PACIFIC REMOTE ISLANDS
NATIONAL WILDLIFE REFUGE COMPLEX

HONOLULU, HAWAII

ANNUAL NARRATIVE REPORT
Calendar Year 1989

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

PACIFIC REMOTE ISLANDS NATIONAL WILDLIFE REFUGE
PERSONNEL - 1989

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HOWLAND, BAKER, AND JARVIS ISLANDS

NATIONAL WILDLIFE REFUGES

Honolulu, Hawaii

ANNUAL NARRATIVE REPORT
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INTRODUCTION

Baker and Howland Island National Wildlife Refuges are isolated coral islands located 20 and 50 miles, respectively, north of the equator in the central Pacific Ocean, about 1,600 miles southwest of Honolulu, Hawaii. Jarvis Island National Wildlife Refuge is located 18 miles south of the equator, about 1,300 miles south of Honolulu and 1,000 miles east of Baker and Howland Islands. The Baker Island Refuge contains about 400 acres of land and 31,337 acres of submerged land and water. The Howland Island Refuge contains about 451 acres of land and 32,100 acres of submerged land and water. The Jarvis Island Refuge contains about 1,080 acres of land and 36,439 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. Due to their remote locations, these islands received few visits in 1989. And because of their ecological similarities, Howland, Baker, and Jarvis Islands have been combined for the purpose of this 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.

HOWLAND, BAKER, AND JARVIS NATIONAL WILDLIFE REFUGE

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

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

A. HIGHLIGHTS

Neither Howland nor Jarvis Islands were visited by Service personnel in 1989. Baker Island was visited by the NOAA vessel MALCOLM BALDRIDGE on 15 June. While the primary purpose of the visit was to service the remote satellite-transmitting meteorological observation station erected in 1986, a survey of marine birds was conducted by the personnel of Point Reyes Bird Observatory.

The U.S. Coast Guard visited Howland and Baker Islands in August for fisheries patrol and to service the day beacons. 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 where the remote sensing instrumentation has been operating to furnish meteorological data. The data collected indicated near-normal conditions with no evidence of the "El Niño" conditions that had adversely impacted seabird populations in 1982 and 1983. Considering the significance of rainfall and its effect on vegetation, it is unfortunate that precipitation data is not collected.

C. PLANNING

5. Research and Investigations

The Pacific Marine Environmental Lab (PMEL), of the National Oceanic and Atmospheric Administration (NOAA) was issued a Special Use Permit, to service their satellite-transmitting meteorological observation station installed on Baker Island in 1986. The team visited the island on 15 June, on board the NOAA vessel MALCOLM BALDRIDGE. They moved the station from the northwestern corner of the island to one of the old wooden antenna poles located on the northeastern end of the island. The data is being collected as part of a chain of stations along the equator to study oceanographic and weather conditions associated with El Niño. While the NOAA vessel was present at Baker Island, Larry Spear and Tim Schantz, biologists from Point Reyes Bird Observatory conducted a survey of the marine birds nesting on Baker Island. Their results are presented in the Wildlife section.

The University of Hawaii vessel RV MOANA WAVE visited Jarvis Island in January and December of 1989. The January trip was part of a geological survey of the Line Islands and the December trip was to service the tidal gauge located in the reef.

3 Weather station located on Baker Island. This station transmits data to satellites and then to NOAA in Seattle. the project is to monitor and study El Niño. (DJF)

E. ADMINISTRATION

1. Personnel

The Refuges are managed by Doug Forsell, the Refuge Manager of the Remote Islands Complex, who is stationed at Johnston Atoll NWR. Stewart Fefer, the Complex Supervisor, is stationed in Honolulu and provides overall direction.

5. Funding

The Refuge receives little funding for the management of these islands. The limited funds necessitates our dependance on other groups such as amateur radio operators to fund the majority of the trips to these islands. This reduces the efficiency of the operations and requires a great deal of Service employees' time in coordinating the trips. Since no trips to the Islands were made in 1989 the only funds expended on these refuges were administrative.

4 Refuge Manager, Doug Forsell, banding a masked booby. (B. Ponwith)

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 by the expense of getting to the islands and the short period of time allotted for work while there. 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.

4. Grasslands

Digitaria pacifica is an introduced perennial grass which grows up to 30 inches high, forms dense mats, and limits the area available for ground nesting seabirds. In the late 1950's and early 1960's, Baker Island was covered by this grass and very few birds nested there. Due to an unknown process most of the grass died out on Baker Island in the late 1960's and a dense growth appeared on Howland Island. There were no surveys conducted during this period, but by 1973 most of the nesting marine birds had moved from Howland to Baker Island. During this same period, the feral cats on Baker Island died out on Baker Island, but those on Howland Island survived Whether the elimination of the cats or the grass were responsible for the birds moving from Howland to Baker Island, or a combination of both will remain unknown. The possibility also exists that the birds themselves were responsible for limiting the grass on Baker Island.

Digitaria covers over 80 percent of the interior of Howland Island, leaving only the old runways, where no soil exists, and the shoreline open for the birds to nest.

3 Doug Forsell censusing fish and invertebrates along permanent transect. (DJF)

14. Contaminants

In 1986, hundreds of drums of petroleum products abandoned by the military during World War II were burned on Baker Island. 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. Further actions to flatten, bury, or remove the drums does not seem warranted at this time, due to the great expense and greater habitat destruction of such an action. In 1989, Spear and Schantz found seabirds use the drums for nesting and roosting. They found 22 percent of the drums they inspected had pairs of red-tailed tropicbirds nesting in them. Red-footed boobies were also the drums for nesting and roosting. These barrels should be thoroughly checked every couple years and those which have deteriorated into a condition where they pose a threat to birds should be rolled over so birds can escape.

6 Red-tailed tropicbird nesting in oil drum on Baker Island. (DJF)

7 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 could not fall into the open drums. (DJF)

The only contaminants found on Jarvis Island during the contaminants survey in 1986 were approximately 15 lead acid batteries left at the unmanned weather station deactivated in 1981. The researchers from the University of Hawaii were asked to remove the lead-acid batteries from the island during their December trip to service the tidal gauge. While the batteries were not left by this particular project, it was a University of Hawaii project. We were grateful that they removed the last contaminants known on these remote islands.

G. WILDLIFE

2. Endangered and/or Threatened Species

No endangered species have been observed on any of the islands, although one hawksbill turtle (Eretmochelys imbricata) was observed off the northeastern corner of Baker Island. No other turtles or tracks were observed on Baker Island in 1989.

5. Shorebirds, Gulls, Terns, and Allied Species

Seabirds and shorebirds were last censused on all of the islands during the spring of 1986. In 1988, a thorough census of the birds on Baker and Howland Islands was conducted and in June of 1989 a limited survey was conducted on Baker Island. Although the majority of birds nest on these islands in the spring, some seabirds nest on the islands throughout the year so one must keep in mind that these censuses only represent "snapshot" views of the islands and many more birds than are counted at any one time using the islands. The results of the 1988 surveys of Baker and Howland Islands are presented in Table 1. The populations for Jarvis Island presented in Table 1 are from the 1986 surveys as this is our best guess of the populations for 1989. The June 1989, survey of Baker Island is presented to show the protracted nesting season and the numbers could probably be added together for a total spring and summer population. Populations of birds found in June of 1989 appear to be lower than would be expected especially for frigatebirds and masked boobies. This may be due to a food shortage or adverse oceanographic conditions.

Table 1. Populations of birds estimated on Baker, Howland, and Jarvis Islands for the most recent surveys. These are 'snapshot' numbers and annual populations are higher as birds breed on these islands throughout the year.

Species	Baker Island 3/1988	Baker Island 6/1989	Howland Island 3/1988	Jarvis Island 4/1986
Red-tailed Tropicbird	13	60	13	85
Masked Booby	1,850	150	1,457	4,564
Brown Booby	197	100	8	72
Red-Footed Booby	400	200	18	258
Great Frigatebird	866	400	0	334
Lesser Frigatebird	5,658	300	0	1,218
Lesser Golden-Plover	285	+	36	?
Wandering Tattler	15	+	14	4
Bristle-thighed Curlew	12	14	11	?
Ruddy Turnstone	380	+	20	?
Gray-backed Tern	1,000	260	0	18
Sooty Tern	100,000	800,000	0	16,000+
Brown Noddy	2,410	100	0	322
Blue-gray Noddy	0	0	0	1
White Tern	4	6	0	0

8 Lesser frigatebirds nesting on Baker Island. (DJF)

11. Fisheries Resources

Compared with other tropical islands the diversity of fish fauna of these refuges is depauperate. This is due to the lack of habitat diversity as the islands do not have lagoons like many islands in the Pacific and the bottom drops off to extremely deep waters only a few hundred meters from shore. 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.

