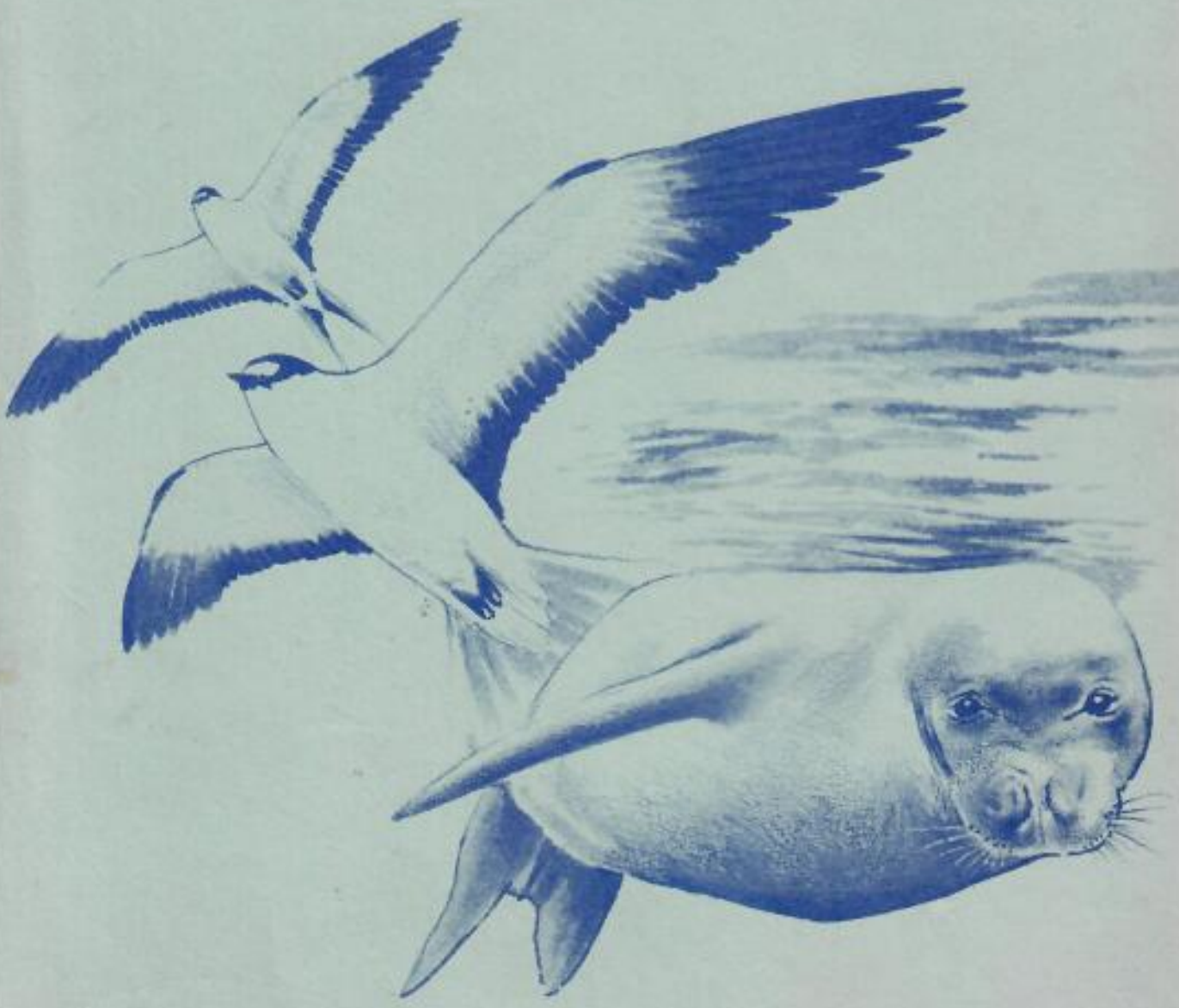


BALAZS

# HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE

MASTER PLAN/ENVIRONMENTAL IMPACT STATEMENT



Department of the Interior  
U.S. Fish and Wildlife Service    Region One

1986

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**HAWAIIAN ISLANDS**  
**NATIONAL WILDLIFE REFUGE**  
COUNTY OF HONOLULU

**Final**  
**MASTER PLAN/ENVIRONMENTAL IMPACT STATEMENT**

**FES #86/11**

**May 1986**

**Department of the Interior**  
**U.S. Fish and Wildlife Service**  
**Region One**

**APPROVAL/CONCURRENCE:**

Pacific Islands Administrator: *Alb Marmist*  
Date: 29 April 1986

Assistant Regional Director-Wildlife Resources: *Francis W. DeFate*  
Date: 5-6-86

Acting  
Regional Director: *[Signature]*  
Date: 5/22/86



# **HAWAIIAN ISLANDS**

## **NATIONAL WILDLIFE REFUGE**

### **MASTER PLAN/ENVIRONMENTAL IMPACT STATEMENT**

#### **Abstract**

Proposed is a management plan for the Hawaiian Islands National Wildlife Refuge. The plan places primary emphasis on protecting and enhancing refuge wildlife resources, particularly threatened and endangered species. The plan would also accommodate limited forms of public use such as wildlife interpretation and environmental education. Additionally the plan would support various compatible public and economic uses throughout the Northwestern Hawaiian Islands archipelago (e.g. commercial fishing outside the refuge boundary). Five alternatives were considered, each composed of different mixes of conservation and public use strategies. The proposed action is a hybrid that would optimally satisfy all refuge objectives.

It is the opinion of the U.S. Fish and Wildlife Service, following a January 10, 1985 internal consultation under Section 7 of the Endangered Species Act of 1973, that adoption and implementation of any of the alternatives considered would promote conservation of the six species of endangered or threatened wildlife addressed in this document. Furthermore, on April 8, 1986 the National Marine Fisheries Service (NMFS) completed a separate biological consultation under Section 7 of the Endangered Species Act (NMFS shares responsibility for the management of threatened green sea turtle and endangered Hawaiian monk seal populations with the U.S. Fish and Wildlife Service) and has concluded that implementation of the revised, final Master Plan/EIS Preferred Alternative is not likely to jeopardize the continued existence of the Hawaiian monk seal or the Hawaiian green sea turtle.

Any further remarks or requests for additional information should be directed to:

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**Department of the Interior**

**U.S. Fish and Wildlife Service      Region One**

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TECHNICAL APPENDICES CONSISTING OF LOCATIONAL CRITERIA AND OUTPUT SUMMARIES ARE UNDER SEPARATE COVER.



## GLOSSARY OF KEY PLANNING TERMS

**Locational Criteria:** Information which describes the resource conditions necessary for production or maintenance of a given output. This information includes locational factors, resource descriptions, and quality ratings of the resources.

**Objective:** A narrative statement concerning an output which represents the long-range goal the U.S. Fish and Wildlife Service (FWS) intends to achieve in producing or maintaining that output. (Production of species refers to numbers of young raised; maintenance of species refers to the number of days of use of the refuge.)

**Output:** Something that is produced, provided for, or maintained on a National Wildlife Refuge.

**Output List:** A prioritized listing of all outputs for the refuge, either currently produced/maintained or proposed for production/maintenance on the refuge. Priorities are established based on legal mandates, specific legislation, FWS policy, and other relevant guidance.

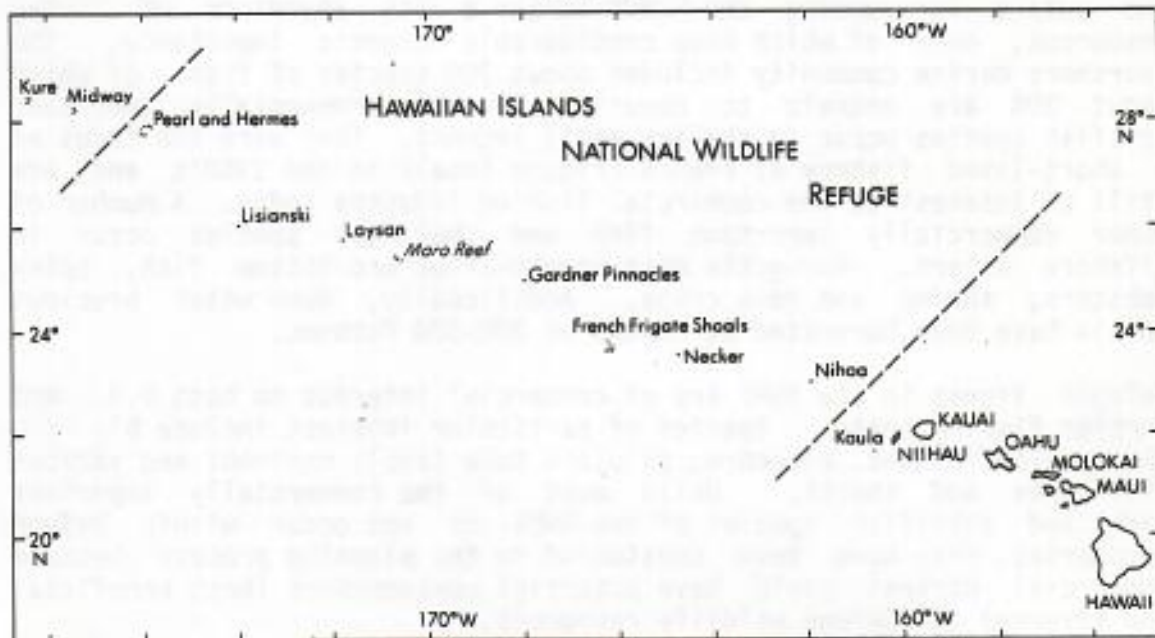
**Output Summaries:** Information concerning the background, potential, demand, and degree of conflict for a specific output. The information contained in an Output Summary often represents a condensation of a much greater volume of information and facts.

## Summary

### A. The Resource

The Hawaiian Islands National Wildlife Refuge (HINWR) consists of a chain of islands, reefs and atolls extending about 800 miles in a northwesterly direction from the main Hawaiian Islands. The Refuge was established in 1909 by President Theodore Roosevelt to protect seabirds which were then being slaughtered for the millinery trade.

Map 1



HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE  
North Pacific Ocean

Because of their geographic isolation, the islands have provided a unique "window" on biological evolution. Many of the endemic floral and faunal species found on the Refuge exist nowhere else in the world. The Refuge is home to the endangered Hawaiian monk seal, which was nearly exterminated by seal hunters in the late 1800's. Under Refuge protection, the population recovered in the late 1950's, but over the last 25 years, surveys indicate that the population has declined again about 50%. The threatened green sea turtle once nested on beaches throughout the main Hawaiian Islands but now nesting is restricted primarily to beaches at French Frigate Shoals within the HINWR. The decline in the population has been caused primarily by overharvest and human disturbance in breeding areas. The Refuge is also home to four endangered land birds - the Laysan duck, Laysan finch, Nihoa finch and Nihoa millerbird. Their future depends upon keeping the island environments free from detrimental changes.



## Summary

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The most abundant wildlife forms occurring in the HINWR are seabirds. The Refuge is a breeding ground for 18 different species including albatross, petrels, shearwaters, storm petrels, tropicbirds, boobies, frigatebirds and terns. The resident seabird population in the Northwestern Hawaiian Islands (NWHI) numbers 12-14 million birds. While no seabird species are endemic to the NWHI, these islands provide breeding habitat for a substantial portion of the worldwide population of at least four species - the black-footed albatross, Laysan albatross, Bonin petrel and the sooty storm-petrel.

The waters surrounding the HINWR harbor a rich abundance of living resources, many of which have considerable economic importance. The nearshore marine community includes about 700 species of fish, of which about 20% are endemic to Hawaii. Several commercially important baitfish species occur in shallow atoll lagoons. They were the focus of a short-lived fishery at French Frigate Shoals in the 1950's and are still of interest to the commercial fishing industry today. A number of other commercially important fish and shellfish species occur in offshore waters. Among the most sought-after are bottom fish, spiny lobsters, shrimp and kona crabs. Additionally, deep water precious corals have been harvested at depths of 200-300 fathoms.

Pelagic fishes in the NWHI are of commercial interest to both U.S. and foreign fishing boats. Species of particular interest include big eye and yellowfin tuna, albacore, skipjack tuna (aku), mahimahi and various billfishes and sharks. While most of the commercially important fish and shellfish species of the NWHI do not occur within Refuge boundaries, they have been considered in the planning process because commercial harvest could have potential consequences (both beneficial and adverse) for Refuge wildlife resources.

Finally, the HINWR is the site of some significant archaeological resources. Ruins consisting of house terraces, ceremonial structures, burial caves, shelters and agricultural terraces are located on Nihoa and Necker Islands. It is suspected that colonizers arrived on the islands about 900 A.D. and built a culture similar to the one they left behind in the Tuamotu Islands, 1600 miles to the southeast.

### B. Federal Responsibilities for the Resource

The HINWR is part of a system of national wildlife refuges that now numbers over 420 units and includes more than 90 million acres of land and water. This system is the only such network of lands and waters in the world that is managed principally for the perpetuation and enhancement of fish and wildlife resources.

As part of that system, the HINWR is managed in accordance with a number of basic legal authorities and legislative mandates. Among the most

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## Summary

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significant are the Migratory Bird Treaty Act of 1918, which establishes a federal responsibility for protection of the international migratory bird resource; the Endangered Species Act of 1973, which provides for the conservation of endangered species of fish, wildlife and plants; the Marine Mammal Protection Act of 1972, which establishes a federal responsibility for conservation of marine mammals; and the National Wildlife Refuge System Administration Act of 1966, under which the Secretary of the Interior is authorized to permit uses on national wildlife refuges provided such uses are compatible with the major purposes for which the Refuge was established. The legal authority which established the Refuge is Executive Order 1019, signed by President Theodore Roosevelt on February 3, 1909, which set aside the islands and reefs extending from Nihoa to Kure, excepting Midway Atoll, " . . . for use . . . as a preserve and breeding ground for native birds."



**Laysan duck (*Anas Laysanensis*)—endemic to Laysan Island. Population may number as high as 600 birds.**

While these basic authorities and mandates establish a clear resource conservation responsibility for the U.S. Fish and Wildlife Service (FWS), the agency's mission statement also makes it clear that the FWS' role is not one of conservation alone, but rather conservation for public benefit. The mission of the FWS is to "provide the federal leadership to conserve, protect and enhance fish and wildlife and their habitats for the continuing benefit of people."

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Public benefits derive from various human "uses" of Refuge resources. Examples of such uses considered in the Master Plan/Environmental Impact Statement (EIS) include environmental education, wildlife interpretation, wildlife photography and commercial and recreational fishing. Thus, an assumption made throughout the planning process is that the FWS has basic responsibilities for meeting wildlife needs and the needs and desires of the public to derive benefits from those wildlife resources.

Refuge objectives developed through the planning process capture both the wildlife preservation aspects and the public benefit aspects inherent in FWS responsibilities for the HINWR. In order of priority, objectives have been written (and where possible quantified) for vulnerable wildlife species such as the monk seal and green sea turtle; environmental values such as cultural resources and wilderness; marine birds; endemic terrestrial and marine species; research and monitoring; education and interpretation; and other public uses including commercial fishing. Objectives are the key ingredient of this Master Plan/EIS. Every recommendation contained in the document is influenced by the objectives. Management strategies, development proposals and recommendations for public use have all been tailored to meet these objectives.

### C. Resource Needs Versus Resource Demands

Wildlife preservation needs and human demands for utilization of wildlife resources in the Northwestern Hawaiian Islands have resulted in serious conflicts, frequently with disastrous results for wildlife. Such conflicts have historic roots, as the resources of the NWHI have been exploited to varying degrees over the past 200 years.

European sailing ships made the earliest commercial excursions into the NWHI in the late 18th and 19th centuries, taking seals, whales, fish, turtles, sharks, birds, pearl oysters and sea cucumbers. In the mid-1800's discoveries of large guano deposits led to leasing of several islands to the North Pacific Phosphate and Fertilizer Company. Guano was commercially removed from Laysan Island between 1891-1910. Rabbits were introduced to the island to supply the workers with a food source. Unfortunately, without natural population checks, the rabbits multiplied until they had consumed most of the island's vegetation. Without the food cover provided by the plants, three bird species - the Laysan rail, Laysan honeycreeper and Laysan millerbird - became extinct.

Over this same period Japanese vessels began a series of trips into the NWHI to harvest bird skins and feathers for the booming millinery trade. Thousands of birds were slaughtered in the process, leading President Roosevelt to designate the islands as a preserve for native birds in 1909.



## Summary

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Commercial fishing in the NWHI has more recent historic roots. The remoteness of the islands with their great distances from markets and a lack of fishery support facilities have limited expansion of the industry. With the disestablishment of the Tern Island Naval Station in 1945, fishermen began to use the facility. However, commercial fishing ventures were short-lived and no commercial harvest has occurred within the boundaries of the HINWR since 1959.

Recognizing the need to broaden and diversify its economic base beyond tourism, the State of Hawaii expressed growing interest in the 1970's to develop a commercial fishery throughout state, including the NWHI. This interest culminated in the publication of the Hawaii Fisheries Development Plan in 1979. That plan identifies the NWHI as the most promising area for future expansion of the commercial fishing industry. Estimates of fishery harvest potential, if realized, would boost total commercial fish landings from about 13 million pounds (1978) to an estimated 74-118 million pounds, with most of the potential (47-71 million pounds) occurring in open ocean tunas. Approximately 90% of Hawaii's current landings are represented by a handful of species - skipjack tuna (aku), yellowfin tuna, big eye tuna, albacore, akule and opelu (mackerel).

Commercial fishing in the NWHI poses a number of potential conflicts with Refuge wildlife resources, despite the fact that almost all of the fishery resources with commercial value would be harvested outside Refuge boundaries. Most seabirds seek food outside Refuge boundaries, in some cases feeding 500 miles or more from their breeding colonies. For the most part seabirds are opportunistic feeders, taking species of small fish that school near the surface. Commercial harvest of tunas and albacore could indirectly affect seabird prey species, because the larger fish are known to drive schools of small fish to the surface, where they become accessible to the birds (Ashmole and Ashmole, 1967). Alternately, a commercial harvest could benefit seabirds in that the removal of tuna would reduce competition for the same prey species.

In addition, harvest of baitfishes in NWHI waters for the aku fishery could place fishermen in direct competition with seabirds, which consume an estimated 900 million pounds of small fish annually. The State of Hawaii has also expressed interest in harvesting lagoon baitfishes at French Frigate Shoals within the HINWR boundary. This would provide commercial fishing boats with a more convenient source of baitfish located much nearer to the fishing grounds. At present, baitfish are primarily harvested in Kaneohe Bay and Pearl Harbor Lagoon on the island of Oahu. Baitfish availability has been a limiting factor in the expansion of the aku fishery.

Baitfishing in atoll lagoons and nearshore waters within the Refuge boundary would disturb monk seals and increase the potential for inadvertent introduction of harmful exotic organisms to the fragile island ecology. Even minor changes could be disastrous. Rats coming

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## Summary

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ashore from a boat, a wildfire, a few weed seeds, destructive insects or their eggs in someone's clothing or equipment, could result in the eventual loss of a species already in danger of extinction.

To assess such potential conflicts and to develop crucial baseline population data on the fish and wildlife resources of the NWHI, the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the State of Hawaii Department of Land and Natural Resources, signed a Tripartite Cooperative Research Agreement in May, 1978. (The University of Hawaii Sea Grant College became a fourth party to the Agreement a year later.) The Agreement initiated a comprehensive 5-year research effort.

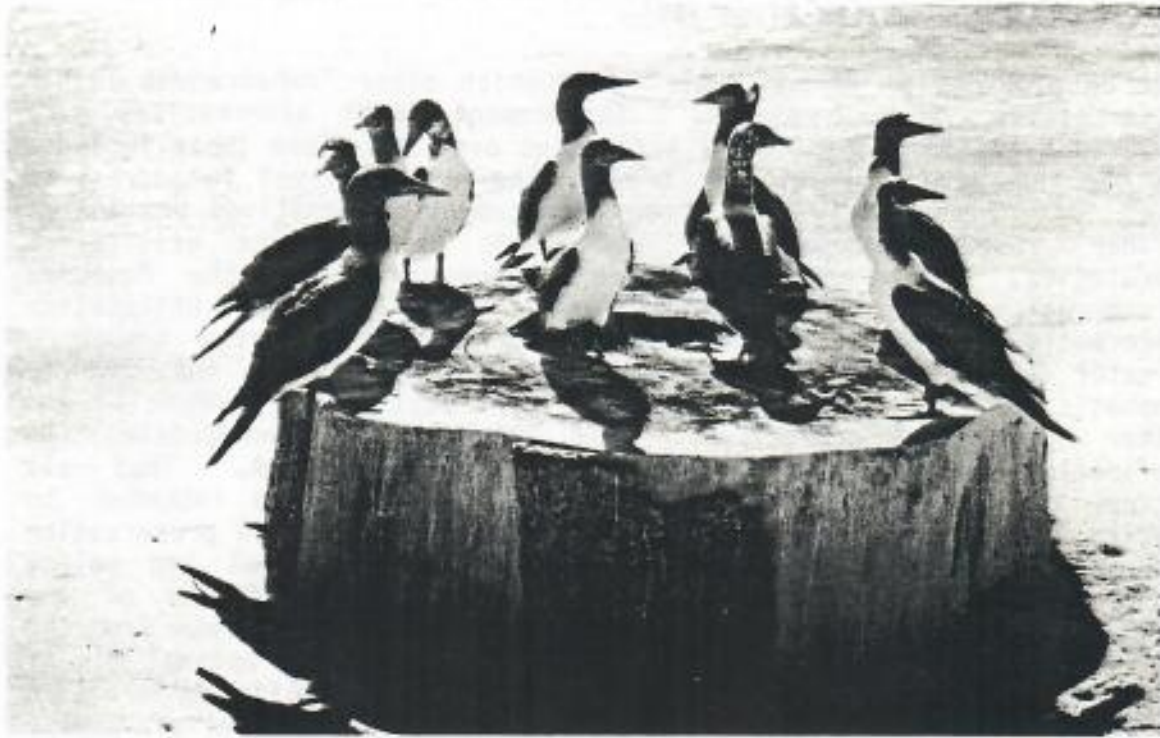
In addition to addressing potential conflicts between commercial fishing and wildlife, Tripartite study results are also applicable to other human activities within the HINWR. One major area of activity in which FWS has been a direct participant is research. The FWS has operated a biological field station on Tern Island since July, 1979, when the U.S. Coast Guard decommissioned its LORAN navigational station. Operation of the Tern Island station has been essential to carrying out high priority objectives for threatened and endangered species, seabirds and other wildlife resources. However, wildlife research and monitoring efforts have required additional, non-FWS personnel to be stationed on Tern Island often for weeks on end. The continuous presence of researchers with ready access to seabird nesting colonies, monk seal pupping beaches or green turtle breeding areas carries with it the ever-present danger of direct disturbance to wildlife or introduction of exotic pest organisms. The issue is one of human access, and the increased probability of disruption to fragile ecosystems with increased access.

The human access issue is also raised in addressing demands for on-site wildlife photography, interpretive activities and environmental education. Given the clear need to enhance public awareness of the resources and the resource issues of the NWHI, it is perhaps ironic that "bringing the public to the resource" has the potential to jeopardize the future existence of that resource.

While human presence in the NWHI has been viewed in light of potential conflicts with wildlife needs, that presence has also benefitted wildlife. The operation of the FWS biological field station on Tern Island contributes directly to the accomplishment of recovery objectives for threatened and endangered species, and plays an integral role in the implementation of key wildlife preservation strategies in the HINWR. Over the last five years the Tern Island facility has also played an incidental but vital role in providing emergency logistical support to the fishing industry in the form of aircraft transport of parts and people, emergency medical evacuation and equipment repairs and radio communications, all of which have facilitated the economic growth of the

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Juvenile masked boobies (*Sula dactylatra*).

NWHI fishery. The relationship has been reciprocal, as fishing vessels have also provided substantial assistance to the FWS in the transport of supplies and staff/research personnel to and from Tern Island.

Thus, in developing management alternatives, the FWS has been required to consider a broad range of demands for human utilization of the resources, while planning for the protection and preservation of those same resources. The result is an array of management alternatives that attempts to strike an objective balance between resource needs and resource demands.

#### D. Alternatives and Their Consequences

Management alternatives were developed by first describing management of the HINWR as it presently exists in order to provide a reference point to compare and evaluate other alternatives under consideration. This description is referred to as the No Action Alternative ("No Action" being defined as "no change"). Recognizing that current management falls short of meeting desired Refuge objectives (due primarily to insufficient human and financial resources) the next task consisted of establishing minimum requirements or "must do" management strategies which address each of the Refuge objectives at what is



considered the minimum level necessary to fulfill legal and policy mandates. Collectively, this set of "must do" strategies became known as the "Baseline Alternative" (BA).

The BA provides a "ground floor" from which other "enhancement level" alternatives were developed. Enhancement level alternatives were created by defining additional strategies over and above those included in the BA, which would go beyond the minimum level in addressing each of the objectives. These enhancement alternatives emphasized either resource preservation strategies or resource utilization strategies, and were designated respectively as the Resource Preservation Alternative (RPA) and the Resource Utilization Alternative (RUA). The RPA contains strategies directed toward a greater degree of fish and wildlife protection. The RUA directs emphasis toward achieving educational, recreational, commercial and other public use objectives. The RPA and RUA incorporate, by definition, all of the strategies contained in the BA. Thus all three represent multiple-use alternatives that are intended to strike three different balance points between resource preservation and resource utilization needs, within identified legal and policy constraints. The FWS' Preferred Alternative (PA) consists of the must-do strategies in the BA plus a hybrid of strategies drawn from the RPA and RUA. It represents what the FWS considers the optimal mix of strategies for meeting statutory requirements for wildlife conservation while at the same time meeting demands for a reasonable level of public use. The alternatives are summarized in the chart on pages 0.10 and 0.11 according to the major categories of objectives discussed above.

The Preferred Alternative places strong emphasis on protecting and enhancing fish and wildlife values of the HINWR. Continuing efforts would go into research and management efforts intended to recover endangered and threatened species. Monitoring of wildlife populations and their habitats would continue to receive high priority. In addition to endangered and threatened species, seabirds would be the primary focus of attention, but endemic marine and terrestrial species would not be ignored, as changes in distribution and abundance of these species are key biological indicators of ecosystem perturbations.

While access to the Refuge would continue to be restricted through a permit system, human activity levels on and around the Refuge would likely increase beyond current levels. The continuing high priority efforts devoted to wildlife research and monitoring activities will mean the influx of greater numbers of researchers and agency staff personnel to Tern Island. Archaeologists and historians will be included in this influx, but their activities will be directed at studying the cultural resources on Nihoa and Necker Islands. Public use on the Refuge will also likely see increases over the next 10-20 years, as demand increases for directly experiencing the unique resources of the Refuge. While the Preferred Alternative would seek to enhance public awareness of Refuge

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## Summary

THE FOLLOWING IS A SUMMARY OF THE STRATEGIES ASSOCIATED WITH THE NO ACTION ALTERNATIVE (NAA) AND BASELINE ALTERNATIVE (BA). BY DEFINITION THE NAA REPRESENTS REFUGE MANAGEMENT AS IT PRESENTLY EXISTS. THE BA, WHICH BUILDS UPON AND FULLY INCORPORATES THE NAA REPRESENTS A LEVEL OF ACTIVITY NECESSARY TO MINIMALLY SATISFY REFUGE OBJECTIVES. TOGETHER THE NAA AND BA PROVIDE A FOUNDATION FOR THE ENHANCEMENT STRATEGIES ON THE NEXT PAGE. ALL OF THE STRATEGIES LISTED BELOW ARE INCLUDED IN THE NAA EXCEPT WHERE FOOTNOTED.

