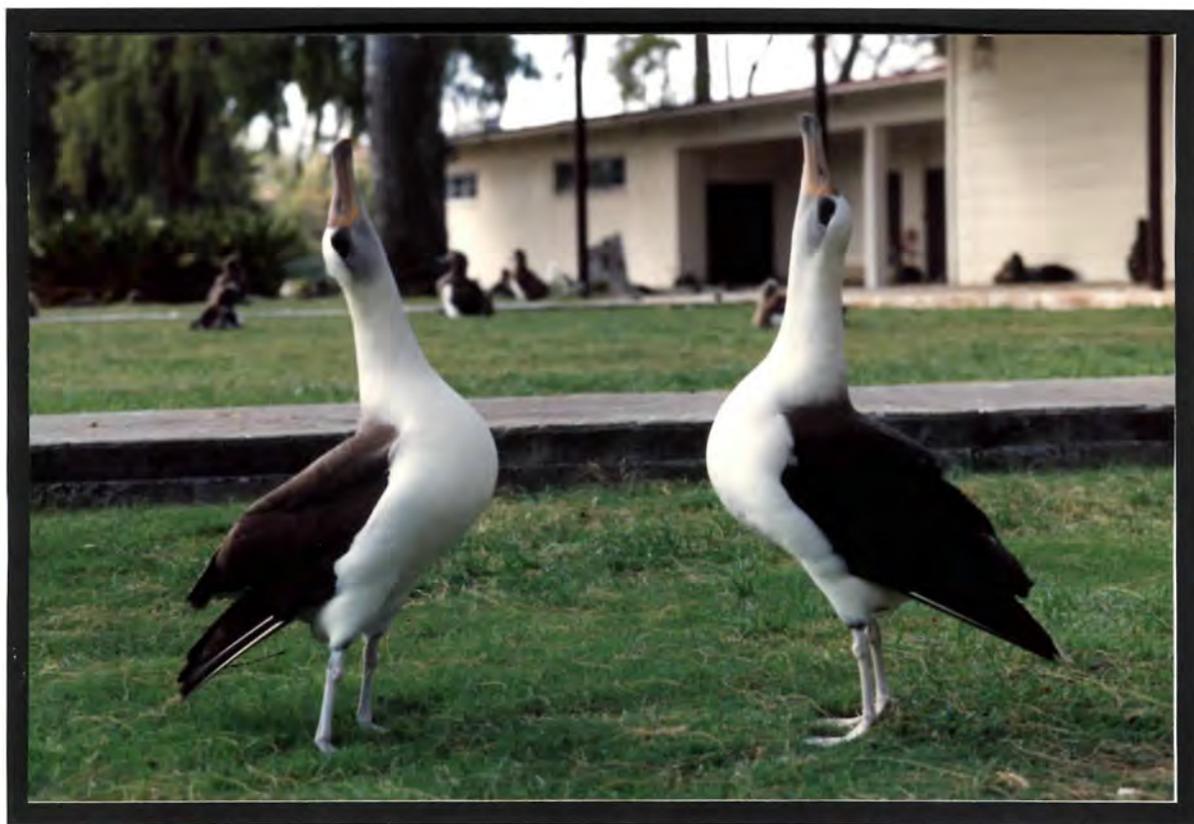


MIDWAY ATOLL NATIONAL WILDLIFE REFUGE

Midway Atoll, Pacific Ocean

ANNUAL NARRATIVE REPORT

Calendar Year 1994



About 430,000 breeding pairs of Laysan albatross (the famous Midway Gooney Bird) nest at Midway Atoll. [TM 3/94]

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 1994

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7/10/95

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8/22/95

Date

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 1994, the Navy staff at Midway typically consisted of one officer and three 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 third country 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 few years.

In 1994, staffs of two contractors, working on BRAC cleanup

projects, increased Midway's human population from about 200 to 300. OHM Remediation Services, Inc. (OHM) was the contractor charged with removal of underground fuel storage tanks. Employees of OGDEN Environmental (OGDEN) and Energy Services Company, Inc. completed extensive contaminant surveys of Eastern and Sand Islands.

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.

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

Underground storage tank removal projects begin in March (Section F-14).

Legacy Project (rat eradication on Eastern and Spit Islands) begins in August (Section F-10).

Cleanup activities on Eastern Island begin in September (Section F-15).

Many staffing changes occur during the year (Section E-1).

Future operation of Midway Atoll NWR may include ecotourism (Section D-2).

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, 1994.

Month	Temperatures °F					Precipitation (inches)
	High	Low	\bar{x} High	\bar{x} Low	Monthly Mean	
JAN	80.8	55.9	73.3	61.8	67.6	0.90
FEB	80.8	55.5	78.1	60.6	69.4	3.20
MAR	81.5	55.9	76.1	63.0	69.6	1.19
APR	Temperature data not available					1.90
MAY	85.6	60.7	80.8	68.5	74.7	1.97
JUN	90.1	70.9	87.3	74.5	80.9	0.98
JUL	90.0	70.7	87.4	73.9	80.7	2.87
AUG	92.0	73.0	88.8	75.5	82.2	3.23
SEP	91.0	71.5	87.2	75.0	81.1	7.66
OCT	89.0	65.5	84.5	72.2	78.4	0.88
NOV	85.5	65.9	80.3	69.2	74.8	2.95
DEC	84.5	62.1	78.7	67.8	73.3	<u>10.86</u>
					Total	38.59

C. LAND ACQUISITION

1. Fee Title

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. 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 to the 3-mile limit. The Service was the only federal agency which requested transfer of Midway.

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 Service felt that this was an unnecessary step as federal agencies normally have first right of refusal for disposal of bases. However, the Navy thought that it was in the best interest of the public to attempt to find a way to keep the airfield and the harbor open. At the time, the Service's position was that we would not be able to keep those facilities open. 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.

A variety of interests were represented at the first reuse meeting:

Phoenix Air: This is an aircraft company that has contracts with Department of Defense for target towing, explosives transport, etc. Midway is critical for them in getting their planes to Honolulu and the far East.

L&L Enterprises: This company wants to buy the island and run it as a resort for as many as 800 people, including shark fishing, casino, ecotourism, etc.

Hawaii Office of State Planning: The state expressed that their only interest was in including Midway within the political boundary of the state.

Hawaii Department of Land and Natural Resources: This agency supported use as a federal refuge.

Hawaii Department of Transportation: This department expressed some interest in assisting with establishment of an airport at Midway, which they felt may have some benefit to airlines for safety and hence tourism.

Federal Aviation Administration: FAA said that they did not have any interest unless a civil airfield was established. They would then have some regulatory oversight.