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 was 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 1988. Permanent plots should be established to monitor this easily over fished population.

H. PUBLIC USE

These islands are not open to the public and 'no trespassing' signs are posted in four languages at the major landing beaches. During past cruises both foreign and American tuna fishing vessels have approached the island and then departed presumably after finding someone present on the island. We suspect that even though these waters are rather isolated and not in any regular shipping lanes, vessels occasionally visit the islands and people land on them.

11. Other Non-Wildlife Oriented Recreation

These Refuges are important to amateur radio operators throughout the world because Howland and Baker Islands are considered a "country" (call sign KH1) and Jarvis Island along with Palmyra Island are another "country" (call sign KH5). "Hams" collect contacts with different countries much the same as bird watchers collect life lists. Due to the great expense required to visit these islands, the Refuge depends on cost sharing with the amateur radio operators to visit these Refuges. In 1989, Forsell began working with a group to plan an expedition to Jarvis Island in the spring of 1990.

17. Law Enforcement

Law enforcement is negligible at these Refuges. The U. S. Coast Guard may visit the islands for fisheries patrol by ship one day per year; and they may fly over one or more of the islands in conjunction with fisheries patrols once per year. We know of no such fisheries patrol in 1989.

From past observations we know trespass occurs, but obvious signs of vandalism or harassment of wildlife have not been noticed. The Refuge boundary signs have all rusted away, but the redwood signs at the beach landings are still in good condition. It is doubtful that visitors to the islands would adhere to the 'no trespassing' signs after traveling such a long distance.

Researchers from the University of Hawaii visited Jarvis Island in February while conducting a geological survey of the Line Islands. They were unaware of the requirement for a Special Use Permit until they observed the sign on the island. The Refuge was contacted upon their return and given a video tape of their activities. They apologized and said they would attempt to make other researchers at the University aware of the restrictions on visiting these Refuges.

I. Equipment and Facilities

8. Other

The redwood signs at the beach landings are holding up well, but the 4x4 uprights are beginning to fall over and should be replaced in the next couple of years. The bolts which hold the 2"x10"s to the uprights are also deteriorating and should be replaced. The signs and lettering are in good shape, but the signs should be treated with an oil or preservative to prevent them from drying out.

J. OTHER ITEMS

4. Credits

This narrative was written by Douglas Forsell and reviewed by Ken McDermond and Jerry Leinecke.

JOHNSTON ATOLL

NATIONAL WILDLIFE REFUGE

Honolulu, Hawaii

ANNUAL NARRATIVE REPORT
Calendar Year 1989

U.S. Department of the Interior
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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 1960's. Beginning in the 1940's, Johnston and Sand Islands were also greatly enlarged by dredging. Johnston Island is presently inhabited by approximately 1,200 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. The U.S. Army uses Johnston Island as a storage facility for chemical munitions. They are also 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 tripling 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 24 acres contaminated with transuranium elements as a result of three failed nuclear tests in the 1960's.

The Refuge was established in 1926 by Executive Order number 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, wintering habitat for 5 species of shorebirds, and as habitat for a diverse assemblage of marine animals, including the threatened green turtle. One Refuge Manager and one Biologist were 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.

1 View of Johnston Island from top of 640 foot high LORAN C transmitting tower on Sand Island. (DJF)

2 Aerial view of Sand and North Islands. (DJF)

A. HIGHLIGHTS

The role of the Refuge on Johnston Island continued to grow in the past year. The funding for the refuge manager/biologist position on Johnston Island was increased by the Army and DNA. This funding allowed the hiring of a full time Wildlife Biologist and allowed the manager to spend more time on refuge and contaminant issues. On the island, Service personnel 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 Service personnel on the atoll throughout the year has increased the Service's visibility and given both the Island's residents and management confidence in the Service's interest in the Refuge, thus fostering greater cooperation. Presentations and tours were given to numerous high ranking personnel from the Department of Defense and members of Congress.

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 on Johnston Island. The plant has received a great deal of interest from the national media, the Department of Defense and those concerned with the environment as it is a prototype for eight other plants planned for the continental United States.

This is the third year where biologists have been present on the island throughout the year to census marine birds since the 1960's. The techniques developed in 1987 and 1988 were further refined to enable us to accurately census each species and measure productivity for five species. Numerous habitat protection and improvement projects were initiated in order to limit conflicts between human activities and the marine birds.

An enormous amount of progress has been made in the area of recycling wastes and cleaning up hazardous waste sites. A few of these include: construction of a new trash burn pit, an environmentally sound fire training facility, and a hazardous waste storage facility. Other programs included the hiring of five persons to handle hazardous waste and environmental concerns for the various organizations on the island.

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 a yearly mean of 80 degrees F, one degree above the 30 year mean. The rainfall in 1989 of 45.2 in. was 18.0 in. above the 30 year mean (Table 1). November was exceptionally wet with over 10 inches above normal.

TABLE 1. Mean temperature and rainfall recorded at Johnston Island during 1989 and the 30 year mean from 1955 through 1984.

Month	Mean Temperature (°F)		Rainfall (inches)	
	1989	30 Year Mean	1989	30 Year Mean
January	78	77	4.1	1.8
February	76	77	3.3	1.6
March	79	77	0.6	2.7
April	77	78	4.8	2.5
May	80	79	1.3	1.9
June	81	80	2.3	1.0
July	82	81	1.0	1.1
August	82	81	3.6	2.5
September	82	81	2.1	2.1
October	82	81	5.7	3.2
November	79	79	13.9	3.6
December	70	78	2.4	3.1
All Months	80	79	45.5	27.1

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 was also asked to participate in the planning of numerous activities and construction on the base. A few of these efforts are described below:

In August, the Army simulated a terrorist attack of the island and flew in a 300 man force from Honolulu 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. All tropicbird nests in the area were checked prior to the operation. No birds abandoned their nests.

The various contractors were advised and monitored on numerous activities including: storage of hazardous waste and materials, allocation of storage areas, avoiding destruction of nesting habitat, and disposal of construction debris and trash.

The Refuge Biologist was involved with at least one meeting per week to plan various strategies for obtaining funding and cleaning up dumps and contaminant problems on the island. The majority of these are discussed under the contaminants section of this narrative. The major projects included: commenting on the planned plutonium clean-up; elimination of waste oil; construction of a fire training burn pit; closure of a waste burn pit and construction of a new burn pit; writing a hazardous waste management plan; seeking modification of the artificial reef permit to allow placement of large items which could not be recycled; monitoring the preparation and placement of materials on the artificial reef; and providing information and comments for modification of the Island's National Pollution Discharge Elimination System (NPDES) permit.

2. Management Planning

As a result of the Johnston Atoll Implementation Plan signed in 1984 between the U.S. Corps of Engineers, Pacific Ocean Division (CEPOD), U.S. Army Chemical Activity, Western Command (USACAW), Field Command Defense Nuclear Agency, and the Service, Refuge personnel have worked closely with these agencies on refuge environmental concerns arising from the JACADS project. On several occasions, Refuge Managers Fefer and Forsell met with officials from these agencies to attempt to work out an environmental monitoring plan for the Refuge. Forsell wrote a draft plan and submitted it to FCDNA in December of 1987. This plan was the subject of several meetings and negotiations and was finalized in the fall of 1988. Unfortunately, after several of the concerned agencies signed the document the Director of FCDNA refused to sign as the U.S. Army was not funding enough of the

studies and the refuge program. Funds for FY-89 were still distributed to environmental programs as stipulated in the document, but a new document was being worked on in 1989. Forsell traveled to Albuquerque, New Mexico in April to meet with DNA officials. The new agreement is to be between the Department of Defense agencies and a separate agreement would be drafted between The Defense Nuclear Agency and the Service in 1990.

