protection of the marine and terrestrial ecosystems of the NWHI and the preservation of cultural and historic resources.

Management of the Monument is the responsibility of three Co-Trustees: the State of Hawaiʻi, through the Department of Land and Natural Resources; the U.S. Department of the Interior (DOI), through the Fish and Wildlife Service (FWS); and the U.S. Department of Commerce (DOC), through the National Oceanic and Atmospheric Administration (NOAA). The Co-Trustees are committed to preserving the ecological integrity of the Monument and perpetuation of the NWHI ecosystems, Native Hawaiian culture, and historic resources. NOAA and FWS promulgated final regulations for the Monument under Title 50 Code of Federal Regulations (CFR) Part 404 on August 29, 2006. These regulations codify the scope and purpose, boundary, definitions, prohibitions, and regulated activities for managing the Monument. In addition, the Co-Trustees developed and signed a Memorandum of Agreement (MOA) on December 8, 2006, to establish roles and responsibilities of coordinating bodies and mechanisms for managing the Monument.

Proclamation 8031 states that the Secretary of Commerce, through NOAA, has primary responsibility regarding the management of the marine areas of the Monument, in consultation with the Secretary of the Interior. The Secretary of the Interior, through FWS, has sole responsibility for the areas of the Monument that overlay the Midway Atoll National Wildlife Refuge (NWR), the Battle of Midway National Memorial, and the Hawaiian Islands National Wildlife Refuge, in consultation with the Secretary of Commerce. Nothing in the Proclamation diminishes or enlarges the jurisdiction of the State of Hawai'i. The State of Hawai'i, through the Department of Land and Natural Resources, has primary responsibility for the Northwestern Hawaiian Islands Marine Refuge and State Seabird Sanctuary at Kure Atoll.

The MOA also requires the Co-Trustees to develop a Monument Management Plan for ensuring the coordinated management of coral reef ecosystems and related marine environments, terrestrial resources, and cultural and historic resources of the Monument. To develop the Monument Management Plan, the Co-Trustees began with the final "draft" of NOAA's Office of National Marine Sanctuaries (ONMS, formerly the National Marine Sanctuary Program) proposal. This document provided a good basis and background information from which to start. Requirements for the FWS National Wildlife Refuge System Comprehensive Conservation Planning process were added. Alternative plans and management approaches were developed and reviewed in an Environmental Assessment (see Volume II, Final Environmental Assessment). Finally, through a process of review and synthesis, the final plan was developed.

The Monument is situated in the northwestern portion of the Hawaiian Archipelago, located northwest of the Island of Kaua'i and the other main Hawaiian Islands (Figure 1.1). A vast, remote, and largely uninhabited region, the Monument encompasses an area of approximately 139,797 square miles (362,075 square kilometers) of the Pacific Ocean. Spanning a distance of approximately 1,200 miles (1,043 nautical miles/1,931 kilometers), the 115-mile-wide (100 nautical mile/185.2 kilometer) Monument is dotted with small islands, islets, reefs, shoals, submerged banks, and atolls that extend from subtropical latitudes to near the northern limit of coral reef development.

The Monument includes a complex array of terrestrial and marine ecosystems. The NWHI are intimately connected to Native Hawaiians on genealogical, cultural, and spiritual levels (Beckwith 1951; DOI 2008). The region's natural resources, together with its rich Native Hawaiian cultural and other historic resources, give this Monument a unique stature as one of the most significant protected areas in the world.

This Monument Management Plan describes a comprehensive and coordinated management regime to achieve the vision, mission, and guiding principles of the Monument and to address priority management needs over the next 15 years. The plan is organized into three sections. This Introduction, Section 1, describes the Monument's setting and the current status and condition of the ecosystem and cultural resources based on existing scientific and historic knowledge. It also describes known anthropogenic stressors that affect Monument resources or may do so in the future.

The management framework for the Monument is described in Section 2 and includes key elements to move toward an ecosystem approach to management. This framework comprises the following elements:

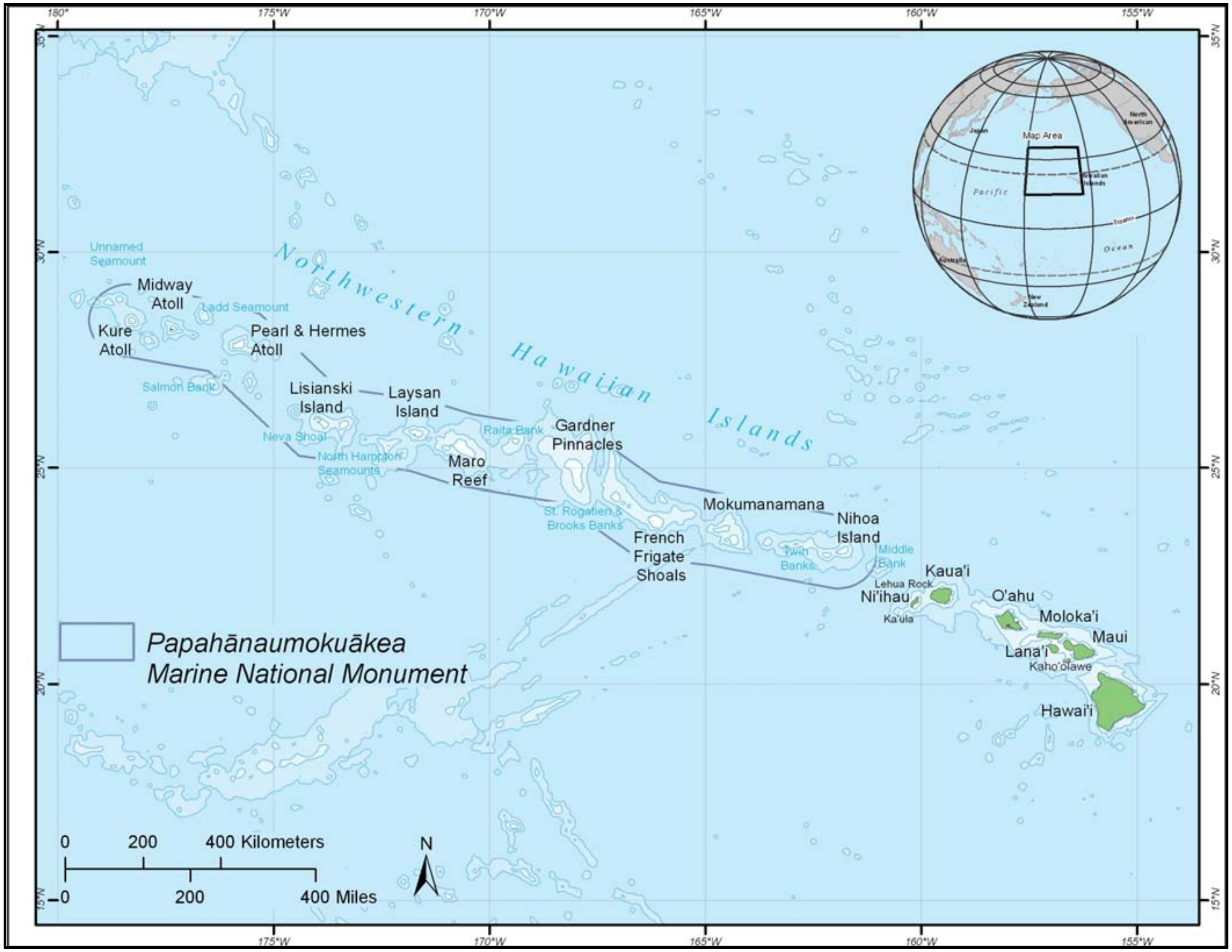
- The legal and policy basis leading to the establishment of the Monument
- Vision, mission, and guiding principles that provide an overarching policy direction for the Monument
- Goals to guide the implementation of specific action plans to address priority management needs
- Institutional arrangements for management among the Co-Trustees and other stakeholders
- Regulations and zoning to manage human activities and threats
- Concepts and direction to move toward a coordinated ecosystem approach to management

Section 3 presents action plans to address six priority management needs over a 15-year planning horizon. These priority management needs are:

- Understanding and interpreting the NWHI
- Conserving wildlife and habitats
- Reducing threats to Monument resources
- Managing human uses
- Coordinating conservation and management activities
- Achieving effective Monument operations

Each action plan consists of multiple strategies and activities to address one or more priority management needs and achieve a desired outcome. Performance measures will be developed to evaluate implementation of the Monument Management Plan. Monument regulations and other policy and operating instruments are provided in the appendices, along with references.

Figure 1.1 Hawaiian Archipelago Including the Northwestern Hawaiian Islands (Nihoa to Kure Atoll) and Main Hawaiian Islands (Hawai‘i to Kaua‘i). Inset shows the Hawaiian Archipelago in the Pacific Ocean.



1.1 Monument Setting

Hānau Moku–The Birth of Islands

Birth is a core theme in Native Hawaiian culture. Pō, the primordial darkness from which all life springs and returns to after death (Kikiloi 2006), is seen as birthing the world and all of the Hawaiian gods. The union of her progeny, Kumulipo and Pōʻele, births all the creatures of the world, beginning in the oceans with the coral polyp—a genealogy that starts with the simplest life form and moves to the more complex.

In keeping with the symbolism of birth, Native Hawaiians view the rising of magma from deep within the earth as birthing of the islands—the physical manifestation of the union between the earth mother, Papahānaumoku, and sky father, Wākea. The symbolism of this union is also the foundation for the name of the Monument: Papahānaumokuākea.

From a Native Hawaiian perspective, the NWHI are the kūpuna (elders or grandparents) of Native Hawaiians. As a kupuna, each island is our teacher; each island has its own unique message. As the younger generation, humans are tasked to mālama (care for) our kūpuna. It is our kuleana (responsibility) to take the time to listen to their wisdom.

Overview – Geographic, Geological and Ecosystem Setting

As one of the world's largest marine protected areas, the Papahānaumokuākea Marine National Monument encompasses a vast area of the Pacific. Extending for a distance of roughly 1,200 statute miles (1,043 nautical miles, 1,931 kilometers) by 115 statute miles (100 nautical miles, 185 kilometers), the Monument covers an area of approximately 140,000 square miles (362,100 square kilometers) and includes a rich, varied, and unique natural, cultural, and historic legacy. The Monument is located approximately between latitudes 22° N. and 30° N. and longitudes 161° W. and 180° W. within the north-central Pacific Ocean. Overlaid on a map of the continental United States, the Monument would cover a distance from the Midwest to the eastern U.S. coastline (figure 1.2).

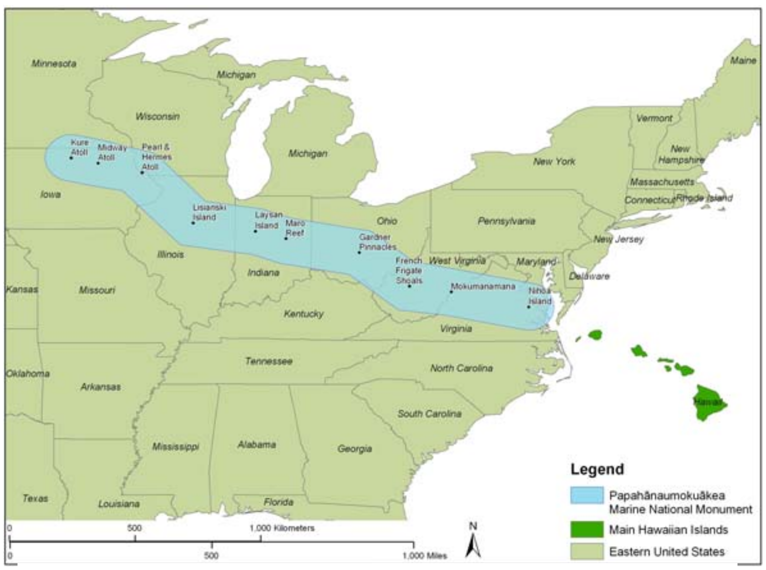


Figure 1.2 Papahānaumokuākea Marine National Monument Overlaid on Eastern North America.

The islands and atolls of the Monument constitute the northwestern three-quarters of the world's longest and most remote island chain. Formed millions of years ago, the islands were created by a sequential series of underwater shield volcanoes which, in combination with the main Hawaiian Islands, form the Hawaiian Archipelago. These once lofty islands have been transported northwest, as if on a conveyor belt, by the movements of the Pacific Plate to their current locations (Dalrymple et al. 1974). Because of the pervasive and unrelenting forces of subsidence and erosion, all that remains today are small patches of ancient land, and shoals and reefs now lie where magnificent mountains once loomed. Northwest of Kaua‘i and Ni‘ihau, the rocky islands, atolls, and reefs become progressively older and smaller.

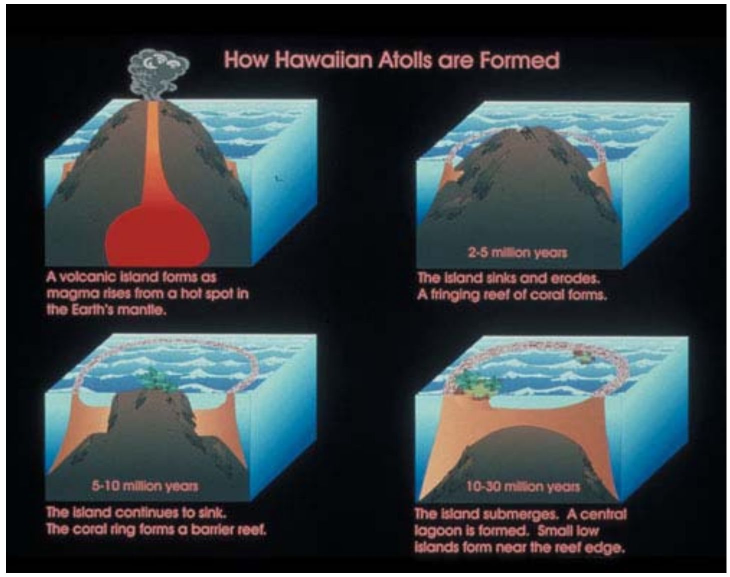


Figure 1.3 Atoll Formation.

Beginning 155 miles (249.4 kilometers) from the main Hawaiian Island of Kaua‘i, the 10 islands and atolls of this chain extend for 1,200 miles (1,931 kilometers) and are referred to as the NWHI, in past decades as the Leeward or Kūpuna Islands, and now as Papahānaumokuākea. None of these islands is more than 2 square miles (5 square kilometers) in size, and all but four have an average mean height less than 32 feet (10 meters). As a group, they represent a classic geomorphological sequence, consisting of highly eroded high islands, near-atolls with volcanic pinnacles jutting from surrounding lagoons, true ring-shaped atolls with roughly circular rims and central lagoons, and secondarily raised atolls, one of which has an interior hypersaline lake. These islands are also surrounded by more than 30 submerged ancillary banks and seamounts. This geological progression along the Hawaiian Ridge continues northwestward beyond the last emergent island, Kure Atoll, as a chain of submerged platforms that makes a sudden northward bend to become the Emperor Seamounts, which extend across the entire North Pacific to the base of the Kamchatka Peninsula in Russia. This unbroken chain of progressively more senescent volcanic structures essentially tracks the movement of the Pacific tectonic plate over the past 80 million years and has provided some of the most compelling evidence that form the basis for current theories of hot-spot-mediated island formation and global plate tectonic movements.

The Monument supports a diverse and unique array of both marine and terrestrial flora and fauna. With a spectrum of bathymetry and topography ranging from abyssal basins at depths greater than 15,000 feet (4,572 meters) below sea level to rugged hillslopes and clifftops on Nihoa and Mokumanamana (Necker Island) at up to 903 feet (275.2 meters) above sea level, the Monument represents a complete cross section of a Pacific archipelagic ecosystem. Habitats contained within the Monument include deep pelagic basins, abyssal plains, submarine escarpments, deep and shallow coral reefs, shallow lagoons, littoral shores, dunes, and dry coastal grasslands and shrublands. Relatively high percentages of most taxonomic groups in the NWHI are found nowhere else on earth.

Nutrient conditions in the NWHI may be influenced by local and regional factors. Upwelling may occur in response to localized wind and bathymetric features. The Monument is located at the northern edge of the oligotrophic tropical Pacific, in the North Pacific central gyre ecosystem (see Figure 1.4). Regional factors are largely influenced by the position of the subtropical front and associated high chlorophyll content of waters north of the front. High-chlorophyll waters intersect the northern portions of the NWHI during southward winter migrations of the subtropical front. The influx of nutrients to the NWHI from these migrations is considered a significant factor influencing different trophic levels in the NWHI (Polovina et al. 1995). It is near the 18°C sea surface isotherm, a major ecological transition zone in the northern Pacific. This boundary, also known as the “chlorophyll front,” varies in position both seasonally and annually, occasionally transgressing the Monument boundary and surrounding the northern atolls of Kure and Midway. The movement of the front influences overall ocean productivity, and resultant recruitment of certain faunal elements such as Hawaiian monk seals and Laysan and black-footed albatrosses (Polovina et al. 1994). The northernmost atolls also are occasionally affected by an episodic eastward extension of the Western Pacific warm pool, which can lead to higher summer ocean temperatures at Kure than are found in the more “tropical” waters of the main Hawaiian Islands farther south. This interplay of oceanography and climate is still incompletely understood, but is a dynamic not seen in most other tropical atoll ecosystems, and it provides a useful natural laboratory for understanding phenomena such as periodic coral bleaching and the effects of El Niño and La Niña ocean circulation patterns.

Ocean currents, waves, temperature, nutrients, and other oceanographic parameters and conditions influence ecosystem composition, structure, and function in the NWHI. The archipelago is influenced by a wide range of oceanographic conditions that vary on spatial and temporal scales. Spatial variability in oceanographic conditions ranges from a localized temperature regime that may affect a small portion of a reef to a temperature regime that influences the entire Monument. Temporal variability in ocean conditions may range from hourly and daily changes to seasonal, annual, or decadal cycles in nutrient inputs, sea level heights, current patterns, and other large-scale oceanographic processes (Polovina et al. 1994). Currents play an important role in the dispersal and recruitment of marine life in the NWHI. Surface currents in the NWHI are highly variable in both speed and direction (Firing and Brainard 2006), with long-term average surface flow being from east to west in response to the prevailing northeast trade wind conditions. The highly variable nature of the surface currents is a result in large part of eddies created by local island effects on large-scale circulation. The distribution of corals and other shallow-water organisms is also influenced by exposure to ocean waves. The size and strength of ocean wave events have annual, interannual, and decadal time scales. Annual extratropical storms (storms that originate outside of tropical latitudes) create high waves during the winter. Decadal variability in wave power is possibly related to the Pacific Decadal Oscillation events (Mantua et al. 1997). A number of extreme wave events were recorded during the periods 1985 to 1989 and 1998 to 2002, and anomalously low numbers of extreme wave events occurred during the early 1980s and from 1990 to 1996. Marine debris accumulation in shallow water areas of the NWHI is also influenced by large- and small-scale ocean circulation patterns and El Niño and La Niña events (Morishige et al. 2007).

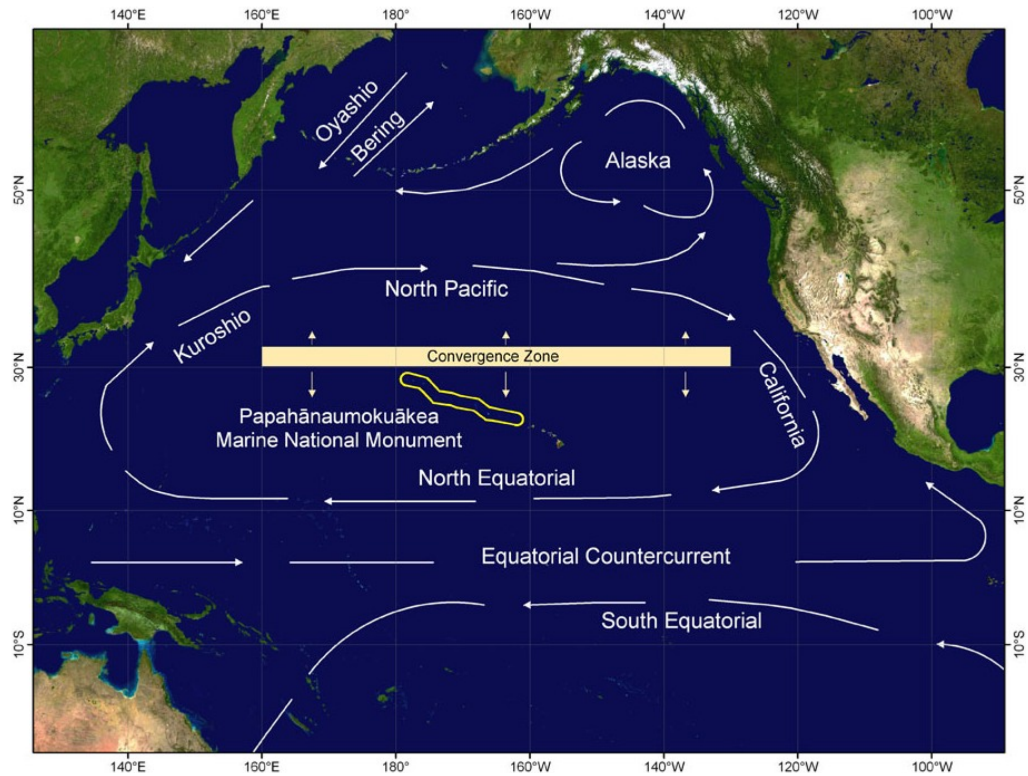


Figure 1.4 Diagram of Central Pacific Gyre. The North Pacific, California, North Equatorial, and Kuroshio currents along with atmospheric winds generate the North Pacific Subtropical Gyre. The Subtropical Convergence Zone, an area where marine debris is known to accumulate, shifts seasonally between 23º N and 37º N latitude.

The physical isolation of the Hawaiian Archipelago explains the relatively low species diversity and high endemism levels of its biota (DeMartini and Friedlander 2004). The direction of flow of surface waters explains biogeographic relationships between the NWHI and other sites, such as Johnston Atoll to the south (Grigg 1981), as well as patterns of endemism, population structure, and density of reef fish within the archipelago (DeMartini and Friedlander 2006).

The shallow marine component of the Monument is nearly pristine and has been described as a "predator-dominated ecosystem," an increasingly rare phenomenon in the world's oceans (Friedlander and DeMartini 2002). Large, predatory fish—such as sharks, giant trevally, and Hawaiian grouper—that are rarely seen and heavily overfished in populated areas of the world are extremely abundant in the waters of the Monument. For instance, such species comprise only 3 percent of fish biomass in the heavily used main Hawaiian Islands, but by contrast represent 54 percent of fish biomass in the waters of the Monument. The NWHI are also characterized by a high degree of endemism in reef fish species, particularly at the northern end of the chain, with endemics comprising more than 50 percent of the population in terms of numerical abundance (DeMartini and Friedlander 2004).

Live coral cover is highest in the middle of the chain, with Lisianski Island and Maro Reef having 59.3 percent and 64.1 percent of their respective available substrate covered with living corals (Maragos et al. 2004). Coral species richness is also highest in the middle of the chain, reaching a maximum of 41 reported coral species at French Frigate Shoals (Maragos et al. 2004). The coral reefs of the Monument are undisturbed by fishing or tourism, with excellent health and high species richness; preliminary faunal inventories indicate that many of their constituent species remain undocumented, and new coral species are still being discovered in this area.

The majority of the Monument consists of deep pelagic waters that surround the island platforms. At least 15 banks lie at depths between 100 and 1,300 feet (30 and 400 meters) within the Monument, providing important habitat for bottomfish and lobster species, although only a few of these banks have been studied in any detail (Kelley and Ikehara 2006). These waters represent critical deepwater foraging grounds for Hawaiian monk seals (Parrish et al. 2002) as well as a spatial refugium for pelagic fishes such as tunas and their allies.

Scientists using deep-diving submersibles have established the presence of deepwater precious coral beds at depths of 1,200 to 1,330 feet (365 to 406 meters); these include ancient gold corals whose growth rate is now estimated to be only a few centimeters every hundred years and whose ages may exceed 2,500 years (Roark et al. 2006). At depths below 1,640 feet (500 meters), a diverse community of octocorals and sponges flourish. These deepwater sessile animals prefer hard substrates devoid of sediments (Baco-Taylor et al. 2006). Even deeper yet, the abyssal depths of the Monument harbor low densities of organisms, and yet the total biomass of the abyssal community is quite large because of the large area of this habitat type within the Monument. Occupying this habitat are odd and poorly documented fishes and invertebrates, many with remarkable adaptations to this extreme environment.

The deep waters are also important insofar as they support an offshore mesopelagic boundary community (Benoit-Bird et al. 2002), a thick layer of pelagic organisms that rests in the deep ocean (1,300 to 2,300 feet, or 400 to 700 meters) during the day, then migrates up to shallower depths (from near zero to 1,300 feet or 400 meters) at night, providing a critical source of nutrition for open-ocean fishes, seabirds, and marine mammals. Overall, the fauna of the Monument's waters below standard SCUBA diving depths remains poorly surveyed and documented, representing an enormous opportunity for future scientific research in a system largely undisturbed by trawling or other forms of resource extraction.

Rates of marine endemism in the NWHI are among the highest in the world. In addition, the sheer mass of apex predators in the marine system is simply not seen in areas subject to higher levels of human impact (DeMartini and Friedlander 2004). The Monument represents one of the last remaining unspoiled protected areas on the planet, and virtually every scientific exploration to the area is a voyage of discovery. In the course of just one 3-week research cruise in the fall of 2006, conducted as part of the global Census of Marine Life project, more than 100 potentially new species were discovered at French Frigate Shoals alone.

In contrast to its marine systems, the terrestrial area of the Monument is comparatively small but supports significant endemic biodiversity. Six species of plants, including a fan palm, and four species of endemic birds, including remarkably isolated species such as the Nihoa finch, Nihoa millerbird, Laysan finch, and Laysan duck, one of the world's rarest ducks, are found only in the NWHI. Of these, the Laysan finch and Laysan duck occurred elsewhere in the archipelago in prehistory (Morin and Conant 2002). In addition, more than 14 million seabirds nest on the tiny islets in the chain, including 99 percent of the world's Laysan albatrosses and 98 percent of the world's black-footed albatrosses. Although still poorly documented, the terrestrial invertebrate fauna also shows significant patterns of precinctive speciation, with endemic species present on Nihoa, Mokumanamana, French Frigate Shoals, Laysan, Lisianski, Pearl and Hermes, and Kure.

Climate

The climate of the entire Hawaiian archipelago features mild temperatures year-round, moderate humidities, persistent northeasterly trade winds, and infrequent severe storms. Hawai'i's climate is notable for its low day-to-day and month-to-month variability (Giambelluca and Schroeder 1998). The climate is influenced by the marine tropical or marine Pacific air masses, depending on the season. During the summer, the Pacific High Pressure System becomes dominant with the ridge line extending across the Pacific north of Kure and Midway. This system places the region under the influence of easterly winds, with marine tropical and trade winds prevailing. During the winter, especially from November through January, the Aleutian Low moves southward over the North Pacific, displacing the Pacific High before it. The Kure-Midway region is then affected by either marine Pacific or marine tropical air, depending on the intensity of the Aleutian Low or the Pacific High Pressure System (Amerson et al. 1974). The surrounding ocean has a dominant effect on the weather of the entire archipelago.

Sea surface temperature is an important physical factor influencing coral reefs and other marine ecosystems. Maximum monthly climatological mean sea-surface temperature measured over the last 20 years at Kure is 80.6 ºF (27 ºC) in August and September (NOAA Pathfinder SST time series; Hoeke et al. 2006), with monthly minimums in February at 66.2 ºF (19 ºC). The large seasonal temperature fluctuations at the northern end of the archipelago result in the coldest and sometimes the warmest sea surface temperatures in the entire Hawaiian chain (Brainard et al. 2004). At the southern end of the Monument, the annual variation in sea surface temperature is much less, with French Frigate Shoals varying only between 74 and 81.5° F (23.3 and 27.5º C) throughout the year. During the period between July and September 2002, sea surface temperatures along the entire Hawaiian Archipelago were anomalously warm, resulting in widespread mass coral bleaching, particularly in the three northern atolls.

Air temperature at the northern end of the archipelago (Kure and Midway atolls) varies between 51 and 92 ºF (11 and 33 ˚C). Air temperature measurements made at six sites on Nihoa (23º N. latitude) from March 2006 to March 2007 ranged between 61 and 94 ºF (16 and 34 °C). Annual rainfall amounts at Tern Island, French Frigate Shoals are shown in Figure 1.5. Annual rainfall over the last 26 years has been 28.85 inches (73.28 centimeters) on average, ranging between 15.99 and 41.04 inches (40.61 and 104.24 centimeters) per year.

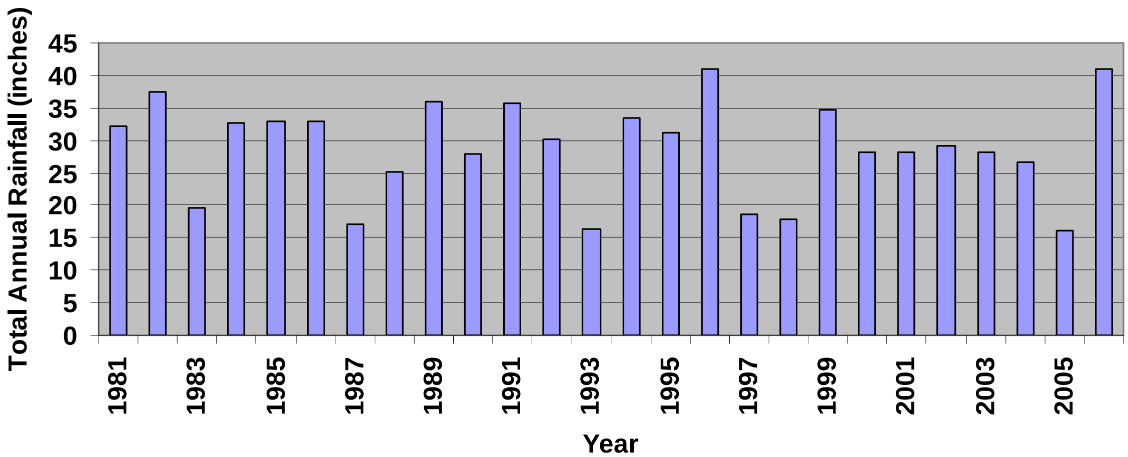


Figure 1.5 Annual Rainfall (inches) Tern Island, French Frigate Shoals.

On average, between four and five tropical typhoons or hurricanes are observed annually in the Central Pacific. Most of these storms develop in the eastern tropical Pacific, but some form in the central tropical Pacific, and occasionally typhoons approach the Monument from the Western Pacific. The strongest hurricane ever recorded in the Monument area was Patsy in 1959, which passed between Midway and Kure with wind speeds of greater than 115 mph (100 knots) (Friedlander et al. 2005). Only two hurricanes nearing the NWHI since 1979 were classified as Category 2 or weaker. No significant tropical storms have been observed in the NWHI since Hurricane Nele passed near Gardner Pinnacles in 1985.

Much more common, and perhaps more significant as a natural process affecting the geology and ecology of the Monument, are the extratropical storms and significant wave events that regularly move across the North Pacific in the boreal winter. These large wave events (larger than 33-foot or 10-meter waves) influence the growth forms and distribution of coral reef organisms (Dollar 1982; Dollar and Grigg 2004; Friedlander et al. 2005) and affect the reproductive performance of winter-breeding seabirds nesting on low islets in the Monument. Most large (16 to 33 feet+ or 5 to 10+ meters) wave events approach the NWHI from the west, northwest, north, and northeast, with the highest energy generally occurring from the northwest sector. The southern sides of most of the islands and atolls of the NWHI are exposed to fewer and weaker wave events. Annually, wave energy and wave power (energy transferred across a given area per unit time) are highest (~1.3 W/m) between November and March and lowest (~0.3 W/m) between May and September. Extreme wave events (33+ feet or 10+ meter waves) affect shallow water coral reef communities with at least an order of magnitude more energy than the typical winter waves (Friedlander et al. 2005).

Islands and Marine Habitats of Papahānaumokuākea

The following section contains brief descriptions of the individual islands and marine habitats within the Papahānaumokuākea Marine National Monument, and their salient physical and biological characteristics. The most commonly used name for each island is given first, with alternative names, if any, provided in parentheses. It should be noted that for the islands northwest of Mokumanamana, the Hawaiian names provided are not yet in use on many modern maps. In addition, multiple Hawaiian names have been given to these islands, with the most ancient still being researched through the study of chants, stories, song, and documents written in the Hawaiian language.

Nihoa
23°03′ N., 161°56′ W.

"He pu'u kolo i Nihoa." ("Crawling up the cliffs of Nihoa.") This traditional Hawaiian saying is a compliment to one who perseveres. (Pukui 1997). Nihoa has many craggy cliffs, and the rough surf in the winter makes landing there even more difficult than during the summer. "Nihoa" literally means "firmly set," which could refer to the people who frequented such rugged conditions, and to the pounding that the island takes from the sea and wind. Nihoa has also been known as Moku Manu (bird island).

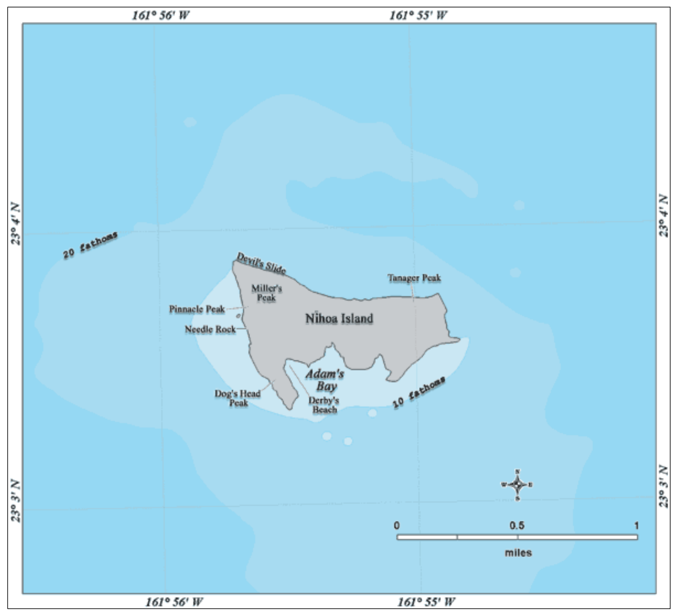


Figure 1.6 Nihoa.

Nihoa is located approximately 155 miles (249.4 kilometers) northwest of Kaua'i, the closest of the main Hawaiian Islands. Measuring roughly 170 acres (0.68 square kilometers), this island is the largest emergent volcanic island within the Monument and the tallest, reaching an elevation of 903 feet (275.2 meters) at Miller Peak. It is also the geologically youngest island within the Monument, with an age calculated at 7.3 million years (Clague 1996). Nihoa is a deeply eroded remnant of a once-large volcano, and the large basaltic shelf of which it is a part stretches 18 miles (28.9 kilometers) in a northeast-southwest direction and averages between 112 to 217 feet (34.1 and 66.1 meters) deep (NOAA 2003b). The island's two prominent peaks and steep sea cliffs are clearly visible from a distance, rising like a fortress above the sea. The island's northern face is composed of a sheer cliff made up of successive layers of basaltic lava, within which numerous volcanic dikes are visible. The surface of the island slopes southward with an average slope of 23° (Johnson 2004). The island's surrounding submerged reef habitat totals approximately 142,000 acres (574.6 square kilometers) and is a combination of uncolonized hard bottom, macroalgae, pavement with sand channels and live coral, and uncolonized volcanic rock (NOAA 2003b), supporting at least 127 species of reef fish and 17 species of corals.

Nihoa's seabird colony boasts one of the largest populations of Tristam's storm-petrel, Bulwer's petrel, and blue noddies in the Hawaiian Islands, and very possibly the world. The island is a unique example of a lowland native community, resembling those lowland communities that once occurred on the main Hawaiian Islands but are now almost completely gone (Wagner et al. 1990). The island's vegetation can be classified as part coastal mixed community (*Sida* mixed shrub and grassland) and coastal dry shrubland dominated by 'ilima (*Sida fallax*), 'āweoweo (*Chenopodium oahuense*), and 'ōhai (*Sesbania tomentosa*). The island supports 21 native plant species, including three endemics: a palm or loulu (*Pritchardia remota*), an amaranth (*Amaranthus brownii*), and an herb (*Schiedea verticillata*) (Wagner et al. 1999). The avifauna of the island includes two endemic passerine birds, the Nihoa finch (*Telespiza ultima*) and the Nihoa millerbird (*Acrocephalus familiaris kingi*), both listed as endangered under the federal Endangered Species Act (ESA) and HRS 195D. The arthropod fauna of the island includes 33 species of mites, three species of spiders, and 182 species of insects, 17 of which are endemic, including a katydid (*Banza nihoa*), a giant tree cricket (*Thaumatogryllus conantae*), two species of endemic seed bugs (*Nysius nihoae* and *Nysius suffusus*), and an endemic trapdoor spider (*Nihoa mahina*) (Evenhuis and Eldredge 2004). Nihoa also has a rich cultural heritage, with at least 88 known wahi kupuna (ancestral sites) constructed by the precontact Hawaiians who inhabited the island for 700 years (until 1700 A.D.), and is listed on the National Register of Historic Places.

Mokumanamana (Necker Island)
23°35′ N., 164°42′ W.

Mokumanamana is translated as a branching or pinnacled island, which aptly describes it, but many people who have studied its many religious and cultural sites suggest that the repetition of the word "mana" (spiritual power) after the Hawaiian word for "island" probably holds even more relevance. The facts that most of the 33 shrines on the island follow the kua (spine) of the island, the solar solstice hits the upright stones at a particular angle, navigational sites have been noted here, and the Hawaiian axes of life and death cross directly over Mokumanamana all potentially explain the reasoning behind the double mana in the name, and the concept of branching.

Figure 1.7 Mokumanamana (Necker Island)

Mokumanamana is a dry volcanic island shaped like a fishhook and includes approximately 45 acres (0.18 square kilometers) of land. Geologists believe the island, with an estimated age of 10.6 million years, was once the size of O'ahu in the main Hawaiian Islands, with a maximum paleo-elevation of 3,400 feet (1,036 meters) (Clague 1996), but due to centuries of erosion its highest point, at Summit Hill, is now only 276 feet (84.1 meters) above sea level. Wave action has eroded the remainder of the original island into a submerged shelf approximately 40 miles (64 kilometers) long and 15 miles (24 kilometers) wide. Although this shelf holds more than 380,000 acres (1,538 square kilometers) of coral reef habitat supporting 125 reef fish species and 18 coral species, severe wave action and currents in the exposed areas tend to inhibit coral growth. The bank provides excellent habitat for spiny lobsters (*Panulirus marginatus*) and slipper lobsters (*Scyllarides squammosus*), especially in areas of less than 90 feet (27.4 meters) depth and high benthic relief (Parrish and Polovina 1994). Because of its limited size, Mokumanamana supports only five indigenous plant species and no land birds, but does harbor three species of mites, two species of spiders, and 70 species of insects, of which 11 are endemic, including a large weevil (*Rhycogonus biformis*), two species of seed bugs (*Nysius neckerensis* and *Nysius chenopodii*), and a trapdoor spider (*Nihoa hawaiiensis*) (Evenhuis and Eldredge 2004). Sixteen species of seabirds breed here, including the black noddy (*Anous minutus*), which historically was called the Necker Island tern.

Mokumanamana is also significant in Native Hawaiian culture. It bears 33 heiau (ceremonial sites) with standing stones that stretch the length of the island's central spine, suggesting that it was visited by Native Hawaiians for spiritual and possibly navigational purposes.

French Frigate Shoals (Kānemiloha‘i)
23°145′ N., 66°10′ W.

The first atoll to the northwest of the main Hawaiian Islands, Kānemiloha‘i (flat, sand island) is also the midpoint of the archipelago and the largest coral reef area in Hawai‘i. This low, flat area is where Pele is said to have left one of her older brothers, Kānemiloha‘i, as a guardian during her first journey to Hawai‘i from Kahiki (Tahiti). Pele continued down the archipelago until finally settling in Kīlauea, Hawai‘i Island, where she is said to reside today.

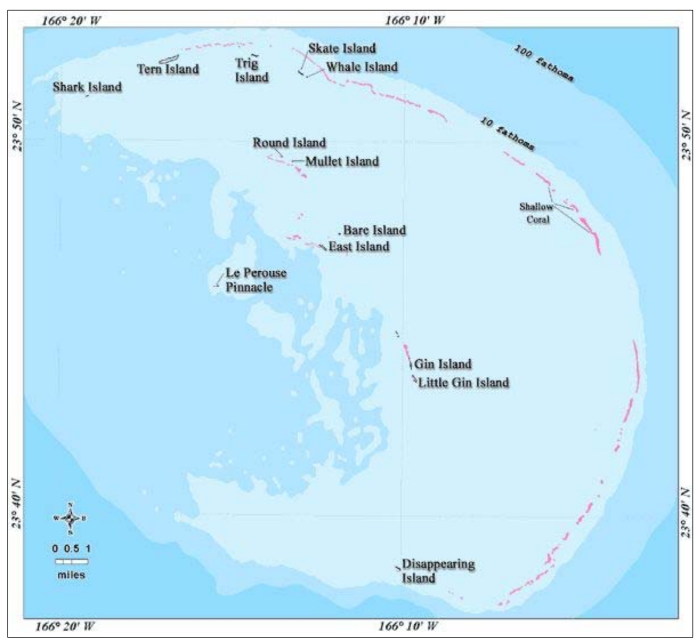


Figure 1.8 French Frigate Shoals.

French Frigate Shoals is the largest atoll in the chain, taking the form of an 18-mile (28.9 kilometers) long crescent. It is estimated to be 12.3 million years old (Clague 1996). The shoals consist of 67 acres (0.27 square kilometers) of total emergent land surrounded by approximately 230,000 acres (931 square kilometers) of coral reef habitat, with a combination of sand, rubble, uncolonized hard bottom, and crustose coralline algae in the windward and exposed lagoon areas, and patch and linear coral reefs in more sheltered areas (NOAA 2003b). Tern Island in the atoll is the site of a FWS field station, which occupies a former U.S. Coast Guard Long-Range Aids to Navigation (LORAN) station that closed in 1979. Within the NWHI, French Frigate Shoals is the center of diversity for corals (more than 41 species, including the genus *Acropora*, which is all but absent elsewhere in Hawai'i) and reef fishes (178 species). A relatively deep (82 to 98 feet or 24.9 to 29.8 meters) coral reef at this atoll has been recently discovered to function as a spawning site for the giant trevally, *Caranx ignobilis* (Meyer et al. 2007); a rare discovery of spawning sites for top predators.

The lagoon is also unusual in that it contains two exposed volcanic pinnacles representing the last vestiges of the high island from which the atoll was derived, as well as nine low, sandy islets. The sand islets are small, shift position, and disappear and reappear. In 1923, the Tanager Expedition mapped 16 islets (Amerson 1971). In 1963, Whaleskate was a 16.8-acre (0.068 square kilometers), vegetated island (Amerson 1971); by 1998, it had completely disappeared (Antonelis et al. 2006). These islets provide highly important habitat for the world's largest breeding colony of the imperiled Hawaiian monk seal, which is listed as endangered under the ESA and HRS 195D, and is internationally recognized as critically endangered by the World Conservation Union. The atoll's sandy islets also provide nesting sites for 90 percent of the threatened green turtle population breeding in the Hawaiian Archipelago. In addition, 19 of Hawai'i's 22 seabird species are found on the island, giving it the highest species richness of breeding seabirds within the Monument. The dry coastal shrublands of the larger islets within the atoll also support an endemic seed bug (*Nysius frigatensis*), moth (*Agrotis kerri*), and mite (*Phauloppia bryani*) (Usinger 1942; Nishida 2002).

Gardner Pinnacles (Pūhāhonu)
25°02′ N., 168°05′ W.

"He pūko'a kū no ka moana."("A large rock standing in the sea.") This traditional Hawaiian saying is used to describe someone who is stubborn, unchangeable, and very determined. This is a suitable description for Pūhāhonu (surfacing of a sea turtle for air/breath), which looks a bit like a turtle's beak coming up for air and consists of two rocks, with the tallest of them 170 feet tall and 200 yards long.

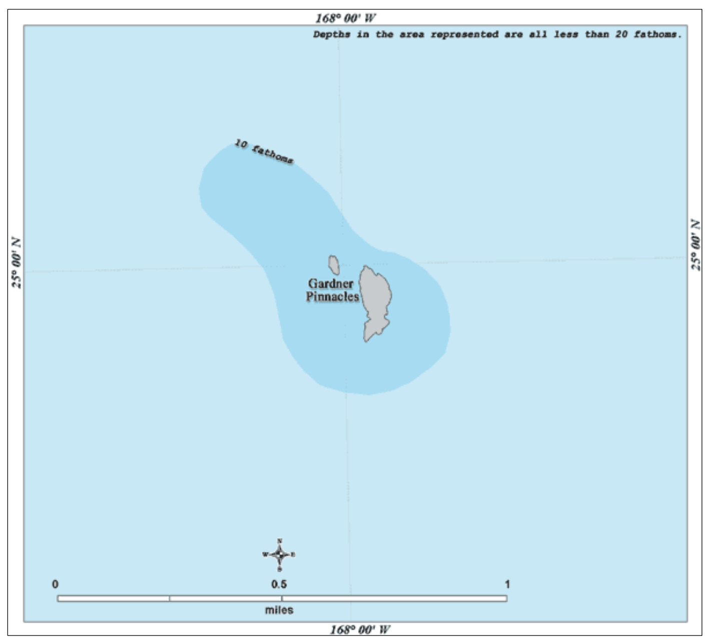


Figure 1.9 Gardner Pinnacles.

Gardner Pinnacles consists of two emergent basaltic volcanic peaks estimated to be 15.8 million years in age (Clague 1996), which represent the oldest high islands in the Hawaiian chain. In scale, these pinnacles are small, the largest reaching only 180 feet (54.8 meters) high and having a diameter of approximately 590 feet (179.8 meters). Because of their limited size, they support only a single species of land plant (*Portulaca lutea*) and a few terrestrial arthropod species, but they are by contrast excellent habitat for seabirds (Clapp 1972). Guano from such seabirds gives the peaks a "frosted" appearance, indicating their importance as roosting and breeding sites for at least 12 subtropical species. Landings and terrestrial surveys rarely take place because of the difficulty of getting ashore under all but the most calm ocean conditions.

These remnant volcanic pinnacles are surrounded by approximately 600,000 acres (2,428 square kilometers) of coral reef habitat, most of which is in waters 60 feet (18.3 meters) or deeper, harboring 124 reef fish species and 27 species of corals. The intertidal bases of the pinnacles are studded with large populations of ‘opihi, endemic Hawaiian limpets that have been seriously depleted by overharvesting elsewhere in the main Hawaiian Islands.

Maro Reef (Ko‘anako‘a, Nalukākala)
25°22′ N., 170°35′ W.

The name Ko‘anako‘a literally means the settling of coral, referring to Maro’s expansive coral reefs. Another name for Maro, Nalukākala, describes surf that arrives in combers, such as the surf that froths over shallow reefs.

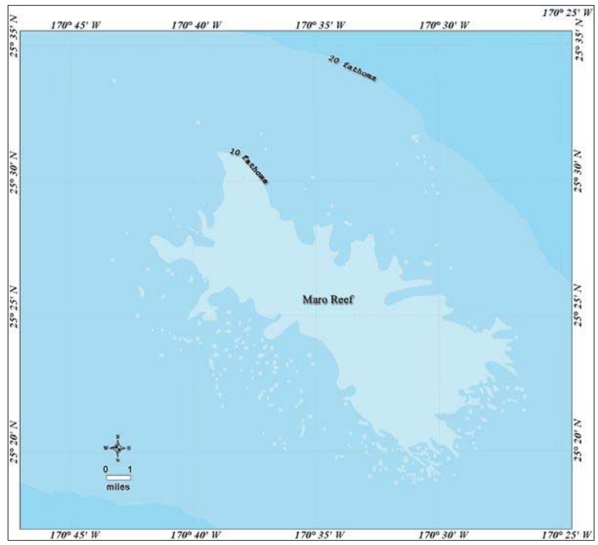


Figure 1.10 Maro Reef.

Maro Reef is a largely submerged open atoll 19.7 million years old (Clague 1996), with less than one acre (4,046.8 square meters) of periodically emergent land. At very low tide, only a small coral rubble outcrop of a former island is believed to break above the surface; as a result, Maro supports no terrestrial biota. In contrast, the shallow water reef system is extensive, covering nearly a half-million acres (2,023 square kilometers), and is the largest coral reef in the Monument. It is also one of the chain’s most ecologically rich shallow water marine ecosystems, with 64.1 percent coral cover over the entire area, among the highest percentage observed in the Monument (Maragos et al. 2004). The documented marine biota at Maro Reef includes 37 species of corals and 142 species of reef fish. Fish species endemic to the Hawaiian Archipelago make up half of all fish recorded here. Maro’s reefs are intricate and reticulated, forming a complex network of reef crests, patch reefs, and lagoons. Deepwater channels with irregular bottoms cut between these shallow reef structures, but navigation through them is difficult and hazardous. Cover types range from unconsolidated with 10 percent or less macroalgae cover to areas with greater than 10 percent coral or crustose coralline algae (NOAA 2003b). Because the outermost reefs absorb the majority of the energy from the open ocean swells, the innermost reticulated reefs and aggregated patch reefs are sheltered and have the characteristics of a true lagoon. Given the structural complexity of this platform, its shallow reefs are poorly charted and largely unexplored.

Laysan Island (Kauō)
25°46′ N., 171°45′ W.

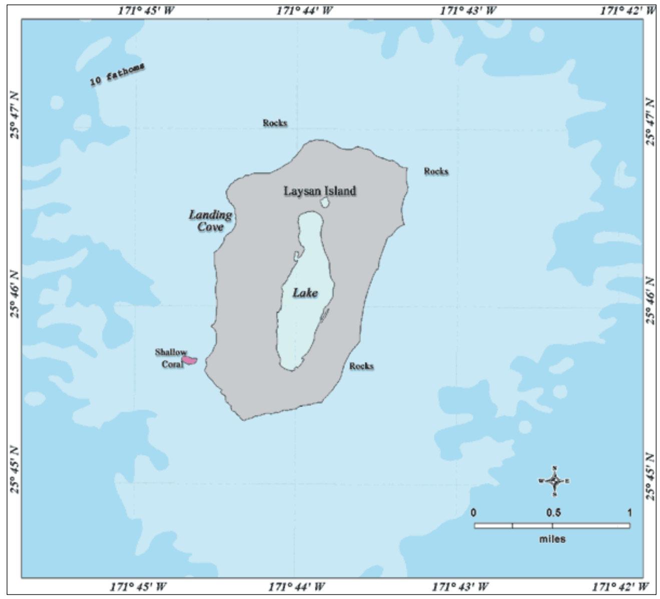


Figure 1.11 Laysan Island.

Kauō (egg) describes both the shape of this island and, perhaps, the abundant seabirds that nest here.

Laysan is a raised atoll, estimated to be 20.7 million years old (Clague 1996), with a maximum elevation of approximately 50 feet (15 meters) above sea level. It represents the second largest island in the Monument, with a land area of approximately 1,023 acres (4.14 square kilometers), surrounded by close to 100,000 acres (405 square kilometers) of coral reef. Most of the reef area at Laysan lies in deeper waters, with a small, shallow-water reef area in a bay off the southwest side of the island. The reef system as a whole supports 131 species of reef fishes and 27 species of corals. Laysan is home to a semi-permanent FWS field camp to support wildlife monitoring and habitat restoration.

The island's ring of sandy dunes surrounds a shallow depression of about 200 acres (0.8 square kilometers). This basin is a mix of hypersaline water and mud flats, a feature unique within the Hawaiian Archipelago and rare within the Pacific as a whole, that changes in size seasonally and annually depending on variations in rainfall. Because of its elevation of about 40 feet (12 meters), Laysan is well vegetated, supporting at least 30 species of flowering plants, including five endemic subspecies prior to human contact (Athens et al. 2007), many of which were driven to extinction by the misguided introduction of rabbits in 1902 during the guano mining era (Ely and Clapp 1973). The plant community is divided into five different associations arrayed in concentric rings around the interior hypersaline lake: (1) coastal shrubs, (2) interior bunchgrass, (3) vines, (4) interior shrubs, and (5) wetland vegetation (Newman 1988). The island also previously harbored five Hawaiian endemic land birds, of which two, the endangered Laysan finch (*Telespiza cantans*) and the endangered Laysan duck (*Anas laysanensis*), still survive (Pratt et al. 1987). In addition, approximately two million seabirds nest here, including boobies, frigatebirds, terns, shearwaters, noddies, and the world's second-largest black-footed and Laysan albatross colonies. The island also supports a relatively rich arthropod fauna, including a large endemic weevil (*Rhyncogonus bryani*), four endemic moths, an endemic wasp, and three endemic mites. A successful 12-year eradication project to remove the sandbur *Cenchrus echinatus,* a plant that had displaced native vegetation over 30 percent of the island, has been completed, and an active ecological restoration project is under way to bring back a number of other plants and animals that were lost after the introduction of rabbits (Morin and Conant 1998).

Lisianski Island (Papaʻāpoho) and Neva Shoal 26°04′ N., 173°58′ W.

Figure 1.12 Lisianski Island and Neva Shoal.

Papaʻāpoho describes a flat area with a depression or hollow, which is exactly how the island of Papaʻāpoho is shaped. Its highest point is a 40-foot-high sand dune, and its lowest point is a depression to the south that runs as a channel toward the ocean.

Lisianski Island is another raised atoll, rising to 40 feet (12.1 meters) above sea level, and with approximately 400 acres (1.6 square kilometers) of emergent land is the third largest island within the Monument. This 23.4-million-year-old island (Clague 1996) is over 1.2 miles (1.9 kilometers) across, consisting of an elevated rim surrounding a broad central depression, although unlike Laysan it does not enclose an interior saline lake. The coral cover on the platform around the island, called Neva Shoal, is extensive, totaling more than 290,000 acres (1,174 square kilometers) with an average of almost 60 percent cover of the substrate. There are 24 coral species at Lisianski and 124 species of reef fish. Fish species endemic to the Hawaiian Archipelago compose 58 percent of all fish recorded here.

Lisianski suffered ecological perturbations similar to those on Laysan because of the introduction of mice (Olsen and Ziegler 1996), guano mining, and the release of rabbits in 1903 (Tomich 1986). Lisianski lost a breeding population of land birds, the Laysan ducks historically known from about 150 years ago. It currently supports no endemic land plant or bird species, although it does harbor an endemic seed bug (*Nysius fullawayi flavus*) and an endemic moth (*Helicoverpa minuta*) (Usinger 1942; Nishida 2002). The island also hosts large Bonin petrel and sooty tern colonies, as well as a variety of other seabirds. Lisianski also has the only grove of *Pisonia grandis* trees in the entire Hawaiian Archipelago; this tree is dispersed by seabirds and is favored as a nesting site for many tree-nesting seabird species.

Pearl and Hermes Atoll (Holoikauaua)
27°50′ N., 175°50′ W.

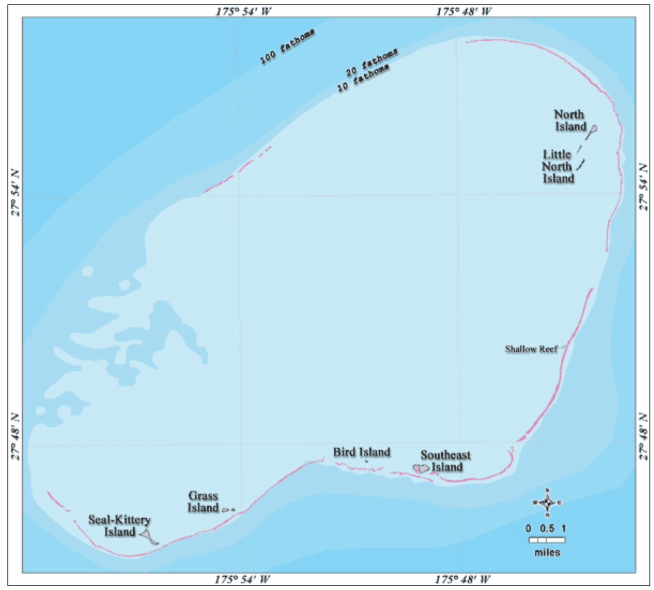


Figure 1.13 Pearl and Hermes Atoll.

The name Holoikauaua celebrates the Hawaiian monk seals that haul out and rest here. Pearl and Hermes Atoll is a large atoll with several small islets, forming 96 acres (0.38 square kilometers) of land surrounded by more than 300,000 acres (1,214 square kilometers) of coral reef habitat. The atoll has an estimated age of 26.8 million years (Clague 1996) and is 20 miles (32 kilometers) across and 12 miles (19.3 kilometers) wide, with dunes rising above sea level. Unlike Lisianski and Laysan to the southeast, Pearl and Hermes Atoll is a true atoll, fringed with shoals, permanent emergent islands, and ephemeral sandy islets. These features provide vital dry land for monk seals, green turtles, and a multitude of seabirds, with 16 species breeding here. The islets are periodically washed over when winter storms pass through the area. The atoll boasts the highest rate of reef fish endemism in the Hawaiian Archipelago, with 62 percent of fish species recorded endemic to the Hawaiian Archipelago out of 174 species overall. Coral species richness is high as well, with 33 species present. The permanent islands with higher dunes also support an endemic subspecies of native seed bug (*Nysius fullawayi infuscatus*) (Usinger 1942). Pearl and Hermes also hosts a small population of endangered Laysan finches that were translocated here in the 1960s.

Midway Atoll (Pihemanu)
28°15′ N., 177°20′ W.

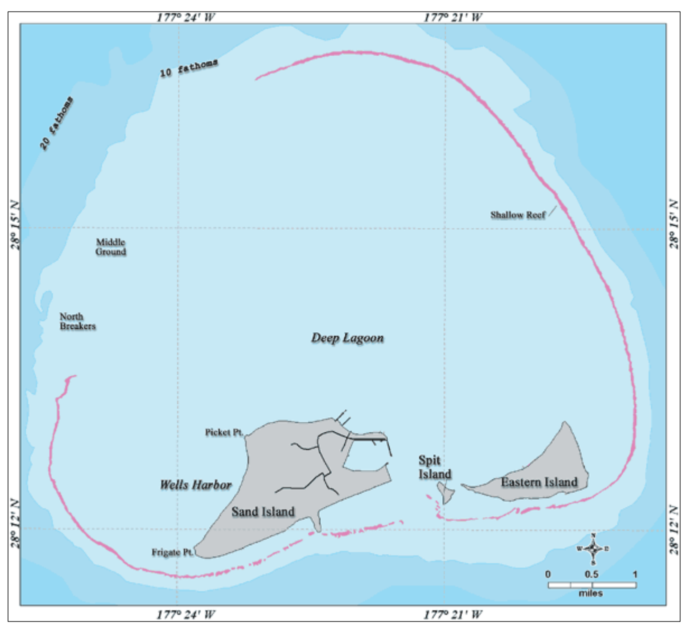


Figure 1.14 Midway Atoll.

Pihemanu is aptly named for the loud din of birds that one hears on this atoll. Midway Atoll consists of three sandy islets (Sand [1,128 acres, 4.56 square kilometers], Eastern [337 acres, 1.36 square kilometers], and Spit [13 acres, 0.05 square kilometers]), for a total of 1,464 acres (5.9 square kilometers) in terrestrial area, lying within a large, elliptical barrier reef measuring approximately 5 miles (8 kilometers) in diameter. The atoll, which is 28.7 million years old (Clague 1996), is surrounded by more than 88,500 acres (356 square kilometers) of coral reefs. In 1965, the U.S. Geological Survey took core samples and hit solid basaltic rock 180 feet (54.8 meters) beneath Sand Island and 1,240 feet (377.9 meters) beneath the northern reef. Numerous patch reefs dot the sandy-bottomed lagoon. These reefs support 163 species of reef fishes and 16 species of corals.

Although Midway's native vegetation and entomofauna have been greatly altered by more than a century of human occupation, the island boasts the largest nesting colonies of Laysan and black-footed albatrosses in the world, forming the largest colony of albatrosses in the world. The Navy, FWS, and U.S. Department of Agriculture-Wildlife Services (USDA Wildlife Services) successfully eradicated rats from Midway, a small forest of mature ironwood trees (an alien invasive species) has been removed from Eastern Island, and new ironwood seedlings from the remaining seedbank are removed as they are detected. Currently, the cover on all of the islands at Midway is approximately 30 percent paved or structures, 23 percent grass and forbs, 18 percent woodland, 7 percent sand and bare ground, 22 percent shrublands, and less than 0.23 percent wetland. Midway Atoll also supports the first successful reintroduced population of endangered Laysan ducks, translocated from Laysan Island in 2004 and 2005. Laysan ducks use both the largely introduced vegetation of Midway Atoll and the restored patches of native vegetation. This reintroduction is significant because island ducks are globally threatened taxa, and because the Laysan duck is the most endangered waterfowl in the Northern Hemisphere and the U.S. Introduced canaries breed among historic buildings that mark the beginning of cable communication across the Pacific near the beginning of the 20th century. The atoll and surrounding seas were also the site of a pivotal battle of World War II, and Midway was an active Navy installation during the Cold War.

Kure Atoll (Mokupāpapa)
28°25′ N., 178°20′ W.

Mokupāpapa literally means flat island, and the name was ascribed to Kure Atoll by officials of the Hawaiian Kingdom in the 19th century. Under the reign of King David Kalākaua, the Hawaiian Kingdom disbursed an official envoy to Kure Atoll to take 'formal possession' of the atoll. At the time, Kure was known in the kingdom as Ocean Island, but Hawaiian Kingdom officials indicated that Kure was "known to ancient Hawaiians, named by them Moku Pāpapa and recognized as part of the Hawaiian Domain."

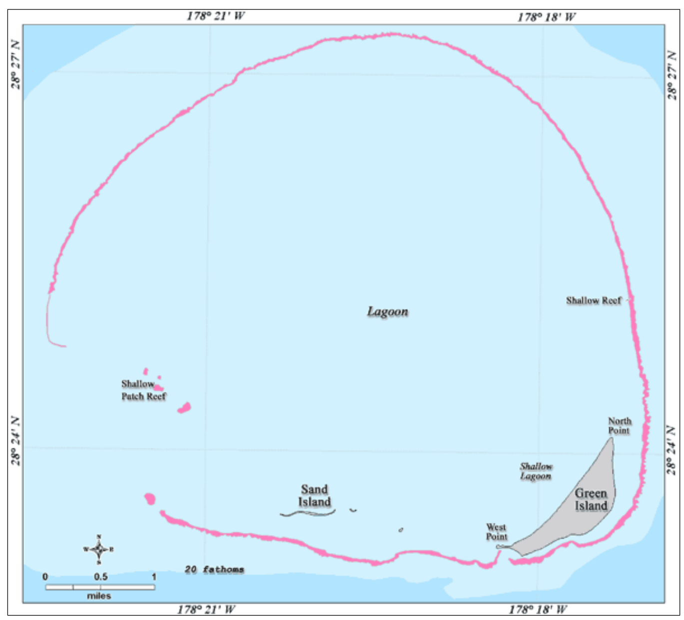


Figure 1.15 Kure Atoll

Kure Atoll is the most northwestern island in the Hawaiian chain and occupies a singular position at the "Darwin Point:" the northern extent of coral reef development, beyond which coral growth cannot keep pace with the rate of geological subsidence. Kure's coral is still growing slightly faster than the island is subsiding. North of Kure, where growth rates are even slower, the drowned Emperor Seamounts foretell the future of Kure and all of the Hawaiian Archipelago. As Kure Atoll continues its slow migration atop the Pacific Plate, it too will eventually slip below the surface.

This 29.8-million-year-old atoll (Clague 1996) is nearly circular, with a reef 6 miles (9.6 kilometers) in diameter enclosing a lagoon with two islets comprising over 200 acres (0.81 square kilometers) of emergent land, flanked by almost 80,000 acres (324 square kilometers) of coral reef habitat. The outer reef forms a nearly complete circular barrier around the lagoon, with the exception of passages to the southwest, and the associated marine habitats support 155 species of reef fishes. Fish species endemic to the Hawaiian Archipelago compose 56 percent of all fish recorded here. There are 27 species of coral found at the atoll. Of the two enclosed islets, the only permanent land is found on crescent-shaped Green Island, which rises to 20 feet (6.1 meters) above sea level and is located near the fringing reef in the southeastern quadrant of the lagoon. The atoll is an important breeding site for black-footed and Laysan albatrosses, Christmas shearwaters, and 14 other breeding seabirds. A resident population of spinner dolphins inhabits the lagoon during the day. There are 11 arthropods on Kure that are endemic to the Hawaiian Archipelago, one of which is a mite (*Hemicheyletia granula*) that is apparently endemic to Kure (Nishida 2001).

The U.S. Coast Guard established a LORAN station at Kure in 1960 (Woodward 1972) and occupied it until 1993. This land use had far-reaching effects on all the plants and animals at Kure Atoll, resulting in elevated invasive species problems and contaminants left behind when the base closed. As early as 1870, explorers documented the presence of Polynesian rats (*Rattus exulans*) here. These rodents influenced the species composition of the seabird community and the reproductive performance of the species that were there. In 1993, the State Department of Land and Natural Resources and USDA Wildlife Services eradicated rats from Kure Atoll.

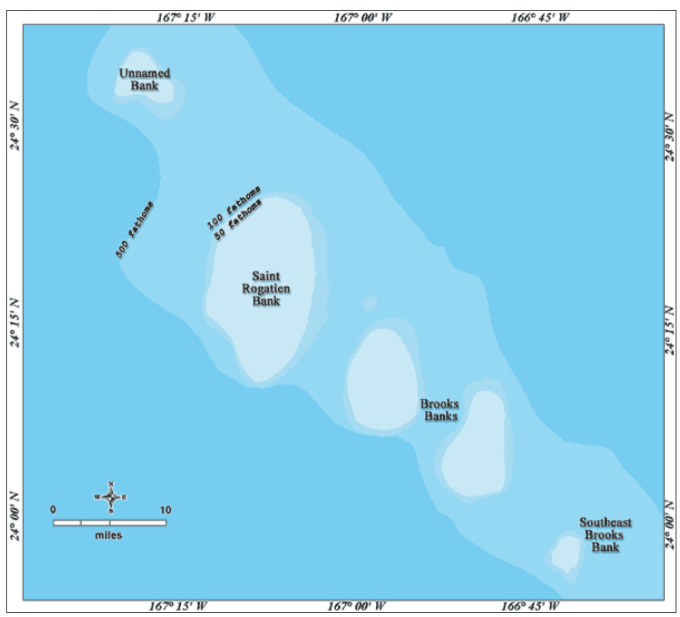


Figure 1.16 Banks and Shoals near French Frigate Shoals.

Banks and Seamounts

Approximately 30 submerged banks are within the Monument (Miller et al. 2004). Deepwater banks, seamounts, and the abyssal plain are among the least studied environments of the NWHI. Recent use of shipboard mapping technologies, submersibles, and remotely operated vehicles, however, has provided valuable information to characterize the physical and biological components of these ecosystems. Multibeam mapping expeditions have revealed dramatic geologic features, including knife-edge rift zones, seafloor calderas, sea-level terraces, submarine canyons, underwater landslide scars and debris fields, and previously unmapped seamounts (Smith et al. 2003; Smith et al. 2004).

Submersible surveys on South Pioneer Ridge (Pioneer Bank) and two unnamed seamounts, one east of Laysan Island and the other east of Mokumanamana, have revealed the presence of various substrate types, deposited when these geologic features were at sea level (Smith et al. 2004). In some areas, dense communities of corals (ahermatypic) and sponges at depths approaching 1,000 fathoms (1,830 meters) obscured the underlying substratum. The deepwater marine plants of the area are a mixture of tropical species, species with cold-temperature affinities, and species with disjunctive distributions, suggesting alternative biogeographical patterns and dispersal routes from the main Hawaiian Islands (McDermid and Abbott 2006).

Mega- to macro-scale descriptions of bottomfish habitats made on Raita Bank, West St. Rogatien Bank, Brooks Bank, and Bank 66 indicate the distribution and abundance of bottomfish are patchy and appear to be associated with high relief and topographic features, including crevices and caves (Kelley et al. 2006). Nihoa sits on a broad double platform, with a large bank immediately to the west, and two smaller banks farther to the northwest. Surrounding French Frigate Shoals is a series of submerged banks, including Southeast Brooks Bank, St. Rogatien Bank, and two other smaller banks to the west, plus another unnamed bank immediately to the east. Raita Bank lies nearly equidistant between Gardner Pinnacles and Maro Reef. Laysan has a small seamount to the southeast and the large Northampton Seamounts to the southwest. In the vicinity of Lisianski, Pioneer Bank is only 22 nautical miles (25.3 miles or 40.7 kilometers) from Neva Shoals, and these features combine to form a major coral reef ecosystem with a variety of intermingled marine habitats, rich in biodiversity. Telemetry studies of Hawaiian monk seals unexpectedly have revealed that these animals spend considerable foraging time at subphotic depths on these banks, particularly in areas that have high levels of relief, such as pinnacles and walls (Parrish and Abernathy 2006).

All of these banks provide prime habitats for bottomfish-associated fish species that are important food sources for Hawaiian monk seals. Such banks also support populations of spiny and slipper lobsters, and colonies of precious gold, pink, and black corals that have been heavily disturbed in much of the remainder of the Pacific by the use of physically damaging harvest methods, such as trawling. These deep-living corals, below the depth where enough light penetrates for photosynthesis, rely on the capture of plankton from the water column with their tentacles rather than deriving energy from symbiotic dinoflagellate algae, known as zooxanthellae, that virtually all shallow-water reef-building corals harbor in their cells. Submersible surveys conducted at depths of 656 to 1,148 feet (199.9 to 349.9 meters) on Raita, West St. Rogatien, and Brooks Banks found little evidence of physical disturbances by bottomfishing from anchors and fishing gear (Kelley and Ikehara 2006).

Pelagic and Deep-water Habitats

The pelagic marine ecosystem is the largest ecosystem on earth. Biological productivity in the pelagic zone is highly dynamic; for example, in the equatorial Pacific Ocean, upwelling extends westward along the equator in a cold tongue of water from the coast of South America, eventually encountering a large pool of warmer water in the western Pacific (the cold tongue-warm pool system). The eastern cold-tongue system is characterized by high levels of primary production, and the western warm pool by lower levels of primary production.

Most of the Monument's area can be considered pelagic habitat. The estimated area of all parts of the Monument with depths greater than 1,000 fathoms (6,000 feet or 1.8 kilometers) is 117,375 square miles (304,000 square kilometers), or about 84 percent of the entire Monument (Miller et al. 2006). Pelagic habitat can be separated into the following five zones relative to the amount of sunlight that penetrates through seawater: (a) epipelagic, (b) mesopelagic, (c) bathypelagic, (d) abyssopelagic, and (e) hadalpelagic. Sunlight is the principal factor of primary production (phytoplankton) in marine ecosystems, and because sunlight diminishes with ocean depth, the amount of sunlight penetrating seawater and its effect on the occurrence and distribution of marine organisms are important. The epipelagic zone extends to nearly 656 feet (200 meters) and is the near extent of visible light in the ocean. The mesopelagic zone occurs between 656 feet (200 meters) and 3,281 feet (1,000 meters) and is sometimes referred to as the "twilight zone." Although the light that penetrates to the mesopelagic zone is extremely faint, this zone is home to wide variety of marine species. The bathypelagic zone occurs from 3,281 feet (1,000 meters) to 13,123 feet (4,000 meters), and the only visible light seen is the product of marine organisms producing their own light, which is called "bioluminescence." The next zone is the abyssopelagic zone (13,123 to 19,685 feet, 4,000 to 6,000 meters), where there is extreme pressure and the water temperature is near freezing. This zone does not provide habitat for very many creatures, except small invertebrates such as squid. The last zone is the hadalpelagic (19,685 feet [6,000 meters] and below) and occurs in trenches and canyons. Surprisingly, marine life, such as tubeworms and seastars, is found is this zone, often near hydrothermal vents.

Pelagic species are closely associated with their physical and chemical environments. Suitable physical environment for these species depends on gradients in temperature, oxygen, or salinity, all of which are influenced by oceanic conditions on various scales. In the pelagic environment, physical conditions such as isotherm and isohaline boundaries often determine whether the surrounding water mass is suitable for pelagic fish, and many of the species are associated with specific isothermic regions. Additionally, fronts and eddies that become areas of congregation for different trophic levels are important habitat for foraging, migration, and reproduction for many species (Bakun 1996).

At least 15 banks lie at depths between 100 and 1,300 feet (30 and 400 meters) within the Monument, providing important habitat for bottomfish and lobster species, although only a few of these banks have been studied in any detail (Kelley and Ikehara 2006). These waters represent critical deepwater foraging grounds for Hawaiian monk seals (Parrish et al. 2002) as well as a spatial refugium for pelagic fishes such as tunas and their allies.

The deep waters are also important insofar as they support an offshore mesopelagic boundary community (Benoit-Bird et al. 2002), a thick layer of pelagic organisms that rest in the deep ocean (1,300 to 2,300 feet, or 400 to 700 meters) during the day, then migrates up to shallower depths (from near zero to 1,300 feet or 400 meters) at night, providing a critical source of nutrition for open-ocean fishes, seabirds, and marine mammals. This community of organisms that inhabit the upper layers of the mesopelagic zone has been surveyed at French Frigate Shoals, Lisianski, Pearl and Hermes, Midway, and Kure using echosounding technology (Lammers et al. 2006). Their work confirmed the presence of a community of vertical migrators, consisting of fish, squid, and shrimp. This temporal variability in the structure of the biotic community is important to understand as the spatial patterns are studied. Mesopelagic fishes, in particular, are important prey for bigeye tuna, which tend to live at greater depths than the other tuna species. Overall, the fauna of the Monument's waters below acceptable SCUBA diving depths (100 to 130 feet or 30 to 40 meters) remains poorly surveyed and documented, representing an enormous opportunity for future scientific research in a system largely undisturbed by trawling or other forms of resource extraction.

Phytoplankton comprise more than 95 percent of primary productivity in the marine environment (Valiela 1995). These represent several different types of microscopic organisms requiring sunlight for photosynthesis living primarily in the upper 100 meters of the euphotic zone of the water column. Phytoplankton include organisms such as diatoms, dinoflagellates, coccolithophores, silicoflagellates, and cyanobacteria. Although some phytoplankton have structures (e.g., flagella) that allow them some movement, their general distribution is primarily controlled by current movements and water turbulence. Diatoms can be either single celled or can form chains with other diatoms. They are mostly found in areas with high nutrient levels, such as coastal temperate and polar regions. Diatoms are one of the major contributors to primary production in coastal waters and occur everywhere in the ocean. Dinoflagellates are unicellular (one-celled) organisms that are often observed in high abundance in subtropical and tropical regions. Coccolithophores, which are also unicellular, are mostly observed in tropical pelagic regions (Levington 1995). Cyanobacteria, or blue-green algae, are often found in warm nutrient-poor waters of tropical ocean regions.

Oceanic pelagic fish including skipjack, yellowfin tuna, and blue marlin prefer warm surface layers, where the water is well mixed by surface winds and is relatively uniform in temperature and salinity. Other pelagic species—albacore, bigeye tuna, striped marlin, and swordfish—prefer cooler, more temperate waters, often meaning higher latitudes or greater depths. In fact, the largest proportion of the tuna catch in the Pacific Ocean originates from the warm pool, even though paradoxically it is a region of low primary productivity. Tuna movement to upwelling zones at the fringe of the warm pool may be key in resolving this apparent discrepancy between algal and tuna production. Preferred water temperature often varies with the size and maturity of pelagic fish, and adults usually have a wider temperature tolerance than subadults. Thus, during spawning, adults of many pelagic species usually move to warmer waters, the preferred habitat of their larval and juvenile stages.

Large-scale oceanographic events (such as El Niño) change the characteristics of water temperature and productivity across the Pacific, and these events have a significant effect on the habitat range and movements of pelagic species. Tuna are commonly most concentrated near islands and seamounts that create divergences and convergences, which concentrate forage species, and also near upwelling zones along ocean current boundaries and along gradients in temperature, oxygen, and salinity. Swordfish and numerous other pelagic species tend to concentrate along food-rich temperature fronts between cold upwelled water and warmer oceanic water masses (NMFS 2001). These frontal zones also function as migratory pathways across the Pacific for loggerhead turtles (Polovina et al. 2000). Loggerhead turtles are opportunistic omnivores that feed on floating prey such as the pelagic cnidarian, *Vellela vellela* ("by the wind sailor") and the pelagic gastropod *Janthina* spp., both of which are likely to be concentrated by the weak downwelling associated with frontal zones (Polovina et al. 2000).

The estimated hundreds of thousands of seabirds breeding in the Monument are primarily pelagic feeders that obtain the fish and squid they consume by associating with schools of large predatory fish such as tuna and billfish (Fefer et al. 1984; Au and Pitman 1986). These fish—yellowfin tuna (*Thunnus albacares*), skipjack tuna (*Katsuwonus pelamis*), mahimahi (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*), rainbow runner (*Elagatis bipinnulatus*), and broadbilled swordfish (*Xiphias gladius*)—are apex predators of a food web existing primarily in the epipelagic zone. Although both the predatory fish and the birds are capable of foraging throughout their pelagic ranges (which encompass the entire Monument and tropical Pacific Ocean), the birds are most successful at feeding their young when they can find schools of predatory fish within easy commuting range of the breeding colonies (Ashmole 1963, Feare 1976, Flint 1991). Recently fledged birds, inexperienced in this complex and demanding style of foraging, rely on abundant and local food resources to survive while they learn to locate and capture prey. Some evidence from tagging studies done by Itano and Holland (2000) suggests both yellowfin and bigeye tuna aggregate around island reef ledges, seamounts, and fish aggregating devices and are caught at a higher rate here than in open-water areas. Yellowfin tuna in Hawai‘i exhibit a summer island-related inshore-spawning run (Itano 2001).

Ashmole and Ashmole (1967) and Boehlert (1993) suggest that the circulation cells and wake eddies found downstream of oceanic islands may concentrate plankton and therefore enhance productivity near islands. Higher productivity, in turn, results in greater abundance of baitfish, thus allowing higher tuna populations locally. Johannes (1981) describes the daily migrations of skipjack tuna and yellowfin tuna to and from the waters near islands and banks. The presence of natural densities of these tunas within the foraging radius of seabird colonies enhances the ability of birds to provide adequate food for their offspring (Ashmole and Ashmole 1967; Au and Pitman 1986; Diamond 1978; Fefer et al. 1984). Wake eddies also concentrate the larvae of many reef fishes and other reef organisms and serve to keep them close to reefs, enhancing survivorship of larvae and recruitment of juveniles and adults back to the reefs. For at least three of the seabird species breeding in the NWHI (brown noddies, white terns, and brown boobies), large proportions (33 to 56 percent) of their diets originate from the surrounding coral reef ecosystem in other areas where their diet has been studied (Ashmole and Ashmole 1967; Harrison et al. 1983; King 1970; Diamond 1978).

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1.2 Status and Condition of Natural Resources

The NWHI can be characterized as a large marine ecosystem exposed to a wide range of oceanographic conditions and environmental and anthropogenic stressors. Submerged geomorphologic features, including reef, slope, bank, submarine canyon, and abyssal plain habitats, support a diverse range of shallow and deepwater marine life. Small islands and islets provide critical breeding grounds and nesting sites for endangered, threatened, and rare species, which forage on land and throughout the coral reef, deepwater, and pelagic marine ecosystems encompassing the NWHI.

These natural systems hold important cultural value, as all archipelagic wildlife are regarded as ancestors to Native Hawaiians (Malo 1951). The life forms defined in this section are inhabitants of the NWHI and referred to in the Kumulipo, a genealogical oli (chant) that frames the evolution of life from the simplest of creatures to the most complex. In the Native Hawaiian worldview, the interface between natural and cultural resources is seamless.

Algae

The marine algal flora in the Monument are diverse and abundant. There are 353 species of macroalgae and two seagrass species known from the NWHI (McDermid and Abbott 2006). The species composition of the macroalgae community is relatively similar throughout the NWHI. Representatives of the Chlorophyta, Rhodophyta, Phaeophyta, branched coralline, crustose coralline, Cyanophyta, and turf algae occur in varying combinations, with green algae having the largest biomass and area coverage (Vroom and Page 2006). Green algae in the genus *Halimeda* was found in more than 70 percent of all quadrats during Monumentwide surveys in 2004. This calcified algae contributes greatly to sand formation (Vroom and Page 2006). An island-specific checklist of the nonvascular plants of the NWHI can be found in Eldredge (2002). The NWHI contain a large number of Indo-Pacific algal species not found in the main Hawaiian Islands, such as the green calcareous alga (*Halimeda velasquezii*). Unlike in the main Hawaiian Islands, where alien species and invasive algae have overgrown many coral reefs, the reefs of the NWHI are largely free of alien algae, and the high natural herbivory results in a natural algal assemblage.

Corals

Fifty-seven species of stony corals are known in the shallow subtropical waters of the NWHI (at depths of less than 100 feet [33 meters]), which cover an area of 911,077 acres (3,687 square kilometers) (Miller et al. 2004; 2006) in the Monument. Endemism of this group is high, with 17 of those species (30 percent) found only in the Hawaiian Archipelago. These endemics also account for 37 to 53 percent of visible stony corals in all shallow reef areas surveyed (Friedlander et al. 2005). Fifteen of the 17 endemic species are in the genera *Montipora, Porites,* or *Pocillopora*.

Deepwater corals in the Monument are even more diverse than those in shallow water. To date, 137 gorgonian octocorals and 63 species of azooxanthellate scleractinians have been documented to occur in the Monument (Parrish and Baco 2007). In November 2007, two new potential genera of deepwater bamboo corals were collected by submersible at a single site off Twin Banks (Watling, pers comm).

Live coral cover is highest in the middle of the chain, with Lisianski Island and Maro Reef having 59.3 and 64.1 percent of their respective available substrate covered with living corals (Maragos et al. 2004). Coral cover varies significantly across the NWHI from these high rates at Maro and at Lisianski to very minimal coverage at most of the other reef sites (Figure 1.17). Despite their high latitudes, a similar number of species of coral have been reported for the NWHI (57) as the main Hawaiian Islands (59) (Friedlander et al. 2005). Coral species richness is also highest in the middle of the chain, reaching a maximum of 41 reported coral species at French Frigate Shoals (Maragos et al. 2004). Stony corals are less abundant and diverse at the northern end (Kure, Midway, and Pearl and Hermes) of the archipelago and off the exposed basalt islands to the southeast (Nihoa, Mokumanamana, La Perouse, and Gardner). At these sites, soft corals such as *Sinularia* and *Palythoa* are more abundant. Table coral in the genus *Acropora* is not found in the main Hawaiian Islands, but seven species are recorded for Mokumanamana, Gardner, Pearl and Hermes, Neva, French Frigate Shoals, Maro, and Laysan, with the highest number of species and colonies at French Frigate Shoals. These colonies of coral may have been established from larvae traveling in currents or eddies from Johnston Atoll, 450 miles (724.2 kilometers) to the south (Grigg 1981; Maragos and Jokiel 1986). The Monument's coral reefs are relatively undisturbed by the impacts of fishing or tourism, with excellent health and high species richness. Preliminary faunal inventories indicate that many of their constituent species remain undocumented; even new coral species are still being discovered.

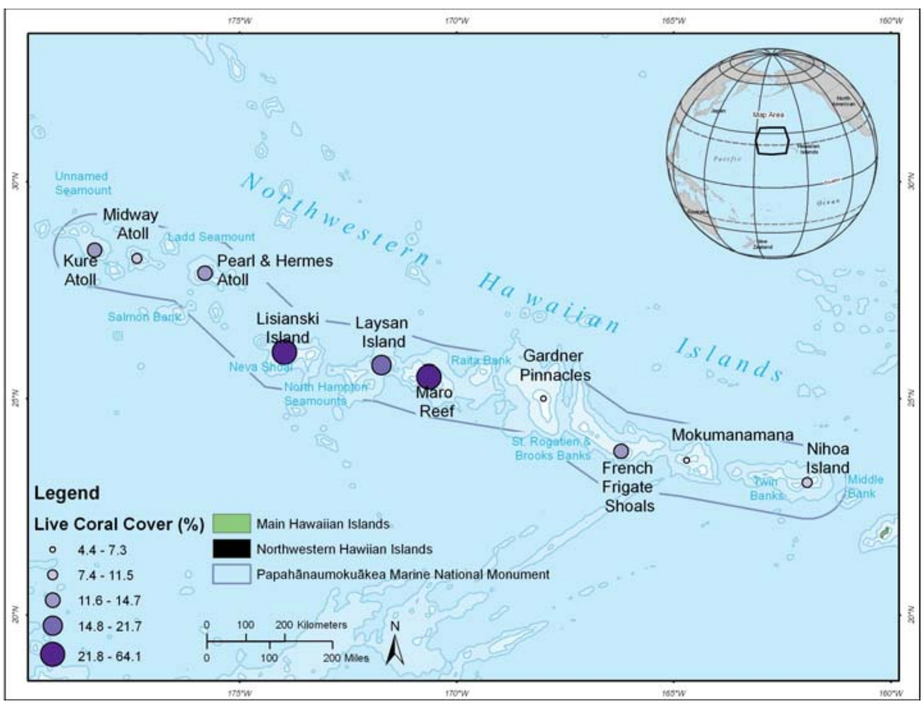

Figure 1.17 Differences in Coral Cover Among Regions within the NWHI.
REA surveys were conducted at 173 sites in 2002. Coral cover was calculated from size frequency data of colony counts within transects. Data are mean and standard error. Based on unpublished data from PIFSC-CRED. Map by Friedlander and Wedding of the NCCOS/CCMA/Biogeography Team.

Benthic Shallow Water Invertebrates
With the exception of coral and lobster species, the marine invertebrates of the NWHI are very poorly known. Only two comprehensive collections of these groups of animals were conducted prior to 2000: the 1902 Albatross Expedition, in which the collected organisms were deposited at the Smithsonian Institution, and the 1923 Tanager Expedition, in which the collection was deposited at the Bishop Museum. In 2000, the NWHI Reef Assessment and Monitoring Program was established, and it continues to the present to assess the biota of all 10 emergent reef areas and shallow waters (less than 65 feet [20 meters]) in the Monument (Friedlander et al. 2005). While this work is ongoing, a number of new species already have been recorded for Hawai‘i, and some of these species may turn out to be endemic to the NWHI (DeFelice et al. 2002). By 2005, a total of 838 species from 12 orders had been identified, and many species are being worked on by taxonomic experts around the world and have yet to be identified (Friedlander et al. 2005).

One species of marine invertebrate for which some population data are available is the black-lipped pearl oyster (*Pinctada margaritifera*). This oyster was discovered in 1927 and was heavily harvested at Pearl and Hermes Atoll until 1929, when the practice was prohibited by law. An estimated 150,000 oysters were harvested before a 1930 expedition estimated the remaining population at 100,000 oysters. More recent surveys in 1969, 1996, and 2000 found only a few oysters, indicating that the population had not recovered since the last harvest. Recent surveys conducted in 2003 at Pearl and Hermes Atoll mapped and measured more than 1,000 individuals (Keenan et al. 2004). The average size of pearl oysters in the 2003 surveys was larger than the 1930 surveys (Figure 1.18). It is unclear whether the number and size structure reflect a potential recovery of the species 70 years later or a more thorough sampling effort relative to the previous survey. However, the slow recovery of this species demonstrates the fragility of some of the Monument resources.

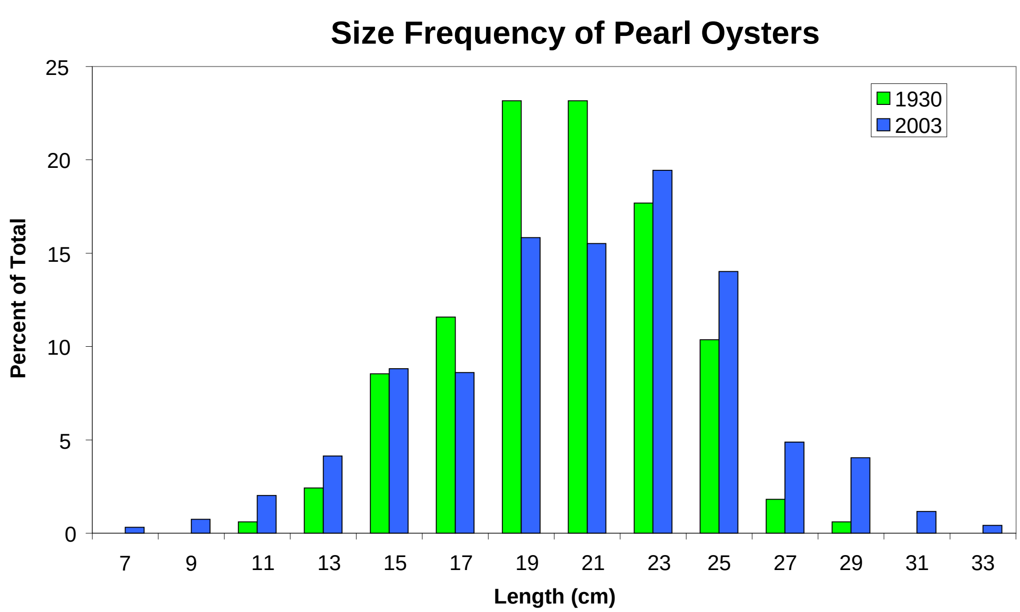

Figure 1.18 Size Frequency Distribution of Pearl Oyster Population at Pearl and Hermes Atoll in 1930 and 2003. Source: Keenan et al. 2004.

Crustaceans
The NWHI lobster trap fishery, which commenced in the mid-1970s, primarily targeted the Hawaiian spiny lobster *(Panulirus marginatus)* and slipper lobster *(Scyllarides squammosus)*. Three other species, green spiny lobster (*P. penicillatus*), ridgeback slipper lobster (*S. haanii*), and sculptured slipper lobster (*Parribacus antarcticus*), were caught in low abundance (DiNardo and Marshall 2001).

Fishery statistics during the early developmental phase of the fishery (1976 to 1982) are scant. The total reported catch and landings of lobsters peaked in 1985 and generally declined from 1986 to 1995. Fishing effort peaked in 1986 and declined in 1988 before increasing in 1990. After 1990, fishing effort generally declined. The fishery initially targeted spiny lobster, but by 1985 gear modifications and improved markets led to an increase in slipper lobster landings. Catches of slipper lobster remained high from 1985 to 1987, fell into a general decline from 1988 to 1996, and increased significantly from 1997 to 1999. The fishery was closed in 2000 because of the uncertainty in the population models used to assess the stocks (DeMartini et al. 2003).

The National Marine Fisheries Service (NMFS), a line office of NOAA, has conducted annual fishery-independent trap surveys through its Pacific Islands Fisheries Science Center (PIFSC) since 1984, with the exception of 1990, to (1) evaluate the performance of commercial and research survey gear, (2) calibrate gear types, and (3) monitor the relative abundance of local populations of lobster in the NWHI. The survey has also been used as a platform for short-term experiments (e.g., studies of handling mortality) and the collection of biological and oceanographic data. Since 1990, the abundance of spiny lobsters at Mokumanamana has generally decreased. Significant drops in abundance were observed in 1992, 1994, and 1998. The abundance of slipper lobsters has remained at relatively low levels at Mokumanamana between 1988 and 2006. Spiny lobster abundance at Maro Reef declined significantly after 1988 and remained low through 1999. An increasing trend in spiny lobster abundance has been detected at Maro Reef since 2000. Slipper lobster abundance at Maro Reef has generally been increasing, with significant increases occurring after 1991. These changes suggest a switch in species dominance at Maro Reef in 1990 (spiny to slipper lobster), and the initial phases of a spiny lobster population recovery in 2000.

Numerous hypotheses have been advanced to explain population fluctuations of lobsters in the NWHI, including environmental (Polovina and Mitchum 1992), biotic (e.g., habitat and competition) (Parrish and Polovina 1994), and anthropogenic (e.g., fishing) (Polovina et al. 1995; Moffitt et al. 2006). Each hypothesis by itself offers a plausible, however simplistic, explanation of events that in fact result from several processes acting together. It is likely that population fluctuations of lobsters in the NWHI can be more accurately described by a mix of the hypotheses presented, each describing a different set of mechanisms (DiNardo and Marshall 2001).

Reef Fish
The extreme isolation of the NWHI chain and its distance from the diverse fish population centers of the Western Pacific contribute to a lower fish species diversity relative to other sites to

the west (Mac et al. 1998). The long-term protection from fishing pressure that has been afforded the NWHI has resulted in high standing stocks of fish more than 260 percent greater than the main Hawaiian Islands. The fish community of the coral reef ecosystem of the NWHI also shows a very different structure than the main Hawaiian Islands and most other places in the world. The shallow-reef fish community is remarkable in the abundance and size of fish in the highest trophic levels. In this large-scale, intact, predator-dominated system, more than 54 percent of the total fish biomass on forereef habitats in the NWHI consists of apex predators. In contrast, the total fish biomass in the main Hawaiian Islands is dominated by herbivorous fish species (55 percent), with only 3 percent composed of apex predators (Friedlander and DeMartini 2002). Apex predator biomass on forereef habitats in the NWHI is 1.3 metric tons per hectare, compared with less than 0.05 metric tons per hectare on forereef habitats in the main Hawaiian Islands (Figure 1.19).

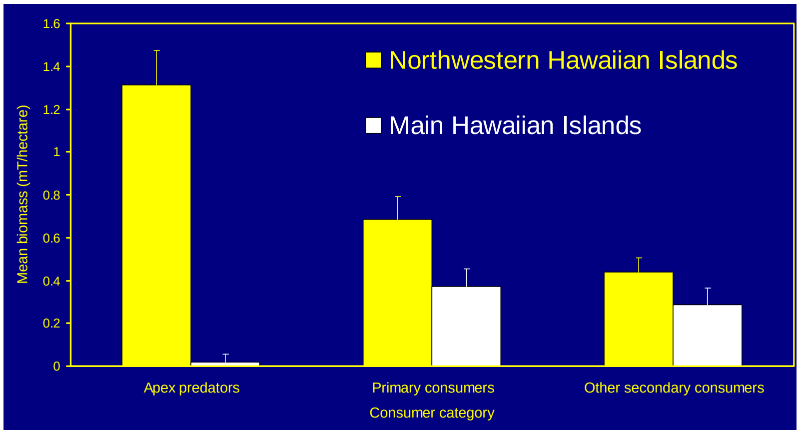

Figure 1.19 Comparison of Biomass in Major Trophic Guilds between the Northwestern Hawaiian Islands and the Main Hawaiian Islands. Source: Friedlander and DeMartini 2002.