Midway Memorial Foundation: This group wanted Midway to be turned into a National Park. They were concerned that, if Midway was turned into a limited access refuge, there would be loss of public access to an important historic site.

Coast Guard: The Coast Guard expressed interest in maintaining the ability to at least land at Midway. The best scenario for them would be to still have access to fuel, berthing, and food. This would allow them to conduct extended search and rescue and law enforcement flights.

All participants were requested to provide written statements summarizing their interests in Midway. In June, we provided our goals, preliminary management objectives, and concerns.

In August, the Service provided comments on proposals from other parties and agreed to work with other entities toward maintaining airport and fueling capabilities, on a limited basis, at Midway. This also included an option for small scale ecotourism.

In December, John Doebel, Robert Smith, and Ken McDermond met with the Navy to discuss progress on transfer of Midway. The Navy indicated that they would recommend transfer of Midway Atoll to the Service to higher commands. This recommendation would be based on our proposed scenario for obtaining a contractor to run the airfield and a small public visitation program. The Navy indicated that approval would take about 6 months. Various scenarios for transition from the Navy to the Service were also discussed at this meeting.

D. PLANNING

2. Management Plan

The Department of Defense published it's recommendation for closure of Naval Air Facility (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 island by 30 June 1997.

The Closure of NAF Midway will dramatically affect management of Midway Atoll NWR. Environmental cleanup activity associated with base closure will dominate Refuge management for the next few years.

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 (ecotourism). 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 1995, negotiations with the private sector will be initiated. Hopefully, some kind of mutually beneficial agreement can be developed. In the present fiscally austere climate, future management of Midway Atoll NWR, without outside assistance, may exceed Service budget constraints.

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 the past the Navy has been issued a Special Purpose Migratory Bird Permit (PRT-780105) to allow for the take of birds in relation to emergency base operations. In anticipation of conflicts between base closure projects and nesting seabirds, this permit was canceled and replaced by Federal Fish and Wildlife Permit #PRT-790696 on 10 June 1994, which was issued to the Manager, Pacific/Remote Islands NWR Complex. This permit was issued to allow for a more 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 will 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 in order 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 2 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 2 conditions: 1)The Navy undertake conservation planning for each major cleanup project; and 2)The Navy provide funding to the Service to assist with this planning, provide training to construction workers, and to assist with site preparation.

Grudgingly, 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.

An Environmental Assessment and Section 7 consultation were completed for implementation of a rat eradication plan on Eastern and Spit Islands. The Finding of No Significant Impact was signed on August 1, 1994.

5. Research and Investigations

During 1994, Four research projects were conducted by independent researchers 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-01-94 "Gene Flow and Genetic Structure of Hawaiian Seabird Colonies" Dr. Scott V. Edwards, University of Florida

From 5-12 May, Dr. Edwards collected a total of 279 blood samples from 12 seabird species that nest at Midway Atoll. Data from analyses of the genetic makeup of these samples and samples collected from other seabird colonies will be used to examine the extent of gene flow between individual nesting colonies. These samples will be permanently stored in the Burke Museum, University of Washington in Seattle, WA and will be made available to other researchers upon request.

MID-02-94 "Hawaiian Monk Seal Population Research at Midway Atoll" William Gilmartin, 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. During March and early April, the Midway Atoll Hawaiian monk seal population was surveyed by National Marine Fisheries Service personnel. They conducted beach patrols on Sand, Eastern, and Spit Islands recording numbers and identifying individuals by flipper tags or by making a photographic record of natural markings. They identified 29 different seals at Midway during their observations. Probability calculations suggest that they found all, or nearly all, seals using Midway during March 1994.

MID-09-94 and MID-01-95 "Contaminant Uptake in Two Species of Albatross in the North Pacific Ocean" James Ludwig, The SERE Group, Ltd

In 1994, the SERE Group completed the second and began the third seasons of a planned 3-year study which assesses 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 seeks to confirm the presence of PCH and other chlorinated contaminants in the pelagic albatrosses of Midway and to evaluate the presence of toxic effects in the young of these albatrosses. The objectives include 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 continued their second year's work from January through 28 July and returned in early November to begin the third year of monitoring the impacts of contaminants on albatross at Midway Atoll.



Dr. James Ludwig and Cheryl Summer taking a blood sample from an adult black-footed albatross. [JH 12/94]

MID-10-93. Effects of Rat Predation on Bonin Petrel (*Pterodroma hypoleuca*) Reproductive Success at Midway Atoll. Nanette Seto, U.S. Fish & Wildlife Service.

Cooperative education student, Nanette Seto, completed the final year of a two-year study examining the effects of 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.

To examine the effects of rat predation on Bonin Petrel reproductive success, Seto developed a closed circuit miniature

camera system which had infrared sensors and was linked to a small TV monitor for viewing. Out of a total of 269 nests studied during 1993 and 1994, 96 (58 with known causes) nests failed. Causes of nest failure included rat predation, nest abandonment, egg infertility, and burrow destruction. Rat predation was the primary cause of nest failure. In both years, a total of 46 nests (79% of the total nest failures with known causes) failed due to rat predation. All observed rat predation was of eggs.

Only six nests failed during the chick stage. These nests were either completely empty or caved in. There were no observations of rat predation on chicks in study nests. However, Seto did observe chick body parts near burrow entrances in other Bonin Petrel nesting areas around the island that may have been killed or scavenged by rats. Bonin Petrel reproductive success generally increased in areas where rat populations were controlled by rodenticides.

Seto constructed 30 artificial nest boxes with hinged lids to facilitate observation of nesting Bonin petrels. A total of nine pairs of petrels attempted to nest in the boxes. Five pairs laid eggs and incubated through to the hatching period. However, only four eggs successfully hatched. The remaining egg was inviable and the pair eventually abandoned the egg. Nest boxes were checked everyday throughout the breeding season to monitor incubation shifts, chick growth, and feeding frequency.

The mean incubation shift observed was 6.8 days per shift. The average shift by a female was 6.18 days (range: 1 to 11 days) and males 8.15 days (range: 1 to 13 days). Mean chick mass ranged from 40.25 g (n=4) at hatching to a maximal mass of 297.5 g (N=4) at age of 66 days. After maximum mass at 66 days, mean chick mass declined until fledging. The maximum mass of a chick was 331 g (62% higher than the mean adult mass (204 ± 22 g, n=100) in a chick 68 days old.

The mean feeding frequency observed was one feeding every 2.12 nights. The longest period a successful chick went without a feeding, excluding the period immediately prior to fledging, was 7 days. The period prior to fledging (period of starvation) in which chicks were not fed ranged from 7 to 11 days with a mean of 8.7 days (n=3). Fledging occurred at a mean mass of 188 ± 10.1 grams (N=3), 92% of mean adult mass.