### NO ACTION ALTERNATIVE AND BASELINE ALTERNATIVE

#### VULNERABLE SPECIES:

Implement high priority research and management tasks in recovery plans.<sup>1</sup>

Monitor populations and habitats.<sup>1</sup>

Prevent/monitor/control harmful exotics.<sup>1</sup>

Restrict access to islands/atolls.

Enhance public awareness.

Identify/protect candidate and sensitive species.

#### ENVIRONMENT:

Conduct archaeological survey; nominate sites to State and National registers.

Nominate emergent lands for wilderness status.<sup>2</sup>

Evaluate Marine Sanctuary status for HIRAR.<sup>2</sup>

Provide research opportunity consistent with Research Natural Area (RNA) criteria.

Seek resolution of boundary dispute.

Pursue overlay IWR status for Midway Atoll.

#### OTHER FISH AND WILDLIFE:

Monitor seabird/other migratory bird populations.

Restrict access to seabird colonies.

Develop/implement oil spill contingency plans.

Prevent/monitor/control harmful exotics.<sup>1</sup>

Enhance public awareness.

#### SCIENTIFIC AND PROFESSIONAL SERVICES:

Utilize field camps/annual boat surveys to monitor populations and habitat.

Produce/distribute research publications.

Monitor human activities and effects.

Provide logistical support for monitoring activities at Tern Island and throughout the Refuge.

#### EDUCATION/INTERPRETATION:

Develop off-refuge exhibits and programs, particularly at Kilaeua Point on Kauai.

Develop/assist in publications and audio-visual materials.

Develop curriculum materials for school system.<sup>2</sup>

Encourage off-site photography, journalism and art (P/J/A) activities.<sup>2</sup>

Develop educational/interpretive materials for Midway and Kure personnel.<sup>2</sup>

#### OTHER PUBLIC USES:

Provide recreational opportunity for authorized personnel at Tern Island.

Provide logistical support for NWHI commercial fishery operations (including use of existing emergency mooring buoy).

Monitor logistical support activities for effect on fish and wildlife.

<sup>1</sup> Strategy included in NAA and expanded or enhanced in BA.

<sup>2</sup> Strategy not included in NAA but included in BA.

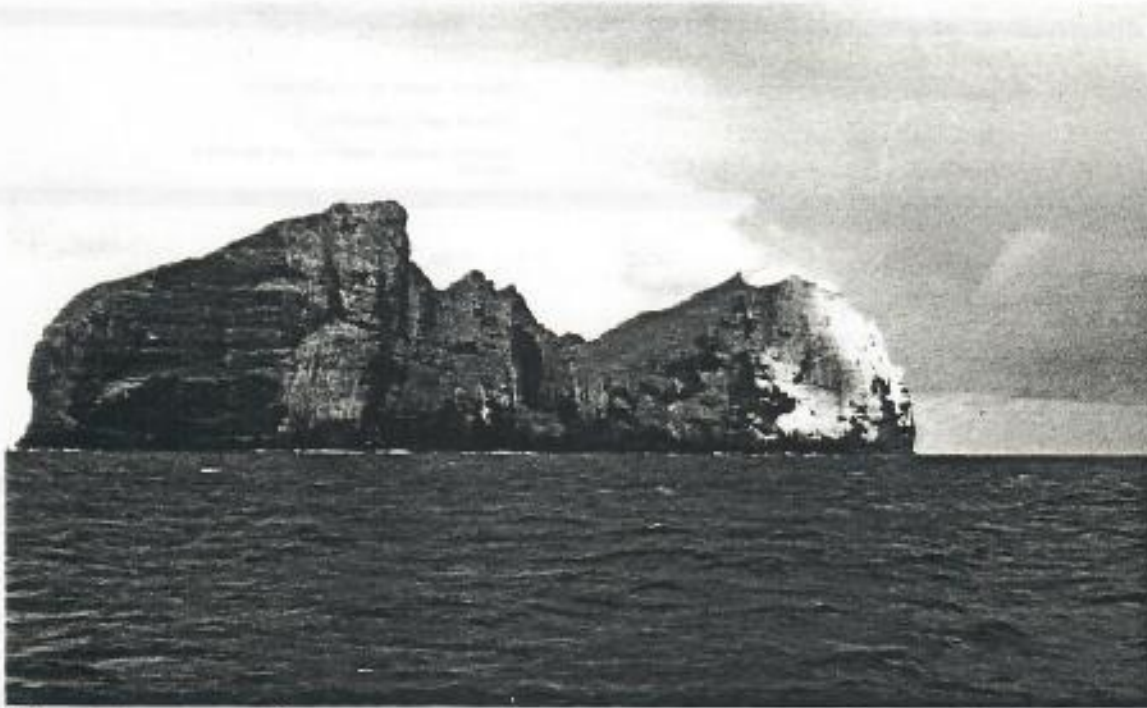


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## Summary

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resources primarily through off-site activities, limited, supervised on-site opportunities would also be provided as feasible to accommodate wildlife photographers, wildlife journalists or wildlife enthusiasts interested in nature tours.



**Nihoa Island, a 900' high island at the southeast end of the Refuge.**

The PA would support the State's current proposal to moor a mothership at French Frigate Shoals, just outside the Refuge boundary. The mothership would provide a support base for a fleet of ten catcher vessels which would fish for several commercially important fish and shellfish species. Under the PA, the FWS would continue to provide emergency logistical support to the multi-species fishery, at a level similar to the support currently provided by the refuge staff.

With the increases in levels of human activity in and around the HINWR, the risks to wildlife resources will also increase. To reduce those risks to an acceptable level, the FWS will place increased emphasis on ensuring that all research and staff personnel take adequate precautions to ensure they are not unwitting carriers of exotic organisms which could devastate native floral and faunal communities. Increased efforts will also be directed toward regulating and monitoring nearshore vessel traffic to minimize the risks of accidental groundings, oil spills or spills of hazardous materials. Finally, the PA calls for the FWS to develop procedures for carefully monitoring research activities, the commercial fishing industry, nature tours and other human activities for possible adverse effects on wildlife.

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## Summary

EACH OF THE THREE ALTERNATIVES LISTED BELOW BUILDS UPON THE NO ACTION AND BASELINE ALTERNATIVES DESCRIBED ON THE PRECEDING PAGE. THE RESOURCE PRESERVATION ALTERNATIVE (RPA) CONTAINS STRATEGIES DIRECTED TOWARDS A GREATER DEGREE OF FISH AND WILDLIFE PROTECTION. THE RESOURCE UTILIZATION ALTERNATIVE (RUA) EMPHASIS TOWARD ACHIEVING EDUCATIONAL, RECREATIONAL, COMMERCIAL AND OTHER PUBLIC USE OBJECTIVES. THE PREFERRED ALTERNATIVE (PA) IS A HYBRID OF STRATEGIES DRAWN FROM THE RPA AND RUA AND REPRESENTS THE FWS' RECOMMENDED ACTION.

RESOURCE PRESERVATION ALTERNATIVE (RPA)	PREFERRED ALTERNATIVE (PA)	RESOURCE UTILIZATION ALTERNATIVE (RUA)
<p>Regulate and monitor nearshore vessel traffic.</p> <p>Conduct lower priority research and management action in recovery plans.</p> <p>Evaluate/establish additional populations of endemic land birds.</p>	<p>Monitor impacts of commercial fishery on listed species.</p>	<p>Monitor nearshore vessel traffic.</p> <p>Conduct limited additional research as in recovery plans.</p>
<p>Designate/support designation of critical habitat for threatened/endangered species.</p> <p>Evaluate/nominate HINER as World Heritage Site / Biosphere Reserve / Natural Landmark.</p>	<p>Nominate HINER lands. Evaluate and, if appropriate, nominate waters.</p>	
<p>Nominate HINER lands/waters to Wilderness System.</p> <p>Conduct historical survey; nominate sites to State/National registers.</p>	<p>Permit limited access to cultural sites for religious purposes.</p>	
<p>Monitor and control disease in resident seabird populations.</p> <p>Regulate and monitor nearshore vessel traffic.</p> <p>Monitor distribution and abundance of native terrestrial species.</p> <p>Map and ground truth terrestrial and marine ecosystems.</p>	<p>Monitor the effects of the commercial fishery and other human activities on "other fish and wildlife."</p>	
<p>Conduct annual aerial photo survey.</p> <p>Conduct extended field camps and/or semi-annual boat surveys.</p> <p>Conduct cooperative monitoring studies on Midway and Laysan.</p>	<p>Conduct biannual aerial photo surveys of HINER islands and atolls.</p>	
	<p>Conduct limited nature tours/environmental education at Tern Island.</p> <p>Facilitate limited, supervised photography, journalism and art visits to the HINER.</p>	
<p>Regulate and monitor nearshore vessel traffic.</p> <p>Cooperate/assist in installation of a mooring buoy outside HINER boundary at French Frigate Shoals.</p>		<p>Monitor nearshore vessel traffic.</p> <p>Permit use of existing emergency mooring buoy within HINER boundary for multi-species fishery.</p> <p>Provide recreation, storage and emergency use of Tern Island in support of a multi-species fishery.</p>

## Summary

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The basic concept would involve the development of monitoring systems sufficiently sensitive to detect at an early stage any harmful disruptions to the ecosystem. Corrective actions would be implemented quickly through the full cooperation of federal and state government agencies and private parties. The PA would seek to create a level of public and private sector cooperation to successfully implement this alternative.

Implementation of the PA will not be realized without a significant price tag. It is estimated that annual operation and maintenance costs of the PA could double current O&M costs of \$305,000. The cost increase reflects primarily the increased research and education initiatives contained in the PA. Cost-sharing arrangements for the operation of the Tern Island facility can reduce the government expense, as can the role of mothership-supported fishing vessels willing to facilitate Refuge research projects. The FWS has concluded that the PA is, on the whole, superior to any of the other alternatives considered. The PA is therefore the recommended course of action which the FWS will seek to implement over the 10-20 year time frame of this Master Plan/EIS.



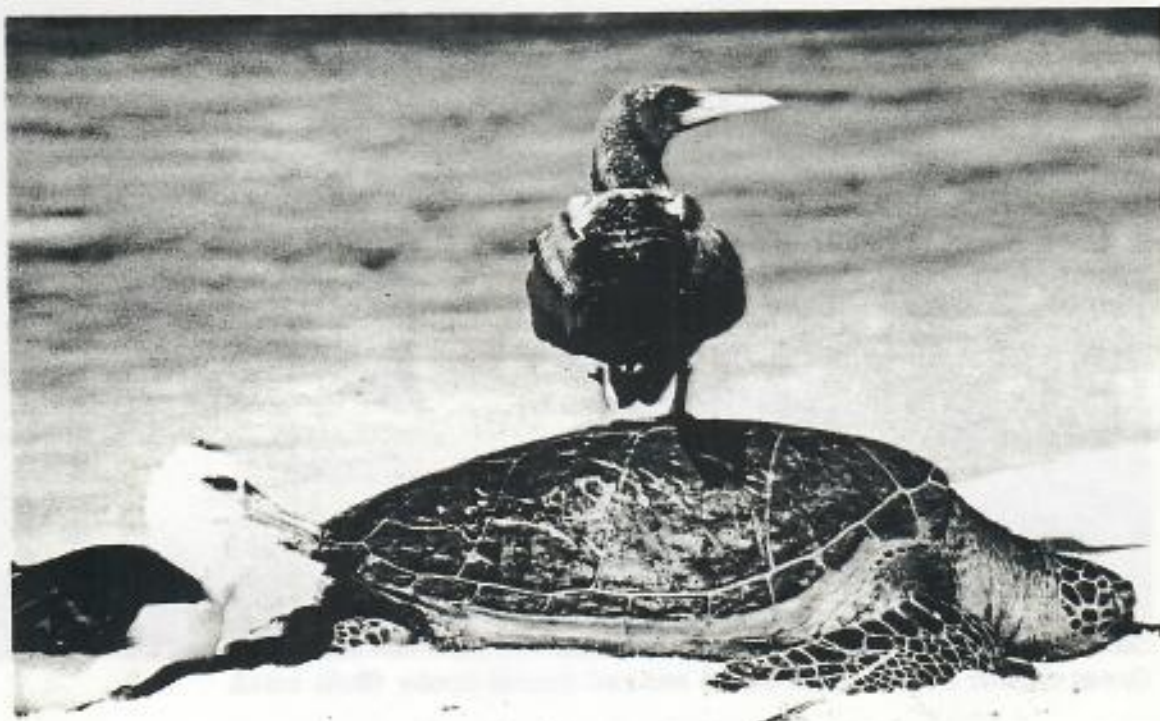
**PURPOSE AND NEED**



## Purpose and Need

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The Hawaiian Islands National Wildlife Refuge (HINWR) is faced today with a number of complex challenges - closer public scrutiny of management philosophies; the desire for citizen participation in the decision-making process; the need for increased citizen understanding of wildlife resources; and potential conflicts between wildlife needs and other resource demands. These challenges, along with new compliance regulations, legal mandates, changes in U.S. Fish and Wildlife Service (FWS) policies and a growing concern for the environment, have served to make the HINWR increasingly visible, and management of the Refuge increasingly controversial.



**Sharing the habitat at French Frigate Shoals (Laysan albatross, masked booby, and green sea turtle).**

In view of these challenges, there is clearly a need for a consistent and documentable method of determining how the resources of the HINWR can best be used and managed over time. Master planning provides that method. Master planning is a comprehensive system of land use planning that provides long-range guidance for the management, utilization, growth and development of the HINWR and its resources.

Integral to that process is full public involvement in the development of management options (alternatives) to address Refuge objectives. The alternatives, and their associated consequences on the physical, biological and social environment, are disclosed in this document in

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## Purpose and Need

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compliance with the National Environmental Policy Act (NEPA) of 1969. Therefore, the resulting document has been designated a Master Plan/Environmental Impact Statement (EIS).

The underlying purpose for preparing a Master Plan/EIS for the HINWR is to facilitate efficient management of refuge wildlife resources so that those resources are protected and enhanced for the public benefit. Consistent with that purpose, the alternatives presented in this document are aimed at promoting management of refuge resources in a manner that will allow for both their wise utilization and perpetuation.



Great frigate bird (*fregata minor*) and red footed booby (*Sula sula*).

While this Master Plan/EIS is responsive to the challenges outlined above, perhaps the one area where the master planning process is most beneficial is in conflict resolution. The Northwestern Hawaiian Islands (NWHI) have been the scene of varying conflicts between resource preservation and resource utilization over at least the past 200 years. European sailing ships made the earliest commercial excursions into the NWHI in the late 18th and 19th centuries, taking seals, whales, fish, turtles, sharks, birds, pearl oysters and sea cucumbers. Guano deposits, discovered in the mid-1800's, led to commercial mining of guano. In the early 1900's Japanese vessels entered the NWHI to harvest bird skins and feathers. It was this activity which ultimately led to designation of the Hawaiian Island Reservation in 1909 as a "... preserve and breeding ground for native birds ..." making it "... unlawful for any person to hunt, trap, capture, willfully disturb or kill any bird of any kind whatever, or take the eggs of such birds ..."

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## Purpose and Need

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More recently, potential wildlife conflicts have arisen as demands have increased to harvest the fishery resources of the NWHI. The drive to diversify the Hawaiian economy - thereby lessening the State's dependence on tourism - has stimulated strong interest in expanding the commercial fishing industry. With fishery stocks off the main Hawaiian Islands already sustaining heavy fishing pressure, the State has looked to the NWHI as the most promising area for expansion. Unharvested stocks of tuna, bottom fish, lobster, shrimp, and baitfish are believed to offer potential for significantly boosting commercial fish landings.

However, commercial fishing also has the potential for conflicting with wildlife needs. For example, commercial harvest of baitfish could put fishermen in direct competition with seabirds, which utilize surface shoaling fishes as a primary food source. Additionally, commercial fishing could attract more boats to the NWHI, thereby increasing the potential of inadvertent introduction of harmful exotics to the fragile ecosystem as well as increasing the probability of disturbance and harassment to wildlife.

To assess the scope and magnitude of such potential conflicts, the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the State of Hawaii Department of Land and Natural Resources, signed a Tripartite Cooperative Research Agreement in May, 1978. (The University of Hawaii Sea Grant College became a fourth party to the Agreement a year later.) The Agreement initiated a 5-year research effort which has generated a tremendous amount of baseline population data on the wildlife resources of the NWHI. These data have been instrumental in assisting the FWS in exploring various alternatives that strike an objective balance between resource preservation needs and utilization of Refuge resources, including commercial fishing.

Commercial fishing is not the only activity which presents potential conflicts with resource preservation. Wildlife research and monitoring efforts often require researchers to be present on site for extended periods with associated hazards of wildlife disturbance. The increasing demand for interpretive and educational tours to the HINWR presents a similar danger. Because any human activity has the potential for adversely impacting wildlife, the FWS has been deliberately conservative over the years in restricting access to the HINWR. The issue of access was in fact a primary consideration throughout the master planning process and is directly reflected in the make-up of the alternatives.

Commercial fishing, research and monitoring activities, and interpretive and educational tours are but a few examples of the activities assessed in this document. The sections which follow cover the full range of current and potential public demands on Refuge resources. The material is intended to provide the reader with an informed basis for evaluating

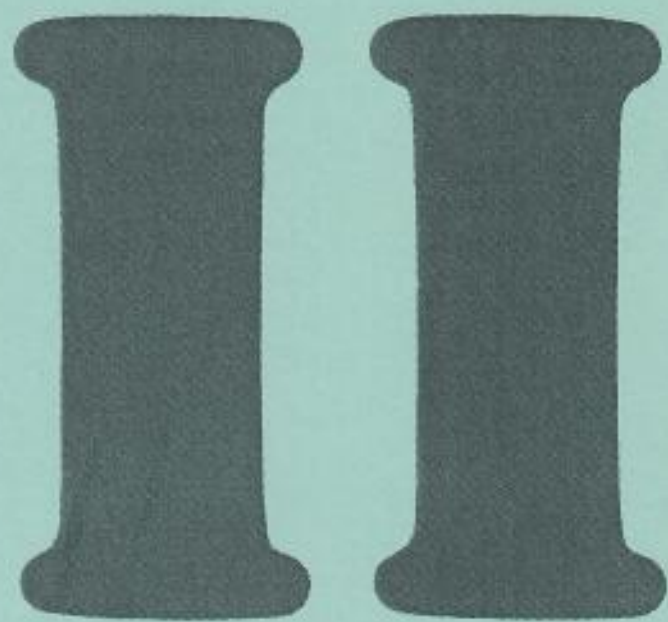
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Monk seal (*Monachus schauinslandi*) lying in net fragments at Kure Island.

the array of management alternatives presented in the document. It is also intended to provide insight to the thought processes used to address some extremely complex resource management issues, where conflict resolution is essential if the resource base is to be perpetuated for the use and enjoyment of the public. The planning process presented in this Master Plan/EIS attempts to establish a rational framework for an objective examination of the underlying issues.





**PLANNING PROCESS**

**A. Introduction**

The Tripartite Cooperative Agreement identified the need for rational management of fish and wildlife resources of the Northwestern Hawaiian Islands (NWHI), based upon the best available scientific data. Mutual efforts of various agencies and institutions participating in this Agreement made available a wealth of new information, building upon a base of data gathered over the last half century. While the study was ongoing 1) state and industry representatives were developing plans and proposals for commercial utilization of fishery resources; 2) agencies were proposing additional measures to protect threatened and endangered species; 3) plans for future research were developing; and 4) the U.S. Fish and Wildlife Service (FWS) which continued to occupy Tern Island, initiated short-term planning for operation of the facility.

Collectively, this flurry of planning activity underlined the need to develop consistent long-term direction for the management of lands, waters and wildlife resources under FWS jurisdiction. The multiplicity of interests, the conflicting demands of involved parties and the large body of resource information upon which to draw, made it appropriate for the FWS to utilize a planning process that would be directly relevant to a national wildlife refuge, geared to maximize public involvement and based upon a method proven in the real world.

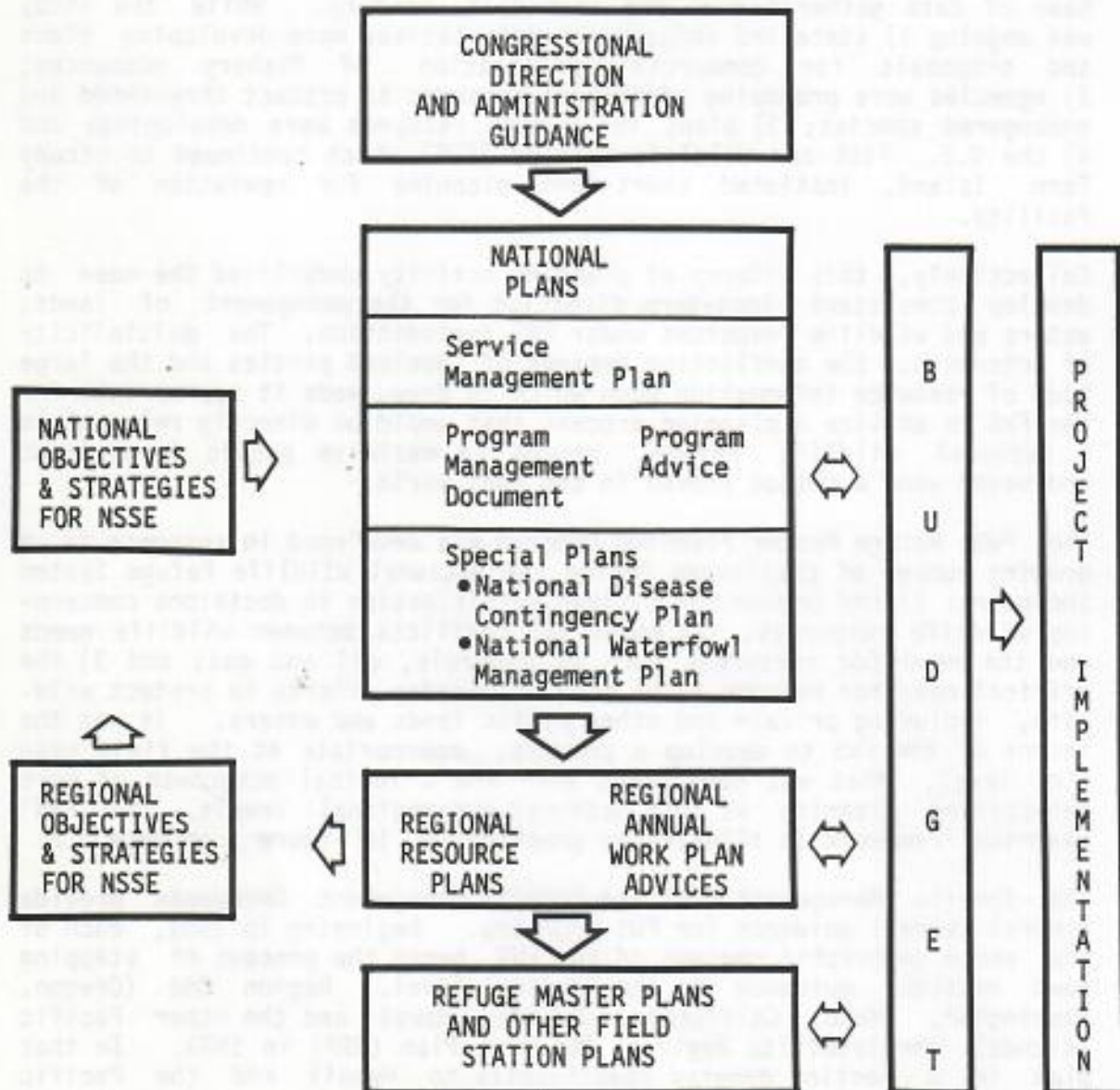
The FWS Refuge Master Planning Program was developed in response to a growing number of challenges facing the National Wildlife Refuge System including: 1) the demand for citizen participation in decisions concerning wildlife resources; 2) potential conflicts between wildlife needs and the need for resources such as minerals, oil and gas; and 3) the critical need for refuges to be part of broader efforts to protect wildlife, including private and other public lands and waters. It was the intent of the FWS to develop a process, appropriate at the field station level, that was consistent with and a logical outgrowth of more generalized planning at both national and regional levels. The FWS' planning framework is illustrated graphically in Figure 1 on page 2.2.

The Service Management Plan and Program Management Documents provide general overall guidance for FWS programs. Beginning in 1981, each of the seven geographic regions of the FWS began the process of stepping down national guidance to the Regional level. Region One (Oregon, Washington, Idaho, California, Nevada, Hawaii and the other Pacific Islands) completed its Regional Resource Plan (RRP) in 1983. In that plan is a section devoted specifically to Hawaii and the Pacific Islands under U.S. jurisdiction. This plan provides guidance oriented specifically to fish and wildlife resource needs, problems and opportunities in the Pacific.



Figure 1

U.S. FISH AND WILDLIFE SERVICE PLANNING FRAMEWORK



Within the vast geographic area covered by the Pacific section of the Region One RRP are a dozen national wildlife refuges, all included within the Hawaiian and Pacific Islands NWR Complex. This Complex, managed from manned facilities on Oahu, Kauai and Tern Island, includes five wetland NWRs, an interpretive site in the main Hawaiian Islands and six remote island NWRs. Within the latter group is the oldest and largest of the NWRs in the Complex, the Hawaiian Islands NWR. When added together, all units in the Complex include approximately 5,435 acres of exposed land and 350,783 acres of submerged lands. Of this total, the Hawaiian Islands NWR accounts for about 71% (1,740 acres exposed land, 252,678 acres submerged lands).

#### B. Master Planning Process

It is the intent of the FWS that general direction found in the Service Management Plan and various RRP's be further stepped down to master plans developed for specific FWS lands and waters. The major objectives of refuge master planning are to:

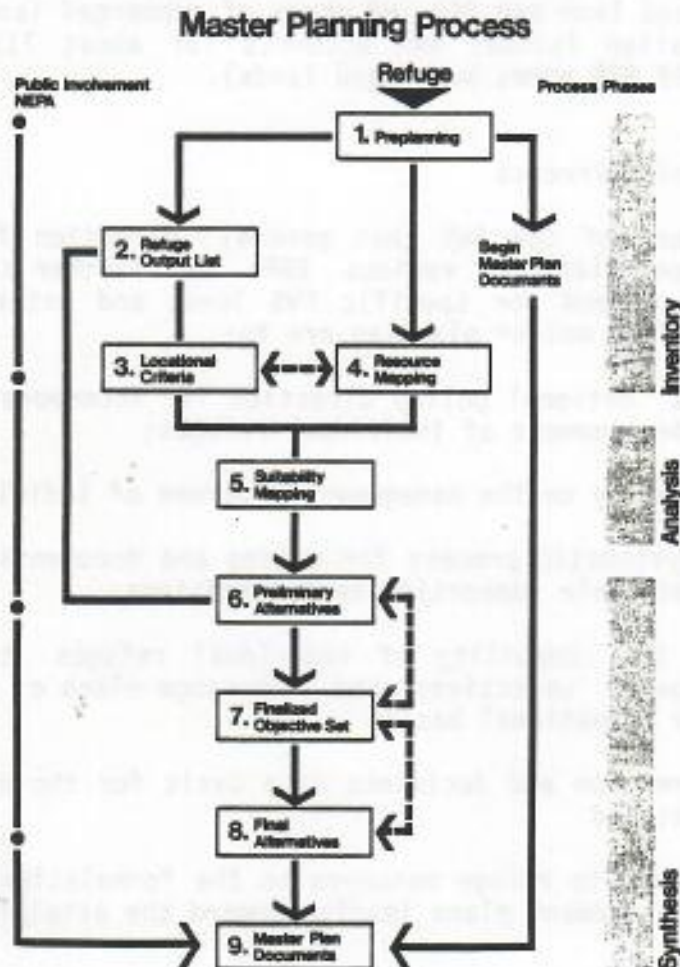
- 1) ensure that national policy direction is incorporated into the management and development of individual refuges;
- 2) provide continuity to the management programs of individual refuges;
- 3) provide a systematic process for making and documenting decisions, including the rationale supporting those decisions;
- 4) determine the capability of individual refuges to assist in meeting the goals, objectives and long-range plans of the FWS on a regional, flyway or national basis;
- 5) produce information and decisions as a basis for the development of budget documents; and
- 6) provide guidance to refuge managers in the formulation of short-term and mid-term management plans leading toward the attainment of refuge objectives.