4. Compliance with Environmental Mandates In February, Forsell drafted comments on the Supplemental Environmental Impact Statement (SEIS) for the Johnston Atoll Chemical Agent Disposal System. The SEIS dealt primarily with alternatives for the disposal of JACADS air pollution abatement system scrubber brines and solid wastes. The Army's preferred alternative was to dump the brines into the ocean 14 miles south of Johnston Island. The Ocean Dumping Act of 1989 eliminated this option. The final decision was to ship all hazardous and non-hazardous wastes from the island to waste facilities in the continental United States. This alternative was preferred by the Service.

In December, Forsell reviewed the first draft of the Second Supplemental Environmental Impact Statement for the Storage and Ultimate Disposal of the European Chemical Munitions Stockpile. The proposed operation will remove chemical munitions from West Germany and transport them by ships to Johnston Island for destruction in the JACADS plant. The Army is expecting extensive opposition to the proposed project. The impacts to the Refuge and the wildlife will be minimal and the project should extend the operation of JACADS for only three months.

5. Research and Investigations

This year saw the continuation of several major research projects. All were designed to assess potential impacts of the JACADS project on the wildlife resources of the Refuge. The two major contract research programs supported by funds from the Army and administered by CEPOD were the seabird monitoring studies of Seabird Research Inc. and the monitoring of the lagoon resources by the Hawaii Cooperative Fisheries Research Unit (HCFRU), University of Hawaii.

JHN-1-89 Seabird Monitoring Studies

The primary goal of the seabird research is to assess and monitor the size and "health" of marine bird populations throughout the operation of 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. This project suffered from the untimely death of Dr. Ralph Schreiber from cancer in April of 1988. Researchers continued their studies under the direction of Elizabeth Schreiber from 31 March to 11 April and from 14 to 28 July 1989.

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. They concluded that chicks were growing well, there was a high fledgling success, and that populations were still increasing. No significant effect of the JACADS plant on the bird populations was noted.

Conflicts between this contractor and the Refuge Biologist continued through 1989. Most of the conflicts resulted from the refusal of the contractor to explain their methods, present sample sizes and confidence intervals of population estimates, and share banding recovery data and nest check data. This has resulted in the Service conducting separate and more thorough studies which makes much of the contractor's data a duplication of effort. During their August visit, William Lennan, the contracting officer from the Corps of Engineers, accompanied them to view their techniques first hand. Several of the our complaints were resolved and will be incorporated in the new Scope of Work when the contract is renewed in 1990.

JHN-2-88

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 census fishes and invertebrates. A report was received in July stating "it appears there was very little impact of fishing on Atoll fish populations", but they also noted that, "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. In October of 1988, the research team decided to travel to Johnston Island once per month to conduct the creel census and determine the amount of under reporting by fishermen on Johnston Island.

Extensive comments on their research and report were written by Forsell in September of 1987. The comments centered on the presentation of data in a form that would facilitate comparison between years. The basic techniques of the study appear sound. The report received in 1989 has still not incorporated all of the suggestions with the excuse that there was not enough time and that they would be incorporated in the 1990 report.

3 Doug Foresell censusing fish and invertebrates along permanent transect. (DJF)

E. ADMINISTRATION

1. Personnel

Douglas Forsell, the Refuge Manager, was stationed at Johnston Island for the entire year. Forsell also functions as the Refuge Manager of the Remote Islands National Wildlife Refuge Complex of which Johnston Atoll is a part. Complex Manager, Stewart Fefer, administers the Refuge operations from the Honolulu Office. In order to carry out an effective biological monitoring program Thomas Evans was hired on a one year appointment in March as a temporary Wildlife Biologist.

The position at Johnston is rather unique in that funding is received from the Army and the Service in addition to some on-island support from the DNA who manages the atoll. 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 major responsibilities of the staff are: monitoring wildlife populations; advising and supporting 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; developing and conducting a contaminant sampling program; encouraging clean up of waste sites; and planning, budgeting, and managing the Refuge resources.

4. Volunteer Programs

Numerous military and civilian personnel assist the Refuge personnel 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 the volunteers to photograph wildlife and receive an interpretive tour. Several proved to be excellent assistants, showing a strong interest and helping on a regular basis.

5. Funding

The Fish and Wildlife Service program at JA for FY-89 was funded jointly by the U.S. Army - Western Command (USACAW), $35,000; the Army's Program Manager - Chemical Demilitarization (PM-CD), $15,000; The Fish and Wildlife Service, $30,000; and The Defense Nuclear Agency, $15,000.

F. HABITAT MANAGEMENT

1. General

Johnston Atoll provides roosting and breeding grounds for tropical Pacific seabirds and wintering grounds for migratory shorebirds. The coral reef ecosystem is unique in that both Hawaiian and central Pacific organisms are represented. Johnston Atoll is 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 land mass would suggest. Within this area, the waters most intensively foraged by birds from Johnston Atoll are probably those to the west where food availability is increased by upwellings and eddies created by the down-current "wake" of the atoll.

5. Grasslands

A front-end loader was again used to control the introduced grass Lepturus on East Island in 1989. 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 to provide roosting habitat for birds. In the weeks following the clearing, several thousand pairs of sooty terns nested in the cleared areas. The grass control project has proven to be a great success in attracting sooty terns away from Sand Island where they are subjected to mortality from colliding with the guy wires supporting the 640 foot LORAN tower operated by the Coast Guard.

4 Area cleared on East Island to create nesting habitat for sooty terns. (TJE)

5 Same area two weeks later, after sooty terns have laid eggs. (TJE)

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 1989. 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% coverage in many areas, is probably one of the fastest growing coral species. It also provides an extensive three-dimensional habitat for many fishes. The fish community is dominated by relatively few species.

Terrestrial habitats especially shrubs are a major concern on Johnston Island. 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, removed about one third of the shrubs under which the tropicbirds nest from 1985 through 1986. The major concern is that the vegetation along the runway, which is relatively undisturbed, is attracting the tropicbirds. 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 Refuge Manager prior to removal or trimming of vegetation. Nevertheless, workers must be carefully monitored to prevent destruction of nests.

Forsell participated in numerous planning meetings in trying 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.

For the past two years, the Base Commander has funded a road grader to grade coral berms around vegetation areas set aside for nesting birds. The Base Commander added an additional $1,000 to this effort in 1989 to preserve additional nesting areas. This project has also helped reduce traffic accidents by directing traffic around obstructions in the roads.

The Base Commander also provided funds to plant shrubs in barren areas of the island to provide nesting habitat for birds and to add greenery to some barren areas.

6 Grader building berms to protect vegetation used as nest sites by red-tailed tropicbirds. (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 booby nests and roosting perches for Great frigatebirds. Monitoring in 1986 and 1987 showed that most of these blocks were being used by boobies. One pair of frigatebirds nested on them in 1986, though the young did not survive.

In conjunction with the clearing of the grass on East Island, grass and coral was placed in piles about four to five feet high for the past four years. In the fall of 1977, approximately 700 cinder blocks were moved to East Island and placed on the ground and on the piles of grass to provide roost and nest sites for the Great frigatebirds and Red-footed boobies. The birds responded to them immediately and within a month several hundred birds were roosting on the bricks. In the spring of 1989, six pairs of frigatebirds laid eggs and one pair successfully raised a young. It is assumed that the birds are first year breeders and the nests of many first time breeders fail. It is hoped that these birds will continue to nest on East Island and produce additional young in the future.

7 Great frigatebirds roosting on "artificial shrubs" created from cinder blocks, pallets, and coral. (C.Rowland)

Artificial Reef

The Fish and Wildlife Service Biologist is tasked with assessing an artificial reef created from vehicles and large appliances placed in the ocean in an area designated by the Service and NMFS biologists in 1985.

Three construction events occurred in January and February of 1989. All vehicles placed on the reef were burned to remove plastics and residual oils and grease. A procedure was developed where the Service representative approves the preparation of the items prior to its placement on the barge and observes all dumping operations.

8 Vehicles being burned to remove floatables and residual oils and grease prior to dumping on the artificial reef. (DJF)

9 Placing vehicles and equipment on artificial reef.(DJF)

14. Contaminants

EPA Inspection

In October 1989, an EPA - Resource Conservation Recovery Act (RCRA) inspection was conducted at Johnston Atoll. This inspection included the Herbicide Orange (HO) contaminated area, the Army's chemical agent storage facility, the plutonium contaminated area, the JACADS facilities, and all base operations. The final report was received in early March of 1990. The Island has come a long way coming into compliance with EPA regulations since the last RCRA inspection in 1977. Most of the deficiencies were corrected prior to the final report being received. Most deficiencies were related to improper documentation of waste shipments. These inspections have been instrumental in obtaining funding for the numerous corrective actions which have been made on the island.