Seto measured culmen length, tarsus length, wing chord, and mass of 50 adults of each sex (females were identified by the presence of distended cloacae after egg laying) to determine if these parameters could be used to determine sex. Statistical tests between means of these parameters showed no significant differences between sexes.

Seto also examined burrow structural integrity and reoccupation during her two-year study. Thirty-six (25%) of 144 marked burrows were reoccupied, 59 (41%) collapsed and 49 (34%) were intact but unoccupied during the second (1994) breeding season. Fifteen of the 36 burrows that were reoccupied, were successful for both years, while eight failed in both years.



Volunteers Carter Atkinson (left) and Andrew Durand assist Seto with mist-netting Bonin petrels. [NS 2/94]

Seto also conducted a capture-recapture project to test the technique for estimating the Bonin petrel's breeding population. Mist-nets were used to capture petrels in three areas during their egg laying period. Each area represented burrow densities of low, medium, and high. Population estimates in each area were used to extrapolate an estimate for the entire island. These

calculations resulted in an estimate of 4,702 breeding pairs. To compare the accuracy of this capture-recapture estimate, Seto surveyed the same three study areas with her burrow camera. This survey resulted in an estimate of 32,066 breeding pairs. This large discrepancy between the two estimates has lead Seto to question the accuracy of the capture-recapture technique. Further studies are planned with the goal of improving the reliability of the capture-recapture technique. The advantage of this technique will be the elimination of habitat disturbance (burrow destruction) which often occurs when censusing burrows.

E. ADMINISTRATION

1. Personnel .

Michael L. Nishimoto, Refuge Manager, GS-486-09, EOD 5/4/92
Transferred to Kealia Pond NWR (Maui, HI) on 9/15/94.

Kenneth R. Niethammer, Wildlife Biologist, GS-486-09, EOD
6/25/94. Transferred from Red Rock Lakes NWR (MT). Acting
Refuge Manager 9/15/94 through end-of-year.

Nanette W.H. Seto, Student Trainee/Wildlife Biologist,
GS-499-07, EOD 12/27/92.

Donna L. O'Daniel, Wildlife Biologist (BRAC), GS-486-7, term
position, EOD 3/28/94, end-of-assignment 7/22/94. Transferred to
Ecological Services (Tinian, MP)

Jon K. Hale, Fish and Wildlife Biologist (BRAC), GS-401-11, EOD
10/16/94. Transferred from Ecological Services (Honolulu).

Anthony Viggiano, BRAC Biological Science Technician, GS-404-5,
temporary position, EOD 4/01/94, end-of-assignment 11/12/94.

Jessica M. Schillaci, BRAC Biological Science Technician, GS-404-
5, temporary position, EOD 7/15/94.

Theresa A. Moore, BRAC Laborer, WG-3502-3, temporary position,
EOD 6/15/94.

Katherine E. Swift, BRAC Laborer, WG-3502-03, temporary
position, EOD 6/15/94, end-of-assignment 07/15/94.

Refuge Staffing, 1989 - 1994

Year	Permanent Full-Time	Permanent Part-Time	Term	Temporary	Total FTE
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.



Refuge Manager Mike Nishimoto (L), BRAC Biologist Donna O'Daniel, BRAC Biological Science Technician Anthony Viggiano, and Wildlife Biologist Trainee Nanette Seto. [KS 4/94]



BRAC Biological Science Technician
Jessica Schillaci (top), BRAC
Biologist Jon Hale (left), Wildlife
Biologist Nanette Seto (center),
Volunteer Laura Megyesi (right), and
BRAC Laborer Theresa Moore (bottom).
[KN 12/94]

4. Volunteer Program

Volunteers who worked on Midway Atoll NWR, 1994.

Name	Begin	End
Scott Richardson	-	11 Jan
Andrew Durand	11 Jan	7 Apr
Katie Swift ¹	11 Jan	15 Jun
Karen Wilson ¹	11 Jan	30 Jan
Bob Dusek ¹	30 Jan	11 Feb
Marsha Dusek ¹	30 Jan	11 Feb
Carter Atkinson ¹	11 Feb	20 Feb
Theresa Moore ²	9 Apr	15 Jun
Laura Megyesi	7 Dec	-

¹These volunteers were sponsored and supported by Nanette Seto's Master's Degree research project on Bonin petrels.

²Theresa Moore continued volunteering her time to monitor albatross and brown noddy Repro-Success study plots after her 15 June appointment to the BRAC laborer position.

Volunteers assisted the refuge staff with biological surveys and censuses, wildlife interpretation, preparing interpretive displays, monitoring of construction activities, rescuing trapped birds and other Refuge work.

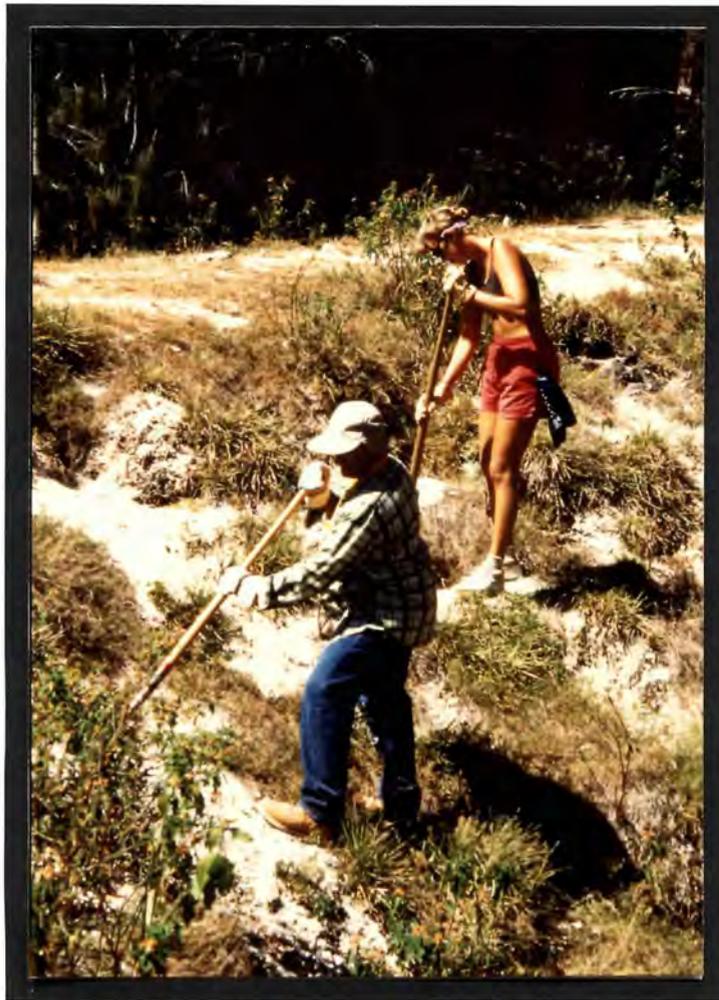
5. Funding

Refuge funding for last 2 years.