The master planning process has been standardized through the development of a Master Planning Workbook and through subsequent review and refinement of procedures at national and regional levels. The process incorporates a series of nine separate steps, grouped into three planning phases. The process begins with an inventory of existing resources. The second phase is an analysis of the capability of the resources to support future land uses. The final phase is a synthesis of data and objectives into a plan to meet present and future needs. For each individual refuge, the process must be adapted somewhat to meet the



specific requirements of the location and resources involved. The process, as adapted for use in the HINWR, is described in more detail within Section V of this report. The national master planning process is illustrated below in Figure 2.

Figure 2



### C. Public Involvement/NEPA Compliance

As illustrated in Figure 2, the master planning process incorporates both public involvement and environmental review components, designed to ensure that the final products are responsive to public concerns and to ensure compliance with the National Environmental Policy Act of 1969. The decision whether to proceed directly to the preparation of an

Environmental Impact Statement (EIS) or to first prepare an Environmental Assessment (EA) is made early in the master planning process and is dependent upon the degree of controversy and the anticipated significance of planning decisions. In the case of the HINWR Master Plan, the FWS elected to produce an EIS in view of the long history of public and interagency involvement in NWHI issues and because of the significant influence that master planning decisions would have on the conservation and utilization of this controversial Refuge. The EIS process is designed to provide an opportunity for public scrutiny and to solicit comments from the public, including those other government agencies having expertise and responsibilities in the areas of concern. Most importantly, the EIS process concentrates attention on the issues that are most significant.

In the case of the HINWR Master Plan, the FWS also decided to "hybridize" the plan and associated EIS into one document. This decision has made it possible to consolidate a large volume of information into one document, with appendices, that minimizes redundancy while addressing the most significant issues. The Master Plan/EIS has been organized and formatted in a way that fully satisfies the requirements of the Master Planning Workbook while complying with legal standards for preparation of a federal EIS. In sum, this document is both a master plan for the HINWR and an EIS concerning the implementation of the recommendations in the plan. The purpose of the document, therefore, is to 1) provide guidance for the management, development and use of the HINWR; and 2) incorporate public involvement in decisions concerning the HINWR, as required by federal law and FWS policy.

Public involvement in the HINWR master planning process has taken many forms. Beginning with formal announcement of the master plan at the Tripartite Symposium in May, 1983, the FWS has embarked on a program of public involvement designed to reach the broad spectrum of interests who share in their concern regarding the wise management of HINWR resources. The program has sought to obtain meaningful input and guidance from the public through a variety of methods. To date, this process has included the following:

- 1) News releases (beginning June 1983)
- 2) Notice of Intent to prepare an EIS on the HINWR Master Plan (Federal Register, August 2, 1983)
- 3) Newsletters called "Planning Updates" with requests for input (July and October of 1983 and March and August of 1984)



- 4) Newspaper announcements and treatment of issues (Honolulu Star-Bulletin, Hawaii Fishing News, West Hawaii Today, Los Angeles Times)
- 5) Radio spots
- 6) Presentations for and/or coordination with special interest groups or involved agencies (Western Pacific Regional Fishery Management Council, Hawaii Fisheries Coordinating Council, Honolulu City Council, Hawaii Department of Land and Natural Resources, Hawaii Audubon Society, Sierra Club, National Audubon Society)
- 7) State Clearinghouse Review process
- 8) Public Workshop concerning preliminary alternatives (March 20, 1984 - Honolulu)
- 9) Distribution of the Draft Master Plan/EIS (August 1984)
- 10) Public workshop concerning the Draft Master Plan/EIS (September 12, 1984)
- 11) Distribution of the Final Master Plan/EIS (May 30, 1986)

Of the various forms of public involvement undertaken to date, the newsletters and workshop have yielded the information most relevant to the planning process. The first Planning Update was distributed in July 1983 to a mailing list of 357 individuals, agencies and organizations. An additional 113 newsletters were distributed upon request. Of this total of 470 recipients, 111 (23.6%) responded. The second Planning Update, distributed in October 1983, reached a mailing list of 498, but produced only 53 (10.6%) responses. The third Planning Update, distributed in March 1984, reached 484 on the mailing list. More than 75 additional copies were distributed at various meetings and in response to written requests. As of May 15, 1984, a total of 38 (7%) information request forms in the third Planning Update had been returned to the FWS. The fourth Planning Update which was distributed in August 1984 described the various management alternatives under consideration by the FWS; directed reviewers to locations where the Draft Master Plan/EIS was available for review; and publicized the September workshop. Collectively, the public response to the four Planning Updates has proven extremely useful in identifying issues of concern and in developing and refining planning outputs, objectives and management alternatives.

Turnout at a public workshop, held on March 20, 1984, was relatively small, despite considerable effort to publicize the workshop through the third Planning Update, newspapers, radio and posted announcements. Yet, we found the input provided by workshop participants to be extremely

useful in planning and refinement of management objectives and alternatives. Preliminary strategies were critically evaluated and rationale was presented to validate the process. In the process of developing the array of alternatives presented in this report, we drew heavily upon the transcript of this workshop. The second public workshop held on September 12, 1984 was attended by 41 participants, including commercial fishermen, environmentalists, members of the academic and research community, environmental educators, resource management students, and representatives from various state and federal resource management agencies. Overall the group as a whole was in basic agreement with strategies outlined in the Preferred Alternative. Numerous suggestions were made to refine, broaden, or clarify certain strategies within the FWS' proposal.

#### D. Report Format

The HINWR Master Plan/EIS provides guidance for the management, development and use of this Refuge through a 10-20 year planning period. It was formulated utilizing a wealth of historic information, the results of recent studies and planning efforts, and considerable public input. It conforms to national policy and legislative mandates affecting the management of units of the National Wildlife Refuge System. The Preferred Alternative within the Master Plan/EIS is built upon a mix of strategies that are subject to change in response to new information. It is designed to be adaptable as conditions require.

The Master Plan/EIS includes a description of the Refuge's physical, biological and social environment, a discussion of the authorities and policies affecting planning, objectives for wildlife and public use activities, an analysis of management alternatives considered, including the Preferred Alternative, and a comparative review of the environmental consequences associated with the alternatives.

To reduce the bulk and improve the readability of this document, some of the information developed in this planning process was organized in a Technical Appendix, (bound separately), which includes:

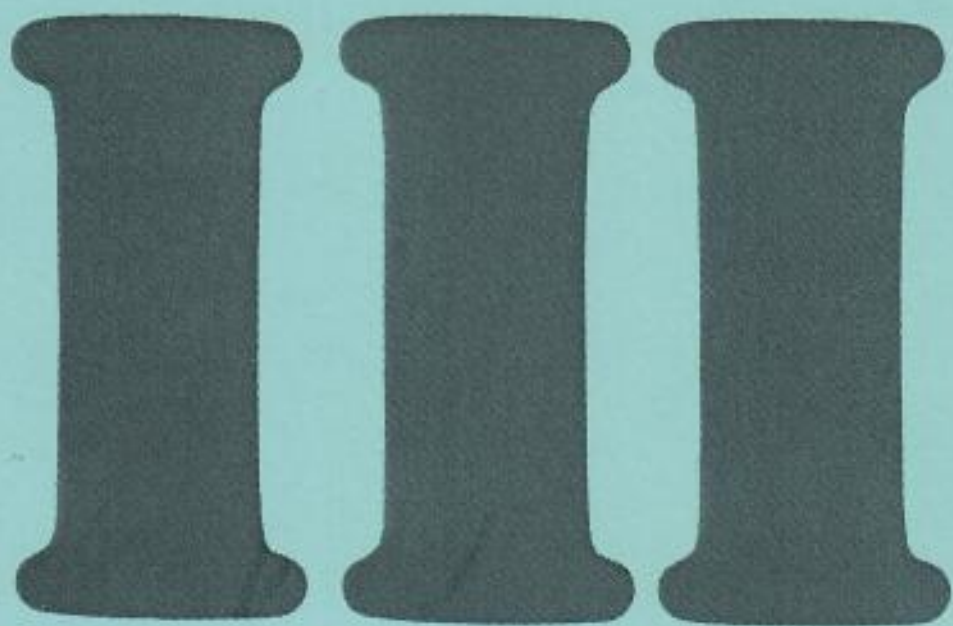
Locational Criteria - information which describes the resource conditions necessary for the production or maintenance of a given output (output defined as "things" produced on the refuge).

Output Summaries - information which provides the background and rationale for development of planning objectives.



**E. Operational/Management Planning**

It is the policy of the FWS to prepare management plans for refuges with approved master plans. As an extension of master planning, management planning is the process by which specific operational activities leading to achievement of refuge objectives are identified and described. Examples of management plans likely to be prepared for the HINWR include predator control, research, oil spill response, disease contingency, etc. Based on realistic expectations of station funding levels over a multi-year period, management planning defines specifically how objectives will be met and to what extent. By identifying in detail that part or parts of the master plan that can be reasonably implemented, the management plan forms the basis for annual work planning and annual budgeting. Management planning for the HINWR is expected to occur over a multi-year period following approval of the Master Plan/EIS.



**AFFECTED ENVIRONMENT**



**A. Physical Environment****1. Geology**

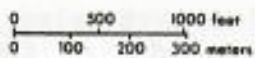
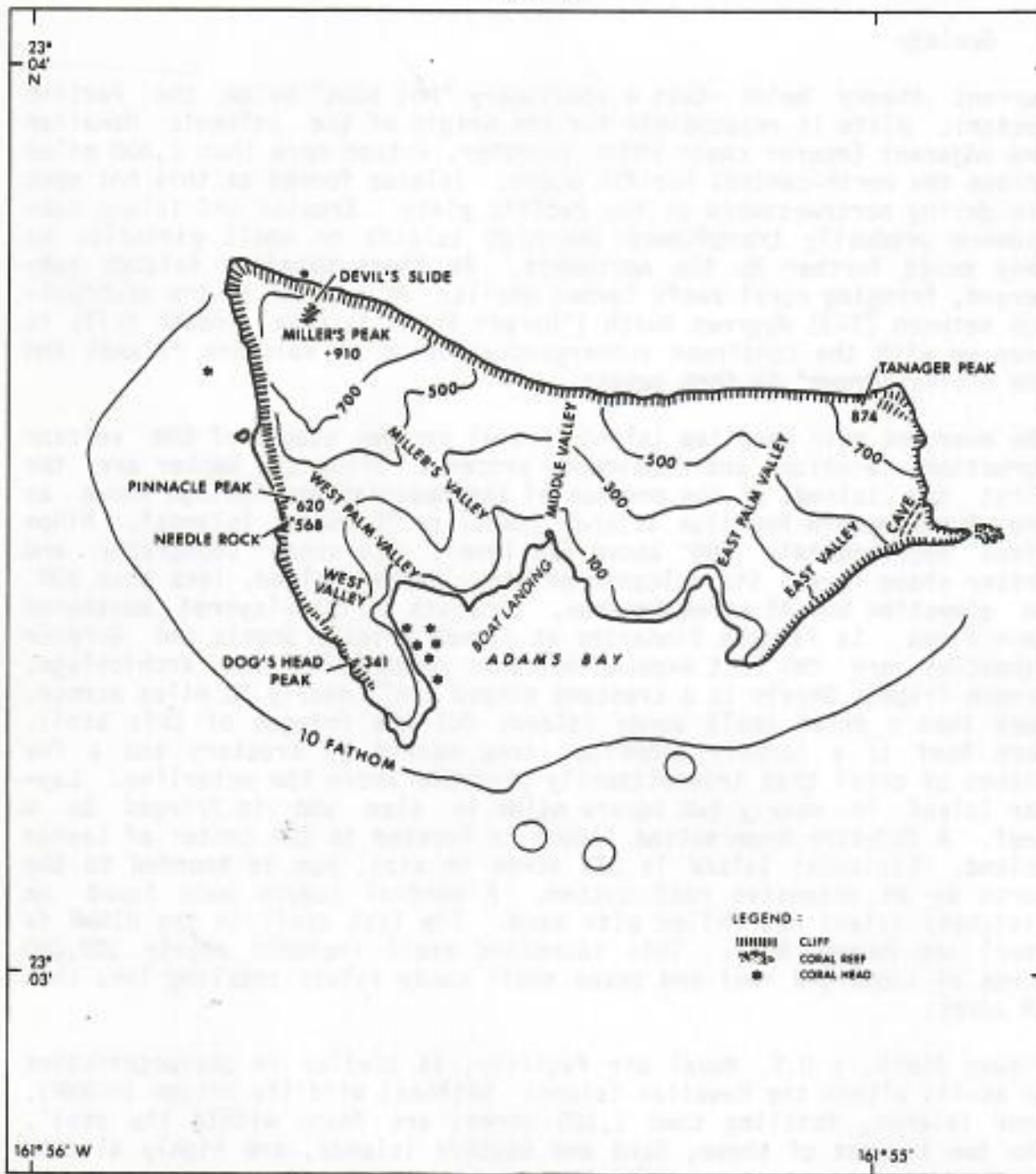
Current theory holds that a stationary "hot spot" below the Pacific tectonic plate is responsible for the origin of the volcanic Hawaiian and adjacent Emperor chain which together, extend more than 2,000 miles across the north-central Pacific Ocean. Islands formed at this hot spot are moving northwestward on the Pacific plate. Erosion and island subsidence gradually transformed the high islands to small pinnacles as they moved further to the northwest. As these basaltic islands submerged, fringing coral reefs formed atolls. At a point in the archipelago between 27-31 degrees North ("Darwin Point"), coral growth fails to keep up with the continued submergence/erosion of volcanic islands and the atolls "drown" to form guyots.

The emergent main Hawaiian Islands reveal various stages of the volcano formation, erosion and subsidence process. Nihoa and Necker are the first two islands of the portion of the Hawaiian archipelago known as the Northwestern Hawaiian Islands (NWHI) or "Leeward Islands". Nihoa rises approximately 900' above sea level. Its steep topography and crater shape reveal its volcanic origin. Necker Island, less than 300' in elevation and 46 acres in area, consists of thin-layered weathered lava flows. La Perouse Pinnacles at French Frigate Shoals and Gardner Pinnacles are the last exposed volcanic remnants in the archipelago. French Frigate Shoals is a crescent shaped atoll nearly 18 miles across. More than a dozen small sandy islands dot the fringes of this atoll. Maro Reef is a largely submerged area marked by breakers and a few pieces of coral that intermittently protrude above the waterline. Laysan Island is nearly two square miles in size and is fringed by a reef. A 200-acre hypersaline lagoon is located in the center of Laysan Island. Lisianski Island is 364 acres in size, but is bounded to the north by an extensive reef system. A central lagoon once found on Lisianski Island has filled with sand. The last atoll in the HINWR is Pearl and Hermes Reef. This inundated atoll includes nearly 100,000 acres of submerged reef and seven small sandy islets totaling less than 85 acres.

Midway Atoll, a U.S. Naval air facility, is similar in characteristics to atolls within the Hawaiian Islands National Wildlife Refuge (HINWR). Four islands, totaling some 1,100 acres, are found within the atoll. The two largest of these, Sand and Eastern islands, are highly altered by man.

Kure Atoll is the northernmost exposed land in the Hawaiian archipelago. Two islands, Green and Sand, are found on the southern edge of the atoll and are included in the Hawaii State Seabird Sanctuary System. Green Island has been altered considerably to also function as a Coast Guard LORAN station.

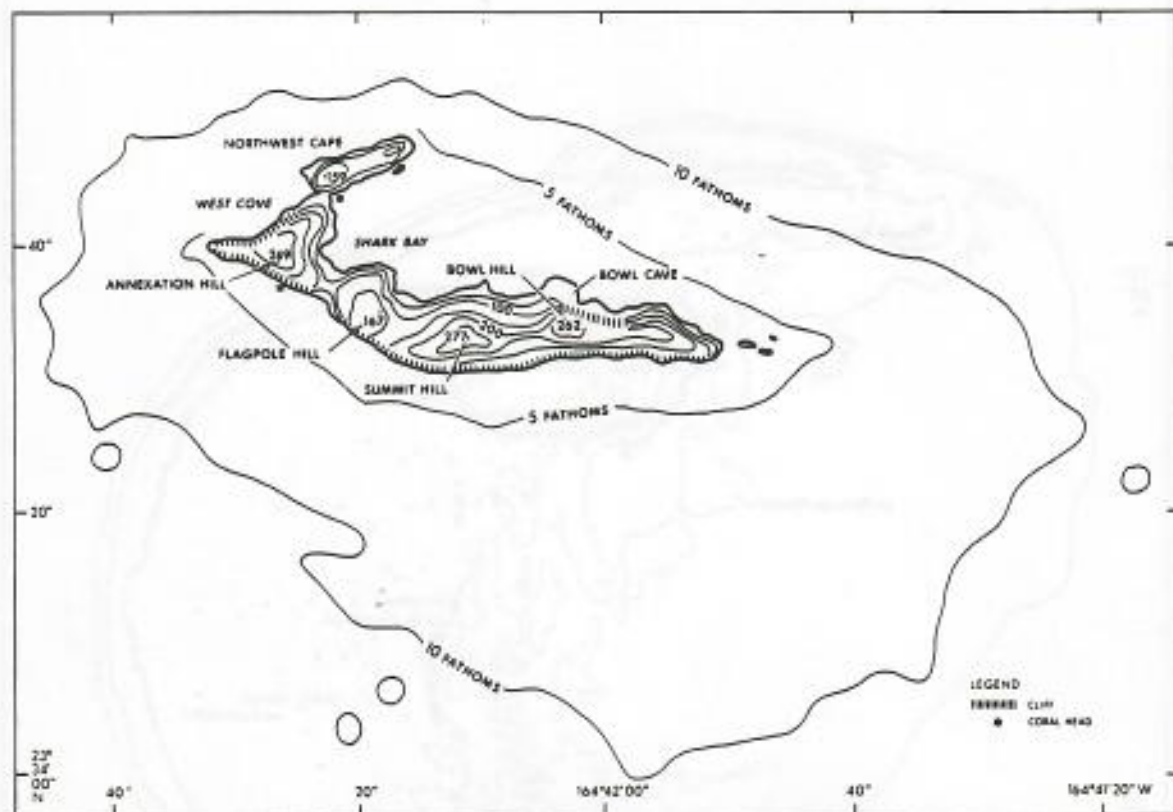
Map 2



HAWAIIAN ISLANDS  
 NATIONAL WILDLIFE REFUGE  
 NIHOA ISLAND  
 North Pacific Ocean

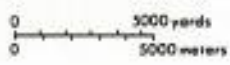
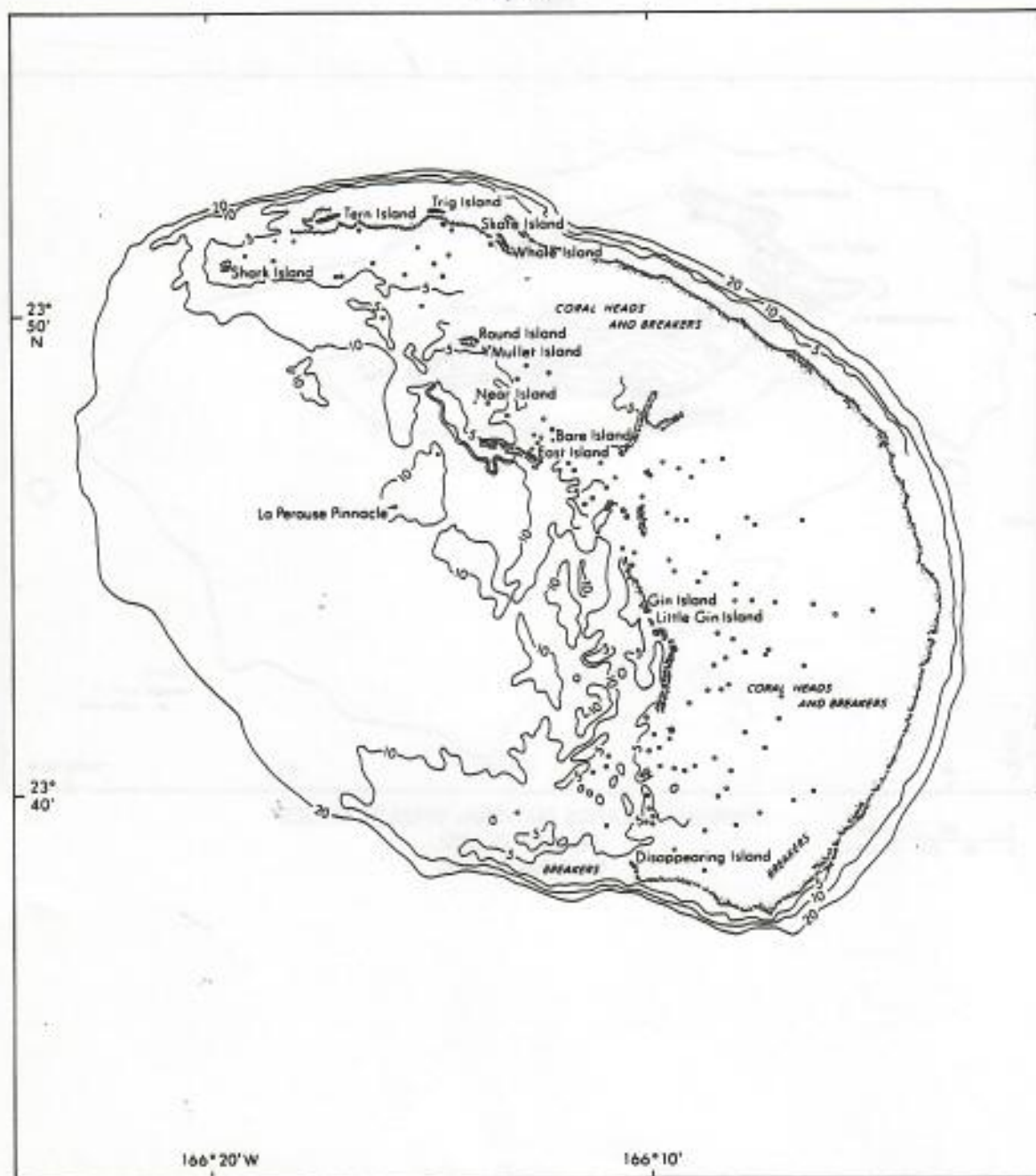


Map 3



HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE  
NECKER ISLAND  
North Pacific Ocean

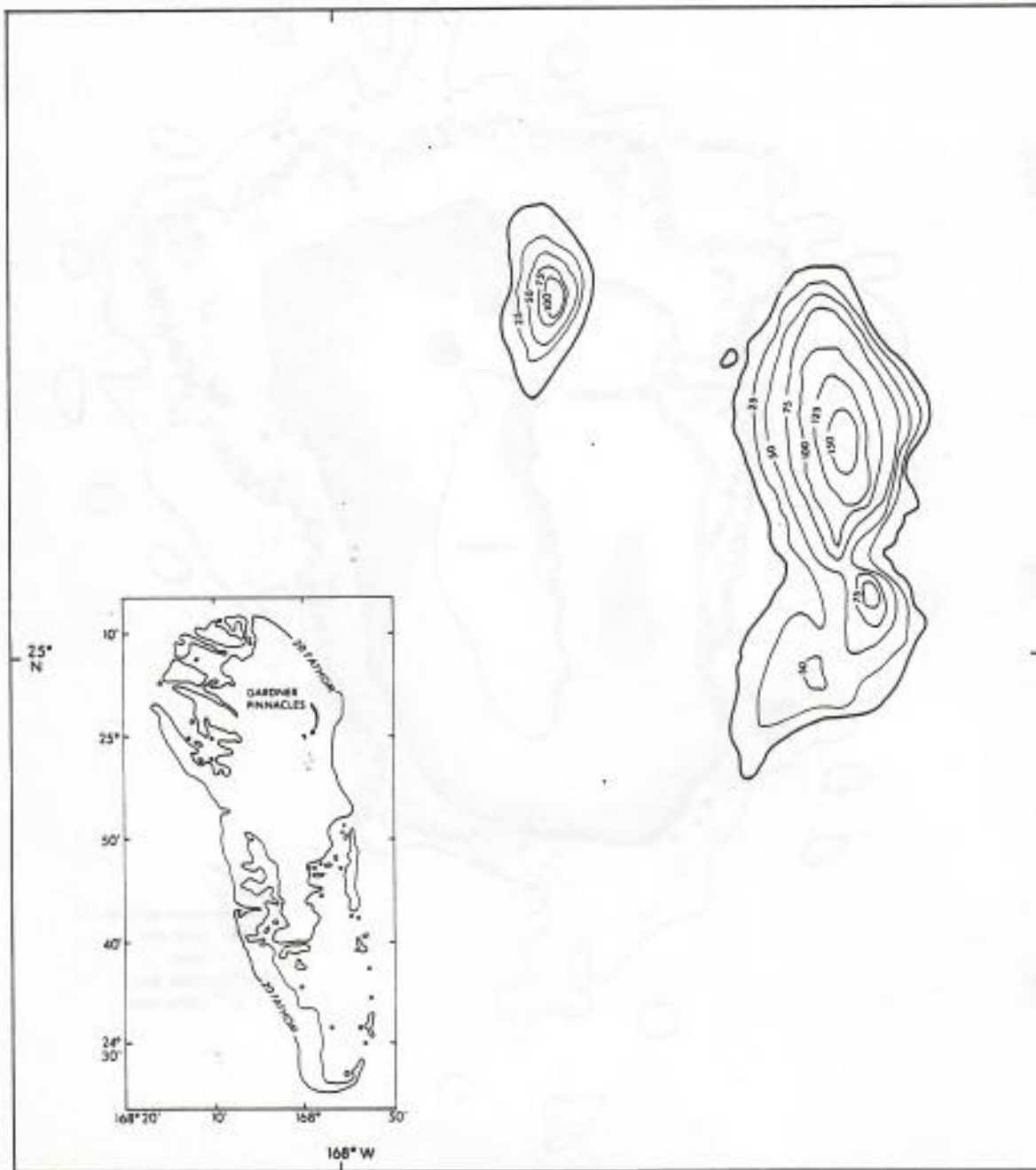
Map 4



HAWAIIAN ISLANDS  
NATIONAL WILDLIFE REFUGE  
FRENCH FRIGATE SHOALS  
North Pacific Ocean



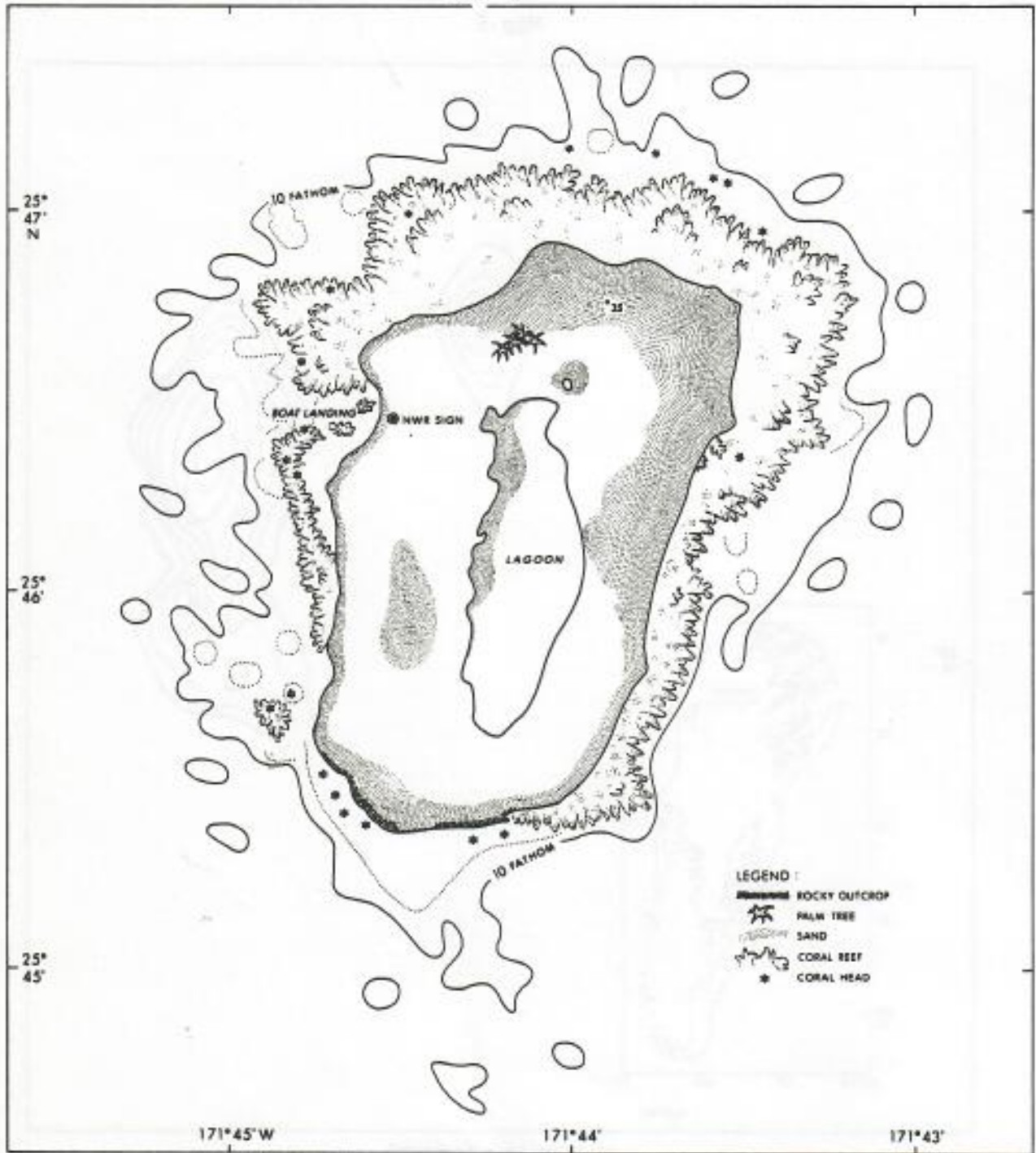
Map 5



0 100 200 feet  
0 50 meters

HAWAIIAN ISLANDS  
NATIONAL WILDLIFE REFUGE  
GARDNER PINNACLES  
North Pacific Ocean

