

MIDWAY ATOLL NATIONAL WILDLIFE REFUGE

Midway Atoll, Pacific Ocean

ANNUAL NARRATIVE REPORT

Calendar Year 1995



During 1995, environmental cleanup and building demolition, associated with the closure of the Naval Air Facility, dominated life at Midway Atoll.

[LP 10/95]

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

REVIEW AND APPROVALS

MIDWAY ATOLL NATIONAL WILDLIFE REFUGE

Midway Atoll, Pacific Ocean

ANNUAL NARRATIVE REPORT

Calendar Year 1995

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INTRODUCTION

Midway Atoll National Wildlife Refuge (NWR) is located in the North Central Pacific Ocean at 28° 12'N latitude and 177° 22'W longitude. It is about 1150 miles west-northwest of Honolulu, Hawaii. As a U.S. possession, it is the only atoll in the Hawaiian Island chain not within the state of Hawaii. The 90,097 acre Refuge extends 3 miles beyond the atoll's outer reef. The Refuge consists of about 88,548 acres of submerged reef and three flat coral islands totaling about 1,550 acres.

Midway Atoll NWR was created in April, 1988 by Cooperative Agreement between the Navy and the Fish and Wildlife Service. Midway Atoll NWR overlays the lands and waters of Naval Air Facility (NAF) Midway Islands. The Refuge was established for the conservation of endangered species, migratory birds, and other fish and wildlife. The first permanent Refuge office opened on Sand Island on November 23, 1990. Although various research and management activities were conducted at Midway during previous decades, establishment of the office provided the Service's first full-time presence.

The Navy retains primary jurisdiction for the atoll. The Commanding Officer Naval Facilities Engineering Command, Pacific Division, Pearl Harbor, Oahu, Hawaii commands NAF Midway Islands through an on-site Officer-in-Charge (OIC). In 1995, the Navy staff at Midway typically consisted of one officer and four Chief Petty Officers.

Base operations and maintenance are executed by Piquini Management Corporation (PMC) the Base Operations Support (BOS) contractor. The base contractor has a staff of about 20 American supervisors and technicians. The remaining PMC employees are foreign nationals from Sri Lanka, Thailand, and the Philippines.

NAF Midway went into operational base closure on October 1, 1993. The Navy is in the process of closing the base and completing environmental cleanup under the Base Realignment and Closure (BRAC) Act of 1990. BRAC cleanup activities are in progress and are expected to continue through June 1997, the date the Navy has targeted for their departure from Midway. These cleanup projects will dominate refuge activities for the next couple of years.

In 1995, staff of OHM Remediation Services, Inc. (OHM), a Navy BRAC contractor charged with removal of fuel storage tanks and

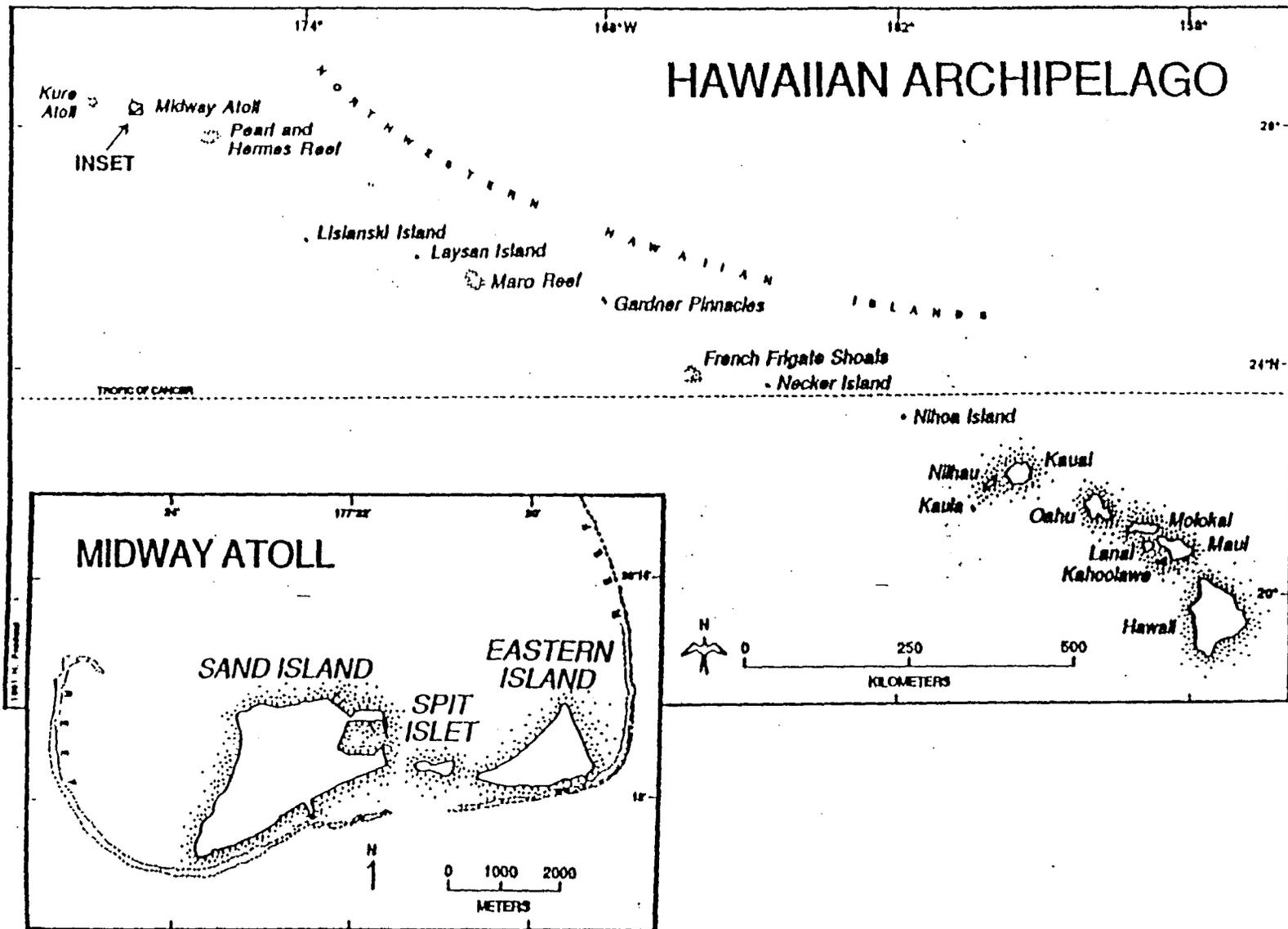
contaminated soil remediation, increased Midway's human population from about 200 to 300.

On November 1, 1993 the Service was notified by the Navy that they intended to dispose of NAF Midway. The notification offered the first opportunity for possible reuse of Midway Atoll to other federal agencies. The Service was the only federal agency which requested transfer of Midway.

At the time, the Service's position was that we would not be able to keep the airfield and the harbor open. The Navy thought that it was in the best interest of the public to attempt to find a way to keep those facilities open. In April of 1994, the Navy convened the Midway Reuse Committee. This committee was formed in accordance with the Base Realignment and Closure Act in an effort to determine the best use of Midway. The Navy hoped to bring together a number of interested parties to determine whether or not keeping those facilities open was feasible. The Navy agreed that whatever uses that were eventually allowed would have to be compatible with Refuge objectives and they would fully consult with us.

Input received during meetings of the Midway Reuse Committee, assisted the Service in developing plans to open Midway to public visitation through a special public/private partnership. In February 1995, the Service issued a Request for Proposal for a joint public visitation program. Two groups, Piquiniq Management Corporation and Phoenix Air, submitted proposals. After reviewing the proposals and negotiations, the Service signed an Agreement to Principal with Midway Phoenix Corporation a subsidiary of Phoenix Air.

The Refuge provides nesting and roosting habitat for over two million seabirds of 15 species, wintering habitat for three common shorebirds, and marine habitat for a diverse assemblage of marine animals, including endangered Hawaiian monk seals (*Monachus schauinslandi*), threatened green sea turtles (*Chelonia mydas*) and Hawaiian spinner dolphins (*Stenella longirostris*). Midway has the world's largest Laysan albatross (*Diomedea immutabilis*) colony and the largest colonies of red-tailed tropicbirds (*Phaethon rubricauda*), black noddies (*Anous minutus*) and white terns (*Gygis alba*) in the Northwestern Hawaiian Island chain. One or two non-breeding, short-tailed albatrosses (*Diomedea albatrus*) typically visit Midway Atoll during the albatross breeding season.



The Hawaiian Archipelago with detail of Midway Atoll.

MIDWAY ATOLL NATIONAL WILDLIFE REFUGE

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ACRONYMS

ADC	- Animal Damage Control
AMC	- Air Mobility Command
BASH	- Bird Air Strike Hazard
BOS	- Base Operations Support contractor
BRAC	- Base Realignment and Closure
EOD	- Explosive Ordinance Disposal
FAA	- Federal Aviation Administration
FWS	- U.S. Fish and Wildlife Service
HAZMAT	- Hazardous Material Storage Buildings
HAZWOPER	- Hazardous Waste Operations and Emergency Response
IQ	- Indefinite Quantity
NAF	- Naval Air Facility
NAVFAC	- Naval Facility Building Complex
NWR	- National Wildlife Refuge
OGDEN	- OGDEN Environmental and Energy Services
OHM	- OHM Remediation Services, Inc.
OIC	- Officer-in-Charge
PCH	- Planar Chlorinated Hydrocarbons
PMC	- Piquini Management Corporation (BOS contractor)
PRINWRC	- Pacific Remote Islands National Wildlife Refuge Complex
UST	- Underground Storage Tank

A. HIGHLIGHTS

Future operation of Midway Atoll NWR may include ecotourism (Sections C-1 and D-2).

Legacy Project (rat eradication on Eastern and Spit Islands) is successful (Section F-10).

Cleanup activities on Eastern Island are almost complete (Section F-15).

B. CLIMATIC CONDITIONS

Midway Atoll has a semi-tropical, oceanic climate generally influenced by moderate northeasterly to easterly trade winds, although strong winds from any direction may occur throughout the year. Heavy rains are common most winters providing an adequate supply of drinking water.

Monthly Climatological Data for Midway, 1995.

Month	Temperatures °F					Precipitation (inches)
	High	Low	\bar{x} High	\bar{x} Low	Monthly Mean	
JAN	81.5	55.5	74.3	64.4	69.4	3.95
FEB	76.5	53.7	71.5	59.3	65.4	5.65
MAR	80.0	56.2	72.7	60.6	66.7	2.63
APR	82.6	59.9	77.2	64.1	70.7	0.93
MAY	81.9	60.7	77.7	65.3	71.5	2.37
JUN	88.4	66.5	85.4	72.5	79.0	1.24
JUL	91.1	72.5	89.1	75.7	82.4	1.10
AUG	92.0	70.7	89.6	75.9	82.8	3.54
SEP	92.7	70.8	85.9	75.7	80.8	2.99
OCT	91.4	69.2	87.3	74.3	80.8	0.93
NOV	84.0	59.9	77.3	66.9	72.1	5.04
DEC	78.7	54.3	74.0	64.3	69.1	<u>9.39</u>
					Total	39.76

C. LAND ACQUISITION

1. Fee Title

On November 1, 1993 the Service was notified by the Navy that they intended to dispose of Naval Air Facility (NAF) Midway. The notification offered the first opportunity for possible reuse of Midway Atoll to other federal agencies. Later that month, a letter was sent, under the regional director's signature, affirming the Service's interest in securing fee title for the islands, reefs, and territorial waters of Midway Atoll. The Service was the only federal agency which requested transfer of Midway.

At the time, the Service's position was that we would not be able to keep the airfield and the harbor open. The Navy thought that it was in the best interest of the public to attempt to find a way to keep those facilities open. In April of 1994, the Navy convened the Midway Reuse Committee. This committee was formed in accordance with the Base Realignment and Closure Act in an effort to determine the best use of Midway. The Navy hoped to bring together a number of interested parties to determine whether or not keeping those facilities open was feasible. The Navy agreed that whatever uses that were eventually allowed would have to be compatible with Refuge objectives and they would fully consult with us.

Input received during meetings of the Midway Reuse Committee, assisted the Service in developing plans to open Midway to public visitation through a special public/private partnership (see Attachment 1 for conceptual brochure). In February 1995, the Service issued a Request for Proposal for a joint public visitation program. During March, representatives from several contractors interested in submitting proposals for a visitation program visited Midway. Two groups, Piquiniq Management Corporation and Phoenix Air Group, Inc., submitted proposals. After reviewing the proposals and negotiations, the Service signed an "Agreement to Principal" with Midway Phoenix Corporation a subsidiary of Phoenix Air Group, Inc. Before the partnership between the Service and Midway Phoenix Corporation could proceed any further, the transfer of ownership of Midway to the Department of Interior had to be finalized.

The first step in the formal transfer of Midway Atoll from the Department of Defense to the Department of Interior is completion of a "Memorandum of Understanding Between the Department of the Navy and the Department of the Interior Concerning Transfer of the Midway Islands". A draft of this MOU was prepared in late 1995 and we expect it to be finalized in early 1996. In 1996, an Executive Order signed by the President of the United States will need to be enacted to complete the transfer.

The Service and Navy intend to expedite transfer of Midway Atoll because several "outside" parties have expressed interest in Midway. Rumors have included the State of Hawaii wanting to establish a commercial fisheries station or a maximum security prison at Midway, Midway being transferred to the National Park Service, and Midway being developed into a nuclear dump site. One threat was a Congressional Act proposed by the International Midway Memorial Foundation requesting that Midway or at least a portion of Midway) be turned over to them to be developed as a Historical Park.

D. PLANNING

2. Management Plan

The Department of Defense published it's recommendation for closure of NAF Midway Islands in the Federal Register (Vol. 58, No. 4, pg. 14084) on 15 March 1993, which stated in part:

Closure of this facility will perpetuate the restrictions incident to the designation by the U.S. Fish and Wildlife Service of Midway Atoll as an Overlay National Wildlife Refuge. All environmental cleanup efforts will continue until complete.