FY	(1261)	(1262)	<u>REIMBURSABLE</u>		TOTAL
	OPERAT	MAINT (MMS)	UST ¹	RATS ²	
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.



Volunteers Theresa Moore (foreground) and Katherine Swift both converted to BRAC Laborer positions after their volunteer assignments. [KN 11/93]

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.

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 with the Navy providing funding for one fish and wildlife biologist and one biological technician. These two personnel worked exclusively on underground storage tank (UST) removal projects until mid-year. In July, as base closure activity escalated, the Navy provided additional funding for a second biological technician or laborer position. 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 of new contractor personnel.

8. Other Items

Fish and Wildlife Service Personnel Visits

Pacific Remote Islands National Wildlife Refuge Complex (PRINWRC) Manager Ken McDermond and Ecological Service's Resource Contaminant Specialist Jon Hale and other members of a BRAC working group visited Midway between 11 and 18 January to conduct some on-site investigations regarding base closure activities.

In June, Andy Yuen the Land Protection Coordinator from the Hawaii & Pacific Islands NWR Complex office arrived for a short visit via a Coast Guard C-130.

National Biological Survey veterinarian Thierry Work, his assistant Bob Rameyer, and volunteers Allison Beale and Lawrence Ames visited Midway between 16 and 23 June. The purpose of their visit was to gather data for his albatross lead ingestion study. (This isn't FWS, shouldn't it be in R&I section?)

On 28 July, Beth Flint (PRINWRC Biologist) and Chris Swenson (Contaminants Biologist from Ecological Services), arrived to assist OGDEN personnel with selecting sites and developing access routes for an extensive contaminant study on both Sand and Eastern Islands. Beth stayed for two weeks and Chris for a week.

Chris Depkin (Johnson Atoll NWR Biologist) was temporarily detailed to Midway for two weeks while waiting permission to return to Johnson Atoll which had been heavily damaged by hurricane "John". Chris arrived on 15 September. During his stay, Chris set up Midway's new 486 computer, organized computer software, "cleaned-up" hard drives on the other Refuge computers, and assisted with monitoring BRAC activities.

On 6 November, Robert Smith (Pacific Islands Ecoregion Manager) and Ken McDermond visited Midway with representatives of Phoenix Air (Ned Neely, Mark Thompson, Bob Wilson, and Rob Webster) for a 2-day review of existing facilities and exploration of the feasibility of future use of Midway by Phoenix Air.

NAF Midway Islands

In September, 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.

Lt. Commander Dave Watts and Lt. Commander Randy Hoffman each filled in as temporary OICs while OIC Lt Commander Jim Ray was in Honolulu on business. Chief Petty Officer Gregg Diefenderfer also filled in as acting OIC for one week in July.

In October, NAF Midway underwent a change of OICs. Lt. Commander Jim Ray departed Midway on 14 October after completing his tour at NAF Midway Islands. Lt. David Black arrived 6 October and assumed OIC responsibilities upon LCDR Ray's departure.

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

Pigunig Management Corporation

During 1994, PMC, the base operations support contractor for NAF Midway Islands, experienced a major turnover of management personnel. New staffing included: Project Manager Jim Cummings, Logistics Manager Hawk Jacques, QC/Safety Manager Rick Summers, Harbor Master Nick Brooks, Craft Master Leonard Richardson, Airfield/Communications Chuck Pomaski, and Facility Maintenance John Rhea.

Vessel Arrivals

On 3 January, the ship *Lok Priti*, transporting wheat from Portland to Japan, was granted permission to anchor offshore and use Midway as a base to make repairs after she was battered by a winter storm. The ship departed on 15 January.

The NOAA vessel *Townsend Cromwell* arrived on 12 February. She departed the following day.

The cargo ship *Green Wave* arrived on 18 April. She departed the next day after unloading supplies for Midway.

The Oiler *Indian Ocean* came into port on 16 July to deliver fuel.

The fishing vessel *Linnea C* declared an emergency due to leaks around her propeller shaft and was permitted entry to Midway on 17 July. She was a long-line vessel with a crew of four. The

vessel was in port for several weeks waiting for parts and making repairs. While in port, members of the crew reported that the captain of the vessel had become intoxicated, scuffled with other members of the crew, and ended up pulling a knife and threatening one of the deck hands. The crew member also reported that the captain had kicked and killed an albatross chick while intoxicated. Midway staff (Navy, PMC, and FWS) investigated the incident. The Captain of the vessel ended up being relieved of duty and shipped off on the next AMC flight. No hard evidence existed in regards to the albatross incident so the matter was not pursued.

The Coast Guard Cutter *Monroe* came in for a 2-day visit on 27 July. She had a crew of about 190.

The Coast Guard Buoy-Tender *Sassafras* and cutter *Washington* visited Midway from 13 through 21 August. The *Sassafras* worked on the Atoll's navigation buoys and served as mother ship for the *Washington* which was patrolling the Northwestern Hawaiian waters looking for illegal boat traffic.

A barge, loaded with equipment for the OGDEN and OHM projects, arrived on 22 September. The equipment was for OGDEN's contaminant survey work and for OHM's Fuel Farm 3 tank-removal project.

The Japanese fishing vessel *Kyoya Maru #1*, which had been discovered fishing illegally in U.S. waters by a Coast Guard C-130 patrol and directed to come to Midway, was boarded by Coast Guard and National Marine Fisheries law enforcement personnel on 16 October.

On 5 December, the cargo ship *Green Wave* once again visited Midway. She departed the next day after unloading supplies.

Another barge came in on 20 December to remove equipment used by OGDEN during their contaminant survey of Midway.

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.

3. Forests

Stands of introduced ironwood trees (*Casuarina equisetifolia*) occur on both Sand and Eastern islands. Ironwoods were removed from Spit Island in 1991. Several other species of ornamental trees have been introduced to Midway over the last half century.

5. Grasslands

Lawns and open areas cleared of brush and dense trees by base contractor personnel through mowing and brushing operations were heavily used by nesting albatrosses. Reduced mowing and brushing operations, as envisioned in the base closure planning, will result in loss of open grassland habitat to thick brush and forests.