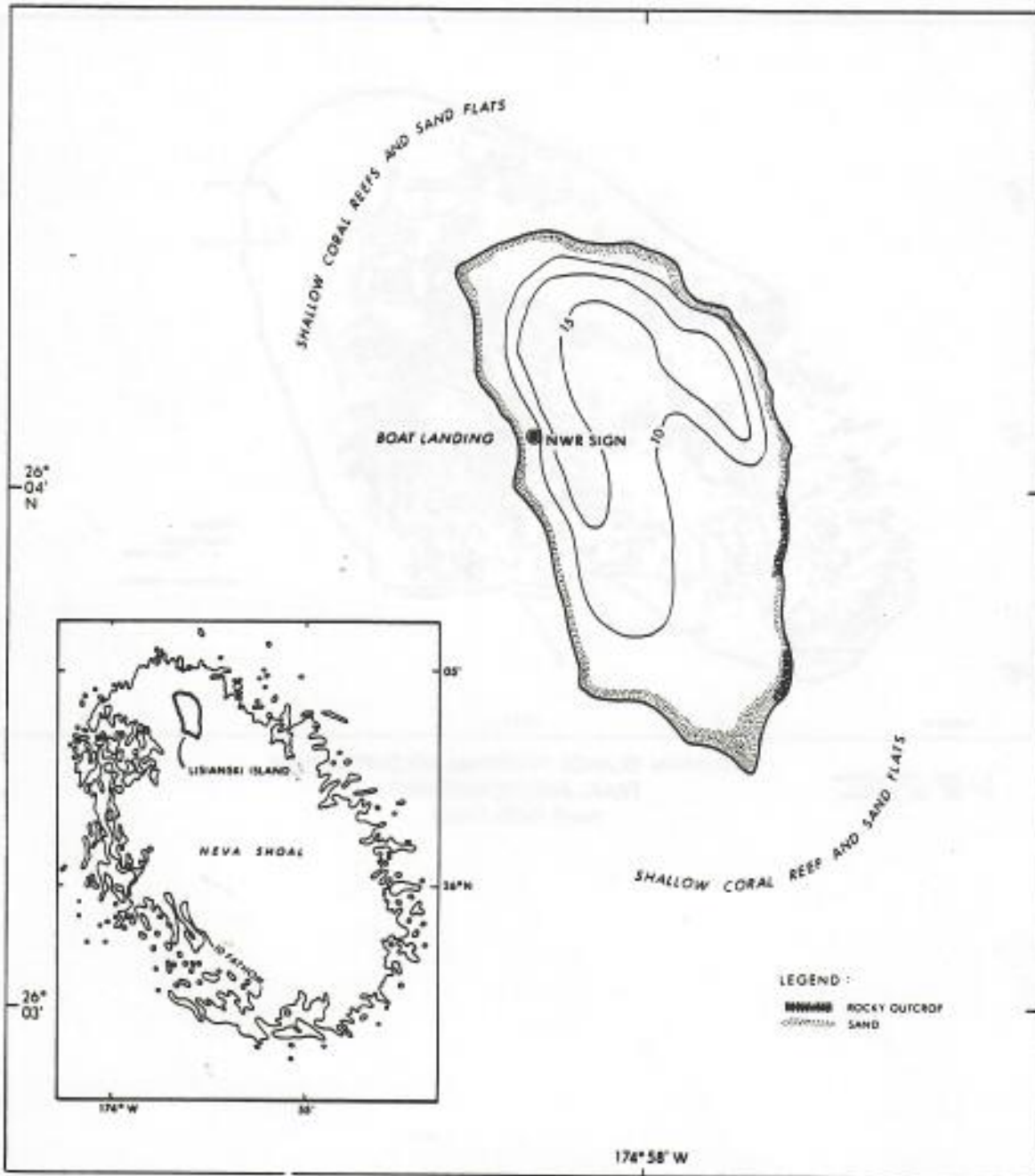
Map 6



HAWAIIAN ISLANDS  
NATIONAL WILDLIFE REFUGE  
LAYSAN ISLAND

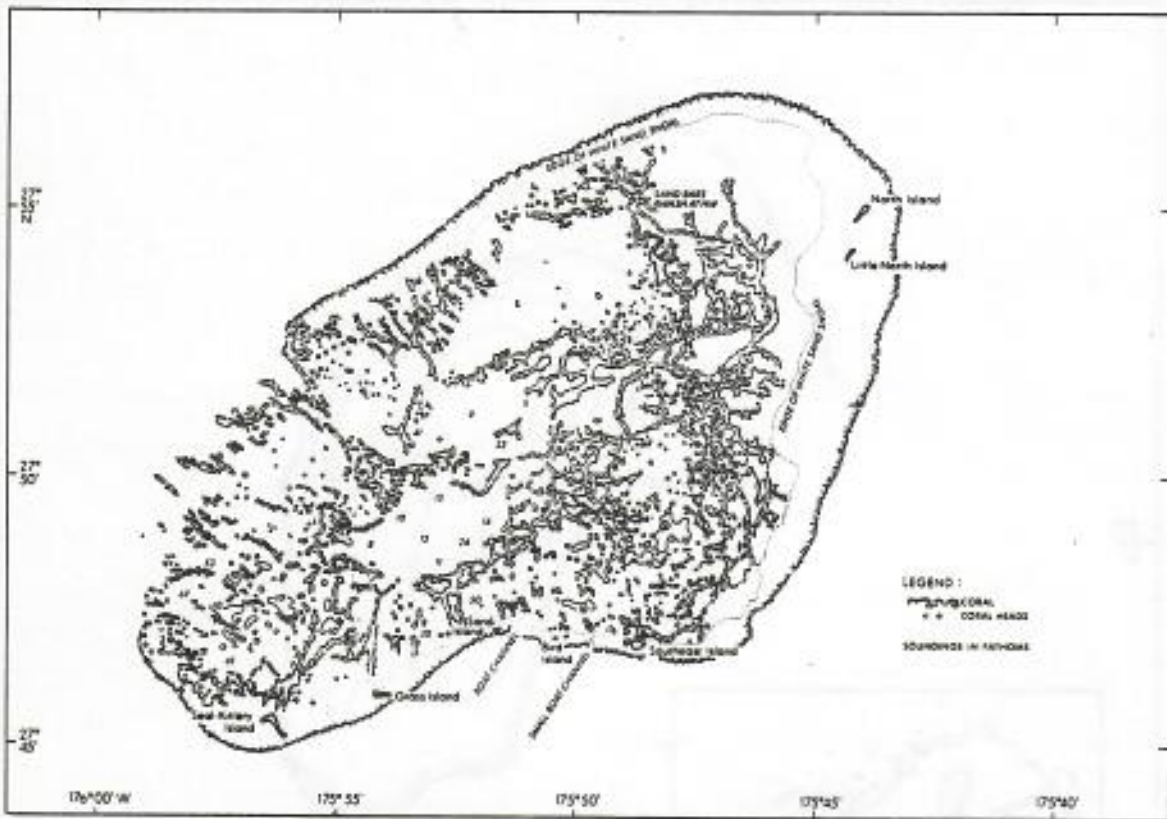


Map 7



HAWAIIAN ISLANDS  
NATIONAL WILDLIFE REFUGE  
LISIANSKI ISLAND  
North Pacific Ocean

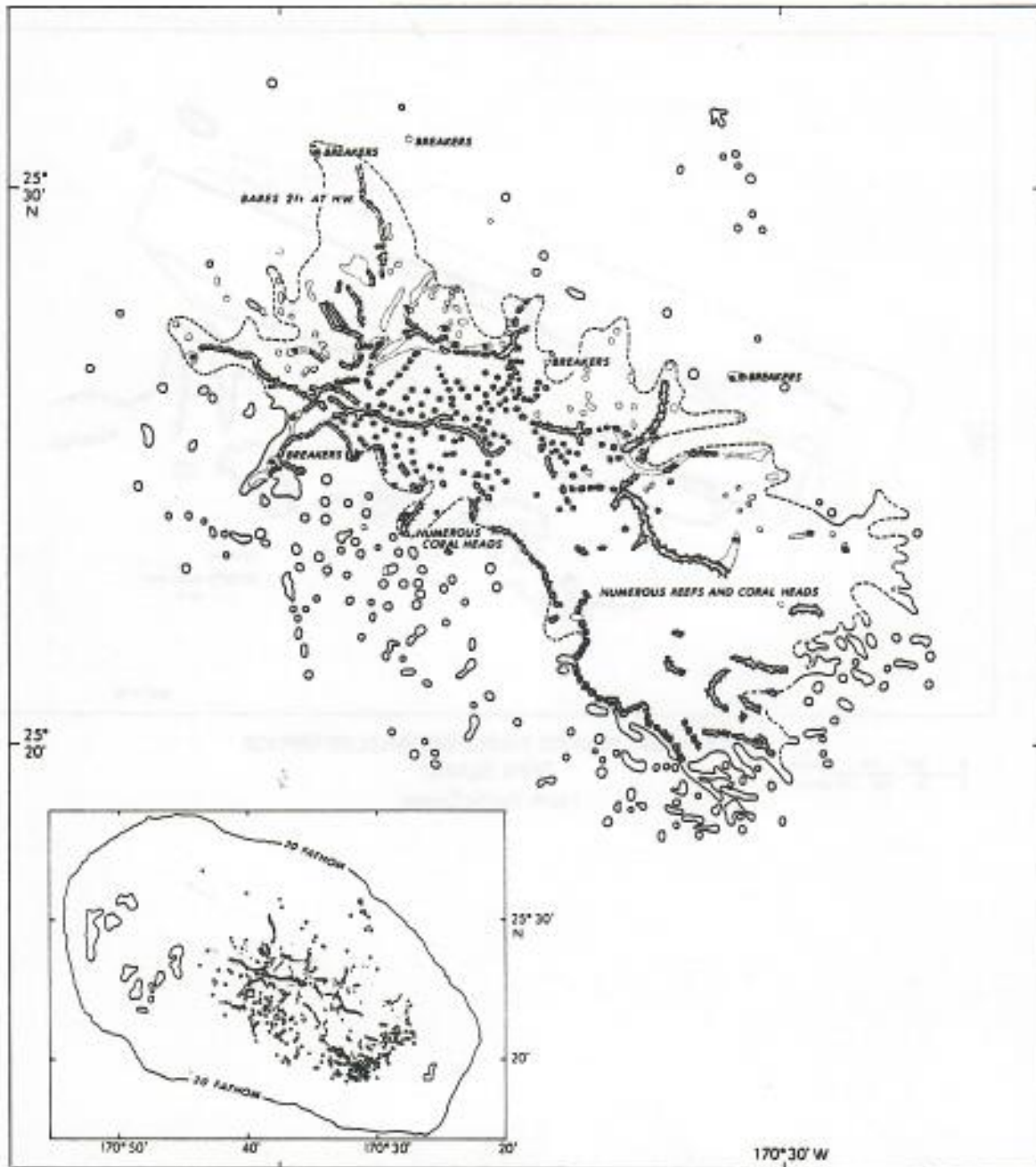
Map 8



HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE  
PEARL AND HERMES REEF  
North Pacific Ocean

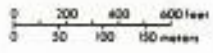
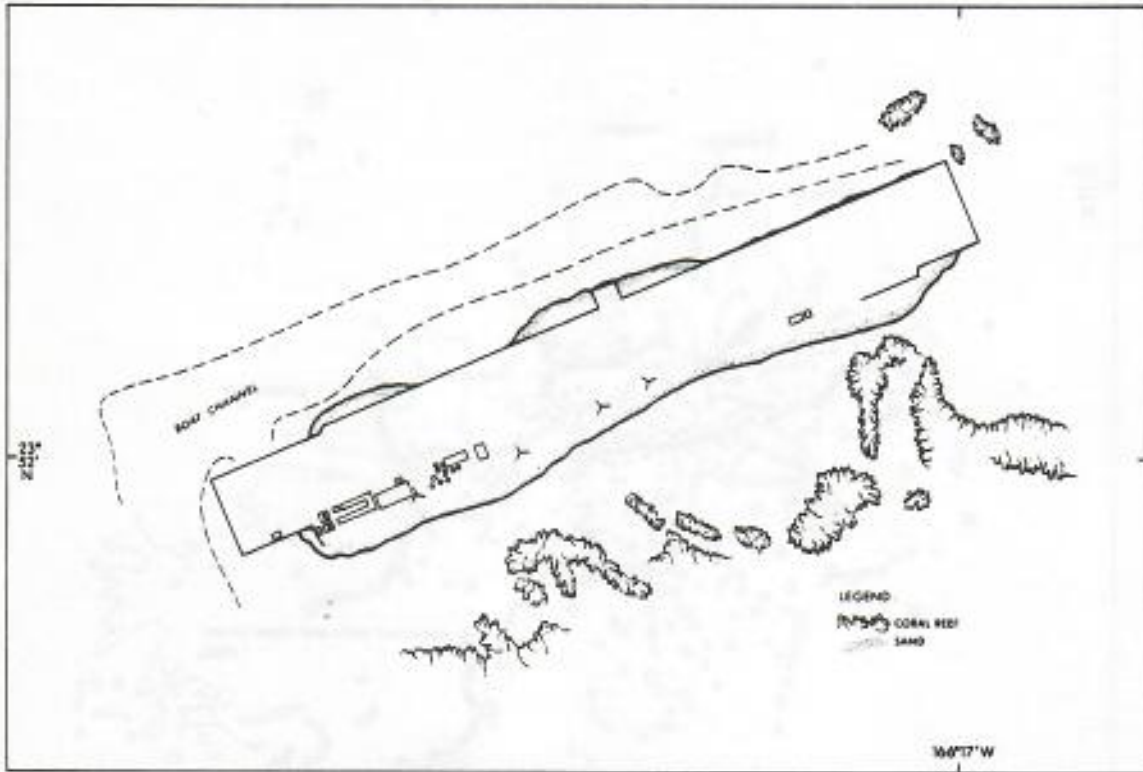


Map 9



HAWAIIAN ISLANDS  
NATIONAL WILDLIFE REFUGE  
MARO REEF  
North Pacific Ocean

Map 10



HAWAIIAN ISLANDS NATIONAL WILDLIFE REFUGE  
TERN ISLAND  
North Pacific Ocean



## 2. Soils

The volcanic NWHI (Nihoa, Necker, La Perouse, Gardner) are composed of basalt. Bird guano also comprises a significant portion of the soil. The sandy NWHI are composed of loose calcareous sand, shells and coarse coral rock rubble. Some humus can be found in vegetated areas. Many of the smaller sandy islets undergo radical changes in shape and size due principally to wave erosion and nearshore currents.

The physical characteristics of individual islands at French Frigate Shoals and Midway and Kure Atolls have been altered through past human activity. Of these altered islands, only Tern Island is within the HINWR. Originally less than 11 acres in size, this islet was enlarged to approximately 37 acres by placement of dredged sand and coral from adjacent areas. Sheet piling contained the fill when the rectangular island was constructed in 1942. Since that time, sand has accreted along the south shore and eroded from the north and west shores.

## 3. Water

The only permanently standing water in the HINWR is the hypersaline lagoon at Laysan. Percolation of rain water through sand is rapid. Fresh water, being slightly lighter, tends to float on salt water below the ground or is trapped by cap rock of phosphatized coral. The coral cap rock overlays the basaltic volcanic base. Historic records reveal that potable brackish water could be found 5-10' below the ground surface on several of the sandy NWHI. On the rocky islands, rain water percolates through the porous basalt until it reaches layers of dike material. Ground water flows along the upper surface of dense materials and where it reaches the ground surface, fresh water seeps are found.

Ocean current movement in the Hawaiian region is typically from east or northeast to west or southwest. Circulation within the NWHI atolls varies considerably with reef configuration, water depth and the location and size of natural passages in the reef. Ocean waves typically break across exposed northern and eastern reefs. Swells within atoll lagoons generally run below four feet, but can exceed 8-10' on particularly windy days. Circulation within atolls has considerable effect on the shoreline configuration, size and shape of small sandy islets. Prior human activities affecting bottom topography, such as the channel dredging project adjacent to Tern Island, have altered water circulation patterns to some degree.

## 4. Climate

Climate of the NWHI is marine and tropical in character. Moderate easterly winds prevail most of the year, but strong westerly winds do

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occur infrequently. Temperature variation in the NWHI is slight. Annual precipitation varies somewhat throughout the chain, ranging from 30-50". Most rain falls in the four month period between December and March. Severe storms, typhoons and tidal waves are relatively uncommon in the NWHI, but occur with sufficient frequency to affect human activities and the terrestrial environment of these islands.

## B. Biological Environment

### 1. Terrestrial Community - Plants and Invertebrates

Less than three square miles of emergent land in the HINWR supports a rich and diverse terrestrial biota, including many species unique (endemic) to these islands. The endemic terrestrial biota includes at least 12 plant species, 8 land snails and an arthropod fauna in excess of 50 species (Conant, et al., 1984). This list is, at best, preliminary as many of the less conspicuous species have been discovered only recently.

Among the most important endemic plant species in the NWHI is the Nihoa palm (Pritchardia remota), although several other less conspicuous plant species are also found only on this 168-acre island. Many other terrestrial plant species are indigenous (also found naturally elsewhere) to these islands or are exotic species that were introduced accidentally or intentionally by man. Among the indigenous or endemic species are 13 species that are especially vulnerable to extinction and are considered candidates for federal listing as endangered or threatened. These are listed in Table 1, page 3.13. The most common and widely distributed plant species in the NWHI, the beach naupaka (Scaevola taccada), are among the 37 recorded indigenous species. Not surprisingly, the vast majority of the 112 known exotic species in the NWHI are found on islands inhabited by man (Herbst, 1981).

The endemic land snail fauna of the Hawaiian Islands includes over a thousand species which evolved from an estimated 25 immigrant species. This group of molluscs in Hawaii represents a remarkable example of the evolutionary process in an island environment. Many of the main Island land snails are now extinct, victims of several centuries of habitat change. Eight land snail species are known from the HINWR, seven of these on Nihoa Island alone. Alteration of the natural vegetation on other islands, particularly Laysan, has degraded the quality of land snail habitat.

Of the terrestrial species, the arthropod fauna is most ecologically diverse. The endemic Hawaiian insect fauna alone includes more than 7,000 species evolved from about 250 original colonist species. Equally spectacular evolution has occurred among Hawaii's spider fauna. The



**Candidate Plants****Affected Environment**

Table 1

## CANDIDATE ENDANGERED PLANTS OF THE NORTHWESTERN HAWAIIAN ISLANDS

<u>Species</u>	<u>Location</u>
Amaranthaceae	
<u>Amaranthus brownii</u> Christopherson & Caum <sup>1</sup>	Nihoa
<u>Achyranthes atollensis</u> St. John <sup>2</sup>	Kure, Pearl & Hermes, Midway, Laysan
Arecaceae	
<u>Prichardia remota</u> Becc. <sup>1</sup>	Nihoa
Caryophyllaceae	
<u>Schiedea verticillata</u> F. Br. <sup>1</sup>	Nihoa
Cucurbitaceae	
<u>Cladocarpa atollensis</u> (St. John) St. John <sup>1</sup>	Kure, Laysan
<u>Cladocarpa caumii</u> (St. John) St. John <sup>1</sup>	Pearl & Hermes
<u>Cladocarpa lamoureuxii</u> (St. John) St. John <sup>1</sup>	Kure, Lisianski
<u>Cladocarpa semitonsus</u> (St. John) St. John <sup>1</sup>	Laysan
<u>Sicyos laysanensis</u> St. John <sup>1</sup>	Laysan
<u>Sicyos nihoaensis</u> St. John <sup>1</sup>	Nihoa
Fabaceae	
<u>Sesbania tomentosa</u> H & A <sup>1</sup>	Necker, Nihoa
Lamiaceae	
<u>Phyllostegia variabilis</u> Bitter <sup>2</sup>	Midway, Laysan
Poaceae	
<u>Cenchrus agrimonioides</u> var. <u>laysanensis</u> F.Br. <sup>2</sup>	Kure, Midway, Laysan

1. Taxa for which FWS has substantial information to support the biological appropriateness of proposing to list the species as endangered or threatened.

2. Same as #1, but the taxon is possibly now extinct.

islands of the HINWR, particularly Nihoa, have revealed a diverse endemic arthropod fauna consisting of nearly 500 species. More than half of the species collected on Nihoa alone are endemic. Large flightless tree crickets, giant earwigs, and unique spiders are among the array of endemic arthropods collected during recent studies in the HINWR. Inevitably, others await discovery. All of these endemic arthropods share the NWHI terrestrial habitat with nearly 300 exotic species. Thirty-two species are considered candidates for federal listing as threatened or endangered. (See Table 2 below.)

The unique terrestrial plant and invertebrate species of the HINWR are components of ecosystems which evolved in the absence of human influence. Continued survival of each is tied in some way to each other, as habitat, as prey, or as cover. These species, in turn, form the foundation of ecosystems which support endemic land birds. The invasion of exotic species onto these islands threatens the integrity of these ecosystems. Change may be dramatic, as was the case when rabbits devegetated Laysan Island. Yet the effects of less conspicuous exotics may ultimately be even more destructive.

Table 2

## CANDIDATE ENDANGERED INVERTEBRATES OF THE NORTHWESTERN HAWAIIAN ISLANDS

Grasshoppers, Crickets, and Katydid (Insects,  
Order Orthoptera)

Banza nihoa

Nihoa

True Bugs (Insects, Order Hemiptera)

Nysius frigatensis<sup>1</sup>

French Frigate Shoals

Nysius fullawayi<sup>1</sup>

Pearl & Hermes,  
Lisianski, possibly

Midway

Nysius neckerensis<sup>1</sup>

Necker

Nysius nihoa<sup>1</sup>

Nihoa

Nysius suffusus<sup>1</sup>

Nihoa

Beetles (Insects, Order Coleoptera)

Plagithmysus nihoa<sup>1</sup>

Nihoa

Odemas breviscopum<sup>1</sup>

Nihoa

Odemas erro<sup>1</sup>

Nihoa

Odemas laysanensis<sup>1</sup>

Nihoa, Necker, Laysan

Odemas neckerensis<sup>1</sup>

Necker

Pentorthrum blackburpi<sup>1</sup>

Laysan (also Oahu)

Rhyncogonus biformis<sup>1</sup>

Necker

Rhyncogonus bryan<sup>1</sup>

Laysan

Rhyncogonus exsul<sup>1</sup>

Nihoa



**Candidate Invertebrates****Affected Environment**

Table 2 (Continued)

## CANDIDATE ENDANGERED INVERTEBRATES OF THE NORTHWESTERN HAWAIIAN ISLANDS

## Beetles (Insects, Order Coleoptera)(Continued)

<u>Stenotrupis pritchardiae</u> <sup>1</sup>	Nihoa (also Oahu, Molokai, Kauai, Hawaii, Maui)
<u>Itodacnus novicornis</u> <sup>1</sup>	Necker
<u>Itodacnus paradoxus</u> <sup>1</sup>	Necker

## Flies (Insects, Order Diptera)

<u>Bryania bipunctata</u> <sup>1</sup>	Nihoa
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## Butterflies and Moths (Insects, Order Lepidoptera)

<u>Petrochroa neckeensis</u> <sup>1</sup>	Necker
<u>Agrotis fasciata</u> <sup>2</sup>	Midway
<u>Argrotis kerri</u> <sup>2</sup>	French Frigate Shoals
<u>Argrotis laysanensis</u> <sup>2</sup>	Laysan
<u>Argrotis procellaris</u> <sup>2</sup>	Laysan
<u>Helicoverpa minuta</u> <sup>2</sup>	Lisianski
<u>Hypena laysanensis</u> <sup>2</sup>	Laysan
<u>Hedylepta laysanensis</u> <sup>2</sup>	Laysan
<u>Oeobia dryadopa</u> <sup>2</sup>	Laysan

## Ants, bees, and Wasps (Insects, Order Hymenoptera)

<u>Sclerodermus nihoaensis</u> <sup>1</sup>	Nihoa
<u>Eupelmus nihoaensis</u> <sup>3</sup>	Nihoa
<u>Nesoprosopis anthracina</u> <sup>3</sup>	Lisianski (also Oahu, Molokai, Lanui, Maui, Hawaii)
<u>Nesoprosopis perkinsiana</u> <sup>1</sup>	Nihoa (also Oahu, Molokai, Hawaii where presumed extirpated)

1. Taxa for which information now in possession indicates that proposing to list the species is possibly appropriate, but for which conclusive data on biological vulnerability and threats are not currently available.
2. Taxa for which the FWS has persuasive evidence of extinction.
3. Same as 2, except taxa thought to be extinct.

