

PACIFIC REMOTE ISLANDS  
NATIONAL WILDLIFE REFUGES  
HONOLULU, HAWAII

ANNUAL NARRATIVE REPORT  
Calendar Year 1987

*U. S. Department of the Interior  
Fish and Wildlife Service  
National Wildlife Refuge System*

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JOHNSTON ATOLL NATIONAL WILDLIFE REFUGE

Honolulu, Hawaii

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NATIONAL WILDLIFE REFUGE SYSTEM

## INTRODUCTION

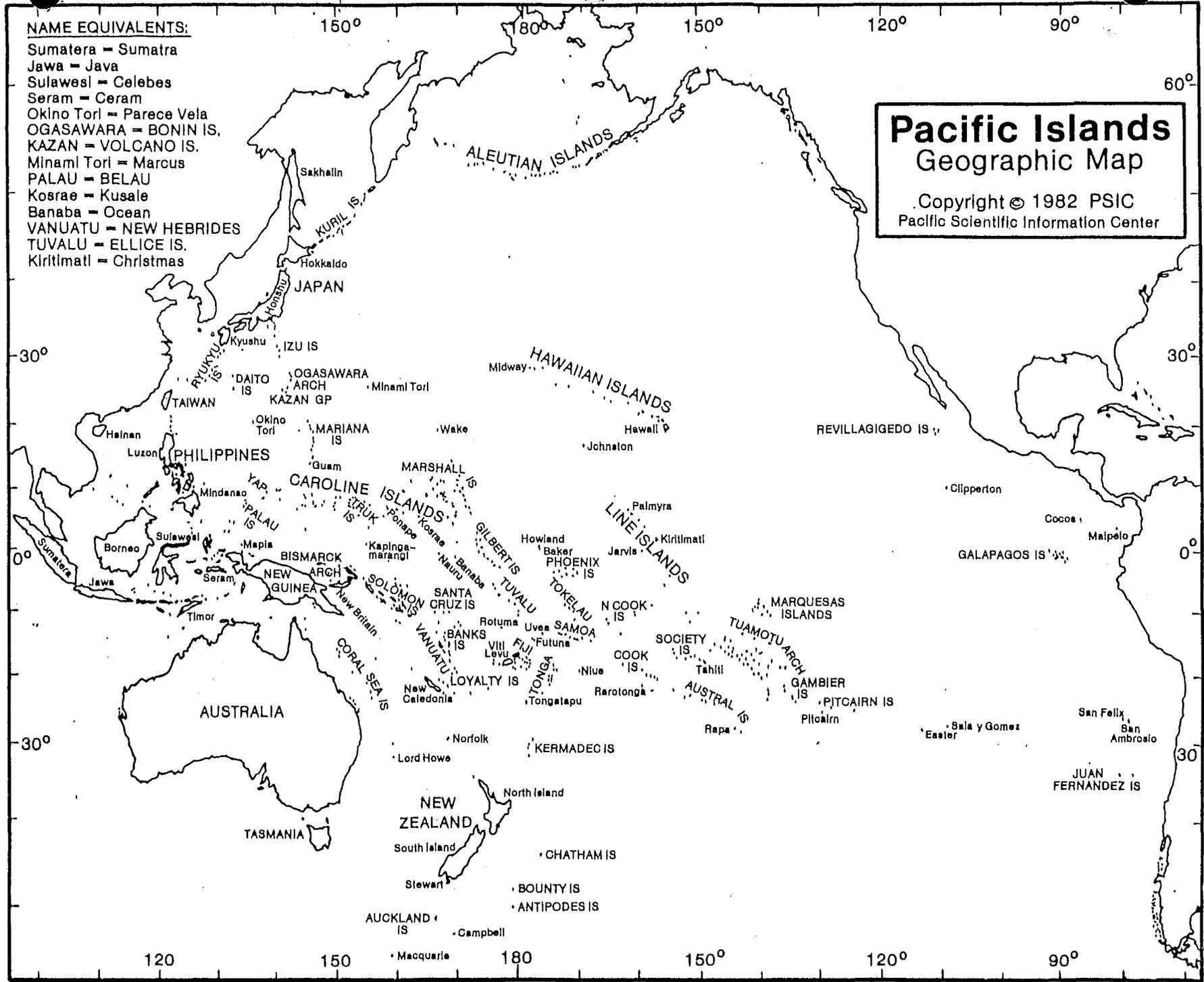
Johnston Atoll National Wildlife Refuge is located in the Central Pacific Ocean, 717 nautical miles west southwest of Honolulu, Hawaii and 460 nautical miles south of French Frigate Shoals. Because of the great distances to other islands, Johnston Atoll is one of the most remote atolls in the world. It is the nearest land to over 820,000 square miles of ocean. The Atoll consists of approximately 32,000 acres of shallows with four small islands totaling 691 acres. Two of the islands, North and East, were man-made through extensive dredging in the early 1960s. Beginning in the 1940s, Johnston and Sand Islands were also greatly enlarged by dredging. Johnston Island is presently inhabited by approximately 1,000 military and civilian contractor personnel while Sand Island is the duty station for 10 Coast Guard personnel who maintain a LORAN C station there.

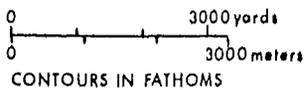
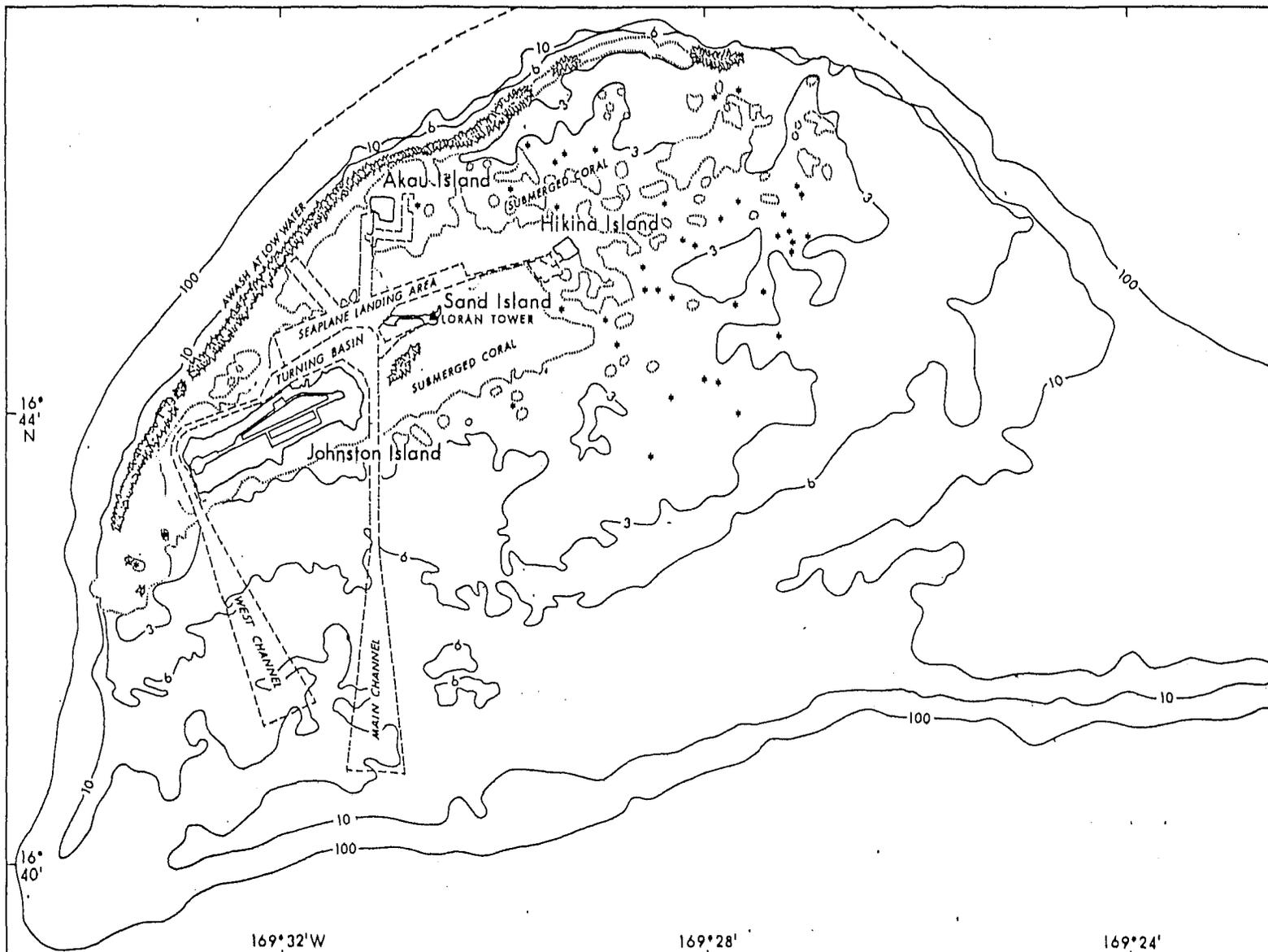
Operational control of Johnston Atoll as a strategic military installation is maintained by the Defense Nuclear Agency (DNA), Department of Defense. Johnston Island is also utilized by the U.S. Army as a storage facility for chemical munitions. The Army is currently constructing a facility on Johnston Island to destroy these obsolete weapons. This facility called the Johnston Atoll Chemical Activity Disposal System (JACADS) has attracted national news coverage and has been responsible for a doubling of the Atoll's population. Other contaminant issues include seven acres of land contaminated with Herbicide Orange, containing soils with over 450 ppb of dioxin and about 40 acres contaminated with transuranium elements as a result of three failed nuclear tests in the 1960s. The refuge was established in 1926 by Executive Order (No. 4467) of President Calvin Coolidge "as a refuge and breeding ground for native birds". At present, the refuge is managed as nesting and roosting habitat for 14 species of seabirds, 6 species of shorebirds, and as habitat for a diverse assemblage of marine animals, including the threatened green sea turtle. One Refuge Biologist was stationed on Johnston Atoll during the period of this report. Johnston Atoll National Wildlife Refuge has been identified by the Service as a high priority area for corrective action relating to contaminant issues.

**NAME EQUIVALENTS:**

- Sumatera = Sumatra
- Jawa = Java
- Sulawesi = Celebes
- Seram = Ceram
- Okino Tori = Parece Vela
- OGASAWARA = BONIN IS.
- KAZAN = VOLCANO IS.
- Minami Tori = Marcus
- PALAU = BELAU
- Kosrae = Kusale
- Banaba = Ocean
- VANUATU = NEW HEBRIDES
- TUVALU = ELLICE IS.
- Kiritimati = Christmas

**Pacific Islands**  
Geographic Map  
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JOHNSTON ATOLL NATIONAL WILDLIFE REFUGE  
North Pacific Ocean

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service

INTRODUCTION

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Aerial view of Johnston Island. (DJF)



Entrance sign at Johnston Island airport. (DJF)

## A. HIGHLIGHTS

The role of the refuge on Johnston Island has undergone considerable growth in the past year. The funding for the biologist position on Johnston Island was increased by the Service through contaminants funds and was partially funded by the U. S. Army. This funding allowed the refuge biologist to work full time on refuge and contaminant issues. In addition, the transfer of funds through the Defense Nuclear Agency, enables the biologist to function as a part of the Base Commander's Staff and therefore carry out refuge goals and the protection of the wildlife and natural resources of the refuge under the Base Commander's authority.

A close working relationship between the Island's population and the Service has been fostered by several interpretive programs. The presence of a biologist on the Island throughout the year has increased the Service's visibility and given both the Island's residents and management confidence in the services' interest in the Refuge, thus fostering greater cooperation. Presentations and tours were given to numerous high ranking personnel from the Department of Defense.

The Johnston Atoll Chemical Agent Disposal System (JACADS) was under construction throughout the year. This plant is the first of its kind and is designed to destroy the obsolete chemical weapons stored at Johnston Island. The plant has received a great deal of interest from the national media, the Defense Department, and those concerned with the environment.

This is the first year since the 1960s where biologists have been present on the island throughout the year to census marine birds. Techniques were developed to census each species as completely as possible. Numerous habitat protection and improvement projects were initiated in order to limit conflicts between human activities and the marine birds.

## B. CLIMATIC CONDITIONS

Johnston Atoll (JA) has a mild tropical oceanic climate dominated by cooling northeasterly trade winds. Weather observations are taken at the Johnston Island Weather Station. Temperatures were moderate throughout the year with the yearly mean of 79°F the same as the 30 year mean. The rainfall in 1987 of 23.0 in. was 4.0 in. below the 30 year mean. Over half of the rain fell during October through December leaving the rest of the year even drier than indicated by a variation of only 4 in. (Table 1).

TABLE 1. Mean temperature and rainfall recorded at Johnston Island during 1987 and the 30 year mean from 1955 through 1984.