Herbicide Orange - Dioxin

Johnston Island was used for the storage and support activities for 1.37 million gallons of HO from 1972 through 1977 after it's removal from Vietnam. In 1977, the agent was removed and burned at sea. The contamination of Johnston Island resulted from leakage of barrels and spillage. At present, the soils contain up to 449 parts per billion (ppb) 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 interested agencies.

Two collections of fish, sediments, and invertebrates were made by Service personnel in 1989. Each collection involved about 25 samples collected in about six hours by two persons SCUBA diving. The entire sample collected in August was destroyed when American Airlines lost the sample for three days in the Houston Airport during temperatures in excess of 100 degrees. An additional sample was collected in October and sent via an overnight package service.

The results from the samples of the past three years have documented a much greater degree of contamination in the biota of the marine waters adjacent to the HO area than previously thought (Table 2). The primary reason is that specimens are being collected closer to shore and represent a wider variety of feeding habits. In 1989, the muscle tissue of five fish and invertebrates were found to have detectable levels and one contained 87 parts per trillion (ppt). The level that the FDA has deemed edible, if not eaten regularly, is less than 50 ppt. This effort will continue in 1990.

The HO area was fenced prior to the EPA inspection and the bill sent to the Air Force as an attention getter. It is their responsibility to eventually fund the clean up, if it is possible. During the EPA's RCRA inspection, the Air Force sent a representative to explain their plans for the area. Forsell spent several hours in

discussions on possible efforts to remediate the situation. There are currently no incinerators certified by the EPA to destroy dioxins. A very rough estimate of the cost to construct and operate an incinerator to burn the was about 35 million dollars. The Air Force is hoping that one of the incinerators from the JACADS plant can be modified to burn soil when the plant has finished processing chemical weapons. One possible temporary action to limit the continued migration of dioxins into the ocean is to scrape the top six to ten inches of soil where the highest levels of dioxin occur and encapsulate it in cement until it can be processed.

FY-91 funds to build a seawall on another area of Johnston Island are being made available to complete a seawall where the greatest contamination is now found in the sediments. This action will hopefully reduce some of the leaching of dioxins into the marine environment.

10 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, erosion, and infiltration through the porous soil.

Table 2. Number of samples with dioxin (TCDD) levels greater than 10 parts per trillion (ppt), and range of TCDD in sample of six five samples collected under modified monitoring plan. Station 1 is located due west of the Herbicide Orange (HO) contaminated area and Station 2 is located north and west of the HO area.

Date	FISH AND INVERTEBRATE			SEDIMENT		
Station	n	TCDD >10 PPT	Range TCDD	n	TCDD >100 PPT	Range TCDD
May 1987						
Station 1	3	1	12	1	0	-
Station 2	2	0	-	1	0	-
October 1987						
Station 1	10	4	12-27	1	1	160
Station 2	0	0	-	1	0	-
January 1988						
Station 1	4	1	49	3	0	-
Station 2	5	0	-	1	0	-
August 1988						
Station 1	0	-	-	1	1	190
Station 2	0	-	-	1	0	-
December 1988						
Station 1	13	8	14-472	3	0	-
Station 2	6	1	352	1	0	-
September 1989						
Station 1	13	3	11-85	5	1	15
Station 2	6	1	23	2	0	-

Sewage, Algae, and Turtle Interactions

Approximately 220,000 gallons of raw sewage is discharged off the south shore of Johnston Island daily. The area is inhabited by an estimated 200 threatened green turtles. The turtles are feeding on algae which is enhanced by the nutrients from the sewage. The sewage has increased from approximately 50,000 gallons per day in 1983. The DNA began construction of a sewage treatment plant in November of 1989. The potential effects on the algae and 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 the number of turtles off the south shore of the island. The plan was modified in 1989 based on discussions with some biologists to monitor only algae and nutrients from the discharge. Monthly surveys of turtles from shore were initiated in August of 1987 and continued through 1989. More extensive surveys by boat, which began in 1987 were suspended in 1989 because the engines of the Service vessel were inoperable. 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 the DNA.

11 Algae growth along the south shore of Johnston Island caused by nutrient enrichment from sewage. Green turtles feed on these algaes. (DJF)

Plutonium and Transuranium Elements

Three rockets exploded on or above Johnston Island during the aerial nuclear testing in the early 1960's. While these were not nuclear detonations, weapons grade plutonium was scattered over several square miles. During several clean-up projects most of the material that was on land was collected and stored in a 24 acre fenced area. Over 100 pairs of red-tailed tropicbirds nest in the area each year. Decontamination of the area is planned for the 1989 to 1992 time period. The Fish and Wildlife Service Biologist at Johnston Island monitors the nesting activity and bands all birds captured in the radiation area. Nesting success appears to be higher than other areas of the island where the disturbance is greater. Most of the nest sites will be eliminated during the clean-up so other 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 also affect the number of nest sites 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 will try to limit impacts of the clean up operation. A sample of birds will be scanned by alpha radiation detectors during the clean-up operation when the potential for airborne contamination by plutonium oxide will exist. The plant designed to separate the plutonium was set up and tested in 1989 with operations scheduled to begin in 1990.

JACADS

Johnston Island is the site used by the U.S. Army Chemical Activity, Western Command for storage of various chemical weapons, including ton containers, rockets, projectiles, bombs, and mines containing the nerve agents GB and VX, and blister agent. The Army is constructing a 450 million dollar plant to destroy the chemicals. The chemicals are stored in 54 bunkers and no agent is released to the environment. The 700 plant workers and those involved with protecting and handling the chemicals represent the major impact of this activity.

Two major studies were conducted by the Service at Johnston Island in 1988 and 1989 in order to modify the Island's National Pollutant Discharge Elimination System (NPDES) permit. The EPA permit is required for all discharges into marine waters. The plant discharges salt water at the rate of about 1600 gallons per minute (GPM) into the nearshore environment. This non-contact cooling water is used to cool the building, air compressors, one furnace door, and hydraulics. The original environmental impact statement stated that "This effluent will be discharged through a new outfall to be located at the shore of the west side of the West Peninsula." During construction, this discharge was located on the northeast side of the peninsula rather than the west side. The parameters of the model for the dissipation of heat were based on a discharge in deep water on the west side of the peninsula rather than shallow water on the northeast side of the peninsula.

Service personnel conducted a study to monitor water temperatures with six continuous recording thermographs which could down load data directly into a IBM personal computer. This involved several phases including shutting down the plant's discharge to gain a baseline of natural warming in the nearshore waters, determining warming near the JACADS outflow under existing conditions; estimating the maximum output of the plant by running the plant at as close to maximum heat production as possible for 24 hours; determining the variation in ocean temperatures at the seawater intake on the north side of the island; and determining if another station on the south side of the island would better represent the receiving water temperatures as these were the basis of warming allowed in the NPDES permit. The report was issued in March of 1989 and was titled: Forsell, Douglas J. 1989, "Ocean temperature variation in the vicinity of JACADS cooling water discharge and possible environmental effects, Hawaiian and Pacific Islands National Wildlife Refuge, Remote Islands Unit". This report also made specific recommendations for modification of the NPDES permit. Service personnel also collect the monitoring data from the temperature sensors and summarize it for the report submitted to the EPA every three months.

12 Aerial view of JACADS plant where chemical weapons will be destroyed. Green dye at the upper right of the peninsula - first try at learning the current patterns of the JACADS cooling water discharge. The tower used to count sea turtles monthly.