Areas with the highest apex predator biomass include Pearl and Hermes Atoll, followed by Lisianski and Laysan Islands (Figure 1.20). Large, predatory fish such as sharks, giant trevally, and Hawaiian grouper that are rarely seen and heavily overfished in populated areas of the world are extremely abundant in the waters of the Monument.

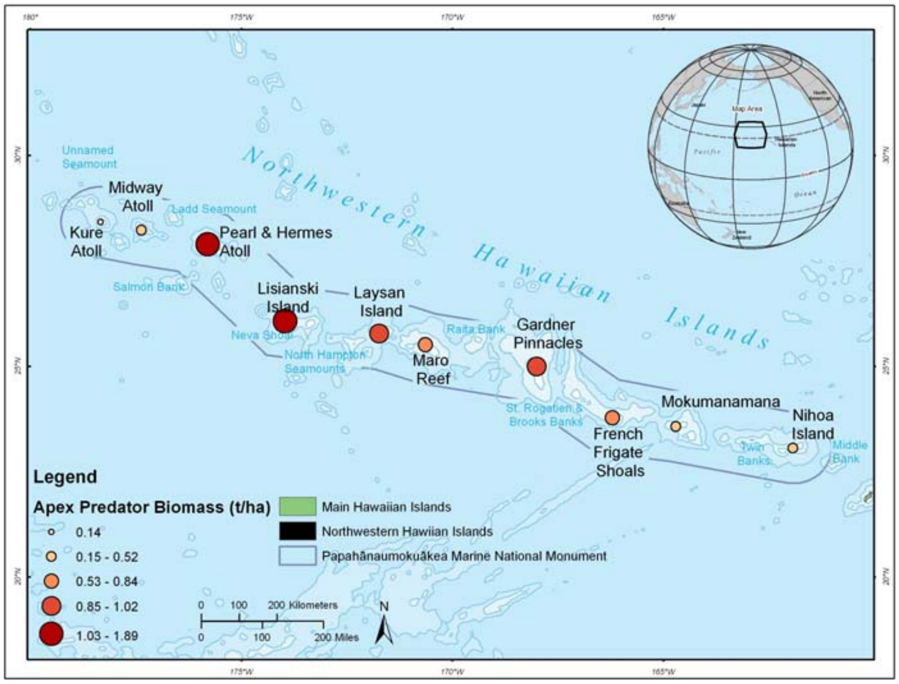

Figure 1.20 Geographic Pattern of Apex Predator Biomass Density (t/ha) at the 10 Emergent Northwestern Hawaiian Islands (NWHI) Reefs Surveyed during September/October 2000, 2001, and 2002. Based on data from DeMartini and Friedlander 2004. Map by Friedlander and Wedding of the NCCOS/CCMA/ Biogeography Team.

The NWHI are also characterized by a high degree of endemism in reef fish species, particularly at the northern end of the chain, with endemism rates well over 50 percent, making it one of the most unique fish faunas on earth (DeMartini and Friedlander 2004). Because of the decline in global marine biodiversity, endemic "hot spots" like Hawai'i are important areas for global biodiversity conservation. Overall fish endemism is higher in the NWHI compared with the main Hawaiian Islands (Friedlander et al. 2005; DeMartini and Friedlander 2004). Within the NWHI, endemism increases up the chain and is highest at the three northernmost atolls and Lisianski (Figure 1.21). Another feature of the shallow-water reef fish community noticed by divers is that some species found only at much greater depths in the main Hawaiian Islands inhabit shallower water in the NWHI. This might be explained by water temperature preferences or by disturbance levels that vary between the two ends of the archipelago.

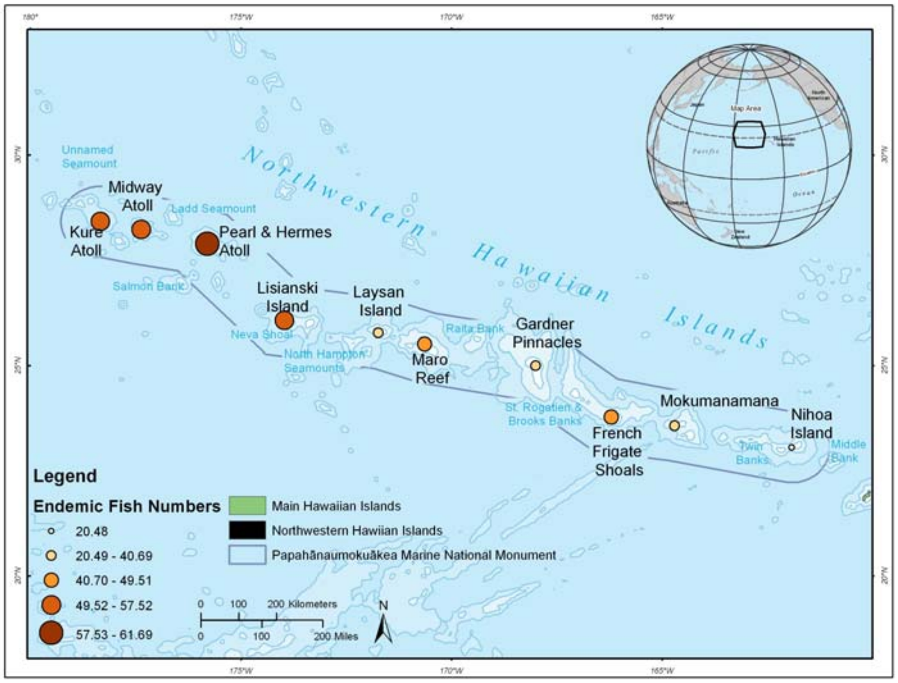

Figure 1.21 Percent Endemism (Based on Numerical Densities) at Each of 10 Emergent NWHI Reefs, Surveyed during September/October 2000, 2001, and 2002. Note patterns of endemism with latitude. Based on data from DeMartini and Friedlander 2004. Map by Friedlander and Wedding of the NCCOS/CCMA/Biogeography Team.

Bottomfish

The bottomfish species in the NWHI are in the taxonomic groups *Lutjanidae* (snappers), *Serranidae* (groupers), *Carangidae* (jacks), and *Lethrinidae* (emperors). The bottomfish stocks in the NWHI Mau and Ho‘omalu zones have not been determined to be overfished, but in 1990, the stocks in the Mau Zone were considered to be near the overfishing threshold. Since then, however, bottomfish harvest rates in the Mau Zone, including the Ho‘omalu Zone, have resulted in a bottomfish stock complex that currently is considered “healthy and lightly exploited,” particularly in comparison to the main Hawaiian Islands (Brodziak 2007).

Pelagic Marine Life

The oceanic Scombroid fish (billfish, tuna, and wahoo) have zoogeographies much more like that of plankton than of benthic fish. Most are cosmopolitan and occur in all oceans within the tropical and subtropical zones but may have very specific water temperature preferences (Longhurst and Pauly 1987). The yellowfin tuna, for instance, prefers water no cooler than 18 to 21 ºC, which coincides with the northern boundary of the Monument. All species undertake seasonal and age-related migrations, traveling between spawning grounds and feeding grounds appropriate for their sizes. They prey on medium-sized pelagic fish, crustaceans, and cephalopods. Tagging studies of yellowfin tuna and bigeye tuna have demonstrated that, while these species have enormous capacity to travel huge distances, they show very specific attraction to fish aggregating devices, island reef ledges, seamounts, and other elements of structure (Itano and Holland 2000). Lowe et al. (2006) similarly found that while two species of large sharks, tiger sharks (*Galeocerdo cuvier*) and Galapagos sharks (*Carcharhinus galapagensis*), are capable of long-distance travel, they showed more site fidelity than expected throughout the year, with 70 percent of tiger sharks exhibiting year-round residence at French Frigate Shoals. Some of the study subjects did make long-distance movements, with sharks marked at French Frigate Shoals showing up at Midway and on the Kona coast of the Island of Hawaiʻi. The tremendous economic value of these fishes has resulted in serious declines of most populations because of industrialized fishing. Myers and Worm (2003) calculated that large predatory fish biomass today is only about ten percent of pre-industrial levels worldwide. Large predatory fish populations remain healthy and robust in the Monument (Friedlander et al. 2005).

Reptiles

The five species of sea turtles that occur in the NWHI are the loggerhead (*Caretta carretta*), the green (*Chelonia mydas*), the olive ridley (*Lepidochelys olivacea*), the leatherback (*Dermochelys coriacea*), and the hawksbill (*Eretmochelys imbricata*). All of these species are protected by the ESA and by HRS 195D. Of these species, only the green turtle comes ashore to bask and breed in the NWHI. French Frigate Shoals is the site of the principal rookery for the entire Hawaiian green turtle stock, with more than 90 percent of the population nesting there (Balazs and Chaloupka 2004a). As adults, most of these turtles travel to foraging grounds in the main Hawaiian Islands or in Midway or Johnston atolls, where they graze on benthic macroalgae. They periodically swim back to the nesting grounds at French Frigate Shoals (or, in smaller numbers, to Lisianski and Pearl and Hermes Atoll) to lay eggs. Breeding adults remain extremely faithful to the colony where they were hatched for their own reproductive activities (Bowen et al.1992). Hatchling turtles may spend several years in pelagic habitats foraging in the neritic zone before switching to a benthic algae diet as adults.

The Hawaiian population of green turtles has been monitored for more than 30 years, following the cessation of harvesting in the 1970s, and has shown a steady recovery from its depleted state (Balasz and Chaloupka 2004a, see Figure 1.22.) The transition zone chlorophyll front, located north of Monument waters most years, occasionally moves southward along with one of the species tightly associated with it, the loggerhead turtle. The North Pacific population breeds in Japan but feed on buoyant organisms concentrated at the convergent front in these high-chlorophyll waters, which support a complex food web including cephalopods, fishes, and crustaceans, also fed upon by albacore tuna (*Thunnus alalunga*) and a variety of billfish (Polovina et al. 2001).

The terrestrial herpetofauna of the NWHI is made up of introduced species of lizards, including four gecko species and two skinks, and a tiny blind snake (*Ramphotyphlops braminus)* that was imported to Midway, most likely in soil. The greatest diversity of these introduced reptiles is found at Midway and Kure atolls.

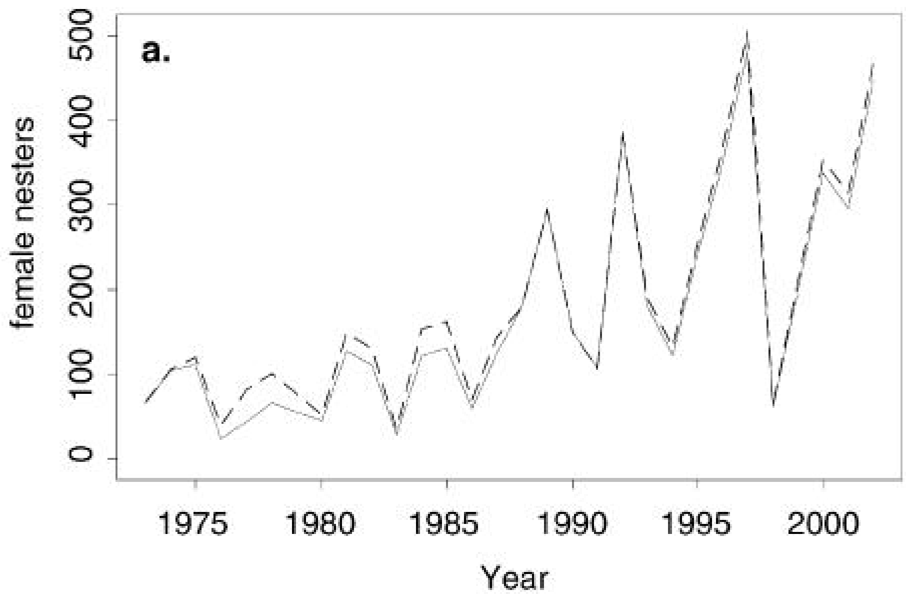

Figure 1.22 Long-Term Trend in the Abundance of Nesting Hawaiian Green Sea Turtles (dash lines represent Bayesian 95 percent credible region). Source: Balazs and Chaloupka 2004a.

Land Birds

Four endangered land bird species in the NWHI are protected under the ESA and HRS 195D. Three species are passerines: the Laysan finch, currently found on Laysan Island and Pearl and Hermes Atoll; and the Nihoa finch and Nihoa millerbird, which are endemic to Nihoa. The fourth species is the Laysan duck, which once was found on many Hawaiian Islands but is now restricted to Laysan Island and Midway Atoll.

The Nihoa millerbird population is very small, and total population estimates fluctuate widely between years. The most recent population estimate (2007) is 814 birds (MacDonald 2008), but results have ranged between 23 and 814 birds in these sporadic and irregularly timed surveys (with broad confidence intervals), and these results are insufficient to adequately monitor trends in the population. Based on monitoring surveys, the Nihoa finch population has fluctuated widely since 1968 from a low of 5,200 individuals to a high of 20,802 (Morin and Conant 2002), but the population and its habitat are considered to be relatively stable. However, the Pearl and Hermes Atoll population is likely declining as a result of habitat alteration by the invasive alien plant *Verbesina encelioides*.

Planning is under way for habitat restoration and possible translocation of the Nihoa species to establish additional populations, but these efforts have not progressed sufficiently to affect the status of the species. An evaluation and structured ranking of potential translocation sites yielded Laysan Island as the top choice for a first translocation of Nihoa millerbirds. Research to gather information pertinent to translocation planning is ongoing.

The total estimated Laysan duck population on Laysan Island has fluctuated from seven to more than 600 adult birds in the last century. The most recent (2005) population estimate of adult birds is 600 birds (Reynolds et al. 2006). The population at Midway was founded with a total of 42 wild birds translocated from Laysan in 2004 and 2005. Of this original total, 25 or 26 birds are believed to have bred. After successful breeding seasons in 2005 through 2007, the number of ducks at Midway had increased to nearly 200 animals (Reynolds et al. 2007). Another successful breeding season at Midway in 2008 added significantly to the population, but an outbreak of avian botulism in August 2008 caused the death of more than 130 ducks and a temporary setback to this new population.

Shorebirds

Forty-seven species of shorebirds have been recorded in the Monument. Most of these are classified as infrequent visitors or vagrants, but the Monument does support regionally significant populations of four migrants: Pacific golden plovers (*Pluvialis fulva*), bristle-thighed curlews (*Numenius tahitiensis*), wandering tattlers (*Tringa incana*), and ruddy turnstones (*Arenaria interpres*). Most of these birds arrive in July and August and return to the Arctic to breed in May, but some of the younger individuals may skip breeding their first summer and remain in the Monument. While in the NWHI, these species use all the habitats available for foraging and sometimes concentrate in large numbers in the hypersaline lake at Laysan and in the artificial water catchment pond on Sand Island at Midway Atoll. The rat-free islands of the Monument provide important wintering sites for the rare bristle-thighed curlew because they are flightless during molt and require predator-free sites. This species and Pacific golden plovers are listed as species of high conservation concern in the National and Regional Shorebird Conservation Plans (Engilis and Naughton 2004) and are designated Birds of Conservation Concern by the FWS at the regional and national scale (FWS 2002).

Seabirds

The importance of seabirds in the NWHI was recognized in 1909 with the establishment of the Hawaiian Islands NWR. Early protection and active management have resulted in large, diverse, and relatively intact seabird populations. Seabird colonies in the NWHI constitute one of the largest and most important assemblages of tropical seabirds in the world, with approximately 14 million birds (5.5 million breeding annually), representing 21 species (Naughton and Flint 2004) (See Table 1.1). Greater than 98 percent of the world's Laysan and black-footed albatrosses nest here. For several other species, such as Bonin petrel, Christmas shearwater, Tristram's storm-petrel, and the gray-backed tern, the Monument supports colonies of global significance. The last complete inventory of NWHI breeding populations was done between 1979 and 1984 (Fefer et al. 1984). Population trends since then have been derived from more intensive monitoring at three islands. Population trends in the NWHI are stable or increasing for most species, but there is concern for a few, especially the albatrosses.

The conservation status of seabirds in Hawai‘i was assessed as part of the North American Waterbird Conservation Plan. Eleven of the 21 species were classified as highly imperiled or of high conservation concern at the broad scale of the plan (eastern north Pacific, western north

Atlantic, and Caribbean) (See Table 1.1.) At the regional scale (Pacific Islands), 6 species were included in these highest concern categories: Laysan, black-footed, and short-tailed albatrosses; Christmas shearwater; Tristram's storm-petrel; and blue noddy.

Table 1.1 Seabird Species Known to Breed in Papahānaumokuākea Marine National Monument (FWS data)[1]

Common Name	Species	Estimated Number of Breeding Birds
Black-Footed Albatross	*Phoebastria nigripes*	111,800
Laysan Albatross	*Phoebastria immutabilis*	1,234,000
Bonin Petrel	*Pterodroma hypoleuca*	630,000
Bulwer's Petrel	*Bulweria bulwerii*	180,000
Wedge-Tailed Shearwater	*Puffinus pacificus*	450,000
Christmas Shearwater	*Puffinus nativitatis*	5,400
Tristam's Storm-Petrel	*Oceanodroma tristrami*	11,000
Red-Tailed Tropicbird	*Phaethon rubricauda*	18,400
White-Tailed Tropicbird	*Phaethon lepturus*	8
Masked Bobby	*Sula lepturus*	3,400
Red-Footed Booby	*Sula sula*	15,800
Brown Booby	*Sula leucogaster*	800
Great Frigatebird	*Fregata minor*	19,800
Little Tern	*Sternula albifrons*	20
Gray-Backed Tern	*Onychoprion lunatus*	86,000
Sooty Tern	*Onychoprion fuscatus*	3,000,000
Blue Noddy	*Procelsterna cerulean*	7,000
Brown Noddy	*Anous stolidus*	150,000
Black Noddy	*Anous minutus*	26,000
White Tern	*Gygis alba*	22,000
	Total	5,971,428

1 - Laysan and black footed albatrosses, Christmas shearwater, Tristram's storm-petrel, and blue-gray noddy are on the Birds of Conservation Concern list for the Hawaiian Bird Conservation Region, and black-footed albatrosses are on the national list (FWS 2002).

Distribution, population status and trends, ecology, and conservation concerns for each of these species are contained in the Regional Seabird Conservation Plan, Pacific Region (FWS 2005). The greatest threats to seabirds that reside in the NWHI are both local and global. These threats include introduced mammals and other invasive species, fishery interactions, contaminants, oil pollution, marine debris, and climate change. Over the past 20 years, active management in the NWRs and State Seabird Sanctuary has included the eradication of black rats (*Rattus rattus)* at Midway Atoll and Polynesian rats (*Rattus exulans)* at Kure Atoll; eradication or control of invasive plants; cleanup of contaminants and hazards at former military sites; and coordination with NMFS and the Regional Fishery Management Councils, as well as industry and conservation organizations, to reduce fishing impacts.

Marine Mammals

The marine and littoral ecosystems of the Monument provide essential habitat for the Hawaiian monk seal **(***Monachus schauinslandi***)**, one of the world's most endangered marine mammals. The Hawaiian monk seal was listed as an endangered species under the ESA in 1976 (41 FR 51611) and is protected by the State under HRS 195D. About 1,200 individuals exist (Antonelis et al. 2006; NMFS 2003; NMFS 2004a), and models predict that the population will fall below 1,000 individuals within the next five years. While 80 to 100 Hawaiian monk seals coexist with humans in the main Hawaiian Islands (D. Schofield, pers. comm.), the great majority of the population lives among the remote islands and atolls of the Monument. Their range generally consists of the islands, banks, and corridors within the Monument, although individual animals may be found beyond this extensive area on occasion, sometimes farther than 50 nautical miles (92.6 kilometers) from shore.

In May 1988, NMFS designated critical habitat under the ESA for the Hawaiian monk seal from shore to 20 fathoms in ten areas of the NWHI. Critical habitat for this species includes all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms around the following: Pearl and Hermes Atoll; Kure Atoll; Midway Atoll, except Sand Island and its harbor; Lisianski Island; Laysan Island; Maro Reef; Gardner Pinnacles; French Frigate Shoals; Mokumanamana; and Nihoa (50 CFR §226.201). Critical habitat was designated to enhance the protection of habitat used by monk seals for pupping and nursing, areas where pups learn to swim and forage, and major haulout areas where population growth occurs.

Reproductive success of the Hawaiian monk seal population has declined, with the total mean nonpup beach counts at the main reproductive NWHI subpopulations in 2001 being approximately 60 percent lower than in 1958 (NMFS 2003). French Frigate Shoals has the largest Hawaiian monk seal breeding site and breeding subpopulation, followed by Laysan Island, Pearl and Hermes Atoll, and Lisianski Island (Figure 1.23).

The foraging biogeography of the Hawaiian monk seal has been described in a number of recent reports (Stewart 2004a, b, and c; Stewart and Yochem 2004a, b, and c) and is illustrated in Figure 1.23. Between 1996 and 2002, the movements and diving patterns of 147 Hawaiian monk seals in the NWHI (consisting of 41 adult males, 35 adult females, 29 juvenile males, 15 juvenile females, 12 weaned male pups, and 15 weaned female pups) were monitored with satellite-linked depth recorders. Overall findings of these studies include the following:

- Monk seal foraging range covers an area of approximately 18,593 square miles (48,156 square kilometers), or almost 14 percent of the total area of the Monument.

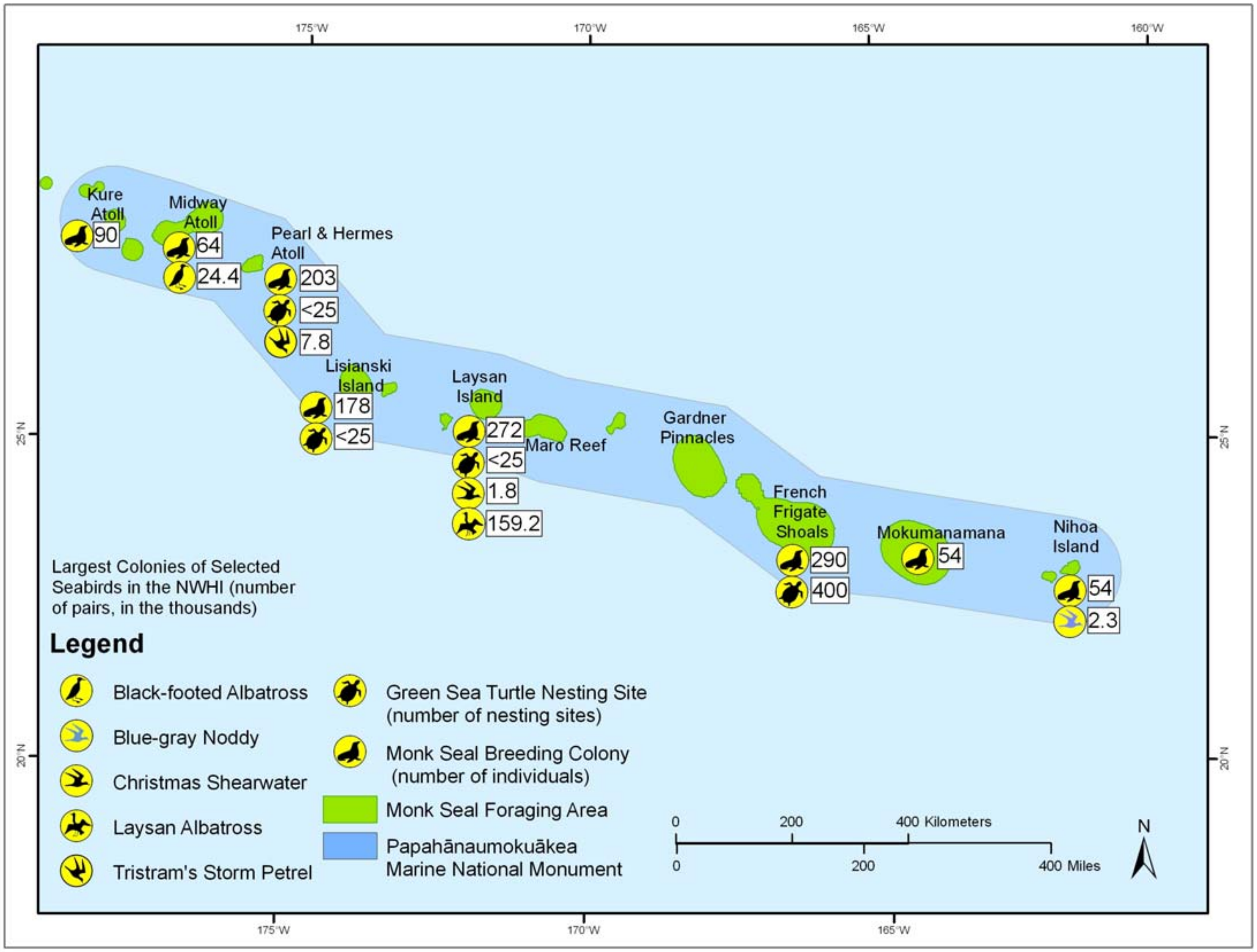

Figure 1.23 Hawaiian Monk Seal Breeding Sites and Subpopulation Sizes and Foraging Area (Stewart 2004a); Green Turtle Nesting Sites (Balazs and Ellis 2000); and Largest Nesting Sites for Seabird Species of Highest Concern for the Pacific Island Region in the Northwestern Hawaiian Islands (Kushlan et al. 2002; Fefer et al. 1984 for seabird colony size).

- Seals foraged extensively at or near their breeding sites and breeding subpopulations and haulout sites (95 percent within 20 miles of these sites), except at French Frigate Shoals, where foraging distances were demonstrated to be greater.
- The highest concentration of monk seal activity in the NWHI is focused on French Frigate Shoals and surrounding banks.
- Seals moved along specific corridors to travel between breeding sites and haulout sites. These corridors were closely associated with the NWHI submarine ridge. Seals likely forage along these corridors around subsurface features like reefs, banks, and seamounts.

Several banks located northwest of Kure Atoll represent the northern extent of the monk seal foraging range (Stewart 2004a). These areas have also been identified as important precious coral habitat as a result of recent research conducted with submersibles and remotely operated vehicles by NOAA's Office of Ocean Exploration (NOAA 2003c). The main terrestrial habitat requirements include haulout areas for pupping, nursing, molting, and resting. These are primarily sandy beaches, but virtually all substrates are used at various islands. The loss of terrestrial habitat is a priority issue of concern in the NWHI, especially habitat loss caused by environmental factors such as storms and sea level rise that could further exacerbate this problem in the future. While some habitat loss (e.g., the subsidence of Whaleskate Island at French Frigate Shoals) has already been observed, sea level rise over the longer term may threaten a large portion of the resting and pupping habitat in the NWHI. Habitat loss has decreased available haulout and pupping beaches.

Past and present impacts to the monk seal population in the NWHI include hunting in the 1880s; disturbance from military uses of the area; entanglement in marine debris (Henderson 2001; 1990; 1984a; 1984b); direct fishery interaction, including recreational fishing (Kure Atoll) and commercial fishing prior to the establishment of the 50-mile Protected Species Zone around the NWHI in 1991 (NMFS 2003); predation by sharks (Nolan 1981); aggression by adult male monk seals; and reduction of habitat and prey caused by environmental change (Antonelis et al. 2006).

The waters of the Monument are also home to more than 20 cetacean species, six of them federally recognized as endangered under the ESA and HRS 195D, and "depleted" under the Marine Mammal Protection Act (see Table 1.4), but comparatively little is known about the distributions and ecologies of these whales and dolphins (Barlow 2006). Recent research by Johnston et al. (2007) reveals that the Monument also hosts many more humpback whales than originally thought. The most well-studied cetacean species in the Monument is the Hawaiian spinner dolphin (*Stenella longirostris*). This geographically isolated subgroup of the spinner dolphin is genetically distinct from those of the eastern tropical Pacific (Galver 2000). They occur off all of the main Hawaiian Islands and only four of the NWHI (Kure, Midway Atoll, Pearl and Hermes Atoll, and French Frigate Shoals) (Karczmarski et al. 2005). Andrews et al. (2006) found that the animals at the three northern sites were a genetically homogeneous population that was distinct from the group at French Frigate Shoals, which had some exchange with dolphins in the main Hawaiian Islands. Genetic isolation, together with an apparent low genetic diversity, suggests that spinner dolphins could be highly vulnerable to anthropogenic and environmental stressors (Andrews et al. 2004).

Terrestrial Invertebrates

Native terrestrial arthropods and land snail communities of the NWHI are the least well studied of the animal groups, but perhaps the most seriously affected by human activities and introductions. In particular, the many species of ants that have accidentally reached all the islands of the archipelago except Gardner Pinnacles have had enormous effects on these native terrestrial invertebrates.

The entomofauna of the Monument includes some groups of insects that demonstrate dramatic adaptive radiations. One such group is the seedbugs, specifically the genus *Nysius*, which shows the complete range of feeding types: from host-specific plant feeders, to diverse plant hosts, to omnivorous feeding, and finally to predator/scavengers. It is a rare occurrence to find herbivory and carnivory occurring within the same genus. Nowhere else in the world is there a lineage like the Hawaiian *Nysius* in which to explore the evolution of carnivory in Heteroptera. Some of these species are single-island endemics and of particular conservation concern because of their limited ranges.

Table 1.2 Number of Terrestrial Arthropod Species in the NWHI Summarized by Order and Island (Nishida 1998; Nishida 2001)

	Number of Terrestrial Arthropod Species by Island								
Terrestrial Arthropod Species	Nihoa	Moku-mana-mana	French Frigate Shoals	Gardner Pinnacles	Laysan Island	Lisianski Island	Pearl and Hermes Atoll	Midway Atoll	Kure Atoll
ARTHROPODA	221	84	108	11	235	55	109	508	155
Arachnida	42	10	10	4	34	6	16	85	35
Acari	31	2	5	2	22	4	13	63	25
Araneae	10	8	5	2	11	2	3	22	10
Pseudoscorpionida	1				1				
Insecta	174	69	94	7	195	49	87	412	115
Blattodea	4	2	3		5	2	3	8	4
Coleoptera	36	11	8	1	36	3	11	78	19
Collembola	2		3		5		10	19	4
Dermaptera	4	1	3	2	4	2	4	4	2
Diptera	28	12	18	1	31	20	15	62	23
Embiidina	2	2	1		2		1	1	
Heteroptera	15	4	9		9	4	8	14	8
Homoptera	10	7	10		15	4	8	21	12
Hymenoptera	37	7	14		21	4	7	105	16
Isoptera			1		1	1		3	
Lepidoptera	23	14	16	2	32	6	15	34	13
Mantodea								1	
Neuroptera					1		1	2	2
Odonata			1					1	1
Orthoptera	5	2	4		1	1		9	3
Pthiraptera		3	1	1	24		3	42	3
Psocoptera	3		1		3	1		1	2
Siphonaptera	1				1		1		
Thysanoptera	2	3	1		4	1		6	3
Thysanura	2	1						1	
Chilopoda	2	2	1		1		1	1	2

Terrestrial Arthropod Species	Number of Terrestrial Arthropod Species by Island								
	Nihoa	Moku-mana-mana	French Frigate Shoals	Gardner Pinnacles	Laysan Island	Lisianski Island	Pearl and Hermes Atoll	Midway Atoll	Kure Atoll
Anostraca					1				
Isopoda	3	3	3		3	3	5	9	3
Amphipoda						1			

Terrestrial Plants

The land plants of the NWHI are typically salt-tolerant and drought-resistant species of the beach strand and coastal scrub. The number of native species found at each site is positively correlated with island size but is negatively influenced by the number of alien species occurring at the site. The three sites with airstrips and a longer history of year-round human habitation have much larger populations of alien species of land plants (See Table 1.3). At least three species of NWHI endemic plants (*Achyranthes atollensis*, *Phyllostegia variabilis*, and *Pritchardia* species of Laysan) are believed to have gone extinct since European contact. Some other native species and genera have found refuge in areas of the NWHI where rats were never introduced, and now occur at much greater densities than they do in the main Hawaiian Islands (e.g., *Pritchardia remota* and *Sesbania tomentosa*, commonly known as ‘ohai).

At least six species of terrestrial plants found only in the region are listed under the ESA and HRS 195D, some so rare that because of the limited surveys on these remote islands, they may have already vanished from the planet. The World Conservation Network lists *Cenchrus agrimonioides* var. *laysanensis* as extinct, though biologists still hold hope that it may exist. *Amaranthus brownii*, endemic to Nihoa, is deemed critically endangered by the World Conservation Network, while *Pritchardia remota* is considered endangered.

Table 1.3 Biogeographic Description of Land Plants of Papahānaumokuākea Marine National Monument (number of species that have been observed at each site in previous 20 years) (Bruegmann, M.M. 1995; Starr, F., and K. Martz 1999; Starr, F., K. Martz, and L. Loope 2001; Morin, M., and S. Conant 1998; Wagner, W.L., D.R. Herbst, and S.H. Sohmer 1999).

Island	Emergent land area (acres)	Island endemic	Indigenous to Hawai‘i and other Pacific Islands	Alien	Total no. of Species
Nihoa	171	3	14	3	20
Mokumanamana	46	0	5	0	5
French Frigate Shoals[1]	67	0	10	27	37
Gardner Pinnacle	5	0	1	0	1
Laysan Island	1015	1	22	11	34
Lisianski Island	381	0	15	5	20
Pearl and Hermes Atoll	80	0	15	10	25
Midway Atoll[1]	1540	0	14	249	263
Kure Atoll[1]	212	0	12	36	49

1 - Sites where an airfield and permanent human habitation has influenced immigraton of novel species.

Endangered and Threatened Species

Twenty-three species of plants and animals known to occur in the NWHI are listed under the ESA and by the State of Hawai'i under HRS 195D (Table 1.4). Specific threats and recovery actions related to these species are discussed in section 1.4, and in individual action plans presented in Section 3.

Table 1.4 Species Occurring in the NWHI Listed as Threatened or Endangered Under the Endangered Species Act and by the State of Hawai'i (HRS 195D)[1]

Marine Mammals		
Hawaiian monk seal	*Monachus schauinslandi*	E
Humpback whale	*Megaptera novaeangliae*	E
Sperm whale	*Physeter macrocephalus*	E
Blue whale	*Balaenoptera musculus*	E
Fin whale	*B. physalus*	E
Sei whale	*B. borealis*	E
North Pacific right whale	*Eubalaena japonica*	E
Marine Turtles		
Olive Ridley turtle	*Lepidochelys olivacea*	T/E
Leatherback turtle	*Dermochelys coriacea*	E
Loggerhead turtle	*Caretta caretta*	T
Hawksbill turtle	*Eretmochelys imbricata*	E
Green turtle	*Chelonia mydas*	T
Terrestrial Birds		
Laysan duck	*Anas laysanensis*	E
Laysan finch	*Telespyza cantans*	E
Nihoa millerbird	*Acrocephalus familiarus kingi*	E
Nihoa finch	*Telespyza ultima*	E
Seabirds		
Short-tailed albatross	*Phoebastria albatrus*	E
Plants		
No common name	*Amaranthus brownii*	E
Kamanomano	*Cenchrus agrimoniodes* var *laysanensis*	E
No common name	*Mariscus pennatiformis* ssp *bryanii*	E
Loulu	*Pritchardia remota*	E
No common name	*Schiedea verticillata*	E
'Ōhai	*Sesbania tomentosa*	E

1 - Under the Endangered Species Act of 1973 and the State of Hawai'i (HRS 195D), endangered species are those in danger of extinction. Threatened species are those likely to become an endangered species within the foreseeable future. E = endangered; T = threatened.

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1.3 Status and Condition of Cultural and Historic Resources

The Monument was established for its unique combination of natural and cultural resources, including Native Hawaiian and post-Western-contact historic resources. It is composed of terrestrial and marine areas that have special national and international significance in terms of conservation, ecology, history, science, education, culture, archaeology, and aesthetics. The establishment of the Monument also provides the framework for coordinated and comprehensive management of the area.

Native Hawaiian Cultural Foundation and Significance

Kū pākū ka pali o Nihoa i ka makani
The cliff of Nihoa stands as resistance against the wind
—*Said of one who stands bravely in the face of misfortune (Pukui 1983: 1924)*

Polynesian navigators began voyaging across the vast Pacific Ocean, unaided by Western instrumentations, about 300 B.C. or earlier (Howe 2006). Over the next 1,300 years, these skilled and visionary wayfinders would leave their mark on a more than 10-million-square-mile area of the Pacific that has become known as the Polynesian triangle, its defining points being made by settlements on Aotearoa (New Zealand) in the West, on Rapa Nui (Easter Island) in the East, and on the Hawaiian archipelago in the North (Polynesian Voyaging Society 2007). A unique spirituality binds the multitude of Polynesian societies that today inhabit the hundreds of islands contained within this region. These Polynesian societies share many of the same cosmologies, genealogies, and oral histories, the origins of which can be traced either back to the wayfinders who first ventured through the Pacific or from subsequent voyagers who traveled across this massive water continent.

Canoes filled with those who would become Native Hawaiians first arrived in the waters of the remote Hawaiian Archipelago, most likely from Hiva or the Marquesas Islands, around 1,600 years ago or earlier (PVS 2007). Upon finding abundant natural resources, they decided to remain, living in harmony with nature to survive on such a remote island chain. They developed complex resource management systems and specialized skill sets to ensure the fertile soils and rich reef environments they found could be sustained for future generations. These included agricultural terraces; extensive water paddies for their staple food, kalo (taro); and incredibly productive fishponds, many of them acres in size that sprawled over shallow coastal waters.

The ocean serves as a central source of physical and spiritual sustenance for Native Hawaiians on a daily basis. Poetically referred to as Ke kai pōpolohua mea a Kāne (the deep dark ocean of Kāne), the ocean was divided into numerous smaller divisions and categories, from the nearshore to the deeper pelagic waters (Malo 1951). Likewise, channels between islands were also given names and served as connections between islands, as well as a reminder of their larger oceanic history and identity.

Today, Native Hawaiians continue to maintain their strong cultural ties to the land and sea. This concept of interconnectedness transcends geography. Native Hawaiians understand the importance of managing the islands and waters as one, as they are inextricably connected to one another (Beckwith 1951; Liliʻuokalani 1978). Despite the fact that the NWHI were not used and experienced on a daily basis by most Hawaiians, they have always been seen as an integral part of the Hawaiian Archipelago and have been honored as a deeply spiritual location, as evidenced by the many wahi kūpuna, or sacred sites, on Nihoa and Mokumanamana.

Much of the information about the NWHI has been passed down in oral and written histories, genealogies, songs, dance, and archaeological resources. Through these cultural resources of knowledge, Native Hawaiians have been able to recount the travels of seafaring ancestors between the NWHI and the main Hawaiian Islands. Hawaiian language archival resources have also played an important role in providing key documentation; a large body of information was published in local newspapers, some of it more than a hundred years ago (e.g., Kaunamano 1862; Manu 1899; Wise 1924).

More recent ethnological studies (Maly 2003) support the continuity of Native Hawaiian traditional practices and histories in the NWHI, and it is important to note that only a fraction of these have been recorded—many more exist in the memories and life histories of kūpuna. Nevertheless, the relationship of Native Hawaiians to the NWHI is marked by some irregularity, notably on the arrival of Europeans to the Hawaiian Archipelago in the late 18th century. At the point of contact between the West and Hawaiʻi, Native Hawaiians were thriving in the islands, with a population estimated between 300,000 and one million. (For discussion on pre-contact Native Hawaiian population, see Stannard 1989.) However, foreign diseases introduced into Hawaiʻi over the next century would cause the Native Hawaiian population to fall into a steep decline. Thus, the sacred path traveled to the islands northwest of Kauaʻi saw few Native Hawaiians for a period of time, and this trend lasted through the early 19th century.

A renewed interest in the NWHI grew as successive Hawaiian monarchs focused on reuniting the entire Hawaiian Archipelago by formally incorporating the NWHI into the territory of the Kingdom of Hawaiʻi. Throughout the 1800s, title to the islands and waters of the region was vested in the Kingdom of Hawaiʻi (Mackenzie and Kaiama 2003). This title came to pass because of the actions of Hawaiian monarchs, which included the following highlights:

- In 1822, Queen Kaʻahumanu organized and participated in an expedition to locate and claim Nihoa under the Kamehameha Monarchy.
- Nihoa was reaffirmed as part of the existing territory of Hawaiʻi in 1856 by authority of Alexander Liholiho, Kamehameha IV (March 16, 1856, Circular of the Kingdom of Hawaiʻi).
- King Kamehameha IV made a round trip voyage between Honolulu and Nihoa in 1857 and instructed Captain John Paty of the *Manuokawai* to annex any lands discovered during further exploration of the region. In 1857, the islands of Laysan and Lisianski were declared new lands to be included into the domain of the Kingdom (Kingdom of Hawaiʻi 1857).
- Lydia Liliʻuokalani, prior to becoming queen, visited Nihoa with a 200-person party aboard the *Iwalani*.
- King David Kalākaua annexed Kure Atoll (Ocean Island) and announced formal possession of the island in 1886, through Special Commissioner Colonel James Harbottel (Harbottel-Boyd 1886).

In 1893, Queen Lydia Lili‘uokalani was overthrown by the self-proclaimed Provisional Government of Hawai‘i, with the assistance of U.S. Minister John L. Stevens. Five years later, in 1898, the archipelago, inclusive of the NWHI, was collectively acquired by the United States through a domestic resolution, called the “New Lands Resolution.”

The ea (sovereignty and life), as well as the kuleana (responsibility), for the entire Hawaiian Archipelago continues to exist in the hearts and minds of many present-day Native Hawaiians—a perspective recognized in law by the Apology Resolution (U.S. Public Law 103-150), which is a joint resolution of Congress signed by President Clinton in 1993. The Apology Resolution states, in part, that “The Congress…apologizes to Native Hawaiians on behalf of the people of the United States for the overthrow of the Kingdom of Hawaii on January 17, 1893 with the participation of agents and citizens of the United States, and the deprivation of the rights of Native Hawaiians to self determination;...” It also recognizes that “the health and well-being of the Native Hawaiian people is intrinsically tied to their deep feelings and attachment to the land.”

The stage was set for a reawakened relationship between Native Hawaiians and the NWHI in 2000, when President Clinton signed the Executive Orders creating the NWHI Coral Reef Ecosystem Reserve. With new channels of access possible, the cultural protocol group, Nā Kupu‘eu Paemoku, traveled to Nihoa on the traditional double-hulled voyaging canoe *Hōkūle‘a* in 2003 to conduct traditional ceremonies. The following year, in 2004, *Hōkūle‘a* sailed more than 1,200 miles (1,931 kilometers) to the most distant end of the island chain, visiting Kure Atoll as part of a statewide educational initiative called “Navigating Change.” Concurrently, officials of the Polynesian Voyaging Society saw that the ancient sailing route between Kaua‘i and Nihoa was an appropriate training course for the next generation of Native Hawaiians interested in reestablishing the traditional system of wayfinding practiced by their ancestors. In 2005, Nā Kupu‘eu Paemoku again sailed to the NWHI, this time to Mokumanamana, where they conducted protocol ceremonies on the Summer Solstice–the longest day of the year, June 21. On June 21, 2007, as a follow-up to the 2005 access, the Edith Kanaka‘ole Foundation ventured to Nihoa and Mokumanamana to conduct its own cultural research initiatives and to better understand the relationship between the wahi kūpuna (ancestral places) and the northern pathway-of-the-sun.

Native Hawaiians’ longstanding and deeply spiritual relationship with the NWHI over millennia reaffirms the importance of positioning the Hawaiian culture as the lens through which the significance of the region, as well as the Hawaiian Archipelago as a whole, is viewed.

Native Hawaiian Cultural Resources

Most family genealogies of Native Hawaiians begin with the Kumulipo, or creation chant (Malo 1951). The Kumulipo depicts the history of creation, beginning with the simplest of organisms and gradually reaching higher levels of complexity in the natural world, eventually completing the cycle of life with humans. As with most oral traditions, different families had variations of the creation chant, and different stories evolved as the chant moved closer to the evolution and naming of humans. It is through the perpetuation of chants like the Kumulipo—and other ancient traditions, practices, and protocols—that Native Hawaiians have passed on their spiritual belief that the people are deeply related to the natural environment, and in fact, all of the natural resources are also cultural resources.

Physical remnants of wahi kūpuna (ancestral places), Hawaiian language archival and oral resources, and historical accounts provide evidence of the various past uses of the NWHI and the surrounding ocean by Native Hawaiians (Kaunamano 1862, in Hoku a ka Pakipika; Manu 1899, in Ka Loea Kalaiaina; Wise 1924, in Nupepa Kuokoa). Evidence indicates that the area served as a home and a place of worship for centuries. It is posited that the first Native Hawaiians to inhabit the archipelago frequented Nihoa and Mokumanamana for at least a 500- to 700-year period (Emory 1928; Cleghorn 1988; Irwin 1992). They brought many of the skills necessary to survive with them from their voyaging journeys throughout Polynesia. Over time, they developed complex resource management systems and additional specialized skill sets to survive on these remote islands with limited resources (Cleghorn 1988).

The impressions left by ancient Hawaiians can be seen through the distinctive archaeology of Nihoa and Mokumanamana. The ceremonial terraces and platform foundations with upright stones found on both Nihoa and Mokumanamana are not only amazing examples of unique traditional Hawaiian architectural forms of stone masonry work, but they also show similarities to samples from inland Tahiti (Emory 1928). The structures are some of the best preserved early temple designs in Hawaiʻi and have played a critical role in understanding Hawaiʻi's strong cultural affiliation with the rest of Polynesia, and the significant role of Native Hawaiians in the migratory history and human colonization of the Pacific (Cleghorn 1988).

It is believed that Mokumanamana played a central role in Hawaiian ceremonial rites and practices a thousand years ago because it is directly in line (23° 34.5' N latitude) with the rising and setting of the equinoctial sun along the Tropic of Cancer. In Hawaiian, this path is called "ke ala polohiwa a Kāne," or the "way of the dark clouds of Kāne," which has been translated to mean death or the westward pathway of the ancestral spirits. Because Mokumanamana sits on the northernmost limit of the path the sun makes throughout the year, it sits centrally on an axis between two spatial and cultural dimensions: pō (darkness, creation, and afterlife) and ao (light, existence). On the summer solstice (the longest day of the year), the sun travels slowest across the sky on this northern passage, going directly over Mokumanamana. The island has the highest concentration of ceremonial sites anywhere in the Hawaiian archipelago. All of these sites are strategically placed and act as physical reminders of the important spiritual role these sites play in Hawaiian culture. The sites and structures are channels for the creation of new life, and facilitate Native Hawaiians' return to source after death (Liller 2000).

Nihoa and Mokumanamana are listed on the National Register of Historic Places, and there are more than 140 documented archaeological sites on these two islands. Though they are quite barren and seemingly inhospitable to humans, the number of cultural sites is testimony to the pre-Western-contact occupation and use of these islands. On Nihoa, a total of 89 archaeological sites are known, including residential features, agricultural terraces, ceremonial structures, shelters, cairns, and burials. This island also has significant soil development for agriculture along with constructed terraces, which suggest investment in agricultural food production. On Mokumanamana, a total of 52 archaeological sites have been documented, including 33 ceremonial features, which makes it the highest concentration of religious sites found anywhere in the Hawaiian archipelago.

While Nihoa and Mokumanamana are thought to have been frequented until about 700 years ago, voyages to these islands and others in Papahānaumokuākea for the gathering of turtles, fish, bird feathers, and eggs continued into the 20th century, particularly from Kaua‘i and Ni‘ihau (Tava and Keale 1989; Maly 2003). Cultural practices like these continue to remind and teach Native Hawaiians of the connections and relationships their ancestors have passed down from generation to generation.

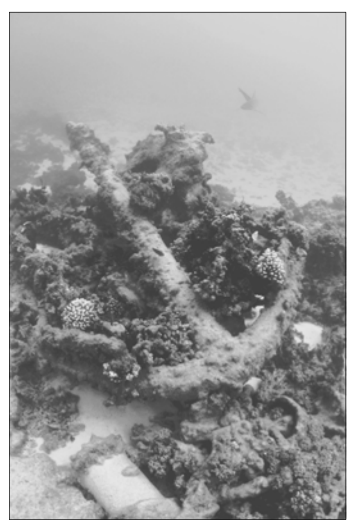
Maritime Heritage Resources

"I had just put my hand upon my coat when the ship struck with a fearful crash...I sprang upon deck… to find ourselves surrounded with breakers apparently mountain high, and our ship careening over upon her broadside..."
—Thomas Nickerson, on the loss of the ship Two Brothers at French Frigates Shoals, 1823 (Nantucket Historical Association MS 106 folder 3.5)

The Monument enjoys a rich maritime history, with ocean vessels from around the world having traveled into the NWHI—although not all that came in made it back out.

Long before Western ships sighted the NWHI, Native Hawaiians and other Polynesians journeyed in large double-hulled canoes to these resource-rich islands and atolls as they explored the vast Pacific Ocean without aid of western instrumentation. Guided by the stars, currents, and weather patterns, Native Hawaiians set the stage for the intrepid ships and crews who would enter the waters of the NWHI beginning in the early part of the 19th century. It is believed that Native Hawaiians frequently sailed along the ancient voyaging routes that connect Kaua‘i to the settlements on Nihoa and Mokumanamana.

In addition to the rich Native Hawaiian cultural setting, maritime activities following Western contact with the Hawaiian Islands have left behind the historical and archaeological traces of a unique past. Currently, more than 60 ship losses are known among the NWHI, the earliest loss dating back to 1818. These, combined with 67 known aircraft crashes, amount to more than 120 potential maritime and military heritage resources. Many of these resources reflect the distinct phases of historical activities in the remote atolls (Van Tilberg 2002).


Anchor from an unidentified 19th century whaling ship at Kure Atoll.
Photo courtesy of James Watt.

As American and British whalers first made passage from Hawai‘i to the seas near Japan in 1820, they encountered the low and uncharted atolls of the NWHI. Some of these early voyages gave rise to the Western names of the islands and atolls as we know them today. Pearl and Hermes Atoll is named for the twin wrecks of the British whalers *Pearl* and *Hermes*, lost in 1822. Midway was originally sighted by Captain Daggett of the New Bedford whaler *Oscar* in 1839. Laysan was reportedly discovered by the

American whaleship *Lyra* prior to 1828. Gardner Pinnacles was named by Captain Allen on the Nantucket whaler *Maro* in 1820, the same year the ship encountered, and gave its name to, Maro Reef.

The history of American whaling is a significant part of our national maritime heritage and is a topic that encompasses historic voyages and seafaring traditions set on a global stage, as these voyages had political, economic, and cultural impacts. The United States was intimately involved in the whaling industry in important and complex ways. Ten whaling shipwrecks are known in the NWHI. Five of these have been located (the American whaler *Parker*, the British whalers *Pearl*, *Hermes*, and the *Gledstanes*, as well as an unidentified whaler at French Frigate Shoals), and their archaeological assessment is under way (Van Tilberg and Gleason, in prep). Whaling vessel wreck sites from the early 19th century are quite rare, and the study and preservation of heritage resources provide a unique glimpse into our maritime past.

Despite being slowly integrated into navigational charts, the NWHI remained an area of low and inconspicuous reefs and atolls for many years, frequented by shipwrecks and castaways. Crews were often stranded for many months while they constructed smaller vessels from salvaged timbers and set out for rescue. Some vessels were lost with all hands. Russian and French ships of discovery transited the NWHI, and sometimes found themselves upon the sharp coral reefs. Nineteenth-century Japanese junks of the Tokugawa Shogunate period, drifting away from their home islands and into the Pacific, were reportedly washed onto the sands of the atolls. Hawaiian schooners and local fishing sampans voyaged into the archipelago, many not to return. Marine salvage expeditions based out of the main Hawaiian Islands profited from the area, although existing records of their cruising activities are scarce. These types of sites have the potential to tell us about early-historic-period voyages in the Pacific and about the seafaring traditions of many cultures.

The strategic geographical location of the NWHI proved early on to be a valuable "commodity." The opening of China and Japan to commerce in the mid-19th century and the transition to steam propulsion brought with it the need for Pacific coaling stations. In August 1869, Captain William Reynolds of the USS *Lackawanna* took formal possession of Midway Atoll for the United States. Soon after, the USS *Saginaw,* a Civil-War-era side-wheel gunboat, was assigned to support improvement efforts at Midway. However, work to open a channel into the lagoon remained incomplete, and the *Saginaw,* on a return voyage from Midway with the contracting party, wrecked on the reef at nearby Kure Atoll on October 29, 1870. The wreck site was discovered in 2003, allowing research into the early technology of the "Old Steam Navy" (Van Tilberg 2003a).

From this inauspicious beginning, the strategic location of Midway and the NWHI continued to grow in importance for commercial and military planners. The Spanish-American War in 1898 led to the American colonization of Guam and the Philippines, as well as annexation of the Hawaiian Islands. This greatly expanded American colonial presence made transpacific communication a priority. By 1903, the first transpacific cable and station were in operation, and employees of the Commercial Pacific Cable Company settled at Midway. In the 1930s, Pan American Airways' "flying clippers" (seaplanes) were crossing the ocean, arriving at Midway from Honolulu on their 5-day transpacific passages (Cohen 1985). In 1939, the U.S. Navy expanded its interest in Midway, and millions of dollars were awarded to the Pacific Naval Air Base Consortium. Construction of the naval air facility at Midway was begun the following year.

Naval activities increased during World War II. French Frigate Shoals was the temporary staging site for Japanese seaplanes, as well as a U.S. naval air facility at a later time. The Navy built an important submarine advance base at Midway Atoll, dredging the reef to form a channel and harbor for submarine refit and repair. The wreck of the USS *Macaw*, a Navy submarine salvage vessel lost in 1944 during the rescue of the submarine *Flier,* testifies to the dangerous nature of Pacific operations at Midway (Van Tilberg 2003a; Van Tilberg 2003b). Eastern Island at Midway possessed the main airfield in the early days of the war, while submarine and seaplane support operations were concentrated on Sand Island. Together, these areas constituted a vital center for undersea, surface fleet, and naval aviation operations. In fact, the Hawaiian Sea Frontier forces stationed patrol vessels at most of the islands and atolls. Tern Island, in French Frigate Shoals, was expanded after the Battle of Midway through dredging to create a naval air facility for staging aircraft from the main Hawaiian Islands and to provide faster resupply of Midway.

In June 1942, the Battle of Midway took place in seas north of Midway Atoll. Four Japanese aircraft carriers and one American carrier were sunk, and the Japanese military was forced to withdraw from a planned invasion. Although most of the battle took place 100 to 200 miles to the north, an intense air fight was waged directly over and around the atoll. Training exercises before and after the battle also took their toll. At least 30 naval aircraft, both American and Japanese, crashed or were ditched into the nearshore waters of Midway and Kure Atolls, many of them combat losses for both American and Japanese navies. Many of these crash sites are war graves. This battle proved to be the most decisive U.S. victory and was the turning point of World War II in the Pacific (Prange 1982).

All of these maritime activities have left a scattered material legacy around and on the islands: whaling ships, Japanese junks, Navy steamers, Hawaiian fishing sampans, Pacific colliers, salvage vessels, and Navy aircraft (Rauzon 2001). Many of these sites, as defined by state and federal preservation laws (the National Historic Preservation Act, the Archaeological Resources Protection Act, and the Abandoned Shipwreck Act), are of national and international historical significance. Programmatic mandates have been established to ensure their preservation and protection. NOAA’s Maritime Heritage Program focuses on the discovery and investigation of these heritage resources for the benefit of present and future generations. These sites are the physical record of past activities in the NWHI and embody unique aspects of island and Pacific maritime history.

Heritage Resources of Midway Atoll

“They had no right to win. Yet they did, and in doing so they changed the course of a war…Even against the greatest of odds, there is something in the human spirit – a magic blend of skill, faith and valor – that can lift men from certain defeat to incredible victory.”
—Walter Lord

Designated as a National Memorial, Midway Atoll preserves the physical remains of the rich historic past in the Monument. With its defensive structures and military architecture, both residential and industrial, the atoll serves as a memorial to the pivotal Battle of Midway. While its role in that battle has earned Midway a prominent place in history, it was the atoll's strategic location that first drew the attention of the world nearly 100 years earlier. Called the "Middlebrook Islands" by Captain N.C. Brooks when he landed there in 1859 (Helber Hastert & Fee 1995; *Paradise of the Pacific* 1936), Midway's location soon proved attractive to transpacific commercial traders, triggering a century of development and manipulation of the landscape to meet the needs of commerce and the military, as well as occasional shipwreck survivors.

Physical improvements started almost immediately after the United States took possession in 1869, with a Congressional appropriation for development of the Sand Island entrance channel. Though the crew of the USS *Saginaw* worked on the channel during their 6½-month stay, the project stalled when the underlying solid limestone reef was encountered and the estimated costs to complete it proved prohibitive.

Interest in the atoll waned for a period, with its only sporadic inhabitants being the survivors of two notable shipwrecks that occurred in the late 1880s. The *General Seigel,* a schooner on a shark-hunting expedition with a crew of eight, wrecked in November 1886. Three crewmen died and one, Adolfe Jorgenson, was marooned by the remaining four members when they sailed from Midway on June 28, 1887. Seven months later, on February 3, 1888, the *Wandering Minstrel* was wrecked on the coral reef during a similar quest for sharks. The crew of 40, which included Captain F.D. Walker and his wife and sons, were surprised to find Adolfe Jorgensen still alive on Sand Island. After spending 14 months stranded on Midway, the Walker family and remaining crew were finally rescued in April 1889. Though none of the structures from this era remains, the stories of the survivors, including tales of murders, mutiny, escapes, buried treasure, and rescue, inspired Robert Louis Stevenson's novel "The Wrecker."

Interest in Midway was renewed in 1903, when the Commercial Pacific Cable Company chose Sand Island for a relay station on its route across the Pacific from San Francisco to the Far East. Armed with plans drafted by San Francisco architect Henry Meyers, Superintendent Ben W. Colley arrived in April 1903 with a staff and several carpenters to construct the station. The innovative reinforced concrete and steel buildings were plumbed and wired for electricity supplied by an acetylene generator. The graceful, two-story design offered shaded verandahs, a library, and billiard room along with kitchens and bedrooms. An ice-making plant, cold storage house, and windmills were also constructed. Superintendent Colley adapted the stark landscape to meet the needs of the cable company by importing soil from Honolulu to make a garden for growing fresh vegetables and by planting vegetation such as naupaka (*Scaevola*), grasses, ironwood trees, and coconuts to control the white sand that drifted everywhere (Colley n.d.). The first round-the-world telegram was issued by President Theodore Roosevelt on July 4, 1903. The remains of the cable station and its landscape can still be observed on the atoll.

In 1935, Pan American Airways began constructing a refueling base at Midway, which consisted of a wooden dock and a mooring barge in the lagoon where the seaplanes landed and discharged cargo and passengers (Yoklavich 1993). The facilities included a prefabricated hotel with a solar-heated hot water system, lounge, dining room, and 40 guest rooms, as well as tennis courts, baseball fields, and even a sandy nine-hole golf course that required the use of black golf balls. None of these structures survives today, though historical photographs and film footage remain to tell the story.

Military interest in Midway accelerated as World War II started in Europe and war in the Pacific appeared inevitable. The strategic importance of an air base at Midway was considered second only to Pearl Harbor (Yoklavich 1993), and construction of the Naval Air Base was authorized in 1939. Architect Albert Kahn of Detroit, Michigan, one of the country's foremost industrial designers, prepared plans for the buildings in 1940 (Woodbury 1946:76 in Yoklavich 1993:24). Development of the military station changed the civilian character of Midway, creating a base landscape that replaced the individual units or "towns" that had defined the cable station and Pan American Airways' presence. The new base design clearly demonstrated the Navy's authority by placing the officer's housing in the center of Sand Island and developing a road system that linked the military's buildings. The architectural style of the buildings enhanced the perception of military control because of its uniform, simple, and efficient design.

On December 7, 1941, two Japanese destroyers shelled Sand Island for almost 2 hours (Hazelwood n.d., in Yoklavich 1993:26). Marine guns returned fire, but the Japanese ships caused extensive damage to several buildings, including the seaplane hangar and power plant. First Lieutenant George H. Cannon was fatally wounded in the shelling and posthumously became the first Marine to receive the Medal of Honor in World War II (Heinl 1948:13, in Yoklavich 1993:26).

The capture of Wake Island and Guam by the Japanese, along with their aggressive offensive operation in the Pacific, caused military strategists to look more closely at Midway as the key to retaining any hope of U.S. success in the Pacific Theater. If Midway fell, it would be a short hop from there to Honolulu and other West Coast cities.

The historical events of the Battle of Midway have been explored in great detail in numerous reports, books, and articles, so only a brief synopsis is included here. In spring 1942, Midway Atoll was thought to be the target of an imminent Japanese attack. To learn their plans, Fleet Admiral Chester William Nimitz sent a command over the secure cable for Midway to broadcast a false distress message. The intelligence trap proved successful when a Japanese message was decoded two days later stating that the target "AF was having trouble with its fresh water distillation system" (Cressman et al. 1990). With the Japanese target clearly identified, Admiral Nimitz focused on planning for the impending battle.

Nimitz inspected the islands on May 2, 1942, to spur every effort to fortify the island with men and equipment. Nearly every inch of Sand and Eastern islands was covered with men and equipment. While most of the new equipment was sent to the European Theater, Nimitz tried to find resources for Midway sufficient to repel a Japanese landing. Several groups of Marine and Navy air detachments as well as Navy PT (patrol torpedo) boats were sent to the atoll to support existing forces.

PBY (patrol bomber-Y) Catalina seaplanes, the famous "flying boats" of World War II, were housed in the seaplane hangar and used the seaplane ramp in Sand Island harbor to make regular patrols. On the morning of June 4, 1942, a Navy PBY pilot radioed a contact report of "the main body" at approximately 700 miles away, headed northeast (Cressman et al. 1990). Though the pilot had actually seen part of the occupation force rather than the attacking force, the report immediately put the U.S. forces on alert.

All aircraft were already prepared to launch when the radar on Sand Island began picking up the incoming enemy flight at about 0630. As 108 Japanese planes zoomed toward Midway, 25 defending U.S. Marine fighters tried valiantly to slow their progress. Eastern Island's airfield was eerily quiet for the few minutes prior to attack, with all but a few airplanes safely launched. Meanwhile, torpedo bombers flew to attack the enemy aircraft carriers. The Japanese military strategy was simple–destroy the air base at Midway and clear the way for occupation.

The attack lasted only 17 minutes, but left the installations on both Sand and Eastern Islands in shambles. The seaplane hangar was hit and set ablaze. The fuel oil tanks 500 yards north of the seaplane hangar were also hit, sending a thick black column of smoke that could be seen for miles. The men on Midway were unable to effectively return fire on such advanced aircraft, which could drop bombs well out of reach of the anti-aircraft guns.

Meanwhile, an epic air battle was unfolding at sea. Against all odds and despite devastating losses of aircraft and pilots as well as the sinking of the USS *Yorktown*, the U.S. forces dealt a fatal blow to the Imperial Japanese Navy. Japanese naval commander Admiral Yamamoto had lost his entire fast carrier group, with its complement of some 250 planes, most of the pilots, and about 2,200 officers and men. On the morning of June 5, he gave the surprising order for a general retirement of his fleet, even though he still maintained overwhelming gunfire and torpedo superiority. In all its long history, the Japanese Navy had never known defeat (Morison 1963). This was America's greatest victory in the Pacific Theater and changed the course of history.

Midway as a military base was closed after World War II, was reactivated during the Korean War, closed again, and was reactivated in 1953. Crucial to the new radar technology tracking system during the Cold War, Midway served as a primary base for the "Pacific Barrier" operation, providing a radar line from Midway Atoll to Adak Island, some 1,300 miles to the north (NAS Barbers Point 1962). Continuous coverage for each 14-hour run necessitated a staggered flight schedule, with the radar planes, called "Willy Victors," leaving Midway every four hours (Sheen pers. com. 1998).

During the Vietnam War, Midway was selected as the site for the June 8, 1969, meeting of President Thieu of the Republic of Vietnam and U.S. President Richard Nixon. President Thieu, fearful of riots if he came to the United States, asked for a remote and safe location for a meeting. The base commander's home (Building 414) at Midway was the site of this momentous meeting (Denfeld, in Yoklavich et al. 1994).

Since its designation in 2000, FWS has managed Midway Atoll as the National Memorial to the Battle of Midway, ensuring that those who fought and died in that battle will always be remembered for their sacrifice. Among Midway's 63 existing National Register-eligible historic properties are six defensive structures related to the Battle of Midway that were listed together as a National Historic Landmark in 1986. These structures, together with the cable station buildings, the Albert Kahn-designed naval base, and war memorials, provide a tangible link to the past and the historic events that have transpired on this small speck of land in the middle of the Pacific.

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1.4 Environmental and Anthropogenic Stressors

Despite their remote location and largely uninhabited condition, the NWHI are subject to a wide range of environmental and anthropogenic stressors. Marine pollution, dredging, invasive species, fishing, climate change, and vessel groundings are some of the factors that have affected or may cause harm to the resources of the NWHI. An understanding of past and present stressors and potential future threats provides a backdrop for identifying priority management needs and informing an ecosystem-based management approach. In recent years, increased efforts have focused on documenting terrestrial and coral reef ecosystem health and the effects of priority environmental and anthropogenic stressors. Future research and monitoring efforts will focus on investigating the direct and indirect effects of climate change, such as increases in water temperature, acidification, productivity, sea level rise, changes in precipitation, and other factors on terrestrial and marine habitats and species. Given the Monument’s status as a relatively pristine control site for the Hawaiian Archipelago and the greater Pacific, information gained here on the effects of climate change and factors contributing to ecosystem resilience will have management applicability for resource managers worldwide. This section describes the environmental and anthropogenic stressors in the NWHI.

Coastal Development

A century ago, coastal development in the NWHI consisted of guano mining at Laysan Island and the establishment of the Commercial Pacific Cable Company on Midway. Then, in 1938, Congress authorized the Hepburn Board, a fact-finding group in the Navy, to make a strategic study of the need for additional U.S. naval bases. This study resulted in the construction of base facilities, airfields, and seadromes during 1939 and 1940 (Hepburn Board Report 1939, Time 1939). One of these facilities was Midway Naval Air Station. Facility construction included dredging a channel and building a seaplane basin and a turning basin. All of this work was accomplished through the dynamiting of coral heads by “skindivers” and by draglines and dredges mounted on land and barges. Approximately 3 million cubic yards (2.29 million cubic meters) of coral and material was removed. An estimated 2,800 feet (853 meters) of sheetpiling bulkhead was installed on Sand Island. Dredged material was pumped behind this bulkhead, creating new land for a seaplane parking-mat (U.S. Navy Bureau of Yards and Docks 1947).

After the Battle of Midway, the Navy recognized the need to be able to resupply Midway within hours, not the days or weeks required for ships to travel there. In less than five months, the Navy SeaBees and contractors dredged 660,000 cubic yards (504,600 cubic meters) of coral, enlarging Tern Island (at French Frigate Shoals) threefold to create a refueling stop for aircraft between O‘ahu and Midway (U.S. Navy Bureau of Yards and Docks 1947).

The Navy occupied Midway, French Frigate Shoals, and Pearl and Hermes during the first half of the 20th century. The U.S. Coast Guard constructed LORAN stations after World War II at Kure and French Frigate Shoals and operated them for several decades (USCG 1994a). Several Cold War operations were conducted at French Frigate Shoals, such as the recently declassified “Corona Project,” the first operational space photo reconnaissance satellite system. French Frigate Shoals served as a tracking and recovery station for this project in the early 1960s.

During the Cold War, French Frigate Shoals housed up to 300 personnel at a time in support of the various classified and unclassified missions (Bill Wood pers. com. 2001). An additional 100 people were stationed at French Frigate Shoals to monitor the aboveground nuclear testing at Johnston Atoll. The Midway Naval Air Station supported several hundred to several thousand soldiers and dependents during the pre- to post-World War II era, before the atoll was transferred to FWS in 1996. Various islands of French Frigate Shoals, Midway, Kure, and Pearl and Hermes Atolls were used in military training exercises that included the use of landing craft, helicopters, and boats.

These types of coastal development activities alter current flow, temperature regimes, and shoreline configuration, and as a result, may significantly alter coastal erosion patterns. Reef disturbances due to storm or human activities are believed to create favorable environments for the formation of ciguatera toxin in marine life (Lehane and Lewis 2000, Van Dolah 2000, Ruff 1989, Kaly and Jones 1994). Operation of housing and other facilities on some islands and the creation of dumps contribute to point and nonpoint sources of pollution to the terrestrial and marine environments.

Since the closure of Navy and Coast Guard facilities, coastal development activities have been limited to small-scale conversion of abandoned Coast Guard buildings on Tern Island at French Frigate Shoals and Green Island at Kure to biological field stations. The only recent coastal construction has been the repair of the seawall protecting Tern Island’s small runway and buildings, and construction of a small boat ramp at French Frigate Shoals in 2004. This construction was needed to halt the erosion of the island and to eliminate the risk of injury and death to endangered monk seals, threatened green turtles, and migratory seabirds previously trapped in eroding seawall sheet piling that has now been removed from the island.

Current human population levels are limited to a few agency staff and volunteers at French Frigate Shoals, Laysan Island, Lisianski Island, and Pearl and Hermes and Kure atolls. In addition to a small number of agency staff and volunteers at Midway Atoll, approximately 50 contract employees operate the infrastructure required to maintain Henderson Airfield as an emergency landing site for commercial transpacific airliners.

Marine Pollution

Marine pollution can be defined as the introduction by humans, whether directly or indirectly, of substances or energy to the marine environment, resulting in deleterious effects such as hazards to the health of marine life and humans, hindrance of marine activities, and impaired water quality. Marine pollution may originate from land-based or sea-based human activities in the form of point-source discharges, groundwater discharges, or nonpoint-source runoff. Studies conducted by the FWS, Coast Guard, Navy, and the University of Hawai‘i have documented contamination in soil, sediment, and biota at French Frigate Shoals, Kure, and Midway. Direct impacts to black-footed albatrosses, in the form of reduced hatching success, have been linked to high organochlorine levels (Ludwig et al. 1997). Finkelstein et al. (2007) found a correlation between levels of organochlorines and elevated levels of mercury and impaired immune function in black-footed albatrosses.

Marine debris, such as derelict fishing gear and discarded plastics, is a global problem. The increase in reliance on plastic materials that float and are persistent in the environment, as well as improper disposal, has led to an abundance of these materials in our oceans. Marine debris degrades the aesthetic value of the coastal environment, creates navigational hazards, and has negative ecological impacts. There are documented cases of maritime disasters resulting in loss of human life because of vessel entanglement with marine debris (Cho 2004), and loss of marine animals through entanglement and drowning in derelict fishing gear (Henderson 1990, 2001). In addition, hazardous waste has washed ashore; for example, at Laysan Island a diverse complement of hazardous materials has been found, including compressed gas cylinders, phosphorus flares, petroleum, and a 55-gallon drum marked “Toluene Diisocyanate.” A container of the pesticide carbofuran is suspected to have washed ashore at Laysan Island, and the area dubbed “The Dead Zone” remained a hazard on the island from 1987 until it was remediated by FWS in 2002.

Impacts of marine debris on the ecological health of the NWHI have not been fully documented due to the large size and remoteness of the region, as well as the historical and ongoing nature of the problem. It is known that fishing and cargo nets lost at sea are carried by currents to shallow water environments of the NWHI, causing physical damage to corals and creating entanglement hazards for monk seals, sea turtles, and other marine organisms. Mortality caused by entanglement in derelict fishing gear, primarily nets, has been documented for several mobile marine species in the NWHI, with impact on the Hawaiian monk seal being of greatest concern because of the endangered status of this animal (Boland and Donohue 2003). Mean annual entanglement rates for monk seals are in a range that is higher than that shown to be detrimental to other pinniped populations, and documentation of entanglements is available only for those seals that return to shore; thus, it is highly probable that the actual impact is underestimated. From 1982 and 2003, 238 Hawaiian monk seal entanglements were documented in the NWHI, of which 162 were disentangled and freed, 61 escaped or had freed themselves, 8 were found dead, and 7 met an unknown fate (Henderson 2006 pers. com.). Other threatened or endangered marine animals, such as sea turtles, have been found entangled in marine debris, and often the only evidence of their drowning is the remains of their bones or shells still caught in the debris. In 2004, the skeleton of a subadult loggerhead sea turtle and the carcass of a small whale were found in a large floating net (NMFS 2004b).

Derelict fishing gear also degrades reef health by abrading, smothering, and dislodging corals and other benthic organisms, as well as by preventing recruitment on reef surfaces (Donohue and Brainard 2001). Estimates of the overall impact of debris on shallow water habitats are difficult to quantify and are complicated by the likelihood that debris acts as a vector for alien species and introduction and spread of disease.

In the NWHI, much of the marine debris is in the form of derelict fishing nets, mostly trawl nets, from North Pacific fisheries. No trawl net fisheries are active in Hawaiian waters, but active domestic and international fisheries use this type of gear in Pacific Rim fisheries. Other types of debris include gill nets, seine nets, lobster traps, fishing floats, Fish Aggregation Devices (FADs), hazardous materials (e.g., barrels, gas cylinders), and plastics. Because much of the debris comes from international fisheries, U.S. activities aimed at prevention are complicated. Debris produced from illegal activities, such as the unauthorized deployment of FADs, unlicensed fishing throughout the Pacific, or dumping of debris at sea, makes the problem even more complex and harder to quantify.

Since 1996, regular marine debris removal efforts have been conducted through a multi-agency effort led by NOAA, in collaboration with FWS, the State of Hawai‘i, City and County of Honolulu, Honolulu Waste Disposal, U.S. Coast Guard, U.S. Navy, University of Hawai‘i Sea Grant College Fund, Schnitzer Steel Hawai‘i Corporation (formerly Hawai‘i Metals Recycling Company), The Ocean Conservancy, and other local agencies, businesses, and nongovernmental partners. Since then, this effort has resulted in the removal of more than 563 tons (502 metric tons) of derelict fishing gear and other marine debris from the coral reef ecosystems of the NWHI (Figure 1.24). Marine debris survey and collection activities have been conducted at Kure Atoll, Midway Atoll, Pearl and Hermes Atoll, Lisianski Island, Laysan Island, and French Frigate Shoals. Removal operations have targeted areas where marine debris has accumulated over the past several decades. It is estimated that the accumulation rate is 57 tons (52 metric tons) per year. Until substantial efforts are made to significantly reduce the sources of debris and until debris can be effectively removed at sea, similar amounts are expected to continue accumulating indefinitely in the reef ecosystems of the NWHI.

Smaller types of marine debris made of plastic, such as disposable lighters, bottle caps, and other fragments, are ingested at sea by adult albatrosses, wedge-tailed shearwaters, and other seabirds when they feed at sea (Fry et al. 1987). These objects are subsequently fed to chicks in Monument colonies. It has been estimated that approximately five tons of plastic are fed to albatross chicks at Midway Atoll each year (Klavitter 2005). The foreign objects may reduce their survival by causing direct injury to the gut, accumulating and reducing the chicks’ ability to swallow full-sized meals, and placing them at greater risk of dehydration, a common cause of death in young albatrosses (Sileo et al. 1990; Sievert et al. 1993; Fry et al. 1987; Auman et al. 1997). Additionally, this debris may increase the birds’ exposure to and ingestion of organochlorine contaminants from plastic surfaces (Carpenter and Smith 1972).

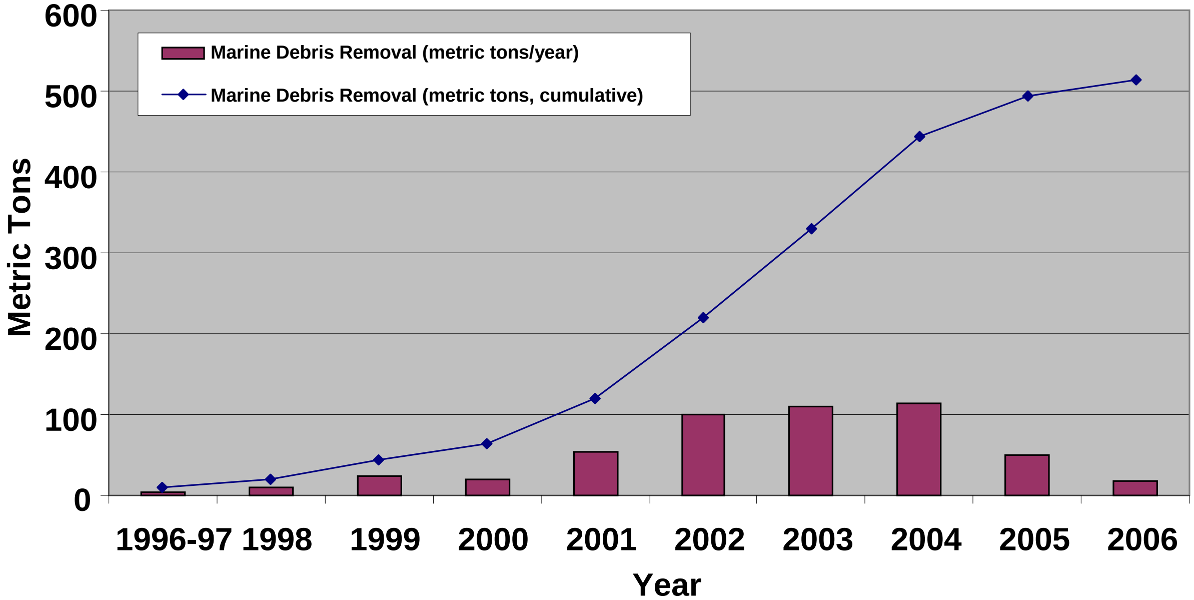

Figure 1.24 Quantity of Marine Debris Removal in the Northwestern Hawaiian Islands. Source: PIFSC-CRED unpublished data.

Terrestrial Pollution

Past uses have left a legacy of modification and contamination throughout NWHI, especially at French Frigate Shoals, Midway Atoll, and Kure Atoll. The NWHI have hosted an array of polluting human activities, including guano mining, fishing camps, Coast Guard LORAN stations, U.S. Navy airfields and bases, and various military missions. Contamination at all these sites includes offshore and onshore contaminated debris such as batteries (lead and mercury), transformers with polychlorinated biphenyls (PCBs), capacitors, and barrels. Debris washing ashore is another source of contamination on the islands. Birds, such as shorebirds, may ingest soil while foraging. Studies have shown that soil can constitute up to 30 percent of the material a bird consumes (Hui and Beyer 1998, Beyer et al. 1994). If the consumed soil is contaminated, it can result in direct intake of toxic substances by foraging birds. Direct ingestion of sand contaminated by carbofuran, a pesticide that washed ashore with marine debris on Laysan Island, caused the deaths of endangered Laysan finches until the source was identified and removed by the FWS (Campbell et al. 2004; David et al. 2001).

Uncharacterized, unlined landfills remain on some of these islands. Kure Atoll and French Frigate Shoals both have point sources of PCBs from former LORAN stations. While the Coast Guard has mounted cleanup actions at both sites, elevated levels of contamination remain in island soils, nearshore sediment, and biota.

During Coast Guard residency at Tern Island (French Frigate Shoals), an area on the north side of the island across from the barracks was used as a general dump and for burning garbage and trash. Waves, rust, and erosion slowly destroyed the northern seawall, and it was breached in late 1980, exposing the dump. Further erosion revealed a great deal of scrap metal, cable, wire, batteries, and electronic equipment such as capacitors and transformers. Coast Guard investigations removed exposed debris over the course of several years. PCB concentrations in the soil ranged from nondetect (<0.033) to 2,300 milligrams/kilogram. In an agreement forged by the Coast Guard and signed by the FWS, EPA, and Coast Guard, a cleanup level for soil was set at two milligrams/kilogram. In 2001, the Coast Guard excavated the landfill (U.S. Coast Guard 2002). Despite the removal of a large amount of material, the Coast Guard left intact an area of approximately 95 by 60 feet (29 by 18.3 meters) that is a jumble of concrete blocks and metal debris from which numerous capacitors, batteries, and transformers have been removed over the years. PCB concentrations in ten soil samples collected from this debris pile ranged from 0.14 to 54 milligrams/kilogram PCBs, with results for five of the ten samples exceeding the cleanup level of two milligrams/kilogram (U.S. Coast Guard 2003). The most highly contaminated sample (54 milligrams/kilogram PCB) is considered hazardous waste. Unfortunately, this area is open to the lagoon, so it is washed by tides and storms. It is also frequented by monk seals and turtles.

During Coast Guard residency at Kure, garbage and scrap metal were disposed of and burned at a dump site located at the southwestern edge of the island. Included in the pit were hazardous materials such as batteries and PCB-containing capacitors. The Coast Guard reported PCBs in the eroding dump to range from nondetect to 393 milligrams/kilogram (U.S. Coast Guard 1994b). In 1994, the Coast Guard remediated the landfill on Kure, excavating and putting into containers soil from the landfill that exhibited a concentration equal to or greater than 25 milligrams/ kilogram. A total of 36 cubic yards (27.5 cubic meters) of soil was removed from the landfill. Scrap metal, cable, nonliquid-containing drums, and remaining soil in the landfill (metal debris and soils with PCB concentrations below 25 milligrams/kilogram) were removed from the landfill and re-interred in the "reburial pit." The depth of the reburial pit was set 15 feet below ground surface, which was estimated to be two feet above the groundwater (U.S. Coast Guard 1994b). Confirmation sampling by the Coast Guard found concentrations of PCBs exceeding the cleanup goal and in excess of 100 milligrams/kilogram.

French Frigate Shoals and Pearl and Hermes Atoll were used for World War II seaplane refueling operations. Leaking underground fuel storage tanks at French Frigate Shoals resulted in petroleum contamination of soil.

Midway Atoll was the site of a U.S. Navy airfield. Before control of the atoll was transferred to the DOI in 1996, numerous contaminated sites throughout the atoll were identified and cleaned up under the U.S. Department of Defense's (DOD) Base Realignment and Closure (BRAC) process. Contamination identified and remediated included petroleum in the groundwater and nearshore waters; pesticides (e.g., DDT) in the soil; PCBs in soil, groundwater, and nearshore sediments and biota; metals, such as lead and arsenic, in soil and nearshore waters; and unlined, uncharacterized landfills. While most of the known areas were remediated, several areas warrant continued monitoring for potential releases. Since the airfield's closure, the Navy has returned on several occasions to conduct further remediation.

Midway has several landfills left behind by the Navy. Some of these landfills were created during base closure for the disposal of construction rubble and asbestos. Other landfills were created during Navy occupancy for disposal of materials associated with operations. One area that needs continued monitoring and potentially further remediation is known as the Old Bulky Waste Landfill. This site is an uncharacterized landfill that was created by the disposal of scrap metal, used equipment, and unconsolidated waste off the south shore of Sand Island to create a peninsula approximately 1,200 feet long by 450 feet (average) wide by nine feet high (366 meters long by 137 meters wide by 2.7 meters high)(Navy 1995). It is bordered on the three seaward sides by an approximately 10-foot-thick (3-meter-thick) band of concrete and stone rip-rap. Wastes known to have been deposited in the landfill are metals (lead, cadmium, chromium, and nickel), gasoline, battery acid, batteries, mercury, lead-based paint, solvents, waste oil, PCBs, dioxins, furans, transmission and brake fluids, vehicles, equipment, tires, and miscellaneous debris (U.S. Navy 1996). The Old Bulky Waste Landfill is subjected to groundwater infiltration from the north and seawater infiltration from the other three sides.

Erosion of the Bulky Waste Landfill on Sand Island, Midway Atoll.

The Technical Memorandum for Evaluation of Remedial Alternatives (U.S. Navy 1995) stated that all remedial alternatives considered for the Old Bulky Waste Landfill would require groundwater monitoring. Alternatives considered were (1) containment, by constructing a multilayer cap in place and providing a lateral barrier extending below the lagoon floor along the landfill periphery; (2) removal, by excavating the landfill and disposing of nonhazardous wastes farther inland; (3) covering, by constructing a multilayer cap in place; and (4) no action. Ultimately, the Old Bulky Waste Landfill was covered in approximately 2 to 2.5 feet (0.6 to 0.8 meters) of soil. Currently, the landfill is eroding, and the soil placed on top is sifting into the debris, causing large holes to open up around the edge and in the center of the landfill. Additionally, burrowing birds are bringing up buried soil and nesting below the cover. More than 500 bird burrows have been counted in the landfill.

Pollution generated by past and present human activities, from sea-based and land-based sources, continues to stress the NWHI ecosystem. Emergency response mechanisms and ongoing cleanup and restoration activities will be maintained and enhanced to address these issues. In the case of marine debris, the NWHI is the recipient, not the source, of this type of marine pollution. This provides the Monument with an important opportunity, as well as a challenge, to facilitate global and Pacific regional cooperation to help solve this problem.

Climate Change

Recent decades have brought increased awareness of the changing global environment and the implications this change may have on ecological processes. The increase in average global temperatures, sea level rise, and change in chemical compositions of the world's oceans are typically cited as the results of global climate change. Changes in the global climate are being brought about by three factors: increasing concentrations of carbon dioxide and other gasses in the atmosphere; alterations in the biogeochemistry of the global nitrogen cycle; and ongoing land use and land cover change. Changes in land use associated with industrialization are causing atmospheric concentrations of carbon dioxide to rise and are considered to be the most important component of global change (Vitousek 1994, Kleypas *et al*. 2006). While there is some debate regarding the extent of the impact these changes will have on Earth's environment, several trends have been well documented. Areas of impact linked to global climate change that may have the greatest potential effect on the Monument are weather changes, coral bleaching, sea level rise inundating important habitat, and oceanic chemical composition change.

Central patch reef, Kure Atoll, September 2002. Bleached *Pocillopora meandrina* with initial overgrowth by turf algae. Photo: Jean Kenyon

According to the findings of the Intergovernmental Panel on Climate Change (IPCC), warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. The international scientific consensus of the IPCC is that most of the recent warming observed has been caused by human activities and that it is "very likely" due to increased concentrations in anthropogenic greenhouse gases (IPCC 2007).

Regional predictions for the North Central Pacific Gyre area within the life of the Monument Management Plan are for surface temperature increases of 0.9 to 1.8° F (0.5 to 1.0 °C), which is a smaller increase than that predicted for the Arctic and Northern hemisphere continental areas. Projected precipitation maps indicate a decrease of 10 to 20 percent of average precipitation by 2090 in the Monument area. The past 30 years have seen increases in the frequency of higher intensity storms and it is likely that this trend will continue as sea surface temperatures continues to rise (Emanuel 2005). Extratropical storm tracks will likely move poleward and be associated with changes in wind, precipitation, and temperature patterns. Projection of the magnitude of sea level rise by 2090 from thermal expansion of water and the melting of land-based ice sheets is less certain, but the estimate ranges from 0.6 to 1.9 feet (0.18 to 0.59 meters) (IPCC 2007). A rise of that magnitude (1.6 feet or 0.48 meters) is predicted to cause the loss of 3 to 65 percent of the terrestrial habitat in the Monument (Baker et al. 2006). Evidence also suggests that the world's oceans are regionally divisible with regard to historical fluctuations in sea level. Localized variations in subsidence and emergence of the sea floor and plate-tectonics activity prevent extrapolations in sea level fluctuations and trends between different regions. Thus, it may not be possible to discuss uniform changes in sea level on a global scale, nor the magnitude of greenhouse-gas-forced changes, as these changes may vary regionally (Michener et al. 1997). As an example, tide gauge records on the Atlantic coast indicate a sea level rise of 0.06 to 0.16 inches/year (0.89 to 0.99 centimeters/year) over the past century, whereas they have indicated a 0.35 to 0.39 inches/year (0.15 to 0.4 centimeters/year) increase along the Gulf Coast of the United States (Michener et al. 1997). More recent modeling indicates that melting could occur faster than the IPCC has predicted (Overpeck et al. 2006). Increases in sea level may also affect low-lying equatorial islands and atolls. Shoreline erosion and saltwater intrusion into subsurface freshwater aquifers have been noted throughout the Pacific (Shea et al. 2001).

Weather Changes

Weather changes, such as reductions in the amount of precipitation and changes in soil moisture and temperature, will affect vegetation communities by changing species compositions, seasonalities, and biomass. These changes in turn may affect the reproductive capabilities of insects and land birds that depend on this vegetation. Increased storm frequency and intensity will have impacts on coral health by direct damage caused by breakage and smothering as sand moves around, and on terrestrial systems through overwashing of islands.

Coral Bleaching

Many corals live in symbiosis with tiny symbiotic algae that live inside their tissues and provide energy. Bleaching occurs when a coral is stressed by temperature, changes in salinity or turbidity as well as other factors. The coral may then evacuate their symbionts leaving themselves energy-depleted and more susceptible to disease and overgrowth by faster growing turf algae. Above-normal mean sea-surface temperatures have been shown to cause bleaching and mortality in corals, both in nature and in the laboratory, with bleaching generally occurring in shallower waters (Floros et al. 2004). Other variables have also been implicated in bleaching and mortality events, including extended periods of high temperatures, low wind velocity, clear skies, calm seas, low rainfall, high rainfall, salinity changes, high turbidity, or acute pollution. Smith and Buddemeier (1992) state, "Reef damage from anthropogenic environmental degradation (nutrient runoff, siltation, overexploitation) is widespread, represents a much greater threat than climate change in the near future, and can reinforce the negative effects of climate change." Floros et al. (2004) goes on to note, "The causes of coral bleaching are debatable, but widely thought to be the result of a variety of stresses, both natural and human-induced, that cause the degeneration and the loss of the colored zooxanthellae from the coral tissues."

Sea surface temperature anomalies resulting from regional and global-scale climatic phenomenon are believed to cause bleaching in the NWHI. Mass coral bleaching in the NWHI occurred during late summer 2002 (Aeby et al. 2003; Kenyon and Brainard 2006), the first time it was recorded or known to exist in the NWHI. Coral bleaching occurred again at high levels in 2004, but was detected at only low rates in 2006 (Kenyon et al. 2006). Furthermore, the NWHI were believed to be less susceptible to bleaching because of their high latitude location. Bleaching was most severe, however, at the three northernmost atolls (Pearl and Hermes, Midway, and Kure), which experience both higher and lower sea water temperatures than the other reef areas of the NWHI. Bleaching occurred but was less severe at Lisianski Island and farther south in the NWHI.

Oceanic Chemical Concentration Change

Glacial and interglacial periods in the Earth's history cycle have been associated, respectively, with low and high concentrations of carbon dioxide, as measured from deep Antarctic ice cores. However, recent increases fall outside the range of peak prehistoric carbon dioxide levels. The rate of increase is also five to ten times more rapid than any of the sustained changes in the ice-core record (Vitousek 1994). Carbon dioxide levels have increased from 280 to 355 microliters per liter (µL/L) since 1800, a level of increase otherwise never reported during the past 160,000 years. Data suggest this increase is linked to fossil fuel combustion and not deforestation (Vitousek 1994). Increasing amounts of CO_2 in the atmosphere have a direct effect on the amount of CO_2 in the ocean. In a process commonly referred to as 'ocean acidification,' CO_2 in the atmosphere reacts with surface waters, resulting in a chain of chemical reactions that serve to increase the acidity of seawater. Anthropogenic release of CO_2 to the atmosphere has already increased the acidity of the ocean since levels from the year 1750 (Royal Society 2005; IPCC 2007). Calcifying marine organisms, such as reef-building corals, plankton and calcareous algae, among others, require an oversaturation of the form of calcium carbonate called aragonite to remain in solid form. This saturation state is a function of depth and pressure, and as the oceans become more acidic, under saturation with respect to aragonite becomes a distinct threat which could facilitate the dissolution of formed reef structures as well as inhibit the growth and accretion of new structure (Vitousek 1994; Royal Society 2005; Kleypas 2006; Fine and Tchernov 2007; Hoegh-Guldberg 2007). Ocean acidification of deep ocean waters will cause metabolic disruptions for deep-living animals as well (Seibal and Walsh 2001).

The full extent as to how alterations to seawater chemistry may affect the oceans and associated ecosystems is as yet unknown. However, current research suggests that ocean acidification may drastically reduce a coral reef's ability to overcome the balance of erosion and depositional forces leaving them and their associated ecosystems (including carbonate-based island atolls) susceptible to the additional threats of sea level rise and increased storm activity.

Chemical concentration changes in the atmosphere may also affect terrestrial ecosystems. For instance, the quantity of nitrogen available to organisms affects species composition and productivity. Increase in nitrogen can alter species composition by favoring those plant species that respond to nitrogen increases (Vitousek 1994). Increased carbon dioxide can also influence photosynthetic rates in plants, change plant species composition, lower nutrient levels, and lower weight gain by herbivores.

Diseases
The incidence of diseases affecting marine organisms is increasing globally; however, the factors contributing to disease outbreaks are poorly known and hampered due to a lack of information on normal disease levels in the ocean (Harvell et al. 1999). The incidence of coral disease is lower in the NWHI (Aeby 2006). The NWHI provide unique opportunities to document baseline levels of disease in coral reefs in the absence of a resident human population (Aeby 2006).

Recent studies in the NWHI have begun to document baseline levels of coral disease (Work et al. 2004; Aeby 2006). Tumors, as well as lesions associated with parasites, ciliates, bacteria, and fungi, have been found on a number of coral species. The overall average prevalence of disease (number of diseased colonies/total number of colonies) was found to be very low in the NWHI, estimated at 0.5 percent (ranging from 0 to 7.1 percent) (Aeby 2006), compared with the average prevalence of disease of 0.95 percent in the main Hawaiian Islands (Friedlander et al. 2005). The prevalence of disease varies among different genera of coral (Figure 1.25), with the highest prevalence in species of the genera *Acropora* and *Montipora*. A protocol for characterizing coral disease has now been incorporated into regular coral surveys and monitoring of the NWHI.

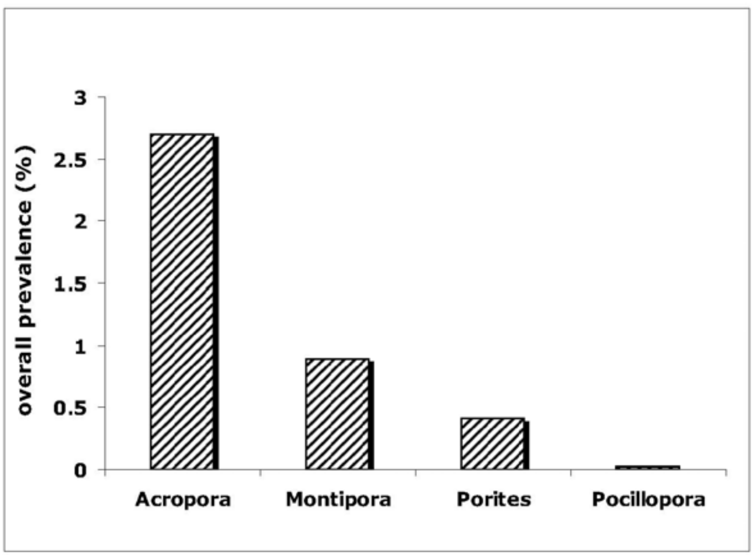

Figure 1.25 Overall Prevalence of Disease in the Four Major Coral Genera in the NWHI. Seventy-three sites were surveyed in July 2003. Prevalence (all surveys combined) is calculated as the number of diseased colonies per genera/total number of colonies per genera x 100. Source: Aeby 2006.