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 a beach cleanup day on Sand Island where many of the island's residents spend the afternoon clearing trash and debris from the beaches.

Entanglement hazards on Spit and Eastern Island beaches were removed by FWS and ADC personnel. Recreational divers and snorkelers assist with removing some of the more dangerous net debris from piers and reefs. In August, Coast Guard divers assisted with removal of nets that they found near navigational buoys.

10. Pest Control

The Service entered into a cooperative agreement with the U.S. Department of Agriculture's Animal Damage Control (ADC) Program to eradicate roof rats (*Rattus rattus*) on Eastern and Spit Islands, at Midway Atoll. This project was funded in FY93 and FY94 by the Department of Defense Legacy Resources Program. Rats were unintentionally brought to the atoll during WWII. The 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 been attributed to rat predation. Rats are also herbivorous and have made major impacts on native vegetation.

Pesticide use Proposals were submitted and received for use of rodenticides containing Brodifacoum and Bromethalin. An environmental assessment and an internal Section 7 consultation were also completed.

In August, ADC biologist Jim Murphy, assisted by four laborers provided by Piquini Management Corporation, the base contractor, began rat eradication efforts on Eastern and Spit Islands. Phase I, 90 days of intensive trapping and baiting, was completed by mid-November. Refuge staff began Phase II, two-year maintenance of poison-bait stations, in December.

Our efforts seem to have been successful: no rats have been observed on Eastern Island since mid-October. Poison stations will be maintained for the next two years and periodic live-trap sampling will be conducted to ensure total removal of the rat population.

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. Control efforts have been increased around boat dock facilities and the eastern end of Sand Island to prevent rats from getting from Sand Island to Eastern and Spit Islands. Hopefully, we can also eradicate rats from Sand Island in the near future.



Jim Murphy and crew with the day's catch. [JM 9/93]

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

Introduced ironwood trees out-compete native shrub vegetation that provide nesting habitat for red-tailed tropicbirds, red-footed boobies, great frigatebirds, black noddies, and brown noddies. Another introduced species golden crown-beard (*Verbesina encelioides*) also presents a future habitat management problem. This dense-growing, rapidly spreading plant may reduce the quality of nesting habitat for albatrosses and burrowing seabird species. One management priority for 1995 is to develop a vegetation management plan that addresses present and potential habitat problems associated with exotic plants.

14. Contaminants

In 1994, contaminant cleanup activities related to base closure and Navy demobilization included: 1) an initial survey of potentially contaminated sites; 2) site investigation to confirm or deny suspected contaminant issues; 3) survey of lead-based paint and asbestos-containing material; 4) test burn of Building 4140; 5) underground storage tank (UST) and fuel pipeline removal; and 6) explosive ordinance disposal (EOD) on Eastern Island. Following is a brief discussion of each of these activities.

1. An on-site survey of potentially contaminated sites was conducted 11-18 January. Participants included NAF Midway, PACDIV Command, OGDEN, NMFS, and the FWS. The purpose of the survey was to familiarize all participants with potential contaminant issues at Midway and to provide initial input into the creation of an Environmental Baseline Survey and Base Closure Plan.

2. A site investigation was conducted by OGDEN Environmental from August through November. Soil, water, and soil vapor samples were collected from throughout Sand and Eastern Islands. Additional sampling schemes and ground water monitoring wells were established in any suspected contaminated sites like landfills, drum storage areas, etc. Samples were also collected from the marine environment surrounding Sand and Eastern Islands. Analytical results from the site investigation will be used to assist the BRAC Cleanup Team and BRAC Project Team in decisions affecting the direction of future cleanup projects.

3. OGDEN Environmental conducted an Atoll-wide survey to determine the extent of lead-base paint and asbestos-containing material in operational and abandoned structures. The data from this survey will assist BRAC Cleanup Team and Project Team members in decisions relating to abatement alternatives. The analytical data will be summarized in a report expected to be complete during the first quarter of 1995.

4. A test burn of Building 4140, a wooden structure, was conducted in November. The purpose of this test was to provide air and ash samples for contaminant analysis. Sample analysis will focus on heavy metals which are known to be present in



Installation of groundwater monitoring well near seaplane hangar on Sand Island. [JH 11/94]

paint on the building (*i.e.*, lead based paint). Asbestos containing materials were removed from the building prior to the test burn. The analytical results from this test burn will be used in decision making with respect to the removal of other buildings on Midway.

5. During the Phase I of underground storage tank removal, 97 USTs were removed from various locations on Sand Island and eleven were removed from Eastern Island (one above ground storage tank was also removed from Eastern Island). Tank removal operations began in early April and continued through the year. About 5 miles of underground fuel pipelines were removed from Sand Island. Pipelines running under essential

roadways, runways, and the sea plane hanger tarmac were not removed. These are to be inerted (flushed and filled with cement) and left in place. There were no fuel pipelines on Eastern Island.



Excavated underground storage tanks staged on seaplane hangar tarmac prior to dismantling and shipment off island. [TM 11/94]

Phase II of the underground storage tank project, removal of tanks in Fuel Farm 3, began in July. Tanks in this fuel farm are huge, ranging from 420,000 to 2.3 million gallon capacity. During July through October, as part of the conservation plan developed to reduce wildlife/construction conflicts, trees were removed from the site and the area was covered with Mirafi fabric to prevent Bonin petrels and albatrosses from nesting. Actual demolition began in October. Four of the 13 tanks in this Fuel Farm 3 were removed in 1994. Removal of the nine remaining tanks is anticipated to be complete by July 1995.



PMC laborers removing trees from the Fuel Farm 3 site.
[TM 6/94]



Fuel Farm 3 after trees were removed and Mirafi fabric was installed to prevent albatross and Bonin petrel nesting at the work site.
[TM 11/94]



OHM crew excavating and removing one of the Fuel Farm
3 tanks. [JH 12/94]

6. Explosive Ordinance Disposal (EOD) on Eastern Island was conducted in December on Eastern Island by Navy EOD specialists from Honolulu. The disposal event involved burning ammunition that was found in conjunction with Eastern Island cleanup projects. The ammunition was collected by EOD specialists as it was located and reported by cleanup workers. Over a several month period several thousand rounds were located. Ammunition recovered and burned consisted mostly of 30 and 50 caliber cartridges.

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 between 26 February and 21 March. The purpose of the assessment was 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.

Indefinite Quantity (IQ) Projects are developed to specifically remediate wildlife hazards identified by the hazard survey. IQ projects are carried out by the on-site base operating services contractor, Piquiniq Management Corporation.