Accordingly, operational closure of NAF Midway Island occurred on 1 October 1993. Environmental cleanup in preparation for Navy demobilization from Midway Atoll began immediately thereafter. The Navy plans to demobilize and depart the atoll by 30 June 1997. In 1995, environmental cleanup activity associated with base closure dominated Refuge management activities.

The Closure of NAF Midway will dramatically affect management of Midway Atoll NWR. The Service plans to continue its operations on the Atoll after the Navy departs. The change in operations at Midway, that will result from the Navy's departure in 1997, will necessitate complete review and modification of all existing management activity and plans at Midway Atoll NWR. The Refuge will be responsible for providing and maintaining all facilities, infrastructure, and logistics required to meet the objectives of the Refuge. The U.S. Coast Guard, National Marine Fisheries Service, National Weather Service, and others that currently use Midway have shown an interest in continuing their use.

The Service believes that Midway presents a unique opportunity to form a partnership between federal government and the private sector which would be mutually beneficial. The overall goal of the partnership from the Service's perspective is to obtain no cost logistic and operational support for Midway Atoll NWR. In exchange for this support, the Service will provide an economic incentive for the private sector partner. The economic incentive that the Service believes would be most compatible with the purpose for which the Refuge was established would be a public visitation program. The purpose of the program would be to provide opportunities for the general public to travel to Midway Atoll and to be educated about the natural and historic resources found there. In the present fiscally austere climate, future management of Midway Atoll NWR, without outside assistance, may exceed Service budget constraints.

In late 1995, preliminary negotiations with the Service's private sector partner, Midway Phoenix Corporation, began. In early 1996, an Environmental Assessment and Section 7 Consultations will be completed for this project. Other key milestones are the development of a Contract between the Service and Midway Phoenix Corporation and a Phase-In Plan. The Phase-In Plan would serve as a blueprint as to how the Service's future Midway operation can be developed as the Navy and its contractors are finishing up BRAC activities and start closing down their operations.

4. Compliance with Environmental and Cultural Resource Mandates

All base closure activities are reviewed by a team consisting of engineers, environmental officers, cultural officers, and coordinators from several agencies and groups. Members of this

team are from the Navy, Department of Interior Office of Environmental Affairs and Office of Environmental Policy and Compliance, National Marine Fisheries Service, Environmental Protection Agency, Advisory Council on Historic Preservation, and Fish and Wildlife Service.

In 1995, The Navy prepared a Programmatic Agreement for Cultural Resources, Sand and Eastern Islands, Midway Atoll. This document directs treatment of historical properties during the transfer of ownership of Midway from the Department of Defense to the Department of Interior. A total of 77 historical buildings or structures have been identified at Midway. Nine are designated as National Historic Landmarks. Twenty-three of the historical sites will continue to be used by the Service after the Navy departs. Thirty-six of the historical sites that will not be used in the future will be secured to prevent wildlife or human health hazards and left in place. Fifteen of the sites will be demolished and 3 will be relocated to more appropriate sites at Midway for display.



WWII metal pillbox on Eastern Island. Gun positions and other historic and cultural resources will be preserved for future interpretation. [TM 12/95]

In anticipation of conflicts between base closure projects and nesting seabirds, Federal Fish and Wildlife Permit #PRT-790696 was issued to the Manager, Pacific/Remote Islands NWR Complex. This permit was issued to allow for a common sense approach to managing a difficult situation. The permit allows the Navy to take migratory birds at levels established by field biologists. The biologists work directly with engineers and construction crews to plan cleanup projects. Take levels are set based upon development of a wildlife conservation plan designed to minimize construction impacts on seabirds, native vegetation, and other wildlife/environmental concerns. The Complex manager signs off and has responsibility for establishing take limits. Conservation plans use the following protocols for preventing take, and for setting priorities when take was unavoidable.

1. Take of migratory birds will be prevented by:

A. Providing orientation briefings to all Navy and civilian personnel involved with BRAC projects. Briefings cover wildlife regulations, wildlife sensitivities, and procedures for minimizing impacts during various projects.

B. Whenever possible, work should be scheduled to take advantage of "windows of opportunity" based upon breeding seasons and least sensitive life phase to minimize conflicts.

C. In the event that work cannot be scheduled to prevent conflicts with nesting seabirds, efforts must be taken to prevent birds from nesting in areas that will be affected by BRAC activities.

D. If necessary, nests can be relocated either temporarily or permanently using techniques based upon sensitivities of the species.

2. If all measures to prevent take have been implemented and there are still conflicts between completing a project and nesting seabirds, the following protocol will apply:

A. Eggs should be taken before chicks. FWS staff will remove eggs to prevent them from hatching as part of site preparation.

B. Chicks will be taken only when absolutely necessary. Whenever possible, chicks or eggs taken will be fostered out to surrogate parents (either human or other adults of the species that have lost their egg or chick).

C. No take of adult birds should be necessary as adults are mobile and can be hazed away from work sites. Accidental take of adult birds may occur.

The migratory bird permit, conservation planning, and the preceding measures have all been developed in coordination with the Navy. This process was designed through negotiations which identified key objectives of both the Navy and the Service. The Navy wants to get out of Midway as soon as possible and do the best job of cleanup that they can with the money available. The Service wants to see the Navy complete environmental cleanup to maximize long term benefits to wildlife, while minimizing the short term impacts of the cleanup activities.

The major conflict between these two objectives was a large nesting seabird population covering diverse and extensive habitats year round. The Service committed to keeping the Navy working 12 months a year on two conditions: 1) the Navy would undertake conservation planning for each major cleanup project; and 2) the Navy would provide funding to the Service to assist with this planning, provide training to construction workers, and to assist with site preparation.

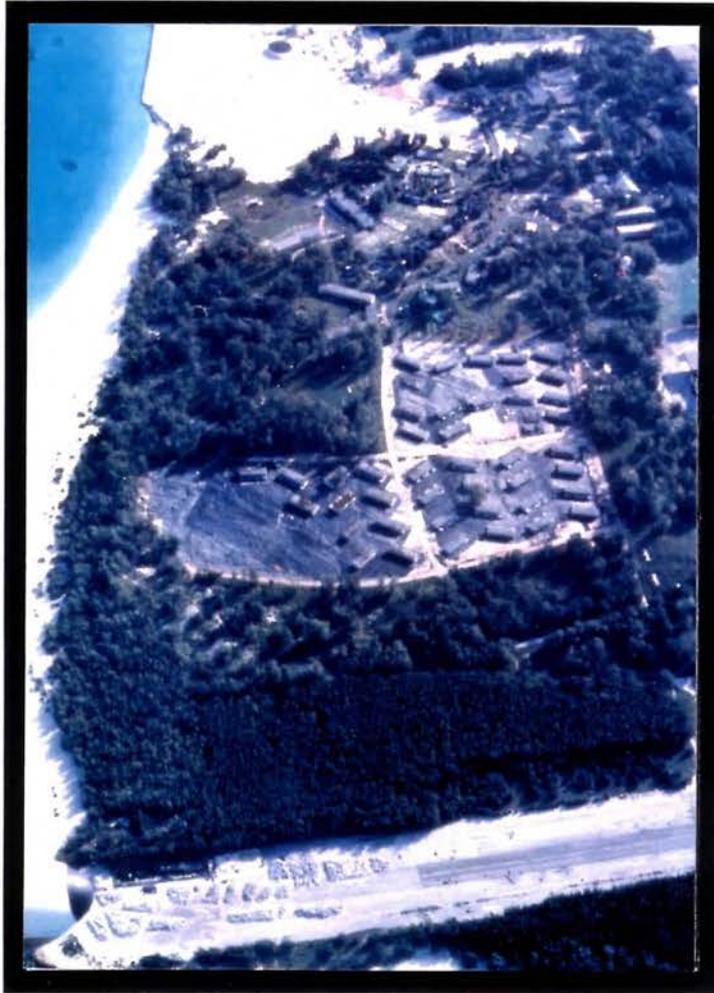
The Navy has gone along with these conditions. To date the Service has not stymied any projects. We believe the Navy is happy with the progress of cleanup efforts, and the Service is equally happy with the cooperation we are receiving. Project delays did cause frustration, however, in two separate instances this year. In both instances these delays resulted in significant additional migratory bird takes.

The first instance occurred due to funding problems and due to a delay in the issuance of a Finding of No Significant Impact relating to an Environmental Assessment for the demolition and disposal of buildings on Sand and Eastern Islands. This project was planned to begin in early July with the demolition of 43, 4-plex housing units in the 6000 Series Housing area on Sand Island. Site preparation was conducted March through June.

Service personnel collected white tern and red-tailed tropicbird eggs from these buildings, and fostered white tern chicks (March - June) to humans and other white tern pairs. Ironwood trees in the vicinity of the project site were cut (May - June) resulting in takes of white tern chicks and adults. Late stage Laysan albatross chicks were moved temporarily to accommodate the tree cutting.

Prior to initiation of this site preparatory work, these takes were carefully considered and thought to be reasonable given the size and scope of the project. Furthermore, it was believed that authorizing these takes (mostly eggs) and conducting the building demolition during the period July through October (albatross nesting season begins mid-October) would result in the least possible overall seabird impacts.

Project delays resulted in the initiation of building demolition to be put off until December, after the beginning of the 1995-1996 albatross nesting season. Geotextile material was laid on the ground in the vicinity of the 6000 housing to deter albatross nesting and allow unimpeded access to the housing units for heavy equipment. The geotextile material does not completely deter egg laying. Some egg laying on the material does occur, with most eggs being abandoned shortly after laying. Eggs were also laid on the back porches of the housing units. All eggs were collected from the material and the porches and counted as takes. Had the project delays not occurred these Laysan albatross takes would not have occurred. Conversely, had we known that the building demolition would not begin until December, we would have been able to delay the site preparation until a later date which would have avoided the white tern and red-tailed tropicbird takes.



Aerial view of geotextile fabric
being install in the 6000 housing
area. [DKM 10/95]

The second instance in which project delays caused frustration occurred due to the late arrival of a landing craft for transporting heavy equipment to Eastern Island. The work on Eastern Island involved demolition and landfilling buildings, scrap material disposal, underground storage tank demolition, and contaminated soil treatment. The barge was expected to arrive in early August to allow initiation of the Eastern Island projects in mid-August. This timing would have facilitated completion of a majority of the work prior to the beginning of albatross egg laying in mid-November. The barge arrived, however, on 2 October, and landfill construction and building demolition began in mid-October. The work was completed in mid-December. Significant albatross egg takes occurred.

In late 1995, Refuge staff put together an Environmental Assessment, Section 7 Consultations, and Pesticide Use Proposals for the Sand Island rat eradication project. This project should begin in June 1996.

5. Research and Investigations

During 1994, several research projects were conducted by independent researchers or refuge staff at Midway Atoll NWR. These research activities were all reviewed and permitted under the Special Use Permit process. Brief summaries of these studies follow.

MID-01-95 "Contaminant uptake in two species of albatross in the North Pacific Ocean" James Ludwig, The SERE Group, Ltd

In 1995, the SERE Group completed the third and final season of a planned 3-year study which assessed impacts of marine contaminants on pelagic Laysan and Black-footed Albatrosses. Chlorinated synthetic contaminants, particularly the planar chlorinated hydrocarbons (PCH), and certain insecticide residues have damaged wildlife in some regions. This research sought to confirm the presence of PCH and other chlorinated contaminants in the pelagic albatrosses of Midway and evaluated the presence of toxic effects in the young of these albatrosses. The objectives included measuring reproductive success, rates of deformities and abnormalities in chicks, impacts of ingestion of plastic on survival of chicks, and the variance in levels of the thyroxine and vitamin A biomarkers in chicks and adults and how these vary with contaminants and age in individuals. Representatives of the SERE Group were at Midway from January through mid-August.

MID-02-95 "Research and photographs for a book on the human and natural history of the Northwestern Hawaiian Islands." Pamela Frierson.

Pamela Frierson visited Midway Atoll twice in 1996 to gather information and photos for a book on the human and natural history of the Northwestern Hawaiian Islands. She was at Midway during 13 January through 24 February and 13 October through 25 November. During both her visits, Pamela also filled in as a half-time volunteer for the Service.

MID-03-95 "Population status and restoration of the Hawaiian black-lip pearl oyster (*Pinctada margaritifera galtsoffi*)." Neil Sims, Black Pearls, Inc.

Neil Sims and Dale Sarver visited Midway between 19 and 26 May. They conducted surveys to determine if any black-lip pearl oyster stocks still exist at Midway and brought up some spat to test whether the waters and conditions at Midway are favorable for pearl oyster growth. No black-lip pearl oysters were found during their survey work. Periodical measurements indicate that survival and growth of the spat is excellent. If spat in the grow-out trials continue to survive, future restocking of Midway may be feasible.

MID-04-95 "Hawaiian monk seal population research, surveys of reef fish abundances, and assessment of ciguatera levels in reef fishes Midway Atoll" Timothy Ragen, National Marine Fisheries Service.

This work is a continuation of National Marine Fisheries Service's long-term monitoring of the Hawaiian monk seal population at Midway Atoll. From 31 March through 28 April, Dr. Lee and Kristen Eberhardt conducted surveys of the atoll's Hawaiian monk seal population. They conducted beach patrols on Sand, Eastern, and Spit Islands recording numbers and identifying individuals by flipper tags, dye-marking, or by making a photographic record of natural markings. They identified 41 different seals at Midway during their observations. During 22 through 25 September, the NOAA vessel Townsend Cromwell visited Midway. While at Midway, National Marine Fisheries crew lead by Frank Parrish conducted reef fish surveys and collected samples for ciguatera testing. The 1995 reef fish survey data will be compared to historical data to analyze population trends.

MID-05-95 "Botanical Survey of Midway." Brooks Harper, Ecological Services, Fish and Wildlife Service.

From 31 March through 7 April, Marie Bruegman, a botanist with Ecological Services, assisted Wildlife Biologist Seto with an inventory of native plants at Midway Atoll. They found a total of 16 native plant species. They also examined potential impacts of various alien plant species.

MID-06-95 "Christmas shearwater (*Puffinus nativitatis*) reproductive success and population assessment, Eastern Island, Midway Atoll." Nanette Seto, Wildlife Biologist, Midway Atoll National Wildlife Refuge.