The threatened Hawai‘i population of the green turtle is affected by fibropapillomatosis (FP), a disease that causes tumors in turtles. The prevalence of FP in the Hawaiian green turtle population was estimated at 40 to 60 percent, with the majority of cases found among juvenile turtles (Balazs and Pooley 1991). The herpes virus has been suggested as the possible cause or as a cofactor of FP (Herbst 1995). The majority of recent turtle strandings are by juvenile turtles with FP (Work et al. 2004). As a result, FP may pose a major threat to the long-term survival of the species (Quackenbush et al. 2001).

Marine Alien Species

Marine alien species can be defined as aquatic organisms that have been intentionally or unintentionally introduced into new ecosystems, resulting in negative ecological, economic, or human health impacts. A total of 13 marine alien invertebrate, fish, and algal species have been recorded in the NWHI (Table 1.5). Alien species may be introduced unintentionally by vessels, marine debris, or aquaculture, or intentionally, as in the case of some species of groupers and snappers and algal species.

Table 1.5 Marine Alien Species in the Northwestern Hawaiian Islands[1]

Species	Taxa	Native Range	Present Status in NWHI[2]	Mechanism of Introduction
Hypnea musciformis	Algae	Unknown; Cosmopolitan	Not Established; in drift only (MAR)	Intentional introduction to Main Hawaiian Islands (documented)
Diadumene lineata	Anemone	Asia	Unknown; on derelict net only (PHR)	Derelict fishing net debris (documented)
Pennaria disticha	Hydroid	Unknown; Cosmopolitan	Established (PHR, LAY, LIS, KUR, MID)	Fouling on ship hulls (hypothesized)
Balanus reticulatus	Barnacle	Atlantic	Established (FFS)	Fouling on ship hulls (hypothesized)
Balanus venustus	Barnacle	Atlantic and Caribbean	Not Established; on vessel hull only (MID)	Fouling on ship hulls (documented)
Chthamalus proteus	Barnacle	Caribbean	Established (MID)	Fouling on ship hulls (hypothesized)
Amathia distans	Bryozoan	Unknown; Cosmopolitan	Established (MID)	Fouling on ship hulls (hypothesized)
Schizoporella errata	Bryozoan	Unknown; Cosmopolitan	Established (MID)	Fouling on ship hulls (hypothesized)
Lutjanus kasmira	Fish	Indo-Pacific	Established (NIH, MOK, FFS, MAR, LAY, and MID)	Intentional introduction to Main Hawaiian Islands (documented)
Cephalopholis argus	Fish	Indo-Pacific	Established (NIH, MOK, FFS)	Intentional introduction to Main Hawaiian Islands (documented)
Lutjanus fulvus	Fish	Indo-Pacific	Established (NIH and FFS)	Intentional introduction to Main Hawaiian Islands (documented)
Cnemidocarpa irene	Tunicate	Indo-Pacific	Established (FFS)	Fouling on ship hulls (hypothesized)
Polycarpa aurita	Tunicate	Indo-Pacific and Western Atlantic	Established (FFS)	Fouling on ship hulls (hypothesized)

Notes:

1 Godwin 2008; Zabin et al. 2003; Godwin 2002; DeFelice et al. 2002; Godwin 2000; DeFelice et al. 1998; McDermid (pers. com.)

2 NIH=Nihoa, MOK=Mokumanamana, FFS=French Frigate Shoals, MAR=Maro, PHR=Pearl and Hermes, LAY=Laysan Island, LIS=Lisianski Island, MID=Midway, KUR=Kure Atoll

Recent compilations of marine alien species in Hawai‘i (Eldredge and Carlton 2002) include some 343 species: 287 invertebrates, 24 algae, 20 fish, and 12 flowering plants. Information concerning marine aquatic invasive species in the NWHI is more recent, and judgments as to whether organisms are invasive or native are based on knowledge of marine aquatic alien species that has been gained in the main Hawaiian Islands over the last decade. This is due both to the lack of taxonomic information for many invertebrate groups and the minimal historical sampling effort in the NWHI. The status of the taxonomy of many non-coral marine invertebrate groups and algae is not fully developed for the NWHI, and comprehensive species inventories have yet to be produced, although efforts to correct this situation are presently under way (Godwin et al. 2006).

The known data concerning marine aquatic alien species in the NWHI were collected from a single focused marine invasive species survey by the Bishop Museum at Midway Atoll in 2000 and subsequent multi-agency RAMP cruises in 2002 and 2003. The results of these efforts have recorded a total of 13 aquatic invasive marine fish, invertebrate, and algae species in the NWHI. Table 1.5 shows the species, the native range of each, their present status in the NWHI, and the hypothesized or documented mechanism of introduction.

Eleven species of shallow-water snappers (*Lutjanidae*) and groupers (*Serranidae*) were purposely introduced to one or more of the main islands of the Hawaiian Archipelago in the late 1950s and early 1960s. Two snappers, the bluestripe snapper (taape, *Lutjanus kasmira*) and the blacktail snapper (*Lutjanus fulvus*), and one grouper, the peacock grouper (*Cephalopholis argus*), are well established and have histories of colonization along the island chain that are reasonably well documented (Randall 1987). Bluestripe snappers have been by far the most successful fish introduction to the Hawaiian coral reef ecosystem. Approximately 3,200 individuals were introduced on the island of O‘ahu in the 1950s. The population has expanded its range by 1,491 miles (2,400 kilometers), until it has now been reported as far north as Midway in the NWHI (Figure 1.26). These records suggest a dispersal rate of about 18-70 nautical miles (33-130 kilometers) per year. The other two species have only been recorded as far north as French Frigate Shoals and are present in much lower numbers than bluestripe snappers.

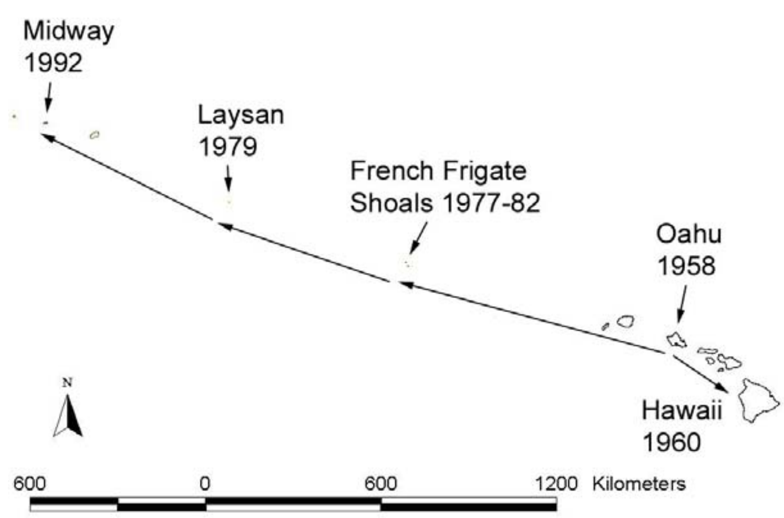

Figure 1.26 Spread of Bluestripe Snapper throughout the Hawaiian Archipelago after Introduction to O‘ahu in 1958. Source: Friedlander et al. 2005.

The magnitude of the problem of aquatic alien species is far greater in the main Hawaiian Islands than in the NWHI. Efforts to control the accelerated introduction of alien species in the NWHI will focus on transport mechanisms, such as marine debris, ship hulls, and discharge of bilge water from vessels originating from Hawaiian Island and other ports, to effectively reduce new introductions. Existing Monument regulations and permitting requirements greatly reduce the chance of new introductions. Monitoring is needed as an early warning system for response actions to be effective. Natural transport mechanisms, such as larval transport in currents, also play a role in the spread of aquatic invasive species.

Terrestrial Alien Species

Human occupation at Midway Atoll has continued uninterrupted since the Commercial Pacific Cable Company took up residence there in 1903. The cable company attempted to make the settlement as self-sufficient as possible through the cultivation of gardens and small livestock. Initial garden attempts failed because of the lack of organic soil on the islands. To remedy this lack, barge loads of soil were brought from O‘ahu and Guam, and contained not only the organic matter that made gardening possible, but also all the associated soil organisms such as ants, centipedes, and fungi. In addition to the introduction of vegetables, trees and ornamentals were also planted, such as ironwoods, eucalyptus, and acacia. So successful were these introductions that, by 1922, an estimated two-thirds of Sand Island was covered with imported vegetation. Livestock and poultry were also raised. While the black rat (*Rattus rattus*) was successfully exterminated on Midway in 1997, mice (*Mus musculus*), along with various species of ants, wasps, ticks, and mosquitoes, continue to plague wildlife and humans. Mosquitoes are of special concern as they are potential vectors for diseases such as West Nile virus, avian malaria, and avian pox.

Laysan Island was the site of another attempt at colonization. In 1890, Captains Freeth and Spencer initiated the mining of guano, resulting in the removal of thousands of tons of guano and the disturbance of hundreds of acres of habitat. The most devastating action on Laysan was the introduction of domestic rabbits, Belgium and European hares, and guinea pigs by Max Schlemmer in 1903. Schlemmer, known as the “King of Laysan,” introduced these animals partly to amuse his many children and as potential livestock for a meat-canning business. Schlemmer’s activities, which included feather exporting, were outlawed with the establishment of the Hawaiian Islands Reservation; however, by then, the rapidly reproducing rabbits had extirpated most of the vegetation on Laysan. The U.S. Bureau of Biological Survey sent an expedition on the *Thetis* in the winter of 1912 and 1913 to exterminate them but ran out of ammunition after 5,000 rabbits were killed; thus, several thousand remained, which continued to destroy the vegetation (Ely and Clapp 1973, Rauzon 2001). The rabbits were finally exterminated in 1923 by the Tanager Expedition, which was a joint expedition by the U.S. Bureau of Biological Survey, the Bishop Museum, and the U.S. Navy (Rauzon 2001). In only a few years, the rabbits destroyed almost all of the vegetation and associated insects of the island, causing the extinction of three species of birds: the Laysan honeycreeper (*Himantione sanguinea freethii*), the Laysan rail (*Porzana palmeri*), and the Laysan millerbird (*Acrocephalus familiaris familiaris*).

The number of alien land plants in the NWHI varies from only three introduced at Nihoa to 249 introduced at Midway Atoll. The level of threat from introduced plants also varies between species. For example, the invasive plant golden crownbeard (*Verbesina encelioides*) displaces almost all native vegetation in some nesting areas. This plant causes entanglement of albatross adults and chicks and increases chick mortality as a result of heat stress by reducing the birds’ ability to use convective cooling for thermoregulation. At Southeast Island, Pearl and Hermes

Atoll, *Verbesina* has displaced almost all native vegetation. When it dies back each year, the endangered Laysan finches (*Telespiza cantans*) suffer severe food and cover restrictions. This plant has quickly covered nesting habitat on Sand, Eastern, and Spit islands of Midway Atoll, Green Island of Kure Atoll, and Southeast Island of Pearl and Hermes Reef.

Sandbur (*Cenchrus echinatus*) is an aggressive invasive grass currently occurring at Kure and Midway Atolls, Pearl and Hermes Reef, Lisianski Island, and French Frigate Shoals. An intensive *Cenchrus* eradication effort at Laysan Island that took 12 years to complete has been a major contribution to the restoration of Laysan's seabird nesting habitat and has facilitated restoration of the island's native vegetation. Laysan Island has also been invaded by Indian Pluchea (*Pluchea indica*), *Sporobolus pyramidatus*, and swine cress (*Coronopus didymus*). Invasive ant species have been detected at all of the islands in the Monument and pose threats to many components of the terrestrial ecosystem, most notably to native terrestrial invertebrates (e.g., the endemic Lepidopteran larvae) and native plants. They also have been observed preying on the eggs and chicks of seabirds in the Monument.

The invasive gray bird locust (*Schistocerca nitens*) was first detected at Nihoa in 1984, and by 2000 was periodically reaching large population levels that were causing damage to the native plant community, including three endemic species listed as endangered. This grasshopper species has now also spread to Mokumanamana, French Frigate Shoals, and Lisianski Island. A workshop was convened in 2005 to identify research and mitigation measures to respond to this invasive insect (Gilmartin 2005). The meeting produced a variety of recommendations that shall be incorporated into the alien species management program of the Monument.

Mandatory quarantine protocols are enforced for any visitors to the NWHI to prevent further importation of invasive organisms. At all of the islands and atolls except Midway and French Frigate Shoals, these protocols include requiring the use of brand new or island-specific gear at each site and treatments such as cleaning, using insecticide, and freezing to minimize the transport of potentially invasive species to the islands. Protocols at Midway and French Frigate Shoals are modified as necessary to accommodate the greater volumes of material coming in, but all possible procedures are still employed to minimize additional introductions at these two sites.

Fishing

Fishing and other resource extractive uses have occurred in varying degrees in the NWHI. Native Hawaiians traveled to these areas as early as 500 A.D. During the western exploration period (1750 to 1920s), explorers and whalers from France, Russia, Japan, Britain, and the United States harvested Hawaiian monk seals, whales, fish, seabirds, and guano from various parts of the NWHI. In more recent history (1920s to 1970s), fishing and other resource extractive uses were punctuated by the overexploitation of the endemic black-lipped pearl oyster (1928 to 1931), the beginning of a Hawaiʻi-based fishing fleet (1930s to 1940s), a cessation of commercial uses during World War II, a resumption of commercial fishing (1945 to 1960) (during which Tern Island was used as a transshipment point for fresh fish flown to Honolulu), and a proliferation of foreign fishing vessels from Japan and Russia (1965 to 1977).

Commercial fishing in the NWHI has, in recent decades, been managed according to federal fishery management plans developed for fisheries for precious corals, bottomfish and seamount groundfish, and pelagic, crustacean, and coral reef fisheries. According to the management scheme, no precious coral or coral reef species fisheries have been permitted in the NWHI. Pelagic longline fishing within 50 nautical miles (92.6 kilometers) of the NWHI has been prohibited since 1991, the year the Longline Protected Species Zone was designated to prevent interactions with endangered species (50 CFR 665.806 [2008] Subpart F). No crustacean (lobster-trap) fishery has operated in the NWHI since 1999. Between 2000 and 2005, NMFS has set an annual harvest guideline of zero lobsters for this fishery. Proclamation No. 8031 directed the Secretaries to ensure that NWHI commercial lobster fishing permits be subject to a zero annual harvest limit.

Proclamation 8031 allows commercial fishing by federally permitted bottomfish fishery participants who have valid permits until mid-2011 (71 FR 36443, June 26, 2006). This amounts to a maximum of eight permitted bottomfish vessels that fish within the Monument.

The only commercial fishery occurring in the Monument is the federal bottomfish fishery. This fishery operates according to the management regime specified in the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region. In the NWHI, the bottomfish fishery is a hook-and-line fishery that targets a range of snappers, jacks, emperors, and groupers that live on the outer reef slopes, seamounts, and banks at depths of approximately 50 to 400 fathoms (91 to 731 meters). The management regime includes several precautionary measures that minimize potential effects of this fishery. For instance, the bottomfish fishery participants do not operate in the presence of the monk seals so as to avoid any direct or indirect effects of the fishery on the species (50 CFR 665.207 [2008] Subpart C). In addition, it is known that the vessels operations do not negatively impact habitat (Kelley and Ikehara 2006). Finally, the annual catch limit in the NWHI is set by regulation at 300,000 lbs. of bottomfish and 180,000 lbs. of pelagic species (50 CFR Part 404), and, to date, annual harvest has fallen below these limits.

Transportation Hazards and Groundings

Hazards to shipping and other forms of maritime traffic, such as shallow submerged reefs and shoals, are inherent in the NWHI's 1,200 miles (1,931 kilometers) of islands and islets. The region is exposed to open ocean weather and sea conditions year-round, punctuated by winter severe storm and wave events. Vessel groundings and the release of fuel, cargo, and other items pose real threats to the NWHI. Likewise, aircraft landing at Midway Atoll or Tern Island pose certain risks to wildlife and other resources, including bird strikes, introduction of alien species, aircraft crashes, and fuel spills. Certain management practices, such as requiring night landings and runway sweeps during albatross season at Midway and alien species inspections, can minimize these risks.

The many types of vessels operating in and transiting through the NWHI pose different threats to the marine environment based on their size, age, draft, port of origin, frequency of visits, activities conducted, navigational protocols, and operations that could disturb or injure wildlife or coral reef ecosystems, as well as the volume, type, and location of discharges. The range of vessel types include 20- to 60-foot fishing and recreational vessels, 150- to 250-foot research vessels, 500- to 700-foot passenger cruise ships and freighters, 700- to 1,000-foot tankers, as well as Coast Guard, military, and international ships of all sizes and types.

Vessel Groundings, Oil and Fuel Spills, and Loss of Cargo Overboard

In the NWHI, a number of factors have contributed to vessel groundings and cargo loss over the years. These factors include human error, lack of appropriate navigational practices, inaccurate nautical charts, and treacherous conditions posed by the low-lying islands, atolls, and shallow pinnacles and banks. All vessels pose a risk to the environment. Periodically, accidental loss of cargo overboard causes marine debris or hazardous materials to enter sensitive shallow-water ecosystems.

Twelve of the 60 ship losses known to have occurred in the region have been located and include whaling vessels, Navy frigates, tankers, and modern fishing boats. Additionally, 67 planes are known to have been lost in the region, mainly naval aircraft (many from World War II), but only two have been located. Some of these ship and aircraft wreck sites fall into the category of war graves associated with major historic events.

Unexploded ordnance, debris, and modern shipwrecks, such as the fishing vessels *Houei Maru #5* and *Paradise Queen II* at Kure Atoll or the tanker *Mission San Miguel* lost at Maro Reef, are not protected as heritage resources and represent a more immediate concern as threats to reef ecosystems. Mechanical damage from the initial grounding, subsequent redeposition of wreck material by storm surge, fishing gear damage to reef and species, and release of fuel or hazardous substances are all issues to be considered in protecting the integrity of the environment. Dissolved iron serves as a limiting nutrient in many tropical marine areas and tends to fuel cyanobacteria (blue-green algae) growth when the iron begins to dissolve (corrode). This is especially a problem on atolls and low coral islands where basalt or volcanic rock is absent in the photic zone and natural dissolved sources of iron in seawater are even lower. Therefore, any ships left in place would be an iron source that could contribute to potential cyanobacterial blooms. It has been demonstrated that not removing non-historic steel vessels can have long-term detrimental effects that, in most cases, can be worse than any short-term damage to the environment caused by the removal action.

In 1998, the *Paradise Queen II* ran aground at Kure Atoll, spilling 11,000 gallons of diesel fuel and 500 gallons of hydraulic fluids and oil. The vessel also lost 3,000 pounds of frozen lobster tails, 4,000 pounds of bait, 11 miles of lobster pot mainline, and 1,040 lead-weighted plastic lobster traps. Traps rolling around in the surf broke coral and coralline algal structures. Two years later, researchers found broken coral and 600 lobster traps among piles of nets surrounding the decaying wheelhouse (Maragos and Gulko 2002).

When the 85-foot longliner *Swordman I,* carrying more than 6,000 gallons of diesel fuel and hydraulic oil, ran aground at Pearl and Hermes Reef in 2000, vessel monitoring system technology allowed agents to track the disaster and quickly send out equipment for a cleanup that cost upward of $300,000, a cost that the government had to sue to recover.

By comparison, the grounded chartered marine debris cleanup vessel *Casitas* caused less environmental damage. Following the removal of 33,000 gallons of fuel and oil, the 145-foot motor vessel *Casitas* was successfully extracted from the reef at Pearl and Hermes Atoll and entombed northwest of the atoll in approximately 7,200 feet (2,195 meters) of water. However, the crew fleeing the sinking vessel was forced to camp on a quarantine island without "clean gear." It has yet to be determined whether any invasive species came ashore with the shipwecked crew. The ship was conducting marine debris cleanup operations under a NOAA charter when it ran aground on July 2, 2005. Unified Command representatives from the Coast Guard, State of Hawaiʻi, and Northwind Inc. (owner of the *Casitas*), in cooperation with the federal trustees FWS and NOAA, oversaw the operation to prevent further damage to the coral reef ecosystem and islands.

On June 1, 2007, a grounded vessel named *Grendel* was discovered inside Kure Atoll's lagoon on the northeast reef. Metal debris from the vessel was found on the reef extending along a 500-foot path from the vessel northeast to the emergent reef, indicating that the vessel entered the lagoon over the northeast reef. The level of fouling on the steel hulled sloop suggested that the vessel wrecked approximately three to four months earlier, in February or March. The vessels sails, sheets, and lines were tangled around the mast, stays, and railings, creating a wildlife entanglement hazard. Approximately 275 pounds of entanglement hazards were removed using snorkeling gear. A battery, 300 pounds of chain, three anchors, and several broken pieces of metal were also removed from the site.

Waste Discharge

The International Convention for the Prevention of Pollution from Ships (MARPOL 1973/78) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It addresses potential sources of pollution, such as oil, chemicals, harmful substances in packaged form, garbage, sewage, and air pollution. (The United States is not a signatory to those parts of the Convention addressing the last two sources.) The Convention's regulations are aimed at preventing and minimizing pollution from both accidental events and routine operations.

Vessel waste generally consists of solid waste, sewage, gray water, and bilge water. Solid waste may consist of food, cans, glass, wood, cardboard, paper, and plastic. Sewage discharge can contain bacteria or viruses or medical wastes that can cause disease in humans and wildlife or affect the ecosystem by increasing nutrient load. Gray water is wastewater from sinks, showers, laundry, and galleys. It may contain a number of pollutants such as suspended solids, ammonia, nitrogen, phosphates, heavy metals, and detergents. Bilge water can contain fuel, oil, and wastewater from engines and machinery that collects in the bottom of the ship's hull as a result of routine operations, spills, and leaks. Discharge in the Monument is tightly regulated by the Proclamation and permit requirements. Monument staff are investigating the potential impacts of various types of discharges and will continue to update permit requirements as need to safeguard the marine resources.

Ballast Water Exchange

Ballast water discharged from ships is one of the primary pathways for the introduction and spread of aquatic nuisance species. In response to national concern regarding these species, the National Invasive Species Act of 1996 was enacted, which reauthorized and amended the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. In addition to the Monument discharge regulations, ballast water exchange in the Monument is regulated by Coast Guard regulations establishing a national mandatory ballast water management program for all vessels equipped with ballast water tanks that enter or operate within U.S. waters. These regulations also require vessels to maintain a ballast water management plan that is specific for that vessel and that assigns responsibility to the master or an appropriate official to understand and execute the ballast water management strategy for that vessel.

Introduction of Alien Species

Introduction of marine alien species, including pathogens, is of great concern. The prohibitions on ballast discharge in the Proclamation and the actions outlined in the Alien Species Action Plan (Section 3.3.2) aim to prevent the introduction of alien species to the marine environment. The Alien Species Action Plan addresses prevention, monitoring of alien species, and education of Monument users and the public about the need to prevent alien species introductions.

Anchor Damage to Reefs

Vessel anchoring has the potential to affect the ecosystem depending on many factors, such as the size of the ship and anchor system, weather conditions, and the location and vicinity of the anchorage relative to sensitive ecosystems, such as coral reefs. Because of the potential for impacts to the ecosystem, anchoring on or having a vessel anchored on any living or dead coral with an anchor, anchor chain, or anchor rope is prohibited. Anchoring on all other substrates is strictly regulated.

Anchors and chains can destroy coral and live rock, directly affecting fishes and benthic organisms and their habitat. To prevent this type of damage, mooring buoys are sometimes used in places where frequent or extended anchoring is necessary. Depending on site conditions and mooring type, such buoys can reduce impacts to the ecosystem. The Office of National Marine Sanctuaries has successfully used mooring buoys to mitigate ecosystem damage in high-use areas in the Florida Keys National Marine Sanctuary. Similarly, in Hawai‘i, the State Department of Land and Natural Resources minimized coral reef and benthic habitat damage at Molokini Islet’s popular anchorage with mooring buoys. Data are available to study potential mooring buoy locations using anchor logs from ships that currently operate, or have done so historically, in the Monument.

Light and Sound Impacts

Light and sound generated by people in the marine environment have been the subject of attention in recent years because of concerns that they may negatively affect a variety of species. In the NWHI, seabirds are attracted to and become disoriented by ship lights at night. With emergent land areas in the NWHI providing breeding and nesting area for millions of seabirds, ships’ nightlights attract birds, which can strike the vessel and become injured. The extent of the impact of lights on the seabirds is affected by many factors, including the amount of light, the size of the vessel, the vessel location relative to nesting areas, the season, and the type of birds in the vicinity. Shearwaters, petrels, and juvenile birds are especially vulnerable to nightlights and deck injuries. Lights from vessels can also attract green turtle hatchlings, making them more vulnerable to predators. Lights and lighted structures on land contribute to seabird mortality by causing collisions and disoriention. Light sources in the vicinity of turtle nest-sites may disorient hatching marine turtles so they travel inland and perish.

Anthropogenic sound may also affect some species in the NWHI environment. Sound is a common element of the marine and terrestrial environment, originating from a variety of natural sources such as wind, waves, earthquakes, and marine organisms. Humans introduce sound incidentally into the environment through activities such as low-flying aircraft, shipping, fishing, and other vessel use. People also introduce sound intentionally using sonar for research or military applications, seismic arrays, fish finders, and other tools that help people "see" underwater, and to better understand or exploit the marine environment. The amount and intensity of sound in the ocean are increasing as human activities expand.

Underwater sounds of both human and natural origin may affect the behavior and, in some cases, the survival and productivity of individual marine mammals. The nature and significance of effects depend on a number of factors involving the intensity, duration, and frequency of the sound, as well as particular aspects of the habitat and the animal it may affect. Of particular concern is midfrequency tactical sonar used by military vessels. This type of sonar has been implicated as the cause of several recent marine mammal stranding events (Marine Mammal Commission 2005). Deep-diving species, such as beaked whales, appear to be particularly at risk from these sound sources. Beaked whales occur throughout the Hawaiian Archipelago, including within the Monument (Barlow 2003).

Little is currently known about sound levels and sources in the Monument. Future assessment of the anthropogenic sound in the NWHI will be conducted in close coordination with the Marine Mammal Commission, NMFS, and other partners. The Marine Mammal Commission maintains a Sound Program and Advisory Committee on Acoustic Impacts on Marine Mammals to address the effects of anthropogenic sound on marine mammals.

The following information summarizes the main types of vessels operating in the Monument. All vessels carry with them some degree of risk associated with groundings, discharge, alien species introductions, and wildlife interactions and other potential threats, which are addressed in different sections throughout this plan or directly though prohibitions or permit requirements.

Fishing Vessels

Eight commercial fishing permits are eligible for use in the Monument until June 2011. The fishermen average two to ten trips per year per vessel, with duration ranging from 3 to 22 days per trip. For the most part, these vessels bottomfish around the atolls and banks at the 100-fathom depth and troll in deep water and across banks as they transit between islands. Annual catch limit is set by the Proclamation and codified by regulation (50 CFR Part 404). Crew size ranges from one to four people. The Proclamation prohibits further commercial bottomfish and associated pelagic fishing after June 15, 2011.

Vessels Conducting Research and Management Activities

Several vessels are engaged in research or management activities in the Monument. These vessels include NOAA's *Oscar Elton Sette*, *Hi'ialakai*, *Ka'imimoana*, and the University of Hawai'i's R/V *Kilo Moana* and R/V *Kaimikai-O-Kanaloa,* as well as chartered vessels for marine debris removal and for FWS management activities. These vessels are most active in the NWHI during April through November. They average 200 feet in length; weigh 2,300 tons; and carry 50 crew, researchers, and other staff. The Coast Guard sends a buoy tender to the NWHI once a year. This mission also serves as a law enforcement patrol. In addition, the Coast Guard may occasionally send other ships to the area as needed (Havlik 2005 pers. com.).

Cruise Ships
A small number of cruise ships visit the Midway Atoll Special Management Area each year. The *Seven Seas Voyager* visited Midway once, and the *Pacific Princess* visited twice in 2004. In 2005, 2006, and 2007, one cruise ship visited the atoll each year (Maxfield 2005 pers. com.). Because of their size and the narrow width of the entrance channel at Midway, as well as port security requirements, cruise ships offload passengers three to four miles outside the lagoon and transport them ashore in small boats.

Worldwide, cruise ships constitute a large and growing industry, and like other ships, present a potential environmental threat to the Monument. Large cruise ships can carry thousands of passengers and crew, producing hundreds of thousands of gallons of wastewater and tons of garbage each day. The cruise industry has attracted a lot of attention regarding the treatment of waste at sea, and the Monument closely monitors scientific and regulatory developments that may influence management decisions associated with these ships.

Merchant Vessels
U.S. flag and international merchant vessels, including container ships, bulk carriers, and tankers, transit the waters surrounding the NWHI regularly. Data on routes and volume of shipping traffic are in the process of being compiled. Vessel traffic passes to the north of the island chain, following great circle routes to and from ports on the west coast of North America and East Asia. Vessels also pass through the Monument. Vessels have been observed using the pass between Pearl and Hermes Atoll and Lisianski Island because it allows vessels to maintain an east-west heading while transiting through the island chain (Tosatto 2005 pers. com.). Periodically, accidental loss of cargo overboard causes marine debris or hazardous materials to enter sensitive shallow water ecosystems.

Native Hawaiian Practices and Education
Between 2003 and 2007, several trips for Native Hawaiian cultural practices, education, and documentary film and photography projects were conducted on vessels in the Monument. Vessel size varied, as did anchoring and waste discharge practices. Some of the trips, such as the *Hōkūle‘a* voyage to Kure in 2004 as part of the “Navigating Change” program, included both FWS and NOAA personnel.

Armed Forces Actions within the Monument

In addition to Midway Atoll, the U.S. military has historically utilized ranges, operating areas, and facilities that today are partially overlaid by the Monument. Beginning well before World War II training and research, development, test, and evaluation (RDT&E) have occurred in the Hawai‘i area.

Military use of the area known as the Pacific Missile Range Facility (PMRF) began in 1940 when the U.S. Army acquired a pre-existing grass airstrip. As described in both the PMRF Enhanced Capability EIS completed in 1998 and the Hawaii Range Complex (HRC) Final

EIS/Overseas EIS completed in 2008, the Department of Defense has utilized areas within the Monument for training and RDT&E.

When the President proclaimed the creation of the Monument, an exemption for military activities was included. Presidential Proclamation 8031 creating the Monument states that its prohibitions "shall not apply to activities and exercises of the Armed Forces that are consistent with applicable laws" and that "All activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse impacts on monument resources and qualities." Proclamation 8031 also requires, "In the event of threatened or actual destruction of, loss of, or injury to a monument resource or quality resulting from an incident, including but not limited to spills and groundings, caused by a component of the Department of Defense or the USCG, the cognizant component shall promptly coordinate with the Secretaries for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the monument resource or quality."

The Final EIS/Overseas EIS for the HRC is the most comprehensive source for information on the current activities of the U.S. Navy and other military users within those portions of the Monument and HRC that overlap. In addition, the Missile Defense Agency's Final Ground-Based Midcourse Defense Extended Test Range EIS provides information on long-range missile defense tests in the Pacific region, some of which occur above or near the Monument.

U.S. Armed Forces activities within the Monument include RDT&E actions, training events such as unit level training, anti-submarine warfare exercises and major exercises such as RIMPAC, as well as assistance to the Monument when such activities can also serve as training consistent with federal fiscal law requirements. The U.S. Navy has provided assistance within the Monument areas in the past. Examples include assistance with hand-cutting of heavy fishing nets from coral areas as training for Navy Reserve divers and assistance with removal of grounded vessels as training in harbor clearance techniques.

As described more fully in the HRC EIS/OEIS, the easternmost portion of the Monument extends into the Hawai‘i operating area (OPAREA). The Monument overlays a small portion of a long-existing military warning area known as W-188 where training occurs. W-188 extends from the Navy's PMRF at Barking Sands, Kauai. At its closest point to Nihoa, W-188's boundary is more than 10 miles away, but given the Monument's extension 50 miles from each island, the Monument overlays approximately 40 miles of W-188. The overlap involves less than 2 percent of the entire Monument – approximately 4,300 square nautical miles of the Monument‘s approximately 140,000 square nautical miles. Navy training activities, such as sonar use, are generally limited to the OPAREA. Armed Forces training, including live-fire training, can take place anywhere within W-188.

The Temporary Operating Area (TOA), an area of airspace north and west of Kauai within the HRC, includes the Monument within its boundaries. The TOA is an area used for RDT&E, primarily missile defense testing and evaluation, which typically occurs high in the atmosphere. The TOA is normally used less than a dozen times per year for missile testing and evaluation for short periods of time – usually a few hours. Some of the missile tests include intercepts of target missiles above or near the Monument and result in intercept debris landing in the Monument. Most intercept scenarios are planned so that debris will land in open ocean areas, far from land. A few tests could result in small amounts of debris on land areas.

U.S. Armed Forces Precautions within the Monument

Presidential Proclamation 8031 states "all activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse impacts on monument resources and qualities." The Armed Forces have demonstrated that they understand and respect the value and importance of the Monument. They also recognize that the primary management philosophy for the Monument is protection and preservation.

To ensure achievement of the Proclamation's objectives, the Armed Forces must comply with an extensive list of environmental laws and Executive Orders that apply to their activities. Some of these laws require the Armed Forces to work with, seek input from, or enter into consultation with the agencies represented by the Monument's Co-Trustees: Department of the Interior's FWS; Department of Commerce through NOAA and NMFS; and the State of Hawai‘i, through the DLNR and its Coastal Zone Management office.

These laws include, but are not limited to:
National Environmental Policy Act, National Historic Preservation Act, Endangered Species Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, National Wildlife Refuge System Administration Act, Magnuson-Stevens Fishery Conservation and Management Act, National Marine Sanctuaries Act, Coastal Zone Management Act, Rivers and Harbors Act, Clean Air Act, Federal Water Pollution Control Act, Executive Order 13089 - Coral Reef Protection, and Executive Order 13352 - Cooperative Conservation.

For activities described in the Hawaii Range Complex EIS/OEIS that could take place within the Monument, protective measures as well as mitigation measures were developed with input from the Co-Trustees' agencies, namely NMFS and FWS, through the Section 7 process of the ESA and the authorization or permitting process of the MMPA. These measures include mandatory NMFS approved lookout training and mandatory safety and shut down zones for use of mid-frequency active sonar in the presence of marine mammals among numerous other requirements. These measures will further reduce the possibility of any adverse impacts on the Monument. The Navy has committed to conduct its activities in accordance with these measures.

For missile testing above or near the Monument, numerous measures are taken to limit possible effects from any missile debris. The probability of any debris hitting birds, seals, other wildlife, or historic and cultural resources would be extremely low. Any quantities of falling debris would also be very low and widely scattered so as not to present a toxicity issue. Any debris as it falls through the atmosphere would have cooled sufficiently so as not to present a fire hazard for vegetation and habitat within the Monument.

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1.5 Global Significance

The Monument is important both nationally and globally, as it contains one of the world's most significant marine and terrestrial ecosystems, includes many areas of cultural significance, is managed to protect ecological integrity, and is one of the world's largest marine protected areas. It serves as an example of ongoing geological processes, biological evolution, and the effects of humans on the natural environment. These volcanic rocks, large atolls of sand and coral, and islets surrounded by reefs and waters provide unique habitats for endemic and rare species of animals and plants, with outstanding and universal value from scientific, conservation, and aesthetic perspectives. This relatively pristine region contrasts sharply with most insular and marine ecosystems, which are more severely affected by human activities and populations around the world.

More recently, the recognition of the uniqueness of the NWHI has led the State of Hawai'i, on behalf of the Co-Trustees, to work toward nomination of the Monument as a United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage Site for its natural and cultural values, and as part of the world heritage of mankind. The National Park Service Office of International Programs is the lead for the U.S. in coordinating nominations through the UNESCO World Heritage Centre. The U.S. submitted a new World Heritage tentative list to UNESCO's World Heritage Centre in January 2008, which included the Monument as one of the top sites for consideration. The Monument is proposed as a mixed site for both its outstanding cultural and natural values for the following reasons:

- The islands are an outstanding example representing a major stage of the earth's evolutionary history;
- The Monument's natural resources are an outstanding example representing significant ongoing geological processes, biological evolution, and man's interaction with his natural environment;
- The islands and atolls provide habitats where populations of rare and endangered species of plants and animals still survive;
- It bears a unique or at least exceptional testimony to a cultural tradition or to a civilization, which is living or which has disappeared, and;
- It is directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.

UNESCO rules require a minimum 1-year delay between the time a Nation submits its tentative list and brings forward an application for consideration of a World Heritage Site. The U.S. submitted its new Tentative List to UNESCO on January 24, 2008. In April 2008, the National Park Service Office of International Programs announced that the Monument had been selected as one of the first two sites to be submitted for nomination by the U.S. to the UNESCO World Heritage Centre in over 15 years. Once the application is submitted, it will take a minimum of 18 months for the site to be considered by the UNESCO World Heritage Committee as a new site for inscription. Applications are submitted once each year in February.

Conserving the NWHI contributes to international community efforts aimed at conserving biodiversity and ecological integrity around the world. These efforts include work by organizations such as the World Conservation Union, the world's largest environmental knowledge network; the Convention on Biological Diversity; the South Pacific Regional Environment Program; and UNESCO. Conservation and management of Monument resources contribute to the reduction in the current rate of loss of biological diversity at the global, national, and regional levels, for the benefit of all life on earth.

Remote, uninhabited, and relatively pristine in comparison to other marine ecosystems in the world, the Monument serves as one of the few modern sentinels for monitoring and deciphering short-term and long-term responses to local, regional, and global environmental and anthropogenic stressors. The Monument is one of the few regions on Earth where monitoring and research activities can be conducted in virtual absence of local human habitation. In comparison, most reef systems in the coastal regions of the world are adjacent to human population centers, where vessel traffic, overharvesting, sedimentation, habitat destruction, and other human actions have altered the terrestrial and adjacent marine environments. At a time when global climate change impacts, such as sea level rise and ocean acidification are emerging as significant threats to our oceans, ongoing research, monitoring, habitat restoration, and conservation management of the insular and marine ecosystems in the NWHI will continue to provide significant insights that will benefit potential management interventions not only for the NWHI, but for insular and marine ecosystems around the world.

On April 3, 2008, the International Maritime Organization (IMO) designated the Monument as a Particularly Sensitive Sea Area (PSSA). As part of the PSSA designation process, the IMO adopted U.S. proposals for associated protective measures consisting of (1) expanding and consolidating the six existing recommendatory Areas To Be Avoided (ATBA's) in the Monument into four larger areas and enlarging the class of vessels to which they apply; and (2) establishing a ship reporting system for vessels transiting the Monument, which is mandatory for ships 300 gross tons or greater that are entering or departing a U.S. port or place and recommended for other ships. The vessel reporting system requires that ships notify the U.S. shore-based authority (i.e., the U.S. Coast Guard; NOAA will be receiving all messages associated with this program on behalf of the Coast Guard) at the time they begin transiting the reporting area and again when they exit. Notification is made by e-mail through the Inmarsat-C system or other satellite communication system. It is estimated that almost all commercial vessel traffic will be able to report via Inmarsat-C. The Armed Forces are not subject to the access restrictions and reporting requirements in the Monument when they are conducting activities and exercises. Sovereign immune vessels also are not subject to the reporting requirement but all vessels are encouraged to participate.

The PSSA and associated protective measures were adopted to provide additional protection to the exceptional natural, cultural and historic resources in the Monument. Requiring vessels to notify NOAA upon entering the reporting area will help make the operators of these vessels aware that they are traveling through a fragile area with potential navigational hazards such as the extensive coral reefs found in many shallow areas of the Monument. The PSSA and associated protective measures are now in effect.

Nevertheless, the Monument is not immune from local, regional, and global-scale influences. The millions of pounds of marine debris that have accumulated in the NWHI illustrate the impact people have on faraway, uninhabited ecosystems at an international scale. In addition, human activities taking place outside of the Monument may have devastating effects on the cultural, historic and natural resources of the Monument. Therefore, in light of the national and global significance of the unique ecosystems of the NWHI, and the fact that two of the most significant threats facing the Monument, marine debris and climate change, originate outside of the Monument, the MMB is committed to continue to work with and promote further collaborations at an international level to preserve and protect the cultural, historical and natural resources of Papāhanaumokuākea.

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Management Framework

2.0 Management Framework

Management of the Monument is carried out by the Co-Trustees in accordance with legal mandates, authorities, and policies of several federal and state agencies, and Monument-specific policies and implementing regulations. In their day-to-day management, the Co-Trustees through the Monument Management Board will ensure the coordinated planning and execution of activities so that they are consistent with the legal and policy structure of the Monument.

Management of the Monument focuses on managing activities for the benefit of the ecosystem's health. In establishing the Monument, President George W. Bush recognized the importance of an ecosystem approach to management. This approach is mindful of the interconnectedness of the Monument resources and requires a holistic approach to managing activities so as to preserve ecosystem structure, function, and key processes and recover resources where necessary.

The management framework supporting an ecosystem approach to management of the Monument includes the following key elements:

(1) A legal and policy foundation for cooperative ecosystem-based management;
(2) Institutional arrangements to promote and enhance collaboration with jurisdictional partner agencies and other stakeholders;
(3) Monument regulations that incorporate multiple management tools including prohibitions, zoning, and regulated activities;
(4) Established Monument vision, mission, guiding principles, and goals;
(5) Operational goals;
(6) Desired outcomes, strategies, and activities that implement the Monumentwide goals and are set forth in action plans specific to management subject areas; and
(7) An iterative and adaptive approach.

Together, these elements provide the framework for managing the Monument ecosystem.

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2.1 Legal Framework for the Monument

President George W. Bush issued Presidential Proclamation 8031 (Establishment of the Northwestern Hawaiian Islands Marine National Monument, June 15, 2006), which created the Monument under the authority of the Antiquities Act of 1906, as amended (16 U.S.C. 431-433). Federal partners—NOAA and FWS—promulgated joint implementing regulations on August 29, 2006 (Northwestern Hawaiian Islands Marine National Monument, 50 CFR Part 404). Specifically, these regulations codify the scope and purpose, boundary, definitions, prohibitions, and regulated activities of the Monument. Furthermore, Proclamation 8031 was amended on February 28, 2007, to declare the Native Hawaiian name for the Monument, Papahānaumokuākea, and clarify some definitions (Presidential Proclamation 8112, Establishment of the Papahānaumokuākea Marine National Monument, February 28, 2007).

The Monument includes areas and management authorities that are under the jurisdiction of one or multiple federal agencies or the State of Hawai‘i. For example, the Monument, an area of approximately 139,793 square miles (362,062 square kilometers), includes the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, managed by NOAA's National Ocean Service (NOS) through the Office of National Marine Sanctuaries; Midway Atoll National Wildlife Refuge/Battle of Midway National Memorial, both managed by FWS; Hawaiian Islands National Wildlife Refuge, managed by FWS; Northwestern Hawaiian Islands Marine Refuge and the State Seabird Sanctuary at Kure Atoll, managed by the State of Hawai‘i, Department of Land and Natural Resources (DLNR). Additionally, NOAA's National Marine Fisheries Service (NMFS) continues its management of fishing and specific protected species conservation programs, FWS oversees activities under its Endangered Species Act and Migratory Bird Treat Act authorities, and the State of Hawai‘i Historic Preservation Division, with the assistance of the Office of Hawaiian Affairs (OHA), ensures preservation of Native Hawaiian cultural and historic sites, while OHA also assures the perpetuation of Hawaiian cultural resources in the Monument, including the customary and traditional rights and practices of Native Hawaiians exercised for subsistence, cultural, and religious purposes under the Constitution of the State of Hawai`i, Article XII, Section 7. The legal relationships among the three Co-Trustees and others (including the DOD) have a long history with respect to natural resource management of the NWHI, beginning in 1903 and continuing to modern-day directives that promote the comprehensive and coordinated ecosystem-based management of resources by NOAA, FWS, and the State of Hawai‘i.

Each agency, as laid out in the Proclamation establishing the Monument, retains its spheres of jurisdiction, responsibility, and expertise. They bring different knowledge and strengths to this process. They work together on many aspects of the management process, which can benefit from the synergies of cooperative action. Throughout this process however, each partner will continue carrying out its statutory responsibilities. Even where one of the MMB members has primary responsibility, input from the other board members can often be helpful and is presumed as part of the plan.

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2.2 Policy Framework

To achieve a coordinated management scheme, the Proclamation ordered a new level of collaboration that would result in coordinated management of the entire Monument. To that end, the Co-Trustees developed and agreed to operate according to terms and institutional relationships set in a memorandum of agreement (MOA), which includes a provision for an annual MOA review by the Co-Trustees (State of Hawai‘i et al. 2006). The signatories of that MOA are the Co-Trustees, who operate with personnel devoted to the development and implementation of coordinated management. The three Co-Trustees are the State of Hawai‘i, the U.S. Department of the Interior (DOI), and the U.S. Department of Commerce (DOC). To provide context for the current management framework, this section briefly summarizes the involvement of each Co-Trustee in the pre-Monument institutional arrangement, which influences, and in some instances, carries over to the collaborative Co-Trustee management.

Institutional Arrangements for Management

The MOA established the institutional arrangements for management of the Monument. The approach demands coordination by the Co-Trustees as well as collaboration with stakeholders to effectively manage under an ecosystem approach. The institutional arrangements for Monument management are described below. These consist of a Senior Executive Board (SEB) providing policy guidance, and a Monument Management Board (MMB), which consists of field staff who conduct the day-to-day management activities of the Monument.

Senior Executive Board

Pursuant to the MOA, a SEB provides policy guidance to their respective agency staff assigned to carry out Monument management activities. The SEB is comprised of a senior-level designee from the DOI, the DOC, and the State of Hawai‘i Department of Land and Natural Resources (DLNR). The SEB oversees the implementation of the following management actions by the MMB:

- Develop a management plan;
- Provide support for enforcement purposes;
- Coordinate resource and monitoring efforts;
- Develop a mechanism to access scientific and resource data;
- Provide support to identify locations of cultural and religious significance;
- Manage recreational, educational, and commercial activities;
- Identify and facilitate coordination and partnership opportunities with stakeholders;
- Facilitate opportunities to participate and collaborate on education activities;
- Develop interagency agreements, grants, and other instruments;
- Ensure appropriate monitoring of activities within the Monument; and
- Enhance coordination by jointly issuing permits.

Monument Management Board

Pursuant to the MOA, the MMB promotes coordinated management of the Monument at the field level. The MMB includes a broader range of representatives from the Co-Trustees, specifically:

- State of Hawai‘i, Department of Land and Natural Resources, Division of Aquatic Resources;

- State of Hawai'i, Department of Land and Natural Resources, Division of Forestry and Wildlife;
- U.S. Fish and Wildlife Service, Hawaiian and Pacific Islands National Wildlife Refuge Complex;
- U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office;
- National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries;
- National Oceanic and Atmospheric Administration, National Marine Fisheries Service; and the
- Office of Hawaiian Affairs.

This group meets on a regular basis to implement the day-to-day management of the Monument. The MMB will operate under an interagency charter, providing details on its roles, responsibilities, and activities. The charter will be regularly reviewed and updated as necessary.

Papahānaumokuākea Interagency Coordinating Committee
The Co-Trustees authorized the MMB to establish the Papahānaumokuākea Interagency Coordinating Committee (ICC) to assist in implementation of Monument management activities. The ICC includes representatives from the Co-Trustees and other agencies, including, but not limited to, the U.S. Environmental Protection Agency, U.S. Coast Guard 14th District Prevention and Response, U.S. Geological Survey, and the DOD. This group is not fixed, meets periodically or as specific topics require, and federal and state agency partners may participate according to the relevancy of their activities and/or mandates related to the Monument.

The Co-Trustees
The U.S. Department of Commerce: National Oceanic and Atmospheric Administration
Two NOAA line offices have mandates that apply to activities in the Monument –NOS and NMFS. In 2000, the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (Reserve) was established via Executive Order 13178 (as amended by Executive Order 13196) to preserve and protect coral reef ecosystems of the NWHI. Responsibility for managing the Reserve was assigned to NOS through the National Marine Sanctuary Program (NMSP) under the authority of the National Marine Sanctuaries Act (16 U.S.C 1431 et seq.) and the National Marine Sanctuaries Amendments Act of 2000, Public Law 106-513, and other applicable statutes. Executive Order 13178 directed NOAA, in consultation with federal and state partners, to initiate a process to designate the Reserve as a national marine sanctuary pursuant to sections 303 and 304 of the National Marine Sanctuaries Act of 2000.

In January 2001, NOAA declared the Reserve an active candidate for sanctuary designation (5509 FR 66). A Reserve Advisory Council (RAC) was established to provide advice and recommendations on the designation and management of any sanctuary and to develop a Reserve Operations Plan for managing the Reserve. Throughout this process, the public and other stakeholders were engaged to seek input and gather information toward developing a unified plan for Reserve operations and the proposed sanctuary. A series of ten public scoping meetings were hosted in Hawai'i and Washington, D C., with more than 13,000 comments received during the initial scoping period. Throughout the designation process, additional input was collected from the public, stakeholder groups, and interagency partners via science workshops (Gittings et al. 2004), focus group discussions (SRG 2004b), and RAC and associated subcommittees meetings. In total, more than 100 meetings were held and close to 52,000 public comments were received that guided the direction and development of a draft sanctuary management plan to direct management of the anticipated sanctuary upon its designation. Simultaneously, a Reserve Operations Plan (ROP) was drafted and finalized with extensive consultation with partner agencies and the RAC (NOAA 2005a). The ROP guides the management of the Reserve and served as the primary foundation from which the draft sanctuary management plan was developed. In addition, a State of the Reserve Report was developed to provide a comprehensive summary of 5 years of Reserve operations (NOAA 2006).

The draft sanctuary management plan has several companion documents packaged into the draft designation proposal, including a draft environmental impact statement and draft implementing regulations. When the Monument was designated in 2006 by Presidential Proclamation, the processing of these documents was halted. However, the Proclamation recognized the extensive public input and the relevancy of the NMSP public processes and resulting draft sanctuary documents, and directed the Co-Trustees to modify, as appropriate, the draft sanctuary management plan in developing a plan to manage the Monument (Presidential Proclamation 8031, 36443 FR 71).

NMFS executes mandates and exercises authority under several statutes that are relevant to natural resource management in the Monument. Among others, these statutes include the Magnuson-Stevens Fishery Conservation and Management Act, the Endangered Species Act, the Marine Mammal Protection Act, the Fish and Wildlife Coordination Act, the Coral Reef Conservation Act, the Global Change Research Act, the Lacey Act Amendments, and the Fish and Wildlife Improvement Act of 1978, as well as various executive orders and proclamations. Since the 1970s, the national and regional management by NMFS (under NMFS' Southwest Region) has included management activities such as conservation, research, and emergency response, and fisheries management in the NWHI. Since its establishment in 2003, the Pacific Islands Regional Office and the Pacific Islands Fisheries Science Center have worked together to build on these programs and fulfill NMFS' functions in the Pacific Region, including the area that is within the Monument. All NMFS programs, Habitat Conservation, Sustainable Fisheries, and Protected Resources are relevant to NMFS' contribution to the Monument complement of programs.

NOAA's line offices collaborate to fulfill NOAA's Co-Trustee responsibilities under the Monument management arrangement. The Monument office of NOAA's Office of National Marine Sanctuaries (ONMS) and NMFS Pacific Islands Region, both headquartered in Honolulu, Hawai'i, represent NOAA at the field level and coordinate with the NOAA headquarters to ensure unified representation in the Co-Trustee arrangement.

The U.S. Department of the Interior: U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service is a bureau of the U.S. Department of the Interior that works with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. Two program offices of FWS, Endangered Species and the National Wildlife Refuge System, have statutory authority for Monument resources and program representatives are members on the MMB. Both coordinate with FWS and DOI headquarters to ensure unified representation in the Co-Trustee arrangement.

The FWS Pacific Islands Fish and Wildlife Office shares the responsibility for administration of the ESA with NMFS and has conservation oversight for all terrestrial species including seabirds. This office also administers coastal conservation and conservation partnerships programs through its habitat conservation division, and provides assistance with invasive species issues and emergency response throughout the Pacific islands.

The FWS also administers the 97-million acre National Wildlife Refuge System, including 548 refuges throughout the United States and its territories. The Hawaiian Islands and Midway Atoll NWRs, located within the Monument, are managed from Honolulu through the FWS Hawaiian and Pacific Islands NWR Complex. This Complex of refuges is in turn administered through the Pacific Regional Office, Regional Refuge Chief, headquartered in Portland, Oregon.

The overarching legislation and guidance for managing the Hawaiian Islands and Midway NWRs are derived from the National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee); the Refuge Recreation Act of 1962 (16 U.S.C. 460k-460k-4), as amended; 50 CFR (Wildlife and Fisheries); and the Fish and Wildlife Service Manual (administrative policy). Of all the laws governing the activities on NWRs, the National Wildlife Refuge System Improvement Act (Improvement Act) (Public Law 105-57, October 9, 1997) exerts the greatest influence. The Improvement Act amended the National Wildlife Refuge System Administration Act of 1966 by including a unifying mission for all NWRs to be managed as a system, a new process for determining compatible uses on refuges, and requiring that each refuge will be managed under a Comprehensive Conservation Plan, developed in an open public process.

The Improvement Act states that the Secretary of the Interior shall provide for the conservation of fish, wildlife, and plants, and their habitats within the Refuge System as well as ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained. House Report 105-106, accompanying the Improvement Act, states, "the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first." Biological integrity, diversity, and environmental health are critical components of fish and wildlife conservation. The FWS Biological Integrity, Diversity, and Environmental Health Policy states that "the highest measure of biological integrity, diversity, and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions (601 FW 310)."

The purpose for which a refuge was established or acquired is of key importance to refuge planning. Refuge purposes and the Refuge System's mission form the foundation for management decisions. The purposes of a refuge are specified or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum that establishes, authorizes, or expands a refuge.

The legal authority that established the area now known as the Hawaiian Islands National Wildlife Refuge (HINWR)—Executive Order 1019, signed by President Theodore Roosevelt on

February 3, 1909—set aside the islets and reefs extending from Nihoa to Kure, excepting Midway Atoll, as the Hawaiian Islands Reservation "…for use…as a preserve and breeding ground for native birds." President Roosevelt took this action to provide additional protections for the seabirds after reports that hundreds of thousands of Laysan albatross were being slaughtered for the millinery trade in violation of the Lacey Act of 1900. In 1940, President Franklin Roosevelt signed Presidential Proclamation 2416, renaming the area the HINWR. The authorities, mandates, and policies that govern the activities of the FWS have resulted in the conservation of island, atoll, and nearshore habitats within the HINWR.

The HINWR has been closed to the public since its establishment and will remain closed to the public under the Monument Management Plan. Access to HINWR prior to Monument establishment was regulated by FWS Refuge Special Use Permit regulations. These permits were issued only to conduct research, education, or to film documentaries to promote public understanding of refuge resources and improve refuge management. In addition, the Secretary of the Interior and the President of the United States in 1974 considered all of the refuge's emergent lands except Tern Island to be ecologically appropriate for inclusion into the National Wilderness Preservation System, as outlined in the Wilderness Act of 1964 (16 U.S.C 1132-1136). Congress, however, has not acted to designate this area within the wilderness system.

The FWS has also been assisting the U.S. Navy with wildlife management issues for almost 50 years at Midway Atoll. A cooperative management plan developed by the Navy and FWS in the early 1980s further defined responsibilities and led to the establishment of an "overlay" NWR on Midway in 1988. On October 31, 1996, President William Clinton signed Executive Order 13022, directing the Secretary of the Interior, through FWS, to administer Midway Atoll NWR. The purposes of the refuge, as defined in the Executive Order, are to maintain natural biological diversity; conserve fish and wildlife and their habitats; fulfill international wildlife treaty obligations; provide for research, education, and compatible wildlife-dependent recreation; and recognize and maintain the atoll's historic significance. In addition, in accordance with language in the Fiscal Year 2000 Interior Appropriations Act, Secretary of the Interior Bruce Babbitt signed Secretary's Order 3217, designating the lands and waters of Midway Atoll NWR as the Battle of Midway National Memorial.

The State of Hawai'i

In 1893, the Kingdom of Hawai'i, which included most of the Northwestern Hawaiian Islands, was overthrown with the involvement of certain United States officials and others. Some involved in the overthrow and others went on to create a provisional government and then the Republic of Hawai'i, which assumed control of approximately 1.8 million acres of crown, government, and public lands of the Kingdom of Hawai'i, including certain submerged and fast lands of the Northwestern Hawaiian Islands. Upon its annexation, the Republic ceded these lands to the United States in 1900. A majority of these lands were again ceded, this time to the State of Hawai'i, upon statehood in 1959.

Under the terms of the statute admitting Hawai'i as a state in 1959, the federal government granted title to Hawai'i to most of the previously ceded lands and mandated that these ceded lands be held by Hawai'i in public trust. In accordance with the Hawaii Organic Act of April 30, 1900, c 339, 31 Stat 141, and the Hawaii Admission Act of March 18, 1959, Pub L 86-3, 73 Stat

4, most of the islands of the Hawaiian Archipelago that were part of the Territory of Hawai'i became part of the State of Hawai'i as part of the public land trust. Hawai'i's lands continue to hold a considerable amount of legal, historical, and sentimental significance to Native Hawaiians. Pursuant to Section 5(f) of the Hawaii Admission Act, one purpose for which the ceded lands are held in trust by the State is "for the betterment of the conditions of native Hawaiians." Proclamation 8031, designating the Monument, specifically states, "Nothing in this proclamation shall be deemed to diminish or enlarge the jurisdiction of the State of Hawai'i."

The State of Hawai'i DLNR has stewardship responsibility for managing, administering, and exercising control over the public trust and submerged lands (most of which are ceded lands), ocean waters, and marine resources, around each of the Northwestern Hawaiian Islands, except at Midway Atoll, Section 171-3 Hawaii Revised Statutes. In 2005, Hawai'i Governor Linda Lingle established the Northwestern Hawaiian Islands Marine Refuge (0 to 3 nautical miles around all emergent lands, except Midway Atoll) under Sections 187A-5 and 188-53(a), Hawaii Revised Statutes (established as ch. 60.5, Hawaii Administrative Rules). Unless otherwise authorized by law, it is unlawful for any person to enter the refuge without a permit except for freedom of navigation, innocent passage, interstate commerce, and activities related to national defense or enforcement, foreign affairs, and in response to emergencies.

The State of Hawai'i, DLNR's Division of Forestry and Wildlife manages the emergent lands of the State Seabird Sanctuary at Kure Atoll. The State Historic Preservation Division and the State Historic Preservation Officer oversee cultural and historic resources statewide. DLNR's Division of Conservation and Resource Enforcement maintains full police powers, including the power of arrest, within all lands and waters within the State's jurisdiction. The State is represented on the MMB by DLNR's Division of Aquatic Resources and Division of Forestry and Wildlife.

Office of Hawaiian Affairs

Established by a 1978 amendment to the Constitution of the State of Hawai'i, Office of Hawaiian Affairs (OHA) serves as the principal agency working for Native Hawaiians. OHA was created for various purposes including bettering the conditions of Native Hawaiians. OHA manages a property and monetary trust, creating its fiduciary duty to Native Hawaiians. The OHA trust is funded in part by a pro rata share of income derived from the ceded lands portion of the public land trust.

Under the direction of nine publicly elected trustees, OHA fulfills its constitutional and statutory mandates. Section 10-1(a), Hawaii Revised Statutes, states: "The people of the State of Hawaii and the United States of America as set forth and approved in the Admission Act, established a public trust which includes among other responsibilities, betterment for conditions of Native Hawaiians. The people of the State of Hawaii reaffirmed their solemn trust obligation and responsibility declared in the state constitution that there be an office of Hawaiian affairs to address the needs of the aboriginal class of people of Hawaii." OHA serves as a member of the MMB and, along with the Native Hawaiian Cultural Working Group, represents a voice of the Native Hawaiian community on Monument matters (see Native Hawaiian Community Involvement Action Plan, Section 3.5.3).

Public Involvement

Stakeholder and community involvement is an integral component to achieving the goals of the Monument. Engaging an informed constituency will further the successful protection of the ecosystems of the NWHI. Monument staff currently conduct diverse constituency building and outreach activities related to the Monument. Staff will continue to cultivate an informed, involved constituency that supports and enhances conservation of the natural, cultural, and historic resources of the Monument. Strategies and activities to further public involvement in Monument management activities are found throughout the Monument Management Plan.

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2.3 Initial Management

Regulations Implementing the Proclamation

The initial Monument regulations were issued to implement the provisions in Presidential Proclamation 8031, and rulemaking was completed jointly by the FWS and NOAA on August 29, 2006 (71 FR 51134). Monument regulations, codified under 50 CFR Part 404, establish the scope and purpose, boundary, definitions, prohibitions, marine zones, and regulated activities for managing the Monument. These regulations can be evaluated and updated as necessary.

Monument regulations: (For a full text, see Appendix D.)

- Prohibit unauthorized access to the Monument;
- Provide for carefully regulated educational and scientific activities;
- Preserve access for Native Hawaiian cultural activities;
- Establish marine zones to manage human activities;
- Provide for visitation in a special area around Midway Atoll;
- Phase out commercial fishing over a 5-year period;
- Ban exploring for, developing, or producing oil, gas, or minerals and using or attempting to use poisons, electrical charges, or explosives in the collection or harvest of Monument resources;
- Prohibit introducing alien species from within or into the Monument; and
- Prohibit anchoring on corals.

The prohibitions required by the Proclamation do not apply to the activities and exercises of the Armed Forces (including those carried out by the Coast Guard) that are consistent with applicable laws. However, it requires them to conduct activities and exercises in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse impacts on Monument resources and qualities. Proclamation 8031 also requires that “in the event of threatened or actual destruction of, loss of, or injury to a monument resource or quality resulting from an incident, including but not limited to spills and groundings, caused by a component of the Department of Defense or the USCG, the cognizant component shall promptly coordinate with the Secretaries for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the monument resource or quality.”

As the prohibitions of the Proclamation were effective upon issuance, there was a pressing need to resolve the permitting scheme as directed by the Proclamation. Thus, the Co-Trustees have collaborated to develop a joint permit system, essentially streamlining all discrete permitting processes into one Monument permit according to the six permit categories iterated in the Proclamation:

1. Research
2. Education
3. Conservation and management
4. Native Hawaiian practices
5. Special ocean use
6. Recreational activities within Midway Atoll

Management Zones

Monument regulations define three types of marine zones to manage activities. The zones are: Special Preservation Areas, Ecological Reserves, and the Midway Atoll Special Management Area (SMA) (Figure 2.1). Each zone addresses protection of habitat and foraging areas of threatened and endangered species; inclusion of a representative range of the diverse array of marine habitats, including shallow coral reef environments, as well as deepwater slopes, banks, and seamounts; and minimization of risks associated with specific activities such as fishing and recreational activities. Zones also protect the ecological linkages between habitats. The location and description of activities prohibited and allowed in each zone are defined in the Monument regulations (see Appendix D).

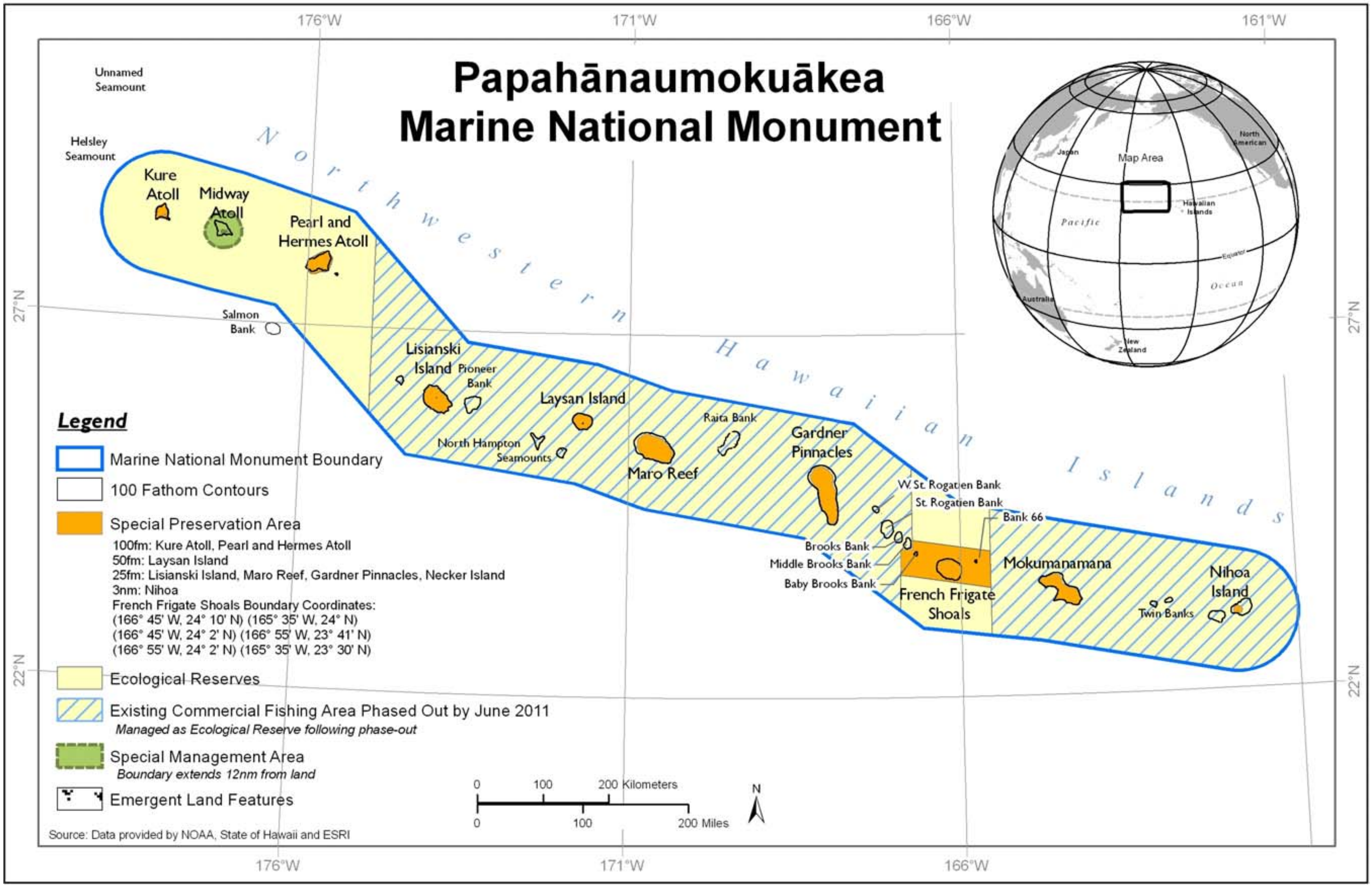

Figure 2.1 Map of the Papahānaumokuākea Marine National Monument and Zones.

Zoning provides protection to highly sensitive habitats, particularly shallow coral reefs. Discrete, biologically important areas of the Monument are designated as Special Preservation Areas, and resource harvest and almost all forms of discharge are prohibited. Other areas designated as Ecological Reserves consist of contiguous, diverse habitats that provide natural spawning, nursery, and permanent residence areas. Resource extraction is highly restricted within the Ecological Reserves. In the Midway Atoll SMA and other NWR areas, proposed activities are subject to findings of appropriateness (603 FW 1) and compatibility determinations (16 U.S.C. 668dd-668ee and 603 FW 2) by the FWS to ensure the activities meet the purposes for establishing the Hawaiian Islands and Midway Atoll NWRs and the mission of the National Wildlife Refuge System. Recreational activities in the Monument are restricted to the Midway Atoll SMA. Due to the vast size of the Monument, the existing zones extend over large areas and include a variety of habitat types and an extensive diversity of species. As new information becomes available, additional zones may be created to further the protection and conservation of the natural and cultural resources of the NWHI.

Toward Ecosystem-Based Management

An ecosystem approach to management for the NWHI requires that multiple steps be implemented in a comprehensive and coordinated way. The Monument approach is unique in that it includes:

- Ecosystem level planning
- Cross-jurisdictional management goals
- Co-management
- Adaptive management
- Marine zoning
- Habitat restoration
- Long-term ocean and coastal observing, monitoring, and research.

Ecosystems, Ecosystem-Based Management, and Ecological Integrity

Over the last decade, considerable scientific discussion and debate have been devoted to developing an understanding of concepts and terms used to describe an ecosystem, ecosystem-based management, and ecological integrity. For the purposes of this plan, an ecosystem is defined as a dynamic and interrelating complex of plant and animal communities and their associated nonliving environment with humans as an integral part of the system. Ecosystems are organized structurally into populations, species, and communities of organisms that interact with each other and with abiotic features of the environment and, functionally, into production and consumption components that process energy and materials (Limburg et al. 1986). Ecosystems vary in size, often with smaller systems embedded within larger ones. Ecosystems have been described as moving targets, with multiple potential futures that are uncertain and unpredictable (Walters 1986). The scale of ecosystems depends on the spatial extent of the system dynamics that are to be studied and influenced by management (Sissenwine and Murawski 2004).

Ecosystem-based management is an approach that recognizes the relationships and interconnectedness among living and nonliving ecosystem components that are affected by a number of natural and anthropogenic factors that vary over space and time. The goal of ecosystem-based management is to maintain ecosystems in a healthy, productive, and resilient condition for their intrinsic value as well as to provide for needed ecosystem services. Ecosystem-based management:

- Provides protection of marine and terrestrial ecosystem structure and function
- Is place-based, focusing on a specific ecosystem and the range of activities affecting it
- Explicitly accounts for the interconnectedness within systems, recognizing the importance of interactions between key species or services
- Integrates ecological, social, economic, and institutional perspectives, recognizing their strong interdependencies.

This approach requires managers to have access to extensive information and data including baseline conditions, the interactions among the components of the ecosystem, and the consequences of natural influences and individual and cumulative human activities. Ecosystem-based management also recognizes that humans are inseparable from and co-evolved with ecosystems. Surrounding any ecosystem are a multiplicity of perspectives and knowledge systems. Attention to the human dimensions assumes that humans affect, and are affected by, the oceans in both positive and negative ways and that these complex relationships between people and the ocean are dynamic, diverse and may differ among the various perspectives. The availability of scientific information, together with Native Hawaiian traditional knowledge, is essential for ecosystem-based management of the Monument.

Maintaining ecological integrity is often cited as the primary goal of ecosystem-based management. Ecological integrity is the capability to support and maintain a balanced, integrated, adaptive community of organisms having species composition, diversity, and functional organization comparable to that of natural habitats of the region (Karr and Dudley 1981). A system will retain its integrity if it preserves all its components, as well as the functional relationships among those components (De Leo and Levin 1997). Kay (1991) described ecological integrity as the ability to maintain ecosystem function and structure in the face of changing environmental conditions, where “environment” refers to the biotic and external abiotic components that affect it, including humans. Considering the dynamic nature of ecosystems, the goal of ecosystem-based management should not be to eliminate all forms of disturbance, but rather to maintain processes within limits or ranges of variation that may be considered natural, historical, or acceptable (Noss 1995). Such an approach must be flexible, adaptive, and experimental at scales compatible with the scales of critical ecosystem functions (Walters 1986).

Ecological integrity is defined for the Monument as “a condition determined to be characteristic of an ecosystem that has the ability to maintain the function, structure, and abundance of natural biological communities, including rates of change in response to natural environmental variation” (50 CFR 404.3). This definition builds on this extensive body of research on ecosystem form and function and the Co-Trustee agencies’ experience and mandates.

Adaptive Management

The Monument offers an unprecedented opportunity to take incremental and informed steps toward ecosystem-based management at a large scale. To progress consistently toward an ecosystem approach to management, new information and data will be used to inform and refine management strategies and activities, consistent with Monument goals and desired outcomes.

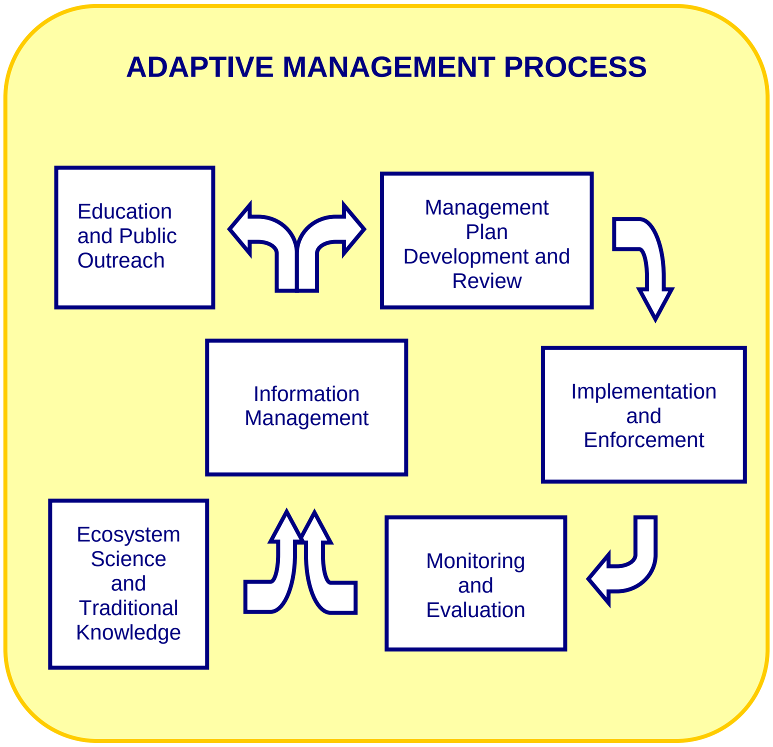

Figure 2.2 Adaptive Management Cycle to Inform Management and Decisionmaking.

Adaptive management is a continuous learning cycle designed to inform management actions and decisionmaking based on implementation of management strategies and actions, conducting monitoring and evaluation, and providing feedback to management on the success of meeting the desired outcomes and strategies (Figure 2.2). The Monument's adaptive management process includes the following elements: management plan development and review, implementation and enforcement, monitoring and evaluation, integration of ecosystem science and traditional knowledge, scientific research, information management, and education and public outreach. Ecosystem science and traditional knowledge are inputs to the learning process, together with the results of monitoring and evaluation. A comprehensive information management system facilitates the compilation of information and data from research, monitoring, plan review, education, and public outreach and also helps to inform research and management priorities. An effective adaptive management process provides managers with timely feedback and information. If the desired outcomes and goals are achieved, then this approach confirms the management strategies and activities are on the right course. If the results are not achieved, then feedback into the management framework can help identify whether it is a specific action or group of strategies or activities that may need to change. Periodic updates of the Monument Management Plan will incorporate feedback from our adaptive management process and result in refined and sometimes new management strategies and activities to meet our overall Monument goals and desired outcomes.

Human dimensions

Humans are integral to ecosystems, and the human dimensions of ecosystems are an integral focus of the science needed to achieve ecosystem-based management. Understanding the impact of humans on the ocean, the impact of the ocean on humans, and the human aspects of ocean governance provides the scientific basis for ensuring ocean health and quality of life for this and future generations (Joint Subcommittee on Ocean Science and Technology, 2007). The relationships between humans and ocean ecosystems are complex, dynamic, and coupled, and recognizing the importance of human-ocean relationships in the management of the NWHI assumes that human "impacts" on oceans are not necessarily negative, but also may restore and foster human and ocean well-being. In the planning, management, and evaluation of the Monument, human dimensions are critical for long-term success.

Marine science and policy institutions in the United States and worldwide recognize that a deeper understanding of the human dimensions of ecosystems—human causes, consequences, and responses to ecosystem stress—is needed to foster improved support for coastal and ocean decisionmaking. Examples include statements by the Joint Subcommittee on Ocean Science and Technology (2007), United States Commission on Ocean Policy (2004), Pew Oceans Commission (2003), International Human Dimensions Programme on Global Environmental Change, and NOAA's External Ecosystem Task Team (2006).

The resilience of ecosystems is integrally connected to that of human systems. According to resilience thinking, a multiplicity of perspectives surrounds a given ecosystem. In the highly diverse Hawaiian archipelago, the idea of a "multiplicity of perspectives" captures the notion that within the community are a variety of perspectives and values about the oceans that vary depending upon people's historical, cultural, social, political, economic, spiritual, or other contexts. These and other human dimensions insights are important considerations in providing a more integrative ecosystem understanding, promoting ecosystem resilience, and ensuring a holistic ecosystem-based management approach.

Incorporation of Traditional Knowledge

Ua lehulehu a manomano ka ʻikena a ka Hawaiʻi.
Great and numerous is the knowledge of the Hawaiians.
—Pukui (1983)

There are many similarities between an ecosystem-based management approach for the NWHI and the traditional knowledge and practices implemented by Native Hawaiians to manage their natural resources. Both approaches share the view of nature as a holistic and dynamic system of interrelated parts and emphasize the need for long-term sustainability and health of our natural resources.

The Native Hawaiian traditional knowledge and worldview is valued for its rich base of empirical knowledge and practical methods of resource management, developed over hundreds of years of living and interacting with the lands and ocean waters of Hawaiʻi (Titcomb and Pukui 1952; Kikuchi 1976; Titcomb et. al. 1978; Poepoe et. al 2003; Kikiloi 2003). Traditional management practices take advantage of understanding seasonal patterns in weather, patterns of biological species, and the designation of ecological zones (Handy et al. 1972; Kelly 1989; Gon 2003; Department of Land and Natural Resources 2003b).

Through detailed observations of the oceanic environment, its interrelation to the terrestrial environment, seasonal and lunar patterns, and species life cycles, species of the ocean and land realms were taxonomically partnered, and systems for resource management developed (Kamakau 1976; Malo 1951; Beckwith 1951). Kapu, or restrictions, on resource extraction were implemented based on these ecological understandings (Pukui and Handy 1950; Handy et al. 1972). Other traditional strategies were set up to naturally enhance marine resources through increased protection, growth, and reproduction (Kikiloi 2003). Understanding the Native Hawaiian worldview of ecosystems and relationships, along with traditional approaches to resource management, aids in moving toward an ecosystem-based management approach for the NWHI. These core principles include viewing ecosystems holistically, recognizing variations in space and time, and continuously building a knowledge base to inform management and successfully care for the environment. The perspective that Native Hawaiian traditional knowledge and resource management approaches bring to the Monument can provide insight into ecosystems and relationships.

2.4 Monument Management Policy Framework: The Vision, Mission, Guiding Principles, and Goals for Managing Papahānaumokuākea Marine National Monument

The Monument vision, mission, and guiding principles establish the overarching policy direction and guidance for Monument management (Figure 2.3 and Table 2.1). The vision describes the long-term management desire of the Monument to maintain the health and diversity of the NWHI ecosystem in perpetuity. The mission establishes the need for integrated management in order to achieve the long-term protection of NWHI ecosystems and the perpetuation of Native Hawaiian practices and heritage resources. The guiding principles provide direction for making informed decisions about human activities consistent with the vision and mission for the Monument. The Monument goals are the unifying elements of successful monument management. They identify and focus management priorities, resolve issues, and link to the public interest in preserving and caring for the historic and scientific objects within the Monument.

Figure 2.3 Monument Management Policy Framework.

Table 2.1 Monument Vision, Mission, Guiding Principles, and Goals

Vision
To forever protect and perpetuate ecosystem health and diversity and Native Hawaiian cultural significance of Papahānaumokuākea.
Mission
Carry out seamless integrated management to ensure ecological integrity and achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture, and heritage resources for current and future generations.
Guiding Principles
The Monument shall be managed in a manner that— • Is consistent with the Vision and Mission; • Recognizes that the resources of the NWHI are administered by the Co-Trustees for the benefit of present and future generations; • Affirms that the NWHI and its wildlife are important, unique, and irreplaceable; • Honors the significance of the region for Native Hawaiians; • Honors the historic importance of the region; • Incorporates best practices, scientific principles, traditional knowledge, and an adaptive management approach; • Errs on the side of resource protection when there is uncertainty in available information on the impacts of an activity; • Enhances public appreciation of the unique character and environment of the NWHI; • Authorizes only uses consistent with Presidential Proclamation 8031 and applicable laws; • Coordinates with federal, state, and local governments, Native Hawaiians, relevant organizations, and the public; and • Carries out effective outreach, monitoring, and enforcement to promote compliance.
Monument Goals
Goal 1: Protect, preserve, maintain, and where appropriate restore the physical environment and the natural biological communities and their associated biodiversity, habitats, populations, native species, and ecological integrity.
Goal 2: Support, promote, and coordinate research, ecosystem characterization, and monitoring that increases understanding of the NWHI, improves management decisionmaking, and is consistent with conservation and protection.
Goal 3: Manage and only allow human activities consistent with Proclamation 8031 to maintain ecological integrity and prevent or minimize negative impacts for long-term protection.
Goal 4: Provide for cooperative conservation including community involvement that achieves effective Monument operations and ecosystem-based management.
Goal 5: Enhance public understanding, appreciation, and support for protection of the natural, cultural, and historic resources.
Goal 6: Support Native Hawaiian practices consistent with long-term conservation and protection.
Goal 7: Identify, interpret, and protect Monument historic and cultural resources.
Goal 8: Offer visitor opportunities at Midway Atoll to discover and appreciate the wildlife and beauty of the NWHI, enhance conservation, and honor its unique human history.

2.5 Management Action Plans

Action plans are composed of specific strategies to address six priority management needs. Each action plan is guided by a desired outcome, a specific need for action, and strategies and associated activities designed to achieve that need. Strategies and activities implement Monument regulations, research and educational partnerships, habitat management and restoration conservation targets, threatened and endangered species recovery, historic preservation, Native Hawaiian cultural practices, and appropriate public uses programmed over a 15-year period, with 5-year reviews.

Monument Management Plan Development and Review

The management plan will be reviewed every five years. The review represents an essential element of the adaptive management process and includes public involvement, characterization of issues, and review and evaluation of action plans.

This Monument Management Plan was developed based on the current state of knowledge on the most appropriate management measures. These management measures consist of regulations and action plans to govern the first five years of Monument management and project activities over a 15-year timeframe, where appropriate. Action plans will be implemented, and where regulations apply, enforced, through interagency collaborative mechanisms based on the jurisdiction of each government agency. After five years, the Monument Management Plan will be reviewed, incorporating lessons learned and new data and information from monitoring, ecosystem science, and traditional knowledge, and a comprehensive evaluation to develop or refine management strategies and actions.

Six Priority Action Plan Groupings

The core of the Monument Management Plan is contained in 22 action plans, organized under six priority management needs. Priority management needs were identified considering legal mandates and inputs from numerous public scoping meetings and workshops, as well as the status of Monument resources based on the multiple temporal and spatial scales of management issues, and meetings conducted with managers, scientists, and other stakeholders. Priority management needs address multiple Monument goals by defining specific areas for focused action, including improving our understanding of the NWHI, conserving wildlife and habitats, reducing threats to the ecosystem, managing human uses, facilitating collaboration and partnerships, and achieving effective Monument operations.

Action plans describe specific strategies to address the six priority management needs for the Monument. Each action plan is guided by a desired outcome and provides the context and history of the particular issue or management activity. Action plans also highlight a specific need for action

Note to Readers Regarding Terminology and FWS Refuge Comprehensive Conservation Program Requirements

The Proclamation stated that, "to manage the Monument, the Secretary of Commerce, in consultation with the Secretary of the Interior and the State of Hawaii, shall modify, as appropriate, the plan developed by NOAA's National Marine Sanctuary Program through the public sanctuary designation process, and will provide for public review of that plan." Sanctuary management plans are structured differently than NWR management plans. As a result, this plan includes desired outcome statements, strategies, and activities as a part of the action plans that direct Monument management actions. For those familiar with refuge management plans, these statements, strategies, and activities are equivalent to goals, objectives, and strategies respectively.

and identify strategies and associated activities designed to address that need. Ultimately, all strategies and activities are designed to help achieve the desired outcome of the action plan (Figure 2.4).

Understanding and Interpreting the NWHI

The NWHI represent a unique opportunity to advance our understanding of ecosystem science through research, monitoring, and the incorporation of traditional knowledge. In turn, coordinated research and long-term monitoring is needed to deepen our understanding of the composition, structure, and function of NWHI ecosystems and to provide the predictive tools to make informed management decisions consistent with the conservation and protection of the region. The continued development of a long-term monitoring program is needed to provide vital data and information necessary to monitor changes in ecosystem status over time and to evaluate the effectiveness of management measures in protecting and restoring ecological integrity. The integration of human dimensions with ecological ones in both research and management will further ecosystem-based management of the Monument. Additionally, the incorporation of indigenous knowledge into management practices will enrich and inform the MMB's approach to long-term planning. The further characterization of Native Hawaiian cultural relationships to the NWHI through the study of oral histories, place names, and practices associated with the region will enhance the physical record of activities in the NWHI. The unique aspects of island and Pacific maritime history, as well as historical and archaeological resources, collectively can provide a basis for developing effective management of resources.

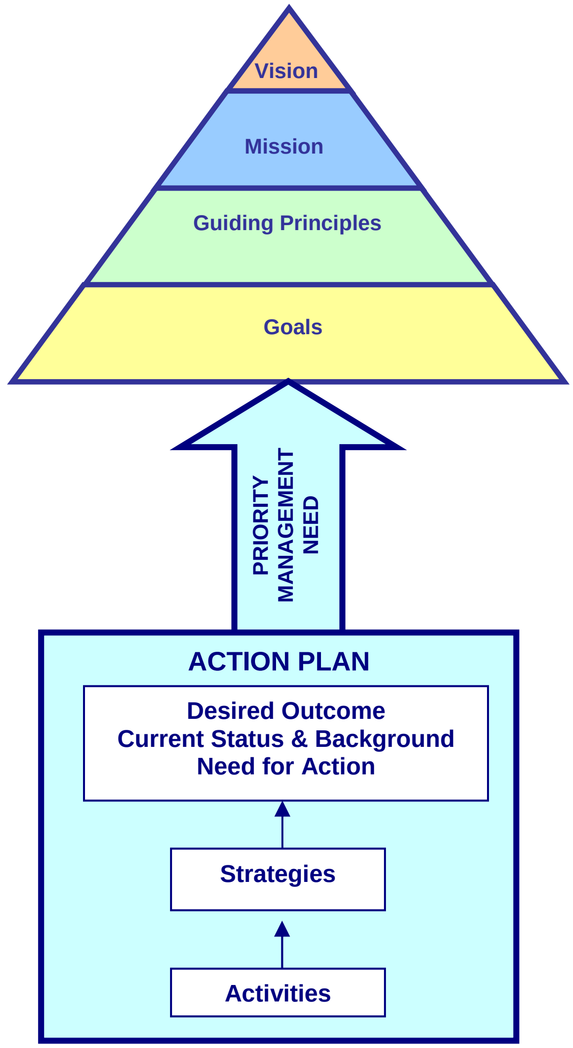

Figure 2.4 Organization of Action Plan by Priority Management Need.

Conserving Wildlife and Habitats

The Presidential Proclamation establishing the Monument highlights that it is in the public interest to preserve marine and terrestrial areas in the NWHI through active conservation and management of wildlife and their habitats. "This diverse ecosystem is home to many species of coral, fish, birds, marine mammals, and other flora and fauna including the endangered Hawaiian monk seal, the threatened green sea turtle, and the endangered leatherback and hawksbill sea turtles" (Presidential Proclamation 8031, 2006). Action plans to address this priority management need contain strategies to maintain the biological integrity, diversity, and environmental health of the Monument and identify activities to assist in the recovery of threatened and endangered species; manage migratory bird populations; and conserve, manage, and, where appropriate, restore the habitats of the Monument's native flora and fauna.

Reducing Threats to the Ecosystem
Despite their remote location, marine and terrestrial ecosystems of the NWHI are at risk from a range of threats from human activities within and outside the Monument. Natural and anthropogenic threats to the Monument include habitat alteration or damage from marine debris, the changing climate including increased storm intensity and frequency, rising sea level and ocean temperature, introduction of alien species, potential vessel and aircraft impacts, release of hazardous materials from landfills, vessel grounding, and past human impacts. Development and implementation of threat reduction protocols and monitoring are needed to protect, preserve, maintain and, where appropriate, restore natural communities, including habitats, populations, native species, and ecological processes, and function as a public trust for current and future generations. In addition to threat reduction, emergency response in the Monument will be coordinated under a series of plans and systems.

Managing Human Activities
The NWHI has experienced a long history of human use, with periods of overexploitation, that have contributed to the current endangered status of some species, including land birds, several plants, sea turtles, and the Hawaiian monk seal. Although the extent of resource exploitation has been limited in recent years, human activities and the use of Monument resources will be carefully managed considering historical uses and new threats. Action plans for managing human activities address the need for permitting, enforcement, and managing specific human uses, including Native Hawaiian cultural practices and visitors at Midway Atoll.

Coordinating Conservation and Management Efforts
Comprehensive and coordinated conservation and management of the Monument can be achieved only through effective interagency coordination and partnerships with a broad range of stakeholders. Coordination between the MMB members and other stakeholders is needed to maintain existing resource protection measures, increase the efficiency and effectiveness of management and enforcement, and reduce conflicts and duplication of Monument management activities. Education and outreach efforts will require coordination among government agencies, nongovernmental organizations, and other stakeholder groups. Coordination with stakeholders and the public will provide a forum for advice and input on Monument management and improve awareness and understanding of the ecological, Native Hawaiian cultural significance, and historic significance of the NWHI. Coordination with international initiatives is needed to address Pacific regional and global management issues affecting the Monument.

Achieving Effective Monument Operations
Monument operations include central and field operations, information management, and overall program evaluation. Central and field operations are essential to support action plans to address all other priority management needs. Central operations are located in the main Hawaiian Islands and include support offices, interpretive facilities, and information management facilities. Field operations include shipboard and research diving operations, as well as land-based operations in the NWHI. Monument staff and facilities provide essential operational capacity for effective collaboration between the MMB and other stakeholders. Operational effectiveness will be evaluated and improved through an adaptive management process that captures lessons learned and transforms them into action.

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Action Plans to Address Priority Management Needs

3.0 Action Plans to Address Priority Management Needs

The Monument Management Plan contains 22 action plans organized under six priority management needs. Each action plan is guided by a desired outcome, a specific need for action, and strategies and associated activities designed to achieve that need over a 15-year period with 5-year reviews. A projected timeline for completion is provided with most strategies in the action plans. These projected timelines begin once the Management Plan becomes final.

The strategies and activities described in each action plan were developed based on the current state of knowledge on the most appropriate management measures. Estimated costs to implement the Monument Management Plan are provided in Table 3.1 by action plan. The cost of administration and planning, field, and infrastructure development activities was estimated and combined for all agencies responsible for management of the Monument.

At the end of each Action Plan, a summary table lists which MMB agency has the lead for coordinating each activity. Lead agency designation does not necessarily relate to actual statutory, jurisdictional, or regulatory authority. However, lead agency does mean that agency will take the lead in providing much of the staff and other resources (such as, funding, volunteers, infrastructure, vessels, aircraft, etc.) to implement the activity and is responsible for coordinating with other agencies to monitor and report the progress of the project(s). It should be emphasized that other MMB agencies are encouraged to participate in shared decision-making and implementation of the activity.

The total estimated cost to implement the Monument Management Plan over the next 15 years is $358,573,974. Roughly one-quarter of this amount are costs identified in Section 3.6.3, Coordinated Field Operations. Most of the coordinated field operations costs would be allocated to one-time infrastructure development activities designed to replace or enhance supporting infrastructure at existing field stations, rehabilitation of historic buildings at Midway, and increase transportation and enforcement assets Monument-wide.

This Monument Management Plan provides long-term guidance for management decisions over a 15-year horizon and sets forth desired outcomes, with strategies and activities to reach those outcomes, including the agencies' best estimate of future needs. These estimates are sometimes substantially above current budget allocations and are included primarily for agency strategic planning and program prioritization purposes. Neither this draft nor the subsequent final plan constitutes a commitment of funds, or a commitment to request funds, by federal or state agencies. All funding for current and possible future Monument activities is subject to the budgeting and appropriations processes of the federal and state governments.

Prioritization of activities in the management plan is not a linear process nor necessarily measured by the amount of funds allocated. Several factors apply when setting the implementation schedule and allocating funds; these include, but are not limited to, natural, cultural, and historic resource needs; funding; agency capacity; completion of necessary planning and environmental review; and community input and support. Each MMB and partner ICC agency develops annual budget projections and priorities and allocates funds based on its own programmatic, legal and policy requirements. The cycle and timelines for funding and planning vary.

After five years, the Monument Management Plan will be reviewed, incorporating lessons learned and new data and information from monitoring, ecosystem science, and traditional knowledge, and a comprehensive evaluation to develop or refine management strategies and actions.

Table 3.1 Total Estimated Cost to Fully Implement Actions Plan by Year

Priority Management Need	Action Plan	Estimated Annual Cost							PMN Total	% of Total
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yrs 6-10	Yr 11-15		
Understanding and Interpreting the NWHI	3.1.1 - Marine Conservation Science	$12,212,725	$7,176,000	$7,571,102	$7,715,012	$8,037,820	$9,085,989	$10,221,737	$79,954,250	22%
	3.1.2 - Native Hawaiian Culture and History	$698,714	$943,562	$906,970	$959,103	$968,227	$1,132,697	$1,323,155		
	3.1.3 - Historic Resources	$692,285	$736,296	$787,952	$827,326	$867,493	$2,106,913	$1,556,014		
	3.1.4 - Maritime Heritage	$364,011	$383,035	$412,626	$430,122	$480,403	$583,894	$773,067		
Conserving Wildlife and Habitats	**3.2.1 - Threatened and Endangered Species**	**$5,907,989**	**$5,662,799**	**$5,793,855**	**$6,176,022**	**$6,564,815**	**$7,690,332**	**$8,651,624**	**$75,890,917**	**21%**
	3.2.2 - Migratory Bird	**$1,876,886**	**$1,943,362**	**$2,012,385**	**$2,211,292**	**$2,381,961**	**$2,960,635**	**$3,246,340**		
	3.2.3 - Habitat Management and Conservation	**$1,309,598**	**$1,359,670**	**$1,407,011**	**$1,650,612**	**$2,037,429**	**$2,374,730**	**$2,671,571**		

This Monument Management Plan provides long-term guidance for management decisions over a 15-year horizon and sets forth desired outcomes, with strategies and activities to reach those outcomes, including the agencies' best estimate of future needs. These estimates are sometimes substantially above current budget allocations and are included primarily for agency strategic planning and program prioritization purposes. Neither this draft nor the subsequent final plan constitutes a commitment of funds, or a commitment to request funds, by federal or state agencies. All funding for current and possible future Monument activities is subject to the budgeting and appropriations processes of the federal and state governments.