Month	Mean Temperature( °F)		Rainfall(in)	
	1987	30 Year Mean	1987	30 Year Mean
January	78	77	0.67	1.79
February	76	77	1.23	1.62
March	77	77	0.43	2.65
April	77	78	1.80	2.46
May	88	79	0.70	1.90
June	81	80	1.17	0.96
July	82	81	1.48	1.06
August	83	81	1.57	2.52
September	84	81	1.14	2.12
October	82	81	6.67	3.19
November	80	79	2.62	3.61
December	78	78	3.52	3.14
All Months	79	79	23.00	27.03

#### D. PLANNING

The refuge biologist is involved regularly with monitoring the day to day operations of the base and maintenance construction contractors advising them on how to limit their impacts on wildlife habitat. He also was asked to participate in planning of numerous activities and construction on the base. A few of the planning efforts are described below:

Manager Forsell accompanied Major Merris (Provost Marshall) on a tour of areas planned for sand bag fortifications. Most sites were not near nesting sites of birds, and those near nests did not disturb the vegetation. These emplacements are for emergency purposes only. In April the Army simulated a terrorist attack of the Island and flew in a 300 man force from Honolulu to the island in the middle of the night. They then attempted to take a terrorist force of 11 persons who had presumably captured some chemical weapons. Prior to the operation all shrubs with nesting birds were wrapped with white flagging and the troops were briefed that they were not allowed to enter the shrubs or disturb the birds. Probably as a result of our restrictions most of the good guys were killed while trying to recapture the chemical weapons. All tropicbird nests in the area were checked prior to the operation and on succeeding days for disturbance. No birds abandon their nests although there had been a great deal of firing of blank rounds in close proximity to the nests. The Military Police fired 50 caliber machine guns at a target located off the western shore of Johnston Island on 28 January. Forsell accompanied them to the site and watched the area for sea turtles while they were firing. No turtles were observed and most rounds entered the water far at sea.

Several days were spent with Major Probst (Provost Marshall), engineers from the Corps of Engineers, and the representatives of Bechtel Inc. planning the boundaries of the security upgrade of the chemical storage area. The contractor was advised and monitored on numerous activities including: storage of hazardous waste and hazardous materials, allocation of storage areas, avoiding destruction of nesting habitat, and disposal of construction debris and trash.

Stearns-Rogers Inc., the equipment installation contractor for the JACADS plant was briefed on hazardous waste, trash, debris, and hazardous material storage and disposal. Areas where few nesting birds would be affected were allocated for storage of their materials.

Hawaiian Dredging Inc., construction contractor for the JACADS plant, were monitored and continually informed of improper disposal of materials, improper storage of materials, and destruction of nesting habitat. This contractor was not briefed properly when they arrived on the island in 1985. It was very difficult to enforce regulations which were not in place when they arrived or which they were not briefed on. The major violations were washing of their cement trucks into the ocean and destruction of nesting bushes.

The routing of new saltwater lines to JACADS was changed when it was found that it was planned to run them through one of the only undisturbed nesting areas on Johnston Island.

## 2. Management Planning

As a result of the Johnston Atoll Implementation Plan signed in 1984 between the Corps of Engineers, Pacific Ocean Division (COE-POD); U. S. Army Chemical Activity, Western Command (USACAW), Defense Nuclear Agency Field Command, Johnston (FCJ), and the Service, Refuge Complex personnel have worked closely with these agencies on refuge environmental concerns arising from the JACADS project. On several occasions, Refuge Managers Leineke, Fefer and Forsell met with Mr. Richard Rife of PEO-PM Chem. Demil. and officials of Defense Nuclear Agency to attempt to work out an environmental monitoring plan for the Refuge. Forsell wrote a draft plan and submitted it to Field Command Defense Nuclear Agency (FCDNA) in December.

A Comprehensive Plan for Johnston Atoll was prepared by the firm of Helber, Hastert, Van Horn, and Kimura Inc. under contract to the Pacific Division, Naval Facilities Engineering Command for the Defense Nuclear Agency. A planning team spent ten days on the island in March of 1987. The Service biologist presented a briefing on refuge resources and conflicts with base operations. Forsell also took the planning team on tours of the outer islands and Johnston Island.

A vegetation map of Johnston Island and a table of bird populations were prepared for the plan. Wildlife related issues addressed in the plan included definition of bird-aircraft strike hazard areas, planning for

zones of vegetation for nesting birds, and recommendations of plants to be planted which are aesthetically pleasing, require little maintenance and water, and provide nesting habitat for marine birds. Several other meetings and briefings concerning the plan were attended by Forsell, including two in Honolulu, plus two drafts were reviewed in 1987.

#### 4. Compliance with Environmental and Cultural Resource Mandates

In November Refuge Manager, Forsell, drafted comments on the Draft Supplemental Environmental Impact Statement (DSEIS) for the Johnston Atoll Chemical Agent Disposal System. The DSEIS dealt primarily with alternatives for the disposal of JACADS air pollution abatement system scrubber brines and solid wastes. The first choice was to dump the brines in the ocean 14 miles south of Johnston Island. The comments were modified by John Ford, FWE-ES, Honolulu and forwarded to DC for the official response which was issued on 14 January 1988. The most salient paragraph was as follows:

"The Draft Statement does not adequately discuss the potential environmental consequences associated with the alternatives being considered. The Services principle concerns include: applicability of the models used to calculate initial dilution factors for certain compounds, discrepancies between the text and the appendices regarding dilution models, the omission of an assessment of the impacts caused by certain alternatives, and the selection of inappropriate species for bioassay." All of the points had been presented to the Army on at least four occasions in both meetings and comments on other drafts.

#### 5. Research and Investigations

This year saw continuation of several major research projects initiated in earlier years. All were designed to assess potential impacts of the JACADS project on wildlife resources of the refuge. The three major contract research programs supported by funds from the Army and administered by the U.S. Army Corps of Engineers, Pacific Ocean Division were the seabird monitoring studies of Dr. R. W. Schreiber and E. A. Schreiber of Seabird Research Inc., green sea turtle monitoring by George Balazs of National Marine Fisheries Service, and monitoring the lagoon resources by the Hawaii Cooperative Fisheries Research Unit (HCFRU), University of Hawaii.

##### JHN-1-86 Seabird Monitoring Studies

The primary goal of the seabird research was to assess and monitor the size and "health" of populations of marine birds throughout the JACADS project. Ten major questions were posed to achieve these goals: total and breeding population size of each species, numbers of nests receiving eggs, number of young raised to fledgling, egg size and weight, growth rates of young, types of nest sites, diet, rates and causes of mortality,

and susceptibility to human disturbance. The research team visited the refuge from 28 February to 12 March and 25 June to 6 July. In selected study plots nests of red-tailed tropicbirds, red-footed boobies, and brown boobies were marked with numbered stakes; eggs of many species were measured and weighed; chicks were measured and weighed; and regurgitation samples were taken and frozen. They concluded that most populations appeared to be stable with a slight increase over 1986, except for great frigatebirds, where the unnatural mortality from birds striking the LORAN tower guy-wires is impacting this population. Fledgling success appears high in most species, and regulations and protection generally seem to contribute to high productivity.

Recommendations from this study included continued monitoring and banding, education of island personnel to avoid disturbing nests, and establishing a policy on how bushes are trimmed in order to preserve them for nesting tropicbirds. These had already been implemented by the Refuge Manager and the Base Commander. Other long-term recommendations such as establishing a baseline of heavy metal contamination of selected species and monitoring of seabird feeding at open ocean dump sites are being considered if ocean dumping is initiated.

#### JHN-2-87

The University of Hawaii Co-op Fisheries Unit continued their monitoring of the lagoon resources to determine the effects, if any, of increased fishing pressure of the larger human population on the island. Darby Irons and Randall Kosaki made two month long trips to the island to conduct censuses of fishes and invertebrates. A report was received in July stating "it appears there was very little impact of fishing on Atoll fish populations" but, "it is too early to tell if the increase in population will affect the fishery in the future."

This project also included a component requesting fishermen to complete catch reports. Their effort in 1987 was reduced from four, month long visits per year in 1986. This placed a greater dependence on the Refuge biologist to conduct creel censuses and try to ensure accurate completion of catch report forms. In 1986, less than 20 percent of island personnel were filling out the forms which was not acceptable to the project. A letter to the Base Commander from the Unit Leader, Dr. James Parrish, requested that greater compliance be achieved. The service biologist wrote new regulations for the boat house operation which required that a report be completed. Although, this program was not embraced by the fishermen, compliance increased to well over 90 percent.

Extensive comments on their research and report were written by Forsell in September. The comments centered on presentation of data in a form which would facilitate comparison between years. The basic techniques of the study seem sound.



Randall Kosaki of the Hawaii Cooperative Fisheries. Research Unit censuses fish and invertebrates along permanent transect. (DJF)

JHN-3-87

A team of five biologists from the National Marine Fisheries Service under the direction of George Balazs visited the Atoll from 23 November through 7 December to study green sea turtles in connection with the JACADS related environmental monitoring effort. Mr. Balazs also visited the Atoll in August for a pre-trip planning survey and to help the Refuge manager develop some standardized census techniques. The major component of their research was the capture and tagging of turtles. Extremely windy weather hampered their efforts as the capture nets were riding up and down with the wind driven waves and allowing the turtles to avoid them. Only two animals were captured, but one individual had been tagged four years earlier at Johnston Island indicating that the population may be the same individuals. Census techniques both from the 24 foot Service vessel and a 20 foot high guard tower were developed. The tower was obtained from the Army by the service biologist. Algae and carapace samples were taken from turtles for plutonium analysis. The results are discussed under contaminants section.



George Balazs and two assistants from the National Marine Fisheries Service remove eagle rays from capture nets. Rays are common at Johnston Island and many more rays were captured than the intended target green sea turtles. (DJF)

JHN-4-87

Dr. E. A. Kay of the University of Hawaii visited the island from 12 to 15 January. Her visit was officially sponsored by the Recreation Department. However, while on the Atoll, Doug Forsell accompanied her to Sand Island, several public presentations on Johnston Island and to the west shore of Johnston Island. The purpose of her visit was to verify and add to her list of marine mollusks from the Atoll. She is working on broad geographic ranges of species in the Central Pacific Ocean and factors affecting the diversity among various atolls. Although her visit was hampered by poor weather and Sand Island was the only outer island we were able to visit, she was able to increase her list of shells of the Atoll from about 200 to 250. She plans to visit again when the weather might allow access to other areas. Dr. Kay suggested that she would try to gather some data so as to advise the refuge if the stocks of the more desirable shells such as the tiger cowrie and triton's trumpet were being over harvested by collectors. Dr. Kay also accompanied Forsell to the dioxin contaminated area to see if there might be some invertebrates present in large enough numbers to make sampling them for dioxin practical. We found very few animals on the rocks along the shore.

### JHN-5-87 Plastic Ingestion by Seabirds

As part of a cooperative study with the Madison Wildlife Health Lab on the prevalence of plastic ingestion by seabirds, the Refuge biologist examined the stomach contents of 60 adult wedge-tailed shearwaters and 50 nestling red-tailed tropicbirds. Essentially no plastic was found in the bird's stomachs indicating the waters surrounding Johnston Island are relatively free of plastic pollution. This was not unexpected, because the currents passing Johnston Island move from east to west through waters with very little human activity, whereas the currents in the leeward Hawaiian Islands move from west to east coming from Japan and an area of great amounts of shipping and fishing. The data was combined with samples taken from the leeward Hawaiian Islands and reported in several presentations and papers by Paul Sievert and Louis Sileo.

### JHN-6-87

Dr. Ira Lavine of the University of Hawaii, Dept. of Chemistry, visited Johnston Island from 31 October to 4 November. His goal was to collect new species of blue-green algae which are then cultured. The metabolites are then isolated and tested as to whether they are poisonous to cancer cells or the AIDS virus and not harmful to mammalian cells. Forsell accompanied him on several dives and trips to the outer islands. Dr. Lavine also advised the biologist on environmentally benign techniques for controlling algae on the recreational boat ramps and helped prepare a memo to the Island's maintenance contractor outlining the recommended method. Two dives were also made in the areas of high algae abundance near the sewage outflow and his advice on monitoring nutrients in the waters were incorporated into recommendations to Defense Nuclear Agency.

### JHN-7-87

Project Thumper was a seismic refraction study funded by the Department of Energy, and conducted by the Los Alamos National Laboratory to determine the subsurface geologic structure of Johnston Atoll. The operation occurred on Johnston Atoll from 9 October through 21 October 1986. They detonated three 20 lb charges on Sand Island, one 25 lb charge and two 45 lb charges on North Island, and three 60 lb charges on East Island.

All charges were buried and caused little disturbance to the few birds roosting on the islands. A small amount of mounding was created at the blast sites, but these were leveled with a front - end loader.

The Final report was received in February of 1988 and found that the Atoll sits upon about 1500 - 1600 of coral and is one of the oldest atolls in the world. As additional mitigation for the project the Department of Energy donated a Landing craft and heavy equipment for two habitat improvement projects on East Island in 1987. These are discussed under the habitat section.