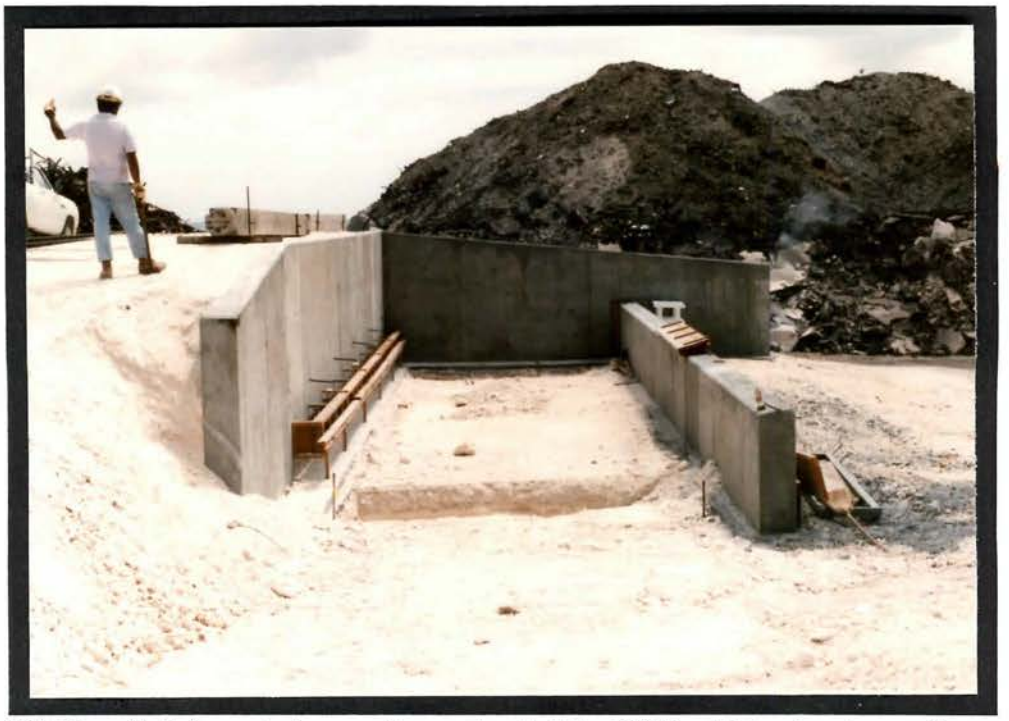
Hazardous Waste

Military operations on Johnston Island have produced a number of dumps and storage sites for hazardous and potentially hazardous wastes including the following:

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. Numerous controls were placed on what was put in the burn pit at the urging of the Service Biologist in 1987 and 1988. The new burn pit completed in early 1989, was designed so the ash and metal debris could be separated.

At the insistence of the Refuge Biologist, a recycling yard was designated and the island tenants were required to separate their scrap metals and place them in the yard rather than dumping them into the island's solid waste burn area. This program has now been funded at over $200,000 per year and all metals are crushed and sent to Honolulu for recycling.

The Fish and Wildlife Service Biologist at Johnston Island worked closely with the Base Civil Engineer and the Holmes and Narver Environmental Coordinator to identify the contaminated areas and wastes going into these areas. In 1989, two major events occurred which have led to enormous strides in the proper handling of hazardous wastes. Holmes and Narver Inc. (the Island's maintenance and operating contractor) which works on a cost plus contract basis is now awarded 15 percent of its profit based on its performance in environmental areas. This has given them an enormous motivation to improve their environmentally related activities. They have now formed an environmental department with two employees on the island and one in Honolulu. The Army and Sterns-Rogers Inc., their contractor who operates the JACADS facility, hired three people to handle their hazardous waste and ensure their operations are handled in an environmentally sound manner.



13 New Solid waste burn pit constructed in 1989. This structure allows the metal to be separated from the ash and sent to the metal recycling yard.

14 Metal crusher in operation in recycling yard. (TJE)

Preliminary Assessment/Site Investigation

The Superfund Amendment and Reauthorization Act of 1986 made federal facilities subject to the same Comprehensive Environmental Response, Compensation, and Liability Act requirements as nonfederal facilities. As a result, Johnston Atoll was required to submit a Preliminary Assessment/Site Investigation (PA/SI) report to the EPA. The major objectives of the PA/SI are: 1) to gain an understanding of the nature and degree of the threat posed by the site; 2) to determine the likelihood of a Hazardous Ranking Score (HRS) of 28.5 or greater; and 3) to identify sites in need of immediate response. Sites with a HRS greater than 28.5 are listed on the National Priorities List (NPL). Federal facilities on the NPL are required by law to begin Remedial Investigations and Feasibility Studies within six months of listing. The PA/SI was prepared and submitted to the EPA in October of 1989. The projected HRS for Johnston Atoll is 52.2 which will make it the highest scoring federal facility in the Pacific. The three major contaminants are the dioxin, plutonium, and weathered diesel fuel, all of which have been released into the marine environment. Only the dioxin has been demonstrated to be entering the food chain.

G. WILDLIFE

2. Endangered and/or Threatened Species

The Refuge supports populations of the threatened green turtle and may provide habitat for endangered whales. The green turtle population has remained stable. The turtles do not nest at Johnston Atoll, but feed extensively on the algae off the south side of Johnston Island.

The only turtle monitoring conducted in 1989 was to count all turtles sighted off the southeastern end of the JACADS peninsula from a four meter high tower during a 15 minute period. Sightings along with size and time of observation are recorded on a map. At the end of the count, the observer attempts to discern how many individuals are present as each active turtle usually surfaces for a breath of air about every five minutes. Based on nine counts, we found a mean of 23.4 individuals and a range of 17 to 36. This is comparable with five counts conducted in 1988 which found a mean of 28.2 and range of 23 to 35 individuals.

15 Green turtles are abundant along the south shore of Johnston Island.

On 16 March, a Cuvier's beaked whale (Ziphis cavirostris) beached herself on the eastern shore of Johnston Island. The animal appeared to be calving. Forsell pushed the animal off the rocks several times, but the waves and wind kept pushing the animal back on shore. Forsell finally guided the whale along 200 meters of seawall and pushed her out to sea.

16 Forsell pushing Cuvier's beaked whale off rocks at Johnston Island.

17 Forsell swimming with whale guiding her back to open water.

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 14 species of seabirds using the Refuge (Table 3). In general, populations of most species are increasing. The most notable increases from 1988 counts are the red-tailed tropicbirds (7%), brown noddies (11%), brown boobies (39%), red-footed boobies (68%).

Table 3. Populations of nesting seabirds and wintering shorebirds estimated on Johnston Atoll during 1989. Estimates 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.

Species	Johnston Island	Sand Island	North Island	East Island	Camera Stands	Total
			Pairs of Breeding Seabirds			
Bulwer's Petrel	0	18+	0	0	0	18+
Wedge-tailed Shearwater	28	684	0	0	0	712
Christmas Is. Shearwater	0	33+	0	0	0	33+
Red-tailed Tropicbird	1,137	248	193	10	0	1,588
Masked Booby	0	0	0	9	2	11
Brown Booby	0	298	0	112	3	413
Red-Footed Booby	0	5	0	473	0	478
Great Frigatebird	0	78	0	0	0	78
Grey-backed Tern	0	0	333	0	2	335
Sooty Tern	0	4,286	0	212,825	0	217,000
Brown Noddy	0	5,551+	1,430+	2,586+	290+	9,857+
Black Noddy	221	0	0	0	0	221
White Tern	154	5	6	0	0	165+
Total Breedin	1,540	11,203+	1,962+	16,015+	297+	230,906+
			Shorebirds Wintering on Atoll (Individuals)			
Pacific Golden Plover	417+	30	10	10	0	467+
Wandering Tattler	18	4	0	0	0	22
Bristle-thighed Curlew	2	11	0	0	0	13
Ruddy Turnstone	143	10	0	0	0	153
Sanderling	8	0	0	0	0	8
Total	595+	44	10	10	0	659+

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

6. Raptors

A peregrine falcon spent the winter at Johnston Island. The bird was first sighted in September 1989 and approximately monthly through April of 1990.

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 4. 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 of fishing tropical reefs, while newcomers, although enthusiastic and curious, are often not very successful until they learn the local techniques. The impact of recreational fishery is minimal on atoll-wide populations (Table 4). The most-taken fish in relation to the atoll-wide population size still suffers only an estimated 1.6% 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 4. The eleven most abundant fish species on Johnston Atoll, July 1988 - July 1989.

Name	Atoll Population	Annual Catch	Percent of Population Caught
Yellow-eyed surgeonfish	1,650,300	986	<0.1
Convict surgeonfish	599,600	1657	0.3
Brick soldierfish	385,400	1799	0.5
Yellowstripe goatfish	188,900	903	0.5
Manybar goatfish	61,850	338	0.5
Doublebar goatfish	48,000	144	0.3
Spectacled parrotfish	29,450	435	1.1
Blue goatfish	27,600	435	1.6
Blue jack	26,500	310	1.1
Low fin chub	22,350	19	0.1

14. Scientific Collection

Betty Ann Schreiber collected a variety of marine birds to begin archiving tissue specimens at the Los Angeles County Museum of Natural History. Skeletons or study skins were prepared from the specimens and were deposited at the Museum. Her team also took blood samples from approximately 40 birds for genetic work.