In 1995, refuge staff conducted the first year of a 3-year study examining the response of the Christmas shearwater population to the removal of the black rat (*Rattus rattus*) from Eastern Island. The black rat, which may have been impacting this seabird species by predation on eggs and chicks, was eradicated from the island in late 1994 through an intensive trapping and poisoning project. In 1995, about 112 nesting pairs of Christmas shearwaters were documented. 174 of the breeding adults were banded. Another 67 non-breeders were also banded. In 1995, a total of 73 chicks fledged. This was six times the number of chicks (12) that fledged in 1994 before rats were eradicated.

MID-07-95 "Assessment for Ciguatera at Midway." Dwight Kikuta, University of Hawaii at Manoa, John A. Burns School of Medicine.

During 11 through 22 September, a 4-member team of researchers collected samples for their investigation into the ciguatera problem at Midway. Samples consisted of a variety of fishes collected from the shallows around Sand Island. Samples were transported back to the University and we are awaiting results from laboratory tests. This study was initiated in 1993 at the request of the Navy because ciguatera outbreaks among workers at Midway have occurred sporadically in recent years. The Navy wanted to assess the magnitude of the ciguatera problem.

MID-08-95 Stable isotope analysis of components of the seabird community of Midway Atoll. Dr. Keith A. Hobson, Canadian Wildlife Service.

The objective of this study is to obtain salvaged egg and other tissues from Laysan, black-footed albatrosses, and other seabird species at Midway Atoll for the purpose of establishing baseline isotropic information which can be used to trace diets and trophic position. We began salvaging eggs and tissue in November. These samples will be sent to Dr. Hobson in early 1995.

MID-10-93 "Effects of rat predation on Bonin petrel (*Pterodroma hypoleuca*) reproductive success at Midway Atoll. Nanette Seto, U.S. Fish & Wildlife Service.

In 1994, cooperative education student, Nanette Seto, completed the final year of a two-year study examining the effects of black rat (*Rattus rattus*) predation on Bonin petrel reproductive success. In addition to examining the effects of rat predation, she documented general petrel breeding biology information, and experimented with the use of capture-recapture procedures to estimate petrel populations.

In 1995, Nanette was selected as the Wildlife Biologist at Midway Atoll NWR. Through an extension to the above Special Use Permit, Nanette continued to gather biological data and refine population monitoring methods for the Bonin petrel.

E. ADMINISTRATION

1. Personnel

Kenneth R. Niethammer, Refuge Manager, GS-485-09, EOD 6/25/94 promoted to GS-485-11 effective 05/28/95. (photo, p. 23)

Nanette W.H. Seto, Student Trainee/Wildlife Biologist, GS-499-07, EOD 12/27/92 promoted to Wildlife Biologist GS-486-09 effective 03/05/95. (photo, p.14 & 23)

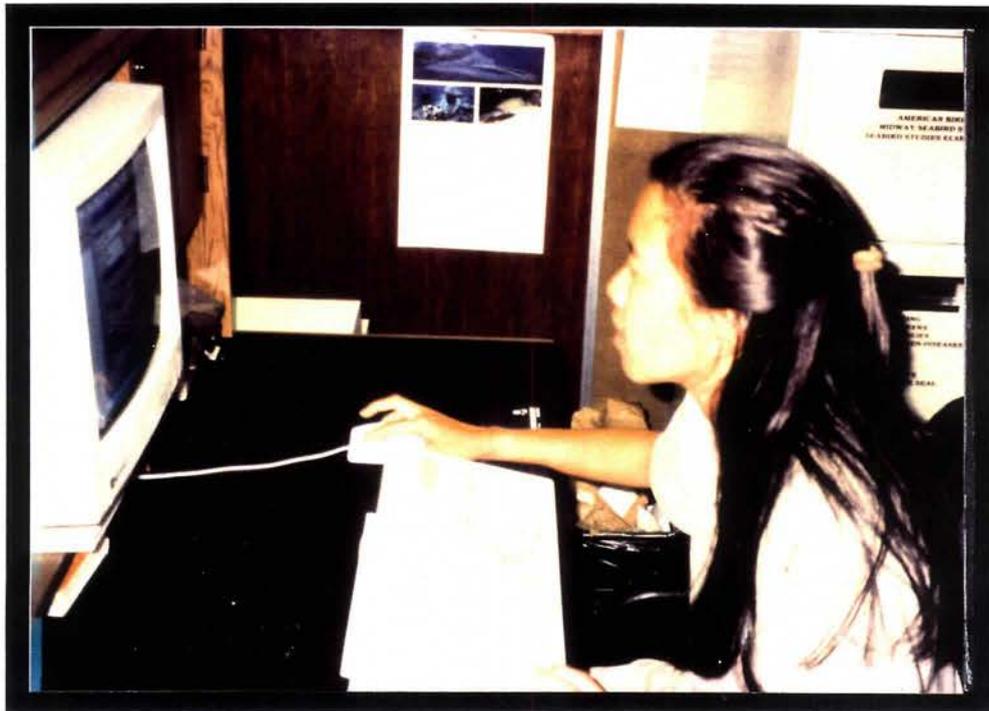
Jon K. Hale, Fish and Wildlife Biologist (BRAC), GS-401-11, EOD 10/16/94. (photo p. 18)

Jessica M. Schillaci, BRAC Biological Science Technician, GS-404-5, temporary position, EOD 7/15/94, end-of-assignment 03/04/95 .

Laura B. Patrick, BRAC Biological Science Technician, GS-404-5, temporary position, EOD 05/14/95. (photo p. 19)

Steve L. Kirkland, BRAC Biological Science Technician, GS-404-5, temporary position, EOD 07/10/95.

Theresa A. Moore, BRAC Laborer, WG-3502-3, temporary position, EOD 6/15/94, end-of-assignment 12/16/95. (photo p. 18)



Nanette Seto achieved her dream of becoming a field biologist for the Service. Here she is studying the blue-screened, desk-dwelling terminal, a species that she is becoming real familiar with. [JH 7/95]

Refuge Staffing, 1989 - 1995

Year	Permanent Full-Time	Permanent Part-Time	Term	Temporary	Total FTE
FY95					
Refuge	1.8	0.0	0.0	0.2	2.0
BRAC ¹	0.0	0.0	1.0	2.2	3.2
FY94					
Refuge	1.3	0.0	0.0	0.5	1.8
BRAC ¹	0.0	0.0	0.4	1.1	1.5
FY93	1.6	0.0	0.0	0.5	2.1
FY92	2.0	0.0	0.0	0.0	2.0
FY91	0.0	0.0	1.0 ²	0.0	1.0
FY90	0.0	0.0	0.0	0.5	0.5
FY89	0.0	0.0	0.0	0.5	0.5

¹Positions funded by Navy in association with base closure cleanup activities.

²NWR Office opened with 1 term position 11/23/90.

Wildlife Biologist Seto and BRAC Laborer Moore were presented Performance Awards by Regional Director Spear during his October visit to the Refuge.

A foreign national laborer will be working with us for a year to fulfill a contract we have with PMC for nursery, rat bait-station maintenance, and vegetation control services.

Meetings attended:

In November, Wildlife Biologist Seto attended the annual Pacific Seabird Group meeting in Victoria, British Columbia, Canada.

Fish and Wildlife Biologist Hale attended the January, April, and October BRAC Team meetings in Honolulu. He also attended the August meeting held at Midway. In June Hale traveled OHM's regional office in California for coordination meetings with the Navy and the environmental cleanup contractor.

In June, Refuge Manager Niethammer attended meetings in Honolulu in which future use proposals were evaluated and discussed. Niethammer also attended the August BRAC meeting held at Midway.

Publications:

N.W.H. Seto, J. Warham, N. L. Lisowski, and L. Tanino. 1996. Jouanin's Petrel *Bulweria fallax* observed on Sand Island, Midway Atoll. (accepted for publication by Colonial Waterbirds)

4. Volunteer Program

Volunteers who worked on Midway Atoll NWR, 1994.

Name	Begin	End
Laura Megyesi	1 Jan	28 Apr
Robert Angell	28 Apr	28 July
Nick Palaia ¹	5 Jan	22 May
Paul Magruder	14 Jul	13 Oct
Pam Frierson	13 Oct	26 Nov
Margaret Feldman	17 Nov	2 Dec

¹Nick Palaia was appointed to a Biological Science Technician position working for the Hawaiian Islands NWR on 22 May. He continued working on Midway until 2 June.

Volunteers assisted the refuge staff with biological surveys and censuses, wildlife interpretation, alien plant control, native plant propagation, preparing interpretive materials, rescuing trapped birds and other Refuge work.

Numerous island residents assisted the refuge with various short-term projects throughout the year. Four individuals volunteered several evenings to mist-net and band Bonin petrels in January and February. Twelve volunteers patrolled the waters off the seawall on Sand Island to rescue waterlogged albatross chicks during the fledging season. This particular project was inspired by Verges Farinas, an employee of a subcontractor working for OHM. She designed a basket and spent her late afternoons "fishing" albatross chicks out of the water. From July through October, 27 volunteers fostered white tern and black noddy chicks that were collected in base closure activity areas. In December, 13 volunteers assisted the refuge in an atoll-wide black-footed albatross nesting population count.

5. Funding

Refuge funding for last 3 years.

FY	(1261)	(1262)	(1230)	REIMBURSABLE		TOTAL
	OPERAT	MAINT (MMS)	NONGAME	BRAC ¹	RATS ²	
95	165.0	-	3.0	184.0		352.0
94	129.0	22.0	-	84.4	81.0	316.4
93	138.8	7.0	-	11.9		157.7

¹Navy provided funds for USFWS biological support of NAF Midway environmental Cleanup and Base Closure projects.

²Navy provided funds through the Legacy Program for planning and implementation of a rat eradication project on Eastern and Spit Islands.

Because of a political budget impasse, the Federal Government shut-down twice once from 13 through 17 November and again from 15 December through the end of the years. All the Midway staff were classified as essential or exempt personnel so the furloughs associated with the government shut-downs did not affect Refuge operations directly. However, the shut-downs did affect purchasing, payroll, and travel plans.

6. Safety

Standard safety procedures were implemented. Boating safety is of paramount importance at Midway. Refuge personnel successfully follow safety rules; thus, no safety problems occurred during the year.

Because of the danger of ciguatera poisoning, the consumption of finfish caught inside the reef is forbidden.

BRAC personnel and other Refuge staff received 40 hour HAZWOPER training for on-site work associated with base closure and environmental cleanup activities.

Midway BOS contractor personnel and the Coast Guard often assist injured personnel from fishing and merchant vessels. In 1994, eight MEDIVAC flights were conducted. Several other injured people were transported to Honolulu via the weekly AMC flights.

Bird/aircraft strikes are frequent. In 1994, the AMC flight schedule was changed so that planes would be landing and taking off after sunset. Bird activity is greatly reduced after sunset when compared to daylight hours. Preliminary reports indicate that this change has dramatically reduced air strikes. In 1994, 129 planes landed at Midway. On 23 occasions bird strike incidents were reported. Several of the incidents involved more than one bird for a total of 34 different bird impacts.

During the Compliance audit in January, OSHA violations were also noted. Refuge staff began addressing these items immediately.

7. Technical Assistance

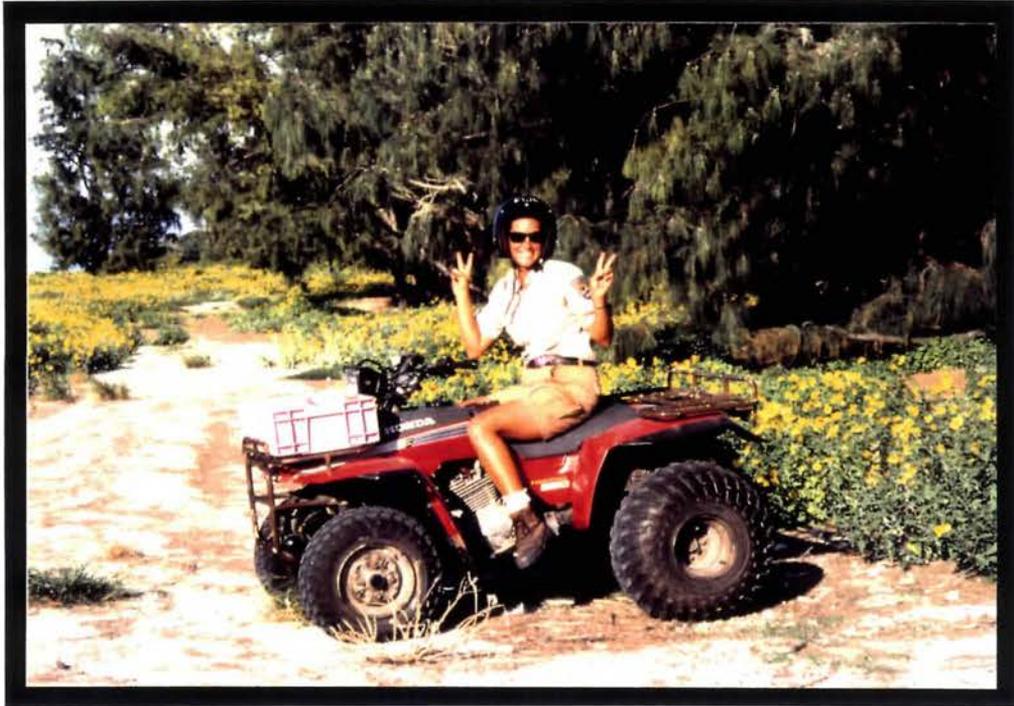
In 1994, the Navy enlisted on-island technical support for the base closure effort from the U.S. Fish and Wildlife Service. This technical support began in March 1994 with the Navy providing funding for one fish and wildlife biologist and one biological technician. In July 1994, as base closure activity escalated, the Navy provided additional funding for a second biological technician or laborer position. A third biological technician was temporarily added to the staff for the last half of 1995. This additional person was necessary due to the increased work load caused by the intense cleanup effort on Eastern Island. The Eastern Island cleanup was completed in

December. Funding for the "BRAC biology program" is expected to continue through completion of the base closure project.