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Priority Management Need	Action Plan	Estimated Annual Cost							PMN Total	% of Total
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yrs 6-10	Yr 11-15		
Reducing Threats to Monument Resources	3.3.1 - Marine Debris	$1,606,097	$1,480,770	$1,862,218	$1,808,975	$2,158,530	$2,471,537	$2,780,229	$41,237,446	12%
	3.3.2 - Alien Species	$1,637,103	$1,538,700	$1,754,562	$2,191,818	$2,296,067	$8,193,403	$3,067,336		
	3.3.3 - Maritime Transportation and Aviation	$297,324	$296,285	$265,592	$290,264	$281,121	$316,261	$355,794		
	3.3.4 - Emergency Response and Natural Resource Damage Assessment	$532,898	$531,087	$561,755	$582,483	$606,759	$692,931	$779,547		
Managing Human Uses	**3.4.1 - Permitting**	**$843,611**	**$788,642**	**$750,839**	**$766,012**	**$815,317**	**$917,232**	**$1,031,886**	**$26,593,569**	**7%**
	3.4.2 - Enforcement	**$1,230,450**	**$1,223,874**	**$1,658,350**	**$1,681,637**	**$1,715,887**	**$1,930,373**	**$2,171,670**		
	3.4.3 - Midway Atoll Visitor Services	**$868,395**	**$1,090,763**	**$1,140,574**	**$1,291,051**	**$1,305,934**	**$1,586,386**	**$1,784,684**		
Coordinating Conservation and	3.5.1 - Agency Coordination	$578,029	$608,845	$669,756	$597,727	$600,966	$676,086	$760,597	$27,482,073	8%

This Monument Management Plan provides long-term guidance for management decisions over a 15-year horizon and sets forth desired outcomes, with strategies and activities to reach those outcomes, including the agencies' best estimate of future needs. These estimates are sometimes substantially above current budget allocations and are included primarily for agency strategic planning and program prioritization purposes. Neither this draft nor the subsequent final plan constitutes a commitment of funds, or a commitment to request funds, by federal or state agencies. All funding for current and possible future Monument activities is subject to the budgeting and appropriations processes of the federal and state governments.

Table 3.1 Total Estimated Cost to Fully Implement Actions Plan by Year

Priority Management Need	Action Plan	Estimated Annual Cost							PMN Total	% of Total
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yrs 6-10	Yr 11-15		
Management Activities	3.5.2 - Constituency Building and Outreach	$1,163,068	$1,527,334	$1,448,710	$1,359,120	$1,431,473	$1,658,847	$1,865,578		
	3.5.3 - Native Hawaiian Community Involvement	$369,330	$381,977	$433,122	$427,368	$461,456	$540,859	$632,901		
	3.5.4 - Ocean Ecosystems Literacy	$1,037,593	$1,045,054	$1,241,202	$1,278,892	$1,271,596	$1,560,868	$1,853,719		
Achieving Effective Monument Operations	**3.6.1 - Central Operations**	**$933,000**	**$976,260**	**$1,365,116**	**$1,211,354**	**$1,374,602**	**$1,611,589**	**$1,886,344**	**$107,415,720**	**30%**
	3.6.2 - Information Management	**$843,350**	**$985,745**	**$1,089,193**	**$1,106,350**	**$1,153,712**	**$1,297,926**	**$1,460,167**		
	3.6.3 - Coordinated Field Operations	**$2,746,185**	**$6,876,156**	**$15,832,853**	**$5,734,067**	**$10,850,138**	**$28,038,706**	**$16,454,795**		
	3.6.4 - Evaluation	**$259,800**	**$319,016**	**$328,586**	**$347,396**	**$760,700**	**$740,053**	**$832,559**		
Total Annual Cost		**$38,008,441**	**$37,875,231**	**$49,294,331**	**$40,644,002**	**$48,422,407**	**$78,168,247**	**$66,161,315**		
Total 15-Year Estimated Cost									**$358,573,974**	

This Monument Management Plan provides long-term guidance for management decisions over a 15-year horizon and sets forth desired outcomes, with strategies and activities to reach those outcomes, including the agencies' best estimate of future needs. These estimates are sometimes substantially above current budget allocations and are included primarily for agency strategic planning and program prioritization purposes. Neither this draft nor the subsequent final plan constitutes a commitment of funds, or a commitment to request funds, by federal or state agencies. All funding for current and possible future Monument activities is subject to the budgeting and appropriations processes of the federal and state governments.

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3.1 Understanding and Interpreting the NWHI

3.1.1 Marine Conservation Science Action Plan
3.1.2 Native Hawaiian Culture and History Action Plan
3.1.3 Historic Resources Action Plan
3.1.4 Maritime Heritage Action Plan

3.1 Understanding and Interpreting the NWHI

Protecting the health and integrity of the resources in the Monument is a key priority for resource managers. "Ecological Integrity" is defined by Monument regulations as a "condition determined to be characteristic of an ecosystem that has the ability to maintain the function, structure, and abundance of natural biological communities, including rates of change in response to natural environmental variation." Protecting the integrity of cultural and historic resources is also a critical component of management. Management actions and decisions need to be informed by a solid understanding of Monument resources. Monitoring, research, and restoration are integral components that provide the data and analysis needed to take the appropriate management actions.

Resource managers and policymakers need comprehensive information about the ocean, and islands and atolls, and their natural and social environments to make wise decisions. The U.S. Commission on Ocean Policy (2005) and the President's Ocean Action Plan have identified a number of areas of scientific inquiry fundamental to management. These topics include coral reefs, marine biodiversity, regional ecosystem dynamics, climate change, and social and economic research. Many of these apply directly to the NWHI. Baseline monitoring data and characterization are essential to identify natural and human-induced temporal changes and provide the basis for evaluating whether management activities are effective or need to be modified based on changing conditions. The Monument Management Plan reflects these nationally recognized natural and social science needs for ecosystem-based management.

The NWHI consist of a complex assemblage of ecological, cultural, and historic resources in relatively undisturbed condition compared with the main Hawaiian Islands and many other marine-based ecosystems in the world (Freidlander et al. 2005). The Monument represents a unique opportunity to improve management decision making, to advance management-driven ecosystem science through research on ecosystem components and processes, and to develop models and other tools to predict ecosystem responses to natural and anthropogenic perturbations, such as climate variability and change. In addition to the Native Hawaiian cultural significance of the region, submerged maritime heritage resources, such as shipwrecks and sunken aircraft, and other historic and archaeological sites provide insight into the NWHI's rich past.

Agencies responsible for caring for this extraordinary place include the State of Hawai‘i, FWS, and NOAA. Establishment of the Monument provides a management framework that encourages, facilitates, and directs coordinated management, preservation, research, education, and planning with other partners. Universities and other research organizations are also integral to building knowledge about the NWHI. As our understanding of the NWHI's ecological, cultural, and historic resources improves, so will our capacity to achieve effective and long-term protection of this special place. A more complete understanding of the NWHI will provide insights for improved management throughout the Hawaiian Archipelago.

Action plans to understand and interpret the NWHI focus on characterizing and monitoring the region from multiple perspectives. They also emphasize sharing information with partners and the public in relevant ways.

Each action plan consists of a set of strategies to address a desired outcome. Over the next 15 years, these desired outcomes are:

- **Marine Conservation Science:** Protect the ecological integrity of natural resources by increasing the understanding of the distributions, abundances, and functional linkages of marine organisms and their habitats in space and time to improve ecosystem-based management decisions in the Papahānaumokuākea Marine National Monument.
- **Native Hawaiian Culture and History:** Increase understanding and appreciation of Native Hawaiian histories and cultural practices related to Papahānaumokuākea Marine National Monument and effectively manage cultural resources for their cultural, educational, and scientific values**.**
- **Historic Resources:** Identify, document, preserve, protect, stabilize, and, where appropriate, reuse, recover, and interpret historic resources associated with Midway Atoll and other historic resources within Papahānaumokuākea Marine National Monument.
- **Maritime Heritage:** Identify, interpret, and protect maritime heritage resources in Papahānaumokuākea Marine National Monument.

Action plans described in this section will be implemented in close coordination with other partners and in conjunction with other priority management needs.

3.1.1 Marine Conservation Science Action Plan

Links to other Action Plans

3.2.1	Threatened and Endangered Species
3.2.2	Migratory Birds
3.2.3	Habitat Management and Conservation
3.3.1	Marine Debris
3.3.2	Alien Species
3.5.1	Agency Coordination
3.6.2	Information Management
3.6.3	Coordinated Field Operations

Desired Outcome

Protect the ecological integrity of natural resources by increasing the understanding of the distributions, abundances and functional linkages of marine organisms and their habitats in space and time to improve ecosystem-based management decisions in the Papahānaumokuākea Marine National Monument.

Links to goals

Goal 2
Goal 4
Goal 6
Goal 7

Current Status and Background

Scientific endeavors in the NWHI were motivated in part by conservation goals as early as 1920, when the Tanager Expedition included people engaged in not only collection of specimens but eradication of invasive species and restoration of habitats damaged by introduced herbivores at Laysan Island. The Pacific Ocean Biological Survey Program carried out by the Smithsonian Institution, while not explicitly designed for conservation purposes, laid the foundation of our knowledge of seabird populations and movements at sea. The Tripartite agreement among the State of Hawai‘i, FWS, and NOAA Fisheries provided a framework for extensive ecological research in the NWHI beginning in 1976. Interwoven with these large institutional efforts are numerous independent research projects that continue to contribute to the body of knowledge available for science-based resource conservation.

Multiagency efforts continued when the Northwestern Hawaiian Islands Reef Assessment and Monitoring Program (NWHIRAMP, historically known as NOWRAMP), was initiated in 2000 to characterize and monitor the coral reefs of the NWHI using a consistent set of sampling protocols. The Reef Assessment and Monitoring Program establishes a baseline for future data gathering and monitoring change over time. NWHIRAMP is a collaborative partnership of agencies and institutions consisting of quantitative diver surveys of fish, coral, algae, and invertebrate communities, supplemented by towed diver surveys of large fish and substrate type, oceanographic data collection, and sediment contaminant studies (Maragos and Gulko 2002).

Other annual multi-agency efforts are supported by a variety of agencies and institutions, including the University of Hawai‘i’s Hawai‘i Institute of Marine Biology (HIMB). This research partnership focuses on conservation science and has produced many key findings that have management implications, not just within the Hawaiian archipelago, but also for the maintenance of healthy coral reef ecosystems around the world. HIMB’s ongoing research on genetic connectivity, tagging studies, disease outbreaks, coral health, threat assessments, and climate change will be used to inform managers’ understanding of the NWHI and help to create a holistic view of ecological structure and function to ensure the best protection of the Monument’s valuable resources. The Monument acts as an ideal site to understand ecosystem function and responses to natural and anthropogenic events in a site largely free from direct human impacts. This provides a unique opportunity to understand how healthy ecosystems respond to change and compare these natural responses with other sites with greater human impact. This understanding will be important for evaluating the effects and ecological implications of climate change in the Monument, as compared with other sites particularly around the Pacific.

In another multi-agency project, NOAA led a significant mapping effort using satellite imagery, multi-beam sonar, and other remote sensing methods to provide detailed maps of the shallow-water seabed features of the Northwestern Hawaiian Islands, including the *Draft Atlas of the Shallow-Water Benthic Habitats of the NWHI* (NOAA 2003b) and the *Bathymetric Atlas of the NWHI* (Miller et al. 2004). These documents begin to describe the marine habitats and bathymetry of the NWHI and establish important baseline information for resource managers. Efforts are under way to expand the coverage of the bathymetry data, interpret the multi-beam backscatter imagery, develop a ground-truthing database, and verify remotely sensed information to further refine and complete these characterizations. The expanded habitat mapping efforts will provide managers with a greater understanding of the available resources as well as provide fundamental data for a variety of modeling efforts such as modeling the effects if climate change.

In May 2003, NOAA, through a multiagency partnership, convened a workshop with NWHI resource managers and researchers from the scientific community to identify information and science needs and resources for effective conservation and management of the NWHI. The results from this workshop were analyzed and summarized in a report titled *Information Needs for Conservation Science and Management of the Northwestern Hawaiian Islands* (Gittings et al. 2004). Workshop results are incorporated into planning and coordination efforts of science and management activities in the NWHI, and research gaps identified by the workshop informed the drafting of the archipelago wide, multiagency Hawaiian Archipelago Marine Ecosystem Research Plan (HAMER). In November 2004, the NWHI Third Scientific Symposium was held in Honolulu, Hawai‘i, and provided further syntheses of the current state of knowledge and management of the NWHI (Macintyre 2006).

Building on these earlier planning efforts, and in light of the complexity and depth of conservation science needs in the Monument, the MMB expanded the development of a stand-alone Natural Resources Science Plan to further identify management priorities, assess and identify standard protocols, formalize collaborative monitoring, and increase effectiveness of protection and management efforts. A scoping meeting for the draft Natural Resources Science Plan was held in November 2007 to solicit input on five broad thematic research categories. The five thematic areas adapted from the HAMER Plan and identified in the draft Natural Resources Science Plan are:

- Research on ecological processes and connectivity
- Research on biodiversity and habitats
- Research on human impacts
- Research on ecosystem change, indicators, and monitoring
- Modeling and forecasting ecosystem change

Biologists survey algae and coral species throughout the NWHI to monitor ecosystem health. Photo: Jean Kenyon

Need for Action

Effective stewardship of the Monument should be based on reliable information on the biological characteristics of the organisms, their ecological relationships, an understanding of the natural temporal variations, and anthropogenic impacts that affect their ecosystems.

It is important to continue and further enhance monitoring efforts to protect and conserve the Monument's flora and fauna. Conducting annual monitoring will provide for an assessment of the continued health of the NWHI. Akin to monitoring vital signs such as heartbeat and blood pressure in humans, monitoring the abundance and diversity of marine organisms allows managers to track health and establish baselines and the range of natural variability throughout the year and between years. These baselines help to identify change over time and can be used in many ways; from assessing the status of groups of organisms, to assessing the effects of management and restoration efforts, to studying the impact of larger-scale phenomena, such as climate change on ecosystems. Monitoring can also be used as a broad-scale warning system, to assess changes, or to identify when management actions need to be modified based on changing conditions. Changing resource conditions may also prompt managers to request more specific research and seek actionable results to best protect and preserve the Monument.

Although monitoring and research are deemed an integral part of the Monument Management Plan, great care will be taken to ensure that the research conducted in the Monument is necessary for the continuation and enhancement of resource protection. The permitting process and future Natural Resource Science Plan (NRSP) will continue to specify that the benefits of data acquisition will outweigh the impacts of conducting these activities.

Recognizing the value of and need for greater understanding of marine habitats, continued characterization and monitoring of marine habitats and species are described within this Action Plan. Because of the connection between marine and terrestrial species, communities and ecosystems, additional management-related surveys, research, and monitoring priorities that span marine and terrestrial habitats are also found in separate action plans within this Monument Management Plan, in particular Threatened and Endangered Species, Migratory Bird, Habitat Management and Conservation, Marine Debris, and Alien Species Action Plans. With coral reefs, seabird colonies, and tropical ecosystems in decline in general around the world, the NWHI present a unique opportunity to characterize an intact ecosystem and begin to understand the degree of natural variability in an ecosystem relatively free of local anthropogenic influences. Studying these remote areas may also make an important contribution toward understanding the impacts of global climate change on coral reef ecosystems. The NWHI are still relatively unexplored, and fundamental information on the species, habitats, and their status is needed to best protect these resources in perpetuity. Functional relationships among the species, habitats, ecosystems, and oceanographic and other physical processes of the NWHI marine environments are also not well understood. Evaluation tools, such as models, are needed to describe complex ecosystem functions and provide resource managers with the capability to assess both the benefits and risks of management decisions.

Strategies to Achieve the Desired Outcome
There are three strategies designed to achieve the desired outcome of protecting ecological integrity by increasing the understanding of the distributions, abundances, and functional linkages of marine organisms and their habitats in space and time to improve ecosystem-based management decisions in the Monument. Systematic characterization, monitoring, and research are means to acquire this information. Strategy MCS-1 and its associated activities are specific to the marine environment, while strategies MCS-2 and MCS-3 apply to all research and monitoring activities in the Monument. The strategies and activities are coded by the acronym for the action plan title, Marine Conservation Science (MCS). A summary of strategies and activities is provided in Table 3.1.1 at the end of this action plan.

- MCS-1: Continue and enhance research, characterization, and monitoring of marine ecosystems for the life of the plan, as appropriate.
- MCS-2: Assess and prioritize research and monitoring activities over the life of the plan.
- MCS-3: Communicate results of research and monitoring over the life of the plan.

Strategy MCS-1: Continue and enhance research, characterization and monitoring of marine ecosystems for the life of the plan, as appropriate.

This strategy is focused on continuing marine research, characterization, and monitoring designed to support an ecosystem-based approach to protection and management. These activities are implemented through a variety of partnerships and collaborations, including those with the University of Hawai‘i's HIMB, Hawai‘i Undersea Research Lab (HURL), School of Ocean and Earth Science Technology, and others. Findings will be synthesized and made available for managers to inform decision making, as well as to the general public. Additional marine research and monitoring activities are found in the Threatened and Endangered Species, Migratory Bird, Habitat Management and Conservation, Marine Debris, and Alien Species Action Plans.

As ecosystem characterization assessments are moving ahead, analysis of data from regular monitoring surveys can be used to evaluate change over time in a given ecosystem. Monitoring data can help scientists understand the causes of change and be used to build ecosystem models. Producing high-level ecosystem functional models can be achieved only through broad-based collaborations among agencies and institutions with varying capacities. It is critical that monitoring protocols be established in collaboration with partner agencies so that they may yield reliable, useful information over time. To the extent possible, relevant datasets will be integrated with the national Integrated Ocean Observing System efforts.

Activity MCS-1.1: Continue to characterize types and spatial distributions of shallow-water marine habitats to inform protection and management efforts.
The MMB will continue working with partners to conduct field work to validate and update existing habitat maps and bathymetry. This work will build on remote sensing data originally collected in the development of the *Draft Atlas of the Shallow-Water Benthic Habitats of the NWHI* and the *Bathymetric Atlas of the NWHI*, Draft. The updated dataset, maps, and images will provide a framework for the biogeographic assessment in Activity MCS-2.3, described below. The results of these activities will better define resource baselines to inform protection

and management efforts. Shallow-water habitats are defined as those less than 16 fathoms (30 meters).

Activity MCS-1.2: Continue monitoring of shallow-water coral reef ecosystems to protect ecological integrity.
Monitor shallow water habitats using sampling protocols developed through interagency collaborative efforts. Sites selected should be representative of broad habitat types. Quantitative surveys of coral, algae, fish, and invertebrates will be conducted annually using methods comparable to or intercalibrated with those of existing historical data sets. This monitoring will be conducted in collaboration with partners. The suitability of these methods, data sets, and analyses to meet management needs will be periodically assessed with partners as described in Activity MCS-2.2, and are subject to change based on the outcomes of that activity. The results of these activities will better define resource baselines for comparisons in protection and management efforts.

Activity MCS-1.3: Map and characterize deep-water habitat.
As resources in this habitat are virtually unknown in the NWHI, it is imperative to understand the dynamics of deep-water habitat to protect and manage them in the future. Working with partners, the MMB will use data collected with the multibeam sonar systems to acquire both bathymetric and backscatter data and produce deep-water benthic habitat maps. Habitat maps will be ground-truthed using remote cameras, submersibles, and other technology, as appropriate. This work will continue to develop baseline inventory of the biological resources and biodiversity of deep reefs, seamounts, banks, and abyssal plains using all available technologies, including submersibles, remotely operated vehicles (ROV), autonomous underwater vehicles (AUV), and technical diving. Deep-water habitats are defined as those greater than 16 fathoms (30 meters). Research investigations will be continued on the deep coral reef, deep slope, seamount, pelagic, and abyssal ecosystems of the NWHI.

Activity MCS-1.4: Establish and implement monitoring program for deep-water ecosystems, as appropriate.
Using the shallow-water ecosystem monitoring protocols as a model, protocols will also be developed for deep-water ecosystems. In collaboration with research partners, the Monument will determine management information needs and establish data collection protocols, statistical sampling design, and site selection criteria for monitoring of deep-water ecosystems, as well as implement monitoring of deep-water reefs, banks, and associated communities to meet these management information needs. All appropriate technologies and methods will be utilized, including submersibles, ROVs, AUVs, bait station drop cameras, and technical diving. Monitoring of key indicator species will be implemented if determined to be a key monitoring tool.

Activity MCS-1.5: Measure connectivity and genetic diversity of key species to enhance management decisions.
Genetic studies can provide data to compare the similarity or differences of populations at different locations across the NWHI. Understanding the genetic diversity of species, and the ways in which an area's populations change, helps managers forecast, prepare for, and mediate potential threats to populations. Identifying the genetic makeup of populations can help

managers understand more about the effective size of a population, its history of immigration from other populations, and the level of genetic diversity inherent in the population. This information is helpful in understanding the various fish stocks, as well as whether the NWHI serve as a source for recruits to the MHI. Comparisons of the population genetics at different sites in the Monument may indicate whether those populations are distinct and must be managed separately or whether the population in question can be considered as the same throughout the archipelago. Population connectivity can be assessed using genetic assays across a broad range of coral reef invertebrates and fishes with widely varying life history characteristics. Understanding the genetic diversity of species provides important information into how anthropogenic influences, such as debris accumulation, pollution, and climate change, can be evaluated Monument-wide. Population connectivity can be assessed using genetic assays across a broad range of coral reef invertebrates and fishes with widely varying life history characteristics.

Activity MCS-1.6: Collect, analyze, and input research, monitoring, and bathymetric data into appropriate databases to inform management decisions.

Information management is critical for organizing and storing large numbers of published and unpublished manuscripts and research findings, as well as for analyzing and summarizing large amounts of data and other research products. Because of the complexity of information management from multiple sources, it is imperative that such an endeavor be conducted in close collaboration with interagency and research partners (see Section 3.6.2 Information Management Action Plan, Activity IM-1.2). Such collaborations necessitate the flow of information to and from other established agency databases, such as NOAA’s Coral Reef Watch Program, NOAA’s Coral Reef Information System (CoRIS), DLNR’s seabird and dolphin database, and the multiagency online Oceanographic Atlas of the Pacific. The Monument Information Management System, as well as other databases, will be updated on a regular basis to manage, analyze, summarize, and interpret research data collected from the NWHI to best protect Monument resources. Products, such as maps and reports on the status and trends of important resources in the NWHI, will be generated from these databases for researchers and managers.

Strategy MCS-2: Assess and prioritize research and monitoring activities over the life of the plan.

A management-driven Natural Resources Science Plan will be developed and assessed on a regular basis to ensure that marine and terrestrial research and monitoring conducted in the NWHI are appropriate, relevant, and necessary to ensure ecological integrity is maintained, enhance effective management, improve management decision making, advance ecosystem science, include traditional knowledge, and begin to understand the impacts of climate change. The plan will build on existing regional science and research planning efforts. Consistency with HAMER and links to similar research in the main Hawaiian Islands will be maintained so that science conducted in this portion of the archipelago can be used across the archipelago. An interdisciplinary range of investigations designed to protect resources and inform management actions will be included in the plan.

Activity MCS-2.1: Develop a prioritized Natural Resources Science Plan to support protection and management activities within 1 year.

Working collaboratively, the MMB will develop a prioritized, interdisciplinary NWHI Monument NRSP. The NRSP will serve as a more detailed implementation plan that supports protection, management and research strategies contained within this action plan, as well as specific management-related surveys, research, and monitoring priorities found in other Action Plans, in particular the Threatened and Endangered Species, Migratory Bird, Habitat Management and Conservation, Marine Debris, Alien Species, and Native Hawaiian Culture and History Action Plans. It will align management priorities among agencies to facilitate resource and information sharing and will address both baseline information needs and management-driven needs, with the ultimate goal of ensuring that the health and ecological integrity of the Monuments resources are protected. The NRSP will be a stand-alone document separate from that of the Monument Management Plan, with its own federal and state environmental review. Each agency or research partner will use the plan as a guide for conducting and authorizing research activities. Information needs and gaps will be reevaluated on a regular basis with input from the MMB, ICC, technical groups, research partners, Native Hawaiians, and the public. The NRSP will also address monitoring requirements to understand the direct and indirect impacts of climate change on species, populations and ecosystems.

Examples of activities to be included in the NRSP under the five thematic areas are:

Research on ecological processes and connectivity
Understanding the mechanisms that link NWHI populations (and where applicable to the main Hawaiian Islands) at various scales, such as oceanographic processes, recruitment variability, larval and adult behavior, bird migratory and foraging patterns and drivers, the effect of isolation on the genetic structure of terrestrial flora and fauna, and other life history characteristics, will reveal the connectivity and interrelationships of the ecosystems within the NWHI.

Research on biodiversity and habitats
Documenting, maintaining, and restoring diversity includes the discovery and description of new species, identifying the spatial distributions of habitats critical for the survival of native species, determining habitat changes important for the survival of native species, and maintaining diversity by affecting the recovery of protected species. This activity may include the study of methods for the restoration of native habitats, plants, and animals; research on terrestrial arthropods and avian components of the biological community; research on circulation patterns, residence times of water, wave climatology, and other physical drivers that structure habitats and result in biological zonation of the marine and terrestrial environments.

Research on human impacts
Understanding the impacts of human activities on the ecosystems of the NWHI may include research on the cumulative impacts of both local (e.g., research, other permitted activities) and distant (marine debris, fishing, climate change) activities, as well as the impact of invasive species on the marine and terrestrial biodiversity of the NWHI. Comparative studies between the main Hawaiian Islands and NWHI provide a unique opportunity to examine the effects of anthropogenic activities on coral reef ecosystems.

Research on ecosystem change, indicators, and monitoring
Establishing baselines on the abundance and health of Monument biota is the first step toward understanding the range of natural variability that characterizes these ecosystems. Research will address marine and terrestrial biodiversity and communities. Coral bleaching follow-up surveys and assessments will be continued with regional research partners to assess the impacts of major bleaching events in 2002 and 2004. Research to define and understand factors contributing to resilience and recovery from these perturbations will assist managers in responding to future bleaching events. The use of indicator species as a monitoring tool will be evaluated.

Modeling and forecasting ecosystem change
Developing functional ecosystem models that reflect the complexity and dynamic nature of the ecosystems of the NWHI is a long-term goal of the Monument's research program. A related goal is to design models that reflect ecological connectivity of the NWHI to the main Hawaiian Islands and other regions of the Pacific. Descriptive and predictive models will be used by managers to better understand ecosystem function, and to evaluate the impacts of proposed activities.

Activity MCS-2.2: Assess monitoring program protocols.
Consistency in data collection protocols over time is of primary importance in any monitoring program in order to enable statistically valid comparisons between time periods. As management needs evolve and our understanding of ecosystem variability improves, monitoring protocols, sampling design, and sampling intervals will be evaluated for their effectiveness in meeting management needs and accurately reflecting change in the environment. An overall goal of these periodic assessments will be to ensure that the sampling and site selection protocols adequately represent the range of habitats in the NWHI, and that the methods provide adequate statistical power to detect differences between sites or changes between time periods and that the data are useful to and informs management decisionmaking. These evaluations will be conducted on a cycle consistent with 5-year management plan reviews with the interagency technical group on research.

Activity MCS-2.3: Formalize collaborative regional monitoring programs for the NWHI.
Several independent monitoring initiatives are being conducted in the NWHI and new initiatives are planned, such as monitoring for invasive species, seabird colonies, the effectiveness of Monument management zones, water chemistry, and water quality. Monitoring programs will need to include data on the organisms in the NWHI in a wide range of habitats as well as oceanographic and climatological parameters. Monument zones, which are spread across a broad distance and include a range of habitats, will require the design of an efficient yet effective monitoring program to maximize protection and management efforts. The Monument will facilitate the development of formal monitoring programs that are closely linked to the needs of NWHI resource managers. Partnerships with collaborating agencies and organizations will be established in which responsibilities, obligations, deliverables, and timelines for a regional monitoring program are clearly articulated.

Activity MCS-2.4: Implement management-driven research priorities identified in the Monument Natural Resources Science Plan.

Once the Monument Natural Resources Science Plan is finalized, priorities identified in the plan will guide research and monitoring activities for both marine and terrestrial environments that will in turn provide the necessary information for effective management actions. These priorities will be reassessed on a regular basis based on the outcome of research and monitoring activities, outcome of evaluation assessments, the 5-year reviews of the Monument Management Plan and regular reviews of the Science Plan. Research and monitoring priorities will be implemented through a variety of partnerships and collaborations.

Activity MCS-2.5: Coordinate research update meetings.
Regular meetings among managers, staff, and researchers will be conducted to facilitate the exchange of information and ensure the management-driven Monument research objectives identified in the NRSP are being met.

Strategy MCS-3: Communicate results of research and monitoring over the life of the plan.

Research is an exciting way to promote ecosystem literacy and caring for the NWHI. Ecosystem research-related education and outreach present an ideal opportunity to “bring the place to the people and not the people to the place.” This strategy serves a dual purpose of presenting the science to a general audience and promoting the research necessary to manage the Monument. In addition, research and modeling discoveries can be shared with the public and incorporated into classroom curricula. Activities contained within this strategy apply to terrestrial and marine research and monitoring activities in the Monument.

Activity MCS-3.1: Coordinate an annual meeting to present current research in the NWHI.
Annual meetings provide an important forum for the NWHI multidisciplinary research community, managers, and interested public to keep abreast of current research initiatives and recent findings. This meeting will seek to incorporate recent findings from research, including but not limited to, ecosystem, Native Hawaiian, maritime heritage, and socioeconomic studies.

Activity MCS-3.2: Identify and prioritize research, monitoring, and modeling projects for education and outreach.
Translating NWHI research findings to the public and incorporating it into classroom curricula is a high priority for the Monument. Working with partner agencies, research, monitoring, and modeling projects will be identified and prioritized for dissemination.

Activity MCS-3.3: Include an educational component in marine research expeditions.
Past NOWRAMP/NWHIRAMP expeditions have included educational components that have been highly successful for education and outreach. Components included live web sites with updates from the research vessel, imagery, and video. Using this model and other innovative ideas, marine research and monitoring expeditions aboard NOAA research vessels will include educational and outreach components.

Activity MCS-3.4: Use materials gathered and created through research to develop or enhance education and outreach products.
Many of the materials developed during previous marine research expeditions have been incorporated into other outreach products, specifically displays at the Mokupāpapa Discovery

Center, slideshows, and educational curricula. Similarly, educational materials have been associated with satellite tracking of albatross and migration of golden plovers. Education and outreach products will continue to be developed based on research conducted in the Monument. (See Section 3.5.4, Ocean Ecosystems Literacy Action Plan).

Table 3.1.1 Summary of Strategies, Activities, and Agency Leads for Marine Conservation Science

Strategies and Activities	Agency Lead
Strategy MCS-1: Continue and enhance research, characterization and monitoring of marine ecosystems for the life of the plan, as appropriate.	
Activity MCS-1.1: Continue to characterize types and spatial distributions of shallow-water marine habitats to inform protection and management efforts.	NOAA
Activity MCS-1.2: Continue monitoring of shallow-water coral reef ecosystems to protect ecological integrity.	NOAA
Activity MCS-1.3: Map and characterize deep-water habitat.	NOAA
Activity MCS-1.4: Establish and implement monitoring program for deep-water ecosystems, as appropriate.	NOAA
Activity MCS-1.5: Measure connectivity and genetic diversity of key species to enhance management decisions.	NOAA
Activity MCS-1.6: Collect, analyze, and input research, monitoring, and bathymetric data into appropriate databases to inform management decisions.	NOAA
Strategy MCS-2: Assess and prioritize research and monitoring activities over the life of the plan.	
Activity MCS-2.1: Develop a prioritized Natural Resources Science Plan to support protection and management within 1 year.	NOAA
Activity MCS-2.2: Assess monitoring program protocols.	NOAA
Activity MCS-2.3: Formalize collaborative regional monitoring programs for the NWHI.	NOAA
Activity MCS-2.4: Implement management-driven research priorities identified in the Monument Natural Resources Science Plan.	NOAA FWS
Activity MCS-2.5: Coordinate research update meetings.	NOAA
Strategy MCS-3: Communicate results of research and monitoring over the life of the plan.	
Activity MCS-3.1: Coordinate an annual meeting to present current research in the NWHI.	NOAA
Activity MCS-3.2: Identify and prioritize research, monitoring, and modeling projects for education and outreach.	NOAA
Activity MCS-3.3: Include an educational component in marine research expeditions.	NOAA
Activity MCS-3.4: Use materials gathered and created through research to develop or enhance education and outreach products.	NOAA

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3.1.2 Native Hawaiian Culture and History Action Plan

Desired Outcome

Increase understanding and appreciation of Native Hawaiian histories and cultural practices related to Papahānaumokuākea Marine National Monument and effectively manage cultural resources for their cultural, educational, and scientific values.

Links to other Action Plans	
3.1.1	Marine Conservation Science
3.1.3	Historic Resources
3.5.2	Constituency Building and Outreach
3.1.4	Maritime Heritage
3.5.3	Native Hawaiian Community Involvement
3.5.4	Ocean Ecosystems Literacy
3.6.2	Information Management

Links to goals
Goal 4
Goal 5
Goal 6
Goal 7

Current Status and Background

Since the early visioning process in 2000 on how best to protect the NWHI, the need to understand and document the cultural significance of the Monument and its integral relationship with the rest of the archipelago has been growing, leading to an increased effort to research and compile known cultural information about this important region. This research effort has produced a substantial amount of cultural information and theories pertaining to the traditions and practices of Native Hawaiians in the NWHI (Kikiloi in prep.). This work includes archival research (Tava and Keale 1989; Mackenzie and Kaiama 2003), ethnographic studies (Maly 2003), and archaeological research (Emory 1928; Cleghorn 1988; Liller 2000; Graves and Kikiloi in prep).

While more cultural research needs to be conducted, several steps have been taken toward integrating this cultural information into educational and outreach efforts. One of these efforts is "Navigating Change," an education and outreach partnership created in 2001 among NOAA, FWS, the State of Hawai'i, the Polynesian Voyaging Society, Bishop Museum, and many other groups. This initiative, which includes classroom curricula and multimedia materials, utilizes Native Hawaiian voyaging traditions and cultural values to engage students and the public in learning about and caring for the NWHI as well as the main Hawaiian Islands. Together, the Polynesian Voyaging Society, FWS, NOAA, and the State coordinated voyages by *Hōkūle'a*, a traditional Hawaiian double-hulled voyaging canoe, to and through the NWHI, as well as the associated educational outreach efforts for the voyages.

Cultural sites at Mokumanamana indicate the use of the NWHI and surrounding oceans by Native Hawaiians in precontact Hawai'i. Photo: Andy Collins

To effectively engage both English and 'ōlelo Hawai'i (Hawaiian language) speakers, and to explicitly recognize the Native Hawaiian history and continued relationship with Papahānaumokuākea, all interpretive signs at Mokupāpapa Discovery Center in Hilo and similar education centers are in both English and 'ōlelo Hawai'i. Native Hawaiian values and histories are integrated into the displays, and Hawaiian-speaking volunteers have been recruited to act as docents at Mokupāpapa.

The Reserve, in collaboration with the Kamakakūokalani Center for Hawaiian Studies at the University of Hawaiʻi, conducted cultural research on the NWHI. This research and synthesis have yielded a university-level course on the NWHI and an informational video that portrays the NWHI from an indigenous perspective. In August 2004, the Kamakakūokalani Center held a 2-day workshop to discuss Native Hawaiian issues and concerns about the NWHI (see also Section 3.5.3, the Native Hawaiian Community Involvement Action Plan).

Also under contract with the Reserve, the Bernice Pauahi Bishop Museum developed an online "Annotated Bibliography of Cultural Resources for the Northwestern Hawaiian Islands." The database contents primarily include holdings available in the Bishop Museum's Library and Archives, the libraries at the University of Hawaiʻi at Mānoa, and the State of Hawaiʻi Archives that may be valuable to researchers and others learning about the NWHI. The database is accessible to the public on the Internet (www2.bishopmuseum.org/noaanwhi/index.asp).

To strengthen the agencies' cultural resource management capability, internal capacity and a liaison program will be developed. Under such a program, liaisons with the Hawaiian community would conduct projects and initiatives to support cultural education, research, and access. The liaisons would work with the Native Hawaiian community, plan and organize cultural working group meetings, and coordinate cultural research and outreach for the Monument (see also Section 3.4.3, the Native Hawaiian Community Involvement Action Plan). Through a Native Hawaiian cultural perspective, we can learn more about the NWHI's ecosystems and histories and develop better ways of managing the area.

Need for Action

Both the executive order that established the Reserve and Proclamation 8031, which established the Monument, recognize and address the significance of the NWHI to Native Hawaiians. Understanding the NWHI from a Native Hawaiian perspective benefits the Monument in many ways. Native Hawaiians' resource management practices were and are mainly guided by their traditional beliefs and familial connections to their natural environment and the imperative to manage the islands and oceans as inextricably linked. As a result, Native Hawaiian research contributes to an ecosystem-based approach to management and complements other types of research. Education of and by, and outreach to, the Native Hawaiian community can elicit greater involvement by Native Hawaiians in Monument management. Utilizing cultural information in education and outreach will engage the broader public in learning about and caring for the Monument and Native Hawaiian culture. This action plan presents strategies and activities for research, education, and outreach aimed at accomplishing that desired outcome.

More research and documentation about Native Hawaiian traditions, practices, and histories of the NWHI need to be done, particularly before the histories held only in the oral tradition are lost with the kūpuna who hold that knowledge. Some of this work can be accomplished through literature searches and other historical, Hawaiian language, and archival research. Other information will require access to the NWHI to conduct new cultural research by both academics and practitioners. As information is gathered and compiled information regarding the location, character, or ownership of certain cultural resources may be withheld from public disclosure, consistent with applicable law such as the National Historic Preservation Act.

The Monument offers a vast, sacred, and protected classroom, which cannot be recreated or modeled anywhere else, for Native Hawaiians or the rest of the world. For example, the experiential learning of traditional wayfinding and cultural protocols by crewmembers of the *Hōkūle'a* and other Polynesian voyaging wa'a (canoes) cannot be learned in a museum or from books. Equally, the historic sites of Nihoa and Mokumanamana represent the most pristine and extensive collection of cultural sites within the Hawaiian archipelago and are being used as a training ground for cultural practitioners who wish to continue to practice such cultural protocols as can only be rediscovered in Papahānaumokuākea. Native Hawaiian cultural tradition is primarily transmitted orally, and current educational studies have shown that Native Hawaiian learning continues to be most productive when done experientially (Tibbetts 2006).

As a result, and as allowed by applicable laws, cultural accesses to promote and expand traditional knowledge may include a component that allows for observational learning and experiences, which help translate in part to building relationships with both the place and the people of the place. These interpersonal relationships with fellow researchers may be as important as ancestral connections that are also related to Papahānaumokuākea. Experiences gained in Papahānaumokuākea are absorbed over time, with information and knowledge earned that potentially may be understood or implemented after the actual experience. Only if relationships with the place, spirits, and people of the place are maintained can the experiential knowledge be appropriately shared and used at the right time. Western scientific terms such as "baseline" and "assessment" are not necessarily used the same way in Hawaiian traditional knowledge, and as such cultural research should not be limited in scope or manner by any such terminology.

Strategies to Achieve the Desired Outcome

Five strategies have been identified to increase understanding and documentation of Native Hawaiian culture and history related to the Monument. The strategies and activities are coded by the acronym for the action plan title, "Native Hawaiian Culture and History" (NHCH). A summary of strategies and activities is provided in Table 3.1.2 at the end of this action plan.

- NHCH-1: Identify and prioritize scientific and Native Hawaiian cultural research needs within 18 months.
- NHCH-2: Conduct, support, and facilitate Native Hawaiian cultural access and research of the NWHI over the life of the plan.
- NHCH-3: Increase cultural resource management capacity across MMB agencies over the life of the plan.
- NHCH-4: Plan, develop, and implement a Monument Cultural Resources Program over the life of the plan.
- NHCH-5: Provide cultural outreach and educational opportunities to serve the Native Hawaiian community and the general public over the life of the plan.

Strategy NHCH-1: Identify and prioritize scientific and Native Hawaiian cultural research needs within 18 months.

Identification and prioritization of research needs will be achieved through consultation with the Native Hawaiian Cultural Working Group and other Native Hawaiian institutions and organizations, and by assessing and identifying gaps in the information assembled in the past in consultation with what was then the Reserve Advisory Council's Native Hawaiian Cultural Working Group and other cultural experts. Potential research topics include (1) understanding the historical relationship Native Hawaiians have had with the NWHI; (2) understanding cultural practices of this region, such as navigation and voyaging, traditional religious worship, place names and geography, mele (song) and hula (dance), mo‘olelo (legendary histories, mythologies, and stories), and fishing techniques; (3) determining culturally and ecologically appropriate methods of following the Hawaiian protocol of giving ho‘okupu (offerings); (4) acquiring and implementing traditional Hawaiian knowledge; (5) increasing research to support and identify sites for protective status; and (6) clarifying how Hawaiian concepts of restoration and preservation of natural and cultural resources fit into current regulatory constraints. Research on these topics will give insight into the appropriateness of certain activities and practices that occur in the area.

Activity NHCH-1.1: Identify research needs that can be accomplished through anthropological, archaeological, historical, and Hawaiian cultural methods.
Such research could be conducted through ethnographic interviews, researching oral traditions and archival historical information written in the English and Hawaiian languages, archaeological survey and analyses, and cultural field experience. Potential topics include further study into the history of Nihoa and Mokumanamana's previous inhabitants, the human-made structures on those islands, and cultural links throughout the archipelago—especially for residents of Ni‘ihau and Kaua‘i with the NWHI. Research needs will be developed within 18 months and consistently updated via such venues as the annual cultural resources research conference (see Section 3.4.3, the Native Hawaiian Community Involvement Action Plan).

Activity NHCH-1.2: Develop cultural research priorities alongside associated management challenges and opportunities.
Once research needs have been identified, priorities will be established by the MMB in consultation with the Native Hawaiian Cultural Working Group that are directly linked to key management challenges and available opportunities to conduct such research. These needs and priorities will be assembled in a report that will be completed within 18 months.

Strategy NHCH-2: Conduct, support, and facilitate Native Hawaiian cultural access and research of the NWHI over the life of the plan.

Ongoing research and documentation about Native Hawaiian traditions, practices, and histories of Papahānaumokuākea are as important as ongoing scientific research in helping us ensure successful management of the Monument. Thus, working closely with partners, we will continue to conduct and support cultural and historical research and seek ways to facilitate access to the NWHI for such purposes. The MMB will also work to support complementary Western science and traditional knowledge investigations, management, and outreach strategies. This work will be done in cooperation with partners, both organizations and individual researchers. Additionally, research findings may help clarify appropriate cultural activities for an area and aid in gaining appropriate additional protections for cultural resources.

Cultural accesses will incorporate opportunities for the perpetuation and expansion of traditional knowledge, including natural resources conservation and management. Such accesses may emphasize the interconnectivity of the entire Hawaiian archipelago and assist Native Hawaiian practitioners in reconnecting to the natural resources knowledge and experience of their ancestors, which will further assist them in teaching and practicing traditional resource management in the main Hawaiian Islands as well as assist managers of Papahānaumokuākea. Native Hawaiian mele (songs), oli (chants) and moʻolelo (stories) that refer both to the NWHI and to natural resource abundance are best understood when observed and experienced first-hand. The NWHI provide a unique opportunity to continually experience and view a sizeable portion of the Hawaiian archipelago much as Native Hawaiian ancestors once did. As Native Hawaiian practitioners connect with and experience the natural and cultural resources through the eyes of their ancestors, they also become aware of an inherent kuleana (responsibility and privilege) to foster the possibility of ʻōuli (ancestral signs or omens expressed through nature) and biophysical and spiritual understandings of the environment.

All of these types of cultural research findings would be integrated and presented as part of an annual meeting to present current research being conducted in the NWHI (see Section 3.1.1, the Marine Conservation Science Action Plan). This annual meeting provides an important forum for the NWHI multidisciplinary research community, managers, and interested public to keep abreast of current research initiatives and recent findings.

Activity NHCH-2.1: Continue to compile information and conduct new cultural and historical research about the NWHI.
Limited cultural and historical research about the NWHI has already been directly conducted by NOAA and FWS in conjunction with partner organizations such as OHA and the Bishop Museum. Monument staff will continue to compile existing information about the region and initiate new research based on the priorities developed under strategy NHCH-1.

Activity NHCH-2.2: Support Native Hawaiian cultural research needs.
Once priorities have been developed, access needs to meet these priority requirements will be considered and established as opportunities arise to create additional partnership contracts, grants, or formal agreements with Native Hawaiian organizations and individuals. Research on the issues identified through the process described in strategy NHCH-1 may also be supported by the MMB through grants, logistical support, berthing space aboard research vessels (see Section 3.6.3, the Coordinated Field Operations Action Plan), and other in-kind resources. Such support has already begun prior to Monument establishment and will be continued.

Activity NHCH-2.3: Facilitate cultural field research and cultural education opportunities annually.
Consistent with activities that have already begun in the Monument, the MMB will continue to facilitate research and education opportunities in the field for students, teachers, and cultural specialists during every field season. Such support includes providing berthing space aboard research vessels, logistical support, and putting researchers and educators in touch with others doing similar work.

Activity NHCH-2.4: Convene a Native Hawaiian nomenclature working group.
Within a year, the Monument will convene a variety of experts, including the Native Hawaiian Cultural Working Group, on the history and meaning of Hawaiian names for known and yet-to-be-discovered regions, islands, geographical and oceanic features, sites, and plant and animal species. These names and their histories and meanings will be included and updated regularly in the forthcoming Monument Information Management System (see below) to ensure that such names continue to reflect Hawaiian knowledge and experience, and processes will be established to ensure that the Native Hawaiian names are imbued with appropriate cultural authority and officially recognized in government records.

Activity NHCH-2.5: Incorporate cultural resources information into the Monument Information Management System.
As cultural information is compiled and generated, in collaboration and cooperation with Native Hawaiian organizations and institutions that are also creating databases of such information (such as OHA's *Wahi Pana* Database), it will be incorporated into the Monument Information Management System (see Section 3.6.2, the Information Management Action Plan). This system will incorporate a security layer for the protection of proprietary cultural information.

Activity NHCH-2.6: Continue to facilitate Native Hawaiian cultural access.
Such access needs may include, but not be limited to (1) access to the NWHI by cultural practitioners for Hawaiian religious practices and ceremonial purposes; (2) regular access for Polynesian voyaging canoes for wayfinding, navigational, and cultural protocol training; (3) gathering specific types of plants, shells, and feathers for cultural implements and ceremonies; (4) repatriating iwi kūpuna (ancestral bones) and monitoring burial sites; (5) honoring ancestral homelands and their associated deities; (6) restoring native species; and (7) observing and reconnecting with natural and spiritual resources. These types of access allow for lessons to be learned at specific sites for specific purposes and to determine significant astronomical relationships, and provide for voyaging training in a voyaging route of Native Hawaiians' kūpuna. Voyaging training provides for traditional navigational apprenticeship in an ancient art, which Hawaiians conceive as learning to pull an island out of the sea from beyond the horizon using only observation and knowledge of the natural environment.

Activity NHCH-2.7: Establish agreements with local universities and museums to address possible curation, research, use, return, and repatriation of collections.
To provide proper stewardship of cultural resources and artifacts, necessary agreements will be established in concert with the Cultural Resources Program Plan (see strategy NHCH-4). Other agreements will be developed as the need arises, including, but not limited to, negotiation for agreements to be initiated within 18 months with the Bishop Museum and University of Hawai‘i about inventories, curation, and access of existing cultural resources currently in their control.

Strategy NHCH 3: Increase cultural resource management capacity across MMB agencies over the life of the plan.

To effectively carry out the strategies and activities outlined within this action plan, the MMB agencies will increase their collective capacity to effectively understand, manage, and protect the

Native Hawaiian cultural resources of the Monument and fulfill federal and state mandates and requirements.

Activity NHCH-3.1: Assess Monument cultural resource capacity.
Limited staff capacity currently exists among the Monument management agencies in the area of cultural resource management. Agencies will identify staff needs and work toward building staff capacity to carry out the strategies and activities contained within this plan. Staffing needs will be identified and included in the development of the Monument Cultural Resources Program Plan (see Activity NHCH-4.1).

Activity NHCH-3.2: Engage Native Hawaiian practitioners and cultural experts and the Native Hawaiian Cultural Working Group in the development and implementation of the Monument's management activities.
The Native Hawaiian Cultural Working Group and other Native Hawaiian cultural practitioners and experts will be consistently consulted and integrated into the creation and implementation of programs (see Section 3.5.3, the Native Hawaiian Community Involvement Action Plan). Examples of their participation may include the following: (1) providing cultural briefings to every person preparing to enter the Monument, as a condition of being permitted access; (2) when feasible, accompanying permittees accessing the Monument to experience, practice, and learn from the Monument resources while educating others; and (3) including Native Hawaiians, particularly the younger generations, as part of cultural and scientific research teams when feasible.

Activity NHCH-3.3: Increase knowledge base of Native Hawaiian values and cultural information through "in-reach" programs for resource managers.
Efforts will be made to increase the knowledge base of Native Hawaiian cultural significance by Monument resource managers. This knowledge base will be increased by having Monument resource managers and staff and MMB members, as appropriate, participate in informal and formal briefings, cultural workshops, and cultural exchanges in cooperation with other marine protected area sites that integrate traditional knowledge into their management.

Activity NHCH-3.4: Identify and integrate Native Hawaiian traditional knowledge and management concepts into Monument management.
In the past, traditional resource management involved recognizing local variations, observing patterns, periodically applying kapu (restrictions on resource extraction and other activities) by konohiki (local managers), and maintaining a deep respect for, and intimate knowledge of, the environment. The MMB will work with the Native Hawaiian community and other cultural experts to identify how traditional knowledge and associated practices may be integrated into Monument management and research activities. A report on traditional knowledge and management practices, including recommendations for integrating these perspectives into management of the NWHI, will be developed to guide implementation.

Strategy NHCH-4: Plan, develop, and implement a Monument Cultural Resources Program over the life of the plan.

All cultural resources in the NWHI are under the jurisdiction of the Monument, and therefore the MMB will support efforts to protect these important elements, including archaeological sites and the sacred resources of the NWHI, according to the parameters and conditions included within Sections 106 and 110 of the National Historic Preservation Act. This strategy may include documenting and evaluating the NWHI as a Traditional Cultural Property and development of a Cultural Resources Program to fully integrate cultural resource protection into Monument management (see Activity HR-3.2 in Section 3.1.3, Historic Resources Action Plan).

Activity NHCH-4.1: Prepare a Cultural Resources Program Plan.
Within 18 months, the MMB will initiate the development of a Cultural Resources Program Plan, in partnership with the Native Hawaiian Cultural Working Group, cultural practitioners and experts, and others. As part of the plan development, the program partners will identify cultural resources, sites, and other locations within the Monument that are appropriate for use in contemporary Native Hawaiian protocols. In addition, the plan will include policies and procedures on the collection, curation, and disposition of archaeological materials, other artifacts, and human remains. The MMB and partners will complete the plan within two years of initiation.

Activity NHCH-4.2: Develop and implement specific preservation and access plans, as appropriate, to protect cultural sites at Nihoa and Mokumanamana.
Both Nihoa and Mokumanamana are recognized as culturally significant, are listed on the National Register of Historic Places, and are protected by the FWS in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended, and the National Historic Preservation Act of 1966. To further protect these sites, preservation plans for both islands will be developed and implemented, as will access plans for other cultural elements and yet-to-be discovered sites within the Monument. These preservation plans will address the monitoring and stabilization of cultural sites and return/repatriation agreements with museums and institutions that house the artifact collections. These preservation plans will be initiated within 18 months.

Activity NHCH-4.3: Initiate implementation of the Monument Cultural Resources Program.
Within six months of completion of the Cultural Resources Program Plan, the MMB will initiate the strategies and activities contained within the plan.

Strategy NHCH-5: Provide cultural outreach and educational opportunities to serve the Native Hawaiian community and the general public over the life of the plan.

Native Hawaiian values and cultural information will be used to guide outreach and education programs to serve both Native Hawaiians and the general public. Native Hawaiian values and resource management practices can be relevant to multiple audiences and help to provide a more complete understanding of the NWHI and the need to protect its ecosystems and other cultural resources. Permittee education and outreach programs will target Monument users.

As requested by the Native Hawaiian Cultural Working Group, staff will strive to provide more outreach to the Native Hawaiian community so that the cultural information compiled and incorporated into Monument materials reaches Native Hawaiians, many of whom otherwise may not have access to such information. Developing culturally relevant materials can also make information more accessible and engaging to Native Hawaiians. For example, making Hawaiian language tours available at Mokupāpapa Discovery Center would increase the center's value and accessibility to Hawaiian language immersion school groups as a culturally relevant learning tool. The Native Hawaiian Cultural Working Group, Native Hawaiian community leaders, cultural experts, and others will be consulted for cultural accuracy and appropriateness and for input on how information is used and shared.

Activity NHCH-5.1: Integrate Native Hawaiian values and cultural information into general outreach and education programs.

Cultural information and traditional Native Hawaiian values will be infused into education and outreach materials aimed at the general public. The "Navigating Change" program, school curricula, promotion of Hawaiian place names in Monument materials, videos, articles, and the lecture series at Mokupāpapa are some of the ways the MMB will accomplish this activity (see Sections 3.5.2 and 3.5.4, Constituency Building and Outreach and Ocean Ecosystems Literacy Action Plans).

Activity NHCH-5.2: Develop a culturally based strategy for education and outreach within the Native Hawaiian community.

This strategy, to be developed within three years, includes making information relevant, attractive, and accessible to Native Hawaiians. Outreach and education designed with and for Native Hawaiians will be accomplished through special events, cultural groups, schools (K-12), and colleges. Products that may be developed include videos and public television programs, publications, and school curricula. Traditional products will be encouraged, such as hula, mele, and oli. The MMB will continue to utilize ʻŌlelo Hawaiʻi in outreach and education materials and programs as appropriate (see Sections 3.5.2 and 3.5.4, Constituency Building and Outreach and Ocean Ecosystems Literacy Action Plans).

Activity NHCH-5.3: Integrate Native Hawaiian values and cultural information into the Monument permittee education and outreach program.

Within two years, the MMB will provide appropriate cultural information and guidelines to all Monument users and will help in fostering a deeper respect for the NWHI through better understanding of, and respect for, Hawaiian values and the cultural significance of the place (see Section 3.4.1, Permitting Action Plan). This activity includes, but is not limited to, the cultural briefing required prior to any permitted access to the Monument; the creation of a course for permit applicants that would engage in experiential approaches to maximize learning through various modalities; the development of a cultural observer program; and the creation of comprehensive research sources, such as willing cultural experts, libraries, and electronic databases of cultural and historical information with security layers for confidential information, which will assist applicants in appropriately completing permit applications.

Table 3.1.2 Summary of Strategies, Activities, and Agency Leads for Native Hawaiian Culture and History

Strategies and Activities	Agency Lead
Strategy NHCH-1: Identify and prioritize scientific and Native Hawaiian cultural research needs within 18 months.	
Activity NHCH-1.1: Identify research needs that can be accomplished through anthropological, archaeological, historical, and Hawaiian cultural methods.	OHA
Activity NHCH-1.2: Develop cultural research priorities alongside associated management challenges and opportunities.	OHA
Strategy NHCH-2: Conduct, support, and facilitate Native Hawaiian cultural access and research of the NWHI over the life of the plan.	
Activity NHCH-2.1: Continue to compile information and conduct new cultural and historical research about the NWHI.	OHA
Activity NHCH-2.2: Support Native Hawaiian cultural research needs.	NOAA OHA State of Hawai‘i FWS
Activity NHCH-2.3: Facilitate cultural field research and cultural education opportunities annually.	NOAA OHA
Activity NHCH-2.4: Convene a Native Hawaiian nomenclature working group.	OHA
Activity NHCH-2.5: Incorporate cultural resources information into the Monument Information Management System.	NOAA
Activity NHCH-2.6: Continue to facilitate Native Hawaiian cultural access.	OHA
Activity NHCH-2.7: Establish agreements with local universities and museums to address possible curation, research, use, return, and repatriation of collections.	FWS
Strategy NHCH-3: Increase cultural resource management capacity across MMB agencies over the life of the plan.	
Activity NHCH-3.1: Assess Monument cultural resource capacity.	OHA
Activity NHCH-3.2: Engage Native Hawaiian practitioners and cultural experts and the Native Hawaiian Cultural Working Group in the development and implementation of the Monument’s management activities.	OHA
Activity NHCH-3.3: Increase knowledge base of Native Hawaiian values and cultural information through “in-reach” programs for resource managers.	OHA NOAA
Activity NHCH-3.4: Identify and integrate Native Hawaiian traditional knowledge and management concepts into Monument management.	OHA
Strategy NHCH-4: Plan, develop, and implement a Monument Cultural Resources Program over the life of the plan.	
Activity NHCH-4.1: Prepare a Cultural Resources Program Plan.	FWS
Activity NHCH-4.2: Develop and implement specific preservation and access plans, as appropriate, to protect cultural sites at Nihoa and Mokumanamana.	FWS
Activity NHCH-4.3: Initiate implementation of the Monument Cultural Resources Program.	FWS

Strategies and Activities	Agency Lead
Strategy NHCH-5: Provide cultural outreach and educational opportunities to serve the Native Hawaiian community and the general public over the life of the plan.	
Activity NHCH-5.1: Integrate Native Hawaiian values and cultural information into general outreach and education programs.	NOAA
Activity NHCH-5.2: Develop a culturally based strategy for education and outreach within the Native Hawaiian community.	NOAA
Activity NHCH-5.3: Integrate Native Hawaiian values and cultural information into the Monument permittee education and outreach program.	OHA

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3.1.3 Historic Resources Action Plan

Links to other Action Plans	
3.1.2	Native Hawaiian Culture and History
3.1.4	Maritime Heritage
3.6.3	Coordinated Field Operations

Links to goals
Goal 5
Goal 7
Goal 8

Desired Outcome

Identify, document, preserve, protect, stabilize, and where appropriate, reuse, recover, and interpret historic resources associated with Midway Atoll and other historic resources within Papahānaumokuākea Marine National Monument.

Current Status and Background

NOAA and FWS comply with the Federal Archaeological Program, a collection of laws and regulations that pertain to the protection of historical and archaeological properties on federal and federally managed lands. The National Historic Preservation Act directs all federal agencies to develop programs to protect historical and archaeological resources. Section 106 requires agencies to consider the potential impacts of their actions. Section 110 requires agencies to actively search for archaeological resources and to assess them for their significance and eligibility for inclusion in the National Register of Historic Places. The locations of cultural and historic resources are considered sensitive data and are not openly released even through the Freedom of Information Act. State agencies comply with similar state laws for protection of historic and cultural resources.

For the purposes of the Monument Management Plan, historic resources are the non-marine sites, structures, artifacts, in the Monument associated with the historic period (after first Western contact with Native Hawaiians in 1778). Historic resources in the Monument fall into two broad categories: Midway Atoll historic period resources, and those elsewhere in the Monument.

At Midway Atoll, historic period cultural resources include 63 structures and buildings eligible for inclusion in the National Register of Historic Places. These historic properties are mostly associated with World War II, the Battle of Midway National Historic Landmark and Memorial, and the early 20th-century Commercial Pacific Cable Company. Section 1.3 describes the history and context of the historic properties that remain on Midway Atoll. FWS currently manages the historic properties at Midway Atoll according to a Programmatic Agreement (Programmatic Agreement 1996) and Historic Preservation Plan (Speulda et al. 1999).

Jurisdiction and control of Midway Atoll were transferred from the Navy to the FWS in 1996 by Executive Order 13022. In preparation for the transfer, the Navy identified, evaluated, and mitigated effects on the 63 historic properties. The Navy conducted this effort in consultation with the Pacific Division of the Naval Facilities Engineering Command, FWS, Advisory Council on Historic Preservation, National Park Service, State Historic Preservation Officer of the State of Hawaiʻi, Sixth Defense Battalion of the U.S. Marine Corps, Defenders of Midway Islands Reunion Association, and International Midway Memorial Foundation. The consultation resulted in a Programmatic Agreement for the treatment of the 63 historic properties (Programmatic Agreement 1996). One of the stipulations in the Programmatic Agreement directed the FWS to prepare a Historic Preservation Plan for long-term management of the 63 historic properties. FWS completed the plan in 1999 (Speulda et al. 1999).

The Midway Atoll Historic Preservation Plan focuses on long-term management and treatment for each of the 63 historic properties. It also identifies procedures for treating new discoveries and caring for museum collections, and includes recommendations for interpretation, education, and public outreach.

The Programmatic Agreement and Historic Preservation Plan prescribe one of six different treatment categories to each of the 63 historic properties. The treatment categories are (1) reuse, (2) secure, (3) leave as-is, (4) fill in, (5) demolish, or (6) relocate. Many factors were used to assign the treatment category for a historic property, including historic importance, interpretive value, overall setting, association with key historic themes, and structural integrity. The determinations were made in consideration of recommendations from interest groups, specialists, and the Advisory Council on Historic Preservation.

In the treatment category assignments, 23 buildings and structures were identified for reuse, including the Officers' housing; carpentry, machine, and transportation shop buildings; the refrigeration plant; the recreation facility; the seaplane hangar and ramp; and water reservoirs. Thirteen buildings were slated for securing and stabilization in place, including the command post, radar buildings, power plant, and the cable station buildings. Twenty structures were placed in the "leave as-is" category and will deteriorate in place under natural environmental conditions. These properties include the Eastern Island gun, runways, and revetments, and the Sand Island cemetery, Japanese gravestones, two 5-inch guns, and gun batteries. Four properties were filled with sand, including a pillbox and an underground bunker. Fifteen properties were slated for demolition, including the N.O.B. armory, the submarine base buildings, the general storehouse and air terminal building, two barracks, and the blackout hangar and associated shops. Three objects were identified for removal to a secure location, including a torpedo, a pillbox turret, and submarine netting.

Beyond the abundant, significant, and dramatic historic resources at Midway Atoll, few other significant historic resources within the Monument are presently known. As outlined in Section 1.3, the post-contact history of the Monument archipelago beyond Midway is rich and varied. However, the present record of tangible non-marine sites that relate to this history is small. This is because historians and archaeologists simply have not spent much time researching locations on the islands and atolls of the Monument for evidence of post-contact historical events such as shipwreck survivor camps, bird and other resource extraction camps, or World War II facilities.

Need for Action

Although the Midway Atoll Programmatic Agreement and Historic Preservation Plan are still in force, they need to be updated. Since the time the plan was written, in 1999, a visitor services plan has been adopted, lead-based paint abatement has become an important priority, and the Monument has been created. Furthermore, the Sixth Defense Battalion of the U.S. Marine Corps and Defenders of Midway Islands Reunion Association and the International Midway Memorial Foundation continue to maintain strong interest in the preservation and interpretation of historic resources at Midway Atoll. The historic properties require continual repair and maintenance according to the terms of the Historic Preservation Plan and the Secretary of the Interior's Standards for the Treatment of Historic Properties. The effects of weathering and erosion by salt water, salt spray, salty soils, precipitation, plant growth, solar radiation, and wind continue to threaten the integrity of the historic properties at Midway Atoll.

Among the islands that compose the Monument beyond Midway Atoll, surveys are needed to identify and evaluate historic resources that relate to shipwreck survivor camps, bird and other resource extraction camps, and World War II facilities. Beyond the historic resources of Midway Atoll, the other atolls and islands of the Monument have histories and associated historic resources that relate to the post-contact history of exploration, commerce, war, and conservation of the Monument.

Strategies to Achieve the Desired Outcome

The strategies and associated activities in this action plan constitute a historic resource program of identification, documentation, protection, preservation, reuse, and interpretation of the varied historic resources in the Monument. The Monument Management Plan calls for the implementation of a range of activities that preserve, stabilize, reuse, rehabilitate, and interpret the historic structures and the stories and artifacts associated with them.

Seven strategies have been developed for achieving the desired outcome of identifying, interpreting, and protecting historic resources in the NWHI. The strategies and activities are coded by the acronym for the action plan title, "Historic Resources" (HR). A summary of strategies and activities is provided in Table 3.1.3 at the end of this action plan.

- HR-1: Update the Midway Atoll Historic Preservation Plan to meet the present needs of the Refuge and Monument within one year.
- HR-2: Implement, supervise, and monitor the historic preservation treatments identified in the Midway Atoll Historic Preservation Plan at two historic properties each year.
- HR-3: Prepare an updated Battle of Midway National Historic Landmark nomination within four years.
- HR-4: Improve the function and capacity of the Midway museum within eight years.
- HR-5: Document and inventory historic resources beyond Midway Atoll NWR within 15 years.
- HR-6: Conduct archaeological and historical research on the historical events and structures at Midway Atoll NWR within 15 years.

Strategy HR-1: Update the Midway Atoll Historic Preservation Plan to meet the present needs of the Refuge and Monument within one year.

The Midway Historic Preservation Plan was written in 1999. Since then, a visitor services plan has been adopted, lead-based paint abatement has become an important priority, and the Monument has been designated. The historic properties require continuous repair and maintenance according to the terms of the Historic Preservation Plan and the Secretary of the Interior's Standards for the Treatment of Historic Properties. The effects of weathering and erosion by salt water, salt spray, salty soils, precipitation, plant growth, solar radiation, and wind continue to threaten the integrity of the historic properties at Midway Atoll NWR. Within one year of Monument Management Plan approval, the Monument partners will update the Historic Preservation Plan and reconcile it with the existing Midway Visitor Services Plan and the lead-based paint removal plan.

Activity HR-1.1: Reconcile the Historic Preservation Plan with the Midway Visitor Service Plan, lead-based paint abatement plan, and other facilities maintenance and use plans.
This activity will require consultation and coordination among refuge program specialists and the MMB to align priorities and needs among these plans. The needs of the Historic Preservation Plan will be balanced with the priorities of lead-based paint removal, visitor services, habitat management, and management infrastructure.

Activity HR-1.2: Submit the updated Historic Preservation Plan for approval to the Advisory Council on Historic Preservation and Monument partners.
The updated Historic Preservation Plan may lead to the preparation of additional documents to support its implementation.

Strategy HR-2: Implement, supervise, and monitor the historic preservation treatments identified in the Midway Atoll Historic Preservation Plan at two historic properties each year.

The Midway Atoll Historic Preservation Plan (Speulda et al. 1999) and its enabling authorities (National Historic Preservation Act of 1966 and the Programmatic Agreement for Treatment of Historic Properties at Midway) have prescribed specific historic preservation treatments for the 63 historic properties at Midway Atoll NWR. Implementing this prescription requires a program that identifies needs and procedures and supervises the conduct of preservation treatments at the properties. This strategy will be coordinated with the facilities operation plan and the lead-based paint abatement priorities. An important activity in this strategy is to adaptively reuse historic buildings and structures at Midway Atoll NWR. Many of Midway's historic properties can serve the need for administrative and public space as Monument activities grow.

Activity HR-2.1: Within three years, create dedicated capacity to implement the updated Historic Preservation Plan.
Limited staff and funds currently exist at the Midway Atoll NWR or among the Monument management agencies for historic preservation and cultural and historic resources management. Agencies will identify staff needs and work toward building staff capacity to carry out the strategies and activities contained within this and related action plans. Staffing needs will be identified and included in the development of the Monument Cultural Resources Program plan (see Section 3.1.2, the Native Hawaiian Culture and History Action Plan).

Activity HR-2.2: Annually train Monument staff and the Midway contractors on the content of the Historic Preservation Plan and implementation of appropriate treatments.
All Midway personnel who are involved in maintaining Midway Atoll infrastructure need to be aware of the historic preservation responsibilities and procedures on the atoll. This will ensure that the use and maintenance of the historic properties occurs according to the treatment identified in the Historic Preservation Plan. Training media will be produced so that all new and visiting personnel and all regular permanent personnel stay current on historic preservation priorities on an annual basis.

Activity HR-2.3: Incorporate into the Midway Atoll visitor services program semiannual opportunities and events for visitors or volunteers to implement historic preservation treatments.

This activity will resurrect and refine the previous refuge program to recruit volunteers to help maintain historic properties, including painting, window restoration, and landscape maintenance.

Strategy HR-3: HR-3: Prepare an updated Battle of Midway National Historic Landmark nomination within four years.

The American victory at the Battle of Midway changed the course of World War II in the Pacific. The Battle of Midway National Historic Landmark was created in 1986 to honor this great achievement and the sacrifices of those involved. The National Historic Landmark focuses on the remains of nine defensive positions on Midway's Sand Island that are directly associated with this historic battle. These include six magazines, a pillbox, a 3-inch gun emplacement at Battery D, and 5-inch gun emplacements at Battery C. We now have a better understanding of historic features at Midway that played an important role in the battle. As a result, it is appropriate to update this important ensemble of National Historic Landmark features. Additional structures to consider for inclusion in the National Historic Landmark include Battery A, which had not been located when the National Historic Landmark was drafted; the underground bunker on south beach; and the south beach pillbox (S-6). The Eastern Island runways will also be considered for inclusion in the National Historic Landmark.

Activity HR-3.1: Identify, collect, and review publications, data sets, and documents on the National Historic Landmark within two years of Monument Management Plan adoption.
Archival research is the first step to identify resources that may be appropriate to include in the National Historic Landmark.

Activity HR-3.2: Plan and conduct a field survey and documentation of selected National Historic Landmark sites and features within two years.
Standard historical archaeological practice will be exercised in this activity.

Activity HR-3.3: Consult with interested parties and update the National Historic Landmark nomination within four years.
This activity includes evaluation of the findings, preparation of a report, an updated National Historic Landmark nomination, and consultation with the Advisory Council on Historic Preservation, the National Park Service National Historic Landmark staff, the Hawai'i State Historic Preservation Office, and interested and knowledgeable parties such as the Sixth Defense Battalion of the U.S. Marine Corps and Defenders of Midway Islands Reunion Association, and the International Midway Memorial Foundation.

Activity HR-3.4: Implement repair and maintenance treatments at National Historic Landmark features within six years.
The National Historic Landmark features require periodic repair and maintenance. Depending on the treatment, some of the repair and maintenance can be accomplished by volunteers or other unskilled labor, while other repair work will require the involvement of specially trained historic preservation architects and engineers.

Strategy HR-4: Improve the function and capacity of the Midway museum within eight years.

The Midway museum should be a general repository containing written material, photographs, artifacts, oral histories, and personal memorabilia relating to Midway's history. The museum should include a climate-controlled storage area, as well as research desks and tape recording and listening booths. The Midway museum should be a unique repository for records and materials useful for interpreting the history and natural history of Midway Atoll.

Activity HR-4.1: Prepare a Scope of Collections Statement within five years.
The Scope of Collections Statement document will help define the scope and types of documents, artifacts, and other historic materials that may be donated, or otherwise acquired by Monument staff for proper museum curation.

Activity HR-4.2: Remodel the Midway museum space within seven years.
This activity will remodel the Midway museum space to meet the needs of the Scope of Collections Statement and the visiting public and to preserve the artifacts and historical materials according to the museum curation standards set forth by the U.S. Department of the Interior Manual 411 DM (U.S. Department of the Interior 1997).

Activity HR-4.3: Organize and curate collections within eight years.
Organize and curate Midway Museum collections according the museum curation standards set forth by the DOI (411 DM).

Strategy HR-5: Document and inventory historic resources beyond Midway Atoll NWR within 15 years.

Studying and protecting historic resources beyond Midway Atoll begins with basic documentary research and field site surveys. These activities are similar to those involved with ecosystem research. Both involve consolidation of past research and archival data and field inventory of non-marine areas within the Monument. Historic resource surveys are compatible with planned multitasking missions, interagency cooperation, and operational efficiency.

Activity HR-5.1: Identify, collect, and review publications, data sets, and documents within 12 years.
Archival research is the first step to identify historic resources that may occur on other islands and atolls in the archipelago beyond Midway.

Activity HR-5.2: Plan, conduct, and report on field surveys and documentation of selected sites within 15 years.
Standard historical archaeological practice will be exercised in this activity.

Strategy HR-6: Conduct archaeological and historical research on the historical events and structures at Midway Atoll NWR within 15 years.

Much has been written and documented about the history and historic properties at Midway Atoll, particularly with respect to its role in World War II. However, Midway's history is rich and varied. Many nontraditional perspectives and sources of information have yet to be investigated. A healthy and responsible historic preservation program at Midway will conduct new research.

Activity HR-6.1: Begin a long-term annual program to compile, collect, curate, and publish oral histories of life on Midway Atoll within 3 years.

From the Commercial Pacific Cable Station era to World War II and through the Cold War, many people have lived on or visited Midway Atoll. Their stories provide a perspective on Midway, commerce, and war that is rarely captured in standard histories and official documents. Some of these personal oral histories have been recorded; many others need to be collected. This activity will ensure that alternative perspectives on the unique history of Midway Atoll will not be lost to the passing of the ages.

Activity HR-6.2: Conduct archaeological investigation of the Commercial Pacific Cable Station site within ten years.

The Commercial Pacific Cable Station era was a unique chapter in the history of Midway Atoll. Archaeological and historical research, including excavation, will shed light on the lifestyle and struggles of Midway's earliest permanent residents.

Table 3.1.3 Summary of Strategies, Activities, and Agency Leads for Historic Resources

Strategies and Activities	Agency Lead
Strategy HR-1: Update the Midway Atoll Historic Preservation Plan to meet the present needs of the Refuge and Monument within one year.	
Activity HR-1.1: Reconcile the Historic Preservation Plan with the Midway Visitor Service Plan, lead-based paint abatement plan, and other facilities maintenance and use plans.	FWS
Activity HR-1.2: Submit the updated Historic Preservation Plan for approval to the Advisory Council on Historic Preservation and Monument partners.	FWS
Strategy HR-2: Implement, supervise, and monitor the historic preservation treatments identified in the Midway Atoll Historic Preservation Plan at two historic properties each year.	
Activity HR-2.1: Within three years, create dedicated capacity to implement the updated Historic Preservation Plan.	FWS
Activity HR-2.2: Annually train Monument staff and the Midway contractors on the content of the Historic Preservation Plan and implementation of appropriate treatments.	FWS
Activity HR-2.3: Incorporate into the Midway Atoll visitor services program semiannual opportunities and events for visitors or volunteers to implement historic preservation treatments.	FWS
Strategy HR-3: HR-3: Prepare an updated Battle of Midway National Historic Landmark nomination within four years.	
Activity HR-3.1: Identify, collect, and review publications, data sets, and documents on the National Historic Landmark within two years of Monument Management Plan adoption.	FWS
Activity HR-3.2: Plan and conduct a field survey and documentation of selected National Historic Landmark sites and features within two years.	FWS
Activity HR-3.3: Consult with interested parties and update the National Historic Landmark nomination within four years	FWS
Activity HR-3.4: Implement repair and maintenance treatments at National Historic Landmark features within six years.	FWS
Strategy HR-4: Improve the function and capacity of the Midway museum within eight years.	
Activity HR-4.1: Prepare a Scope of Collections Statement within five years.	FWS
Activity HR-4.2: Remodel the Midway museum space within seven years.	FWS
Activity HR-4.3: Organize and curate collections within eight years.	FWS
Strategy HR-5: Document and inventory historic resources beyond Midway Atoll NWR within 15 years.	
Activity HR-5.1: Identify, collect, and review publications, data sets, and documents within 12 years.	FWS
Activity HR-5.2: Plan, conduct, and report on field surveys and documentation of selected sites within 15 years.	FWS
Strategy HR-6: Conduct archaeological and historical research on the historical events and structures at Midway Atoll NWR within 15 years.	
Activity HR-6.1: Begin a long-term annual program to compile, collect, curate, and publish oral histories of life on Midway Atoll within three years.	FWS
Activity HR-6.2: Conduct archaeological investigation of the Commercial Pacific Cable Station site within ten years.	FWS

3.1.4 Maritime Heritage Action Plan

Links to other Action Plans	
3.1.2	Native Hawaiian Culture and History
3.1.3	Historic Resources Action Plan
3.3.4	Emergency Response and Natural Resource Damage Assessment
3.4.1	Permitting
3.5.3	Native Hawaiian Community Involvement

Links to goals
Goal 3
Goal 4
Goal 5
Goal 7

Desired Outcome

Identify, interpret, and protect maritime heritage resources in Papahānaumokuākea Marine National Monument.

Current Status and Background

The maritime heritage of the NWHI began hundreds, if not thousands, of years ago with Polynesian and Native Hawaiian voyages across the Hawaiian archipelago and beyond. This history, the lessons this history provides, and the need to further the understanding of this heritage are critical and are dealt with in other areas of this Monument Management Plan (see Section 3.1.2, the Native Hawaiian Culture and History Action Plan, and Section 3.5.3, the Native Hawaiian Community Involvement Action Plan).

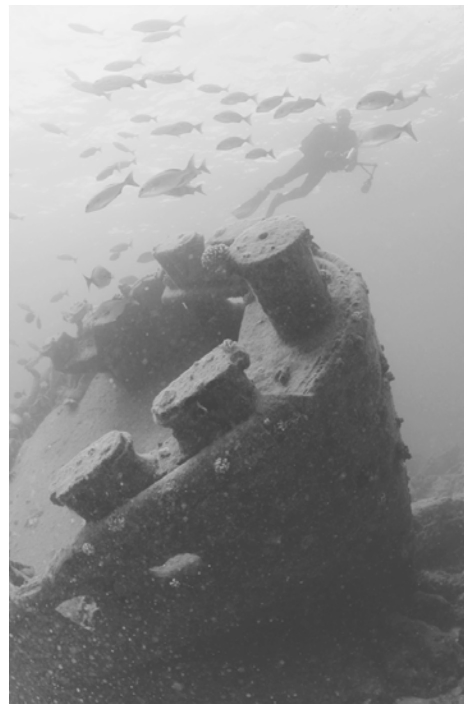
A preliminary survey of the maritime heritage resource base began during the Northwestern Hawaiian Islands Reef Assessment and Monitoring Program research expedition in 2002 and continued in 2003, with annual surveys beginning in 2005. Initial investigations in the NWHI led to the discovery of the naval steamer USS *Saginaw*, wrecked in 1870, the submarine rescue vessel USS *Macaw*, lost in 1944, the sailing ship *Carrollton*, lost in 1906, and the whale ship *Parker*, lost in 1842. In 2004, NOAA divers located the remains of the British whaling ships *Pearl* and *Hermes*, lost in 1822. These two archaeological sites provide a unique material record of historic activities, being the oldest wrecks yet found in the Hawaiian Islands and the only known whalers of the British South Seas Company in the world. Annual surveys provide for continued documentation and discovery of new maritime heritage sites. Applying heritage practices to maritime resources challenges society to value what has only too often been considered out of sight and out of mind.

Best practices in the maritime heritage field, at both the national and international levels, highlight similarities between heritage preservation and natural resources conservation. These best practices aim to value maritime heritage resources in a manner that complements, rather than conflicts with, ecosystem management. While excavation may be appropriate in certain circumstances, in situ management is considered the first or preferred alternative in the overall research design. In situ management does not preclude recovery, but does set forth a “precautionary” approach in terms of the artifacts and their environment. Proposed heritage work in the NWHI region emphasizes a low-impact approach, to an extent consistent with the Monument’s conservation goals and guiding principles. The coordinated management of heritage and natural resources is achieved through a unified permitting process.

Need for Action

For the purposes of this Monument Management Plan, the definition of maritime heritage resources includes submerged and beached shipwrecks, aircraft, and other sites of historical, cultural, and archaeological significance. These resources have not been adequately inventoried or protected within the NWHI. The main Hawaiian Islands have experienced the illegal removal of historic artifacts, as well as the potential destruction of historic material from nearshore construction and dredging projects. By comparison, NWHI maritime heritage resources are relatively intact and undisturbed. NOAA, the State of Hawai'i, and FWS have the statutory responsibility to inventory, evaluate, and interpret these heritage resources, and together increase maritime heritage preservation in the Monument and awareness of these unique resources throughout the State.

NOAA, the State of Hawai'i, and FWS share similar goals of heritage resource preservation in the Monument. Protection and management of sites that meet established heritage criteria are mandated by state and federal preservation laws. Maritime heritage resources, when properly studied and interpreted, add an important dimension to our understanding and appreciation of our nation's rich maritime legacy, and make us more aware of the critical need to be wise stewards of our ocean planet.



NOAA diver surveys the USS *Macaw* remains off Midway Atoll . Photo: James Watt

NOAA and FWS comply with the Federal Archaeological Program, a collection of laws and regulations that pertain to the protection of historical and archaeological properties on federal and federally managed lands. The National Historic Preservation Act directs all federal agencies to develop programs to protect historical and archaeological resources. Section 106 requires agencies to consider the potential impacts of their actions, including the review of permit applications for projects that may allow the disturbance of the seabed, where archaeological remains may lie. Section 110 requires agencies to actively search for archaeological resources and to assess them for their significance and eligibility for inclusion in the National Register of Historic Places. This action plan presents strategies and activities for addressing maritime heritage resource management and protection needs in the Monument. To this end, each program or agency may contribute its own particular expertise: the Maritime Heritage Program, under NOAA's Office of National Marine Sanctuaries (ONMS), features field survey skills in underwater archaeology; FWS manages its comprehensive cultural resources program; and the State of Hawai'i Department of Land and Natural Resources provides the context of the state inventory.

Strategies to Achieve the Desired Outcome

The strategies and associated activities in this action plan are designed to increase our understanding of maritime heritage resources and foster effective and protective management in the Monument. These strategies will be carried out in collaboration with maritime heritage staff of ONMS, Pacific Islands Region; the Historic Preservation Division of the State Department of Land and Natural Resources; and the FWS Cultural Resources Team.

Three strategies have been developed for achieving the desired outcome of identifying, interpreting, and protecting maritime heritage resources in the NWHI. The strategies and activities are coded by the acronym for the action plan title, “Maritime Heritage” (MH). A summary of strategies and activities is provided in Table 3.1.4 at the end of this action plan.

- MH-1: Document and inventory maritime heritage resources throughout the life of the plan.
- MH-2: Incorporate maritime heritage into public education and outreach throughout the life of the plan.
- MH-3: Coordinate interagency efforts to protect maritime heritage resources for the life of the plan.

Strategy MH-1: Document and inventory maritime heritage resources throughout the life of the plan.

Studying and protecting maritime heritage resources begin with basic documentary research and field site surveys. These activities are similar to those involved with ecosystem research. Both involve consolidation of past research and archival data, scientific SCUBA diving operations, and bathymetric mapping and remote sensing surveys. Maritime heritage surveys are compatible with planned multitasking missions, interagency cooperation, and operational efficiency.

Activity MH-1.1: Identify, collect, and review publications, data sets, and documents annually.
Archival research and review of existing documents are the first steps in creating and confirming the maritime heritage resource inventory in the NWHI, as well as in formulating an effective field survey plan. Documents from at least two maritime heritage sites will be added to the site database per year.

Activity MH-1.2: Plan and carry out coordinated field mapping surveys of selected sites annually.
Conducting field mapping surveys is the next step in understanding and interpreting heritage sites. Techniques can include shoreline terrestrial survey and inventory; marine remote sensing using magnetometer and side-scan sonar to locate potential heritage targets; and noninvasive diving surveys to assess and inventory sites (Dean 1992). These phases generally take place during multidisciplinary research cruises and are the result of coordinated interagency planning. Results are incorporated into a comprehensive Monument maritime heritage resource inventory maintained by ONMS. As an ongoing annual activity, maritime heritage field surveys will be conducted and progress reports will be completed annually.

Activity MH-1.3: Complete a status report on potential environmental hazards within 1 year, and update it annually.
Wreck sites and other debris can represent potential environmental hazards that may be identified through field survey work. The MMB will be informed of any discovered potential hazards in order to assess the need for response or remediation (see Section 3.3.4, Emergency Response and Natural Resource Damage Assessment Action Plan). A status report on potential environmental hazards from wreck sites, disposal, etc. will be compiled by year 1 and updated annually.

Activity MH-1.4: Develop status report on maritime heritage artifact recovery operations within two years, and recover and conserve maritime heritage artifacts as appropriate.
When excavation and analysis of material remains are appropriate for site interpretation, and when these tasks can be done in a manner that respects the integrity of the ecosystem and the environmental goals of the Monument, recovery of selected artifacts is a way of bringing the data to the public, rather than taking more visitors to the NWHI site. Such recovery will be carried out through the established permitting processes of the Monument (see Section 3.4.1, Permitting Action Plan, and Appendix A). A status report on potential and completed maritime heritage recovery operations will be completed by year 2 and updated annually.

Activity MH-1.5: Develop and implement an internal maritime heritage resource database within 5 years.
An internal database of known maritime heritage resources will be established and maintained by the Monument maritime archaeologist for the prioritization of targets, to be completed by year 5.

Strategy MH-2: Incorporate maritime heritage into public education and outreach throughout the life of the plan.

Raising public awareness of the maritime heritage field is essential to better valuing and protecting the resource. Protection comes through understanding the nature of heritage resources and what we can learn from them, as well as familiarity with established preservation laws. Education and outreach efforts for maritime sites emphasize “bringing the place to the people, not the people to the place” in a responsible manner.

Activity MH-2.1: Incorporate maritime heritage materials into Monument education and outreach projects annually.
Resources and opportunities for collaboration for education and outreach are available through the MMB agencies and other entities. Monument maritime archaeologists will coordinate and participate in public outreach regarding Monument heritage resources and maritime history. Outreach efforts may include presentations, displays, still and video projects, and website materials. This activity includes potential support for the promotion of Native Hawaiian cultural outreach and education via Section 3.1.2, the Native Hawaiian Culture and History Action Plan.

Activity MH-2.2: Develop and deliver public maritime heritage educational materials at selected presentations, conferences, and events.
Shipwreck topics often appeal to large audiences at local, national, and international levels, and offer a chance to not only highlight the relatively new field of maritime heritage, but also to emphasize the unique nature of the NWHI, the need for conservation and ecosystem management, and the overall stewardship of all ocean resources. A minimum of two maritime heritage presentations will be given at professional conferences or public events each year.

Strategy MH-3: Coordinate interagency efforts to protect maritime heritage resources for the life of the plan.

Because of NOAA's previous maritime heritage work in the region, efforts to inventory, evaluate, interpret, and preserve maritime heritage resources in the NWHI will be coordinated by a staff maritime archaeologist through ONMS, and conducted in close collaboration and coordination with the MMB. Each program or agency provides expertise in related fields: maritime archaeology field survey (NOAA); museum program, terrestrial archaeology, and National Historic Preservation Act (NHPA) implementation (FWS); and state survey, inventory, and preservation (Department of Land and Natural Resources).

Activity MH-3.1: Coordinate interagency maritime heritage resources management annually.
Communication by the MMB with heritage preservation efforts on a larger scale is essential. Communication involves sharing research and preservation efforts in the Monument with the related professional fields of archaeology and cultural resource management, among others. Coordination of field activities is also necessary for the more effective use of facilities and equipment. Efforts to collaborate and coordinate will occur annually for the duration of the plan.

Activity MH-3.2: Enhance protective measures for selected sites within the NWHI through the National Register nomination process within 2 years.
Protection of specific heritage sites will be enhanced by federal recognition under the National Heritage Preservation Act and the National Register of Historic Places (Delgado 1985). Additionally, preservation measures of the Department of Land and Natural Resources will be implemented for resources on state submerged lands (up to 3 nautical miles from emergent lands) via the State Historic Preservation Division. Protective status for specific sites will be sought as needed using measures described above. This activity includes potential support for the protection and preservation of Native Hawaiian cultural resources discussed in the Native Hawaiian Culture and History Action Plan (Section 3.1.2). The National Register nomination process for maritime heritage sites will begin by year 2.

Activity MH-3.3: Develop and implement a Monument Maritime Heritage Research Plan within 2 years.
The Monument Maritime Heritage Resource Research Plan will be completed within 2 years. Working collaboratively with partner and local agencies, universities, and experts in the field, the MMB will develop a research plan that outlines maritime heritage priorities for the NWHI. This effort will be coordinated by the Monument maritime archaeologist.

Table 3.1.4 Summary of Strategies, Activities, and Agency Leads for Maritime Heritage

Strategies and Activities	Agency Lead
Strategy MH-1: Document and inventory maritime heritage resources throughout the life of the plan.	
Activity MH-1.1: Identify, collect, and review publications, data sets, and documents annually.	NOAA
Activity MH-1.2: Plan and carry out coordinated field mapping surveys of selected sites annually.	NOAA
Activity MH-1.3: Complete a status report on potential environmental hazards within one year, and update it annually.	NOAA
Activity MH-1.4: Develop status report on maritime heritage artifact recovery operations within 2 years, and recover and conserve maritime heritage artifacts as appropriate.	NOAA
Activity MH-1.5: Develop and implement an internal maritime heritage resource database within 5 years.	NOAA
Strategy MH-2: Incorporate maritime heritage into public education and outreach throughout the life of the plan.	
Activity MH-2.1: Incorporate maritime heritage materials into Monument education and outreach projects annually.	NOAA
Activity MH-2.2: Develop and deliver public maritime heritage educational materials at selected presentations, conferences, and events.	NOAA
Strategy MH-3: Coordinate interagency efforts to protect maritime heritage resources for the life of the plan.	
Activity MH-3.1: Coordinate interagency maritime heritage resources management annually.	NOAA
Activity MH-3.2: Enhance protective measures for selected sites within the NWHI through the National Register nomination process within 2 years.	NOAA
Activity MH-3.3: Develop and implement a Monument Maritime Heritage Research Plan within 2 years.	NOAA

3.2 Conserving Wildlife and Habitats

3.2.1 Threatened and Endangered Species Action Plan
3.2.2 Migratory Birds Action Plan
3.2.3 Habitat Management and Conservation Action Plan

3.2 Conserving Wildlife and Habitats

Coastal development in the main Hawaiian Islands has resulted in the destruction of natural habitats for many protected species, giving rise to the NWHI's function as a wildlife haven relatively undisturbed by human presence. A significant number of species found in the NWHI are at risk of extinction and depend upon the unique habitat found there for their survival. Ninety percent of the Hawaiian population of green turtles nests in the NWHI, and the majority of Hawaiian monk seals pup there. The NWHI also host one of the largest and most important assemblages of seabirds in the world.

Past human activities in the NWHI have left lasting habitat impacts in the form of sunken and grounded vessels, dilapidated buildings and structures, military sites, and introduced species that have become invasive. The remnants of these activities can sometimes pose a threat to wildlife and their natural habitat. Other impacts resulting from climate change pose significant threats to NWHI habitats and endangered species. To address these impacts, the FWS maintains a full-time presence at French Frigate Shoals, Laysan Island, and Midway Atoll to monitor wildlife, eliminate noxious weeds, restore native vegetation, prevent the extinction of native species, and clean up contaminated sites. NOAA maintains seasonal field camps at several islands to monitor Hawaiian monk seal populations and works with FWS at seasonal field camps at French Frigate Shoals. The State also maintains a part-time presence at Kure Atoll to undertake similar activities.

Action plans to take care of threatened and endangered species, migratory birds, and the habitats upon which they depend focus on undertaking on-the-ground conservation and management strategies. These strategies and activities focus on population enhancement through the maintenance and improvement of key ecosystem components. Many of the strategies and activities reflect information contained in the Hawai‘i Comprehensive Wildlife Conservation Strategy developed by the Hawai‘i Department of Land and Natural Resources (Mitchell et al. 2005) and were considered in the development of the Monument Management Plan.

Each action plan consists of a set of strategies to address a desired outcome. Over the next 15 years, these desired outcomes are:

- **Threatened and Endangered Species:** Safeguard and recover threatened and endangered plants and animals and other protected species within Papahānaumokuākea Marine National Monument.
- **Migratory Birds:** Conserve migratory bird populations and habitats within Papahānaumokuākea Marine National Monument.
- **Habitat Management and Conservation:** Protect, maintain, and where appropriate, restore the native ecosystems and biological diversity of Papahānaumokuākea Marine National Monument.

Action plans described in this section will be implemented in close coordination with agency partners and in conjunction with other priority management needs.

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3.2.1 Threatened and Endangered Species Action Plan

Desired Outcome
Safeguard and recover threatened and endangered plants and animals and other protected species within Papahānaumokuākea Marine National Monument.

Links to other Action Plans	
3.2.3	Habitat Management and Conservation
3.3.1	Marine Debris
3.3.2	Alien Species
3.4.1	Permitting Action Plan
3.5.1	Agency Coordination
3.5.4	Ocean Ecosystems Literacy
3.6.3	Coordinated Field Operations

Current Status and Background

Links to goals
Goal 1
Goal 3
Goal 4

Two federal acts, as well as multiple state statutes, protect specific species in the NWHI. The federal acts are the Endangered Species Act of 1973 (ESA) and the Marine Mammal Protection Act of 1972 (MMPA). The ESA provides for the conservation of species at risk of extinction throughout all or a significant portion of their range and the protection of critical habitats on which they depend. The ESA also gives individual states the option to assist in managing endangered species recovery programs. The MMPA provides for the protection and conservation of all marine mammals and their ecosystems, whether or not they are listed under the ESA. Because of the overlap of protections, this action plan's activities are directed at both ESA listed and non-ESA listed marine mammals. The State of Hawai‘i has additional protections for endangered species in its wildlife laws, which also affords other indigenous species treatment as threatened or endangered if criteria are met (HRS 195D, HRS 183D, HRS 125, and Hawai‘i Administrative Rules Title 13). The recovery plans issued pursuant to the ESA guide conservation efforts of threatened and endangered species. The most recent iterations of these plans were used to guide the strategies and activities under this action plan. Specific recovery activities for listed species are included in recovery plans, which may be accessed at: http://www.nmfs.noaa.gov/pr/recovery/plans.htm and http://www.fws.gov/endangered/recovery/index.html#plans. In addition, many of the strategies and activities are informed by Hawaii's Comprehensive Wildlife Conservation Strategy (Mitchell et al. 2005).

Hawaiian Monk Seal: The Hawaiian monk seal is in crisis. The population is in a decline that has lasted 20 years, and as of 2008, there were about 1,200 monk seals. Modeling predicts that the species' population will fall below 1,000 animals by the year 2012. Actions to date have not been sufficient to result in a recovering population. Most of the entire world population of Hawaiian monk seals breeds and forages inside the Monument. The recovery plan for the Hawaiian monk seal (NMFS 2007) provides a detailed description of actions that should be taken by NMFS and its collaborators to recover the species. This action plan details the ways the MMB can facilitate and support those efforts.