## E. ADMINISTRATION

### 1. Personnel

Douglas Forsell, was the Wildlife Biologist (GS-11) stationed at Johnston Island for the entire year. The refuge was managed out of Honolulu by Richard Wass. Dick accepted a position as manager of Hakalau National Wildlife Refuge on the island of Hawaii and moved from Honolulu in March. Forsell assumed the duties of refuge manager of the Remote Islands National Wildlife Refuge Complex of which Johnston Atoll is a part. Complex Manager Fefer administers the Refuge operations from the Honolulu Office.



Refuge Manager Forsell holding Tropicbird removed from nest during demolition of barracks on Sand Island. Helmet and flack jacket were required near explosives. (W.Rumley, USCG).

The position at Johnston is rather unique in that funding is received from the Army and the service plus some on-island support comes from the Defense Nuclear Agency who manages the Island. The biologist functions as a member of the Base Commander's Staff yet has numerous responsibilities to other funding agencies. This leaves him with several groups demanding his time and attention to their projects.

The six major responsibilities of the biologist are: monitoring wildlife populations; advise and support the JA Base Commander and tenant commands on environmental and refuge concerns; providing interpretation and

education programs for JA residents and visitors; liaison and coordination with visiting researchers; develop and conduct contaminant sampling program encourage clean up of hazardous wastes; and planning, budgeting, and managing refuge resources to achieve these goals.

#### 4. Volunteer Program

Numerous military and civilian personnel assist the Refuge Biologist with biological surveys and seabird banding duties. All of these individuals expressed a strong interest in natural history and the biology of the species found on the refuge. Many of the volunteers are used for one or two surveys and the trips provide both aid to the biologist and an opportunity to allow them to photograph wildlife and receive an interpretive tour. Several proved to be excellent assistants, and showed a strong interest in helping on a regular basis so volunteer agreements were signed.

#### 5. Funding

Fish and Wildlife Service program at JA, including the Biologist position and operational support money were funded jointly by the Army's Office of the Program Manager - Chemical Demilitarization (OPM CD) (\$45,000), The Fish and Wildlife Service (\$30,000), and The Defense Nuclear Agency (\$10,000).

### F. HABITAT MANAGEMENT

#### General

Johnston Atoll serves primarily as a roosting and breeding grounds for tropical Pacific seabirds, a wintering grounds for migratory shorebirds, and a unique coral reef ecosystem combining elements of both Hawaiian and Central Pacific organisms. Johnston Atoll is the closest point of land, thus, the only island available as a roosting and breeding habitat for seabirds in 820,000 square miles of ocean. The importance of Johnston Atoll in the ecology of the Central Pacific is far greater than it's relatively small landmass would suggest. Within this area, the waters most intensively foraged by birds from Johnston Atoll are probably those to the west of Johnston Atoll where food availability is increased by upwellings created by the down-current "wake" of the atoll.

#### Grassland

In 1986, a front-end loader was provided by the Department of Energy's Thumper Project for control of the introduced grass *Lepturus* on East Island. The heavy growth of grass limits the area in which ground nesting seabirds can lay their eggs. The grass and soil was piled along the edges of the clearings in hopes that, as the vegetation decomposed, the hills

In October of 1987 Department of Education provided funding for additional clearing of grass and habitat manipulations on East Island. At the recommendation of Dr. Ralph Schreiber the strips were made narrower than in 1986 so that young birds would have grass in close proximity to hide in and escape the heat. Similar to the proceeding year within a month several thousand sooty terns had laid eggs in the cleared areas.



Aerial view of East Island showing areas cleared to create nesting habitat for sooty terns. (DJF)



Sooty terns nesting in cleared areas of East Island. (DJF)

## 6. Other Habitats

The lagoon and surrounding shallow waters of the refuge were thoroughly characterized by the HCFRU Aquatic Resources Survey conducted in 1984. Their program of monitoring five permanent stations within the lagoon twice per year found no significant change in the populations during 1987. *Acropora* and *Montipora* species dominate the coral community, with *Acropora cytherea* being especially dominant in coverage. This species, commonly called "table coral", can attain 100% cover in many areas, is probably one of the fastest growing coral species, and provides extensive three-dimensional habitat for many different fish. The fish community is dominated by relatively few species.

Terrestrial habitats especially shrubs were a major concern on Johnston Island during 1987. The population of red-tailed tropicbirds is growing by about 200 pairs per year. Numerous construction activities associated with both the JACADS plant and island maintenance over the past three years has removed about one third of the shrubs under which the tropicbirds nest. The major concern is that the vegetation which has not been disturbed is along the runway. Tropicbirds do a great deal of hovering flight during courtship and pair formation creating a hazard of bird-aircraft collisions. A great deal of time was expended in trying to preserve vegetation in areas away from the runway. Regulations adopted in late 1986 require consultation with the biologist prior to removal or trimming of vegetation.



Storage of construction materials near shrubs used by tropicbirds for nesting was actively discouraged. (DJF)

Nevertheless, workers must be carefully monitored to prevent destruction of nests. The biologist participated in numerous planning meetings to try to limit the impact of projects on the vegetation. Also when projects can not avoid destruction of shrubs the project is required to mitigate the loss by planting other shrubs or transplanting those which must be moved. This policy was not well received by workers and contractors, but has been adhered to in most cases.

Hawaiian Dredging, the contractor building the JACADS plant stored a great deal of equipment in unauthorized areas and were asked to fund \$1,000 worth of habitat restoration. This could not be accomplished until 1988 because the items being stored in unauthorized areas had to be removed prior to restoration work.



Remains of shrub once used as nest sites after being run over by construction vehicles. This shrub supported two pairs of red-tailed tropicbirds the previous year. (DJF)

Other major projects included the placing of a new saltwater and fresh water lines across the island to the JACADS plant. The trench and lay down areas for the pipe were planned to pass through the a nesting area, but Forsell convinced the engineers to move the line 20 feet to avoid the problems. Another project with a major impact on nest sites was the demolition of old Coast Guard barracks on Sand Island. Forsell spent two days mapping nest sites and transplanting shrubs with a front-end loader prior to the arrival of the Marines who demolished the buildings. A major portion of the demolition was to include the destruction of the buildings

with the use of explosives. The Service had extensive preplanning input and chose the time the demolition would occur to coincide with a period when few birds nested in the area. Forsell was given control of the operation including the authority to stop any portion of the operation if disturbance to birds became too great or other environmental problems arose. A few pairs of tropicbirds were nesting in the vicinity, thus they had to be removed from nests prior to detonation of explosives. This activity plus oversight of placement of rip-rap on the shoreline and removal of five 25,000 gal fuel tanks necessitated that Forsell be present on Sand Island for several hours each day of the month long operation.



Shrubs being removed from near building on Sand Island. These shrubs provide valuable nesting habitat for red-tailed tropicbirds. (DJF)



One of over thirty explosions used by Marines to destroy Coast Guard Barracks. (DJF)



Great frigatebirds roosting on artificial shrubs created from cinder blocks and coral. (DJF)

In 1975 Dr. Ralph Schreiber of Seabird Research identified a lack of nest and roost sites for red-footed boobies and great frigatebirds on East Island. In response, one hundred and fifty concrete cinder blocks were moved to the north side of East Island. Here they provided off-ground bases for red-footed booby nests and roosting perches for great frigatebirds away from the hazard of the LORAN tower's guy wires over Sand Island. Monitoring in 1986 and 1987 showed that most of these blocks were being used by boobies and one pair of frigatebirds nested on them in 1986, although the young did not survive. In conjunction with the clearing of the grass on East Island the grass and coral was placed in piles about four to five feet high both in 1986 and 1987. This year approximately 700 blocks were moved from the Coast Guard barracks being demolished on Sand Island to East Island and placed on the ground and in piles to provide roost and nest sites for the frigatebirds and red-footed boobies. This work was accomplished with the aid of the Commanding Officer and Chief Petty Officer of the Coast Guard who helped Forsell collect the bricks and place them on pallets. Several other volunteers from Johnston Island aided in placing the bricks on East Island. The moving of the bricks was accomplished by the base contractor funded by the Department of Energy. Birds responded to them immediately and within a month several hundred birds were roosting on the bricks.

#### Artificial Reef

The Fish and Wildlife Service biologist is tasked with assessing an artificial reef created from vehicles and landing craft placed in the ocean in an area designated by the Service in 1985. The reef was to be placed in the ocean on a barren sandstone shelf about four miles south of Johnston Island. Several attempts were made in 1987 to locate the reef in order to assess the benefits. Unfortunately, the buoy marking the reef washed away in 1985 and it was impossible to relocate the exact position. Four attempts were made to locate the reef in 1987. Three included surveys using depth sounders and SCUBA diving. Unfortunately, the large number of sharks in the area and strong currents make diving operations difficult. Usually more time is spent fending off sharks and trying to anchor the boat than searching for the reef. Defense Nuclear Agency requested a renewal of the permit in December and received an extension of three years. Plans are being made to continue constructing the reef and the Service representative will supervise the decontamination and dumping of the vehicles in the future. He will also be coordinating the placement of a permanent buoy at the reef site. Two buoys placed there in 1987 disappeared.

## 5. Environmental Contaminants

Johnston Island was used for the storage and support activities for 1.37 million gallons of herbicide orange (HO) from 1972 through 1977 after it's removal from Vietnam.



Shore line of former agent orange storage area. Studies by the Service and the Air Force have found dioxin is making its way into the marine environment probably from runoff and erosion of this beach. (DJF)

In 1977 the agent was removed and burned at sea. The contamination on Johnston Island resulted from leakage of barrels and spillage. At present the soils contain up to 449 parts per billion (ppb) of dioxin. In 1987 the Service Biologist researched and wrote a new plan for monitoring the infiltration of dioxin into the marine environment. This plan was accepted by the Air Force Occupational and Environmental Health Lab who funds the lab analysis and reports the results to the interested agencies. Fish and Wildlife Service has assumed the responsibility for collecting the samples due to poor quality control in the past sampling efforts. The Fish and Wildlife Service biologist at Johnston Island participated in six days of collection of samples of fish, sediments, invertebrates, and shorebirds from the areas adjacent to the contaminated area. The muscle tissue of three fish were found to have up to 38 parts per trillion this year. This is level that the FDA has deemed eatable if not eaten regularly. Due to the low number of samples we're able to process at a cost of \$800 per sample we believe that there is potential for greater amounts in the fish and the ban on fishing in the area remains in effect. This effort will continue in 1988.

### Sewage, Algae, and Turtle Interactions

Approximately 220,000 gallons of raw sewage is discharged off the south shore of the Johnston Island daily. The area is inhabited by an estimated 150 to 200 threatened green sea turtles. The turtles are feeding on algae which is probably enhanced by the nutrients from the sewage. The sewage has increased from approximately 50,000 gallons per day in 1983. The Defense Nuclear Agency is planning to build a sewage treatment plant in 1989. The potential effects on the algae and thus, the turtles is unknown.

The Fish and Wildlife Service biologist at Johnston Island has prepared a plan to monitor bacteria, dissolved oxygen, water temperatures, nutrients, algae, and numbers of turtles off the south shore of the island. Equipment for measuring temperatures, salinities, and dissolved oxygen were ordered. Full-face masks were purchased to reduce the risk of FWS divers becoming infected while diving in the area. Monthly surveys of turtles were initiated in August of this year. The Defense Nuclear Agency is considering funding lab support and technician salary for the above mentioned plan. The Fish and Wildlife Service will have to retain the lead responsibility for monitoring the turtles as we have the only biologist stationed on the island full time and the refuge boundary encompasses the area of concern. Additionally, much of the work must be conducted on calm days with low surf conditions which occur less than 20% of the time. Work on algae and nutrients will depend on funding from Defense Nuclear Agency. Defense Nuclear Agency has been asked to incorporate in the design of the plant, the ability to replace nutrients into the effluent if it is found that their removal has an adverse impact on the turtles.

### Plutonium

During aerial nuclear testing in the early 1960's three rockets exploded on or above Johnston Island. While these were not nuclear detonations the weapons grade plutonium was scattered over a several square miles. During several clean-up projects most of the material that was on land was collected and stored in a 43 acre fenced area. Because of the extensive activity of the biologist on Johnston Atoll, he now wears one of nine film badges issued to the island.

Over 100 pairs of red-tailed tropicbirds nest in the area each year. Decontamination of the area is planned for the 1988-1992 time period. The Fish and Wildlife Service biologist at Johnston Island monitors the nesting activity in the radiation area and bands all birds captured in the area. Nesting success appears to be higher than other areas of the island where disturbance is greater. Most of the nest sites will be eliminated during the clean-up soother suitable nest sites are being created to limit the impact of this activity. This activity must be coordinated with other activities on the base which affect nest site in shrubs to try to keep from creating a greater bird-aircraft strike problem. The Service will continue to monitor the birds nesting in the plutonium contaminated area

and try to limit impacts of the clean up on them. Birds will be analyzed for plutonium especially during the clean-up operation when the potential for airborne contamination by plutonium oxide will exist.