**2. Terrestrial Community - Land Birds**

Seven endemic land bird species were known to exist in the HINWR. All were found either on Nihoa or Laysan islands. Of these, three species from Laysan (Laysan honeycreeper, Laysan rail and Laysan millerbird) became extinct in the early part of this century due to the devegetation of the their habitat by introduced rabbits. Two Laysan bird species survived this event.

The Laysan finch (*Telespyza cantans*) is presently found both at Laysan Island and at Pearl and Hermes Reef, where it was introduced intentionally to provide a hedge against extinction in its natural habitat. The current population is estimated at about 10,000 on Laysan and 500 distributed on several islets at Pearl and Hermes Reef. Laysan finches nest in clumps of bunch grass and feed on insects, plant parts and seabird eggs. The Laysan duck (*Anas laysanensis*) is restricted in natural distribution to Laysan Island, although it is maintained and bred in zoos around the world. The devegetation of Laysan caused the duck population to drop to less than a dozen individuals. The current population appears to fluctuate widely, but may range as high as 600 birds. The species is intimately dependent on the Laysan lagoon as a source of food (brine flies) and water. Neighboring vegetation provides cover for nesting.



Laysan Island, approximately two square miles in size—home of the endemic Laysan finch and Laysan duck.



Two endemic land birds inhabit Nihoa Island. The Nihoa finch (*Telespyza ultima*) is closely related to the Laysan finch. Both are believed to be similar in appearance and habits to the original colonist species that ultimately evolved into the more than 50 species and subspecies in the unique Hawaiian subfamily of birds, Drepanidinae. The Nihoa finch population may fluctuate between 2,000-4,000. They nest in holes in the cliffs or on rocky outcroppings. Nihoa finches feed on seeds, shoots and flower heads of plants, arthropods and seabird eggs. They drink water from fresh water seeps on the island. An attempted transplant of this species to Tern Island failed in the 1960's. The Nihoa millerbird (*Acrocephalus familiaris kingii*) is closely related to the extinct Laysan millerbird. Nihoa millerbirds number between 200-500 birds. They are associated with dense native vegetation that covers approximately 2/3 of the island. Millerbirds forage within vegetation and on the soil surface for various insects and other invertebrates.

The land bird fauna of the NWHI also includes a variety of introduced resident species and vagrants from other locations which occasionally land on these remote islands. Canaries, pigeons and mynas are well established on Sand Island at Midway. Vagrant land birds in the NWHI include, among others, mockingbirds, cattle egrets and short-eared owls.

### 3. Terrestrial Community - Seabirds and Other Species

The NWHI support among the most important seabird colonies in the world. They harbor approximately 5.4 million breeding birds of 18 species. (See Table 3, page 3.18.) Among these are albatross (2), petrels (2), shearwaters (2), storm-petrels (1), tropicbirds (1), boobies (3), frigatebirds (1), and terns (6). Together with non-breeding birds of these species, the total NWHI resident seabird population exceeds 12-14 million birds. Although there are also several seabird colonies within the main Hawaiian Islands, the NWHI colonies harbor more than 90% of the total Hawaiian archipelago seabird population.

No seabird species are endemic to the NWHI, yet these islands do provide breeding habitat for a substantial portion of the worldwide population of at least four species, the black-footed albatross, Laysan albatross, Bonin petrel and the sooty storm-petrel. For some seabird species it is difficult to assess the relative importance of the NWHI populations because estimates of populations elsewhere are unavailable. However, the NWHI populations of Christmas shearwater, gray-backed tern, and the blue-gray noddy are sizable and may be the most important populations worldwide. The sooty tern, the most abundant breeding seabird in the central Pacific, is also the most numerous nesting seabird in the NWHI, accounting for almost half of the total breeding population.

Table 3

## SEABIRDS BREEDING IN THE NORTHWESTERN HAWAIIAN ISLANDS

<u>Common Name</u>	<u>Scientific Name</u>	<u># of Pairs</u>
Black-footed albatross	<u>Diomedea nigripes</u>	49,000
Laysan albatross	<u>Diomedea immutabilis</u>	379,000
Bonin petrel	<u>Pterodroma hypoleuca</u>	331,500
Bulwers petrel	<u>Bulweria bulwerii</u>	103,000
Wedge-tailed shearwater	<u>Puffinus pacificus</u>	261,500
Christmas shearwater	<u>P. nativitatis</u>	3,000
Sooty storm petrel	<u>Oceanodroma tristrami</u>	7,500
Red-tailed tropicbird	<u>Phaethon rubricauda</u>	11,500
Masked booby	<u>Sula dactylatra</u>	2,500
Brown booby	<u>S. leucogaster</u>	500
Red-footed booby	<u>S. sula</u>	5,500
Great frigatebird	<u>Fregata minor</u>	10,000
Gray-backed tern	<u>Sterna lunata</u>	51,000
Sooty tern	<u>Sterna fuscata</u>	1,330,500
Blue-gray noddy	<u>Procelsterna cerulea</u>	4,000
Brown noddy	<u>Anous stolidus</u>	93,000
Black noddy	<u>A. tenuirostris</u>	16,500
White tern	<u>Gygis alba</u>	15,000

Adapted from Fefer et al., NWHI Symp. 1984.

Nearly one-half million seabirds of 17 species breed on Nihoa Island each year. This high rocky island provides abundant nest sites for crevice and cavity nesting petrels and noddies. Over 95% of the Bulwer's petrels and half the NWHI blue-gray noddy population occur on Nihoa. In total, this island harbors the largest NWHI colonies for six seabird species. Necker Island and Gardner Pinnacles together provide habitat for over 100,000 breeding seabirds of 16 and 12 species, respectively.

French Frigate Shoals provides rocky habitat for cavity nesters (La Perouse Pinnacle) and sandy habitat for burrow nesters. It is the only atoll in the NWHI at which all 18 breeding seabird species are found. About 200,000 seabirds nest here each year, including the largest NWHI colony of masked boobies.

Approximately 2 million seabirds of 17 species breed annually on Laysan Island. Only the crevice nesting blue-gray noddy is absent. Laysan Island supports the world's largest black-footed albatross colony and the largest wedge-tailed shearwater and Christmas shearwater colonies in the NWHI. Feather and egg hunters near the turn of the century killed



hundreds of thousands of seabirds at Laysan. The Island was nearly devegetated by rabbits. Only after eradicating this pest and several decades of recovery, have most seabird populations returned to levels comparable to those before the decline. However, the Laysan albatross and Christmas shearwater populations have not fully recovered.

Lisianski Island supports a breeding seabird population nearly as large as Laysan's. The sooty tern alone accounts for a million or more birds. The Bonin petrel is the next most numerous bird, with its burrows scattered across virtually the entire island. Lisianski Island has the largest NWHI colonies of both Bonin petrels and gray-backed terns.

About 165,000 breeding seabirds of 17 species breed on islets at Pearl and Hermes Reef. Over 20% of the world's population of black-footed albatross are found on islets totalling less than 85 acres in area. The atoll is also an important nesting site for the sooty storm-petrel. Feather hunting also occurred at Pearl and Hermes during the early part of this century, but seabird populations appear to have recovered.

Midway and Kure Atolls are not in the HINWR, but harbor significant populations of seabirds found throughout the archipelago. Midway has the world's largest nesting colony of Laysan albatross, as well as the largest NWHI nesting colony of red-tailed tropicbirds, black noddies and white terns. Over 550,000 seabirds of 14 species breed at Midway. In addition, a small number of short-tailed albatross (Diomedea albatrus), an endangered species largely restricted to Japan, appear regularly at Midway. Islands at Kure Atoll support many of the same seabird species as Midway, but harbor a substantially larger population of brown and masked boobies. Both Kure Island and Midway Island seabird populations have suffered declines due to the presence of introduced rats. Burrow nesters have been most severely impacted.

Several arctic breeding shorebird species winter on islands in the Pacific basin, including the NWHI. Regular migrants include the Pacific golden plover (Pluvialis dominica), ruddy turnstone (Arenaria interpres), sanderling (Calidris alba), wandering tattler (Heteroscelus incanus) and the bristle-thighed curlew (Numenius tahitiensis). More than a dozen other shorebird species appear irregularly on the NWHI during fall and winter months. Migratory waterfowl appear in low numbers as well. The greatest numbers of NWHI migrants appear at the Laysan Island central lagoon.

#### 4. Marine Community - Reef Species

The geological and biological characteristics of the nearshore marine community in the NWHI are intimately tied to the volcanic origin of the Hawaiian Islands and the northwestward movement of the Pacific plate. Fringing reefs of larger sandy islands and shallow atoll lagoons are



extensive in area. Corals are the most conspicuous members of the reef community. Yet, several studies have shown that limestone production by coralline algae, molluscs, echinoderms and foraminifera is also significant (Grigg and Dollar, 1980). Coral reefs provide habitat, shelter and food for most reef inhabitants, including species such as monk seals and turtles that also spend time on land.

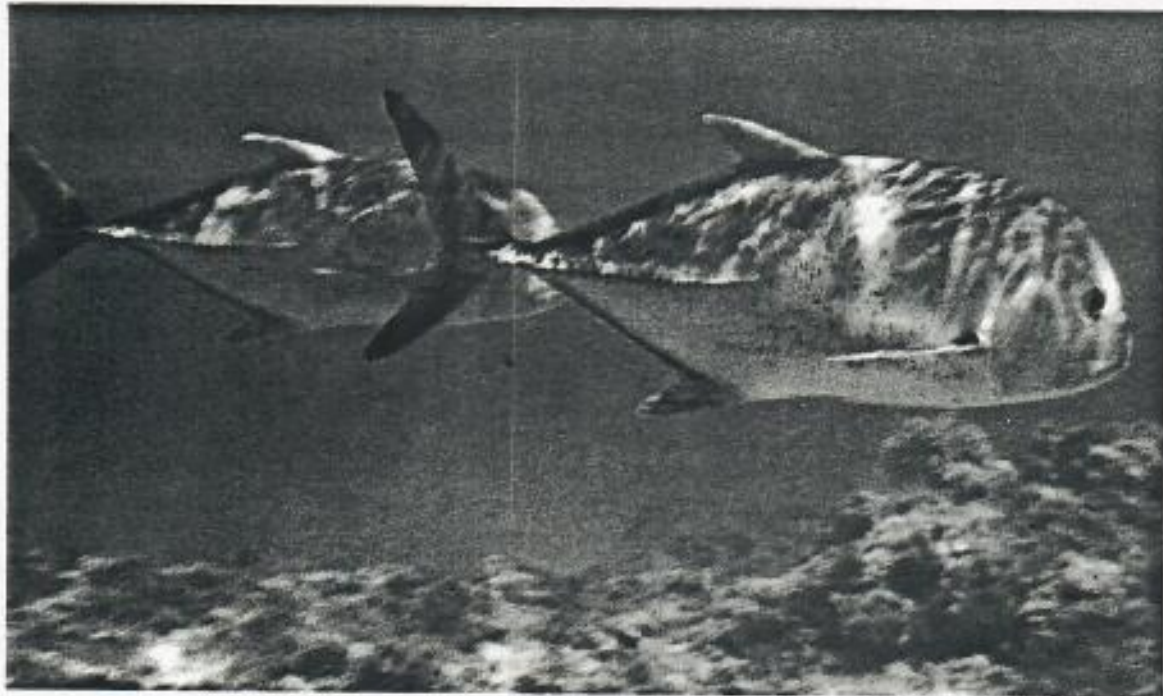
Recent studies have clearly demonstrated a pattern of declining coral growth as a function of latitude in the NWHI (Grigg, op. cit.). Yet, no large differences in coral community structure have been documented within the archipelago. Variations in coral species dominance do occur and some types of coral, such as the genus *Acropora*, are restricted in their pattern of occurrence. The largest number of coral species and the highest coral species diversity occur midway in the chain at French Frigate Shoals and Maro Reef. These sites offer a wide variety of habitat, including seaward and leeward reefs, lagoons, coral flats, banks and shoals.

The Hawaiian nearshore marine community includes numerous species of fish ( $\pm 700$ ), algae ( $\pm 400$ ), molluscs ( $\pm 1,000$ ) and other invertebrates ( $\pm 1,350$ ). Most of these are representative of species distributed throughout the Pacific and Indian Oceans, yet about 20% are endemic to Hawaii (Grigg, op. cit.). Until recently, knowledge of the Hawaiian reef fish fauna was based almost entirely on the results of studies in the main Hawaiian Islands. The diversity of reef habitats influences the distribution and abundance of reef fishes in the NWHI. Recent data suggest that major fish species on main Island reefs tend to lose dominance northwestward, while major species at Kure and Midway are more evenly distributed over the archipelago (Hobson, 1980). Although the number of fish species tends to diminish in a northwest direction, the shift in reef fish community structure along the archipelago is not a smooth progression. As an example, some species of butterfly fish were found only at French Frigate Shoals (Hobson, op. cit.). For some fish species, greater historic fishing pressure in the main Hawaiian Islands may explain distributional trends, but for most, parameters such as water temperature and reef structure and diversity are influential.

The nearshore fish community of the NWHI includes several species that do not inhabit the interstices of the reef but are found in shallow atoll lagoons. Shoaling species within the HINWR include aholehole (*Kuhlia sandvicensis*), moi (threadfin, *Polydactylus sexfilis*), amaama (mullet, *Mugil cephalus* and *Neomyxus leuciscus*) and various baitfish (iao or silverside, *Pranesus insularum*, piha or sprat, *Spratelloides delicatulus*, akule or big-eye scad, *Selar crumenophthalmus*). These species, the focus of a short-lived fishery at French Frigate Shoals in the 1950's, are of interest to the commercial fishing industry. At some locations these species vary seasonally in abundance. Three species of



sharks (Galapagos, Carcharhinus galapagensis, gray reef, Carcharhinus amblyrhynchos, and tiger, Galeocerdo cuvieri) play an important role as top carnivores in the nearshore marine community. They are most conspicuous in summer months when breeding aggregations are observed and predation on fledgling seabirds is common. Carangid species (jacks or ulua) are also important nearshore marine predators, consuming other fish, cephalopods and crustacea (Parrish, et al., 1980).



**Ulua at French Frigate Shoals.**

Two species each of spiny lobster (Panulirus marginatus and P. penicillatus) and the slipper lobster (Scyllarides squammosus and S. haanii) occur throughout the Hawaiian archipelago. Of these species, all but P. penicillatus are of serious commercial interest. Lobsters inhabit nearshore waters but also range into substantially greater depths, where most commercial fishing occurs. Within atoll lagoons, they inhabit coral reefs, where they find shelter, food and protection from predation. Larvae of P. marginatus and S. squammosus are known to recruit to nearshore habitats throughout the archipelago (MacDonald, C.D. 1984; and Morin, T.D. and MacDonald, C.D. 1984).

#### 5. Marine Community - Monk Seals and Turtles

Two species that are particularly conspicuous in the nearshore marine community are the Hawaiian monk seal (Monachus schauinslandi) and the green sea turtle (Chelonia mydas). The Hawaiian monk seal is a modern



representative of the most ancient lineage of living phocid seals and, as such, might be characterized as a "living fossil" (Repenning and Ray, 1977). The closely related Mediterranean monk seal (M. monachus) is reported to number between 500-1,000 and swiftly declining (Sergeant et al., 1979). The Caribbean monk seal (M. tropicalis) is believed to be extinct.

The endemic Hawaiian monk seal was almost eliminated by sealing expeditions in the mid-19th century. Under refuge protection in the first half of this century, the population recovered to a point where beach counts in the late 1950's averaged about 1,200 animals. Over the last 25 years the number recorded on beach counts dropped about 50% overall. The decline in the western atolls was particularly dramatic (70-90%), while the population at French Frigate Shoals increased and then leveled off in the last decade. Currently the beach counts at French Frigate Shoals represent nearly half of the census for the entire archipelago. Causes for the rapid decline appear to include predation by sharks, harassment of young and females by some aggressive adult males, ciguatera poisoning, human disturbance at inhabited atolls, and entanglement in lost and discarded fishing gear and other debris.

Coral beaches are the preferred habitat for monk seal pupping, hauling out and nursing. Protected reef and water areas are used by adult females with young pups that are learning to feed. Pupping occurs in nearly all months of the year with a peak between March and June. Females appear to breed about every other year, giving birth to a single black pup. Occasionally a female will "adopt" another female's pup. Mating behavior has been observed in nearshore waters. Diving studies indicate that seals forage in waters up to 100 fathoms or more in depth. Seals feed on eels, fish and marine macro invertebrates.

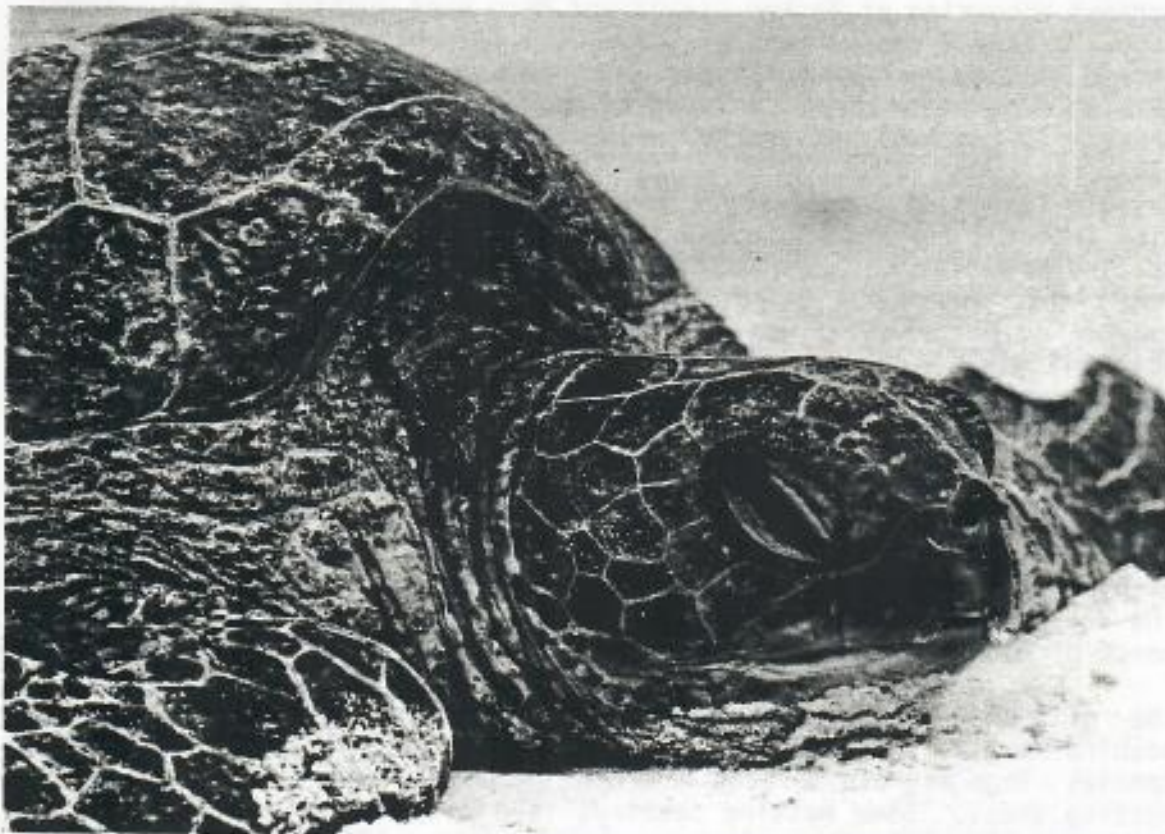
At least five species of marine turtles are known to occur in Hawaii (green, Chelonia mydas, loggerhead, Caretta caretta, Pacific ridley, Lepidochelys olivacea, hawksbill, Eretmochelys imbricata, and leatherback, Dermochelys coriacea). Of these, only the green turtle is widely distributed throughout the archipelago. Reductions in the world-wide population of green turtles have occurred throughout its range due to over-exploitation and habitat loss. In Hawaii, green turtles nested historically on beaches throughout the main Islands but now nesting is restricted, for the most part, to beaches of the HINWR. Even in this refuge, declines have been noted at Pearl and Hermes Reef and at Lisianski Island.

Over 90% of the remaining Hawaiian nesting population is found on East and Whale-skate Islands at French Frigate Shoals (Balazs, 1980). Most nesting occurs in June with hatching occurring approximately 60 days later in August. Young depart the nest site to graze in the pelagic zone soon after hatching. They are rarely observed again until they

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reach about 35 cm. (Balazs, op. cit.). Recovery of the green turtle population from prior overharvest is inhibited by low recruitment of young into the breeding population, slow recolonization of underutilized nesting islands, slow growth rates and infrequent breeding of adult females. The approximate number of females nesting annually at French Frigate Shoals ranges from only 94 - 248 (mean = 180), another factor which contributes to slow recovery even when their habitat is adequately protected.



**Green sea turtle (*Chelonia mydas*) basking on a beach at French Frigate Shoals.**

#### 6. Marine Community - Offshore Species

Almost all of the 252,000+ acres of submerged lands in the HINWR are within the 10-fathom contour, so the offshore marine community is of less direct significance to Refuge management than are the nearshore or terrestrial communities. However, most of the inhabitants of the Refuge lagoons, as well as the abundant nesting seabirds, range in distribution well beyond Refuge boundaries. If for no other reason, this makes the characteristics of the offshore environment pertinent to this planning process.



Benthic slope resources adjacent to the HINWR islands and atolls include several species of bottomfish of considerable commercial importance. Among the most sought-after species are opakapaka, (Pristipomoides filamentosus), onaga (Etelis coruscans), uku (Aprion virescens), and hapuupuu (Epinephelus quernus). Except for the uku which most commonly occurs at a depth of 20-40 fathoms, these species are most commonly taken in waters from about 50-150 fathoms on atoll slopes, banks and seamounts. Spiny lobsters extend in distribution from nearshore waters out to approximately 100 fathoms. They too, are not evenly distributed in waters offshore the NWHI, with greatest catch rates during recent surveys occurring at Necker Island and Maro Reef (Uchida, et al., 1980). Other offshore crustaceans of commercial interest include caridean and penaid shrimps, slipper lobster, and kona crabs. Deep water precious corals have also been a focus of exploratory commercial surveys and harvest in the NWHI, at depths around 200-300 fathoms.

Pelagic fishes of the offshore zone in the NWHI are a source of commercial interest for both U.S. and foreign boats. True pelagic species of particular interest include big-eye tuna (Thunnus obesus), yellowfin tuna (ahi, Thunnus albacares), albacore (Thunnus alalunga), skipjack tuna (aku, Katsuwonus pelamis), mahimahi (Coryphaena hippurus) and various billfishes and sharks. More coastal species include ono (wahoo, Acanthocybium solandri), kawakawa (Euthynnus affinis), rainbow runner (Elagatis bipinnulatus) and akule (big-eye scad, Selar crumenophthalmus). Tunas and billfishes have been fished primarily by foreign Tongline vessels operating in the Fishery Conservation Zone and beyond, though recent restrictions imposed by the Preliminary Fishery Management Plan for Billfishes and Sharks have temporarily curtailed this fishery within 200 miles of the NWHI. Albacore are highly migratory across the north Central Pacific. The Hawaiian albacore fishery, principally north of Midway Atoll, peaks in the June-August period.

The offshore marine environment is of particular importance to those seabird species that breed on the NWHI and to several additional seabird species that migrate through Hawaiian waters enroute to and from other nesting areas. Some nesting seabirds feed within atolls, but most seek food outside Refuge boundaries, in some cases 500 miles or more from their colonies. Most feed opportunistically on surface shoaling fishes and squid, but take crustaceans and insects to a lesser degree. The nesting cycle of some seabirds appears linked to the seasonal abundance of their prey. The fish families Exocoetidae, Mullidae, Carangidae, Synodontidae, Dussumieriidae, Coryphaenidae, Molidae and Holocentridae and the squid family Ommastrephidae appear to be especially important to NWHI seabirds (Harrison and Hida, 1980).

Several species of cetaceans have also been recorded in both nearshore and offshore waters of the NWHI. A population of 1,200 humpback whales (Megaptera novaengliae) winters in Hawaiian waters and migrates to North Pacific feeding grounds in April and May. During the latter



stages of the winter migration, humpbacks are occasionally sighted near HINWR islands and atolls. Bottlenose dolphins (*Tursiops gilli*) and spinner dolphins (*Stenella longirostris*) are commonly seen adjacent to and within HINWR atolls and over offshore banks (Shallenberger, 1979). In addition to these common species, several other cetaceans are known to Hawaiian waters. (See Table 4 below.)

Table 4

CETACEANS IN HAWAIIAN WATERS  
(From Shallenberger 1981)

<u>Species</u>	<u>Common Name</u>
<i>Balaenoptera physalus</i>	Fin whale
<i>Balaenoptera edeni</i>	Brydes whale
<i>Megaptera novaeangliae</i>	Humpback whale
<i>Physeter catadon</i>	Sperm whale
<i>Ziphius cavirostris</i>	Goosebeaked whale
<i>Mesoplodon densirostris</i>	Densebeaked whale
<i>Orcinus orca</i>	Killer whale
<i>Pseudorca crassidens</i>	False killer whale
<i>Feresa attenuata</i>	Pygmy killer whale
<i>Peponocephala electra</i>	Melon-headed whale
<i>Globicephala macrorhynchus</i>	Pilot whale
<i>Grampus griseus</i>	Risso's dolphin
<i>Kogia breviceps</i>	Pygmy sperm whale
<i>Tursiops gilli</i>	Bottlenose dolphin
<i>Steno bredanensis</i>	Rough-toothed dolphin
<i>Stenella coeruleoalba</i>	Striped dolphin
<i>Stenella attenuata</i>	Spotted dolphin
<i>Stenella longirostris</i>	Spinner dolphin

**C. Social Environment****1. Archaeological/Historic Resources**

The primary archaeological resources in the NWHI are located on Nihoa and Necker Islands. These islands possess some of the densest scatters of prehistoric structural sites in Hawaii. Emory (1928) described 25-35 house terraces, 15 ceremonial structures, burial caves, bluff shelters and agricultural terraces at Nihoa. He also found squid lures, adzes, stone bowls and fish hooks which established a close relationship with the Hawaiian culture in the main Hawaiian Islands. Emory estimated that as many as 175 people could have survived for extended periods at Nihoa several hundred years before discovery of the island by European ships. Lack of a permanent water supply is theorized as a reason why the Island was eventually deserted.

Necker Island, with its numerous religious sites, appears to have been used primarily for worship by visitors from other Hawaiian Islands. Yet, numerous temples, called maraes, closely resemble those of inland Tahiti, establishing a strong link between this site and the early Tahitian culture. Necker is considered too small and dry to have supported human inhabitation for extended periods. Cultural sites on both Necker and Nihoa are some of the best preserved and represent a "pure sample of the culture prevailing in Hawaii before the thirteenth century" (Emory, op. cit.).

The historic significance of the other NWHI stems from the independent discovery of individual island groups and the subsequent commercial and military use of these areas. Captain Douglas of the Iphigenia rediscovered Nihoa Island in 1789. In 1822, Queen Kaahumanu heard ancient chants referring to Nihoa. She visited and annexed the island for the Kingdom of Hawaii. In 1885, Princess Liliuokalani and her 200-person entourage landed on Nihoa. A fire during this trip is said to have swept the island. Necker Island was rediscovered by Comte de La Perouse. More recently the island was used as a bombing target by the military.