In 1994, intensive effort was put into eliminating wildlife hazards on Eastern Island. Cleanup activity began in September and continued for the remainder of the year. Eastern Island IQ projects included:

- removed antenna debris from beach areas
- removed poles and overhead wires
- removed antenna ground planes and guy wires
- removed submarine netting and floats from beach
- demolished microwave tower
- disposed of all Navy debris above high water line
- demolished building 9122 (Quonset hut)
- removed abandoned minor property from buildings
- consolidated abandoned materials
- filled pits and voids

Materials collected during the Eastern Island cleanup projects have been staged on the abandoned runway. A final decision on disposal (landfill or transported off island) of this material is pending.



Antenna debris on southeast beach of Eastern Island
before cleanup. [File slide 11/94]



Southeast beach on Eastern Island after removal of
antenna debris. [JS 11/94]

Wildlife hazard abatement will continue throughout the base closure and cleanup period. Electrical lines, injure or kill a number of seabirds. The Navy has begun removing all unnecessary overhead lines and poles. The Service has stipulated that all future electrical lines shall be underground lines to eliminate this hazard.

The base had numerous fenced enclosures. These enclosures allowed albatross to land, but were not large enough to allow the birds to take flight and escape. In 1994, the HAZMAT, Fuel Farm, and water-treatment plant fences were all removed. These were the last of the major entrapment fences at Midway.



Bone graveyard of albatrosses trapped within a fenced area. In 1994, these fence-entrapment areas were all eliminated. [CC ?]

Open 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 1994. Extensive efforts will be made to fill Sand Island "death" pits in 1995.



Entrapment of Laysan albatrosses in a storm drain which was left uncovered. [JH 11/94]

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.

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.

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.

Mowing of lawns, brush cutting, and tree trimming can result in the disturbance, abandonment, or destruction of eggs or chicks.

G. WILDLIFE

1. Wildlife Diversity

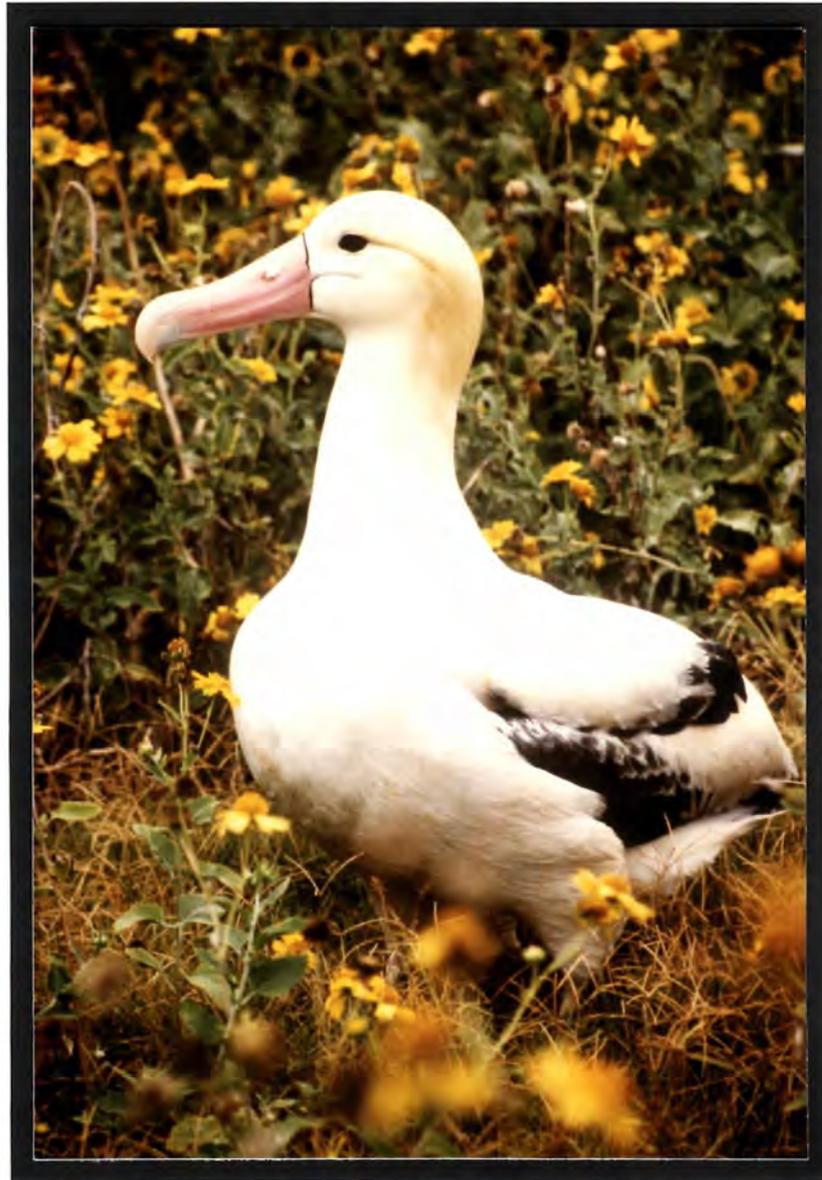
Many islands within the Pacific/Remote Islands NWR Complex, are managed with the intent of restoring and maintaining their pre-human floral and faunal diversity. Currently, the flora and fauna of Midway Atoll is probably far more diverse than pre-human occupation. This is due to the introduction of many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



Adult short-tailed albatross locally know as a golden gooney. [TM 11/93]

In the early 1960s, a pair of short-tailed albatross successfully nested for several years. Since 1963, no successful nesting has occurred. Two short-tailed albatross individuals (white 000 and yellow 015) were observed frequently on Sand Island during the 1993/94 breeding season. The younger individual (yellow 015) was believed to have laid an egg in November 1993. Yellow 015 attended (incubated) the egg from 9 November until 9 December. Then the egg was abandoned.

The subadult (yellow 015) was observed on Eastern Island on 28 February. Late in the 93/94 breeding season (March), the two individuals were observed courting on at least two occasions at the site where the older bird (white 000) resides.

In October 1994, the beginning of the 1994/5 nesting season, both of these individuals returned to Midway. They did not seek each other out and no eggs were laid. The older bird (000) remained at Midway for several weeks, then disappeared. The juvenile (015) was sighted throughout the remainder of the year.

Midway's population of endangered **Hawaiian monk seals** 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, then 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. Efforts to decrease human disturbance and other management actions may be showing some promise.