Six samples of bone tissue from green sea turtles were sent to the University of Washington for analysis of plutonium and other radio nuclides. The samples were collected by NMFS and the analysis was paid by USFWS. Algae was also collected from the area where the turtles feed for analysis.

### JACADS

Johnston Island is the site used by the U. S. Army Chemical Activity, Western Command for storage of various obsolete chemical weapons including ton containers, rockets, projectiles, bombs, and mines containing the nerve agents GB and VX and mustard agent. The Army is constructing a large plant to destroy the chemicals. The chemicals are stored in 54 bunkers and little if any agent is released to the environment. The construction of the plant and the 700 people involved with protecting and handling the chemicals represent the major impact of this activity. The Fish and Wildlife Service biologist at Johnston Island is daily involved with some aspect of this project. Populations of birds are monitored as are shrubs and other nesting habitat to try to limit the impact of this project. All persons entering the island are briefed on refuge regulations. Any contractors found destroying nesting habitat are asked to mitigate for it. All construction projects and much routine work is reviewed by the biologist for environmental considerations.



Aerial view of JACADS plant where chemical weapons will be destroyed. (DJF)

## Hazardous Waste

The operations of the military on Johnston Island have produced a number dumps and storage sites of hazardous waste and potentially hazardous wastes including the following: 1) A burn pit where most combustible island waste is burned daily. There has been no control of what has been put in this dump and the ash pile is over 2,000 cu yds. 2) Waste oil burn pit containing waste oil, other combustible fluids, laboratory wastes, pesticides, and oil from transformers; 3) Scrap metal pile of over 800 tons of miscellaneous ferrous and nonferrous metals; 4) Over 100 surveyed vehicles; 5) Numerous bags of asbestos buried in the ground.

The Fish and Wildlife Service biologist at Johnston Island has been working closely with the Base Civil Engineer to identify the contaminated areas and wastes going into these areas. They conduct weekly or biweekly inspections of the dumps to assess what is going into these. We have stopped several activities such as dumping oil in the waste oil burn pit and dumping hazardous chemicals and car batteries in the burn pit.



Trash burn pit at Johnston Island. A great deal of effort went into the eliminating the dumping of hazardous waste and metal into this facility. Note the standing water in the middle of the pit is ocean water which rises into the pit through the porous coral soil during high tides. (DJF)



Oily residue and solvents dumped into drain ditch which leads to the ocean 75 ft away. These types of practices are being eliminated through much effort by the Refuge Manager and the Base Civil Engineer. Habits practiced for 30 years die hard. (DJF)

Funds were obtained (25K) from Defense Nuclear Agency for an environmental audit. The contract was awarded to Fred C. Hart Associates, Inc. Their team was present on the Atoll from 9-13 November and the report titled: Environmental Compliance Assessment of Johnston Atoll was distributed on January 25, 1987. They concluded that "Johnston Atoll is generally in compliance with environmental regulations for air pollution and drinking water, but out of compliance for waste water discharge, solid waste, hazardous wastes, pesticides, PCB's, petroleum based fuels, and hazardous materials." While in many of these areas noncompliance was mostly inadequate documentation the areas mentioned above were identified as needing corrective action.

On October 29 and 30, a RCRA investigation was conducted at Johnston Atoll by Mr. Carl Romer of Jacobs Engineering, acting under the authority of the Environmental Protection Agency. This inspection included the herbicide orange contaminated area, the Army's chemical agent storage facility, the plutonium contaminated area, the JACADS facilities, and all areas operated under separate RCRA permits. Additionally, he also looked at base operations and came to the same conclusions as the Hart and Associates.

His final report was received in early February of 1988. The Service Biologist spent a great deal of time with both inspections including transporting them to the outer islands.

## 10. Pest Control

Pest control on the Island is handled by the base support contractor and primarily includes poisoning of mice, roaches, ants and termites. Forsell was prompted to investigate the use of pesticides after observing the misuse of herbicides in the chemical munitions storage area (spraying in winds above 20 knots). It was found that the herbicide program in the munitions area was poorly thought out and unnecessary. The herbicide was meant for use in soils which retains the pesticide and not the porous coral of Johnston Island where it would quickly make its way into the ocean. Additionally after investigating the Army regulations which covers the storage of explosives, it was found that the vegetation could be up to 12 inches high in the vicinity of the bunkers rather than the three inches which they had been told. Their practice of completely spraying the area every two weeks was halted in favor of mechanical control and spot spraying with backpacks. A side benefit of the halting of the spraying was that the number of false alarms by the sensitive chemical agent detection systems on the bunkers was reduced as the pesticides may have been triggering them.



Manager Forsell spraying shrubs with pine cleaner to eliminate white flies. (DG)

White flies are a small fly which kills a number of shrubs on the island. These are controlled on Johnston Island, but not on the outer islands. When several shrubs in which tropicbirds nest began dying on North Island, Forsell enlisted the help of the pest control specialist. He recommended spraying the shrubs with a 20 percent solution of pine cleaner each month. After two applications the problem was eliminated and most of the shrubs revived.

## G. WILDLIFE

### 2. Endangered Species

The refuge supports populations of the threatened green sea turtle and potentially the endangered Hawaiian monk seal. The populations of the green sea turtle have apparently remained stable. The turtles do not nest on Johnston Atoll, but feed extensively on the algae off the south side of Johnston Island. One notable finding in 1987 was the recovery of a turtle tagged in 1984 in the same area. This indicates that at least some of the turtles are long term residents.



Green sea turtle are abundant along the south shore of Johnston Island. (GB)

Hawaiian monk seals have historically used Johnston Atoll intermittently in very low numbers (migrating from HINWR). Of the nine Hawaiian monk seals translocated from HINWR to the refuge in 1984, only one was present until March of 1986 and no animals were reported in 1987. They have either migrated back to the Northwestern Hawaiian Islands (NWHI), or perished. Natural migrations are certainly within the species' capabilities, but the missing seals have not been resighted in the NWHI despite an extensive observation program. Federal laws and island regulations concerning the protection of both the monk seals and the turtles are stressed to all visitors as well as permanent personnel.

### 3. Waterfowl

Although the refuge supports no wetland habitat, ducks are often found during fall migration. Four Northern Pintails (Anas acuta) and one LesserScaup (Aethia affinis) were found in October 1987, but most died from starvation.

### 5. Shorebirds, Gulls, Terns, and Allied Species

All four islands of Johnston Atoll are used as roosting and/or breeding grounds for at least some of the 15 species of seabirds using the refuge.



Masked booby nesting on the east camera stand. This species had escaped detection of their nests by biologists until 1986 by nesting on remote coral towers fifty feet in diameter and twenty feet above the water. (DJF)

One masked booby nest was found nesting on the east camera stand in October of 1986 and surveys of the area in 1987 revealed that several pairs have nest on the platform. Several hundred brown noddy were counted on the west camera stand in 1987. Nesting on these structures had not been observed previously perhaps because of their remoteness and lack of ladders to climb the 20 foot high walls.

Table 2. Populations of nesting seabirds and wintering shorebirds estimated on Johnston Atoll during 1987.\*

Species	Johnston Island	Sand Island	North Island	East Island	Camera Stands	Total
Pairs of Breeding Seabirds						
Bulwer's Petrel	0	14	0	0	0	14
Wedge-tailed Shearwater	35	900	0	0	0	935
Christmas Is. Shearwater	0	25+	0	0	0	25+
Red-tailed Tropicbird	770	165	129	6	0	1,070
Masked Booby	0	0	0	1	3	4
Brown Booby	0	180	0	35	1	216
Red-footed Booby	0	2	0	125	0	127
Great Frigatebird	0	90+	0	0	0	90+
Grey-backed Tern	0	0	175	0	2	178
Sooty Tern	0	112,794+	0	125,000	0	240,000
Brown Noddy	0	3,325+	855+	1,730+	196+	6,108
Black Noddy	50	0	0	0	0	50
White Tern	70+	5	1	0	0	76+
Total Breeding	925+	117,500	1,160	126,897	202+	248,893a
Shorebirds Wintering on Atoll						
Pacific Golden-Plover	300+	30	10	10	0	350+
Wandering Tattler	20	2	0	0	0	22
Bristle-thighed Curlew	10	2	2	0	0	14
Ruddy Turnstone	120	10	0	0	0	130
Total	450+	44	12	10	0	516+

+any number may be rounded up and Atoll totals may not be equal to totals of the Islands.

\*Estimates made by D. Forsell from Fish and Wildlife Service data and banding data from Schreiber and Schreiber. Estimates of seabirds do not include non-breeding and roosting individuals which may be as large as 50 to 100 percent of the breeding populations, and much greater in frigatebirds, red-footed boobies, and white terns.

## 6. Raptors

Two short-eared owls were consistently sighted in the vicinity of the "Scientific Row" buildings along the runways on Johnston Island. Short-eared owls had been regularly reported from Johnston Island before. It is presumed they feed on the abundant population of mice, since pellets contained only mouse bones. A falcon probably a peregrine was sighted in September and at least two white terns were found with the breasts eaten by this bird. At least one peregrine falcon has been collected in the past. In October an osprey was present for at least two weeks.

## 9. Marine Mammals

See G.2, Endangered and/or Threatened Species (above).

## 11. Fisheries Resources

The fisheries resources of the refuge consist of approximately 271 species of fish and many species of coral and other invertebrates. Of the fish species, the actual take is concentrated on just a few species as shown in Table 3. Although fishing is popular with both military and long-time resident personnel, the latter are responsible for the bulk of the take. These long-time residents have the experience and familiarity with fishing tropical reefs, while newcomers, although enthusiastic and curious, are often not very successful until they learn the local techniques. The impact of this recreational fishery is minimal on the atoll-wide populations, as shown in Table 3. The most-taken fish in relation to atoll-wide population size still suffers only an estimated 3% annual mortality from recreational fishing. The population estimates were derived from the lagoon surveys of the HCFRU team, while the annual take was estimated from the Catch Report Forms and the Creel Censuses performed by the same research team.

TABLE 3. The eleven most abundant fish species on Johnston Atoll\*

Name	Atoll	Annual Population	Population Catch	Percent of Caught
Yellow-eyed surgeonfish		1,650,300	1,609	<0.1
Convict surgeonfish		599,600	3,569	0.6
Brick sholderfish		385,400	4,854	1.2
Yellowstripe goatfish		188,900	553	0.2
Manybar goatfish		61,850	379	0.6
Doublebar goatfish		48,000	396	0.8
Spectacled parrotfish		29,450	401	1.3
Blue goatfish		27,600	409	1.5
Blue jack		26,500	538	2.0
Low fin chub		22,350	148	0.7

\*The HCFRU report also noted that the six dominant surgeon fishes (Acanthuridae) are especially widespread and consistently found in most zones, while others (Butterflyfish - Chaetodontidae) were more variably distributed between zones.

#### 14. Scientific Collection

No scientific collecting was conducted during 1987.

#### 15. Animal Control

##### Bird-Aircraft Strikes

On 26 January a C-141 struck a Red-tailed tropicbird on takeoff. The bird struck the aircraft on the landing gear and caused no visible damage to the aircraft. The tropicbird, which died shortly after being found, possessed a Fish and Wildlife Service band and the band showed considerable wear indicating the bird was probably several years old and should be accustomed to aircraft flights in the area. The strike occurred about 1300 hours a time when tropicbirds engage in considerable aerial displaying during courtship. Manager Forsell suggested in a memo to the Base Commander that we try to document the strikes and near misses in order to determine if a problem exists and if so where the major hazard occurs. Col. Reese accepted the suggestion and Forsell drafted a form to be filled out by all persons observing dead birds in the vicinity of the runway and pilots involved in collisions or near misses. Through 1987 there were less than 10 strikes or near misses reported. This information was incorporated into the comprehensive planning effort reported under section D. 1. Master Plan. An exceptionally large number of sooty terns nested on Sand Island in 1987.

On small islands such as Sand (less than 9 acres of available habitat) this species tends to spread across the island in a progressive fashion with the birds courting and establishing territories along one edge of the colony and progressing across the island. On Sand Island this year they spread over the island for two months until they encountered the road to the Coast Guard's Loran C transmitter building. Coast Guard operations depend on this road remaining open and the Coast Guard Commander requested that he be able to destroy eggs. Forsell contacted Complex Supervisor Fefer who suggested that terns will not lay eggs on black plastic. An 8 ft X 150 ft roll of plastic lined tar paper was purchased through the supply system and with the help of the Coast Guard spread along the road. Because of the constant winds at Johnston Atoll a large number of bricks and boards were necessary to secure it to the ground. Within a few days the hundreds of birds which had been courting above the road and laying eggs abandon the area and the colony began growing along a different front.



Black plastic laid on road to Coast Guard Loran "C" transmitter building to prevent sooty terns from laying eggs on the road. Note the sharp delineation of habitat. (DJF)

We hypothesized that the terns were probably reacting to the heat retained by the plastic, but it may have been due to the texture or water retention. Regardless of the reason, it worked well. We could not afford to experiment with clear plastic in order to further clarify why the birds will not lay eggs on black plastic.