The BRAC biologist is responsible for coordinating wildlife conservation planning and implementation on all cleanup and closure projects. Specifically, the biologist works with the Navy and its contractors to schedule, design, and implement projects in a manner that minimizes short-term impacts to fish and wildlife species while maximizing the amount of cleanup projects that can be completed before June 1997 the target date for the Navy's departure. The biological technicians work on-site assisting with implementing conservation measures such as surveying sites prior to work, preparing sites prior to work, hazing birds, moving birds, and performing follow-up surveys after work is complete. All BRAC employees assist with orientation briefings and training new contractor personnel.



BRAC Fish and Wildlife Biologist Hale and Laborer Moore help the Navy with demolition of an old water tower. [LP 9/95]



BRAC Biotech Laura Patrick takes a lunch break during the hectic 7-days per week work schedule during the Eastern Island cleanup work. [JH 10/95]

On 11 January, Refuge staff presented OHM, the Navy's main environmental cleanup contractor, with a plaque to show the Service's appreciation of OHM's willingness to incorporate protection of wildlife practices into their operational guidelines. Their cooperation is much appreciated!

Refuge staff provided information regarding seabird nesting phenology, activity patterns, etc. to a four-person Airforce team that visited Midway in April. The team was here to evaluate bird air-strike hazard at Midway and to make recommendations on timing of plane arrivals and departures.

8. Other Items

Fish and Wildlife Service Personnel Visits

On 18-19 January, the Navy sponsored a trip to Midway for Members of the Press. The Objective of the trip was to inform the public about the cleanup/base closure activities at Midway. Pacific Remote Islands National Wildlife Refuge Complex (PRINWRC) Manager

Ken McDermond visited Midway along with representatives of the Press. He gave interviews in which he explained the Service's role at Midway and assisted with tours of the Midway cleanup sites.

During 24-31 March, Complex Manager Ken McDermond and Contract Specialist Dot Baker (Region 1) visited Midway in conjunction with a visit of contractors interested in submitting proposals for future use of Midway.

From 31 March through 8 April, Marie Bruegman, a botanist with Ecological Services, conducted a botanical survey of Midway Atoll (see Section D-5).

On 10 April, Pacific Islands Ecoregion Manager Robert Smith, Complex Manager Ken McDermond, and Resource Contaminant Specialist Chris Swenson (ES) visited Midway with a group of people looking at BRAC issues. The group included personnel from the Navy, NMFS, and Marine Mammal Commission. Robert Smith and Ken McDermond stayed with the group as they toured Sand and Eastern Islands. Refuge Manager Ken Niethammer and Chris Swenson discussed contaminant issues and surveyed several contaminant sites.

Amy Edmonds, a member of the Laysan "sandbur" team, became ill (Laysan fever) and was picked up and transported to Midway by the Coast Guard cutter *Assateague*. She arrived at Midway on 8 June and departed on the 9 June AMC flight. Leah de Forest, Amy's replacement, arrived on the 9 June AMC flight and was transported to Laysan by the *Assateague* which departed Midway on 15 June.

Complex Manager Ken McDermond, Contaminants Specialist Don Palawski (ES), and Regional Historian LouAnn Spedula visited Midway between 18 and 25 August in conjunction with the BRAC team meeting.

On 31 August, Ecoregion Manager Robert Smith and Complex Manager Ken McDermond visited Midway to attend the International Midway Memorial Foundation's ceremony in honor of the 50th anniversary of VJ Day.

Regional Director Mike Spear, Ecoregion Assistant Regional Director John Doebel, Ecoregion Manager Robert Smith, Complex

Manager Ken McDermond visited Midway from 27 through 20 October to meet with representative of Phoenix Air and to tour Midway.

Ecoregion Manager Robert Smith, Hawaiian and Pacific Islands National Wildlife Refuge Complex Field Supervisor Jerry Leinecke, and Complex Manager Ken McDermond visited Midway from 8 through 10 December to meet with representatives of Phoenix Air, Navy, and PMC to discuss future operation of Midway.

From 8 through 15 December, a 4-member Compliance Review Team, Charlie Fasano, Don Palawski, and Tom Smiley from the Service and Donna Schell from the Army Corps of Engineers, visited Midway. The objective of their visit was to conduct an overall (non-binding) compliance audit of facilities and to identify factors that may affect the Service's future operation of Midway.

NAF Midway Islands

On 16 March, Rear Admiral Ryan visited Midway. He graciously offered to divert his plane to Midway to pick up a OHM employee who needed to return to the mainland to visit his ailing mother. Midway's Navy and Refuge staff gave the Admiral a tour of Midway during his short visit.

On 10 April, Admiral Nash, LCMDR Hoffman, and other Navy personnel visited (including the next OIC, Lt. Karyn Rinaldi) Midway with a group of people looking at BRAC issues.

In July, Navy Biologist Lawrence Pinter arrived with two U.S. Forest Service personnel to continue monitoring their research on subterranean termites at the termite research farm near NAVFAC. This research project may continue after the Navy leaves Midway.

The BRAC team visits Midway for a week long meeting, 18 through 25 August.

Deputy Asst. Under Secretary of the Navy (in charge of Conversion and Redevelopment of Navy Bases) visited Midway on 14/15 September. The Secretary was interested in looking at the progress of BRAC activities and discussing the future of Midway. He was given tours of Eastern and Sand Island and briefed on what is happening at Midway.



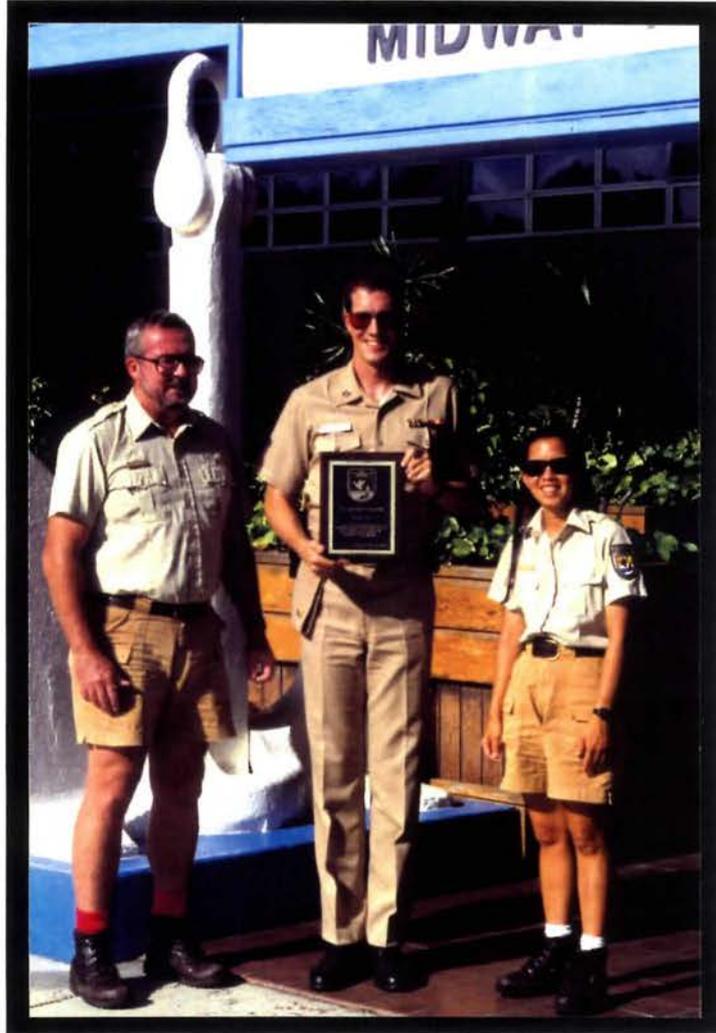
Members of the BRAC team on a field trip to Eastern Island. [TM 8/95]

The Refuge presented OIC Lt. David Black with an appreciation plaque during an after hours gathering at the OIC's residence on 14 September. Present were the Deputy Asst. Under Secretary of the Navy, Captain Check, and resident Navy and Refuge staff. The Plaque was presented to show the Services appreciation of Lt. Black's efforts and contributions to the environmental cleanup of Midway Atoll and its transition to a National Wildlife Refuge.

In October, NAF Midway underwent a change of OICs. Lt. David Black departed on 6 October after completing his tour at NAF Midway Islands. Lt. Karyn Rinaldi arrived on 29 September and assumed OIC responsibilities upon Lt. Black's departure.

LCDR Hoffman visited Midway from 8 through 10 December to meet with representatives of the Service, Phoenix Air, and PMC to discuss future operation of Midway.

Throughout the year, other Navy personnel, both civilian and military, often visited Midway. Most of the visits were in association with BRAC activities.



Refuge Manager Niethammer and Wildlife Biologist Seto present OIC Lt. David Black with a plaque expressing the Services appreciation of his efforts and contributions to the environmental cleanup of Midway Atoll and its transition to a National Wildlife Refuge. [JH 9/95]

In 1995, we also had a change of some of the Chief Petty Officers assigned to Midway. Chiefs Gregg Diefenderfer and Randy Jackson finished their tours and departed. Chiefs Sharon Middleton, Dale Farnworth, and Brian O'Kelly were assign to Midway in 1995. Chief Blickenstaff was stationed at Midway all year.

Pigunig Management Corporation

During 1995, PMC, the base operations support contractor for NAF Midway Islands, experienced a turnover in a few management positions. New staffing included: Project Manager Wayne Hatfield, Operations Manager Al Davis, QC/Safety Manager Pat Rhea, Harbor Master Leonard Richardson, Craft Master Bill Brogan, Communications/Electronics Technician Earl Reece, Public Works Supervisor Terry Collin, and Logistics Manager Gus Goldenpenny. Rhea and Richardson were promoted from their previous Midway positions: Public Works Supervisor and Craft Master, respectively. Cliff Gregory served a couple of short stints as Operations Manager and Project Manager. In November, PMC hired Bill Myerson as their new Pacific Region Manager.

U.S. Coast Guard

From 10 through 12 January, a C-130 plane conducted law enforcement patrols using Midway as a base of operations.

In early February, the cutter *Rush* stopped in while on patrol in the area.

On 7 April, a C-130 stopped in to refuel. They conducted law enforcement patrols in the area. They stayed overnight and departed early the next morning.

On 31 May, a C-130 stopped on law enforcement patrol stopped in to refuel.

The cutter *Assateague* was in-and-out of Midway from 8 through 15 June. They conducted law enforcement patrols in the area.

From 10 through 17 July, C-130s used Midway as a base of operations during their pursuit of an illegal drift-netter spotted in the middle of the North Pacific Ocean. The planes were keeping a 24-hour surveillance upon the vessel until a cutter, the *Rush*, could get to the location. The vessel was finally boarded and taken to Guam.

The cutter *Kiska* and buoy-tender *Sassafras* visited Midway between 18 and 25 September. The *Sassafras* worked on navigation buoys and removed ATON batteries from a site within the inner lagoon. The *Kiska* conducted law enforcement patrols and transported Dave Smith and three other Forestry and Wildlife Department (Hawaii) employees to Kure' Atoll so they could conduct wildlife surveys.

The *Kiska* law enforcement patrols were supported by C-130 patrols. The C-130 used Midway as a base of operation.

From 26 through 28 December, a C-130 conducted law enforcement patrols using Midway as a base of operations.

Other

The Airforce sent a four-person team to Midway to evaluate the bird air-strike hazard. The team was at Midway for a week (14 through 21 April). They documented bird activity in the runway areas during day and night time and made recommendations on timing of plane arrivals and departures.

During 16 through 23 June, an 11-member team including representatives from the Department of Transportation (DOT), U.S. Coast Guard, NMFS, and DOT contractors visited Midway to examine the ATON battery site. They took sediment and biota samples for contaminant analyses and mapped the battery areas.

A Phoenix Air Lear jet stopped in on 7 June. They needed to take a couple of pictures of the seawall for their engineers to use.

Airforce C-130 stopped in to deliver some mail on 12 June.

Thierry Work and Robert Rameyer, from National Biological Service's National Wildlife Health Center, visited Midway from 30 June through 7 July to check on unusual mortality of adult Laysan albatrosses (see Section G-17).

Bill Gilmartin and four other NMFS representatives were at Midway from 4 through 18 August. Their objective was to conduct censuses and to tag as many of the untagged Hawaiian monk seals as possible.

On 28 August, a Japanese P-3 came to Midway to rendezvous with helicopters from other Japanese ships. They were transferring the body of a sailor, who had died aboard a destroyer, back to Japan.

Two representatives of Phoenix Air, Bob Wilson and Birgit Winning (Oceanic Society), visited Midway between 22 and 29 September to examine and select buildings and facilities that they will need for their future operation of Midway.

Mark Thompson and Ned Neely (Phoenix Air) visited Midway from 27 through 29 October. Three other Phoenix Air staff members, Robert Wilson, Robert Flemming, and Ben Rainsford, were at Midway from 27 October through 4 November. The objectives of these visit were to build a foundation between the Service and Phoenix Air for the future operation of Midway and to begin looking at facilities and making preliminary plans.

From 2 through 8 December, a 9-member team from Barret Consulting Group (Navy contractor) visited Midway to gather information needed to develop a Storm Water Pollution Prevention Plan.

Other Vessel Arrivals

On 18 February, an OHM barge arrived to deliver equipment for the on-going UST closure project. Equipment was quickly off-loaded and the vessel departed the same day it arrived.

On 13 February, a Chinese barge, *Shahekou*, carrying a large crane to Portland, requested permission to enter and anchor in the Lagoon. The crane had become unstable and they needed to make emergency repairs. Repairs were completed and they departed on 22 February.

On 12 May, the *Glorita*, being chartered by NMFS, stopped at Midway to pick up 7 Hawaiian monk seal pups from the "Head Start" program. These seals came in from Honolulu on the 12 May AMC flight. On 13 May, the *Glorita* transported the pups to Kure' Atoll where they will be released.

On 31 May, an OHM barge, the *Alaska Trader* arrived to pick up scrap metal from the underground storage tank project. Several hundred thousand tons of scrap metal were sent off to be recycled. It took 6 days to load all the scrap metal on the barge.