Cetaceans: In the NWHI, sighting and acoustic recordings of baleen whales as well as toothed whales and dolphins have been documented. Five species of baleen whales listed as "endangered" under the ESA and HRS 195D, and as "depleted" under the MMPA have been sighted or heard in the Monument area. In addition to these five, the endangered sperm whale and at least 18 other non-ESA listed species are found in the Monument (Barlow 2006). It has now been documented that groups of humpback whales are overwintering in the waters of the Monument, including whales with small calves and some that exhibit breeding behavior

(Johnston et al. 2007). Recovery actions for this listed species are summarized in the final recovery plan for the humpback whale, *Megaptera novaeangliae* (NMFS 1991). Draft recovery plans are available for the fin whale and sperm whale (NMFS 2006a, 2006b), and a final recovery plan is available for the blue whale (NMFS 1998).

Marine Turtles: Marine turtles that are known to occur in the Monument are the Hawaiian population of the green turtle and hawksbill, loggerhead, and leatherback turtles. While there are no records of the threatened olive ridley within Monument waters, their wide distribution throughout the tropical Pacific makes it likely that they do sometimes occur there. Green and loggerhead sea turtles are listed as threatened species; the hawksbill and leatherback turtles are listed as endangered species. Recovery plans are in place for each of these species in the Pacific and 5-year reviews were jointly published in 2007 (NMFS and FWS 1998a; 1998b; 1998c; 1998d; 1998e, 2007). Sea turtle population declines have occurred across the Pacific because of nesting habitat loss, harvesting of eggs and turtles for commercial and subsistence purposes, and fishery interactions. About 90 percent of nesting activity for the Hawaiian population of green turtles occurs in the NWHI at islets of French Frigate Shoals (Balazs and Chaloupka 2004a).

Birds: Five endangered bird species in the NWHI are afforded protection under the ESA and HRS 195D. Three species are passerines: the Laysan finch, found on Laysan Island and Pearl and Hermes Atoll, and the Nihoa finch and the Nihoa millerbird, which are endemic to Nihoa. Research, recovery, and management of these species take into consideration the recommendations of the Northwestern Hawaiian Islands Passerines Recovery Plan (FWS 1984), Hawaii's Comprehensive Wildlife Conservation Strategy for the Northwestern Hawaiian Islands (Mitchell et al. 2005) and ongoing input from species experts. Numerous sites were evaluated and ranked for translocation of these species to establish additional populations; this information and some recommendations for proceeding with translocation were provided recently by Morin and Conant (2007).

The Laysan duck has the most restricted range of any duck species and is especially vulnerable to extinction because of its small population size (fewer than 800 individuals) and extremely limited range. In 2004 and 2005, a total of 42 Laysan ducks were translocated to Midway Atoll NWR. Not all of these birds have reproduced, but the newly established population has grown since 2005 from 42 to a preliminary estimate of 192 birds in 2007 (Reynolds and Citta 2007). Additional activities are described in the Draft Revised Recovery Plan for the Laysan Duck (*Anas laysanensis*) (FWS 2004).

The short-tailed albatross breeds on Torishima, an island owned and administered by Japan. The short-tailed albatross was first observed at Midway Atoll between 1936 and 1941. Since then, one to four individuals have been observed every year in the NWHI. The Short-tailed Albatross Draft Recovery Plan (FWS 2005) provides suggestions for ways in which Monument staff can facilitate recovery of this species.

Plants: Six plant species known historically from the NWHI are listed as endangered. Three plant taxa have probably always been rare and restricted to Nihoa, although one species, the loulu or fan palm, also occurred on Laysan Island. *Mariscus pennatiformis* ssp. *bryanii* is known only from Laysan Island. *Cenchrus agrimonioides* var. *laysanensis* was historically known from

Laysan Island and Midway and Kure Atolls, but has not been seen there since about 1980 (O'Connor 1999; HBMP database 2007). A recovery plan for three species found only at Nihoa (Nihoa fan palm, *Schiedea verticillata*, and *Amaranthus brownii*) was finalized in 1998 (FWS 1998). Recovery actions for the other three species (*Cenchrus agrimonioides*, *Mariscus pennatiformis*, and *Sesbania tomentosa* or 'ohai) are described in the Recovery Plan for the Multi-Island Plants (FWS 1999).

Need for Action

A coordinated and comprehensive approach is required to understand and address specific threats (e.g., climate change, habitat loss) in order to protect and recover these 23 endangered or threatened species. Cooperation among the MMB agencies is crucial to ensure that management actions conducted in the Monument are effective in protecting and enhancing populations of these endangered species and marine mammals because the entire world population of many of these species occurs only, or almost entirely, within the Monument.

Strategies to Achieve the Desired Outcome

The strategies and associated activities in this action plan are designed to increase populations of threatened and endangered species and foster effective and protective management in the Monument. These strategies will be carried out in collaboration with and coordination by the Co-Trustees and other entities. The proposed activities in this Action Plan are characterized by more urgency, and perhaps in some cases more controversy, than those in some of the other action plans. Extra consideration is needed during prioritization of activities and in permitting in light of the high cost of failure to act. A great effort to coordinate with key stakeholder groups and the Native Hawaiian community will ensure that all interests have been identified. In addition to these management strategies for threatened and endangered species, additional and more detailed research and monitoring activities will be incorporated into the Natural Resources Science Plan.

Eight strategies have been developed for achieving the desired outcome of protecting marine mammals and aiding in the recovery of threatened and endangered plants and animals in the Monument. The strategies and activities are coded by the acronym for the action plan title, "Threatened and Endangered Species" (TES). A summary of strategies and activities is provided in Table 3.2.1 at the end of this action plan.

- TES-1: Support activities that advance recovery of the Hawaiian monk seal for the life of the plan.
- TES-2: Determine the status of cetacean populations and verify and manage potential threats over the life of the plan.
- TES-3: Ensure that nesting populations of green turtles at source beaches are stable or increasing for the life of the plan.
- TES-4: Work with the international recovery team for short-tailed albatrosses to facilitate an increase in the total breeding population of this species to at least 25 breeding pairs occurring on sites other than Torishima and Senkaku islands for the life of the plan.
- TES-5: Conduct activities to increase Laysan duck populations in the Monument over the life of the plan.

- TES-6: Maintain stable or increasing populations of the Laysan finch, Nihoa finch, and Nihoa millerbird in the Monument over the life of the plan.
- TES-7: Establish populations of each listed plant species on one to three additional Monument islands and ensure genetic material is also protected in approved repositories for the life of the plan.
- TES-8: Ensure protection of threatened and endangered species by facilitating Endangered Species Act consultations for Monument activities throughout the life of the plan.

Strategy TES-1: Support activities that advance recovery of the Hawaiian monk seal for the life of the plan.

For nearly 3 decades, a concerted effort has been made to save the Hawaiian monk seal. The U.S. Government, the State of Hawai‘i, nongovernment organizations, private-sector entities, and countless individuals in local communities across Hawai‘i have worked to recover the species. These efforts have not been sufficient to prevent a continued decline in the species. However, without these efforts, the situation would likely be much worse.

As recommended by the 2007 Recovery Plan for the Hawaiian Monk Seal, several key actions are required to address current and potential threats to the monk seal in attempts to alter the trajectory of the Hawaiian monk seal population and to move the species toward recovery. The most critical activities described in the plan that are applicable to the monk seal population in the Monument are to (1) investigate food limitations and take actions to increase female juvenile survival, (2) prevent entanglement of seals in marine debris, (3) reduce shark predation on seals, (4) reduce exposure to and spread of infectious disease, (5) continue population monitoring and research, (6) reduce impacts from grounded vessels, (7) reduce the impact of human interactions, and (8) conserve monk seal habitat.

To advance efforts on these key actions to address threats to monk seal survival and recovery, the MMB will pursue several key strategies in support of monk seal recovery efforts. These efforts will advance the objective of reversing the population decline of monk seal populations in the Monument and achieving a positive growth rate during the life of this plan.

Activity TES-1.1: Support marine debris removal activities to promote recovery.
Hawaiian monk seals have one of the highest documented entanglement rates of any pinniped species, and marine debris, such as derelict fishing gear, are chronic forms of pollution affecting the NWHI. The incidence of entangled monk seals at the breeding sites of the NWHI has been well documented and field staff actively disentangle seals. Cetaceans, sea turtles, and sea birds are also subjected to the detrimental effects of derelict fishing gear and other marine debris. Monument staff will support efforts to reduce marine debris as detailed in the strategies and activities in the Marine Debris Action Plan. These efforts, particularly in key monk seal habitat, will decrease the number of injuries and mortalities caused by entanglement (see Section 3.3.1, Marine Debris Action Plan).

Activity TES-1.2: Support and facilitate emergency response for monk seals.

The ability to respond to situations in the Monument that threaten monks seals, such as ship groundings, oil spills, and disease outbreak, requires a well-coordinated interagency effort and is constrained by limited transportation and logistical capabilities. Several agencies have response protocols, but further coordination and collaboration among the agencies will help minimize the effects during these events. Agreed-upon and standardized protocols will be put into place to ensure that a rapid and well-organized response, including assessment, proper collection of evidence, and continued monitoring, occurs during and after an event. The Monument can facilitate these types of responses through coordination, permitting, and transportation and logistical support.

Activity TES-1.3: Conserve Hawaiian monk seal habitat.
Consideration should be given to evaluating the loss of habitat caused by erosion and other factors (e.g., sea level rise) that have contributed to the loss of critical habitat for seals. Predicted increases in sea level this century and beyond may severely reduce the amount of habitat for seals to rest, breed, and rear their pups. Feasibility of restoration will be evaluated to consider rebuilding habitat essential for the reproduction of monk seals and other protected species (e.g., turtles and sea birds) at several alternative sites that could lead to rebuilding preferred, stable pupping habitat (i.e., accessibility, long shoreline, and stable beach).

Activity TES-1.4: Reduce the likelihood and impact of human interactions on monk seals.
Efforts will be made to ensure that all users of the NWHI are aware of the impacts of disturbing monk seals on breeding beaches and in nearshore waters. Any proposed activity in the Monument that may increase seal disturbance or threaten survival (such as nearshore ship traffic, beach use, noise, research, or any other impact that could negatively affect the marine or terrestrial habitat of the monk seal) should be scrutinized carefully during the permit review process to ensure recovery of the monk seal population is not hampered by the activity.

Activity TES-1.5: Support outreach and education on Hawaiian monk seals.
Increased outreach and education activities focused on the Hawaiian monk seal are now being conducted. Continuation of these activities will provide the public and interest groups with information to understand the critical status of the Hawaiian monk seal population and the urgent action that is needed to prevent extinction.

Activity TES-1.6 Reduce shark predation on monk seals.
More than two decades of monk seal studies indicate that predation by Galapagos sharks on pre-weaned pups is an unusual behavior, occurring primarily at French Frigate Shoals. These sharks are known to kill and injure Hawaiian monk seals, and more needs to be understood about shark abundance, prey preferences, and seasonal movement patterns. The problem should continue to be monitored. Site-specific mitigation plans and methods should be developed and implemented, as appropriate.

Strategy TES-2: Determine the status of cetacean populations and verify and manage potential threats over the life of the plan.

Management actions and efforts to reduce the impacts to cetaceans in the NWHI have been limited, largely because of sparse information on the distribution, abundance, and ecology of species using the Monument. Initial efforts should address this lack of information, which should then lead to the identification and management of threats.

Activity TES-2.1: Census cetacean populations.
In order to best develop management strategies for cetaceans in the Monument, surveys and observations will be pursued to gain information on species distribution and abundance estimates. This information will allow managers to better define humpback whale breeding and calving areas in the NWHI.

Activity TES-2.2: Conduct annual spinner dolphin mark and recapture photo identification surveys.
Annual spinner dolphin mark/recapture photo identification surveys will be continued at Midway, Kure, and Pearl and Hermes Atolls in order to maintain the only long-term data set (1998-2007) in the NWHI. The census may be expanded to other locales in the future.

Activity TES-2.3: Monitor, characterize, and address the effects of marine debris on cetaceans in the Monument.
Monument staff will reduce the potential for cetaceans to be adversely affected by marine debris. The long-term solution is ultimately a decrease in the amount of debris entering the ocean; strategies are included in Section 3.3.1, the Marine Debris Action Plan.

Activity TES-2.4: Respond to any suspected disease and unusual mortality incidents affecting cetaceans.
To date, no cases of a NWHI cetacean with an infectious disease have been documented. Should an ill cetacean be sighted, when feasible, the animal will be examined and sampled for a broad spectrum of possible diseases, treated appropriately, and monitored for recovery. Performing timely and complete necropsies with cetaceans will facilitate disease surveillance and monitoring in the NWHI. Contingency response plans will be developed to respond to disease outbreaks, mass strandings, and necessary human and material resources will be identified to initiate an appropriate response.

Activity TES-2.5: Prevent human interactions with cetaceans.
Efforts will be made to prevent negative human-cetacean interactions that may occur as a result of visitor programs or research activities through design controls on both. The controls will aim to prevent disturbance to cetaceans resting in Monument lagoons or nearshore areas and restrict geological research using sound levels known to be dangerous to marine mammals.

Strategy TES-3: Ensure that nesting populations of green turtles at source beaches are stable or increasing over the life of the plan.

The Hawaiian population of the green turtle is a discrete genetic stock of *Chelonia mydas* that is endemic to the Hawaiian Archipelago. This population of threatened green turtles has been monitored since the 1970s and is one of the few populations in the Pacific that is increasing in numbers. The principal rookery for the Hawaiian population of the green turtle is located on sand islands at French Frigate Shoals. More than 90 percent of all green turtle nesting in the Hawaiian Archipelago occurs here. The main rookery island at French Frigate Shoals is East

Island, where at least 50 percent of the nesting occurs, and approximately 200 to 500 females nest each year. Other atolls within the NWHI that support green turtle nesting include Laysan Island, Lisianski Island, and Pearl and Hermes Atoll. Individual nests have been documented for the first time at Midway Atoll in 2006 and 2007.

Green turtles were listed under the ESA in 1978 because of overexploitation for commercial and other purposes, the lack of adequate regulatory mechanisms and effective enforcement, evidence of declining numbers, and habitat loss and degradation. The protections of the ESA and HRS 195D have been effective at restoring Hawaiian green turtle population abundance, as evidenced by a long-term, steady increase in the number of nesting females at the principal green turtle rookery at French Frigate Shoals.

Activity TES-3.1: Collect biological information on nesting turtle populations.
Research has been conducted on the green turtle nesting population in the NWHI since 1973 and comprises one of the longest time series of nesting abundance data for any sea turtle population around the globe. Information on abundance of nesting turtles is critical for making intelligent management decisions, understanding the status of the Hawaiian population of the green turtle, and evaluating the success of management programs. Maintenance of standardized and consistent monitoring protocols is crucial to understanding population trends, leading to effective management (See Section 3.1.1, Marine Conservation Science Action Plan). In addition to maintaining current nesting monitoring at East Island, distribution of nesting activity throughout the Monument will be periodically reassessed. As the population increases, or nesting sites are degraded as a result of sea level rise, new sites may be used for nesting.

Activity TES-3.2: Protect and manage nesting and basking habitat.
Green turtle nesting habitat, including basking beaches, will be protected by use of best management practices to prevent the introduction of mammalian predators on eggs and hatchlings, reduce artificial lighting near nesting beaches, prohibit undesirable habitat alteration, and control human access. Limited entry policies will be continued, and human activities will be strictly regulated at islands and reefs used by green turtles.

Rises in sea level as a result of climate change are predicted to reduce the availability of green turtle nesting habitat at French Frigate Shoals, and changes in nest-site temperature regimes may affect population ecology by modifying sex ratios of hatchling populations. Management actions may need to be undertaken to delay habitat loss as a result of rising sea level. Awareness of these impacts will improve our ability to reduce impacts and manage habitat for sea turtle populations.

Activity TES-3.3: Protect and manage marine habitat, including foraging areas and migration routes.
Areas of high turtle foraging activity in the Monument will be identified and mapped, along with high-use corridors used by turtles migrating between their breeding sites and foraging areas outside the Monument. Activities in the Monument, such as anchoring and vessel transit, will be managed to minimize disturbance to foraging areas; reduce discharge and introduction of contaminants, silt, and oil; and minimize vessel hazards to turtles transiting the open water areas of the Monument.

Strategy TES-4: Work with the international recovery team for short-tailed albatrosses to facilitate an increase in the total breeding population of this species to at least 25 breeding pairs occurring on sites other than Torishima and Senkaku islands.

The short-tailed albatross was listed as federally endangered in the United States in 2000. The foraging range of the short-tailed albatross overlaps with that of the black-footed and Laysan albatrosses and covers most of the northwestern and northeastern Pacific Ocean. The short-tailed population dropped dramatically as a result of feather hunters in the late nineteenth century. The world population of short-tailed albatross is currently estimated at fewer than 2,000 birds, with 85 percent of individuals breeding at a single colony on Torishima Island in Japan, and the remaining individuals breeding on Senkaku Island, just southwest of Torishima.

Activity TES-4.1: Work cooperatively with the Japanese government to establish one or more breeding populations on islands free from threats such as active volcanoes and introduced mammals.
While most of the recovery actions for short-tailed albatrosses will necessarily be carried out by the Japanese government, activities such as providing use of surrogate species for development of translocation techniques and technical assistance will contribute to the recovery of this species. In 2006, ten Laysan albatross chicks from Midway Atoll were translocated to Kīlauea Point National Wildlife Refuge on Kaua‘i, where Japanese ornithologists raised them to learn appropriate nurturing techniques. With this knowledge, it may be possible to translocate short-tailed albatross from Torishima to safer habitats. FWS staff also help Japanese biologists with satellite tagging projects studying feeding patterns, how weather systems and winds influence short-tailed albatross movements, and how ocean productivity and seafloor bathymetry affect their distribution.

This activity also includes attempts to attract birds to Midway Atoll using decoys and recorded colony sounds and monitoring and maintaining any new breeding colony sites established at Midway Atoll. In recent years, one to four short-tailed albatross have been attracted to Midway, and two birds were practicing their mating dance on Eastern Island at Midway in 2008.

Activity TES-4.2: Conduct studies to examine the correlation between reproductive success and contaminant loads.
Analysis of the feathers, eggs, and dead chicks of black-footed albatrosses at Midway Atoll will determine the levels of persistent environmental contaminants. These data will be used as a surrogate for estimating contaminant body-burdens in short-tailed albatrosses.

Activity TES-4.3: Create and disseminate information on fisheries bycatch and bycatch reduction to all fisheries occurring outside the Monument.
Materials will be created for public outreach and attendance at domestic and international meetings to carry out government-to-government communication on fisheries mitigation measures that can reduce bycatch during commercial fishing operations.

Strategy TES-5: Conduct activities to increase Laysan duck populations in the Monument over the life of the plan.

The Laysan duck, endemic to the Hawaiian Islands, was federally listed as endangered in 1967. Prior to 2004, only a single population of the species remained, on Laysan Island. Since 2004, a second population of Laysan ducks has been established at Midway Atoll, through two translocations of subadults from Laysan Island. Current population estimates at both Midway and Laysan indicate a population size of fewer than 800 individuals. Within 15 years, the target, based on interim downlisting criteria in the Draft Revised Recovery Plan for the Laysan Duck (FWS 2004), is to ensure that at least five stable populations occur in predator-free or predator-controlled sites throughout the Monument and main Hawaiian Islands, and that the population at Laysan is stable or increasing. The plan also calls for island-specific management plans for each population that identify habitat improvement, predator control, and population supplementation as needed.

Activity TES-5.1: Continue population monitoring on Laysan Island and Midway Atoll.
Activities include population size estimation through mark-recapture and monitoring of reproductive success and survival for population modeling; disease screening and prevention to avoid translocation of unhealthy individuals; and genetics research to prevent loss of genetic diversity during population translocations. Monitoring Laysan duck populations for potential human disturbance, especially during molt (when the birds are flightless) and during the nesting season, is necessary when disturbance may result in nest abandonment and brood fragmentation.

Activity TES-5.2: Carry out translocations to other sites in the Monument.
Required activities include restoring or creating habitat necessary to support Laysan duck populations; transporting juveniles from established populations to additional islands; and conducting post-release monitoring to assess foraging behavior, body condition, survival, habitat suitability, and reproductive success of translocated birds, as identified in the Draft Revised Recovery Plan for the Laysan Duck (FWS 2004).

Strategy TES-6: Maintain stable populations of the Laysan finch, Nihoa finch and Nihoa millerbird in the Monument over the life of the plan.

The Laysan finch, Nihoa finch, and Nihoa millerbird are endemic passerines in the NWHI that have extremely limited distributions within relatively sensitive biological systems. Because of the inherently small population sizes of these species as a result of the extremely limited habitat availability, all three of these passerine species in the Monument have been listed as federally endangered. The most recent population estimates indicate a total population size of approximately 10,000 Laysan finches, which occur only on Laysan Island and at Pearl and Hermes Atoll (a result of translocations conducted in 1967); fewer than 5,000 Nihoa finches, which occur only on Nihoa; and fewer than 600 Nihoa millerbirds, also endemic to Nihoa.

Activity TES-6.1: Continue to conduct annual censuses of populations of each passerine species and monitor their food and habitat requirements.
In particular, these monitoring activities allow for detection of changes in population and habitat availability by monitoring the status of native plant and terrestrial invertebrate populations. Monitoring methods will be assessed and altered as necessary to improve trend detection and develop knowledge of habitat requirements for these species.

Activity TES-6.2: Implement translocations of each species and site restoration as needed by developing appropriate techniques for capture, translocation, release, and monitoring.
Capture, translocation, and restoration are critical steps in establishing additional populations. These potential translocations will provide a buffer against catastrophic declines of current natural populations.

Strategy TES-7: Establish populations of each listed plant species on one to three additional Monument islands and ensure genetic material is also protected in approved repositories.

Amaranthus brownii, Schiedea verticillata, and *Pritchardia remota* are believed to be endemic to Nihoa. *A. brownii*, an herbaceous annual, is the rarest native plant species on Nihoa; when last seen in 1983, only 35 plants were located. *S. verticillata*, a perennial herbaceous species, is confined to approximately 10 colonies totaling fewer than 400 individuals on Nihoa. *P. remota*, a long-lived perennial fan palm, has fewer than 1,500 individuals and occurs in four valleys on Nihoa. Because of the small number of existing individuals and their extremely limited distributions, these species are subject to an increased likelihood of extinction from random events. *Cenchrus agrimonioides* var. *laysanesis* was known historically only from the NWHI at Laysan Island, Kure Atoll, and Midway Atoll. Although *C. agrimonioides* var. *agrimonioides* currently occurs on O‘ahu and Maui, the *laysanensis* variety has not been observed since 1973. *Mariscus pennatiformis* spp. *bryanii*, a member of the sedge family, is known only from Laysan Island, and comprises only one to 200 individuals annually.

Activity TES-7.1: Ensure all endangered plant species from Nihoa and Laysan Island are fully represented in an ex situ collection such as a nursery or arboretum.
For these extremely rare taxa, it is critical to ensure that these plants are maintained in off-site locations to protect them from extinction should these in situ populations or their critical habitat experience a catastrophic event. Using guidelines for collection described in an authorized Endangered Species Permit, seeds of all listed plants will be collected and sent to seed banks such as the Lyon Arboretum and National Tropical Botanical Garden.

Activity TES-7.2: Increase numbers and locations of Amaranthus brownii and Schiedea verticillata on Nihoa by 2018.
Existing colonies will be augmented via outplanting, and factors restricting colony expansion (e.g., competition from alien species) will be eliminated. Attempts will be made to establish new colonies within the historical range of these species by identifying key environmental factors associated with plant growth and reproduction, preparing the sites, propagation, outplanting, and post-planting maintenance.

Activity TES-7.3: Establish a self-sustaining Pritchardia remota population on Laysan Island by 2012.
In accordance with the Draft Laysan Island Restoration Plan (Morin and Conant 1998), sites will continue to be prepared for planting and elimination of immediate threats, such as alien plants. Pureness of seed stocks will be ensured by using standard operating procedures for maintaining the plants in the field. Frequent monitoring will be conducted to improve outplanting methods

and protect the site from alien species invasion, and plant vigor data will be collected to guide future outplanting strategies and techniques.

Activity TES-7.4: Continue greenhouse operations on Laysan Island to propagate and outplant rare plant taxa.
The plant propagation facility at Laysan Island is described in the Draft Laysan Island Restoration Plan (Morin and Conant 1998). *Pritchardia remota* seeds are collected at Nihoa and *Mariscus pennatiformis* seeds are collected following collection guidelines, including taking no more than 15 percent of seeds from any source plant. For *Pritchardia remota*, the surface of the seeds is sterilized before transporting them to Laysan Island to ensure that they are free of pests, diseases, and pathogens. The plants are germinated in shade houses and outplanted after they reach the optimal size for subsequent survival in the wild. A plant restoration database for Laysan is maintained to document variations in handling and treatment protocols and success after outplanting. All monitoring, collection, propagation, and outplanting follow guidelines from the Hawaiʻi Rare Plant Restoration Group, including Instructions and Methods, Collecting and Handling Protocols, and General Reintroduction/Outplanting Guidelines.

Activity TES-7.5: Evaluate the potential to establish one to three colonies of *Amaranthus brownii, Schiedea verticillata,* and *Pritchardia remota* outside of their historical ranges.
To protect the taxa from catastrophic events and achieve recovery objectives, it may be necessary to establish colonies of each taxa on other islands outside their historical range. Impacts on native flora and fauna at transplant sites will need to be assessed and evaluated to prevent the risk of hybridization with closely related species. Factors to consider include avoiding impacts to native species at establishment sites, finding suitable habitat, and choosing areas accessible enough to allow for planting and monitoring of introduced populations. Mokumanamana, Laysan Island, Kure Atoll, and Eastern and Sand Islands at Midway Atoll should be considered as potential sites.

Strategy TES-8: Ensure protection of threatened and endangered species by facilitating Endangered Species Act consultations for Monument activities throughout the life of the plan.

Since threatened and endangered species occur within the Monument, actions proposed by Federal agencies frequently require consultation with NMFS or FWS. Section 7(a)(2) of the ESA requires that federal agencies consult with NMFS for listed species under its jurisdiction and with the FWS for listed species under its jurisdiction (jurisdiction for sea turtles is shared by the two agencies) on actions that the federal agencies conclude may affect listed species or designated critical habitat.

This strategy undertakes the activities required to increase the capacity of the consultation actions under the ESA, promote timely and effective coordination among the action agencies and consulting agencies, and produce current baseline assessments of key species and designated critical habitat. These activities will help to improve the consultation process for all involved and result in protection and recovery of listed species and habitat.

Activity TES-8.1: Increase the capacity of NMFS and FWS to address ESA consultations for activities within the Monument.

This activity will seek to build the capacity of the consulting agencies to conduct consultations and coordinate with the action agencies and Monument staff. This activity will implement programs to improve the consulting personnel's knowledge about the species, habitat, and agency consultation procedures and laws. Such a program will include, among other elements, appropriate education, training, and regular interaction with species and habitat experts who can provide valuable input and review.

Additional staffing will most likely be needed by the agencies to carry out federal consultation requirements; staff will have expertise in ESA regulatory requirements, work to complete consultations in a timely fashion, coordinate between agencies and the Monument staff, appropriately integrate relevant biological information on the subject listed species or critical habitat, and develop and deliver Section 7 workshops for action agencies.

Activity TES-8.2: Develop baseline assessments for listed species and critical habitat and streamline the Monument consultation process to facilitate ESA consultations.

This activity will assist Monument managers, consulting agencies, and action agencies by producing ecological baselines of listed species and critical habitat, description of sensitive areas, and other information that can be considered early in any planning process relevant to the Monument. This information will be made available to action agencies to assist them in determining whether their activities may affect listed species and, if so, improve their biological assessments for consultations. It also will assist NMFS and FWS staff in evaluating proposed actions and developing their biological opinions. Also, ESA and other consultation procedures will be reviewed and streamlined and benefit from the preparation of current descriptions.

Activity TES-8.3: Work with federal agencies proposing activities in the Monument to increase their knowledge about the ESA and listed species and critical habitat in the Monument.

An action agency must be knowledgeable about the species, habitat, and laws directing consultation. When an action agency makes a determination regarding whether to consult and how to consult, the determination should be based on sound science and according to the criteria set forth in the regulatory regime implementing the ESA. To help action agencies recognize when their activities may affect listed species or critical habitat and the character of the effects, NMFS and the FWS will coordinate with its partners to build capacity within the action agencies.

Capacity building activities in this activity include the development and delivery by NMFS and FWS of targeted workshops that provide information on the requirements for ESA consultations and on the Monument listed species and critical habitat and working with partners to develop a cache of "best practices" and other operations protocols to avoid any impacts to listed species and habitat. These workshops and other like information exchanges will help to reduce and avoid any detrimental effects to listed species and critical habitat, improve the overall relationship with action agencies, and facilitate timely and effective consultations.

Table 3.2.1 Summary of Strategies, Activities, and Agency Leads for Threatened and Endangered Species

Strategies and Activities	Agency Lead
Strategy TES-1: Support activities that advance recovery of the Hawaiian monk seal for the life of the plan.	
Activity TES-1.1: Support marine debris removal activities to promote recovery.	NOAA
Activity TES-1.2: Support and facilitate emergency response for monk seals.	NOAA
Activity TES-1.3: Conserve Hawaiian monk seal habitat.	NOAA
Activity TES-1.4: Reduce the likelihood and impact of human interactions on monk seals.	NOAA
Activity TES-1.5: Support outreach and education on Hawaiian monk seals.	NOAA
Activity TES-1.6: Reduce shark predation on monk seals	NOAA
Strategy TES-2: Determine the status of cetacean populations and verify and manage potential threats over the life of the plan.	
Activity TES-2.1: Census cetacean populations.	NOAA
Activity TES-2.2: Conduct annual spinner dolphin mark and recapture photo identification surveys.	State of Hawai‘i
Activity TES-2.3: Monitor, characterize, and address the effects of marine debris on cetaceans in the Monument.	NOAA
Activity TES-2.4: Respond to any suspected disease and unusual mortality incidents affecting cetaceans.	NOAA
Activity TES-2.5 Prevent human interactions with cetaceans.	NOAA
Strategy TES-3: Ensure that nesting populations of green turtles at source beaches are stable or increasing over the life of the plan.	
Activity TES-3.1: Collect biological information on nesting turtle populations.	FWS
Activity TES-3.2: Protect and manage nesting and basking habitat.	FWS
Activity TES-3.3: Protect and manage marine habitat, including foraging areas and migration routes.	NOAA
Strategy TES-4: Work with the international recovery team for short-tailed albatrosses to facilitate an increase in the total breeding population of this species to at least 25 breeding pairs occurring on sites other than Torishima and Senkaku islands.	
Activity TES-4.1: Work cooperatively with the Japanese government to establish one or more breeding populations on islands free from threats such as active volcanoes and introduced mammals.	FWS
Activity TES-4.2: Conduct studies to examine the correlation between reproductive success and contaminant loads.	FWS
Activity TES-4.3: Create and disseminate information on fisheries bycatch and bycatch reduction to all fisheries occurring outside the Monument.	NOAA
Strategy TES-5: Conduct activities to increase Laysan duck populations in the Monument over the life of the plan.	
Activity TES-5.1: Continue population monitoring on Laysan Island and Midway Atoll.	FWS
Activity TES-5.2: Carry out translocations to other sites in the Monument.	FWS

Strategies and Activities	Agency Lead
Strategy TES-6: Maintain stable populations of the Laysan finch, Nihoa finch, and Nihoa millerbird in the Monument over the life of this plan.	
Activity TES-6.1: Continue to conduct annual censuses of populations of each passerine species and monitor their food and habitat requirements.	FWS
Activity TES-6.2: Implement translocations of each species and site restoration as needed by developing appropriate techniques for capture, translocation, release, and monitoring.	FWS
Strategy TES-7: Establish populations of each listed plant species on one to three additional Monument islands and ensure genetic material is also protected in approved repositories.	
Activity TES-7.1: Ensure all endangered plant species from Nihoa and Laysan Island are fully represented in an ex situ collection such as a nursery or arboretum.	FWS
Activity TES-7.2: Increase numbers and locations of *Amaranthus brownii* and *Schiedea verticillata* on Nihoa by 2018.	FWS
Activity TES-7.3: Establish a self-sustaining *Pritchardia remota* population on Laysan Island by 2012.	FWS
Activity TES-7.4: Continue greenhouse operations on Laysan Island to propagate and outplant rare plant taxa.	FWS
Activity TES-7.5: Evaluate the potential to establish one to three colonies of *Amaranthus brownii*, *Schiedea verticillata*, and *Pritchardia remota* outside of their historical ranges.	FWS
Strategy TES-8: Ensure protection of threatened and endangered species by facilitating Endangered Species Act consultations for Monument activities throughout the life of the plan.	
Activity TES-8.1: Increase the capacity of NMFS and FWS to address ESA consultations for activities within the Monument.	FWS NOAA
Activity TES-8.2: Develop baseline assessments for listed species and critical habitat and streamline the Monument consultation process to facilitate ESA consultations.	NOAA FWS
Activity TES-8.3: Work with federal agencies proposing activities in the Monument to increase their knowledge about the ESA and listed species and critical habitat in the Monument.	NOAA FWS

3.2.2 Migratory Birds Action Plan

Links to other Action Plans	
3.2.3	Habitat Management and Conservation
3.3.2	Alien Species
3.3.4	Emergency Response
3.5.4	Ocean Ecosystems Literacy
3.6.3	Coordinated Field Operations

Links to goals
Goal 1
Goal 2
Goal 3
Goal 4
Goal 5

Desired Outcome

Conserve migratory bird populations and habitats within Papahānaumokuākea Marine National Monument.

Current Status and Background

In 1903, President Theodore Roosevelt placed Midway under the jurisdiction and control of the Navy to stop the "wanton destruction of birds that breed on Midway." In 1909, he ordered that "the following islets and reefs, namely: Cure Island, Pearl and Hermes Reef, Lysianski or Pell Island, Laysan Island, Mary Reef, Dowsetts Reef, Gardiner Island, Two Brothers Reef, French Frigate Shoal, Necker Island, Frost Shoal and Bird Island ….are hereby reserved and set apart, subject to valid existing rights, for the use of the U.S. Department of Agriculture as a preserve and breeding ground for native birds." Thus, native birds were the first wildlife species for which the Monument area was managed for conservation purposes by the U.S. Government. Early protection was important in ensuring the large, diverse seabird and shorebird populations present today in the Monument. Seabird colonies in the NWHI constitute one of the largest and most important assemblages of tropical seabirds in the world, with approximately 14 million birds (6 million breeding annually), representing 22 species. Greater than 95 percent of the world's Laysan and black-footed albatrosses nest here. For several other species, such as the Bonin petrel, Christmas shearwater, Tristram's storm-petrel, and gray-backed tern, the NWHI supports colonies of global significance. For the species of boreally breeding shorebirds that overwinter in the tropical Central Pacific, the NWHI are an essential stopover or wintering site. In particular, the bristle-thighed curlew relies on the mammal-free islands of the Monument because it goes through a flightless period during molt and is very vulnerable to predation.

Need for Action

The majority of all tropical seabirds in Hawai'i nest in the Monument, and those breeders plus an equal number of species of nonbreeding seabirds transit through or forage in the waters of the Monument. While the breeding colonies are secure from future development and disturbance, a variety of threats still faces seabirds in the Monument, including contaminants left from former activities in the area and contaminants, such as oil, arriving from the sea; habitat loss to sea level rise; changes in food availability resulting from climate change; marine debris, which causes both ingestion and entanglement hazards; invasive species; fisheries interactions outside the Monument boundary; and wildlife diseases. Breeding seabirds and migratory shorebirds rely on terrestrial areas of the Monument for valuable wintering habitat, free of mammalian predators.

Statute and policy at several levels mandate the protection and management of migratory bird populations in the Monument. The primary federal protective measure for these species is the Migratory Bird Treaty Act of 1918, which prohibits hunting, taking, capturing, killing, or selling of seabird species, and also fully protects eggs, nests, and feathers from collection or destruction. Additional directives from international treaties, domestic legislation, executive orders, state law, and FWS policy require the protection, monitoring, and assessment of migratory nongame birds;

determination of the effects of environmental changes and human activities on migratory birds; and active protection of colonies, roosts, loafing sites, and adjacent waters for seabirds.

Strategies to Achieve the Desired Outcome
Four strategies have been identified for achieving the desired outcomes of protecting and enhancing migratory bird populations in the Monument. The strategies and activities are coded by the acronym for the action plan title, "Migratory Birds" (MB). A summary of strategies and activities is provided in Table 3.2.2 at the end of this action plan.

- MB-1: Protect and enhance habitats for terrestrial and marine migratory birds throughout the life of the plan.
- MB-2: Minimize the impact of threats to migratory birds such as habitat destruction by invasive species, disease, contaminants (including oil), and fisheries interactions for the life of the plan.
- MB-3: Monitor populations and habitats of migratory birds at a level sufficient to ascertain natural variation and then to detect changes in excess of that variation that might be attributed to human activities, including anthropogenic climate change.
- MB-4: As threats are removed, restore seabird species at sites where they have been extirpated.

Strategy MB-1: Protect and enhance habitats for terrestrial and marine migratory birds for the life of the plan.

Safe habitats for breeding and foraging are essential for all of the migratory birds using the Monument. While most seabirds and shorebirds exhibit some flexibility in their habitat requirements, features of the plant community (species and structural characteristics) favor or limit populations.

Activity MB-1.1: Control or eradicate nonnative species at all sites where they have a negative impact on the survivorship or reproductive performance of migratory birds.
Invasive species affect survival and reproduction of migratory birds by causing direct mortality through predation or parasitism, or by modifying the habitat to make it less suitable for survival or reproduction. Invasive species that have been shown to diminish the quality of migratory bird habitat in the Monument include several plants such as sandbur (*Cenchrus echinatus*), ironwood (*Casuarina equisetifolia*), and golden crownbeard (*Verbesina encelioides*), and introduced scale insects and associated ants that damage vegetation providing appropriate habitat for migratory birds. (See Section 3.3.2, Alien Species Action Plan.)

Activity MB-1.2: Restore components of the native plant communities that are important to seabird nesting.
Opportunities for restoring native habitats for seabirds exist wherever nonnative species have been eradicated or controlled or human activities limiting migratory bird species have ceased. Translocation, propagation, and outplanting of native plants *(Eragrostis variabilis, Sesbania tomentosa, Sida fallax, Scaevola sericea,* etc.*)* to improve habitat for migratory bird nesting and foraging are ongoing at Laysan Island and Midway and Kure Atolls and are planned for other sites in the Monument (Rehkemper et al. 2005).

Strategy MB-2: Minimize the impact of threats to migratory birds such as habitat destruction by invasive species, disease, contaminants (including oil), and fisheries interactions for the life of the plan.

The original motivation for the protection of the area by the federal government was to eliminate illegal harvest of breeding seabirds. Minimizing threats to migratory bird populations remains a primary concern.

Activity MB-2.1: Conduct surveillance for evidence of avian disease outbreaks, and follow existing response plan if disease is detected.
The MMB participates with other National Wildlife Refuges and agencies as partners in the Hawai‘i–Pacific Islands Working Group on Avian Influenza Surveillance to guard against wildlife diseases such as Asian H5N1 Avian Influenza. Staff report all instances of unusual mortality and collect samples using approved safety protocols and protective gear. If avian influenza is detected, Monument staff will use the Highly Pathogenic Avian Influenza Disease Contingency Plans in place for the Midway Atoll NWR and Hawaiian Islands NWR.

Activity MB-2.2: Monitor contaminant levels in birds and their habitats, and respond if the potential exists to cause immediately lethal or sublethal effects.
Bird health and contaminant levels in areas of contamination that have already been identified will be monitored, and unexplained health problems in other areas will be evaluated for possible links to contaminants.

Activity MB-2.3: Ensure that all spill response plans have adequate coverage of actions necessary to minimize mortality to migratory birds.
Monument staff will coordinate with and provide technical contributions regarding migratory birds to multiagency spill prevention and pre-spill activities, as well as actual response actions and Natural Resource Damage Assessments. (Also see Section 3.3.4, Emergency Response Plan.) Staff will contribute to keeping seabird and shorebird information current for the area contingency plan and maintain a list of restoration activities for the Co-Trustees.

Activity MB-2.4: Maintain rigorous quarantine protocols to prevent the introduction of alien species that may prove hazardous specifically to migratory birds.
Alien species are one of the greatest threats to migratory birds, either directly in the case of pathogens or predators, or indirectly in the case of invasive plants or animals that damage habitat. Rigorous quarantine protocols must be maintained to ensure new alien species are not introduced or transmitted from one island to another. (See Section 3.3.2, Alien Species Action Plan.)

Activity MB-2.5: Work with partners to reduce the impact of commercial and sport fisheries outside the Monument on migratory bird populations.
Sport and commercial fishing was eliminated, or is being phased out, within the Monument. However, such activities outside the Monument can adversely impact Monument resources. FWS established national policy in 2001 that identified the bycatch of migratory birds in fisheries as a serious conservation problem and may be inconsistent with of the underlying tenets

of the Migratory Bird Treaty Act. FWS and the U.S. Department of State worked with NMFS to draft a National Plan of Action for addressing the problem of seabird bycatch to comply with the Code of Conduct for Responsible Fisheries developed by the Food and Agriculture Organization of the United Nations. This group of agencies and representatives of the Regional Fisheries Management Councils work with industry and conservation organizations to guide implementation of the National Plan of Action to reduce fishing impacts. Laysan albatrosses and black-footed albatrosses, two of the species most affected by bycatch mortality in the northern hemisphere, nest almost exclusively in the Monument, so the responsibility to provide data on seabird population status and biological expertise regarding the problem falls to Monument staff. Staff provide additional assistance by teaching seabird identification skills to fishers and fisheries observers and by assisting with the development of mitigation techniques. Implementation of many of the actions identified in the FWS Migratory Bird Draft Conservation Action Plan for Black-footed Albatross (*Phoebastria nigripes*) and Laysan Albatross (*P. immutabilis*) will involve Monument staff.

Activity MB-2.6: Research mite impacts on black-footed albatross chicks on Kure Atoll.
Mites (including the native mite *Womersia midwayensis*) causing mortality and morbidity on black-footed albatross (*P. nigripes*) chicks on Kure Atoll should be investigated. This activity is necessary to determine the preferred habitat of mites and assess the potential to alter habitat or discourage albatross nesting.

Strategy MB-3: Monitor populations and habitats of migratory birds to ascertain natural variation and to detect changes in excess of that variation that might be attributed to human activities, including anthropogenic climate change.

Monitoring migratory bird populations and habitats is necessary to detect changes in excess of natural variation that might be attributed to human activities. Monitoring must include statistically valid sample sizes and must provide time series long enough for credible evaluations of population responses to threats and management actions.

Activity MB-3.1: Using standard methods devised for tropical seabirds, monitor a suite of 15 focal seabird species at specific sites in the Monument to track changes in population size and understand underlying causes of that change.
A coordinated program to assess the status and trends of seabird populations is essential to provide scientific information necessary to make management decisions and to evaluate the efficacy of management actions. The Regional Seabird Conservation Plan (FWS Pacific Region 2005) recommends inventories of all seabird colonies at long-term intervals, such as every ten years, and intensive quantitative monitoring of specific parameters, such as survival or population size of a select group of species at selected localities, on an annual basis. The 15 focal species were identified during a review of seabird monitoring in the NWHI by the U.S. Geological Survey and FWS and were chosen because they are Birds of Conservation Concern, stewardship species of the NWHI, or representative of specific foraging or breeding guilds. A recently completed assessment of seabird monitoring for Hawai‘i and the Pacific (Citta, Reynolds, and Seavy 2006) will be used to develop a standardized seabird monitoring plan for the Monument as well as other areas in the U.S. Central Tropical Pacific. As part of the plan, the monitoring data will be maintained in the PIMS.

Activity MB-3.2: Monitor changes in habitat quality by measuring reproductive performance and diet composition in selected seabird species.
Parameters such as hatching success, fledging success, and diet composition provide a more immediate indication of ocean conditions and prey abundance and availability than does long-term population monitoring. This is because seabirds take many years to mature to recruitment into the breeding population, and actual fluctuations in the number of breeders may reflect conditions that occurred five to ten years previously. As a result, quantification of population parameters such as reproductive success and survival, and subsequent modeling of population trends, provides a better understanding of the status of these seabird populations.

Activity MB-3.3: Develop and use standardized methods to accurately assess the population size and trends of over-wintering and migrating Pacific golden plovers, bristle-thighed curlews, wandering tattlers, and ruddy turnstones.
Repeatable surveys at reference sites where we can predict continuity of measurement in the future will allow us to evaluate long-term changes in transient and winter resident shorebirds in the Monument and contribute to international monitoring of these wide-ranging species.

Strategy MB-4: As threats are removed, restore seabird species at sites where they have been extirpated.

Many examples of extremely successful conservation programs are based on the principle that populations can be restored to an area if a limiting threat is removed. Seabird populations that formerly occurred at various sites in the Monument have the potential to be restored by using behavioral manipulation techniques such as colony attraction through sound and visual stimuli or the provision of artificial nest structures.

Activity MB-4.1: Use social attraction techniques to encourage recolonization at Midway and Kure Atolls by Bulwer's petrels and Tristram's storm-petrels.
The introduction of Polynesian rats to Kure sometime before 1912 and of black rats to Midway in 1943 resulted in the extirpation of these two small seabird species at these two atolls. Both rat species have now been eradicated. Petrel species are typically very conservative about dispersing and starting new colonies, but successful restoration of petrels using social attractants such as playing recorded calls has been documented in several studies (Podolsky and Kress 1987), and the provision of nest boxes has been shown to enhance reproductive success and thus accelerate the recolonization process (Bolton et al. 2004).

Table 3.2.2 Summary of Strategies, Activities, and Agency Leads for Migratory Birds

Strategies and Activities	Agency Lead
Strategy MB-1: Protect and enhance habitats for terrestrial and marine migratory birds throughout the life of the plan.	
Activity MB-1.1: Control or eradicate nonnative species at all sites where they have a negative impact on the survivorship or reproductive performance of migratory birds.	FWS
Activity MB-1.2: Restore components of the native plant communities that are important to seabird nesting.	FWS
Strategy MB-2: Minimize the impact of threats to migratory birds such as habitat destruction by invasive species, disease, contaminants (including oil), and fisheries interactions for the life of the plan.	
Activity MB-2.1: Conduct surveillance for evidence of avian disease outbreaks, and follow existing response plan if disease is detected.	FWS
Activity MB-2.2: Monitor contaminant levels in birds and their habitats, and respond if the potential exists to cause immediately lethal or sublethal effects.	FWS
Activity MB-2.3: Ensure that all spill response plans have adequate coverage of actions necessary to minimize mortality to migratory birds.	FWS
Activity MB-2.4: Maintain rigorous quarantine protocols to prevent the introduction of alien species that may prove hazardous specifically to migratory birds.	FWS
Activity MB-2.5: Work with partners to reduce the impact of commercial and sport fisheries outside the Monument on migratory bird populations.	FWS
Activity MB-2.6: Research mite impacts on black-footed albatross chicks on Kure Atoll.	State of Hawai‘i
Strategy MB-3: Monitor populations and habitats of migratory birds to ascertain natural variation, including anthropogenic climate change.	
Activity MB-3.1: Using standard methods devised for tropical seabirds, monitor a suite of 15 focal seabird species at specific sites in the Monument to track changes in population size and understand underlying causes of that change.	FWS
Activity MB-3.2: Monitor changes in habitat quality by measuring reproductive performance and diet composition in selected seabird species.	FWS
Activity MB-3.3: Develop and use standardized methods to accurately assess the population size and trends of over-wintering and migrating Pacific golden plovers, bristle-thighed curlews, wandering tattlers, and ruddy turnstones.	FWS
Strategy MB-4: As threats are removed, restore seabird species at sites where they have been extirpated.	
Activity MB-4.1: Use social attraction techniques to encourage recolonization at Midway and Kure Atolls by Bulwer's petrels and Tristram's storm-petrels.	FWS

3.2.3 Habitat Management and Conservation Action Plan

Links to Other Action Plans	
3.2.1	Threatened and Endangered Species
3.2.2	Migratory Birds
3.3.2	Alien Species
3.5.1	Agency Coordination
3.5.4	Ocean Ecosystems Literacy
3.6.3	Coordinated Field Operations

Links to Goals
Goal 1
Goal 2
Goal 3
Goal 4

Desired Outcome

Protect, maintain, and where appropriate, restore the native ecosystems and biological diversity of Papahānaumokuākea Marine National Monument.

Current Status and Background

Presidential Proclamation 8031 prescribes ecosystem-based management for the Northwestern Hawaiian Islands, and the National Wildlife Refuge System Administration Act of 1966, as amended, also requires such management for all NWRs. They require protections of ecosystem structure and function; conservation of fish, wildlife, plants, and their habitats; and ensuring the biological integrity, diversity, and environmental health of the Monument. Section 1.1 of this Monument Management Plan describes habitats in the NWHI, ranging from abyssal benthic areas to the high cliff faces of Nihoa and Mokumanamana (Necker), and Section 1.2 elaborates on the historical and current status of those habitats as well as describing resources of concern in the Monument. The Environmental and Anthropogenic Stressors section (1.3) describes known threats to biological integrity, diversity, and environmental health of the Monument. Habitat management activities included in this action plan include inventory of Monument resources, characterizing habitat health, investigating problems, changing plant communities to meet ecosystem goals, removing contaminants, preserving wilderness character, and engaging in ecological restoration of native habitats.

Need for Action

While the Monument remains one of the most remote and undisturbed archipelagos in the world, it still requires active habitat management on the part of managers to fulfill the mandate of protecting, maintaining, and restoring its wide range of native habitats. Furthermore, FWS has a mandate to conserve and restore, where appropriate, wildlife and habitats on NWRs. In accordance with refuge system laws and policies, management must "maintain existing levels of biological integrity, diversity, and environmental health at the Refuge scale. Following that, [managers] will restore lost or degraded elements of biological integrity, diversity, and environmental health at all landscape scales where it is feasible and supports fulfillment of refuge purposes" (601 FW 3). Restoration, when and where appropriate, will be undertaken using best available information about pre-disturbance conditions. This action plan will provide guidance for management of Monument lands and waters, rationale for the activities listed, and a framework for continuity and consistency in habitat management decisions for the life of the plan.

Strategies to Achieve the Desired Outcome
Strategies for conservation and management in the varied habitats of the Monument have been identified to achieve the desired outcome of protecting native ecosystems and biological diversity. The strategies and activities are coded by the acronym for the action plan title, "Habitat Management and Conservation" (HMC). A summary of strategies and activities is provided in Table 3.2.3 at the end of this action plan.

- HMC-1: Within 15 years, develop and implement a strategy for restoring the health and biological diversity of the shallow reefs and shoals where anthropogenic disturbances are known to have changed the ecosystem, using best available information about pre-disturbance conditions.
- HMC-2: Within 10 years, investigate and inventory sources of known contamination from historical human uses of the NWHI and, where appropriate, coordinate with responsible parties to develop plans and complete cleanup actions.
- HMC-3: Protect and restore beach strand and crest habitats over the life of the plan.
- HMC-4: Within 10 years, restore and maintain coastal mixed grasses and shrubs on all the coralline islands and atolls of the Monument using best available historical information about the original indigenous ecosystem.
- HMC-5: Within 10 years, restore and maintain coastal mixed grasses and shrublands on basalt islands in the Monument.
- HMC-6: Maintain and better understand the Monument's wetland and mudflat habitats to benefit migratory shorebirds and waterfowl for the life of the plan.
- HMC-7: Maintain, enhance, and, where appropriate, develop freshwater seeps, intermittent streams, and freshwater ponds as necessary for the benefit of native species for the life of the plan.
- HMC-8: Maintain no more than 150 acres of ironwood woodlands on Sand Island, Midway Atoll, to provide seabird nesting and roosting habitat for the life of the plan.
- HMC-9: Protect and maintain 120 acres of vertical rocky cliff-face habitat at Nihoa and Mokumanamana for nesting seabirds for the life of the plan.

Strategy HMC-1: Within 15 years, develop and implement a strategy for restoring the health and biological diversity of the shallow reefs and shoals where anthropogenic disturbances are known to have changed the ecosystem, using best available information about pre-disturbance conditions.

The shallow reef (less then 16 fathoms, 30 meters) areas of the Monument have been affected by a variety of human activities through the years, including overharvesting of some species, dredging and filling, and anchor damage from vessels stopping in the area. The extent and relative severity of these impacts are poorly understood.

Activity HMC-1.1: Identify and prioritize restoration needs in shallow water reef habitats impacted by anthropogenic disturbances within 5 years.
For more than 100 years, human activities in the NWHI have created disturbance in natural systems. Many such actions affecting marine and terrestrial wildlife are known, but the impacts of disturbance in the marine environment in particular, opportunities for restoration, and priorities for undertaking restoration actions are not thoroughly analyzed. One example of a

shallow-reef marine organism that has been negatively impacted by human activities is the black-lipped pearl oyster (*Pinctada margaritifera*), which has not recovered at Pearl and Hermes atoll since it was intensely harvested in the 1920s (Galtsoff 1933; Keenan et al. 2006). Where appropriate, and using the best available information about pre-disturbance conditions, opportunities for restoring species will be identified and prioritized.

Activity HMC-1.2: Analyze historical and present impacts on reef growth at Midway Atoll and determine factors limiting nearshore patch reef growth to facilitate restoration of natural reef building.
Midway Atoll has been the site of the most dramatic modification of reef circulation and the most prolific source of anthropogenic inputs to nearshore reefs in the NWHI. Evaluating these pressures and their effects on reefs will provide useful information to help replace lost ecosystem function and integrity of reefs at Midway and potentially at other sites with similar threats to nearshore reef habitats.

Activity HMC-1.3: Where feasible, implement appropriate restoration activities.
As follow-up to identifying restoration priorities (HMC-1.1), appropriate restoration activities will be assessed (HMC-1.2), actions developed and, where feasible, implemented.

Strategy HMC-2: Within 10 years, investigate, inventory, and map sources of known contamination from historical human uses of the NWHI and, where appropriate, coordinate with responsible parties to develop plans and complete cleanup actions.

Human occupation and activity in the NWHI have resulted in numerous impacts, some of which can be categorized as contaminants that disrupt native ecosystems in various ways. These contaminants are found in both terrestrial and marine environments of the Monument and include, but are not limited to, heavy metals, iron, PCBs, and other organochlorines. Other materials that have come into the Monument by way of the ocean include pesticides, oil from undocumented spills at sea, and plastic marine debris (see Section 3.3.1, Marine Debris Action Plan). These contaminants occur both in known dumping sites and in areas less well characterized or not yet discovered.

Activity HMC-2.1: Evaluate effects of contamination in terrestrial and nearshore areas from shoreline dumps at French Frigate Shoals and at Kure, Midway, and Pearl and Hermes atolls and prioritize cleanup action based on risk assessments.
Various dumps left behind from military activities during World War II and the Cold War are disintegrating quickly. Runoff, erosion, and seepage from all of these dumps have contaminated nearshore habitats. The extent of the effects of this contamination to birds nesting on the dumps and marine organisms in adjacent waters will be investigated.

Activity HMC-2.2: Work with partners and responsible parties to verify the integrity of known landfills and dumps and to conduct additional remediation if necessary.
Landfills and dumping sites at Midway Atoll, such as the Old Bulky Waste Landfill, which was designated as a contaminated site during the Navy's Base Realignment and Closure (BRAC) program assessment at Midway, and "Rusty Bucket" on Sand Island at Midway, which was not designated contaminated in the BRAC assessment, need to be evaluated every five years for integrity, containment effectiveness, and hazard potential. Monument staff will work with the

U.S. Environmental Protection Agency (EPA) and the Navy to ensure best practices for preventing the contained contaminants at these sites from migrating out of the dump areas at Midway. In collaboration with the Coast Guard, EPA, and Hawaiʻi Department of Health, the Co-Trustees will work to investigate washing and leaching of PCBs from known dumps at Kure Atoll and to finish the removal of the dump at Tern Island, French Frigate Shoals, to achieve agreed-upon levels of PCBs there.

Activity HMC-2.3: Locate historic disposal sites at French Frigate Shoals and at Kure, Midway, and Pearl and Hermes atolls, and investigate them for contamination.
There is a need to search for documented but not yet located landfills at Tern and East Islands, French Frigate Shoals, and Southeast Island, Pearl and Hermes Atoll, and for underground storage tanks at Eastern Island, Midway Atoll. It is also important to investigate the 1993 unlined landfill created by the Coast Guard on Green Island, Kure Atoll, during remediation of the LORAN station to confirm that the PCBs placed in the unlined landfill are not leaching to groundwater and that the documented surface hot spots have been removed. In addition, the 25 milligram/kilogram cleanup level for PCBs should be evaluated to ensure that it is adequately protective of wildlife.

Activity HMC-2.4: Evaluate costs to ecosystem function and benefits of removing anthropogenic iron sources such as metal from shipwrecks and discarded debris from reefs throughout the Monument.
Increasing the available iron in tropical oceanic waters often results in an overgrowth of certain cyanobacteria that are naturally rare in the iron-limited environments of the tropical Pacific away from volcanic islands. The MMB will develop a catalog of all anthropogenic iron sources and the factors associated with each site that would enable prioritization for removal and a cost-benefit analysis.

Activity HMC-2-5: Continue collection and fingerprinting of oil found washed ashore and on wildlife from mystery spills to determine its provenance, and build an oil sample archive for possible use as evidence in liability assignment.
The occurrence of oil on nesting seabirds and washed up on beaches in the Monument that cannot be attributed to a known spill is a regularly recorded event at all the staffed sites in the NWHI. Because of the enormous foraging range of subtropical seabirds and the large number of vessels transiting the North Pacific, these spills are rarely attributed to any responsible party. Samples collected in the Monument can be used to compare with banks of petroleum signatures and may help in understanding more about the primary sources of this pollution.

Activity HMC-2-6: Continue monitoring the area at Laysan Island that was contaminated by the insecticide carbofuran.
In 1988, biologists first detected unexplained mortality of carrion flies and ghost crabs at a beach crest site on Laysan Island. These scavengers were coming in to feed on dead albatross chicks, commonly seen in summer months at Laysan. Upon entering the area later referred to as the "Dead Zone," they would abruptly die. The cause was finally identified by FWS as the pesticide carbofuran, and the area was cleaned by removing and treating on-site contaminated sand in 2002. Continued vigilance is needed to make sure that such effects do not flare up again in that area because of an overlooked hot spot.

Activity HMC-2.7: Conduct ecological risk assessment to determine allowable lead levels in soils at Midway and remove lead from buildings and soils to nonrisk levels.
Lead in the soils around many of the buildings at Midway is adversely affecting the birds nesting and burrowing in these areas by causing droop-wing and other lethal and sublethal effects. Before the lead can be effectively removed from the soil, an ecological risk assessment will be performed to determine the cleanup level necessary to ensure the protection of human and wildlife health. The lead-based paint flaking from the buildings at Midway will be removed to eliminate this contamination.

Strategy HMC-3: Protect and restore beach strand and crest habitats over the life of the plan.

Beach strand and beach crest habitats on French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, Midway Atoll, and Kure Atoll provide important habitat for a variety of native organisms, several of them listed as threatened or endangered. Anthropogenic threats, including previous manipulation of shorelines and additions of structures and the suite of effects to shoreline habitats associated with global climate change, make it necessary to actively manage these habitats in the Monument.

Activity HMC-3.1: Evaluate loss of beach strand and crest due to erosion and sea level rise to aid in formulating a restoration plan that will stop as much net loss of beach strand and beach crest habitat as is possible.
Projected sea level rise, increased storm frequency, changes in current patterns, and large wave events pose a particular danger to the low-lying terrestrial habitats of the Monument. In addition to sea level rise, invasive species threaten the dune stability, particularly golden crownbeard (*Verbesina enceliodes*) and ironwood (*Casuarina equisetifolia*) on Kure and Midway Atolls. Monument staff will evaluate the loss of beach strand and crest in order to formulate a restoration plan.

Activity HMC-3.2: Inventory and map manmade structures and changes in natural beach and reef state that may influence erosion and depositional processes at all of the beach strand units of the Monument.
Human modification of shorelines and channels may be affecting ecosystem function in the NWHI. These features will be evaluated, their effects analyzed, and their restoration considered.

Strategy HMC-4: Within 10 years, restore and maintain coastal mixed grasses and shrubs on all the coralline islands and atolls of the Monument using best available historical information about the original indigenous ecosystem.

Coastal mixed grass and shrub habitats cover the majority of the Monument's terrestrial area and are important habitat for seabirds, shorebirds, landbirds, and terrestrial invertebrates. Careful review of historical botanical accounts and studies of pollen preserved in the anaerobic sediments of Laysan Lake (Athens, et al. 2007) provide a template for restoration of the plant communities of the coastal grass and shrublands.

Activity HMC-4.1: Propagate and outplant native species chosen on the basis of historical records at Midway and historical and pollen records from Laysan Island in 250 acres of

vegetated area at Midway Atoll, focusing on the original footprint of the island and then moving to the dredge spoils section.

Using seed sources deemed most appropriate by botanical experts, including bunchgrass *(Eragrostis variabilis),* naupaka *(Scaevola sericea),* morning glory *(Ipomoea pes caprae, I. indica), Solanum nelsonii, Capparus sandwichiana, Chenopodium oahuense,* and *Lepidium bidentatum,* and treated to maintain quarantine standards, Monument staff will propagate seeds in the greenhouse on Sand Island and outplant them in selected areas of the entire atoll.

Activity HMC-4.2: Implement the Draft Laysan Island Restoration Plan by removing invasive plants, and propagating and outplanting all extant species identified in the pollen record or historical documents as formerly having occurred at Laysan.

The Draft Laysan Island Restoration Plan (Morin and Conant 1998) details the biological history of the island's habitats and lays out a plan for ecological restoration of habitat structure and function. This document includes plans for restoration of plants, terrestrial arthropods, and avian components of the biological community that occurred at Laysan Island prior to human contact and the resultant loss of many of the island's species.

Activity HMC-4.3: At Laysan Island, replace 60 acres of the introduced shrub Indian pluchea with native species.

The need to provide appropriate nesting habitat and maintain elements of ecosystem function while restoring native species requires management of the timing of vegetation replacement. Reestablishment of the native shrub community (including *Sida fallax, Chenopodium oahuense*, and *Capparis sandwicensis)* will precede the removal of the alien plant *Pluchea indica* in order to maintain the ecosystem function of providing nesting substrate for red-footed boobies, great frigatebirds, and black noddies.

Activity HMC-4.4: Formulate and implement a restoration plan for Lisianski Island using guidelines established for neighboring Laysan Island.

Our current and historical knowledge of the vegetation community at Lisianski Island is less well developed than that of its neighbor, Laysan Island. Lisianski Island may provide good opportunities for ecological restoration following appropriate investigation of its botanical history. Sediments at the lowest part of the island will be sampled for ancient pollen to aid in reconstructing the composition and structure of the plant community prior to human visitation. Fossil pollen scientists believe that the soil of Lisianski Island may have characteristics amenable to the preservation of ancient pollen in the low-lying center of the island.

Activity HMC-4.5: Propagate and outplant native vegetation on 34-acre Southeast Island at Pearl and Hermes Atoll to replace native plant community extirpated by invasion of the alien plant golden crownbeard.

As golden crownbeard (*Verbesina encelioides*) is removed, native habitats will be restored on Southeast Island at Pearl and Hermes Atoll. This restoration is of great importance for the survival of several native plant populations, especially *Eragrostis variabilis*, *Solanum nelsonii*, *Tribulus cistoides*, *Lepidium bidentatum*, and *Boerhavia repens* at the northern end of the archipelago, and for a small translocated population of the endangered Laysan finch (*Telespyza cantans*). Propagules from the same native species still extant on several of the other islets in the atoll will be used.

Activity HMC- 4.6: Implement coordinated ecosystem restoration activities on Kure Atoll.
In 2007, the State of Hawai‘i began drafting a management plan for Kure Atoll. This plan includes prioritizing and eliminating ecosystem threats caused by past anthropogenic disturbances. Ongoing efforts to restore ecosystem function include removing invasive species and increasing the range of and the reintroduction of native plant species. These activities are designed to improve nesting, foraging, and resting habitat for migratory birds. Kure Atoll has been identified as a site for potential translocation of the endangered Laysan finch and Laysan duck. Assessment of the feasibility of these activities has begun.

Activity HMC-4.7: Monitor changes in the species composition and structure of mixed grass and shrub plant communities at each site.
An understanding of the range of natural variability caused by weather in these simple but dynamic vegetation communities allows managers to better evaluate the effectiveness of various management actions.

Strategy HMC-5: Within 10 years, restore and maintain coastal mixed grasses and shrublands on basalt islands in the Monument.

The coastal mixed grass and shrubland habitat of the basalt islands in the Monument (Nihoa and Mokumanamana, La Perouse Pinnacle, and Gardner Pinnacles) are remarkably intact with respect to their species composition and vegetation structure. They represent a window to the past in that they probably closely resemble the dryland coastal plant communities that have been lost in the main Hawaiian Islands.

Activity HMC-5.1: Inventory and document life histories of endemic terrestrial invertebrates at Nihoa and Mokumanamana.
The vegetation communities of Nihoa and Mokumananamana are the most intact native coastal plant assemblages in the State. They do suffer from the introduction of a number of alien insects species. Understanding the ecology of these new terrestrial arthropods will aid in identifying which species pose the greatest threat to the native coastal mixed grass and shrubland habitat, including the five endangered plant species there, and the endemic and native terrestrial invertebrates of these basalt islands.

Activity HMC-5.2: Monitor changes in species composition and structure of the coastal shrub and mixed grass communities on basalt islands throughout the life of the plan.
Surveys and mapping of the plant community will help document losses of native species and provide a template for restoration of any that are lost through invasive species competition, herbivory, or other means.

Strategy HMC-6: Maintain and better understand the Monument’s wetland and mudflat habitats to benefit migratory shorebirds and waterfowl for the life of the plan.

The vast oceanic areas that many boreal shorebirds and waterfowl must cross during their annual migration provide few resting places other than these small natural wetlands at Midway Atoll, Kure Atoll, Pearl and Hermes Atoll, and most importantly Laysan Island. While they are a small part of the total Monument area, they may provide a temporary habitat for migrant birds that determines their survival.

Activity HMC-6.1: Monitor water level, salinity, and other water quality parameters of Laysan Lake, and document any loss of lake area.

The hypersaline lake and associated mudflats at Laysan Island, and to a lesser extent, the ʻākulikuli (*Sesuvium portulacastrum*) flats at Southeast Island, Pearl and Hermes Atoll, and Spit Island in Midway Atoll, serve as an important habitat for migratory waterfowl and shorebirds. Historically, during times of low vegetative cover caused by overbrowsing by rabbits or long periods of drought, the dunes have drifted into the lake.

Activity HMC-6.2: As needed, restore dune habitat on Laysan Island to stabilize movement if lake loss starts to occur.

Dune habitat can be effectively restored through vegetation protection or drift fences to minimize sand movement. Measures to slow sand movement may protect the wetland habitat at these sites.

Strategy HMC-7: Maintain, enhance, and, where appropriate, develop freshwater seeps, intermittent streams, and freshwater ponds as necessary for the benefit of native species for the life of the plan.

The vast majority of all the species of animals in the Monument can survive without access to any fresh water, but a few invertebrates, landbirds, and waterbirds at certain life stages (particularly the Laysan duck) require water with low salinity, and periodic access to these sources is essential. Freshwater sources are found at Nihoa, Mokumanamana, and Laysan Islands, and Midway and Kure Atolls.

Activity HMC-7.1: Monitor salinity, parasites, contaminants, and native arthropods associated with freshwater seeps, ponds, and streams.

The endemic passerines (particularly Nihoa finch and Laysan finch), the Laysan duck, and certainly a number of the native invertebrates, freshwater algae, and terrestrial arthropods rely on fresh water, particularly during their reproductive seasons. Water quality and abundance are important factors in the reproduction of many of these species.

Activity HMC-7.2: Evaluate potential for development and create as needed additional freshwater sources at potential translocation sites of the Laysan duck, Nihoa finch, Laysan finch, and Nihoa millerbird.

Some potential translocation sites for endangered endemic birds in the NWHI may contain all important habitat features for survival except for fresh water. Evaluation of the potential for water development at these locations will allow evaluation of overall translocation site suitability.

Strategy HMC-8: Maintain no more than 150 acres of ironwood woodlands on Sand Island, Midway Atoll, to provide seabird nesting and roosting habitat for the life of the plan.

The ironwood (*Casuarina*) forests at Sand Island provide nesting and roosting habitat for very large populations of white terns and the only breeding population of black noddies in the northern end of the Monument. While this species is an invasive nonnative, it does support these large seabird populations and will be replaced with adequate native alternatives before removing it completely.

Activity HMC-8.1: Remove ironwood on Sand Island from 50 acres outside designated woodland and control young ironwood in areas managed for grass and shrubs.
Ironwood is a fast-spreading species that will displace other vegetation types if not restrained. Forested infestations can be treated with heavy machinery or cutting and application of Garlon®. Young *Casuarina* can be controlled by hand-pulling and cutting and herbicide treatment.

Activity HMC-8.2: Devise and implement methods for monitoring population size and reproductive success in tree-nesting seabird species.
Better census techniques for tree-nesting seabirds such as white terns and black noddies are needed to assist decisionmaking about vegetation management and ultimate replacement of introduced species with natives. These studies will enable evaluation of whether certain age classes or forest types are more productive than others for these seabirds.

Strategy HMC-9: Protect and maintain 120 acres of vertical rocky cliff-face habitat at Nihoa and Mokumanamana for nesting seabirds for the life of the plan.

Throughout Hawaiʻi, vertical cliff habitats provide a safe haven for native birds, insects, and plants that can survive in the exposed inaccessible sites. Nihoa and Mokumanamana support colonies of cliff-nesting seabirds (white terns, black noddies, brown boobies, and white-tailed and red-tailed tropicbirds) and an unknown suite of plant and insect species on their dramatic rocky faces.

Activity HMC-9.1: Educate other federal and state agencies about overflight rules and promote compliance regarding overflights and close approaches.
Overflight restrictions are indicated on flight sectional charts, and the Federal Aviation Administration encourages pilots to maintain a minimum altitude of 2,000 feet above national wildlife refuges and national monuments. The Navy requires a minimum altitude of 3,000 feet over noise-sensitive areas such as national monuments. In addition, 50 CFR 27.34 prohibits the operation of aircraft at altitudes resulting in the harassment of wildlife. Aircraft approaches to the cliff habitats cause disturbance and possible loss of seabird eggs and chicks. Rapid turnover of personnel engaging in flights over the Monument has resulted in periodic overflights at too low an altitude. New staff (e.g., Coast Guard and DOD) will be made aware of the implications for wildlife disturbance.

Activity HMC-9.2: Develop and implement techniques for monitoring plant and animal populations on cliff habitats in the Monument within 10 years.
The cliff habitats of Nihoa and Mokumanamana are virtually inaccessible because of their height (up to 900 feet), windward location, and fragile rock type, which preclude safe climbing or rappelling. These cliffs provide habitat for significant proportions of seabirds, including white terns, black noddies, gray-backed terns, brown boobies, and red-tailed tropicbirds that nest on these islands. Monument staff will investigate culturally appropriate and innovative remote and direct methods as possible options for monitoring cliff habitats.

Table 3.2.3 Summary of Strategies, Activities, and Agency Leads for Habitat Management and Conservation

Strategies and Activities	Agency Lead
Strategy HMC-1: Within 15 years, develop and implement a strategy for restoring the health and biological diversity of the shallow reefs and shoals where anthropogenic disturbances are known to have changed the ecosystem, using best available information about pre-disturbance conditions.	
Activity HMC-1.1: Identify and prioritize restoration needs in shallow water reef habitats impacted by anthropogenic disturbances within 5 years.	NOAA
Activity HMC-1.2: Analyze historical and present impacts on reef growth at Midway Atoll and determine factors limiting nearshore patch reef growth to facilitate restoration of natural reef building.	NOAA FWS
Activity HMC-1.3: Where feasible, implement appropriate restoration activities.	NOAA FWS
Strategy HMC-2: Within 10 years, investigate, inventory and map sources of known contamination from historic human uses of the NWHI and, where appropriate, coordinate with responsible parties to develop plans and complete cleanup actions.	
Activity HMC-2.1: Evaluate effects of contamination in terrestrial and nearshore areas from shoreline dumps at French Frigate Shoals and at Kure, Midway, and Pearl and Hermes atolls and prioritize cleanup action based on risk assessments.	FWS
Activity HMC-2.2: Work with partners and responsible parties to verify the integrity of known landfills and dumps and to conduct additional remediation if necessary.	FWS
Activity HMC-2.3: Locate historic disposal sites at French Frigate Shoals and at Kure, Midway, and Pearl and Hermes atolls, and investigate them for contamination.	FWS
Activity HMC-2.4: Evaluate costs to ecosystem function and benefits of removing anthropogenic iron sources such as metal from shipwrecks and discarded debris from reefs throughout the Monument.	FWS
Activity HMC-2-5: Continue collection and fingerprinting of oil found washed ashore and on wildlife from mystery spills to determine its provenance, and build an oil sample archive for possible use as evidence in liability assignment.	FWS
Activity HMC-2-6: Continue monitoring the area at Laysan Island that was contaminated by the insecticide carbofuran.	FWS
Activity HMC-2.7: Conduct ecological risk assessment to determine allowable lead levels in soils at Midway and remove lead from buildings and soils to nonrisk levels.	FWS
Strategy HMC-3: Protect and restore beach strand and crest habitats over the life of the plan.	
Activity HMC-3.1: Evaluate loss of beach strand and crest due to erosion and sea level rise to aid in formulating a restoration plan that will stop as much net loss of beach strand and beach crest habitat as is possible.	FWS
Activity HMC-3.2: Inventory and map manmade structures and changes in natural beach and reef state that may influence erosion and depositional processes at all of the beach strand units of the Monument.	FWS

Strategies and Activities	Agency Lead
Strategy HMC-4: Within 10 years, restore and maintain coastal mixed grasses and shrubs on all the coralline islands and atolls of the Monument using best available historical information about the original indigenous ecosystem.	
Activity HMC-4.1: Propagate and outplant native species chosen on the basis of historical records at Midway and historical and pollen records from Laysan Island in 250 acres of vegetated area at Midway Atoll, focusing on the original footprint of the island and then moving to the dredge spoils section.	FWS
Activity HMC-4.2: Implement the Draft Laysan Island Restoration Plan by removing invasive plants, and propagating and outplanting all extant species identified in the pollen record or historical documents as formerly having occurred at Laysan.	FWS
Activity HMC-4.3: At Laysan Island, replace 60 acres of the introduced shrub Indian pluchea with native species.	FWS
Activity HMC-4.4: Formulate and implement a restoration plan for Lisianski Island using guidelines established for neighboring Laysan Island.	FWS
Activity HMC-4.5: Propagate and outplant native vegetation on 34-acre Southeast Island at Pearl and Hermes Atoll to replace native plant community extirpated by invasion of the alien plant golden crownbeard.	FWS
Activity HMC- 4.6: Implement coordinated ecosystem restoration activities on Kure Atoll.	State of Hawai‘i
Activity HMC-4.7: Monitor changes in the species composition and structure of mixed grass and shrub plant communities at each site.	FWS
Strategy HMC-5: Within 10 years, restore and maintain coastal mixed grasses and shrublands on basalt islands in the Monument.	
Activity HMC-5.1: Inventory and document life histories of endemic terrestrial invertebrates at Nihoa and Mokumanamana.	FWS
Activity HMC-5.2: Monitor changes in species composition and structure of the coastal shrub and mixed grass communities on basalt islands throughout the life of the plan.	FWS
Strategy HMC-6: Maintain and better understand the Monument's wetland and mudflat habitats to benefit migratory shorebirds and waterfowl for the life of the plan.	
Activity HMC-6.1: Monitor water level, salinity, and other water quality parameters of Laysan Lake, and document any loss of lake area.	FWS
Activity HMC-6.2: As needed, restore dune habitat on Laysan Island to stabilize movement if lake loss starts to occur.	FWS
Strategy HMC-7: Maintain, enhance, and, where appropriate, develop freshwater seeps, intermittent streams, and freshwater ponds as necessary for the benefit of native species for the life of the plan.	
Activity HMC-7.1: Monitor salinity, parasites, contaminants, and native arthropods associated with freshwater seeps, ponds, and streams.	FWS
Activity HMC-7.2 Evaluate potential for development and create as needed additional freshwater sources at potential translocation sites of the Laysan duck, Nihoa finch, Laysan finch, and Nihoa millerbird.	FWS

Strategies and Activities	Agency Lead
Strategy HMC-8: Maintain no more than 150 acres of ironwood woodlands on Sand Island, Midway Atoll, to provide seabird nesting and roosting habitat for the life of the plan.	
Activity HMC-8.1: Remove ironwood on Sand Island from 50 acres outside designated woodland and control young ironwood in areas managed for grass and shrubs.	FWS
Activity HMC-8.2: Devise and implement methods for monitoring population size and reproductive success in tree-nesting seabird species.	FWS
Strategy HMC-9: Protect and maintain 120 acres of vertical rocky cliff-face habitat at Nihoa and Mokumanamana for nesting seabirds for the life of the plan.	
Activity HMC-9.1: Educate other federal and state agencies about overflight rules and promote compliance regarding overflights and close approaches.	FWS
Activity HMC-9.2: Develop and implement techniques for monitoring plant and animal populations on cliff habitats in the Monument within 10 years.	FWS

3.3 Reducing Threats to Monument Resources

3.3.1 Marine Debris Action Plan
3.3.2 Alien Species Action Plan
3.3.3 Maritime Transportation and Aviation Action Plan
3.3.4 Emergency Response and Natural Resource Damage Assessment Action Plan

3.3 Reducing Threats to Monument Resources

Situated in the middle of the Pacific Ocean at the fulcrum of the North Pacific gyre and the mid-point between the economic giants of the east and west, the NWHI are subject to the full range of environmental and anthropogenic stressors despite their remote location and the absence of human population. Many threats originate far outside the NWHI. Marine debris, largely consisting of discarded or lost fishing nets from distant fleets and plastic trash, threatens and damages coral reef and coastal habitats, entangles and chokes marine life, and aids in the transport of contaminants.

The introduction of alien species to the islands has led to the establishment of invasive species that crowd out native species, altering habitat and food webs. Alien species may arrive on vessels or debris of any kind from ports around the world. Discharges from vessels operating in or transiting the NWHI can introduce pathogens that contribute to coral disease and could threaten marine mammal populations.

Vessel groundings and cargo spills occur somewhat infrequently in this remote archipelago, and response to such emergencies has required exceptional collaborative interagency effort and resources to minimize effects to the fragile coral reef and terrestrial ecosystems.

Through an ecosystem-based approach to management, of which interagency coordination and cooperation are central, reducing threats to the ecosystem is achieved through an effective regulatory framework, education and outreach, preventative measures to minimize risk, emergency response, and natural resource damage assessment and restoration when unforeseen events cause injury to natural resources.

Action plans to reduce existing and potential threats and prevent impacts to the ecosystem focus on developing and implementing risk reduction assessment and protocols, emergency response plans, and alien species prevention and eradication, where feasible. Each action plan consists of a set of strategies to address a desired outcome. The desired outcomes of these action plans over the 15-year planning horizon are:

- **Marine Debris:** Reduce the adverse effects of marine debris to Papahānaumokuākea Marine National Monument resources and reduce the amount of debris entering the North Pacific Ocean.
- **Alien Species:** Detect, control, eradicate where possible, and prevent the introduction of alien species into Papahānaumokuākea Marine National Monument.
- **Maritime Transportation and Aviation:** Investigate, identify, and reduce potential threats to Papahānaumokuākea Marine National Monument from maritime and aviation traffic.
- **Emergency Response and Natural Resource Damage Assessment:** Minimize damage to Papahānaumokuākea Marine National Monument resources through coordinated emergency response and assessment.

Action plans described in this section will be implemented in close coordination with agency partners and in conjunction with other priority management needs.

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3.3.1 Marine Debris Action Plan

Links to other Action Plans	
3.2.1	Threatened and Endangered Species
3.2.3	Habitat Management and Conservation
3.3.2	Alien Species
3.3.4	Emergency Response
3.5.1	Agency Coordination
3.5.4	Ocean Ecosystems Literacy
3.6.3	Coordinated Field Operations

Desired Outcome

Reduce the adverse effects of marine debris to Papahānaumokuākea Marine National Monument resources and reduce the amount of debris entering the North Pacific Ocean.

Links to Goals
Goal 1
Goal 2
Goal 3

Current Status and Background

In 1982 annual net and line removal began along NWHI beaches. A multiagency effort launched in 1996 strengthened and expanded efforts to address the problem of marine debris, a problem that was much larger than any agency alone might resolve. An estimated 750 to 1,000 tons of marine debris were on reefs and beaches in the NWHI. NOAA, in collaboration with 14 other partners, including the Coast Guard, Schnitzer Steel Hawai‘i Corporation (formerly Hawai‘i Metals Recycling Company), the Sea Grant College Program, the U.S. Navy, FWS, the City and County of Honolulu, the State of Hawai‘i, The Ocean Conservancy, Hawai‘i Wildlife Fund, Matson Navigation Company, and others removed 66 tons of marine debris and derelict fishing gear from 1996 to 2000.

In 2001, the multiagency cleanup effort was extended, and yields grew from approximately 25 tons per year in 1999 and 2000 to 68 tons in 2001, 107 tons in 2002, 118 tons in 2003, 126 tons in 2004, 57 tons in 2005, 21 tons in 2006, and 19 tons in 2007. The total amount of marine debris removed from 1996 to 2007 was 582 tons. The 2006 field season marked the first year of the maintenance mode effort, in which specific study areas called “High Entanglement Risk Zones” for Hawaiian monk seals are cleaned and designated accumulation rate zones are studied. Based on a recent study, the accumulation of new debris in the NWHI is now estimated to be 57 tons (or 52 metric tons) annually (Dameron et al. 2007). Even if all new input of debris were stopped, existing debris in the ocean would continue to accumulate in the NWHI for years to come.

Pacific Island Fisheries Science Center, Coral Reef Ecosystem Division's marine debris removal team at work in the NWHI. Photo: Jake Asher

In 2005, with guidance from Congress, a Marine Debris Program was established under NOAA’s Office of Response and Restoration. This program is undertaking a national and international effort focused on identifying, removing, reducing, and preventing debris in the marine environment. This program is a significant step toward addressing the marine debris issue and providing much-needed support to projects that address the issue. As one example, a project funded in 2005 established a port reception facility and derelict net recycling program in Honolulu for proper disposal of derelict fishing gear. Also in 2005, the Marine Debris Program joined the multiagency cleanup effort through funding for debris removal field operations.

On December 22, 2006, the Marine Debris Research, Prevention, and Reduction Act was signed into law. The Act makes the Marine Debris Program permanent and directs NOAA to work in conjunction with federal agencies such as EPA and the Coast Guard to identify the origin, location, and projected movement of marine debris within navigable waters of the United States and the U.S. exclusive economic zone. The Act specifically targets fishing gear as a threat to the marine environment and navigation safety, authorizes the research and development of alternative types of fishing gear, and allows the use of voluntary incentives to promote recovery of lost or discarded gear. The Act also authorizes NOAA to offer grants to academia, nonprofit organizations, commercial organizations, and state, local, or tribal governments to identify, assess, reduce, and prevent marine debris.

In recognition of the magnitude of the marine debris problem, NOAA has contributed to mitigating the effects of marine debris by providing funding for debris removal efforts and participating in the NWHI multiagency partnership. This work will now continue through the establishment of the Monument, and the MMB is already working to increase awareness of this very serious threat to coral reef ecosystems through national and international documentaries and publications, public outreach displays at Mokupāpapa Discovery Center, development of lesson plans about marine debris in the Navigating Change Teacher's Guide, and community presentations.

Need for Action

Marine debris, especially derelict fishing gear, is a severe chronic threat to the shallow-water ecosystems of the NWHI and hinders the recovery of the endangered Hawaiian monk seal and threatened sea turtles through ingestion of debris and entanglement, which can lead to drowning and suffocation (see Section 3.2.1, the Threatened and Endangered Species Action Plan). Ocean currents carry marine debris, including derelict fishing nets and other gear from North Pacific fisheries, plastics, hazardous materials and hazardous waste lost or discarded from ships during transit, authorized and unauthorized fish aggregation devices (Donohue 2005), and other shore-based debris from Pacific Rim countries, across the greater Pacific Ocean. The North Pacific Subtropical Convergence Zone, located just north of the Hawaiian Archipelago, concentrates some of these materials. Under certain conditions, such as during an El Niño event, this convergence zone dips southward and straddles the Hawaiian Archipelago, depositing much higher volumes of debris on the island chain than in years when these conditions are not in effect (Harrison and Craig 1993; Matsumura and Nasu 1997; Ingraham and Ebbersmeyer 2001; Donohue and Foley 2007; Morishige et al. 2007).

Large conglomerations of derelict fishing nets that are carried into shallow waters degrade reef health by shading, abrading, smothering, and dislodging fragile corals and other benthic organisms and by preventing recruitment on reef surfaces (Donahue and Brainard 2001). Nets and line pose deadly entanglement hazards for all marine life. Smaller marine debris, such as disposable lighters and plastic bottle caps, are ingested by albatrosses while foraging for food and affect survival rates of these birds. Marine debris washes ashore in the NWHI, degrading habitat and the health of the Monument's ecosystems. Debris in the form of hazardous materials, unknown substances, and unexploded ordnance endangers wildlife as well as Monument field staff. Marine debris also acts as a vector for the accelerated introduction of alien species into the region and poses a navigational hazard to maritime vessels (see Sections 3.3.2 and 3.3.4, the Alien Species and Emergency Response and Natural Resource Damage Assessment action plans). This action plan presents strategies and activities for addressing marine debris issues in the Monument as well as the North Pacific region.

Strategies to Achieve the Desired Outcome

Ultimately, the Monument's desired outcome is the elimination of marine debris, including derelict fishing gear, from the NWHI. Complete elimination of marine debris in the near future is virtually impossible because of the financial cost, the size of the area, and the continuous influx of new debris. However, removal of existing debris, detection and prevention of incoming debris, and education to prevent future generations of debris are the achievable strategies to reduce the overall impact of debris. Three strategies have been developed to achieve the desired outcome. The strategies and activities are coded by the acronym for the action plan title, "Marine Debris" (MD). A summary of strategies and activities is provided in Table 3.3.1 at the end of this action plan.

- MD-1: Remove and prevent marine debris throughout the life of the plan.
- MD-2: Investigate the sources, types, and accumulation rates of marine debris within 5 years.
- MD-3: Develop outreach materials regarding marine debris within 2 years.

Strategy MD-1: Remove and prevent marine debris throughout the life of the plan.

Continued support of existing debris removal programs, including the Marine Debris Program, is essential. Existing debris, particularly large fishing nets, poses an acute entanglement threat to endangered and threatened species. The only way to decrease entanglement rates from existing debris is to remove the nets from beaches and the nearshore areas, including those around French Frigate Shoals, Maro Reef, Lisianski Island, Laysan Island, Pearl and Hermes Atoll, Midway Atoll, and Kure Atoll. Nets and other debris also combine into large masses that are moved around by wave energy. These masses scour the bottom, abrading and breaking coral colonies, preventing colonization, and damaging other benthic resources. Removal of debris, particularly large nets that have come into shallow waters, is expensive and dangerous. Programs to identify, track, and remove nets both within and outside the Monument, combined with incentive programs for fishermen to pick up these nets and bring them back to shore for disposal, may be more cost effective and would prevent damage to fragile reef ecosystems. The MMB will work in partnership with the Coast Guard and other marine debris partners to provide incentives for fishing vessels to participate in disposal programs and still comply with Coast Guard policies regarding the transport of debris as "cargo-for-hire."

Activity MD-1.1: Continue working with partners to remove marine debris in the Monument and reduce additional debris entering the Monument.

The MMB will continue to support and participate in the multiagency cleanup effort that has been highly effective in removing marine debris from shallow-water areas and beaches. With existing infrastructure, protocols, and experience in executing this demanding and logistically intensive task, it is beneficial to all parties to continue participating in the existing effort. Data collected and analyzed as part of the multiagency effort will be entered into the Papahānaumokuākea Information Management System (PIMS), once it is developed.

Although cleanup efforts have removed the majority of accumulated large nets in NWHI waters less than 30 feet (9 meters) deep, additional debris keeps coming in. NOAA estimates that, each year, 57 tons (52 metric tons) of derelict fishing gear and other netting originating from outside the U.S. accumulates on coral reefs and beaches in the NWHI (Dameron et al. 2007). Two ways to prevent debris from entering the shallow-water reef ecosystem are to retrieve the existing debris at sea and to change existing fishing gear disposal practices. Potential changes include designing gear modifications, implementing gear loss reporting requirements, requiring permanent identification of fishing gear, requiring dockside gear accountability inspections of vessels prior to their departure on fishing trips and upon their return, working with the fishery management councils in the United States and similar agencies in foreign countries to reduce illegal fishing and destructive fishing practices, and pursuing technological means to detect and retrieve gear lost at sea.

Activity MD-1.2: Catalog, secure, contain, and properly remove hazardous materials that wash ashore in the NWHI.

Unidentified chemical containers, unexploded ordnance, oceanographic instruments, loose fish aggregating devices, and other unidentified objects regularly wash up on beaches in the Monument. The items will be documented, identified, and then secured until appropriate removal and disposal by approved contractors can occur.

Activity MD-1.3: Develop and implement a 5-year marine debris removal and prevention strategy for the Monument.

Using recommendations from national and international marine debris conferences and data from ongoing marine debris removal efforts, and in coordination with partner agencies and organizations, a coordinated strategy for marine debris removal and prevention will be developed for the NWHI. Data and information on the types, sources, locations, and impacts of debris obtained from ongoing removal efforts and additional studies will be used to develop focused, short-term and long-term initiatives geared to achieve the greatest return on investment in terms of ecological protection. The MMB will continue to pursue activities that identify, track, and collect large debris at sea, along with development of incentive programs for fishing vessels to collect debris at sea and bring it to dockside collection facilities. A dockside collection program has been implemented on O'ahu for fishermen to offload derelict fishing gear retrieved at sea. This program illustrates the type of coordination among multiple government agencies, community groups, and the private sector needed to address this issue. The marine debris removal and prevention strategy will investigate this mechanism to provide additional incentive for debris prevention.

Activity MD-1.4: Work with the U.S. Department of State to gain international cooperation and involvement for marine debris issues.

The MMB will work through the Interagency Marine Debris Coordinating Committee, the U.S. Department of State, and other appropriate U.S. agencies to call international attention to marine debris problems in the NWHI and to identify approaches to reducing foreign debris sources. Approaches may include, but are not limited to, permanent identification of fishing gear, incentive programs for recovered debris, and dockside gear accountability inspections of vessels prior to their departure on fishing trips and on their return.

Activity MD-1.5: Work with the fishery management councils to address marine debris prevention with U.S. fishing fleets.

The MMB will work with the Western Pacific and North Pacific Fishery Management Councils to assess and address fishing practices or domestic fishing gear that contribute to the marine debris problem. The MMB will coordinate with the Councils to initiate an accountability requirement for all vessels that use the type of gear that is contributing to marine debris in the NWHI. This requirement could include permanent identification of fishing gear, incentive programs for recovered debris, disposal and recycling programs, dockside gear accountability inspections of vessels prior to their departure on fishing trips and on their return, and other approaches.

Strategy MD-2: Investigate the sources, types, and accumulation rates of marine debris within 5 years.

The MMB, in partnership with other governmental and nongovernmental entities, will conduct research into mechanisms to locate, track, and remove debris at sea before it reaches fragile Monument ecosystems. This program will attempt to use unmanned aircraft systems to locate the debris at sea and may also take advantage of remote sensing systems being researched for Monument enforcement purposes to detect large debris conglomerates. Once an area of high concentration of debris is located, unmanned aircraft can be launched from vessels to find individual conglomerations of debris and target removal efforts. These initiatives will help direct the cleanup effort to where it will have the greatest effect, with limited resources. Using satellite imagery, NMFS is also working with partners to design a statistical survey to census marine debris in the north Pacific. This information will provide us with an estimate of the magnitude of the marine debris problem in the Pacific. In addition, NMFS and its partners are working to track debris movement in the Pacific Ocean, including areas within the Monument, through the use of satellite-tracked drifter buoys.

Another project is to address the small plastic debris being fed to young albatrosses. Much of the debris being fed to young albatross is picked up at sea by the adults. Monitoring the debris that washes up onto the beaches at Midway Atoll will provide a snapshot of what is in the waters surrounding the Monument islands, the most economical approach to such identification. This study will also allow us to begin to identify sources of the debris and then to develop a strategy for use of this information for prevention through education and outreach targeting key stakeholders and user-groups that are associated with the behaviors that produce these forms of marine debris.

Activity MD-2.1: Work with partners on marine debris studies.

The MMB will work with the Marine Debris Program to support studies on the marine debris issue, including research to quantify resource impacts and to determine marine debris accumulation rates, biological and ecological impacts, efforts to track sources and types of debris, and documentation of the cost estimates of damage. One such study, implemented in August 2008, will assess resource impacts from nets found on corals and the recovery of net-scars over time at Midway Atoll reefs.

Activity MD-2.2: Develop and standardize marine debris monitoring protocols for marine and terrestrial habitats.

Currently, marine debris data are collected by numerous entities using a variety of data collection methods. Synthesizing, quantifying, and interpreting marine debris data are therefore difficult. The MMB will work with all federal and state partners to standardize protocols to maximize the use and utility of data collected by the various programs. Development of a statistically sound and biologically relevant marine debris monitoring protocol for Midway Atoll has begun. This protocol may serve as the basis for a long-term monitoring program within the Monument. Since 1984, 22 international marine debris conferences have recommended standardization of data collection as one of their top two priorities. This unique project at Midway Atoll, in partnership with the Dow Chemical Company and with additional funding from a National Fish and Wildlife Foundation grant, hopes to lay the foundation for a greater understanding of debris sources.

Strategy MD-3: Develop outreach materials regarding marine debris within 2 years.

To better explain the scope and impacts of marine debris in the NWHI, an outreach strategy will be developed with the multiagency partnership to reach both local and international audiences and specific fishing communities.

Activity MD-3.1: Work with partners to continue to develop and implement an outreach strategy for marine debris.

To better explain the scope and impacts of marine debris in the NWHI, an outreach strategy will be developed with the multiagency partnership to reach a broad audience and specific fishing communities. Such outreach will be coordinated with other efforts as described in the Constituency Building and Outreach Action Plan (Section 3.5.2) as well as with broader efforts of the Marine Debris Program.