#### 16. Marking and Banding

Both Service personnel and Seabird Research Inc., are actively banding birds at Johnston Atoll. Table 4, summarizes the accomplishments for 1987.

TABLE 4. Summarizes the accomplishments for 1987.

Species	Birds Banded by FWS Personnel	Birds Banded by Seabird Research Inc.
Christmas Shearwater	67	0
Wedge-tailed Shearwater	379	0
Bulwer's Petrel	4	0
Great Frigatebird	0	9
Red-tailed Tropicbird	816	788
Masked Booby	7	16
Brown Booby	60	125
Red-footed Booby	89	130
Sooty Tern	2	0
Grey-backed Tern	160	0
Brown Noddy	23	50
White Tern	44	76
Total	1,651	1,200

#### H. PUBLIC USE

##### 1. General

The population of Johnston Atoll grew from approximately 850 personnel in 1986 to an average of 1,000 military and civilian contractor personnel by the end of 1987. This growth was primarily due to the on going construction of the Johnston Atoll Chemical Agent Disposal System (JACADS). There is no "public" access as such; the base is a restricted installation and all personnel must be employed at the facility and possess an entry authorization from the Base Commander to debark from any plane or ship. Because of the high visibility of JACADS and chemical operations, the island receives at least monthly visits by general grade officers, Senior Executive Service personnel of the Department of Defense,

or congressional aids. The refuge biologist usually delivers a one to five minute briefing at the airport, a 10 to 30 minute slide show, tours of nesting areas, or lagoon resources depending on the visitor's interests and time on the Atoll. These briefings explain the refuge's role and try to ensure that planning concerning the Atoll takes into consideration the wildlife resources. General Grade Officers and Senior Executive Service personnel who were given briefings this year included: Mr. Rick Smith, Consul General of Australia; Air Vice Marshal Barry Graten, Australian Attache; and Brigadier General Ostovich, U. S. Army, PACCOM; Mr. Carl Schafer, Deputy Assistant Secretary of Defense (Environment); Governor John Waihee, State of Hawaii; Senator Richard Wong, the President of Hawaii State Senate; Representative Daniel Kihano, the Speaker of the House, Hawaii State House of Representatives; Mr. John Bellinger, Aid to the Secretary of the Army; Brigadier General Thomas Lightner; General Maxwell Thurman (Vice Chief of Staff of the Army) and his staff; General Richard Thompson, Commander, Army Material Command, plus a number of other generals; Lieutenant General Pickett, Director, Defense Nuclear Agency; Vice Admiral John T. Parker, Director, Defense Nuclear Agency; Brigadier General Paul Kavanaugh, Field Command, Defense Nuclear Agency; Lieutenant General Charles Bagnal, Commander, WESTCOM; Lieutenant General Henry Doctor, Jr., The Inspector General of the Army; Major General James Smothermon, Director of Operations, Defense Nuclear Agency; Major General Robert Lynn, Director J-6, USPACCOM; Rear Admiral William P. Kozlovsky, Commander, Fourteenth Coast Guard District; Brigadier General Frank Hamilton, USMC, and Brigadier General Walter W. Kastenmayer, Deputy Chief of Staff for Chemical and Nuclear Matters, AMC. Several other presentations were given to other visiting Colonels and IG inspectors.



Lt. Col Schmidt (DNA) photographs a brown booby chick. (DJF)

## 7. Interpretive Programs

All new personnel arriving on the refuge, whether they are temporary visitors or permanently assigned, are presented a three to four minute briefing of the refuge status of Johnston Atoll and the regulations pertaining to them. They are also given a copy of the refuge brochure to aid in their orientation. A second briefing, for all "newcomers" stationed more than one month on the Atoll is part of the three hour introductory program given each Friday. The refuge biologist presents a twenty minute slide show including: The regulations of the refuge, a brief history of the refuge and the reasons for its existence, natural history the major species which use the refuge, and the research projects currently underway. The longer briefing is tailored to providing background information as to why the protection and regulations exist and what each individual's responsibilities are while on the Atoll. The refuge brochure has been a great success and all personnel arriving on the island receive a copy. Many people request additional copies to mail to friends and relatives.

On most trips to the outer islands to band birds or conduct censuses one to three volunteers are used to record data or to help with the census. This provides an excellent opportunity to do interpretive work on a one on one basis and allows people to photograph birds in a controlled setting, rather than having them going to the islands unaccompanied when the nesting seabirds may be disturbed.

Several drafts of the interpretive display for Johnston Island were reviewed by refuge staff on Johnston Island and in Honolulu. The contract was let in 1986 at a cost of just under \$10,000 for one large panel and six smaller panels to be changed monthly. Additional funds were allocated in 1987 to complete an additional six monthly panels and to have the same contractor who is designing and producing the panels build the frames. The wooden supports and hardware to mount the display were purchased through the Island's maintenance contractor. The displays were completed in October and shipped to Johnston Island arriving on Johnston Island in early February of 1988.

Two films of Johnston Island were made in 1987. Defense Nuclear Agency photographers were on Johnston Atoll for three days to make a film on island life. The Army also funded a film team to do a video on the Island and the JACADS plant. Both groups were taken to the bird colonies where they shot extensive footage. Additionally, the script for the Army's film concerning the environment was written by the Refuge Biologist.

### **Fishing**

Recreational fishing is a popular activity on Johnston Atoll. In terms of actual public use, the HCFRU survey team estimated approximately 9,600 hours of fishing effort in 1987. Catches are made hand, by pole and line, by throw net, and by spear while diving. Additionally, fishing parties organized by the Base Recreational Services Office use landing craft

("Mike" boats) to troll outside the refuge boundary for pelagic species such as wahoo (ono) and tunas (ahi and aku). Refuge regulations on fishing were modified slightly in 1987 to give specific size measurements of 3.25 in carapace length of lobster rather than "about one pound" which was the current regulation.



Coral is often harvested by divers for gifts and as a memory of Johnston Atoll. (DJF)

#### 11. Wildlife Observation

Marine birds nest on all of the islands and are enjoyed by most of the Island's residents. This use is impossible to quantify. The use of the lagoon resources is somewhat easier to quantify as boat logs from the boathouse can be summarized. Table 5. indicates recreational use of the lagoon for those checking out power boats.

Table 5. Recreational use of Johnston Atoll from 17 May through 18 August.\*

Activity	Lagoon Area	East, North, or Sand Is.	Total
Pole Fishing	68	89	157
Net Fishing	0	89	89
Spear Fishing <sup>1</sup>	178	85	263
Snorkeling	210	45	255
SCUBA Diving	335	75	410
Boating	30	11	41
Skiing	15	0	15
Wildlife Viewing	0	68	68
Dive Raft Skin and SCUBA Diving (non consumptive)	132	0	132
Total	969	462	1,433

<sup>1</sup>Most spear fishing is accomplished while snorkeling, but is not included in snorkeling figures.

\*Each entry is one person visit by power boats checked out from Recreation Services. If more than one activity was conducted on a single trip the people were divided among the activities so each number represents one visit no matter how many activities they participated in.



White terns often hover above intruders near their nests and are a favorite subject of photographers. (DJF)



Yellow headed eel is one of the many marine animals enjoyed by SCUBA divers on a night dive. (DJF)

## 16. Other None-Wildlife Related Recreation

The lagoon is used for a variety of non-wildlife related recreation including sailing, canoeing, water skiing, and wind surfing. All of the equipment is provided free by the Recreation Department.



Two of the many sailboats available for recreation in the lagoon. (DJF)

## 17. Law Enforcement

The Refuge Biologist has no law enforcement authority on the refuge as all enforcement authority is vested in the Base Commander and carried out by the base Security Force. As a result of the severe punishments involved (probable loss of job and deportation from the island) and the interpretive program, violations of the wildlife regulations are quite rare. Suggestions for extensive revisions to the base regulations pertaining to wildlife were made in 1986 and published in January 1987. The three most significant changes included more stringent control of pets, limitation of access to the outer islands based on actual nesting activity rather than specific dates, and establishing controls on cutting of shrubs and trees.

In conjunction with the limiting of access to the outer islands it was decided to construct new signs for the islands. Col. Reese, the Base Commander, personally designed the signs and funded half of the construction. The signs were erected with the aid of volunteers in July.



One of two army vehicles which constantly patrol the Island. The machine guns tend to discourage any trespass violations. (DJF)

#### I. EQUIPMENT AND FACILITIES

The primary Fish and Wildlife Service facility on the refuge is the Refuge Biologist's office located in the Joint Operations Center. The office is adjacent to the offices of the Base Engineer and the Base Commander. This office is provided and furnished by Defense Nuclear Agency so that the Refuge biologist could work closely with the Base Command. The office includes desk and chairs, filing cabinets, lab table with microscope, bookshelves, and a couch. The Joint Operations Center building is completely air-conditioned and highly secure.

A number of items of equipment were purchased in 1987 to allow the biologist to function more efficiently. These included a much needed golfcart type vehicle which arrived in December. Prior to this we were constantly borrowing vehicles and having to adjust work schedules around availability of vehicles.

The 24 foot Service vessel was finally put back into service in February of 1987. This vessel had not been run in several years and was being surplused in 1986. This would have left the Refuge with no vessel and dependent on rental boats from the recreation department. Forsell spent a great deal of his spare time to recondition the boat.

A partial list of the problems with the vessel included: most nuts and bolts were corroded and many had to be drilled out; the water pumps were destroyed; shift cables were broken; water was in the fuel tanks; the batteries were dead; the cooling system corroded; trim cylinders were corroded and leaking; and the electrical systems had to be reworked as most connections were corroded. This boat is minimally adequate and should be replaced or at a minimum the engines and outdrives replaced with outboards.



Fish and Wildlife Service vessel at Johnston Island. Due to constant repairs needed the vessel spends about half of its time on the trailer. (DJF)

#### 4. Credits

This narrative was written by Douglas J. Forsell and reviewed by Stewart I. Fefer.

ROSE ATOLL NATIONAL WILDLIFE REFUGE

Honolulu, Hawaii

ANNUAL NARRATIVE REPORT

Calendar Year 1987

U.S. Department of the Interior  
Fish and Wildlife Service  
NATIONAL WILDLIFE REFUGE SYSTEM

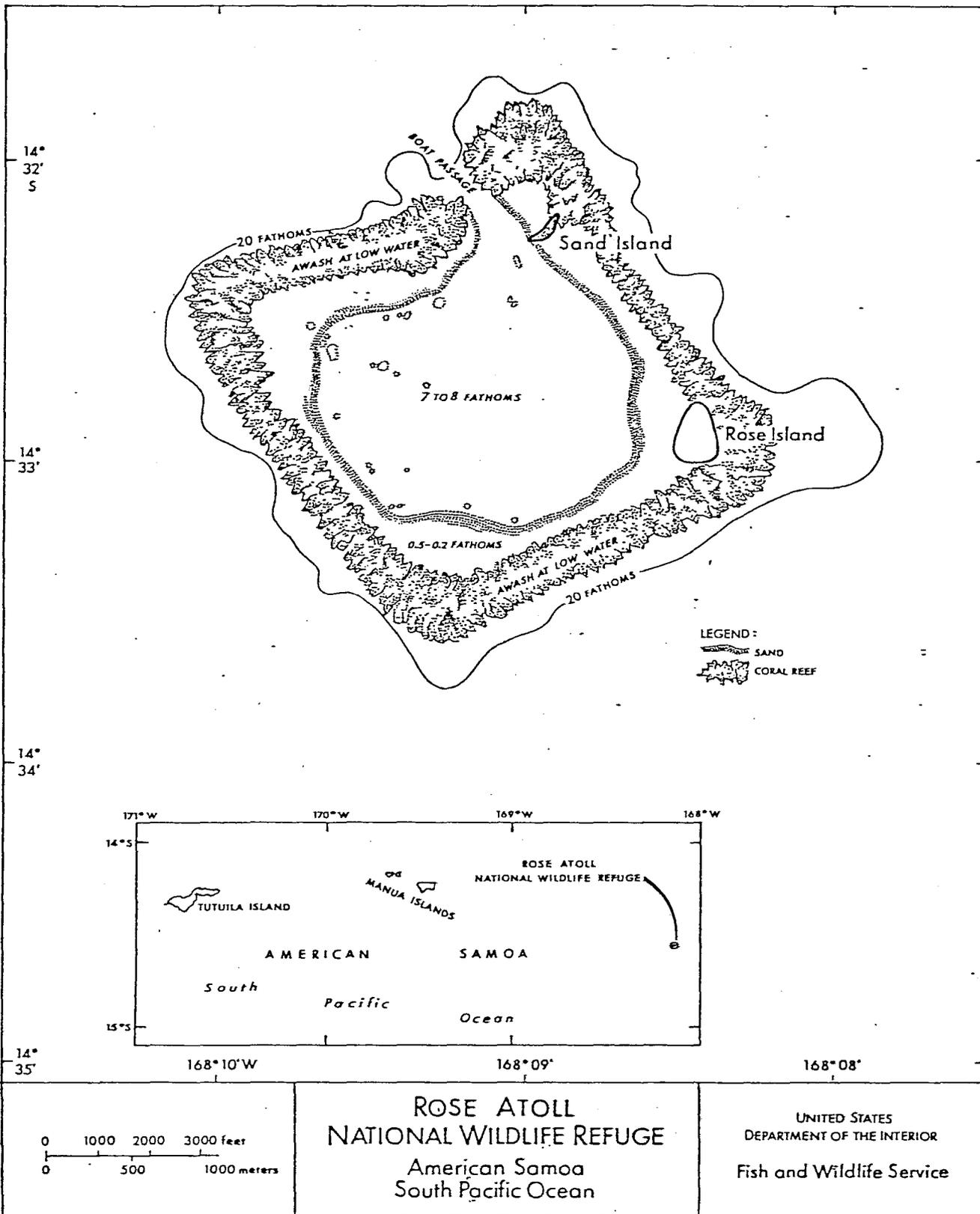
## INTRODUCTION

Rose Atoll National Wildlife Refuge (Refuge) is the southernmost unit of the Hawaiian/Pacific Islands National Wildlife Refuge Complex located 14 degrees south of the equator in the tropical Pacific approximately 2,500 miles south of Hawaii and 180 miles east of Tutuila Island, American Samoa. It is a coral atoll with 1,593 acres of submerged reef and lagoon and two emergent islands. Rose Island comprises 18 acres and is heavily vegetated with Pisonia trees and Tournefortia shrubs. Sand Island comprises 2 acres and has been unvegetated until recently. Rose Atoll has never been inhabited, though Samoans traditionally fished the nearshore waters.