Four Hawaiian monk seal pups were born in 1994 (2 on Eastern Island and 2 on Spit Island). None of these pups were tagged. L. L. and K. V. Eberhart, volunteers for National Marine Fisheries Service, were on Midway from 5 to 31 March. 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 Island indicated an average beach count on Sand Island of 4.3 seals and on Eastern Island, 6.4 seals. The overall average beach count for Midway was 12.7

seals, excluding pups born in 1994. During the March survey, 29 different seals were identified at Midway. Individual seals were identified by bleach markings and tags.

Immature and subadult threatened **green sea turtles** (*Chelonia mydas*) were common in Midway's waters. Adults are less common. Few turtles bask on Midway beaches, but occurrence of basking turtle have increased in recent years. There are no historic records of turtles nesting at Midway.

3. Waterfowl

Waterfowl do not regularly migrate to or overwinter at Midway. However, each year a few misguided birds arrive at Midway. In 1994, green-winged teals (*Anas crecca*), northern pintails (*Anas acuta*), Eurasian wigeons (*Anas penelope*), American wigeons (*Anas americana*), and buffleheads (*Bucephala albeola*) were occasionally observed in protected marine waters or ephemeral ponds and catchments.

5. Shorebirds, Gulls, Terns and Allied Species

Common, non-breeding, migratory shorebird species that overwintered 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*), and sharp-tailed sandpiper (*Calidris acuminata*)

Least/Little Tern

Two individuals were observed at the Catchment Pond from 28 May to through early-July.

Gray-backed Tern

The first of the season observations were made on 19 February on the channel markers. Others were seen on Sand and Spit Islands by 17 March. The first eggs of the season were observed on 29 March on Eastern Island. Chick started hatching by 13 May. By the end of September, all chicks had fledged.

Sooty Tern

Adults were first heard calling overhead on 16 February on Sand Island. By 8 March, 2,000 to 7,000 Sooty terns were observed in the air over Eastern Island. The first eggs of the season were observed on 21 April. The first chicks of the season were observed by 25 May on Eastern Island and hatching continued throughout June. By the end of September, chicks all had fledged.

Brown Noddy

In 1994, reproductive success study plots were monitored. Egg laying occurred from 3 May through 15 October. The first egg of the season occurred on 3 May in the study plot on the south side of the runway near the NAVFAC buildings. Nests were observed later in the month in the Taxiway study plot. A total of 164 nests were monitored in the NAVFAC plot and 13 nests were monitored in the Taxiway plot. In the NAVFAC plot, 52% of the nests were successful and in the Taxiway plot, 31% were successful. Twenty-six nests, 34%, failed during the egg stage. These eggs appeared to be eaten by rats since they were either completely missing or only egg shell fragments remained in the nest. Thirty nests, 39%, failed during the chick stage. These chicks completely disappeared from the nest and could have been taken by rats or Frigatebirds.

Black Noddy

Black Noddies were observed nesting from January through August. Eggs and young chicks were observed during January. Chicks of all stages were observed during February with several close to fledging by the end of the month. The 1994 nesting season appeared to be coming to an end by late August. By early October, adults were observed picking up nesting material, and thus the onset of the 1995 had approached.

White Tern

Scattered eggs and chicks were observed by the end of January. Egg laying increased during March through June. The nesting season seemed to be coming to an end by late August.



Two curious white tern adults.

[KN 11/94]

Gull spp.

Two unidentified gulls in juvenile plumage was observed on Eastern Island in January and March. Another or same gull was observed on Spit Island on 18 February. One gull in winter plumage was found dead on 2 March in the inner harbor on Sand Island. Another unidentified gull was observed at the catchment pond on Sand Island on 18 March.

6. Raptors

Norther Harrier (*Circus cyaneus*) was observed overhead on Sand Island during early January.

7. Other Migratory Birds

Laysan and Black-footed Albatross

Midway has the world's largest colony of breeding Laysan albatrosses. During the 1991/92 breeding season, an atoll-wide count determined albatross populations of 429,308 breeding pairs of Laysan albatross. During the 1993/94 breeding season, we made

an estimate of $174,052 \pm 32,797$ (0.95 confidence level) breeding pairs of Laysan albatrosses on Sand Island from 20 x 20 m² random plots. This was similar to the 180,622 pair figure developed from the 1991/92 count.

During the 1991/92 breeding season, the atoll's black-footed albatross (*Diomedea nigripes*) population was 19,757 breeding. Because of a reported population decline at French Frigate Shoals, the refuge staff at Midway decided to conduct an atoll-wide count of breeding pairs to determine if the Midway black-footed albatross population was also declining. The count was conducted in early December and data was compared to an atoll-wide survey conducted in December 1991. The 1994/95 atoll population of 18,731 breeding pairs was down 5.2% from 1991; however, most of this decline could be attributed to nesting habitat being disturbed by the ongoing underground storage tank removal projects on Eastern Island. Data from Eastern Island (10,614 pairs), where nesting habitat was not as extensively disturbed, showed a 0.81% increase over the 1991 total.

The reproductive success of Laysan and black-footed albatrosses have been monitored on Sand Island since the 1991/92 breeding season. During 1993/94, 11 Laysan and 7 black-footed plots were randomly selected so the results would reflect reproduction at Sand Island. Among Laysan plots the hatching success of the first 25 eggs laid was not greater than randomly selected eggs (89.14% vs 84.57%; paired t-test, $P=0.09$). Similarly, chicks from the first 25 eggs laid was no more successful than randomly selected eggs (0.88 chicks fledged/egg hatched vs 0.84 chicks fledged/egg hatched; paired t test, $P=0.12$). By comparison, we recorded 0.77 chicks fledged/egg hatched in 1991/92 and the same rate in 1992/93. Differences between the 1993/94 data and previous years may be due to different plot locations. The lack of statistical differences in reproductive rates between the first 25 egg laid and randomly selected eggs may be helpful in future monitoring efforts.

Black-footed albatross had 0.83 chicks fledged/egg hatched in 1993/94. During the 1991/92 and 1992/93 seasons, black-footed albatross had 0.84 and 0.95 chicks fledged/egg hatched, respectively.

Bonin Petrel

The first eggs of the season were observed on 15 January. Chick were hatching by 7 March. By mid-June, most of the chicks have fledged. By early August, the number of adults arriving over the nesting colonies were increasing. A small number of adults were found in burrows during the day as early as 5 August.

Wedge-tailed Shearwater

Several adults were first observed at the golf course hill behind the All-Hands Club on 27 March. The first egg was observed on 8 June. By August, most of the eggs have hatched and chicks were about 1/3 grown. All chicks had fledged by late November.

Christmas Shearwater

The first adults returned to Eastern Island on 8 March. Eggs were first observed on 13 May. Approximately 123 adults were counted on Eastern Island between 13 and 14 May. However, only six birds were found on eggs at this time. Chicks were observed by June. Twelve chicks were banded in mid-September. All chicks had fledged by October.