15. Animal Control

Bird-Aircraft Strikes

Red-tailed tropicbirds engage in considerable aerial courtship displays over the runway during the afternoons. Preservation of vegetation used as nesting habitat helps reduce the bird-aircraft strike hazard, since birds stop courting once nesting starts. Approximately 200 pairs of tropicbirds nest in the vegetation close to the runway. Since this area is in the runway clear zone, the birds are subjected to minimal human disturbance. Unfortunately, the Air Micronesia flights leave Johnston Island at close to maximum weight and thus require most of the runway to become airborne. This area should be cleared of vegetation, but what the short term effect of that action would be is unknown. These birds return to the same nest site year after year and if the nest sites are removed, it is unclear whether these birds will spend more time hovering over the runway. Some vegetation was removed in 1989 in order to try to mitigate this problem.

16. Marking and Banding

TABLE 5. Summary of banding accomplishments for 1989.

Species	Birds Banded by FWS Personnel	Birds Banded by Seabird Research Inc.
Christmas Shearwater	42	0
Bulwer's Petrel	12	0
Great Frigatebird	0	9
Red-tailed Tropicbird	1,115	788
Masked Booby	7	16
Brown Booby	261	125
Red-footed Booby	238	130
Grey-backed Tern	333	0
Brown Noddy	0	50
White Tern	6	76
Total	2,014	1,200

H. PUBLIC USE

1. General

The population of Johnston Atoll averaged about 1200 military and civilian contractor personnel in 1989. There is no "public" access as such; the base is a restricted installation and all personnel must be employed at the facility and posses an entry authorization from the Base Commander to debark from any plane or ship. Because of the high visibility of JACADS and the chemical operations, the island receives at least monthly visits by general grade officers, the Senior Executive Service personnel of the Department of Defense, or members of Congress. Refuge personnel usually deliver 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. These briefings explain the Refuge's role and try to ensure that planning concerning the Atoll takes into consideration the wildlife resources.

7. Other 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 on 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 for more than one month on the Atoll is part of the three hour introductory program given each Friday. Refuge personnel present a twenty minute slide show including: the regulations of the Refuge, a brief history of the Refuge and the reasons for its existence, the natural history of 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. It also allows the volunteers to photograph birds in a controlled setting, rather than having them going to the islands unaccompanied when disturbance of the nesting seabirds may be harmful.

The Refuge display consists of two signs: one being a general sign that is displayed permanently, which describes the Refuge and the diversity of nesting habitats of the seabirds; the second sign features a different species or group of animals each month.

9. Fishing

Recreational fishing is a popular activity on Johnston Atoll. In terms of actual public use, the HCFRU survey team estimated approximately 6,898 man hours of fishing effort in 1989. This was approximately half of the 1988 effort. Catches are made by 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).

16. Other Non-Wildlife Oriented Recreation

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

17. Law Enforcement

The Refuge Biologist has no law enforcement authority on the Refuge because 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.

I. EQUIPMENT AND FACILITIES

8. Other

The primary Fish and Wildlife Service facility is the Refuge office located in the Joint Operations Center. The office is adjacent to the offices of the Base Engineer and the Base Commander. It is provided and furnished by DNA so that the Refuge staff is able to work closely with the Base Command. The office facilities includes a 144 sq. ft. private office and a 250 sq. ft. outer office with a desk for a technician, storage cabinets, and a reception area. The Joint Operations Center building is completely air-conditioned and highly secure.

The Service has a golf cart type vehicle on the island which provides transportation and is an excellent vehicle for surveying the birds as it is designed for frequent stops and starts and has no doors which provides easy access. We also maintain a 24 foot Glassply boat with two Mercruiser inboard engines. The vessel was minimally adequate as the engines were subject to constant repairs and breakdowns. The engines were replaced with twin 115 HP OMC Seadrives in 1989 which greatly improved the safety of operating of the boat.

4. Credits

This narrative was written by Doug Forsell and Thomas Evans and was reviewed by Ken McDermond and Jerry Leinecke.

ROSE ATOLL NATIONAL WILDLIFE REFUGE

HONOLULU, HAWAII

ANNUAL NARRATIVE REPORT
Calendar Year 1989

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

INTRODUCTION

Rose Atoll National Wildlife Refuge (Refuge), the southernmost unit of the National Wildlife Refuge System, is located in the tropical Pacific Ocean approximately 14 degrees south of the equator, 2,500 miles south of Hawaii, and 180 miles east of Pago Pago, American Samoa. It is an atoll with 1,593 acres of submerged reef, lagoon and two emergent islands. Rose Island has an area of about 18 acres and is heavily vegetated with Pisonia and Tournefortia trees. Sand Island is comprised of two acres and has been unvegetated until recently.

Rose Atoll has never been permanently inhabited, although 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, 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 turtle and provides nesting, roosting, and foraging areas for about 15 species of seabirds and shorebirds. Hundreds of fish and coral species, and other invertebrates inhabit the shallow reefs and lagoon, including the giant clam (Tridacna maxima) which is highly prized as food by the Samoans.

1 Aerial view of Rose Atoll. Note the characteristic rose coloration of the reef from the coralline algae. (USCG)

ROSE ATOLL NATIONAL WILDLIFE REFUGE

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A. HIGHLIGHTS

Two trips were conducted to Rose Atoll this year aboard the American Samoa government vessel, the SAUSAUIMOANA. The first trip was conducted in March and the second in October. Both trips were accompanied by a Service employee and several personnel from the Office of Marine and Wildlife Resources, Government of American Samoa. The purpose of the trips was to conduct surveys of the marine environment, vegetation, turtles, and birds of the atoll.

The marine birds appeared to be breeding normally and populations were comparable to past years. During the fall trip, green turtles were nesting on the beaches and over 70 nest pits were found.

B. CLIMATIC CONDITIONS

The nearest weather station 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 Atoll 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 northeast.

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 when the Refuge was established in 1974. The agreement provides for management of the Refuge through periodic surveys and the deputizing of Samoan Officials to enforce Refuge regulations.

In keeping with their desire to emphasize the 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 makes possible the hiring of three biologists. The presence of a biological staff has allowed greater effort in surveys of the fishery resources, seabirds, turtles, and rats at Rose Atoll. The Service provided on-site training for three of the biologists during the October visit.

A Memorandum of Understanding between the Service and the American Samoa Government was written in 1989 to "facilitate the administration of the Service's program by providing for the cooperation and coordination of the parties to develop baseline information and manage the wildlife resources of the Refuge." The agreement is expected to be signed in early 1990 and remain in effect through 1999.

2 FV SAUSAUIMOANA anchored in lagoon at Rose Atoll. (CMR)

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. Two such visits were made during 1989. The first trip from 14 to 18 March was made by Craig Rowland, a Biological Technician of the Hawaiian Islands National Wildlife Refuge, and two biologists and two technicians from the Office of Marine and Wildlife Resources. The results of the wildlife surveys are reported in: Rowland, C. M. 1989, "Spring Survey of Rose Atoll, 13 to 20 March 1989. Administrative Report, U.S. Fish and Wildlife Service, Hawaiian and Pacific Islands National Wildlife Refuge Complex." 12 pp. The second trip was conducted from 24 to 27 October 1989. Refuge Manager Doug Forsell made this trip accompanied by three biologists from the Office of Marine and Wildlife Resources. The results of this survey are cited in: Forsell, D. J., 1990, "Fall Survey of Rose Atoll - 23-28 October 1989. Administrative Report, U. S. Fish and Wildlife Service, Hawaiian and Pacific Islands National Wildlife Refuge." 18 pp.

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 are 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) as a 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 the March trip and clams were surveyed on the fall trip.