The Refuge was established in 1973 by Cooperative Agreement between the Government of American Samoa and the Fish and Wildlife Service (Service) and is jointly managed by both agencies. Management objectives are to preserve the marine and terrestrial habitats and associated flora and fauna for scientific study and environmental education and to protect the aesthetic values as part of our national heritage. The Atoll is an important nesting area for the threatened green sea turtle and provides nesting, roosting, and foraging areas for about 15 species of seabirds and shorebirds. Hundreds of species of fishes, corals, and other invertebrates inhabit the shallow reefs and lagoon, including the giant clam (Tridacna maxima) which is highly prized as food by the Samoans.



Aerial view of Rose Island. (USCG)



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K. FEEDBACK

## A. HIGHLIGHTS

Only one trip was conducted to Rose Atoll this year aboard the American Samoa Government vessel SAUSAUIMOANA. Service personnel were unable to accompany this trip. Other agencies and groups participating in the trip included the Office of Marine and Wildlife Resources and the Department of Education (both with the Government of American Samoa).

Rose Atoll was severely hit by Hurricane Tusi in January. Damage to the reef was not extensive but wind and wave damage to the vegetation was extensive. Many trees and shrubs were uprooted on both Islands. Some wave damage occurred on both islands, but the more extensive damage may have occurred from waves washing over the Islands and killing vegetation.

In an effort to capitalize on the educational and cultural values of the refuge, a teacher training session involving 9 Samoan teachers was conducted at Rose Atoll under the auspices of the Department of Education and the Office of Marine and Wildlife Resources, Government of American Samoa. The purpose of the trips was to give the teachers an awareness and appreciation for the Atoll's ecosystem and to cause them to convey this to their students and the general public.

## B. CLIMATIC CONDITIONS

The nearest weather station to Rose Atoll is located 180 miles to the west at Pago Pago on Tutuila Island, American Samoa. There is a distinct difference between the topography of Rose and Tutuila Island, so there is little value in summarizing weather data for Tutuila. The climatic conditions at Rose can be summarized as warm and humid. Prevailing trade winds are from the East North East.

Hurricane Tusi passed over the Atoll bringing winds estimated to have been over 100 mph on 17 January 1987. Damage by the hurricane is discussed under sections concerning vegetation, wildlife, and facilities.

## D. PLANNING

### 2. Management Plan

Rose Atoll National Wildlife Refuge is administered by the Service under a Cooperative Agreement with the Government of American Samoa developed at the time the Refuge was established in 1974. The agreement provides for management of the Refuge through periodic surveys and the deputization of Samoan Officials to enforce Refuge regulations.

In keeping with their desire to emphasize educational and scientific uses of the Atoll, the Government of American Samoa has initiated an effort to increase research and survey efforts within the marine and terrestrial habitats.

The receipt of Pittman-Robertson funding by the Government of American Samoa made possible the hiring of a wildlife biologist and resulted in the name change from "Office of Marine Resources" to "Office of Marine and Wildlife Resources" during 1986. The presence of a wildlife biologist on the Government of American Samoa staff has resulted in increased effort to survey and manage seabirds, turtles and rats at Rose Atoll on a regular basis. The Service provided on-site training for the biologist during November of 1986 as well as written methodologies for surveys of wildlife populations and habitats. Most of the methodologies were outlined in the following report: "Hu, Darcy. January 1987. Rose Atoll Trip Report, 4-12 November 1986, Administrative Report, Refuges and Wildlife, Honolulu Hawaii." The Office Of Marine and Wildlife Resources wildlife biologist will continue to monitor wildlife populations at Rose Atoll using methods developed by Service biologists resulting in a larger data base on this atoll.

In connection with the Samoan Government's attempt to provide cultural and educational opportunities at Rose, a teacher's training program was initiated in 1985 to provide teachers with an awareness of Rose Atoll's ecological importance and the desire and ability to pass it on to their students. The Office of Marine and Wildlife Refuge biologists work with the teachers to allow them a valuable learning experience and for them to provide valuable assistance in collecting data. The Service issued a separate Special Use Permit for the Department of Education activities in 1987 with very specific controls placed on their activities to ensure that their activities have little impact if any.

##### 5. Research and Investigation

Research at Rose Atoll has consisted principally of surveys of terrestrial and marine organisms and their habitats during brief visits to the Atoll. Only one such visit was made during 1987. Marine and Wildlife biologists from the Office of Marine and Wildlife Resources, eight school teachers, and one science specialist from the Department of Education visited Rose from 24 to 28 February. The biologists surveyed the damage caused by Hurricane Tusi.

The Office of Marine and Wildlife Resources has established five permanent reef transects on the seaward edges of the reef for the collection of quantitative data on fishes, corals, and other invertebrates. The data will be used: 1) as a baseline from which to measure future changes in the resources and habitats; 2) as a basis for developing management recommendations and regulations relative to the fishery conducted just outside the Refuge boundary; and 3) for comparison with similar data collected along the heavily fished shoreline of Tutuila which is the main island in American Samoa. The transects were surveyed on this trip to Rose Atoll and little damage to the marine resources from the hurricane was found.



William Knowles of the Office of Marine and Wildlife Resources Places a permanent plot marker on Pisonia tree on Rose Island. (DH)

Biologists and teachers also conducted surveys of vegetation, marine birds, turtles, clams, and rats. Their results were compiled in the report: Knowles, William. 1987. Trip Report - Rose Atoll National Wildlife Refuge February 24 - 28, 1987.

## E. ADMINISTRATION

### 1. Personnel

There are no personnel assigned specifically to Rose Atoll National Wildlife Refuge. The Refuge is administered from the Hawaiian/Pacific Island Office of Refuges and Wildlife in Honolulu, Hawaii. Richard Wass

was Refuge Manager until March of 1987 when he moved to Hakalau National Wildlife Refuge and the duties of Refuge Manager were assumed by Doug Forsell located at Johnston Atoll. Administrative activities are carried out by Stewart Fefer, the Refuge Complex Manager.

## 5. Funding

There was no funding provided for specific projects at Rose Atoll in 1987. Funds to administer this Refuge are part of the overall refuge complex budget.

## F. HABITAT MANAGEMENT

### 1. General

Rose Atoll, one of the smallest atolls in the world, is composed of a coralline algae reef that encloses a 50-foot deep lagoon. A single channel leads into the lagoon which can be navigated by medium-sized vessels at high tide. The Atoll is almost square in shape and is notable for the high density of coralline algae that comprises most of the reef substrate. The Atoll is about two miles across diagonally. Two islands are located on the northeast side. Rose Island is the largest of two islands and is heavily vegetated. Sand Island is much smaller and has been unvegetated until recently.

### 3. Forests

Rose Island is dominated by a Pisonia forest on the south side of the island and groves of Tournefortia bushes on the east and north sides of the island. In addition, there is a small grove of coconut palms near the center. The palms were introduced during visits by Samoan officials during the first half of this century. The Tournefortia forest has increased in size from a few plants in the early 1970s to the point where most of the northern and eastern part of the island is covered. It provides nesting habitat for red-footed boobies and frigatebirds. Vegetation on Rose Island was termed "generally healthy" during the November 1986 field trip. The hurricane blew over several large Pisonia trees and numerous Tournefortia trees along the edge of the island. Some of the trees may have suffered additional damage which is taking a longer time to take effect from waves which washed saltwater over the island. This effect will be monitored on future visits.



Beach along the northeast side of Rose Island. The dead Tournefortia trees were presumed to be damaged by the hurricane. (WK)



Dead Tournefortia trees on Sand Island, presumably killed by the hurricane. (WK)

In April 1983, six Tournefortia bushes up to five feet tall and two seedlings were observed on Sand Island. There are no historical records of vegetation on this island and none was documented during Service field trips conducted prior to this date. In May 1985, a group of science teachers visited Sand Island and reported the presence of 47 Tournefortia bushes of various sizes. During November 1986, 35 Tournefortia plants were counted by Service personnel and flowering Boerhavia was noted. The hurricane evidently drove waves over Sand Island and killed most of the Tournefortia bushes. Only three bushes remained alive and they had been severely damaged. Only one had green leaves remaining.

## 6. Other Habitats

The most extensive habitat at Rose Atoll is the marine habitat. The reef, which is dominated by coralline algae, forms an approximate square with a single opening to the sea. The outside of the reef descends to great depths and is composed of an extremely diverse coral complex.



Giant clam in shallow waters of the lagoon. (GMC)

The inner edge of the reef crest slopes gradually to a rubble-dominated shelf that contains numerous patch reefs composed of coralline algae, coral, and a diversity of other sessile invertebrates including the giant clam, Tridacna maxima. The rubble shelf slopes abruptly to about 50 feet and forms the bottom of a mile wide lagoon. The bottom of the lagoon is principally composed of rubble, sand, and small coral patches. Occasional patch reefs project nearly to the surface. A high diversity of fishes and invertebrates is present within the lagoon. The diversity is even greater outside the Atoll.

## 10. Pest Control

Polynesian rats (Rattus exulans) remain extremely abundant on Rose Island. No attempts to control the animal have been instituted, although, they have been observed to prey on the eggs of seabirds and hatchling turtles. No rats have ever been documented on Sand Island.

During the November 1986 trip a monitoring effort was initiated to determine population are cycles in order to determine the best time to attempt an eradication effort. This survey was continued in 1987 although this results are somewhat confounded by their extreme abundance on the island and the possible effects of the hurricane. Table 1 presents the data from these efforts and was excerpted from Knowles report. Trapping success was much greater this year indicating a higher population. However, because of the possible effects of the hurricane in eliminating the rats food they may have simply been hungrier than the survey conducted in November 1986 and easier to trap.

This was the explanation of Bill Knowles who had numerous observations of rat behavior to indicate an over population. These included a higher percentage of rats eating dead rats in the traps, rats foraging in daylight on the beach, several rats in poor to bad condition, and rats fighting. The monitoring effort will continue in future years.

Table 1. Rats caught at Rose Atoll during November 1986 and February 1987 surveys.

Date	Pisonia		Tournefortia		Total	
	Rats	%	Rats	%	Rats	%
November 8, 1986	53	72	4	31	57	66
November 9, 1986	37	51	5	42	42	49
November 10, 1986	29	40	3	23	32	38
February 14, 1987	62	98	19	76	81	92
February 15, 1987	47	77	17	80	63	79



Sooty tern eggs predated by rats. (GML)

## G. WILDLIFE

### 1. Wildlife Diversity

Wildlife resources at the Atoll include nesting and resident marine birds, nesting endangered and threatened sea turtles, rats, and a low diversity of terrestrial invertebrates, (coconut crabs, hermit crabs, and insects).

Diversity varies during the year because of the seasonal nature of the use of the Atoll by nesting and roosting seabirds and shorebirds.

Coconut crabs, Birgus latro, were unknown at Rose Island until their presence was documented during an October 1982 field trip. During the 1984 trips, juveniles were commonly observed around the campsite at night, and one individual weighing an estimated one-quarter pound was found. This species now appears to be well established as individuals are seen on every trip to the island.

### 2. Endangered and/or Threatened Species

Rose Atoll supports populations of the endangered hawksbill turtle and the threatened green sea turtle. Only green sea turtles have been found nesting, but continued surveys may discover hawksbills on the beaches. Previous studies have shown that turtle nesting activity occurs in the

fall. Unfortunately the cancellation of the fall trip precluded turtle surveys this year. However, several sets of fresh tracks were reported by Knowles which had been made between the hurricane in mid January and the late-February trip. This indicates nesting occurs throughout the austral summer similar to French Frigate Shoals in the central north Pacific Ocean.