French Frigate Shoals was first visited by two French ships under the command of La Perouse in November, 1786. Many additional sailing ships visited the shoals and other NWHI over the next century and several of these ended their voyage as shipwrecks on shallow reefs. Interest in the commercial exploitation of marine and terrestrial resources was the driving force that accounted for most visitation in the late 19th and early 20th centuries. Of the HINWR islands, development of land-based commercial facilities was greatest on Laysan Island, where guano and feather harvest operations continued until establishment of the Hawaiian Islands Reservation in 1909, and illegally for a few years beyond that date. The only obvious remnants of this operation now on Laysan are guano piles, pieces of rail and grave sites.



French Frigate Shoals is of particular historical significance because of the military activities which have occurred there. Remnants of this activity include the dredged seaplane runways and channels, Tern Island and its associated buildings and facilities, and debris on East Island from the Coast Guard LORAN station that occupied the island from 1944 until 1952.



Prehistoric house site on Nihoa Island.

## 2. Education/Recreational Opportunity

Meaningful educational and recreational use of refuge lands has been a high priority objective of the National Wildlife Refuge System for decades. This objective is based on the premise that public lands and the resources produced on those lands should be managed for the "benefit" of the public. The FWS encourages this activity on the belief that educational and recreational opportunity relating to wildlife and cultural resources fosters public awareness and ultimately results in broader public support for resource management programs. Research activities are also generally encouraged because they contribute to our basic understanding of natural resources and cultural and aid in the development and implementation of effective resource management programs.

The Hawaiian Islands Refuge, like most of the other early additions to the National Wildlife Refuge System, was established initially to put a halt to the unregulated commercial exploitation of wildlife resources.



Other resource values of the Refuge and the factors which threatened those resources, became the focus of a much broader resource management program in the HINWR over the years since the Refuge was established. To date, principal management attention is directed towards the numerous threatened and endangered species, the rich seabird resource and the unique terrestrial and marine ecosystems. Survey, documentation, and preservation of archaeological resources are additional Refuge concerns.

Because of the priorities placed on protection of fish and wildlife resources from direct and indirect human impact, educational, cultural, and recreational use of the HINWR has been far more restricted than is typical of most NWRs. An exception to that rule has been the FWS' policy of facilitating management-related research on HINWR lands and waters. This policy was formalized with designation of the HINWR lands and atolls as Research Natural Areas in 1967. Yet the criteria for acceptable research in the HINWR, like any other human use, has always been one of compatibility with programs to maintain, and recover if possible, the rich fish and wildlife resources of the Refuge. The two periods of most intense research in the HINWR occurred in the mid-60's during the Smithsonian Institute's Pacific Ocean Biological Survey Program and between 1978-1983, when multidisciplinary resource assessment (Tripartite) studies were conducted by the FWS, National Marine Fisheries Service, University of Hawaii, Sea Grant College and the State of Hawaii.

Since 1964, when a federal Refuge manager was first stationed in Hawaii, all Refuge activities have been managed by the Special Use Permit (SUP) process. Even the activities of the Coast Guard, stationed on Tern Island until 1979, were regulated by SUP. Other permitted visits to the HINWR have included biologists from cooperating agencies, authorized researchers and a very limited number of journalists, commercial filmmakers/photographers and other visitors, typically accompanied by Refuge staff. Most of these visits, particularly since the FWS occupied Tern Island in 1979, have occurred at French Frigate Shoals.

Although public interest in educational, recreational, cultural, and religious access to the HINWR has increased somewhat, recent research results have led to an even more restrictive policy regarding public visitation at certain locations. Our awareness of the vulnerability of unique terrestrial ecosystems and cultural resources to the indirect effects of frequent human visitation has increased measurably through recent studies. In addition, hazards and discomforts inherent in visiting the HINWR islands (e.g. rough landings, precipitous rocky slopes, sharks, rough ocean weather, bird - aircraft strikes) have been a deterrent to expanded public visitation.

In an attempt to realize the values of public educational and recreational use without the adverse effects, the FWS has explored and implemented related off-site activities. The Kilauea Point National Wildlife



Refuge on Kauai is the FWS' principal interpretive facility in the Islands. Visitors are exposed through interpretive signs and educational programs to the wildlife resources of the Hawaiian NWRs, including both wetland and remote island sites. Nesting seabirds, as well as turtles, dolphins and whales at the Point also provide an opportunity to experience wildlife species in common with the HINWR without disturbance to the resource.

In 1983, the volunteer Kilauea Natural History Association was formed to provide interpretive and educational programs at the Point and to distribute brochures and sell natural history materials to the general public. The site attracted about 140,000 visitors in 1983. Numerous school groups also used the site. Teacher workshop programs at Kilauea and at other main island refuges also provide exposure to Refuge programs and wildlife habitats. HINWR brochures and related publications provide a source of information to the interested public as do frequent lectures and slide programs for groups by Refuge staff. A sound-slide program relating specifically to the HINWR is used widely by Oahu and Kauai schools, in particular. Films produced in the HINWR during previous visits are also used regularly by schools and, on occasion, by the local television media.

The FWS has cooperated with other agencies to accommodate and facilitate educational and recreational use of Midway and Kure atolls by military personnel, military contractors, and Coast Guard staff. Both Midway and Kure have a long history of human occupation. Midway, in particular, has proven to be a valuable site for research. Involvement of the FWS in educational or recreational programs for local military personnel at Midway and Kure has been coordinated closely with the site managing agencies.

### 3. Economic Considerations

The potential for commercial utilization of fish and wildlife resources has drawn attention to the NWHI for two centuries. European sailing ships made the earliest commercial excursions in the late 18th and 19th centuries. They took seals, whales, fish, turtles, sharks, birds, pearl oysters and sea cucumbers (beche-de-mer) at various NWHI locations. Reports of substantial guano deposits in the mid-19th century resulted in exploratory cruises and eventually led to the leasing of several NWHI to the North Pacific Phosphate and Fertilizer Company in the 1890's. Guano was removed from Laysan Island between 1891 and 1910. Over the same period, Japanese vessels began a series of trips into the NWHI to harvest bird skins and feathers. It was this activity which ultimately led to designation of the Hawaiian Islands Reservation in 1909 and vessel patrols to prevent bird poaching.



Military facilities constructed at French Frigate Shoals also attracted commercial interest. Soon after the Navy disestablished its station at Tern Island in 1945, commercial fishermen began to use the facility. A joint venture, Hawaiian-American Fisheries, chartered a DC-3 to fly fish from Tern Island, beginning in November, 1946. They operated for three years, grossing \$73,000 in fishery operations at the shoals (Amerson, 1971). Subsequent short-lived fishery ventures occurred at the shoals, ending in 1959. Since that date, no commercial harvest of fishery resources within the managed boundaries of the HINWR is known to have occurred. This is the result of the enforcement of Refuge regulations by the FWS, the continued occupation of Tern Island and the greater interest of the fishing industry in resources substantially more abundant outside the Refuge boundary.

NWHI commercial fisheries over the last 25 years have focused primarily on bottomfishes, lobster, aku, albacore and shrimp. Exploratory surveys have addressed these species as well as squid, pelagic fishes, precious coral and kona crab. Most Hawaiian fishing vessels in the NWHI have been multipurpose boats that concentrate in areas east of Maro Reef. Albacore boats have focused their attention in waters north of Midway. All of these fishery resources noted above are found exclusively or in greatest concentration outside Refuge boundaries. However, the State of Hawaii has expressed the opinion that support of fishery operations outside the HINWR through shared use of Tern Island facilities would enhance the economic development of commercial fisheries. Furthermore, the State has expressed interest in the commercial exploitation of species inside HINWR boundaries, particularly at French Frigate Shoals, where a short-lived fishery for akule, opelu and various baitfish species occurred in the 1950's.

The State of Hawaii formalized its interest in fishery activities at French Frigate Shoals with a December, 1979 request to conduct 1) a "trial feasibility" study of fishery support at Tern Island and 2) a baitfish resource assessment within French Frigate Shoals. The proposal was subjected to Section 7 (Endangered Species Act) review by the FWS and National Marine Fisheries Service (NMFS). Both agencies determined the proposed activity would jeopardize the population of monk seals and turtles at French Frigate Shoals. An alternative project involving exploring the feasibility of a mothership operation and a primarily visual assessment of baitfish resources was proposed by NMFS and FWS, but was not initially acted upon by the State. The recent (November 1983) State proposal for a mothership-based multi-species fishery at French Frigate Shoals addresses the issue of fishery support raised in the 1979 proposal, but it does not address the originally proposed lagoon fishery for baitfish and other species.

The effect that Refuge restrictions on the harvest of lagoon resources have had on the economics of NWHI fishery development is a subject of considerable debate. In the State's 1979 proposal for a test bait-



fishery within French Frigate Shoals, it was estimated that a minimum of 10,000 additional tons of aku (skipjack tuna) could be harvested from the central Pacific Ocean without any appreciable harm to the reproductive capacity of the basic stocks. Results of a small number of brief surveys conducted prior to 1950 were cited as evidence of a commercially viable source of baitfish within French Frigate Shoals which could be used to harvest aku in that area. In a response to this proposal, dated March 11, 1981, NMFS noted that these early reports had demonstrated a marked seasonality of fluctuation in abundance of baitfish at French Frigate Shoals. Upon review of the limited historic data on baitfish abundance, NMFS concluded that French Frigate Shoals represented an "erratic source of bait."

Even more complex than the baitfish issue is the role that restrictions on use of Tern Island have played in the economic development of NWHI commercial fisheries to date. In spite of the short-lived Tern Island based fishery in the 1950's, subsequent interest in the use of the island for fishery support was quite limited prior to 1979, when the Hawaii Fishery Development Plan was published. During that period, a small number of boats continued to exploit NWHI fisheries, largely independent of Tern Island. Over the last five years, the number of vessels fishing in the NWHI has increased and the degree of support provided by the Tern Island facility, now occupied by the FWS, has increased as well. Support in the form of aircraft transport of parts and people, emergency medevacs, equipment repairs and radio communications has facilitated the economic growth of the NWHI fishery. The fishing industry, in turn, has provided substantial assistance to the FWS in the transport of supplies and people to and from Tern Island. The tangible economic benefits to each party of this reciprocal support have been poorly defined, but have probably been on the order of \$40,000-50,000 per year. The extent to which economic growth of the fishing industry may have been more rapid had a greater level of support been provided is a subject open to speculation but with little hard data. It is clear, however, that the less-than-projected availability of certain NWHI fishery resources and the limited ability of the Honolulu market to accommodate substantially increased catches have been a far greater deterrent to expanded NWHI fisheries than has the "limited" degree of fishery support at Tern Island.

The affected economic environment within which the HINWR master plan will be implemented also includes the projected commercial fishery potential in the NWHI and the role that the Refuge may play in the exploitation of the fishery. The Hawaii Fishery Development Plan (HFDP) identified a fisheries resource potential within the Hawaiian region of 74-117.5 million pounds per year, representing an additional harvest beyond present levels of 61-104 million pounds per year. Of this total, 47-71 million pounds of the resource potential were in open-ocean tunas. Since publication of this plan, results of NWHI fishing activities and various Tripartite studies have caused a

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downward revision of the estimates of resource potential for some key species. The Tripartite Delphi study included projections by fishery "experts" of average annual catch estimates that were substantially less for all species than the HFDP estimates. For some key species (e.g. akule/opelu, bottomfish, aku), the Delphi expected average annual catch estimates ranged from 60-90% less than the HFDP estimates of resource potential (Miller and Davidson, 1983). The State of Hawaii is currently revising and updating the HFDP.



**Deteriorated sea wall at Tern Island.**

Other economic considerations include the management costs associated with and the contribution to the economy made by the Refuge management program. The HINWR budget and staffing picture is complicated because this Refuge is only one of 12 refuges within the Hawaiian and Pacific Islands NWR Complex. The total Refuge Complex budget (in thousands of dollars) and staffing (in full-time equivalent positions) over the last five years is shown on the next page:



**Economics****Affected Environment**

	<u>Budget</u>	<u>Est. HINWR Share</u>	<u>Staff</u>	<u>Est. HINWR Share</u>
FY 80	\$431.0	\$235.0	15	8
FY 81	530.0	260.0	18	10
FY 82	537.0	275.0	18	10
FY 83	547.0	280.0	17	9
FY 84	680.0	305.0*	16	10

\*Not including funds for master planning.

The figures for the HINWR represent an unusually high percentage of the Refuge Complex budget and staffing during this period due to FWS involvement in the cooperative Tripartite research project, start-up costs at Tern Island and involvement in master planning. Operational costs at Tern Island have included salaries (Tern Island staff, supervision, administration); equipment purchase, maintenance and repairs; supplies; and charter aircraft and vessels. Only very limited funds have been spent for major projects to rehabilitate facilities. Projected major rehabilitation costs (1984 data) and estimated scheduling is indicated below:

<u>Facilities/Equipment</u>	<u>Est. Cost (\$ X 1000)</u>	<u>Est. Date Required</u>
1. Buildings	\$ 30.0	1988-90
2. Runway	250.0	1990-95
3. Generators	30.0	1986 *
4. Boat Hoist	25.0	1988
5. Sea Wall	2-3,000.0	1990 **

\* 250KW generators not required for present level of FWS operation. Projected cost is for repair and preparation for long-term storage.

\*\* Sea wall rehabilitation presently under study by FWS and Corps of Engineers. Projected costs and timing very preliminary. Short-term repair of critical areas may postpone the need for major rehabilitation.

Funds spent on research within the HINWR contribute substantially to the local economy through the purchase of supplies, hiring of personnel, contracting of vessel and aircraft support, etc. While for some research projects it is difficult to clearly differentiate work outside

the HINWR from that within, it is estimated that between \$300,000-400,000/year was spent by cooperating agencies for within-refuge research during the recent five-year (1978-1983) Tripartite project. Not surprisingly, results of the Tripartite research have stimulated rather than diminished interest among the research community regarding future projects within the HINWR, particularly at Tern Island.

Funds expended on or generated by non-FWS educational programs in the HINWR have been very limited due to restrictions on public access. On the average, 1-2 feature articles on the HINWR have appeared during each of the last 10 years in major publications directed at the general public. Commercial films and photographs from the HINWR have been distributed widely.

#### 4. Aesthetics

Among the HINWR's most notable attributes is its richly varied scenic vistas and truly beautiful marine and terrestrial areas. Views of the Refuge are particularly spectacular from the air and underwater. Regrettably, relatively few individuals have had or are likely to have the opportunity to experience this beauty first hand. Numerous published photographs, displays and films provide the only tangible exposure to the aesthetics of this area for most of the general public.

Maintenance of the high quality of water has both aesthetic and resource management significance. The condition of the nearshore marine and shoreline habitats of the HINWR is intimately tied to the quality of the ocean waters in the NWHI. Human activities that adversely alter ocean water quality can have widespread and, potentially, irreversible effects. Fortunately, the HINWR has been relatively free of the effects of oil and chemical spills, although groundings and related events in the recent past make it clear that even these remote island and atolls are vulnerable. The vessel grounding and release of kaolin clay cargo from a freighter at French Frigate Shoals and the spillage of five million gallons of crude oil from a tanker north of Lisianski Island are the two most notable examples from recent years. Fortunately, neither event appears to have had lasting effects on the Refuge or its fish and wildlife resources.

Air quality is another factor whose significance to the aesthetics of the HINWR is limited by the scarcity of people exposed to the area. Both natural and human-related phenomena do affect HINWR air quality. The odor of guano, decaying wildlife and rotten eggs are conditions to which all visitors to the Refuge are exposed. Human effects on air quality are most noticeable at Tern Island, where motor exhaust, intermittent open burning, aircraft-stirred dust and related conditions may be temporarily offensive.

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**Sooty tern (*Sterna fuscata*), the most abundant seabird in the HINWR.**

#### 5. Other Social Considerations

Restrictions on public access to HINWR lands and waters have prevented widespread direct exposure to the unique biotic and cultural resources of this area, for both consumptive and non-consumptive use. Yet, extreme isolation of these islands, water and weather conditions, recognition of ecosystem fragility and related factors have combined to limit observed and latent demand for access to the HINWR. Many concerned individuals and groups have acknowledged the desirability of measures to limit public access to the HINWR (including their own) if, as a result, the unique values of the area are preserved. For these people, the "quality of life" is enhanced by simply knowing this unique resource is protected, whether or not they experience it first hand. For others, the resource is of little or no value unless it is utilized.

# IV

**PLANNING CONSTRAINTS  
AND CONSIDERATIONS**



**A. Introduction**

Many factors have been considered in preparing a master plan for the Hawaiian Islands National Wildlife Refuge (HINWR). Such factors include 1) the status of fish and wildlife populations and habitats (historic, current and projected); 2) the opportunities for resource enhancement through effective management; 3) public demand for utilization of fish, wildlife, and cultural resources; 4) the documented and anticipated effects of resource utilization; and 5) the comparative cost of various management options. Yet, no factor has had a greater effect in shaping the master planning process than the authorities, mandates and policies that govern the activities of the U.S. Fish and Wildlife Service (FWS).

Legal mandates and administrative guidance provide constraints or "side boards" to planning. Some constraints, particularly federal laws and regulations, provide very little flexibility in their application. Other authorities and policies provide greater license to consider and implement management strategies that can have far-reaching effects. In considering the large body of authorities, mandates and policies pertinent to this planning process, it is apparent that some have general applicability while others are specific to this Refuge.

In reviewing the management recommendations contained in this plan, it is important to recognize the national significance of the issues under consideration here. The HINWR is part of a system of national wildlife refuges that now numbers over 420 units and includes more than 90 million acres of land and water. This system is the only such network of lands and waters in the entire world that is managed principally for the perpetuation and enhancement of fish and wildlife resources. With this in mind, it is clear that the decisions affecting the HINWR, or any other individual national wildlife refuge, must take into account issues of both local and national concern. Proposed actions must be evaluated in the context of their relationship to local and national, even international, priorities.

**B. International Treaties**

Four separate treaties between the U.S. and foreign countries were developed to ensure protection of migratory birds that range beyond national boundaries. These conventions were established with Great Britain (for Canada) in 1916, with Mexico in 1936, with Japan in 1974 and with the Soviet Union in 1978. The treaties with the Soviet Union and Japan include specific mandates to protect migratory bird habitats of special value. The treaty with the Soviet Union further directs each nation to undertake measures necessary to protect and enhance migratory bird environments and to prevent and abate pollution or



detrimental alteration of their habitat. It also requires each nation to identify those breeding, feeding, wintering and moulting areas of "special importance" under their jurisdiction and to take measures to protect these ecosystems. Authority for implementation of these treaties by the U.S. stems from the Migratory Bird Treaty Act, as amended. This Act further provides for regulations to control taking, selling, transporting and importing migratory birds, their nests, eggs, parts or products, and provides enforcement authority and penalties for violations.

### C. National Authorities

#### 1. Executive Orders

a) On February 3, 1909, President Theodore Roosevelt established the Hawaiian Islands Reservation through Executive Order 1019 which set aside the islands and reefs extending from Nihoa to Kure, excepting Midway Atoll, "for use of the Department of Agriculture as a preserve and breeding ground for native birds." This executive order (EO) made it "unlawful for any person to hunt, trap, capture, willfully disturb or kill any bird of any kind whatever, or take the eggs of such birds . . . ." Kure was placed under Navy jurisdiction in 1936 (EO 7299) and transferred to the Territory of Hawaii in 1952 (EO 10413). Administration of the Hawaiian Islands Reservation was transferred to the Secretary of the Interior in 1939 and incorporated into the National Wildlife Refuge System by a name change to the HINWR in 1940 (Presidential Proclamation No. 2466).

b) Executive Order 11593, issued in 1971, directs federal agencies to inventory historic, archaeological and paleontological properties for inclusion on the National Register of Historic Places and to adopt policies that would contribute to the protection of such resources.

#### 2. Federal Laws and Regulations

a) Endangered Species Act, as amended: This Act provides for the conservation of federally listed threatened and endangered species of fish, wildlife and plants. The Act authorizes i) the determination and listing of such species; ii) the designation of "critical habitat"; iii) the prohibition of certain actions (unauthorized taking, possession, sale, transport); iv) the establishment of cooperative agreements/grants-in-aid to States; v) the assessment of civil and criminal penalties for violating the Act or implementing regulations; and vi) the development of programs for the recovery of threatened and endangered species. Section 7 of the Act instructs federal agencies to carry out conservation programs for listed species and to ensure that their actions do not



jeopardize the continued existence of listed species or destroy or adversely modify their "critical habitat."

Six wildlife species in the HINWR presently derive protection pursuant to the Endangered Species Act. The Nihoa finch, Laysan finch, Nihoa millerbird and Laysan duck were all listed as "endangered" in April 1967. The Hawaiian monk seal was listed as endangered in 1976 and the green sea turtle as "threatened" in 1978. To date, no "critical habitat" has been formally designated for any of these listed species. Recovery plans have been drafted for the monk seal and Laysan duck, a plan addressing the three passerine birds is being prepared and a plan to address all U.S. populations of the green sea turtle will be initiated in 1985. According to a memorandum of understanding, jurisdictional responsibility for the monk seal and green sea turtle is shared between the National Marine Fisheries Service (NMFS) and FWS. NMFS has principal jurisdiction over the monk seal although FWS regulations apply in the HINWR. NMFS has jurisdiction for sea turtles in the marine environment while the FWS retains jurisdiction for sea turtles on land. A total of 13 plant species were identified as candidate species in December 1980 but have not been formally proposed for listing.



**"Endangered" Laysan finch (*Telespiza cantans*), endemic to Laysan Island. A small population has been transplanted to Pearl & Hermes Reef.**



b) Marine Mammal Protection Act: This Act gives authority to the Secretaries of the Interior and Commerce (depending upon the species involved) to enforce provisions against "taking" or importation of marine mammals. In the case of the monk seal, listed in 1976 as "depleted" under the Act, NMFS has jurisdiction. This protection extends to cetaceans (whales and porpoises), some of which are known to frequent HINWR atolls and adjacent waters.

c) Migratory Bird Treaty Act, as amended: (See B.1. above.)

d) National Wildlife Refuge System Administration Act of 1966, as amended: This Act establishes policies and directives for administration and management of all areas in the National Wildlife Refuge System (50 CFR). The Secretary of the Interior is authorized to permit, by regulations, the use of any area within the System provided such uses are compatible with the purposes for which the Refuge was established. The Act requires congressional action for the divestiture of lands and waters within the System, with few exceptions.

e) Wilderness Act of 1964: This Act directs the Secretary of the Interior to review and recommend roadless areas which may qualify for formal preservation under a special Act of Congress. To qualify, an area must be largely unaffected by human activities and must be protected and managed so as to preserve its natural condition. Although specific regulations relating to management of Wilderness Areas do not apply unless formally designated by Congress, it is FWS policy that Wilderness management procedures are applicable to designated areas and to areas identified as qualifying and/or under formal consideration for designation. A formal proposal for designation of the entire HINWR (exclusive of Tern Island) as Wilderness was submitted by the FWS in 1969. In response to considerable local opposition, the proposal was changed to include only emergent lands of the refuge, again exclusive of Tern Island. The proposal has not, as yet, been acted on by Congress.

f) Antiquities Act of 1906: This Act requires that a permit be obtained for examination of archaeological sites on certain federal lands. It also authorizes scientific investigation of antiquities and authorizes the President to designate National Monuments.

g) Archaeological Resources Protection Act of 1979: This Act replaces the 1906 Act's permitting procedures for archaeological research. The Act protects irreplaceable archaeological resources on public lands which are subject to loss or destruction from actions of persons who would excavate, remove, damage, alter, or deface them for commercial or personal reasons.

h) National Historic Preservation Act of 1966: This Act provides for the protection, rehabilitation, restoration and reconstruction of historic and archaeological resources. This statute together with



EO 11593 designate the Secretary of the Interior as the responsible official for administering procedures for nomination, registration and protection of cultural resources. All federal agencies are directed to identify and protect potential and actual cultural resource sites that may be affected by their actions.

i) Fish and Wildlife Coordination Act, as amended: This Act specifies a process of coordination between the FWS and other federal and state agencies engaged in water resource projects that may affect fish and wildlife resources. The intent of the Act is to prevent, minimize, or mitigate adverse impacts on fish and wildlife resources that could result from these projects.

j) National Environmental Policy Act of 1969: This Act, known as NEPA, requires all federal agencies to prepare an environmental impact statement (EIS) for "major federal actions, significantly affecting the quality of the human environment." Subsequent regulations, published by the Council of Environmental Quality, provide guidance to federal agencies in the process of determining their NEPA responsibilities. The NEPA process, as it pertains to the HINWR master planning project, is discussed in more detail within Section II of this report.

k) Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977: This legislation effectively prohibits any type of discharge into waters of the United States unless permitted by a specified authority. Pursuant to Section 404 of the Clean Water Act, proposed actions in the HINWR that would involve dredging or deposition of fill in the water would require a permit issued by the Department of the Army.

l) Rivers and Harbors Act of 1899: This Act authorizes the U.S. Army Corps of Engineers to regulate, by permit, the construction of any obstructions to navigation in the navigable waters of the U.S. In the HINWR, this would apply to the proposed construction of shore protection structures, docks, pilings and pipelines in the marine environment.

m) Federal Aid in Wildlife Restoration Act of 1937, as amended: This Act, commonly known as the Pittman-Robertson Act, provides funding to states for wildlife restoration projects. The program is administered by the FWS.

n) Fishery Conservation and Management Act of 1976: This statute extends jurisdiction of the United States over waters 200 miles from the territorial sea baseline. Provisions of the Act exempt highly migratory species (e.g. tunas); prohibit foreign fishing (unless permitted by approved fishery management plans) and establish Regional Fishery Management Councils. In Hawaii and the Western Pacific, the Western Pacific Regional Fishery Management Council has been involved in the



development of Fishery Management Plans (FMPs) for spiny lobster, bill fish, precious coral, bottomfish, and seamount groundfish.

o) Refuge Recreation Act of 1962: This statute authorizes the Secretary of the Interior to administer refuges for recreational use, when such uses do not interfere with the area's primary purposes. It also authorizes the charging of fees for public use.

p) Refuge Revenue Sharing Act of 1935: This Act provides for the sharing with counties of revenues from areas solely or primarily administered by the FWS. For FWS lands withdrawn from the public domain, such as is the case in the HINWR, the payments to counties on an annual basis is 25 percent of net receipts. These payments are in lieu of taxes.

q) Refuge Trespass Act of 1909, as amended: This Act makes it unlawful (except in compliance with rules and regulations) to hunt, trap, capture, willfully disturb, or kill any bird or wild animal on a refuge.

r) Coastal Zone Management (CZM) Act of 1972: This statute establishes federal policies and goals for management and development of the nation's "coastal zone" and provides a program to encourage coastal states to develop management plans in conformity with federal standards. Upon acceptance of such plans by the Office of Coastal Zone Management (OCZM) (National Oceanic and Atmospheric Administration [NOAA], Department of Commerce) states then have the authority to regulate all uses in the state-designated coastal zone. Federal lands are excluded from state control under the CZM Act, although Section 307 of the Act provides that all federal actions that affect the coastal zone must conform "to the maximum extent practicable" with the state management plans. Hawaii's coastal zone program, with the Department of Planning and Economic Development as the lead state agency, was approved by the OCZM in 1978.

s) Marine Protection, Research and Sanctuaries Act of 1972, as amended: This statute authorizes the Secretary of Commerce, with Presidential approval, to designate ocean waters as national marine sanctuaries for the purpose of preserving or restoring their conservation, recreational, ecological or aesthetic values. The Act is administered by NOAA through the OCZM. Goals of the program are to i) enhance resource protection through the implementation of a comprehensive, long-term management plan tailored to the specific resources; ii) promote and coordinate research to expand scientific knowledge of significant marine resources and improve management decisionmaking; iii) enhance public awareness, understanding, and wise use of the marine environment through public interpretive and recreational programs; and iv) provide for optimum compatible public and private use of special marine areas. At present, no marine sanctuaries have been designated in the NWHI. However, the FWS has received a proposal for marine sanctuary designation that

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v) Other Regulations: Regulations concerning wildlife, including administration of wildlife refuges, are published in Title 50 of the Code of Federal Regulations (CFR). The regulations implement the various laws and Executive Orders. Once promulgated, the regulations have the significance and effect of law.