Awareness of the impact of marine debris must be increased. Most people are not aware that much of the shore-based marine debris comes from the careless disposal of garbage, such as cigarette lighters and other plastics, and that much of the derelict fishing gear comes from losses at sea caused by bad weather, gear failure, and improper disposal. Educating the public about the impacts of this debris in the ocean environment aims to change behaviors and ultimately reduce the volume of debris in the ocean. Documentaries and feature stories regarding this issue already have led to significant actions by several nations aimed at reducing marine debris. Such educational activities will be encouraged by the MMB. In addition, outreach products will be developed to reach specific fishing communities and industries. These materials will target recreational fishermen and commercial fishing sectors on proper disposal and reporting of gear lost at sea. The outreach materials will highlight lost gear to better explain the scope and impacts of this type of marine debris.

Table 3.3.1 Summary of Strategies, Activities, and Agency Leads for Marine Debris

Strategies and Activities	Agency Lead
Strategy MD-1: Remove and prevent marine debris throughout the life of the plan.	
Activity MD-1.1: Continue working with partners to remove marine debris in the Monument and reduce additional debris entering the Monument.	NOAA
Activity MD-1.2: Catalog, secure, contain, and properly remove hazardous materials that wash ashore in the NWHI.	FWS
Activity MD-1.3: Develop and implement a 5-year marine debris removal and prevention strategy for the Monument.	NOAA
Activity MD-1.4: Work with the U.S. Department of State to gain international cooperation and involvement for marine debris issues.	NOAA
Activity MD-1.5: Work with the fishery management councils to address marine debris prevention with U.S. fishing fleets.	NOAA
Strategy MD-2: Investigate the sources, types, and accumulation rates of marine debris within 5 years.	
Activity MD-2.1: Work with partners on marine debris studies.	NOAA
Activity MD-2.2: Develop and standardize marine debris monitoring protocols for marine and terrestrial habitats.	NOAA
Strategy MD-3: Develop outreach materials regarding marine debris within 2 years.	
Activity MD-3.1: Work with partners to continue to develop and implement an outreach strategy for marine debris.	NOAA

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3.3.2 Alien Species Action Plan

Links to other Action Plans	
3.1.1	Marine Conservation Science
3.2.1	Threatened and Endangered Species
3.2.3	Habitat Management and Conservation
3.3.1	Marine Debris
3.3.3	Maritime Transportation and Aviation
3.4.1	Permitting
3.4.2	Enforcement
3.5.2	Constituency Building and Outreach
3.5.4	Ocean Ecosystems Literacy
3.6.2	Information Management
3.6.3	Coordinated Field Operations

Links to Goals
Goal 1
Goal 2
Goal 3
Goal 4
Goal 5

Desired Outcome

Detect, control, eradicate where possible, and prevent the introduction of alien species into Papahānaumokuākea Marine National Monument.

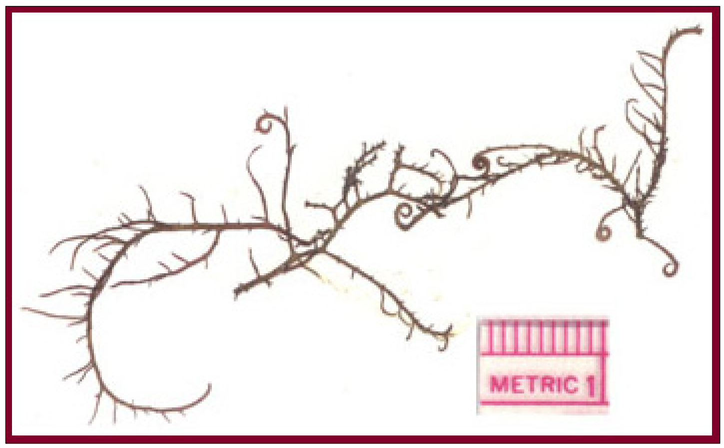
Current Status and Background

Despite the extreme remoteness of the Monument, the relatively low rate of visitation, and the high amount of administrative control over the conditions of any visits, alien species have left their mark on natural communities in the Monument. Insular ecosystems are often more vulnerable to the effects of introduced species than continental areas due to smaller total population sizes, higher endemism, and species that have evolved longer in the absence of predators and thus are less likely to have developed defenses against them (Blackburn et al. 2004). An invasive species is defined as a species (1) that is nonnative (or alien) to the ecosystem under consideration, and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Invasive species can affect native species by competitive exclusion, niche displacement, hybridization, introgression, predation, and ultimately extinction (Mooney and Cleland 2001). The known incidence and distribution of alien species in the NWHI is described in Section 1.4, Environmental and Anthropogenic Stressors.

The ecosystems of Hawai‘i have changed profoundly and at an accelerating pace since humans arrived, accompanied by an array of alien species. The NWHI now have terrestrial invaders in most taxa, some of which have caused great disruption to the native ecosystems. In the main Hawaiian Islands, alien algae have altered native habitat and in some areas have overgrown and completely smothered extensive areas of coral reef (DLNR 2003a). Other alien species have caused serious economic effects. Each year, Maui County spends thousands of dollars to remove more than a million pounds of the alien algae *Hypnea* from its beaches (Coloma-Agaran 2003). Snowflake coral (*Carijoa riisei*) has covered significant portions of black coral beds in the main Hawaiian Islands in depths greater than 250 feet (75 meters) and is now considered one of the most invasive invertebrates on deep-water coral reefs (DLNR 2003a). Hawai‘i’s harbors and bays are the most common sites for alien species introductions (Godwin et al. 2006).

In 2003, the State of Hawai‘i DLNR and various federal, state, industry, and nonprofit organizations released the State of Hawai‘i Aquatic Invasive Species Management Plan (DLNR 2003a). Many of the strategies outlined in that plan complement those outlined in this action plan but are much broader in scope, as they concern the entire archipelago, including the complexities of the highly populated and commercially active main Hawaiian Islands. An assessment of the potential threats of nonindigenous marine species in the NWHI was completed by Eldredge (2005). A 2006 report by HIMB addresses issues specific to reducing the potential impacts of invasive marine species in the NWHI (Godwin et al. 2006).

Early attempts to establish human settlements in the NWHI in the late 1800s and early 1900s, especially at Laysan Island and Midway Atoll, resulted in the introduction of many alien terrestrial species, including plants, insects, and mammals. The number of alien land plants in the NWHI varies from only three introduced at Nihoa to 249 introduced at Midway Atoll. The level of threat from introduced plants also varies between species. For example, the invasive plant golden crownbeard (*Verbesina encelioides*) displaces all native vegetation in nesting areas, causing entanglement and heat prostration and killing hundreds of albatrosses each year. The invasive gray bird locust (*Schistocerca nitens*) was first detected at Nihoa in 1984 and by 2000 was periodically reaching population levels large enough to cause damage to the native plant community, including three endemic species listed as endangered. This grasshopper species has now also spread to Mokumanamana, French Frigate Shoals, and Lisianski Island. To prevent further importation of invasive plants, animals, or insects, mandatory quarantine protocols are enforced for any visitors to all the islands in the NWHI (with the exception of Midway Atoll and French Frigate Shoals). These protocols require the use of brand new or island-specific gear at each site and treatments such as cleaning, using insecticide, and freezing to minimize the transport of potentially invasive species to the island.



Hypnea musciformis, an alien algae species which is invasive in the main Hawaiian Islands, has been documented in the waters surrounding Mokumanamana. Photo W.H. Magruder (Bishop Museum)

Of the 343 marine alien species found in the Main Hawaiian Islands, a total of 13 alien marine invertebrate, fish, and algal species have been recorded in the NWHI, with the highest concentrations occurring at Midway Atoll (see Table 1.1, and also Eldredge and Carlton 2002; Godwin et al 2006). The location, source, and year of each confirmed sighting are contained in the Monument's geodatabase. Several patterns have emerged through analyses of these data: (1) of the three alien fish species in the Monument, ta'ape (*Lutjanus kasmira*) has spread significantly farther and is more abundant than either to'au (*Lutjanus fulvus*) or roi (*Cephalopholis argus*); (2) aside from the Christmas tree hydroid (*Pennaria disticha*), invasive invertebrates are concentrated in the harbors of Midway Atoll and Tern Island in French Frigate Shoals. Invasive invertebrates commonly thrive in harbors, benefiting from anthropogenic structures, such as pier pilings and seawalls, as well as protection from wave action; (3) alien algae have not yet spread far into the Monument. *Hypnea musciformis* has been found only on lobster traps retrieved near Mokumanamana (Godwin et al. 2006).

Although the remoteness and relative inaccessibility of the NWHI have helped to prevent the introduction of some alien species to the area, these islands are vulnerable to introductions through a variety of human activities. Maritime vessels are recognized as the primary vector for transporting marine alien species through contaminated vessel equipment, hull fouling, ballast water, and ballast sediment. Additional vectors include deliberate and accidental release and transport by artificial substrates such as fish attractant devices and marine debris (See Section

3.3.1, the Marine Debris Action Plan, and also Godwin et al. 2006.). Analyses are currently being conducted of the algal and invertebrate communities living on derelict nets collected during the 2007 marine debris removal effort. This information will provide needed insight on the quantity and diversity of alien biota living on the nets and facilitate the assessment of this threat to the ecosystems of the NWHI.

Existing Laws, Regulations, and Protocols

Vessel hull fouling and ballast water discharge have been identified as two major vectors for transporting alien species in marine environments (International Maritime Organization 1997, 2001). Therefore, Monument regulations and permit requirements specifically target these pathways. Best management practices for Monument access will continue to use the latest information to address both marine and terrestrial alien species introductions and support the requirements developed by FWS to prevent alien species introductions to the Hawaiian Islands NWR (see Section 3.4.1, the Permitting Action Plan, and Appendix A).

In 2000, the State of Hawaiʻi Legislature designated DLNR as the lead agency for preventing the introduction of alien aquatic organisms through ballast water and hull fouling. DLNR reestablished an interagency task force to discuss and make recommendations to address concerns about alien aquatic organism issues related to ballast water and hull fouling, including adopting administrative rules and penalties. DLNR has hired a project coordinator to address issues relating to aquatic invasive species through hull fouling and ballast water. The State of Hawaiʻi has also been working on developing a comprehensive ballast water and hull fouling program since September 2002, with NOAA funds administered by the State Office of Planning, Coastal Zone Management Program.

Federal laws that apply in addressing alien species and invasive species in the NWHI include the Lacey Act of 1900, as amended (18 U.S.C. 42, 16 U.S.C. 3371), the Endangered Species Act of 1973, the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 U.S.C. 4701), and the National Invasive Species Act of 1996 (Public Law 104-332); Executive Order 13112 on Invasive Species (1999) also applies. Executive Order 13112 established the National Invasive Species Council and requires development of a National Management Plan for Invasive Species. Under the Nonindigenous Aquatic Nuisance Prevention and Control Act, NOAA and FWS have responsibility for control and management of invasive aquatic species.

The Coast Guard has developed the Mandatory Ballast Water Management Program for U.S. Waters. The Coast Guard published regulations on July 28, 2004, establishing a national mandatory ballast water management program for all vessels equipped with ballast water tanks that enter or operate within U.S. waters. These regulations also require each vessel to maintain a ballast water management plan that is specific to that vessel and assigns responsibility to the master or another appropriate official to understand and execute the ballast water management strategy for that vessel. The International Maritime Organization (1997) has developed ballast water exchange guidelines. In Hawaiʻi, the Alien Aquatic Organisms Task Force is also developing strategies to address the transport of alien species by vessels. DLNR promulgated Title 13, Chapter 76, Hawaii Administrative Rules (Non-indigenous Aquatic Species) on October 12, 2007, to manage ballast water discharge from vessels operating in Hawaiʻi waters (Appendix F). They are consistent with and complement the federal regulations and coincide with the national focus to protect U.S. water in which many states have adopted their own rules.

The MMB incorporated FWS policies aimed primarily at preventing the introduction of terrestrial alien species to the islands in the Hawaiian Islands NWR (Appendix F). These policies include requiring personnel and other visitors to use new, island-specific clothing, shoes, and other gear, such as tents and bedding, that have been frozen for at least 48 hours and carefully packed to prevent contamination at all islands with the exception of Midway Atoll and French Frigate Shoals. In addition, considerable resources and staff time are devoted to controlling and eradicating invasive species on the islands. The eradication of the introduced grass *Cenchrus echinatus* at Laysan Island is an example of the success the FWS has had in its prevention and eradication programs (Rehkemper and Flint 2002). The MMB has also taken steps toward preventing marine alien species introductions through the development of protocols for reducing the risk of transmission from vessel hulls, discharge, and equipment used throughout the Monument (Appendix F).

Monument Regulations and Permit Requirements

Preventing alien species from entering the NWHI ecosystem is the most important action to take in protecting the ecosystem from the impacts of invasive species. It is difficult, if not impossible, to predict whether an alien species will become invasive in a given environment. The probability of a successful eradication of an alien species in the marine environment is low. Therefore, efforts will be made to prevent all alien species from entering NWHI ecosystems. Monument regulations and permit requirements (based on best management practices) related to alien species target key vectors known for transporting alien species. Monument regulations related to preventing alien species introductions include a prohibition of the release or introduction of alien species into the Monument, and the State regulates any kind of vessel discharge (see Appendix F; HAR Title 13 Chapter 76). Mandatory hull inspections and cleaning, if needed, are a Monument permit requirement for all ships authorized to enter the Monument. In addition, aircraft landing within the Monument are subject to inspection, as are all visitors and their luggage.

In addition to regulations and permit conditions, outreach programs offer tools for enlisting the support of Monument permittees in protecting ecological integrity. (See also the action plans for Permitting, Section 3.4.1; Ocean Ecosystems Literacy, Section 3.5.4; Constituency Building and Outreach, Section 3.5.2; and Marine Transportation and Aviation, Section 3.3.3.)

Need for Action

Worldwide, invasive species are causing negative ecological and economic impacts. While not all alien species will become invasive in a given environment, it is difficult, if not impossible, to determine which will have harmful impacts. Therefore, a precautionary approach treats all alien species as potentially invasive other than a select few that have been cleared for human consumption. The need to prevent introductions of both marine and terrestrial alien species to the NWHI was raised as an issue of concern during public scoping meetings in 2002 and consistently during public scoping and comment periods since that time. Protecting the lands and waters of the NWHI from the impacts of alien species is critical to achieving the Monument's primary goal of resource protection.

While few alien species are established in the waters of the NWHI, global trends suggest that others could be introduced to this relatively pristine ecosystem. For example, marine debris serves as a vector for invasive species by providing a ride for sessile aliens and a microhabitat for other species that may arrive unattached but associated with the debris. By causing mechanical damage to reef structures, it may also create favorable habitat for settling out and recruitment of nonnative species. Once established, invasive species can be extremely costly to control and would likely be impossible to eradicate. The remoteness of this area compounds the challenge. If appropriate prevention and control measures are not taken, alien species could continue to spread and may cause substantial damage to the health and integrity of marine ecosystems across the Hawaiian Archipelago. This action plan presents strategies and activities for addressing alien species needs in the Monument, as well as the NWHI region.

Strategies to Achieve the Desired Outcome

Strategies identified for achieving the desired outcomes range from preventing alien species introductions to monitoring, controlling, and eradicating existing alien species in the Monument, to detecting new invasive species threats. The strategies and activities are coded by the acronym for the action plan title, "Alien Species" (AS). A summary of strategies and activities is provided in Table 3.3.2 at the end of this action plan.

- AS-1: Conduct planning to prioritize by threat level, invasiveness, and practicality of eradication or control all nonnative organisms in the Monument over the life of the plan.
- AS-2: Engage in active surveillance to monitor existing infestations and to detect new infestations of alien species over the life of the plan.
- AS-3: Establish and enforce quarantine procedures appropriate for each site and habitat (terrestrial and aquatic) in the Monument to prevent the invasion or reinfestation of nonindigenous species over the life of the plan.
- AS-4: Eradicate the house mouse population on Sand Island, Midway Atoll, within 15 years.
- AS-5: Prioritize infestations of alien terrestrial arthropods by species and locations and, within 5 years, develop and subsequently implement plans to control and if possible eradicate the highest-priority species.
- AS-6: Control and eventually eradicate the highest-priority invasive plants in the terrestrial parts of the Monument within 15 years.
- AS-7: Investigate methods to eventually eradicate aquatic invasive organisms already known to be present in the Monument, and conduct regular surveillance for new invasions.
- AS-8: Conduct and facilitate research designed to answer questions regarding invasive species detection; effects on ecosystem; and alien species prevention, control, and eradication over the life of the plan.
- AS-9: Engage Monument users and the public in preventing the introduction and spread of alien species.
- AS-10: Participate in statewide and Pacific regional alien species efforts.

Strategy AS-1: Conduct planning to prioritize by threat level, invasiveness, and practicality of eradication or control all nonnative organisms in the Monument over the life of the plan.

The consolidation of efforts and information and the standardization of methods for approaching invasive species problems will enable managers to prioritize invasive species projects, maintain better readiness to respond to new invasions, and prevent or reduce the probability of additional invasions.

Activity AS-1.1: Complete an Integrated Alien Species Management plan.
An Integrated Alien Species Management Plan (IASMP) for the Monument will be developed based on review of the effectiveness of existing protocols and a critical geospatial threat analysis of alien species found within the NWHI and risks associated with new introductions from maritime traffic from the main Hawaiian Islands and interisland travel by aircraft or vessel. The plan will be based on a comprehensive risk assessment and enable prioritization of alien species management actions. Any necessary pesticide use proposals and Section 7 consultations will address terrestrial alien species control, eradication, and response to outbreaks within two years. The IASMP and associated compliance requirements will be updated every 5 years and will include proactive components such as completing pesticide use proposals and Section 7 consultations before they are needed to facilitate rapid response.

Activity AS-1.2: Develop best management practices to prevent, control, and eradicate alien species.
The integrated alien species management plan will include a definition of specific protocols and requirements for preventing, controlling the spread of, and eradicating alien species, such as hull inspections and island quarantine protocols, a description of each partner's role in alien species control, best management practices to prevent the spread of species within the NWHI, and priority areas. Species of concern will be identified. One concern the plan will address is the need to prevent the spread of alien species within the NWHI, especially from Midway Atoll.

The plan will incorporate individual Co-Trustee guidelines, as appropriate, for the most effective and collaborative efforts possible. Memoranda of agreement will be developed as necessary to adopt and implement agency guidelines. Planning may also include development of a formal inter-agency rapid-response field team modeled after similar efforts for brown tree snakes, the state terrestrial and aquatic alien invasive species (AIS) response teams, oil-spill response teams, and the Federal Incident Command System. A rapid response plan that details complete areas of responsibilities for each managing partner on the discovery of a new introduction needs to be a part of the plan.

This plan will include strategies for a rapid risk assessment, possible methods for containment and eradication, and a provision for quickly accessing funding needed for the control or eradication attempt. Additionally, measures to reduce the chances that ships are transporting deleterious species should be encouraged even if no ballast water is intentionally discharged in the Monument. These measures may include exchange; pre-intake treatments such as filtration, ultraviolet treatment, or sonic treatment; post-intake extermination of organisms; and regular cleaning of ballast tanks. Coordination with existing groups already working on some of these alien species issues will be a high priority to build on the plans already drafted. Examples of these are the State of Hawai'i Aquatic Invasive Species Management Plan (DLNR 2003a), the report on Reducing Potential Impact of Invasive Marine Species in the NWHI CRER (Godwin et al. 2006), the Assessment of the Potential Threat of Marine Nonindigenous Species in the NWHI (Eldredge 2005), the Draft Pacific Islands Rat Spill Contingency Plan (FWS in prep.), and the Draft Laysan Island Restoration Plan (Morin and Conant 1998). This activity will be closely linked with the field protocols developed in the Coordinated Field Operation Action Plan (Section 3.6.3) and in the Maritime Transportation and Aviation Action Plan (Section 3.3.3).

Strategy AS-2: Engage in active surveillance to monitor existing infestations and to detect new infestations of alien species over the life of the plan.

The two pressing needs in managing areas affected by invasive species are to identify what new species have recently arrived and become established and which alien species exhibit invasive characteristics and are, therefore, the most dangerous. Maintaining careful records of the distribution of known alien species and actively searching for new arrivals are essential to correctly prioritize response and restoration activities.

Activity AS-2.1: Survey distributions and populations of known alien species at regular intervals.
Existing invasions should be closely monitored to determine their rate of spread and distribution relative to sensitive native species in the Monument. This will assist managers in prioritizing response actions. Monument staff will incorporate alien species data collection into existing annual ecosystem monitoring activities (see Section 3.1.1, Marine Conservation Science Action Plan).

Activity AS-2.2: Maintain a GIS database of marine and terrestrial alien species.
Data collected during alien species monitoring will be added to the Monument's geographic information system (GIS) database for tracking and analysis purposes (see Section 3.6.2, Information Management Action Plan). These data will help track the spread of invasive species and the success of control measures instituted by Monument managers.

Activity AS-2.3: Develop and implement monitoring protocols for early detection and characterization of new infestations.
In accordance with the Monument's integrated alien species management plan, protocols will be developed and refined as necessary to monitor selected areas for possible alien species introduction. Discoveries of new alien species will be immediately reported to managers for appropriate response and incorporated into the Monument's GIS database.

Strategy AS-3: Establish and enforce quarantine procedures appropriate for each site and habitat (terrestrial and aquatic) in the Monument to prevent the invasion or reinfestation of nonindigenous species over the life of the plan.

The benefits of preventing the introduction of a new species far outweigh its cost. Reducing the probability of alien species being transported to the Monument by developing effective quarantine protocols and enforcing them is tremendously important to maintain the biological integrity, diversity, and environmental health of the system.

Activity AS-3.1: Enforce the use of existing quarantine protocols to prevent the introduction of invasive terrestrial species to the Monument.
Strict enforcement of existing policies (see Appendix F) requiring the use of island-specific soft gear that is brand new and has been frozen for 48 hours has resulted in a very low incidence of new invasive species being reported in the NWHI since the inception of the current program in 1991 at all high-quarantine sites (Nihoa, Mokumanamana, Gardner Pinnacles, Laysan Island, Lisianski Island, and Pearl and Hermes Atoll).

Activity AS-3.2: Continue to require hull inspection and cleaning of all vessels, SCUBA gear, marine construction material, and instruments deployed in the Monument.
A majority of recent marine invasive species to Hawai'i are directly attributed to sessile and mobile biofouling organisms associated with hull fouling (Godwin et al. 2006). Therefore, prevention efforts will focus on introductions by vessel dispersal. These modes of dispersal include hulls and propellers, outboard motors, anchors and chains, fishing equipment, scientific dive gear, research floating platforms, and drydocks (Godwin et al. 2005). Inspections are mandatory for all permitted vessels prior to entering the Monument. A hull cleaning may be required prior to access.

Strategy AS-4: Eradicate the house mouse population on Sand Island, Midway Atoll, within 15 years.

Subsequent to the eradication of the black rat (*Rattus rattus*) at Midway Atoll and the Polynesian rat (*Rattus exulans*) at Kure Atoll, the house mouse (*Mus musculus*) on Sand Island, Midway, remains the only nonnative mammal left in the NWHI. Mice can cause high mortality in seabirds as large as albatrosses (Wanless et al. 2007.) In addition, Midway now hosts a translocated population of endangered Laysan ducks that are likely to be negatively affected by high mouse populations. Mice are also a major threat to native plants and terrestrial invertebrates.

Activity AS-4.1: Produce a house mouse eradication plan within 5 years and procure appropriate permits for chosen eradication techniques.
The eradication of introduced rodents from islands is routine, and the successful removal of black rats at Midway Atoll in recent years has provided a model for mouse eradication. Mice present additional challenges, however, such as much smaller home range sizes and different foraging and reproductive ecology. A careful planning effort that emphasizes the minimization of effects to nontarget organisms at the site and the other biological differences that may affect the operation is necessary.

Activity AS-4.2: Implement and complete house mouse eradication.
All of Sand Island (1,128 acres) will be treated with rodenticide, with active management to prevent nontarget impacts to native wildlife. Surveys of the affected ecosystem components before and after the operation will provide a valuable demonstration of the effects of introduced mice on biological communities.

Strategy AS-5: Prioritize infestations of alien terrestrial arthropods by species and locations and, within 5 years, develop and subsequently implement plans to control and if possible eradicate the highest-priority species.

Introduced insects can have devastating effects on native plant and animal communities, but our state of knowledge of the ecology of native terrestrial invertebrates in the Monument and our understanding of technologies for controlling and eradicating introduced arthropod species are minimal. Planning and prioritization will improve our chances of successfully managing this group of invasive species while minimizing negative effects to native species (terrestrial and aquatic).

Activity AS-5.1: Within 5 years, formulate a priority list of locations and species and a treatment plan to control and eventually eradicate all social Hymenopterans, such as ants and wasps, at all islands in the Monument.
Nineteen different species of ants have been recorded in the NWHI through the years (Nishida 1998, 2000). All of these are alien, and some have the potential to be exceedingly invasive and damaging to native plants and animals. Some species are more dangerous to native species than others, and different species of ant may require different approaches to eradication or control in terms of toxicant delivery and effectiveness, seasonality, habitat choices, and differences in accessibility of the infested islands. Other Hymenopterans such as wasps also threaten indigenous species, particularly insects.

Activity AS-5.2: Conduct toxicant trials to evaluate their efficacy and document ecological effects at selected islands on highest-priority invasive species of ants and wasps.
Specific toxicants for killing target species of ants and wasps and baits most palatable to the target species will be tested for efficacy and attractiveness before full-scale eradication efforts begin.

Activity AS-5.3: Control and if possible eradicate the two introduced mosquito species at Midway Atoll within 10 years using methods prescribed in the Integrated Alien Species Management Plan.
Reduction or elimination of mosquitoes (*Aedes albopictus* and *Culex quinquefasciatus*) at Midway will benefit humans, nesting seabirds, and the endangered Laysan duck, as well as other endangered bird species that might be translocated to Midway in the future (see the Threatened and Endangered Species Action Plan, Section 3.2.1) by eliminating the vector for avian pox, which already occurs there, and other arthropod-borne diseases that may arrive in the future. Monument staff will continue to kill mosquito larvae in freshwater ponds and manage mosquito reproduction while avoiding harm to endangered Laysan ducks and other species of migratory waterbirds and shorebirds, using either mosquito fish (*Gambusia affinis)* or bacterial control (*Bacillus thuringiensis israelensis*), depending on the wildlife species using each site. We will also eliminate mosquito breeding habitat by getting rid of standing water sources, where possible and appropriate, and by limiting access to standing water in pipes and cisterns.

Activity AS-5.4: Develop and implement a plan to control and if possible eradicate the invasive gray bird locust wherever it occurs.

Gray bird locusts *(Schistocerca nitens)* have been found on Nihoa, Mokumanamana, French Frigate Shoals, and Lisianski Island. To better respond to the invasive grasshopper *Schistocerca nitens*, a workshop was held in 2005 to address this threat species. Addressing one of the recommendations, Monument staff will continue to collect climate data, along with grasshopper abundance measures, to develop and continue improving a model for predicting outbreaks. Locust outbreaks are triggered by specific combinations of rainfall and drought, with egg laying favored by warm and dry conditions and survival of young grasshoppers favored by a flush of vegetation caused by rains at the appropriate time. Looking for correlations between grasshopper abundance and moisture and temperature conditions will allow better predictions of high locust populations.

Activity AS-5.5: Protect endangered plants threatened by gray bird locust outbreaks at Nihoa by developing appropriate baits for localized application of toxicants to protect specific high-priority plant sites.
Control of grasshoppers on islands such as Nihoa, with its many endemic species of arthropods, requires very careful choices of agents. Lower toxicity to nontarget organisms or specificity of delivery to just grasshoppers will be ensured.

Strategy AS-6: Control and eventually eradicate the highest-priority invasive plants in the terrestrial parts of the Monument within 15 years.

Invasive plants brought to the Northwestern Hawaiian Islands in the course of human activity have caused extensive damage through the years by displacing native plants and by changing the structure and composition of the vegetation community to make it less useful as habitat for other native organisms.

Activity AS-6.1: Control and eventually eradicate golden crownbeard and co-occurring weedy shrubs in all areas where they occur.
Golden crownbeard (*Verbesina encelioides)* is an invasive annual plant that is a prolific seed producer and grows in extremely dense monotypic stands, in which most other plant species are excluded. The species is currently found at Kure, Midway, and Pearl and Hermes Atolls. Control and eventual eradication will require breaking the cycle of the plant setting seed and then depleting the soil seed bank. This task is made much more difficult because of the high density of nesting seabirds, which precludes many mechanized forms of control. Areas to be treated by hand-pulling, mowing when appropriate, and treatment with glyphosate to prevent plants from setting seed and to exhaust the seed bank include 1,098 acres on Midway Atoll, 75 acres on Kure Atoll, and 34 acres on Pearl and Hermes Atoll. Several other invasive weeds are associated with *Verbesina* at Midway Atoll and will respond to the same treatments described above. These weeds include Spanish needle or beggartick (*Bidens alba* and *B. pilosa)*, spiny pigweed (*Amaranthus spinosus*), haole koa (*Leucaena leucocephala*), castor bean (*Ricinus communis*), and hairy abutilon (*Abutilon grandifolium*).

Activity AS 6.2: Control and eventually eradicate the invasive grass sandbur from all areas of the Monument where it currently occurs.
The invasive grass sandbur *(Cenchrus echinatus)* has been successfully eradicated at Laysan Island and French Frigate Shoals, but currently exists at Kure, Midway, and Pearl and Hermes

Atolls, and Lisianski Island, so replicating the techniques described in Rehkemper and Flint (2002) will prevent the habitat degradation and loss of native plants and breeding seabirds at other sites in the NWHI where *Cenchrus echinatus* occurs. It can be eliminated by maintaining a year-round program of hand-pulling and limited spraying of glyphosate, to be scheduled so that no plant is ever allowed to go to seed; thus, the seed bank is eventually depleted.

Activity AS-6.3: Control and eventually eradicate Indian pluchea,* Sporobolus pyramidatus, *and swine cress from Laysan Island.
The introduced shrub *Pluchea indica* will be eradicated by cutting and painting stumps with Garlon® in a gradual manner to make sure seabird nesting habitat provided now by *Pluchea* is replaced with other shrubs being used in the ecological restoration at Laysan Island, such as ‘ilima (*Sida fallax*). Replacing this invasive shrub with native plants providing the same structure used by many nesting birds at Laysan Island is prescribed by the Draft Laysan Restoration Plan (Morin and Conant 1998). Athens, Ward, and Blinn (2007) discovered the pollen of the native shrub *Sida fallax*, previously unknown to Laysan Island, in the 7,000-year pollen core they studied from Laysan Lake. ‘Ilima has a similar growth form to the *Pluchea* now favored by nesting red-footed boobies and great frigatebirds at Laysan Island. The introduced grass *Sporobolus pyramidatus* and the herbaceous plant swine cress (*Coronopus didymus)* are vulnerable to hand-pulling and glyphosate treatments and also will be treated often enough to prevent any plant from setting seed.

Activity AS-6.4: Control and eventually eradicate prioritized alien plant species from Kure Atoll.
A preliminary Draft Kure Atoll Management Plan (2007) prioritizes alien species that need to be eradicated. Ironwood (*Casuarina equisetifolia*) will be eradicated by cutting down trees and painting the stumps with Garlon 4®. Beach heliotrope (*Tournefortia argentea*) will be controlled in beach dune areas by selectively removing young trees that have not attained the size that seabirds utilize for nesting. Chemical (probably glyphosate) and mechanical methods will be used to control and in some cases eradicate *Flaveria trinervia*, *Setaria verticillata*, *Chenopodium murale*, *Cynodon dactylon*, *Portulaca oleracea*, and *Boerhavia coccinea*. Native plants propagated in Kure Atoll’s nursery will be used to replace the nonnative plants that are removed.

Strategy AS-7: Investigate methods to eventually eradicate aquatic invasive organisms already known to be present in the Monument, and conduct regular surveillance for new invasions.

Aquatic invasive species present difficulties to resource managers because the technology for detection and subsequent control and eradication is not well established in marine environments. The spread of these alien species is harder to contain than are pests located on islands. These factors make locating, characterizing, and eliminating infestations of aquatic invasive species a high priority.

Activity AS-7.1: Map, control, and eventually eradicate invasive red algae where it occurs.
Monument staff will map current distributions by using SCUBA, technical mixed gas diving, or remotely operated vehicles and concentrate searches in areas where lobster trapping (commercial

or research) occurred. Searching for the extent of the infestation of *Hypnea musciformis* should start in areas in the NWHI where commercial and research trapping for lobsters has occurred, because it is thought that the original transport of the invasive algae may have been made by traps previously deployed in the main Hawaiian Islands.

Activity AS-7.2: Conduct surveillance at appropriate sites for snowflake coral and other incipient marine invasives.
Based on preferred sites already infested by snowflake coral (*Carijoa riisei)* in other areas and on understanding of the species life history and dispersion methods, the MMB will devise a plan for surveying sites with the highest probability of invasion by this damaging species.

Strategy AS-8: Conduct and facilitate research designed to answer questions regarding invasive species detection, effects on ecosystem, and alien species prevention, control, and eradication over the life of the plan.

Some of the invasive species problems facing Monument managers are without precedent because of the kinds and sizes of habitats being managed, the species involved, and the logistical and technical difficulties of working there. Research designed to assist in adapting methods to the Monument situation is essential for managing this unique National Monument.

Activity AS-8.1: Support and conduct research on alien species detection and the effects of invasive species on native ecosystems.
Monument staff, working with subject experts, will determine which methodologies for alien species detection and control will be appropriate for use in the NWHI. As appropriate, staff will initiate or support research on alien species detection and documentation of their ecological effects. Some of this work will be based on previous research done in other places and methodologies that have already been developed. Research priorities will be identified through updates to the Monument Research and Monitoring Plan (see the Marine Conservation Science Action Plan, Section 3.1.1). Research results on ecosystem effects will aid in prioritization of control and eradication efforts.

Activity AS-8.2: Support and conduct research on invasive species prevention, control methods, and eradication techniques.
The high level of protection afforded the Monument enables managers to exercise unprecedented levels of influence over practices that may prevent movement of invasive species into the area. Research to document the effectiveness of these measures will aid those managing other wildlands in choosing quarantine methods. Successful invasive species control and eradication programs require systematic investigations into the efficacy of techniques chosen and the ecological impacts of any methods used. Such an investigation has been outlined for the grasshopper invasion on Nihoa (Gilmartin 2005).

Strategy AS-9: Engage Monument users and the public in preventing the introduction and spread of alien species.

The organisms that have caused the greatest ecological disruption in the Monument all arrived as accidental introductions by humans. Educating all visitors to the area will go a long way toward preventing future harmful species from reaching Papahānaumokuākea and will be knowledge that applies wherever they travel.

Activity AS-9.1: Integrate alien species information into the overall outreach program for Monument permittees.

As part of the outreach to all Monument permittees, Monument staff will develop outreach materials that include information on regulations, permit requirements, and best management practices related to alien species. The outreach program will help people identify alien species and understand the importance of, and methods for, preventing alien species introductions. A guide to marine and terrestrial alien species with photographs, modes of transport, reporting protocols, and best management practices will be used as part of the outreach program. Outreach may consist of printed materials and videos, as well as presentations that are part of the permit application process and as taxonomy training for staff and volunteers. Such a program could be developed in partnership with the University of Hawaiʻi HIMB to develop staff, partners, and volunteers with expertise in field identification of various marine taxa. This program could include a certification program that demonstrates identification skill sets. (See the action plans for Permitting, Section 3.4.1; Enforcement, Section 3.4.2; Ocean Ecosystems Literacy, Section 3.5.4; and Constituency Building and Outreach, Section 3.5.2), and the Midway Atoll Visitor Services Plan (Appendix B).)

Activity AS-9.2: Integrate alien species information into general Monument outreach materials.

Monument staff will integrate messages on alien species into general education and outreach materials when appropriate opportunities arise. For example, the "Navigating Change" curriculum and video series developed in 2004 contained information on the threat of invasive species to native ecosystems (see the Ocean Ecosystems Literacy Action Plan, Section 3.5.4).

Strategy AS-10: Participate in statewide and Pacific regional alien species efforts.

Invasive species management is a challenge shared by resource managers worldwide. Exchange of technologies, strategies, and case histories of successes and failures are invaluable for all ecosystem stewards.

Activity AS-10.1: Build relationships with other resource managers and invasive species experts in the State, nation, and other countries based on shared challenges concerning invasive species.

Information exchange will maximize the effectiveness of collective resources and keep the MMB current on invasive species research, management, and outreach efforts throughout Hawaiʻi and the Pacific. Because most vessels bound for the NWHI come from the main Hawaiian Islands, it is particularly important to support efforts there. Groups addressing invasive species in Hawaiʻi include the Hawaiʻi Invasive Species Council, the Alien Aquatic Organism Task Force, and the Coordinating Group on Alien Pest Species, among several others. The Pacific Invasives Network is addressing invasive species issues in Pacific islands. The State of Hawaiʻi has hired an AIS coordinator with funds from the National Aquatic Nuisance Task Force and has obtained Hawaiʻi Invasive Species Council funds to support the Aquatic Alien Species Response Team. Communication with these groups will provide opportunities for information and resource sharing and implementation of standardized protocols for alien species reporting and monitoring species, including support for hull inspections, vessel monitorings, and other joint MMB activities.

Monument staff will participate in public and professional conferences, working group meetings, and activities focused on reducing the impacts of alien species statewide and in the Pacific region.

Table 3.3.2 Summary of Strategies, Activities, and Agency Leads for Alien Species

Strategies and Activities	Agency Lead
Strategy AS-1: Conduct planning to prioritize by threat level, invasiveness, and practicality of eradication or control all nonnative organisms in the Monument over the life of the plan.	
Activity AS-1.1: Complete an Integrated Alien Species Management Plan.	FWS
Activity AS-1.2: Develop best management practices to prevent, control, and eradicate alien species.	FWS
Strategy AS-2: Engage in active surveillance to monitor existing infestations and to detect new infestations of alien species over the life of the plan.	
Activity AS-2.1: Survey distributions and populations of known alien species at regular intervals.	FWS NOAA
Activity AS-2.2: Maintain a GIS database of marine and terrestrial alien species.	NOAA
Activity AS-2.3: Develop and implement monitoring protocols for early detection and characterization of new infestations.	NOAA
Strategy AS-3: Establish and enforce quarantine procedures appropriate for each site and habitat (terrestrial and aquatic) in the Monument to prevent the invasion or reinfestation of nonindigenous species over the life of the plan.	
Activity AS-3.1: Enforce the use of existing quarantine protocols to prevent the introduction of invasive terrestrial species to the Monument.	FWS
Activity AS-3.2: Continue to require hull inspection and cleaning of all vessels, SCUBA gear, marine construction material, and instruments deployed in the Monument.	NOAA
Strategy AS-4: Eradicate the house mouse population on Sand Island, Midway Atoll, within 15 years.	
Activity AS-4.1: Produce a house mouse eradication plan within 5 years and procure appropriate permits for chosen eradication techniques.	FWS
Activity AS-4.2: Implement and complete house mouse eradication.	FWS
Strategy AS-5: Prioritize infestations of alien terrestrial arthropods by species and locations and, within 5 years, develop and subsequently implement plans to control and if possible eradicate the highest-priority species.	
Activity AS-5.1: Within 5 years, formulate a priority list of locations and species and a treatment plan to control and eventually eradicate all social Hymenopterans, such as ants and wasps, at all islands in the Monument.	FWS
Activity AS-5.2: Conduct toxicant trials to evaluate their efficacy and document ecological effects at selected islands on highest-priority invasive species of ants and wasps.	FWS
Activity AS-5.3: Control and if possible eradicate the two introduced mosquito species at Midway Atoll within 10 years using methods prescribed in the Integrated Alien Species Management Plan.	FWS
Activity AS-5.4: Develop and implement a plan to control and if possible eradicate the invasive gray bird locust wherever it occurs.	FWS
Activity AS-5.5: Protect endangered plants threatened by gray bird locust outbreaks at Nihoa by developing appropriate baits for localized application of toxicants to protect specific high-priority plant sites.	FWS

Strategies and Activities	Agency Lead
Strategy AS-6: Control and eventually eradicate the highest-priority invasive plants in the terrestrial parts of the Monument within 15 years.	
Activity AS-6.1: Control and eventually eradicate golden crownbeard and co-occurring weedy shrubs in all areas where they occur.	FWS
Activity AS 6.2: Control and eventually eradicate the invasive grass sandbur from all areas of the Monument where it currently occurs.	FWS
Activity AS-6.3: Control and eventually eradicate Indian pluchea, *Sporobolus pyramidatus*, and swine cress from Laysan Island.	FWS
Activity AS-6.4: Control and eventually eradicate prioritized alien plant species from Kure Atoll.	State of Hawai‘i
Strategy AS-7: Investigate methods to eventually eradicate aquatic invasive organisms already known to be present in the Monument, and conduct regular surveillance for new invasions.	
Activity AS-7.1: Map, control, and eventually eradicate invasive red algae where it occurs.	NOAA
Activity AS-7.2: Conduct surveillance at appropriate sites for snowflake coral and other incipient marine invasives.	NOAA
Strategy AS-8: Conduct and facilitate research designed to answer questions regarding invasive species detection, effects on ecosystem, and alien species prevention, control, and eradication over the life of the plan.	
Activity AS-8.1: Support and conduct research on alien species detection and the effects of invasive species on native ecosystems.	NOAA
Activity AS-8.2: Support and conduct research on invasive species prevention, control methods, and eradication techniques.	FWS
Strategy AS-9: Engage Monument users and the public in preventing the introduction and spread of alien species.	
Activity AS-9.1: Integrate alien species information into the overall outreach program for Monument permittees.	NOAA
Activity AS-9.2: Integrate alien species information into general Monument outreach materials.	NOAA
Strategy AS-10: Participate in statewide and Pacific regional alien species efforts.	
Activity AS-10.1: Build relationships with other resource managers and invasive species experts in the State, nation, and other countries based on shared challenges concerning invasive species.	FWS

3.3.3 Maritime Transportation and Aviation Action Plan

Links to other Action Plans	
3.2.1	Threatened and Endangered Species
3.3.2	Alien Species
3.3.4	Emergency Response
3.4.1	Permitting
3.4.2	Enforcement
3.5.2	Constituency Building and Outreach
3.5.4	Ocean Ecosystems Literacy
3.6.3	Coordinated Field Operations

Links to Goals
Goal 1
Goal 2
Goal 3
Goal 4
Goal 8

Desired Outcome

Investigate, identify, and reduce potential threats to Papahānaumokuākea Marine National Monument from maritime and aviation traffic.

Current Status and Background

With the exception of a few small boats at Midway Atoll, French Frigate Shoals, and Kure Atoll, no vessels have home ports in the NWHI. Therefore, almost all marine traffic in the waters surrounding the NWHI is from transiting merchant vessels, research ships, and fishing vessels; with cruise ships, U.S. Coast Guard ships, and recreational vessels visiting less frequently. An estimated 50 vessels pass through the U.S. Exclusive Economic Zone surrounding the NWHI each day (Mathers 2005, pers. com.). Navy ships and vessels conduct training and participate in testing activities in the Hawaii Range Complex, which encompasses the Monument, and vessels that support missile defense tests occasionally operate in Monument waters. Vessels in shallow waters are at higher risk of impacting resources.

A relatively small number of flights are conducted in the Monument. The MMB agencies charter on average 27 flights to French Frigate Shoals and 45 flights to Midway Atoll each year to transport supplies and personnel. The Coast Guard conducts regular enforcement overflights, often landing at Midway Atoll for refueling. A few research and management activities associated with remote sensing, mapping, wildlife survey, and marine debris detection may be conducted by aircraft each year. The planning associated with ship, small boat, and aircraft activities is discussed in the Coordinated Field Operations Action Plan, Section 3.6.3.

Need for Action

All activities conducted in the Monument must meet the requirements articulated in Presidential Proclamation 8031, which established the Monument. Consistent with the spirit of the Proclamation, the MMB will investigate, identify, and reduce threats to the NWHI ecosystems. This work includes regularly evaluating the effects ships and aircraft may have on the environment during the course of normal operations and identifying ways in which they can be reduced. The MMB will periodically review vessel and aircraft activities, recognizing that future increase in access to and use of the Monument could result in increased risks associated with transportation. The MMB is committed to minimizing the environmental footprint generated through maritime and aviation traffic.

Ships and aircraft allow human access and make activities possible in the vast and remote NWHI. However, they also bring with them the possibility of threats or environmental hazards. Some of these hazards are critical in nature and demand immediate response, such as groundings and fuel, chemical, or oil spills (see the Emergency Response and Natural Resource Damage Assessment Action Plan, Section 3.3.4). Others are biological in nature, such as the threat of alien species introductions through vessel hull fouling or ballast water discharge (see the Alien Species Action Plan, Section 3.3.2), or interactions with protected marine species (see the Threatened and Endangered Species Action Plan, Section 3.2.1). This action plan establishes a framework to evaluate various activities conducted by ships and aircraft.

Strategies to Achieve the Desired Outcome

Two strategies have been identified for achieving the desired outcome of preventing and reducing impacts of vessels and aircraft operating in and transiting the NWHI. Strategies and activities are coded by the acronym for the action plan title, "Maritime Transportation and Aviation" (MTA). A summary of strategies and activities is provided in Table 3.3.3 at the end of this action plan.

- MTA-1: Increase awareness of navigational hazards and ecological sensitivity of the Monument.
- MTA-2: Conduct studies to identify potential aircraft and vessel hazards and adopt measures to prevent adverse impacts.

Strategy MTA-1: Increase awareness of navigational hazards and ecological sensitivity of the Monument.

The banks, atolls, and other reefs of the NWHI support a diverse array of species assemblages forming a system that is unique in the world (Friedlander et al. 2005), which could experience catastrophic losses in the event of a major ship grounding or oil spill. The MMB continues to analyze threats to the ecosystem from vessel traffic (see activity MTA-2.1, below). The establishment of internationally recognized shipping designations will raise awareness about the sensitivity and dangers of operating in the Monument, as well as provide information about the incidence of unreported international vessels transiting the area.

Activity MTA-1.1: Coordinate implementation of domestic and international shipping designations with appropriate entities.
Potential impacts to Monument resources from ship traffic, including habitat damage from groundings, hazardous materials spills, and sewage and ballast water discharges, have been identified as some of the primary anthropogenic threats to the vulnerable and valuable natural and cultural resources of the area. PSSA designation will augment domestic protective measures by alerting international mariners to exercise extreme caution when navigating through the area.

On April 3, 2008, the IMO designated the Monument as a PSSA. As part of the PSSA designation process, the IMO adopted U.S. proposals for associated protective measures consisting of (1) expanding and consolidating the six existing recommendatory Areas To Be

Avoided (ATBAs) in the Monument into four larger areas and enlarging the class of vessels to which they apply; and (2) establishing a ship reporting system for vessels transiting the Monument, which is mandatory for ships 300 gross tons or larger that are entering or departing a U.S. port or place and recommended for other ships. The IMO protective measures do not apply to the activities and exercises of the Armed Forces (including the U.S. Coast Guard) that are consistent with applicable laws. Sovereign immune vessels also are not subject to the reporting requirement but all vessels are encouraged to participate.

The vessel reporting system requires that ships notify the U.S. shore-based authority (the U.S. Coast Guard; NOAA will be receiving all messages associated with this program on behalf of the Coast Guard) at the time they begin transiting the reporting area and again when they exit. Notification is made by e-mail through the Inmarsat-C system or other satellite communication system. It is estimated that almost all commercial vessel traffic will be able to report via Inmarsat-C. The Armed Forces are not subject to the access restrictions and reporting requirements in the Monument when they are conducting activities and exercises.

The PSSA and associated protective measures were adopted to provide additional protection to the exceptional natural, cultural, and historic resources in the Monument. Requiring vessels to notify NOAA upon entering the reporting area will help make the operators of these vessels aware that they are traveling through a fragile area with potential navigational hazards such as the extensive coral reefs found in many shallow areas of the Monument. The PSSA and associated protective measures are now in effect.

NOAA and FWS are establishing the infrastructure that will be required to maintain an international ship reporting system and to ensure that information regarding PSSA designation will be incorporated into nautical charts and other information sources. Appendix G of Volume III contains the relevant documents for the IMO designated PSSA around the Monument.

Activity MTA-1.2: Develop boundary and zoning informational tools.
Information on the PSSA designation, zones, boundaries, and regulations will be made available to Monument users to help them comply with all maritime transportation requirements. Global positioning system coordinates will be provided along with nonnavigational reference maps in the appropriate public documents. The MMB will work with NOAA's Office of Coast Survey to update NOAA navigational charts as well as to provide appropriate information to mariners in the United States Coast Pilot®, a series of nautical reference books.

Activity MTA-1.3: Provide necessary updates to nautical charts and the Notice to Mariners.
The MMB will work with the appropriate NOAA and Coast Guard offices to update the nautical charts and Notice to Mariners to reflect Monument boundaries, zones, and other pertinent designations. The U.S. Notice to Mariners announces updates to National Geospatial-Intelligence Agency and National Ocean Service charts using information collected from many sources, among them the Coast Guard Local Notices. The U.S. Notice to Mariners will contain only those chart corrections of interest to ocean-going vessels.

Bathymetric data collected as part of research and monitoring in the NWHI may be used to update nautical charts. However, standards for data used for benthic habitat mapping are less rigorous than are applied to hydrographic survey, so most of the data collected to date in the NWHI are unlikely to be used for updating charts Monument-wide. Nautical charts can be updated only using bathymetric surveys that meet the standards of the International Hydrographic Organization (IHO). Therefore, when a survey is to be conducted in an area where chart updates would be useful, the survey planners will work with the Hydrographic Surveys division of the Office of Coast Survey to determine whether the minimum requirements for IHO standards for chart updates are compatible with the mandated research objectives. Often, these standards are greater than the scientific survey needs, so if collaborative dual-purpose surveying is undertaken, cost-sharing agreements will be sought with the Office of Coast Survey during survey planning. Nautical charts are updated based on national prioritized needs, and even if data are collected to IHO standards, many years could pass between survey completion and the incorporation of updates to the associated charts. As such, updating all NWHI nautical charts is a long-term goal.

Strategy MTA-2: Conduct studies to identify potential aircraft and vessel hazards and adopt measures to prevent adverse impacts.

While many aircraft and vessel hazards are known and can be reduced through regulations and permit requirements, more information needs to be gained about potential hazards to minimize human impacts and maximize resource protection. Specific information gained through small-scale studies can strengthen or add specificity to regulations and permit requirements should they be needed.

Activity MTA-2.1: Conduct studies on potential aircraft and vessel hazards and impacts.
Various studies on potential aircraft and vessel hazards may be conducted based on priority threats identified in the comprehensive threat assessment discussed in the Enforcement Action Plan (Section 3.4.2). These studies may include, but are not limited to, the following: an anchoring/mooring location feasibility study; a long-term study on mandatory hull inspections and cleaning for all vessels accessing the Monument; studies on alien species introductions via aircraft; an assessment of permit reporting requirements for interactions with federally protected species and other wildlife; a light and sound study; and a discharge study.

Activity MTA-2.2: Develop protocols and practices as needed and integrate with existing protocols for safe aircraft and vessel operations.
The MMB will work with the ICC to convene a group of experienced aircraft and vessel operators to discuss safety for humans and wildlife during flight and boating operations. Existing protocols will be evaluated and other recommendations sought to reduce risks to personnel and the environment through pre-trip training and standard procedures. New protocols and practices will be developed as needed.

Activity MTA-2.3: Improve existing pre-access information for inclusion on the Monument website and in permit application instructions.
The following information will be incorporated into pre-trip training for Monument users and vessel operators: information on regulations and compliance; navigation hazards; emergency

response protocols and contacts; zoning designations, including waste discharge location and types; preventing the introduction of alien species; preventing and reporting interactions with protected species and other wildlife; preventing light and sound pollution; and preventing anchor damage to coral reefs and other benthic habitats and organisms. The information will be conveyed as appropriate to all vessel operators, captains, crews, and trip participants. The MMB will also incorporate this information into written materials to be distributed to potential visitors. (See the action plans for Permitting, Section 3.4.1; Enforcement, Section 3.4.2; Ocean Ecosystems Literacy, Section 3.5.4; and Constituency Building and Outreach, Section 3.5.2.)

Activity MTA-2.4: Conduct activities to improve energy and water conservation measures on all vessels operating in the Monument.

The NOAA ship *Hi'ialakai* sets an example for the fleet by increasing shipboard conservation measures each year. In 2006, the ship began a recycling program and began installing water-saving devices to reduce impacts to the Monument as well as other parts of the ocean where the ship operates. In 2008, NOAA plans to test the use of biofuels and nonpetroleum-based hydraulic fluid on the *Hi'ialakai*. The MMB will continue to work with ship managers on these measures and encourage similar practices for all vessels that operate in the Monument.

Table 3.3.3 Summary of Strategies, Activities, and Agency Leads for Maritime Transportation and Aviation

Strategies and Activities	Agency Lead
Strategy MTA-1: Increase awareness of navigational hazards and ecological sensitivity of the Monument.	
Activity MTA-1.1: Coordinate implementation of domestic and international shipping designations with appropriate entities.	NOAA
Activity MTA-1.2: Develop boundary and zoning informational tools.	NOAA
Activity MTA-1.3: Provide necessary updates to nautical charts and the Notice to Mariners.	NOAA
Strategy MTA-2: Conduct studies to identify potential aircraft and vessel hazards and adopt measures to prevent adverse impacts.	
Activity MTA-2.1: Conduct studies on potential aircraft and vessel hazards and impacts.	NOAA
Activity MTA-2.2: Develop protocols and practices as needed and integrate with existing protocols for safe aircraft and vessel operations.	NOAA
Activity MTA-2.3: Improve existing pre-access information for inclusion on the Monument website and in permit application instructions.	NOAA
Activity MTA-2.4: Conduct activities to improve energy and water conservation measures on all vessels operating in the Monument.	NOAA

3.3.4 Emergency Response and Natural Resource Damage Assessment Action Plan

Desired Outcome

Minimize damage to Papahānaumokuākea Marine National Monument resources through coordinated emergency response and assessment.

Links to other Action Plans	
3.3.2	**Alien Species**
3.3.3	**Maritime Transportation and Aviation**
3.4.1	**Permitting**
3.6.2	**Information Management**

Links to Goals
Goal 1
Goal 2
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Goal 4

Current Status and Background

The history of shipwrecks and groundings is as old as the history of ships in the NWHI. Many islands and atolls are named for ships that went aground. This history continues, with four recent vessel groundings. The *Paradise Queen* and *Grendel* went aground at Kure Atoll in 1998 and 2007, respectively, and the *Swordman II* and *Casitas* went aground at Pearl and Hermes Atoll in 2000 and 2005, respectively. Natural disasters such as tropical cyclones and tsunamis, while rare, also threaten Monument natural, cultural, and historic resources. The remote locations in the Monument have logistically and financially challenged effective response and remediation efforts to date and will continue to be a primary factor in future emergency response efforts.

Houei Maru #5 bow section. Wrecked in 1976 at Kure Atoll. Photo: Dan Suthers

Emergency response in the NWHI will be coordinated under a series of plans and systems, including the National Response Plan and the National Incident Management System. The National Response Plan establishes a comprehensive all-hazards approach to enhance the ability of the United States to manage domestic incidents, including oil and hazardous chemical spills. This plan incorporates the National Contingency Plan and its regulations governing how oil pollution response is conducted by the Coast Guard, EPA, the affected state, and resource trustees, including NOAA and FWS. The NWHI are covered specifically by the Hawai‘i Area Contingency Plan (Version 5.0 - May 02, 2005; http://homeport.uscg.mil/mycg/portal/ep/portDirectory.do?tabId=1&cotpId=27). This Area Contingency Plan describes the strategy for a coordinated industry, federal, state, and local response to a discharge or substantial threat of discharge of oil or a release of a hazardous substance. The Area of Responsibility of U.S. Coast Guard Sector Honolulu Captain of the Port Zone includes the Northwestern Hawaiian Islands.

FWS and NOAA have designated representatives who are federal members of the Regional Response Team, which makes response recommendations to the federal on-scene coordinator.

The Hawai‘i DLNR and the Hawai‘i Department of Health are the designated state representatives for all marine injury events. The Department of Health is the state on-scene coordinator. These representatives work closely with all parts of FWS, NOAA, the State, and the MMB in making recommendations on the use of alternative response technologies, such as dispersants. Unlike the State, NOAA and DOI can make only consultative recommendations; they do not have a formal vote in that process.

While the Monument and state regulations regulate access, they also provide a general exemption for activities necessary to respond to emergencies. The general exemption for emergencies allows for individuals responding to emergencies threatening life, property, or the environment to conduct necessary activities without the need for a permit. The general exemption applies only to the emergency response activity itself and not to ancillary activities, such as training for emergency response, salvage operations, remediation, or restoration. These ancillary actions also require timely response and would be covered under the appropriate agency’s conservation and management permit.

Monument staff have access to resources-at-risk information that is of interest during contingency planning and spill response through the Sanctuaries Hazardous Incident Emergency Logistics Database System, a web-based decision support tool commonly referred to as “SHIELDS.” This tool includes regulatory information, contact lists, GIS maps, environmental sensitivity indexes, information on resources at risk, and significant terrestrial and submerged historic and cultural resource and hazards data. Environmental Sensitivity Indices were last produced by NOAA for this area in 2001. Environmental Sensitivity Indices identify resources at risk on a seasonal and location basis and facilitate decisions about response options given threats to specific resources at risk.

In addition, the Monument’s own GIS database of spatial resource data and the FWS Asset Maintenance Management System will be used to document this information. As the Monument continues to move toward a comprehensive biogeographic, cultural, and historic understanding of the NWHI, prevention and emergency response methods will improve (see the Information Management Action Plan, Section 3.6.2).

Need for Action

In light of recent vessel grounding events in the NWHI and devastating natural disasters around the world, a clear need exists for the Monument to participate in emergency response efforts to address situations that threaten resources in and around the Monument. Grounded vessels and their related debris and pollution must be removed from the reefs as soon as possible to prevent damage to coral reef ecosystems and protected marine mammals, turtles, and seabirds. Emergency response for events such as vessel groundings; oil, fuel, or chemical spills; or releases of hazardous substances is addressed through the Hawai‘i Area Contingency Plan, which is a local plan under the larger structure of the National Response Plan. The Monument Co-Trustees and Interagency Coordinating Committee will seek to address NWHI responses as part of the Area Contingency Plan.

Developing a response capacity for events that fall beyond the scope of the existing response structure of the Area Contingency Plan is necessary to support the mission of the Monument and the long-term protection of the resources of the NWHI. Events that may require an MMB-directed response include vessel groundings that neither pose the threat of hazardous release nor navigational hazard, as well as detrimental natural events such as disease outbreaks, severe storms, alien species introductions, or impacts of climate change (e.g., coral bleaching).

This action plan describes strategies and activities to plan for and respond to an emergency within the established Incident Command System (ICS) for the region, and other unanticipated events that fall outside the scope of the Hawai‘i Area Contingency Plan. The MMB will establish a Monument Emergency Response and Assessment Team (ERAT) that will determine what types of emergencies are likely within the Monument. For each identified possible emergency, the type and scope of necessary response will be determined.

Strategies to Achieve the Desired Outcome
Within the context of the existing Area Contingency Plan and other informational tools, including SHIELDS, the MMB seeks to integrate its resources in a way that benefits both Monument resources and regional efforts. The MMB can contribute primarily through building an internal and interagency capacity to contribute to emergency response efforts and by providing relevant and current information regarding NWHI resources so that current data are readily available and accessible to the Regional Response Team and any unified command that may be established to address an incident.

To coordinate Monument response to emergencies in a manner that minimizes damage to resources and mechanisms to assess damage, the following strategies have been identified. The strategies and activities are coded by the acronym for the action plan title, “Emergency Response and Natural Resource Damage Assessment” (ERDA). A summary of strategies and activities is provided in Table 3.3.4 at the end of this action plan.

- ERDA-1: Create a Monument Emergency Response and Assessment Team within 1 year.
- ERDA-2: Assess response needs for non-Incident Command System emergencies within 2 years.
- ERDA-3: Update and create, as necessary, Monument resource protection plans and protocols within 3 years.

Strategy ERDA-1: Create a Monument Emergency Response and Assessment Team within 1 year.

An interagency team will be created and integrated with local responders from other federal and state agencies to assess resource damage and respond to emergencies in the Monument. The Monument ERAT will interface with the existing local area response team within the Incident Command. Whenever possible, the team will provide assistance and coordination in an actual response. Following an emergency, the ERAT will participate in an injury assessment with other federal and State of Hawai‘i natural, cultural, and historic resource trustees. In the event of a response to and assessment of injury from a non-ICS event, such as severe storm damage or coral bleaching, the team will conduct this assessment and initiate appropriate monitoring.

Activity ERDA-1.1: Create a Monument Emergency Response and Assessment Team for ICS responses.
An ERAT will be created to interface with the existing local area response team within the Incident Command, the Regional Response Team, and the Scientific Support Team. The team members will include specific species experts, law enforcement, and experts by area and habitat type, and may recruit or consult other such experts as needed. Because this is an interagency effort, regular reports on the status of the ERAT will be made to the ICC. The team will also assist in identification of primary and compensatory restoration options as well as implementation and oversight of restoration and monitoring. The team will also develop standard operating procedures for onsite incident investigations, resource injury determination, asset conditions, emergency detection, assessment, and restoration.

Activity ERDA-1.2: Acquire and maintain training and certification to complement and support the Regional Response Team.
Under the Area Contingency Plan, the Regional Response Team is charged with preparedness for emergencies. This preparedness will necessitate training and certifications, including ICS, Hazardous Waste Operations and Emergency Response (HAZWOPR), boat safety, flight safety, first responder, and first aid.

Activity ERDA-1.3: Participate in emergency response and preparedness drills and meetings throughout the life of the plan.
The ERAT will attend Regional Response Team meetings, as appropriate, to keep abreast of current communication and training and to build working relationships with agency staff that make up both the Regional Response Team and the Coast Guard agency staff. Participation in emergency response drills and other events will help with preparedness and better integration into the response process. One of the main functions of the ERAT is to provide information and data to minimize impact on Monument resources by the event or the response.

Activity ERDA-1.4: Participate in damage assessment programs and training throughout the life of the plan.
Damage assessment is an important component of any emergency response. The ERAT is expected to contribute in area and resource knowledge; therefore, training in natural resource damage assessment is necessary. The ERAT will work closely with the FWS Environmental Contaminants Program and Oil Spill Response Coordinator and the ONMS Resource Protection Team in Silver Spring, Maryland, State on-scene coordinator, and State Department of Health Office of Hazard Evaluation and Emergency Response, as appropriate, to ensure that appropriate response, injury assessment, and restoration activities take place for any given case. This effort may include coordination with the DOI, FWS, NOAA Natural Resource Damage Assessment and Restoration Programs, the U.S. Department of Justice, Coast Guard, and other federal and State of Hawai‘i resource damage assessment programs to assess the extent of injury from a particular emergency event (see Section 3.3.2, Alien Species Action Plan, Activity AS-1.1).

Strategy ERDA-2: Assess response needs for non-Incident Command System emergencies within 2 years.

Activity ERDA-2.1: In the second year, determine the non-ICS emergencies and the necessary type and scope of responses.

The ERAT will be responsible for determining what types of non-ICS emergencies are likely within the Monument. In the event of a needed response to natural events—such as disease outbreaks, severe storms, alien species introductions, or coral bleaching events,—or vessel groundings not releasing oil or hazardous substances, the ERAT will need specialized protocols for response. For each identified possible non-ICS emergency, the type and scope of necessary response will be determined.

Activity ERDA-2.2: Designate appropriate Monument personnel for each non-ICS response team.

The team members will include specific species experts and experts by area and habitat type, and may recruit or consult other such experts as needed. Because this is an interagency effort, regular reports on the status of the response teams will be made to the Papahānaumokuākea ICC. Each team member will also assist in the identification of primary and compensatory restoration options, if warranted, as well as implementation and oversight of restoration and monitoring. Team members will also develop standard operating procedures for injury determination, emergency detection, assessment, and restoration.

Activity ERDA-2.3: Throughout the life of this plan, ensure that appointed personnel acquire and maintain training and certifications.

Designated response personnel will maintain preparedness for emergencies. Preparedness will necessitate training and certifications including HAZWOPR, boat safety, flight safety, and first aid. Additional training considerations can include the Oil Pollution Act (OPA) and Natural Resource Damage Assessment (NRDA) process.

Strategy ERDA-3: Update and create, as necessary, Monument resource protection plans and protocols within 3 years.

Multiple agency and interagency emergency plans that apply to the Monument currently exist, such as continuity of operations plans, oil spill response plans, and aircraft incident plans. To ensure efficiency and effectiveness, the MMB agencies will coordinate and update these plans, as well as develop new plans or protocols as needed.

Activity ERDA-3.1: Update and improve upon the Area Contingency Plan and the Environmental Sensitivity Indices.

In concert with partners, MMB staff will update and improve upon the Hawaiʻi Area Contingency Plan to better describe a range of potential emergency response actions in the NWHI and appropriately define how the ERAT will assess and respond to an emergency. Monument-specific information will be presented to the area committee for inclusion as appropriate in the Area Contingency Plan. In order to determine and develop appropriate response strategies to emergencies in the NWHI, a workshop will be held involving all partner agencies, parties that are typically involved in responses, and individuals, organizations, and researchers who are active in the region or have a particular specialty area that relates to the NWHI.

Activity ERDA-3.2: Within 3 years, create damage assessment criteria and protocols.

Following an emergency, the ERAT will participate in an injury assessment with other federal and State of Hawai‘i natural resource trustees. In the event of an MMB response to a non-ICS event, the team will conduct the assessment and initiate appropriate monitoring. Therefore, the ERAT will develop damage assessment criteria and protocols for the natural, cultural, and historic resources in the Monument.

Table 3.3.4 Summary of Strategies, Activities, and Agency Leads for Emergency Response and Natural Resource Damage Assessment

Strategies and Activities	Agency Lead
Strategy ERDA-1: Create a Monument Emergency Response and Assessment Team within 1 year.	
Activity ERDA-1.1: Create a Monument Emergency Response and Assessment Team for ICS responses.	NOAA
Activity ERDA-1.2: Acquire and maintain training and certification to complement and support the Regional Response Team.	NOAA
Activity ERDA-1.3: Participate in emergency response and preparedness drills and meetings throughout the life of the plan.	NOAA
Activity ERDA-1.4: Participate in damage assessment programs and training throughout the life of the plan.	NOAA
Strategy ERDA-2: Assess response needs for non-Incident Command System emergencies within 2 years.	
Activity ERDA-2.1: In the second year, determine the non-ICS emergencies and the necessary type and scope of responses.	NOAA
Activity ERDA-2.2: Designate appropriate Monument personnel for each non-ICS response team.	NOAA
Activity ERDA-2.3: Throughout the life of this plan, ensure that appointed personnel acquire and maintain training and certifications.	NOAA
Strategy ERDA-3: Update and create, as necessary, Monument resource protection plans and protocols within 3 years.	
Activity ERDA-3.1: Update and improve upon the Area Contingency Plan and the Environmental Sensitivity Indices.	NOAA
Activity ERDA-3.2: Within 3 years, create damage assessment criteria and protocols.	NOAA

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3.4 Managing Human Uses

3.4.1 Permitting Action Plan
3.4.2 Enforcement Action Plan
3.4.3 Midway Atoll Visitors Services Action Plan

3.4 Managing Human Uses

Globally, pollution, coastal development, resource extraction, climate change, natural hazards, and alien species introductions threaten terrestrial and marine ecosystems. As many of these threats are associated with human activities, a common element shared among most protected areas is the need to regulate human activities to minimize impacts. Indeed, this need to regulate human activities is the reason most protected areas are established. In certain sites, protection is achieved through prohibiting all access to a given area. In other areas, education may be the sole tool used to lessen the impacts people have on a given environment. Most protected areas utilize an assortment of management strategies, including zoning, permit authorization, regulations, and conservation plans to manage human activities and their potential impacts.

As a remote site without a significant resident or visitor population, the Monument has an advantage over many other protected areas in that the number of people and overall activity occurring is relatively low. Conversely, the Monument's remote location presents surveillance and enforcement challenges for effective management.

The NWHI have a long history of human activity, including early discovery and use by Native Hawaiians; exploitation of terrestrial and marine resources beginning in the late 1800s; commercial fishing beginning in the mid-1900s; and military activity during World War II. More recent activities in the NWHI include the U.S. Navy's use of Midway Atoll, the U.S. Coast Guard's stations at Kure Atoll and Tern Island, an ecotourism operation at Midway Atoll, and a commercial lobster fishery that was subject to zero harvest in 2000. Current activities are limited primarily to management activities by jurisdictional agencies, including habitat conservation and management, research, education, Native Hawaiian practices, recreation and historic preservation at Midway Atoll, and fishing by a small commercial bottomfish and pelagic trolling fleet. The DOD also conducts missile defense testing and Navy training and testing activities.

Human activities in the Monument are managed through a framework of regulations, permitting, zoning, and enforcement. The three action plans in this section focus on regulating activities through permits and compliance, through enforcement surveillance of activities in the Monument, and under a visitor services program at Midway Atoll. Zoning through Special Preservation Areas, Ecological Reserves, and the Midway Atoll Special Management Area establish spatial restrictions on human activities and are described in more detail in Section 2.0.

The Monument regulations prohibit access except for: passage without interruption; activities and exercises of the Armed Forces (including those of the Coast Guard); activities necessary to respond to emergencies or necessary for law enforcement; and, until June 15, 2011, bottomfish fishing conducted pursuant to a valid permit issued by NOAA. Monument permits are required for activities conducted in the Monument. Prior to the establishment of the Monument, each jurisdictional agency would have considered and issued separate permits for the same activity. Development of the Monument permit application process and application instructions was completed within a year after Monument designation. This process produced a single permit application for all applicants and a general permit template used by Co-Trustees when issuing permits throughout the Monument. Most of the Co-Trustee agency mandates and policies are met by this general template. Those that are not met are addressed by special conditions that are added in addition to the general terms and conditions listed on each permit.

Compliance with regulations, laws, and permit requirements for all activities is enforced using surveillance, Vessel Monitoring System tracking, relevant technology, operations plans, and penalties. Co-Trustee and interagency cooperation on enforcement will become increasingly integrated and coordinated, allowing for greater capacity, effectiveness, and efficiency over time.

With the establishment of the Monument, Midway Atoll takes on the additional role of providing a "window" so that visitors can learn about and enjoy a small portion of the largest fully protected marine managed area in the world. The Co-Trustees remain committed to offering a high-quality, small-scale visitor program at Midway Atoll. By physically experiencing the Northwestern Hawaiian Islands, visitors will return home with a personal connection and commitment to protecting and conserving the Monument's unique resources.

Each action plan consists of a set of strategies to address a desired outcome. The desired outcomes of these action plans over the 15-year planning horizon are:

- **Permitting:** Implement an effective and integrated permit program for Papahānaumokuākea Marine National Monument that manages, minimizes, and prevents negative human impacts by limiting access only for those activities consistent with Presidential Proclamation 8031 and other applicable laws, regulations and executive orders.
- **Enforcement:** Achieve compliance with all regulations within Papahānaumokuākea Marine National Monument.
- **Midway Atoll Visitor Services**: Offer visitors opportunities to discover, enjoy, appreciate, protect, and honor the unique natural, cultural, and historic resources of Papahānaumokuākea Marine National Monument.

Action plans described in this section will be implemented in close coordination with Co-Trustee partners and in conjunction with other priority management needs.

3.4.1 Permitting Action Plan

Links to other Action Plans

3.1.1	Marine Conservation Science
3.1.2	Native Hawaiian Culture and History
3.2.1	Threatened and Endangered Species
3.2.2	Migratory Birds
3.2.3	Habitat Management and Conservation
3.4.2	Enforcement
3.4.3	Midway Atoll Visitors Services
3.5.1	Agency Coordination
3.5.2	Constituency Building and Outreach
3.5.3	Native Hawaiian Community Involvement
3.5.4	Ocean Ecosystems Literacy
3.6.2	Information Management

Links to Goals

Goal 1
Goal 2
Goal 3
Goal 4
Goal 5
Goal 7
Goal 8

Desired Outcome

Implement an effective and integrated permit program for Papahānaumokuākea Marine National Monument that manages, minimizes, and prevents negative human impacts by limiting access only for those activities consistent with Presidential Proclamation 8031 and other applicable laws, regulations and executive orders.

Current Status and Background

The Monument permit program is an integral part of a management framework based on Monument regulations (see Appendix D), other federal and state regulations, zoning, enforcement, goals, Native Hawaiian cultural values, and collaboration within the MMB. This permit program is designed to ensure long-term protection of the NWHI by providing the Co-Trustees with a management tool to regulate, monitor, and understand the impacts of permitted activities on the ecosystem.

Proclamation 8031 requires a Monument permit for access to the Monument for a limited range of activities. State regulations (HAR sections 13-60.5 and 13-125, 50 CFR Part 25, 26, 38, and 404) are subject to permit requirements in State waters as well. Prior to Monument designation, many of these activities would have required multiple access permits from different agencies. Permits authorized for activities conducted within the national wildlife refuges, the state's Northwestern Hawaiian Islands Marine Refuge, the State Seabird Sanctuary at Kure Atoll, or the Reserve may have required one or more permits issued by FWS, the State of Hawai'i, or the Reserve. However, with the advent of the Monument, all proposed activities are reviewed and considered jointly by all three Co-Trustees.

Development and implementation of a unified Monument permit application, application instructions, and Monument permit template occurred within the first year following Monument designation. All permitted activities are authorized under the issuance of a single Monument permit signed by designees of the three Co-Trustees. Most of the Co-Trustee agency mandates and policies are met by this unified permit. Those that are not met by the permit general terms and conditions are added as special conditions. The Co-Trustees issue Monument permits under the authority of the implementing regulations for the Monument, as described in 50 CFR 404.11 and consistent with all other applicable state and federal laws.

Previously, the State of Hawai'i Land Board was the primary public forum for notification of Monument permit applications under consideration by Co-Trustees. To ensure the general public has access to and is informed of all permit applications under review, a policy on public posting was developed and finalized in November 2007 (Appendix A). This policy was developed jointly by the MMB to guide public notification of permit applications and provide an opportunity to review all proposed activities in the Monument.

Monument Permit Types

All activities in the Monument, with limited exceptions, require a permit (see Monument regulations, Appendix D). Activities are either prohibited, excluded (no permit is needed), or regulated (must be considered through permitting process). Prohibited activities include:

- Exploring for, developing, or producing oil, gas, or minerals within the Monument;
- Using or attempting to use poisons, electrical charges, or explosives in the collection or harvest of a Monument resource;
- Introducing or otherwise releasing an introduced species from within or into the Monument; and
- Anchoring on or having a vessel anchored on any living or dead coral with an anchor, anchor chain, or anchor rope.

Exempted activities include:

- Response to emergencies threatening life, property, or the environment;
- Law enforcement purposes;
- Activities and exercises of the Armed Forces; (including the United States Coast Guard) and
- Passage without interruption.

Domestic vessels wishing to pass though the Monument must meet notification requirements, including notification by phone or email at least 72 hours prior to entry and within 12 hours of leaving the Monument (see Appendix D, Monument Regulations).

The Proclamation allows the Secretaries of the Interior and Commerce to issue permits for sustenance fishing outside of any Special Preservation Area as a term or condition of any permit issued, if the activity is conducted in a manner compatible with the Proclamation. Sustenance fishing in the Midway Atoll Special Management Area can be permitted only if it is determined by the Director of the FWS (or designee) to be compatible with the purposes for which the Midway Atoll NWR was established. In accordance with these specifications, the draft FWS Appropriateness Finding and Compatibility Determination for this activity was available as a part of the Draft MMP and has been finalized.

The existing federally regulated commercial bottomfish fishery (permitted under the authority of NOAA Fisheries) does not require a Monument permit. However, in addition to compliance with the fisheries regulations, these permittees must also comply with the Proclamation and Monument regulations. The Proclamation closes the remaining commercial bottomfish fishery in June 2011.

Regulated activities must be considered in the permit process. Under Monument permit criteria, access may be permitted for six types of activities. These are:

- Research,
- Education,
- Conservation and management,
- Native Hawaiian practices,
- Special ocean uses, and

- Recreation.

These permit categories, although different in name from the three types of activities listed in section 13-60.5-5, HAR are consistent with activities that may be allowed under state law. All activities eligible for a Monument permit must comply with all applicable laws. The unified Monument permitting system was specifically developed to address and incorporate the differences. For example, sustenance fishing is not allowed in state waters.

Research

Research permits are required for activities designed to enhance understanding of Monument resources and activities to improve resource management decisionmaking. Priority is given to research proposals that help meet the management needs of the Monument and its Co-Trustees, as identified in this Monument Management Plan or the Monument Natural Resources Science Plan (see Section 3.1.1, Marine Conservation Science Action Plan). The types of activities that can be conducted under a research permit include, but are not limited to, biological inventories, ecosystem-based research, restoration investigations, cultural studies, and terrestrial and marine archaeological research.

In the event sampling is requested, research proposals will be evaluated to ensure proposed sample sizes allow for the effective application of statistical techniques while minimizing harm to the population or ecosystem under study. Collection of samples must be justified and meet Proclamation findings.

Education

Education permits are required for activities that further the educational value of the Monument. Educational activities may enhance the understanding of the NWHI ecosystems, improve resource management decisionmaking, promote Native Hawaiian knowledge and values, or aid in enforcement and compliance efforts. Permits are considered for activities that have clear educational or public outreach benefits to understand Monument resources or management and that promote “bringing the place to the people rather than the people to the place.” Some examples of potentially eligible projects are teacher-at-sea programs, distance learning projects, and university classes.

Conservation and Management

Conservation and management permits are required for general management of the Monument. This may include activities associated with resource management, such as field station operations, benthic mapping, habitat characterization, marine debris removal, development and maintenance of infrastructure, species and habitat restoration, and long-term resource monitoring programs such as monitoring of endangered species and seabird populations, and terrestrial native plant communities (see Section 3.2.3, the Habitat Management and Conservation, Section 3.2.2, Migratory Bird, and Section 3.2.1, Threatened and Endangered Species action plans). Conservation and management permits provide a mechanism to respond and follow up to urgent events in the Monument that may not have been anticipated, such as response to vessel groundings, coral bleaching episodes, and invasive species detection.

Native Hawaiian Practices

Permits are required for Native Hawaiian cultural practices. The Native Hawaiian Cultural Working Group, working closely with the Office of Hawaiian Affairs, is currently developing a process whereby permit applications will be reviewed by select cultural practitioners or cultural resource managers. The findings and criteria in Proclamation 8031 and regulations (see Appendices D and E) state that Native Hawaiian Practice permits must be noncommercial, deemed appropriate and necessary by traditional standards, benefit the NWHI and Native Hawaiian community, perpetuate traditional knowledge, and restrict the consumption of harvested resources from the Monument. Permit conditions and protocols will continue to be developed by the Co-Trustees and the Office of Hawaiian Affairs through consultation with the Native Hawaiian Cultural Working Group and the Native Hawaiian community, as appropriate. (See Section 3.1.2, the Native Hawaiian Culture and History, and Section 3.5.3, Native Hawaiian Community Involvement Action Plans.)

Special Ocean Use

Special ocean use permits are required for projects related to commercial ocean uses, including ecotourism and documentary filmmaking that have a net benefit to the Monument. Special ocean use is defined as any activity or use of the Monument that is engaged in to generate revenue or profits for one or more of the persons associated with the activity or use. These permits are not restricted to activities in the ocean.

Special ocean use permits must meet the additional findings stated in Monument regulations (see Appendix D). These findings include the requirement to provide public notice for any activity not previously identified as a special ocean use and all activities being considered as special ocean use for locations outside of Midway. In addition, the Co-Trustees will authorize the conduct of a special ocean use permit activity only if the activity is compatible with the purposes for which the Monument is designated and is consistent with the protection of Monument resources. Special ocean use permits for activities being permitted for the first time will be restricted to pilot projects. Pilot projects will be closely monitored and restricted in duration. Only after a pilot project for the category has been determined by the Co-Trustees to meet the criteria in Proclamation 8031 can subsequent special ocean use permits be issued for the category of activity. Activities that could qualify as another permit type (e.g., research or education) but that directly generate revenue or profit for one of the persons involved in the activity must be permitted as special ocean use. Furthermore, special ocean use proposals involving activity outside of the Midway Atoll Special Management Area must be for educational or research purposes that directly benefit the conservation and management of the Monument. These activities may not involve use of a commercial passenger vessel, defined in the Monument regulations as “a vessel that carries individuals who have paid for such carriage.”

Recreation

Recreational permits are required for all recreational activities and are limited to the Midway Atoll Special Management Area. In addition to the general findings, recreational activities may not be associated with any for-hire operation or involve any extractive use. Examples of activities that may be permitted under a recreational activity permit include snorkeling, SCUBA diving, wildlife viewing, and kayaking.

FWS, in close consultation with the MMB, has updated the Interim Visitor Services Plan for the Midway Atoll National Wildlife Refuge, the Battle of Midway National Memorial, and the Papahānaumokuākea Marine National Monument's Midway Atoll Special Management Area (see Section 3.4.3, the Midway Atoll Visitor Services Action Plan, and Appendix B). This plan details the types of recreational activities permitted within the Midway Atoll Special Management Area. This plan also describes the permitting process for recreational activities, the number of annual recreational visitors expected within the Midway Atoll Special Management Area, and accommodations on Midway Atoll.

Findings and Review Criteria

Monument findings and review criteria must be met by all applicants to demonstrate that their proposed activities are consistent with the Proclamation and the goals of the Monument (see Section 2, Management Framework). The MMB may require applicants to submit additional information, apply special conditions, or undergo additional training. To issue a permit, the Secretaries must determine the following:

- The activity can be conducted with adequate safeguards for the resources and ecological integrity of the Monument.
- The activity will be conducted in a manner compatible with the management direction of the Proclamation, considering the extent to which the conduct of the activity may diminish or enhance Monument resources, qualities, and ecological integrity; any indirect, secondary, or cumulative effects of the activity; and the duration of such effects.
- There is no practicable alternative to conducting the activity within the Monument.
- The end value of the activity outweighs its adverse impacts on Monument resources, qualities, and ecological integrity.
- The duration of the activity is no longer than necessary to achieve its stated purpose.
- The applicant is qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.
- The applicant has adequate financial resources available to conduct and complete the proposed activity and mitigate any potential impacts resulting from its conduct.
- The methods and procedures proposed by the applicant are appropriate to achieve the proposed activity's goals in relation to their impacts to Monument resources, qualities, and ecological integrity.
- The applicant's vessel has been outfitted with a mobile transceiver unit approved by NOAA Office of Law Enforcement and complies with the requirements of Proclamation 8031.
- There are no other factors that would make the issuance of a permit for the activity inappropriate.

Additional findings are required for Native Hawaiian Practices, special ocean use, and recreation applications. See Appendix D for additional findings from regulations.

Permit applications include requests for information that will assist the Co-Trustees in determining how the proposed activities are compatible with conservation and management of all of the resources of the Monument: natural, historic and cultural.

Permit General Terms and Conditions

Permitted activities are subject to general terms and conditions that satisfy Proclamation 8031 and Monument regulations (see Appendices D and E) and comply with MMB agency mandates and policies. All authorized permits must meet all applicable federal and state regulations. As previously mentioned, those mandates and policies that are not met within the general permit terms and conditions are addressed by special conditions. General terms and conditions in Monument permits address the following categories, as required by Monument regulations, Proclamation 8031, and other MMB agency mandates and policies:

- Monthly, annual, and summary reporting
- Submittal of a copy of all data acquired under each respective Monument permit
- Adherence to all federal, state, and local laws and regulations
- Coordination with Monument staff while in the field
- Prohibition of alcohol possession and consumption in Hawaiian Islands NWR
- Adherence to hazardous material storage and transport guidelines
- Requirement to demonstrate proof of insurance, or financial capability to cover evacuation in the event of an emergency, medical evacuation, or weather
- Requirement for permittees to attend a cultural briefing on the significance of Monument resources to Native Hawaiians
- Prohibition against the disturbance of any cultural or historic property.

Additional terms for entering the Monument via vessel:

- Maintenance of cruise log
- Notification of entry and exit
- Requirement to demonstrate proof of vessel hull, tender, gear, ballast water, and rat inspections
- Vessel Monitoring System requirements.

Permit Special Terms and Conditions

Each permit may contain special terms and conditions that place additional restrictions on the permitted activity to minimize or eliminate impacts to Monument resources or qualities. Permits may contain terms and conditions addressing sustenance and subsistence fishing reporting requirements, permitted activity locations, scientific collection methods, maintenance and retrieval of temporary structures in the Monument, or disinfection of gear and collecting equipment between permitted activity locations. Special terms and conditions are placed in permits depending on the nature of the permitted activity request and the location and duration of activities permitted to take place in the Monument. For example, all permits that involve collection of samples or specimens contain a special condition prohibiting the sale of the organisms collected, as well as the use or sale of any organisms, by-product, or materials collected within the Monument for obtaining patent or intellectual property rights.

One definition of bioprospecting is the search for new chemicals compounds, genes and their products in living things that will have some value to people. This inherently involves the identification of biological resources with potential commercial value that may be developed into marketable commodities such as pharmaceuticals, pesticides and cosmetics. Thus these conditions, applied to all permits, in effect prohibit bioprospecting for commercialization or for obtaining patent or intellectual property rights for organisms collected within the Monument.

Permit Tracking

The MMB will track and monitor all permitted activities to evaluate potential impacts to Monument resources. A multiagency-accessible database that records and tracks information on all Monument permits is currently under development. Application and reporting data from all permits will provide information on the nature, extent, and location of activities occurring in the Monument. This information is essential for managers to make informed decisions about evaluating types and locations of activities proposed in the Monument. It also provides necessary information to conduct a geospatial assessment of impacts and to assess cumulative impacts over time. The tracking system will also provide data essential for conducting a threat assessment for the Monument.

Need for Action

The Monument is a vast protected natural area, largely uninhabited by humans, and rich in biodiversity, history, and culture. The NWHI have a history of Native Hawaiian cultural access and practices, as well as protections interspersed with periods of commercial exploitation and military use. With the advent of new technology and dedicated resources, there is increased awareness and interest in the region. Access to the Monument for all activities, with limited exceptions, requires a Monument permit.

The Monument permit program allows for a comprehensive review of proposed activities and will be administered to ensure compliance with Presidential Proclamation 8031, as well as other applicable federal and state laws and regulations. Efforts are ongoing to make the permitting process more efficient for applicants, the MMB, and the public while maintaining safeguards for the ecosystem. The following strategies and activities are designed to ensure that the permit program is refined in accordance with Monument requirements and policies within existing law and that permit data are effectively tracked and collected for management purposes.

Strategies to Achieve the Desired Outcome

Three strategies have been identified to achieve the desired outcome to implement an effective and integrated Monument permit program that manages, minimizes, and prevents negative human impacts by allowing access only for those activities consistent with the purpose of the Monument. The strategies and activities are coded with the letter “P,” for “Permitting.” A summary of strategies and activities is provided in Table 3.4.1 at the end of this action plan.

- P-1: Refine, implement, and improve the permit process to integrate all state and federal regulations into a single permitting process on an ongoing basis.
- P-2: Track and monitor permitted activities and their impacts.
- P-3: Coordinate information, outreach, and education regarding Monument permits and regulations.

Strategy P-1: Refine, implement, and improve the permit process to integrate all state and federal authorities into a single permitting process on an ongoing basis.

The strategy of the Monument permitting program is to integrate the previous three jurisdictionally based permitting programs into one. A joint permit application, application instructions, and a permit template were approved and implemented (see Appendix A). The permitting program for the Monument allows for a comprehensive review of proposed activities to ensure compliance with the regulatory provisions of the Proclamation as well as other applicable federal and state laws and regulations. Efforts are ongoing to make the permitting process more efficient for both applicants and MMB while maintaining safeguards for the natural, cultural, and historic resources of the Monument.

Activity P-1.1: Effectively and promptly review permit applications to ensure informed permit-related decisionmaking across Co-Trustee agencies.

Monument staff serve as the central portal through which all permit inquiries and applications are received and processed. These staff will continue to work together to discuss and coordinate permit assessment and review efforts by each Trustee agency. Monument staff will bring all permits and permit-related issues before the MMB on a regular basis for discussion and decisionmaking.

Activity P-1.2: Refine and update the permit application, instructions, and permit template through feedback from permittees and other users.

The permit application was developed with extensive input from legal counsel and the MMB to meet agency requirements. Each year, the permit application, instructions, and template will be evaluated and updated based on lessons learned from the previous year. In addition, feedback from permittees and applicants will be gathered on an annual basis to maintain the most efficient and comprehensible permit program possible.

Activity P-1.3: Coordinate appropriate environmental review for all permitted activities.

NEPA, the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.), and Chapter 343, Hawai‘i Revised Statues (“Environmental Impact Statements”), are planning tools used to integrate environmental concerns into federal and state actions and programs, using environmental quality as the essential component. NEPA requires federal agencies to consider the impacts of their actions on the natural and human environment prior to making final management decisions. Hawai‘i requires additional analysis on state agency actions’ potential impacts on the state’s resources, Native Hawaiian culture, and traditional and customary rights. The issuance of Monument permits requires environmental review compliance in the form of one of three documents: Environmental Impact Statements, Environmental Assessments, or Categorical Exclusions. When state agency actions are involved in a permit, a Cultural Impact Assessment is also required. Currently, the federal Co-Trustees follow their individual agency procedures to ensure appropriate environmental review for all permitted activities. However, the Monument staff, along with the MMB and other Co-Trustee experts, will work to develop an efficient integrated process by which all Co-Trustee agencies can continue fulfilling their respective environmental review requirements and effectively document compliance for every Monument permit.

Activity P-1.4: Engage outside experts in review of permit applications.

External reviews of Monument permit applications can provide valuable and unbiased technical evaluations of proposed activities. The MMB utilizes experts to consult on permit applications.

This practice will continue by identifying and engaging a pool of experts trained in Monument-related subject matter including culture, policy, purpose, and proclamation findings.

Activity P-1.5: Investigate individual and vessel insurance and other avenues to fund mitigation of any damages associated with permitted activities.
Activities conducted throughout the Monument pose varying degrees of risk to the resources of the Monument. Medical evacuations, vessel groundings, alien species introductions, and hazardous material spills are among the possible scenarios that might be mitigated by some form of insurance. The MMB will develop joint criteria for insurance that may be required before a permit authorizes activities in the Monument.

Strategy P-2: Track and monitor permitted activities and their impacts.

Detailed tracking of all permitted activities assists the Monument Co-Trustees in making informed decisions about the types and locations of activities permitted in the Monument. It also provides necessary information to conduct a geospatial assessment of impacts and to assess cumulative impacts over time.

Activity P-2.1: Develop a Geographic Information System-based permit tracking system.
The Monument will develop a GIS-based system to track and monitor NWHI permit data to aid enforcement and management decisions. This system and associated data will be established to integrate into the Co-Trustee agencies' individual databases. Each agency will enter and document permit data consistent with the individual agency's requirements. Through data-sharing agreements which are consistent with applicable federal and state laws and confidentiality considerations, the GIS-based tracking system will include partner agency information to ensure a comprehensive portrayal of activities in the region (see the Information Management Action Plan, Section 3.6.2). The MMB will also work together to provide input on cruise dates and locations and shared resources to prevent redundancy (see the Coordinated Field Operations Action Plan, Section 3.6.3).

Activity P-2.2: Analyze permit data to inform management decisionmaking.
The extent to which current and future levels of activity in the NWHI have the potential to cause cumulative impacts on the ecosystem is an active area of investigation. To assist in ecosystem-based management decisionmaking, a system will be developed to analyze data generated from each permit application and reporting requirements to provide the insight needed to make informed management choices about appropriate levels and locations of permitted activities. This system will allow Monument Co-Trustees and partners to better understand uses and use patterns in the Monument and to develop methodology for assessing the cumulative impacts caused by various activities. Analyses conducted with these data will also be used to modify reporting requirements and make them more relevant, as well as aiding enforcement and other program area planning efforts. In addition to being used to assess the cumulative impacts of the human activities, the data will also be used in the development of a Monument threat assessment (see EN-2.1).

Special ocean use permits issued as pilot projects will require additional tracking to develop an understanding of how often each category of special ocean use activity occurs in the Monument, as well as the location of these activities. This information will be used to conduct ecological and socioeconomic evaluations to aid in management decisions on authorizing future special ocean use permits.

Activity P-2.3: Analyze permit data for patterns of compliance.
The MMB will regularly review permit files for patterns of compliance, and compliance will be evaluated every two years (see the Enforcement Action Plan, Section 3.4.2). Specifically, the MMB should undertake a technical analysis of the effectiveness and consistency of the permits that were issued compared to the permitting criteria. Permit criteria, permits issued, applications processed, and patterns of use which will be evaluated.

Activity P-2.4: Develop and implement a Monument reporting process.
Permits are issued based on regulatory requirements as well as proclamation findings and other criteria established by the MMB to assist with permit reviews. One of those criteria is the submittal of reports. An integrated MMB review of the follow-up process is needed to ensure that reports are complete and submitted on time. Additional follow-up includes recording data, ensuring that the results of research are made available, ensuring the systematic reporting of sustenance fishing, and ensuring adherence to regulations and laws. Follow-up may also require compliance visits from enforcement agents.

Strategy P-3: Coordinate information, outreach, and education regarding Monument permits and regulations.

Information, education, and outreach are important aspects of the Monument permitting program. Strategies have been developed to ensure that the public is kept informed of Monument regulations and permit requirements. These strategies are geared toward achieving the highest degree of user compliance and assistance, while fostering a broader public understanding of the NWHI ecosystem and cultural values. Coordination will be conducted across partner agencies to ensure that the public is engaged in and informed of the Monument permitting program. In addition, the MMB has established and will maintain a policy to ensure the public is informed of activities proposed to occur in the Monument.

Activity P-3.1: Develop and implement a permit and regulatory education program.
Many of the action plans include educational or outreach activities related to permitting or regulations, such as the Enforcement (Section 3.4.2), Ocean Ecosystems Literacy (Section 3.5.4), Midway Atoll Visitor Services (Section 3.4.3), Native Hawaiian Culture and History (Section 3.1.2), Alien Species (Section 3.3.2), and Maritime Transportation and Aviation (Section 3.3.3) action plans. Monument staff will work together to ensure that the educational activities proposed in these action plans are integrated to provide a consistent and effective message.