The February trip found eight sets of post storm tracks on Sand Island with 20 nest pits associated with them. At least 10 sets of post storm tracks were located on Rose Island. No turtles were observed on the beach during the February trip and no hatchlings were observed.

#### 5. Shorebirds, Gulls, Terns and Allied Species

Eleven species of seabirds comprise the most prominent group of wildlife utilizing the refuge. The species nesting at Rose Island in approximate order of abundance are: sooty tern, black noddy, white tern, brown noddy, red-footed booby, brown booby, masked booby, great frigatebird, grey-backed tern, red-tailed tropicbird, lesser frigatebird, and white-tailed tropicbird. Six species of shorebirds (golden plover, ruddy turnstone, wandering tattler, bristle-thighed curlew, and reef heron) inhabit the Atoll during the austral summer.

Table 2. Populations of birds estimated on Rose Atoll on 24 - 28 February 1987 by Knowles and on 23 - 26 March of 1982 by Fefer.

Species	Roosting or Courting		Nests	
	Feb 87	Mar 82	Feb 87	Mar 82
Red-tailed Tropicbird	20	8	2	4
White-tailed Tropicbird	1	2	0	0
Masked Booby	30+	90	0	17
Brown Booby	64+	750	0	122
Red-footed Booby	hundreds	450	9	205
Great Frigatebird	40+	80	0	0
Lesser Frigatebird	few	10	0	0
Reef Heron	1	1	0	0
Lesser Golden-Plover	6+	8	-	-
Wandering Tattler	10+	15	-	-
Bristle-thighed Curlew	6	5	-	-
Ruddy Turnstone	8	25	-	-
Gray-backed Tern	1	1	0	0
Sooty Tern	0	1800	0	350
Brown Noddy	50+	900	0	168
Black Noddy	25+	2,160	1,080	66 chicks
White Tern	20	600	2	294

During the February field trip, the Office of the Marine and Wildlife Refuge personnel censused birds on both islands. They found very few nesting birds; in fact their estimates of bird populations are the lowest ever recorded (Table 2). There have been no previous surveys in February thus, the only data possibly comparable to this survey was that of Fefer in March of 1982, (Table 2). This data indicates that the hurricane may have destroyed many nests. Although Fefer found very few booby chicks older than three weeks, with the associated incubation periods of about 45 days there should have been many nests in February assuming other factors were similar.

One confounding factor was that Fefer's survey was also conducted following a major storm and nests may have been destroyed. Thus, both surveys may not represent "normal" conditions. We assume that the low levels of nesting and roosting birds was a result of the storm.

#### 11. Fisheries Resources

Fishery resources within the refuge include a wide variety of reef fishes, resident and migratory pelagic fishes, lobsters, and Tridacna clams. Some commercial fishing is conducted for bottom fishes (snappers, groupers, and jacks) along the outer reef slope at depths of 20-200 fathoms just outside the refuge boundary. The long distance to the inhabited islands (180 miles to Tutuila and 80 miles to Ofu and Ta'u), however, generally limits the effort to less than a half dozen boat trips per year.

#### 16. Marking and Banding

No banding was accomplished on the February trip and no recoveries were reported this year for birds or turtles marked at Rose Atoll.

### H. PUBLIC USE

#### 1. General

Because of the small size of the refuge, the presence of threatened green sea turtles and endangered hawksbill turtles, and the susceptibility of the island's environment to the introduction of noxious species, public access is limited to all but those conducting authorized biological studies or those participating in educational activities.

#### 3. Outdoor Classrooms - Teachers

Both the Government of American Samoa and the Service feel that the natural resources of Rose Atoll have great educational value to the territory. Efforts to take advantage of this value are encouraged. To this end, a Special Use Permit (ROS-2-87) was issued to the Government of Samoa's Department of Education for the third year in a row. The Permit

authorized two three-day trips to the refuge, but only one trip was made from 24 - 28 February. Eight Samoan school teachers, one science specialist from the Department of Education, and five biologists of the Office of Marine and Wildlife Refuge visited the Refuge. The objective of the trip was to provide the teachers with an awareness of the environmental importance of Rose Atoll and to give them the experience of studying the Atoll's resources so they could convey the experience and importance to their students and to the Samoan public. The teachers took photographs and videotapes, censused and measured clams and coral, conducted reef transects for comparison with transects on Tutuila Island, inventoried beach debris, made seabird and turtle observations, mapped vegetation, and kept journals. Upon their return to Pago Pago, each teacher was required to present lectures, videotapes, and slide shows to school classes or to the public and to write a narrative of their impressions and observations. As was the case for the 1985 and 1986 trips, the 1987 trip were deemed a great success. The effort will continue in 1988.

A few quotes excerpted from the reports of teachers are as follows: "I feel that I am much more aware and educated in the field of science than before I participated in this trip. I'm not a science teacher but ... this trip has influenced me to be more interested in science, and thus more interested in teaching it." "My concern and awareness for the preservation and conservation of marine resources has been greatly enhanced. I will try my best to promote the public awareness in trying to prevent marine pollution and to keep the marine environment in its natural state." "It was an incredible experience to see an island untouched by man and pollution." "Observing the wildlife on Rose Island has opened my eyes and made me more aware of the problem (pollution). I just hope that others who are privileged enough to see the island have the same reaction and try to keep our own island cleaner and healthier."

If one bears in mind that much of American Samoa has a rather high population concentrated along a very narrow coastal road and that many of the marine resources were long ago depleted it is gratifying that teachers in a position to influence the youth of American Samoa can gain such an experience on a Refuge.

The data collected by the teacher training groups are mostly used for their own purposes though some of the observations will be of value to refuge managers and biologists for determining habitat and population changes overtime. One survey of particular value was conducted by Richard Pease and Netini Sauni. Their report titled "The Vegetation of Rose Atoll - An updated map of the terrestrial vegetation of Rose Atoll" contained an updated vegetation map presented in a quantitative and repeatable manner. The Rose Island map will allow us to document future changes in the vegetation and determine the areas of habitat types for estimates of bird populations based on sampling of specific cover types.

## I. EQUIPMENT AND FACILITIES

### 2. Rehabilitation

The main entrance large wooden refuge sign was knocked over by the hurricane and the cover blew away. The crew members of the SAUSAUIMOANA repaired and erected the sign.

## J. OTHER ITEMS

### 3. Credits

This narrative was written by Doug Forsell, and reviewed by Stewart I. Fefer.

## K. FEEDBACK

Rose Atoll is the most distant refuge in the National Wildlife Refuge System. We depend on the resources of the Samoan government to transport us to the Atoll because we have little or no funds to support the Refuge. The rats on the Atoll are incredibly abundant and it is difficult to answer the teachers who are appalled by their abundance and their predation on birds as to why we have not eradicated them. The Refuge has requested funding of \$20 K to eradicate the rats for several years. The amount of money seems negligible in relation to the benefits the birds will derive.

HOWLAND, BAKER, AND JARVIS ISLANDS

NATIONAL WILDLIFE REFUGES

Honolulu, Hawaii

ANNUAL NARRATIVE REPORT

Calendar Year 1987

U.S. Department of the Interior  
Fish and Wildlife Service  
NATIONAL WILDLIFE REFUGE SYSTEM

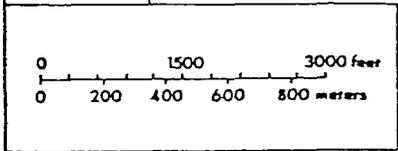
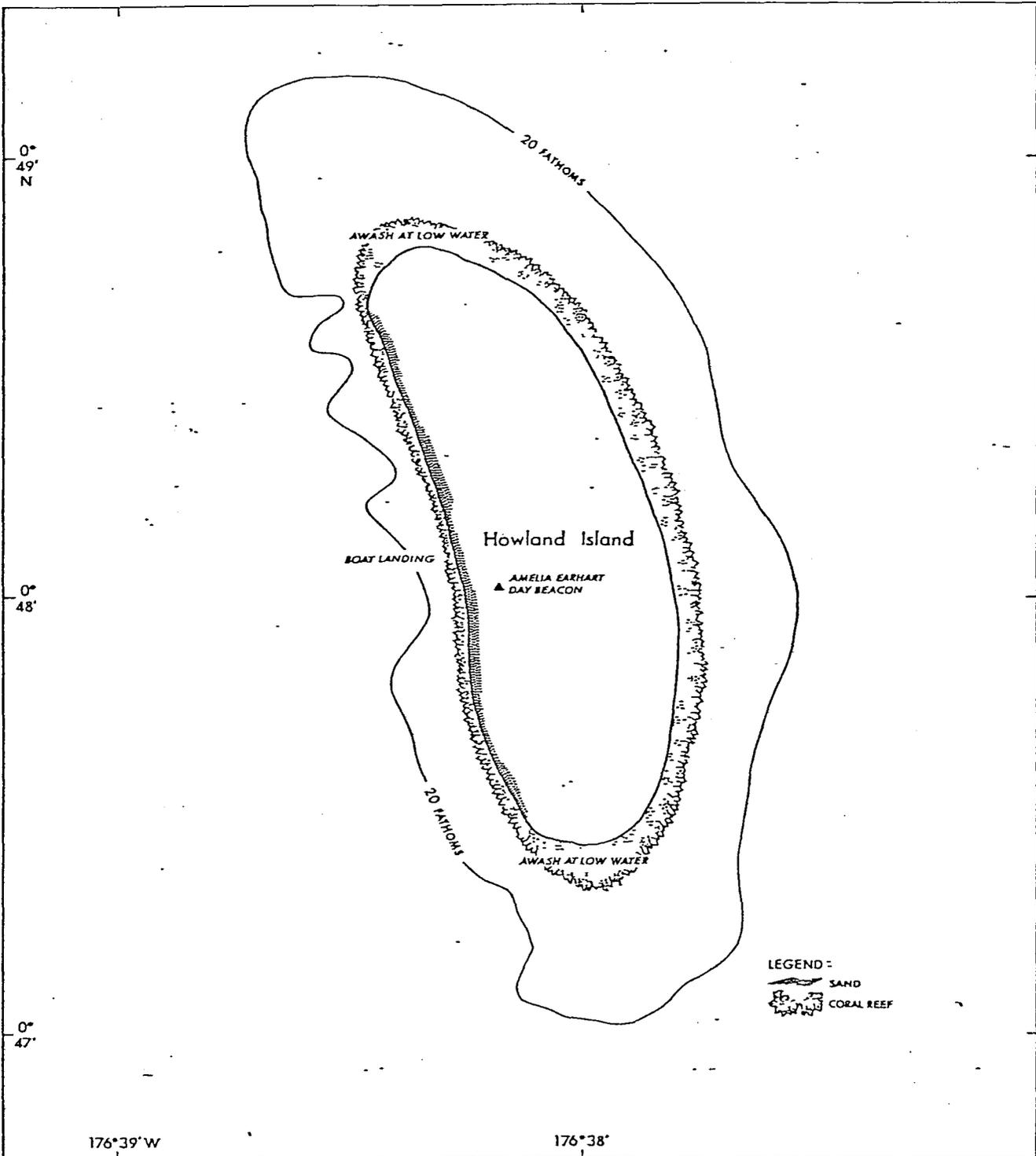
## INTRODUCTION

Baker Island and Howland Island National Wildlife Refuges are isolated coral islands 50 and 20 miles north of the equator in the central Pacific Ocean about 1,600 miles southwest of Honolulu, Hawaii. Jarvis Island National Wildlife Refuge is located 20 miles south of the equator about 1,300 miles south of Honolulu and 1,000 miles east of Baker and Howland Islands. Baker Island Refuge contains about 390 acres of land and 31,397 acres of submerged land and water. Howland Island Refuge contains 455 acres of land and 32,150 acres of submerged land and water. Jarvis Island Refuge contains 1,100 acres of land and 36,419 acres of submerged land and water. All three islands are uninhabited and vegetated only by grasses, prostrate vines, and low-growing shrubs due to scant rainfall and intense sun. Because all islands are so remote, received few visits in 1987, and are ecologically similar they have been combined for the purpose of the narrative.

The refuges were established by the Secretary of the Interior in 1974 when management responsibility was transferred from the Office of Territorial Affairs to the Fish and Wildlife Service. They are managed primarily as nesting and roosting habitat for about 20 species of seabirds and shorebirds.