#### D. State Authorities

##### 1. State Laws and Regulations

a) Hawaii Endangered Species Act and Monk Seal Act: These statutes provide protection similar to the Federal Endangered Species Act. The state list of endangered species is, with few exceptions, virtually identical to the federal list. The Monk Seal Act makes it unlawful to "molest, kill, capture or possess" any Hawaiian monk seal or part thereof.

b) State Wildlife Refuge: In cooperation with the FWS (then the Bureau of Sport Fisheries and Wildlife), the State of Hawaii established a wildlife refuge in the NWHI in 1952. The State refuge includes the emergent lands in the HINWR and the islands at Kure Atoll.

c) Coastal Zone Management Act: This statute implemented the federal statute (see C.2.r. above). The HINWR is within the coastal zone, as defined by implementing regulations. However, "refuges" are specifically defined in the federal statute as areas of "national interest" and each state is mandated to recognize this fact in their programs.

d) Leeward Islands Fishing Act: This statute provides the State authority to adopt, through the Department of Land and Natural Resources (DLNR), regulations to control fishing in the "Leeward Islands." Such authority is granted to DLNR where "the action will not deplete stocks of fish or shellfish" in the area. The statute also establishes a permit system for such fishing. However, federal regulations preempt regulations to implement this Act within the boundaries of the HINWR.

e) State Historic Preservation Act: This Act provides complimentary protection to the federal statute (see C.2.h. above). The State Historic Preservation Office maintains a list of cultural resource sites that are proposed and formally listed in the State Register of Historic Places.

f) State Department of Health Water Quality Standards and Water Pollution Control: These Administrative Rules specify specific water quality standards and criteria for certain classifications of waters, and describe regulatory and enforcement procedures to maintain/control such standards. FWS proposals have been developed in full consideration of these Rules.

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would include both atoll waters within the HINWR and adjacent nearshore waters. (See Section VI.C.5.)

t) Research Natural Area: Federal land management agencies have been actively developing a national system of Research Natural Areas (RNAs) since 1927. This system has grown to more than 400 areas. Each area is administered by one of eight cooperating federal agencies. The RNA designation is used by these agencies to establish areas on which natural features and processes are preserved with minimal human intervention for research and educational purposes. Each agency has a different procedure leading to the designation of an RNA. Existing regulatory authorities are utilized to protect the values of RNAs. The seven large islands or atolls of the HINWR (Nihoa, Necker, French Frigate Shoals, Gardner Pinnacles, Laysan, Lisianski, and Pearl and Hermes Reef) were each formally designated as RNAs in 1967 by the Department of the Interior.

u) Area to be Avoided: Several incidents of groundings and offshore oil spills in the NWHI resulted in a proposal to restrict vessel traffic in the vicinity of islands and shoals in 1979. The Intergovernmental Maritime Consultative Organization (IMCO) adopted an "Area to Be Avoided" proposal in May 1981 to encompass an area within a 50-mile radius of NWHI islands and atolls. The IMCO action was issued as an advisory only. It applies only to ships of more than 1,000 gross tons carrying cargoes of oil or hazardous chemicals, but does not apply to ships carrying cargoes of chemicals not on the EPA hazardous chemical list nor to ships carrying oil only as their fuel supply. Furthermore, the advisory excluded Midway and Kure from the Area to Be Avoided.



Grounding in 1969 of a foreign fishing boat on Laysan Island.



**E. Fish and Wildlife Service Mission, Goals and Policies****1. Service Mission**

The mission of the FWS is to "Provide the federal leadership to conserve, protect and enhance fish and wildlife and their habitats for the continuing benefit of people."

**2. FWS Program Goals**

The degree to which goals of various FWS programs have a bearing on the management of national wildlife refuges depends upon the fish and wild life resources found within a particular NWR. The following broad program goals, and subordinate objective statements are most relevant to the management of the HINWR:

a) Endangered Species: "To prevent the endangering or extinction of plant and animal species which is caused by man's influence on existing ecosystems, and to remove such species from threatened or endangered status."

i) List as endangered or threatened and add to the appendices of the Convention on International Trade and annex of the Pan-American Convention all species qualifying under existing authorities.

ii) Provide protection for all listed species from taking, interstate commerce, sale and offering for sale, import and export, and assist federal agencies in insuring that their proposed actions do not jeopardize the continued existence of the species or destroy or adversely modify its Critical Habitat.

iii) Effect the recovery of native species requiring help beyond the automatic benefits of listing and protection, and of foreign species to the extent possible under the Act and remove those species from the list when their recovery has been affected and their future well being is reasonably secure.

b) Migratory Birds: "To conserve and manage migratory birds in a way that provides optimum opportunity for their use and enjoyment by people."

i) Prevent any migratory bird species from becoming "threatened" with extinction.

ii) Maintain migratory bird population levels with optimum species diversity, consistent with the availability of habitat and the demands of society.

iii) Preserve and manage habitats needed to achieve population goals.

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- iv) Achieve migration and distribution patterns most beneficial to both migratory birds and society.
  - v) Minimize losses of migratory birds to disease, predation, illegal kill, crippling and other adverse influences.
- c) Mammals and Non-Migratory Birds (MNB): "To assure natural diversity and optimum population levels of wildlife for the benefit of people through those management activities that are Service responsibility." (Note: The MNB program, in spite of its name, encompasses all wildlife except threatened and endangered species, migratory birds or fishery resources.)
- i) Prevent any native wildlife species from becoming threatened with extinction.
  - ii) Manage FWS lands for a diversity of wildlife species at optimum population levels by providing a wide range of habitats at various successional stages.
  - iii) Assure the perpetuation of nationally important wildlife ecosystems.
  - iv) Protect native wildlife resources and other domestic interests from adverse impacts which would result from importation of injurious foreign wildlife species.
- d) Interpretation and Recreation: "To inform and educate the public on environmental issues affecting fish and wildlife resources and provide compatible recreation on FWS lands."
- i) Contribute to the natural heritage of all Americans through the preservation and management of cultural, historic and archeological properties, wilderness and other designated areas.
  - ii) Help develop an ecological understanding and public responsibility for conservation and the improvement of fish and wildlife and their environments.
  - iii) Provide compatible recreation on FWS lands where adequate funding exists and a need has been documented.

The FWS' program relating to fishery resources deserves mention at this point to clarify its relevance to activities within the HINWR. The Fishery Resources program goal statement is "To promote the conservation and management of the Nation's fresh water and anadromous fish populations for the benefit of people" (emphasis added).

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**3. Mission of the National Wildlife Refuge System (NWRS)**

The special mission of the NWRS is to "provide, preserve, restore, and manage a national network of lands and waters sufficient in size, diversity and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wildlands is enhanced and made available." The goals of the NWRS are responsive to broader FWS program goals (see above):

- a) To preserve, restore, and enhance in their natural ecosystems (when practicable) all species of animals and plants that are endangered or threatened with becoming endangered.
- b) To perpetuate the migratory bird resource.
- c) To preserve a natural diversity and abundance of fauna and flora on refuge lands.
- d) To provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment, and to provide Refuge visitors with high-quality, safe, wholesome, and enjoyable recreational experiences oriented toward wildlife to the extent these activities are compatible with the purposes for which the refuge was established.

**4. FWS Public Use Policy**

The Director of the FWS approved a new Public Use Policy statement on January 5, 1984. The objectives of the FWS' public use management philosophy are as follows:

- a) To provide the public with wildlife/wildlands related opportunities when they are compatible with the primary purpose of the individual field station.
  - b) To provide visitors with the opportunity to enjoy appropriate activities on FWS lands and to learn about and understand the relationships of plant and animal populations within the ecosystem.
  - c) To enhance the public's understanding of natural resource management programs and ecological concepts to enable the public to: i) better understand the problems facing our wildlife/wildlands resources; ii) realize what effect the public has on wildlife/wildlands resources; iii) better understand the biological facts upon which FWS management programs are based; and iv) foster an appreciation as to why wildlife and wildlands are important to them.
  - d) To encourage public participation.
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**5. Regional and Area Goals/Policies**

a) Regional Resource Plan (RRP): The RRP for Region One of the FWS was completed in 1983. It is a 10-year plan that addresses priority resource issues for Washington, Oregon, California, Nevada, Idaho, Hawaii and other Pacific Islands under U.S. jurisdiction. Emphasis in the RRP is on threatened and endangered species, migratory birds, and anadromous fishery resources. For the Pacific section of the RRP, management objectives are developed for threatened/endangered species and for migratory birds.

In the threatened/endangered species category, the RRP includes one major objective relating to listed HINWR species:

"Maintain existing populations of Laysan duck, Laysan finch, Nihoa millerbird and Nihoa finch and protect the islands of the refuge from the introduction of harmful exotic species and oil spills."

The RRP places further emphasis on actions absolutely essential to prevent extinction of federal listed species. Priority is directed at actions included in listed species recovery plans.

In the Migratory Bird category, the RRP section for the Hawaii and Pacific Islands identifies nine management objectives:

- i) Maintain/restore to non-sensitive status viable populations of sensitive species on non-FWS lands.
  - ii) Maintain/restore to non-sensitive status viable populations of sensitive species on FWS lands.
  - iii) Identify potentially threatened/sensitive species.
  - iv) Restore/increase nesting seabird populations restricted by limiting factors such as exotic plants/animals and ongoing activities on FWS lands.
  - v) Maintain the existing, naturally occurring populations, distribution and diversity of nesting seabirds on FWS lands.
  - vi) Ensure maintenance or enhancement of populations and optimum habitat conditions by documenting population status and distribution of nesting seabirds on non-FWS lands and waters in the Pacific Islands Area and utilizing all available programs and measures.
  - vii) Maintain existing populations and habitats for migratory shorebirds, wading birds and waterfowl.
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viii) Protect populations and habitats of pelagic seabirds and other species that winter in or migrate through the Pacific Islands Area.

ix) Develop and implement a public awareness program to help achieve Area Migratory Bird objectives.

b) Regional Marine Bird Policy: Region One of the FWS issued a policy statement on March 9, 1981, relating specifically to marine birds. It is included here because of its relevance to management of the HINWR. Pursuant to this statement, it is the policy of the FWS in Region One to:

i) Implement to the fullest extent possible those Migratory Bird Treaty provisions dealing specifically with marine birds, especially those within the recent Japanese and Soviet Union treaties.

ii) Maintain all marine birds occurring on National Wildlife Refuge lands and waters at not less than current population levels, in their natural diversity and on native habitat throughout their range.

iii) Utilize all available programs and divisions of the FWS to influence the maintenance of the population and habitat conditions in #ii above on all non-FWS lands, especially other federally owned lands.

iv) Recognize that most marine bird colonies, roosts and loafing sites are important to their survival and work toward the establishment and active protection of these habitats and their adjacent waters as marine bird sanctuaries by private, local, state or federal interests.

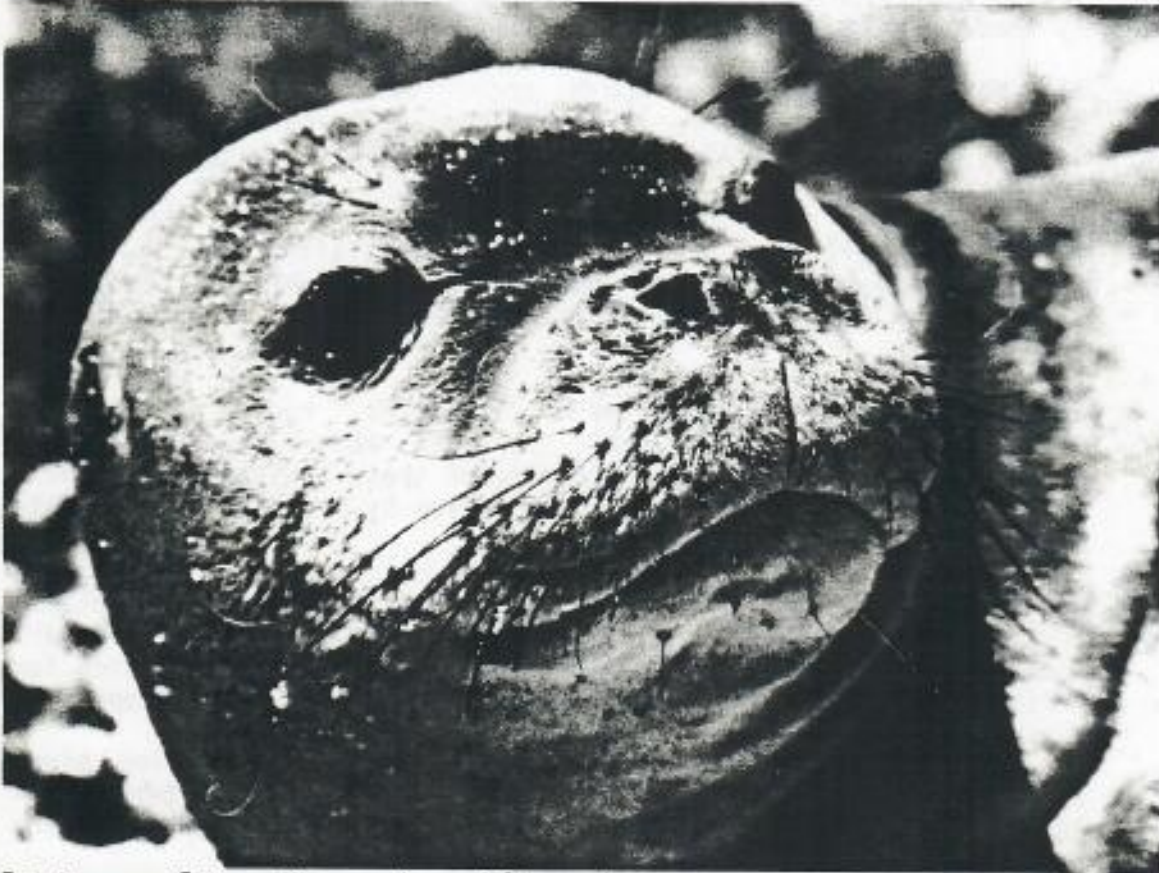
v) Encourage formulation of comprehensive land management plans, and effective regulation of offshore oil and mineral development and stringent tanker safety laws to provide adequate protection for marine birds and their habitats in areas which may be developed.

vi) Encourage appropriate research and surveys on marine birds and their ecosystems, especially work related to long-term monitoring of populations and habitats and identifying species nearing threatened status.

vii) Remove all introduced predators from marine bird colonies on all national wildlife refuges and encourage their removal from all other colonies.

**F. Related Plans and Proposals****1. Endangered Species Recovery Plans**

The Endangered Species Act of 1973, as amended, directs responsible federal agencies to develop recovery plans for federally listed species. The intent of recovery planning is to chart a path that will result in sufficient population recovery or removal of limiting factors to justify downlisting or delisting of species. The responsible agency may determine whether or not appointment of a recovery team is needed for plan preparation. To date, recovery plans for HINWR species have been finalized for the Hawaiian monk seal and Laysan duck. A plan for the three endemic passerine bird species (Nihoa finch, Nihoa millerbird, Laysan finch) was completed and approved on October 4, 1984. Recovery planning for the green sea turtle is scheduled to begin during fiscal year 1985.



**"Endangered" Hawaiian monk seal (*Monachus schauinslandi*). An endemic seal whose population has declined by 50% over the last 25 years.**

a) Hawaiian Monk Seal: The plan for this species, finalized in March 1983, was prepared by the National Marine Fisheries Service. A recovery

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team of 12 members, representing various agencies and organizations, assisted in plan preparation. The objectives of the specific activities outlined in the plan are to:

- i) Identify and, where possible, mitigate the natural factors causing or contributing to the decreased survival and productivity of monk seals;
- ii) Characterize the marine and terrestrial habitat requirements of the monk seal, including use patterns and feeding habits;
- iii) Assess the monk seal population and monitor population trends;
- iv) Document and, where possible, mitigate the direct and indirect effects of human activities on monk seals;
- v) Implement appropriate management actions leading to conservation and recovery of the species; and
- vi) Develop an educational program to foster greater conservation efforts among the users of the Northwestern Hawaiian Islands and the public.

The Recovery Plan outlines FWS involvement by recommending "overlay" National Wildlife Refuge status for Midway Atoll; enforcement of regulations in Title 50, CFR, that relate to management of NWRs, including the HINWR; issuance and enforcement of refuge Special Use Permits for all activities within the HINWR; development of a response plan for dealing with oil and other hazardous substance spills in the HINWR; and cooperation and support in population monitoring of monk seals. The FWS is currently conducting activities on Tern Island that are in direct support of at least four of the six stated objectives.

b) Laysan Duck: The plan for this species was finalized in December 1982. The major recovery strategies outlined by the recovery team include:

- i) Maintain legislative and regulatory protection of Laysan Island.
- ii) Manage the Laysan duck population and habitat, including exotic pest control, as needed, maintenance of captive flocks and continued studies of ecological requirements.
- iii) Promote public awareness of the Laysan duck population and its habitat.

The Recovery Plan outlines FWS involvement by designation as lead agency in all management activities involving the Laysan duck, including such

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actions as erecting snow fences to stabilize shifting sands which may encroach on the fresh water habitat of the duck and preventing disturbance by limiting entry and access to the islands.

c) HINWR Passerine Birds: This plan for three HINWR land bird species has been reviewed by various agencies and revisions are nearly complete. The final draft directs the following major actions:

- i) Prevent unauthorized entry to Laysan and Nihoa Islands.
- ii) Prevent the establishment of exotic organisms.
- iii) Prevent the outbreak of avian disease.
- iv) Monitor populations and habitat.
- v) Establish additional populations to provide a buffer against catastrophic declines in the natural populations.

The Recovery Plan outlines FWS involvement by designation as lead agency in all management activities involving the Nihoa millerbird, Nihoa finch, and Laysan finch, including such actions as preventing disturbance by limiting entry and access to the islands and transplanting birds to islands that were historically inhabited by the species.

d) Green Sea Turtle: No recovery plan has been prepared for the green sea turtle. Recovery planning is scheduled for fiscal year 1985. The focus of recovery efforts will be the protection and enhancement of nesting habitat.

## 2. Critical Habitat Proposals

The Endangered Species Act of 1973, as amended, further provides for the formal designation of specific habitat areas determined to be "critical" to the recovery and survival of federally listed species. Formal designation of critical habitat would officially and specifically delineate those areas that constitute needed habitat. Federal agencies involved in some action in the "critical habitat" would be required to comply with the Endangered Species Act Section 7 requirements.

A proposal to designate critical habitat for the green sea turtle was prepared in 1978 but is not currently under active consideration. Critical habitat was proposed for the monk seal by NMFS in 1978 and in a second draft in 1980. The proposal included three boundary options and hearings were held to obtain public input into the consideration of these options. Considerable opposition to the critical habitat proposal was raised because of the potential adverse effect such designation might have on the development of commercial fisheries in the NWHI. In a Supplemental Draft Environmental Impact Statement distributed by NMFS in

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December 1984, critical habitat was repropoed to include all beach areas, lagoon waters, and ocean waters out to a depth of 10 fathoms around Kure Atoll, Midway Islands, (except Sand Island), Pearl and Hermes Reef, Lisianski Island, Laysan Island, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island. This proposal is opposed by most of the members of the Monk Seal Recovery Team which has recommended designation of monk seal critical habitat to include selected beach habitats and waters to the 20-fathom isobath in the NWHI. Critical habitat has not been formally proposed for any land bird species in the HINWR.

There is considerable debate regarding whether or not critical habitat designation, for any species, would result in additional regulatory authority not presently provided by the portion of Section 7 prohibiting actions of federal agencies which "jeopardize the continued existence" of listed species. It would address actions which "destroy or adversely modify critical habitat", but, presumably, these actions would constitute "jeopardy" as well. Critical habitat designation would insure that adverse modifications to habitat were prohibited, whether or not jeopardy was demonstrated. In the case of the HINWR, where all activities within the efrage require Special Use Permits, the issuing of the permit would be a "federal action" as defined by the Act and would be subject to Section 7.

### 3. State Fishery Development Plan

This plan was prepared by the Hawaii Department of Land and Natural Resources (DLNR) in 1979 to increase the productivity of Hawaii's fishing industry in terms of landings, value and employment. The plan focused on those commercial fisheries showing the greatest potential net economic benefits. Estimates of fishery resource potential in the Hawaiian Islands region ranged from 74 million to 117.5 million pounds.

Relevance to HINWR issues was demonstrated by the projection that essentially all of the potential for expanded bottomfish, lobster, shrimp, akule and opelu fisheries was found within the Northwestern Hawaiian Islands. Of particular significance was strong recommendation in the plan that shore-based fishery support facilities be developed at both Midway and Tern Islands.

### 4. Other State Proposals for Tern Island/French Frigate Shoals

Interest in utilization of facilities at Tern Island for fishery support stems back to the period immediately following World War II, when a limited fishery for bait species, akule and turtles utilized the runway for fish transport. Recreational fishing was also considered at this time. No authorized fishing has occurred within French Frigate Shoals since 1959. In response to increasing pressure to permit fishery support at Tern Island, former Interior Secretary Cecil Andrus committed

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the FWS in February 1979 to take no action at Tern that would preclude the possibility of its future use as a fishery support facility until Tripartite studies were completed.

By letter of December 1979, the State of Hawaii formally requested permission to initiate a test project using Tern Island as a fishery support station and also proposed to initiate a test fishery for bait species within French Frigate Shoals. Meetings were held to review the proposals. Endangered Species Act, Section 7 consultations were conducted by NMFS and FWS. A March 1981 biological opinion issued by NMFS concluded that the support facility would jeopardize the monk seal and green sea turtle. The opinion proposed that as a reasonable and prudent alternative to a fishery support facility on Tern Island, the feasibility of a mothership operation be explored. The proposed alternative to the baitfish test fishery was a limited visual survey and a net experiment. The FWS biological opinion concurred with the NMFS opinion.

As a result of the NMFS/FWS response to the proposal, then State Senator Wadsworth Yee made a formal request to then Interior Undersecretary Donald Hodel for a "return" of the Tern Island facility to the State and for use of the Island as a fishery support station. Undersecretary Hodel committed the FWS to further evaluate a shared use option for Tern, but after one meeting to discuss this option, the State was asked by Undersecretary Hodel to prepare a detailed proposal. The State then developed an alternate plan. Senator Yee announced a "mothership" option in February 1983 and both FWS and NMFS reviewed the proposal shortly thereafter. After review, the proposal was finalized by the State Division of Aquatic Resources in November 1983 and published in May 1984 under the title: "A Proposal to Establish a Fishery Support Operation at French Frigate Shoals, Northwestern Hawaiian Islands." French Frigate Shoals is designated as the preferred site for the support facility because 1) it lies near the geographic center of the fisheries it would service; 2) the reef is large enough to provide some shelter during heavy weather; 3) there is emergency access to facilities at Tern Island; and 4) access to Tern Island is available for gear storage and recreation.

The recent proposal is based upon the concept of a moored mothership within French Frigate Shoals that would service a fleet of 10 catcher vessels during a 70-100 day fishing season. This multi-species fishery would harvest a variety of resources including pelagic fish, bottomfish, spiny lobster and other species. Most of the catch would be stored frozen aboard the mothership for later transshipment to Honolulu. The mothership would also provide fuel, supplies and provisions. The proposal suggested that Tern Island be used for short-term recreation, emergency evacuations and temporary storage of some fishing gear.



This proposal, like any other public use considered for the HINWR, requires thorough assessment concerning compatibility with refuge objectives. Within this Master Plan/EIS compatibility is addressed in the conflict analysis described in Section V.D. Conflict and the absence of conflict (i.e. compatibility) is documented for each wildlife species and proposed use of the Refuge in the Output Summaries which are included in the Technical Appendix (under separate cover).

#### 5. FWS Planning for Tern Island Operation

Upon notification by the Coast Guard in 1978 of intent to decommission the LORAN station at Tern Island, the FWS initiated planning for operation of the facility. In March 1979, Manta Corporation was contracted by the FWS to evaluate various short-term management options for the station. The data gathering phase of the study involved more than 45 separate interviews with interested parties and/or knowledgeable individuals, a review of pertinent published and unpublished documents and a field survey. Based, in part, on the information presented in the draft report of this study, the FWS manned the facility in July 1979 and has maintained continual presence since that date. The operational aspects of the station were considered further during an in-house planning exercise completed in June 1981.

The TERN ISLAND STUDY revealed a wide diversity of opinions among interested agencies, organizations and individuals with respect to the long-term management of Tern Island. Concern was expressed among representatives of conservation organizations and others that FWS "presence" should be maintained at French Frigate Shoals, yet all activities, including research, should be limited to avoid adverse impacts on wildlife. Strong opinions were also voiced by representatives of state agencies and the fishing industry that Tern Island could provide valuable logistical support for commercial use of NWHI fishery resources.

#### 6. Hawaii Wildlife Plan

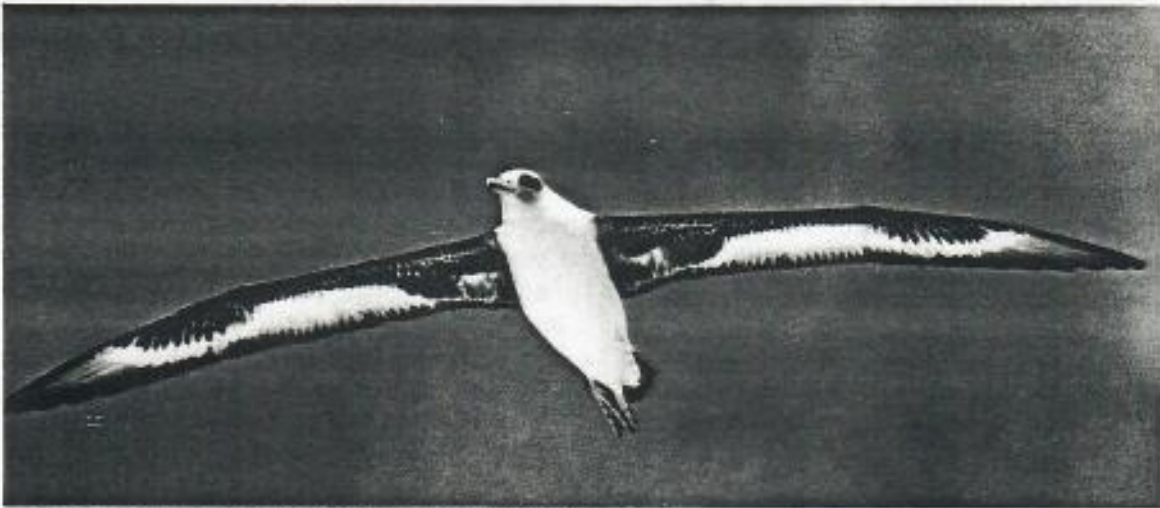
This plan, approved in 1983, was prepared by the Division of Forestry and Wildlife, Department of Land and Natural Resources. The plan "is intended to provide an integrated strategy towards solving the most critical wildlife problems." The geographical scope is statewide, with an emphasis on state-owned or controlled lands. Recommended actions are proposed in three separate categories: species plans, general plans and special plans.