The cargo ship *Green Wave* arrived on 12 June. She departed on 14 June after unloading supplies for Midway.

Refuge staff received NMFS equipment and supplies that were delivered to Midway on the 7 July AMC flight and held it until the NOAA vessel *Townsend Cromwell* arrived. The *Cromwell* came in on 14 July and picked up the gear, supplies, and NMFS personnel who arrived on the 15 July AMC flight and departed on 16 July. They also off-loaded researchers who had completed their lobster

research on the way up to Midway. These researchers caught the 15 July AMC flight back to Honolulu.

From 4 through 18 August, a 5-person Hawaiian monk seal research team visited Midway to conduct seal censuses and to tag seals.

The NOAA vessel *Townsend Cromwell* visited Midway between 22 and 25 September. They delivered some supplies to the Midway Atoll NWR. While at Midway, a NMFS crew lead by Frank Parrish conducted fish surveys and collected ciguatera samples.

On 12 September, the *Strong Texan* came in and picked up some empty cargo containers and the luxury yacht *Valiant* came in for fuel and emergency repairs.

On 16 December, the much awaited cargo ship *Green Wave* once again visited Midway. She departed the next day after unloading much needed supplies.

F. HABITAT MANAGEMENT

1. General

The lands of Midway Atoll NWR provide roosting and breeding habitat for tropical seabirds, migration and wintering grounds for shorebirds, haulout and pupping beaches for monk seals, and basking areas for sea turtles. The expansive marine environment included in the Refuge provides habitat for a variety of marine life including seabirds, marine mammals, sea turtles, fishes, and other marine organisms.

This year, we completed sections of a refuge habitat management plan that, in its entirety, will include detailed plans to manage both the terrestrial and marine habitat on Midway. Completed sections included: 1) Ironwood management, 2) Golden Crown-beard management, 3) Native plant management, and 4) Alien Species Management.

We began a native plant nursery to provide plants for restoration of Midway's native plant community. This past summer, we started experimenting with different propagation techniques on beach *naupaka* (*Scaevola sericea*), beach morning-glory (*Ipomea pes-caprae*), *alena* (*Boerhavia repens*), and *emoloa* (*Eragrostis variabilis*). We also included beach Heliotrope (*Tournefortia argentea*) in our propagation efforts. Although this plant is not

considered native, it provides habitat for nesting seabirds without displacing native plants. Seeds or cuttings were collected from each species, except for *Eragrostis*, and brought into our nursery. To prevent disturbance to the small number of *Eragrostis* plants found on Midway, propagation efforts were focused on seeds collected by Service personnel on Laysan Island, where *Eragrostis* is abundant. We were able to germinate seeds from *Scaevola*, *Ipomea*, *Boerhavia*, and *Eragrostis*. We were also able to propagate *Scaevola* and *Ipomea* easily from cuttings. Cuttings taken from *Boerhavia* and *Tournefortia* were not as easily cultured taking much more effort and time. Thus, propagation of these two plants through cuttings is slow, but possible.



Laborer Ramachandran Sudar Shan watering plants in our native plant nursery. [NS 12/95]

After much discussion about alien species introduction, Midway Phoenix Corporation was allowed to bring 12 grapefruit trees to Midway. These trees are part of an experiment to examine the feasibility of producing some on-island produce for use in their future operations at Midway. These trees received a comprehensive examination and treatment to prevent introduction

of unwanted alien species. All the trees seem to have survived their trip to Midway.

3. Forests

Stands of introduced ironwood trees (*Casuarina equisetifolia*) occur on both Sand and Eastern Islands. Dense monospecific stands of ironwood eliminate almost all other vegetation which reduces nesting habitat for seabirds. Ironwoods shade out native vegetation including dune binding species that are essential for preventing excessive beach erosion, and shrubs which provide essential nesting habitat for seabirds.



Dense ironwood stands reduce the quality of seabird nesting habitat. [KN 6/95]

Ironwoods were removed from Spit Island in 1991. We continue to monitor Spit for ironwood seedlings throughout the year to prevent its re-establishment. In 1995, we initiated an ironwood control/eradication management plan for Eastern and Sand islands. This plan develops a systematic approach for removal and control of ironwoods. As areas are cleared of ironwood trees, we will

revegetate with native plants. We plan to remove ironwood trees from Eastern Island during the first year of this project. Next, we will systematically control ironwoods on Sand Island beginning with the beach zones where some native plants still survive. Eventually, we would like to be in a position where ironwoods no longer exist on Spit and Eastern islands and are completely under control on Sand Island to a point that if necessary they can be quickly and totally eradicated from Midway.

We are using Garlon4 a to kill ironwood trees. This herbicide is applied by hacking to the cambium layer in several locations around the trunk and squirting these areas with the herbicide. This herbicide, which masks as a growth hormone, is quickly translocated throughout the entire plant.

By the end of the year, we applied herbicide to one-third of the ironwood trees on Eastern Island. Within two weeks of application of the herbicide, the needles on small trees turned yellow then brown. Larger trees, however, were still alive with only portions of the tree turning yellow as long as 3 months after application. These trees may need repeated treatment because of their large size.

Several other species of ornamental trees have been introduced to Midway over the last half century. Most of these trees have not spread from their locations in gardens, and thus, do not pose as a threat to native plant communities.

5. Grasslands

Presently, lawns and several fields are maintained as grass fields by mowing. These areas are heavily used by nesting albatrosses. If these areas are not mowed, the open grassland habitat would be replaced by dense stands of Golden Crown-beard (*Verbesina encelioides*) and/or ironwood trees. *Verbesina* was introduced to Midway Atoll sometime between 1903 and 1955. Its seeds were probably brought to Midway in 9000 tons of imported top soil, which occurred during the first half of the 20th century. Since its introduction, *Verbesina* has spread to cover most unshaded and unmowed areas of Sand and Eastern Islands. Small patches of *Verbesina* are found on Spit Island. These patches were removed regularly throughout the year.

We speculate that dense stands of *Verbesina* creates an

obstruction to nesting albatrosses, petrels, or shearwaters because of the difficulty in moving through these dense stands and the risk of entanglement. In addition, dense stands of *Verbesina* have been observed to harbor mosquitos, which are vectors of avian pox. Avian pox is the common name for a mild to severe, slow-developing disease of birds caused by a large virus belonging to the avipoxviruses. Immature birds are usually most frequently and severely infected with poxvirus on Midway.

Because of the magnitude and potential cost of *Verbesina* management at Midway and the potential negative effects that it can have on seabird nesting habitat if it is not controlled, we need to determine the most effective and efficient methods of management. In 1995, we began studies that will assess the impact of *Verbesina* on nesting seabirds and our native plant community, and the effectiveness of various control methods.

In September, we set up seven study plots on Sand Island. By monitoring these plots over a period of five years, we will assess: 1) the impact of *Verbesina* on nest density and success of albatrosses, Bonin petrels, and wedge-tailed shearwaters, 2) the impact of *Verbesina* on the recruitment of the native shrub, *naupaka*, 3) direct impacts of mowing on adult survival and nesting success of burrow-nesting birds, and 4) evaluate the effectiveness of mowing, and manual and chemical control methods.

6. Other Habitats

Abandoned fishing nets and other entanglement hazards for seals and turtles were removed from beaches, piers and pilings in the Refuge's marine waters. Periodically, we have beach cleanup days on Sand Island where many of the island's residents spend the afternoon clearing trash and debris from the beaches. In 1995, we had major beach cleanup days in July, September, and December. Entanglement hazards on Spit and Eastern Island beaches were removed by FWS personnel. Recreational divers and snorkelers assist with removing some of the more dangerous net debris from piers and reefs.

10. Pest Control

Rats were accidentally introduced to Midway during WWII. Rats prey directly on the eggs and chicks of several seabird species. Bulwer's petrels (*Bulweria bulwerii*) are thought to have been

extirpated by rats on Midway. The reduced populations of Bonin petrels (*Pterodroma hypoleuca*), Christmas (*Puffinus nativitatis*) and wedge-tailed shearwaters (*Puffinus pacificus*) have also been attributed to rat predation. Rats are also herbivorous and have made major impacts on native vegetation. Eradicating rats from Midway Atoll is essential to preserve seabird nesting habitat and to ensure the survival and repatriation of several seabird species.

In 1994, the Service entered into a cooperative agreement with the U.S. Department of Agriculture's Animal Damage Control (ADC) Program and the Navy to eradicate black rats (*Rattus rattus*) on Eastern and Spit Islands at Midway Atoll. This eradication project, funded by the Department of Defense Legacy Resources Program, went into Phase II in 1995. During phase II, we monitored and restocked poison-bait stations on Eastern Island every month, with the exception of a 4-month period during the sooty tern nesting season when our presence in tern nesting colonies would have caused too much disturbance. During our monitoring checks, we did not find any signs of rat activity. The missing bait appeared to be eaten by ants and other invertebrates.

In September, Peter Silva and Caesar Trinidad of ADC visited Midway for two weeks to conduct live trapping on Eastern and Spit Islands as a follow-up to the rat eradication project. No rats or mice were trapped. They also checked to see if they could find any scat or other signs of rodent activity. They did not find any. The eradication project appears to be a success! In 1996, we will continue monitoring the bait stations on Eastern Island on a quarterly basis.

We worked with PMC and OHM to implement a rodent prevention plan to prevent the reintroduction of rats or introduction of mice to Eastern Island during BRAC activities this past fall. This involved the placement of rodenticide bait stations around the harbor, inside vehicles traveling to and from Eastern Island, landing sites for the landing craft, and staging areas for vehicles on both Sand and Eastern Islands.

The Navy, through its base contractor, has an ongoing program to control introduced rats in the inhabited portions of Sand Island using poison bait stations. We also placed rat poison bait stations around dense Bonin petrel nesting areas on Sand Island,

primarily near the abandoned 6000 housing area. The petrel's productivity during 1995 was observed to be lower in these areas than that observed in 1993 and 1994. We believe this low productivity was caused by an influx of rats from the abandoned 6000 housing area after it was cleared of debris and vegetation which eliminated food and nesting habitat forcing the rats into other areas.

In late 1995, the Navy received funds through the Department of Defense Legacy Resources Program to conduct a similar rat eradication project of Sand Island. PMC has been contracted to begin the project in June 1996. Refuge personnel prepared an Environmental Assessment, Section 7 consultations, and Pesticide Use Proposals for this project. By December 1996, Midway Atoll should be rat free.

In addition to *Casuarina* and *Verbesina*, many other alien plant species were introduced to Midway since human inhabitation. This past year, we evaluated all alien plants for their potential as major pest species. The following species were identified as potential pests: 1) lantana (*Lantana camara*), 2) mother-in-law's tongue (*Sansevieria trifasciata*), 3) umbrella plant (*Cyperus alternifolius*), 4) sandbur (*Cenchrus echinatus*), 5) guinea grass (*Panicum maximum*), 6) black mustard (*Brassica nigra*), 7) koa haole (*Leucaena leucocephala*), 8) wild poinsettia (*Euphorbia cyathopora*), 9) Christmas berry (*Schinus terebinthifolius*), 10) air plant (*Kalanchoe pinnata*), 11) turks cap (*Malvaviscus arboreus*), and 12) guava (*Psidium guajava*). These species will be controlled or eradicated before they develop widespread populations that may impact the natural plant species diversity of the atoll.

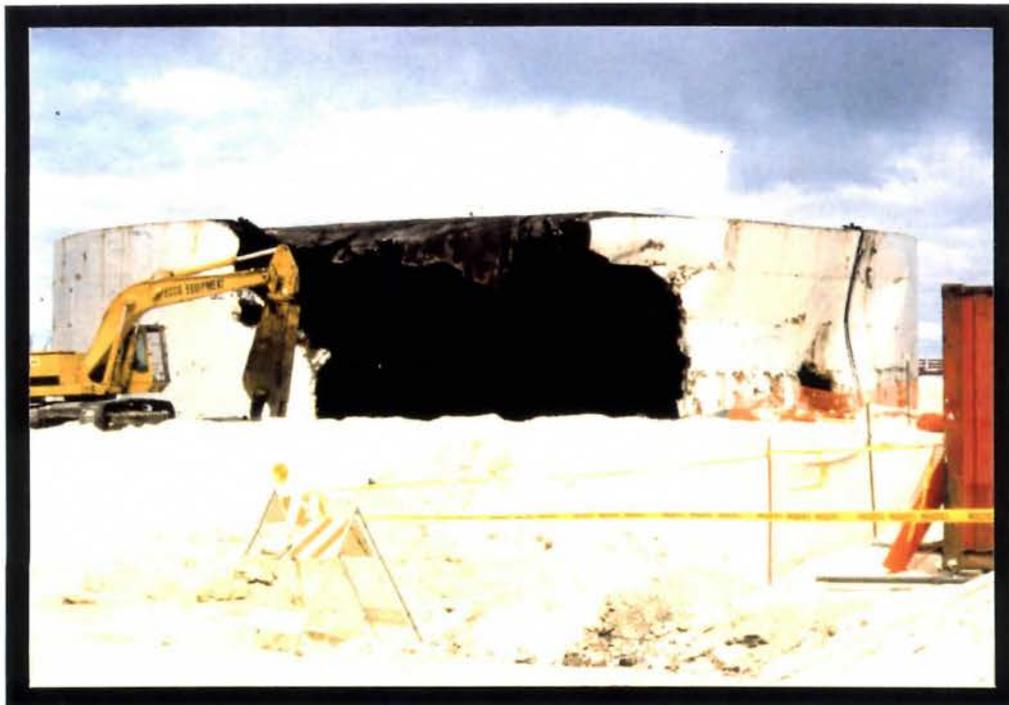
Pesticide use Proposals were submitted and received for use of herbicides Garlon4 and Rodeo. Garlon4 was used to control *Casuarina*. We intend to use Rodeo in association with management of *Verbesina*, and other alien plant species.

The base contractor may also conduct spot spraying to control mosquitoes and flies. Buildings are periodically treated to control cockroaches.

14. Contaminants

In 1995, contaminant cleanup activities related to base closure and Navy demobilization included: 1) fuel storage tank and pipeline removal; 2) soil and groundwater remediation projects; 3) building demolition on Sand Island; 4) Eastern Island cleanup; and, 5) groundwater monitoring at active bulky waste landfill on Sand Island. Following is a brief discussion of each of these activities.