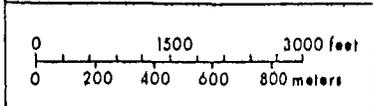
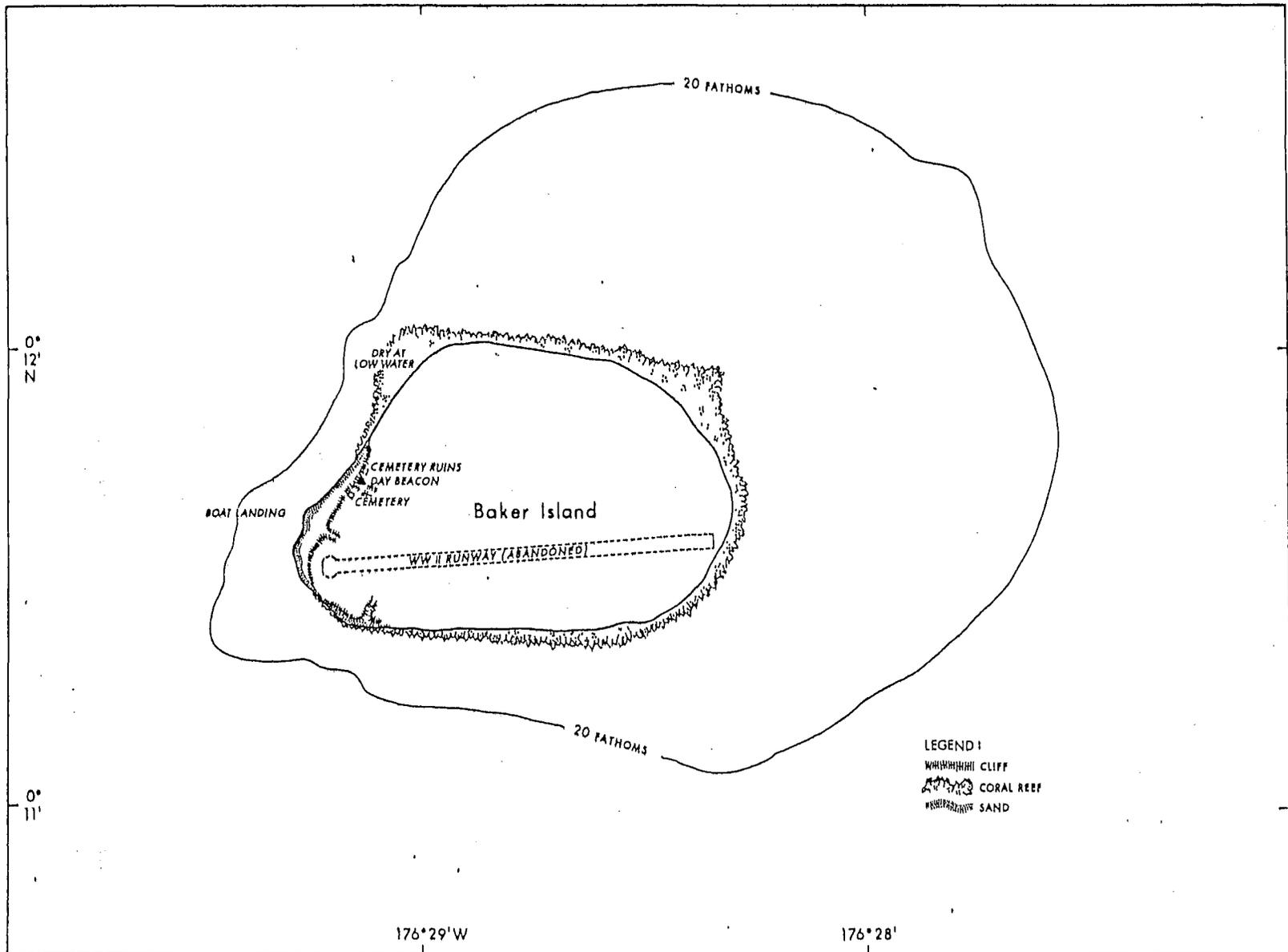


Aerial view of Baker Island taken by U.S. Coast Guard personnel from C-130 while on fisheries patrol. (USCG)



HOWLAND ISLAND  
NATIONAL WILDLIFE REFUGE  
Central Pacific Ocean

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service



**BAKER ISLAND NATIONAL WILDLIFE REFUGE**  
Central Pacific Ocean

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service

0°  
22'  
S

0°  
23'  
BOAT LANDING

BOAT LANDING

DAY BEACON

Jarvis Island

20 FATHOMS

20 FATHOMS

160°02'W

160°01'

160°00'

0 1500 3000 feet  
0 200 400 600 800 meters

JARVIS ISLAND NATIONAL WILDLIFE REFUGE  
Central Pacific Ocean

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service

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6. Interpretive Exhibits/Demonstrations . . . . .	NTR
7. Other Interpretive Programs . . . . .	NTR
8. Hunting . . . . .	NTR
9. Fishing . . . . .	NTR

H. PUBLIC USE (Cont.)

10. Trapping . . . . .	NTR
11. Wildlife Observation . . . . .	NTR
12. Other Wildlife Oriented Recreation . . . . .	NTR
13. Camping . . . . .	NTR
14. Picnicking . . . . .	NTR
15. Off-Road Vehicling . . . . .	NTR
16. Other Non-Wildlife Oriented Recreation . . . . .	NTR
17. Law Enforcement . . . . .	NTR
18. Cooperating Associations . . . . .	NTR
19. Concessions . . . . .	NTR

I. EQUIPMENT AND FACILITIES

1. New Construction . . . . .	NTR
2. Rehabilitation . . . . .	NTR
3. Major Maintenance . . . . .	NTR
4. Equipment Utilization and Replacement . . . . .	NTR
5. Communications Systems . . . . .	NTR
6. Computer Systems . . . . .	NTR
7. Energy Conservation . . . . .	NTR
8. Other . . . . .	NTR

J. OTHER ITEMS

1. Cooperative Programs . . . . .	NTR
2. Other Economic Uses . . . . .	NTR
3. Items of Interest . . . . .	NTR
4. Credits . . . . .	8

K. FEEDBACK



Aerial view of Howland Island taken by U.S. Coast Guard personnel from C-130 while on fisheries patrol. (USCG)

#### A. HIGHLIGHTS

No visits by Fish and Wildlife Service (service) personnel occurred to Baker, Howland, or Jarvis Island Refuges during 1987. The U.S. Coast Guard visited Howland and Baker Islands in October and were accompanied by University of Hawaii personnel, who serviced the remote satellite-transmitting meteorological observation station installed on Baker Island in 1986. Jarvis Island was visited by University of Hawaii personnel in the fall to exchange oceanographic instruments which measure sea temperature and barometric pressure.

A trip to Howland and Baker Islands largely funded by amateur radio operators, was planned for the spring, but the breakdown of the ship which was to be chartered necessitated the cancellation of the trip. The large expenditure of time and money required to visit these small isolated islands precludes regular trips by refuge personnel to monitor seabird populations and terrestrial and marine habitats.

#### B. CLIMATIC CONDITIONS

Climatic conditions are only known for Baker Island. The remote sensing instrumentation was operating to furnish meteorological data.

Unfortunately, rainfall, the most significant data which affects vegetation, is not collected. Data collected indicated near-normal conditions with no evidence of the "El Nino" conditions that adversely impacted seabird populations in 1982 and 1983.

#### D. PLANNING

##### 5. Research and Investigations

The Pacific Marine Environmental Lab, of the National Oceanic and Atmospheric Administration was issued a special use permit (BHJ-1-87) to service a satellite-transmitting meteorological observation station installed on Baker Island in 1986. A technician from the University of Hawaii accompanied the U.S. Coast Guard to Baker Island in the spring of 1987. The data is being collected as part of a chain of stations along the equator to study oceanographic and weather conditions associated with El Nino.



Remote satellite transmitting weather station erected on Baker Island during the spring trip. This station will transmit data to satellites and then to NOAA in Seattle. The project is to monitor and study El Nino. (DJF)

Jarvis Island was visited by University of Hawaii personnel in the fall to exchange oceanographic instruments which measure sea temperature and barometric pressure.

## E. ADMINISTRATION

### 1. Personnel

The refuges are managed by the Refuge Complex Manager and the Remote Islands stationed at Johnston Atoll. These responsibilities were assumed following a reorganization in February when Richard Wass became the Refuge Manager for the newly created Hakalau Forest National Wildlife Refuge and moved to the Island of Hawaii.

### 5. Funding

The Refuge received no funding in 1987 for the management of these islands. The lack of Service funds for these surveys necessitates our dependance on other groups to fund the trips. This reduces the efficiency of the operations and requires a great deal of service employee time in planning the trips.

## F. HABITAT MANAGEMENT

### 1. General

Habitat management on each of these islands has been based on the philosophy that the resident populations of seabirds and other wildlife will return to a natural state if environmentally destructive conditions resulting from former human habitation of the islands are removed or controlled. Past management efforts have been limited due to the expense of getting to the islands and the short time allotted for work on the islands. These have taken two forms: control of introduced cats and the destruction of debris and contaminants. The natural state of these islands is maintained by a restrictive policy of limited entry and of allowing only those activities that would be beneficial to the wildlife populations. The fact that the nearest inhabited island is 240 miles away from Jarvis and 660 miles away from Howland and Baker Islands facilitates this type of management. In 1986 several projects were accomplished on the refuges to enhance the habitat for marine birds and rid the islands of contaminants. Feral Cats were eradicated on Howland Island. On Baker Island, hundreds of drums of petroleum products abandon by the military during World War II were burned. Empty drums were laid on their sides and opened to prevent roosting seabirds from falling in and dying because they are unable to fly out or clamber up the vertical sides. The seabird populations of both island should benefit greatly from the actions described above. Further actions to flatten, bury or remove the drums are not recommended at this time. However, populations of seabirds and their use of the drums for nesting and roosting will be monitored during future trips to the island to ensure that the presence of the drums poses no further threat. If adverse impacts are detected, further actions will be recommended to mitigate the problems.



Abandoned fuel and oil drums left by the military during World War II were burned in 1986 and placed on their sides so that birds would not fall into the open drums. (DJF)



Immature boobies roosting on remains of B-29 aircraft abandoned in 1942 at Baker Island. (DJF)

## G. WILDLIFE

### 5. Shorebirds, Gulls, Terns, and Allied Species

Seabirds and shorebirds were last censused on all of the islands during the spring of 1986. Some seabirds nest on the islands throughout the year so one must keep in mind that censuses only represent "snapshot" views of the islands and many more birds than are counted at any one time utilize the islands. The results of the 1986 surveys are presented as this is our best guess of the populations for 1987. In 1986, populations appeared to be healthy and well protected with larger populations now than in historical times.



Lesser Frigatebirds nesting on Baker Island. (DJF)

**Table 1.** Populations of birds estimated on Baker, Howland, and Jarvis Islands during spring surveys of 1986. It is assumed that numbers were similar in 1987. These snapshot, numbers, and annual populations are higher as birds may breed on these islands throughout the year.

Species	Baker Island	Howland Island	Jarvis Island
Red-tailed Tropicbird	34	122	85
Masked Booby	2,830	2,387	4,564
Brown Booby	170	15	72
Red-footed Booby	648	41	258
Great Frigatebird	900+im	few	334
Lesser Frigatebird	5,920++im	0	1,218
Lesser Golden-Plover	50	18	?
Wandering Tattler	3	0	4
Bristle-thighed Curlew	26	0	?
Ruddy Turnstone	150	0	?
Gray-backed Tern	500	0	18
Sooty Tern	81,720++	50	16,000++
Brown Noddy	1,214	0	322
Blue-gray Noddy	1	0	1
White Tern	7	2	0

## II. Fisheries Resources

Compared with other tropical Islands the fish fauna of these refuges is depauperate. This is probably due to the lack of habitat diversity. However, the fish biomass at these Islands is much greater than in the Samoan Islands—even when compared to Rose Atoll which has little fishing pressure. The large size and numbers of a relatively few species makes these refuges especially vulnerable to over fishing. These island's fisheries resources will become increasingly important as a baseline for comparison to other atolls in the central Pacific as they become over fished by ever expanding human populations.



Assortment of reef fishes at Howland Island. This type of scene is more the rule than the exception at all of the three refuges. (DJF)



Reef flats at Howland Island. Note the giant clams on the reef. These clams would not be present if the island were open to fishing. (DJF)

Giant clams (*Tridacna maxima*) are one example of a fishery resource which could be over fished in a very short time. They are fairly abundant on the reefs of all islands to depths of at least 40 ft. The lack of small individuals is noteworthy as no specimens smaller than three inches were sighted by Wass in 1986. At Rose Atoll National Wildlife Refuge giant clams of less than three inches valve width are far more abundant than larger individuals. Baker and Howland specimens also seem to grow to a larger size than those at Rose Atoll. Specimens as large as 14 inches were found in 1986.

#### H. PUBLIC USE

These islands are not open to the public and are posted in four languages at the major landing beaches. It is suspected that the islands are visited either by passing fishing vessels or pleasure craft or even by foreign fishing vessels. During past cruises foreign and American tuna fishing vessels approached the island and then departed presumably after finding someone present on the island.



Entrance sign at Baker Island. These redwood signs have lasted 11 years in an extremely harsh environment. (DJF)

#### J. OTHER ITEMS

##### 4. Credits

This narrative was written by Douglas J. Forsell and reviewed by Stewart I. Fefer.