White-tailed Tropicbird

A bird was observed incubating an egg in an ironwood tree near the water towers on 13 February. The chick had hatched by 12 March and fledged by 30 May. This chick was banded before fledging. A second bird on a nest was observed in the flower bed of Building 422 on 25 February. This is same site where a chick fledged in 1993. A day after hatching, the adult and chick were gone and what remained were downy feathers scattered around the nest site. The chick was probably attacked by a rat. On 9 December, a bird was observed incubating an egg in the same nest site near the water towers. By 11 December, the bird was gone and only egg shell fragments remained in the nest.

Red-tailed Tropicbird

Although present throughout the year on Midway, more birds were returning in January. February marked the start of egg laying period for this year. Chicks of various stages were commonly observed from June through August. By late August, egg laying was seemed to be coming to an end. By the end of the year, only a few late stage chicks were present.

Great Frigatebird

The first eggs of the season were observed on 8 March on Eastern Island. A total of 90 birds were counted on 17 March. A total of 57 nests and three chicks were counted among three colonies on 25 May. By June, most of the chicks were at stage "D" or younger.

Red-footed Boobies

A very small number of adults on eggs were observed on Eastern Island in January. Most of the colony were on eggs by 8 March. By May, most of the chicks had hatched, although some birds were still incubating. By the end of July, no eggs were observed and all of the chicks had hatched. Chicks were close to fledging age by late August.

Masked Booby

Two birds were commonly observed roosting on Eastern Island (near Area 5).

Brown Booby

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

9. Marine Mammals

An estimated 100+ Bottle-nosed dolphins (*Tursiops truncatus*) were observed 2-3 miles west of Frigate Point (outside the reef) on 17 June.

Our resident population of Spinner dolphins (*Stenella longirostris*) were regularly seen in the lagoon throughout the year. A dead spinner dolphin was found washed up near the boat ramp on 2 June.

10. Other Resident Wildlife

Midway's only terrestrial breeding bird species were the introduced common canary (*Serinus carius*) and common myna (*Acridotheres tristis*). In recent years, mynas have been observed depredating local gardens. 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 by predominantly reef fishes, are associated with Midway Atoll. Additional pelagic fish species occur in deeper waters within and outside the atoll.



Reef fishes

[TM 37/94]

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).

Blood samples from several seabird species were collected in 1994 (see Section D-5).

15. Animal Control

Piguniq Management Corp. (base contractor) used 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.

Historically, Bird Air Strike Hazard (BASH) was a major issue at Midway. In the 1950's and 60's this resulted in the killing of over fifty thousand albatross. Although BASH still exists, the Navy has not requested any assistance in alleviating the problem. Aircraft traffic at Midway has been much reduced since the 1960's.

16. Marking and Banding

In 1994, Refuge staff banded 2,955 birds.

Birds banded in 1994 by Refuge staff.

Species	LOCAL	ADULT	TOTAL
Black-footed Albatross	139 ¹	-	139
Laysan Albatross	367 ¹	-	367
Bonin Petrel	505	1830	2335
Christmas Shearwater	11	1	12
White-tailed Tropicbird	1	-	1
Brown Noddy	101 ¹	-	101
Total	1124	1831	2955

¹All of the albatross chicks and 62 of the brown noddy chicks were also color banded.

In 1994, the SERE Group banded several thousand adult and chick albatrosses and about 2 thousand white terns.

H. PUBLIC USE

1. General

There is no "public" access as such. The base has restricted access and base clearance must be acquired before arrival.

Residents must be employed or be a spouse of an employee at the facility. Visitors are allowed for specific projects or, in some cases, aircraft layovers and emergency ship repairs.

Midway is supplied by a weekly Air Mobility Command (Air Force) 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.

6. Interpretive Exhibits/Demonstrations

All arriving personnel were given wildlife briefings immediately after they stepped foot on Midway. These briefings were designed to inform the new arrivals of potential wildlife/human conflicts so that these conflicts could be avoided or minimized.

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.

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 1994, this site was regularly used by residents and visitors for cookouts.

16. Other Non-Wildlife Related Recreation

Other non-wildlife recreational pursuits included softball, tennis, motor boating, snorkeling, diving, beach combing, and beach volleyball. Equipment for the above was provided at nominal charges by base recreational services. These activities were not regulated by the Refuge unless conflicts with fish or wildlife were determined to exist.

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

4. Equipment Utilization and Replacement

In February, the Refuge received a new 17-foot Boston Whaler. It is equipped with a main 70 Hp and a backup 25 Hp outboard motors. This boat will augment the refuge's fleet which previously consisted of one Mark III Zodiac inflatable-boat.

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

5. Communications Systems

The Refuge depends on the Navy's Autovon telephone system for communications. The entire island depends on a single line and consequently the refuge had a terrible time communicating with the Complex office in Honolulu. Telephone communication was also available through the AT&T International line, but at international telephone rates.

6. Computer Systems

In August, the Refuge received a new 486 Acma computer. We now have two 486 and one 286 computers. We also received a new Laserjet4 printer. Presently, each computer has its own printer with the 486s hooked to the Laserjet and a Hewlett Packard Deskjet 500 printer and the 286 is online with a dot matrix printer.

New software purchased this year included Word Perfect updates, Sigmastat, and Sigmaplot.

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 area as office space. Plans are to move the museum exhibits to the main hangar building.

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). Options being examined range from a small scale FWS presence to an ecotourism operation.

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 is probably the most beneficial habitat management action that can be undertaken at Midway. We hope to be able to obtain funding for expanding the

rat eradication program, that was initiated on Spit and Eastern Islands in 1994, to Sand Island in the near future. Alien plant species now dominate the terrestrial landscape. In 1995, a management plan will be developed that will address control, eradication, and prevention of alien plant species and reestablishment of native plant communities.

4. Credits

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

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K. FEEDBACK

This has been a challenging year for the staff of the refuge and for complex office staff. The closure and ongoing cleanup of Midway have forced us to develop 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.

The base cleanup process will continue to be a challenge until the planned departure of the Navy in 1997. However, if we can continue the same level of communications, understanding, and cooperation over the next two and a half years we will have it made.

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 innovative and challenging goal anywhere in the continental mainland. At remote Midway it will be exceedingly so, but with greater risk. This effort will take a serious commitment of support from the regional office, primarily in terms of contract development and monitoring.

This is not to say that this isn't a great project with benefits to wildlife and the public, but the pit falls must be identified, acknowledged, and addressed with reasonable solutions.