1. Fuel Storage Tank and Pipeline Removal: In 1995, the last of the fuel storage tanks were removed. Nine underground fuel storage tanks (USTs) were removed from Fuel Farm 3 (FF3) on Sand Island, and one UST was removed from a site about 85 meters southwest of the Eastern Island pier. One aboveground storage tank was also removed from the active fuel farm on Sand Island. Fuel pipelines were removed from FF3 and from the north side of Nimitz Avenue between the cargo pier and FF3. All known USTs have now been removed, and all fuel pipelines slated for removal have been removed.



Demolition of one of the last of the large fuel tanks in Fuel Farm 3. [LP 10/95]

2) Soil and Groundwater Remediation Projects: Pesticide (DDT and DDE), polychlorinated biphenyls (PCBs), and petroleum contaminated soil and groundwater remediation projects were initiated this year. Pesticide contaminated soil (about 800 cubic yards) was excavated from 2 Sites on Eastern Island. The sites were backfilled with clean soil. This soil was transported to Sand Island and stockpiled in containment berms on a concrete pad across the street from the landing craft beach on Sand Island, and on the seaplane tarmac south of the seaplane hangar. Two pesticide sites on Sand Island were identified and characterized, through sampling and analysis, to determine the lateral extent of contamination. The Sand Island sites are expected to be excavated and backfilled with clean sand in 1996. Decisions relating to pesticide contaminated soil treatment are pending.

Four PCBs contaminated sites on Eastern Island and five sites on Sand Island were characterized and excavated this year. PCBs contaminated soil (about 1,500 cubic yards) is currently staged in containment berms on a concrete pad across the street from the landing craft beach on Sand Island, and on the seaplane tarmac south of the seaplane hangar. These soils are segregated by concentration (*i.e.*, above and below 25ppm). Treatment methodology for PCBs contaminated soil will depend on the contaminant concentration. Soils below 25ppm will be placed in the new Sand Island landfill. Soils above 25ppm will be shipped off-island for disposal at a certified hazardous waste disposal facility, and is expected to occur in 1996.

Petroleum contaminated soil and groundwater will be treated using *ex-situ* and *in-situ* remedial approaches. Contaminated soils (about 8,600 cubic yards) were excavated from isolated tank locations and relocated to staging areas on the seaplane tarmac and at the end of abandoned runway 15-33. These soils will be treated using one of two possible *ex-situ* techniques. Incineration is one alternative. This would require shipping a specially designed incinerator to Midway. Vapor extraction/bioventing is another alternative. This would involve injecting heated air, water, fertilizer, and possibly yeast into the contaminated soil stockpiles to promote biodegradation.

Larger scale petroleum contamination in the vicinity of FF1, FF3, FF4, and building 354 (old power plant) will be remediated using an *in-situ* technique. This process involves injecting heated steam into the ground through injection wells. The steam will cause the petroleum products in the soil and groundwater to become less viscous. Extraction wells will pull the petroleum product-laden-steam out of the ground for treatment. Installation of the systems to perform this *in-situ* treatment began in August. The systems should be fully installed and operational by April 1996.



Extensive oil contamination of ground and groundwater was found in the vicinity of Fuel Farms and generator facilities. [JH 6/95]

3) Building Demolition on Sand Island: Building demolition on Sand Island began in the 6000 Series Housing area. Two contaminant issues relating to building demolition were addressed this year including asbestos-containing materials (ACMs) and lead-based paint (LBP).

ACMs are present in buildings in several forms, including lagging (hot water pipe insulation), floor tile, wall and roof panels (Transite). Originally all ACMs were being removed from buildings prior to demolition. The purpose for ACMs removal is to prevent the release of asbestos fibers into the air. Inhalation of asbestos fibers has been shown to cause terminal respiratory illness in humans. The question was raised, however, relating to the need to remove non-friable ACMs prior to demolition. A test demolition was conducted in an attempt to answer this question. Friable ACMs (pipe lagging) were removed from the test building and non-friable ACMs (floor tile) were left in place. Air monitoring was conducted during the test demolition to determine if asbestos levels exceeded action limits established by regulatory agencies. Air monitoring results indicated that demolishing the buildings without removing non-friable ACMs will not result in significant risks to workers or the environment. Placing non-friable ACMs in the landfill will not pose a risk to the environment because the exposure pathway for asbestos is inhalation.

Lead-based paint (LBP) chips and flakes knocked off of buildings during demolition was also addressed this year. The decision was made that soil will be excavated to a depth of about three inches from around buildings after demolition, and placed into the landfill. This will be done only if the soil is observed to contain an obviously significant quantity of paint chips. The purpose of this action will be to remove the chips from the ground surface where ground-nesting seabirds can ingest them. Two studies have shown negative health affects in albatross chicks at Midway due to lead-based paint chip ingestion. Sampling and analysis has indicated that virtually all buildings on Midway are painted with lead-based paint.

4) Eastern Island Cleanup: Eastern Island cleanup work involved demolition and landfilling buildings, scrap material disposal, underground fuel storage tank demolition, and contaminated soil treatment. ACMs were removed from Eastern Island buildings and placed in the southeast corner of the new Eastern Island landfill. Building demolition sites were surveyed for the presence of LBP chips following demolition.



Equipment, personnel, and materials needed for environmental cleanup and building demolition on Eastern Island were transported from Sand Island by landing craft. [LP 10/95]

LBP chips were not observed in significant quantity, and no soil excavation was conducted. One UST was removed from a site about 85 meters southwest of the Eastern Island pier. Pesticide and PCBs contaminated soil was removed from several sites on Eastern Island as discussed in section 14.2 above.

Two additional contaminant issues on Eastern Island were addressed this year. These included removal of oil-filled electrical switches and transformers from buildings prior to demolition, and the disposal of creosote treated wood poles. The electrical switches and transformers were removed from buildings, placed in metal drip pans, and transported to a temporary hazardous waste storage facility on Sand Island (building 8107). The oil, some of which contains PCBs, was drained into 55-gallon drums and is awaiting shipment off-island to a certified hazardous waste disposal facility.

Creosote treated wood (telephone poles and wooden submarine netting floats) was hauled from Eastern Island to Sand Island and staged on the seaplane tarmac. Decisions relating to final disposal are pending.

5) Groundwater Monitoring at Active Bulky Waste Landfill on Sand Island: Navy contractors injected fluorescent dye into groundwater monitoring wells (installed in 1994) at the active bulky waste landfill on Sand Island. The purpose of this study is to trace the movement of groundwater at the bulky waste landfill. The information gained from this study will be used in decisions relating to the closure of the landfill. The study is ongoing and is expected to be completed during 1996.

Refuge Manager Niethammer attended Oil Spill Response Training provided by the Navy on 30 October through 2 November. On 1 November, we were to have an oil spill training exercise. Because of high winds, this training was canceled. However, about 2 hours after canceling the training exercise, we had the real thing. A hose on a fuel storage bladder, containing product from UST removal work, was not properly secured and several thousand gallons of product spilled into the secondary containment area. Response to the spill was immediate, there was no danger to wildlife, and all the product was contained within the lined-containment area. The spill was quickly cleaned up. Our response to the actual event was used as a training tool by the Oil Spill Response team that was on island for the training. We analyzed our actions. Much was learned.

15. Wildlife Hazards

Manmade wildlife hazards are abundant at Midway. Fenced enclosures, overhead wires, poles, lights, pits and voids, vehicle traffic, etc., adversely impact seabird, seal, and sea turtle survival. Elimination of these wildlife hazards is a major component of the BRAC process. The Navy contracted with Helbert Haster & Fee, Planners, for an assessment of man-made hazards to wildlife on Sand and Eastern Islands. Field surveys were conducted in 1994 to: 1) identify, describe, and map all man-made physical hazards to migratory birds, monk seals, and sea turtles; 2) prioritize the hazards according to a predetermined hierarchy of species; 3) identify methods to remediate the hazards; 4) estimate the cost of hazard remediation; and, 5)

develop a remediation schedule for the hazards based on minimizing impacts to wildlife.



Debris from the Eastern Island building demolition and environmental cleanup was put into a landfill specifically constructed for that purpose. [JH 11/95]

Buildings and aboveground structures create flight and entrapment hazards for seabirds. Abandoned and unnecessary buildings and structures are slated for demolition in order to eliminate the wildlife hazard they represent. Buildings and structures on Eastern Island (13 buildings and two large aboveground water tanks) were demolished in 1995. One small building was left for Service use as a storage shed for equipment and field supplies. Demolition rubble from the buildings and water tanks were buried in a new bulky waste landfill on the southwest side of the intersection of abandoned runways 12-30 and 6-24. Metal that had recycle value was transported to Sand Island and staged for future shipment to recycling facilities. Miscellaneous scrap materials (minor property from buildings, scrap metal, and wood) collected and staged on the abandoned runways in 1994 was also

transported to the new Eastern Island landfill for disposal. All wood was burned to reduce volume and to prevent landfill settling due to wood decomposition.

Building demolition on Sand Island also began in 1995. In December the first three housing units in the 6000 Series Housing area were demolished and placed in a new bulky waste.

Other wildlife hazards were addressed through the base closure process in 1995. Electrical lines injure and kill a number of seabirds every year. The Navy has begun removing unnecessary overhead lines and poles. The Service has stipulated that all future electrical lines should be placed underground to eliminate this hazard. Tar from the walls of a World War II era sentry post on the south shore of Eastern Island had melted and run out onto the ground surrounding the dilapidated structure. The tar covered an area on the ground surface measuring about 10x15 feet. On sunny days the tar became soft and sticky, creating an entrapment hazard for seabirds. Numerous albatross carcasses have been observed stuck in the tar. Sampling and analysis showed the tar to contain no environmentally hazardous constituents. The tar was removed from the site and placed in the new landfill on Eastern Island.

Operations to remove the sea wall along the north shore of Eastern Island began on 26 August and were aborted on 11 September. The intent of the project was to remove the decaying sea wall because of the entrapment hazard it poses for seals, sea turtles, and fledging albatross chicks. The entrapment hazard was created over a period of years as the above-water portion of the seawall began to rust and sand eroded from behind the wall. Albatross chick mortalities due to entrapment is high at this site during the later stages of the albatross nesting season. A similar situation on Tern Island, French Frigate Shoals, has resulted in seal and turtle entrapments.

The sea wall project was performed by a Navy Underwater Construction Team (UCT) based at the Navy's Construction Battalion Center in Port Hueneme, California. Operations to mitigate this entrapment hazard involved the use of explosives. The explosives did not work as well as expected. Repeated shots were necessary to sever the sea wall along the first 100 foot section of seawall. The use of explosives in the marine

environment poses a risk to federally protected Hawaiian monk seals, green sea turtles, and spinner dolphins. The operation was, therefore, aborted due to the inability to sever the sea wall, without using an excessive amount of explosives. The UCT will return in 1996 to attempt to remove the sea wall pilings using underwater cutting torches.



The Navy's Underwater Construction Team tried to remove sections of the old Eastern Island seawall by using explosives. [JH 9/95]

The UCT also knocked down an abandoned water tower (structure #5305) on Sand Island using explosives. The water tower represented a flight hazard for seabirds. The tower was disassembled and the scrap metal staged for shipment off-island to be recycled.

Open fresh-water treatment tanks trap albatrosses throughout the breeding season and particularly during the fledging period. These tanks are monitored and trapped birds are removed by PMC personnel. Albatrosses and Bonin petrels are especially

vulnerable to any kind of pit or void in the ground. These birds have an uncanny ability to find and enter these "death pits". Wildlife hazards, such as these pits, receive high priority treatment in BRAC planning. Pits and voids on Eastern Island were located and filled during the fall of 1994 and winter of 1995. Extensive efforts were made to fill pits and voids on Sand Island in 1995. This effort is expected to continue throughout the base closure process as new pits and voids are identified.

Nocturnal seabirds (petrels and shearwaters) are "attracted" to street lights as well as lighting around buildings. These birds are blinded and confused when they approach a light. Often, they will fly into the building, pole, or light and be injured or killed. Fledgling Bonin petrels are especially vulnerable to being disoriented by lights. The Service and Navy are working together to reduce the adverse impacts of lighting on seabirds by modifying lights and eliminating unnecessary lights. In January, the Navy modified four street light covers on Cannon Avenue, an area in which we have observed numerous dead petrels near light poles in recent years. Closed covers were replaced with open, cylindrical covers that were painted black on the side. This directed the light straight down towards the road. We observed petrel activity after these changes and found that petrels were not as disoriented as previously observed.

The Service, Navy, and base contractor continuously issue memos, verbal reminders, etc. cautioning drivers to be careful and obey the 15 mph speed limits. However, albatross are occasionally run over by careless drivers. Educational efforts have been somewhat successful as the number of vehicle mortalities have decreased over previous years. Road barriers were put up May through early August to reduce vehicle traffic in areas where densities of albatross chicks were too high to allow safe passage of cars and trucks.

Bird/aircraft strikes were common particularly during the spring. The birds always lose. Several strikes caused sufficient damage to ground aircraft until replacement parts could be sent out.



Roads in areas where albatross chick densities were too high to allow safe passage of vehicles were closed from mid-April through early July. [KN 6/95]

G. WILDLIFE

1. Wildlife Diversity

Many islands within the Pacific/Remote Islands NWR Complex, are managed with the intent of restoring and maintaining their pre-human floral and faunal diversity. Currently, the flora and fauna of Midway Atoll is probably far more diverse than pre-human occupation. This is due to the introduction of many plant and animal species either intentionally or accidentally. These introduced species have often out competed native species.

However, some of these changes have benefitted native seabird species. For example: the black noddy and white tern populations are probably significantly above those of pre-human habitation. This is due to the introduction of ironwood trees which provide nesting habitat. On the other hand, ironwood trees have adversely impacted nesting success of red-tailed tropicbirds and

Christmas shearwaters by shading out native shrubs that provide nesting cover for these two seabird species.