3 Biologists and technicians from the Office of Marine and Wildlife Resources count eggs of sooty terns and brown noddies on Sand Island. (DJF)

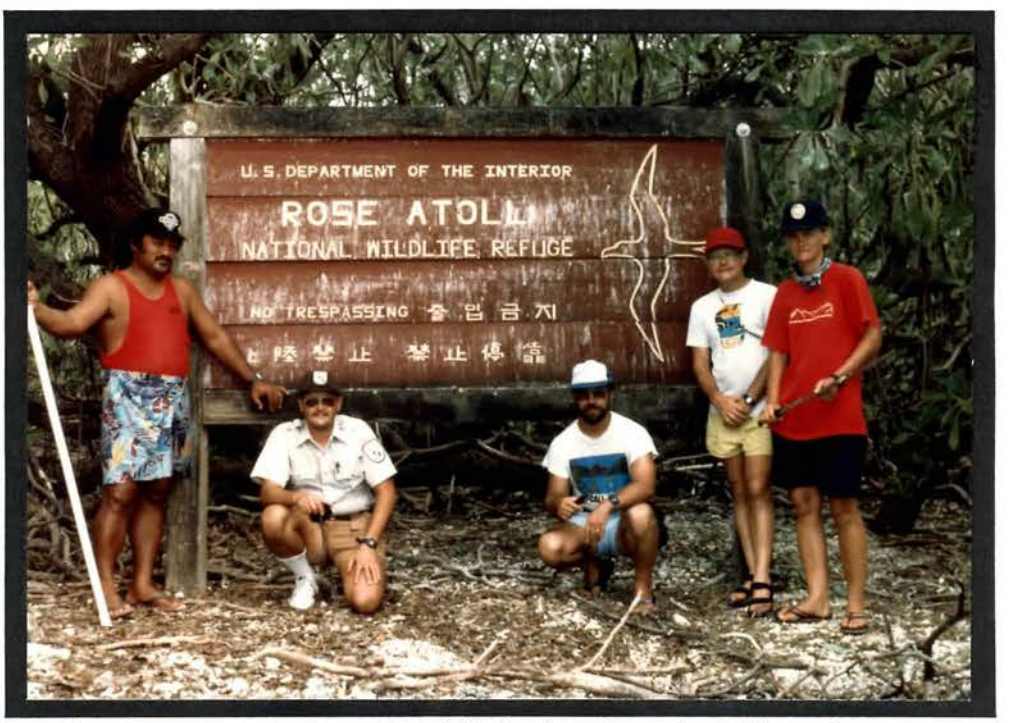
E. ADMINISTRATION

1. Personnel

Rose Atoll National Wildlife Refuge is administered from Johnston Atoll by Doug Forsell, the Refuge Manager of the Remote Pacific Islands Refuge Complex. Administrative activities are carried out by Stewart Fefer, the Complex Manager.

5. Funding

A total of $5,000 was provided for management and surveys of Rose Atoll in 1989. Funds to administer this Refuge are part of the overall Refuge Complex budget.



4 Refuge Manager D. Forsell and biologists from the Office of Marine and Wildlife Resources, October 1989. Persons from left to right are:
F. Tuilagi, D. Forsell, W. Syron, Dr. P. Craig, and B. Ponwith.(E. Seui)

F. HABITAT MANAGEMENT

1. General

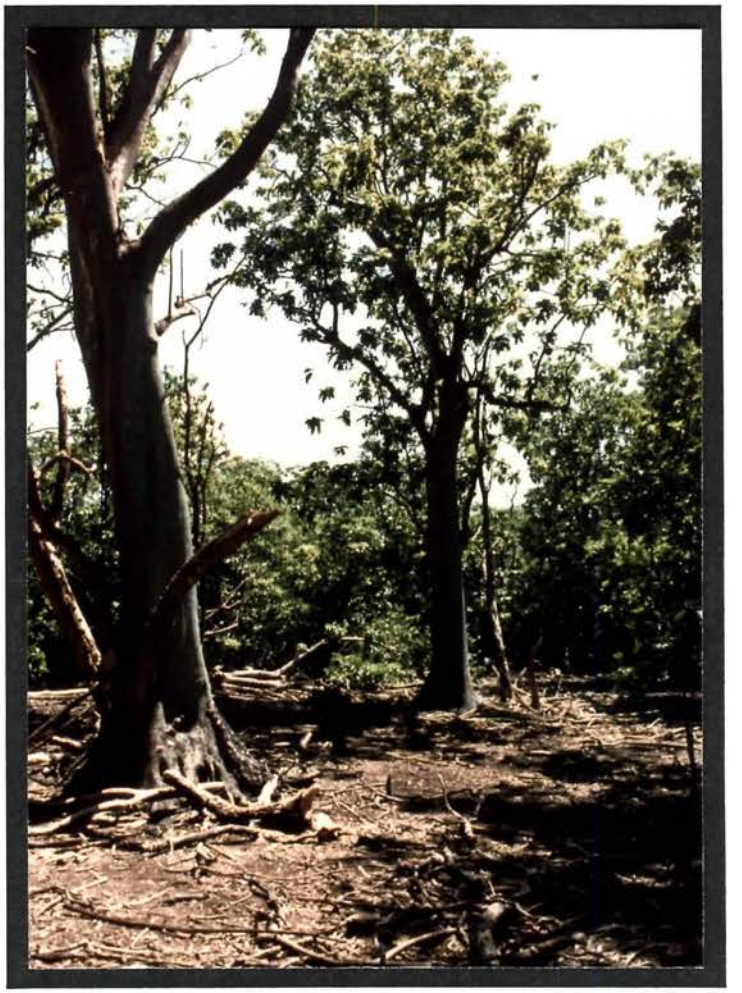
Rose Atoll, one of the smallest atolls in the world, is composed of a coralline algae reef that encloses a 50-foot deep lagoon. A single channel leads into the lagoon which can be navigated by medium-sized vessels at high tide. The Atoll is almost square in shape and is noted for the high density of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

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 1970's to the point where most of the northern and eastern portions of the island are covered. They provide nesting and roosting habitat for red-footed boobies and frigatebirds. Several large Pisonia had fallen in the middle of the forest creating a larger opening in the canopy than found in 1988. While the forests appear to be thriving with lots of new growth, the larger trees seem be falling and loosing their large branches. The cause of the die off is unknown. In 1988, Knowles postulated that a large amount of saltwater may have washed over the island during Hurricane Tusi and killed the trees. Since the trees appear healthy, perhaps the trees are reaching senescence or are merely growing too large for the soft wood to support. We expect that in the next few years, most of the larger Pisonia will fall and will be replaced by younger trees. A similar die off of Pisonia occurred in the 1970's.

The vegetation on Sand Island appears to be recovering from the damage of Hurricane Tusi. The hurricane evidently drove waves over Sand Island and killed most of the Tournefortia bushes. Only three bushes remained alive in 1987. The vegetation on Sand Island appears to be recovering well. In 1989, there were 17 live Tournefortia bushes, a few seedlings, and several dead shrubs. Boerhavia is growing on the central portion of the island as is one small coconut palm.

5 Aerial view of Rose Island showing holes in canopy created by falling trees. (USCG)



6 Opening in Pisonia forest created by trees which have fallen. (CMR)

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. Beyond the reef, the bottom quickly descends to great depths and is composed of an extremely diverse coral complex.

On the lagoon side, the reef crest slopes gradually to a rubble-dominated shelf that contains numerous patch reefs composed of coralline algae, coral, and a diverse assemblage of other sessile invertebrates, including the giant clam. 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 patches of coral. Occasionally, these patch reefs project nearly to the surface. A high diversity of fishes and invertebrates are present within the lagoon, but the diversity is even greater outside the Atoll.

10. Pest Control

Polynesian rats (Rattus exulans) remain extremely abundant on Rose Island. Although they have been observed to prey on the eggs of seabirds and hatchling turtles, no attempt to control the animals has been initiated. On both trips this year, rats were observed to have eaten the eggs of sooty terns. In October, a small group of thirty eggs were being laid at about 1200 hours and by midnight only six eggs remained. Several rats were observed eating the contents of the eggs. The egg of one brown noddy nest about eight feet up a tree was also eaten. Rats were also observed eating flowers at the end of a Tournefortia tree. This would indicate that rats are capable of reaching all nests in trees and probably prey on eggs of most of the tree nesting species.

Rats were trapped only during the spring trip. This survey was a continuation of the surveys started in 1986 to determine if there were population cycles which might indicate the best time to attempt an eradication of the rats. Table 1 presents the percentage of traps that captured rats. Trapping success alone is somewhat misleading as most of the traps were sprung by rats or hermit crabs, and would probably have caught rats if they had not been sprung. The results of the trapping effort indicate that there are no major cycles in the rat population and an eradication effort could be conducted at any time.