This plan addresses issues of significance to the HINWR in several areas. Seabird colony protection and monitoring is a high priority objective. Captive propagation of the Laysan duck, and possible introduction to other islands, are suggested as viable management tools to recover the species. The threat of introduced rats at Laysan is also noted. In the "general" plan section, high priority is directed at the

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need for improved data collection, an expanded information and education program and improved avian disease response capability. The "special" plan section places considerable importance on the statewide endangered species recovery program, focusing on the need for close coordination with other involved agencies.



**Laysan albatross (*Diomedea immutabilis*).**

#### 7. Fishery Management Plans

Fishery Management Plans (FMPs) for the Hawaiian portion of the Fishery Conservation Zone are prepared by the Western Pacific Regional Fishery Management Council (WPRFMC) in cooperation with the National Marine Fisheries Service (NMFS). The five FMPs now completed or in preparation focus on species groups that are selected on the basis of habitat similarities and susceptibility to capture on certain fishing gear (Rutka, 1983). These FMPs include billfish and other pelagic species (other than tunas), spiny lobster, bottomfish, seamount groundfish and precious coral.

The lobster and bottomfish plans will have the most direct bearing on the HINWR, although all five plans will affect the extent of vessel activity in the NWHI. The lobster FMP, officially implemented in March 1983, establishes as closure areas all NWHI waters shallower than 10 fathoms and within 20 miles of Laysan Island, and also establishes gear restrictions to reduce the risk of monk seal entrapment. The lobster FMP fails to address the FWS' managed boundary of the HINWR. In so doing, the FMP creates a potential conflict in management of the small amount of HINWR waters that are deeper than 10 fathoms. In spite of this area of conflicting jurisdiction, the lobster FMP provides an important foundation for regulating a fishery that might otherwise result in overexploitation of limited stocks.



In developing an FMP for bottomfish, the WPRFMC has acknowledged that main Island stocks are fully exploited and, for some species, possibly overfished. Economic incentives in an expanded NWHI bottomfishery have led to increasing pressure on this resource by both local boats and Mainland-based vessels. The draft FMP for Bottomfish and Seamount Groundfish Resources of the Western Pacific Region (March 1985) addresses this pressure by proposing a system to limit entry to the NWHI bottomfish fishery. A permit system would limit the number of participating fishermen, thereby reducing the risk of overfishing, imposing less surveillance and enforcement burden and assisting with the achievement of other management objectives. It is proposed in the FMP that permits be issued to fishermen who meet certain past performance conditions, namely, the ability to document a minimum of 50,000 lbs. of bottomfish landings or a minimum of ten landings and sales of fish from the NWHI during the past two years. Permit renewal would require the landing and sale of at least 25,000 lbs. of bottomfish or a minimum of five landings and sales of bottomfish from the NWHI. Entry would thus be limited to relatively few people with a history of fishing within the NWHI and with proven ability. Implementation of the system would have obvious benefits for the Refuge including:

- a) The number of vessels bottomfishing in the area would be reduced from the present number (20 vessels in 1984) and no increases would occur. The potential for adverse impacts on wildlife resources and habitats would thus be reduced.
- b) Having fished the area for two or more years, fishermen would be familiar with navigational hazards and sea conditions and less likely to be involved in accidental vessel groundings.
- c) The permit requirement would give the refuge manager a point of contact with each fisherman, thereby facilitating information transfer, working relationships and educational efforts.

The WPRFMC has expressed the perspective that land-based support in the NWHI (specifically Tern Island and Midway) is essential to the effective utilization of this resource.

#### 8. Ocean Management Plan

The Ocean Management Plan (OMP) was drafted by the State of Hawaii's Department of Planning and Economic Development (DPED) in July 1983 through the Hawaii Coastal Zone Management Program. It is intended to provide consistency in management of ocean resources by setting forth objectives and policies by which government entities can orient their efforts. It also attempts to resolve conflicts and establish priorities. As part of this planning effort, ten issue papers were prepared that focused on key ocean management problems and issues.

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Those issue papers of most direct relevance to the NWHI include manganese nodules, fisheries management, nearshore recreation and marine conservation and preservation. The Fisheries Management issue paper, in particular, addresses the State's effort to utilize NWHI fishery resources. The issue papers and draft OMP have been revised and edited to incorporate comments, but neither has been finalized.

The July 1983 OMP draft includes a list of objectives, policies and implementing actions relating generally to ocean management and more specifically to each of the issue paper topics. The OMP places high priority on protection, public use and economic development of ocean resources and addresses conflicts between these objectives. Of particular relevance to the HINWR Master Plan/EIS is the recommendation to develop facilities in the NWHI "for seafood processing and transshipment as well as for conducting research" which appears in the Fisheries section of the OMP. Implementing actions and policies in the Marine Conservation and Preservation section of the OMP address the need to coordinate marine conservation efforts of various agencies.

#### 9. City and County of Honolulu Planning for the NWHI

County authority in the NWHI arises from state statute and county charter. The geographical limits of the City and County of Honolulu includes all of the NWHI in the State of Hawaii (excludes Midway Atoll). The County does not presently assert a role in resource or refuge administration in the NWHI but it does have a major regulatory role in Honolulu. The NWHI are located in the State's designated coastal zone management area. Each county regulates activities in its coastal zone through the shoreline management area (SMA) permit process. No SMA has been officially defined for the NWHI as yet, so the City and County of Honolulu's role through the regulatory process is unclear. The County could, however, exercise some influence through the shoreline setback law, which restricts placement of structures in the area immediately above the wave wash line. The County also has the power to issue well, grading and building permits throughout its area of jurisdiction.

The existing city and county general plan does not include the NWHI. However, the Plan is currently being amended to address this area. City Council member Leigh-Wai Doo has pointed out that adoption of a county general plan for the NWHI would ensure that the State Land Use Commission would consider the County's general plan designation when reviewing proposed land use district boundary amendments. He has further noted that placement of the NWHI in "preservation" status through a general plan would ensure that all proposed construction projects would require a plan amendment, a procedure requiring a legislative mandate and thorough public review.



As all lands in the NWHI (except Midway) are presently in the State's "protective subzone" of the conservation zone, proposals for non-conservation type uses would require a Conservation District Use Permit (CDUP) and a public hearing would be required. Councilman Doo has recommended that the County could allow for greater public participation in the regulatory process by designating a SMA encompassing the land and nearshore areas of the NWHI. The process of obtaining an SMA permit and shoreline setback variance would occur before processing a CDUP application, so the County could deny the permit before it was even considered by the State. Councilman Doo has also noted that establishment of an SMA could lead to greater County input in development of oceans adjacent to the NWHI.

On June 29, 1983, the City and County of Honolulu, City Council adopted Resolution 83-240, requesting the preparation of a Ninth Development Plan "on Northwestern Hawaiian Islands and those islands in the City and County of Honolulu beyond the island of Oahu and to prepare an amendment to expand the scope of the General Plan." This resolution was followed by Resolutions 84-239 and 84-240 on August 1, 1984, requesting the Department of General Planning to process General Plan and Development Plan amendments relating to the description provided in Resolution 83-240.

On November 30, 1984, proposed amendments to both the City's General Plan and Development Plan Ordinance were presented for public comment. An informal public information meeting on the proposed amendments was held on December 18, 1984. The FWS then provided written comments on the proposed amendments. The General Plan explicitly expresses the City and County's interest in environmental preservation and protection, recognizes economic development must be compatible with objectives to preserve the area's unique environmental, marine, and wildlife assets, and further recognizes and encourages federal leadership to protect these assets.

The Development Plan is proposed "to preserve and protect the environmental, marine, and wildlife of the Northwestern Hawaiian Islands" and to "emphasize the protection of resources together with controlled use of these resources for educational, research, and recreational purposes."

In summary, Councilman Doo has proposed that adoption of a County General Plan, Development Plan, and SMA for the NWHI would ensure that extensive public input and County legislative mandate would be required before proposed changes to the islands could be implemented.



**10. State/FWS Proposals for Midway Atoll**

Exploratory albacore trolling operations by U.S. vessels in the central North Pacific began in 1975 and have continued in waters north-northwest of Midway since that date. On the basis of the results of historical Japanese fisheries and the results of exploratory fishing by U.S. vessels, the State of Hawaii began negotiations with the Navy in 1978 to permit entry to Midway for support of the fishery. A purse seiner was used as a support vessel at Midway under a Facilities Use Permit from the Navy in 1979. Similar support was not arranged in 1980-1982, although the number of vessels in the fishery increased.

In 1982, the State legislature appropriated funds for a Midway support facility feasibility study. This project was contracted to Pacific Analysis Corporation and their final report was completed in March 1984. The report recommended short- and long-term support scenarios, involving purse seiner motherships in the early phase, progressing to a tug/barge operation and eventually a cargo ship with refrigerated containers. A fleet of at least 100 catcher vessels was projected in this report.

During the same period of time that the State of Hawaii has been investigating fishery support options at Midway, the FWS has also been evaluating options to insure effective management of fish and wildlife resources at the site. The FWS has been involved in field studies at Midway since 1956, beginning with an assessment of the bird-aircraft strike hazard and expanding into an ambitious research program involving seabird population monitoring, predator control, study of disease and habitat manipulation. The FWS has also monitored monk seals at the site over the last 25 years and have been joined in this effort in recent years by NMFS.

Midway was designated a Navy Wildlife Refuge in 1973. Concern regarding the declining seal population, rat predation in seabird colonies and avian disease outbreaks prompted the FWS to accelerate its research and management role at Midway over the last decade. In association with this expanded role, the FWS, NMFS, and Navy entered into a cooperative wildlife management agreement to begin addressing the identified problem areas. In 1981, the FWS initiated an evaluation of long-term wildlife management options on Midway. Among the options considered in this evaluation has been an "overlay" national wildlife refuge scenario under which fish and wildlife management responsibility would rest cooperatively with the FWS and Navy while facility operational responsibility would be retained by the Navy. Such an arrangement is functioning at Johnston Atoll NWR, managed cooperatively by the Defense Nuclear Agency and the FWS. The Navy and the FWS are currently reviewing the results of this evaluation process.



These two planning efforts relating to Midway Atoll have considerable bearing on the long term management of the HINWR. The fishery station proposal could likely be implemented without significant adverse impact to fish and wildlife resources and habitat within Midway Atoll. Yet the expanded fishery facilitated by such a support operation poses additional risks (groundings, oil spills, rodent introductions, etc.) to and adds to the management burden of islands and atolls of the HINWR. The wildlife management options under review by the FWS and the Navy would not adversely impact either existing naval operations or proposed fishery support at Midway. However, to the extent that expanded FWS presence on Midway would facilitate wildlife research, the course of action at Midway will affect the array of preferred management strategies within the HINWR.

#### G. Other Issues

##### 1. Boundary Dispute

It is the State of Hawaii's position that the boundary of the HINWR never legally included more than the emergent lands of the NWHI, excluding Midway, and that Kure was transferred to the Navy (and later the State) by Executive Order in 1936. In contrast, it is the FWS' position that the HINWR also includes approximately 252,000 acres of submerged lands, principally at French Frigate Shoals, Maro Reef and Pearl and Hermes Reef. The FWS' position stems from the original EO 1019 which included "islets and reefs" and identified the various atolls, not the individual islets. The boundary dispute extends to the question of ownership of Tern Island, an island that was increased from 11 to 37 acres by dredging in 1942.

The boundary dispute has obvious implications to the planning process and the actual management of the HINWR. However, it is the FWS' position that until such time as the boundary issue is resolved, hopefully by mutual agreement, it is appropriate to master plan for the refuge as defined by the FWS. It is our belief that the master planning process will result in the most appropriate resource management strategies, regardless of the location of the legally defined boundary. Virtually all fish and wildlife species that inhabit the disputed areas also range beyond the FWS' managed boundary so it is critical that the planning effort address their habitat requirements from a broader perspective.

##### 2. Ocean Mining

The FWS is currently coordinating with the Minerals Management Service of the Department of the Interior and the State of Hawaii Department of Planning and Economic Development to focus on the exploration of the potential for deep offshore mining in the vicinity of the HINWR. A

joint federal-state task force was formed in February 1984 to evaluate the economic potential and environmental impacts of ocean mining for cobalt-rich manganese crusts in the 200-mile Exclusive Economic Zone surrounding the Hawaiian Archipelago. In September 1984, data collection began in the French Frigate Shoals area with the use of a deep-diving submersible. The data are being utilized in the development of a Draft Environmental Impact Statement. Leasing of deep ocean tracts could occur within three years. Because the specifics of leasing proposals, mining activities, the need for land-based support facilities, etc., are not yet known, ocean mining has not been addressed in any of the alternatives in Section VI. At the date of this writing, it appears that the areas on the flanks of the islands, atolls and shoals of the HINWR will eventually be excluded from further ocean mining consideration. As planning for ocean mining progresses, it is anticipated that the FWS will remain fully involved in assessing the potential impacts on refuge wildlife resources. A proposal for deep ocean mining will trigger the requirement for an Environmental Impact Statement prior to federal-state approval of the project.





**FORMULATION OF  
OBJECTIVES**

**A. Introduction**

This section describes the process used by the U.S. Fish and Wildlife Service (FWS) to formulate objectives for the Hawaiian Islands National Wildlife Refuge (HINWR). The results of the process are narrative objective statements which are also presented in this section. Objectives are the key ingredients of the HINWR Master Plan/EIS. Essentially every recommendation and proposed action within this document is influenced by objectives. In particular, the individual strategies that will constitute the various refuge management alternatives (see Section VI) are each developed to address one or more objectives.

**B. Outputs**

The first task in developing objectives for the HINWR was to prepare a preliminary list of the "things" produced or provided on the Refuge. This list included all of the "things" that are currently produced or provided, as well as those that have the potential to be produced or provided. These "things" are referred to in the Master Plan/EIS as outputs. An example of a current resource output of the HINWR is the production of young green sea turtles. This output is measured in terms of the number of young turtles produced per year. An example of a public use output would be the opportunity to conduct research. This output would be measured in terms of the number of studies conducted.

The HINWR Master Planning Team began the process of developing outputs for this Refuge by referring to a Master Output List. This list addressed a wide range of outputs arranged in national priority order for the National Wildlife Refuge System. This list also provided general guidance for prioritizing broad (generic) categories of outputs in formulating a list directly applicable to the HINWR. Guidance in developing priorities was also found in pertinent legal mandates, regional policy and other planning considerations (see Section IV). Developing an output list particularly suited to the HINWR required some adaptation of the Master Output List, in view of the uniqueness of this particular refuge in the System.

The HINWR output list was refined and revised throughout the master planning process based on further review of pertinent data and as a result of public and agency input through newsletter responses and meetings. The final output list is presented in Figure 3. Brief explanations of these outputs are provided on the following pages to facilitate the reader's understanding of the list. Several wildlife resource outputs include the terms "production" and "maintenance". For the purposes of this discussion, "production" refers to the number of



young produced per year. "Maintenance" refers to the number of individuals of a particular type of wildlife (e.g. seabirds) present on the refuge for a period of one day. A "maintenance" population is measured in "use-days".

Figure 3

HAWAIIAN ISLANDS NWR OUTPUT LIST

The following list represents all outputs that are currently produced or provided on the refuge or possibly may be produced or provided on the refuge. Outputs are listed in priority order.

VULNERABLE SPECIES (ENDANGERED, THREATENED, SENSITIVE, AND CANDIDATE):

1. Monk Seal Production and Maintenance
2. Laysan Duck Production and Maintenance
3. Endemic Finches and Millerbird Production and Maintenance
4. Sea Turtle Production and Maintenance
5. Sensitive/Candidate Species Production and Maintenance

ENVIRONMENT:

6. Cultural Resource Protection
7. Wilderness
8. Research Natural Area
9. Other Protective Status

OTHER FISH AND WILDLIFE:

10. Marine Bird Production and Maintenance
11. Other Migratory Bird Maintenance
12. Terrestrial Endemic/Native Species Maintenance
13. Marine Reef Species Maintenance

SCIENTIFIC AND PROFESSIONAL SERVICES:

14. Research Studies

EDUCATION/INTERPRETATION:

15. Environmental Education
16. Interpretation
17. Photography/Journalism/Art

OTHER PUBLIC USES:

18. Other Compatible Public and Economic Uses

**Explanations of HINWR Outputs and Output Categories:**

- a) **Vulnerable Species:** This category includes endangered, threatened, sensitive or candidate species, all of which are susceptible (to various degrees) to extinction.
- b) **Endangered Species:** This term includes any species in danger of extinction throughout all or a significant portion of its range. Endangered species resident in the HINWR include the Hawaiian monk seal, Laysan duck, Laysan finch, Nihoa finch and Nihoa millerbird. Endangered hawksbill turtles and other marine mammals are also found occasionally within Refuge waters. All threatened and endangered species are identified on a Federal list, pursuant to the Endangered Species Act.
- c) **Threatened Species:** This term refers to species which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. The only wildlife species currently listed as threatened in the HINWR is the green sea turtle.
- d) **Sensitive Species:** By FWS definition, sensitive species are vulnerable enough that they could become listed as threatened or endangered in the near future. Sensitive species identification focuses management attention on these species to avoid the need for future listing as threatened or endangered. To date, only one species in the HINWR (sooty storm-petrel) has been formally identified by the FWS as a sensitive species.
- e) **Candidate Species:** Species which are currently being considered for listing as threatened or endangered (e.g. *Acropora* spp.).
- f) **Cultural Resource Protection:** This output refers to the identification and protection of sites and areas of significance to human history.
- g) **Wilderness:** This output refers to any area of land and/or water that qualifies for formal designation in accordance with the Wilderness Act of 1964. Portions of the HINWR have been formally proposed for "Wilderness" designation.
- h) **Research Natural Area (RNA):** RNAs are formally designated areas of land and/or water recognized for their intrinsic values to research and education. Natural processes are generally permitted to operate without human intervention within an RNA. Each of the major islands and atolls of the HINWR were designated by the FWS as RNAs in 1967.
- i) **Other Protective Status:** This broad output includes other types of formal protective designation that may be appropriate for refuge lands and waters. Among those under consideration are marine sanctuaries, critical habitat for listed species, world heritage sites and national
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## **Definitions**

## **Formulation of Objectives**

natural landmarks. For the purposes of discussion, this output also includes consideration of refuge boundary status.

j) Marine Birds: This output includes a population of more than 12 million birds (breeders and non-breeders) of 18 species of seabirds resident in the HINWR. Included are albatross, petrels, storm-petrels, shearwaters, tropicbirds, boobies, frigatebirds and terns.

k) Other Migratory Birds: This output includes more than two dozen shorebird and waterfowl species that migrate into or through the HINWR during their non-breeding season.

l) Terrestrial Endemic/Native Species: This broad output includes various species of plants, arthropods, land snails and other invertebrates native to or restricted in distribution to the terrestrial environment of refuge islands.

m) Marine/Reef Species: This output was created for the HINWR to include the wide variety of marine species that inhabit the lagoons and nearshore waters within the Refuge.

n) Research Studies: This output includes a variety of human activities within the HINWR that are designed to gather and disseminate data on vulnerable species, endemic terrestrial species, other refuge species, their habitats, and other environmental related research such as that associated with the weather. These studies may be performed by refuge staff or cooperating investigators.

o) Environmental Education: Included here is the use of refuge lands and waters for structured environmental studies, usually involving teacher-led groups. These activities are generally part of a formal course of study involving "hands-on" field work.

p) Interpretation: By FWS definition, interpretation is an educational activity aimed at revealing relationships, examining systems and exploring the relationship between the natural world and human activities. Conducted interpretation involves the use of trained staff or volunteers. Interpretation may also be self-guided (e.g. nature trails). Interpretation may also occur off the refuge when inaccessibility or other conflicts with wildlife make on-site interpretation inappropriate or impossible.

q) Photography/Journalism/Art (P/J/A): This broad output includes a wide range of non-consumptive activities that are wildlife-related. This output is grouped with the education and interpretation outputs in planning for the HINWR because the emphasis is placed on the educational exposure of the non-visiting general public to the the results of P/J/A activities (articles, books, films, etc.).



r) Other Compatible Public and Economic Uses: This broad output includes the following uses that have been determined to be compatible with refuge purposes (future uses will require assessment on a case by case basis):

(i) Support of Commercial Fishing: Provide logistical support for the commercial utilization of renewable fishery resources in the Northwestern Hawaiian Islands, including principally bottom-fish, lobster, aku, albacore, shrimp and other species.

(ii) Recreational Fishing: This activity refers to the non-consumptive recreational use of fishery resources within to the HINWR boundary.

(iii) Other Recreation: This use includes other recreational pursuits on the HINWR, including those activities not related to or dependent upon fish and wildlife resources.



Laysan albatross colony—Southeast Island, Pearl & Hermes Reef.

### C. Locational Criteria

Once it was determined which outputs were appropriate for the HINWR and the priority listing for those outputs was determined, it was then necessary to study the resource conditions required to support the various outputs. This analysis makes it possible to determine how much or how little of an output the refuge is capable of sustaining. This



information was also needed to determine how outputs relate to each other and where potential conflicts among outputs may occur.

Locational Criteria statements were developed to organize and document a considerable volume of pertinent information in a concise, summarized manner. Locational Criteria statements describe ecological relationships, locational factors and quality ratings for specific resources that have been found to be essential to the existence of a particular output. Because of their volume, Locational Criteria Statements have been packaged under separate cover in the Technical Appendix.

#### D. Output Summaries

For the HINWR Master Plan, it was appropriate to go beyond the Locational Criteria Statements in an effort to fully analyze the potential to produce various outputs, the demand or justification for output production and the degree to which various outputs would conflict with one another. This analysis was accomplished by developing "Output Summaries" for each output. Output Summaries, which are included under separate cover in the Technical Appendix, provide this background of analysis undertaken in the development of narrative objective statements.

Potential to continue or increase production of a particular output on the HINWR is an important consideration in establishing realistic objectives for both wildlife and public use outputs. Simply stated, if the resources do not exist in sufficient quantities on the refuge to support a particular species, then it is not realistic to recommend a high production or maintenance objective for that species. Alternately, if a large, untapped resource is found to exist on the refuge, then the FWS has the responsibility to consider how this resource might be utilized to enhance outputs whose existence is dependent upon that resource. It is important to note, however, that high potential would not, in itself, justify programs to enhance production of a particular output if significant conflicts with higher priority outputs were apparent.

Demand for a particular output, like potential, is an important factor to consider in developing refuge objectives. Both documented and undocumented latent demand are relevant. For example, public interest in nature tour visits to the HINWR has been relatively limited, yet growing international interest in this type of activity makes it likely that considerable latent demand would become evident should this type of opportunity be made available. Also pertinent in this analysis is the "justification" for production of a particular output that derives from statutes or policy statements that are the foundation of refuge management programs (see Section IV). For example, existing legal mandates (Endangered Species Act) and recovery plans leave little room



for interpretation when considering whether or not production and maintenance of endangered species should be a high priority output for the HINWR. Numerous plans and proposals relating to the development of commercial fisheries in the NWHI also provide "justification" for serious consideration of this output in the master planning process.

The Output Summaries also include a brief analysis of the principal conflicts likely to occur in the production or maintenance of individual outputs. Conflicts between outputs may be direct, such as the case when two outputs compete for the same refuge resources at the same point in time. Conflicts may be indirect as well. An example might include the conflicts between the production and maintenance of endangered land birds on Laysan Island and the implementation of an environmental education (EE) program on that island. In this case, the EE program would not involve the direct consumption of land birds, but the disturbance of the birds and habitat associated with the activity may make the two outputs incompatible at this location. Where anticipated conflicts can be mitigated by adjusting locations or schedules, these measures are noted and subsequently incorporated into objective statements and management strategies. Where conflict cannot be mitigated, lower priority outputs are "traded-off" in order to accommodate or provide for higher priority outputs.

Having identified the areas of significant conflict, a set of objectives was developed that avoided or mitigated conflict to the greatest extent possible, while providing a diversity of compatible wildlife and public uses. It should be assumed therefore, that in order to be included in the final list of objectives (see Section V.E. below) each objective was found to be sufficiently compatible with the others on the list.

#### E. Objective Statements

The result of the analytical process described above was a clear, comprehensive understanding of the most important factors affecting the current and potential existence of various outputs in the HINWR. With this understanding, it was possible to develop realistic, long-range objective statements that satisfy statutory and policy requirements of the FWS while also representing a suitable balance between the protection and utilization of refuge resources. Objectives are quantified where appropriate and are listed below in priority order under output categories:

##### VULNERABLE SPECIES:

1) Monk Seal Production and Maintenance: Maintain existing populations at French Frigate Shoals, Necker and Nihoa at or above present levels. Recover populations at Laysan, Lisianski and Pearl and Hermes Reef to at least midcentury levels.

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- 2) Laysan Duck Production and Maintenance: Maintain current population levels and captive breeding stock. Prevent ecological disturbances on Laysan Island.
- 3) Endemic Finches and Millerbird Production and Maintenance: Maintain current populations. Prevent ecological disturbances to Nihoa Island and Laysan Island.
- 4) Sea Turtle Production and Maintenance: Maintain aquatic habitat for sea turtles. Maintain existing nesting and basking populations of green sea turtles at French Frigate Shoals, Necker and Nihoa. Increase nesting populations at Laysan, Lisianski and Pearl and Hermes Reef to at least midcentury levels.
- 5) Sensitive and Candidate Species Production and Maintenance: Identify, maintain and/or restore viable populations of sensitive and candidate species in the HINWR.

**ENVIRONMENT:**

- 6) Cultural Resource Protection: Complete cultural resource studies; nominate eligible sites to State/National Registers and protect all identified sites from adverse impacts.
- 7) Wilderness: Manage all emergent lands, exclusive of Tern Island, as de facto wilderness. Nominate, if appropriate after review, HINWR lands and waters as Wilderness.
- 8) Research Natural Area: Manage the HINWR consistent with Research Natural Area designation.
- 9) Other Protective Status: Evaluate and seek, where appropriate, additional protective status for the NWHI (e.g. World Heritage Site, Marine Sanctuary, Natural Landmarks, Critical Habitat, Midway Overlay, Boundary Review).

**OTHER FISH AND WILDLIFE:**

- 10) Marine Bird Production and Maintenance: Maintain existing populations, distribution and diversity of nesting seabirds in the HINWR.
- 11) Other Migratory Bird Maintenance: Maintain existing terrestrial and marine habitats for migrating marine birds, shorebirds, wading birds and waterfowl.

## **Objectives**

## **Formulation of Objectives**

12) Terrestrial Endemic and Native Species Maintenance: Maintain and restore natural diversity of terrestrial ecosystems.

13) Marine Reef Species Maintenance: Maintain current abundance, distribution and diversity in the reef ecosystem.

### **SCIENTIFIC AND PROFESSIONAL SERVICES:**

14) Research Studies: Conduct and facilitate studies to gather data necessary to assess, monitor and manage refuge resources and environmental impacts of public use.

### **EDUCATION/INTERPRETATION:**

15) Environmental Education (EE): Encourage off-site EE activities at more accessible locations where compatible with wildlife resource-related objectives. Facilitate, where feasible, limited on-site EE opportunities for both teachers and students.

16) Interpretation: Increase opportunities for off-site interpretive activities. Provide, where feasible, limited on-site supervised interpretive opportunities.

17) Photography/Journalism/Art (P/J/A): Increase opportunities for off-site P/J/A. Provide, where feasible, limited and strictly controlled on-site supervised P/J/A opportunities.

### **OTHER PUBLIC USES:**

18) Other Compatible Public and Economic Uses: Provide support for other compatible public and economic uses throughout the NWHI archipelago. (At the present time, limited logistical support for the commercial fishing industry and recreation for authorized personnel on Tern Island are the only "other public uses" evaluated as compatible with refuge purposes. Compatibility of future uses will require assessment on a case by case basis).