Elimination of all alien species to return to a pre-human native diversity is probably not possible. Current and future Refuge management will address eradicating or controlling alien species that have major adverse impacts on native bio-diversity and prevention of additional introductions.

2. Endangered and/or Threatened Species

The **short-tailed albatross** (*Diomedea albatrus*) is not presently listed as an endangered species under the U.S. Endangered Species Act (petition to list is presently being considered). However, because of its low population, estimated world-wide population of about 700, it is treated as an endangered species at Midway Atoll NWR.

In the early 1960s, a pair of short-tailed albatross was suspected of nesting on Sand Island for several years. Since 1963, no successful nesting has occurred. However, several sightings of four different individuals occurred on Sand and Eastern Islands from the late 60's through the early 80's.

Two short-tailed albatross individuals (white 000 and yellow 015) have been visiting Midway every year during their breeding season since 1984 (white 000) and 1989 (yellow 015). The adult (white 000) was last seen on Sand Island on 3 November in 1994. It has not returned to Midway since. The younger individual (yellow 015) continued to visit Sand Island for the remainder of the 1995 season (through mid-April). It returned to Midway in late October 1995. On 8 November, it was observed sitting on an egg in a nest cup. It diligently incubated the egg until 8 January 1996 for a total of 60 days. The egg was infertile and collected. An abandoned black-footed albatross egg was placed in the nest cup. This same individual (yellow 015) was believed to have laid an egg in November 1993. It incubated that egg for 31 days.

A subadult (red-orange 051) has been observed frequently on Eastern Island on since 13 December 1995. It was sighted at the northeast corner of the island in an open area next to a group of ironwood trees.

Midway's population of endangered **Hawaiian monk seals** (*Monachus schauinslandi*) has declined precipitously since the 1950's. The highest recorded counts occurred in 1957-58 when there was a mean of 55.7 seals. Virtually all of those seals were found on islets between Sand and Eastern islands. However in March 1968 only a single seal was observed during an aerial survey. The decline has been attributed to human disturbance and its effects on reproduction and juvenile survival. The human population of Midway declined after World War II; but increased in the 1960's to a maximum of about 6,000. By 1978, the human population had declined to its present level at about 250-300. Efforts to decrease human disturbance and other management actions may be showing some promise.

Six monk seal pups were born in 1995 (3 on Eastern Island and 3 on Spit Island). At least 5 of these pups were tagged by refuge staff, L.L. and K.V. Eberharts, and NMFS staff.



Hawaiian monk seal mom and pup. In 1996, six pups were born at Midway Atoll. [RA 6/96]

L. L. and K. V. Eberhart, volunteers for National Marine Fisheries Service, were on Midway from 1 to 28 April. The purpose of their trip was to determine the status of the Hawaiian Monk Seal population at Midway Atoll. Results from their beach counts conducted on Sand and Eastern Islands indicated an average beach count of 7.3 seals on both Sand and Eastern islands. The overall average beach count for Midway was 15.6 seals, excluding pups born in 1995. During the March survey, 41 different seals were identified. Individual seals were identified with bleach markings or tags. The Eberharts tagged a total of 7 seals during their trip (2 weaned pups, 2 yearlings, and 3 two-year olds).

In August, Bill Gilmartin and four other NMFS personnel visited Midway from the 4th through the 18th to conduct censuses and tag any untagged seal. This group tagged a total of 8 seals.

Immature and subadult threatened **green sea turtles** (*Chelonia mydas*) were common in Midway's waters. Adults are less common. A few turtles bask on Midway beaches. There are no historic records of turtles nesting at Midway. In May, a dead turtles washed up on the beach near the cargo pier on Sand Island. This turtle was obviously attacked by a shark. It's shell was scraped up with tooth marks and indentations, and a bite-size section missing. There were also injuries to two flippers and the tail. Tissue samples from this turtle were sent to George Balazs (NMFS) to be added to a study which is examining the genetic structure of the Hawaiian green turtle population. In November, a medium to large platter sized turtle was observed under attack by at least 4 tiger sharks and several other reef sharks in waters between Sand and Eastern Islands.

3. Waterfowl

Waterfowl do not regularly migrate to or overwinter at Midway. However, each year a few misguided birds arrive at Midway. In 1995, blue-winged teals (*Anas discors*), northern pintails (*Anas acuta*), common pochard (*Aythya ferina*), tufted ducks (*Aythya fuligula*), and buffleheads (*Bucephala albeola*) were observed in protected marine waters or ephemeral ponds and catchments. Records of observations were sent to American Birds.

5. Shorebirds, Gulls, Terns and Allied Species

Common, non-breeding, migratory shorebird species that overwinter at Midway are the Pacific golden plover (*Pluvialis dominica*), bristle-thighed curlew (*Numenius tahitiensis*), wandering tattler (*Heteroscelus incanus*) and ruddy turnstone (*Arenaria interpres*). Other migrants that were observed include: Cattle egret (*Bubulcus ibis*), semipalmated plover (*Charadrius semipalmatus*), sanderling (*Calidris alba*), pectoral sandpiper (*Calidris melanotos*), sharp-tailed sandpiper (*Calidris acuminata*), western sandpiper (*Calidris mauri*), buff-breasted sandpiper (*Tryngites subruficollis*), dowitcher (*Limnodromus sp.*), and dunlin (*Calidris alpina*).

Least/Little Tern

Two individuals were observed at the Catchment Pond from 6 July through 28 August in breeding plumage. Two individuals in first summer plumage were observed, also at the catchment pond, from 28 August through 21 September. All four individuals were observed together on 28 August.

Gray-backed Tern

The first adults observed in 1995 were seen flying over Eastern and Spit Islands, and resting on channel markers in the lagoon on 28 February. The first eggs of the season were observed on 14 April on Eastern Island. Chicks started hatching by 18 May. By the end of September, most chicks had fledged. Small numbers of adults and chicks, however, were still present through October. Mean incubation counts conducted from 16 April through 24 August observed a peak in breeding activity (198 nests) on 19 June.

Sooty Tern

Adults were first heard calling overhead on 24 March on Eastern Island. By early April, thousands were observed in the air over Eastern and Spit Islands. The first eggs of the season were observed on 24 April. The first chicks of the season were observed by 12 June on Eastern Island. Fledged chicks were observed as early as late July. By the end of October, no adults or chicks were present in the atoll.

Brown Noddy

Adults started arriving on Sand Island in early April. The first egg of the season was observed on 7 May on Sand Island. Egg

laying continued through September with an apparent peak in June and July. Chicks were observed beginning in mid-June. By early September, most chicks had fledged. Small numbers of fledged chicks were present through December.

Black Noddy

Black Noddies were observed exhibiting nesting behavior throughout the year. However, most of the nesting activity occurred from April through September. By early October, few adults were observed on the island.

White Tern

Nesting occurred throughout the year. Peak nesting activity occurred from April through August.

Gull spp.

As many as six gulls (herring gull, glaucous gull, and unidentified species) in winter or juvenile plumage were observed on Sand and Eastern Islands from January through April. A silver gull was observed on Sand Island for a couple of weeks in early November.

6. Raptors

A black kite was observed on Sand Island from late December 1994 through early March 1995. The identification of the kite was verified through Bob Pyle at Bishop Museum.

7. Other Migratory Birds

Laysan and Black-footed Albatross

Midway has the world's largest colony of breeding Laysan albatrosses. Over the past years, human activity on the atoll has declined. With this decrease in disturbance, the albatross population has increased to as many as 429,308 breeding pairs (1991). We have scheduled for the 1996/97 nesting season to conduct another atoll-wide population count of the Laysan albatross.

Because of a reported population decline at French Frigate Shoals in 1994, the refuge staff at Midway conducted atoll-wide counts of breeding black-footed albatrosses to determine if the Midway population was also declining. The counts were conducted in

early December 1994 and 1995 and data was compared to an atoll-wide survey conducted in December 1991. During the 1991/92 breeding season, the atoll's black-footed albatross population was 19,757 breeding pairs. We counted a total of 18,731 breeding pairs in 1994 and 18,628 in 1995. Most of the 5.2% (atoll-wide) decline observed in 1994 when compared to 1991 occurred on Sand Island and could be attributed to disturbance in nesting areas due to underground storage tank removal projects. The number of albatrosses nesting on Eastern Island actually increased by 1% in 1994. In 1995, the nesting population was 2.5% lower than that of 1991; but, 2.8% higher than in 1994.

The decrease in the total population could be explained by a several possible factors: 1) increased base cleanup activities are altering nesting habitat and disturbing nesting birds, 2) impacts from long-line fishery industries, and/or 3) a natural fluctuation in the black-footed albatross population. Recent data suggest that long-line fishing boats are injuring or killing adult albatrosses, primarily black-footed albatrosses. We are concerned and will continue to monitor the population.

Bonin Petrel

Adults first returned to nesting colonies in early August. Egg laying started in mid-January and continued through mid-February. Chick were hatching by 7 March. By mid-June, most of the chicks had fledged. During banding forays in three banding sites (near the baseball field, behind the chapel, and near the AT&T satellite dish), we observed very low numbers of fledglings. These low numbers may have been caused to an influx of rats from the neighboring abandoned 6000 housing area that was being cleared for demolition or it may have been a poor production year because of other environmental conditions such as poor prey availability.

We conducted 9 mist-net sessions from 24 January through 13 February in three historical plots set up in 1994. These sessions were conducted to repeat the study conducted in 1994 with a smaller sample size. This study evaluated the possibility of using capture-recapture procedures to estimate the breeding population of Bonin petrels. Other than banding and reading bands, the data set was not useful because it was too small to generate a population estimate.

Six pairs of birds nested in artificial nest boxes placed in the ground since 1994. Three of these pairs nested in the same box in both 1994 and 1995. Two pairs successfully fledged chicks. Fates of the other nests were: one chick killed by a rat, one egg eaten by a rat, one egg abandoned by a female whose mate never came to relieve her, and one infertile egg.

Wedge-tailed Shearwater

Several adults were first observed at the golf course hill behind the All-Hands Club on 23 March. The first egg was observed on 6 June. By August, most of the eggs had hatched and chicks were about 1/3 grown. All chicks had fledged by late November.

Christmas Shearwater

This year, we conducted an intensive project assessing the Christmas shearwater breeding and non-breeding population, and documenting the reproductive success of breeding birds. The first adults returned to Eastern Island on 16 March. By mid-April, as many as 100 birds were observed scattered throughout the different breeding colonies at night. We observed the first eggs of the season on 28 April. Eggs were found between 28 April and 19 July. These dates, however, did not reflect the shearwater's egg laying period. All possible nesting sites were not thoroughly searched due to limited personnel and bad weather. Thus, a number of nests were found late in the egg stage. Of the 45 nests monitored during the chick hatching period, chick hatching dates ranged from 16 June through 26 July. During an 8-day period from 19-26 June, 86% of the chicks hatched. Chicks fledged from 25 September through 3 November. Fifty-eight percent of the chicks fledged by 3 October.

We calculated a 74.5% hatching success (n=95), a 84.5% fledgling success (n=71), and an overall reproductive success of 63.16%. A total of 73 chicks fledged successfully in 1995. This is a much higher number than the 12 fledged chicks that were observed in 1994. It is possible that this increase in reproductive success resulted from eradication of rats from Eastern Island during the previous year. There were no signs of rat predation at failed shearwater nests.



Adult Christmas shearwater with chick. [RA 7/96]

White-tailed Tropicbird

A total of 6 nest sites, all on Sand Island, are presently known. Five active nests were observed in 1995, four of which were newly discovered nest locations. Of these active nests, 3 successfully fledged chicks, all in the abandoned 6000 housing area. These chicks were banded before fledging. A fourth nest, located in the flower box of bldg. 422, contained an egg in late August. This egg, however, was either destroyed by the bird or eaten by a rat. The fifth nest was found in early November in a cavity at the base of a tree located near an abandoned barracks building across of the albatross statue. This chick was already fully feathered with traces of down. Within two weeks, the chick developed avian pox lesions covering both eyes. By the end of November, the chick was completely blinded by the lesions and extremely thin. It was euthanized.

In early March, a dead fledgling was found on Decanter road, near the abandoned 6000 housing area. The nest site of this chick was never found.



White-tailed tropicbird on a nest in
an ironwood tree. [TM 8/93]

Red-tailed Tropicbird

A few are present throughout the year on Midway. However, most return in January and February. Eggs were observed as early as mid-February, with a peak in May and June. By late August, egg laying seemed to be coming to an end. By the end of the year, only a few late stage chicks were present.

Great Frigatebird

Frigatebirds roost on all three islands in the atoll. They nest, however, only nest on Eastern Island. The first eggs of the season were observed on 24 March. Chicks were hatching by 19 May and by early November, some chicks had fledged. By early December, few adult and juvenile frigatebirds were observed in

the atoll. Mean incubation counts on Eastern Island were conducted from 24 March through 30 October. Nest counts ranged from 7 to 87. The highest number of active nests, 87, was counted on 19 May.

Red-footed Boobies

A very small number of adults on eggs were observed on Eastern Island in February. More eggs were laid by mid-March. Heavy storms, however, caused many nests to fail by late March. Surviving nests hatched chicks in late March. By late April, most of the failed birds had relayed eggs. By late November, the number of adults and late stage chicks was very low.

Masked Booby

Nesting activity has not been recorded since the mid-1980's. This year, a total of 4 nesting attempts occurred on Eastern Island. Since the adults are not banded, we do not know whether all four nests were attempted by different pairs. However, we can account for at least 2 nesting pairs (nesting together late in the year). One individual from the first successful nest was banded in December. In 1996, we will band adults with colored aluminum bands to allow individual identification disturbing them.

The first nest observed this year was on 27 March. This nest failed by early April. By late April, another nest with two eggs was observed. This pair incubated the eggs until 26 July, 69 days past the expected hatch date. Then, the pair abandoned the nest. On 11 September, a pair was observed incubating two eggs. The eggs hatched on 24 and 26 October. The younger chick was tossed out of the nest. By the end of the year, the chick was developing with scapulars visible and down present on the head and back only. On 18 December, another pair of birds laid a single egg about 20 meters from the nest with the chick.

Brown Booby

A few individuals were observed on buoys in the lagoon in early September.



Masked booby adult with chick.