7 Sooty tern eggs just after being destroyed by rats. (B. Ponwith)

Table 1. Percentage of traps with rats caught on Rose Island during November 1986, February 1987, October 1988, and March 1989 surveys.

Date	Trap Success Rate In Pisonia Habitat (%)	Trap Success Rate In Tournefortia Habitat (%)	Total Trap Success Rate
November 8, 1986	72	31	66
November 9, 1986	51	42	49
November 10, 1986	40	23	38
February 14, 1987	98	76	92
February 15, 1987	77	80	79
October 12, 1988	95	50	77
October 13, 1988	63	84	71
March 14, 1989	96	-	96
March 15, 1989	92	-	92

G. WILDLIFE

1. Wildlife Diversity

Wildlife resources at the Atoll include nesting and resident marine birds, nesting threatened green 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. The marine environment is extremely diverse supporting several hundred species of fishes and invertebrates.

2. Endangered and/or Threatened Species

Rose Atoll supports populations of the endangered hawksbill turtle (*Eretmochelys imbricata*) and the threatened green turtle (*Chelonia mydas*). Only green turtles have been found nesting, but continued surveys may discover hawksbills on the beaches. Previous studies have shown that the peak of turtle nesting activity occurs from September through November. Only two female green turtles were found on Rose Island in 1989; one individual was prospecting for a nest site and the other was observed to lay about 50 eggs in a nest. Both turtles were tagged by us and appeared to have no scars from previous tags.

During the October survey, we counted 70 turtle tracks and 127 nest pits on Rose Island. On Sand Island, we counted 17 tracks and 48 pits. The number of tracks and pits found were slightly higher than found in October of 1988.

The atoll also supports a population of giant clams (*Tridacna maxima*), which are listed under Appendix II of CITES.

8 Green turtle being tagged by Wayne Syron and Peter Craig on Rose Island. (B. Ponwith)

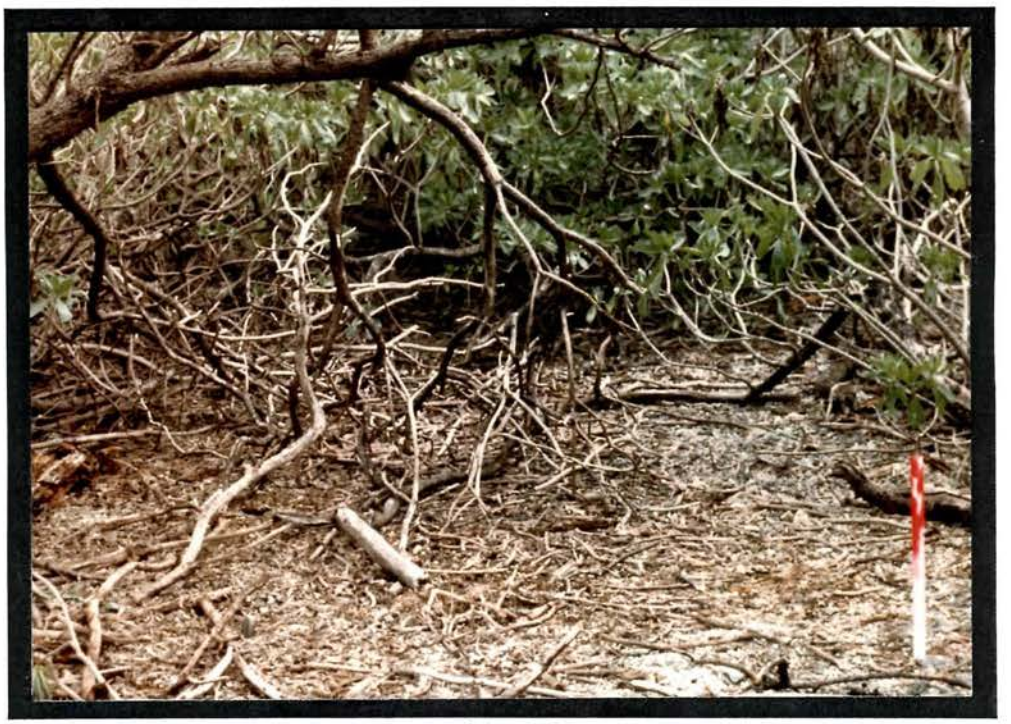
5. Shorebirds, Gulls, Terns, and Allied Species

Ten species of breeding seabirds comprise the most prominent group of wildlife utilizing the Refuge. These birds have a protracted breeding season and while the austral spring appears to have the largest number of breeding birds, a few species may nest throughout the year. Thus, the populations counted on any one survey represents only a snapshot view and are by no means the total population of birds using the Refuge. The populations of seabirds found breeding on Rose Atoll during 1989 are listed in Table 2. A rough estimate of the total breeding population for 1989 was made based on the two surveys and is also listed Table 2.

Table 2. Estimates of pairs of breeding birds on Rose Atoll during 1989. Estimates for March are by Rowland and for October 1989 are by Forsell. Total breeding populations are estimates based on the two surveys.

SPECIES	MARCH 1989	OCTOBER 1989	TOTAL ESTIMATED BREEDING PAIRS 1989
Red-tailed Tropicbird	20	6	35
Masked Booby	1	4	30
Brown Booby	125	15	250
Red-Footed Booby	217	270	600
Great or Lesser Frigatebirds	0	56	70
Gray-backed Tern	0	2	20
Sooty Tern	300	597	2,000
Brown Noddy	230	148	600
Black Noddy	350	7	500
White Tern	100	4	150

Rose Island is extremely difficult to census due to the dense vegetation. As trees fall over it seems the habitat is undergoing change making the use of the traditional Pisonia transect less representative and more difficult to extrapolate census results to the overall area of habitat. Additionally, complete counts of birds in the Tournefortia forest is quite difficult for one or two individuals. In 1989, a 30 m grid of stations was laid out on the island so that if complete counts are impractical, plots could be counted. This will also facilitate consistent census and give us a base of reference for vegetation mapping. The grid was marked with PVC stakes and numbered with aluminum tags.



9PVC pipe was used to mark a grid of 30 m on Rose Island. The stakes can be use for station counts, to delineate 900 square meter plots, or for navigation in the thick forest. (DJF)

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 nearest inhabited islands (180 miles to Tutuila and 80 miles to Ofu and Ta'u) generally limits the effort to less than a half dozen boat trips per year.

16. Marking and Banding

In 1989, we banded 14 masked boobies and 37 brown boobies on Rose Atoll. We also read bands on 40 masked and 12 brown boobies. Tags provided by the National Marine Fisheries Service were placed on two female turtles found on the beaches of Rose Island. No recoveries from other regions 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 turtles and endangered hawksbill turtles, and 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. Two sailing vessels requested access to the atoll this year and were denied Special Use Permits for the above mentioned reasons. We found no signs of trespass on the Atoll. During the fall, the U.S. Coast Guard flew one fisheries patrol flight over Rose Atoll and found no vessels in the area.

3. Outdoor Classroom - Teachers

In connection with the Samoan Government's attempt to provide cultural and educational opportunities at Rose Atoll, 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. Biologists from the Office of Marine and Wildlife Resources worked with the teachers to allow them a valuable learning experience and for them to provide valuable assistance in collecting data. No educational trips were made in 1989, but this program is expected to continue in 1990.

I. EQUIPMENT AND FACILITIES

14. Other

The redwood sign at the beach landing site is holding up well, but the uprights are deteriorating and should be replaced in the next couple of years. The boards which contain the writing appear to be in good condition. An interesting shortcoming of the sign is that "no trespassing" is written in four languages, but not in Samoan.

J. OTHER ITEMS

4. Credits

This narrative was written by Doug Forsell and reviewed by Ken McDermond and Jerry Leinecke.

K. FEEDBACK

Rose Atoll is the most distant refuge in the National Wildlife Refuge System. We depend on the resources of the American 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. It is difficult to understand why the Service has not provided funding to eradicate them. The Office of Marine and Wildlife Resources has determined that such an effort would be worthwhile and has offered logistical support in the form of use of their vessel for transportation. An eradication effort should be pursued in FY-90 or 91.