Activity P-3.2: Develop and implement a Native Hawaiian cultural education program for permit applicants.
The MMB will develop and implement an educational program that can be provided online from the Monument web page, which will educate prospective applicants about the Native Hawaiian culture. Those interested in applying for a Monument permit may complete the educational program before submitting their application for review. This educational program will also provide avenues for

additional knowledge gathering should the applicant wish to delve deeper into the Hawaiian culture and develop a greater understanding of the values of the Monument.

Activity P-3.3: Coordinate permitting outreach.
Additional information and outreach will aid interagency permitting efforts and better inform the public about Monument permitting. Information on the permitting process will be posted on Monument websites, including application forms and instructions. This information will reduce delay and confusion for applicants, the public, and agencies as they plan for activities in the Monument. Outreach materials such as presentations, publications, and DVDs will be designed to aid public understanding of agency regulatory and permitting responsibilities. In addition, individual MMB agencies will further exchange information on their roles and responsibilities so that each may better understand and explain permitting requirements.

Activity P-3.4: Develop a pre-access training and briefing program.
Pre-access training is an important component of all permitted activities. Pre-access training is required for all those planning to enter the Monument for the first time. Several MMB agencies have formal and informal training mechanisms already in place. Many activities conducted in the Monument will span multiple agencies; thus, the MMB will work with Monument staff to develop a comprehensive pre-access training and briefing program that is appropriate for a variety of activities and locations within the Monument. This training will include information on the proclamation regulations, permit terms and conditions, reporting requirements, the significance of the NWHI to Native Hawaiians, and ways to best conduct activities to reduce human impacts to the natural environment and cultural resources. The training program will build on protocols and materials already in place by FWS, the State of Hawaiʻi, and NOAA. For those users who have already undergone pre-access training, shorter update briefings will be developed to ensure that all users have the most up-to-date information on the Monument rules and policies.

Activity P-3.5: Regularly update the public on proposed and permitted activities.
The MMB is committed to keeping the public engaged and informed on a regular basis on all proposed and permitted activities that will be conducted in the Monument. To ensure broad dissemination to the public, Co-Trustees will share a single URL address that will be designated as the Monument website. This site will be the location for the public to access information regarding the Monument, including information on the Monument permit program. Information such as lists of permitted activities along with associated permit reports, publications, and productions will be made available or referenced on the Monument website. It will also serve as a primary point of access to notify the public of proposed activities to be conducted in the Monument, as both permit summaries and permit applications will be posted (see Appendix A). As required by the Federal Privacy Act, the privacy of individual applicants will be protected, and all sensitive information will be removed from the permit application prior to public posting. Additional opportunities for the public to be notified and comment on Monument permit applications include:

- Special ocean use permit applications are posted for public notice and comment 30 days prior to the issuance of a permit (Monument regulations, 50 CFR Part 404.11).

- Environmental reviews (e.g., environmental impact statements, environmental assessments, and compatibility determinations) related to Monument permit applications are posted for public comment.
- Monument permit applications that include proposed activities within the state's Northwestern Hawaiian Islands Marine Refuge are posted to the Board of Land and Natural Resources (BLNR) website for 7 days prior to the scheduled BLNR meeting as part of the overall Land Board submittal.

Table 3.4.1 Summary of Strategies, Activities, and Agency Leads for Permitting

Strategies and Activities	Agency Lead
Strategy P-1: Refine, implement, and improve the permit process to integrate all state and federal authorities into a single permitting process on an ongoing basis.	
Activity P-1.1: Effectively and promptly review permit applications to ensure informed permit-related decisionmaking across Co-Trustee agencies.	NOAA
Activity P-1.2: Refine and update the permit application, instructions, and permit template through feedback from permittees and other users.	NOAA
Activity P-1.3: Coordinate appropriate environmental review for all permitted activities.	NOAA
Activity P-1.4: Engage outside experts in review of permit applications.	NOAA
Activity P-1.5: Investigate individual and vessel insurance and other avenues to fund mitigation of any damages associated with permitted activities.	
Strategy P-2: Track and monitor permitted activities and their impacts.	
Activity P-2.1: Develop a Geographic Information System-based permit tracking system.	NOAA
Activity P-2.2: Analyze permit data to inform management decisionmaking.	NOAA
Activity P-2.3: Analyze permit data for patterns of compliance.	NOAA
Activity P-2.4: Develop and implement a Monument reporting process.	NOAA
Strategy P-3: Coordinate information, outreach, and education regarding Monument permits and regulations.	
Activity P-3.1: Develop and implement a permit and regulatory education program.	NOAA
Activity P-3.2: Develop and implement a Native Hawaiian cultural education program for permit applicants.	OHA
Activity P-3.3: Coordinate permitting outreach.	NOAA
Activity P-3.4: Develop a pre-access training and briefing program.	NOAA
Activity P-3.5: Regularly update the public on proposed and permitted activities.	NOAA

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3.4.2 Enforcement Action Plan

Links to other Action Plans	
3.3.2	Alien Species
3.4.1	Permitting
3.5.1	Agency Coordination
3.5.4	Ocean Ecosystems Literacy
3.6.2	Information Management

Links to goals
Goal 1
Goal 2
Goal 3

Desired Outcome

Achieve compliance with all regulations within Papahānaumokuākea Marine National Monument.

Current Status and Background

The three principal entities with responsibility for managing lands and waters of the Monument—NOAA, FWS, and the State of Hawai‘i—are working cooperatively to administer Monument policies and regulations. This role and the relationships among the three Co-Trustees are further described in a Memorandum of Agreement among the Co-Trustees that provides the general terms and conditions under which they will cooperate. Particular to enforcement activities, the Memorandum of Agreement directs the cooperating agencies to coordinate research and monitoring efforts to better understand and address major threats to Monument resources; to provide access and support for enforcement purposes; share enforcement resources and data, as appropriate; and develop joint enforcement capabilities as needed to ensure compliance with applicable state and federal laws. It also gives the agencies the ability to develop additional interagency agreements, grants, memoranda of understanding, or other appropriate instruments that allow for ease in sharing resources, including funds as appropriate, and a sharing of in-kind assistance and support—such as the sharing of vessel time, aircraft missions, or other logistical support—as a means of facilitating cooperation.

In addition to the federal and state laws in place prior to the establishment of the Monument, NOAA and FWS promulgated joint regulations (50 CFR Part 404, see Appendix D) that implement the provisions of the President’s Proclamation. These regulations were issued under NOAA and FWS statutory authorities.

Need for Action

The size and remote location of the NWHI present challenges to enforcement. The Monument is the largest conservation area under U.S. jurisdiction. An effective law enforcement program is needed to protect and conserve Monument resources. The primary aim of the Monument enforcement program is for the jurisdictional partners to achieve resource protection by gaining compliance with all applicable laws and regulations. Increased law enforcement capacity will move agency partners toward more effective enforcement of all federal and state rules that protect the Monument’s resources.

Managers and law enforcement personnel must work together to prioritize and initiate appropriate activities that will have the greatest impact. Depending on the complexity and breadth of a particular enforcement activity, a single agency may not have the manpower or other resources to commit to the effort. Opportunities to efficiently and economically accomplish priority enforcement activities in the Monument must be optimized.

All activities within the Monument, with the limited, specific exceptions discussed in the Permitting Action Plan (Section 3.4.1), require a permit. In addition, all activities within the Monument, including the transit of vessels, present varying degrees of threat to Monument resources and varying potential for noncompliance with Monument rules and regulations. To increase voluntary compliance, outreach tailored to address these threats will be emphasized. Informing the permitted and potential users, as well as the general public, about the Monument resource threats and the regulations in place to protect them is important to ensure responsible behavior before resources can be adversely impacted.

Strategies to Achieve Desired Outcome

Effective law enforcement is an essential component to fulfill the overall management vision to protect Monument resources. The enforcement of regulations in the remote Monument can be difficult and time consuming. Natural barriers to law enforcement, such as remoteness and distance from operating bases, must be overcome.

Enforcement capabilities utilized to monitor activity and detect violations within the Monument will include traditional strategies such as patrols by vessel and aircraft. However, the application of emerging technologies will also be necessary to assure the comprehensive coverage of this vast area. Though Vessel Monitoring Systems (VMS) are currently being utilized, the potential use of other technological capabilities such as satellite based surveillance, remote sensors, or use of unmanned aircraft (drones) will need to be researched further to determine if such use is practical and feasible, and if so, how they may be used.

VMS are prevalent in commercial fisheries and are required to be carried by all vessels permitted to operate in the Monument. VMS is useful to monitor the locations and travel of vessels so equipped; however, to assure viable deterrence and compliance, it is important to establish the capacity to intercept and make at-sea contact with vessels actively engaged in activities that constitute a violation, particularly those not equipped with VMS that cannot be tracked or monitored remotely. This is an area that will rely upon an enforcement partner, the U.S. Coast Guard, to play a key role.

Outreach is an essential part of any law enforcement program. Community Oriented Policing and Problem Solving (COPPS), also referred to as "interpretive enforcement," is a key component to the Monument law enforcement strategy. The goal is to inform Monument users and the general public about the regulations and allowed activities, as well as educate them about the detrimental effects of illegal activities on Monument natural, cultural, and historic resources and the surrounding environment. This goal can be accomplished through focused workgroups with regular and potential permit applicants, public forums, printed materials, interpretive signs, displays, and public service announcements.

This action plan contains three management strategies to achieve the desired outcome of achieving compliance with all regulations within the Monument. The strategies and activities are coded by the abbreviation for the action plan title, "Enforcement" (EN). A summary of strategies and activities is provided in Table 3.4.2 at the end of this action plan.

- EN-1: Increase law enforcement capacity and integration over the life of the plan.
- EN-2: Implement a threat-based detection and monitoring program within 2 years.
- EN-3: Develop and implement a multiagency COPPS/interpretive enforcement program within 2 years.

Strategy EN-1: Increase law enforcement capacity and integration over the life of the plan.

This strategy undertakes the activities required to increase the capacity (i.e., quantity and quality of services) of the law enforcement agencies, promote cooperation among these agencies, and build on existing resources to execute an integrated law enforcement program in the Monument.

Standard operating procedures will increase the efficiency of law enforcement activities and may include monitoring responsibilities, coordinating response to intelligence handling of possible violations, standardizing communications, and reporting activities.

Activity EN-1.1: Charter a Monument law enforcement working group.
A successful Monument law enforcement program must have active involvement and oversight by each of the law enforcement agencies that have responsibilities in the NWHI. The primary law enforcement team entities for the Monument are NOAA Office of Law Enforcement, NOAA Office of General Counsel for Enforcement & Litigation, FWS Office of Law Enforcement and National Wildlife Refuge System Law Enforcement, U.S. Attorneys, U.S. Coast Guard, and Hawaii DLNR - Division of Conservation and Resource Enforcement, Hawaii Attorney General's Office. Numerous other agencies have enforcement authority and will be consulted as appropriate. Staff from these agencies, primarily credentialed law enforcement officers, will form the Monument law enforcement group. The group will meet regularly to (1) coordinate enforcement-related tasks for each agency in support of this plan, (2) develop operating protocols, and (3) assist in evaluating the overall effectiveness of law enforcement efforts.

Activity EN-1.2: Develop necessary interagency agreements.
Effective law enforcement in the Monument would be enhanced by the establishment of formal agreements between law enforcement agencies. At the national level, NOAA and FWS share agreements on enforcement. Cooperative enforcement agreements at a regional level would allow law enforcement officers of partner agencies to enforce statutes under each other's authorities. The MMB will discuss opportunities to formalize Coast Guard support through a memorandum of agreement or other means. Officers of partner agencies can be dedicated to Monument efforts with appropriate funding. For the most effective use of scarce resources on the part of all agencies, law enforcement officers should seek ways to maximize collaboration.

Activity EN-1.3: Develop an integrated law enforcement training program.
Training courses will be conducted by Monument staff to ensure that all law enforcement personnel have the most up-to-date information, including environmental education and Native Hawaiian cultural practices. Enforcement personnel must understand the environmental consequences that could occur as a result of violations. In addition, environmental training will enhance the ability of these officers to provide outreach.

Activity EN-1.4: Assess Monument law enforcement capacity and program effectiveness.
The Monument law enforcement working group will assess the effectiveness of ongoing law enforcement activities, including analyzing efforts to determine if there are any “hot spots” that require focus. On an annual basis, the group will present a formal briefing to the MMB on

ongoing and planned activities, consider new technologies, and discuss potential opportunities for new personnel and sharing law enforcement resources.

Activity EN-1.5: Increase law enforcement capacity on Midway Atoll within two years.
As a predicted hub of activity for the Monument and the site of the only authorized recreational activities, Midway Atoll will be a major access point into the Monument. Presence of credentialed officers at Midway Atoll is necessary to ensure visitor and staff safety, regulatory compliance, and enforcement. Midway is unique in that it is located outside the State of Hawai‘i and, as such, regulations are in place to direct public civil obedience (50 CFR Part 38).

Strategy EN-2: Implement a threat-based detection and monitoring program within 2 years.

Before surveillance resources can be effectively deployed Monument-wide, law enforcement agencies should accurately assess current existing threats. Threats to be assessed include the potential for regulatory violations as well as the potential for resource damage. Once threats are well described, the law enforcement agencies can orient detection and monitoring activities toward the highest-priority areas. Traditional surveillance methods (aircraft and vessel patrols), electronic sensors (land and satellite-based), and automated monitoring (VMS) should be implemented immediately, where needed, to detect violations and resource threats. If needed, expansion of the program to include high-tech and emerging remote surveillance technologies (e.g., unmanned aerial vehicles) may bring long-term cost savings.

Activity EN-2.1: Conduct a comprehensive threat assessment and draft an enforcement plan.
It is important to analyze the level and types of activities occurring throughout the Monument, and then assess the potential for violations and threats to Monument resources. Multiple sources of information should be accessed to analyze vessel and activity patterns. The MMB has already initiated a threat assessment in late 2007 that will continue through 2008 and will include cost-benefit analyses of applicable technologies and solutions. The Monument law enforcement working group will collaborate on this threat assessment and subsequent enforcement plan. The plan will identify effective means of coordination, opportunity for further collaboration and efficient use of limited resources.

Activity EN-2.2: Operate a Vessel Monitoring System for all permitted vessels.
A mandatory monitoring system for all permitted vessels was identified as one of the most critical components of a successful law enforcement program in the NWHI. NOAA Office of Law Enforcement will maintain and operate a VMS to monitor compliance with Monument regulations (50 CFR Part 404).

Activity EN-2.3: Integrate additional automated monitoring systems and ship reporting systems for all vessels transiting the Monument.
Existing automated monitoring and ship reporting systems will be utilized for vessels transiting the monument and that are so equipped. Many “larger” vessels are required to carry and utilize Automated Identification Systems. As mandated through the Maritime Transportation Security Act, the use of Automated Identification Systems is required on all commercial vessels longer than 65 feet. As Coast Guard and Naval researchers develop and expand the systems to collect,

manage (sort), and distribute this information through shore based and satellite technologies, its use may be an effective tool to monitor ship traffic within and around the monument.

Activity EN-2.4: Increase available platforms to support law enforcement.
On-the-water presence will help to ensure that users of Monument resources are deterred from willful or inadvertent violations and will place law enforcement personnel in a better position to respond to violations and other resource emergencies. Because of the remoteness of this area, increased aerial and ship-based resources, both for surveillance and for response, are needed. The Monument law enforcement working group will identify existing platforms that could be used if deemed necessary to increase enforcement, surveillance, and response; as well as to develop proposals to acquire new assets if feasible.

Strategy EN-3: Develop and implement a multiagency COPPS/interpretive enforcement program within 2 years.

COPPS and interpretive enforcement are approaches that seek voluntary compliance with Monument regulations, primarily through education of users about existing regulations, why and how they apply, and how users can play a role in protecting Monument resources. The primary objectives of interpretive law enforcement are to protect Monument resources by increasing the public's understanding of the importance of Monument regulations and to inform the public through educational messages and literature about responsible behavior. On-site methods will be used to reach the public with educational messages. For example, Monument enforcement officers will deliver interpretive programs both onsite and in the main Hawaiian Islands, targeting specific user groups. Reaching out to the community through educational messages and literature is a cost-effective, prevention-oriented measure to reduce the number of violations and foster a sense of stewardship among Monument users.

Activity EN-3.1: Integrate regulations briefings into pre-access training required for all Monument users.
As part of pre-access briefings for all users of the Monument, training programs will be developed to inform users of regulations, permit requirements, and best management practices. Working closely with partner agencies and in consultation with the NWHI enforcement group, specific information on all applicable laws will be developed for these workshops. Workshop materials will include videos, printed materials, and presentations (see the Permitting Action Plan, Section 3.4.1, and Alien Species Action Plan, Section 3.3.2).

Table 3.4.2 Summary of Strategies, Activities, and Agency Leads for Enforcement

Strategies and Activities	Agency Lead
Strategy EN-1: Increase law enforcement capacity and integration over the life of the plan.	
Activity EN-1.1: Charter a Monument law enforcement working group.	NOAA
Activity EN-1.2: Develop necessary interagency agreements.	NOAA
Activity EN-1.3: Develop an integrated law enforcement training program.	NOAA
Activity EN-1.4: Assess Monument law enforcement capacity and program effectiveness.	NOAA
Activity EN-1.5: Increase law enforcement capacity on Midway Atoll within 2 years.	FWS
Strategy EN-2: Implement a threat-based detection and monitoring program within two years.	
Activity EN-2.1: Conduct a comprehensive threat assessment and draft an enforcement plan.	NOAA
Activity EN-2.2: Operate a Vessel Monitoring System for all permitted vessels.	NOAA
Activity EN-2.3: Integrate additional automated monitoring systems and ship reporting systems for all vessels transiting the Monument.	NOAA
Activity EN-2.4: Increase available platforms to support law enforcement.	NOAA
Strategy EN-3: Develop and implement a multiagency COPPS/interpretive enforcement program within two years.	
Activity EN-3.1: Integrate regulations briefings into pre-access training required for all Monument users.	NOAA

3.4.3 Midway Atoll Visitor Services Action Plan

Links to other Action Plans	
3.4.1	Permitting
3.5.2	Constituency Building and Outreach
3.5.4	Ocean Ecosystems Literacy
3.6.3	Coordinated Field Operations

Links to Goals
Goal 3
Goal 4
Goal 5
Goal 7
Goal 8

Desired Outcome

Offer visitors opportunities to discover, enjoy, appreciate, protect, and honor the unique natural, cultural, and historic resources of Papahānaumokuākea Marine National Monument.

Current Status and Background

Since 1995, FWS has been strongly committed to welcoming visitors to Midway Atoll. This island is the first and only remote NWR in the Pacific to provide the general public with an opportunity to learn about and experience these unique ecosystems. With the establishment of the Monument, Midway Atoll takes on the additional role of providing a "window" so that visitors can learn about and enjoy a small portion of the largest fully protected marine managed area in the world.

A regularly scheduled visitor program operated on Midway Atoll from 1995 until early in 2002, but ended when the FWS cooperator left the atoll. Since then, visitors have arrived almost exclusively by the occasional cruise ship or sailboat, or for a Battle of Midway commemorative event. In May 2007, the FWS approved an interim visitor services plan to guide a small-scale visitor program on Midway Atoll until the Monument Management Plan is completed. In January 2008, a regularly scheduled visitor program began, offering limited opportunities for people to experience Midway's wildlife and history.

As part of the interim visitor services plan and in accordance with the National Wildlife Refuge System Administration Act of 1966, the following wildlife-dependent recreational uses were determined to be compatible at Midway Atoll Special Management Area and National Wildlife Refuge: wildlife observation and photography, environmental education and interpretation, and participatory research. Hunting and fishing, which normally are given priority on national wildlife refuges if they are determined to be compatible, will not take place at Midway Atoll. All animal species are protected by law or occur in numbers too low for harvest to allow hunting opportunities. Recreational fishing is precluded under the Presidential Proclamation designating the Monument. Additional compatibility determinations allow for nonwildlife-dependent beach use activities such as swimming and volleyball, nonadministrative airport operations, limited outdoor sports such as bicycling and jogging, and amateur radio use.

Each compatibility determination includes stipulations necessary to ensure protection of Midway's natural, cultural, and historic resources. These compatibility determinations are valid for 15 years for wildlife-dependent visitor activities and ten years for nonwildlife-dependent activities.

Any additional activities that may be proposed within Midway Atoll NWR would need to be evaluated through the compatibility determination process with formal public review. Activities that are determined to be compatible are authorized through the issuance of Monument permits, which fall within six permit types: conservation and management, research, education, Native Hawaiian practices, special ocean uses, and recreation. The permitting process is discussed in Section 3.4.1, the Permitting Action Plan.

Some strategies and activities outlined in the Midway Atoll Visitor Services Plan are included within other action plans; see the Ocean Ecosystems Literacy (Section 3.5.4), Constituency Building and Outreach (Section 3.5.2), and Coordinated Field Operations (Section 3.6.3) action plans.

Visitors spend part of their time on Midway helping to restore wildlife habitat.

Need for Action

Since the Interim Visitor Services Plan was designed to be in effect only until a Monument Management Plan was completed, this action plan addresses a longer-term visitor services program for Midway Atoll. The interim program was initiated in January 2008, so only minimal updates are included in the Midway Atoll Visitor Services Plan (Appendix B).

The Co-Trustees remain committed to offering a high-quality, small-scale visitor program at Midway Atoll as a "window" to the Monument. The aim is that by physically experiencing the Northwestern Hawaiian Islands, visitors will return home with a personal connection and a commitment to protecting and conserving the Monument's unique resources.

Strategies to Achieve the Desired Outcome

The Midway Atoll Visitor Services Plan includes numerous detailed activities that constitute the visitor program. Since the reinitiated program is only a few months old, the MMB will be monitoring the program and adapting it as necessary to ensure protection of natural, cultural, and historic resources and visitor safety, accessibility under the Americans with Disabilities Act (ADA), and satisfaction. The strategies and activities are coded by the acronym for the action plan title, "Visitor Services Action Plan" (VS). A summary of strategies and activities is provided in Table 3.4.3 at the end of this action plan.

- VS-1: Implement the Midway Atoll Visitor Services Plan, providing visitor opportunities for up to 50 overnight guests at any one time.

- VS-2: Assess the level of visitor satisfaction, financial stability of the program, staffing needs, and program structure, resulting in recommendations for improvement beginning in 2009 and biennially thereafter.

Strategy VS-1: Implement the Midway Atoll Visitor Services Plan, providing visitor opportunities for up to 50 overnight guests at any one time.

The Midway Atoll Visitor Services Plan extends the interim visitor program that was reinitiated on a regular schedule in January 2008. Most of the same restrictions and stipulations identified in the interim plan have been carried over into this longer-term plan. In light of infrastructure limitations and to ensure a quality program, the maximum number of overnight visitors will be limited to no more than 50 people at any one time; because of transportation availability, that number generally will be from 15 to 30 people. This number of visitors may be exceeded for short-duration prearranged visits (less than one day) by ocean vessels or aircraft.

Activity VS-1.1: Provide visitors with opportunities for wildlife-dependent recreation to enhance their knowledge and appreciation of the Monument's natural resources.
As outlined in the Midway Atoll Visitor Services Plan, visitors will be offered opportunities for guided interpretive tours, wildlife photography, snorkeling, diving, kayaking, and self-guided walks. At few other places in the world can visitors be so totally surrounded by wildlife. Midway's seabirds have little fear of humans, and visitors are offered opportunities to observe and photograph them from the time they arrive until they leave. More sensitive species, such as the Hawaiian monk seal and green turtle, are observed from a distance to ensure they are not disturbed. Snorkeling and diving will allow visitors a glimpse of the Monument's magnificent coral reefs and their inhabitants. The focus of all activities will be educational in nature, and visitors will be encouraged to share their experiences and knowledge when they return to their homes to develop a broader constituency for the Monument.

Activity VS-1.2: Provide visitors with opportunities to learn about and appreciate the Monument's cultural and historic resources.
Visitors will be offered guided interpretive tours, self-guided walks, interpretive exhibits, and written materials that focus on Midway's and the Monument's distinguished human history. In establishing the Battle of Midway National Memorial, FWS was charged with helping others keep knowledge of this important battle alive for future generations. Numerous historic structures on Midway Atoll were present during World War II and serve as reminders of the heroic courage of the men who risked their lives in the midst of the Pacific and turned the tide of the war.

Because it serves as the "window" to the Monument, it is important that interpretation at Midway be broadened to include information about the Northwestern Hawaiian Islands' importance in Native Hawaiian culture. Interpretive exhibits will be developed to reflect all of Midway's "eras," from prerecorded history to Polynesian and Western contact, to shipwrecks and the Commercial Pacific Cable Company days, the Pan American Flying Clipper period, the Battle of Midway, and on through the Cold War and Vietnam conflicts. Additional exhibits will focus on the cultural and historic sites throughout the NWHI, such as the archaeological remains at Nihoa and Mokumanamana and submerged resources throughout the NWHI.

To the extent possible, remnants of these eras will be interpreted as they exist on Midway. To ensure all cultural and historic resources are included in the story, one of the historic buildings on Sand Island will be restored to house a permanent museum and library that will be available to all visitors.

Activity VS-1.3: Continuously monitor the impacts of visitors and other users on wildlife and historic resources to ensure their protection.
Monument staff will monitor the impacts of visitors and other users on wildlife and historic resources to ensure continuing compatibility, as required by Monument and FWS policies. Monitoring methodology to assess impacts on seabirds, Hawaiian monk seals, sea turtles, corals, and fishes has been developed based on previous work on other refuges and protected areas and is included in the Midway Atoll Visitor Services Plan. The visitor program supervisor, in consultation with FWS and NOAA Cultural Resources Program staffs, monitors impacts on historic resources.

Based on FWS experience from 1996 to 2002, when up to 100 overnight visitors were allowed on Midway at any one time, few impacts are anticipated as long as visitors comply with Refuge and Monument rules and regulations.

Strategy VS-2: Assess the level of visitor satisfaction, financial stability of the program, staffing needs, and program structure, resulting in recommendations for improvement beginning in 2009 and biennially thereafter.

A more regularly scheduled visitor program resumed operation on Midway Atoll in January 2008 during development of this Monument Management Plan. After gathering approximately one year of experience and data, Monument staff will be in a better position to make recommendations to improve the program.

Activity VS-2.1: Monitor visitor satisfaction surveys completed by outgoing visitors, adjusting activities, facilities, and maintenance schedules as appropriate on a monthly basis.
The FWS contractor has designed and implemented a visitor satisfaction survey to be completed as visitors depart Midway Atoll. These questionnaires provide valuable insight into how the visitor program could be improved, as well as providing practical information such as room maintenance needed. The information is compiled on a monthly basis and provided to the refuge manager for appropriate action.

Activity VS-2.2: Convene a team of visitor services specialists and Midway Atoll staff to review the visitor program on a biennial basis.
Beginning in March 2009, the team will conduct a visitor services requirements evaluation to assess whether the visitor program is meeting the standards outlined in the Visitor Services Plan, as well as the purposes and goals of the Refuge and Monument, and provide recommendations to management based on their evaluation. The team will also review the results of monitoring visitor activities for impacts to wildlife and historic resources, review financial information relevant to the visitor program to assess the need to adjust visitor fees, and make recommendations on the program’s financial stability, including staffing and facility needs.

Activity VS-2.3: Based on the assessment above, seek funding, authority, or other needs to implement the recommendations for improvement.

Depending on the results of the visitor services evaluation, steps will be taken to implement improvements to the visitor program. Possible improvements could include revisions to the Midway Atoll Visitor Services Plan, facility improvements, additional staffing, changes in fee structure, changes to visitor activities or stipulations associated with them, or new implementation structures (such as working through a concessionaire).

Table 3.4.3 Summary of Strategies, Activities, and Agency Leads for Midway Atoll Visitors Services

Strategies and Activities	Agency Lead
Strategy VS-1: Implement the Midway Atoll Visitor Services Plan, providing visitor opportunities for up to 50 overnight guests at any one time.	
Activity VS-1.1: Provide visitors with opportunities for wildlife-dependent recreation to enhance their knowledge and appreciation of the Monument's natural resources.	FWS
Activity VS-1.2: Provide visitors with opportunities to learn about and appreciate the Monument's cultural and historic resources.	FWS
Activity VS-1.3: Continuously monitor the impacts of visitors and other users on wildlife and historic resources to ensure their protection.	FWS
Strategy VS-2: Assess the level of visitor satisfaction, financial stability of the program, staffing needs, and program structure, resulting in recommendations for improvement beginning in 2009 and biennially thereafter.	
Activity VS-2.1: Monitor visitor satisfaction surveys completed by outgoing visitors, adjusting activities, facilities, and maintenance schedules as appropriate on a monthly basis.	FWS
Activity VS-2.2: Convene a team of visitor services specialists and Midway Atoll staff to review the visitor program on a biennial basis.	FWS
Activity VS-2.3: Based on the assessment above, seek funding, authority, or other needs to implement the recommendations for improvement.	FWS

3.5 Coordinating Conservation and Management Activities

3.5.1 Agency Coordination Action Plan
3.5.2 Constituency Building and Outreach Action Plan
3.5.3 Native Hawaiian Community Involvement Action Plan
3.5.4 Ocean Ecosystems Literacy Action Plan

3.5 Coordinating Conservation and Management Activities

Many government agencies and nongovernmental organizations work in close coordination with the MMB to achieve Monument goals. Implementation of action plans relies on resources and efforts from a variety of partners. The Co-Trustees and the MMB generally have a high level of involvement for most action plans, while other governmental agencies and nongovernmental organizations will contribute to action plans at varying levels. As Monument projects develop, more organizations will likely be involved. Section 2, Management Framework, and Section 3.5.1, the Agency Coordination Action Plan, provide discussions on the importance of collaboration and partnerships in effectively achieving Monument goals.

Participation by a broad sector of the public is also essential to any successful system of governance (Creighton 1981). The NWHI face an array of complex issues and competing interests. Public input into the decisionmaking process can help ensure that those interested are fairly represented and a strong base of support is built. Without a forum for participation and collaboration, disputes can linger and resources degrade (Pew 2003).

Working together, the MMB will adopt a three-part approach to coordinate management of the Monument. Each part is integral to the success of the whole: (1) agency coordination, which is essential to foster stewardship that takes ecosystem effects into account, (2) involvement of stakeholders, and (3) a strong program of education and outreach to build community support for ecosystem conservation.

Responsibility for management of the Monument is shared by the Co-Trustees. Stakeholders include Native Hawaiians, researchers, educators, conservation groups, fishers, and others. Collaborative management mechanisms are needed to facilitate effective interagency coordination for management and to provide opportunities for active stakeholder participation and input from community forums and various partnerships, and specifically from the Native Hawaiian community.

Action plans to facilitate collaboration and partnerships in the management of the NWHI focus on providing the operational framework to enhance interagency coordination and to provide broad stakeholder involvement in managing the NWHI. Each action plan consists of a set of strategies to address a desired outcome. The desired outcomes of these action plans are as follows:

- **Agency Coordination:** Successfully collaborate with government partners to achieve publicly supported, coordinated management in Papahānaumokuākea Marine National Monument.
- **Constituency Building and Outreach:** Cultivate an informed, involved constituency that supports and enhances conservation of the natural, cultural, and historic resources of the Papahānaumokuākea Marine National Monument
- **Native Hawaiian Community Involvement:** Engage the Native Hawaiian community in active and meaningful involvement in Papahānaumokuākea Marine National Monument management.

- **Ocean Ecosystems Literacy:** Cultivate an ocean ecosystems stewardship ethic, contribute to the nation's science and cultural literacy, and create a new generation of conservation leaders through formal environmental education.

Action plans described in this section will be implemented in close coordination with agency partners and in conjunction with other priority management needs.

3.5.1 Agency Coordination Action Plan

Links to other Action Plans	
3.3.1	Permitting
3.3.2	Enforcement
3.5.3	Coordinated Field Operations

Desired Outcome
Successfully collaborate with government partners to achieve publicly supported, coordinated management in Papahānaumokuākea Marine National Monument.

Links to Goals
Goal 1
Goal 2
Goal 4

Current Status and Background
The NWHI has had a long history of multiagency coordination as a result of the divided responsibilities among several management agencies over the past 100 years (Shallenberger 1984). The Navy assumed jurisdiction over Midway Atoll in 1903. In 1909, President Theodore Roosevelt signed Executive Order 1019 to create the Hawaiian Islands Reservation, and management responsibility was given to the U.S. Department of Agriculture; the reservation was later renamed the Hawaiian Islands National Wildlife Refuge and managed under the authority of the FWS. On February 10, 1936, President Franklin Roosevelt set aside Kure Island to the U.S. Navy by Executive Order 7299. Sixteen years later, President Harry Truman "restored" "Kure (Ocean) Island, together with the surround reef,… to the possession, use, and control of the Territory of Hawaii" (Executive Order 10413, November 17, 1952). The Hawaii Organic Act and the Hawaii Admission Act gave the Territory of Hawaiʻi responsibility for nearshore waters of the NWHI, excluding Midway. In 1988, Midway Atoll was designated a National Wildlife Refuge. Under federal law, NOAA Fisheries is responsible for the management of monk seals, as well as for sea turtles when they are in marine waters; FWS is responsible for the management of sea turtles when they are on land. The State of Hawaiʻi also has jurisdiction over these species under state wildlife and endangered species laws. NOAA's National Ocean Service, through the National Marine Sanctuary Program, joined the jurisdictional players in December 2000, when Executive Order 13178 (as amended by 13196) created the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (adapted from Shallenberger 2004).

Several innovative programs involving federal, state, and private entities have resulted in cooperative efforts to protect and restore natural, cultural, and historic resources in the NWHI. Notable examples include the following:

- The creation of a State Marine Refuge in the NWHI in 2005.
- Several multiagency collaborative research efforts under the Northwestern Hawaiian Islands Reef Assessment and Monitoring Program, conducted since 2000.
- Collaborative educational partnerships, including Navigating Change, Hawaiʻi's Living Reef program, and outreach for the 2002 and 2004 Northwestern Hawaiian Islands Research and Monitoring Program efforts.
- A multiagency collaborative process to establish a regional research forum and to identify regional research and science priorities.
- The NWHI Third Scientific Symposium (2004).
- A regional collaboration that led to the identification of several maritime archaeology and history sites.
- A process to identify opportunities for collaborative permitting and enforcement efforts.
- Development of a unified permitting system for the Monument.

- Critically needed multiagency marine debris removal efforts, ongoing since 1996.
- Collaborative support of Hawaiian monk seal and green turtle recovery and field camps.

Coordination of Monument resource management is overseen by the Co-Trustee agencies, while day-to-day management is implemented by the MMB, as described in Section 2. However, several other federal agencies, including the U.S. Coast Guard, U.S. Geological Survey, EPA, and DOD and various state agencies have roles to play in the Monument, including helping to implement the various strategies and activities in the Monument Management Plan. They could be part of the larger Interagency Coordinating Committee (ICC). Coordination among all parties with regulatory and management responsibilities is crucial to successful Monument operations. The ICC is further described in Section 2.2.

Need for Action

The creation of the Papahānaumokuākea Marine National Monument in 2006 offers a unique opportunity to carry out coordinated management across multiple federal and state agencies to achieve strong, long-term protection of the NWHI. While management of the Monument is the responsibility of the three Co-Trustees, as described in Proclamation 8031, many important government partners also have missions that are affected by and may affect Monument management strategies. Collaboration with all government stakeholders is essential, which is why the MMB and the ICC were established. The unique biological, cultural, scientific, educational, historic, and recreational values of the NWHI require that the region be carefully managed to ensure these values are not diminished for future generations. This action plan presents strategies and activities for facilitating interagency coordination to successfully collaborate with government partners in the NWHI.

Strategies to Achieve the Desired Outcome

Agency coordination in the remote Monument ecosystems is essential to the lasting protection of ecosystems and resources. To achieve the desired outcome of publicly supported coordinated management, three strategies have been developed. The strategies and activities are coded by the acronym for the action plan title, “Agency Coordination” (AC). A summary of strategies and activities is provided in Table 3.5.1 at the end of this action plan.

- AC-1: Ensure effective communications and procedural operations of the MMB.
- AC- 2: Establish and support cooperative management agreements with agency partners.
- AC-3: Promote international, national, and local agency collaborations to increase capacity building and foster networks that will improve management effectiveness.

Strategy AC-1: Ensure effective communications and procedural operations of the MMB.

The MMB was established by the Co-Trustee MOA in 2006 (see Section 2, Management Framework). The MMB is charged with promoting coordinated management of the Monument at the field level and implementing day-to-day management activities necessary to achieve strong, long-term protection of the NWHI for current and future generations. Working across multiple agencies can present a challenge to management if clear and effective procedures are not established.

Activity AC-1.1: Establish standard operating procedures, as needed, to provide direction and improve communication within the MMB.

Standard operating procedures are often necessary to facilitate consistent implementation and ensure that processes are continued and completed on a prescribed schedule. They also serve as a historical record of steps taken and a basis for revising the steps when changes to the process are proposed. In order to ensure that unwritten knowledge and skills do not disappear when positions are filled with new staff, standard operating procedures for the MMB will be written and properly maintained. Standard operating procedures will be developed and included in the interagency MMB charter that will guide the operations of the MMB. These procedures will be reviewed on a regular basis and updated as necessary.

Strategy AC-2: Establish and support cooperative management agreements with agency partners.

The MOA signed in 2006 by the State of Hawai‘i, the DOI, and the DOC promotes coordinated management of the Monument and establishes the functional relationships to effectively coordinate on all management actions. This agreement serves as the foundation for entering into other agreements among the Co-Trustees and with agencies and other entities, as appropriate. Formal partnerships and agreements will be developed with essential agency partners who can help provide comprehensive protection for the ecosystems and resources of the NWHI. The MMB will explore the potential of developing new agreements, including the possibility of amending the 2006 MOA to increase Native Hawaiian involvement in the management of the Monument.

Activity AC-2.1: The MMB will explore the potential of developing new agreements, including the possibility of amending the 2006 MOA to increase Native Hawaiian involvement in the management of the Monument.

The Native Hawaiian voice is missing at the Co-Trustee level under the MOA signed in 2006 for the coordinated management of Papahānaumokuākea, which is precious and sacred to Native Hawaiians. The MMB will explore the potential of developing new agreements, including the possibility of amending the 2006 MOA to increase Native Hawaiian involvement in the management of the Monument. If it is determined that the 2006 MOA should be amended to include a Native Hawaiian governmental organization as a signatory party, the Office of Hawaiian Affairs could fill the position of the fourth Co-Trustee until a Native Hawaiian governing entity is re-established to assure that the cultural significance of Papahānaumokuākea is given as much importance as is noted in Presidential Proclamation 8031.

Activity AC-2.2: Establish agreements for coordinated management and conduct cooperative management operations.

Building on the MOA signed in 2006 and any subsequent amendments, new agreements will be developed among the MMB to support collaborations that facilitate coordinated management. Such agreements will specify roles, responsibilities, and periodic reviews. Opportunities for interagency collaboration may include personnel agreements and crosscutting budget initiatives to promote coordinated management and effective implementation of strategies identified in the action plans. The MMB will work together to establish priorities and initiate joint activities.

Activity AC-2.3: Develop interagency agreements, grants, and memoranda of agreement as needed to carry out specific program priorities.

Cooperative projects will be pursued with agencies outside of the MMB that allow for ease in sharing resources and in-kind assistance and support, as appropriate. Efforts will continue to coordinate with and support the ICC. Formal agreements required for specific program areas will be developed as needed. Collaborative agency efforts that may benefit from formal and other informal agreements are described in the following action plans: Alien Species (Section 3.3.2), Coordinated Field Operations (Section 3.6.3), Emergency Response and Natural Resource Damage Assessment (Section 3.3.4), Enforcement (Section 3.4.2), Threatened and Endangered Species (Section 3.2.1), Information Management (Section 3.6.2), Maritime Heritage (Section 3.1.4), Marine Debris (Section 3.3.1), Permitting (Section 3.4.1), and Habitat Management and Conservation (Section 3.2.3).

Activity AC-2.4: Convene Interagency Coordinating Committee meetings, including an annual workshop.

The ICC is an important venue for state and federal agencies to share information about the Monument's natural and cultural resources and their activities in and around the Monument. This venue also provides an opportunity to facilitate agency coordination and collaboration on implementing the various MMP strategies and activities. The MMB is committed to organizing and supporting periodic ICC meetings to improve coordination and information exchange and as necessary to discuss and resolve interagency issues. An annual interagency strategic planning workshop will be conducted with the ICC to discuss previous year activities and align planned activities and priorities. Gaps and additional needs will be identified along with strategies to address them. (See the Evaluation Action Plan, Section 3.6.4)

Strategy AC-3: Promote international, national, and local agency collaborations to increase capacity building and foster networks that will improve management effectiveness.

Collaborations at the international, national, and local levels are needed to promote information sharing, relationship building, and adaptive use of management tools for conservation and resource management. These partnerships can provide a regional and global context to better understand the significance of traditional knowledge in resource management, the need for scientific and cultural research, and the development of management models that could be applied to the Pacific and beyond.

Activity AC-3.1: Enhance communication and cooperation with the U.S. Department of Defense and the U.S. Navy Pacific Fleet.

Through the ICC and other forums, the MMB will maintain open communication with the DOD and the Navy on potential areas of cooperation, including enforcement; minimizing adverse impacts on Monument resources and qualities; support of zoning, permitting, and tracking programs; and regional and local restoration and wildlife protection efforts.

Activity AC-3.2: Network with other marine protected areas in the Pacific.

The MMB will foster and promote relationships with the marine protected area managers and constituents in Hawai‘i and the Pacific that face impacts of climate change, enforcement, surveillance, and other challenges common to coral reef ecosystem management. Through such regional collaboration, participating organizations could share information on subjects such as coordinated management plan development, mitigation and response strategies to deal with climate change, enforcement, incorporating traditional knowledge, research, and outreach about the importance of coral reef ecosystems to the world. Networking with other marine protected areas in the Pacific is essential for promoting collaborations and to establish the role of the Pacific in the overall global context of marine conservation. Efforts will also be made to promote exchanges within the Pacific Region to an international audience.

Activity AC-3.3: Support the bid for World Heritage Site status.

In 2007, the Monument was included on the new U.S. World Heritage Tentative List as a site within the United States for outstanding universal value for both its natural and cultural heritage. The U.S. Tentative List was submitted to the UNESCO World Heritage Center for consideration in February 2008. The MMB will continue to support the bid for World Heritage designation across agencies to ensure a high level of communication and coordination.

Table 3.5.1 Summary of Strategies, Activities, and Agency Leads for Agency Coordination

Strategies and Activities	Agency Lead
Strategy AC-1: Ensure effective communications and procedural operations of the MMB.	
Activity AC-1.1: Establish standard operating procedures, as needed, to provide direction and improve communication within the MMB.	NOAA
Strategy AC-2: Establish and support cooperative management agreements with agency partners.	
Activity AC-2.1: Explore the potential of developing new agreements, including the possibility of amending the 2006 MOA to increase Native Hawaiian involvement in the management of the Monument.	OHA
Activity AC-2.2: Establish agreements for coordinated management and conduct cooperative management operations.	NOAA
Activity AC-2.3: Develop interagency agreements, grants, and memoranda of agreement as needed to carry out specific program priorities.	NOAA
Activity AC-2.4: Convene Interagency Coordinating Committee meetings, including an annual workshop.	NOAA
Strategy AC-3: Promote international, national, and local agency collaborations to increase capacity building and foster networks that will improve management effectiveness.	
Activity AC-3.1: Enhance communication and cooperation with the U.S. Department of Defense and the U.S. Navy Pacific Fleet.	State of Hawaii
Activity AC-3.2: Network with other marine protected areas in the Pacific.	State of Hawai‘i
Activity AC-3.3: Support the bid for World Heritage Site status.	State of Hawai‘i

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3.5.2 Constituency Building and Outreach Action Plan

Links to other Action Plans
All Action Plans

Links to Goals
Goal 4 Goal 5 Goal 6 Goal 8

Desired Outcome
Cultivate an informed, involved constituency that supports and enhances conservation of the natural, cultural, and historic resources of Papahānaumokuākea Marine National Monument.

Current Status and Background
The MMB currently conducts diverse constituency building and outreach activities related to the Monument, such as:

- Operating discovery centers and visitor facilities, including Mokupāpapa Discovery Center in Hilo and the Midway Atoll visitor center;
- Developing and disseminating informational materials such as fact sheets, brochures, planning updates, and reports;
- Updating and maintaining Monument websites;
- Conducting informational meetings, workshops, and seminars to inform constituencies and seek input on various aspects of Monument management;
- Issuing news releases, feature stories, and public service announcements;
- Working with partners in community fairs, photography exhibits, and documentaries;
- Partnering with support groups such as the Friends of Midway Atoll NWR and the National Marine Sanctuary Foundation;
- Involving volunteers in management and support activities;
- Seeking public review of Monument permit applications for activities proposed in State waters at the State Board of Land and Natural Resources; and
- Seeking public review of draft plans and environmental analyses through NEPA requirements.

The Monument's diverse constituencies in Hawai'i and beyond include federal and state agencies with responsibilities for the region; industry and community stakeholders; and prospective and permitted users. Key Monument constituencies that have been identified to date include, but are not limited to, the following:

- Government agencies with responsibilities in the NWHI
- Native Hawaiian community
- Conservation groups
- Research/academia
- Commercial and recreational fishers
- Local community experts
- Schools, organizations, and institutions that conduct marine education and outreach programs throughout Hawai'i
- Other states, territories, and Pacific nations managing coral reefs
- Business/industry
- Elected officials
- General public at large

Outreach to these diverse communities must be coordinated closely with the strategies and activities identified in the individual action plans detailed in this management plan. A vigorous public outreach and education effort that bridges community concerns and needs with measures applied to protect the resources of the Monument will galvanize broader support for ocean and island conservation and the MMB's work. Such support will bolster the MMB's ability to effectively protect NWHI marine resources.

A strong, sustained constituency-building effort is particularly important in the Monument's early formative years to establish its role in the region and in local, national, and global resource management circles and to set a proactive course into the future.

Need for Action

Stakeholder and community involvement is an integral component to creating an informed and engaged constituency that would further the successful protection of the ecosystems and resources of the NWHI, thus achieving the goals of the Monument (see Section 2, Management Framework). Active and meaningful engagement between management and local experts is considered integral to resilient and adaptive approaches (Berkes 2003; Leslie & Mcleod 2007).

A study conducted by Ward Research in March 2006 for the National Marine Sanctuary Foundation found that the majority of residents of the State of Hawai‘i were unaware of the NWHI and its protected status. More than 50 percent of Hawai‘i's residents believed that there are only eight Hawaiian Islands (Ward Research 2006). For the question, "How many islands, atolls, and other land masses make up what we know as the Hawaiian Islands?," the proportion of residents who answered the correct, "more than 15" or "plenty/too many to count" decreased from the previous year (22 percent, compared with 28 percent in 2005).

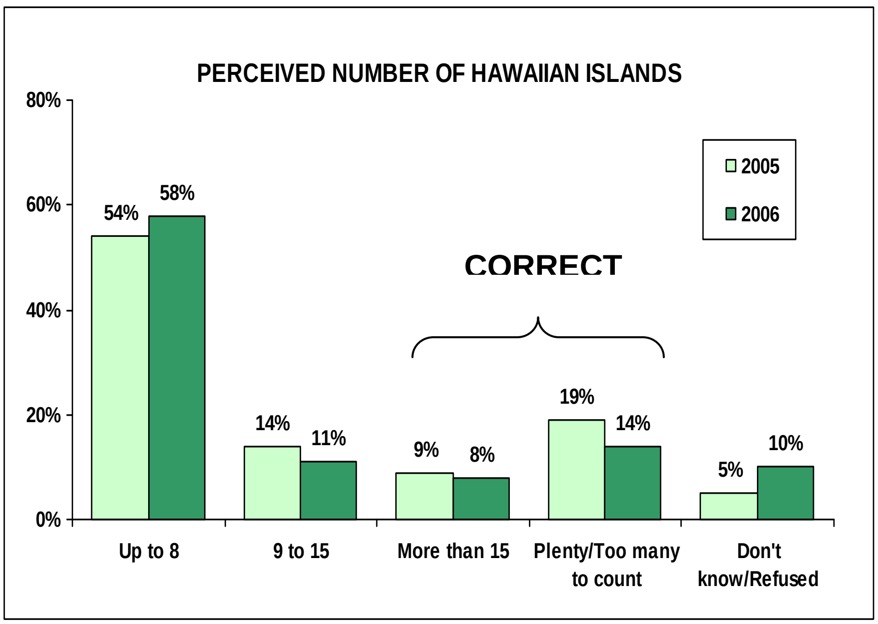

Figure 3.1 Perceived Number of Hawaiian Islands

The establishment of the Monument provides opportunities for the managing agencies to collaborate and share resources for effective constituency building and outreach activities. Currently, the agencies often implement public outreach activities separately, use a similar and limited range of strategies and activities, and target similar constituencies. As the Monument constituencies comprise a wide range of user groups and individuals, various methods will be needed to best engage them in Monument management. A range of strategies and activities are needed to develop, engage, and sustain the active involvement and support of constituencies in Hawai‘i as well as national and international publics. These strategies and activities will keep the public informed as well as provide opportunities for input on management decisionmaking from various stakeholder groups. This action plan presents strategies and activities to develop an integrated constituency-building framework supported by collaborative activities of the Co-Trustees.

Strategies to Achieve the Desired Outcome
The following strategies have been identified to achieve the desired outcome of cultivating an informed, involved constituency that supports and enhances conservation of the natural, cultural, and historic resources of the Monument. These strategies provide both capacity building, which will ensure continuity and effectiveness of Monument communication efforts, and public interface, which will allow for various levels of support for and participation in activities related to the Monument. The strategies and activities are coded by the acronym for the action plan title, “Constituency Building and Outreach” (CBO). A summary of strategies and activities is provided in Table 3.5.2 at the end of this action plan.

- CBO- 1: Develop and implement an integrated communications strategy, based on an assessment of ongoing activities and future needs, to coordinate outreach and engage Monument constituencies within 5 years.
- CBO-2: Continue to develop and disseminate materials and improve and update tools that help inform Monument constituencies about the Monument over the life of the plan.
- CBO-3: Continue initiatives that allow Monument constituencies to be more involved in the Monument and enhance opportunities for long-term engagement over the life of the plan.
- CBO-4: Develop and implement an overarching Monument interpretive strategy, including site-specific planning documents for the Monument’s visitor facilities, within 5 years.

Strategy CBO-1: Develop and implement an integrated communications strategy, based on an assessment of ongoing activities and future needs, to coordinate outreach and engage Monument constituencies within 5 years.

The integrated communications strategy will be made up of various components, including visitor site administration, capacity building, research and development, telecommunication tools, and assessment. The following activities will help to achieve the initiatives of these components and ensure the effectiveness of the integrated strategy.

Activity CBO-1.1: Develop an integrated communications strategy based on an assessment of ongoing activities and future needs.
A unified strategy for constituency building and outreach for the Monument will be developed. The integrated strategy will include a description of the different types of constituencies that need to be informed, engaged, and sustained in support of the Monument; specific strategies, messages, and activities related to each constituency; and indicators to evaluate effectiveness. In developing the document, the MMB will engage analogous entities, such as administrating agencies of

Australia's Great Barrier Reef, to learn lessons from their constituency building and outreach successes. Existing constituency building activities of all MMB agencies generally will be continued under the new Monument framework. This will ensure continued support for already successful programs and the development of new activities that enhance existing support for the region. The Monument communications strategy will be reviewed and updated every 3 years, at a minimum.

Activity CBO-1.2: Continue to refine and implement the Monument Media Communications Protocol to engage news media in informing the public about the Monument's resources and activities.

A key aspect of the communications strategy is media protocol. In February 2007, a Monument media communications protocol was developed to ensure the media receive accurate, consistent, and timely information about the Monument; its natural, cultural, and historic resources; and ongoing activities related to the Monument. An interagency communications team implements the strategy, ensuring that all of the managers are included in the review process and presenting a unified position to the public. Contacts, standards, and procedures are clearly identified within the protocol. Unlike the communications strategy overall, the protocol will be reviewed any time the need arises from any agency or is deemed necessary because of unforeseen external circumstances.

Activity CBO-1.3: Develop a consistent Monument identity to be used in all communications strategies that reflects its comanagement within 1 year.

The Co-Trustees currently maintain their three separate identities and include all agency logos on most communications materials. The MMB will develop a new Monument "corporate identity," reflecting its shared management on behalf of the American people.

Activity CBO-1.4: Incorporate new perspectives for understanding the value of NWHI ecosystems, including socioeconomic studies, to increase ocean ecosystems literacy and conservation in the Monument within 5 years.

The Monument will serve as a powerful focal point for understanding climate change and increasing ocean ecosystems literacy. To engage a broad and diverse base of constituents and local experts, Monument staff must continuously expand the types of products, messages, and modes of communication used in education and outreach programs. The MMB will support and seek out traditional and local knowledge as well as new perspectives that contribute different ways of valuing the ecosystems of the NWHI. New and innovative ways to look at the value of marine ecosystems, such as socioeconomic analysis of the nonmarket value of coral reefs, will also be supported.

Activity CBO-1.5: Research and implement new technologies and tools to increase public understanding of the NWHI ecosystems within 5 years.

Telepresence (technologies that allow a person to feel as if they were present, to give the appearance that they were present, or to have an effect at a location other than their true location) is an important tool for helping to educate the larger community about the special region of the Monument. Since most people will not be able to visit the Monument because of its remoteness and fragility, it is important to bring the place to the people. Telepresence technologies such as underwater video cameras, real-time video transmission, virtual field trips, website interfaces, and exhibits in discovery centers that present this content will play an important role in educating the public about the NWHI. Obstacles to implementing these technologies do exist, such as cost, feasibility, and ecological sensitivities, but the Monument will continue to invest in and utilize new technologies for providing this virtual experience.

Strategy CBO-2: Continue to develop and disseminate materials and improve and update tools that help inform Monument constituencies about the Monument over the life of the plan.

Providing information about the Monument through products such as websites, brochures, and other media is one of the first steps toward raising the overall awareness of the Monument with the public (local, national, and international). The MMB will also seek to provide versions of materials in ʻōlelo Hawaiʻi when appropriate and possible.

Activity CBO-2.1: Establish a new Monument website that will allow constituents to visit a single site for all Monument-related information within 1 year.
Currently, the three Co-Trustee agencies all maintain separate websites that provide information about the Monument. The MMB is developing a single interagency website (http://www.papahanaumokuakea.gov) that will be jointly managed and regularly updated with information about permit and management activities, planning updates, and other information.

Activity CBO-2.2**: **Continue to develop and update printed materials to aid Monument constituencies in understanding key aspects of the Monument.
Although an overall site brochure is the primary informational mechanism to help the public understand the Monument, additional materials will be developed to aid in the understanding of more specific aspects of the entire region and on the ways in which the public can participate. Topics to be addressed will include, but will not be limited to, Native Hawaiian culture; research; management activities; permitting; Monument wildlife, historic, and cultural resources; impacts associated with climate change; and volunteer activities. These materials will be printed pieces, such as the update letter that was provided to the public during the development of the Monument Management Plan, but may also include multimedia components or be developed as a suite of materials.

Activity CBO-2.3: Support other entities' efforts to broaden knowledge of and appreciation for Monument resources and management priorities.
Establishment of the Monument has created interest from documentary filmmakers, writers, photographers, and other entities to help us "bring the place to the people." The MMB will support those endeavors that provide benefit to Monument resources and management and our constituents without impacting Monument resources.

Strategy CBO-3: Continue initiatives that allow Monument constituencies to be more involved in the Monument and enhance opportunities for long-term engagement over the life of the plan.

This strategy will continue efforts to create an interactive experience with constituents by providing the support and activities necessary to develop a long-term commitment to the

Monument from a growing number of increasingly knowledgeable constituents. This strategy will also explore means by which local experts can be actively and meaningfully involved in the management of the Monument. The Monument is a vast region that will need a strong network of constituents who are connected to the NWHI in order to ensure that the plans initiated today are carried out and implemented successfully over time. However, this kind of success is realized only when the support is rooted in an engaged community and when the relationship between the agency and its constituents has matured into one of collaboration.

***Activity CBO-3.1*: Continue to seek out and participate in events that reach a broader audience and provide constituents with knowledge of the Monument.**
The MMB agencies individually have a history of participating in various public outreach activities. We will collaborate to enhance existing participation and find new venues. Examples of such activities include, but are not limited to, events such as fairs, lecture series, and public forums.

Activity CBO-3.2: As needed, hold focused forums on various Monument-related issues or topics to inform and engage a broader range of constituents.
The MMB will offer public forums on specific topics or issues both to exchange information with our constituencies and to build awareness and support. These forums will be offered at various locations to facilitate participation by a broad range of constituents.

***Activity CBO-3.3*: Continue to seek out and support partnership opportunities that focus on Oceania-related issues.**
As the Hawaiian Archipelago is most closely related to other sites across Oceania, it is important for the Monument to collaborate with a network of marine managed areas in this region. These partnerships will allow for a greater exchange of knowledge and expertise. They will also provide opportunities to build awareness about the important connection between cultural and conservation practices.

***Activity CBO-3.4*: Continue to build and nurture volunteer programs that develop knowledge of, involvement in, and support for Monument programs and resources.**
Volunteers offer an opportunity to build a new base of constituents who are closely connected to and involved in efforts of the Monument. Volunteers are essential in carrying out our mission to protect this valuable resource. We will work to enhance existing efforts and to build capacity to support these important efforts.

Long-term volunteers help with outreach and education needs, especially at Mokupāpapa Discovery Center and Midway Atoll, and with habitat restoration and wildlife monitoring, especially at Tern Island, Laysan Island, Midway Atoll, and Kure Atoll. In addition, we will incorporate Midway Atoll visitors into volunteer programs for habitat restoration, wildlife population monitoring, and historic restoration projects, as outlined in the Midway Atoll Visitor Services Plan. Overnight visitors will be encouraged to participate in volunteer activities, including eradication of invasive plants, collection of marine debris, and restoration of native plants and historic structures. Many visitors want to "give something back" to the environment during their time on the atoll, and these activities will help restore acres of habitat.

Activity CBO-3.5: Establish and support a Papahānaumokuākea Marine National Monument Alliance to engage a broad range of constituents, who will provide recommendations and information on specific management issues on a regular basis.

The Co-Trustees are committed to establish a Monument Alliance within 1 year, composed of individuals who represent communities and stakeholders interested in the Monument's stewardship. The Alliance will provide individual advice and recommendations to the Monument management agencies regarding management of Monument resources over which the Co-Trustees have responsibilities. It will serve as a community-based forum to exchange information; provide community input and individual recommendations on Monument policies, activities, and management; advocate for Monument conservation; and enhance broader community and public understanding. Within 2 years after the release of the Monument Management Plan, the Co-Trustees will charter the Alliance as an advisory committee under the Federal Advisory Committee Act (FACA), or as a FACA-exempt advisory body to allow the Alliance to provide consensus advice to the Co-Trustees, per the amended Memorandum of Agreement.. Meetings of the Monument Alliance will be convened on a regular basis, with specific topics identified for each meeting. The meetings will be well publicized and open to the public, and will be held at various locations to facilitate

Activity CBO-3.6*: *Continue to support the Native Hawaiian Cultural Working Group through the Office of Hawaiian Affairs.
This group is made up of members of the Native Hawaiian community who provide guidance to the State of Hawaiʻi through the Office of Hawaiian Affairs. This group has offered support on permit review and cultural protocols, and provided the Monument with its name. By better incorporating Hawaiian culture into Monument management, we gain long-term support and greater understanding from the community that represents the host culture of the entire Hawaiian Archipelago.

Activity CBO-3.7*: *Continue working with the Friends of Midway Atoll National Wildlife Refuge through FWS and support the establishment of a Monument-related "friends" group.
The Friends of Midway Atoll NWR is a nonprofit group that was formed in 1999 and currently has more than 200 members from across the nation who contribute to the interpretation, recreation, and educational programs of the Refuge. In addition to continuing to work with the Friends of Midway Atoll NWR, we will work with other Monument-wide "friends" groups if established.

Activity CBO-3.8*: *Continue to convene the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve Advisory Council through NOAA's Office of National Marine Sanctuaries until the Monument Alliance is established.
The Reserve Advisory Council (RAC) was formed in 2001 and has served as a mechanism for public input and a venue for public comment on management activities. The composition of the Reserve Advisory Council is designed to provide formal advice to the ONMS from a variety of stakeholder viewpoints and geographic representation. Continuing the RAC would provide a public forum for members of the community and constituencies to allow for input on the Reserve until such a mechanism is established for the Monument.

Strategy CBO- 4: Develop and implement an overarching Monument interpretive strategy, including site-specific planning documents for the Monument's visitor facilities, within 5 years.

As one of many means of communication, several facilities that interpret Monument resources and activities have been developed, most of them prior to designation of the Monument. This strategy includes the development of an interpretive plan, as well as evaluation strategies and maintenance schedules. By unifying all Monument interpretation under a single strategy, the MMB can ensure targeted, appropriate messages are delivered to our constituents in a consistent manner that leads to achievement of Monument goals.

Activity CBO-4.1: Develop interagency Monument interpretive themes to guide all interpretive products and activities.
Although initial discussions of Monument-wide interpretive themes have been held among the Co-Trustee agencies, a more focused study is needed. These interpretive themes will guide the development and presentation of interpretive sites and products, linking tangible resources to intangible meanings, creating emotional and intellectual connections to the meanings of the resource, and making the Monument personally relevant to individuals.

Activity CBO-4.2: ***Review existing interpretive sites and activities to determine their current relevance to the Monument and how they could better represent Monument themes.***
Two existing interpretive facilities—Mokupāpapa: Discovery Center for Hawai‘i's Remote Coral Reefs in Hilo, Hawai‘i, and the Midway Atoll NWR visitor center on Sand Island, Midway Atoll—and the proposed visitor facility at NOAA's Pacific Regional Center on Ford Island, O‘ahu, will be reviewed and updated so that they better reflect the Monument's cultural, natural and historic resources as a whole.

Activity CBO-4.3: Develop a Monument interpretive plan to guide future interpretive projects and activities.
The overarching Monument interpretive strategy will identify the Monument's interpretive themes, audiences, messages, and media, and include information on project priorities, costs, staffing needs, and schedules.

Activity CBO-4.4: Seek additional opportunities to expand Monument interpretive efforts to new sites and through new technologies, creating a network of coordinated interpretive sites.
The MMB will identify new sites and technologies to better reach our audiences. In many cases, we will work with private or other government entities to include Monument messages in broader arenas. Possible partnership opportunities exist in aquaria, schools and universities, parks, government buildings, hotels, and many other locations.

Activity CBO-4.5: Working with the National Park Service, U.S. Navy, and other key entities, develop off-site exhibits on the Battle of Midway and the associated National Memorial to be integrated into World War II memorial sites of the Pearl Harbor Historic District.
In establishing the Battle of Midway National Memorial at Midway Atoll, FWS was charged with ensuring that the heroic courage and sacrifice of those involved in the battle will never be forgotten. Although this interpretive theme will be important at Midway Atoll, a relatively small

number of visitors will be reached. A much broader audience will be found within the Pearl Harbor Historic District, where the USS Arizona Memorial, USS Missouri, USS Bowfin, and sites on Ford Island receive at least 1.5 million visitors each year. The MMB, working with partner agencies and other key entities, will develop exhibits about the Monument that can be integrated with other existing interpretative facilities and sites.

Table 3.5.2 Summary of Strategies, Activities, and Agency Leads for Constituency Building and Outreach

Strategies and Activities	Agency Lead
Strategy CBO-1: Develop and implement an integrated communications strategy, based on an assessment of ongoing activities and future needs, to coordinate outreach and engage Monument constituencies within 5 years.	
Activity CBO-1.1: Develop an integrated communications strategy based on an assessment of ongoing activities and future needs.	FWS
Activity CBO-1.2: Continue to refine and implement the Monument Media Communications Protocol to engage news media in informing the public about the Monument's resources and activities.	FWS
Activity CBO-1.3: Develop a consistent Monument identity to be used in all communications strategies that reflects its comanagement within 1 year.	NOAA
Activity CBO-1.4: Incorporate new perspectives for understanding the value of NWHI ecosystems, including socioeconomic studies, to increase ocean ecosystems literacy and conservation in the Monument within 5 years.	NOAA
Activity CBO-1.5: Research and implement new technologies and tools to increase public understanding of the NWHI ecosystems within 5 years.	NOAA
Strategy CBO-2: Continue to develop and disseminate materials and improve and update tools that help inform Monument constituencies about the Monument over the life of the plan.	
Activity CBO-2.1: Establish a new Monument website that will allow constituents to visit a single site for all Monument-related information within 1 year.	NOAA
Activity CBO-2.2: Continue to develop and update printed materials to aid Monument constituencies in understanding key aspects of the Monument.	NOAA
Activity CBO-2.3: Support other entities' efforts to broaden knowledge of and appreciation for Monument resources and management priorities.	FWS
Strategy CBO-3: Continue initiatives that allow Monument constituencies to be more involved in the Monument and enhance opportunities for long-term engagement over the life of the plan.	
Activity CBO-3.1: Continue to seek out and participate in events that reach a broader audience and provide constituents with knowledge of the Monument.	NOAA
Activity CBO-3.2: As needed, hold focused forums on various Monument-related issues or topics to inform and engage a broader range of constituents.	State of Hawai‘i

Strategies and Activities	Agency Lead
Activity CBO-3.3: Continue to seek out and support partnership opportunities that focus on Oceania-related issues.	NOAA
Activity CBO-3.4: Continue to build and nurture volunteer programs that develop knowledge of, involvement in, and support for Monument programs and resources.	FWS
Activity CBO-3.5: Establish and support a Papahānaumokuākea Marine National Monument Alliance to engage a broad range of constituents, who will provide recommendations and information on specific management issues on a regular basis.	NOAA
Activity CBO-3.6: Continue to support the Native Hawaiian Cultural Working Group through the Office of Hawaiian Affairs.	OHA
Activity CBO-3.7: Continue working with the Friends of Midway Atoll National Wildlife Refuge through FWS and support the establishment of a Monument-related "friends" group.	FWS
Activity CBO-3.8: Continue to convene the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve Advisory Council through NOAA's Office of National Marine Sanctuaries until the Monument Alliance is established.	NOAA
Strategy CBO-4: Develop and implement an overarching Monument interpretive strategy, including site-specific planning documents for the Monument's visitor facilities, within 5 years.	
Activity CBO-4.1: Develop interagency Monument interpretive themes to guide all interpretive products and activities.	NOAA
Activity CBO-4.2: Review existing interpretive sites and activities to determine their current relevance to the Monument and how they could better represent Monument themes.	FWS
Activity CBO-4.3: Develop a Monument interpretive plan to guide future interpretive projects and activities.	FWS
Activity CBO-4.4: Seek additional opportunities to expand Monument interpretive efforts to new sites and through new technologies, creating a network of coordinated interpretive sites.	NOAA
Activity CBO-4.5: Working with the National Park Service, U.S. Navy, and other key entities, develop off-site exhibits on the Battle of Midway and the associated National Memorial to be integrated into World War II memorial sites of the Pearl Harbor Historic District.	FWS

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3.5.3 Native Hawaiian Community Involvement Action Plan

Links to other Action Plans	
3.1.2	Native Hawaiian Culture and History
3.5.1	Agency Coordination
3.5.2	Constituency Building and Outreach

Links to Goals
Goal 2
Goal 3
Goal 4
Goal 5
Goal 6
Goal 7

Desired Outcome

Engage the Native Hawaiian community in active and meaningful involvement in Papahānaumokuākea Marine National Monument management.

Current Status and Background

The Executive Order that designated the NWHI Coral Reef Ecosystem Reserve (Reserve) in 2000 required that Native Hawaiians, among others, provide advice regarding management of the Reserve and ensuring the continuance of Native Hawaiian practices. It did so through provisions allowing for "culturally significant, noncommercial subsistence, cultural, and religious uses" in the Reserve by Native Hawaiians, and set aside three voting seats on the Reserve Advisory Council for Native Hawaiians. During its first five years of operation, the RAC established a Native Hawaiian Cultural Working Group, which broadened the inclusion of Native Hawaiians in the operations of the Reserve and in planning for a proposed National Marine Sanctuary.

In addition to Native Hawaiian representation on the RAC and the establishment of a Native Hawaiian Cultural Working Group, the Reserve began efforts to consult with the Native Hawaiian community through a grant to the University of Hawai‘i's Kamakakūokalani Center for Hawaiian Studies. This grant provided an opportunity for Native Hawaiians to develop the content of NOAA's report on the cultural history of the NWHI from an indigenous point of view. The grant also convened key Native Hawaiian community members for a two-day planning session to make recommendations about future research, educational, and cultural activities that should be made available to Native Hawaiians and others to ensure a strong cultural link in the planning and management of the Reserve and throughout the sanctuary designation process.

These efforts provided a foundation for Native Hawaiian involvement in the Reserve, and this foundation has continued and expanded in the management of the Monument. Many Native Hawaiians remain unaware of efforts under way to protect the NWHI through management of the Monument. Although several prominent members of the Native Hawaiian community have been involved in the management and implementation of the Reserve, many others should be engaged, in part by working more closely with Native Hawaiian institutions.

Participants of the 2004 NWHI workshop on Native Hawaiian issues and concerns held at Kamakakūokalani Center for Hawaiian Studies at U.H. Mānoa. Photo: Dr. Kekuni Blaisdell

The Reserve set a standard for recognition and inclusion of Native Hawaiians in determining the future management of the NWHI. Strategies will be developed to involve the Native Hawaiian community in the management of the Monument not only because of strong public support, but also because of the mandates of the Office of National Marine Sanctuaries to protect biological and cultural resources in the areas it manages, of the FWS to preserve historic sites as well as conserve and promote wildlife and their habitat, and of the State to protect ceded lands and the rights of Native Hawaiians.

An increasing number of resource management and conservation partnerships are being formed between indigenous groups and governmental bodies worldwide. In Hawai‘i, the Kaho‘olawe Island Reserve Commission and Mo‘omomi, Moloka‘i partnerships are examples of how traditional knowledge and values are integrated into resource management. An international example is seen in New Zealand, where Maori involvement in government conservation management projects ranges from consultation to full control over marine and terrestrial tribal regions.

The Native Hawaiian community has expressed a strong interest in participating in management decisions affecting the Reserve and Monument. Respecting Native Hawaiian traditions and values and providing an effective degree of participation in the protection and stewardship of the Monument will provide an opportunity for Native Hawaiians to maintain ancestral connections to the NWHI. Such connections will continue to further ongoing reconciliation efforts between Native Hawaiians and the United States.

Efforts are needed to directly engage Native Hawaiian concepts and participation in resource management, including perspectives in managing natural, cultural, and historic resources. The resulting synthesis of western and Hawaiian management concepts and practices is a significant step toward improving relationships and communication regarding Monument management. The MMB is committed to working with the Native Hawaiian community to identify specific and meaningful ways of engagement in managing the Monument. A variety of strategies to promote this engagement have been identified in this action plan as well as those in Section 3.1.2, the Native Hawaiian Culture and History Action Plan.

Need for Action

Numerous public comments collected during the scoping process for the proposed National Marine Sanctuary identified the need to include Native Hawaiians and Native Hawaiian traditional resource management practices in the management of the NWHI. Communities also expressed concern that Native Hawaiians must have access to continue cultural practices in the region. The comments indicated the need for direct consultation with Native Hawaiians, or more consultation over and beyond the representation of Native Hawaiians currently included in the management of the Monument.

The inclusion of terrestrial areas (particularly Nihoa, Mokumanamana, and Kure Atoll) and waters in the Monument creates a greater urgency to include Native Hawaiian perspectives in the Monument's management. All of the documented Native Hawaiian archaeological sites in the NWHI are on Nihoa and Mokumanamana; they hold some of the densest scatters or concentrations of prehistoric structural sites in Hawai‘i; and they represent a pure example of the culture prevailing in Hawai‘i before the 13th century.

The Constitution of the State of Hawai‘i requires the State to care for Hawai‘i’s public trust resources and recognizes the state’s obligation to work for the cultural rights of Native Hawaiians. Given the unique history and constitutional and statutory requirements of the State to protect the claims and rights of Native Hawaiians in their homeland, the Native Hawaiian community must be involved in the planning, management, and operations of the Monument.

Strategies to Achieve the Desired Outcome

Three strategies have been identified for achieving the desired outcome of engaging the Native Hawaiian community in active and meaningful involvement in Monument management. The strategies and activities are coded by the acronym for the action plan title, “Native Hawaiian Community Involvement” (NHCI). A summary of strategies and activities is provided in Table 3.5.3 at the end of this action plan.

- NHCI-1: Regularly involve the Native Hawaiian community for the life of the plan.
- NHCI-2: Develop and annually maintain partnerships with Native Hawaiian organizations and institutions.
- NHCI-3: Identify and integrate Native Hawaiian traditional knowledge and management concepts into Monument management annually for the life of the plan.

Strategy NHCI-1: Regularly involve the Native Hawaiian community for the life of the plan.

The MMB includes representation by the Office of Hawaiian Affairs (OHA). Currently, OHA is the only State agency with a statutory mandate to advocate for Native Hawaiians and to assess the policies and practices of other agencies’ impacts on Native Hawaiians. OHA, on behalf of the MMB, will continue to convene the Native Hawaiian Cultural Working Group to obtain advice and guidance from Native Hawaiian cultural experts, including kūpuna (respected elders) and practitioners, on all Monument actions affecting Native Hawaiians and cultural resources in the Monument. Over time, the MMB may develop other mechanisms to bring together Native Hawaiians to participate in Monument activities and management.

Activity NHCI-1.1: Formalize, expand, and convene the Native Hawaiian Cultural Working Group.

During year 1, the MMB, through OHA, will formally establish a cultural working group, expanding the previously established working group, to ensure a strong cultural link in the planning and management of the Monument. Like its predecessor, this body would consist of kūpuna, cultural practitioners, Native Hawaiian resource managers, and others (see Section 3.5.2, the Constituency Building and Outreach Action Plan).

Activity NHCI-1.2: Engage the Native Hawaiian Cultural Working Group in the development of a Monument Cultural Resources Program.

The MMB will work with the Native Hawaiian Cultural Working Group and other Native Hawaiian organizations and institutions to develop a Monument Cultural Resources Program and corresponding cultural resource management activities. (See Section 3.1.2, the Native Hawaiian Culture and History Action Plan.)

Activity NHCI-1.3: Establish an annual cultural resources exchange.
The MMB will annually convene groups of Native Hawaiians who have visited the Monument to provide a safe venue to discuss the knowledge, experiences, and new questions gained during the past research season. The MMB will also update the Native Hawaiian community on its lessons learned from the last research season, including synopses of nonproprietary cultural reflections provided in various permittees' final reports. These exchanges may also include previous and on-going research, as well as status of curated cultural resources. These exchanges will not only update the Native Hawaiian community, but will also engage that community in determining the priorities and proposed methodologies of forthcoming research queries, theories, and needs. (See Section 3.1.2, the Native Hawaiian Culture and History Action Plan.)

Strategy NHCI-2: Develop and annually maintain partnerships with Native Hawaiian organizations and institutions.

Memoranda of Understanding, grant programs, and cooperative agreements have been useful in developing working relationships with partner agencies and organizations. Partnerships with Native Hawaiian organizations could similarly help to strengthen that community's involvement in Monument management and the development and implementation of programs involving Native Hawaiians. Partnering will help the Monument to consult with the broader Native Hawaiian community and aid in gathering information about cultural resources and practices.

Activity NHCI-2.1: Continue to expand and explore opportunities to partner with institutions serving Native Hawaiians.
In 2003, the Reserve established a partnership with the Kamakakūokalani Center for Hawaiian Studies and the University of Hawaiʻi to conduct cultural research, consult with the Native Hawaiian community, and produce educational materials related to the NWHI. The MMB will seek other opportunities to formally consult with and engage other Native Hawaiian groups and will develop outreach programs for the Native Hawaiian community. (Interagency partnerships are also addressed in Section 3.5.1, the Agency Coordination Action Plan.) Additional partnerships, contracts, grants, or formal agreements with Native Hawaiian organizations will be considered and established as opportunities arise.

Strategy NHCI-3: Identify and integrate Native Hawaiian traditional knowledge and management concepts into Monument management annually for the life of the plan.

Traditional resource management involves recognizing local variations, observing patterns, periodically applying kapu (restrictions on resource extraction and other activities) by konohiki (local managers), and maintaining a deep respect for, and intimate knowledge of, the environment. Integrating traditional knowledge will not only strengthen the relationship between Monument managers and the Native Hawaiian community, but will also provide additional tools and methods for improving management practices. This relationship will also perpetuate the application of traditional knowledge across the Hawaiian Archipelago.

Activity NHCI-3.1: Engage the Native Hawaiian community to identify how traditional knowledge will be integrated into Monument activities.
The Monument's cultural resources staff, to be developed pursuant to the Native Hawaiian Culture and History Action Plan (Section 3.1.2), will work with the Native Hawaiian community

and cultural experts to preserve and recover the knowledge of traditional Hawaiian resource management strategies and to identify how traditional knowledge and associated practices may be woven into Monument management and research activities. This activity will include developing recommendations for integrating these skills and knowledge into Monument management, and preparing a report of the recommendations within 2 years.

Activity NHCI-3.2: Use and integrate Native Hawaiian traditional knowledge in Monument management activities.

Based on recommendations developed under Activity NHCI-3.1, the MMB will integrate traditional perspectives, knowledge, and approaches in the management of Monument resources.

Table 3.5.3 Summary of Strategies, Activities, and Agency Leads for Native Hawaiian Community Involvement

Strategies and Activities	Agency Lead
Strategy NHCI-1: Regularly involve the Native Hawaiian community for the life of the plan.	
Activity NHCI-1.1: Formalize, expand, and convene the Native Hawaiian Cultural Working Group.	OHA
Activity NHCI-1.2: Engage the Native Hawaiian Cultural Working Group in the development of a Monument Cultural Resources Program.	OHA
Activity NHCI-1.3: Establish an annual cultural resources exchange.	OHA
Strategy NHCI-2: Develop and annually maintain partnerships with Native Hawaiian organizations and institutions.	
Activity NHCI-2.1: Continue to expand and explore opportunities to partner with institutions serving Native Hawaiians.	OHA
Strategy NHCI-3: Identify and integrate Native Hawaiian traditional knowledge and management concepts into Monument management annually for the life of the plan.	
Activity NHCI-3.1: Engage the Native Hawaiian community to identify how traditional knowledge will be integrated into Monument activities.	NOAA
Activity NHCI-3.2: Use and integrate Native Hawaiian traditional knowledge in Monument management activities.	NOAA

3.5.4 Ocean Ecosystems Literacy Action Plan

Desired Outcome
Cultivate an ocean ecosystems stewardship ethic, contribute to the Nation's science and cultural literacy, and create a new generation of conservation leaders through formal environmental education.

Links to other Action Plans	
All action plans in:	
3.1	Understanding and Interpreting the NWHI
3.2	Conserving Wildlife and their Habitats
3.3	Reducing Threats to Monument Resources
3.4	Managing Human Uses

Current Status and Background
Prior to the establishment of the Monument, the Co-Trustees took active steps to address the need for ocean ecosystems literacy. Adopting a cooperative approach has exponentially enhanced and extended the agencies' educational efforts. Educational partnerships have enabled the implementation of programs far beyond the resources of any one agency, institution, or organization alone.

Links to Goals
Goal 5
Goal 6
Goal 8

The NWHI provide a model and rare benchmark of a healthy, intact ecosystem, conserved in its natural state, that may serve to inspire Hawai'i residents, all Americans, and the global community to take part in ocean restoration efforts. Inspired by the Polynesian Voyaging Society, this guiding premise brought together resource management agencies and partners to implement the multiyear "Navigating Change" project, which focuses on raising awareness and motivating people to change their attitudes and behaviors to better care for Hawai'i's land and ocean resources. A five-part video, standards-based educational curriculum, and teleconferences with the traditional Polynesian voyaging canoe *Hōkūle'a* during its 2004 expedition to the NWHI have been completed in partnership with several agencies and organizations. Teacher workshops on the "Navigating Change" program have been held since 2003 across Hawai'i. The MMB also organized a number of education-at-sea initiatives.

The multiagency educational partnership remains active and fluid and continues to work well, even in the absence of formal agreements because of the clear benefits to all parties. Shared objectives include information sharing, aligning education with management needs, setting regional priorities, reducing duplication of efforts, and sharing resources. Through partnering, organizations and agencies are better able to meet their educational mandates. Partnerships take advantage of existing expertise and experience, as well as preexisting markets for educational outreach. Cost and staff sharing of education and outreach programs help to alleviate limited funding and staffing issues for these programs.

Students visit Mokupāpapa Discovery Center in Hilo. Photo: James Watt

Mokupāpapa: Discovery Center for Hawai'i's Remote Coral Reefs
The Reserve built a visitor/education center collocated with its Hilo office to

spur greater public awareness of the region and ocean conservation issues. Mokupāpapa: Discovery Center for Hawai'i's Remote Coral Reefs was conceived and built in 2003 to interpret the natural science, culture, and history of the NWHI and surrounding marine environment. The 4,000-square-foot center brings the region to people by proxy, since most will never have the opportunity to visit the area. At the time of this publication, more than 300,000 people have been exposed to the wonders of the NWHI through the center. The center has served as a physical hub of learning, regularly hosting well-attended educational talks, summer programs, and activities, while drawing a constant stream of field trips for school and community groups from around the State and beyond.

Need for Action

The U.S. Commission on Ocean Policy (2004) stressed the need to strengthen the nation's ocean awareness and to improve ocean-related education efforts as "critical to building an ocean stewardship ethic, strengthening the nation's science literacy, and creating a new generation of ocean leaders." The report concluded that an interested, engaged public is an essential prerequisite "to successfully address complex ocean- and coastal-related issues, balance the use and conservation of marine resources, and realize future benefits from the ocean."

The President's Ocean Action Plan places a major emphasis on ocean-related awareness and education. This action plan addresses the need to build upon our environmental education efforts to cultivate students as an informed, involved constituency that cares about restoring, protecting, and conserving our precious ocean resources. Strengthening awareness of the importance of the NWHI as a model of a wild marine ecosystem being maintained in its natural state requires a heightened focus on stewardship values and resource management issues through both formal and informal education efforts. School curricula, starting in kindergarten, will expose students to ocean issues and prepare the next generation of scientists, managers, educators, and leaders through diverse educational opportunities. Furthermore, students' increased understanding is anticipated to naturally influence their families, extending the extracurricular reach of the Monument's educational activities.

Strategies to Achieve the Desired Outcome

Monument staff will work closely with existing and new partners to further their environmental education goals. Two strategies have been identified to cultivate an ocean ecosystem ethic, strengthen the nation's science literacy, and create a new generation of conservation leaders. The strategies and activities are coded by the acronym for the action plan title, "Ocean Ecosystems Literacy" (OEL). A summary of strategies and activities is provided in Table 3.5.4 at the end of this action plan.

- OEL-1: Develop and implement educational programs in Hawai'i to increase ocean ecosystems literacy and promote stewardship values within 5 years.
- OEL-2: Develop and implement new tools to "bring the place to the people" with a focus on students, within 3 years.

Strategy OEL-1: Develop and implement educational programs in Hawaiʻi to increase ocean ecosystems literacy and promote stewardship values within 5 years.

A coordinated and long-term strategy for mainstreaming NWHI and ocean ecosystem stewardship values-based educational materials into Hawaiʻi's schools will be developed. Appropriate educational materials and curricula geared to improve ocean literacy, understand climate change and increase ocean stewardship will be developed in concert with the NWHI education partnership and the State of Hawaiʻi Department of Education, Independent Schools of Hawaiʻi, Nā Lei Naʻauao Native Hawaiian Charter School Alliance, and the Charter School Association of Hawaiʻi. Materials developed through activities in other action plans will be used as resource and support materials for development of curricula. Programming will also be developed in the Hawaiian language for use in Hawaiian language immersion and culture-based charter schools. Ultimately, increased knowledge of ocean ecosystems issues, in particular of the NWHI, will allow Hawaiʻi's children, their families, and lifetime learners to be more active ocean stewards and to better understand the issues related to ocean management and climate change.

Activity OEL-1.1: Expand and improve the NWHI educational partnership's Navigating Change curriculum for elementary and middle school students, with increased focus on ocean ecosystems literacy, within 3 years.
Building on existing NWHI-based curricula developed under the Navigating Change partnership and the new Hawaiʻi Marine Curriculum, the MMB will contract with curricula developers to improve and expand "A Teacher's Guide to Navigating Change." Additional study units will be added for the current guide targeted at 4th and 5th grade students, and units focusing on other grade levels will be developed. As the effects of climate change are further studied and potential mitigations are identified, a unit on this topic will be developed. External grants for curricula development will also be sought. Education partners will work with the Department of Education and private and charter schools as curricula are being developed to ensure that the department's and schools' needs are incorporated into the work and to facilitate incorporation of the new curricula into existing educational programming. Whenever possible, families will be drawn into the lesson plans and activities. Planting the seed of awareness in young minds and those of their families concerning alien species, climate change and ocean acidification, and marine debris cleanup and prevention issues will effectively support long-range prevention efforts to deal with these threats.

Activity OEL-1.2: As curricula are developed, work with Hawaiian-language immersion schools to ensure the curricula meet their needs, including translation into the Hawaiian language.
The Navigating Change partnership will work closely with the Native Hawaiian community to ensure appropriate cultural information is included within all curricula, and that the units meet the needs of Hawaiian-language immersion and culture-based charter schools.

Activity OEL-1.3: Develop an ocean stewardship program for middle school and high school students within 5 years.
In concert with development of Navigating Change educational materials for primary schools, an ocean stewardship program will be developed with educational partners to give middle and high school students real-world, hands-on experience with the issues of ocean management. Real

examples from the Monument will be used as the basis for the science- and culture-based program, which will use educational activities such as interviews with people in the student's communities, and collecting and analyzing research data to resolve management issues. Through these activities, students will be encouraged to apply their newfound knowledge to help restore the ecosystems closer to their homes.

Activity OEL-1.4: Conduct at least four teacher workshops in the main Hawaiian Islands per year to introduce and support the elementary school and middle/high school environmental education programs.

Teacher workshops to present and demonstrate the use of Monument-developed educational materials, activities, and curricula, as well as those developed with partners, are effective ways to get Monument-based information into classrooms and informal education venues. Development and distribution of educational materials is not enough; teachers are often overwhelmed by available materials and should be taught how to use them, assisted in implementing materials in their classrooms, and supported by follow-up activities.

Activity OEL-1.5: Continue Teacher and Class-at-Sea programs on an annual basis.

In 2005, the first teacher and class-at-sea educational expedition to the NWHI was conducted. During NOAA vessel allocation meetings, NOAA agreed to accommodate annual education missions aboard one of the several research vessels active in the NWHI. Teachers who have been active in using existing Monument educational materials will be chosen to participate in these educational cruises, and select students will be sought. These programs allow teachers and students who are active in learning about the NWHI to experience the area firsthand and share the wonder of the place with the rest of the educational community. Annual expeditions will be planned in conjunction with educational opportunities with state and FWS partners. Monument educational materials developed in activity OEL-1.3 will be used during these expeditions. For linked activities, see also the Native Hawaiian Culture and History Action Plan, strategy NHCH-5, in Section 3.1.2.

Activity OEL-1.6: Expand educational programs for school groups at Mokupāpapa: Discovery Center for Hawai'i's Remote Coral Reefs to host at least ten groups per month.

Educational programming at the Monument's premier education and outreach venue, Mokupāpapa: Discovery Center for Hawai'i's Remote Coral Reefs, will be expanded. Working closely with local public, private, and charter schools, Discovery Center staff will create educational partnerships to promote Mokupāpapa as an educational facility and field trip venue. Discovery Center staff will collaborate with the Monument's educational partners to co-develop standards-based education programs at the Discovery Center for K-12 students. Visitation calendars, pre- and post-visit teacher background and activities packets, and volunteer docent capacity will be developed to meet the various needs of school and community groups. Expanded programming, such as guided tours in the Hawaiian language, monthly talks, tide pool classes, and reef-at-night visits to the aquarium, will provide continuing education opportunities for adults. Discovery Center staff will work with partner facilities and agencies on Hawai'i Island to codevelop on- and off-site programming, where appropriate, and to develop an education strategy and identify areas of collaboration.

Activity OEL-1.7: Provide annual wildlife-dependent educator and conservation leader workshops at Midway Atoll, targeting a mix of formal and informal educators and community and conservation leaders and building upon Navigating Change curricula and vision.
One goal of these educator and conservation leader workshops is to inspire a new group of educators as a method of connecting students and lifelong learners to Hawai‘i's wildlife and culture. Another goal is to have participants in these workshops actually propose and implement an environmental stewardship program in their community, utilizing their experience at Midway as inspiration. The major themes discussed during these workshops could provide the stepping stones for future development of educational activities such as telepresence, distance learning projects, and ocean stewardship programs.

Agency planning for Midway Atoll educator workshops began in 2007, and a focus group of teachers, curriculum developers, educational leaders, and Navigating Change Educational Partnership members held a planning workshop on Midway Atoll in January 2008. Co-Trustee education staff will be coordinating and conducting these workshops with input from previous classes of workshop attendees, collectively referred to as Alaka‘i. As curricula geared at new grade levels and targeting different audiences are developed, the number of educator workshops offered within the Monument may increase. Offering more educators and conservation leaders the opportunity to experience Midway Atoll and bring the Monument back to their students and lifetime learners will be an important role for Midway in the coming years.

Activity OEL-1.8: Facilitate at least two opportunities per year for educational groups, private/nonprofit environmental, or historical organizations to conduct wildlife-dependent or historical courses or to administer informal educational camps, within 2 years.
Organizations have already shown their interest in using Midway for educational experiences, since it provides unparalleled wildlife-dependent educational opportunities. Sponsoring organizations will be responsible for providing instructors and leading their participants. Monument staff will provide guidance during a mandatory advance orientation. When possible, Monument staff can provide learning opportunities that engage participants in biological and historical projects such as habitat restoration or historic preservation. FWS staff will also monitor group activities to ensure Midway's wildlife and historic resources are protected.

The MMB also will collaborate with universities to offer semester internship opportunities for students interested in resource management, cultural studies, history, or natural sciences. In the future, the MMB will investigate opportunities to bring select middle and high school students to Midway for courses in atoll ecosystems. The MMB supports expanding environmental education opportunities to the extent feasible on Midway Atoll. Developing lower-cost housing, increasing classroom and laboratory space, providing grants to help cover their costs at Midway, and finding a lower-cost means of transportation, will facilitate these programs. An opportunity to study Midway's unique natural resources could be the catalyst to inspire lifelong devotion to the field of science.

Activity OEL-1.9: Build formal evaluations into education programs within 2 years.
Evaluation of education and outreach programs and activities is critical to ensuring that the MMB is achieving its desired goals and reaching target audiences. This information is also

useful in helping to redesign current efforts to be more successful. Formal evaluations take time, expertise, and will require external assistance in development.

Strategy OEL-2: Develop and implement new tools to "bring the place to the people," with a focus on students, within 3 years.

The Monument will serve as a powerful focal point for increasing ocean literacy in Hawai'i, the nation, and the world. To engage a broad and diverse base of students around the world, the MMB will continuously expand the types of products and modes of communication used in educational programs. The MMB will benefit from continually exploring new research initiatives, new technologies, and best management practices that may advise its efforts and enhance its ability to restore, protect, and conserve Monument resources.

Activity OEL-2.1: Identify and prioritize research and development projects to increase ocean ecosystems literacy and conservation in NWHI.

The MMB, working together with educational partnerships and other relevant groups, including the private sector, will identify and prioritize research and development projects for new products and innovative technologies that could be employed to increase ocean ecosystems literacy and support for conservation of the NWHI. These tools may include technologies for making remotely collected scientific data available for education purposes on a real-time basis, and the possibility of hosting student research projects in the Monument, similar to what NASA does with the space shuttle and space station. Since the challenges of increasing awareness of the Monument have been likened to those involved in increasing understanding of space, the MMB will work with NASA to learn from their extensive education programs.

Activity OEL-2.2: Use telepresence technology for educational and outreach activities within 5 years.

Telepresence is an important tool for helping to educate the larger community about the special ocean region of the NWHI. Since most people will not be able to visit the NWHI because of its remoteness and fragility, it is important to bring the place to the people. Technologies such as underwater video cameras, real-time video transmission, virtual field trips, formal distance learning programs, website interfaces, and exhibits in discovery centers can play an important role in educating students and the public about the NWHI. Obstacles to implementing these technologies do exist, such as cost, feasibility, and ecological sensitivities, but the MMB will continue to invest in and use new technologies for providing this virtual experience.

Table 3.5.4 Summary of Strategies, Activities, and Agency Leads for Ocean Ecosystems Literacy

Strategies and Activities	Agency Lead
Strategy OEL-1: Develop and implement educational programs in Hawai‘i to increase ocean ecosystems literacy and promote stewardship values within 5 years.	
Activity OEL-1.1: Expand and improve the NWHI educational partnership’s Navigating Change curriculum for elementary and middle school students, with increased focus on ocean ecosystems literacy, within 3 years.	NOAA
Activity OEL-1.2: As curricula are developed, work with Hawaiian-language immersion schools to ensure the curricula meet their needs, including translation into the Hawaiian language.	NOAA
Activity OEL-1.3: Develop an ocean stewardship program for middle school and high school students within 5 years.	NOAA
Activity OEL-1.4: Conduct at least four teacher workshops in the main Hawaiian Islands per year to introduce and support the elementary school and middle/high school environmental education programs.	NOAA
Activity OEL-1.5: Continue Teacher and Class-at-Sea programs on an annual basis.	NOAA
Activity OEL-1.6: Expand educational programs for school groups at Mokupāpapa: Discovery Center for Hawai‘i’s Remote Coral Reefs to host at least ten groups per month.	NOAA
Activity OEL-1.7: Provide annual wildlife-dependent educator and conservation leader workshops at Midway Atoll, targeting a mix of formal and informal educators and community and conservation leaders and building upon Navigating Change curricula and vision.	FWS NOAA
Activity OEL-1.8: Facilitate at least two opportunities per year for educational groups, private/nonprofit environmental, or historical organizations to conduct wildlife-dependent or historical courses or to administer informal educational camps, within 2 years.	FWS
Activity OEL-1.9: Build formal evaluations into education programs within 2 years.	NOAA
Strategy OEL-2: Develop and implement new tools to “bring the place to the people,” with a focus on students, within 3 years.	
Activity OEL-2.1: Identify and prioritize research and development projects to increase ocean ecosystems literacy and conservation in NWHI.	NOAA
Activity OEL-2.2: Use telepresence technology for educational and outreach activities within 5 years.	NOAA

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3.6 Achieving Effective Monument Operations

3.6.1 Central Operations Action Plan
3.6.2 Information Management Action Plan
3.6.3 Coordinated Field Operations Action Plan
3.6.4 Evaluation Action Plan

3.6 Achieving Effective Monument Operations

Monument operations provide the support system for implementing strategies and activities described in other action plans. This support system includes improvement and maintenance of infrastructure in Honolulu to support field sites in the NWHI, information management, coordination of field operations and improvement and maintenance of field infrastructure, and program evaluation for both Honolulu and field sites.