[NS 12/95]

9. Marine Mammals

Our resident population of Spinner dolphins (*Stenella longirostris*) were regularly seen in the lagoon throughout the year.

10. Other Resident Wildlife

Midway's only terrestrial breeding bird species are the introduced common canary (*Serinus carius*) and common myna (*Acridotheres tristis*). In recent years, mynas have been observed depredating local gardens and scavenging abandoned eggs. Introduced rats and mice were also present on Sand Island. Mice do not occur on Eastern or Spit Islands.

11. Fisheries Resources

About 49 families, represented predominantly by reef fishes, are associated with Midway Atoll. Additional pelagic fish species occur in deeper waters within and outside the atoll.

14. Scientific Collection

The SERE group salvaged abandoned albatross eggs and injured albatrosses and collected blood samples from several hundred healthy albatross adults (see Section D-5).

In December, Ten Laysan albatross eggs collected in association with BRAC activities in December were salvaged for Canadian Wildlife Service biologist, Keith Hobson (see Section D-5).

Twelve specimens of dead vagrant or local seabird species were collected and transferred to Bishop Museum's Vertebrate Zoology Collections Department.

15. Animal Control

Piquiniq Management Corp. uses bait stations to control rat populations in and near occupied areas of the NAF on Sand Island. While designed for the welfare of the human population, these measures benefit burrow nesting petrels and tree nesting white terns and black noddies. Refuge staff placed additional bait stations in areas of dense Bonin petrel nesting areas. For further information on rat control and eradication efforts at Midway refer to Section F-10.

16. Marking and Banding

In 1995, Refuge staff banded 1,013 birds.

Birds banded in 1995 by Refuge staff.

Species	LOCAL	ADULT	TOTAL
Black-footed Albatross	72 ¹	4	139
Laysan Albatross	101	18	119
Bonin Petrel	64	271	335
Christmas Shearwater	83	242	325
Wedge-tailed Shearwater	83	-	83
White-tailed Tropicbird	3	-	3
White Tern	72	-	72
Total	478	535	1013

¹45 of the black-footed albatross chicks were also color banded.

In 1995, the SERE Group banded several thousand albatross adults and chicks.

17. Disease Prevention and Control

Wildlife Disease Specialist, Thierry Work, and his assistant Bob Rameyer, visited Midway from 30 June through 7 July to investigate a sudden increase of adult Laysan albatross mortality. We contacted Work after observing groups of adult Laysan albatrosses dying with no obvious signs of acute trauma. Dead birds were found in positions that appeared as if the birds were resting and just died. Numerous adult birds were also found panting heavily. After a few days of observations, Work and Rameyer noticed that sick birds were excessively panting, had a very yellow bill, and were weak and hesitant to move away when approached by humans. Work and Rameyer necropsied 21 adults and 16 chicks and took blood from 43 sick adults and 10 chicks. They found that sick adults were very anemic and had elevated white blood cell counts. Necropsies revealed that the birds appeared to be in fair to good body condition with no evident lesions other than pale organs and green lungs (probably due to post-mortem artefact). Preliminary results suggest possible causes for these deaths: 1) adults are dying from simple exhaustion after a season of nurturing chicks to fledgling stage; 2) an infectious agent is affecting the hematopoietic system of these birds; 3) some toxin, perhaps a sort of biotoxin that the birds are feeding on, is destroying their red blood cells; or 4) a local toxin (man-made), such as lead, is causing anemia in these birds. Work is awaiting results from further analysis of collected tissues to determine the precise cause of these deaths.

H. PUBLIC USE

1. General

Presently, there is no "public" access as such. The base has restricted access and base clearance must be acquired before arrival. Residents must be employed at the facility. Visitors are allowed for specific projects or, in some cases, aircraft layovers and emergency ship repairs. In 1995, about 2,000 people visited Midway under the above guidelines.

Midway is supplied by a weekly Air Mobility Command (Airforce) C-141 cargo plane which carries passengers, mail, perishable goods and high priority cargo. Other supplies and equipment are brought via cargo ships about every 6 months.

On 31 August, Midway Atoll was the location of a ceremony in remembrance of and the battle of Midway and in celebration of the 50th anniversary of VJ Day. This ceremony was organized by the International Midway Memorial Foundation. The ceremony was attended by about 125 people flown in on a plane chartered for this occasion or who arrived via military planes. Visitors included Navy VIPs (CNO, Rear Admirals, Vice Admirals, etc.) Veterans, families of veterans, and others. The day-long activities went well. A monument to the men who fought the "Battle of Midway" was the centerpiece for the ceremony. A plaque re-dedicating the Eastern Island landing strips as Henderson Field was installed on Eastern Island as a part of the day's ceremonies.



About 125 people attended a ceremony in remembrance of the battle of Midway and in celebration of the 50th anniversary of VJ Day. [KN 8/95]

6. Interpretive Exhibits/Demonstrations

All new arriving personnel were given wildlife briefings. These briefings were designed to inform the new arrivals of rules and regulations that they must follow while at Midway. The objective of the wildlife portion of the briefings was to prevent potential wildlife/human conflicts. Employees of contractors working on Base cleanup projects that involved working within wildlife sensitive areas were given additional briefings within a few days of their arrival.

A display of the wildlife of the Northwestern Hawaiian Islands was located in the new-arrivals briefing room. The Refuge office also had several informational displays of local wildlife posted on its walls.

7. Other Interpretive Programs

Refuge staff are regular contributors to the Base newspaper. Staff submitted articles on the biology of seabirds and other wildlife issues. We found that the newspaper is an excellent avenue to remind island inhabitants to be considerate of wildlife. Topics of articles submitted by Service personnel in 1995 included: short-tailed albatross, Hawaiian monk seals, wedge-tailed shearwater, coral reefs, Bonin petrels, ironwood tree management, green sea turtles, and the future of Midway after the Navy departs.

On 24 May, Neil Sims and Dale Sarver presented a slide show presentation on the black-lip pearl oyster and the objectives of their pearl-oyster research at Midway.

On 31 August, Wildlife Biologist Seto presented slide shows on the "Wildlife of Midway" to visitors attending the International Midway Memorial Foundation ceremony. Manager Niethammer provided wildlife and historic building/facility briefings to these visitors during bus tours of Sand Island. BRAC Laborer Moore assisted with a limited (about 20 people) tour of Eastern Island.

On 18-19 January, the Navy sponsored a trip to Midway for members of the Press. The Objective of the trip was to inform the public about the cleanup/base closure activities at Midway. Pacific Remote Islands National Wildlife Refuge Complex (PRINWRC) Manager

Ken McDermond visited Midway along with reporters from Channel 9 TV (Honolulu), Star Bulletin (Honolulu), and San Francisco Chronicle. He gave interviews in which he explained the Service's role at Midway.

Midway Atoll National Wildlife Refuge was introduced to the general public through inclusion in a segment "Our Gifts to Us" on the CBS News Sunday Morning program which aired on 24 December. Photojournalist Mike May visited Midway twice in December (8-10 and 15-19) to get video footage for this program.

8. Hunting

Hunting is not allowed at NAF Midway. Firearms are prohibited.

9. Fishing

Recreational fishing is a popular activity at Midway Atoll. Finfish are caught by hand line, pole and line, and throw net. Spear fishing is not allowed at NAF Midway. Because of the danger of ciguatera poisoning, the consumption of finfish caught inside the reef is forbidden. The recreational take of finfish is not otherwise regulated at Midway since it lies outside of state jurisdictional boundaries. As weather and seas allow, fishing parties use Base recreational boats to troll outside the reef for pelagic fish species, such as ahi (*Thunnus alalunga*), aku (*Katsuwonus pelamis*), and ono (*Acanthocybium solandri*), which have not been found to be ciguatoxic. The Refuge does not manage the fishing program at Midway.

10. Trapping

Spiny lobster (*Panulirus marginatus*) trapping and free-hand capture by snorkelers and divers were allowed at NAF Midway. The take of lobsters was popular with local residents. Lobsters do not accumulate the ciguatera toxin and were considered safe for consumption.

11. Wildlife Observation

The ability for the public to participate in wildlife observation was limited at Midway due to the controlled access onto the military installation. In addition, visitation to the

uninhabited islands was further restricted by the Officer-in-Charge (OIC) and Refuge. Island residents and visitors were able to observe nine species of seabirds nesting on the inhabited island (Sand). Monk seals and sea turtles were commonly observed on the beaches or in the nearby waters.

14. Picnicking

One picnic pavilion is located at the recreational beach on the north side of Sand Island. In 1995, this site was regularly used by residents and visitors for cookouts.

16. Other Non-Wildlife Related Recreation

Other non-wildlife recreational pursuits included softball, cricket, tennis, motor boating, snorkeling, jogging, bicycling, diving, ceramics, beach combing, table-tennis, basketball, racketball, beach volleyball, and various other pursuits. Recreational equipment is provided at nominal charges by base recreational services. These activities were not regulated by the Refuge unless conflicts with fish or wildlife existed.



One of the Sri Lankian teams preparing for the annual cricket ceremony and game. [JH 9/95]

17. Law Enforcement

Refuge staff had no law enforcement authority and base law enforcement duties were vested in the Officer-in-Charge. Generally, deliberate violations of wildlife regulations by island residents are rare due to severe punishments (probable loss of job and deportation from Midway). Refuge staff try to prevent human/wildlife conflicts by providing briefings to all arriving personnel, articles in the base newspaper, and other educational avenues.

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

In late 1995, the Service and its private sector partner for future operation of Midway, Phoenix Air, put together a list of buildings and facilities that we plan to use after the Navy departs. The list included 158 structures. The Service will use 5 buildings for our office and residences, the U.S. Weather Service will use one building for their remote weather/tide station, and Phoenix Air will occupy the rest of the buildings during their future operations. Most of the "future use" facilities will require some degree of rehabilitation or remodeling before they can be fully utilized. This rehab work will begin in 1996. Of the 145 existing buildings that will not be used, about 125 will be demolished and 15 will be secured to eliminate wildlife or human health hazards and left in place.

4. Equipment Utilization and Replacement

In 1995, the Refuge had a 17-foot Boston Whaler, equipped with a main 70 Hp and a backup 25 Hp outboard motors, and a Mark III Zodiac inflatable-boat, equipped with a 25 Hp outboard motor, for water transportation.

The Service had a refurbished electric golf cart, a gas powered golf cart, nine bicycles, and one four-wheel all terrain vehicle for land transportation.

5. Communications Systems

The Refuge depends on the Navy's Autovon telephone system for communications. The entire island depends on this line. Sometimes, callers have to wait several hours to place an call. Consequently, phone communication with the Complex Office in Honolulu is often trying. Telephone communication was also available through the AT&T International line, but at international telephone rates which really impacts the budget.

6. Computer Systems

In May, we upgraded the RAM in our old 486 from 4 to 12 MB. In September, the Refuge received a new Pentium 90 computer. We now have the Pentium 90, two 486, and one 286 computers. Presently, one of the 486s, the Pentium 90, and the 286 computers are hooked up to our Laserjet4 printer and the other 486 is online with a Hewlett Packard Deskjet 500 printer. We have a dot matrix printer as a backup printer.

New software purchased this year included Word Perfect 6.1 upgrades, Excel, and ArcView GIS system.

8. Other

The Service's primary facility was the Refuge office located in the one-room NAF Museum at the Midway "Mall". When the office opened in November 1990, it occupied a small corner in the one-room NAF Museum. The Refuge staff has grown and we have slowly spread to where we now use the entire Museum as office space.

The Refuge Manager, Wildlife Biologist, and BRAC Biologist reside in the Service's duplex, residence building (Bldg. #330). Other Service employees, volunteers, and visitors are billeted in the Navy barracks.

J. OTHER ITEMS

1. Cooperative Programs

The refuge overlays an Navy installation which is in the process of being closed; thus, the entire site is managed cooperatively

with the military and its contractors. Refuge personnel monitor base projects, programs, and situations for potential to negatively impact fish and wildlife resources. Refuge staff make recommendations to avoid, reduce, or otherwise mitigate impacts. Since almost all unpaved areas provide nesting habitat for some species of seabirds, most outdoor projects and activities have potential for some impact.

3. Items of Interest - Wildlife Issues

The amount and type of future use of Midway after the Navy departs in 1997 will have dramatic impacts on the management of Midway Atoll NWR. Presently, just what level of activity will occur is unknown (see Section C-1).

The control/eradication of alien plant and animal species will be a major emphasis of refuge management for the foreseeable future. Eliminating the impacts of rat predation on seabird eggs and chicks and herbivory on native plants was probably the most beneficial habitat management action that could be undertaken at Midway. The Navy funded rat-eradication projects should solve this problem. Alien plant species now dominate the terrestrial landscape. In 1995, we developed a management plan that addresses control, eradication, and prevention of alien plant species and reestablishment of native plant communities.

Harmful impacts that overhead wires and lights have on wildlife are other areas that will receive priority attention in 1996.

4. Credits

This narrative was written by Nanette Seto, Jon Hale, and Kenneth Niethammer. Duane K. McDermond also contributed to the document.

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K. FEEDBACK

This has been another challenging year for the staff of the refuge and for complex office staff. The closure and ongoing cleanup of Midway have forced us to use and refine our negotiation skills. In the face of massive cleanup projects we have had to watch as the resources we are dedicated to protect have been disturbed, displaced, and sometimes destroyed. As difficult as this has been we keep our eye to the long term in the belief that we are clearing the way for a better lot for wildlife in the future. We believe that the tradeoffs we have made have been justified.

The success, so far, of the base closure process can be attributed to only one thing - the reasonable and cooperative nature of all parties and individuals involved. The Navy has shown great character and stewardship. Refuge staff have worked long and hard to negotiate and implement reasonable conservation measures; the regional law enforcement office showed great trust and were progressive in issuing a migratory bird permit for base cleanup.

A concurrent challenge at Midway is charting a course for the refuge's future. As discussed in this report, the current approach is to obtain a concession contract for operation of a public visitation program, with the added requirement for supporting the refuge with logistics and facility maintenance. This would be an ambitious, innovative, and challenging goal anywhere in the continental mainland. At remote Midway it will be exceedingly so.