Action plans to achieve effective operations focus on building and maintaining the vital personnel and infrastructure needs, both on land and at sea. The Information Management and Evaluation Action Plans (Sections 3.6.2 and 3.6.4) describe programs and functions necessary to effectively carry out and assess the effectiveness of all other action plans. Each action plan consists of a set of strategies and corresponding activities to address a desired outcome. The desired outcomes of these action plans over the 15-year planning horizon are as follows:

- **Central Operations:** Conduct effective and well-planned operations with appropriate human resources and adequate physical infrastructure in the main Hawaiian Islands to support management of Papahānaumokuākea Marine National Monument.
- **Information Management:** Consolidate and make accessible relevant information to meet educational, management, and research needs for Papahānaumokuākea Marine National Monument.
- **Coordinated Field Operations:** Coordinate field activities and provide adequate infrastructure to ensure safe and efficient operations while avoiding impacts to the ecosystems in the Papahānaumokuākea Marine National Monument.
- **Evaluation:** Determine the degree to which management actions are achieving the vision, mission, and goals of Papahānaumokuākea Marine National Monument.

Action plans described in this section will be implemented through close coordination among the MMB and in conjunction with other priority management needs.

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3.6.1 Central Operations Action Plan

Links to other Action Plans
All action plans

Links to Goals
Goal 1 Goal 4

Desired Outcome

Conduct effective and well-planned operations with appropriate human resources and adequate physical infrastructure in the main Hawaiian Islands to support management of Papahānaumokuākea Marine National Monument.

Current Status and Background

The Hawaiian Islands NWR, Midway Atoll NWR, NWHI Coral Reef Ecosystem Reserve, NWHI Marine Refuge, and State Seabird Sanctuary at Kure Atoll were established prior to 2006, and remain part of the Monument. The MMB agencies had varying levels of human resources and facility infrastructure in place when the Monument was established. The majority of the staff and administrative support is located in Honolulu. Outreach and other activities are conducted at other locations within the main Hawaiian Islands, and some on-site management is conducted as needed at a few sites within the Monument.

The FWS and its preceding natural resource agencies have conducted management activities in the NWHI since the establishment of the Hawaiian Islands NWR in 1909. Full-time staff were assigned for administrative and logistical support in 1979 when the U.S. Coast Guard abandoned its presence at French Frigate Shoals. These FWS operations in support of the Hawaiian Islands NWR were first conducted at Kīlauea Point NWR on the island of Kaua‘i, and were later moved to the central FWS refuge office in Honolulu. FWS assumed wildlife management responsibilities at Midway Atoll NWR in 1988.

The FWS currently maintains numerous Monument staff, in diverse roles, in Honolulu in the Prince Jonah Kūhiō Kalaniana‘ole Federal Building. Support also is provided by other FWS staff within the federal building, including from the Hawaiian and Pacific Islands National Wildlife Refuge Complex, the Pacific Islands External Affairs and Visitor Services, and the Pacific Islands Fish and Wildlife Office. Both the Hawaiian Islands and Midway Atoll NWRs, under the Monument staffing structure, maintain staff in Honolulu and in the NWHI (see Section 3.6.3, Coordinated Field Operations Action Plan). In addition to the facilities at the federal building, FWS maintains a bunkhouse and storage facility in the Kapahulu area of Honolulu. This facility, while periodically available for FWS Monument needs, is administered by and primarily serves the Pacific Remote Islands National Wildlife Refuge Complex.

Much of the necessary NOAA-related infrastructure and personnel were established while implementing the Reserve from 2001 to the present. This infrastructure included the creation of an office in Hilo and an office in Honolulu, hiring of key staff, and the design, construction, and opening of the Mokupāpapa: Discovery Center for Hawai‘i’s Remote Coral Reefs in Hilo.

Prior to Monument designation, Reserve staff carried out operations specific to the Reserve while devoting a considerable amount of time working toward the designation of the Reserve as a national marine sanctuary. Because of these demands, staff size increased steadily between 2000 and 2005, with most staff managing multiple diverse roles and becoming more centralized in the

Honolulu office. In 2004, Honolulu Reserve staff located to offices shared by the NMSP Pacific Region and Hawaiian Islands Humpback Whale National Marine Sanctuary. Also in 2004, NOAA began plans to relocate all Hawai‘i NOAA offices to a new consolidated Pacific Regional Center on Ford Island by 2010. The Mokupāpapa: Discovery Center exceeded expectations for the number of annual visitors in its first year of operation requiring additional staff for managing the facility.

In 2006, when the NWHI were designated as a marine national monument by Presidential Proclamation 8031, staff involved in managing the Hawaiian Islands NWR, Midway Atoll NWR, and the Reserve became Monument staff and immediately began carrying out a rolling implementation of management of the newly designated Papahānaumokuākea Marine National Monument.

NMFS provides management support and program coordination for the Monument from the Pacific Islands Regional Office (PIRO), located in downtown Honolulu. Established in 2004, PIRO has increased its resources to meet a growing number of regional, national and international requirements. In addition to senior leadership direction, a NMFS Management Officer was reassigned from existing staff to directly support the development and implementation of Monument activities. NOAA’s Pacific Islands Fisheries Science Center, located adjacent to the University of Hawai‘i’s Mānoa campus, supports a variety of scientific activities taking place within the Monument.

The State of Hawai‘i has had an active presence in monitoring and managing resources in NWHI, starting with assessing and managing fisheries in the 1950s and continuing with the on-site management of Kure Atoll in the late 1980s when the U.S. Coast Guard returned atoll management to the State. Resources under state jurisdiction are mainly managed by the DLNR. The key line offices for undertaking this management are the Division of Aquatic Resources and the Division of Forestry and Wildlife, both administrative offices located in the Kalanimoku Building in downtown Honolulu. Staff involved in the management of the Monument are located at this site and are also collocated with NOAA staff at its offices in Hawai‘i Kai. Staff involved in the management of the State NWHI Marine Refuge immediately began carrying out rolling implementation of the Monument as the needs of comanagement evolved. While state staff involved in Monument operations have not grown in the past few years, recent state administrative and legislative action has created additional positions to implement state Monument activities.

In addition to those activities undertaken at the state administrative offices, staff involved in the management of the State Seabird Sanctuary at Kure Atoll are located at the Division of Forestry and Wildlife baseyard. All staff associated with the support of wildlife activities in the O‘ahu district (of which Kure is a component) are located at this site. The Division of Aquatic Resources also has an additional site for staging all boating and diving operations at its Ānuenue Fisheries Research Facility at Sand Island in Honolulu Harbor.

Additional support activities, including conservation enforcement, alien species response, emergency response, and historic preservation, are located throughout the DLNR and the Department of Health.

OHA serves as a member of the MMB, and, along with the Native Hawaiian Cultural Working Group, represents Native Hawaiian interests on Monument matters. The nine OHA trustees and OHA's main administrative staff are housed in the Pacific Plaza Building in Honolulu, with community resource offices on five of the main Hawaiian Islands, including two offices on Hawai‘i Island.

Volunteers currently provide support to the Monument in a number of locations, including administrative offices, the Mokupāpapa Discovery Center in Hilo, French Frigate Shoals, Laysan Island, Midway Atoll, and Kure Atoll. These volunteers help Monument staff in carrying out their missions to protect the natural, cultural, and historic resources of the Monument (see Section 3.5.2, Constituency Building and Outreach Action Plan).

Need for Action

Effectively managing such an extraordinary and high profile marine conservation project requires a strong operational foundation to support management goals. Operational support of on-site management and day-to-day operations require that highly trained and experienced staff are maintained and recruited to implement the strategies and activities described throughout this management plan. Volunteer services are also needed to augment this staff. In addition, the appropriate physical infrastructure must be in place to support operations. Each of the MMB agencies currently has infrastructure to maintain and possibly collocate both in Honolulu and elsewhere in the main Hawaiian Islands. Successful site operations are achieved through a synergy of personnel and available resources. This action plan presents strategies and activities designed to implement the shared facilities, coordinated schedules, and cooperative agreements required to achieve effective site operations.

Strategies to Achieve the Desired Outcome

Three strategies have been identified to ensure the necessary human resources, physical infrastructures, and administrative procedures are in place to successfully manage the Monument. The strategies and activities are coded by the acronym for the action plan title, Central Operations (CO). A summary of strategies and activities is provided in Table 3.6.1 at the end of this action plan.

- CO-1: Coordinate annual site operations planning and implementation over the life of the plan.
- CO-2: Assess and enhance human resource and organizational capacity over the life of the plan.
- CO-3: Assess and enhance physical infrastructure and facilities, as necessary, in the main Hawaiian Islands over the life of the plan.

Strategy CO-1: Coordinate annual site operations planning and implementation over the life of the plan.

Monument management agencies develop annual operating plans guided by their agency policies and procedures and consistent with the Monument Management Plan. These individual agency operating plans may be integrated to the extent possible to better guide day-to-day activities based on budget allocations to ensure efficient and effective use of public resources.

Activity CO-1.1*: *Coordinate and implement annual operating plans.
Annual operating plans will be developed and coordinated in accordance with agency requirements and guided by site-specific needs articulated in planning documents and based upon funding availability. The results of annual evaluation activities and current priorities will be reviewed and considered in developing annual operating plans (see Section 3.6.4, Evaluation Action Plan). Financial administration includes budget tracking, managing the financial portions of memoranda of understanding and contracts, and purchasing and travel planning according to state and federal purchasing regulations. Administrative procedures and functions also include planning for emergencies to ensure staff safety; complying with programmatic reporting requirements; records retention; purchasing and maintaining equipment, supplies, and vehicles; maintaining communication equipment including telephones, cellular phones, satellite phones and connections, and radios, as well as communication policy. Although each agency will follow their own procedures, activities will be coordinated to the extent possible to increase efficiencies and, where possible, standard operating procedures will be developed to outline roles and responsibilities as needed.

Strategy CO-2: Assess and enhance human resource and organizational capacity over the life of the plan.

Both human resource and organizational capacity are needed to achieve effective site operations. With the proclamation announcement comes high expectations for the Monument to implement management actions in a short amount of time. To effectively meet Monument goals, the MMB will develop a strong operational framework of human resources as early as possible. Human resources and organizational capacity may be increased to carry out programs, including administration, research and monitoring, threat reduction, education and outreach, information management, and enforcement.

Activity CO-2.1: Regularly assess current status and future needs for human resources.
In order to implement the Monument Management Plan effectively, human resource and organizational capacity needs will be regularly assessed. These assessments will be used to organize and better utilize existing staff, and identify technical and administrative human resource overlaps and gaps. The assessments will also identify and prioritize capacity building opportunities, and regional capacities and opportunities to coordinate and share resources with partners. Alternative human resource capacity-building measures, such as internships, volunteer programs, and partnerships, will be considered in the assessments as a means to increase staffing capacity.

Activity CO-2.2: Improve human resources and organizational capacity.
As funding, field-based housing, and other factors allow, the human resource and organizational capacity of the Monument will be enhanced to address specific needs and carry out the strategies and activities contained within the Monument Management Plan. Human resource development includes staff recruitment, retention, recognition, training, communication, regular meetings, time and attendance, as well as staff safety.

Strategy CO-3: Assess and enhance physical infrastructure and facilities, as necessary, in the main Hawaiian Islands over the life of the plan.

Effective and efficient human resources must be supported by sufficient physical infrastructure resources. Efforts will be ongoing to maintain existing facilities in the main Hawaiian Islands and design and improve facilities as required to support Monument administration and operations and to ensure compliance with the ADA.

Activity CO-3.1: Regularly assess current status and future needs for infrastructure and facilities.
In conjunction with assessments of human resource needs, infrastructure and facilities needs will also be reviewed to optimize facilities utilization. These assessments will aim to organize and better utilize existing facilities and infrastructure in the main Hawaiian Islands, identify physical resource overlaps and gaps, and identify needs to support projected future growth and collocation. These assessments will also identify and prioritize capacity building opportunities, and regional capacities and opportunities to coordinate and share resources with partners.

Additional educational venues, such as Mokupāpapa, will be considered for development as stand-alone facilities or in partnership with existing educational and interpretive facilities. Additional consideration will be given to the already planned and scheduled NOAA transition to the NOAA consolidated facility.

Activity CO-3.2: Maintain and improve infrastructure and facilities.
Maintenance and retention of current physical assets and the procurement or lease of additional assets will be driven by need and available funding. All efforts will be made to combine utilization of assets among MMB agencies for more efficient use of available resources.

Activity CO-3.3: Improve information technology infrastructure.
Computer and information technology are an integral part of site infrastructure. Appropriate equipment will be acquired, upgraded, and maintained to meet management needs. New technologies will be regularly integrated (see Section 3.6.2, Information Management Action Plan).

Table 3.6.1 Summary of Strategies, Activities, and Agency Leads for Central Operations

Strategies and Activities	Agency Lead
Strategy CO-1: Coordinate annual site operations planning and implementation over the life of the plan.	
Activity CO-1.1: Coordinate and implement annual operating plans.	NOAA State of Hawai‘i FWS OHA
Strategy CO-2: Assess and enhance human resource and organizational capacity over the life of the plan.	
Activity CO-2.1: Regularly assess current status and future needs for human resources.	NOAA State of Hawai‘i FWS OHA
Activity CO-2.2: Improve human resources and organizational capacity.	NOAA State of Hawai‘i FWS OHA
Strategy CO-3: Assess and enhance physical infrastructure and facilities, as necessary, in the main Hawaiian Islands over the life of the plan.	
Activity CO-3.1: Regularly assess current status and future needs for infrastructure and facilities.	NOAA
Activity CO-3.2: Maintain and improve infrastructure and facilities.	NOAA
Activity CO-3.3: Improve information technology infrastructure.	NOAA

3.6.2 Information Management Action Plan

Links to other Action Plans
3.1.1 Marine Conservation Science 3.1.4 Maritime Heritage 3.3.1 Permitting 3.3.2 Alien Species

Links to Goals
Goal 1
Goal 2
Goal 3
Goal 4

Desired Outcome

Consolidate and make accessible relevant information to meet educational, management, and research needs for Papahānaumokuākea Marine National Monument.

Current Status and Background

Biogeographic studies, bathymetric spatial data, temporal analyses, research notes, maritime heritage data, Native Hawaiian cultural research, historic charts, published field project results, and other data all comprise the large and varied collection of NWHI information. These data sets include databases, oral histories, raw scientific results, physical specimens, and digital imagery. This collection has in the past been scattered among federal and state agencies, universities, museums, and other agencies and institutions in varied formats, and some has simply remained in the possession of the individual investigator. Often, the data are not adequately documented, creating the need for resource intensive validation for future integration purposes. Both the data and associated documentation are needed in order to be useful for long-term ecosystem-based management.

Strategic efforts to address the broad issue of data management for the NWHI have begun. Multiagency Reef Assessment and Monitoring Program expeditions in the NWHI, begun in 2000, represent an initial attempt to establish a multiagency data clearinghouse for management purposes. To date, only a portion of the many years of existing NWHI data have been processed and made available.

Several complementary projects have been initiated to address information management needs. A GIS spatial bibliography database for the NWHI is under development. This GIS incorporates georeferenced journal articles, gray literature and other sources of information into a spatially reference on-line search tool. Additionally, an annotated bibliography of cultural resources for the NWHI is available on line at http://www2.bishopmuseum.org/noaanwhi/index.asp, which incorporates past cultural, geological, and biological studies in the NWHI. This annotated bibliography of past cultural, geological, and biological studies in the NWHI was created with the support of NOAA's National Ocean Service and the Reserve. The resources catalogued are primarily available in the Bishop Museum Library and Archives, the libraries at the University of Hawai'i at Mānoa, and the State of Hawai'i Archives. Additionally, the Office of Hawaiian Affairs is developing an archipelago-wide Wahi Pana Database of cultural information, and the MMB is working to integrate this database with other Monument data sets.

The MMB also participates in the ONMS Information Management and Spatial Technology (IMaST) plan for all field sites. The IMaST plan organizes the many spatial resources within the National Marine Sanctuary System and makes them available to all sites and partner staff needing geospatial information, data, training, software, hardware, and hands-on experience. IMaST enhances capacity and integrates capabilities for site and national program staff in the utilization of geospatial technology.

Additionally, the MMB has initiated the development of a field-based data collection tool that will help to facilitate collection of research and vessel activity data from scientific expeditions conducted aboard research vessels active in the NWHI. This system will help to meet permit criteria for data management and reporting, and will assist in data entry, metadata recording, and data integrity. This system is one component of the larger information management system that is addressed in strategies outlined below and is already being developed based on management data needs.

Need for Action

Access to accurate information is essential to implement an adaptive, ecosystem approach to the management of the Monument. A large amount of data have been, and will continue to be, collected on the NWHI environments by various state, federal, and academic institutions, as well as private-sector partners. Presently, results of research efforts are in multiple independent locations and in formats not readily available to resource managers, who need access to pertinent characterization information and up-to-date reports as a basis to make decisions for the protection of ecosystems. To address this difficulty, this action plan presents strategies and activities to develop a comprehensive data management and retrieval system, and to consolidate and organize information gathered from diverse sources, thus ensuring that stakeholders will share access to an expanding repository of knowledge on the NWHI.

Strategies to Achieve the Desired Outcome

Research and information compilation on the Monument is ongoing; therefore, gathering and consolidating that information is also an ongoing process. A comprehensive approach is critical to achieving the desired outcome, which is to ensure that relevant information is collected and integrated in a standardized and useable manner, consolidated, and made accessible. Only a broad and comprehensive approach can ensure that information management will promote data gap analysis for the purposes of management and research. The Monument will not duplicate data, but along with partners, has already begun to build a decentralized information system that allows data discovery and access while allowing principal investigators and major agencies to house and maintain their own data.

The MMB will create the Papahānaumokuākea Information Management System (PIMS), a crucial tool for integrated management of the Monument. Aggregated data in the PIMS will provide material for multiple purposes, including outreach and education products, Monument management and evaluation, regional coordination among partners, and comparative data for regional research work. As a clearinghouse node for information, the PIMS must ensure that appropriate material is made available to managers, researchers, and the public in a timely manner. Some of the data available for management or research purposes may be of a sensitive nature and, therefore, not appropriate for public and education-focused release. Security procedures and policies will be in place to ensure that only appropriate users can access specific data, including proprietary cultural information.

Through the PIMS, managers will have access to integrated biogeographic and spatial analyses, maps, and reports that define the characterization of the ecosystem diversity, maritime heritage data, and Native Hawaiian cultural information to aid in evaluating the interaction and effectiveness of past, current, and future management efforts. Management of information in a manner that is responsive to the changing needs of the Monument is part of an adaptive, ecosystem-based management system and ensures that NWHI research will be fully valued. The following strategies are designed to consolidate and make more readily available the abundance of useful information on the NWHI for management, research, education, and enforcement purposes. The strategies and activities are coded by the acronym for the action plan title, "Information Management" (IM). A summary of strategies and activities is provided in Table 3.6.2 at the end of this action plan.

- IM-1: Within 5 years, develop and implement a system for handling Monument data.
- IM-2: Within 5 years, facilitate appropriate access and use of PIMS.

Strategy IM-1: Within 5 years, develop and implement a system for handling Monument data.

The sources and types of NWHI data are diverse and do not necessarily adhere to uniform data management. For all data to be accessible by the PIMS, data protocols and Federal Geographic Data Committee-compliant metadata standards will be implemented. These standards must also adhere to existing data management and metadata protocols established by the federal government. Agreements between various agencies for data sharing, access, security, and use must also be developed and implemented.

Activity IM-1.1: Develop and implement a data discovery, inventory, and acquisition strategy.
A data discovery, inventory, and acquisition strategy will be developed and implemented based on meetings and workshops with partners and other organizations. The strategy will identify the types, format, and sources of existing information and data sets, as well as potential new data sources. Workshops will be held annually to review progress of data acquisition and revise the strategy as needed.

Activity IM-1.2: Develop appropriate data management protocols, procedures, and agreements with partner agencies.
One of the first tasks in information management, after data sources have been identified, is to develop and implement protocols for how data are collected, documented, stored, and shared, as well as their schema and format. Existing metadata standards within NOAA will be utilized to document the data. Agreements with data providers to define use and access restrictions, as well as data transfer methods, will be developed. A shipboard data collection tool is currently being developed and implemented aboard the NOAA ships active in the NWHI. This tool will help to facilitate data capture, standardization, and chain of custody. A rigorous quality assurance/quality control protocol will be developed and implemented to maintain information and data quality in the system in accordance with the Data Quality Act (Public Law 106-554). A long-term strategy for data assimilation and review will be developed in conjunction with data providers.

Activity IM-1.3: Continue to design, build, and maintain the Papahānaumokuākea Information Management System.
An information and database management system is being designed, developed, and configured to meet a broad spectrum of needs of the MMB, including Monument program and site applications, research and educational needs, and public access. The system is built on a sophisticated data model implemented in a relational database, and incorporates custom applications for spatial data management, tabular data management, data import/export and reconciliation, and reporting as an integral part of the data management strategy. Storage and security of data, as well as ease of access, are some of the issues that are being addressed. Agreements with data providers developed in the previous activity (IM-1.2) will be essential to the success and utility of this system, since the PIMS is not a massive data archive but is instead a system that defines interrelationships between distributed data sources, which are the vast majority of data. The PIMS stores some data that are not already maintained by other partner agencies, such as image and video data, and the spatial bibliography.

Activity IM-1.4: Begin incorporating information into PIMS.
A significant amount of effort will be involved in data entry, formatting, and regular review. A long-term strategy for data assimilation and review processes will be developed in conjunction with data providers. The prioritization of data entry will be based on specific management and scientific questions. This activity will initiate in-depth analyses to answer these questions. The data needed and accessed for these analyses will be documented and loaded into the inventory. Collaborative links to data that are being maintained by partners will be created and maintained to ensure seamless access to these data. Co-Trustee agencies will make data collected in the Monument available to the PIMS system.

Strategy IM-2: Within 5 years, facilitate appropriate access and use of PIMS.

Tools and protocols to access the data in PIMS need to be developed and deployed. Some information may be public domain, and other information, such as the exact locations of historic shipwrecks, will be restricted by law to protect the resources. Levels of access to the data will be determined through agreements with partners. Educational materials that interpret the data and make the information accessible and understandable to a wider audience will also be developed and deployed.

Activity IM-2.1: Design tools for accessing the PIMS.
Using the latest technologies, the MMB will develop tools for accessing, updating, analyzing, and retrieving PIMS data. Access tools will be primarily web-based. These tools will allow for integration into GIS, on-line analytical processing via open database connectivity, object linking and embedding, and synchronization with analogous database management system resources.

Tools will include integrated biogeographic and spatial analyses, maps, and reports that define the characterization of the ecosystem diversity, interaction, and health, and the effectiveness of past, current, and future management efforts.

Activity IM-2.2: Assess data access needs and provide training for PIMS users.

Assessing the uses of the PIMS will be an evolving process, and providing access will be tightly integrated with activity IM-2.1, above. Before any access is provided, rules and access restrictions will be determined to ensure security and confidentiality of the data. These restrictions will be established in coordination with data providers. A training program for management and other users of the PIMS will be developed so that access and use are facilitated.

Activity IM-2.3: Develop interfaces to feed data to repositories such as National Biological Information Infrastructure, Pacific Basin Information Node, Coral Reef Information System, and Integrated Ocean Observing System.

The MMB will maintain standardized metadata records for data indexed within the PIMS to help facilitate the population of other data repositories with NWHI data. To automate this process, agreements and data streaming and sharing mechanisms will need to be developed.

Table 3.6.2 Summary of Strategies, Activities, and Agency Leads for Information Management

Strategies and Activities	Agency Lead
Strategy IM-1: Within 5 years, develop and implement a system for handling Monument data.	
Activity IM-1.1: Develop and implement a data discovery, inventory, and acquisition strategy.	NOAA
Activity IM-1.2: Develop appropriate data management protocols, procedures, and agreements with partner agencies.	NOAA
Activity IM-1.3: Continue to design, build, and maintain the Papahānaumokuākea Information Management System.	NOAA
Activity IM-1.4: Begin incorporating information into PIMS.	NOAA
Strategy IM-2: Within 5 years, facilitate appropriate access and use of PIMS.	
Activity IM-2.1: Design tools for accessing the PIMS.	NOAA
Activity IM-2.2: Assess data access needs and provide training for PIMS users.	NOAA
Activity IM-2.3: Develop interfaces to feed data to repositories such as National Biological Information Infrastructure, Pacific Basin Information Node, Coral Reef Information System, and Integrated Ocean Observing System.	NOAA

3.6.3 Coordinated Field Operations Action Plan

Links to other Action Plans
All Action Plans are related to carrying out field operations

Links to goals
Goal 1 Goal 2 Goal 3 Goal 4 Goal 7 Goal 8

Desired Outcome

Coordinate field activities and provide adequate infrastructure to ensure safe and efficient operations while avoiding impacts to the ecosystems in Papahānaumokuākea Marine National Monument.

Current Status and Background

Field operations in the Monument to support protection and management rely on ships, aircraft, seasonal field camps, and three field stations with varying degrees of infrastructure. Interagency planning and sharing of resources for fieldwork began with the Tripartite Commission's work in the late 1970s (Tripartite Agreement 1978). Recent field activities in the NWHI continue this cooperative work through a number of projects. One of the most significant of these is the annual NWHI Reef Assessment and Monitoring Program (RAMP) research and outreach expeditions. These expeditions are made possible through sharing of both vessels and dive teams.

Two NOAA ships service the majority of ship based management needs in the Monument. The NOAA Ship *Oscar Elton Sette* first arrived in Hawai‘i in 2003 primarily to support the scientific missions of NMFS, Pacific Islands Fisheries Science Center in Honolulu. *Oscar Elton Sette* is a 224-foot T-AGOS-class research ship that is designed to conduct and facilitate research operations in remote areas. The ship normally operates throughout the central and western Pacific and conducts fisheries assessment surveys, physical and chemical oceanography, marine mammal projects, and coral reef research. The *Oscar Elton Sette* has participated in coordinated RAMP efforts since its arrival in 2003.

In September 2004, the NOAA ship *Hi‘ialakai* became the first oceanographic research platform primarily dedicated to the National Ocean Service. *Hi‘ialakai*, the sister ship to the *Oscar Elton Sette*, is a 224-foot T-AGOS-class research ship that is designed to conduct and facilitate research operations in remote areas throughout the Pacific. The ship's primary mission is to support the research, monitoring, assessment, restoration, and outreach needs of NOAA's National Ocean Service in waters around the Hawaiian Islands and the American Flag Territories. Maintenance and operations of NOAA ships are managed by NOAA Marine and Aircraft Operations.

NOAA Ship *Hi‘ialakai*. Photo: Dan Suthers

Several other vessels, such as the NOAA ships *Ka‘imimoana* and *Okeanos Explorer*, the

University of Hawai'i's R/V *Kilo Moana* and R/V *Kaimikai-O-Kanaloa*, Coast Guard vessels, and chartered vessels, are engaged in mapping, deep-water benthic characterization, marine debris removal, protected species recovery activities, management-oriented research, and resupply missions to FWS and state land-based operations throughout the Monument. Collectively, these ships conduct approximately 10 to 12 missions per year during the months of April through November. Much of the field work conducted in the Monument is supported by NOAA ships.

FWS maintains permanent staff and infrastructure at Tern Island (French Frigate Shoals) and Midway Atoll, as well as a year-round FWS field camp at Laysan Island. The State maintains facilities at Kure Atoll, which are staffed for much of the year. Seasonal field camps are located at Nihoa, Lisianski Island, and Pearl and Hermes Atoll.

Midway Atoll NWR includes facilities and infrastructure left by the military when the Naval Air Facility closed. It includes 237 real property assets, including a Federal Aviation Administration (FAA)-approved commercial airport, numerous buildings, airplane hangars, roads, utilities, docks, seawalls, shipping channel, in addition to structures eligible for listing on the National Register of Historic Places. The infrastructure at Midway supports refuge management operations, airport operations, and a limited number of partners and visitors. The FWS and FAA have partnered together to manage Henderson Airfield and maintain Midway Atoll's aging infrastructure. Over the past 6 years, FWS has been upgrading and rightsizing Midway's operating systems, and FAA has constructed a new airfield operations building and provided funding for other airfield improvements.

By utilizing the existing World War II and Cold War era buildings, FWS managers are able to preserve the history of the atoll, provide support to the many ongoing management and research projects, and focus on protecting the islands and surrounding reefs for the benefit of the unique mix of species that live at Midway Atoll. In order to effectively plan for future Monument operations at Midway, the Midway Atoll Conceptual Site Plan was drafted. The Conceptual Site Plan (Volume IV) outlines the vision and practical realities of future uses and provides an overarching view of priority actions. Field infrastructure requirements for education, research, restoration, and management programs were identified by the MMB in a requirements planning process carried out in 2007.

Tern Island is the support hub for management operations at French Frigate Shoals. The facilities consist of 42 real property assets that remain from prior Coast Guard use. These facilities include shore protections, two septic tanks, a small barracks that serves as a residential and office facility, a single warehouse, several small storage and utility buildings, water catchment systems, a 3,000-foot crushed coral runway, a shipping channel, and a small boat ramp and dock. All of the Tern Island real property assets are utilized by and support MMB agencies and are maintained by FWS.

Laysan Island is a temporary year-round field camp that supports management of the island. The facility consists of seven temporary wood-framed platform tents used for sleeping, offices, communications, cooking, and storage. To support this field camp, a reverse osmosis water system, a photovoltaic power system, and a hurricane shelter for high wind and surf emergencies are maintained. Laysan Island is currently accessible only by ship.

Green Island serves as the hub for the State of Hawai‘i's Seabird Sanctuary at Kure Atoll. The facilities consist of storage buildings, a four room residential and office building, water tank, septic tank, a nonoperational coral runway, and a small boat pier. The assets on Green Island are maintained by the State.

Past coordination efforts

In the past, NOAA has hosted an annual NWHI field calendar meeting to facilitate overall field coordination among the Co-Trustees. The goal of this type of meeting was to create a master calendar of all field operations, scheduled flights, cruise plans, field camps, and similar activities. These meetings were open to managers, scientists, and staff from all agencies and groups conducting research or field activities in the NWHI. Attendees provided dates, places, and other logistical details of planned fieldwork to the calendar. Field activities typically included NOAA research vessel cruises, scheduled FWS charter flights to Midway and Tern Island, marine debris cleanup activities, ship charters to support FWS field stations, and special field activities such as *Hōkūle‘a* voyages. The purpose of the common calendar was to increase coordination, efficiency, and safety for all NWHI fieldwork.

Impacts of field work

Well-planned field activities benefit wildlife habitats and historic and cultural resource protection, and are designed to minimize negative impacts to ecosystems, avoid redundant efforts, and achieve efficient use of agency resources. Each year, coordinated planning benefits management activities such as the multiagency-supported effort to remove derelict fishing gear from the reefs and beaches; implementation of endangered plant, monk seal, sea turtle, and bird recovery actions; management and restoration of marine and terrestrial species and their habitats; and conducting management-oriented research. This emphasis on coordinated planning and the application of consistent interagency permit requirements will prevent or minimize potential impacts that could be associated with these types of activities.

Diving Protocols

Standardization of safety training and diving protocols among different agencies has proved difficult in the past. MMB agencies have established interagency reciprocity agreements for diving protocols and with affiliated institutions of the American Academy of Underwater Sciences. These agreements are renewed and updated as necessary.

Need for Action

Appropriate vessels, aircraft, facilities, equipment, and training are critical to carrying out field operations in a safe and effective manner. Coordinating these assets among Co-Trustees is central to achieving the goals of the Monument. Field coordination among the MMB and the ICC provides for efficient use of public funds, increased availability of assets, reduced duplication of effort, and minimized impacts to Monument resources. Because of the remote nature of the region and limited availability of facilities, coordination is essential to the success of activities such as emergency response, wildlife and habitat management, law enforcement, research, as well as marine debris removal and other threat reduction tasks.

This plan provides strategies and activities for coordinating the implementation of low-impact field operations by ensuring that necessary facilities, equipment, and transportation are available and that staff is properly trained (see Section 3.3.4, Emergency Response and Damage Assessment Action Plan). One of the important principles in all of these strategies and activities is to use the latest "greening" methodologies and technologies in future operations and infrastructure improvement projects at Midway and all other field sites, including NOAA ships. As required, facilities and other infrastructure will be ADA compliant.

Strategies to Achieve the Desired Outcome
Nine strategies have been identified for achieving the desired outcome of coordinating field activities and providing adequate infrastructure to ensure safety and efficient operations while avoiding impacts to ecosystems in the Monument. The strategies and activities are coded by the acronym for the action plan title, "Coordinated Field Operations" (CFO). A summary of strategies and activities is provided in Table 3.6.3 at the end of this action plan.

- CFO-1: Conduct necessary site planning and infrastructure improvements to increase safety and enhance Monument field operations capacity over the life of the plan.
- CFO-2**:** Enhance interagency planning and coordination for field operations in support of Monument protection and management, and develop protocols and processes that will be utilized throughout the life of the plan.
- CFO-3**:** Maintain and improve housing and field camp safety and operational efficiency using short-, medium- and long-term approaches to protect Monument resources across the life of the plan.
- CFO-4: Meet fuel requirements for aircraft, vessel, utility, and equipment needs at Midway Atoll to support operations to protect and manage Monument resources.
- CFO-5: Rehabilitate critical utility systems and ailing structures and facilities at Midway Atoll within 5 to 15 years.
- CFO-6: Within 5 years, improve the small boat operational capacity to enable quick, reliable access to the region in support of protection and management and continue to enhance the program throughout the life of the plan.
- CFO-7: Within 5 years, identify interisland aircraft transportation needed to protect and manage the Monument.
- CFO-8: Develop a safe and comprehensive dive operations program for Monument management activities within 5 years.
- CFO-9: Provide for necessary research, education, visitor, and administrative facilities that will further the protection of Monument resources across the life of the plan.

Strategy CFO-1: Conduct necessary site planning and infrastructure improvements to increase safety and enhance Monument field operations capacity over the life of the plan.

In-depth site planning and analyses are needed to ensure that field operations align with the purpose and mission of the Monument, as well as the purposes of the Midway Atoll and Hawaiian Islands National Wildlife Refuges, NWHI Coral Reef Ecosystem Reserve, the State of Hawai‘i NWHI Marine Refuge, and the Seabird Sanctuary at Kure Atoll. This effort will help meet the shared responsibilities for management, emergency response, enforcement, education, recreation, and research in the Monument.

Activity CFO-1.1: Initiate and complete necessary planning to implement the Midway Atoll Conceptual Site Plan.
Substantial time and resources are required for infrastructure rehabilitation, reconstruction, and development included in the Midway Atoll Conceptual Site Plan (Volume IV). Priority actions for Midway have been identified in Chapter 6 of the Midway Atoll Conceptual Site Plan and are included in this action plan. Several of these actions are projected for completion in the short term, while others will require additional planning and environmental analysis and are anticipated to take place over the life of the plan.

Activity CFO-1.2: Develop conceptual site plans for Hawaiian Islands National Wildlife Refuge and Seabird Sanctuary at Kure Atoll to enhance management and restoration capabilities.
Individual conceptual site plans will be developed for the Hawaiian Islands NWR and the State Seabird Sanctuary at Kure Atoll to identify long-term infrastructure alternatives and priorities. These plans will be based on the identification of field requirements developed by the MMB in 2007 and will assess the opportunity for education, research, habitat restoration, and management programs. It is anticipated that these plans will be developed within 3 years.

Activity CFO-1.3: Develop alternative energy system and waste reduction strategies for the Monument within 2 years.
In accordance with agency building standards, the strategy will consider solar and other renewable energy generation, integration of kitchen waste with biodiesel or other sustainable fuel types use in machinery, composting of food waste, growing produce on site (at Midway only), passive lighting and cooling, and replacing aging infrastructure using sustainable nontoxic building materials. Each building will be evaluated to determine the feasibility of generating its own power. In the interim period, proven energy efficiencies will be implemented.

Activity CFO-1.4: Plan for use of sustainable engineering, technology, and landscape architecture for facilities and assets throughout the Monument.
In support of the "Greening of America" government-wide initiative, the managing agencies will apply feasible "greening" methodologies and technologies to future operations and infrastructure improvement projects at Midway and all other field sites, including NOAA ships. Greening will also be applied to alternative transportation options and opportunities, particularly at Midway. These green principles will be applied to the operation of vehicles at Midway, small boats, selection of nontoxic lubricants and maintenance materials, and development of fuel capacity.

Strategy CFO-2: Enhance interagency planning and coordination for field operations in support of Monument protection and management, and develop protocols and processes that will be utilized throughout the life of the plan.

One of the Monument's operating principles is to use effective planning and communication to coordinate activities in order to minimize resource impacts, avoid redundant or duplicative efforts, and achieve efficient use of agency resources in the implementation of priority management needs. The MMB will work with partners in planning field operations for these purposes and to contribute to the success of each project. Ship scheduling, coordination of logistical support, and interagency collaboration are elements of field operations that will be addressed in advance of each field season.

***Activity CFO-2.1: Develop interagency agreements to facilitate effective field coordination throughout the Monument*.**

Interagency agreements to coordinate field operations, share resources, and commit to joint implementation of field priorities will be developed as appropriate. Agreements will be considered among the Co-Trustee agencies and the Interagency Coordinating Committee, as appropriate. (See Section 3.5.1, Agency Coordination Action Plan)

Activity CFO-2.2: Develop and implement standardized field operation protocols.

Environmental, safety, and preparedness protocols for field operations consistent with partner agency standards will be developed to provide resource protection and safe field operations. A field operations manual will be prepared and updated as needed that includes these protocols, as well as protocols and chain of command procedures for reporting environmental and safety incidents, personnel communication, and evacuations. All principal investigators and managers working in the NWHI will receive a copy of the field operations manual.

Activity CFO-2.3: Assess threats that field activities pose to Monument resources.

Permitted activities will be monitored through field activity reports to assess the threats they may pose to the resources. Reporting requirements will be developed with partners that will draw on existing databases when available. Any incidents will be tracked to assess potential damages to resources. Data will be managed in PIMS to provide for adaptive management by the MMB in conducting or authorizing future field activities (see the Information Management Action Plan, Section 3.6.2).

Activity CFO-2.4: Annually coordinate field operations to efficiently deploy personnel and share resources among agency partners.

The MMB will create an annual NWHI master field calendar of all field operations, scheduled flights, cruise plans, field camps, and similar activities. Agency partners will contribute information on dates and locations of research, management, and field activities in the NWHI. The common field calendar will be developed to ensure that the highest priority management needs are met as efficiently and economically as possible, and with the highest possible level of safety.

Activity CFO-2.5: Develop a staff coordination agreement between Midway Atoll NWR and the State Seabird Sanctuary at Kure Atoll.

To assist in island management activities, occasional site “exchange” visits will be conducted between the State and FWS staff at Midway and Kure Atolls. These visits will ensure that habitat restoration and management activities and wildlife monitoring activities are coordinated between FWS and the State.

Strategy CFO-3: Maintain and improve housing and field camp safety and operational efficiency using short-, medium-, and long-term approaches to protect Monument resources across the life of the plan.

There is a critical need to plan and design facilities at various field sites to ensure that activities can be accomplished without impairing the ecosystem. Some of the field sites within the Monument include existing buildings, roads, airstrips, and other structures. Many of these buildings are important for management of the Monument. Others will be removed as they outlast their useful life. As structures are re-used and others removed, we expect a net decrease in the number of facilities within the Monument. The needs of resources, visitors, staff, volunteers, contractors, researchers, and educators will be considered, as well as temporary accommodations in case of emergency aircraft landings, ship evacuations, or emergency response events. As stated in Activity CFO-1.4, the MMB will apply all feasible green engineering methods and technologies to all future projects.

Activity CFO-3.1: Design and construct a pilot low-impact shelter.
A low-impact shelter will be built on the footprint of a previously existing building, as a pilot project in the housing zone on Midway Atoll within 4 years in accordance with the Midway Atoll Conceptual Site Plan. This pilot project will serve to gauge the feasibility of using this type of structure on Midway. These structures may be used to replace aging, energy-inefficient buildings and will be designed to optimize renewable energy resources. The buildings will incorporate recycled materials, will be nonpolluting, and may potentially increase the available wildlife habitat. The buildings will serve as lodging for short-term and transient visitors.

Activity CFO-3.2: Utilize the existing footprint of Bravo Barracks for replacement housing at Midway Atoll.
Bravo Barracks houses permanent operations and maintenance personnel, but the end of its current useful life is within 3 years. The barracks are in critical need of demolition and replacement or major repair. Replacement or improvement is essential in order to provide safe housing for personnel to sustain island operations. The replacement building will be designed to optimize renewable energy resources and improve wildlife habitat.

Activity CFO-3.3: Utilize the existing footprint of Charlie Barracks for replacement housing at Midway Atoll.
Charlie Barracks replacement or major repair is essential in order to provide safe housing for island visitors and transient personnel. Such improvement is envisioned to take place within 10 years and will follow the low-impact guidelines.

Activity CFO-3.4: Rehabilitate "Officers' Row" Housing at Midway Atoll.
The ten historic Officers' Row houses, present during the Battle of Midway, serve as examples of historic Albert Kahn architecture and are identified for restoration in the draft Midway Atoll Conceptual Site Plan. Optimizing the housing capacity within these existing structures will accommodate increased agency and partner personnel without adding structures to the island. The rehabilitation of these structures would take place within 10 years.

Activity CFO-3.5: Maintain and enhance, where appropriate, the infrastructure at Kure Atoll.

Well-established, permanent biological monitoring and restoration programs at Kure Atoll are dependent on existing housing and facilities on Green Island at Kure Atoll. Given the harsh environmental conditions that exist, there is an ongoing need to maintain, improve, or replace communications equipment, solar power and water production units, sewage treatment infrastructure, buildings, and equipment. All field operations requirements at Kure Atoll will be assessed in accordance with Activity CFO-1.2.

Activity CFO-3.6: Maintain and enhance, where appropriate, the infrastructure at French Frigate Shoals.
A permanent biological field station exists on Tern Island at French Frigate Shoals. The biological monitoring programs that operate from the island are dependent on existing housing, warehouses, small boat facilities, and a short coral rubble air strip. Given the harsh environmental conditions, there is an ongoing need to maintain, improve or replace communications equipment, solar power and water production units, buildings, and equipment. For example, the barracks roof requires replacement by 2012. All field operations requirements at French Frigate Shoals will be assessed in accordance with Activity CFO-1.2.

Activity CFO-3.7: Evaluate, maintain, and enhance the small tent field camp at Pearl and Hermes Atoll on Southeast Island.
A seasonal three-person tent field camp is currently maintained at Pearl and Hermes Atoll to support the long-term Hawaiian monk seal population monitoring and recovery effort. Periodic overwashing of the islands by storm surges will require tent platforms to be built as soon as possible to provide for personnel safety and to minimize resource impacts. A year-round small tent camp is also needed to improve habitat by supporting invasive plant species eradication. The establishment of a permanent field camp in addition to upgrading the existing seasonal camp will be evaluated in accordance with Activity CFO-1.2.

Activity CFO-3.8: Maintain and enhance the existing tent field camp at Laysan Island to support on the ground management and restoration capacity.
An intensive alien species eradication and native habitat restoration program is currently under way at Laysan Island. A year-round presence of staff on island is necessary. Staff reside in a minimal tent camp, which requires routine maintenance and replacement of solar power, water purification, and communications equipment, as well as periodic replacement of tents and other structures.

Strategy CFO-4: Meet fuel requirements for aircraft, vessel, utility, and equipment needs at Midway Atoll to support operations to protect and manage Monument resources.

The current fuel capacity at Midway Atoll was designed to meet the requirements of the FWS, FAA, and the Coast Guard. This capacity includes fuel for island power supply, aircraft, and heavy equipment and a limited amount of gasoline for small boats and vehicles. Additional Co-Trustee fuel requirements will be met by adding storage capacity, using biodiesel or other sustainable fuel types, and improving fuel efficiency in all of Midway's operations.

Activity CFO-4.1: Maintain recently replaced fuel farm at Midway Atoll.

The Midway Atoll fuel farm is designed to meet current FWS, FAA, and Coast Guard needs. In the short term, a Memorandum of Agreement will be drafted describing how the MMB agencies can share and replenish existing supplies, while increasing the capacity of gasoline, biodiesel, or other sustainable fuel types. The MMB will convert existing and new small boats, vehicles, heavy equipment, and generators to more fuel-efficient models using other sustainable fuel types where feasible.

Activity CFO-4.2: Develop biodiesel fuel capacity or other sustainable fuel types at Midway Atoll within 2 years.
The MMB will work toward converting existing and new small boats, vehicles, and heavy equipment to the use of biodiesel or other sustainable fuel types where feasible. Two locations will be evaluated for storage and distribution of this type of fuel. The first is located on the concrete pad adjacent to the north seawall on the inner harbor of the atoll. This location has the advantage of being close to future small boat piers, which would allow for simple and safe fueling procedures. However, this would require regular supervision of this fuel supply in addition to that required at the fuel farm. Alternatively, the fuel could be stored at the existing fuel farm location, but this option would necessitate a fueling truck or the use of boat trailers to complete fueling operations.

Strategy CFO-5: Rehabilitate critical utility systems and ailing structures and facilities at Midway Atoll within 5 to 15 years.

A number of centralized systems, such as water and sewage, and a number of facilities and buildings are utilized by personnel throughout the Monument. Critical infrastructure is also the backbone of all operations that support Midway's conservation and management purpose. Without substantial investment in the rehabilitation and repair of these resources, operations would be seriously impaired. System needs have been identified through the draft Midway Atoll Conceptual Site Plan and will continue to be evaluated to reduce reliance on centralized utilities. All rehabilitation and repair work will follow low-impact guidelines. Additional needs for other islands and atolls throughout the Monument will be developed in the future, as cited in Activity CFO-1.2.

Activity CFO-5.1: Rehabilitate water catchment and distribution system.
Within 5 years, the water catchment and distribution system will be rehabilitated in order to adequately supply existing needs and those envisioned in the draft Midway Atoll Conceptual Site Plan.

Activity CFO-5.2: Rehabilitate septic and wastewater systems.
Reliable septic and wastewater systems will be required to support existing and additional needs envisioned in the draft Midway Conceptual Site Plan. The rehabilitation of these systems will take place within 5 years.

Activity CFO-5.3: Treat all wooden historic structures at Midway Atoll for termites.
All wooden historic structures must be treated for termites within 3 to 5 years in order to maintain the structural integrity of the buildings. Without treatment, the buildings will deteriorate beyond repair.

Activity CFO-5.4: Evaluate and optimize food services as necessary.
The Clipper House currently serves as the primary food service facility at Midway. Overall food services will need to be optimized to accommodate population needs.

Activity CFO-5.5: Rehabilitate seaplane hangar.
Because of its size (large enough to hold heavy equipment, boats, and workshops), its location (short distance from inner harbor and boat ramp), and its historic significance (designed by Albert Kahn and still contains scars from the Battle of Midway), the seaplane hangar needs to be maintained. A priority is to replace the roof of the building.

Activity CFO-5.6: Repair inner harbor sea wall.
The inner harbor is critical to operations at Midway. Any future docking and pier facilities in the harbor must be preceded by the repair of the existing seawall within 15 years.

Strategy CFO-6: Within 5 years, improve the small boat operational capacity to enable quick, reliable access to the region in support of protection and management and continue to enhance the program throughout the life of the plan.

Improved access to the islands and atolls of the NWHI has been identified as a top priority. Small boat support is a key component to reliable access between islands and around individual island reef systems. Small boat capacity is instrumental to research, conservation, enforcement, outreach, education, and emergency response throughout the archipelago.

Activity CFO-6.1: Inventory, maintain, and coordinate the use of small boats and related field resources.
The Co-Trustees have a variety of small boats and related field resources that are used for fieldwork within the Monument. An inventory of small boats and support equipment will be conducted Monument-wide to determine whether these resources can be used more effectively by the Co-Trustees and to reduce duplicative efforts.

Activity CFO-6.2: Within 2 years, station additional vessels at Midway for use during the summer marine research field season.
New vessels will be used to support existing field activities at Midway Atoll and to establish an annual research and monitoring program for marine debris, maritime heritage, and coral reef communities. These vessels will expand the range of operations both inside and outside the lagoon as well as to neighboring islands and atolls on a limited basis.

Activity CFO-6.3: Within 5 to 10 years, station a small research/enforcement vessel at Midway Atoll.
A small research/enforcement vessel would expand research, enforcement, education, response, and restoration capabilities from French Frigate Shoals to Kure Atoll. Repair and maintenance facilities will be improved at Midway, and full-time support personnel will be identified to properly manage this asset. This vessel will be permanently based at Midway, but could also be based out of the main Hawaiian Islands for part of the year to service the southeastern portions of

the Monument. This vessel will provide the opportunity to dedicate short cruises to individual projects on a regular basis.

Activity CFO-6.4: Construct new finger piers inside of Midway's inner harbor.
To meet the small boat needs, within 5 years evaluate the structural integrity of the inner harbor seawall, make appropriate improvements, and construct up to three finger piers. These piers will be designed to simplify, and increase the safety, of fueling and loading as well as to provide short-term in-water storage for a variety of small boats. Any new piers will follow the low-impact guidelines. Midway's inner harbor is not fully protected from outside sea conditions, and additional piers will allow for sheltered small boat storage under a variety of conditions.

Activity CFO-6.5: Redevelop existing boathouse at Midway into a multiuse facility. Consistent with the priorities contained within the Midway Atoll Conceptual Site Plan, redevelop the existing boathouse at Midway into a multipurpose boathouse, dive center, and storage facility. The facility will have maintenance bays for servicing small boats and a dive locker, including a compressor, recompression chamber, appropriate storage, and work area. The facility may also include temporary, short-term bunk space and limited, interim lab space until other facilities were renovated and reconstructed to meet these needs. The building will be re-sited and potentially raised to address concerns over flooding on the seaplane pad, and to minimize resource impacts. Small boat operations depend on a reliable means of removing the boats from the water. At present, the seaplane ramp that is used is not sufficiently steep and results in inadvisable launch and recovery methods. A new boat ramp will be constructed to address this concern, while renovating the adjacent small boat pier.

Activity CFO-6.6: Evaluate needed improvements to Pier No. 1 in the ship basin and the Tug Pier at Midway Atoll.
In order to ensure access for large vessels such as NOAA, Coast Guard, and university research vessels, Pier No. 1 and the Tug Pier will be evaluated for needed renovations and maintenance. The ability for ships to dock at Midway, in conjunction with reliable air transport, will assist in efficient research operations and crew changes on cruises, while also providing an additional place for supply ships and other vessels to dock. All pier renovations will follow the low-impact guidelines.

Activity CFO-6.7: Make needed improvements to or replace the pier at Eastern Island.
Eastern Island pier renovation is required to ensure continued access for researchers and field workers. Attention is required as soon as feasible to prevent damage to boats and improve passenger safety. Eastern Island pier renovations will follow the low-impact guidelines.

Strategy CFO-7: Within 5 years, identify interisland aircraft transportation needed to protect and manage the Monument.

The small number of regularly scheduled flights to and from the Monument is a limiting factor to the expansion of a visitor services program and science station at Midway Atoll, and a host of management, research, educational activities, and enforcement and emergency response throughout the Monument. Frequent and reliable access in support of these activities is needed. Regular flights are currently contracted and managed by the FWS. Additional flights are currently booked by individual entities on an as-needed basis, which contributes to their high costs. The following activities will be conducted to ensure that Monument aircraft needs are considered and met.

Activity CFO-7.1: Identify a reliable, efficient, cost-effective aircraft service to improve the delivery capacity of personnel and cargo between Honolulu and Midway.
Without reliable air transport, the vast majority of current operations at Midway, as well as many operations in the other islands of the NWHI, would cease to exist. Air transport maintains the link between Midway and Honolulu and allows Midway to serve as the logistical hub for the northern end of the archipelago. Air transport is currently limited by the small cargo and personnel capacity of the aircraft being used. Identifying a more capable aircraft service is key to optimizing the operations on Midway and other areas within the Monument.

Activity CFO-7.2: Within 5 to 10 years, evaluate the need for a dedicated aircraft for transportation, research, evacuation, education, surveillance, management, and enforcement in the Pacific region.
A shared aircraft that would be used across the Pacific region, throughout the year or seasonally, may be an effective way to defray the high costs of air transportation. Maintenance facilities and staffing would need to be considered if such a craft were acquired. The need for a dedicated aircraft will be evaluated within 5 to 10 years.

Activity CFO-7.3: Within 15 years, acquire appropriate aircraft to service the Monument and the Pacific region.
Pending the outcome of the evaluation (Activity CFO-7.2), an appropriate aircraft or use of multiple platforms will be acquired as necessary to meet the needs of the Monument and region.

Strategy CFO-8: Develop a safe and comprehensive dive operations program for Monument management activities within 5 years.

Coordinated dive operations are critical to effectively and safely carrying out marine research, monitoring, emergency response, and management activities. Such a program will require infrastructure and equipment investments, training, interagency communication and agreements, and compliance with all agency requirements.

Activity CFO-8.1: Refurbish or replace the dive recompression chamber at Midway.
A dive recompression chamber was installed and refurbished on Midway in the late 1990s in support of commercial dive tour operations and research. The chamber has not been serviced in more than 5 years and needs to be assessed and refurbished or replaced. This chamber would be maintained by an on-site chamber operator or dive technician.

Activity CFO-8.2: Investigate acquisition of a portable dive recompression chamber for use on a small research vessel.
A small, portable recompression chamber aboard the small research vessel referenced in CFO-6.3 would vastly extend the SCUBA-based research capacity of scientists in the remote NWHI. This equipment would be based at Midway and maintained by an on-site chamber operator or dive technician.

Activity CFO-8.3: Incorporate a dive operations center into the refurbished boathouse facility at Midway.
Consistent with the draft Midway Atoll Conceptual Site Plan, the boathouse facility on Sand Island should be re-sited and refurbished to include a dive center complete with storage, maintenance facility, compressor, recompression chamber, and dive locker, as articulated in Activity CFO-6.5.

Activity CFO-8.4: Support interagency dive operations.
Agency dive supervisors will support interagency and contract field operations by maintaining updated reciprocity agreements, open communication among agency dive masters and chief scientists, and current records on agency and contract divers to ensure certifications and training requirements are current. Each agency is responsible for maintaining and ensuring the proficiency of its divers.

Strategy CFO-9: Provide for necessary research, education, visitor, and administrative facilities that will further the protection of Monument resources across the life of the plan.

A variety of infrastructure needs have been identified by the MMB and partner agencies for research, education, visitor interpretation, and administration to effectively meet the vision, mission, and goals of the Monument. Planning and appropriate redevelopment of existing buildings and limited construction of new low-impact facilities will take place according to the priorities identified in the draft Midway Atoll Conceptual Site Plan and the future Seabird Sanctuary at Kure Atoll and Hawaiian Islands National Wildlife Refuge conceptual site plans, as cited in Activity CFO-1.2.

Activity CFO-9.1: Design a marine laboratory at Midway and develop in phases.
A variety of needs will be met by the development of a marine laboratory at Midway. An evaluation and planning effort will help determine if the research and educational needs of potential users will be best met by developing several small facilities over time, or by a design that allows new requirements to be filled as they arise. Initially, the laboratory would provide basic amenities to augment research and education capacity including field schools, seasonal research, and long-term monitoring. A monk seal captive care facility (as outlined in Activity CFO-9.2), wet/dry laboratory infrastructure, and quarantine standards will be included in the plan and engineered as funding becomes available. Several existing buildings are well suited for conversion into a laboratory and will be evaluated to determine which is the most appropriate site.

Activity CFO-9.2: Complete planning for and construct a captive care monk seal facility on Sand Island.
A monk seal captive care facility at Midway Atoll has been identified as a critical component for survival of the species. Holding tanks, water treatment and pumping capability, freezer storage, and a dedicated food preparation area are required to be included in this facility, which will dramatically improve the effectiveness of rehabilitating ailing monk seals in the NWHI.

Activity CFO-9.3: Provide logistical, infrastructure, and transportation support for threatened and endangered species recovery actions.
Advanced recovery efforts, particularly efforts to address juvenile survival, will require logistical, infrastructure, and transportation capabilities that currently do not exist. For example, the ability to hold Hawaiian monk seals in a temporary facility, likely on Midway Atoll, is a critical component of these types of recovery actions. The ability to transport threatened and endangered species, equipment, and personnel among the various atolls is a challenge to animal relocation efforts, as is the capture and return of animals that may be brought into captivity for nutritional support or medical treatment.

Activity CFO-9.4: Complete Phase I rehabilitation of Midway Mall and the commissary building.
Collectively, the commissary building and the Midway Mall present ideal central locations for MMB and partner offices, classroom space, storage, visitor services, and basic laboratory space. Phase I rehabilitation of Midway Mall and the commissary will include cleaning and maintenance, renovation of office and classroom space and a feasibility study of how best to incorporate solar and other renewable energy, a green roof, and other sustainable design principles. The complete Midway Mall rehabilitation will require more substantial work and resources.

Activity CFO-9.5: Construct airport welcome center on Sand Island within 2 years.
A passenger terminal/welcome facility will be constructed at the airport to handle passenger arrival to and departures from Midway. This simple facility will offer restrooms, baggage handling, and a waiting area out of the weather. Design of the welcome center will follow the low-impact guidelines.

Table 3.6.3 Summary of Strategies, Activities, and Agency Leads for Coordinated Field Operations

Strategies and Activities	Agency Lead
Strategy CFO-1: Conduct necessary site planning and infrastructure improvements to increase safety and enhance Monument field operations capacity over the life of the plan.	
Activity CFO-1.1: Initiate and complete necessary planning to implement the Midway Atoll Conceptual Site Plan.	FWS
Activity CFO-1.2: Develop conceptual site plans for Hawaiian Islands National Wildlife Refuge and Seabird Sanctuary at Kure Atoll to enhance management and restoration capabilities.	State of Hawai‘i FWS
Activity CFO-1.3: Develop alternative energy system and waste reduction strategies for the Monument within 2 years.	FWS
Activity CFO-1.4: Plan for use of sustainable engineering, technology, and landscape architecture for facilities and assets throughout the Monument.	FWS
Strategy CFO-2: Enhance interagency planning and coordination for field operations in support of Monument protection and management, and develop protocols and processes that will be utilized throughout the life of the plan.	
Activity CFO-2.1: Develop interagency agreements to facilitate effective field coordination throughout the Monument.	NOAA
Activity CFO-2.2: Develop and implement standardized field operation protocols.	FWS
Activity CFO-2.3: Assess threats that field activities pose to Monument resources.	NOAA
Activity CFO-2.4: Annually coordinate field operations to efficiently deploy personnel and share resources among agency partners.	NOAA
Activity CFO-2.5: Develop a staff coordination agreement between Midway Atoll NWR and the State Seabird Sanctuary at Kure Atoll.	State of Hawai‘i
Strategy CFO-3: Maintain and improve housing and field camp safety and operational efficiency using short-, medium- and long-term approaches to protect Monument resources across the life of the plan.	
Activity CFO-3.1: Design and construct a pilot low-impact shelter.	FWS
Activity CFO-3.2: Utilize the existing footprint of Bravo Barracks for replacement housing at Midway Atoll.	FWS
Activity CFO-3.3: Utilize the existing footprint of Charlie Barracks for replacement housing at Midway Atoll.	FWS
Activity CFO-3.4: Rehabilitate “Officers Row” Housing at Midway Atoll.	FWS
Activity CFO-3.5: Maintain and enhance, where appropriate, the infrastructure at Kure Atoll.	State of Hawai‘i
Activity CFO-3.6: Maintain and enhance, where appropriate, the infrastructure at French Frigate Shoals.	FWS
Activity CFO-3.7: Evaluate, maintain, and enhance the small tent field camp at Pearl and Hermes Atoll on Southeast Island.	FWS
Activity CFO-3.8: Maintain and enhance the existing tent field camp at Laysan Island to support on the ground management and restoration capacity.	FWS

Strategies and Activities	Agency Lead
Strategy CFO-4: Meet fuel requirements for aircraft, vessel, utility, and equipment needs at Midway Atoll to support operations to protect and manage Monument resources.	
Activity CFO-4.1: Maintain recently replaced fuel farm at Midway Atoll.	FWS
Activity CFO-4.2: Develop biodiesel fuel capacity or other sustainable fuel types at Midway Atoll within 2 years.	NOAA FWS

Strategy CFO-5: Rehabilitate critical utility systems and ailing structures and facilities at Midway Atoll within 5 to 15 years.	
Activity CFO-5.1: Rehabilitate water catchment and distribution system.	FWS
Activity CFO-5.2: Rehabilitate septic and wastewater systems.	FWS
Activity CFO-5.3: Treat all wooden historic structures at Midway Atoll for termites.	FWS
Activity CFO-5.4: Evaluate and optimize food services as necessary.	FWS
Activity CFO-5.5: Rehabilitate seaplane hangar.	FWS
Activity CFO-5.6: Repair inner harbor sea wall.	FWS
Strategy CFO-6: Within 5 years, improve the small boat operational capacity to enable quick, reliable access to the region in support of protection and management and continue to enhance the program throughout the life of the plan.	
Activity CFO-6.1: Inventory, maintain, and coordinate the use of small boats and related field resources.	NOAA
Activity CFO-6.2: Within 2 years, station additional vessels at Midway for use during the summer marine research field season.	NOAA
Activity CFO-6.3: Within 5 to 10 years, station a small research/enforcement vessel at Midway Atoll.	NOAA
Activity CFO-6.4: Construct new finger piers inside of Midway's inner harbor.	FWS
Activity CFO-6.5: Redevelop existing boathouse at Midway into a multiuse facility.	FWS NOAA
Activity CFO-6.6: Evaluate needed improvements to Pier No. 1 in the ship basin and the Tug Pier at Midway Atoll.	FWS
Activity CFO-6.7: Make needed improvements to or replace the pier at Eastern Island.	FWS
Strategy CFO-7: Within 5 years identify interisland aircraft transportation needed to protect and manage the Monument.	
Activity CFO-7.1: Identify a reliable, efficient, cost-effective aircraft service to improve the delivery capacity of personnel and cargo between Honolulu and Midway.	FWS
Activity CFO-7.2: Within 5 to 10 years, evaluate the need for a dedicated aircraft for transportation, research, evacuation, education, surveillance, management, and enforcement in the Pacific region.	NOAA
Activity CFO-7.3: Within 15 years, acquire appropriate aircraft to service the Monument and the Pacific region.	NOAA
Strategy CFO-8: Develop a safe and comprehensive dive operations program for Monument management activities within 5 years.	
Activity CFO-8.1: Refurbish or replace the dive recompression chamber at Midway.	NOAA

Strategies and Activities	Agency Lead
Activity CFO-8.2: Investigate acquisition of a portable dive recompression chamber for use on a small research vessel.	NOAA
Activity CFO-8.3: Incorporate a dive operations center into the refurbished boathouse facility at Midway.	FWS NOAA
Activity CFO-8.4: Support interagency dive operations.	NOAA State of Hawai‘i FWS OHA
Strategy CFO-9: Provide for necessary research, education, visitor and administrative facilities that will further the protection of Monument resources across the life of the plan.	
Activity CFO-9.1: Design a marine laboratory at Midway and develop in phases.	FWS NOAA
Activity CFO-9.2: Complete planning for and construct a captive care monk seal facility on Sand Island.	FWS NOAA
Activity CFO-9.3: Provide logistical, infrastructure, and transportation support for threatened and endangered species recovery actions.	NOAA
Activity CFO-9.4: Complete Phase I rehabilitation of Midway Mall and the commissary building.	FWS
Activity CFO-9.5: Construct airport welcome center on Sand Island within 2 years.	FWS

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3.6.4 Evaluation Action Plan

Desired Outcome
Determine the degree to which management actions are achieving the vision, mission and goals of Papahānaumokuākea Marine National Monument.

Links to other Action Plans
All action plans

Current Status and Background

Links to Goals
All Goals

The Monument evaluation process is designed to meet specific site-level vision, mission, goals, and desired outcomes, as well as FWS', NOAA's, and the State of Hawai'i's overarching missions, goals, and priorities. The Government Performance and Results Act seeks to make the federal government more accountable to the American people for the tax dollars it spends and the results it achieves. NOAA and FWS view the use of performance measures for assessment and evaluation as critical to continued success.

Act 100, Session Laws of Hawaii, 1999, 'Relating to Government Operations' holds departments and agencies of the State of Hawai'i responsible for identifying their goals, objectives, and policies in order to provide a basis for determining priorities and allocating limited public funds and human resources. The State of Hawai'i DLNR approach in responding to these requirements was to develop an annual response that includes goals and objectives against which performance will be measured over the next one, two, and five years. This approach is designed to produce a more effective tool for measuring performance and will assist DLNR in establishing departmental priorities (DLNR Report to the Twenty-Fourth 2008 Legislature).

NOAA's strategic plan (2004a) and NOAA's National Ocean Service Strategic Plan (NOAA 2003a) outline four mission goals and six cross-cutting priorities. ONMS falls under the first mission goal:

> Protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management.

The ONMS also clearly supports five of the six cross-cutting priorities:

- Integrated global environmental observation and data management system
- Environmental literacy, outreach, and education
- Sound, reliable, state-of-the-art research
- International cooperation and collaboration
- Organizational excellence

The DOI is complying with the Government Performance and Results Act through its performance management system, which provides useful information to managers and promotes accountability for results. Specifically, FWS has adopted the following principles and priorities, which all apply to Monument management:

Conservation Principles:

- Science: Our work is grounded in thorough, objective science.

- Stewardship: Our ethic is to conserve natural resources for future generations.
- Service: It is our privilege to serve the American people.
- Professionalism: We hold ourselves to the highest ethical standards, strive for excellence, and respect others.
- Partnerships: We emphasize creative, innovative partnerships.
- People: Our employees are our most valued asset.
- Legacy: We ensure the future of natural resource conservation by connecting people with nature.

Priorities:

- National Wildlife Refuge System: Conserving our lands and resources.
- Landscape Conservation: Working with others.
- Migratory Birds: Conservation and management.
- Threatened and Endangered Species: Achieving recovery and preventing extinction.
- Aquatic Species: National Fish Habitat Initiative and trust species.
- Connecting People with Nature: Ensuring the future of conservation.

Given the similarity of NOAA and FWS priorities and the alignment of DLNR's Goals with the unifying Monument vision, mission, and goals, the Co-Trustees are committed to developing management plan performance measures to evaluate whether the strategies and activities contained in the action plans are achieving the goals and desired outcomes of the Monument. The management plan performance measures fall into three categories: annual benchmarking, management capacity assessment, and outcome assessment.

Annual benchmarking measures will be used to determine whether activities have occurred as planned. Management capacity assessment measures will be used every two to three years to determine the adequacy of implementation mechanisms and processes, including interagency coordination and stakeholder and community participation. Outcome assessment measures will be used every four to five years to evaluate the impacts of management actions on the resources and ecosystem status. These measures will be further defined through the process described in Activity EV-1.1, below.

Need for Action

One of the largest challenges in the management of ocean resources lies in knowing whether management actions are effective over time (Pomeroy 2004). Research and long-term monitoring programs are essential in an ecosystem-based management context, to provide reliable information and data to determine whether management actions are achieving desired outcomes. A second and equally important challenge is improving management based on reliable information and data, a sound governance process, and experience (Olsen et al. 1999).

Evaluation is needed to determine if management actions are achieving the desired outcomes, addressing priority management needs, and meeting the goals of the Monument. The outcomes of evaluation processes can then be used to improve processes, programs, and accountability; prioritize activities; and inform constituents.

The U.S. Commission on Ocean Policy recommends that national goals and guidelines be developed leading to a uniform process for effective design, implementation, and evaluation of marine protected areas. The President's Ocean Action Plan has elements addressing this issue. Since the Monument is the largest marine protected area in the United States, NOAA, FWS, and the State of Hawai‘i are in a unique position to respond to these challenges and recommendations through a comprehensive evaluation process.

Strategies to Achieve the Desired Outcome
A meaningful evaluation requires the use of measurable strategies and the ability to monitor, evaluate, provide feedback, and then assess what is working and what needs to be changed in terms of desired outcomes, strategies, and activities. The strategy and activities are coded by the abbreviation for the action plan title, "Evaluation" (EV). A summary of strategies and activities is provided in Table 3.6.4 at the end of this action plan.

- EV-1: Implement a comprehensive evaluation process within 1 year.

Strategy EV-1: Implement a comprehensive evaluation process within 1 year.

Management plan measures will be used to determine the degree to which management actions achieve desired outcomes, address priority management needs, and meet the goals of the Monument. The use of site performance measures will ensure that potential changes are consistent with the Monument vision, mission, management principles, and goals.

Evaluation activities will be developed and implemented by the MMB. Evaluation reports will be prepared and reviewed by partner agencies and organizations for review and recommendations.

Activity EV-1.1: Prepare a comprehensive Monument evaluation strategy.
A comprehensive evaluation strategy will be designed to guide evaluation activities over a 5-year period. The strategy will describe information and data needs and methods to evaluate activity outputs and to quantify site measures. The output from this activity is a Monument evaluation strategy that describes site performance measures, their evaluation methods and timeframes, measurable elements, and roles and responsibilities of the Co-Trustees, partner agencies, and other organizations involved in the evaluation process.

Activity EV-1.2: Conduct annual program review.
Agency leads will be identified and responsible for developing milestones for each plan, tracking progress, and reporting to the MMB regarding milestones reached or interventions needed. The status of implementation of each action plan will be reviewed annually. MMB staff leads for each action plan will be responsible for determining the status of completion of planned activities and accomplishment of activity outputs. Data and information on site indicators will be compiled and analyzed in accordance with the timeframes described in the evaluation plan. The output of this activity is an annual report describing the status of activity implementation and recommended adjustments.

Activity EV-1.3: Conduct comprehensive evaluation and prepare a State of the Monument Report.
Every 5 years, a comprehensive evaluation will be conducted, considering the results of preceding annual reports and incorporating surveys, assessments, and long-term research and monitoring studies as described in the comprehensive evaluation plan (Activity EV-1.1). The comprehensive evaluation will describe the degree to which management actions have achieved desired outcomes, addressed priority management needs, and met goals for the Monument over the 5-year period. Status and trends of Monument resources, management issues, and ecosystem components will be described with recommendations for improved management actions. The output from this activity is a State of the Monument Report.

Activity EV-1.4: Conduct a management plan review.
As part of an adaptive management approach to ensure that Monument management is effective, the Monument Management Plan will undergo a review every 5-years. Scientific discoveries, identification of new sensitive or representative resilient areas for rezoning, advancements in managing marine resources and human dimensions approaches, and new resource management issues or approaches to issues will be updated over time.

The comprehensive evaluation and State of the Monument Report will serve as the primary input for the 5-year management plan review. Monument staff, together with partner agencies and organizations, will review past activities, revise strategies and activities accordingly and, as appropriate, add new strategies and activities based on priority management needs. The output of this activity will be a revised Monument Management Plan and revised regulations (as needed) for the next 5 years of operations, based on the review of recommended changes identified by the comprehensive evaluation.

Table 3.6.4 Summary of Strategies, Activities, and Agency Leads for Evaluation

Strategies and Activities	Agency Lead
Strategy EV-1: Implement a comprehensive evaluation process within 1 year.	
Activity EV-1.1: Prepare a comprehensive Monument evaluation strategy.	NOAA
Activity EV-1.2: Conduct annual program review.	NOAA
Activity EV-1.3: Conduct comprehensive evaluation and prepare a State of the Monument Report.	NOAA
Activity EV-1.4: Conduct a management plan review.	NOAA

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GLOSSARY

GLOSSARY

Abiotic: Pertaining to the non-living components of the environment.
Abyssal (zone): Relating to the bottom waters of oceans, usually below 1,000 meters.
Adaptive management: The process of adjusting management actions or directions as new and better information emerges about the ecosystem
Adaptive reuse: A process that changes a disused or ineffective item into a new item that can be used for a different purpose.
Alien species (exotic, nonnative): With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.
Anthropogenic: Caused by humans.
Apex predator: A species (e.g., fish) at the top of the food chain.
Appropriate Use (NWR)**:** A proposed or existing use on a refuge that meets the criteria in 603 FW 1.
Aquaculture: Cultivation of aquatic organisms under controlled or semi-controlled conditions.
Archipelago: A group or cluster of islands.
Ballast water: Any water and associated sediments used to manipulate the trim and stability of a vessel
Bathymetry: Study and mapping (benthic mapping) of sea floor elevations and the variations of water depth; the topography of the sea floor.
Battle of Midway: A naval battle in the Pacific Theater of World War II. It took place from June 4, 1942 to June 7, 1942, approximately one month after the Battle of the Coral Sea, about five months after the Japanese capture of Wake Island, and six months after the Empire of Japan's attack on Pearl Harbor that had led to a formal state of war between the United States and Japan.
Benthic habitat: Of the sea floor, or pertaining to organisms living on or in the sea floor.
Biodiversity: Defined as the number of different organisms or species that inhabit a given ecosystem or the earth overall. It can also refer to the variability within species and among species living on the earth or in a particular community. Many ecologists also include the interaction of species the environment when describing biodiversity. All biodiversity has its origins in the different combinations of genetic material (DNA) and how this is expressed in different organisms.
Biogeographical: Of relating to or involved with biogeography, a branch of biology that deals with the geographical distribution of animals and plants.
Biological community: A naturally occurring assemblage of plants and animals that live in the same environment and are mutually sustaining and interdependent.
Biological inventory or Biodiversity inventory: Catalog of all biota in a given area. Inventories of large clades (a clade is a related group with a common ancestor) of organisms that are likely to contain many undescribed species or otherwise require major revision to complete their taxonomy.
Biomass: The total weight of all the living organisms, or some designated group of living organisms, in a given area.
Bioprospecting: Search for new chemicals compounds, genes and their products in living things that will have some value to people.

Biota: All the organisms, including animals, plants, fungi and microorganisms, living components of an ecosystem.

Biotic: Pertaining to any aspect of life, especially to characteristics of entire populations or ecosystems.

Bishop Museum: Founded in 1889, the Bishop Museum is the largest museum in Hawai'i and the premier natural and cultural history institution in the Pacific, recognized throughout the world for its cultural collections, research projects, consulting services and public educational programs. It also has one of the largest natural history specimen collections in the world.

Board of Land and Natural Resources: An appointed Board of the State of Hawai'i composed of seven members, one from each land district and two at large, and the Chairperson, the executive head of the Department. Members are nominated and, with the consent of the Senate, appointed by the Governor for a 4-year term. The BLNR convenes twice monthly to review and take action on department submittals, including Monument permits.

Bottomfish species: Means bottomfish management unit species as defined at 50 CFR 665.198.

Bottomfishing: Fishing for bottomfish species using hook-and-line method of fishing where weighted and baited lines are lowered and raised with electric, hydraulic, or hand-powered reels.

Calderas: A crater whose diameter is many times that of the volcanic vent because of the collapse of subsidence of the central part of a volcano or because of explosions of extraordinary violence.

Catch-per-unit-effort (CPUE): The average number of fish caught in a discrete amount of time.

Categorical Exclusion: A category of actions that the agency has determined does not individually or cumulatively have a significant effect on the quality of the human environment.

Ciguatera toxin: Toxins produced by a marine microalgae called *Gambierdiscus toxicus.* These toxins become progressively concentrated as they move up the food chain from small fish to large fish that eat them, and reach particularly high concentrations in large predatory tropical reef fish.

Co-Trustees: U.S. Department of Commerce, through the National Oceanic and Atmospheric Administration, the U.S. Department of the Interior through the Fish and Wildlife Service, and the State of Hawai'i.

Commercial Fishing: Fishing in which the fish harvested, either in whole or in part, and are intended to enter commerce through sale, barter or trade.

Compatible use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge. (50 CFR 29.21)

Comprehensive Conservation Plan: A document that describes the desired future conditions of the refuge, and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the system, and to meet other relevant mandates.

Coral bleaching: When zooxanthellae, symbiotic algae that live in coral tissue, leave the coral as a result of thermal and other types of stress.

Crustacean: A member of the phylum Crustacea, such as a crab, shrimp, or lobster.

Cultural literacy: The art and understanding of the intangible meanings and emotions conveyed through a particular written cultural language.

Cultural resources: Any resources, whether they are tangible or intangible, such as stories, people, structures, or artifacts that identifies a certain native people's culture inherent in the way they live and practice their traditions.

Cumulative effects (National Environmental Policy Act, NEPA)**:** Cumulative impact of the direct and indirect effects of the proposed action and its alternatives when added to the aggregate effects of past, present, and reasonably foreseeable future actions.

Customary rights: Rights customarily and traditionally exercised for subsistence, cultural, and religious purposes and possessed by ahupuaʻa tenants who are descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778.

Derelict: Abandoned, especially by the owner or occupant; forgotten or unused.

Direct effects (NEPA)**:** Effects caused by the action and occurring at the same time and place.

Distance-learning: Education initiated on-site at a remote location offered to others often times providing two way communication through audio or video (or both) technology links.

Ecological: Of, or having to do with, the environments of living things or with the pattern of relations between living things and their environments.

Ecological impacts: The effect that a human-caused or natural activity has on living organisms and their environment.

Ecological Reserve: An area of the Monument consisting of contiguous, diverse habitats that provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life, and also to protect and preserve natural assemblages of habitats and species within areas representing a broad diversity of resources and habitats found within the monument.

Ecological Restoration: Replacement of lost ecosystem function and integrity.

Ecosystem: A geographically specified system of organisms (including humans), the environment, and the processes that control its dynamics.

Ecosystem Health: A condition in which structure and functions allow the desired maintenance over time of biological diversity, biotic integrity, and ecological processes.

Ecological Integrity: A condition determined to be characteristic of an ecosystem that has the ability to maintain its function, structure, and abundance of natural biological communities, including rates of change in response to natural environmental variation.

Ecosystem Services: The natural processes by which the environment produces resources. Common examples are water, timber, and habitat for fisheries, and pollination of native and agricultural plants.

Ecosystem-based management approach: Management that carefully considers impacts to all species and trophic interactions, including maintenance of biological communities and the protection of natural habitats, populations and ecological processes. The approach emphasizes the inherent value of ecosystems and recognizes the importance of species interactions and conservation of habitats, and only permits resource utilization in a manner that is consistent with the Monument's primary goal of resource protection.

Ecotourism: Travel to natural areas to foster environmental and cultural understanding, and appreciation and conservation. The Proclamation defines Ocean-Based Ecotourism as a class of fee-for-service activities that involves visiting the Monument for study, enjoyment, or volunteer assistance for purposes of conservation and management.

Effects (Impacts): As defined by NEPA (direct, indirect, cumulative): Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.

El Niño: A climatic phenomenon characterized by a large scale weakening of the trade winds and warming of the surface layers in the eastern and central equatorial Pacific Ocean. El Niño events occur irregularly at intervals of two to seven years, although the average is about once every three to four years and typically last 12 to 18 months. During El Niño, unusually high atmospheric sea level pressures develop in the western tropical Pacific and Indian Ocean regions, and unusually low sea level pressures develop in the southeastern tropical Pacific. Southern Oscillation tendencies for unusually low pressures west of the date line and high pressures east of the date line have also been linked to periods of anomalously cold equatorial Pacific sea surface temperatures, sometimes referred to as **La Niña**.

Endangered species: An animal or plant species in danger of extinction throughout all or a significant portion of its range.

Endemic: Referring to species native to and confined to a particular region, thus often having a comparatively restricted distribution.

Environmental Assessment (EA): A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact.

Environmental Impact Statement (EIS): Documentation that assesses the impacts of major Federal actions significantly affecting the quality of the human environment as required by Section 102(2)(C) of NEPA.

Exclusive Economic Zone (EEZ): A zone contiguous to the territorial sea, including zones contiguous to the territorial sea of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands (to the extent consistent with the Covenant and the United Nations Trusteeship Agreement), and United States overseas territories and possessions extending to a distance of 200 nautical miles from the baseline from which the breadth of the territorial sea is measured.

Fathom: A unit of length equal to 1.8 meters (6 feet) used to measure water depth.

Field camp (camp): In this document refers to both seasonal camps that are placed on Lisianski, Pearl and Hermes, Kure, and Nihoa; and one permanent camp at Laysan Island. Seasonal camps are established for specific activities such as monk seal research. The Laysan Island camp is staffed year-round to work on restoration of the island. Camps depend on tents, import all water, and have very limited communications and physical access.

Field station: In this document is used to refer to permanent infrastructures on Tern Island or Midway Atoll. These stations have buildings, water-making abilities, greater power sources, advanced communication, and regular access by boat and aircraft.

Fishery: The act, process, or season of taking fish or other sea products for sale or consumption.

Friends of Midway Atoll NWR: Association whose mission is "[t]o support the Midway Atoll National Wildlife Refuge in its efforts to preserve, protect and restore the biological diversity and historic resources of Midway Atoll, while providing opportunity for wildlife-dependent recreation, education and scientific research."

Geographic Information System (GIS): A system of spatially referenced information, including computer programs that acquire, store, manipulate, analyze, and display spatial data.

Geomorphologic: Relating to geomorphology, a science that deals with land and submarine relief features of the earth's surface.

Hazardous material: A substance or material that is capable of posing an unreasonable risk to health and safety or property when transported in commerce and has been designated as hazardous under the Federal Hazardous Materials Transportation Law (49 USC 5103).

Hazardous Waste: The Resource Conservation and Recovery Act (RCRA) specifically defines a hazardous waste as a solid waste (or combination of wastes) that, based on its quantity, concentration, physical, chemical, or infectious characteristics, can cause or significantly contribute to an increase in mortality. RCRA further defines a hazardous waste as one that can increase serious, irreversible, or incapacitating reversible illness or pose a hazard to human health or the environment when improperly treated, stored, disposed of, or otherwise managed.

Hiʻialakai: NOAA research vessel. Hiʻialakai means "embracing pathways to the sea" in the Hawaiian language.

***Hōkūleʻa*:** A traditional Hawaiian double hulled voyaging canoe recreated by the Polynesian Voyaging Society in the 1970s which signified a rebirth of ancient voyaging and navigation and a new cultural renaissance period in Hawaiian history. [*Hōkūleʻa* is Hawaiian for star of gladness].

Hypersaline: Salinity well in excess of that of seawater; found in enclosed water bodies.

Impacts: See **Effects**

Indirect effects (NEPA)**:** Those are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

In situ [Latin]**:** In place

In-reach: Purposefully communicating to personnel working within your agency, or Co-Trustees.

Indigenous (species): Existing within a historical ecological range, usually within a balanced system of coevolved organisms.

Infrastructure: In this document refers to physical buildings and structures, roads, and utility and communications systems.

Interagency: Involving two or more public or government agencies.

Introduced Species:

1. A species (including, but not limited to, any of its biological matter capable of propagation) that is nonnative to the ecosystem(s) protected by the Monument; or
2. Any organism into which genetic matter from another species has been transferred in order that the host organism acquires the genetic traits of the transferred genes.

"Introduction" means the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.

Invasive species: A nonindigenous species that may threaten the diversity or abundance of native species or the ecological stability and or uses of infested waters and the introduction of which into an ecosystem may cause harm to the economy, environment, human health, recreation, or public welfare.

Invertebrates: Any animal that is not a vertebrate, that is, whose nerve cord is not enclosed in a backbone of bony segments.

Island-specific: Pertains to a specific island of the Monument and may not be translated to other islands.

Knowledge-base: Information and ideas acquired through pre-existing experiences and cumulative education.

La Niña: see **El Niño**

Larval: An immature stage of any invertebrate animal that differs dramatically in appearance from the adult.

Lead-based paint: Paint that contains high levels of lead, generally found in houses and apartments built before 1978, when the federal government banned it from housing.

Longline Protected Species Zone: The area in the Northwestern Hawaiian Islands where longline fishing is prohibited, described as within a 50 nm radius from the geographic centers of Nihoa, Mokumanamana, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, Midway Atoll, and Kure Atoll.

Management Zones: Special Preservation Areas, Ecological Reserves, and the Midway Atoll Special Management Area (SMA) as defined in Monument regulations (50 Code of Federal Regulations [CFR] 404).

Marine debris: Any persistent solid material and contents that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment.

Maritime: Of or relating to navigation or commerce on the sea.

Memorandum of Agreement or Understanding (MOA/U): A nonbinding agreement between state or federal agencies, or divisions within an agency, that delineates tasks, jurisdiction, standard operating procedures or other matters which the agencies or units are duly authorized and directed to conduct.

Meta-population: A subdivided population of a single species.

Midway Atoll Special Management Area: The area of the monument surrounding Midway Atoll out to a distance of 12 nautical miles, established for the enhanced management, protection, and preservation of Monument wildlife and historical resources.

Migratory bird: Birds that are listed in Title 50 of the Code of Federal Regulations, Section 10.13.

Mitigate (mitigation): To make less severe. An action or series of actions that offset the environmental impact, or reduce the severity or consequences. Usually done by sequestering or reducing contact thereby reducing risk or by compensating, enhancing, or restoring areas adversely affected.

Mobile transceiver unit: A vessel monitoring system or VMS device installed on board a vessel that is used for vessel monitoring and transmitting the vessel's position as required by this proclamation.

Monument Management Board (MMB): The MOA established a locally based Monument Management Board (MMB) to guide field level coordination. The seven-member MMB includes representation of the Co-Trustee agencies and the Office of Hawaiian Affairs.

Monument Regulations: Initial regulations prescribed by Presidential Proclamation 8031 completed jointly by the FWS and NOAA on August 29, 2006 (71 FR 51134). Monument regulations, codified under 50 CFR Part 404, establish the scope and purpose, boundary, definitions, prohibitions, marine zones, and regulated activities for managing the Monument.

National Historic Landmark: Nationally significant historic places designated by the Secretary of the Interior possessing exceptional value or quality in illustrating or interpreting the heritage of the United States.

National Historic Properties: Properties listed in, or eligible for listing in the National Register of Historic Places (National Historic Preservation Act of 1966, as amended; implementing regulation for evaluation and determination of eligibility are in 36 CFR 60), "National Register of Historic Places."

National Marine Sanctuary Foundation: A private, nonprofit, 501(c)(3) tax-exempt organization created to assist the federally managed National Marine Sanctuary Program with education and outreach programs designed to preserve, protect, and promote meaningful opportunities for public interaction with the nation's marine sanctuaries.

National Monument: An area on lands owned or controlled by the Government of the United States designated by the President of the United States under the Antiquities Act of 1906, to recognize historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest.

National Register of Historic Places: The nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources.

National Wildlife Refuge System: All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife, and plant resources.

Native Hawaiian: Any individual who is a descendent of the aboriginal people who, prior to 1778, occupied and exercised sovereignty in the area that now constitutes the State of Hawai‘i.

Native Hawaiian Practices: Cultural activities conducted for the purposes of perpetuating traditional knowledge, caring for and protecting the environment, and strengthening cultural and spiritual connections to the Northwestern Hawaiian Islands that have demonstrable benefits to the Native Hawaiian community. This term may include, but is not limited to, the noncommercial use of monument resources for direct personal consumption while in the Monument.

Native species: A species (plant or animal) within its natural range or natural zone of dispersal without human aid.

Natural variability: Uncertainties that stem from inherent or assumed randomness and unpredictability in the natural world.

Northwestern Hawaiian Islands (NWHI): Beginning 155 miles (249.4 kilometers) from the main Hawaiian Island of Kaua‘i, the 10 islands and atolls of this chain that extend for 1,200 miles (1,931 kilometers) to Kure Atoll. In past decades, also known as the Leeward or Kūpuna Islands, and now as Papahānaumokuākea.

NOWRAMP or NWHIRAMP: The Northwestern Hawaiian Islands Coral Reef Assessment and Monitoring Program, which began in 2000, to rapidly evaluate and map the shallow water reef habitats in the NWHI.

Oceania: Collective name for the islands scattered throughout most of the Pacific Ocean.

Oceanographic: Of or relating to oceanography, a science that deals with the ocean and its phenomena.

Outreach: The act of communicating activities and conceptual ideas to public audiences outside the administering agency/agencies and actively involving them in Monument activites.

Pacific Rim: includes the countries that lie along the Pacific Ocean, plus the island countries of the Pacific.

Passage without interruption: A vessel passing through waters within the Monument boundary without stopping anywhere within the boundary of the Monument.

Pelagic: Referring to the open ocean.

Pelagic species: From the Proclamation: Pelagic Species means Pacific Pelagic Management Unit Species as defined at 50 CFR 660.12.

Permit: As used in the Monument Management Plan, authorization by the Co-Trustees to conduct an activity within the Monument that: (i) is research designed to further understanding of monument resources and qualities; (ii) will further the educational value of the monument; (iii) will assist in the conservation and management of the monument; (iv) will allow Native Hawaiian practices; (v) will allow a special ocean use; or (vi) will allow recreational activities.

Petrels: Any of numerous seabirds constituting the families Procellariidae and Hydrobatidae.

Polynesian Voyaging Society (PVS): A society founded in 1973 to research how Polynesian seafarers discovered and settled on the islands in the Pacific Ocean before European explorers arrived in the 16th century.

Pono: [Hawaiian] Appropriate, correct, and deemed necessary by traditional standards in the Hawaiian culture.

Precautionary approach: In the decisionmaking process, if there is a reasonable suspicion of harm, this approach urges a full evaluation of available alternatives for the purpose of preventing or minimizing harm. When consequences are uncertain, managers err on the side of caution thereby giving the benefit of the doubt to nature, public health, and community well-being.

Predator-dominated marine ecosystem: Reef ecosystems that have relatively greater abundance of large fish, such as sharks and jacks and fewer smaller fish that graze on the coral and algae.

Presidential Proclamation 8031: Establishment of the Northwestern Hawaiian Islands Marine National Monument, A Proclamation by the President of the United States of America, June 15, 2006. **(also Proclamation, Presidential Proclamation, and Proclamation 8031)**

Productivity: Rate of energy fixation or storage per unit time; not to be confused with production.

Prohibitions: Actions prohibited by authority of law.

Recreational Activity: For the purposes of the Monument, an activity conducted for personal enjoyment that does not result in the extraction of Monument resources and that does not involve a fee-for-service transaction. This term includes, but is not limited to, wildlife viewing, SCUBA diving, snorkeling, and boating.

Remediation: Rehabilitation of a section of the environment that has been polluted or degraded from a sustainable (self-repairing) state.

Repatriation: The transfer of legal interest in and physical custody of Native American cultural items to lineal descendants, culturally affiliated Indian tribes, and Native Hawaiian organizations.

Resiliency: The ability of an ecosystem to recover from, or adjust to, stress or change.

Restoration: Replacement of lost ecosystem function and integrity.

SCUBA: A self-contained underwater breathing apparatus and includes, but is not limited to, open circuit and rebreather technology.

Seamount: Submerged volcanic mountain rising above the deep-sea floor.

Secretaries: For the Monument, collectively refers to the Secretary of Commerce and the Secretary of the Interior

Sessile invertebrates: Organism being attached to a substrate.

Shoal: Elevation of the sea bottom comprising any material except rock or coral (in which case it is a reef) and which may endanger surface navigation.

Socioeconomic: Relating to or involving a combination of social and economic factors.

Spawning: The direct release of sex cells into the water for reproduction.

Special Ocean Use: An activity or use of the Monument that is engaged in to generate revenue or profits for one or more of the persons associated with the activity or use, and does not destroy, cause the loss of, or injure monument resources. This term includes ocean-based ecotourism and other activities such as educational and research activities that are engaged in to generate revenue, but does not include commercial fishing for bottomfish or pelagic species conducted pursuant to a valid permit issued by NOAA.

Special Preservation Area (SPA): Discrete, biologically important areas of the Monument within which uses are subject to conditions, restrictions, and prohibitions, including but not limited to access restrictions. SPAs are used to avoid concentrations of uses that could result in declines in species populations or habitat, to reduce conflicts between uses, to protect areas that are critical for sustaining important marine species or habitats, or to provide opportunities for scientific research.

Stakeholder: Any and all interested parties; an organization, governmental entity, or individual that has a stake in, or may be affected by, a given approach to environmental regulation or other agency action.

Submersible: A research submarine, designed for manned or remote operation at great depths.

Substrate: The material making up the base on which an organism lives or to which it is attached.

Substratum: The bottom of the bay, the soils of the bay bottom. May also refer to any surface that allows for the colonization of marine life.

Sustenance Fishing: For the Monument**,** sustenance fishing means fishing for bottomfish or pelagic species in which all catch is consumed within the Monument, and that is incidental to an activity permitted.

Symbiotic: Situation in which two dissimilar organisms live together in close association.

Temporary Structure (Nonpermanent): A structure with no permanent foundation that is easy to assemble, dismantle, and transport and is removed from a site between periods of actual use except as specifically permitted otherwise.

Terrestrial species: Plants and animals living on land.

Threatened species: Any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Topographic: General elevation pattern of the land surface or the ocean bottom.

Traditional knowledge: A way of knowing and learning that is acquired through expressions of dance or other forms of art, orally, or thru actual hands-on experiences passed down from generation to generation.

Trolling: Fishing using one or more lines with hooks or lures attached and drawn through the water behind a moving vessel.

Trophic: Relating to nutrition; the position of an organism in a food chain or food pyramid.

Unexploded Ordnance (UXO): Munitions that contain explosive components. In the Monument, refers to lost or abandoned military items.

Unified Ocean Governance: An integrated ecosystem-based management approach using an overall governance framework of shared principles and authority, clear communications and protocols.

Unusual Mortality Events: Criteria used to determine if mortalities seen in the Hawaiian monk seal are significantly abnormal to indicate an underlying vector. Criteria include: a marked increase in the magnitude of strandings is occurring when compared with prior records; animals are stranding at a time of the year when strandings are unusual; an increase in strandings is occurring in a very localized area; the species, age, or sex composition of the stranded animals is different; stranded animals exhibit similar or unusual pathologic findings, or the general physical condition; mortality is accompanied by unusual behavior patterns; and endangered species are stranding.

Vessel Monitoring System (VMS): Means a vessel monitoring system or mobile transceiver unit approved by the NOAA Office for Law Enforcement for use on vessels permitted to access the Monument in accordance with the Proclamation and 50 CFR 404. The hardware and software used by vessels to track and transmit their positions to a receiver in a remote location.

Wayfinding: Noninstrument navigation. Wayfinding involves navigating on the open ocean without sextant, compass, clock, radio reports, or satellites reports. The wayfinder depends on observations of the stars, the sun, the ocean swells, and other signs of nature for clues to the direction and location of a vessel at sea.

Zooxanthellae: A group of dinoflagellates living symbiotically in association with one of a variety of invertebrate groups and found in corals and other marine organisms.

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